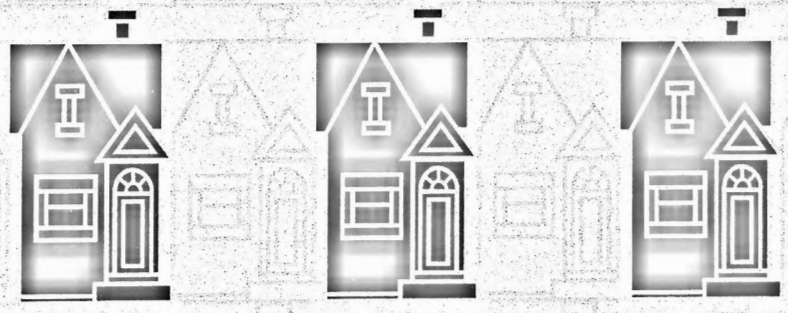
An Actuarial Review for Fiscal Year 1996 of the Federal Housing Administration's Mutual Mortgage Insurance Fund

Final Report

February 14, 1997



Price Waterhouse LLP

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Price Waterhouse LLP

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February 14, 1997

The Honorable Nicolas P. Retsinas
Assistant Secretary for Housing -- Federal Housing Commissioner
451 Seventh Street, SW
Room 9100
Washington, DC 20410

Dear Mr. Retsinas:

The Cranston-Gonzalez National Affordable Housing Act requires an independent actuarial analysis of the economic net worth and soundness of the Federal Housing Administration's Mutual Mortgage Insurance (MMI) Fund. We have completed the fiscal year 1996 Actuarial Review of the Mutual Mortgage Insurance Fund and summarize our findings below.

The primary purpose of our review was to estimate

- the economic value of the MMI Fund, defined as the sum of existing capital plus the net present value of current books of business

- the current and projected capital ratio, defined as the economic value divided by the total insurance-in-force.

We estimate that the MMI Fund's economic value was $9.397 billion at the end of fiscal year (FY) 1996 and that the capital ratio was 2.54 percent. We project that in FY 2000 the Fund's economic value will be $14.825 billion and that the capital ratio will be 3.57 percent.

The estimates presented here require projections of events more than 30 years into the future. These projections are dependent upon a number of assumptions, including economic forecasts by DRI/McGraw-Hill and the assumption that FHA does not change its refund and premium policies. To the extent these assumptions, or others, are not accurate, the actual experiences will vary from our projections.

The full actual report explains these projections and the reasons for the improvements since last year's actuarial review. If you have any questions, please feel free to call Barry Dennis at (703) 741-1265.

Very truly yours,

Price Waterhouse

200 East Randolph Drive
Chicago, IL 60601

Telephone 312 540 1500

Price Waterhouse LLP

FEDERAL HOUSING ADMINISTRATION'S
MUTUAL MORTGAGE INSURANCE FUND

ACTUARIAL REVIEW FOR FISCAL YEAR 1996

I have reviewed the "Actuarial Review for Fiscal Year 1996 of the Federal Housing Administration's Mutual Mortgage Insurance Fund", dated February 14, 1997 (Actuarial Review). The objective of my review was to determine the reasonableness of the methodology used, the underlying assumptions applied, and the resulting estimates derived therefrom.

The Actuarial Review was based upon data and information prepared by the Federal Housing Administration (FHA). In this regard, I have relied upon the FHA for its accuracy and completeness. In addition, I also relied upon the reasonableness of the recently prepared future economic outlook by DRI/McGraw Hill, from which the base case used in the Actuarial Review was derived.

Based on these reliances, it is my opinion that on an overall basis the methodology and underlying assumptions used in the Actuarial Review are reasonable. Although actual experience will not develop exactly as projected, the estimates made are within a reasonable range of probable values as of this time.

Sam Gutterman, FSA, FCAS, MAAA
Chicago, Illinois
February 14, 1997
(312) 540-2330

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Executive Summary

The Cranston-Gonzalez National Affordable Housing Act (NAHA) requires an independent actuarial analysis of the economic net worth and soundness of the Federal Housing Administration's (FHA's) Mutual Mortgage Insurance (MMI) Fund. This report presents our findings with respect to this required analysis for fiscal year (FY) 1996.

The primary purpose of our review was to estimate

- the economic value of the MMI Fund, defined as the sum of existing capital plus the net present value of current books of business, and
- the current and projected capital ratio, defined as the economic value divided by the total insurance-in-force (IIF).

A. Status of the Fund

NAHA mandated that the MMI Fund achieve a capital ratio of at least 1.25 percent by fiscal year 1992 and a capital ratio of at least 2.00 percent by FY 2000. Last year's Actuarial Review estimated that the MMI Fund's capital ratio at the end of FY 1995 was 2.05 percent, the first time it exceeded the 2.00 percent year 2000 requirement. This year, as a result of continued strengthening in the Fund, we estimate that the FY 1996 capital ratio has increased to 2.54 percent, again meeting the FY 2000 statutory requirements of NAHA. We also estimate that the FY 2000 capital ratio will be 3.57 percent. Exhibit ES-1 provides our estimates of the Fund's current and future economic value and capital ratio.

In describing the capital ratio, NAHA stipulates the use of unamortized insurance-in-force. However, "unamortized insurance-in-force" is defined in the legislation as "the remaining obligation on outstanding mortgages" -- a definition generally understood to apply to amortized IIF. Price Waterhouse continues to use the unamortized IIF measure (as generally defined) in calculating the capital ratio, although it is also instructive to consider the capital ratio based on amortized IIF, which is the basis the General Accounting Office used in its April 1996 report on the status of the Fund. Our estimate of the FY 1996 capital ratio using amortized IIF is 2.71 percent and our estimate of the FY 2000 capital ratio is 4.01 percent. Unless stated otherwise, all references to the Fund's capital ratios in this report refer to the ratio computed using unamortized IIF.

B. Sources of Change in the Status of the Fund

Change in Economic Value from FY 1995 to FY 1996

We estimate the economic value of the MMI Fund to be $9.397 billion at the end of FY 1996, which represents an increase of $2.311 billion over our estimate of the FY 1995 value reported last year. This 33 percent increase in the estimated economic value of the MMI Fund, which accompanied a 7.3 percent increase in the unamortized IIF, resulted in the capital ratio increasing by 0.49 percentage points from 2.05 percent to 2.54 percent.

Exhibit ES-1

Projected MMI Fund Performance for FYs 1996 to 2000 ($ Millions)

Fiscal Year	Economic Value of the Fund[a]	Capital Ratio	Volume of New Endorsements	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,397	2.54%	$58,863	$370,484	$1,377	n/a
1997	$10,670	2.80%	$41,210	$381,671	$990	$282
1998	$11,947	3.05%	$40,796	$392,076	$957	$320
1999	$13,306	3.31%	$42,082	$402,027	$1,001	$358
2000	$14,825	3.57%	$45,904	$414,734	$1,120	$399

[a]All values are as of the end of each fiscal year. The economic value for future years (FYs 1997 through 2000) is equal to the economic value of the Fund at the end of the previous fiscal year, plus the interest earned on the Fund's balances in the current year, plus the economic value of the new book of business.

Current Estimate of FY 1996 Economic Value Compared with the Estimate Presented in the FY 1995 Actuarial Review

This year's estimate of the FY 1996 economic value is $1.224 billion higher than the economic value projected for FY 1996 in the FY 1995 Actuarial Review. The difference is primarily attributable to changes in economic forecasts. The higher than previously forecasted interest rates and a higher predicted growth in house prices resulted in lower claim and prepayment rates in the near future and increased the estimated economic value by $945 million. The combined effect of all other changes, including changes in data, estimates of current and future origination volumes, and technical refinements, resulted in a net decrease of $187 million in the Fund's estimated FY 1996 economic value. Table ES-2 provides a breakdown of the changes in the Fund's economic value between FY 1995 and FY 1996.

Exhibit ES-2

Summary of Changes in MMI Fund Estimated Economic Value Between FY 1995 and FY 1996 ($ Millions)				
	Change in FY 1996 Economic Value	FY 1996 Economic Value	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1996 Economic Value Presented in the FY 1995 Review Excluding the 1996 Book of Business:		**$7,086**		**3.24%**
Plus: Forecasted Value of FY 1996 Book of Business and Interest on Previous Business Presented in the FY 1995 Review	+$1,088			
Equals: **FY 1996 Economic Value Presented in the FY 1995 Actuarial Review**		**$8,173**		**3.24%**
Plus: FHA Data and Origination Volume Updates and FY 1996 Experience	-$113	$8,060	-0.08%	3.16%
Plus: Economic Forecasts	+$945	$9,005	+0.11%	3.27%
Plus: Econometric Model Refinements	-$154	$8,851	+0.09%	3.36%
Plus: Adjustments to Financial and Cash Flow Assumptions	+$546	$9,397	+0.21%	3.57%
Equals: **Estimate of FY 1996 Economic Value**	**+$1,224**	**$9,397**	**+0.33%**	**3.57%**

The financial position of the Fund continues to be strengthened by the addition of new business, and the capital ratio over the next four years is likely to continue growing by approximately 0.25 percentage points each year. As a result, in the absence of major changes in economic conditions or FHA policies, the MMI Fund will exceed the mandated FY 2000 capital ratio requirement of 2.00 percent.

Although the combined effect of changes in data, estimates of current and future origination volumes, technical refinements, and adjustments to the financial and cash flow assumptions contributed to a net increase of $279 million above the FY 1996 economic value estimated in the FY 1995 Review, when viewed individually there were several significant sources of change.

- The net effect of all data and origination volume changes was a net decrease in the FY 1996 economic value of $113 million. Updates to the volume and composition of FY 1995 originations resulted in a decrease of $42 million in the estimated FY 1996 economic value and a decrease in the FY 1996 capital ratio of 0.03 percentage points. This updated volume was concentrated in the smaller house price categories, making the overall FY 1995 book of business riskier. Updates to the actual volume of FY 1996 originations

from the projections in the FY 1995 Review resulted in an increase in the economic value of $223 million and a decrease in the FY 1996 capital ratio of 0.01 percentage points. These changes are due to the much higher than expected volume (IIF) of the FY 1996 book of business. The FY 1996 book was larger than what was projected in the FY 1995 Review by $11.931 billion, or 25 percent. Updates were also made to the actual loan composition of FY 1996 originations, which shifted FHA's portfolio composition toward streamline refinancings. Because streamline refinancings have a shorter stream of annual premium payments than other mortgage types, this change in loan composition decreased the economic value of the 1996 book by $41 million. Updates to the historical claim and prepayment information contained in FHA's A-43 database, and the substitution of actual for predicted FY 1995 and FY 1996 termination rates resulted in a decrease in the estimated FY 1996 economic value of $253 million and a corresponding decrease in the FY 1996 capital ratio of 0.10 percentage points.

- The net effect of model modifications was a net decrease of $154 million in the estimated FY 1995 economic value and a 0.09 percentage point increase in the FY 2000 capital ratio. These modifications include the exclusion of the house price skewness measure from the 30 year fixed-rate mortgage claim rate model (which contributed an insignificant explanatory effect) and the exclusion of the house price dispersion measure in the 30 year streamline refinancing mortgage claim rate model (due to the sample used in the measurement of the dispersion being too small to add useful information).

- The last category of change, the effect of changes in financial and cash flow assumptions, resulted in a net increase in the estimated FY 1996 economic value of $546 million, resulting in an increase in the estimated FY 1996 capital ratio of 0.14 percentage points. The estimation of the future loss rate of conveyed properties represents the most significant adjustment in this category, an increase of $708 million. Other changes in the financial cash flow assumptions were made to incorporate updated information, including adjustments to the time lags, claim settlement factors, loss rates on assigned mortgages, lower administrative costs per dollar of IIF, and the incorporation of loss rates specific to FHA's Pre-foreclosure Sales Program, all based on updated experience information. Some of these factors, namely the econometric model of conveyance loss rates, claim settlement factors, loss rates on assigned mortgages, adjustments to the time lags, and loss rates on preforeclosure sales, jointly determine the overall loss rates of each termination year. As a result, their effects should always be considered simultaneously, and the focus should be on their joint net effect. Taken together, these factors reduce the FY 1996 economic value by a total of $162 million.

Change in Estimated Future Insurance-in-Force

Our FY 1996 estimates of the Fund's IIF in FYs 1996 to 2000 are larger than our estimates presented in the FY 1995 Actuarial Review. There are a few factors causing these higher IIF estimates. First, the FY 1995 volume in the 1995 Review is 10 percent lower than the actual origination volume due to reporting lag. This error was larger than previous years' estimates, in part due to the partial shutdown of the Federal government at the end of calendar year 1995. A large number of originations were not entered into the A-43 database until January 1996. Second, the FY 1996 origination volume is substantially higher than estimated in the 1995 Review due to the continuing recovery of the national economy and the interest rate trough experienced in the middle of FY 1996. The higher origination volume of these two books of business resulted in a higher IIF as of the end of FY 1996. Third, the interest rate forecasts for FY 1997 to 2000 increased by about 100 basis points from the same estimation a year ago. The higher interest rate forecast has two impacts on the IIF of the Fund. On one hand, this causes the prepayment rates of existing books of business to decrease, causing IIF to decrease more slowly than initially projected. On the other hand, the higher interest rate indicates a higher payment burden to potential FHA borrowers, resulting in lower origination volumes in the FY 1997 to FY 2000 books of business. The effect of a lower volume of new purchase money mortgage originations in the next four years was captured from the results of a series of econometric models designed to forecast future demand for FHA originations based on economic and policy variables. The net result of these offsetting effects is an increase of about $12.5 billion in IIF by the end of FY 2000 from the IIF estimation presented in the 1995 Review.

Estimated Loss Rates Using Loss Rate Models

In the process of conducting the FY 1995 Review, we developed a loss rate model to estimate future loss rates under different scenarios. This loss rate model, with some additional refinements, was incorporated into this Review. In previous Reviews, average historical loss rates were used as estimates for future losses. These loss rates have decreased gradually over the last few years, and during a period of declining loss rates, using the historical average tends to overestimate the loss rates in the future. Therefore, using the loss rate model has a positive impact on the estimated economic value of the Fund. The newly applied loss rate model provides significantly lower estimates of future loss rates, resulting in an increase of $708 million in FY 1996 economic value and an increase of 0.19 percentage points in the FY 1996 capital ratio.

Termination of Assignment Program

In FY 1996, Congress passed legislation that contains a provision for the termination of the Single-Family Mortgage Assignment Program (the "Assignment Program"). Previous studies by HUD and the General Accounting Office have found that the losses incurred by FHA on assigned

mortgage notes are significantly greater than losses on conveyed properties. As a result of the higher loss rates on mortgage assignments, the discontinuation of the assignment program has had a significant positive impact on the Fund's current economic value. In the FY 1995 Review, we estimated the economic value of the Fund in FY 1995 to be $513 million lower than the projections estimated assuming the Assignment Program was maintained in its current form.

Although FHA ceased accepting applications for assignments on April 26, 1996, as of the end of FY 1996, there remained about 8,400 applications outstanding that had been received prior to the cut-off date. During our FY 1995 Review, we assumed that no assignments would occur in FY 1997. The unresolved 8,400 assignments result in a higher weighted average loss rate for terminations in FY 1997 than that assumed in the FY 1995 Review and reduce the estimated economic value for FY 1996 by $22 million.

Effects of Loss Mitigation

The same legislation that terminated the Assignment Program authorized FHA to recompense mortgagees for their actions to mitigate potential losses by providing mortgage foreclosure alternatives, such as special forbearance, mortgage assumptions by lenders, pre-foreclosure sales, deed-in-lieu-of-foreclosure transactions, partial claim payments, and loan modifications. Many of these loss mitigation techniques have been successfully employed in the conventional mortgage market by private mortgage insurers, Fannie Mae, and Freddie Mac. During FY 1996, FHA continued to explore ways to encourage lenders to use different loss mitigation tools by providing incentives such as a reduction in paper work, reimbursement for administrative expenses, monetary incentives to reward success, and a more flexible approach. However, the financial effect of these methods are difficult to estimate with sufficient confidence for this purpose, given that FHA has little or no data on the historical performance of these tools.

We are able to provide such estimates for the Pre-foreclosure Sales Program on the basis of experience from a demonstration program that began in October 1991, and which became a nationwide program in November 1994. In our analysis of FHA's data on the Pre-foreclosure Sales Program we estimated that the average loss as a percent of total claim payments for a pre-foreclosure sale was 25 percent, lower than the loss rate for properties conveyed over the same time period. In last year's Review, we assumed that FHA would successfully resolve 5 percent of claim terminations in FY 1996 and 10 percent of claim terminations in FY 1997 and beyond using pre-foreclosure sales. During FY 1996, there were 2,416 pre-foreclosure sale cases among a total of 52,776 claims. This is equivalent to approximately 4.6 percent, which is very similar to our estimation in the FY 1995 Review. Given that the pre-foreclosure sales as a percentage of all claims have continued to increase over the recent months, we retain last year's assumption that FHA will resolve 10 percent of claim terminations in FY 1997 and beyond.

Additional Comments

The estimates presented here reflect projections of events more than 30 years into the future. These projections are dependent upon a number of assumptions, including economic forecasts by DRI (a data forecasting corporation) and the assumption that FHA does not change its refund, premium or underwriting policies. To the extent these or other assumptions are not accurate, the actual results will vary, perhaps significantly, from our current projections.

This year, OMB has required that all Federal agencies meet an accelerated timetable for completion of all financial audits. In order for FHA to meet this deadline, this Review had to be completed much earlier than in past years. Estimation of the equations used for predicting prepayments and claims require large amounts of loan level data. This data takes several weeks to process before it can be used. In addition, complete data for a fiscal year is generally not available for a few months after the end of the fiscal year due to reporting and processing lags. For both reasons, the Review could not be completed in the OMB time frame and be based on complete data for the fiscal year. Consequently, we took a different approach to using the loan level data this year. In summary, in July of 1996 we obtained a data cut as of June 30, 1996. This data cut contained loan level information, providing information on both the aggregate level of activity and the distribution of that activity. We processed this data and estimated our econometric equations based on it. During subsequent months, we obtained updates to monitor whether significant changes were occurring in the portfolio. In January, we obtained updated aggregate data on the Fund, and adjusted the overall estimated levels to conform to these aggregate levels.

Finally, while we have reviewed the integrity and consistency of the data supplied by FHA and believe it to be reliable, we have not audited it for accuracy. Additionally, the information contained in this report may not correspond exactly with other published analyses that rely on FHA data compiled at a different time or obtained from other systems.

C. Impact of Economic Forecasts

The economic value of the Fund and its pattern of capital accumulation to FY 2000 depends on several factors. One of the most important factors is the nation's future economy during the remaining lifetime of FHA's books of business. We capture the most significant factors in the U.S. economy affecting the performance of the Fund's books of business through the use of the following variables in our models:

- FHA mortgage interest rate
- One-year Treasury bill rate
- Growth rate of constant quality house prices
- Growth rate of mean household incomes

The performance of FHA's books of business, measured by their economic value, is affected by changes in these economic variables. Higher mortgage interest rates raise initial and ongoing payment burdens on household cash flows, and hence default risks. Lower mortgage interest rates have the reverse effect and tend to accelerate refinancing of earlier originations. Faster average house price growth facilitates the accumulation of home equity, which tends to reduce the likelihood of borrower default. It also contributes to greater mobility and household asset portfolio rebalancing, leading to greater turnover of housing and refinancings, thus increasing prepayment rates. Faster income growth reduces the relative burden of mortgage payments on household cash flows over time, reducing risks of default as mortgages mature.

The base case results in this report are based on DRI's control forecast as of October 1996 for interest rates, constant quality house prices, and inflation rates. We considered two other scenarios based on DRI forecasts: 1) a pessimistic forecast (similar to the hard-landing scenario forecasted by DRI in December 1996), which projects lower real growth in house prices and mean household income, and higher inflation and interest rates; and 2) an optimistic forecast (similar to the boom-bust scenario forecasted by DRI in December 1996), which projects higher real growth in house prices and median household income, and lower inflation and interest rates. These two scenarios do not represent the full range of possible experiences, but represent variations from the base case that might reasonably be expected and demonstrate the sensitivity of the analysis to variations in economic conditions. We use the optimistic and pessimistic terminologies to be consistent with previous Reviews. As can be seen in Exhibit ES-3, the optimistic scenario actually results in lower capital ratio at the end of FY 2000. We present our estimates of the Fund's performance under each of these economic scenarios in Exhibit ES-3.

Exhibit ES-3

Summary of MMI Performance by Macroeconomic Scenario ($ Millions)			
	Pessimistic	**Base Case**	**Optimistic**
Current Economic Value (FY 1996)	$9,019	$9,397	$9,478
Current Capital Ratio (FY 1996)	2.43%	2.54%	2.56%
Projected Capital Ratio (FY 2000)	3.64%	3.57%	3.49%

Estimated FY 1996 economic values under the different scenarios vary by approximately $459 million, and the estimated FY 1996 capital ratio varies from 2.43 percent to 2.56 percent. We project that under all three scenarios the Fund will significantly exceed the NAHA FY 2000 capital ratio target of 2.00 percent.

D. The Economic Value of Future Books of Business

Due to the fact that the Fund's capital ratio reflects experience from its entire book of business, the Fund's capital ratio at any point in time does not provide a strong indication regarding the underlying quality or soundness of recent mortgage originations. Consequently, we have developed two measures of the financial performance of a book of business that provide a better indication of the overall quality and profitability of future business. These two measures, the "initial" and "converging" capital ratios, represent respectively, the present value of net income per dollar of initial IIF for a single book of business (excluding refinancings), and the capital ratio that the entire Fund would eventually approach if all future originations were identical to the book of business under consideration. We calculate these two measures of financial performance based on the FY 2000 book of business in order to reduce the effects of changes in short-term economic forecasts from our estimates.

Last year, we estimated that the initial capital ratio for the FY 2000 book of business was 2.17 percent and that the converging capital ratio for the Fund based on this book was 5.47 percent. This year, we estimate that the initial capital ratio of the FY 2000 book of business will be 2.58 percent, and that the converging capital ratio for the Fund is 6.27 percent. This increase in the converging capital ratio is largely due to both the forecasts of stronger house price growth and higher interest rates. Nonetheless, given the forecasted economic conditions, it is evidence that the Fund's recent performance has continued to improve and that the underlying quality of the new business being originated is sound relative to the current premium and refund schedules.

E. Volatility in Fund Performance

Despite the continued financial strengthening of the Fund, this Review has highlighted the sensitivity of the Fund to changes in economic conditions, particularly interest rates. The Fund's portfolio is highly concentrated in recent books of business, with over 60 percent of outstanding insurance-in-force (IIF) contained in books that are less than four years old. This significant concentration of business in recent books may reduce the Fund's ability to spread risk over time, as it has done in the past (for example, during the late-1980s, when surpluses on books originated in the 1970s offset deficits on books originated during the early- to mid-1980s). If these recent books experience adverse economic conditions over the next few years, the economic value of the Fund could decrease significantly below the base case estimates provided in this Review.

Furthermore, while FHA has created a partial hedge against its exposure to interest rate risk and adverse selection by offering an attractive streamline refinancing option, this hedge could reduce future income given the current premium and refund structure. While the value of the Fund increases when loans originated prior to FY 1992 prepay rapidly, this is not the case with originations in or after FY 1992 because of the relatively large refunds on up-front premiums and the loss of annual premiums that would accrue to the Fund if the loans were not paid off. For loans with loan-to-value ratios over 95 percent originated in or after FY 1992, annual premiums typically constitute over 50 percent of total premium revenue, and may constitute as much as 75 percent of total premium revenue. Thus, if prepayment rates increase as a result of interest rate declines, the FYs 1992 and later books will lose significant amounts of annual premium income. Although the amounts vary by book and interest rate scenario, the resulting losses will more than offset any accompanying reduction in expected claims. While much of this loss is likely to be recaptured by future originations of streamline refinancings (SRs), it is unlikely that FHA will be able to recapture significantly more than 50 percent of future refinancings, and those that are recaptured will pay annual premiums for only seven years, instead of 30. Thus, while the Fund as a whole is unlikely to experience losses as a result of moderate interest rate movements, the FYs 1992 to 1996 books (and all future books) could experience sharp reductions in economic value under economic conditions involving rapid prepayment activity.

F. Additional Sensitivity Analysis

In order to test the sensitivity of our estimates of Fund value to changes in economic and other controlling assumptions we conducted a number of sensitivity analyses. These analyses focused on assumptions on which the model rests that are either based on less information than we would ideally like, or have a potentially significant effect on the economic value of the Fund. This approach provides information on the extent to which our conclusions on the performance of the Fund would vary due to inaccurate treatment of these issues. The sensitivity analyses we conducted included:

- alternative economic scenarios
- alternative interest rate scenarios
- alternative assumptions regarding the effects of FHA's loss mitigation efforts
- alternative assumptions regarding claim and disposition lags

Under all of these sensitivity analyses, the estimated economic value of the Fund still exceeds the mandated FY 2000 capital ratio of 2.00 percent.

Section I: Introduction

The Cranston-Gonzalez National Affordable Housing Act (NAHA), enacted in 1990, mandated that the Federal Housing Administration's (FHA's) Mutual Mortgage Insurance (MMI) Fund attain a capital ratio of 1.25 percent by October 1, 1992. This statute further directed that the Fund achieve a capital ratio of 2.00 percent by October 1, 2000. NAHA defines the capital ratio as the ratio of the Fund's capital or economic net worth[1] to its unamortized insurance-in-force.[2]

In addition to codifying this actuarial standard, NAHA established the requirement that the Department of Housing and Urban Development (HUD) undergo an annual independent actuarial review of the MMI Fund. The purpose of the review is to assess the actuarial soundness of the Fund and to report on FHA compliance with respect to the new capital standards set forth in NAHA. Price Waterhouse LLP has conducted this required review for fiscal years (FYs) 1989 through 1996. This report contains our evaluation of the actuarial soundness of the Fund as of September 30, 1996 (the end of HUD's FY 1996) and includes an assessment of the Fund's current and forecasted capital ratios. This analysis is based on information provided by HUD regarding the historical performance of the existing MMI Fund loan portfolio and projected future economic conditions and mortgage originations.

A. Implementation of NAHA and Recent Congressional Revisions

Following the issuance of the FY 1989 Actuarial Review and the ensuing debate, Congress, as part of the Cranston-Gonzalez Act, mandated various changes to the MMI Fund. The revisions to the MMI Fund called for in the NAHA legislation focused on four major issues: 1) the development of an actuarial standard of financial soundness; 2) revisions to the minimum equity requirements; 3) changes in the pricing of insurance premiums; and 4) revisions to policies regarding distributive shares.

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[1] The economic net worth is defined in the National Affordable Housing Act of 1990 as the "current cash available to the Fund, plus the net present value of all future cash inflows and outflows expected to result from the outstanding mortgages in the Fund."

[2] The term "unamortized insurance-in-force" is defined in the legislation as the "remaining obligation on outstanding mortgages" -- a definition generally understood to apply to amortized insurance-in-force. This apparent contradiction has led to some confusion regarding which is the appropriate measure to be used in the actuarial reviews. Price Waterhouse continues to use the unamortized insurance measure as conventionally defined for our calculations of capital ratios. This is consistent with Price Waterhouse's previous reports.

The provisions of NAHA regarding the MMI Fund have had a significant impact on the performance of current and future books of business. The changes called for in the Act were specifically designed to remedy the past financial difficulties encountered by the Fund. Each change was intended to either reduce the risks inherent in the additional books of business or to adjust premiums to more adequately compensate for the costs of these risks.

The NAHA legislation required that the Fund be operated on an actuarially sound basis by providing specific capital standards for the Fund and time frames in which these standards should be met. It also defined the actuarial standard as a ratio of the Fund's capital or economic net worth to its unamortized insurance-in-force.

NAHA also included several changes to both the structure and size of future premiums. Under NAHA, insurance premiums were changed to include a risk-based component that is based on a loan's initial loan-to-value (LTV) ratio. Also, effective July 1991, FHA phased in a new premium schedule consisting of successively lower upfront premiums combined with annual premiums. The NAHA schedules were intended to increase the premiums on more risky loans without affecting the less risky, more financially desirable business. By switching to a combination of upfront and annual premiums, the new schedules reduced the initial financing requirement for borrowers who finance the upfront premium. The introduction of annual premiums enables the Fund to offset the loss in revenue caused by lower upfront premiums.

In October 1992, Congress passed a modification to NAHA that increased the percentage of closing costs that could be financed from 57.25 percent to 100 percent. This change should increase the potential claim risk, since an increase in the percentage of financeable closing costs should result in loans with higher effective LTV ratios. As a result, claims are likely to increase. The FY 1991 Actuarial Review (issued December 1992) estimated that the projected economic value of the Fund would decline by $31 million annually as a result of this change.

The 1992 modification to NAHA also raised the maximum loan size limit from $124,875 to $151,725.[3] An additional modification in FY 1995 changed the maximum loan size limit from a single predetermined value to a variable limit indexed to the conforming loan limit used by Fannie Mae and Freddie Mac. This change resulted in the maximum FHA loan limit increasing in FY 1995 to $152,362, in FY 1996 to $155,250, and further, in FY 1997 to $160,950. These changes are likely to increase the value of the Fund, since both an increased volume of loans is being insured and the average size of each individual loan insured increases. FHA's historical experience has shown that, all else being equal, larger loans tend to have lower conditional claim

[3] The new loan limit is still subject to the 95 percent of area median rule, thus continuing to cause the FHA population to consist of below median-priced homes.

rates and lower loss rates. Consequently, insuring larger loans will tend to increase the value of the Fund. The estimated effects of these changes in the loan size limit are provided later in this section.

To further strengthen the capital position of the Fund, the NAHA legislation linked FHA's ability to pay distributive shares to the actuarial soundness of the entire MMI Fund (as defined in the legislation), rather than solely considering the performance of the loans endorsed during a particular year as was done in the past. This amendment should ensure that distributive share payments are not made if the Fund has not achieved the capital standards established by this legislation. In all our estimates of Fund performance, we have assumed that regardless of whether the Fund meets the NAHA capital requirements, no distributive shares will be paid. We make this assumption because it is consistent with current FHA policy. NAHA prohibits the disbursement of distributive shares until the mandated FY 2000 capital ratio of 2.00 percent is achieved, and while we estimate that since FY 1995 the MMI Fund has surpassed the NAHA mandated capital ratio, FHA management has not provided indication that it will pay distributive shares in the near future.

B. Recent FHA Policy Developments and Underwriting Changes

During FY 1996 and early FY 1997, FHA faced several policy changes, including an increase in the FHA loan limit, elimination of the Single-Family Mortgage Assignment Program, and implementation of loss mitigation techniques. Each of these developments is summarized below.

1. Increase in FHA's Single-Family Loan Ceiling

HUD announced in early December 1996 that it would raise the single-family FHA loan limit by 3.67 percent on January 1, 1997. This change in FHA's loan ceiling follows from the 3.67 percent increase in the conforming loan limit imposed upon Fannie Mae and Freddie Mac and the legislative change in FY 1995 that allows FHA's high-cost loan limit to be 75 percent of the conforming loan limit. This change is likely to increase the volume of loans insured as well as the size of individual loans insured by FHA.

2. Elimination of the Single-Family Mortgage Assignment Program

In FY 1995, Congress passed legislation containing a provision for the termination of the Single-Family Mortgage Assignment Program (the "Assignment Program"). Previous studies by HUD and the General Accounting Office have found that the losses incurred by FHA on assigned mortgage notes are significantly greater than losses on conveyed properties. As a result of the higher loss rates on mortgage assignments, the discontinuation of the assignment program has

had a significant positive impact on our assessment of the Fund's current economic value. In the FY 1995 Review, we estimated that the economic value of the Fund in FY 1995 would be $513 million lower than current projections if the Assignment Program was maintained in its current form.

The termination of the assignment program had an impact on the Fund in FY 1996 and will continue to affect the Fund through FY 1997. FHA ceased accepting applications for assignments on April 26, 1996. At that time, there were approximately 12,000 applications outstanding. About 3,600 of these applications were processed during FY 1996. During the first quarter of FY 1997, FHA processed another 2,392 applications. According to FHA, the remaining 6,000 loans will be processed before the end of FY 1997, which will result in about 8,400 assignments occurring over FY 1997. This estimate has been used in our analysis to derive the weighted average loss rates between conveyances and assignments for FY 1997 terminations.

3. Implementation of Loss Mitigation Techniques

The same legislation that terminated the Assignment Program authorized FHA to recompense mortgagees for their actions to mitigate potential losses by providing mortgage foreclosure alternatives, such as special forbearance, mortgage assumptions by lenders, pre-foreclosure sales, deed-in-lieu-of-foreclosure transactions, partial claim payments, and loan modifications. Many of these loss mitigation techniques have been successfully employed in the conventional mortgage market by private mortgage insurers, Fannie Mae, and Freddie Mac. Except in the case of pre-foreclosure sales, the uncertainty surrounding these techniques and FHA's ability to utilize them effectively makes it difficult for us to provide a dollar estimate of the effects they will have on the MMI Fund.

We are able to provide such estimates for the Pre-foreclosure Sales Program, however, which began as a demonstration program in October 1991 and became a nationwide program in November 1994. Using FHA's data on the Pre-foreclosure Sales Program, we estimated that the average loss as a percent of total claim payments for a pre-foreclosure sale was 25 percent, versus 35 percent for properties conveyed over the same time period (as a percent of unpaid principal balance the estimated loss rates were 27 percent and 40 percent, respectively, which are identical to the rates reported by HUD in its 1994 report on the demonstration program). During FY 1996, FHA successfully resolved about 4.6 percent of terminations using pre-foreclosure sales. This was very close to our estimate in the FY 1995 Review that pre-foreclosure sales would account for about 5 percent of terminations in FY 1996. Given this confirmation of our estimate and based on the upward trend in the percentage of pre-foreclosure sales in total terminations over the past two years, we retain the assumption used in the FY 1995 Review that FHA will successfully resolve 10 percent of claim terminations in FY 1997 and beyond using pre-foreclosure sales. These projections are lower than those provided by HUD in its projections of pre-foreclosure

sales and other loss mitigation techniques. HUD estimates that FHA will resolve approximately 24 percent of claim terminations in FYs 1997 and beyond using pre-foreclosure sales.

C. Trends in Housing Finance

The interest rates of Treasury securities decreased rapidly through the second half of FY 1995 and through most of FY 1996. Both the one-year and ten-year Treasury interest rates during the second quarter of FY 1996 were more than 150 basis points lower than their levels a year ago. While the movement in mortgage interest rates is not as significant, there has been a decrease of 75 basis points in the FHA contract rate during the same period. Although interest rates have decreased substantially from their FY 1995 levels, they are still above the levels of late 1993 and early 1994.

The lower interest rates and the improved economic environment, evidenced by higher household income growth rates in FYs 1995 and 1996, have increased the affordability of housing. In addition, the recovery of the housing market from the early 1990's slow house price growth rate has also reduced potential home buyers' fear of losing home equity. As a result of these more general economic conditions, FHA's total origination volume in FY 1996 has risen approximately 43 percent from its FY 1995 level to reach a total of $59 billion. Due to the lower interest rates, the proportion of streamline refinancings among total originations increased significantly from about 5 percent in FY 1995 to over 15 percent in FY 1996. Since a large portion of higher interest rate loans had already refinanced during the low interest rate period of the early 1990's, the streamline refinancing percentage remains lower than it was in FYs 1993 and 1994. Although modest gains in loan refinancing are expected over the next several years as interest rates are expected to remain low, the boom in refinancing experienced between 1992 and 1994 is not likely to be repeated in the near future.

FHA's non-refinancing origination volume increased about 20 percent from FY 1995. Among the non-refinancing originations, the share of 30-year FRMs increased from 68 percent to 72 percent, while the share of ARMs decreased from 30 percent to 26 percent. This is consistent with the historical pattern which indicates that when the overall interest rate level decreases, households tend to choose FRMs over ARMs so that they may lock into a low interest rate for the future years. Since a higher portion of loans originated in FY 1996 were FRMs with low interest rates, their prepayment rates are likely to be lower than that of the FY 1995 loans. This results in a longer average loan life for these mortgages. Although they are expected to have lower conditional claim rates, these loans are exposed to default risk for longer time periods, and therefore they exhibit a cumulative claim rate higher than those of the FY 1995 book of business.

Other conventional mortgage market trends have been higher than normal default and foreclosure rates on loans made in 1994 and 1995. Several credit agencies predict that these loan quality problems, which may stem from aggressive underwriting, will persist in the months ahead. Recent data indicate, though, that FHA maintained a high level of loan quality throughout FYs 1994 and 1995. The claim rates of these two books of business were found to be the lowest of all books of business studied under this Review except FY 1993 originations.

FHA's share of the new home market had fallen from over 20 percent during the 1980s to about 12 percent in the past three years. This appears to be the result of a decline in purchases by first-time home buyers and the increased lending of loans with high loan-to-value ratios (LTV) by conventional lenders. During the past two years, both Fannie Mae and Freddie Mac have increased their effort in promoting products with high loan-to-value ratios. This market outreach has allowed more borrowers to obtain a conventional mortgage with an initial LTV ratio as high as 97 percent. As conventional lenders continue to increase their activities in the high LTV market, we expect that FHA's market share will decline slightly in the next few years.

D. Current and Future Economic Environment

During FY 1996, the national housing market continued to grow stronger with a 4.6 percent increase in the constant quality house price index, the highest level in the past nine years. This trend is expected to continue during FY 1997, in which the constant quality house price index is projected to reach 5.7 percent, its highest level in 15 years. The growth rate of the real national mean household income remained high at 1.7 percent, its highest rate of growth in the last eight years, with the exception of FY 1995. This growth rate is expected to remain at this level through FY 1997. The trend in interest rates, however, exhibited a slightly more volatile pattern. In the first half of FY 1996, interest rates reached their lowest level in two years. The second half of FY 1996, though, was characterized by rapidly increasing interest rates. The one-year, ten-year, and 30-year Treasury rates, and the Freddie Mac lender survey rate all increased by about 1 percent by the end of FY 1996. Although the first few months of FY 1997 have shown slight decreases in interest rates, it is still expected that the overall interest rate levels of FY 1997 will be higher than that of FY 1996. These high interest rates, high house price growth rates, and high household income growth rates, suggest that existing mortgages are likely to experience low prepayment and claim rates over the next year.

The long-run forecasts we have used in estimating the Fund's future economic value are consistent with current economic conditions. These economic projections, which have been obtained from DRI/McGraw Hill's October 1996 forecasts, estimate that mortgage interest rates will increase by about 20 basis points between FY 1996 and FY 1997 and then gradually decrease to a level in future years that is about 100 basis points higher than DRI's forecast for the

same period a year ago. Annual growth rates in the constant quality house price index are projected to increase by 2 percentage points from now through the end of FY 1998 and then decrease rapidly to less than 1 percent in FY 2002 and 2003. The projected household income growth rates follow a similar pattern, increasing slightly in FY 1997 and decreasing rapidly to less than 0.4 percent during FYs 2001 and 2002. The slow growth rates of house price and household income imply a deceleration of economic growth in the late 1990's and early 2000's. Section II presents these forecasts in greater detail, and Section V provides an analysis of the Fund's sensitivity to changes in specific economic variables.

E. Data Sources and Future Projections

The estimates presented here require projections of events more than 30 years into the future. These projections are dependent upon a number of assumptions, including economic forecasts by DRI and the assumption that FHA does not change its refund and premium policies. To the extent these or other assumptions are not accurate, the actual results will vary, perhaps significantly, from our current projections.

Furthermore, Price Waterhouse's analysis is based on an extract of FHA's A-43 database that was obtained at the end of June, 1996. While we have reviewed the integrity and consistency of this data and believe it to be reliable, we have not audited it for accuracy. The information contained in this report may not correspond exactly with other published analyses that rely on FHA data compiled at a different time or obtained from other FHA systems.

F. Structure of this Report

The remainder of this report is divided into the following sections:

II. Summary of Findings and Comparison with FY 1995 Actuarial Review - presents the Fund's estimated economic value, capital ratio, and insurance-in-force for FYs 1996 through 2000. This section also provides a reconciliation and explanation of the major differences between the FY 1995 Review and the FY 1996 Review;

III. Current Status of the Fund - presents the estimated economic value and capital ratio for the Fund for the end of FY 1996 and provides an analysis of the performance of the FYs 1975 through 1996 books of business;

IV. Characteristics of the FY 1996 Book of Business - describes the FY 1996 book of business and compares the risk characteristics of the current book to previous books;

V. MMI Fund Sensitivities - presents sensitivity analyses of the MMI Fund using alternative economic assumptions and loan characteristics;

VI. Performance of Future Books of Business - presents the economic values of future books of business and discusses the volume and distribution of future books of business;

VII. Methodology - presents an overview of our econometric and cash flow models and highlights the technical changes made from the FY 1995 Review to the FY 1996 Review;

VIII. Conclusions - provides a summary of the report's results and the conclusions that can be drawn from those results;

Appendix A. Econometric Analysis of FRMs - provides a technical description of our econometric model for both 30-year and 15-year fixed-rate mortgages;

Appendix B. Econometric Analysis of ARMs - details the general approach for modelling adjustable-rate mortgages;

Appendix C. Econometric Analysis of SRs - provides a detailed explanation of our approach to modelling both 30-year and 15-year streamline refinancings;

Appendix D. Loss Rate Analysis - provides a technical description of our model for forecasting future loss rates based on analysis of historical data;

Appendix E. Cash Flow Analysis - provides a technical description of our cash flow model;

Appendix F. Analysis of Demand for FHA Insurance - provides a detailed explanation of the model used to predict future FHA origination volume;

Appendix G. Econometric and Cash Flow Results - presents claim and prepayment rates from our econometric model and detailed results from our cash flow model.

Section II: Summary of Findings and Comparison with FY 1995 Actuarial Review

This section presents the economic value and capital ratios of the Fund for fiscal year (FY) 1996 and presents an explanation of how the results of this year's Review compare with those of last year.

A. The FY 1996 Actuarial Review

The FY 1996 Actuarial Review assesses the actuarial soundness of the MMI Fund as of the end of FY 1996 (September 30, 1996) and projects the status of the Fund through FY 2000. We conducted the Review using the econometric and financial cash flow models that Price Waterhouse LLP developed in previous Actuarial Reviews of the Fund, with certain refinements added for this year's review. The objectives of our analysis include:

- evaluating the historical experience of the fund, including loan termination experience due to claims and prepayments and losses associated with those terminations;
- estimating future loan termination rates and their corresponding losses and projecting future cash flows of the existing Fund portfolio and future books of business;
- determining the adequacy of current and future capital resources to meet estimated cash requirements.

We conducted this review by estimating the economic relationships of historical loan performance using historical data provided by FHA, applying the appropriate policy parameters, and using forecasts of future macroeconomic conditions.

The econometric and cash flow models used in the FY 1996 analysis are similar to those used in the FY 1995 Review, but reflect loan level data on the Fund's experience reported through June 1996 and aggregate fund level data through September 30, 1996. These models also incorporate an updated set of economic assumptions and forecasts. The models used for 30 year fixed-rate mortgages and 30 year streamline refinancings are slightly different from those used in last year's Review in that they exclude independent variables that do not significantly improve the forecast power of the models. Also, the loss rates in the future are estimated by a three step econometric model instead of using historical average rates. (For descriptions of the individual models see Appendices A through D.) Our major findings are as follows:

- as of the end of FY 1996, the MMI Fund had an estimated economic value of **$9.397** billion and an unamortized insurance-in-force (IIF) of **$370.484** billion;

- the FY 1996 book of business has added an estimated **$1.377 billion** in present value to the economic value of the MMI Fund;

- we estimate that the capital ratio was **2.54 percent** as of September 30, 1996, and project that it will be **3.57 percent** as of September 30, 2000. Based on these estimates, we conclude that the Fund already exceeds the NAHA mandated 2.00 percent capital ratio for FY 2000.

Our current projections indicate that the Fund's economic value will continue to increase in the future, rising by an average of 12 percent in each successive fiscal year until FY 2000. These projections also indicate that the Fund's reported capital ratio will increase by approximately 25 basis points each year over the next five years. Exhibit II-1 provides estimates of the Fund's economic value, IIF, and capital ratio until the end of FY 2000.

Exhibit II-1

Projected MMI Fund Performance for FYs 1996 to 2000
($ Millions)

Fiscal Year	Economic Value of the Fund*	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,397	2.54%	$58,863	$370,484	$1,377	n/a
1997	$10,670	2.80%	$41,210	$381,671	$990	$282
1998	$11,947	3.05%	$40,796	$392,076	$957	$320
1999	$13,306	3.31%	$42,082	$402,027	$1,001	$358
2000	$14,825	3.57%	$45,904	$414,734	$1,120	$399

*All values are as of the end of each fiscal year. The economic value for future years (FYs 1997 through 2000) is equal to the economic value of the Fund at the end of the previous year, plus the current year's interest earned on previous business, plus the economic value of the new book of business.

B. Change in Estimated Strength of the Fund

Exhibit II-2 displays the components of the Fund's current economic value and capital ratio from the FY 1996 Review and the FY 1995 Review. The FY 1995 Review estimated that the Fund had total capital resources of $10.592 billion at the end of FY 1995, that the present value of future cash flows was -$3.606 billion, and that the Fund had collected up-front premiums of $100 million from loans originated in FY 1995, but endorsed in FY 1996. These up-front premiums are added to our estimates of economic value because the Actuarial Review assigns loans based on

Exhibit II-2

Estimates of MMI Fund Economic Value End of FY 1995 and End of FY 1996 ($ Millions)

	End of FY 1995[a]	End of FY 1996[b]
Capital Resources		
Cash	$ 1,232	$ 3,863
Investments	6,587	7,642
Properties	1,002	949
Mortgages	3,318	2,344
Other Assets	317	332
Net Receivables and Payables	-1,864	-3,579
Total Capital Resources[c]	**$10,592**	**$11,551**
PV of Future Cash Flows		
Pre-1975 Business	$18	$15
1975-1993 Business	-2,831	-1,703
1994 Business	-462	-416
1995 Business	-360	-134
1996 Business	n/a	-58
Total PV Future Cash Flows	**-$3,606**	**-$2,296**
Additional FY 1995 Up-front Premium[d]	$100	$142
Economic Value	**$7,086**	**$9,397**
Unamortized Insurance-in-Force	$345,278	$370,484
Current Capital Ratio	**2.05%**	**2.54%**

[a]Cash flows are from the FY 1995 Review and are valued as of the end of FY 1995.
[b]Cash flows for FY 1996 Review are valued as of the end of FY 1996.
[c]From FY 1996 Audited Financial Statements.
[d]Upfront premiums associated with loans originated in FY 1996, but endorsed in FY 1997.

origination date instead of endorsement date, the basis used in the financial statements. Thus, the up-front premiums associated with these loans are not included in the FY 1996 capital resource values obtained from FHA's financial statements. Therefore, as of September 30, 1995, the Fund had $7.086 billion more in capital resources than was needed to cover the present value of projected remaining cash flows from the FY 1995 and prior books.

The FY 1996 Review estimates that the fund had total capital resources of $11.551 billion at the end of FY 1996, that the present value of future cash flows was -$2.296 billion, and that the Fund collected up-front premium income of $142 million from loans originated in FY 1996, but endorsed in FY 1997. Thus, the Fund had $9.397 billion more in capital resources than was needed to cover the present value of projected remaining cash flows from the FY 1996 and prior books.

As seen in Exhibit II-2, this improvement in the Fund's capitalization is due in large part to an increase in the estimated present value of the future cash flows of the FYs 1975 to 1995 books. The detail by book included in Exhibit II-3 shows that the improvement is fairly evenly split between the FYs 1986 to 1991 books and the FYs 1992 to 1995 books. The major reason for the increase in the FYs 1986 to 1991 books is that since FY 1995, an additional year of claims and prepayments has resulted in less volume remaining that may ultimately claim. This also increases the estimated present value of the future cash flows associated with the FYs 1975 to 1983 books. However, these books continue to pay annual premiums; therefore, reductions in volume have resulted in reductions in the present value of the future cash flows of these books.

A similar explanation accounts for a portion of the reduction in the present value of the future cash flows associated with the FYs 1992 to 1995 books. However, much of the reduction in the present value of the future cash flows from the FYs 1992 to 1995 books is attributable to a significant reduction in the forecasted claim rates applied to these books. This reduction is largely the result of increases in the house price growth rates forecasted for future years and the low claim rates experienced by these books to date.

Exhibit II-3

Present Value of Future Cash Flows by Book of Business, FY 1995 Review, FY 1996 Review, and Difference[c] ($ Millions)			
Book of Business	**1995 Review[a]**	**1996 Review[b]**	**Difference**
pre-1975	$18	$13	-$5
1975	9	7	-2
1976	13	10	-3
1977	21	17	-4
1978	36	30	-6
1979	57	47	-10
1980	40	28	-12
1981	8	7	-1
1982	-1	-4	-3
1983	10	10	0
1984	-45	-45	0
1985	-52	-50	2
1986	-257	-188	69
1987	-493	-313	180
1988	-282	-210	72
1989	-305	-217	88
1990	-370	-300	70
1991	-287	-231	56
1992	-299	-90	209
1993	-597	-209	388
1994	-470	-416	54
1995	-360	-134	226
1996	n/a	-58	n/a
Total	**-$3,606**	**-$2,296**	**$1,310**

[a] Values as of the end of FY 1995
[b] Values as of the end of FY 1996
[c] Numbers do not add due to rounding

C. Decomposition of Changes from FY 1995 Review to FY 1996 Review

This section describes the sources of change in the current economic value of the Fund and the FY 2000 capital ratio from the FY 1995 Review to the FY 1996 Review. Separating out the effects of interrelated approaches and assumptions can be done only to a certain degree of accuracy. The interrelationships among the approaches and assumptions prevent us from identifying and analyzing these as purely independent effects -- the effects are sometimes jointly determined. However, this section presents a reasonable allocation of all changes from last year, by source of change. The

purpose of the decomposition is twofold. First, it describes the change in the economic value from FY 1995 to FY 1996. Second, it explains changes between the current estimates of the economic value and capital ratio in FY 1996 and the estimates for FY 1996 that were presented in the FY 1995 Review.

1. Change in Economic Value from FY 1995 to FY 1996

The FY 1995 Review estimated the economic value of the Fund as of the end of FY 1996 would be $8.173 billion, and projected the FYs 1996 and 2000 capital ratios to be 2.34 percent and 3.24 percent, respectively. We estimate the current economic value of the MMI Fund to be $9.397 billion, which represents an increase of $2.311 billion over the estimated FY 1995 economic value. This 32.6 percent increase in the estimated economic value of the MMI Fund, which accompanied a 7.30 percent increase in the unamortized IIF, resulted in the capital ratio increasing by 0.49 percentage points from 2.05 percent at the end of FY 1995 to 2.54 percent at the end of FY 1996.

2. Current Estimate of FY 1996 Economic Value Compared with the Estimate Presented in the FY 1995 Actuarial Review

The FY 1995 Review projected that the FY 1996 book of business and interest on the Fund's balances would add $875 million and $213 million respectively to the economic value of the Fund, resulting in a projected FY 1996 economic value of $8.173 billion. This year's estimate of the FY 1996 economic value is $1.224 billion higher than the economic value projected for FY 1996 in last year's Review. Exhibit II-4 provides a summary of the decomposition of changes in the current economic value of the Fund and the FY 2000 capital ratio from the FY 1995 Review to the FY 1996 Review. The difference is primarily attributable to the change in the economic forecast, particularly as it relates to future house price growth rates and interest rates.

The effect of the new economic forecast has been to decrease future claim and prepayment rates, thereby reducing claim costs and refund payments, and increasing annual premium income. The overall effect of the new economic forecast has been to increase the FY 1996 economic value by $945 million and the FY 2000 capital ratio by 0.11 percentage points.

The change in the estimated status of the Fund that resulted from incorporating the changes that occurred during FY 1996 and new economic forecasts is decomposed into 14 component pieces. These changes are grouped into three categories: changes due to FHA data and origination volume updates and FY 1996 experience, changes resulting from model refinements and economic forecasts, and changes resulting from modifications to financial and cash flow assumptions. Exhibit II-4 summarizes the cumulative effects of these three categories while Exhibits II-5, II-7, and II-9 illustrate the individual effects of each of these changes on the Fund's economic value and capital ratio in FYs 1996 and 2000.

Exhibit II-4

Summary of Changes in MMI Fund Estimated Economic Value Between FY 1995 and FY 1996 ($ Millions)					
		Change in FY 1996 Economic Value	FY 1996 Economic Value	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1996 Economic Value Presented in the FY 1995 Review, Excluding the FY 1996 Book of Business:			**$7,086**		**3.24%**
Plus:	Forecasted Value of 1996 Book of Business and Interest on Previous Business Presented in the FY 1995 Review	+$1,088			
Equals:	**FY 1996 Economic Value Presented in the FY 1995 Actuarial Review**		**$8,173**		**3.24%**
Plus:	FHA Data and Origination Volume Updates and FY 1996 Experience	-$113	$8,060	-0.08%	3.16%
Plus:	Economic Forecasts	+$945	$9,005	+0.11%	3.27%
Plus:	Econometric Model Refinements	-$154	$8,851	+0.09%	3.36%
Plus:	Adjustments to Financial and Cash Flow Assumptions	+$546	$9,397	+0.21%	3.57%
Equals:	**Estimate of FY 1996 Economic Value**	**+$1,224**	**$9,397**	**+0.33%**	**3.57%**

3. Changes due to FHA Data and Origination Volume Updates and FY 1996 Experience

Exhibit II-5 depicts changes in the Fund's economic value and capital ratio resulting from new FHA data on 1995 and 1996 terminations, and 1995 origination volume and distribution. Adjusting the model to include the most recent FHA data involved the incorporation of one additional year of historical experience regarding claim and prepayment rates and actual FY 1996 origination volume. These adjustments also included updating the volume and distribution of FY 1995 originations.

The effects of updates in loan volume have been divided into the effect associated with the change compared to last year's estimate in total dollar volume, and the effect associated with the change in the composition of loan volume in terms of loan type, loan-to-value (LTV) ratio, and house price categories. Additionally, we have provided the effect of changes in our estimates of the future volume of originations on the estimated capital ratio in FYs 1997 to 2000. The effects on FY 2000 are shown in Exhibit II-5.

Exhibit II-5

Change in MMI Fund Estimated Economic Value Between FY 1995 and FY 1996 Resulting From FHA Data and Origination Volume Updates and FY 1996 Experience ($ Millions)

	Change in FY 1996 Economic Value	FY 1996 Economic Value	Change in FY 1996 Capital Ratio	Corresponding FY 1996 Capital ratio	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
Estimated FY 1996 Economic Value Presented in the FY 1995 Review	n/a	$8,173	n/a	2.34%	n/a	3.24%
Plus: Updates to 1995 Volume and Loan Composition	-$42	$8,131	-0.03%	2.31%	-0.03%	3.21%
Plus: Updates to Actual 1996 Volume	+$223	$8,354	-0.01%	2.30%	+0.00%	3.21%
Plus: Updates to Actual 1996 Loan Composition	-$41	$8,313	+0.03%	2.29%	-0.01%	3.20%
Plus: Updates to FHA 1995 Termination Data and Actual 1996 Terminations	-$253	$8,060	-0.10%	2.19%	-0.07%	3.13%
Estimates after FHA Data Updates and FY 1996 Experience	-$113	$8,060	-0.15%	2.19%	-0.08%	3.13%

a. Additional FY 1995 Volume and Loan Composition

The FY 1995 data used in last year's Review were tabulated before all information for the fiscal year was collected and entered in FHA's A-43 database. As a result, the FY 1995 Review, which was based on the December 1995 extract, did not include information on all loan origination volume during the last quarter of the year. This missing volume due to the reporting lag was partly a result of the partial shut down of the Federal government in late 1995. As a result of the shut down, some information was not entered into the database until January 1996. A proportionate increase in all originations would have a positive effect on the economic value of the Fund. However, the additional volume was concentrated in the smaller house price categories, making the overall FY 1995 book of business riskier. The net effect of the additional volume and increased risk resulted in a decrease in economic value of $42 million.

b. Higher Than Expected Volume in FY 1996

The FY 1996 book, which had a relatively large number of streamline refinancings (SRs), was 25

percent larger than projected in the FY 1995 Review. According to the DRI forecast, interest rates are expected to rise steadily in the next few years. In response to this expectation and to the interest rate trough experienced in the middle of FY 1996, current homeowners with high mortgage rates are more likely to refinance immediately. The overall increase in the FY 1996 book of business' origination volume increased the estimated FY 1996 economic value by $223 million.

c. Updates to FY 1996 Composition

The actual composition of the FY 1996 book, particularly the higher than expected proportion of SRs, resulted in a book of business with an economic value $41 million lower than last year's projection (holding total volume constant). This is largely due to the shorter time period over which SRs pay annual premiums (seven years versus 30 years for mortgages with LTV ratios greater than 95 percent). Consequently, while the FY 1996 book was 25 percent larger than expected, it had a lower economic value per dollar of origination volume.

d. Changes in Termination Experience

The termination experience for FY 1995 reported in this year's Review has changed from that reported last year for several reasons. First, due to the delay of data entry to the A-43 database, the termination experience in FY 1995 was understated in the FY 1995 Review. Adjusting for this understatement decreases the economic value in FY 1996. Second, the actual FY 1996 conditional claim rates were lower for books originated prior to FY 1992 than the estimated conditional claim rates in our FY 1995 Review, and higher for books originated after FY 1992. As a result, and due to the high percentage of loans in the more recent books, there was a net underestimation of total FY 1996 claims in the FY 1995 Actuarial Review. Exhibit II-6 compares the actual conditional claim rates for all 30-year FRMs in FY 1996 to predicted rates from the FY 1995 Review.

Last, the actual FY 1996 conditional prepayment rates for most books were lower than the estimated conditional prepayment rates in the FY 1995 Review due to higher average interest rates in FY 1996 than those forecasted last year. In particular, the prepayment rates were significantly lower for books originated between FYs 1984 and 1991. Since these books pay no annual premiums and have low premium refund rates, increased prepayments from them tend to increase Fund value. Thus, the lower-than-expected prepayment rates in FY 1996 tend to reduce both the value of these books and the overall Fund's value. The lower-than-expected prepayment rate for books originated between 1990 and 1993 also reduces refunds of up-front premiums. This reduced premium refund expense tends to increase the economic value of the Fund.

The combined effects of the higher claim and lower prepayment rates observed in FY 1996 was a decrease of $253 million in the FY 1996 fund value, and an increase in the estimated FY 2000 capital ratio by 0.01 percent.

Exhibit II-6

Comparison of Actual and Forecasted Conditional Claim and Prepayment Rates for FY 1996 for All 30-Year Fixed-Rate Mortgages, by Book of Business

Amortization Year	FY 1996 Actual Claim Rates	FY 1995 Predicted Claim Rates	FY 1996 Actual Prepayment Rates	FY 1995 Predicted Prepayment Rates
1975	0.07	0.18	8.00	7.87
1976	0.11	0.21	9.63	8.55
1977	0.15	0.22	8.25	8.84
1978	0.21	0.28	8.63	7.67
1979	0.38	0.47	9.00	7.69
1980	0.59	0.59	8.63	8.18
1981	0.80	1.25	6.40	13.37
1982	0.73	1.80	3.69	30.01
1983	1.09	1.57	8.45	13.52
1984	1.67	2.21	7.67	16.01
1985	1.97	2.31	8.51	20.62
1986	1.56	1.63	10.39	13.42
1987	1.22	1.22	9.48	8.51
1988	1.99	2.13	10.62	13.20
1989	2.52	2.42	11.04	20.79
1990	2.06	2.24	12.18	20.61
1991	2.03	1.77	12.52	26.13
1992	1.30	1.21	10.43	19.60
1993	0.87	0.69	6.80	13.83
1994	0.62	0.53	5.86	5.44
1995	0.21	0.37	9.10	5.56
1996	0.00	0.02	0.37	0.34

Sources: A-43 database, June 30, 1996 extract.

4. Decomposition Related to Economic Forecasts and Model Refinements

Exhibit II-7 describes changes in the Fund's economic value resulting from new economic forecasts and modifications made to the econometric models used to forecast the Fund's performance.

Exhibit II-7

Change in MMI Fund Estimated Economic Value Between FY 1995 and FY 1996 Resulting From Economic Forecasts and Model Refinements ($ Millions)

	Change in FY 1996 Economic Value	FY 1996 Economic Value	Change in FY 1996 Capital Ratio	Corresponding FY 1996 Capital ratio	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1995 Estimates with Data Updates and FY 1996 Book of Business	n/a	$8,061	n/a	2.19%	n/a	3.13%
Plus: Changes in Economic Forecasts	+$945	$9,005	+0.25%	2.44%	+0.14%	3.27%
Plus: Refinements to Econometric Models	-$154	$8,851	-0.04%	2.40%	+0.09%	3.36%
Estimates after Model Refinements and Forecasts	+$790	$8,851	+0.21%	2.40%	+0.23%	3.36%

a. Changes in Economic Environment

The primary reason for the change in the FY 1996 economic value was the change in the economic forecast (Exhibit II-8), and the consequent change in the forecasted termination streams of future books. Taking into account the new economic forecasts increased the estimated FY 1996 economic value by $945 million. The increase in the estimated FY 1996 Fund value results primarily from higher house price growth and higher mortgage interest rates in the near future. The higher house price growth reduces claim rates directly, while the higher interest rates reduce prepayment rates, particularly on relatively unseasoned books, such as those that originated in FYs 1992 to 1996. Higher interest rates also reduce conditional claim rates of existing books with lower contract rates. For these books, lower prepayment rates, particularly in the first seven years, increase economic value since they lower refund costs and increase annual premium revenue more than they increase the number of loans that are exposed to claim risk.

In the FY 1995 Actuarial Review, our forecasts of future purchase money mortgage originations were based on a series of econometric models designed to forecast future demand for FHA originations based on economic and policy variables. These models were again used in this year's Review, although

the volume forecasts were based on updated data on mortgage originations and the new economic forecast. The forecasts of origination volume for FYs 1997 to 2000 in this Review have decreased slightly due to the higher interest rate forecasts. The effect of this new origination volume forecast is an increase in insurance-in-force (IIF) of $12.5 billion in FY 2000. Combining this higher volume of IIF and higher economic value due to the lower claim and prepayment rates expected in the next few years, we estimate the FY 2000 capital ratio to increase by 0.21 percentage points.

A pattern exhibited from the current analysis is that the forecasted claim rates among loan-to-value categories are relatively flat compared to the historical pattern. For example, for the 30 year FRMs, the predicted ultimate claim rates for over 97 percent LTV loans are about 20 percent higher than predicted ultimate claim rates for 80 to 90 percent LTV loans; the ultimate claim rates for 90 to 95 percent LTV loans are about three percent higher (that is, a multiple of 1.03) than those of the 80 to 90 percent LTV loans. However, the average historical cumulative claim rates for over 97 percent LTV and 90 to 95 percent LTV loans of the 1986 to 1991 books of business are about 80 and 18 percent higher, respectively, than those for the 80 to 90 percent LTV loans during the same time interval.

One major factor contributing to this relatively flat claim rate pattern is the stronger economic forecast used in this Review. The impact of stronger economic conditions on mortgages is to reduce overall claim rates. However, the reduction would not be proportional among all mortgage categories. In particular, the claim rates of riskier loans would decrease more than those of less risky loans. This is due to the asymmetric effect that good and bad economic conditions have on the claim rates. Since a higher portion of the loans in a risky category are at the margin of default, a slight change in economic conditions would result in a larger marginal increase/decrease in the claim rate. On the other hand, it would take a significant change in economic conditions for less risky loans to have the same magnitude of change in claim rates. As a result, the difference in claim rates between loans in the high and low LTV categories would become smaller and reveal the pattern shown in this Review. Exhibit A-8 in Appendix A decomposes the change in the estimation of cumulative claim rates of FY 1996 loans in different LTV categories between the FY 1995 and FY 1996 Reviews. The decomposition shows that the higher house price growth rate assumption used in the FY 1996 Review is the single most significant factor causing the decrease in cumulative claim rates and the reduction in the variation among different LTV categories.

The historical claim pattern is obtained from pre-1992 books of business. Because those loans were originated before the 1992 Credit Reform Act, they may have characteristics significantly different from those of the newer books of business. Books originated after Credit Reform have characteristics similar to the FY 1996 loans. The claim rate pattern of these more recent books is less representative of the overall historical pattern of claims because they have yet to reach their peak of claims. This difference between pre- and post-Credit Reform books of business could be another factor causing the difference in LTV claim rate patterns.

Exhibit II-8

Forecast of Economic Variables Used in the Econometric and Cash Flow Analyses[a]

	Constant Quality House Price Growth		FHA Contract Rate[b]		FHLMC Commitment Rate		Mean/Median Household Income Growth[c]		Financing Account Rate[d]	
Year	1996 Review	1995 Review	1996 Review	1995 Review	1996 Review	1995 Review	1996 Review	1995 Review	1996 Review	1995 Review
1996	5.71%	1.77%	7.96%	7.51%	7.71%	7.54%	1.73%	1.36%	6.33%	7.11%
1997	6.76%	2.17%	7.88%	7.60%	8.25%	7.63%	1.60%	1.58%	6.33%	7.11%
1998	4.38%	2.67%	7.82%	7.54%	8.19%	7.57%	0.97%	1.69%	6.33%	7.11%
1999	3.89%	3.34%	7.64%	7.25%	7.99%	7.29%	0.69%	1.51%	6.33%	7.11%
2000	2.43%	3.47%	7.54%	7.09%	7.89%	7.13%	0.39%	1.20%	6.33%	7.11%

Source: DRI October, 1996 10-year trend forecast

[a] Values in shaded cells represent actual experience.

[b] The FHA contract rate is forecasted as a function of the Freddie Mac Commitment Rate. See Appendix D for more information.

[c] In the FY 1995 Review, Mean household income was disposable income divided by the number of households. In the FY 1996 Review it is median household income.

[d] The financing account rate is set at the credit reform interest rate in effect for the last quarter of FY 1996. This rate is used to discount future cash flows.

b. Econometric Modifications

As part of this year's Review we made minor modifications to our econometric claim and prepayment rate models to improve their predictive ability and enable them to better accommodate increased data. These refinements included removing the insignificant skewness variable from the 30-year FRM model and removing the house price dispersion variable, which resulted in unreasonable forecasted termination rates, from the 30-year SR model. These modifications resulted in a net decrease in the estimated FY 1996 economic value of $154 million, and a corresponding reduction in the FY 1996 capital ratio of 0.04 percentage points.

Exhibit II-9

Change in MMI Fund Estimated Economic Value Between FY 1995 and FY 1996 Resulting From Changes to Financial and Cash Flow Assumptions ($ Millions)

	Change in FY 1996 Economic Value	FY 1996 Economic Value	Change in FY 1996 Capital Ratio	Corresponding FY 1996 Capital ratio	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1995 Estimates with Data Updates, Model Refinements, and New Economic Forecasts and FY 1996 Book of Business	n/a	$8,851	n/a	2.40%	n/a	3.36%
Plus: Difference Between Expected and Actual Change in Capital Resources	+$27	$8,878	0.00%	2.40%	0.00%	3.36%
Plus: Change in Administrative Cost Factor	+$299	$9,177	+0.08%	2.48%	+0.13%	3.49%
Plus: Change in Conveyance Loss Rates	+$708	$9,885	+0.19%	2.67%	+0.25%	3.74%
Plus: Change in Claims Settlement Adjustment Factor	-$243	$9,642	-0.07%	2.60%	-0.10%	3.64%
Plus: Change in Assignment Loss Rates	-$22	$9,620	0.00%	2.60%	0.00%	3.64%
Less: Change in Default to Claim Lag	-$13	$9,633	0.00%	2.60%	0.00%	3.64%
Less: Change in Disposition Lag	-$236	$9,397	-0.06%	2.54%	-0.07%	3.57%
Equals: **FY 1996 Estimates**	+$546	$9,397	+0.14%	2.54%	+0.21%	3.57%

5. Adjustments to Financial and Cash Flow Assumptions

a. Difference Between Expected and Actual Change

Our projections of the FY 1996 economic value in the FY 1995 Review implicitly assumed that the Fund's capital resources would increase by $973 million in FY 1996. This increase represented the sum of all cash flows, expenses, and interest earned by the Fund. The actual increase in the capital resources was $959 million, the increase in the missed premiums was $42 million, and the decrease in the pre-1975 book of business is $3 million, for a total increase of $998 million. Thus, the net effect of

the difference between the actual and expected growth in capital resources is an increase in the estimated FY 1996 economic value of $27 million.

b. Change in Administrative Cost Factor

Based on current data, we found that the overall MMI Fund administrative costs decreased to about 9 basis points from the 11 basis points assumed in the FY 1995 Review. Administrative cost factors in FY 1996 and FY 1995 were .0965 percent and .1128 percent, respectively. The reduction of the administrative expenses caused the economic value of the Fund to increase, resulting in a $229 million increase in the FY 1996 economic value and an increase of 0.13 percentage points in the FY 2000 capital ratio.

c. Change in Loss Rates

In the FY 1995 Review, we developed a loss rate model to estimate future conveyance loss rates under different situations but the data were not detailed enough to permit satisfactory analysis. This Review estimated the same loss rate model, although some refinements were made, and incorporated the model into the cash flow model. These loss rates are applied to the acquisition cost of the loan (the outstanding balance of the loan plus additional costs of claims settlement) in order to estimate losses due to claims. The loss rates of mortgages in the MMI Fund have decreased gradually during the last few years. In previous Reviews, average historical loss rates were used as estimates for future claims. This improved loss rate model increased the estimated economic value of the Fund. The loss rate model estimated this year better captured the declining trend in the loss rate during recent years and provided lower loss rates, which led to higher estimated economic values and capital ratios. The net effect of incorporating this loss rate model was an increase in the 1996 economic value of $708 million.

Estimates of future loss rates for assignments and pre-foreclosure sales were obtained for FY 1997 by using a weighted average of the assignment loss rate (43 percent) and the pre-foreclosure loss rate (25 percent) used in last year's Review. This results in a weighted average loss rate of 32 percent. Although the assignment program has been terminated, FHA continued to accept some assignments in FY 1996 and expects to handle a number of assignments in FY 1997. Due to this recent activity with the assignment program, the assignment loss rate has been included in the weighted average loss rate for non-conveyances. After FY 1997, however, no further assignments are expected to occur. Therefore the non-conveyance loss rate will be comprised of solely the pre-foreclosure sale loss rate, which is currently estimated to be 25%.

As can be seen in Exhibit II-10, the loss rates estimated by the econometric model are lower than the rates used in the FY 1995 Review for the riskier house price categories (categories 1-3, 30-year FRMs and ARMs), leading to an increase of the estimated FY 1996 economic value of the Fund by $708 million and increase in the FY 2000 capital ratio by 0.25 percentage points.

Exhibit II-10

Loss Rates for FY 1996 - FY 1996 Review								
Mortgage Type	**House Price 1**	**House Price 2**	**House Price 3**	**House Price 4**	**House Price 5**	**House Price 6**	**House Price 7**	**House Price 8***
30-year FRMs	0.38	0.34	0.33	0.33	0.33	0.32	0.33	0.33
30-year SRs	0.36	0.33	0.32	0.31	0.31	0.31	0.31	0.32
ARMs	0.34	0.31	0.29	0.29	0.29	0.29	0.29	0.30
15-year FRMs	0.30	0.27	0.26	0.25	0.25	0.25	0.25	0.26
15-year SRs	0.32	0.29	0.28	0.27	0.27	0.27	0.27	0.28
GPMs	0.33	0.29	0.28	0.28	0.28	0.28	0.28	0.29
Loss Rates for FY 1995 - FY 1995 Review								
Mortgage Type	**House Price 1**	**House Price 2**	**House Price 3**	**House Price 4**	**House Price 5**	**House Price 6**	**House Price 7**	**House Price 8**
30-year FRMs	0.45	0.38	0.34	0.29	0.27	0.22	0.24	0.05
30-year SRs	0.45	0.38	0.34	0.29	0.27	0.22	0.24	0.05
ARMs	0.49	0.39	0.33	0.32	0.27	0.24	0.27	n/a
15-year FRMs	0.38	0.25	0.20	0.21	0.18	0.24	0.21	n/a
15-year SRs	0.38	0.25	0.20	0.21	0.18	0.24	0.21	n/a
GPMs	0.43	0.52	0.42	0.32	0.29	0.26	0.19	n/a

*Due to the lack of observations in this category, loss rates could not be computed for each mortgage type.

d. Change in Claim Settlement Adjustment Factor

When FHA pays a claim, the claim payment typically consists of the unpaid principal balance on the mortgage, the interest expense on the unpaid principal balance, and foreclosure and acquisition costs. The claim settlement adjustment factor used in the model estimates the foreclosure and acquisition costs incurred by FHA. This factor is based on the relationship between the actual historical dollar value of FHA claim payments and estimates of those claim payments associated with the unamortized balance of the corresponding mortgages generated by the Actuarial model in the same fiscal years. In the past, we have estimated this factor to be 7 percent; in the current Review we have increased this factor to 11 percent based on recent Fund experience and our use of new loss rates (see below). The effect of this change has been to reduce the estimated FY 1996 economic value by $243 million, and the FY 2000 capital ratio by 0.10 percentage points.

e. Change in Assumption on Assignment Program

Although FHA eliminated the assignment program in April 1996, mortgages accepted into the assignment program prior to the program's termination continue to be assigned to FHA. Based on FHA estimates, we have increased the percentage of claims in FY 1997 that are assumed to be assignments from zero in the FY 1995 Review to 16 percent in the current Review. We have also decreased the loss rate on these assigned mortgages from 49 to 43 percent of the total claim payment based on FHA's current portfolio of assigned notes. The combined effect of these two changes is to reduce the estimated FY 1996 economic value by $22 million.

f. Change in Default-to-Claim Lag

The default-to-claim lag is the amount of time that elapses between loan default and claim payment (and acquisition in the case of a conveyance). Since FHA pays interest and certain carrying costs during this period, the longer the period, the greater the cost per claim to FHA. The FY 1996 review assumes the lag between loan default and claim payment is 14.46 months, 13.37 months, and 14.51 months in FY 1996 , FY 1997, and FYs 1998 and forward, respectively, whereas the FY 1995 Review assumed a lag of 14.24 months. The 14.51 month value represents an increase from the average lag used last year, which was based on loans that terminated between FYs 1992 to 1994. The change in the lags for FYs after 1996 decreased the estimated FY 1996 fund value by $13 million and had no discernible effect on the estimated FY 1996 and FY 2000 capital ratios.

g. Change in Disposition Lag

The disposition lag is the amount of time that elapses from the date when FHA acquires a property to the date that it disposes of that property. This time has decreased in recent years, dropping from approximately 7.2 months in FY 1989 to 3.8 months in FY 1995. In the FY 1995 Review we assumed that the average disposition lag in FY 1996 was 5.4 months, while in the FY 1996 Review we assume it was 3.9 months. In this Review we assume that the disposition lag will be 3.8 months in FY 1997 and 4.7 months for FY 1998 and forward. The 1996 and 1997 estimates reflect a reduced amount of loan volume disposed of through conveyances, with the remainder of dispositions occurring through non-conveyance methods. In order to provide a conservative estimate for the future, the lag for FY 1998 and forward has been calculated using the historical average (obtained from actual data) from 1992 to 1995.

These lags account for the zero disposition lags associated with pre-foreclosure sales as well as the lags pertaining to assignments. After FY 1996, pre-foreclosure sales were assumed to account for ten percent of all terminations and for FY 1996, actual percentages of pre-foreclosure sales, assignments, and conveyances were used. These percentages, along with average lags from loans that terminated from FY 1992 to FY 1995, were used to yield a single weighted average lag. The effect of this decrease in the disposition lag has been a decrease in the estimated value of the Fund by $236 million

and a decrease in both the FY 1996 and FY 2000 capital ratios by 0.06 and 0.07 percentage points, respectively. There are two reasons for this counter-intuitive result. First, one of the primary effects of a change in the disposition lag is to shift cash flows from the future to the current fiscal year. When the disposition lag falls by two months, for example, proceeds from the disposition of property previously expected to occur in the second month of FY 1997 now occur in the last month of FY 1996. This change in the timing of cash flows reduces future cash flows expected, reducing the economic value of the Fund. Second, the reduction in the conveyance loss rate, which is described above, is in part due to the change in the disposition lag. Therefore, the analysis of the effect of the reduction in conveyance loss rates, presented earlier, captures part of the effect of the change in disposition lag.

Section III: Current Status of the MMI Fund

As of the end of fiscal year FY 1996, the MMI Fund had an estimated economic value of $9.397 billion and a capital ratio of 2.54 percent. Both of these figures reflect increases from last year and suggest continued improvement in the Fund's performance. This section provides a more detailed analysis of the MMI Fund's current status by examining the Fund's current situation and the projected future performance of the FY 1975 through 1996 books of business. It includes a description of the basic components of the Fund's economic value and an explanation of the historical and estimated claim and prepayment rates that are used to estimate future performance.

A. Estimating the Current Economic Value of the MMI Fund

According to the statutory definition, the economic value (or economic net worth) of the Fund is the "cash available to the Fund, plus the net present value of all future cash inflows and outflows expected to result from the outstanding mortgages in the Fund." We base our estimate of this value on the level of capital resources as stated on the MMI Fund balance sheet plus the present value of expected future cash flows of the existing loan portfolio as estimated from our financial models.

Capital resources include cash, investments, properties, mortgages, and receivables net of payables. The present value of expected future cash flows is calculated by a financial model which uses the most current information available to estimate cash flows, including the present value of the expected cash inflows (premiums, income from recoveries, and investment income), and outflows (claim payments, premium refunds, and administrative costs). The cash flows included in these calculations are those from the origination year to the year of maturity (*e.g.*, 30 years from the first policy year for 30-year mortgages). Exhibit II-2 in Section II presents our estimate of the economic value of the MMI Fund as of the end of FY 1996.

1. Economic Value by Book of Business

In order to estimate the economic value of the entire Fund, we have estimated the economic value of each book of business by loan-to-value (LTV) category for each major mortgage type. Exhibit III-1 displays the economic values for each LTV category within a book of business. The economic value of the loans in an individual LTV category reflects the results of the termination patterns and the premiums of a particular category. These economic values represent simulated historical and projected future values, and should not be interpreted as the current economic value of the entire Fund. In particular, these values do not include the residual surplus from loans originated prior to 1975 or the net accumulated interest earned on prior fund balances. Thus, this exhibit is offered to facilitate comparison between books of business and LTV categories, and not to decompose total fund value.

The "No Appraisal" category in Exhibit III-1 primarily consists of streamline refinancings (SRs) from FYs 1991 to 1996. For years prior to FY 1991, it consists of loans without LTV values assigned in the A-43 database. These older loans have exhibited the highest claim rates of any LTV category, which accounts for the large negative values associated with this category in the early 1980s.

Exhibit III-1

1996 Economic Values by Origination Year and LTV For All Mortgage Types ($ Millions)[a]

Fiscal Year	No Appraisal[b]	0-65%	65-80%	80-90%	90-93%	93-95%	95-97%	97-100%	Investor[c]	Total
1975	$25	$5	$20	$47	$49	$44	$60	$44	$27	$321
1976	$16	$4	$16	$40	$45	$58	$83	$89	$29	$380
1977	$41	$6	$26	$60	$78	$92	$119	$144	$40	$605
1978	$101	$8	$31	$61	$67	$86	$118	$174	$45	$691
1979	$54	$14	$55	$88	$47	$44	$19	($100)	$36	$257
1980	($68)	$17	$30	($60)	($223)	($107)	($163)	($504)	($41)	($1,119)
1981	($425)	$4	($25)	($240)	($189)	($101)	($235)	($537)	($203)	($1,952)
1982	($255)	$1	($36)	($179)	($110)	($101)	($266)	($464)	($183)	($1,593)
1983	($539)	$36	$6	($182)	($249)	($204)	($494)	($869)	($285)	($2,781)
1984	($85)	$10	($28)	($130)	($167)	($150)	($333)	($967)	($365)	($2,215)
1985	($47)	$12	($16)	($165)	($176)	($166)	($416)	($906)	($634)	($2,513)
1986	($27)	$74	$87	($24)	($136)	($143)	($366)	($938)	($425)	($1,900)
1987	($6)	$91	$156	$102	$30	($10)	($167)	($436)	($52)	($292)
1988	($1)	$12	$28	$19	($0)	($18)	($105)	($339)	($44)	($449)
1989	($8)	$9	$27	$15	$7	($9)	($66)	($276)	($18)	($319)
1990	($5)	$12	$29	$26	$9	($4)	($45)	($255)	$0	($233)
1991	($8)	$8	$19	$30	$9	$5	$1	($98)	($4)	($37)
1992	$54	$19	$49	$180	$162	$241	$556	$171	$51	$1,483
1993	$243	$16	$50	$210	$191	$272	$623	$456	$64	$2,124
1994	$310	$15	$44	$174	$167	$240	$597	$473	$74	$2,093
1995	$3	$5	$16	$75	$83	$129	$329	$249	$39	$930
1996	$29	$6	$23	$114	$122	$196	$484	$340	$62	$1,377

[a]All values are as of the end of FY 1996.
[b]See Appendix C for a full description of loans contained within this category.
[c]Includes investor loans and all dwellings with two or more units.

Similarly, the "Investor" category in Exhibit III-1 consists of a number of different loan types. The A-43 database does not explicitly identify investor loans. This category contains loans that, based on previous statistical analyses conducted by Price Waterhouse LLP, have been identified as loans that are likely to have participated in FHA's Investor Program, which was discontinued in

FY 1991. Since most loans for properties with two-to-four living units originated prior to FY 1991 were likely to have participated in the Investor Program, all of these loans are included in the Investor category. New loans for two-to-four unit properties, which represent approximately four percent of the MMI Fund's new loan volume, are included for estimation purposes in the Investor category, despite the fact that they are not investor loans.

2. Capital Resources

Capital resources are the net assets of the Fund which, if necessary, could be converted into cash to meet the Fund's obligations. These resources consist of cash, investments, properties, mortgages, and the net of miscellaneous receivables and payables. These values, shown in Exhibit III-2, are taken from the annual audited financial statements of the Fund.

The value included in the capital resources line item is derived primarily from four sources:

- residual surplus from insurance on loans (most of which were originated prior to 1975) that had matured by FY 1996
- conveyed property and other assets awaiting disposition
- any prior capital provided by the government
- current net reserve of premium income from existing insurance-in-force.

Since assets are valued at market value when booked, shifts among the capital resource accounts have relatively little impact on our analysis. For comparative purposes, all capital resources and their associated expected cash flows are treated as equivalent to cash.

Exhibit III-2

MMI Fund Capital Resources
End of Fiscal Year Value in FY 1992 Through FY 1996
($ Millions)

Capital Resources	FY 1992 Audit	FY 1993 Audit	FY 1994 Audit	FY 1995 Audit	FY 1996 Audit
Cash	$758	$1,242	$1,277	$1,232	$3,863
Investments	5,781	5,140	5,665	6,587	7,642
Properties	1,721	1,281	1,187	1,001	949
Mortgages	2,275	2,639	3,134	3,318	2,344
Other Assets	n/a	n/a	n/a	317	332
Net Receivables and Payables	(582)	(604)	(503)	(1,638)	(3,579)
Total Capital Resources	$9,503	$9,698	$10,760	$10,592	$11,551

Source: Audited Financial Statements for FYs 1992-1996.

3. Estimated Contribution of Existing Books of Business to Capital Resources

The estimated "contribution of a book of business to capital resources" refers to the net accumulative contribution of the book to the total estimated capital resources of the Fund, from its origination through the end of FY 1996. According to our financial cash flow model, the insurance endorsed between FYs 1975 and 1996 has contributed an estimated -$2.832 billion to the Fund's capital resources as of the end of FY 1996 (see Exhibit III-3). In other words, the FYs 1975 to 1996 books have decreased the current total estimated capital resources of the Fund by $2.832 billion.

We estimate the contribution to capital resources using historical claim, prepayment, loss, and interest rates, along with assumptions regarding premiums, premium refunds, and administrative costs, to estimate the cash flows associated with each book of business through the end of FY 1996. These cash flows are added to each book's initial estimated cash balances, which are created through the payment of up-front and annual premiums. Thus, each year's cash flows either build or deplete a given book's capital resource balance until an end-of-year contribution to Fund

Exhibit III-3

Estimated Contribution to Capital Resources and Net Present Value of Future Cash Flows at End of FY 1996 by Loan Type ($ Millions)

	Total MMI FY 1996		30-Year FRMs		30-Year SRs		ARMs		15-Year FRMs		15-Year SRs		GPMs	
Year	ECCR[a]	PV FCF[b]	ECCR	PV FCF	ECCR	PV FCF	ECCR	PV FCF	ECCR	PV FCF	ECCR	PV FCF	ECCR	PV FCF
1975	$314	$7	$314	$7	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1976	370	10	370	10	0	0	0	0	0	0	0	0	0	0
1977	588	17	587	17	0	0	0	0	0	0	0	0	1	0
1978	661	30	546	26	0	0	0	0	0	0	0	0	115	4
1979	210	47	74	32	0	0	0	0	0	0	0	0	136	15
1980	(1,148)	28	(691)	20	0	0	0	0	0	0	0	0	(457)	9
1981	(1,958)	7	(1,348)	5	0	0	0	0	(3)	0	0	0	(607)	2
1982	(1,589)	(4)	(1,079)	(3)	0	0	0	0	(3)	0	0	0	(507)	(1)
1983	(2,791)	10	(2,053)	9	0	0	0	0	(22)	0	0	0	(715)	2
1984	(2,170)	(45)	(1,630)	(40)	0	0	0	(0)	(50)	(0)	0	0	(490)	(5)
1985	(2,463)	(50)	(2,151)	(47)	0	0	(1)	(0)	(60)	(0)	0	0	(250)	(3)
1986	(1,712)	(188)	(1,653)	(184)	0	0	(3)	(1)	15	(2)	0	0	(70)	(1)
1987	21	(313)	(26)	(307)	0	0	16	(1)	66	(3)	0	0	(35)	(2)
1988	(238)	(210)	(233)	(204)	(5)	(0)	22	(4)	5	(2)	(0)	(0)	(28)	(1)
1989	(102)	(217)	(76)	(215)	(5)	(0)	9	(1)	6	(1)	(0)	(0)	(36)	1
1990	66	(300)	91	(297)	(2)	(0)	8	(1)	9	(2)	(0)	(0)	(40)	1
1991	194	(231)	163	(220)	4	(1)	46	(9)	13	(3)	1	(0)	(33)	2
1992	1,573	(90)	1,104	(52)	87	(37)	317	(2)	50	1	16	(3)	(1)	1
1993	2,333	(209)	1,244	164	634	(364)	305	20	30	(4)	118	(27)	2	1
1994	2,509	(416)	1,113	98	787	(480)	432	9	27	(6)	135	(37)	2	0
1995	1,064	(134)	697	(77)	40	(40)	308	(10)	10	(3)	8	(4)	1	(0)
1996	1,435	(58)	857	134	228	(202)	308	27	16	(5)	26	(12)	1	0
Total	($2,832)	$(2,311)	($3,768)	$(1,127)	$1,768	($1,125)	$1,767	27	$108	($29)	$305	($82)	($3,011)	$25

[a]ECCR is estimated contribution to capital resources at the end of year.
[b]PV FCF is present value of future cash flows at the end of the year.

capital resources for FY 1996 is calculated. Exhibit III-3 shows the estimated contribution to capital resources and present value of future cash flows of each book of business from FYs 1975 through 1996 for the MMI Fund as a whole, as well as for each loan type.

The present value of the future cash flows of a book of business is the sum of all discounted remaining cash flows of the book from the end of FY 1996 forward. Based on the results of our cash flow models, the total net present value of future cash flows resulting from books of business written from FY 1975 through FY 1996 is -$2.311 billion. In other words, the future cash outflows from the Fund to cover claims and other costs associated with these books will be $2.311 billion less, in present value terms, than the future cash inflows these books will generate through premiums, recoveries, and other non-interest income.

These negative present values are expected due to FHA's premium structure, which includes relatively large upfront premiums and in some cases small annual premiums. The Fund collects much of its premium income in the first year of a book of business, invests the balances, and pays claims in the future as they occur. For example, of the total present value of future cash flows for the FY 1996 book of business, a negative $58 million is attributable to the projected future cash flows of the FY 1996 book of business. However, because of its current estimated contribution to capital resources of $1,435 million (due primarily to the collection of upfront premiums in FY 1996), the economic value of the FY 1996 book is $1,377 million. Thus the FY 1996 book has a positive economic value, despite the fact that the present value of its future cash flows is negative.

4. Amortization of Current Books of Business

For purposes of calculating the MMI Fund's capital ratio, we use unamortized insurance-in-force (IIF), although it is also instructive to consider the capital ratio based on amortized IIF, which is the basis the General Accounting Office (GAO) used in its April 1996 report on the status of the Fund. At any given time, the actual dollar value that is at risk is the amortized IIF. In Exhibit III-4, we present the volume of new mortgage originations, the unamortized IIF at the end of FY 1996, and the amortized IIF at the end of FY 1996 for all mortgage types.

As Exhibit III-4 indicates, the FY 1996 book of business constitutes approximately 18 percent of the Fund's total amortized IIF. Over three quarters of the amortized IIF at the end of FY 1996 is from the 1990's. Consequently, a significant proportion of the MMI Fund's exposure is in recent mortgage originations.

Exhibit III-5 displays estimated capital ratios of the Fund using amortized IIF instead of the estimates of unamortized IIF used elsewhere in this report. The Fund's estimated capital ratio for FY 1996 and FY 2000 would be 2.71 and 4.01 percent, respectively, if amortized IIF were substituted for unamortized IIF. Price Waterhouse LLP continues to use the unamortized IIF

measure (as generally defined) in calculating the capital ratio, although it is also instructive to consider the capital ratio based on amortized IIF.

Exhibit III-4

Endorsements and Insurance-in-Force as of End of FY 1996 for All Mortgages ($ Thousands)

Book of Business	New Mortgage Originations	Unamortized Insurance-in- Force[a]	Amortized Insurance-in-Force[a]
1975	$4,690,049	$1,139,028	$629,207
1976	$5,733,815	$1,478,867	$875,805
1977	$7,176,389	$2,266,307	$1,406,287
1978	$10,025,103	$3,222,893	$2,168,445
1979	$15,657,126	$4,323,289	$3,189,063
1980	$14,875,812	$2,581,110	$2,060,947
1981	$10,269,001	$1,169,756	$1,012,658
1982	$7,322,800	$641,313	$589,029
1983	$26,795,607	$2,788,584	$2,243,913
1984	$15,921,794	$1,526,136	$1,275,025
1985	$24,047,176	$2,301,794	$1,904,902
1986	$57,515,839	$14,027,210	$11,459,213
1987	$69,943,517	$26,546,190	$22,158,244
1988	$37,431,316	$10,374,144	$8,640,419
1989	$39,763,058	$10,301,010	$8,914,284
1990	$47,126,046	$13,047,096	$11,395,669
1991	$44,066,667	$14,699,797	$12,676,797
1992	$45,091,810	$26,747,609	$23,098,140
1993	$73,786,677	$58,313,448	$52,628,161
1994	$79,654,034	$70,652,725	$65,037,062
1995	$41,155,571	$36,251,054	$33,418,765
1996	$58,863,309	$58,553,118	$58,028,834
Total	**$736,912,516**	**$362,952,477**	**$324,810,869**

[a] Figures calculated as end of year insurance-in-force.

Exhibit III-5

Projected MMI Fund Performance Using Amortized Insurance-in-Force ($ Millions)			
At End of Fiscal Year	Economic Value of the Fund[a]	Capital Ratio	Amortized Insurance in Force
1996	$9,397	2.71%	$347,021
1997	$10,670	3.02%	$353,167
1998	$11,947	3.33%	$358,294
1999	$13,306	3.67%	$362,745
2000	$14,825	4.01%	$369,888

[a]All values are as of the end of each fiscal year. The economic value for future years (FYs 1997 through 2000) is equal to the economic value of the Fund at the end of the previous fiscal year, plus the interest earned on the Fund's balances in the current year, plus the economic value of the new book of business.

B. Historical and Estimated Claim and Prepayment Rates

1. Historical and Estimated Claim Rates

The historical and forecasted conditional claim rates of 30 year fixed-rate mortgages for the first 15 policy years and the 30-year cumulative claim rates are shown below in Exhibit III-6. (Complete tables for all policy years and each LTV category are included in Appendix G.) The results indicate that projected conditional claim rates for books of business originating between FYs 1980 and 1986 will continue to remain high. However, over 85 percent of the loans on these books have already been either prepaid or claimed. As a result, the economic costs of future claims and prepayments on these books should be relatively small. Partially due to new underwriting guidelines implemented by FHA in FY 1987, the claim rates for books originated after FY 1986 have experienced significantly lower conditional claim rates. The claim rates of loans originated after 1992 are the lowest among all books of business since FY 1975. Given their characteristics and superior performance during the first few years, our model estimates the ultimate claim rates of these books of business could be as low as those for the loans originated in the mid 1970's. Because of the large outstanding balance of these books of business, these loans will be the primary source of claim payments over the next few years. Due to the high refinancing rates and low claim rates during its first three policy years, the FY 1993 book of business is estimated to have the highest ultimate prepayment rate and the lowest ultimate claim rate. The future FY 1997 to FY 2000 books of business are estimated to have claim rates comparable to the loans originated in the first half of the 1990's.

Exhibit III-6

Historical and Forecasted Conditional Claim Rates for 30-Year Fixed-Rate Mortgages
Annual Rates for the First Fifteen Policy Years and 30-Year Ultimate Rates

PY	Endorsement Year																					
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.06	0.11	0.05	0.03	0.03	0.03	0.10	0.15	0.02	0.04	0.03	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
2	0.79	0.94	0.52	0.44	0.49	0.80	1.59	2.32	0.56	1.19	0.98	0.50	0.40	0.46	0.39	0.34	0.36	0.24	0.17	0.19	0.21	0.24
3	1.17	1.01	0.66	0.61	0.94	1.43	3.58	4.49	1.71	3.12	3.49	1.87	1.14	1.26	1.22	1.17	1.22	0.84	0.61	0.62	0.85	0.67
4	0.91	0.77	0.47	0.56	0.83	1.74	3.30	5.21	2.31	4.98	6.07	2.33	1.37	1.66	1.71	1.73	1.93	1.31	0.87	1.01	1.07	0.90
5	0.62	0.47	0.36	0.45	0.92	1.55	3.39	5.57	3.33	6.71	5.48	2.16	1.40	1.89	1.94	2.28	2.33	1.30	0.80	0.94	1.05	0.93
6	0.39	0.33	0.28	0.51	0.82	1.55	3.21	6.36	4.70	5.86	4.18	1.99	1.39	1.89	2.43	2.42	2.03	0.96	0.60	0.78	0.93	0.83
7	0.29	0.28	0.30	0.42	0.82	1.52	3.88	6.27	4.07	4.11	3.54	1.79	1.29	2.19	2.58	2.06	1.47	0.77	0.51	0.70	0.84	0.78
8	0.21	0.29	0.24	0.43	0.84	1.85	4.38	4.24	2.85	3.19	3.15	1.66	1.40	2.31	2.25	1.88	1.21	0.63	0.43	0.62	0.77	0.70
9	0.27	0.26	0.26	0.43	0.97	2.27	3.24	2.84	2.43	2.84	3.06	1.81	1.38	1.99	1.78	1.64	1.09	0.61	0.41	0.62	0.77	0.68
10	0.22	0.21	0.26	0.48	1.19	1.92	2.56	2.17	2.19	2.44	2.88	1.86	1.22	1.71	1.55	1.45	1.01	0.58	0.42	0.62	0.75	0.65
11	0.22	0.23	0.29	0.64	1.07	1.57	2.06	1.84	1.91	2.38	2.67	1.56	0.82	1.43	1.32	1.28	0.92	0.55	0.40	0.56	0.68	0.57
12	0.19	0.24	0.39	0.62	0.91	1.35	1.72	1.41	1.86	1.93	1.97	1.27	0.73	1.24	1.22	1.22	0.99	0.66	0.53	0.65	0.76	0.62
13	0.21	0.34	0.39	0.55	0.82	1.17	1.49	1.32	1.57	1.67	2.05	1.24	0.65	1.16	1.16	1.20	0.99	0.64	0.50	0.60	0.69	0.58
14	0.26	0.34	0.38	0.49	0.70	1.12	1.33	1.05	1.09	2.22	1.67	0.89	0.53	0.91	0.93	0.96	0.80	0.51	0.39	0.45	0.54	0.45
15	0.27	0.34	0.32	0.39	0.60	1.02	1.24	0.73	1.31	1.97	1.48	0.79	0.48	0.84	0.88	0.89	0.72	0.45	0.35	0.40	0.48	0.41
Ult	**5.65**	**5.66**	**5.00**	**6.84**	**11.07**	**16.08**	**22.12**	**20.13**	**15.93**	**20.33**	**18.25**	**13.68**	**10.25**	**11.58**	**10.15**	**8.87**	**7.07**	**5.78**	**4.65**	**6.97**	**6.28**	**7.11**

Shaded values indicate actual experience.

2. Historical and Estimated Prepayment Rates

The historical and forecasted conditional prepayment rates for the first 15 policy years and 30-year ultimate prepayment rates are shown below in Exhibit III-7. (Complete tables for all policy years and each LTV category are included in Appendix G.) The rates along the shaded diagonal illustrate a significant increase in prepayment rates experienced in FY 1996 as a result of the interest rate trough experienced in the middle of FY 1996. According to the DRI forecast, interest rates should rise steadily in the next few years. As a result, current homeowners with high mortgage rates are more likely to refinance immediately rather than deferring with the expectation that interest rates will decrease further in future periods. Given that the future mortgage rates are forecasted to stay in a narrow range between 7.3 and 7.8 percent, we expect the prepayment rates of the FY 1997 to 2000 books of business to be low.

Exhibit III-7

Historical and Forecasted Conditional Prepayment Rates for 30-Year Fixed-Rate Mortgages
Annual Rates for the First Fifteen Policy Years and 30-Year Ultimate Rates

PY	Endorsement Year																					
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.20	0.28	0.36	0.35	0.29	0.36	0.17	0.35	0.28	0.21	0.29	0.51	0.26	0.37	0.45	0.38	0.37	0.36	0.63	0.30	1.73	0.37
2	1.88	3.40	3.25	2.46	0.82	0.92	0.42	17.40	0.92	1.41	11.18	3.72	1.02	1.50	2.01	2.06	5.46	7.27	4.02	1.97	9.10	1.77
3	6.76	8.39	6.18	2.05	0.68	0.35	7.09	9.34	2.19	18.63	23.33	2.67	1.74	3.06	4.12	9.71	25.91	16.62	3.92	5.86	6.25	3.93
4	9.97	8.98	3.53	1.32	0.36	1.76	4.75	12.29	17.62	25.72	10.59	3.18	2.85	4.60	14.94	29.44	29.83	6.30	6.80	4.85	7.98	5.50
5	8.96	4.73	1.82	0.75	1.42	2.03	6.02	28.99	26.75	11.31	8.50	4.47	3.42	14.29	28.60	29.35	7.82	10.43	9.76	5.73	10.54	6.73
6	4.48	2.41	0.79	1.99	1.64	2.65	19.37	26.16	10.80	9.17	10.33	5.49	8.49	26.87	27.66	8.25	12.52	10.53	10.01	6.18	10.95	7.20
7	2.35	1.00	2.69	2.07	2.04	9.20	21.55	11.71	8.43	9.92	12.38	14.40	19.65	26.14	8.19	12.18	15.80	12.54	12.66	7.46	13.49	7.98
8	1.15	3.25	2.76	2.40	4.81	14.11	9.78	8.24	9.74	10.50	21.57	26.40	21.02	7.85	11.04	13.71	16.09	14.68	14.71	8.44	13.22	8.35
9	3.30	3.34	3.15	5.28	7.58	7.23	7.23	6.58	11.71	16.18	23.09	25.36	6.48	10.62	12.12	11.60	15.02	13.41	14.12	7.11	10.72	7.27
10	3.37	3.59	5.79	7.66	5.49	5.86	7.08	5.98	19.26	17.40	22.67	7.54	9.48	8.15	10.20	10.72	13.65	13.11	12.58	6.34	9.47	6.70
11	3.59	6.09	7.65	5.63	5.17	6.57	7.32	7.23	19.11	18.53	8.41	10.39	6.53	7.19	9.68	9.93	12.98	11.17	11.13	5.85	8.54	6.26
12	5.89	7.89	5.73	5.17	5.52	7.27	11.02	7.45	19.37	7.56	8.51	10.77	6.62	7.64	9.95	10.48	11.69	10.34	10.50	5.76	8.25	6.19
13	7.72	5.86	5.23	5.41	5.29	13.66	12.75	7.54	7.64	7.67	11.85	9.84	6.60	7.21	9.54	8.91	10.05	9.51	10.03	5.54	7.68	6.01
14	5.75	5.33	5.47	5.28	8.79	16.09	13.27	3.83	8.45	9.10	10.77	10.27	6.90	7.46	8.71	8.31	9.73	9.44	10.29	5.71	7.81	6.20
15	5.23	5.47	5.23	7.29	13.78	16.66	6.30	3.69	8.70	7.83	9.96	10.01	6.97	6.57	7.72	7.69	9.18	9.23	10.25	5.77	7.63	6.24
Ult.	**81.06**	**81.95**	**81.99**	**77.15**	**73.08**	**71.61**	**70.18**	**76.83**	**79.29**	**75.05**	**78.55**	**80.63**	**77.31**	**79.62**	**84.18**	**86.22**	**89.69**	**89.33**	**91.24**	**77.65**	**86.10**	**79.44**

Shaded values indicate actual experience.

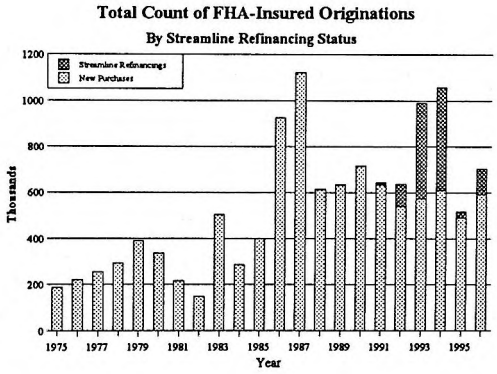
Section IV: Characteristics of the Fiscal Year 1996 Book of Business

This section describes the fiscal year (FY) 1996 book of business. The description includes the following: an analysis of the loans' origination volume and composition by mortgage type, the breakdown of purchase mortgages versus refinancings, and the distribution of loans among house price and loan-to-value (LTV) categories. In addition, this section compares the FY 1996 book to previous books and explains how the unique characteristics of the FY 1996 book are likely to influence future performance.

A. Volume of Mortgage Originations

In FY 1996, FHA insured $59 billion in single family mortgages through the MMI Fund, bringing the fund's total unamortized insurance-in-force (IIF) to $370 billion. Exhibit IV-1 indicates the annual number of loan originations by FHA from FY 1975 to FY 1996, as well as the portion which were streamline refinancings (SRs).

Exhibit IV-1



Source: A-43 database, June 30, 1996 extract.
The total originations in 1996 are scaled up by a factor of 1.48 which was obtained by dividing origination volume from the December 1996 extract by the origination volume from the June 30, 1996 extract.

As shown in Exhibit IV-1, the FY 1996 book of business was substantially larger than the FY 1995 book. The increase in mortgage originations during the most recent fiscal year can be attributed largely to a significant increase in SRs which is the result of a rapid decline in interest rates from FY 1995 to FY 1996. The lower interest rate, coupled with a stronger economic environment (as demonstrated by higher household income growth rates) have increased the affordability of housing. In addition, the recovery of the housing market from the slow growth rate of the early 1990s has also reduced the potential home purchaser's concern of loss in home equity. These more favorable economic conditions have caused new purchase mortgages also to increase significantly from the 1995 level. However, since the current interest rates have not declined as much as they did during FY 1993 and 1994, even though new purchase mortgages have reached a level similar to that of the FY 1993-1994 period, the number of SRs is still far lower than it was during those years.

Although FHA insures loans in each of the fifty states, as well as U.S. territories such as Puerto Rico, more than half of FHA's total dollar volume in FY 1996 had been originated in only ten states. Exhibit IV-2 illustrates the percent of FHA's total dollar volume originated in these ten states between FYs 1993 and 1996.

Exhibit IV-2

Percentage of FHA Dollar Volume Originated Between FY 1993 and FY 1996				
State	**1993**	**1994**	**1995**	**1996**
California	11.63%	13.40%	15.07%	16.30%
Colorado	5.32%	4.25%	3.32%	4.14%
D.C.	3.45%	3.23%	3.61%	2.70%
Florida	5.41%	6.23%	5.94%	5.33%
Georgia	3.99%	3.62%	3.31%	3.16%
Illinois	3.85%	4.11%	5.00%	4.80%
New York	2.97%	3.28%	4.00%	4.28%
Pennsylvania	2.01%	2.01%	2.43%	2.32%
Tennessee	2.58%	2.67%	3.13%	2.90%
Texas	8.36%	8.50%	6.33%	6.82%
% of Total	**49.57%**	**51.30%**	**52.12%**	**52.75%**

Source: A-43 database, June 30, 1996 extract.

As Exhibit IV-2 illustrates, since FY 1993 the proportion of FHA's origination volume coming from the ten states in which FHA does most of its business has increased slightly. Particularly striking is the fact that the percentage of FHA-insured loan volume originated in California has increased by 4.67 percentage points since FY 1993, making almost one out of every six FY 1996 originations a California mortgage. This experience is significantly greater than that of the conventional mortgage market, in which California loans accounted for about ten percent in 1995. This indicates that the MMI Fund would be more sensitive than conventional mortgages to the economic conditions in California.

B. Originations by Mortgage Type

As Exhibit IV-3 indicates, 30-year FRMs have historically constituted the bulk of FHA's business. Graduated-payment mortgages (GPMs), which comprised over one-fourth of the business when interest rates were very high, between FYs 1979 and 1981, have decreased markedly and are currently a negligible portion of FHA's business. Similarly, 15-year Streamline Refinancings and FRMs became an increasingly large share of new business from FYs 1992 to 1994 because a reduction in interest rates made them popular choices for refinancers who could switch to a 15-year term with a minimal or no increase in monthly payments. However, the popularity of 15-year FRMs, which were once very popular between FY 1983 and FY 1987, has diminished since 1995 and remained low in 1996 as interest rates have increased from their 1993 trough.

Exhibit IV-3

FHA-Insured Originations By Mortgage Type
(Percentage of FHA-Insured Mortgages by Dollar Volume)

Year	Purchases Mortgages and non-SRs				Streamline Refinancings	
	30-Year FRMs	15-Year FRMs	ARMS	GPMs	30-Year SRs	15-Year SRs
1975	99%	1%	n/a	n/a	n/a	n/a
1976	99%	1%	n/a	n/a	n/a	n/a
1977	99%	1%	n/a	0%	n/a	n/a
1978	86%	0%	n/a	14%	n/a	n/a
1979	64%	0%	n/a	36%	n/a	n/a
1980	65%	0%	n/a	35%	n/a	n/a
1981	73%	0%	n/a	27%	n/a	n/a
1982	77%	1%	n/a	22%	n/a	n/a
1983	82%	6%	n/a	12%	n/a	n/a
1984	82%	6%	0%	12%	n/a	n/a
1985	87%	7%	0%	6%	n/a	n/a
1986	89%	8%	1%	2%	n/a	n/a
1987	91%	7%	2%	1%	n/a	n/a
1988	90%	4%	5%	1%	0%	0%
1989	95%	3%	2%	1%	0%	0%
1990	95%	3%	1%	1%	0%	0%
1991	90%	3%	4%	1%	2%	0%
1992	66%	2%	16%	0%	12%	2%
1993	45%	2%	12%	0%	33%	8%
1994	42%	2%	17%	0%	31%	8%
1995	65%	1%	29%	0%	3%	1%
1996	61%	1%	22%	0%	13%	2%

Source: A-43 database, June 30, 1996 extract.

In recent years, FHA has seen a surge in the number of adjustable-rate mortgage (ARM) originations. Prior to FY 1992, ARMs accounted for less than five percent of MMIF's business. However, from FY 1992 to FY 1994 ARMs comprised 12 to 17 percent of all originations, and in FY 1995 and FY 1996 ARMs comprised 29 percent and 22 percent, respectively, of originations. Though these percentages were much higher than previous years', they are a result of the 1992-1994 refinancing boom. When refinancings are excluded, ARM shares as percentage of total new purchase mortgage originations were 19 percent for FY 1992, 20 for FY 1993, 28 for 1994, 30 for 1995, and 26 for FY 1996. Declining interest rates created an incentive for borrowers to choose FRMs in which they could lock into a low interest rate for the future years.

The SR program, which was first significantly used in FY 1991, has also experienced rapid growth. In particular, SRs constituted 40 percent of the MMIF's business in both FY 1993 and FY 1994. Although the number of SRs in 1996 increased significantly from the 1995 level, it remains considerably lower than the 1992-1994 levels because interest rates are still higher than they were in 1994 and because many borrowers recently refinanced during FYs 1992-1994.

C. Initial Loan-to-Value Distributions

Prior econometric studies of mortgage termination behavior have suggested that a borrower's equity position is a major determinant of default behavior. More specifically, the larger the equity position, the greater the incentive to avoid a default on the loan. The loan-to-value ratio (LTV) is a measure of borrower equity. Exhibit IV-4 shows the distribution of mortgage originations among initial LTV categories.

As Exhibit IV-4 indicates, the LTV distribution of FY 1996 originations is remarkably similar to the LTV distribution of FY 1995 originations. Nearly 60 percent of the purchase mortgages originated in FY 1996 have LTV ratios of 95 percent or more, and over 80 percent have LTV ratios above 90 percent. Changes in the distribution between FYs 1990 and 1991 are partly due to a change in the way FHA calculated the LTV ratio. Prior to FY 1991, FHA defined the value of the mortgage as the appraised value of the property plus closing costs. Beginning in FY 1991, closing costs were no longer considered a factor when determining a property's value. As a result, the LTV ratios of borrowers after FY 1991 who financed their closing costs are correspondingly higher. We have attempted to adjust for this change in our data processing by increasing the average LTV of all borrowers in books prior to FY 1991 by the average amount of closing costs financed in those years. This adjustment permits comparisons between the LTV distributions from FYs 1975 to 1990 and the LTV distributions in FYs 1991 to 1996, although variations in closing costs and differences between origination dates and endorsement dates introduce a minor amount of measurement error in the FYs 1975 to 1990 distribution. However, volume in the high LTV categories was fairly constant within the FY 1992-1996 period, with the exception of the 97-100 percent LTV category, where volume was exceptionally low, at 12 percent in FY 1992.

Exhibit IV-4

Distribution of Originations by Initial LTV Category
(Percentage FHA-Insured Mortgages by Dollar Volume[a])

Book of Business	Unknown LTV	0-65%	65-80%	80-90%	90-93%	93-95%	95-97%	97-100%	Investors[b]
1975	18%	1%	3%	8%	9%	9%	15%	32%	7%
1976	18%	1%	2%	6%	7%	9%	16%	35%	6%
1977	11%	1%	3%	7%	9%	12%	18%	34%	6%
1978	18%	1%	3%	6%	7%	10%	15%	35%	6%
1979	19%	1%	4%	9%	9%	16%	11%	25%	5%
1980	11%	2%	8%	14%	16%	8%	11%	21%	8%
1981	25%	2%	7%	16%	9%	5%	10%	16%	10%
1982	16%	4%	10%	16%	8%	6%	11%	16%	12%
1983	20%	5%	10%	13%	9%	6%	11%	16%	10%
1984	3%	4%	9%	9%	10%	8%	13%	29%	17%
1985	1%	4%	9%	11%	9%	8%	14%	26%	19%
1986	0%	4%	11%	13%	10%	8%	13%	25%	16%
1987	0%	4%	10%	13%	8%	7%	18%	26%	14%
1988	0%	2%	5%	9%	8%	9%	21%	38%	10%
1989	0%	1%	5%	8%	8%	9%	22%	39%	8%
1990	1%	1%	4%	8%	8%	9%	21%	39%	7%
1991	4%	1%	4%	12%	8%	10%	19%	40%	3%
1992	3%	1%	3%	13%	11%	16%	37%	12%	3%
1993	0%	1%	2%	12%	10%	14%	33%	25%	3%
1994	0%	1%	2%	11%	9%	14%	32%	27%	4%
1995	0%	1%	2%	10%	9%	14%	33%	27%	5%
1996	0%	1%	2%	11%	9%	15%	33%	25%	5%

Source: A-43 database, June 30, 1996 extract.
[a]Streamlined-Refinancing loans (SRs) are not included since they generally do not report LTV ratios.
[b]Includes investor loans and all loans for dwellings with two or more units.

D. Initial House Price Distributions

In accordance with the change in the FY 1995 Actuarial Review, this year's Review uses relative house price categories rather than the loan size categories we had used in earlier Reviews to characterize loans. The implementation of relative house price categories eliminates the upward bias which occurs when classifying loans in higher-cost areas using absolute loan size categories. The upper limits for categories one through seven are based on breakpoints determined by a percentage of the median house price in each of the forty-four largest metropolitan statistical areas (MSAs) and the 50 states. House price category eight represents all originations in areas

with limits exceeding the FHA maximum limit, as well as loans with missing MSA or state identifiers. This category contains a variety of exceptions to the general limit, such as loans originated in Alaska, Hawaii, Guam, and the Virgin Islands; loans originated under special programs; and other special cases.

Exhibit IV-5 shows the percentage of new originations within each relative house price category.

Exhibit IV-5

Distribution of Originations by Relative House Price Category
(Percentage of FHA-Insured Mortgages by Dollar Volume)

Book of Business	0-60% of Median House Price	60-70% of Median House Price	70-80% of Median House Price	80-95% of Median House Price	95-106% of Median House Price	106 to 122% of Median House Price	Greater than 122%	U.S. Territores*
1975	13%	11%	14%	23%	13%	12%	12%	1%
1976	17%	14%	16%	24%	12%	9%	7%	1%
1977	18%	15%	18%	24%	11%	9%	5%	1%
1978	15%	13%	17%	25%	12%	10%	7%	2%
1979	13%	13%	18%	24%	13%	10%	8%	1%
1980	10%	11%	15%	25%	14%	12%	12%	1%
1981	12%	12%	16%	25%	13%	11%	11%	1%
1982	12%	10%	14%	22%	12%	12%	17%	1%
1983	8%	8%	12%	22%	14%	14%	23%	0%
1984	8%	8%	11%	22%	14%	15%	21%	1%
1985	7%	7%	10%	20%	14%	17%	24%	1%
1986	6%	7%	10%	20%	15%	18%	24%	1%
1987	7%	8%	12%	20%	15%	18%	21%	1%
1988	12%	10%	12%	21%	14%	14%	15%	1%
1989	15%	10%	11%	19%	13%	13%	18%	1%
1990	14%	9%	11%	18%	13%	14%	19%	1%
1991	14%	10%	12%	19%	13%	14%	17%	1%
1992	14%	11%	14%	22%	14%	13%	11%	1%
1993	14%	12%	15%	23%	14%	12%	9%	1%
1994	16%	13%	15%	22%	12%	11%	9%	1%
1995	15%	12%	15%	23%	12%	12%	9%	2%
1996	14%	11%	14%	22%	13%	12%	11%	1%

Source: A-43 database, June 30, 1996 extract.
*Includes loans originated in U.S. territories or that do not fall within the 94 regional categories.

FHA experience indicates that loans of higher priced houses tend to perform better in two respects than loans written on lower priced houses in the same geographical area, all else being

equal. Loans on higher priced houses claim at a lower rate, and in those cases where a claim occurs, the percentage loss is smaller. The loss rate is defined as the percentage of a claim amount not recovered through the sale of the conveyed property or mortgage note. Those houses whose prices fall at the upper end of the FHA loan size limit tend to be in the median house price range for their area. Since the market is relatively liquid and there are a relatively large number of these similar quality homes in the area, the house price volatility of these areas tends to be relatively small in comparison to the house price volatility of areas containing extremely low and high priced houses. With similar initial LTVs, the higher priced houses tend to be associated with larger loan amounts. In addition, because a large portion of claim costs are fixed and do not vary with regard to loan or property value, larger loans are generally accompanied by lower loss rates.

The risk profile of FHA's recent originations has improved partly due to the changing loan size and the direct positive relationship between better performance and loan size. We found from historical data that the average loan size across all mortgage types and house price categories has increased relative to the loan sizes reported in the FY 1995 Review. This change can be partially attributed to the increases in the loan limit in FYs 1990 and 1993, and the recent policy change which links FHA's limit to changes in the Federal Housing Finance Board's house price index. The increase in average loan sizes may also provide insight into the varying risk characteristics among different mortgage types. As will be discussed further later in the Review, in the absence of rising interest rates, ARMs have been estimated to have a claim rate approximately 31 percent lower than FRMs. This can be explained in part by the fact that ARM originations tend to be larger than those of FRMs.

Exhibit IV-6

Average Loan Size by Mortgage Type and Relative House Price Category in FY 1996 ($)

Mortgage Type	House Price Category							
	1	2	3	4	5	6	7	8
30-Year Fixed Rate	56,073	70,746	79,368	88,071	93,471	98,493	106,543	68,988
30-Year Streamline	65,051	80,898	88,906	96,880	101,863	107,243	112,226	65,694
Adjustable Rate Mortgage	68,591	84,633	94,594	104,230	106,178	111,177	118,198	n/a
15-Year Fixed-Rate	38,776	53,379	59,518	67,737	76,610	80,850	92,095	53,099
15-Year Streamline	44,654	57,826	63,287	68,127	74,185	77,871	83,004	45,273
Graduated Payment Mortgage	74,535	98,989	96,374	108,704	103,604	115,588	122,864	n/a

Source: A-43 database, June 30, 1996 extract.

Exhibit IV-6 provides a detailed breakdown of average loan sizes by mortgage type and relative house price category. Loans in category eight do not follow the trend for average loan size since this category has a unique composition.

E. Initial Contract Interest Rate

Research has shown that in the case of FRMs, a lower contract rate will generally result in fewer claims. Exhibit IV-7 displays the average contract rate by mortgage type since FY 1975. FHA loan originations for 30-year fixed-rate mortgages (FRMs) in FY 1994 had an average contract rate of 7.6 percent, the lowest in the last twenty years. This has resulted in lower estimated conditional claim rates for this book relative to other books. The average contract rate on 30-year FRMs rose in FY 1995 and then dropped again to 7.7 percent in FY 1996, the second lowest rate during the recent years, indicating that 30-year FRMs are likely to experience lower conditional claim rates in the near term.

However, mortgages with low contract rates are found to prepay more slowly. These slower prepayment rates indicate that mortgages are exposed to default risk for longer periods of time. Recent research has found that there is a strong substitution effect between prepayments and claims. Therefore, the expected low prepayment rates of the FY 1996 book of business should tend to raise the cumulative claim rates. In summary, the FY 1996 book of business is likely to have low conditional prepayment and claim rates in the near term and to have a low cumulative prepayment rate. The cumulative claim rate could be higher or lower than other books of business depending on the magnitude of the substitution effect. Our analysis found it to be slightly higher than that of the 1995 book of business.

Exhibit IV-7

Average Contract Interest Rates by Loan Type and Aggregate

Year	F30s	F15s	ARMs	GPMs	S30s	S15s	Average
1988	10.09%	9.82%	8.88%	9.99%	10.88%	9.91%	10.05%
1989	10.07%	10.00%	9.08%	9.83%	11.02%	9.91%	10.07%
1990	9.70%	9.57%	8.54%	9.75%	10.60%	9.80%	9.71%
1991	9.46%	9.23%	7.56%	9.49%	9.90%	9.18%	9.40%
1992	8.54%	8.41%	6.48%	8.43%	8.56%	8.34%	8.26%
1993	7.76%	7.48%	5.86%	7.04%	8.00%	7.55%	7.60%
1994	7.57%	7.34%	6.07%	6.90%	7.59%	7.38%	7.36%
1995	8.39%	8.23%	7.19%	8.14%	8.47%	8.74%	8.10%
1996	7.71%	7.41%	6.33%	7.64%	7.80%	7.61%	7.45%

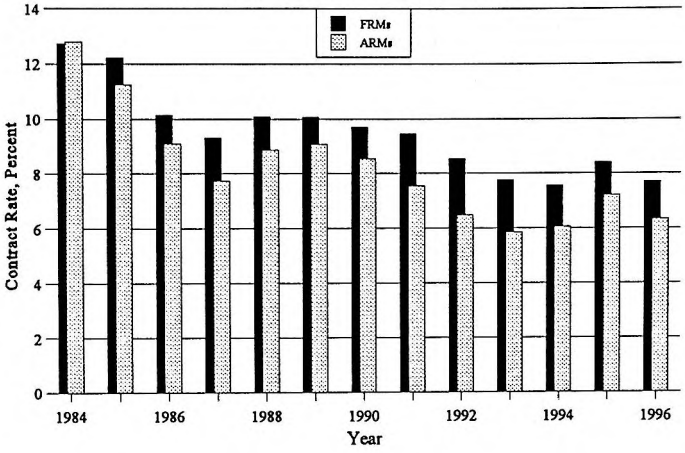
Source: A-43 database, June 30, 1996 extract.

In contrast to FRMs, low initial contract interest rates on ARMs are not associated with lower claim and prepayment rates. When rates rise, the contract rate adjusts, and thus the borrower never has a below-market loan to protect, except in the case of binding interest rate caps.

Exhibit IV-8

Average Initial Contract Interest Rates

30-Year Fixed-Rate vs. Adjustable Rate



Source: A-43 database, June 30, 1996 extract.

Section V: MMI Fund Sensitivities - Performance of the Fund under Various Scenarios

This section presents the results of several sensitivity analyses we performed as part of the fiscal year (FY) 1996 Actuarial Review of the MMI Fund. The purpose of these analyses is to test the sensitivity of our estimates of the Fund's value to changes in economic and other controlling assumptions. We ran sensitivity analyses on model assumptions that are either based on less information than we would ideally like, or whose variations may have a potentially significant impact on the Fund's economic value. The analyses provide information on the robustness of our analyses and the extent to which our conclusions on the performance of the Fund might be incorrect due to inaccurate treatment of these issues. The sensitivity analyses performed assessed the effects of:

- alternative economic scenarios
- alternative interest rate scenarios
- alternative default to claim lags
- alternative disposition lags
- the effectiveness of FHA's loss mitigation program

A. Alternative Economic Scenarios

For our base case estimate of the economic value of the Fund, we employed DRI's[1] base case forecasts of the constant quality house price index (CQHPI) growth rate, the FHLMC commitment rate (which we use to estimate FHA's contract interest rate, as explained in Appendix E), and mean household income growth rate.

To test the sensitivity of the Fund's economic value to alternative scenarios for the U.S. economy, we employed two alternative forecasts produced by DRI: (1) an "optimistic" forecast which assumes higher inflation and interest rates than the base forecast, and higher growth in both mean household income and house price of constant quality; and (2) a "pessimistic" forecast that assumes lower inflation and interest rates, and lower growth in both median household income and house prices. These two scenarios were constructed based on the alternative scenarios for the U.S. economy forecasted by the DRI in December 1996. The optimistic forecast was based on the boom-bust projection and the pessimistic forecast was based on the hard-landing projection in DRI's report. As noted in the Executive Summary, these two scenarios are not really optimistic or pessimistic in nature; we use the optimistic and pessimistic terminologies to be consistent with previous Reviews. As seen in Exhibit V-2, the optimistic scenario actually results in a lower

[1] References to DRI forecasts refer to McGraw-Hill/DRI forecasts of U.S. annual national economic figures. Forecasts used in this review were released by DRI in October, 1996.

capital ratio at the end of FY 2000. The assumed values of the economic variables used to produce each of these sensitivity scenarios are included in Exhibit V-1.

Exhibit V-1

Economic Assumptions for Sensitivity Analyses

Fiscal Year	Constant Quality House Price Growth			FHA Effective Rate			Mean Household Income Growth		
	Base Case	Opti-mistic	Pessi-mistic	Base Case	Opti-mistic	Pessi-mistic	Base Case	Opti-mistic	Pessi-mistic
1996	4.63%	4.63%	4.63%	8.02%	8.02%	8.02%	1.72%	1.72%	1.72%
1997	5.71%	6.11%	5.51%	8.23%	8.27%	7.93%	1.73%	1.63%	1.03%
1998	6.76%	8.06%	6.06%	8.17%	8.74%	7.19%	1.60%	2.00%	-0.30%
1999	4.38%	5.38%	3.48%	7.97%	9.36%	6.82%	0.97%	0.87%	0.87%
2000	3.89%	3.79%	3.09%	7.87%	9.23%	6.57%	0.69%	-0.81%	1.29%
2001	2.43%	2.13%	1.63%	7.66%	8.37%	6.14%	0.39%	0.39%	1.09%

Exhibit V-2 depicts the estimated economic values of the Fund corresponding to these optimistic, base case, and pessimistic scenarios. The estimated current economic value of the Fund varies by nearly $459 million between the scenarios, from a high of $9.478 billion for the optimistic scenario to a low of $9.019 billion for the pessimistic scenario. This exhibit also displays the impact of the three economic scenarios on the Fund's FYs 1996 through 2000 capital ratios. In all three scenarios the Fund can be expected to exceed the NAHA mandated capital ratio of 2.00 percent by FY 2000.

Exhibit V-2

Pessimistic Scenario ($ millions)					
Fiscal Year	**Economic Value of the Fund***	**Capital Ratio**	**Insurance in Force***	**Economic Value of New Book of Business**	**Interest on Fund Balances**
1996	$9,019	2.43%	$370,484	$1,127	n/a
1997	$10,090	2.65%	$380,566	$800	$271
1998	$11,224	2.93%	$382,504	$831	$303
1999	$12,418	3.27%	$379,935	$857	$337
2000	$13,748	3.64%	$377,955	$958	$373
Base Case Scenario ($ millions)					
Fiscal Year	**Economic Value of the Fund***	**Capital Ratio**	**Insurance in Force***	**Economic Value of New Books of Business**	**Interest on Fund Balances**
1996	$9,397	2.54%	$370,484	$1,377	n/a
1997	$10,670	2.80%	$381,671	$990	$282
1998	$11,947	3.05%	$392,076	$957	$320
1999	$13,306	3.31%	$402,027	$1,001	$358
2000	$14,825	3.57%	$414,734	$1,120	$399
Optimistic Scenario ($ millions)					
Fiscal Year	**Economic Value of the Fund***	**Capital Ratio**	**Insurance in Force***	**Economic Value of New Book of Business**	**Interest on Fund Balances**
1996	$9,478	2.56%	$370,484	$1,440	n/a
1997	$10,825	2.83%	$382,130	$1,063	$284
1998	$12,106	3.07%	$394,532	$956	$325
1999	$13,343	3.28%	$406,851	$873	$363
2000	$14,685	3.49%	$420,687	$938	$400

*All values based on projected values for end of the corresponding FY.

B. Alternative Interest Rate Scenarios

Mortgage interest rates have proven to be a significant factor in the estimation of conditional claim and prepayment rates for all mortgage types. The pessimistic and optimistic scenarios described above measure the effect of different interest rate scenarios along with changes in other economic variables. In order to isolate the effects of more pronounced changes in interest rates, we have run six different interest rate scenarios in which only the interest rate assumptions input into the econometric models were modified. The six scenarios include: (1) a gradual increase, which assumes a uniform increase in interest rates of 0.5 percent per year for ten years, and then a return to original forecasted rates; (2) a rapid increase in interest rates of 1.0 percent a year for five years and then gradually decreasing to forecasted levels; (3) a temporary interest rate "shock," which assumes an immediate increase of 3.0 percent in interest rates, a constant rate for five years, and then a return to the original forecasted level; (4) a gradual decrease scenario, which assumes interest rates decrease by 0.5 percent a year for eight years and then return to predicted rates; (5) a rapid decrease in which interest rates decrease by 1.0 percent a year for four years and eventually return to forecasted levels; and (6) a "shock drop" scenario which assumes a decrease of 3.0 percent in the first year, a steady "low" state for five years, and then a return to predicted levels. Exhibit V-3 displays the six interest rate scenarios, as illustrated by the FHA effective rate, alongside the forecasted rates used in the base case scenario.

Exhibit V-3

Alternative Interest Rate Scenarios							
Fiscal Year	FHA Effective Interest Rates						
	Base Case	Gradual Increase	Rapid Increase	Rate Shock	Gradual Decrease	Rapid Decrease	Shock Drop
1996	8.02%	8.02%	8.02%	8.02%	8.02%	8.02%	8.02%
1997	8.23%	8.52%	9.02%	11.02%	7.52%	7.02%	5.02%
1998	8.17%	9.02%	10.02%	11.02%	7.02%	6.02%	5.02%
1999	7.97%	9.52%	11.02%	11.02%	6.52%	5.02%	5.02%
2000	7.87%	10.02%	12.02%	11.02%	6.02%	4.02%	5.02%
2001	7.66%	10.52%	13.02%	11.02%	5.52%	5.02%	5.02%
2002	7.73%	11.02%	12.02%	10.02%	5.02%	6.02%	6.02%
2003	7.80%	11.52%	11.02%	9.02%	4.52%	7.02%	7.02%
2004	7.81%	12.02%	10.02%	8.02%	4.02%	7.81%	7.81%
2005	7.81%	12.52%	9.02%	7.81%	4.52%	7.81%	7.81%
2006	7.80%	13.02%	8.02%	7. 80%	5.02%	7.80%	7.80%

It should be noted that these interest rate sensitivity analyses were completed in stylized fashion. Specifically, interest rate movements normally occur in tandem with movements of other economic variables including house price and inflation. The sensitivity analyses reported here do

not include these other effects, allowing us to isolate the effect of interest rate movements on the Fund.

When interest rates increase above original contract rates, conditional claim rates tend to decrease on fixed-rate mortgages (FRMs). However, conditional claim rates on adjustable-rate mortgages (ARMs) will tend to move in the opposite direction, since the monthly payments on ARMs will increase as interest rates increase. Although ARM interest rate changes are capped at one percent per year, an interest rate scenario in which interest rates are steadily higher over a number of years (as in the cases of the rapid increase and rate "shock") is likely to result in a substantial increase in ARM claims. Also, mortgages originated at high contract rates tend to have higher claim rates and particularly rapid prepayment rates, resulting in lower economic values. This is why scenarios in which interest rates increase tend to have lower estimated capital ratios in FY 2000.

One of the most notable observations from the interest rate sensitivity analyses is the tendency for the economic values of books of business originated prior to FY 1992 (but after FY 1983) to respond differently to interest rate changes than books of business originated after FY 1992 (excluding future originations). In particular, the economic value of books originated prior to FY 1992 tends to increase in response to interest rate decreases, while the economic value of books originated after FY 1992 tends to decrease under such conditions. This may be explained by the change in the premium structure in FY 1991. Since the FYs 1984 to 1991 books do not pay annual premiums, and are entitled to little or no up-front premium refund (by FY 1998 none of these books will be eligible for refunds), the Fund benefits when prepayments from these books accelerate. This is because the Fund loses little or no revenue and avoids future claim costs. Thus, lower interest rates tend to increase the economic values of these books. However, books originated after FY 1992 do pay annual premiums, and the refunds FHA must pay on prepayments from these books are significantly greater, since these books are less seasoned. Consequently, FHA tends to lose significant revenue and incur large expenses when recent books of business prepay rapidly, although this effect is partially offset by the reduction in future claims that accompanies large prepayments.

This balance between the pre- and post-FY 1992 books, combined with the differential effect that changing interest rates have on ARMs, new originations, and streamline refinancings (SRs) indicates that the MMI Fund is partially hedged against sudden interest rate changes. However, over the next few years, as post-FY 1992 books increasingly comprise the vast majority of outstanding insurance-in-force (IIF), this hedge will weaken somewhat. In particular, the Fund's existing business (loans originated in or before FY 1996) will be more susceptible to scenarios in which interest rates drop significantly for a short period of time.

Exhibit V-4 shows that the gradual increase in interest rates results in capital ratios which are higher than the base case in FY 1996 through 2000. Although higher interest rates reduce the volume of new endorsements relative to the base case, claim and prepayment rates are also

reduced. The dominant effect is the reduction in claim and prepayment rates, leading to higher capital ratios, economic values, and IIF.

Exhibit V-4

Projected MMI Fund Performance with Gradual Increase ($ millions)						
Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,973	2.69%	$58,863	$370,484	$1,660	n/a
1997	$11,481	3.00%	$39,350	$382,630	$1,209	$299
1998	$12,896	3.29%	$33,868	$392,165	$1,071	$344
1999	$14,241	3.57%	$29,246	$398,902	$958	$387
2000	$15,600	3.85%	$27,888	$405,272	$932	$427

The results from the rapid increase in interest rates show both the estimated FY 1996 capital ratio and the FY 2000 capital ratio increasing. As in an environment of gradually increasing interest rates, claim and prepayment rates of existing books tend to decrease as market interest rates gets higher. However, as shown in Exhibit V-3, interest rates start declining in FY 2002 in the rapid increase case. As a result, the benefit of the higher market interest rate diminishes when we approach FY 2002. On the other hand, the interest rates in the gradual increase case continue to increase until FY 2006, making the higher market interest rate effect more significant in the later years. Therefore, the FY 1999 and 2000 capital ratios are lower in the rapid increase case than in the gradual increase case. Exhibit V-5 displays the results from the rapid interest rate increase scenario.

Exhibit V-5

Projected MMI Fund Performance with Rapid Increase ($ millions)						
Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$10,184	2.75%	$58,863	$370,484	$1,730	n/a
1997	$11,623	3.04%	$35,303	$382,009	$1,133	$306
1998	$12,840	3.30%	$27,094	$388,924	$868	$349
1999	$13,885	3.54%	$20,958	$391,871	$660	$385
2000	$14,843	3.78%	$17,794	$393,068	$542	$417

Exhibit V-6 shows the results of the rate shock scenario. In this case the FY 1996 capital ratio increases to 2.77 percent, the highest of all the interest rate increase cases. This effect occurs largely as a result of lower claim rates on fixed-rate mortgages and lower prepayment from the

FY 1992 to 1996 books. In this scenario, the market interest rate stays at 11.02 percent from 1997 to 2001, and gradually decreases after 2001. This means that while the FY 1997 to 2000 books of business have high contract rates, they do not experience the benefits of low claim and prepayment rates that result from further increases in market interest rates. As a result, the growth in the capital ratio is significantly reduced in this scenario.

Exhibit V-6

Projected MMI Fund Performance with Rate Shock ($ millions)						
Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$10,249	2.77%	$58,863	$370,484	$1,715	n/a
1997	$11,294	2.99%	$24,272	$377,891	$738	$307
1998	$12,232	3.21%	$20,483	$381,115	$599	$339
1999	$13,177	3.44%	$20,014	$383,314	$578	$367
2000	$14,175	3.67%	$21,356	$386,248	$603	$395

When interest rates decrease below the original contract rates, conditional claim rates on FRMs tend to increase. In contrast, the claim rates on ARMs will most likely decrease as the payment burden falls. Additionally, books of business originated with low contract interest rates tend to have higher economic values than books originated with high contract interest rates. To measure the effect of a falling interest rate environment, we analyzed the effect of decreasing interest rates on the value of the Fund using three scenarios. In the gradual decrease scenario, the Fund's estimated capital ratio was higher than the capital ratio estimated in the base case scenario in FYs 1999 and 2000.

Exhibit V-7

Projected MMI Fund Performance with Gradual Decrease ($ millions)						
Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,386	2.53%	$58,863	$370,484	$1,122	n/a
1997	$10,516	2.77%	$50,720	$380,293	$849	$282
1998	$11,678	3.02%	$57,535	$386,577	$846	$315
1999	$12,888	3.32%	$66,576	$387,766	$860	$350
2000	$14,181	3.68%	$81,236	$385,112	$906	$387

Although the capital ratios in FYs 1996 and 1997 are lower than those in the scenarios with increasing interest rates, the impact of higher claim rates on FRMs appears to be mitigated by

increased refinancing activity and the dramatic increases in estimated economic values of future books. Exhibit V-7 displays complete results from this analysis.

Exhibit V-8 displays the results from the rapid decrease scenario. These results indicate a lower FY 1996 capital ratio as compared to the base case scenario. However, the capital ratio increases at a much faster rate than under the base case, reaching 5.12 percent in FY 2000.

Exhibit V-8

Projected MMI Fund Performance with Rapid Decrease ($ millions)						
Fiscal Year	**Economic Value of the Fund**	**Capital Ratio**	**Volume of New Endorse-ments**	**Insurance in Force**	**Economic Value of New Book of Business**	**Interest on Fund Balances**
1996	$9,241	2.49%	$58,863	$370,484	$965	n/a
1997	$10,334	2.76%	$58,662	$373,826	$816	$277
1998	$11,547	3.23%	$76,658	$357,927	$903	$310
1999	$12,914	4.05%	$100,435	$391,222	$1,021	$346
2000	$14,928	5.12%	$124,110	$291,452	$1,626	$387

The results from the shock drop scenario are similar to those from the rapid decrease scenario, with a capital ratio in FY 1996 of 2.38 percent compared to 2.49 percent. In FY 2000, the estimated capital ratio reaches 4.97 percent. Exhibit V-9 displays the results of the shock drop scenario.

Exhibit V-9

Projected MMI Fund Performance with Shock Drop ($ millions)						
Fiscal Year	**Economic Value of the Fund**	**Capital Ratio**	**Volume of New Endorse-ments**	**Insurance in Force**	**Economic Value of New Book of Business**	**Interest on Fund Balances**
1996	$8,816	2.38%	$58,863	$370,484	$816	n/a
1997	$10,061	3.25%	$92,482	$310,046	$981	$264
1998	$11,475	3.91%	$101,704	$293,403	$1,112	$302
1999	$13,002	4.47%	$102,310	$291,094	$1,183	$344
2000	$14,825	4.97%	$106,489	$298,275	$1,433	$390

C. Alternative Default-to-Claim Lags

The average time interval between default and claim is an important factor in our loss rate model. In this Review, the average default-to-claim lag was assumed to be 13.37 months for FY 1997 and 14.51 months for FY 1998 forward books of business. The average default-to-claim lags in

the past two decades ranged from nine months to over 15 months. Longer default-to-claim lags not only increase the unearned interest that FHA pays to the lenders but also increase the seriousness of the physical deterioration of the housing on which the defaulted mortgage was written. Recent research showed that the loss severity of mortgage defaults is very sensitive to the default to claim lag. During 1995, Fannie Mae required its lenders to speed up the foreclosure process in order to shorten the duration of default-to-claim lag. We tested for the sensitivity of the Fund to this lag. Exhibit V-10 shows that the FY 1996 economic value would increase by $500 million if the average claim lag were reduced by a quarter to 11 months. The FY 1996 capital ratio would increase by .13 percentage points.

Exhibit V-10

Projected MMI Fund Performance with 11 Month Default to Claim Lag ($ millions)

Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,898	2.67%	$58,863	$370,484	$1,461	n/a
1997	$11,235	2.94%	$41,210	$381,671	$1,041	$297
1998	$12,582	3.21%	$40,796	$392,076	$1,010	$337
1999	$14,031	3.49%	$42,082	$402,027	$1,071	$377
2000	$15,646	3.77%	$45,905	$414,734	$1,195	$421

D. Alternative Claim-to-Disposition Lags

The claim-to-disposition lag has also been found to significantly affect loss rates. In recent years, FHA has attempted to shorten this time lag by applying different methods such as asset sales. The average claim to disposition lag of conveyed properties has declined from about eight months to less than four months. In this Review, we assumed the average claim-to-disposition lag to be about four months. We tested for the sensitivity of the Fund to this lag by reducing the claim-to-disposition lag to three months. Exhibit V-11 shows that if FHA were able to continue to reduce the claim-to-disposition lag to three months, the economic value of the Fund would increase by $464 million in FY 2000, and the FY 2000 capital ratio would increase by 0.12 percentage points.

Exhibit V-11

Projected MMI Fund Performance with Three Month Claim to Disposition Lag ($ millions)						
Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,679	2.61%	$58,863	$370,484	$1,430	n/a
1997	$10,993	2.88%	$41,210	$381,671	$1,023	$290
1998	$12,315	3.14%	$40,796	$392,076	$992	$330
1999	$13,720	3.41%	$42,082	$402,027	$1,036	$369
2000	$15,289	3.69%	$45,905	$414,734	$1,157	$412

E. Effect of Increases in the Use of Loss Mitigation Techniques

The same legislation that terminated the Assignment Program authorized FHA to implement a variety of loss mitigation techniques, including special forbearance, mortgage assumptions by lenders, pre-foreclosure sales, deed-in-lieu-of-foreclosure transactions, partial claim payments, and loan modifications. These loss mitigation techniques will be alternatives to foreclosure and property conveyance. Due to difficulties involved in estimating the ultimate effect of many of these loss mitigation techniques, we have only attempted to capture the potential effects of the expanded use of pre-foreclosure sales on the Fund.

In our analysis of FHA's data on the pre-foreclosure sales program we estimated that the average loss as a percent of total claim payments for a pre-foreclosure sale was 25 percent, substantially lower than the loss rate for properties conveyed over the same time period. We assume that FHA will successfully resolve ten percent of the defaults every year in the future, a much more conservative assumption than FHA's estimate of 24 percent. Exhibit V-12 provides estimates of the Fund's economic value and capital ratio from FY 1996 through FY 2000 if FHA were to resolve 20 percent of the defaults by pre-foreclosure sales or other loss mitigation methods. We estimated that the economic value of the Fund in FY 1996 would be $75 million higher if FHA resolved 20 percent of defaults with loss mitigation techniques. Furthermore, the capital ratio would increase by 0.02 percentage points in FY 1996 and 0.04 percentage points in FY 2000.

Exhibit V-12

Projected MMI Fund Performance with 20 Percent Loss Mitigation ($ millions)						
Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorse-ments	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,472	2.56%	$58,863	$370,484	$1,393	n/a
1997	$10,758	2.82%	$41,210	$381,671	$1,001	$284
1998	$12,049	3.07%	$40,796	$392,076	$969	$323
1999	$13,422	3.34%	$42,082	$402,027	$1,012	$361
2000	$14,957	3.61%	$45,905	$414,734	$1,132	$403

Section VI: Performance of Future Books

This section describes the performance of future books of business for FYs 1997 through 2000 and presents estimates of their contribution to the Fund's future economic value and capital ratio. This section also discusses the projected volume and distribution of these future books of business.

A. Economic Value and Capital Ratios for Future Books

The projected future economic values and capital ratios of the entire Fund through FY 2000 are shown below in Exhibit VI-1. These economic values are calculated using both our projections of future termination rates and our projections of the volume and distribution of future books.

Exhibit VI-1

Projected MMI Fund Performance for FYs 1997 to 2000 ($ millions)					
Fiscal Year	**Economic Value of New Book of Business[a]**	**Interest on Fund Balances**	**Economic Value of Fund**	**Capital Ratio of Fund**	**Total Insurance-in-Force**
1997	$990	$282	$10,670	2.80%	$381,671
1998	$957	$320	$11,947	3.05%	$392,076
1999	$1,001	$358	$13,306	3.31%	$402,027
2000	$1,120	$399	$14,825	3.57%	$414,734

[a]All values are as of the end of each fiscal year. The economic value for future years (FYs 1997 to 2000) is equal to the economic value of the Fund at the end of the previous year, plus the interest earned on previous business, plus the economic value of the new book of business.

The FY 1998 book of business has a slightly lower estimated economic value than the other years in the period of analysis due primarily to the projected decrease in the growth rates of the constant quality house price and the median household income. Based on DRI economic projections, household income growth and constant quality house price were predicted to decline starting in 1997 and 1998, respectively. Since the FY 1998 book of business would be exposed to the longest period of the economic slowdown between 1998 and early 2000's, this book of business is likely to experience higher claim rates during the first few policy years. Since the growth in house price is expected to surpass the growth in household income between 1997 and 1998, houses would become relatively less affordable for first time home buyers. This could cause more new purchase mortgage borrowers to shift into the ARM market. Based on FHA

experience, ARMs tend to have higher claim rates during the earlier policy years. The higher ARM share of the 1998 book of business also contributes to the book's lower estimated economic value. However, the soundness of this assessment is contingent upon the accuracy of the DRI economic forecasts.

The capital ratio of the Fund is essentially determined using the weighted average of the capital ratios of each book of business plus the effect of interest the Fund earns on its current balances. Since, by construction, the *ex ante* economic value of each book remains constant in every policy year (*i.e.*, the FY 1996 book will have the same economic value stated in 1996 dollars in FY 1996 as it does in FY 2023), and since the insurance-in-force (IIF) decreases due to prepayments and claims, the capital ratio for an individual book (calculated as the economic value of that book divided by the outstanding unamortized IIF) will increase over time as long as the economic value of the book is positive. Thus, the capital ratio of an individual book of business will tend to increase over time. The overall capital ratio for the Fund, which is the weighted average of all books, will tend to be significantly higher than the initial capital ratio on the most recent book of business since the capital ratios on the older books of business will push the average upwards.

The Fund's capital ratio reflects overall Fund performance and does not differentiate between the performance of different books of business, particularly older versus newer books. Consequently, we have developed two measures of the financial performance of a book of business that provide more detailed indications of the overall quality and profitability of future business. The first of these two measures, denoted the "initial" capital ratio of a given book, represents the present value of profits per dollar of insurance originated (excluding refinancings). The second measure, the "converging" capital ratio, signifies the capital ratio that the Fund would eventually approach if all future originations were identical to the book of business under consideration. Refinancings are excluded since these loans will involve reductions in the IIF in previous books and thus any gain in the current book's economic value and IIF will be offset by a reduction in a previous book. We calculate these two measures of financial performance based on the FY 2000 book of business in order to reduce the effects of changes in short-term economic forecasts from our estimates.

Last year, we estimated that the initial capital ratio for the FY 2000 book of business was 2.17 percent and that the converging capital ratio was 5.47 percent. This year, we estimate the initial capital ratio of the FY 2000 book of business to be 2.58 percent, and the converging capital ratio to be 6.27 percent. This increase in the converging capital ratio is largely driven by continued acceleration in prepayment rates, as opposed to a reduction in claim rates. Nonetheless, it is strong evidence that the Fund's recent performance has continued to improve and that the underlying quality of the new business being originated is sound relative to the current premium and refund schedules. Exhibit VI-2 illustrates the capital ratios estimated for the FY 2000 book in the Reviews for FYs 1995 and 1996, respectively as of the end of each policy year.

Exhibit VI-2

Estimated Capital Ratio for the FY 2000 Book of Business ($ millions)				
Policy Year	FY 1995 Actuarial Review[a]		FY 1996 Actuarial Review[a]	
	Insurance-in-Force	Capital Ratio	Insurance-in-Force	Capital Ratio
1	$50,132	2.17%	$43,387	2.58%
2	$50,004	2.17%	$43,271	2.59%
3	$48,853	2.23%	$42,027	2.67%
4	$45,947	2.37%	$39,515	2.84%
5	$41,005	2.65%	$36,497	3.07%
6	$35,919	3.03%	$33,226	3.37%
7	$31,881	3.41%	$30,325	3.69%
8	$27,994	3.88%	$27,243	4.11%
9	$24,500	4.44%	$24,332	4.60%
10	$21,819	4.98%	$21,977	5.10%
11	$19,884	5.47%	$19,963	5.61%
12	$18,204	5.97%	$18,238	6.14%
13	$16,852	6.45%	$16,684	6.72%
14	$15,645	6.95%	$15,300	7.32%
15	$14,529	7.48%	$14,006	8.00%

[a]Insurance-in-force numbers and capital ratios do not include refinancings.

B. Volume and Distribution of Future Books

In projecting the volume and composition of future books of business, we estimate separately purchase money mortgage originations and refinancings. Forecasts of future purchase money mortgage originations are derived from a series of econometric models designed to forecast future demand for FHA originations based upon economic and policy variables. These models have produced lower estimates of future originations than were used in last year's Review because of

the lower projected rate of growth in household income and higher projected FHA effective interest rates. More precisely, these factors tend to decrease housing affordability for marginal and first time home buyers. Appendix F describes these models in detail. Our projections of future refinancings are based on both the estimated volume of prepayments and the underlying mobility rate of the borrower population. The methods used to forecast future refinancing volumes are discussed in Section VII. Exhibit VI-3 presents the projected volumes of future books of business.

Exhibit VI-3

Volume of Future Originations for All Mortgage Types ($ Millions)			
Book of Business	**Purchase Mortgages**	**Streamline Refinancings**	**Total**
1997	$38,686	$2,524	$41,210
1998	$38,558	$2,238	$40,796
1999	$39,506	$2,576	$42,082
2000	$43,387	$2,517	$45,904

VII. Summary of Methodology

This section presents a brief overview of our modelling approach. It also highlights the differences between the FY 1995 models and FY 1996 models. A complete description of the current models is provided in the technical appendices.

A. Application of Econometric Models of Loan Termination

Most of the Fund's risk arises from potential variations in the future performance of the insured loan portfolio. Changes in estimated claim and prepayment rates can dramatically affect the Fund's condition, since future claim and prepayment rates, along with future loan volume and composition, loss rates, and future economic conditions, will determine the Fund's future cash flows. The future cash flows include inflows from insurance premiums and loss recoveries, and outflows for claim payments, refunds and Fund administration. Projections of these future cash flows are discounted to provide estimates of the Fund's current and future net present values.

We have produced claim estimates using econometric models which are based on the hypothesis that a borrower's equity position is a significant determinant of claim behavior. The equity position varies with factors such as house price appreciation rates and changes in interest rates. To control for the possible disparity in house price appreciation rates across regions of the country, a regional house price dispersion measure is also included in the model.

Prepayments are primarily due to household mobility and changes in interest rates. A borrower's equity growth position also influences the prepayment decision, because the likelihood that a borrower will sell his/her home to "trade up" increases as the wealth of the borrower increases.

We developed our models by performing regression analysis on data from FHA's A-43 database and estimating economic relationships for specific categories of house price, LTV, and loan origination years. The forecasts based on these models depend upon projections of the following factors:

- house price appreciation rates
- interest rates
- house price dispersion measures
- household income growth rates

Therefore, the results of this analysis are sensitive to changes in these assumptions.

A pattern exhibited from the current analysis is that the forecasted claim rates among loan-to-value categories are relatively flat compared to the historical pattern. For example, for the 30

year FRMs, the predicted ultimate claim rates for over 97 percent LTV loans are about 20 percent higher than predicted ultimate claim rates for 80 to 90 percent LTV loans; the ultimate claim rates for 90 to 95 percent LTV loans are about three percent higher than those of the 80 to 90 percent LTV loans. However, the average historical cumulative claim rates for over 97 percent LTV and 90 to 95 percent LTV loans of the 1986 to 1991 books of business are about 80 and 18 percent higher, respectively, than those for the 80 to 90 percent LTV loans during the same time interval.

One major factor contributing to this relatively flat claim rate pattern is the stronger economic forecast used in this Review. The impact of stronger economic conditions on mortgages is to reduce overall claim rates. However, the reduction would not be proportional among all mortgage categories. In particular, the claim rates of riskier loans would decrease more than those of less risky loans. This is due to the asymmetric effect that good and bad economic conditions have on the claim rates. Since a higher portion of the loans in a risky category are at the margin of default, a slight change in economic conditions would result in a larger marginal increase/decrease in the claim rate. On the other hand, it would take a significant change in economic conditions for less risky loans to have the same magnitude of change in claim rates. As a result, the difference in claim rates between loans in the high and low LTV categories would become smaller and reveal the pattern shown in this Review. Exhibit A-8 in Appendix A decomposes the change in the estimation of cumulative claim rates of FY 1996 loans in different LTV categories between the FY 1995 and FY 1996 Reviews. The decomposition shows that the higher house price growth rate assumption used in the FY 1996 Review is the single most significant factor causing the decrease in cumulative claim rates and the reduction in the variation among different LTV categories.

The historical claim pattern is obtained from pre-1992 books of business. Because those loans were originated before the 1992 Credit Reform Act, they may have characteristics significantly different from those of the newer books of business. Books originated after Credit Reform have characteristics similar to the FY 1996 loans. The claim rate pattern of these more recent books is less representative of the overall historical pattern of claims because they have yet to reach their peak of claims. This difference between pre- and post-Credit Reform books of business could be another factor causing the difference in LTV claim rate patterns.

B. Cash Flow Analysis

Once claim and prepayment rates are estimated by the econometric models, we estimate future cash flows and discount them to determine the present value of future cash flows. The cash flow model converts claim and prepayment rates, as well as other assumptions about discount rates, administrative costs, premium refunds, recovery rates, and timing, into dollar values, and calculates end-of-year cash balances and insurance-in-force. The model then discounts the future cash flows to the end of FY 1996 to determine the resources the Fund would currently need in

order to meet its financial obligations through the scheduled maturity of the FY 1996 book of business.

C. Time Lags

The default-to-claim lag of 14.51 months is based on the average lag for all loans that terminated between FYs 1992 and 1995 and incorporates the default-to-claim lag on pre-foreclosure sales (estimated to be 8.8 months) which we will assume will represent ten percent of claim terminations from FY 1997 to FY 2000. Assignments are presumed to be zero in and after FY 1998 and the FY 1997 lag is based on expected percentages of assignments, pre-foreclosures, and conveyances in FY 1997. Historical averages of default-to-claim lags by termination year were combined with the lags for FYs 1996-2000 to create a vector of lags that associates a certain lag with a termination year in the cash flow model. This is a refinement from last year, when just one weighted lag was used for all books, past, present and future. The pre-foreclosure program was initiated by FHA on November 1, 1994 and pre-foreclosures comprised two percent of claim terminations in that year. However, as FHA continues to actively pursue alternatives to foreclosure, the proportion of pre-foreclosures is expected to increase.

The disposition lags for FY 1996-FY 2000 account for the zero lags associated with pre-foreclosure sales as well as the lags pertaining to assignments. For FY 1996, actual percentages of pre-foreclosure sales, assignments, and conveyances were used. From FY 1997 to FY 2000, pre-foreclosure sales were assumed to account for ten percent of all terminations. These percentages along with average lags from loans that terminated from FY 1992 to FY 1995 were used to yield one weighted average lag.

D. Technical Refinements

The models used for this year's Review follow conceptually from those used in last year's Review. We continue to estimate five different sets of econometric models to accommodate the unique features of the following loan types:

- 30-year fixed-rate mortgages (FRMs)
- 30-year streamline refinancings (SRs)
- adjustable-rate mortgages (ARMs)
- 15-year FRMs
- 15-year SRs

Since there is only a small number of graduated-payment mortgages (GPMs), we have not developed a distinct model to estimate conditional claim and prepayment rates associated with these loans. The rates are calculated by applying the forecasted conditional claim and prepayment

rates estimated in the 30-year FRM econometric model to the future policy years of each book of GPM business.

Last year's Review marked the first time that the loans were categorized by house price instead of loan size. House price was found to have more significant explanatory power than loan size. This year's Review used the same approach.

This year's Review used the same claim models that last year's Review did, except that the house price skewness factor in the 30-year FRM model and the house price dispersion factor in the 30-year SR model were excluded. The house price skewness factor was excluded because it was not statistically significant in most LTV categories and the signs of the coefficients did not exhibit a consistent pattern. Recent theoretical research suggests that a default can be viewed as a put option in which a homeowner can sell his/her home to the lender at the price equal to the loan balance. Since the value of a put option depends only on the mean and the variance of the future house value and since the bulk of the variation in house price movement is captured by these two measures, adding its skewness does not improve the explanatory power of the model by much. The house price dispersion factor was excluded from the 30-year SR claim model because the resulting estimated claim rates for later policy years appear unreasonable and were caused by this factor. This is likely caused by the lack of sufficient historical observations, as streamline refinancing is a relatively new program which had no significant origination volume until FY 1991, meaning that there is virtually no information beyond the fifth policy year. The 30-year refinancing claim model should be further refined when more seasoned data become available.

1. Loss Rate Estimation Model

In the FY 1995 Review, we developed a loss rate model to estimate future conveyance loss rates under different situations but the data were not detailed enough to permit satisfactory analysis.. This Review estimated the same loss rate model, although some refinements were made, and incorporated the model into the cash flow model. The loss rates of mortgages in the MMI Fund have decreased gradually during the last few years. In previous Reviews, average historical loss rates were used as estimates for future claims. This improved loss rate model increased the estimated economic value of the Fund. The loss rate model estimated this year better captured the declining trend in the loss rate during recent years and provided lower loss rates, which led to higher estimated economic values and capital ratios. The net effect of incorporating this loss rate model was an increase in the 1996 economic value of $708 million.

As shown in Appendix D of this Review, the loss rate model is based on estimations of three key components of the loss rate: holding costs, foreclosure costs, and change in (or loss on) asset value. These three factors and the foregone interest sum to the dollar amount of loss. Each of these three components is estimated as a percentage of remaining principal balance and, when

summed and combined with foregone interest income, result in an estimate of loss as a percentage of remaining principal balance.

In order to examine the trends in loss rates and to make the model apply directly to the cash flow model, loss rates were estimated as a function of relative house price, LTV, and loan type categories. Thus to obtain forecasted loss rates by these cell components, the coefficients from the previous three regressions for holding cost, foreclosure cost, and loss on asset value are multiplied by future values of independent variables such as disposition lags and contract rates. This product plus the future foregone interest (which can be calculated directly) yields the future predicted loss rate by cell. Due to the lack of significant trends in LTV and comprehensive loss rate data for terminations in FY 1996, loss rates for FY 1996 and later do not vary by LTV category and from FY 1996 onward forecasted loss rates are used.

This year's model differs from last year's model in that two independent variables were dropped in the regressions. Actual loan amount was not used because it is highly correlated with the house price interaction variables and thus its inclusion would lead to biased estimates and multicollinearity. Policy year squared was not used this year because it did not add significantly to the explanatory power of the regression. Furthermore, the data only contained loans with a maximum of twenty-one policy years of historical experience, thus could significantly skew the forecasted loss rates in the later policy years if policy year squared were used in the regression. As a result, we assume that each cell had the same loss rate as the cell in the twenty-first policy year.

2. Partial Year Adjustment Method

This year, OMB has required that all Federal agencies meet an accelerated timetable for completion of all financial audits. In order for FHA to meet this deadline this Review had to be completed much earlier than in past years.

Given the time requirement, it was not possible to conduct the Review based on the FHA data as of the end of the fiscal year 1996, as has been the practice in previous Reviews. Instead, this Actuarial Review was completed based on a combination of a loan level data cut as of June 30, 1996 and updated aggregated information as of December 31, 1996. With respect to this partial year loan level data set, we have developed an adjusted twelve month approach that has the following four advantages. First, the approach allowed us to start working by July, 1996 to meet the accelerated schedule and make timely delivery of the review. Second, the accuracy and reliability of the Review were maintained in high quality. Third, the results of the Review were consistent with the financial statements. Fourth, this year's Review is directly comparable to the previous Reviews.

With the adjusted twelve-month approach, the origination and termination activities during the fourth quarter of 1996 were estimated by historical intra-year patterns. The partial year origination volume and conditional termination rates were then estimated by scaling factors to convert the three quarter data to the whole year level. These scaling factors were calculated in the following manner. First, by using monthly origination and termination volume during the FY 1990 to 1995 period, the six month volume is computed by taking an arithmetic average of the first six month volume for the period. Second, this average six month volume is then divided by the average annual volume to obtain the half-year adjustment factor. The volumes in the third quarter of FY 1996 are not as representative due to a typical reporting lag of two to three months and were excluded from this step. Third, we multiplied the first six month volume of FY 1996 obtained from the June data extract by the half-year adjustment factor to obtain the estimated whole year volume. Finally, the scaling factor is calculated by dividing the estimated whole year volume by the total volume included in the June data extract (including some volume from the last six months). The scaling factors were estimated to be 1.39, 1.32, and 1.44 for originations, claims, and prepayments, respectively. They represent about $55 billion of origination volume, 53,000 claims, and 571,000 prepayments.

To the extent the distribution of activity actually occurring in the fourth quarter differs significantly from that occurring in the other three quarters, the results of the Review could be biased. Monthly data updates from FHA for July, August, and September of FY 1996 as well as October of FY 1997 were analyzed to monitor the distribution of the origination and termination activity among different loan types, LTV and relative house price categories. These monthly data updates include loan originations and terminations that were processed during each month. These analyses show no evidence of a significant shift of distributions during the last three months of FY 1996.

To accommodate the additional information that would be available after the June 30, 1996 data cut but before the completion of the review and to make the final results consistent with the financial statements, the scaling factors were recalculated when the complete year information became available. For this review, the final scaling factors of originations, claim rates, and prepayment rates were derived by the data available as of December 31, 1996. They are 1.48, 1.32, and 1.24 for origination, claim, and prepayment volume respectively. Except for the prepayment adjustment factor, the estimated factors by using partial year data are quite accurate. The new scalars were used to adjust the discrepancy between estimated and actual activity in the fourth quarter. With these final adjustment factors, the results generated are consistent with the annual financial statement.

VIII. Conclusion -- Compliance with the National Affordable Housing Act

According to our estimates based on the base case economic scenario, as of the end of FY 1996 the MMI Fund had an economic value of $9.397 billion and unamortized insurance-in-force of $370.484 billion, resulting in a capital ratio of 2.54 percent. Furthermore, we project that by FY 2000 the capital ratio will increase to 3.57 percent. Therefore, we estimate that the Fund has exceeded the FY 2000 target of 2.00 percent during this past year based on our base case economic scenario. Estimates based on alternative economic scenarios are provided in Section V.

Total FHA originations were substantially higher in FY 1996 than experienced in FY 1995 as a result of the significant increase in refinancing and new purchase volume. Current economic conditions and forecasts are likely to result in continued strengthening of the Fund. As older loans, particularly those for which only small refund payments are due, move out of the Fund, the Fund's exposure to potential claims is reduced. In addition, the streamline refinancing program continues to reduce the effect of adverse selection by increasing FHA's ability to recapture relatively low-risk borrowers that might otherwise have left the Fund. Our forecasts also indicate that future books of business will continue to add positive value to the Fund, resulting in the Fund exceeding its FY 2000 capital ratio.

Appendix A: Econometric Analysis of Fixed-Rate Mortgages

Price Waterhouse has developed econometric models to estimate the statistical relationships between termination rates and economic and policy variables for loans insured by the MMI Fund and originated between fiscal years (FYs) 1975 and 1996. Together with assumptions regarding future economic conditions, these estimated relationships are used to produce forecasts of future loan performance for both existing and future books of business. When combined with information regarding the income and expenses associated with different loan performance estimates, such forecasts enable us to simulate the Fund's current and future cash flows. The Fund's economic value and the resulting capital ratio are then calculated based on the present value of these cash flows and the Fund's current capital resources as estimated in the annual financial audit.

In Appendix A, we first present a full description of the 30-year fixed-rate mortgage (FRM) models. We describe the theory and approach underlying the econometric models used to explain the observed historical claim and prepayment rates, provide descriptions of the models' specifications, and review their goodness-of-fit. The last section of the appendix describes the estimation technique applied to 15-year FRMs.

While the FY 1996 Review contains separate estimation of econometric models for loans other than 30-year FRMs, the latter remain the most important loan type both in origination volume and potential effect upon the MMI Fund. Furthermore, the models used to estimate claim and prepayment rates for 30-year FRMs form the basis for many of the models of alternative loan types. In particular, the estimation technique and the variable definitions discussed below are repeatedly referenced in later appendices.

I. Data Sources and Sample Definition

Historical loan performance data are taken from the Federal Housing Administration's (FHA's) A-43 database. The A-43 contains comprehensive individual loan records on all FHA-insured mortgage originations, including information on loan-to-value (LTV) ratio, date of origination, principal balance, loan type, interest rate, termination date (if applicable), and status.[1] Price Waterhouse requested and received an extract of the A-43 database covering FYs 1975 to 1996.

Historical economic data are taken from private and US Government sources, including the Bureau of the Census and DRI/McGraw-Hill. Data on the share of the mortgage market composed of adjustable-rate mortgages (ARMs) is taken from the A-43 database (for the FHA

[1] The status variable is coded "A" for active loans, "C" for loans that have claimed, and "T" for loans that have terminated (prepaid).

market) and from information provided by the Mortgage Bankers' Association (for the conventional market).

Price Waterhouse has attempted to separate those FHA-insured loans made as part of the Investor Program. However, the A-43 database does not explicitly identify investor loans. Consequently, for the purposes of our analysis we identify all loans with LTV ratios of approximately 85 percent (after taking into account closing costs and upfront premiums) as investor loans. To this sub-sample, we add those loans with two or more living units. FHA discontinued its Investor Program in FY 1991; however, we have continued to place multi-unit properties in the Investor LTV category.

Actuarial Reviews completed prior to FY 1994 grouped streamline refinancings (SRs) into the "No Appraisal" LTV category and analyzed them through the general 30-year FRM model. However, as experience with the SR program has accumulated, it has become more appropriate to study them separately. Therefore, in the last three reviews, we have removed from the main FRM analysis all loans identified as SRs.[2] Hence, while in past reviews LTV category 1 was considered synonymous with SRs, it is now considered a miscellaneous category intended to catch, after the removal of the SRs, the remaining loans with anomalous or non-conforming LTV ratios.

II. 30-Year Fixed-Rate Mortgages

The 30-year FRM econometric models are similar to those used in last year's reviews. Our estimation technique remains identical to last year's review, including the dependent variable transformation and the correction for first-order serial correlation (see below for details).

Although decisions regarding mortgage obligations occur at the individual household level, our models do not use individual loan records as units of observation. Instead, our claim and prepayment models are designed to explain and forecast termination rates for groups (or cells) of similar loans. Our cells are defined by four dimensions:

- amortization year (the fiscal year in which the first mortgage payment is made)
- policy year
- initial house price category
- initial LTV.

Loans within the same cell are presumed to be homogeneous. Since claim and prepayment decisions are categorical, our models are specified as types of cell-based or grouped logistic

[2] See Appendix C for a discussion of how SRs are identified.

models and are estimated using Ordinary Least Squares (OLS) techniques. A separate regression is estimated for each LTV category.[3]

A. Claim Model Specification[4]

Consistent with the FY 1995 Review, we assume that, in a given policy year, a borrower may take one of three actions:

- continue making timely mortgage payments
- prepay (typically through refinancing or sale)
- default.

We begin our analysis with the default option, focusing on claim rates rather than actual delinquency or default rates (either of which may include non-claim cases) because our objective is to estimate the financial impact of claims on the MMI Fund. In the next part of this appendix, we discuss our prepayment model.

Our claim model is specified as follows (a separate equation is estimated for each of our nine LTV categories):

$$F30CCRx_{i,y,t} = \sum_{l=1}^{13} \alpha_l P_{l,t} + \sum_{m=1}^{8} \gamma_m (LSC_{m,i} \cdot EMx_{y,t-1}) + \sum_{n=1}^{10} \lambda_n EFFINT_{n,y} + \beta_1 PAYMENT_{y,t} + \beta_2 HPDISP_{y,t-1} + \beta_3 EQ82\_86_y + \beta_4 EQPOST86_y + \beta_5 CMPPAY_{y,t} + \varepsilon_{i,y,t} \quad (1)$$

where

$F30CCRx_{i,y,t}$ ≡ the Cox transformed conditional claim rate for 30-year FRMs in LTV category x, of loan size category I, originated in fiscal year y,

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[3] Logistic models estimated using Maximum-Likelihood (ML) techniques and designed to explain individual household behavior would have certain advantages in explaining historical termination patterns. However, much of the data used in this model, such as house price appreciation trends and household income growth, are available only in aggregate form.

[4] Our claim model specification is based on work found in C. Foster and R. Van Order, "FHA Terminations: A Prelude to Rational Mortgage Pricing," *AREUEA Journal*, Vol 13(3) 1985, pp. 273-91; _____, _____, "An Option-Based Model of Mortgage Default," *Housing Finance Review*, Oct. 1984, Vol 3(4), pp. 351-72. See also P. Hendershott and W. Schultz, "Equity and Non-equity Determinants of FHA Single Family Mortgage Foreclosures in the 1980s," *AREUEA Journal*, Vol 21(4) 1993, pp. 405-430.

and observed in policy year t,

$P_{l,t}$ ≡ thirteen policy year variables constructed so that $P_{l,t} = 1$ when policy year (t) = l and $P_{l,t} = 0$ otherwise,[5]

$LSC_{m,I}$ ≡ eight loan size category variables constructed so that $LSC_{m,I} = 1$ when loan size category (I) = m and $LSC_{m,I} = 0$ otherwise,

$EMx_{y,t-1}$ ≡ market value of equity index (lagged one year) for loans of LTV category x, originated in fiscal year y and observed in policy year t-1,

$EFFINT_{n,y}$ ≡ ten time-sensitive effective interest rate variables that take the average value of the effective interest rate for loans originated in fiscal year y when policy year (t) falls within time period n, and take the value zero otherwise,

$PAYMENT_{y,t}$ ≡ payment burden variable for loans originated in fiscal year y and observed in policy year t,

$HPDISP_{y,t-1}$ ≡ house price dispersion index for loans originated in fiscal year y and observed in policy year t-1 (lagged one year),

$EQ82\_86_y$ ≡ first "underwriting" variable constructed so that $EQ82\_86_y = 1$ for loans originated during the period FY 1982-86 (*i.e.*, $82 \le y \le 86$) and equals zero otherwise,

$EQPOST86_y$ ≡ second "underwriting" variable constructed so that $EQPOST86_y = 1$ for loans originated in FY 1987 or later (*i.e.*, $87 \le y$) and equals zero otherwise,

$CMPPAY_{y,t}$ ≡ cumulative prepayment variable for loans originated in fiscal year y, and observed in policy year t.

$\alpha, \beta, \delta, \gamma$ ≡ Constants

ϵ ≡ Error term.

[5] In the case of the thirteenth policy year dummy variable, $P_{13,t} = 1$ when policy year (t) ≥ 13 and $P_{13,t} = 0$ otherwise.

The independent variables can be grouped under four main types:

- equity variables
- burden of payment variables
- adverse selection variables
- policy year variables.

Below, we discuss each of the variable types, detailing the underlying theory of our regressors and outlining their construction. However, we begin with a description of the dependent variable $F30CCRx_{i,y,t}$.

1. Conditional Claim Rate

Our dependent variable is a modification of the common logistic transformation, $\ln(\rho/1-\rho)$ where ρ is the probability that a particular event will occur (in the present case, that a borrower default will result in a claim). In our cell-based model, the probability that a mortgage will end in a claim is best measured by the observed claim rate within a cell. However, the expression $\ln(\rho/1-\rho)$ is undefined in instances with zero claim observations.

To correct for this problem, we employ a logistic transformation developed by Cox.[6] The structure of the Cox transformation variable is given by

$$F30CCRx_{i,y,t} = \ln\left(\frac{claim\ count_{i,y,t} + \frac{1}{2}}{survivor\ count_{i,y,t} - claim\ count_{i,y,t} + \frac{1}{2}}\right). \qquad (2)$$

where $claim\ count_{i,y,t}$ refers to the number of loans of LTV category x, of relative house price category I, originated in fiscal year y, that claim in policy year t. $Survivor\ count_{i,y,t}$, similarly indexed, refers to the number of loans which survived into year t.[7] The addition of the constant ½ eliminates the problem of zero observations. The variable $F30CCRx_{i,y,t}$ is a conditional claim rate: thus, it is a measure of how many loans claim in policy year t, conditioned on the fact that they survived into policy year t.

[6] D. R. Cox, *The Analysis of Binary Data*, Spottiswoode, Ballantyne, & Co., Ltd., London and Colchester, 1970, pp. 30-42.

[7] In the first policy year, when $t = 1$, the survivor count is synonymous with the initial origination volume.

2. Equity Variables

Net equity is understood to be the monetary value of a borrower's stake in a property. It is formally defined as the market value of the home less the outstanding mortgage obligations. Borrower equity has demonstrated itself to be the most important indicator of loan performance, as the decision to default will often follow an accumulation of negative equity. The treatment of the role of negative equity is based on the implicit put-option embedded within a standard mortgage. In many cases, this option effectively enables a homeowner to "sell" a house back to the lender for the remaining mortgage balance by simply walking away from the property. If homeowners were to maximize wealth at all times, they might default on their mortgages whenever the resale values of their homes fell below their remaining balances, *i.e.*, whenever they experienced negative equity (assuming there are no transaction costs). However, defaulting on a mortgage carries economic costs such as moving expenses and a negative credit report. It also carries intangible yet non-trivial psychological costs. Moreover, equity need not be negative to increase the likelihood of defaults and claims. While an increase in home owner mobility usually leads to higher prepayment rates, if the events that precipitate greater mobility, such as divorce or job loss, also produce significant changes in household income, higher levels of claim tend to result. When borrowers experiencing these mobility-induced events have little or no equity, they may be unable to sell their properties for a profit and may have insufficient income to meet mortgage payments, resulting in higher claim rates.

Net household equity enters the claim model directly through the market equity index, $EMx_{y,\,t-1}$ and the "quality" of equity enters through the two underwriting variables that reflect time periods in which equity estimates, due to poor underwriting and inaccurate appraisals, will be more or less subject to bias. The variables $HPDISP_{y,\,t}$ captures the dispersion of housing market trends among different geographical areas which shape the distribution of $EMx_{y,\,t-1}$.

I. Market Equity Index[8]

Price Waterhouse's equity index is defined as

$$EMx_{y,t} = 1 + \frac{Mx_y(a_{y,t} - MV1\$_{y,t,T})}{Px_y \prod_{l=y}^{t}(1 + r_l - \delta)} \qquad (3)$$

[8] Similar indices of equity appear in Foster and Van Order," *op. cit.*, and in R. L. Cooperstein, *et al.*, "Modeling Mortgage Terminations in Turbulent Times," *AREUEA Journal*, Vol 19(4), 1991, pp. 473-94.

where $EMx_{y,t}$ is as defined above and

Mx_y	≡	the average total originated amount[9] for loans of LTV category x, originated in fiscal year y, based on a one dollar mortgage,
$a_{y,t}$	≡	the value of the premium refund owed to loans originated in fiscal year y and prepaying in policy year t, expressed as a percent of the total loan amount,
$MV1\$_{y,t,T}$[10]	≡	the value in policy year t of future mortgage payments plus the future prepayment amount of a one dollar mortgage originated in fiscal year y, assuming prepayment in policy year T,[11] all discounted at the prevailing mortgage interest rate,[12]
Px_y	≡	the purchase price of a one dollar property for loans of LTV category x, originated in fiscal year y,
r_l	≡	the national appreciation rate of residential property between years l-1 and l, as measured in the annual rate of growth in the constant quality house price index between the same years, and
δ	≡	rate of depreciation for residential property, set at 0.01.

Thus, our market equity variables captures many of the important determinants of loan performance, including the initial LTV (Mx_y/Px_y) and house price appreciation.

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[9] "Total originated amount" includes the mortgage principal as well as any financed closing costs and upfront premiums. We have estimated financed closing costs to be 2.30% of the principal amount. Financed upfront premiums have varied in the past, from zero (prior to 1984) to 3.80% (from 1984 to the passage of NAHA in 1990) to 3.00% (from NAHA to the present). In the future, we have set financed upfront premiums at 2.25%.

[10] This variable itself has a fairly complicated construction. See Foster and Van Order, "An Option-Based Model of Mortgage Default," *op. cit.*, p. 361 for its precise specification.

[11] Our computations of a mortgage's market value assume, based on historical evidence, that a mortgage will always prepay after policy year T, 40 percent of its remaining life. See Foster and Van Order, "An Option-Based Model of Mortgage Default," *op. cit.*

[12] In our analysis, we use the forecasted values of the FHA effective interest rate as the prevailing market rate.

Because borrowers always have the option of prepaying their mortgages by paying the outstanding principal balance (*i.e.*, the book value of the mortgage $BVI\$_{y,t,T}$), the value of their future payment liabilities (represented by $MVI\$_{y,t,T}$) is constrained to be less than 1.05 times the book value. Analysis of the performance data suggests that any difference greater than 1.05 will usually lead borrowers to refinance rather than default.

The effect of $EMx_{y,t}$ is expected to vary in magnitude depending on the actual dollar size of the loan and the relative price of the home. Home owners with larger loans and higher priced houses are less likely to default because the "option value" of their mortgages increases with their house prices. This is because the default option effectively limits a borrower's potential loss on the property (assuming claim costs do not vary with loan size). However, if house prices begin to increase, the potential capital gain to a home owner is greater for a larger loan. Thus, the effect of $EMx_{y,t}$ is expected to be greater for loans in high-loan size or high-price categories.

In the FY 1996 Actuarial Review, we continued to group loans by the relative size of the underlying house as opposed to the size of the loan in real dollars. The relative size is determined by reference to the median house price in the metropolitan statistical area (MSA) or state in which the loan was originated. This method enables our models to capture differences in loan performance between "small" and "large" houses and between similarly priced homes in high- and low-cost areas. Since these relative house price categories are highly correlated with loan size, a house with a large relative price will also be highly likely to have a large loan. Consequently, the effects that loan size might be expected to have on loan performance are largely captured by the effects of relative house price.

A second reason that loan size, or house price, may affect claim rates is that certain transactions costs associated with prepayment do not vary with house price (such as the time and personal expense involved in selling a house). For example, if selling a property incurs costs of $500, regardless of loan size, then a borrower with a $100,000 loan and $2000 in equity may have an incentive to sell and prepay (rather than default) while a home owner with a $20,000 loan and $400 in equity might not (despite having the same relative equity level). To account for both of these phenomena, $EMx_{y,t}$ is interacted with the eight loan size variables, $LSC_{m,i}$.

An alternative explanation for the varying effect of $EMx_{y,t}$ is that house price is correlated with borrower characteristics, such as income and wealth, that are likely to affect the probability of claim. This is the primary reason for classifying houses based on the price relative to the local market.

ii. Underwriting Variables

Loans originated in FYs 1982 through 1986 are more likely to have been subject to a variety of underwriting practices, including interest rate buy-downs and aggresive seller-financing, that result in inflated appraisal or sale amounts. Thus, equity measures constructed for such loans may have been diluted in ways for which we cannot directly account. By contrast, the post-1986 period is marked by more thorough FHA lender monitoring (as evidenced by the greater number of referrals to and sanctions by the Lender Review Board) and greater conservatism in lending practices. As a consequence, the estimated equity levels for loans originated during this period display a stronger negative correlation with claim rates. The two underwriting variables capture this effect.

iii. House Price Dispersion Index

When average property values are rising so that widespread borrower default is not likely, there may still be some borrowers who are at risk if their regional housing market is experiencing falling prices. It is the borrowers in the lower tail of the national house price appreciation distribution (those that experience persistent low or negative rates of house price appreciation) which are at the greatest risk of defaulting and producing claims. Assuming that increased aggregate volatility in house price movements occurs during periods in which there is an increase in properties with poor appreciation rates (*i.e.*, as the variance of the distribution increases, the density mass below zero equity becomes larger), a measure of house price dispersion should indicate the existence of weak regional housing markets where there are likely to be large populations of "at-risk" households.

Price Waterhouse constructed a house price dispersion index $HPDISP_{y,t}$ using the national constant quality house price index (CQHPI) provided by the Bureau of the Census and the 51 house state price indices (including Washington, D.C.) provided by Fannie Mae/Freddie Mac. This is an improvement from last year's use of four regional indices. For each origination year y, the CQHPIs were re-indexed so that they equalled 1.00 in year y. We then computed the standard deviation of the regional indices, r, for each origination year y and policy year t. This value was divided by the national ratio to create a measure of relative dispersion in house price appreciation. Deflating by the national CQHPI adjusts for the general upward trend in house prices. That is, the index is computed as:

$$HPDISP_{y,t} = \frac{[\sum_{r=1}^{51} (CQDEF_{r,y,t} - \frac{1}{51}\sum_{r=1}^{51} CQDEF_{r,y,t})^2]^{0.5}}{CQDEF_{y,t}} \qquad (4)$$

where $CQDEF$ is the CQHP in policy year t divided by the CQHP in policy year one.

We base our assumptions of future dispersion on its historical experience. Historically, dispersion for a given origination year tends to rise for a decade and then be roughly constant. For some origination years regional house prices continued to diverge, while for others prices converge. Generally, when averages of dispersion rates across a given policy year are computed for a series of years and compared with similar averages for a different series of years, the averages are comparable. There is one clear exception, however. The sharp decline in house prices in Texas and other oil patch states during the FY 1985 to 1987 period, combined with sharply rising prices in many coastal areas, caused a surge in dispersion for all origination years from FY 1975 to 1985.

To exclude this unusual period from the formation of our expectations about the future, we have calculated the average dispersion rate by policy year using data from the FY 1963 to 1984 origination years but excluding the impact of post-1984 price movements. Thus the average dispersion rate for the first policy year is the average over FY 1963 to 1984. For the second year, the average is over FY 1963 to 1983 and so on until the "average" for the 21st policy year is based solely on FY 1963.

This average rises monotonically to 0.09 in the seventh policy year and then oscillates between 0.08 and 0.10. Interestingly, if we compute an average policy year dispersion rate in a comparable manner based solely on the FY 1987 to 1994 data, this average also rises montonically to 0.09 in the seventh year.

For new books of business, we assume that dispersion rises over time similar to the FY 1963 to 1984 average rates, reaching 0.10 in the eighth policy year, and remaining constant thereafter. On existing books of business for the FY 1975 to 1983 period, dispersion in the last observed policy year ranges between 0.08 and 0.11. For the FY 1987 to 1994 business, the last observed dispersion rate is, with one exception, within 0.01 of our average. We assume that dispersion for these books will equal our average in the future. For the FY 1984 to 1986 books of business, a slight adjustment is necessary, since the last dispersion rates vary between 0.05 and 0.07. We increase these rates by 0.01 per year until they reach 0.10 and then hold them at that value.

3. Payment Burden Variables

While equity is an important determinant of claim risk, cash flow considerations also play a substantial role in a household's mortgage payment decisions. As mortgage servicing costs absorb a larger fraction of a household's income, the risk of default and eventual claim increases. If a low-income household with limited or negative equity experiences an unexpected drop in income, the household's ability to make mortgage payments will be correspondingly restricted. Furthermore, the low level of equity may prevent the sale of the home. Under such a scenario, we would expect borrowers with high LTV loans to be more susceptible to liquidity-driven claims.

Price Waterhouse has decomposed last year's burden of payment variable to produce the ten $EFFINT_{n,y}$ variables and $PAYMENT_{y,t}$. The $EFFINT_{n,y}$ variables capture the initial payment burden by assuming the value of the effective interest rate at origination. Loans originated with higher interest rates, all else held constant, face higher monthly mortgage payments and thus are more exposed to cash flow pressures. The initial loan size also plays a considerable role in determining the burden of payment. However, loan size categories already enter the equation as equity interactions (see above).

Since the mortgage payment is fixed in nominal terms for the life of a mortgage, the fraction of household income necessary to service the loan is likely to decrease as nominal household income increases with inflation and household productivity gains. Thus, as a mortgage seasons, the initial monthly payment burden becomes less influential in determining borrower behavior. This effect is captured by specifying ten $EFFINT_{n,y}$ variables which take the value of the effective interest rate in year y if the loan is observed when policy year (t) falls into the range of time period n and are set to zero otherwise. Essentially, the effective interest rate has been interacted with ten dummy variables that indicate the time over which the mortgage has seasoned. Exhibit A-1 defines the time periods used in constructing the $EFFINT_{n,y}$ variables. By making the later time periods longer, we are able to represent not just the fact that the influence of effective interest rate tends to die out, but that it does so at a declining rate. In so defining the effective interest rate variables, we are allowing the effect of the initial payment burden to "burn out" over time.

The $EFFINT_{n,y}$ variables also indirectly capture relative changes in the composition of non-equity borrower risk characteristics in each book of business. Higher effective interest rates will, on average, result in fewer mortgages originations, and they will tend to increase FHA's share of the market, since the conventional market's more restrictive debt-to-income ratio requirements are more likely to bind when interest rates are high (conventional lenders have also been reported to more rigorously enforce all underwriting criteria when interest rates are high). Since, at the margin, high risk borrowers will be less likely to be deterred from originating a mortgage in a high-interest rate environment, we might expect that an FHA-insured cohort with a higher effective interest rate will contain a greater density of high-risk borrowers than an FHA-insured cohort with a low effective interest rate.

Exhibit A-1

Definition of $EFFINT_{n,y}$ Time Periods	
Time Period *n*	**Policy Years Covered**
1	1
2	2
3	3
4	4
5	5
6	6-7
7	8-9
8	10-11
9	12-13
10	14 +

As the loan seasons, the variable $PAYMENT_{y,t}$ tracks the subsequent payment burden. $PAYMENT_{y,t}$ is defined as follows:

$$PAYMENT_{y,t} = \frac{DTIR}{\prod_{i=y}^{t}(1 + \Delta MHINC_i)} \qquad (6)$$

with $\Delta MHINC_i$ defined as the change in mean household income between the years i and i-1 and $DTIR$ as the initial debt-to-income ratio for a cohort of borrowers. We have set $DTIR$ to 0.33 for all borrowers based on the assumption that, at the time of origination, the average FHA-insured household will allocate approximately one-third of its income to meeting its mortgage obligations.[13] As better data on FHA debt-to-income ratios for specific borrowers become

[13] The figure 0.33 is an estimate. The actual fraction of household income allocated for mortgage payments will vary with the interest rate and the loan size, both of which enter the model as discussed above.

available, we will adjust the starting value of this variable for specific populations. The denominator of this term increases with mean household income so that $PAYMENT_{y,t}$ declines over time.

4. Adverse Selection Variable

During the life of a book of business, its composition shifts as individual loans default or prepay out of the MMI Fund. In particular, Price Waterhouse recognizes that the population of loans which prepay may differ significantly from the population of borrowers that remain within the Fund. Loans which refinance out of the Fund do so to avoid paying a mortgage insurance premium or to pay a lower one through a private mortgage insurer (PMI). However, in order to do so, such loans are generally required to meet more restrictive qualification standards. Thus, we expect that loans which refinance out of the Fund and therefore meet such standards, will, on average, have higher equity levels, higher incomes, and better credit histories than the population which remains within the MMI Fund. As a book of business matures and the better risk loans refinance out of the Fund, we therefore expect that the overall quality of the book will degrade as a function of refinancing activity. We refer to this phenomenon as "adverse selection."

We have constructed the cumulative prepayment rate variable in order to measure the relative level of refinancing activity experienced by a given loan cohort. The rate captures the degree to which actual refinancing activity exceeds the level that would have occurred had there been no interest rate movements in the period in question.

The values for the cumulative prepayment variable are calculated using a three-step process. First, the conditional prepayment rate model (discussed in more detail below) is estimated. Using the coefficients from the estimated model, we then predict by origination year y and policy year t what prepayment rates would have been had all interest rate variables been kept at constant values. By removing interest rate fluctuations from our model, we are estimating what the mobility-induced conditional prepayment rates were. From the actual and the mobility-induced conditional rates, we compute estimated cumulative prepayment rates, $ACT\_CMPR_{y,t}$ and $MOB\_CMPR_{y,t}$. Our cumulative prepayment variable is finally defined as

$$CMPPAY_{y,t} = \frac{(1 - ACT\_CMPR_{y,t})}{(1 - MOB\_CMPR_{y,t})} \qquad (7)$$

The lower the value of the cumulative prepayment variable, the more likely it is that the cohort in question has been affected by high levels of refinancing activity.

5. Policy Year Variables

Many of the variables in our 30-year FRM claim model are time sensitive and follow discernible trends across time. There remain, however, important yet unobservable determinants of borrower behavior which also change with time measured from endorsement year. Our thirteen policy year dummy variables are intended to represent such intangibles.

In particular, during the first year of a mortgage's life, the likelihood of a claim payment is quite low (if claim seemed imminent within a year, the loan likely would not have been extended). After the first year, default rates steadily increase until they reach a peak around the fourth or fifth policy year. As the mortgage seasons, the probability of claim then decreases. Over time, home owners may develop non-trivial attachments to their properties which lessen the likelihood of default. The policy year variables are intended to capture these and other time-related effects.

B. Claim Model Results

Our claim model coefficient estimates are presented in Exhibit A-2. The results conform to our expectations, and, based on the values of adjusted-R^2, the models explain a high proportion of the variance in our data.

The negative coefficients of the loan size/equity interactions indicate that, as we expected, increases in equity reduce the probability of claim termination within an LTV category. Moreover, the coefficients in Exhibit A-2 indicate that equity exerts a stronger influence in reducing propensity to claim as loan size increases. This effect was anticipated above. $PAYMENT_{y,t}$ has the expected sign for all LTV categories, indicating that as the payment burden increases, so does the likelihood of default. The positive coefficients for $HPDISP_{y,t-1}$ conform with our intuition regarding the volatility of house prices. As the variance of the house price distribution increases, we observe larger levels of claims.

The coefficients of the underwriting variables $EQ82\_86_y$ and $EQPOST86_y$ indicate that for low-LTV borrowers, the quality of underwriting standards did not produce a substantial effect, as indicated by the similar coefficient values of the two variables for LTV ratios below 90 percent. For high-LTV borrowers, however, the change in underwriting standards had a noticeable effect. In particular, the positive coefficient values (in some cases, less negative values) for $EQ82\_86_y$ demonstrate that riskier loans tended to be originated during the period between FYs 1982 and 1986. The ten $EFFINT_{n,y}$ variables also behave as expected. After reaching a peak around time period $n = 2$ or $n = 3$, the influence of the effective interest begins to wane.

Finally, the coefficients of $CMPPAY_{y,t}$ carry the expected sign. As the cumulative rate of prepayment increases, the variable $CMPPAY_{y,t}$ becomes smaller (see eq. (6)). The negative

coefficients therefore indicate that higher cumulative prepayment rates lead to a greater likelihood of claim termination. Morever, the effect of $CMPPAY_{y,t}$ decreases for higher-LTV classes where the potential for adverse selection is more remote since fewer of these borrowers will qualify to refinance out of the Fund.

Exhibit A-2

Regression Results for 30-Year FRM Conditional Claim Rate Model by LTV Category
(t-statistics in parentheses)

Variable	Unknown LTV	0-65%	65-80%	80-90%	90-93%	93-95%	95-97%	97-100%	Investor[a]
$P_{1,t}$	-3.2881 -(5.6290)	-0.5339 -(0.7106)	-6.7997 -(11.0416)	-10.2137 -(20.4539)	-11.0000 -(20.6841)	-13.7490 -(25.3528)	-16.8783 -(32.7353)	-14.1878 -(29.3935)	-8.5597 -(14.7040)
$P_{2,t}$	-7.2361 -(6.4140)	-4.6822 -(2.5029)	-15.4266 -(9.8267)	-12.4829 -(9.8125)	-13.4975 -(10.2391)	-13.3654 -(10.1494)	-14.1327 -(11.1633)	-12.5339 -(11.1185)	-15.2493 -(11.3495)
$P_{3,t}$	-9.2094 -(7.9393)	-2.3295 -(1.2020)	-13.2158 -(8.1440)	-11.1829 -(8.7377)	-10.9391 -(8.2998)	-11.1546 -(8.5506)	-12.2377 -(9.8090)	-11.0279 -(9.8652)	-11.8388 -(8.5124)
$P_{4,t}$	-9.0192 -(7.4276)	-0.3674 -(0.1832)	-12.5160 -(7.4823)	-9.5285 -(7.3517)	-9.7765 -(7.3503)	-9.3543 -(7.1607)	-10.7049 -(8.6007)	-10.0335 -(8.9153)	-10.5354 -(7.3025)
$P_{5,t}$	-9.0296 -(6.9095)	2.0473 (0.9779)	-12.3298 -(7.0078)	-9.7778 -(7.0342)	-10.1361 -(7.0124)	-10.0362 -(7.0438)	-10.9756 -(8.1036)	-10.4069 -(8.4524)	-10.6224 -(6.8994)
$P_{6,t}$	-10.1279 -(7.4659)	2.0196 (0.9280)	-14.0864 -(7.6261)	-11.6682 -(7.7578)	-11.9090 -(7.5762)	-11.7241 -(7.4163)	-12.5764 -(8.3253)	-10.7626 -(8.2949)	-11.4173 -(7.0698)
$P_{7,t}$	-10.0275 -(7.4130)	1.9509 (0.8995)	-14.1938 -(7.7087)	-11.7735 -(7.8453)	-11.9867 -(7.6400)	-11.7684 -(7.4587)	-12.6545 -(8.4016)	-10.8492 -(8.3859)	-11.5699 -(7.1902)
$P_{8,t}$	-9.9120 -(7.1960)	0.4930 (0.2254)	-13.1176 -(7.0058)	-13.5363 -(8.7252)	-13.1407 -(8.1517)	-12.7165 -(7.8131)	-13.6130 -(8.8381)	-11.4405 -(8.6830)	-10.4604 -(6.4292)
$P_{9,t}$	-9.8269 -(7.1661)	0.6254 (0.2870)	-13.1299 -(7.0445)	-13.5319 -(8.7631)	-13.0616 -(8.1476)	-12.7267 -(7.8659)	-13.6265 -(8.8973)	-11.4249 -(8.7260)	-10.4538 -(6.4518)
$P_{10,t}$	-9.1504 -(6.8602)	2.9498 (1.3579)	-12.1565 -(6.5965)	-12.0674 -(7.9610)	-13.6085 -(8.7481)	-13.1752 -(8.4372)	-13.5165 -(9.1182)	-11.5190 -(9.0962)	-10.6476 -(6.7072)
$P_{11,t}$	-9.0232 -(6.7925)	3.0210 (1.3925)	-12.0187 -(6.5345)	-12.1532 -(8.0378)	-13.6813 -(8.8356)	-13.1818 -(8.4744)	-13.6200 -(9.2173)	-11.5213 -(9.1455)	-10.7187 -(6.7696)
$P_{12,t}$	-5.5602 -(4.5146)	5.8097 (2.8297)	-9.8999 -(5.7814)	-9.9121 -(7.2962)	-10.3421 -(7.4459)	-10.0277 -(7.2574)	-12.0533 -(9.2132)	-8.5817 -(7.6934)	-9.5143 -(6.5484)
$P_{13,t}$	-5.5146 -(4.5010)	5.9879 (2.9383)	-9.9141 -(5.8345)	-9.8560 -(7.3138)	-10.3036 -(7.4755)	-10.0050 -(7.3009)	-11.9955 -(9.2533)	-8.5235 -(7.7143)	-9.6066 -(6.6572)
$LSC_{1,t} * EMx_{y,t-1}$	-2.1947 -(8.3147)	-3.4494 -(7.4922)	-0.4567 -(1.6587)	-1.2210 -(6.0267)	-1.9604 -(9.6578)	-1.6672 -(8.4435)	-1.2562 -(7.1652)	-2.1417 -(14.6876)	-1.2613 -(6.2629)
$LSC_{2,t} * EMx_{y,t-1}$	-3.2620 -(12.0416)	-3.7087 -(8.0996)	-0.7509 -(2.7104)	-1.8120 -(8.7519)	-2.8391 -(13.5830)	-2.4521 -(12.1849)	-2.1844 -(12.0992)	-3.0205 -(19.5882)	-1.7635 -(8.4564)
$LSC_{3,t} * EMx_{y,t-1}$	-3.7157 -(13.6676)	-4.1522 -(9.1816)	-1.2424 -(4.6306)	-2.4111 -(12.2071)	-3.3631 -(17.1683)	-2.9292 -(15.5207)	-2.5713 -(14.7323)	-3.2482 -(21.0691)	-2.1258 -(10.3654)
$LSC_{4,t} * EMx_{y,t-1}$	-4.0993 -(15.1407)	-4.7473 -(10.6522)	-1.5587 -(6.0614)	-2.9294 -(15.8892)	-3.6978 -(20.2773)	-3.4140 -(19.3775)	-2.9402 -(17.8623)	-3.5490 -(23.2864)	-2.3980 -(12.1370)

$LSC_{5,t}$ * $EMx_{y,t-1}$	-4.5028 -(15.7679)	-4.7344 -(10.5707)	-1.5251 -(5.8340)	-3.0722 -(15.9891)	-3.8597 -(20.1323)	-3.6974 -(19.8335)	-3.1779 -(17.4115)	-3.6508 -(20.3041)	-2.5944 -(12.5752)
$LSC_{6,t}$ * $EMx_{y,t-1}$	-4.5171 -(15.2441)	-4.7701 -(10.7140)	-1.6972 -(6.5526)	-3.2501 -(17.1103)	-4.0888 -(21.3752)	-3.6847 -(19.4188)	-3.1276 -(16.2386)	-3.6697 -(18.4751)	-2.5787 -(12.5466)
$LSC_{7,t}$ * $EMx_{y,t-1}$	-4.3146 -(13.3210)	-4.1668 -(9.4679)	-1.9468 -(7.7153)	-3.2853 -(17.4726)	-4.1813 -(21.3077)	-3.6521 -(17.9535)	-3.1323 -(14.6920)	-3.3969 -(13.9679)	-2.3461 -(11.6246)
$LSC_{8,t}$ * $EMx_{y,t-1}$	-4.0527 -(11.4034)	-4.6559 -(10.1138)	-2.5091 -(8.2204)	-2.8873 -(9.1863)	-3.6076 -(9.5116)	-2.2189 -(5.2867)	-2.7735 -(6.1892)	-4.0651 -(12.0167)	-3.1134 -(10.6161)
$PAYMENT_{y,t}$	7.8741 (2.4589)	3.0090 (0.6189)	15.7749 (3.7578)	5.8404 (1.6673)	5.0395 (1.3949)	4.4867 (1.2302)	4.5173 (1.2867)	2.2568 (0.7447)	11.6745 (3.2996)
$HPDISP_{y,t-1}$	2.6451 (5.4482)	4.6120 (5.7657)	4.5091 (6.7933)	1.9522 (3.7230)	2.2759 (4.3123)	1.6513 (3.1974)	1.6489 (3.3211)	1.4009 (3.4149)	3.2611 (6.1554)
$EQ82\_86_y$	0.0569 (0.9961)	-1.0145 -(14.8825)	0.2408 (4.2232)	0.5611 (11.6675)	0.5912 (11.8957)	0.4523 (8.7082)	0.6170 (12.3761)	0.2611 (6.3904)	0.5988 (12.6290)
$EQPOST86_y$	-0.1806 -(1.9679)	-0.9122 -(12.2224)	0.3247 (5.2897)	0.3001 (6.0496)	0.0214 (0.4190)	0.0076 (0.1490)	0.0331 (0.6871)	-0.3530 -(8.4958)	0.1552 (3.0771)
$EFFINT_{1,y}$	-1.1706 -(5.1749)	-0.6772 -(2.5495)	0.0046 (0.0196)	0.9304 (4.9783)	1.1171 (5.5102)	2.4164 (11.9296)	3.3654 (17.7807)	2.5799 (13.3308)	0.7571 (3.6611)
$EFFINT_{2,y}$	0.5660 (2.4915)	1.3144 (4.8546)	2.4269 (10.1298)	2.3702 (12.1939)	2.7484 (13.0726)	2.9857 (14.1610)	3.0302 (15.3481)	3.0575 (15.3634)	3.3207 (15.6546)
$EFFINT_{3,y}$	1.7216 (7.4382)	0.6625 (2.3152)	1.9292 (7.6752)	2.3434 (11.7363)	2.1918 (10.2028)	2.5661 (11.9858)	2.7233 (13.5886)	2.8651 (13.9231)	2.3740 (10.7473)
$EFFINT_{4,y}$	1.6789 (6.7757)	-0.0704 -(0.2197)	1.7424 (6.2238)	1.7972 (8.2165)	1.8696 (7.9724)	1.9777 (8.5003)	2.2127 (10.1635)	2.5555 (11.3394)	1.9275 (7.8176)
$EFFINT_{5,y}$	1.7302 (6.3098)	-1.1086 -(2.7983)	1.6591 (4.7745)	1.9457 (6.7850)	2.0867 (6.8293)	2.3260 (7.4633)	2.3744 (8.0593)	2.7364 (9.6516)	1.9549 (6.5982)
$EFFINT_{6,y}$	2.1914 (8.5257)	-1.0936 -(2.6828)	2.3744 (6.6866)	2.7516 (9.2479)	2.8467 (9.2401)	3.0622 (9.5953)	3.0629 (10.2270)	2.8815 (11.2782)	2.2786 (7.7545)
$EFFINT_{7,y}$	2.1636 (7.4884)	-0.5204 -(1.1579)	1.9344 (4.8288)	3.4842 (9.9608)	3.3312 (9.3131)	3.4565 (9.3110)	3.4677 (10.1039)	3.1205 (10.7711)	1.7755 (5.4244)
$EFFINT_{8,y}$	1.8829 (6.3168)	-1.4220 -(3.0351)	1.5388 (3.6858)	2.9079 (7.9582)	3.5587 (9.6990)	3.6533 (9.5245)	3.4176 (9.6334)	3.1609 (10.4734)	1.8714 (5.5589)
$EFFINT_{9,y}$	0.4618 (1.7374)	-2.5328 -(6.3600)	0.6088 (1.7586)	1.9201 (6.7410)	2.1575 (7.5818)	2.3401 (7.9660)	2.7278 (10.1257)	1.9087 (8.2676)	1.3493 (5.0374)
$EFFINT_{10,y}$	0.4095 (1.5377)	-2.4742 -(6.0539)	0.7155 (2.0157)	1.9034 (6.5505)	2.1551 (7.4463)	2.2731 (7.6107)	2.6205 (9.5069)	1.8104 (7.6717)	1.4335 (5.2289)
$CMPPAY_{y,t}$	-1.3078 -(4.7419)	-3.2987 -(12.3563)	-1.8507 -(7.4659)	-0.9198 -(3.6790)	-0.3180 -(1.1910)	-0.7468 -(2.4909)	0.0413 (0.1432)	-0.1523 -(0.7862)	-1.8191 -(5.7190)

Summary of Regression Statistics									
Adjusted-R^2	0.966	0.967	0.970	0.978	0.973	0.978	0.981	0.978	0.971
F-statistic	1595.334	1624.877	1839.804	2499.348	2064.658	2426.653	2857.347	2554.527	1856.043

*Investor loans and loans for dwellings with two or more units.

C. Prepayment Model Specification

Price Waterhouse's prepayment model is specified as follows (as with the claim model, a separate equation is estimated for each of our nine LTV categories):

$$F30CPRx_{i,y,t} = \sum_{l=1}^{13} \alpha_l P_{l,t} + \sum_{m=1}^{8} \gamma_m (LSC_{m,i} \cdot EBx_{y,t-1}) + \sum_{n=1}^{10} \lambda_n EFFINT_{n,y} + \beta_1 MA\_RATE_t + \beta_2 PVDIFPOS_{y,t} + \beta_3 PVDIFNEG_{y,t} + \beta_4 INTRA\_INT_t + \beta_5 ARMSHR_y + \varepsilon_{i,y,t} \quad (8)$$

where

$F30CPRx_{i,y,t}$ ≡ the Cox transformed conditional prepayment rate for 30-year FRMs in LTV category x, of loan size i, originated in fiscal year y, and observed in policy year t,

$EBx_{y,t-1}$ ≡ book equity index for loans of LTV category x, originated in fiscal year y, and observed in policy year t-1 (lagged one year),

MA_RATE_t ≡ the ratio of the average FHA contract rate during the last six years to the current FHA contract rate, constrained to a minimum value of one,

$PVDIFPOS_{y,t}$ ≡ the discounted present value of the gain from refinancing at a lower interest rate in policy year t a loan originated in fiscal year y,

$PVDIFNEG_{y,t}$ ≡ the discounted present value of the loss from refinancing at a higher interest rate in policy year t a loan originated in fiscal year y (the calculation of $PVDIFNEG_{y,t}$ is identical to the calculation of $PVDIFPOS_{y,t}$),

$INTRA\_INT_t$ ≡ an intra-year interest rate variable designed to track intra-year movements in the FHA contract rate, defined as the ratio of the

average of the three lowest monthly interest rates in policy year t to the average for all of policy year t, and

$ARMSHR_y$ ≡ the share of the mortgage market in fiscal year y that is composed of ARMs.

$F30CPRx_{i,y,t}$ is analogous to the claim model dependent variable, including the Cox transformation. Independent variables in eq. (7) that are not described above are identical in definition and purpose to those used in the claim model.

Prepayment decisions are generally motivated by one of two factors:

- the necessity or desire to move (due to job loss, divorce, increased wealth, etc.)
- interest rate fluctuations (allowing borrowers to refinance at a lower rate and thus lower their payment burdens)

Variables related to both of these factors are detailed below.

1. Mobility Variables

i. Book Equity

A borrower who is forced to move may either default or prepay. As with the claim model, borrower equity is an important determinant of behavior in such situations. However, since refinancing is no longer an option, the market value of the mortgage $MV1\$_{y,t,T}$ is replaced by $BV1\$_{y,t,T}$, the book value. The resulting variable is referred to as book equity and is formally defined as

$$EBx_{y,t} = 0.94 + \frac{Mx_y(a_{y,t} - BV1\$_{y,t,T})}{Px_y \prod_{l=y}^{t}(1 + r_l - \delta)} \qquad (9)$$

with $BV1\$_{y,t,T}$ equal to the book value of the mortgage (*i.e.*, the remaining principal balance on a one dollar mortgage) and all other terms as previously defined. The first term in eq. (3) is replaced with 0.94 to account for transaction costs specifically associated with prepayment, such as costs incurred selling the property.

Consistent with the claim model, the prepayment equity variables are interacted with loan size dummies $LSC_{m,i}$. The rationale is identical to that expressed above (see, in particular, the discussion of transaction costs in subsection B.1.b.i).

ii. ARM Share[14]

We expect that a borrower will chose the mortgage instrument which best meets the needs of his situation. In particular, we expect that a borrower who anticipates a change of residence and prepayment in the near future will be more likely to take advantage of the lower initial interest rate offered by an ARM. Thus, as the proportion of the mortgage market composed of ARMs grows, we hypothesize that the more mobile home owners will be drawn from the 30-year FRM pool and into the ARM market. The variable $ARMSHR_y$ captures this effect. We expect that as this variable increases, mobility-induced prepayments in the 30-year FRM model will decline.

2. Interest Rate Variables

i. $\text{PVDIFxxx}_{y,t}$ *Variables*

The $PVDIFxxx_{y,t}$ variables represent estimates of the present value of the difference in mortgage servicing costs under the current interest rate in year t versus the original mortgage contract rate of a loan originated in year y, net of closing costs. $PVDIFPOS_{y,t}$ represents the potential savings available by refinancing at a lower rate while $PVDIFNEG_{y,t}$ represents the losses associated with refinancing at a higher rate. We have included two distinct variables to measure gains and losses because their effects should be dissimilar. $PVDIFPOS_{y,t}$ captures the incentive to prepay and refinance the same property. On the other hand, if a borrower anticipates a loss if he refinances, then the effect of $PVDIFNEG_{y,t}$ should be smaller and the borrower will not incur the hassle of refinancing only to obtain a higher monthly payment. In fact, $PVDIFNEG_{y,t}$ actually measures the disincentive to prepay and change residences. As such, it is similar to the mobility variables discussed above while $PVDIFPOS_{y,t}$ is a pure interest rate variable.

ii. Burnout

The predisposition to prepay will vary between individual borrowers in ways which no model, regardless of its sophistication, can completely predict. When interest rates fall below the initial coupon rate for the first time, the borrowers with the highest predisposition to prepay will do so. It follows that the remaining population has a lower average predispostion to prepay and will be less responsive to interest rate fluctuations in later periods. This effect, know in the literature as

[14] Our inclusion of the "ARM share" variable is based on a discussion in C. Foster and R. Van Order, "Estimating Prepayments," *Secondary Mortgage Markets*, Winter 1990/1, pp. 24-26.

"burnout,"[15] is captured by the variable MA_RATE_t, the ratio of the average FHA contract rate in the six years prior to t to the current FHA contract rate in year t. If interest rates have been relatively low in the recent past, we expect that books of business may have been "burnt-out."

iii. Intra-year Interest Rate Movements

Intra-year fluctuations in interest rates are no less valid incentives to prepay than longer-term trends. However, such short-term changes can be obscured by a single interest rate variable specified for a given fiscal year. Therefore, we have included the variable $INTRA\_INT_t$ to represent intra-year volatility in interest rates.

D. Prepayment Model Results

Our prepayment model coefficient estimates are presented in Exhibit A-3. As with our conditional claim model, the regression results conform to prior expectations. Also, our goodness-of-fit measures indicate that our prepayment model performs well in explaining the variance in our data.

The positive coefficients of the loan size/book equity interactions indicate that higher levels of equity increase the likelihood of prepayment. An increase in a borrower's book equity may be interpreted as an increase in the borrower's overall wealth. Hence, borrowers with higher levels of book equity are better able to prepay their mortgages and "trade up" (*i.e.*, purchase more expensive properties).

Similarly, MA_RATE_t carries the expected positive sign. High interest rates in the recent past dampen the effect of burn-out. High interest rates therefore increase the probability of prepayment relative to a cohort which has experienced low interest rates and has consequently been burnt-out.

The $PVDIFxxx_{y,t}$ coefficients work as expected, all with positive coefficients. A positive coefficient on $PVDIFNEG_{y,t}$ may appear counter-intuitive. However, the variable itself is always negative, and thus, when interacted with a positive coefficient, a more negative value (representing a larger absolute loss from refinancing) will decrease the likelihood of prepayment, as expected. Furthermore, $INTRA\_INT_t$ has the expected negative sign, demonstrating that high levels of intra-year interest rates lower the likelihood that borrowers will prepay and refinance.

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[15] For a complete discussion of burnout, see A. Davidson and M. Herskovitz, "Analyzing the Path of Dependence in MBSs," *The Handbook of Mortgage-Backed Securities*, Probus Publishing Co., Chicago, pp. 687-718.

The $EFFINT_{n,y}$ coefficients are estimated to have negative signs, indicating that borrowers who originate loans in high interest rate environments tend to be riskier.[16] Moreover, during high interest rate scenarios, individuals who might otherwise have qualified for private mortgage insurance may find themselves denied private coverage as such lenders tighten standards of credit-worthiness. These higher-risk borrowers may then turn to FHA as a last resort. The negative coefficient values capture these phenomena.

[16] A high initial interest rate is, of course, an incentive to prepay and refinance at a lower rate. This financial consideration is already represented in $PVDIFPOS_{y,r}$. The $EFFINT_y$ variables capture another influence of the initial interest rate as detailed in the text.

Exhibit A-3

Regression Results for Conditional Prepayment Rate Model by LTV Category
(t-statistics are in parentheses)

Variable	Unknown LTV	0-65%	65-80%	80-90%	90-93%	93-95%	95-97%	97-100%	Investor*
$P_{1,t}$	-4.1094 -(6.3140)	-6.6862 -(14.6367)	-4.5345 -(9.7152)	-3.8422 -(8.7060)	-3.7779 -(7.8160)	-2.4726 -(4.8988)	-2.3118 -(4.9117)	-3.6807 -(7.4419)	-6.9706 -(13.5112)
$P_{2,t}$	0.7829 (1.2124)	-5.0462 -(11.0032)	-3.9904 -(8.4893)	-1.9867 -(4.4424)	-1.1520 -(2.3620)	0.5361 (1.0536)	1.4105 (2.9667)	0.2187 (0.4348)	-4.2496 -(8.2242)
$P_{3,t}$	4.3371 (7.1136)	-4.3167 -(9.2461)	-2.8372 -(5.8639)	-0.6527 -(1.4414)	0.1466 (0.2974)	1.7153 (3.3556)	2.6916 (5.6537)	2.3343 (4.5447)	-2.8007 -(5.1923)
$P_{4,t}$	4.3602 (7.1503)	-4.4640 -(9.2511)	-2.8819 -(5.6830)	-1.3033 -(2.7321)	0.0186 (0.0356)	1.0740 (1.9625)	1.7629 (3.4489)	3.1521 (5.7612)	-2.1035 -(3.6679)
$P_{5,t}$	4.9742 (7.4452)	-3.5590 -(6.3922)	-1.9792 -(3.3158)	-0.3502 -(0.5864)	1.3362 (2.0569)	2.5810 (3.6898)	3.3261 (5.0318)	4.2897 (6.4157)	-0.8563 -(1.3288)
$P_{6,t}$	4.8863 (7.0897)	-0.7612 -(1.4028)	0.4178 (0.7212)	0.7508 (1.2316)	1.8255 (2.7886)	2.7090 (3.7098)	3.7759 (5.4230)	3.8242 (5.9563)	0.4662 (0.7665)
$P_{7,t}$	5.9777 (9.4986)	2.3714 (4.9573)	3.4270 (6.6073)	3.4814 (6.2688)	4.0653 (6.7450)	4.8275 (7.1580)	6.0244 (9.3826)	5.0954 (8.5452)	2.8577 (5.2316)
$P_{8,t}$	5.4700 (7.5957)	3.9838 (7.2113)	4.5060 (7.5385)	4.4867 (6.8622)	4.4989 (6.3479)	5.3196 (6.6422)	6.4870 (8.5718)	5.6385 (7.9768)	4.2158 (6.8383)
$P_{9,t}$	5.3953 (7.5504)	3.7227 (6.7236)	4.2502 (7.1105)	4.2780 (6.5527)	4.3739 (6.1895)	5.2086 (6.5241)	6.3459 (8.4055)	5.5555 (7.8856)	4.0159 (6.5259)
$P_{10,t}$	4.8549 (6.6931)	1.2660 (1.9283)	2.8361 (4.1342)	4.4451 (6.1730)	5.3274 (7.0394)	6.3159 (7.4780)	6.6186 (8.2461)	5.6299 (7.6304)	3.7336 (5.3844)
$P_{11,t}$	4.6931 (6.4761)	1.1310 (1.6992)	2.7183 (3.9198)	4.3681 (6.0228)	5.2841 (6.9659)	6.2552 (7.3975)	6.5261 (8.1002)	5.5475 (7.5059)	3.7103 (5.3077)
$P_{12,t}$	3.2942 (5.0884)	2.9356 (4.6830)	4.5230 (7.1326)	4.6861 (7.5169)	4.9461 (7.6865)	5.7670 (8.1427)	5.8267 (8.7493)	4.3666 (7.2445)	4.8250 (7.6548)
$P_{13,t}$	3.1581 (4.9072)	2.9075 (4.6893)	4.4655 (7.1375)	4.6588 (7.5830)	4.9156 (7.7445)	5.6990 (8.1476)	5.7842 (8.8029)	4.3142 (7.2416)	4.8421 (7.7820)
$LSC_{1,t}$ * $EBx_{y,t-1}$	0.3978 (1.4966)	-0.9895 -(3.3115)	-0.4438 -(2.0328)	-0.5727 -(2.8454)	-0.4225 -(2.0584)	-0.0920 -(0.4182)	-0.1758 -(0.8861)	0.0844 (0.4973)	-1.3667 -(6.8407)
$LSC_{2,t}$ * $EBx_{y,t-1}$	0.6803 (2.5116)	-0.8636 -(2.9052)	-0.2109 -(0.9657)	-0.1825 -(0.8969)	-0.0028 -(0.0134)	0.2829 (1.2732)	0.1923 (0.9537)	0.3735 (2.1290)	-1.0776 -(5.2913)
$LSC_{3,t}$ * $EBx_{y,t-1}$	0.7035 (2.5899)	-0.7425 -(2.5209)	-0.0802 -(0.3748)	-0.0584 -(0.2953)	0.1318 (0.6574)	0.4218 (1.9744)	0.2980 (1.5122)	0.4124 (2.3548)	-1.0003 -(4.9721)

$LSC_{4,t}$ * $EBx_{y,t-1}$	0.7071 (2.6096)	-0.6648 -(2.2801)	0.0494 (0.2374)	0.0120 (0.0634)	0.1026 (0.5366)	0.3486 (1.7066)	0.3393 (1.7875)	0.3768 (2.1725)	-0.9428 -(4.8066)
$LSC_{5,t}$ * $EBx_{y,t-1}$	0.6756 (2.3969)	-0.6445 -(2.2051)	0.0765 (0.3651)	0.0105 (0.0540)	0.0910 (0.4626)	0.3009 (1.4290)	0.3147 (1.5635)	0.3358 (1.7453)	-0.9823 -(4.8806)
$LSC_{6,t}$ * $EBx_{y,t-1}$	0.5400 (1.8648)	-0.6351 -(2.1830)	0.1026 (0.4929)	0.0335 (0.1739)	0.1300 (0.6639)	0.3088 (1.4572)	0.3351 (1.6256)	0.2863 (1.4057)	-0.9964 -(4.9659)
$LSC_{7,t}$ * $EBx_{y,t-1}$	0.5540 (1.8003)	-0.6619 -(2.2973)	0.1781 (0.8731)	0.0499 (0.2616)	0.1164 (0.5871)	0.3468 (1.5771)	0.4060 (1.8567)	0.1682 (0.7216)	-1.1045 -(5.6023)
$LSC_{8,t}$ * $EBx_{y,t-1}$	-0.9390 -(2.7759)	-1.6520 -(5.5151)	-1.5007 -(6.4148)	-1.6412 -(6.0214)	-1.6515 -(5.0377)	-1.6256 -(4.1318)	-1.8987 -(4.5992)	-1.7165 -(5.2604)	-2.6417 -(9.7800)
MA_RATE_t	1.4868 (5.5499)	3.1909 (15.1122)	3.0365 (14.1268)	2.8079 (13.2659)	2.4236 (10.9960)	2.3257 (9.9570)	2.4402 (10.9322)	1.4083 (6.5880)	2.3954 (10.8769)
$PVDIFPOS_{y,t}$	12.9126 (18.6670)	13.1667 (26.0778)	17.0990 (31.5900)	20.2380 (35.1472)	22.4580 (35.9846)	23.1495 (33.4637)	23.0759 (35.3491)	22.7600 (36.9902)	17.2561 (30.8214)
$PVDIFNEG_{y,t}$	16.1526 (27.5352)	7.9100 (14.7351)	9.3143 (17.1127)	10.6963 (19.5982)	10.8965 (19.4336)	11.1601 (18.3306)	10.9569 (18.7474)	11.0783 (20.9917)	8.4284 (15.2246)
$INTRA\_INT_t$	-2.4789 -(5.8971)	-0.2696 -(0.9114)	-1.2628 -(4.2558)	-1.3247 -(4.5487)	-1.1964 -(3.7981)	-1.9891 -(6.0014)	-2.3139 -(7.4942)	-1.3029 -(4.2647)	-0.7625 -(2.3805)
$EFFINT_{1,y}$	-0.1540 -(0.7863)	-0.0612 -(0.4202)	-0.7696 -(4.9066)	-1.1720 -(7.7345)	-1.2952 -(7.6379)	-1.5989 -(8.8204)	-1.5760 -(9.3121)	-0.9477 -(5.2079)	0.2530 (1.4361)
$EFFINT_{2,y}$	-1.3987 -(7.1444)	-0.1087 -(0.7303)	-0.3780 -(2.3464)	-1.2499 -(7.9458)	-1.6224 -(9.2490)	-2.0513 -(10.9272)	-2.3570 -(13.4293)	-1.8352 -(9.7733)	-0.2235 -(1.2354)
$EFFINT_{3,y}$	-2.6511 -(13.4248)	-0.2874 -(1.8258)	-0.7296 -(4.2877)	-1.6044 -(9.6857)	-1.8980 -(10.2516)	-2.2526 -(11.3284)	-2.6196 -(14.0998)	-2.4493 -(12.3750)	-0.6691 -(3.4617)
$EFFINT_{4,y}$	-2.5143 -(11.5132)	-0.2292 -(1.2771)	-0.6878 -(3.5640)	-1.2639 -(6.7422)	-1.7419 -(8.4278)	-1.8767 -(8.4712)	-2.1187 -(10.2644)	-2.6717 -(12.2303)	-0.9002 -(4.2551)
$EFFINT_{5,y}$	-2.7787 -(11.6281)	-0.6362 -(3.0186)	-1.0907 -(4.7836)	-1.6797 -(7.1438)	-2.3121 -(8.9657)	-2.5308 -(8.9235)	-2.7788 -(10.3962)	-3.1382 -(11.5121)	-1.4009 -(5.8366)
$EFFINT_{6,y}$	-2.7399 -(13.0945)	-1.8272 -(9.9135)	-2.1253 -(10.6763)	-2.1811 -(10.1227)	-2.5437 -(10.9207)	-2.6089 -(9.8368)	-2.9930 -(11.8630)	-2.9645 -(12.7228)	-1.9662 -(9.6107)
$EFFINT_{7,y}$	-2.5734 -(10.3660)	-2.4634 -(10.9004)	-2.5555 -(10.4840)	-2.5844 -(9.8299)	-2.7084 -(9.6798)	-2.8159 -(8.8434)	-3.1911 -(10.5534)	-3.2027 -(11.4725)	-2.4825 -(10.0197)
$EFFINT_{8,y}$	-2.3566 -(8.7155)	-1.5096 -(5.6958)	-2.0589 -(7.2856)	-2.7253 -(9.2086)	-3.1845 -(10.3004)	-3.3462 -(9.6322)	-3.3487 -(10.1377)	-3.2803 -(10.8393)	-2.4146 -(8.5494)
$EFFINT_{9,y}$	-1.7884 -(8.4043)	-2.2607 -(10.4093)	-2.7961 -(12.2200)	-2.8502 -(12.2975)	-3.0286 -(12.5634)	-3.1192 -(11.5131)	-3.0300 -(11.9369)	-2.7731 -(12.1507)	-2.8746 -(12.6856)
$EFFINT_{10,y}$	-1.8002 -(8.3209)	-2.2301 -(9.9662)	-2.7684 -(11.7307)	-2.8436 -(11.9364)	-3.0169 -(12.2152)	-3.1175 -(11.2550)	-3.0291 -(11.6672)	-2.7455 -(11.7917)	-2.8500 -(12.2001)
$ARMSHR_y$	-0.0002 -(0.2271)	-0.0066 -(10.2916)	-0.0087 -(12.8118)	-0.0095 -(13.4425)	-0.0102 -(13.1429)	-0.0110 -(13.0947)	-0.0112 -(14.4594)	-0.0082 -(11.1917)	-0.0079 -(11.1640)

Summary Regression Statistics									
Adjusted-R^2	0.958	0.957	0.960	0.964	0.961	0.960	0.967	0.966	0.955
F-statistic	1277.917	1260.466	1344.173	1502.757	1385.965	1354.938	1654.185	1596.235	1262.722

*Investor loans and loans for dwellings with two or more units.

E. Simulating Loan Performance

We used the estimated econometric claim and prepayment models to simulate the history of loan performance and to develop projections of future loan performance under alternative economic scenarios. The historical simulation analysis can be used to evaluate how well the models predict claims and prepayments across the loan categories and over the policy years. The forecast analysis develops conditional claim and prepayment rates and, in turn, projections of the number of claims and prepayments from FY 1997 forward for each of the defined loan categories and for each origination year from FY 1975 through 1996.

1. Simulation of Historical Claims and Prepayments

We conducted a simulation of the number of claims and prepayments across the historical period from FY 1975 to 1996 to evaluate the ability of the models to explain and forecast the conditional claim and prepayment rates. Actual survivor data are used for the first policy year and estimated values are used thereafter. The predicted conditional probability rates multiplied by the estimated loan survivor rates at the beginning of the policy year yield a predicted number of claims and prepayments in that policy year. The survivors less the sum of claim and non-claim terminations for each year yield a projection of the number of loans that survive to the beginning of the next policy year.

It would be useful to have a measure of the accuracy of the econometic models' predictions for the years beyond the sample period (the "out-sample" accuracy). By definition it is not possible to evaluate predictive accuracy for future periods. However, we can approximate that test by examining the models' accuracy within the estimation period (the "in-sample" accuracy). Because the models were estimated on these years, generally we would expect the accuracy over the in-sample period to be greater than the accuracy in the out-sample period.

Predictive accuracy is determined by comparing the predicted numbers of claims and prepayments across selected categories of loans. Exhibits A-4 and A-5 report the results for in-sample accuracy tests classifying the data according to LTV category, loan size category, and loan termination year. In aggregate, the model simulation predicts total claims to be 97 percent of the actual value and total prepayments to be 105 percent of the actual value. Both models

Exhibit A-4

Simulation of 30-Year FRM Claims and Prepayments for the Period 1975-96 By Loan Size and LTV Categories
(Across all Origination and Termination Years)

LTV Category	Number of Claims			Number of Prepayment		
	Actual	Predicted	Predicted/ Actual	Actual	Predicted	Predicted/ Actual
Unknown LTV	51602	48769	95	290531	302909	104
0-65%	4472	5374	120	136859	142694	104
65-80%	20942	20587	98	323559	337599	104
80-90%	46695	44688	96	474186	497351	105
90-93%	44990	43390	96	373417	390635	105
93-95%	48272	46724	97	375686	393597	105
95-97%	126330	121329	96	798974	841673	105
97-100%	279241	272685	98	1411189	1478569	105
Investor[a]	86130	83363	97	438758	455017	104
Loan Size						
1	174439	155597	89	622393	752103	121
2	97537	87112	89	486020	548093	113
3	99516	92479	93	595310	644757	108
4	133121	127663	96	948862	981927	103
5	71142	72451	102	596472	592183	99
6	64490	70413	109	615695	596844	97
7	64312	73568	114	712010	680712	96
8	4117	7626	185	46396	43426	94
Total	708,673	686,909	97%	4,623,159	4,840,044	105%

[a]Investor loans and loans for dwellings with two or more units.

Exhibit A-5

Simulation of 30-Year FRM Claims and Prepayments by Termination Year
(Across all Loan Sizes and LTV Categories)

Termination Year	Number of Claims			Number of Prepayments		
	Actual	Predicted	Predicted/ Actual	Actual	Predicted	Predicted/ Actual
1975	109	79	72	380	714	188
1976	1710	915	53	4119	5633	137
1977	4307	3167	74	20642	23079	112
1978	5037	4996	99	43485	29732	68
1979	5208	5846	112	52784	27654	52
1980	5350	7385	138	30483	18125	59
1981	7629	8903	117	18403	12166	66
1982	10597	10908	103	9353	13468	144
1983	17480	15040	86	60334	64706	107
1984	18971	26983	142	48065	47630	99
1985	25963	32272	124	62913	76165	121
1986	34383	43770	127	265406	258851	98
1987	48175	55199	115	356036	426528	120
1988	64071	48136	75	159804	153516	96
1989	64893	46545	72	144995	164338	113
1990	60022	50074	83	181892	199643	110
1991	60691	53428	88	220110	265378	121
1992	64300	65426	102	536349	591370	110
1993	62557	71283	114	1007565	1018227	101
1994	57618	54884	95	826761	688198	83
1995	47952	44294	92	233485	297160	127
1996	41650	37379	90	339795	457762	135
Total	708,673	686,909	97%	4,623,159	4,840,044	105%

perform well in predicting claims and prepayments across LTV and loan size categories. Across termination years, however, their accuracy is somewhat more volatile. In particular, claims are overestimated and prepayments underestimated during periods of heavy refinancing activity prior to FY 1988. This is caused by our inability to identify and model separately refinacing loans prior to that year. During the most recent refinancing wave (FYs 1992 to 1994), the models' accuracy is considerably better.

2. Forecasting Future Conditional Claim and Prepayment Rates

Price Waterhouse's method for estimating future termination rates is similar to the methodology for developing in-sample predictions. Based on our projections of future economic and policy variables,[17] the models are used to estimate future claim and prepayment rates. Our forecasts, beginning with the FY 1997 policy year, use actual counts of surviving loans to the start of FY 1997 and estimated survivor counts thereafter. For future books of business, origination volumes and counts are estimated as explained in Appendix F.

After an initial survivor count is established, the estimated conditional claim and prepayment rates are applied to the number of survivors at the beginning of a policy year to estimate how many will claim during that period. These terminations are subtracted from the original count to estimate the number of survivors into the next time period. The process is then repeated through the 30th policy year. Complete forecasts of our base-case conditional claim and prepayment rates are reported in Appendix G. A summary is provided in Exhibits A-6 and A-7 where claim and prepayment rates, respectively, for the books of business from FYs 1989 through 1997 are displayed for their first eleven policy years. Ultimate claim and prepayment rates are also provided.

[17] Price Waterhouse's methodology for estimating future economic and policy conditions is discussed in detail in Appendix D.

Exhibit A-6

Forecast of Conditional Claim Rates for 30-Year FRMs for FYs 1989 through 1997

Policy Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	0.015	0.007	0.011	0.008	0.006	0.002	0.004	0.002	0.018
2	0.385	0.343	0.355	0.238	0.173	0.187	0.209	0.243	0.224
3	1.219	1.168	1.216	0.837	0.612	0.618	0.852	0.666	0.648
4	1.709	1.727	1.930	1.307	0.872	1.009	1.074	0.896	0.937
5	1.936	2.281	2.331	1.303	0.802	0.936	1.047	0.932	0.975
6	2.432	2.421	2.030	0.963	0.596	0.782	0.928	0.828	0.896
7	2.577	2.055	1.468	0.771	0.505	0.696	0.838	0.779	0.825
8	2.252	1.882	1.212	0.631	0.425	0.615	0.773	0.703	0.723
9	1.776	1.644	1.085	0.605	0.414	0.620	0.771	0.684	0.685
10	1.553	1.450	1.005	0.584	0.422	0.615	0.750	0.650	0.636
11	1.324	1.280	0.916	0.552	0.397	0.564	0.677	0.566	0.546
Ultimate	10.146	8.868	7.072	5.780	4.650	6.968	6.275	7.109	6.676

Source: A-43 database, June 30, 1996 extract.

Exhibit A-7

Forecast of Conditional Prepayment Rates for 30-Year FRMs for FYs 1989 through 1997

Policy Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	0.451	0.381	0.373	0.364	0.630	0.299	1.726	0.370	0.335
2	2.014	2.061	5.455	7.265	4.023	1.973	9.102	1.770	2.357
3	4.123	9.712	25.913	16.622	3.922	5.859	6.250	3.932	5.394
4	14.935	29.438	29.825	6.302	6.798	4.850	7.982	5.501	7.031
5	28.597	29.350	7.820	10.429	9.758	5.731	10.535	6.730	9.287
6	27.655	8.249	12.516	10.532	10.005	6.184	10.953	7.199	8.325
7	8.186	12.176	15.796	12.543	12.661	7.463	13.487	7.982	9.228
8	11.040	13.709	16.088	14.684	14.712	8.443	13.219	8.351	9.936
9	12.120	11.604	15.016	13.407	14.124	7.106	10.719	7.273	8.645
10	10.203	10.720	13.650	13.106	12.584	6.341	9.472	6.697	7.967
11	9.680	9.932	12.981	11.172	11.129	5.847	8.544	6.259	7.368
Ultimate	84.176	86.219	89.689	89.327	91.240	77.647	86.101	79.438	83.454

Source: A-43 database, June 30, 1996 extract.

Exhibit A-8

Ultimate Claim Rates for 30-Year FRMs							
	LTV 2	LTV 3	LTV 4	LTV 5	LTV 6	LTV 7	LTV 8
1995 Model, 1995 Forecast	5.14 (0.70)	6.22 (0.85)	7.33 (1.00)	7.51 (1.02)	9.24 (1.26)	10.03 (1.37)	10.32 (1.41)
Change in CQHP forecasts	4.55 (0.78)	5.38 (0.92)	5.82 (1.00)	5.59 (0.96)	6.86 (1.18)	7.58 (1.30)	7.38 (1.27)
Chnage in interest rate forecasts	4.97 (0.86)	5.84 (1.01)	5.79 (1.00)	5.53 (0.96)	6.61 (1.14)	7.18 (1.24)	6.92 (1.20)
Change in income forecasts	5.04 (0.80)	6.48 (1.03)	6.28 (1.00)	5.96 (0.95)	7.11 (1.13)	7.75 (1.23)	7.33 (1.17)
Change in other forecasts	4.61 (0.75)	6.29 (1.02)	6.17 (1.00)	6.07 (0.98)	6.36 (1.03)	6.84 (1.11)	7.20 (1.17)
Change of econometric model	5.25 (0.83)	6.47 (1.02)	6.33 (1.00)	6.52 (1.03)	6.70 (1.06)	7.30 (1.15)	7.51 (1.19)

Numbers in parentheses are the ultimate claim rates relative to the ultimate claim rate of LTV category 4.

In this Review, the forecasted claim and prepayment rates for all books of business and all policy years have been estimated by the same set of econometric models. As the model captures the general trend of all observations with different book and policy year combinations, the estimates fit some observations better than others. Outliers may be found which the model cannot estimate as accurately. One example is the prepayment rate forecasts of the FY 1982 book of business. Due to the extremely high mortgage contract rates, the model estimates high prepayment rates. The FY 1982 book, however, has experienced unusually low prepayment rates during the past several years. Since over 90 percent of this book of business has already been terminated, a small difference in prepayment volume may cause a large change in prepayment rates. We realize that while the model may overestimate the prepayment rate for the next few years, given the low remaining volume, the financial impact on the fund would be immaterial.

Another pattern worth mentioning is that the forecasted claim rates among loan-to-value ratio categories are relatively flat compared to the historical pattern. This relatively flat claim rate pattern is mainly caused by the stronger economic forecast used in this Review. The impact of stronger economic conditions on mortgages is to reduce overall claim rates. However, the reduction would not be proportional among all mortgage categories. In particular, the claim rate of riskier loans would decrease more than that of less risky loans. This is due to the asymmetric effect that good and bad economic conditions have on the claim rates. Since a higher portion of the loans in a risky category are at the margin of default, a slight change in economic conditions would result in a larger marginal increase/decrease in the claim rate. On

the other hand, it would take a significant change in economic conditions for less risky loans to have the same magnitude of change in claim rates. As a result, the difference in claim rates between loans in the high and low LTV categories would become smaller and reveal the pattern shown in this Review. Exhibit A-8 decomposes the change in the estimation of cumulative claim rates of FY 1996 loans in different LTV categories between the FY 1995 and FY 1996 Reviews. The decomposition shows that the higher house price growth rate assumption used in the FY 1996 Review is the single most significant factor causing the decrease in cumulative claim rates and the reduction in the variation among different LTV categories.

Alternative estimates of future economic and policy variables may be substituted to simulate the future performance of loans under a variety of scenarios and to determine the sensitivity of the projections to changes in select components of our forecasts.

III. 15-Year Fixed-Rate Mortgages

Price Waterhouse estimates 15-year FRM termination rates as functions of the corresponding 30-year FRM termination rates. While conceptually much simpler than the 30-year models, the 15-year FRM models nevertheless acquire much of the explanatory power of the former.

Our choice of methodology reflects the fact that the conditional claim and prepayment rates of 15-year FRMs closely follow the conditional claim and prepayment rates of 30-year FRMs. Since both mortgage types face a fixed interest rate environment, the factors affecting the latter are similar to those affecting the former. However, because 15-year FRMs amortize more quickly than 30-year FRMs, we expect the 15-year mortgages to have lower claim rates. In addition, we anticipate prepayment rates will be lower for 15-year FRMs since the benefit of refinancing at a lower interest rate is less than the benefit of refinancing a 30-year mortgage, owing to both a smaller principle balance and a shorter remaining life.

We classified 15-year FRMs as loans with a term of 15 years or less. As with the 30-year models, our 15-year models are based on an aggregate cell-based approach with cells defined across three dimensions:

- amortization year (the fiscal year in which the first mortgage payment is made)
- policy year
- initial LTV.

Unlike the 30-year FRMs, we do not distinguish between the house price categories due to the high frequency of zero claims and prepayments which would have resulted if the data had been divided into the usual eight categories. Furthermore, limitations in the number of observations in

earlier years led us to use only FYs 1985 through 1996 in our regression analysis. As with the 30-year FRM models, a separate regression is performed for each of our nine LTV categories.

A. Model Specifications

The claim and prepayment models are specified as

$$F15CCRx_{y,t} = \alpha_{CCR} + \beta_{CCR} F30CCRx_{y,t} + \varepsilon_{CCR,y,t} \quad \textbf{(10a)}$$

$$F15CPRx_{y,t} = \alpha_{CPR} + \beta_{CPR} F30CPRx_{y,t} + \varepsilon_{CPR,y,t} \quad \textbf{(10b)}$$

with $F15CCRx_{y,t}$ defined as the conditional claim rate for 15-year FRMs of LTV category x, originated in fiscal year y and observed in policy year t. The other dependent variable and the two independent variables are defined analogously. Because one rate is regressed directly on another, the Cox transformation is unnecessary. Hence all rates, including the 30-year FRM regressors, are defined strictly as the number of claim and prepayments in a cell divided by the initial number of loans in the cell.

B. Model Results

The estimates of the coefficients of the claim and prepayment models are presented in Exhibits A-9 and A-10, respectively. These results support our beliefs about the behavior of 15-year FRMs relative to 30-year FRMs: in both cases we observe lower conditional claim and prepayment rates.

Exhibit A-9

Regression Results for 15-Year FRM Conditional Claim Rate Model by LTV Category
(t-statistics in parentheses)

Variable	Unknown LTV	0-65%	65-80%	80-90%	90-93%	93-95%	95-97%	97-100%	Investor[a]
Constant	-0.0020 (-1.2569)	0.0000 (0.0343)	-0.0002 (-13091)	-0.0007 (-2.2316)	0.0001 (0.2800)	-0.0011 (-1.4255)	-0.0014 (-1.9130)	-0.0019 (-3.3689)	-0.0004 (-12441)
$F30CCR_{x,t}$	0.4182 (8.8860)	0.1732 (9.8125)	0.2745 (15.8818)	0.3874 (22.6555)	0.3634 (14.7074)	0.4782 (13.6759)	0.4883 (17.6573)	0.5157 (26.5217)	0.3406 (24.3776)
Summary Regression Statistics									
R^2	0.428	0.478	0.707	0.831	0.674	0.641	0.749	0.871	0.851
F-statistic	78.960	96.285	252.231	513.272	216.307	187.029	311.781	703.402	594.266

[a]Investor loans and loans for dwellings with two or more units.

Exhibit A-10

Regression Results for 15-Year FRM Conditional Prepayment Rate Model by LTV Category
(t-statistics in parentheses)

Variable	Unknown LTV	0-65%	65-80%	80-90%	90-93%	93-95%	95-97%	97-100%	Investor[a]
Constant	0.0249 (2.7448)	0.0120 (2.8347)	0.0137 (3.4357)	0.0160 (4.6054)	0.0172 (5.0134)	0.0179 (5.1494)	0.0160 (5.8892)	0.0163 (5.3181)	0.0081 (2.6690)
$F30CPR_{x,t}$	0.7243 (12.7084)	0.7825 (27.0330)	0.7938 (28.5675)	0.8088 (32.9655)	0.8101 (32.8506)	0.8221 (31.4441)	0.8099 (37.3723)	0.8396 (32.1036)	0.8931 (36.3243)
Summary Regression Statistics									
R^2	0.607	0.875	0.887	0.913	0.912	0.905	0.931	0.908	0.927
F-statistic	161.502	730.780	816.103	1086.722	1079.164	988.733	1396.685	1030.642	1319.452

[a]Investor loans and loans for dwellings with two or more units.

3. Simulating Loan Performance

We used the estimated econometric models for conditional claim rates and conditional prepayment rates to simulate the history of loan performance and to develop projections of future loan performance, similar to the process used for 30-year FRMs.

1. Simulation of Historical Claims and Prepayments

We conducted this analysis in the same method as we did for 30-year FRMs. The results from this analysis yielded an in-sample prediction rate of 94 percent for claims and 100 percent for prepayments. Exhibit A-11 shows the breakdown of the predicted versus the actual claim and prepayment counts across all LTV categories.

Exhibit A-11

Simulation of 15-Year FRM Claims and Prepayments for the Period 1985-96 By Loan Size and LTV Categories (Across all Origination and Termination Years)

LTV Category	Number of Claims			Number of Prepayments		
	Actual	Predicted	Predicted/ Actual	Actual	Predicted	Predicted/ Actual
Unknown LTV	503	590	117%	8511	8123	95%
0-65%	275	249	91%	40672	40591	100%
65-80%	942	868	92%	47412	47293	100%
80-90%	1558	1390	89%	37763	37640	100%
90-93%	916	849	93%	15359	15261	99%
93-95%	845	749	89%	11360	11318	100%
95-97%	1988	1739	87%	21109	21062	100%
97-100%	3429	3159	92%	32140	32615	101%
Investor*	2456	2488	101%	36768	35939	98%
Total	12,913	12,082	94%	251,094	249,842	100%

*Investor loans and loans for dwellings with two or more units.

Examining the actual versus predicted claim and prepayment counts for each termination year reveals comparable results to the chart above as seen in Exhibit A-12. Due to the limited number of loans in earlier years, the model's in-sample predictions during this period are less accurate than in later years.

Exhibit A-12

Simulation of 15-Year FRM Claims and Prepayments by Termination Year
(Across all Loan Sizes and LTV Categories)

Termination Year	Number of Claims			Number of Prepayments		
	Actual	Predicted	Predicted/ Actual	Actual	Predicted	Predicted/ Actual
1985	272	220	81%	1151	2410	209%
1986	616	468	76%	9465	14042	148%
1987	1099	879	80%	20079	21636	108%
1988	1675	1413	84%	10393	11504	111%
1989	1670	1483	89%	10789	11172	104%
1990	1473	1294	88%	14345	13348	93%
1991	1364	1212	89%	17403	15554	89%
1992	1335	1181	88%	34283	31470	92%
1993	1085	1108	102%	49830	50988	102%
1994	954	1068	112%	44326	43253	98%
1995	733	930	127%	17401	14226	82%
1996	575	790	137%	21128	18354	87%
Totals	12,913	12,082	94%	251,094	249,842	100%

2. Forecasting Future Claims and Prepayments

As with the 30-year FRM models, the 15-year FRM models are used to forecast conditional claim and prepayment rates over the term life of the mortgage. Exhibits A-13 and A-14 show conditional claim and prepayment rates for books of business FYs 1989 through 1997 for the first eleven policy years. Ultimate claim and prepayment rates are also provided..

Exhibit A-13

Forecast of Conditional Claim Rates for 15-Year FRMs for FYs 1989 through 1997

Policy Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	0.009	0.000	0.000	0.000	0.004	0.000	0.010	0.000	0.002
2	0.177	0.150	0.129	0.078	0.055	0.060	0.107	0.019	0.010
3	0.470	0.516	0.402	0.406	0.235	0.171	0.230	0.169	0.186
4	0.705	0.612	0.632	0.340	0.285	0.280	0.320	0.259	0.324
5	0.814	0.678	0.609	0.378	0.231	0.265	0.318	0.278	0.343
6	0.632	0.677	0.410	0.289	0.152	0.209	0.273	0.236	0.306
7	0.591	0.544	0.464	0.218	0.119	0.180	0.241	0.217	0.273
8	0.515	0.598	0.373	0.165	0.087	0.151	0.217	0.188	0.225
9	0.561	0.522	0.330	0.157	0.086	0.155	0.219	0.184	0.208
10	0.496	0.464	0.313	0.160	0.104	0.171	0.229	0.188	0.185
11	0.421	0.406	0.280	0.149	0.097	0.157	0.206	0.160	0.143
Ultimate	3.654	3.130	2.338	1.739	1.235	1.650	1.851	1.682	1.795

Source: A43 database, June 30, 1996 extract.

Exhibit A-14

Forecast of Conditional Prepayment Rates for 15-Year FRMs for FYs 1989 through 1997

Policy Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	0.502	0.580	0.670	0.639	0.789	0.784	1.160	0.717	1.874
2	2.432	2.859	4.750	6.328	4.949	2.990	6.261	3.273	3.521
3	4.343	9.183	18.941	13.913	5.738	5.695	6.822	4.929	5.993
4	12.095	23.005	24.737	8.116	8.069	5.479	7.783	5.961	7.331
5	21.499	24.424	9.540	11.485	8.714	5.972	9.464	6.737	9.167
6	22.686	9.262	12.434	10.007	9.460	6.718	10.209	7.505	8.377
7	9.703	12.704	15.083	12.264	12.412	8.439	13.025	8.791	9.106
8	11.346	14.074	15.686	14.495	14.840	9.839	13.404	9.550	9.683
9	11.953	11.552	14.096	12.842	13.599	8.068	10.712	8.097	8.624
10	9.912	10.380	12.446	11.947	11.374	6.811	8.990	7.040	8.052
11	9.333	9.611	11.806	10.377	10.177	6.317	8.168	6.587	7.557
Ultimate	78.115	80.949	84.145	78.643	76.617	61.173	72.894	62.461	66.915

Source: A-43 database, June 30, 1996 extract.

Appendix B: Econometric Analysis of Adjustable Rate Mortgages

This appendix describes the econometric analysis we have performed on adjustable-rate mortgages (ARMs) insured by the MMI Fund. It presents the framework underlying the econometric models, provides descriptions of the model specifications, and reviews their goodness-of-fit.

I. General Approach and Data Limitations

FHA began insuring ARMs in 1984, issuing 19 loans worth $1.2 million that year. Although the number of loans increased to 587 in 1985, it was not until 1986 that volumes moved into the thousands of loans, and not until 1992 that more than $2 billion in ARMs were issued. Thus, there is relatively limited data on ARMs, and the available data is heavily skewed towards recent originations.

Our ARM modeling approach follows that described in the previous section on fixed-rate mortgages (FRM). We developed a cell-based model with which to estimate ARM claim and prepayment rates by dividing loans into cells by book of business, policy year, house price category, and initial LTV category. Each cell was then treated as an individual observation in our analysis.

Unlike the 30-year FRM equations, the ARM equations could not be estimated for individual LTV categories since there was not a sufficient number of observations. Instead, we estimated a single ARM equation for all LTV categories, differentiating the cells in the model by initial LTV category and adding LTV dummy variables to allow for different claim responses for loans with different initial LTVs. Due to the limitations in the number of observations in each cell, we limited the number of initial house price categories used in the regressions to two -- initial house price categories 1 through 4 were combined, and 5 through 8 were combined. Additionally, the number of initial LTV cell categories was reduced to two -- loans with LTV ratios less than 90 percent, and loans with LTV ratios greater than 90 percent or with unknown LTVs.

In addition to the limitations placed on the LTV and house price categories, cells with fewer than 50 observations were omitted from the equations. This was done to prevent biases that might arise from unusual individual loans within the cell. Also, the ARM conditional claim rate model does not use data from policy year one in the estimations. Although a few claims occur in the first policy year, the claim rates are low, and the small number of loans in each cell causes measurement error in the first policy year.

II. Conditional Claim Rate Model

This section describes the specification and model results for the ARM conditional claim rate model. In general, the approach is similar to the approach used for 15-year FRMs, although variables in this model have been added to capture the unique claim and prepayment characteristics of ARMs.

A. Claim Model Specification

The model used to estimate $ARMCCR_{i,j,y,t}$ the conditional claim rate of ARMs from origination year y, policy year t, house price category i, LTV category j is

$$ARMCCR_{i,j,y,t} = \sum_{n=3}^{8} \alpha_n P_{n,t} + \gamma_1 LTV_{1,j} + \beta_1 F30CCR_{i,j,y,t} + \beta_2 PAYINC_{y,t} + \varepsilon_{i,j,y,t} \qquad (1)$$

where the variables are defined as follows:

$P_{n,t}$ ≡ five policy year dummy variables ranging from policy year three to policy year greater than or equal to eight, constructed so that $P_{n,t} = 1$ when policy year $(t) = n$ and $P_{n,t} = 0$ otherwise,[1]

$LTV_{1,j}$ ≡ one LTV dummy variable constructed so that $LTV_{1,j} = 1$ when LTV ratio is less than or equal to 90 percent,

$F30CCR_{i,j,y,t}$ ≡ the conditional claim rate for 30-year FRMs of house price i, of LTV category j, endorsed in fiscal year y, and observed in policy year t, and

$PAYINC_{y,t}$ ≡ the ratio of the payment on a one dollar ARM endorsed at the average FHA ARM rate in fiscal year y with interest rate adjusted each year up to policy year t, divided by the median household income in policy year t (this ratio is scaled to 0.33 in the loan origination year).

[1] In the case of the fifth policy year dummy variable, $P_{8,t} = 1$ when policy year $(t) \geq 8$ and $P_{8,t} = 0$ otherwise.

B. Claim Model Results

In a stable interest rate environment, we would expect ARMs and FRMs to claim at roughly the same rate. With declining interest rates, we would expect ARMs to claim at a relatively lower rate both because the payment burden is eased, reducing ARM claims, and because FRM borrowers will have little incentive to keep an above-market loan and will claim slightly more often. When interest rates rise, we would expect ARMs to claim at a higher rate than FRMs, again for two reasons. "Payment shock," the increase of monthly payments above the level initially anticipated by the borrower, will induce greater ARM claims, while a below-market coupon rate will lower FRM claims in rising interest environments. However, since 1986, we have not experienced a continuously rising interest rate environment and thus are unable to fully analyze the effects such an environment will have on ARMs, but we expect the response to rising rates will be stronger than the response to declining rates. This supposition appears to be supported by the interest rate sensitivities discussed in Section V. In each of the rising interest rate scenarios, the benefit received from lower claims on FRMs is partially mitigated by much higher claims on ARMs.

The results from the empirical estimation of conditional claims rates for ARMs is presented in Exhibit B-1. The coefficient on the FRM claim rate is 0.69 and the payment to income ratio has a coefficient of 0.021. Thus in the absence of rising interest rates, ARMs are calculated to claim at about a 31 percent lower rate than FRMs. With the exception of 1995, the estimation of conditional claim rates has been based mostly on a period with declining interest rates. Therefore, ARM performance in a high interest rate scenario can not be accurately inferred from the estimated coefficients. However, as expected, this equation would suggest that higher interest rates would cause ARMs to default at a higher rate.

Exhibit B-1

Regression Results for ARM Conditional Claim Rate Model (t-statistics are in parentheses)	
Constant	-0.006 (-1.862)
$F30CCR_{i,j,y,t}$	0.695 (7.198)
$PAYINC_{y,t}$	0.021 (2.336)
$P_{3,t}$	0.002 (1.216)
$P_{4,t}$	0.003 (1.743)
$P_{5,t}$	0.006 (3.257)
$P_{6,t}$	0.004 (2.196)
$P_{7,t}$	0.004 (2.061)
$P_{\geq 8,t}$	-0.006 (-0.356)
$LTV_{i,j}$	-0.000 (-0.041)
Summary Regression Statistics	
Adjusted R^2	0.521
F-statistic	26.005

Although other empirical studies have suggested that conventional ARMs are more likely to claim than conventional FRMs, our results have shown that for FHA-insured mortgages the opposite is true[2]. There are several explanations for the different performance between FHA ARMs and conventional ARMs. First, FHA ARMs tend to start at significantly higher interest rates than conventional ARMs. Even in the presence of stable interest rates, the "teaser" rate on conventional ARMs, which provides borrowers with exceptionally low interest rates in their first year or two, will produce "payment shock" as borrowers' monthly payments increase by more than 10 percent per year. Second, FHA ARMs have more restrictive caps and ceilings than conventional ARMs. This limits the amount of "payment shock" that an FHA borrower will experience. Lastly, in FHA's portfolio, ARMs tend to be relatively large compared to 30-year FRMs. Exhibit B-2 shows the average loan amount by mortgage type for loans originated in FY 1996. Since our empirical analysis has found that larger loans tend to have lower claim and loss rates than smaller loans, this size difference also explains part of the performance difference between FHA ARMs and FHA FRMs.

Exhibit B-2

Average Loan Size by Mortgage Type and Relative House Price Category in FY 1996 ($)

Mortgage Type	House Price Category							
	1	2	3	4	5	6	7	8
30-Year Fixed Rate	56,073	70,746	79,368	88,071	93,471	98,493	106,543	68,988
30-Year Streamline	65,051	80,898	88,906	96,880	101,863	107,243	112,226	65,694
Adjustable Rate Mortgage	**68,591**	**84,633**	**94,594**	**104,230**	**106,178**	**111,177**	**118,198**	**n/a**
15-Year Fixed-Rate	38,776	53,379	59,518	67,737	76,610	80,850	92,095	53,099
15-Year Streamline	44,654	57,826	63,287	68,127	74,185	77,871	83,004	45,273
Graduated Payment Mortgage	74,535	98,989	96,374	108,704	103,604	115,588	122,864	n/a

One of the primary reasons why FHA ARMs tend to be larger than FHA FRMs is that a large portion of FHA ARMs are originated in geographic regions with high median house prices, particularly in California. Thus, regional differences are an important factor in assessing the risk associated with ARMs. Furthermore, this allows us to attribute the larger ARM origination

[2]See D.F. Cunningham and C.A. Capone, Jr., "The Relative Termination Experience of Adjustable to Fixed-Rate Mortgages," Journal of Finance, Vol XLV(5), 1990, p. 1687-1703.

amounts to geographic differences instead of ascribing it to higher incomes among ARM borrowers. Exhibit B-3 displays the ten states with the largest dollar volume of ARM originations between FYs 1989 and 1996, representing almost 64 percent of ARM dollar volume in FY 1996.

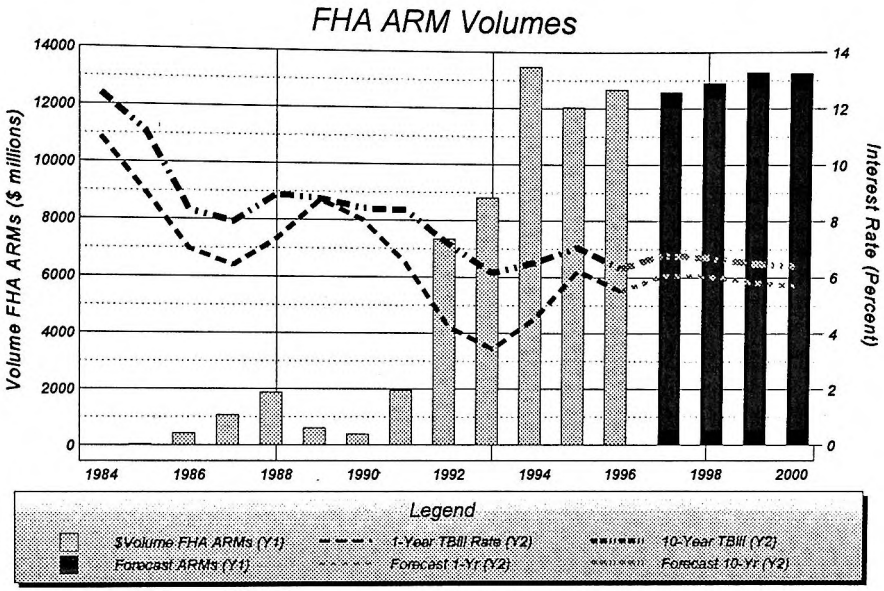
Exhibit B-3

Percentage of ARM Dollar Volume Originated Between FY 1989 and FY 1996								
State	1989	1990	1991	1992	1993	1994	1995	1996
Arizona	2.61%	1.67%	2.93%	3.57%	2.80%	3.10%	3.85%	4.37%
California	9.54%	9.51%	10.91%	12.36%	20.53%	26.20%	22.63%	21.45%
Colorado	4.42%	3.42%	4.07%	4.80%	5.09%	4.30%	5.07%	7.08%
D.C.	2.24%	2.13%	3.38%	4.67%	5.12%	3.68%	4.07%	2.57%
Florida	3.88%	1.69%	3.53%	4.25%	3.90%	3.75%	3.86%	2.77%
Georgia	3.07%	2.31%	2.98%	3.05%	2.23%	2.52%	2.97%	2.63%
Illinois	4.53%	11.27%	11.42%	9.77%	9.87%	9.09%	10.13%	10.82%
Maryland	3.57%	4.03%	5.47%	4.41%	6.04%	5.31%	5.81%	5.01%
Minnesota	2.99%	11.43%	10.60%	7.49%	6.22%	4.82%	3.24%	3.15%
Washington	6.18%	2.81%	4.58%	4.08%	5.30%	4.91%	4.03%	3.81%

Another possible explanation for why ARM claim rates are lower than FRM claim rates is the possibility that the ARM data could be reflecting sample selection bias. Exhibit B-4 shows the FHA ARM volume and interest rates during the period from FYs 1984 to 1996, along with forecasted values for FYs 1997 to 2000. Although interest rates rose slightly between 1987 and 1989 and again in 1995, the increases were small and unsustained, and thus may not have contributed to ARM claims the way a continually rising interest rate environment might.

Exhibit B-4

Interest Rate Environment



III. Conditional Prepayment Rate Model

This section describes the model specification and results for the ARM conditional prepayment model.

A. Prepayment Model Specification

The model used to estimate $ARMCPR_{i,j}$, the conditional prepayment rate of ARMs from origination year y, policy year t, house price category i, and LTV category j is

$$ARMCPR_{i,j,y,t} = \sum_{n=1}^{5} \alpha_n P_{n,t} + \gamma_1 LTV_{1,j} + \beta_1 F30CPR_{i,j,y,t} + \varepsilon_{i,j,y,t} \qquad (2)$$

where $F30CPR_{i,j,y,t}$ is the conditional prepayment rate for 30-year FRMs of house price i, of LTV category j, endorsed in fiscal year y, and observed in policy year t. The variables on the right hand side are defined above in the claims model discussion.[3]

B. Prepayment Model Results

We would anticipate that more mobile and more income constrained borrowers would be more likely to select ARMs. ARMs allow mobile households to avoid paying for the costly call option of FRMs, and ARMs allow constrained borrowers to circumvent constraints with a lower initial coupon rate. Those choosing ARMs for mobility reasons are likely to have lower initial LTVs than those choosing ARMs for affordability reasons.

In a stable or rising interest rate environment, we would expect ARMs to prepay faster than FRMs because more mobile borrowers, who attach less value to the prepayment option, will choose ARMs. Moreover, in a rising interest rate environment, FRMs will prepay much slower than ARMs because FRM borrowers will avoid prepaying below-market loans. And in a declining interest rate scenario, FRMs will prepay faster than ARMs because FRM borrowers will have a greater incentive to refinance into lower rate loans than ARM borrowers (ARM rates will fall without refinancing).

[3] The policy year dummy variables in the prepayment equation are specified over a different range than the variables in the claim equation.

In modeling ARM prepayment behavior, we relate the ARM prepayment rate to the FRM prepayment rate, expecting a coefficient less than one because of the lesser sensitivity of ARMs to interest rate declines. The generally greater mobility of ARM borrowers is captured by a larger constant term and/or coefficients on the policy year dummies.

Exhibit B-5 shows the results from the ARM prepayment model estimation. The coefficient on the FRM prepayment variable is 0.25, suggesting that FHA ARMs are 25 percent as likely to prepay as FRMs. In the 1986-1994 period, which saw heavy refinancing activity on the part of FRMs, this is not surprising. The coefficients on the policy year dummy variables become less negative as policy year increases, and, when offset by the intercept, indicate more rapid prepayment of ARMs in a stable interest rate environment than of FRMs.

Exhibit B-5

Regression Results for ARM Conditional Prepayment Rate Model (t-statistics in parentheses)	
Constant	0.060 (17.806)
$F30CPR_{i,j,y,t}$	0.248 (15.275)
$P_{1,t}$	-0.062 (-13.040)
$P_{2,t}$	-0.046 (-10.256)
$P_{3,t}$	-0.029 (-6.828)
$P_{4,t}$	-0.008 (-1.829)
$LTV_{4,j}$	0.010 (3.712)
Summary of Regression Statistics	
Adjusted R^2	0.808
F-statistc	168.356

C D E F G

Appendix C: Econometric Analysis of Streamline Refinancing Loans

The Federal Housing Administration's (FHA's) program of streamline refinancing (SR) allows borrowers to refinance their FHA-insured loans at low cost and with minimum paperwork. Generally, applications in the SR program are processed without cash outlays, credit checks, or, most importantly, appraisals. The lack of appraisal information precludes any direct measure of a borrower's equity and is hence a frustration when attempting to model SR loans together with purchase mortgages.[1] Furthermore, while working with SR data, it becomes increasingly obvious that SR loans experience termination patterns which differ significantly from those observed for other loan types. Our SR model is designed to overcome the lack of equity information and to explain the different loan behavior we observe.

Below, we discuss our data source, the difficulties inherent in analyzing SRs, our modeling approach, and the results of our analysis.

I. Data Source and Limitations

Price Waterhouse's SR analysis is based on FHA's A-43 database, several limitations of which make it difficult to properly identify and classify SR loans. In FY 1988 a refinance indicator was added to the A-43 database and loans coded "R" or "S" were identified as SR loans.[2] In addition to this population, we classified as SRs those loans with loan-to-value (LTV) ratios coded as 30% or 999%. Because SRs generally lack appraisal information (and hence lack LTV ratios), individual field offices often used these values to indicate an SR loan's unknown LTV ratio. Field offices also used zeros to indicate SRs, and in past actuarial reviews Price Waterhouse has included such loans in the SR category. As with last year's Review, we are discontinuing this practice since the zero code is also used for any loan with an unknown or non-conforming LTV

[1] There is a third category of loans in addition to SRs and purchases mortgages: refinancings required to obtain an appraisal (*i.e.*, non-streamline refinancings). Since these loans report appraisal information, they can be successfully modelled together with purchase mortgages. Hence, throughout this section, the term "home purchases" is a bit of a misnomer and is understood to include the small number of refinancings with appraisals. Furthermore, despite the lack of an appraisal requirement for SRs, approximately 25 percent of our sample reported an appraisal value in the A-43 database. Nevertheless, these loans were treated in the SR model.

[2] The refinance status of loans originated prior to FY 1988 remains unknown. However, the SR program did not see wide use until FY 1990, and prior to FY 1988 SR volume was certainly negligible.

ratio (SR or not). Thus, unless a loan's refinance indicator explicitly identifies it as an SR, a zero LTV ratio was not considered a streamline refinancing.[3]

Once an SR was identified, Price Waterhouse was interested in obtaining not only information on the refinancing, but also on the original endorsement. However, individual loan records do not contain data on an SR's history prior to the refinancing. In particular, there is no information on the original LTV ratio, date of origination, principal balance, or loan type. Nevertheless, since all SRs were originally FHA-insured, such information presumably exists somewhere in the A-43 database. FHA provided Price Waterhouse with SR data linked to records containing previous origination information. While this linked data does not link all loans identified as SRs, we assume that the sample of linked loans is representative of the entire population and that no systematic bias is created by the inability to link all loans, although the limited amount of data makes it impossible to conclude whether a bias does or does not exist. Our analysis is therefore contingent on the representativeness of the linked sample.

II. Sample Definition

Price Waterhouse's SR claim and prepayment models are derived from the purchase mortgage models. Consistent with the latter, the SR models employ a cell-based logistic specification. However, several important differences between the purchase mortgages and the SRs necessitated separate cell and sample definitions.

The main 30-year fixed-rate mortgage (FRM) purchase mortgage model discussed in Appendix A defines cells by amortization year, policy year, relative house price category, and LTV category. The SR model adds the additional cell dimension of refinance year.[4] This addition, compounded with the lower volume of SRs relative to purchase mortgages, threatened to stretch observations per cell too thinly to warrant meaningful analysis. In order to accommodate this potential difficulty, SR loan cells are not divided according to relative house price categories.[5] Furthermore, whereas in the main 30-year FRM model, separate equations are estimated for each of nine LTV categories, the SR econometric model consists of only one equation estimated across

[3] Loans not coded as SRs and with LTV ratios of zero were grouped into LTV category 1, used for all loans with anomalous LTV ratios.

[4] Throughout this section, "refinance" indicates an SR's refinancing and "origination" indicates the original origination. Thus we are able to distinguish between origination year and refinance year without relying on the awkward expressions "original origination year" and "refinance origination year."

[5] Loan size categories are ignored for the econometric analysis of past SR behavior. However, when forecasting into the future, SR loan size categories are preserved. The same applies for LTV categories. This allows the cashflows of each cohort to be treated separately.

all LTV categories (not only would LTV categories have stretched the data, but in most cases, they are unknown).

After aggregating across loan size and LTV categories, the early years of the SR program (FYs 1988 through 1990) still contained too few observations. Thus, our SR model is based on refinancings occurring between FYs 1991 and 1996. Moreover, although loans endorsed prior to FY 1986 and surviving into the 1990s were eligible for the SR program, the prepayment rates for these older loans are substantially lower than the rates of more recently originated loans and consequently very few of the former appear in the SR data. Hence, the econometric analysis excludes SRs originally endorsed prior to FY 1986.

Finally, for the first policy year (the first year after refinancing) we double observed claim and prepayment rates. We assume that refinances occur uniformly throughout the fiscal year, so that the average SR will refinance in the middle of the fiscal year. Hence, on average, our window of observation for the first policy year is actually only a half year, leading us to under-estimate the true number of terminations which would have occurred in a full year. Doubling the claim and prepayment rates in the first policy year is an effort to compensate for this phenomenon.

III. 30-Year Streamline Refinancings

Price Waterhouse differentiates SRs by loan term (either 30-year or 15-year). No distinction is made between fixed-rate (FRMs), adjustable-rate (ARMs), or graduated-payment mortgages (GPMs).

A. Claim Model Specification and Results

The 30-year claim model is specified as follows:

$$S30CCR_{y,r,t} = \sum_{m=1}^{6} \alpha_m S_{m,y,r} + \sum_{n=1}^{4} \gamma_n P_{n,t} + \beta_1 EM_{y,t-1} \cdot EQADJ_{y,t-1} + \beta_2 PAYMENT_{y,t} \cdot (1 - ADJ_{y,r}) + \varepsilon_{y,r,t} \quad (1)$$

where

$S30CCR_{y,r,t}$ ≡ the Cox transformed conditional claim rate for 30-year streamline refinancings originated in fiscal year y, refinancing in fiscal year r, and observed in policy year t,

$S_{m,y,r}$ ≡ six dummy "seasoning variables" indicating the years elapsed between origination in fiscal year y and refinancing in fiscal year r constructed so that $S_{m,y,r} = 1$ when elapsed time $(r - y + 1) = m$ and $S_{m,y,r} = 0$ otherwise,

$P_{n,t}$ ≡ four policy year dummy variables indicating years elapsed since refinancing in year r constructed so that $P_{n,t} = 1$ when elapsed time $(t - r + 1) = n$ and $P_{n,t} = 0$ otherwise,

$EM_{y,t-1}$ ≡ market value of equity index for loans endorsed in fiscal year y and observed in policy year $t-1$ (lagged one year),

$EQADJ_{y,t-1}$ ≡ equity adjustment factor for loans endorsed in fiscal year y and observed in policy year $t-1$ (lagged one year),

$PAYMENT_{y,t}$ ≡ payment burden variable for loans originated in fiscal year y and observed in policy year t, and

$ADJ_{y,r}$ ≡ average percentage reduction in monthly mortgage payments for loans originated in fiscal year y and refinancing in fiscal year r.

Formal definitions and discussions of the variables listed above can be found in Appendix A.

As in all of the econometric models, the dependent variable $S30CCR_{y,r,t}$ is a conditional claim rate. Thus, it is a measure of how many loans from origination year y, refinancing in fiscal year r, will claim in policy year t, conditioned on the fact that they survive into policy year t. The seasoning variables attempt to capture intangible psychological and demographic factors which accumulate over the period of a borrower's residence. For example, a borrower who refinances after living in his home for an extended period will likely have developed non-trivial attachments to the property which, on average, would lessen the likelihood that he would default on his mortgage. The policy year dummy variables are analogous in design and purpose to the policy year variables in our other econometric models. We include only four dummies due to the limited time period used for the SR analysis.

As mentioned above, for SRs, FHA does not require an appraisal at the time of refinance, and, as a result, the majority of SRs lack any information regarding their equity levels. The absence of such a measure hinders our ability to assess the risk characteristics of the SRs since our general approach as well as most empirical evidence indicates that borrower equity is the most important

predictor of loan performance. As a proxy for the equity level of an SR loan originated in fiscal year *y*, refinancing in fiscal year *r*, and observed in policy year *t*, we use the equity level of a new purchase endorsed in the same fiscal year *y*, which never refinances, and which is observed in policy year *t-1* (as in the other econometric models, the variable is lagged one year). In using the variable $EM_{y,\,t-1}$ from a non-refinancer as a proxy for the equity of an SR, we do not make any presumptions regarding the relative levels of house price appreciation (the main determinant of equity movement) experienced by an SR. To account for this possible discrepancy in equity, we interacted the equity variable with an adjustment factor, $EQADJ_{y,\,t-1}$. This adjustment factor is calculated by subtracting the equity level of SRs from non-SRs based on the 51 state house price indices.

The payment burden will always be lower for the SR population, since they have refinanced at a lower interest rate in order to obtain a lower monthly payment. Consequently, the $PAYMENT_{y,\,t}$ variable must be modified. The payment variable is adjusted using the adjustment factor $(1\text{-}ADJ_{y,\,r})$ which represents the average percentage reduction in monthly mortgage payments that SR loans originated in fiscal year *y* enjoy as a result of refinancing in fiscal year *r*. The value of $ADJ_{y,\,r}$ is constrained so that borrowers cannot increase their monthly payments by streamline refinancing.

Our estimated coefficients are presented in Exhibit C-1.

Exhibit C-1

Regression Results for 30-Year SR Conditional Claim Rate Model (t-statistics in parentheses)	
$S_{1,y,r}$	-1.854 (-4.488)
$S_{2,y,r}$	-1.722 (-4.646)
$S_{3,y,r}$	-1.475 (-4.310)
$S_{4,y,r}$	-1.121 (-3.498)
$S_{5,y,r}$	-0.847 (-2.888)
$S_{6,y,r}$	-0.527 (-2.033)
$P_{1,t}$	-12.826 (-12.091
$P_{2,t}$	-11.115 (-10.698)
$P_{3,t}$	-9.568 (-9.599)
$P_{4,t}$	-8.581 (-8.521)
$EM_{y,t-1} * EQADJ_{y,t-1}$	-3.430 (-3.137)
$PAYMENT_{y,t} * (1 - ADJ_{y,t})$	21.604 (5.139)
Summary Regression Statistics	
Adjusted-R^2	0.743
F-statistic	39.383

B. Prepayment Model Specification and Results

Price Waterhouse specified the following thirty-year prepayment model:

$$S30CPR_{y,r,t} = \sum_{m=1}^{6} \alpha_m S_{m,y,r} + \sum_{n=1}^{4} \gamma_n P_{n,t} + \beta_1 PVDIFPOS_{r,t} + \beta_2 PVDIFNEG_{r,t} + \varepsilon_{y,r,t} \quad (2)$$

where

$S30CPR_{y,r,t}$ ≡ the Cox transformed conditional prepayment rate for thirty-year streamlined refinancings originated in fiscal year y, refinancing in fiscal year r, and observed in policy year t,

$PVDIFPOS_{r,t}$ ≡ the discounted present value of the gain from refinancing at a lower interest rate in policy year t a mortgage already streamline refinanced in fiscal year r, and

$PVDIFNEG_{r,t}$ ≡ the discounted present value of the loss from refinancing at a higher interest rate in policy year t a mortgage already streamline refinanced in fiscal year r (the calculation of $PVDIFNEG_{r,t}$ is identical to the calculation of $PVDIFPOS_{r,t}$).

Independent variables in eq. (2) that are not described above are identical in definition and purpose to those used in the claim model.

As is the case with our other econometric models, the dependent variable is again a conditional claim rate. The seasoning and policy year dummy variables are identical to those constructed above in the claim model section. The $PVDIFxxx_{r,t}$ variables are analogous to those used in the 30-year FRM purchase mortgage model. See Appendix A for a full discussion of their definition and justification. Exhibit C-2 presents the coefficient estimates from our model.

Exhibit C-2

Regression Results for 30-Year SR Conditional Prepayment Rate Model (t-statistics in parentheses)	
$S_{1,y,r}$	0.264 (1.227)
$S_{2,y,r}$	0.110 (0.510)
$S_{3,y,r}$	-0.101 (-0.470)
$S_{4,y,r}$	-0.074 (-0.345)
$S_{5,y,r}$	-0.167 (-0.777)
$S_{6,y,r}$	-0.140 (-0.649)
$P_{1,t}$	-3.323 (-20.264)
$P_{2,t}$	-2.925 (-14.815)
$P_{3,t}$	-2.498 (-11.083)
$P_{4,t}$	-2.966 (-14.875)
$PVDIFPOS_{r,t}$	39.446 (9.042)
$PVDIFNEG_{r,t}$	4.379 (0.548)
Summary Regression Statistics	
Adjusted-R^2	0.559
F-statistic	17.843

IV. Fifteen-year Streamline Refinancings

As with the thirty-year SRs, the fifteen-year models do not distinguish between FRMs, ARMs, or GPMs. Furthermore, like the fifteen-year purchase FRM model, the fifteen-year SR model is a simple regression of fifteen-year SR claim and prepayment rates on those of thirty-year SRs. In so doing, cells are defined only by refinance year r and policy year t. Exhibit C-3 presents the regression results for the 15-year SR claim and prepayment equations.

Exhibit C-3

Regression Results for 15-Year SR Conditional Claim and Prepayment Models (t-statistics in parentheses)		
Variable	**Claim Model**	**Prepayment Model**
$S30CxR_{r,t}$	0.191 (33.027)	0.699 (19.243)
Summary Regression Statistics		
Adjusted-R^2	0.964	0.871
F-statistic	535.215	134.704

Appendix D: Loss Rate Analysis

I. Introduction

One of the primary sources of variation in MMI Fund performance has been the loss experienced on loans that result in claims. This loss, when expressed as a percentage of either the dollar amount of the claim payment, or the acquisition cost of the loan or the underlying real estate, is referred to as the "loss rate." This appendix describes our analysis of historical loss rates.

In the FY 1995 Actuarial Review, as with previous Actuarial Reviews, loss rate forecasts used in estimating the Fund's current and future economic value and capital ratio had been based on average historical loss rates. As part of the FY 1995 Review, Price Waterhouse completed an analysis of historical loss rates which should allow for the statistical estimation of future loss rates. While this analysis facilitated a more accurate assessment of trends and changes in loss rates for future Reviews (including the potential effects of loss mitigation efforts) it could not be included in the FY 1995 Review due to limitations in the available data. In particular, the loss rate data available for this analysis only provided comprehensive information on loan activity through FY 1993; therefore, this data did not capture the significant decreases in loss rates that occurred in FYs 1994 and 1995. For the FY 1996 Review, a complete loss rate model, based on comprehensive data on loan performance up through most of FY 1995, was used and applied to the cash flow model but was based on comprehensive data on loan performance through most of FY 1995. While the results of this analysis are applicable to other types of claim settlement, since conveyances account for the majority of claims and assignment was terminated in 1996, the primary focus of our analysis was on losses resulting from foreclosures and property conveyances.

II. Data Sources

The analysis of historical loss rates is based on extracts of three FHA database systems: the A-43, the A-43C, and the A-78 (the Single-Family Accounting and Management System (SAMS)). Since each of these databases contains independent information, we obtained extracts from each and attempted to link them. The A-43 database contains loan and borrower characteristics, the A-43C database provides information related to claim settlement and property acquisition, and the SAMS provides information on holding costs and property sales.

Using FHA case numbers, Price Waterhouse linked extracts from all three of these databases in order to construct a single dataset for analysis. However, since the SAMS extract contained a large number of missing observations and was current only as of June 1995, there were no linked observations for FY 1996 terminations to permit detailed loss rate analysis for FY 1996. However, there were sufficient loss data in the June 30, 1996 cuts of the A-43 and A-43C databases to permit analysis of time lags for FYs 1995 and 1996 and analysis of aggregate loss rates for FY 1995, both of which are described in Section III of this appendix.

III. Trends in Historical Data

While the principal objective of this analysis is to create a model that predicts future loss rates, another goal is to better understand and explain the trends in loss rates experienced by the MMI Fund. To achieve this goal, we have examined the effects of economic, policy, and time variables on the Fund and the losses incurred by FHA.

In order to fully understand this analysis, it is illustrative to consider the process that occurs prior to a claim payment by FHA. When a mortgagee misses a monthly payment, he is considered delinquent. If the delinquency persists for 60 days, the mortgage is in default and the lender may initialize foreclosure proceedings. While FHA currently offers and encourages several alternatives to foreclosure, this analysis focuses on loans for which foreclosure is pursued. Once foreclosure takes place, FHA makes a payment to the lender to settle the claim and acquire the underlying property. The claim payment FHA makes to the lender, known as the "acquisition cost," may be viewed as including three components: the remaining principal balance of the loan; the foregone interest lost by the lender as a result of the loan default, and legal and administrative costs associated with foreclosure, including any expenses associated with the cost of repairing or maintaining the property prior to conveyance. The acquisition cost can be expressed as:

Acquisition Cost = Remaining Principal Balance + Foregone Interest + Foreclosure Costs

Following acquisition, FHA attempts to sell the property, sometimes at a reduced price in order to assist prospective low-income homebuyers in obtaining a house. During the time in which the property is held by FHA, but not yet sold, FHA incurs various costs and generates several cash flows in preparation for selling the property. Outflows include any taxes, and repairs and maintenance on the property, and inflows include rental income and other types of income. The net effect of these cash flows is called the "holding cost." Upon sale, FHA receives the sales price less any sales expense. In sum, the loss amount is the total amount that FHA loses on the mortgage. The loss amount is calculated as:

Loss Amount = Acquisition Cost + Holding Cost - Sales Price + Sales Expense

The loss amount expressed as a percentage of acquisition cost is referred to as the "loss rate." This loss rate provides a way to judge FHA's performance in managing real estate assets. The loss rate is given as:

Loss Rate on Claim Amount = Loss Amount/Acquisition Cost

In analyzing the historical loss rate trends, Price Waterhouse examined loss rates by LTV, house price, policy year, termination year, and origination year. The first three groupings are described in greater detail in Appendix A. Origination year is the fiscal year in which a mortgage begins to

amortize, while termination year is the fiscal year in which a mortgage terminates. It is useful to examine loss rates by termination year since this enables us to better capture changes in FHA asset management and disposition policies.

Exhibits D-1 and D-2 show that loss rates have been steadily decreasing since FY 1988. There are several reasons underlying this decline. First, there has been a concentrated effort on the part of FHA to reduce the time required to dispose of a property, which reduces FHA's holding cost. Furthermore, regional housing markets in general have been much stronger than they were during the mid-1980s and thus sales prices of HUD-held properties have increased significantly as a percentage of claim costs. This effect may also be attributed to improved FHA property sales procedures.

The default-to-claim lag is the period of time that transpires between borrower default and claim payment by FHA. When viewed by termination year, the default-to-claim lag has been increasing over time. However, this can be explained in part by the existence of a few observations with extremely long lags that have skewed the average lag upward. This is evident when we consider the average default-to-claim lag by origination. This lag has decreased significantly since FY 1977, as can be seen in Exhibit D-3. Among the factors this reduction can be attributed to is the fact that starting in the early 1990s, FHA focused on reducing the time it took to dispose of properties and concentrated on selling existing inventory.

Explaining the directions of trends in loss rates using only historical averages is difficult because the effects of certain variables cannot be disaggregated. For example, policy year may capture a trend in loss rates that cannot be seen when loss rates are grouped by house price or loan type categories. Moreover, the effect of one variable may mask the significant effect of another. Also, for predictive power, it is necessary to examine the effect of changes in policy variables (most notably, decreases in disposition lags) on loss rates for a given cohort. In order to overcome these obstacles, the loss rate model described below incorporates several policy and qualitative variables, enabling us to examine the effects of policy changes on future loss rates.

Exhibit D-1

Historical Conveyance Loss Rates by Relative House Price Category and Termination Year
(in percentage)

Termination Year	Category 1 0-60% of Median House Price	Category 2 60-70% of Median House Price	Category 3 70-80% of Median House Price	Category 4 80-95% of Median House Price	Category 5 95-106% of Median House Price	Category 6 106to 122% of Median House Price	Category 7 Greater than 122%	Category 8 U.S. Territories
1975	33.95	29.22	29.27	22.41	34.06	29.39	24.77	n/a
1976	37.56	29.23	27.21	26.22	27.28	21.77	23.75	22.69
1977	37.89	29.57	29.34	27.77	24.52	23.43	26.43	19.79
1978	43.86	32.60	34.97	29.98	31.12	21.89	36.20	25.22
1979	44.94	37.12	35.82	35.88	29.47	25.59	28.23	36.55
1980	49.78	39.42	39.06	36.20	34.95	27.27	37.34	38.95
1981	48.81	42.94	40.55	32.82	38.18	35.64	37.87	42.27
1982	49.57	41.91	38.76	35.64	32.80	36.27	34.83	41.50
1983	47.41	37.91	34.15	30.92	30.18	28.39	34.58	31.99
1984	48.89	38.45	35.72	32.28	31.17	33.98	36.04	32.68
1985	48.64	39.03	35.06	33.15	33.84	33.38	33.28	27.16
1986	52.46	42.47	38.84	35.49	35.37	32.88	34.37	23.46
1987	55.91	46.29	42.80	39.14	36.63	35.91	37.56	19.12
1988	56.98	46.75	42.54	39.13	37.53	36.76	39.64	18.63
1989	55.20	43.30	40.37	37.00	35.90	35.91	38.87	12.92
1990	50.47	42.82	39.14	35.86	34.00	33.96	37.39	5.84
1991	51.76	44.32	39.47	35.58	33.14	32.33	33.91	13.56
1992	52.60	44.50	40.24	36.86	32.35	30.26	31.67	14.15
1993	52.13	43.10	38.30	33.88	30.66	27.87	28.13	3.54
1994	50.37	42.42	37.55	32.67	29.35	26.86	26.50	8.65
1995	46.26	37.36	33.47	28.89	26.34	22.15	23.82	5.32
1996	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Source: A-43 database, June 30, 1996 extract.

Exhibit D-2

Historical Conveyance Loss Rates by Loan Type and Termination Year (in percentage)

Termination Year	30-Year FRMs	30-Year SRs	ARM	15-Year FRMs	15-Year SRs	GPM
1975	30.85	n/a	n/a	45.43	n/a	n/a
1976	32.24	n/a	n/a	27.75	n/a	n/a
1977	32.93	n/a	n/a	42.94	n/a	n/a
1978	37.86	n/a	n/a	41.14	n/a	43.85
1979	39.84	n/a	n/a	53.24	n/a	34.21
1980	43.79	n/a	n/a	50.58	n/a	35.58
1981	42.71	n/a	n/a	59.31	n/a	41.35
1982	42.29	n/a	n/a	44.71	n/a	40.47
1983	37.93	n/a	n/a	43.01	n/a	36.58
1984	38.94	n/a	n/a	44.16	n/a	37.32
1985	39.03	n/a	n/a	44.24	n/a	34.57
1986	40.98	n/a	43.92	43.55	n/a	37.71
1987	43.63	n/a	44.49	46.13	n/a	40.33
1988	43.73	45.38	46.89	44.73	39.82	40.92
1989	41.78	39.17	38.95	42.01	38.40	39.12
1990	39.65	36.09	39.04	41.32	42.75	37.37
1991	39.41	39.34	38.07	40.77	34.30	37.77
1992	39.88	38.45	38.88	40.70	32.59	39.00
1993	38.49	37.62	38.35	39.00	39.69	37.80
1994	37.86	35.72	38.31	38.28	36.13	37.42
1995	34.05	32.02	35.64	33.81	29.97	34.57
1996	n/a	n/a	n/a	n/a	n/a	n/a

Source: A-43 database, June 30, 1996 extract.

Exhibit D-3

Time Lags for Conveyances by Termination Year (in months)		
Termination Year	**Default-to-Claim Lag**	**Disposition Lag**
1975	n/a	n/a
1976	9.00	1.00
1977	14.20	47.33
1978	11.84	64.94
1979	11.66	52.95
1980	12.42	38.45
1981	11.78	21.68
1982	12.95	9.70
1983	12.94	7.24
1984	14.47	6.02
1985	14.54	6.61
1986	13.83	7.53
1987	13.72	7.40
1988	14.11	6.96
1989	14.17	7.15
1990	13.88	6.15
1991	14.15	5.64
1992	14.25	5.57
1993	14.68	5.36
1994	15.37	5.05
1995	15.87	3.77
1996	16.25	n/a

Source: A-43 database, June 30, 1996 extract.

IV. Loss Rate Model Specification

For the purposes of our analysis, loss costs were separated into three components: foreclosure costs (including foregone interest cost), holding costs, and the change in asset value. Foreclosure costs comprise the costs incurred by the lender necessary for undertaking foreclosure proceedings, which are eventually reimbursed by FHA, and foregone interest cost is the amount of lost interest FHA reimburses lenders. Holding costs are the costs FHA incurs prior to the disposition of the property including repair costs, maintenance costs, net taxes, and other costs required to maintain the property. The change in (or loss on) asset value represents the difference between sales price at disposition and the remaining principal balance at acquisition. This section describes the relationship between each of these components and the loss rates experienced by FHA.

A. Estimation of Foreclosure Cost

The model used to estimate *FCRPB*, the foreclosure cost on FHA insured properties as a percentage of remaining principal balance (RPB), is:

$$FCRPB = \alpha + \beta_1 TLAG + \beta_2 JUD + \beta_3 PYR \qquad (1)$$

where

FCRPB ≡ foreclosure costs as a percentage of remaining principal balance,

TLAG ≡ lag (in months) between default and claim,

JUD ≡ variable equal to 1 when a claim occurred in a state with judicial law and 0 otherwise, and

PYR ≡ policy year.

The results of this regression are given in Exhibit D-4. Since the costs of foreclosure are primarily fixed and heavily dependent on state laws, these costs are largely a function of a constant term and other variables which reveal the static nature of foreclosure costs. In our estimation of foreclosure costs, it is also assumed that foreclosure costs are dependent on the lag between default and termination. More specifically, foreclosure costs increase as the lag between default and termination increases. This is evidenced by the coefficient of 0.005 on the termination lag variable.

Exhibit D-4

Regression Results for Estimating Foreclosure Costs as a Percentage of RPB (t-statistics in parentheses)			
CONSTANT	**TLAG**	**JUD**	**PYR**
-0.036629 (-73.66)	0.004514 (180.77)	0.023612 (59.53)	0.007413 (123.81)

B. Estimation of the Holding Cost

The costs FHA incurs while holding a property for disposition were calculated as:

$$Holding\ cost = Nettax + Repair + Mando - Capinc \quad (2)$$

where

Nettax ≡ net amount of money paid out by HUD in taxes on behalf of a property and of money HUD has been reimbursed for prepaid taxes that are yet unearned at the time of sale,

Repair ≡ sum of money that HUD paid on behalf of a property for repairs,

Mando ≡ sum of money that HUD has paid on behalf of a property for maintenance and operation, and

Capinc ≡ total net inflow of income generated from the holding of a property.

The model used to estimate *HCUPB*, the holding costs incurred by FHA as a percentage of RPB, is:

$$HCUPB = \alpha + \beta_1 DLAG \quad (3)$$

where

HCUPB ≡ holding costs as a percentage of remaining unpaid principal balance and

DLAG ≡ lag (in months) between acquisition and disposition.

Exhibit D-5 shows the results of this regression. The constant has a coefficient of 0.046 while the

disposition lag has a coefficient of 0.004. This shows that the longer FHA takes to sell a property, the greater the holding cost.

Exhibit D-5

Regression Results for Estimating Holding Costs as a Percentage of RPB (t-statistics in parentheses)	
CONSTANT	**DLAG**
0.045853 (199.691)	0.004432 (166.754)

C. The Change in Asset Value Component

The model used to estimate *AVUPB*, the change in asset value as a percentage of RPB, is:

$$AVUPB = \alpha + \beta_1 DLAG + \beta_2 JUD + \beta_3 PYR + \beta_4 HPDISP + \beta_5 LT2 + \beta_6 LT3 + \beta_7 LT4 + \beta_8 LT5 + \beta_9 LT6 + \beta_{10} HLS1 + \beta_{11} HLS2 + \beta_{12} HLS3 + \beta_{13} HLS4 + \beta_{14} HLS5 + \beta_{15} HLS6 + \beta_{16} HLS7 + \beta_{17} HLS8 \quad (4)$$

where, in addition to previously mentioned variables in this Appendix,

AVUPB ≡ the change in asset value as a percentage of remaining principal balance,

HPDISP ≡ house price dispersion index by disposition year,

LT2 ≡ variable equal to 1 if a S30 resulted in the claim and 0 otherwise,

LT3 ≡ variable equal to 1 if an ARM resulted in the claim and 0 otherwise,

LT4 ≡ variable equal to 1 if a F15 resulted in the claim and 0 otherwise,

LT5 ≡ variable equal to 1 if a S15 resulted in the claim and 0 otherwise,

LT6 ≡ variable equal to 1 if a GPM resulted in the claim and 0

otherwise, and

HLSi ≡ interaction of house price growth with relative house price category *I*, with *I* ranging from 1 to 8.

Exhibit D-6 presents the results of this model. The results show that as house price increases, the loss on asset value decreases. This supports our finding that higher-priced homes tend to have lower loss rates. The policy year variables capture the effect of mortgage life on loss rates. For example, our estimated coefficient on policy year is -0.014, implying that mortgages that have a shorter life span will have higher losses in asset value compared to those with longer lifetimes.

House price dispersion is another crucial factor in predicting the change in asset value. Incorporating a dispersion index creates a proxy for the effect of the regional differences in house price growth (see Appendix A for a full description of house price dispersion). Additionally, in lieu of a single house price variable, we interacted house price growth by disposition year with house price category dummy variables. The coefficients of these variables are negative, implying that increases in house price growth result in a decrease in the loss on asset value. This follows intuition since sales price is a direct function of house price growth and as house price grows, sales price increases, and FHA will recoup more of its losses. Also, variables for all loan types except 30-year FRMs were included to allow us to forecast loss rates for each loan type.

Exhibit D-6

Regression Results for Estimating the Loss on Asset Value as a Percentage of RPB		
Variable	**Coefficient**	**T-statistic**
CONSTANT	0.262	14.27
DLAG	0.011	67.27
JUD	0.066	48.99
PYR	-0.014	-63.71
HPDISP	0.250	6.05
LT2	-0.021	-3.21
LT3	-0.045	-9.39
LT4	-0.092	-20.59
LT5	-0.068	-2.22
LT6	-0.059	-11.05
HLS1	-0.096	-5.19
HLS2	-0.099	-5.39
HLS3	-0.106	-5.74
HLS4	-0.105	-5.69
HLS5	-0.103	-5.57
HLS6	-0.097	-5.25
HLS7	-0.085	-4.60
HLS8	-0.045	-1.80

V. Forecasting Loss Rates

In order to forecast loss rates and incorporate them into the cash flow model, the loss rates must be in the same cell format as the cash flow model--by termination year, LTV, and relative house price category--for each of six mortgage types and each beginning amortization year. This categorization is accounted for by the inclusion of the relative house price categories and mortgage type variables in at least one of the three regressions. Additionally, future values of the independent variables are needed to obtain the forecasted loss rates by cell. General economic variables such as mortgage contract rate and house price growth are forecasted into the future by Freddie Mac and DRI/McGraw-Hill. Other variables strictly pertaining to the model, such as default-to-claim lags and disposition lags, are weighted averages of the past three years, not varying in the future years.

The next step is to multiply the estimated coefficients by the forecasted independent variables, which will result in forecasted values of holding costs, foreclosure costs, and loss on asset value, all as percentages of remaining principal balance. Adding these together and combining with foregone interest income as a percentage of remaining principal balance yield the forecasted loss rate by cell. The foregone interest is not predicted via regressions but is calculated directly using future values of mortgage rates and default-to-claim lags. However, since other analyses performed in the MMI review utilize loss rates expressed as a percentage of acquisition cost, the forecasted loss rates are converted to losses as a percentage of acquisition cost by the additonal costs of claims settlement adjustment factor. The forecasted loss rates are then grouped by beginning amortization year and loan type, which allows for them to be used directly in the cash flow model.

Appendix E: Cash Flow Analysis

I. Introduction

The purpose of the actuarial analysis is to assess the MMI Fund's ability to withstand future losses caused by either its current mortgage portfolio and future books of business. Specifically, we analyze the Fund's value under alternative economic and policy scenarios by projecting future loan performance and the corresponding financial performance of the Fund. This appendix focuses on how the projections of loan performance are used to evaluate the financial soundness of the Fund.

In evaluating the Fund's value, we examined the Fund in a manner similar to the way an investor would evaluate the market value of a company. An investor estimates a company's value as the present value of its current business plus the present value of new business expected to be undertaken. Assuming FHA continues to insure loans, its value depends on both its current portfolio of loans and future books of business.

To analyze future changes in the Fund's equity, we developed a model that incorporates projections of loan and operating performance and information about its insurance-in-force (IIF) to project the Fund's major cash flows. The discounted value of cash flows occurring between two points in time equals the change in the Fund's equity over that same time period.

The actuarial model uses the forecasts from the econometric models discussed in Appendices A through D. The econometric models forecast conditional claim and prepayment rates and loss rates for each cross-sectional category of loan-to-value (LTV) ratio and house price on an origination and policy year basis for 30-year fixed-rate mortgages (FRMs), 15-year FRMs, adjustable rate mortgages (ARMs), and streamline refinancings (SRs).

Based on the termination rates predicted by the econometric model, the major components of cash flow are projected into the future. Future interest income is reflected though the present value process. The cash flow components analyzed are presented in Exhibit E-1.

These components were projected for each cross-section of LTV ratio and house price category and then aggregated according to the origination year and fiscal year level. For mortgage types with smaller volumes, we have distinguished between LTVs and not loan sizes. The next section discusses the sources of each of these cash flows.

Exhibit E-1

Cash Flow Components	Cash Inflow	Cash Outflow
Premiums	X	
Claim Payments		X
Proceeds from Asset Dispositions	X	
Refunded Premiums		X
Administrative Expenses		X
Distributive Shares		X

II. Cash Flow Components

A. Background Information

We provide the following background information to clarify our discussion of the components of cash flow.

- **Insurance-in-force**: the unamortized insurance-in-force value of the surviving mortgages insured by FHA. This is distinct from the conventional notion of amortized insurance-in-force, which includes only the current outstanding balance on surviving loans.

- **Average Outstanding Balance Factor (AOB):** the principal balance outstanding divided by the original mortgage amount. The AOB is calculated based on the term and type of the mortgage and mortgage contract rate. The outstanding balance is taken at the mid-point of the fiscal year. We obtained the historical average mortgage contract rates for all loans from the FHA A-43 database. These rates reflect the average contract rate for all originations during that fiscal year. For ARMs, this is the initial mortgage interest rate. For future years, we used October 1996 DRI forecasts. These values are shown in Exhibit E-2.

- **Conditional Claim Rate:** the number of claims divided by the number of surviving loans in force at the beginning of the period.
- **Conditional Prepayment Rate:** the number of prepayments divided by the

number of surviving loans in force at the beginning of the period.

Exhibit E-2

FHA Contract Rates

Fiscal Year	30 Year FRM	15 Year FRM	Adjustable Rate Mortgage	Graduated Payment Mortgage
1975	8.47%	8.76%	n/a	n/a
1976	8.61%	8.73%	n/a	n/a
1977	8.22%	8.23%	n/a	8.31%
1978	8.70%	8.69%	n/a	9.17%
1979	9.74%	9.88%	n/a	9.76%
1980	11.12%	11.40%	n/a	11.49%
1981	13.24%	13.74%	n/a	13.88%
1982	15.16%	15.23%	n/a	15.30%
1983	12.15%	11.27%	n/a	12.31%
1984	12.73%	11.94%	12.80%	13.03%
1985	12.24%	11.73%	11.25%	12.52%
1986	10.15%	9.96%	9.10%	10.77%
1987	9.31%	9.07%	7.74%	9.47%
1988	10.11%	9.89%	8.88%	9.98%
1989	10.08%	10.04%	9.08%	9.81%
1990	9.72%	9.67%	8.54%	9.74%
1991	9.47%	9.28%	7.56%	9.48%
1992	8.55%	8.43%	6.47%	8.43%
1993	7.91%	7.64%	5.95%	7.03%
1994	7.57%	7.34%	6.07%	6.90%
1995	8.41%	8.36%	7.21%	8.13%
1996	7.70%	7.44%	6.27%	7.64%
1997	7.67%	7.67%	7.67%	7.67%

*Shaded values indicate forecast values. 1997 Forecasts are from DRI October 1996 Control Forecasts.

- **Termination Year:** this refers to the year in which a mortgage terminates either through a claim or a prepayment.
- **Policy Year:** the first policy year starts the day the mortgage has originated.

Subsequent policy years start on the anniversary of the mortgage origination.

- **Fiscal Policy Year:** a fiscal policy year covers a single fiscal year. The year in which the mortgage is originated is assigned a fiscal policy year of one, even though it is not a complete year. For calculation purposes, we assume that all mortgages are originated in the middle of the year. For example, for FY 1993, we assume that the average of all mortgage origination dates is six months into the fiscal year. Thus, the first fiscal policy year is assumed to start at month six of the first fiscal year. In order to be consistent with the model's fiscal year convention, the first fiscal policy year is thus on average only the six months long (i.e., it ends at the end of the first fiscal year). It is assumed that second fiscal policy year contains the last six months of the first policy year and the first six months of the second policy year. The last fiscal policy year corresponds to the last six months of the mortgage; therefore, for 30-year mortgages the model has 31 fiscal policy years.

B. Premiums

Premium Structure

The insurance premium is the primary source of revenues collected by the Fund. If the Fund's mortgage insurance is priced to be premium sufficient, the insurance premiums collected and interest earned on them will cover all costs incurred in insuring the mortgages. During the period being analyzed, the insurance premium was structured in three ways:

- Through September 1, 1983 the mortgage premium was collected on a monthly basis as a percentage of the outstanding principal balance for the period. We assumed for this analysis that the annual premium policy was in effect through the end of FY 1983.

- Between September 1, 1983 and September 30, 1991 a mortgage premium based on a percentage of the original mortgage amount was collected at the time of origination. This amount was 3.8 percent for 30-year mortgages and 2.4 percent for 15-year mortgages.

- As of July of FY 1991, the NAHA-specified premium structure became effective. This structure specifies that an up-front premium be collected and an annual renewal premium that depends on the initial LTV of the loan is assessed on the outstanding balance for a period.

- As of April 17, 1994, FHA lowered the up-front premium rate on 30-year mortgages from 3.00 percent to 2.25 percent. In our model, we have used a weighted average of the two up-front premium rates for FY 1994. FHA has maintained the FY 1994 NAHA annual premium schedule since then and it is assumed that it will be continued in the future.

The up-front premium schedule for new origination mortgages with 15- and 30-year termination schedules is presented in Exhibit E-3.

Exhibit E-3

Up-front Premium Rates for New FHA Originations		
Fiscal Year	**Fifteen Year Mortgages**	**Thirty Year Mortgages**
1983 through 1991	2.4%	3.8%
1992	2.0%	3.8%
1993	2.0%	3.0%
1994 through April 16, 1994	2.0%	3.0%
April 17 through the end of FY 1994	2.0%	2.25%
1995 and greater	2.0%	2.25%

The NAHA Annual Premium Schedule for new mortgage originations is shown below in Exhibit E-4:

Exhibit E-4

NAHA Annual Premium Rate for 15- and 30-Year Mortgages (purchase originations only)			
Mortgage Term	**Initial LTVs**	**Fiscal Years**	
		1992	**1993-2000**
30-Year	Below 90%	0.50% for 5 Years	0.50% for 7 Years
	Between 90% and 95%	0.50% for 8 Years	0.50% for 12 Years
	Above 95%	0.50% for 10 Years	0.50% for 30 Years
15-Year	Below 90%	0.50% for 5 Years	0.00%
	Between 90% and 95%	0.50% for 8 Years	0.25% for 4 Years
	Above 95%	0.50% for 10 Years	0.25% for 8 Years

Insurance Premiums for SRs are shown in Exhibit E-5 below:

Exhibit E-5

Premium Rates for Streamline Refinancings		
Year of Initial Origination	**30-Year Mortgages**	**15-Year Mortgages**
Pre-NAHA (prior to July 1, 1991)	3.8% Up-front Premium - No Annual Premiums	2.4% Up-front Premium - No Annual Premiums
FY 1992	3.8% Up-front Premium - Annual Premiums 7 Years	3.8% Up-front Premium - Annual Premiums 7 Years
FY 1993	3.0% Up-front Premium - Annual Premiums 7 Years	2.0% Up-front Premium - No Annual Premiums
1994 until April 17, 1994	3.0% Up-front Premium - Annual Premiums 7 Years	2.0% Up-front Premium - No Annual Premiums
April 17, 1994 until end of FY 1994	2.25% Up-front Premium - Annual Premiums 7 Years	2.0% Up-front Premium - No Annual Premiums
FY 1995 through FY 2000	2.25% Up-front Premium - Annual Premiums 7 Years	2.0% Up-front Premium - No Annual Premiums

Calculating the Premiums

The up-front premium is calculated as follows:

Premium Amount = Origination Amount (excluding any financed up-front premium) Mortgage Insurance Premium Rate (percentage)*

The up-front premiums calculated by our model may not be equivalent to the up-front premiums received by FHA in a particular fiscal year due to limitations inherent in the data provided from the FHA A-43 database. Since the A-43 database records the origination on the first amortization date, not the actual endorsement date, our origination volume does not match the actual endorsement volume with originations in FY 1996 included in FHA's FY 1996 financial statements. For example, in FY 1996, the data from the A-43 database produced a larger volume of originations than the endorsements on FHA's financial statements. This was primarily because some originations in FY 1996 were not endorsed until FY 1997. To adjust for this time lag, we included in our estimates of premium income an adjustment of $142 million in FY 1996 to reflect the up-front premiums for loans endorsed in FY 1997, but originated in FY 1996. Since our model already includes all other future cash flows associated with these loans in our estimate of the FY 1996 book's economic value, this change makes our up-front premium calculation consistent with our other cash flow predictions.

The A-43 database origination amount also includes the up-front premium if the up-front premium has been financed. However, the A-43 database does not indicate whether or not the up-front premium has been financed and thus included in the origination amount. In our model we assume that the up-front premium is always financed. This is a rational assumption because by financing the up-front premium, a borrower can allocate the money toward lowering the initial LTV and thus reducing annual premiums.

However, when a mortgage defaults, FHA must pay a claim consisting of the unamortized portion of both the mortgage and financed premium. As a result, in our model, FHA effectively collects very little of the up-front premium on mortgages that result in a claim early in their lives.

The annual premium is actually collected on a monthly basis by FHA. However, in our model, we only calculate one annual premium for the fiscal year, assumed to be calculated in the middle of the fiscal year. The annual premium calculation is as follows:

Annual Premium = Amortized Insurance in Force (excluding any up-front premiums) Annual Insurance Premium Rate (percentage)*

Even though FHA is responsible for insuring financed up-front premiums, the annual premium is not assessed on the financed up-front premium and as a result is not applied against it in the cash flow model.

C. Losses Associated with Claims

Losses due to claims are the Fund's largest expense. When a mortgage defaults, the lender files a claim with FHA and FHA pays the claim to the lender. In most cases, FHA takes possession of the foreclosed property and sells the property to recover its loss. This type of claim is called a conveyance.

A claim results in two separate cash flows:

- the cash outflow of the claim payment
- the cash inflow of any net proceeds received in selling the conveyed property

Because there is typically a lag between the time of the claim payment and the receipt of proceeds from the sale of the property disposition, we analyze these two cash flow components separately.

The claim payment consists primarily of the outstanding balance at the time of the default. In addition, FHA may pay for other costs incurred by the mortgagee on the defaulted mortgages. In order to account for these costs on a portfolio-wide basis, we use the following formula:

$$\textit{Claim Payment}_t \textit{ (Acquisition Cost)} = \textit{(Amortized Insurance in Force * Claim Rate}_t \textit{ * Additional Costs of Claims Settlement Adjustment Factor)+ Interest Income Lost}$$

In our analysis, we assume that the primary cost associated with claims is the interest income lost by the mortgagee between the time at which the mortgage defaults and the claim is paid. Based upon our analysis of the A-43 data, we estimated the average lag between default and conveyed claim payment to be approximately 14.46 months, 13.37 months, and 14.51 months in FY 1996, FY 1997, and FYs 1998-2000, respectively, whereas the FY 1995 Review assumed a lag of 14.4 months. Thus, the additional mortgagee costs were estimated as interest income lost on the outstanding balance of the mortgage for the length of time between default and claim payment.

In addition to interest income lost, mortgagees usually incur additional costs associated with a claim such as legal fees. These costs are captured in the "Additional Costs of Claims Settlement Adjustment Factor." The adjustment factor is calculated by comparing the actual dollar value of claims paid according to FHA's financial statements with the claim payments calculated by our

model. We calculated the average cost of claims settlement factor in every year since FY 1989 to be about ten percent, which is what we assumed for all future claims settled by foreclosure and conveyance. However, we assumed that the cost of claims settlement factor on pre-foreclosure sales will be 3 percent, since many of the legal and administrative costs associated with foreclosure would be avoided.

Proceeds on the sale of a conveyed property were estimated by multiplying the claim payment by one minus the loss rate for a conveyance. However, because property sales currently lag claim payments, we allocated the net proceeds cash flow to the appropriate fiscal year. We have analyzed the trends in disposition lags and have found a downward trend over the past few years. For future years, we used an average of the last three years. This is approximately 4.7 months. Proceeds received in fiscal year *t* are calculated as follows:

$$Proceeds_t = (Property\ Disposition\ Lag/12) * Claim\ Payments_{t-1} * (1\text{-}Loss\ Rate) + ((12 - Property\ Disposition\ Lag)/12) * Claim\ Payments\ (1 - Loss\ Rate)_t$$

The definition of a loss rate is as follows:

$$Loss\ Rate\ on\ Claim\ Amount = Loss\ Amount/Acquisition\ Cost$$

The acquisition cost is the amount that FHA pays to the lender, which is approximately the unamortized value of the mortgage plus the interest income lost. The loss amount is the total amount that FHA loses on the mortgage, which includes the holding costs that FHA incurs until FHA sells the property.

The loss ratio calculations were based on data obtained from linking the June 30, 1996 extracts from the A-43 and A-43C databases, and the June 1995 extract of the SAMS database. We examined the data for different trends in loss rates. Specifically, we analyzed loss rates by different mortgage types, relative house prices, initial LTVs, endorsement year, policy year of termination, and fiscal year of termination. See Appendix D for a complete description of our loss rate analysis.

Exhibit E-6

Loss Rates								
Mortgage Type	**House Price 1**	**House Price 2**	**House Price 3**	**House Price 4**	**House Price 5**	**House Price 6**	**House Price 7**	**House Price 8**
Fixed 30s	0.38	0.34	0.33	0.33	0.33	0.32	0.33	0.33
Streamline 30s	0.36	0.33	0.32	0.31	0.31	0.31	0.31	0.32
ARMs	0.34	0.31	0.29	0.29	0.29	0.29	0.29	0.30
Fixed 15s	0.30	0.27	0.26	0.25	0.25	0.25	0.25	0.26
Streamline 15s	0.32	0.29	0.28	0.27	0.27	0.27	0.27	0.28
GPMs	0.33	0.29	0.28	0.28	0.28	0.28	0.28	0.29

As in the FY 1995 Actuarial Review, Price Waterhouse LLP used relative house price categories in this year's Review to replace the loan size categories we used to characterize loans in past Reviews. The upper limits for categories one through seven are based on breakpoints determined as a percentage of the median house price in each of 44 largest metropolitan statistical areas (MSAs) and the 50 states. House price category eight represents all originations in areas that exceed the FHA limit, as well as loans missing MSA or state identifiers. This category contains loans with a wide variety of exceptions to the general limit, such as loans in Alaska, Hawaii, Guam, and the Virgin Islands; loans originated under special programs; and other special cases.

FHA has experienced a downward trend in loss rates in recent years. This decline in loss rates can be explained by FHA's ability to reduce losses by disposing of properties more quickly and using other loss mitigation techniques more frequently. Future loss rates are projected using the loss rate model described in Appendix D. Exhibit E-6 presents a summary of loss rates used for 30-year FRM by loan size and termination year status.

The construction of relative house price categories has produced an observable trend in loss rates by house price category. Specifically, loss rates are lower for loans falling into categories with higher house prices. These findings support those included in past Reviews regarding the relationship between loss rates and loan size categories.

Assigned Loans and the Pre-Foreclosure Sales Program

Congress recently passed legislation containing a provision for the termination of the Single-Family Mortgage Assignment Program (the "Assignment Program"). Previous studies by HUD and the General Accounting Office have found that the losses incurred by FHA on assigned mortgage notes are significantly greater than losses on conveyed properties. In addition, our analysis suggests that the loss rate on future mortgage assignments is likely to be 43 percent, which is higher than the loss rate for future property conveyances (this represents a decrease from our estimate of 49 percent last year). Thus the discontinuation of the Assignment Program has had a significant positive impact on our assessment of the Fund's current economic value.

The same legislation that terminated the Assignment Program authorized FHA to recompense mortgagees for their actions to mitigate potential losses by providing mortgage foreclosure alternatives, such as special forbearance, mortgage assumptions by lenders, pre-foreclosure sales, deed-in-lieu-of-foreclosure transactions, partial claim payments, and loan modifications. Many of these loss mitigation techniques have been successfully employed in the conventional mortgage market by private mortgage insurers, Fannie Mae, and Freddie Mac. The degree of uncertainty surrounding the effectiveness of these techniques and FHA's ability to utilize them makes it difficult for us to provide a dollar estimate of the effects they will have on the MMI Fund, except in the case of pre-foreclosure sales, which we are able to provide estimates for.

The Pre-foreclosure Sales Program, which began as a demonstration program in October 1991, became a nationwide program in November 1994. In our analysis of FHA's data on the Pre-foreclosure Sales Program we estimated that the average loss as a percent of total claim payments for a pre-foreclosure sale was 25 percent, which is lower than the loss rate for properties conveyed over the same period. In FY 1996, FHA successfully resolved 4.6 percent of terminations using pre-foreclosure sales. Based on the upward trend in the number of terminations being resolved through pre-foreclosure sales, and the likelihood that pre-foreclosure sales will increase significantly now that the assignment program has been terminated, we have assumed that FHA will successfully resolve ten percent of claim terminations in FY 1997 and beyond using pre-foreclosure sales. Assuing a loss rate of 25 percent for pre-foreclosure sales, we estimate that the economic value of the Fund in FY 1996 would be $74 million higher and the capital ratio would be higher by 0.02 percentage points if 20 percent of claim terminations were successfully resolved using pre-foreclosure sales and other loss mitigation techniques.

D. Refunded Premiums

With the initiation of the up-front premium in FY 1984, FHA began refunding a portion of the premium when borrowers prepaid their mortgages. The up-front premiums are considered to be "earned" over the life of the loan, and upon prepayment, an approximation of the unearned portion of the premium is returned to the borrower. Thus, the amount of the refund depends upon the time in the life of the mortgage at which it is prepaid. The insurance-in-force used to calculate the refunded premium does not include the financed up-front premium.

The refund payments are calculated as follows:

*Refund Payments = Unamortized Insurance in Force (excluding up-front premium) * Up-front Premium Rate * Prepayment Rate * Refund Rate * Refund Adjustment Factor*

The refund adjustment factor has been approximately 94 percent in past years, and we assume it will remain at this level in future years. This adjustment factor can be attributed to problems related to the data as recorded in the A-43 database and to timing. We assume that a prepayment occurs in the middle of a fiscal policy year and assign the corresponding refund rate on the refund schedule. In reality, the timing of prepayments may be slightly different due to the pattern of interest rate movements within a particular year and the time it takes to make these payments.

Exhibit E-7 shows the two refund schedules. For refunds after January 1, 1994 the new seven-year refund schedule applies. Therefore, mortgages originating before 1988 no longer receive a refund of their up-front premium.

E. Administrative Expenses

In addition to estimating cash flows associated with loan performance, the cash flow model also projects administrative costs incurred in insuring mortgages. Administrative expenses are calculated based on the outstanding balance of the insurance-in-force over the period. The factor used in determining future cash flows in this analysis is 0.0965 percent, which is the experience rate for FY 1996.

F. Distributive Shares

Distributive shares were designed to allow FHA to return a portion of the insurance premium to the insured borrower if the business for that endorsement year was more profitable than expected. Specifically, if the premiums for a cohort of loans are more than sufficient to cover the costs of insuring the loans, a portion of the premium in excess of the costs can be returned to the borrower

through a distributive shares payment. However, payment of distributive shares has been suspended since 1990. This suspension is assumed to continue indefinitely, even though we estimate that the Fund has already achieved its capital ratio goals.

Exhibit E-7

Percentage of Up-front Premium Refunded			
Fiscal Policy Year	Current Refund Schedule		New Refund
	Thirty Year Mortgages	Fifteen Year Mortgages	All Mortgages
1	0.99	0.99	0.98
2	0.94	0.93	0.90
3	0.82	0.81	0.80
4	0.67	0.66	0.60
5	0.54	0.51	0.39
6	0.43	0.39	0.22
7	0.35	0.29	0.08
8	0.29	0.21	0.00
9	0.24	0.15	
10	0.21	0.11	
11	0.18	0.08	
12	0.16	0.06	
13	0.15	0.04	
14	0.13	0.03	
15	0.12	0.02	
16	0.11	0.00	
17	0.10		
18	0.09		
19	0.09		
20	0.08		
21	0.07		
22	0.07		
23	0.06		
24	0.05		
25	0.05		
26	0.04		
27	0.04		
28	0.04		
29	0.04		
30	0.00		

III. Economic Value and Capital Ratio

A. Historical Portfolio Rates

For years prior to FY 1992, we revised our interest rate series to reflect more appropriately the interest that FHA accumulates on its investments. Although estimates of the rates were used prior to FY 1983, we were able to obtain actual FHA portfolio rates for FYs 1983 through 1996. The interest rates are shown in Exhibit E-8.

Exhibit E-8

Investment Yields			
Fiscal Year	**Interest Rate**	**Fiscal Year**	**Interest Rate**
1975	6.98%	1986	9.39%
1976	7.02%	1987	9.08%
1977	7.06%	1988	8.54%
1978	7.89%	1989	8.59%
1979	8.74%	1990	8.93%
1980	10.81%	1991	8.85%
1981	12.87%	1992	8.51%
1982	12.23%	1993	8.51%
1983	10.84%	1994	7.47%
1984	9.60%	1995	7.59%
1985	10.06%	1996	n/a*

*This information was not available as of the date this Review was produced.

B. FHA Contract Rate

One of the most important economic determinants of the Fund's performance is the average initial contract rate on FHA-insured loans. The initial contract rate is among the most influential variables in determining both claim and prepayment behavior, and small changes in interest rate forecasts can significantly affect estimates of FHA's performance.

The average initial FHA contract rate on FRMs is closely related to, but distinct from, other major mortgage interest rate measures, such as the FHLMC commitment rate. In order to forecast future FHA contract rates, we have estimated the historical movements of the FHLMC commitment rate and FHA's contract rates. These rates have moved in lock-step for several years. Using forecasts of the FHLMC commitment rate obtained from DRI/McGraw-Hill, we forecast future FHA contract rates based on the historical relationship between these two rates.

Exhibit E-9 provides our forecasts of the FHA rate and DRI's forecasts of the FHLMC rate.

Exhibit E-9

Forecasted FHA Contract Rate and FHLMC Commitment Rate		
Year	**FHLMC Commitment Rate**	**FHA Contract Rate**
1997	7.63%	7.48%
1998	7.57%	7.42%
1999	7.29%	7.14%
2000	7.13%	6.98%
2001	7.12%	6.97%

Sources: A-43 June 1996 Extract and DRI Forecasting.

C. Credit Reform Act and Interest Rate Forecasts

In the Federal Credit Reform Act of 1990, which became effective on October 1, 1991, OMB specifies the methodology that FHA must follow in accounting for its cash flows, based upon the date when the credit was authorized or committed. For books of business originating prior to FY 1992, cash flows are processed through a "liquidating account." For books of business originating in FY 1992 or later, cash flows are processed through a "financing account."

The interest rates associated with the financing account, which are based on ten-year Treasury bonds, are generally lower than the interest rates associated with the liquidating account. Investments in the liquidating accounts will earn higher yields due to investments made in prior years.

D. Calculating the Economic Value and Capital Ratio

For FY 1996, the economic value of the MMI Fund was calculated by first determining the present value of the future cash flows for all previous books of business as of September 30, 1996. This figure was then added to the capital resources of the MMI Fund. The capital ratio is defined as the economic value divided by the unamortized insurance-in-force of the Fund. To analyze mortgages endorsed prior to FY 1975, we used FHA's most recent survivorship tables for 30-year mortgages. These mortgages were sufficiently seasoned that economic conditions should not affect their performance significantly.

For fiscal years beyond 1996, the economic value of the fund was calculated by the following equation:

Economic Value = Economic Value at the beginning of the year + Interest + Economic Value of the New Book of Business

The interest rate used in the above equation is 3.0 percent and represents an estimate of future real rates of interest.

Appendix F: Demand Analysis Model

I. Introduction

In general, the MMI Fund's performance is largely determined by four factors: the size and composition of future books of business; the projected prepayment experience; the projected claims experience; and the projected loss severity. The future capital ratios of the MMI fund depend not only on the performance of the current insurance-in-force but also on that of the future books of business. The more years into the future, the more influence the future books of business have on the Fund's capital ratios.

The capital ratio of the Fund in the future can be viewed as a weighted average of those of the current insurance-in-force and the future books of business. The impact of the future books of business on the capital ratio is a function of the changes in economic environment. If house prices were to fall following a recent rally, new books of business originated right before or at the beginning of decline will be more likely to default than the existing mortgages. In this case, the underestimation of the future books of business will result in the underestimation of the future capital ratios. The composition of future books of business is also an important determinant of the Fund's future performance. Thus, a better estimation of the future demand for FHA mortgage insurance will enhance the accuracy of the estimates of the MMI fund's performance for the future years.

The purpose of the demand analysis model is to forecast the size and composition of FHA's future books of business and to analyze the financial and behavioral consequences of changes in economic conditions and in FHA policy decisions. For a given economic scenario, this model will produce the demand for FHA mortgage insurance for each LTV, loan size, and mortgage product category, and for each category characterized by income, wealth, marital status, education level, and age.

II. Overview of the Demand Analysis Model

The DAM was designed to achieve two objectives: consistency with the current Actuarial Review models and the capability to perform policy analysis. To achieve these two objectives, a methodology was utilized that employs historical loan level estimations of mortgage originations and cell-based forecasts to produce estimates of future originations in each segment of the

mortgage market[1].

There are three basic components of the DAM:

- **Aggregate Mortgage Origination Module (AMOM)**: a module designed to produce forecasts of the aggregate dollar volume of purchase and refinance mortgage originations;
- **Purchase Mortgage Origination Module (PMOM)**: a module designed to divide the volume of purchase mortgage originations into loan-to-value (LTV), loan size, mortgage product, and mortgage insurance categories;
- **Refinance Mortgage Origination Module (RMOM)**: a module designed to divide the volume of FHA refinancings into FHA recaptures (i.e. FHA-insured mortgages that refinance with FHA) and conventional captures (i.e. FHA-insured mortgages that refinance with conventional mortgages, either insured or uninsured).

Each of the three modules utilizes different estimation techniques and data series. A brief overview of each is provided below.

Aggregate Mortgage Origination Module

While the PMOM and the RMOM may both be viewed as estimating how the mortgage market is divided among different segments, the AMOM estimates the total size of the mortgage market. It does this by utilizing a macroeconomic time series equation to explain historical movements in the volume of originations reported by HUD's Survey of Mortgage Lending. It relies heavily on macroeconomic and demographic variables, such as interest rates, house price growth rates, and mobility rates. It also employs FHA policy variables designed to capture the effect of FHA premium levels and underwriting criteria on total originations.

Purchase Mortgage Origination Module

The PMOM models the borrower decision-making as a sequence of choices, each estimated using qualitative choice models. Thus, for each choice, such as the mortgage insurance choice, the module estimates a conditional probability based on the estimated outcome of any preceding choice, such as loan-to-value (LTV) ratio choice. This allows the PMOM to simulate each

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1 These segments include insurance status (FHA versus conventional), product type (fixed versus conventional rate), LTV, and loan size. There are several other relevant segments of the mortgage market that could have been included, such as those relating to the type of lending institution, property, or region, but their inclusion was beyond the scope of this project.

decision from the choice of LTV ratio through the choice of mortgage product (i.e., adjustable-rate versus fixed-rate) independently, instead of as a single choice. The four choice models associated with the PMOM module include the following:

- housing demand
- LTV and loan size choice
- mortgage insurance choice
- mortgage product choice

The outcome from the PMOM will be FHA's estimated share of the purchase money mortgage market in each loan size, LTV, and mortgage product class. These market share projections, combined with estimates of the total value of purchase mortgage originations produced by the AMOM, will provide the inputs necessary to estimate the economic value and capital ratio of new MMI Fund purchase money mortgage originations.

Because the PMOM utilizes micro data from the American Housing Survey and the Survey of Income and Program Participation, neither of which directly corresponds to FHA's A-43 database, all estimates of future FHA volume generated by the PMOM will be expressed in terms of percentage changes from the PMOM baseline. These changes may then be converted into changes in FHA volume and used with the Actuarial Review models.

Refinance Mortgage Origination Model

The RMOM has been designed to use data from FHA's A-43 database to estimate FHA recapture rates. These rates, which represent the percentage of FHA-insured refinances that retain FHA insurance, are estimated and forecasted in cells that correspond to the cells used in the Actuarial Review. Because the RMOM provides estimates of the FHA-insured mortgages that refinance with FHA, and the AMOM provides estimates of the total volume of refinance originations, future volumes of non-FHA refinance originations may be obtained by subtracting the one estimated from the other, as long as we may assume that all loans that refinance with FHA were previously insured by FHA.

III. Data Sources

Because no single data set contained information capable of meeting the disparate needs of the DAM, multiple sources have been used to estimate the model. The Survey of Mortgage Lending Activity (SMLA) was used for the AMOM, the American Housing Survey (AHS)-National Core and the Survey of Income and Program Participation (SIPP) for the PMOM, and the A-43 data provided by FHA for the RMOM. A brief description of each data set is provided below.

Survey of Mortgage Lending Activity

The SMLA offers long and precise time series on mortgage originations. This time series, which provides monthly observations on total originations and quarterly observations on FHA-insured originations, is consistent with other measures of mortgage activity, such as the Census Bureau's C-25 data series, the National Association of Realtor's existing home sales data series, and the FHA's A-43. .

American Housing Survey

The AHS is a weighted borrower survey of approximately 50,000 households performed every two years. The AHS contains a national sample called the National Core Sample as well as separate samples taken from nine Metropolitan Statistical Areas. To enable longitudinal analyses of homes and households, the same housing units are repeatedly surveyed. The same survey was administered to a completely new sample population drawn from the 1980 census. The AHS contains detailed information about the living unit, geographic location, neighborhood and household composition, and mobility. The two types of data most relevant to housing demand are income and housing costs.

Survey of Income and Program Participation

The SIPP includes wealth data that is not provided in the AHS. It contains a detailed list of wealth variables such as unsecured and secured household debt, statistical measures of total net worth, as well as various income variables. The SIPP is a weighted survey of approximately 20,000 households that is conducted every four months. The survey contains three principal sections. First, the control card is used to record the basic social and demographic characteristics for each person in the household at the time of the initial interview. Second, the core portion covers labor force activity as well as detailed descriptors of income and wealth. The final section contains several supplements such as child care, work history, and training that are only included during selected household visits.

Linking the AHS and the SIPP Data Sets

Linking the SIPP and AHS data sets allows us to construct a comprehensive database of borrower characteristics that incorporates both personal and financial information. The first step in linking the data was to break both data sets into cells, i.e., grouping the data sets according to education, income, tenure, marital status, and age. The second step was to match the cells in each survey according to income. It was then necessary to determine how to match the quarterly observations per household contained in the SIPP survey with the annual observation provided by the AHS survey. Given time and budgetary constraints, Price Waterhouse took the straightforward

approach of matching AHS observations to SIPP observations that were closest in time. Additionally, SIPP data for 1988 were not available. Consequently, those who moved in 1988 were not able to be counted and a separate wealth function had to be estimated for these borrowers.

IV. Estimation Techniques

Different econometric estimation techniques are employed in each of the three modules that comprise the Demand Analysis Model (DAM) because each utilizes a different data set and represents a different type of behavior, choice, or outcome. The following estimation techniques were used in the DAM:

- Time Series Estimation
- Qualitative Dependent Variable Model Estimation
- Grouped Logit Model Estimation

Each of these techniques is described below.

A. Time Series Estimation

In the AMOM, a linear regression model was used to estimate and forecast the purchase and refinance originations for the entire market. Because the underlying relationships between the mortgage originations and the influencing factors are likely to be nonlinear, the error terms in the simplified linear model we use are likely to be autocorrelated. In addition, the omission of relevant variables could also result in autocorrelation in the disturbance terms. Although least squares estimates are still unbiased and consistent when the disturbances are autocorrelated and when no lagged dependent variables are included in the regression, they are inefficient because the model is a generalized model.

In order to estimate the aggregate model, the mortgage originations data series, which is a non-stationary time series, was transformed into a stationary time series. This was done by taking the ratio of per capita origination dollar volume to a house price index as a dependent variable. A Durbin-Watson test was then performed to estimate the autocorrelation of the disturbances. The model was then estimated using maximum likelihood procedures to obtain efficient estimates of

the parameters.

B. *Qualitative Dependent Variable Model Estimation*

Many of the econometric estimations performed as part of the DAM, particularly those associated with the PMOM, utilized a multinomial logit (MNL) model. The dependent variable in this model takes on discrete values with each value associated with one response. Consider a borrower i who is faced with $J+1$ choices. Let Y_i represent the random variable indicating the choice made $(Y_i = 1,2,...,J,J+1)$ and x_i the explanatory variables, which include borrower characteristics as well as choice attributes. Then the probability that choice j is made in the mortgage choice model is given by:

$$\text{Prob}(Y_i = j) = \frac{e^{\beta_j' x_{ij}}}{1 + \sum_{j=1}^{J+1} e^{\beta_j' x_{ij}}} \qquad j = 1,2,...,J,J+1$$

$$\text{Prob}(Y_i = 1) = \frac{1}{1 + \sum_{j=1}^{J+1} e^{\beta_j' x_{ij}}} \qquad (1)$$

where β_1 has been set to zero for normalization. Suppose there are k explanatory variables. Then $J*(k+1)$ coefficients will be estimated (including the coefficients for the constant terms). The MNL model is complete by specifying the explanatory variables x_i, which are specific to the actual choice being modeled.

C. *Grouped Logit Model Estimation*

When performing a logit estimation on a data set that contains a large number of observations, those observations with similar characteristics can be grouped into cells. Each cell will then have a proportion of observations in which an event will occur, which may be viewed as the probability that individuals contained within the cell will produce the event or choice being considered. These probabilities may then be transformed into an odds-ratio and estimated using ordinary least squares regression analysis. Such a technique is referred to as a grouped logit model. The current Actuarial Review models employ this grouped logit technique, as does the Refinance Mortgage Origination Module.

V. Aggregate Mortgage Origination Module

The Aggregate Mortgage Originations Module consists of two separate models, the Aggregate Purchase Volume Model and Aggregate Refinance Volume model.

A. *Aggregate Purchase Volume Model*

Because the dollar volume of purchase mortgage originations is nonstationary and positively correlated with house price level and total population, the dependent variable used in the purchase mortgage originations regression was the dollar volume of the purchase mortgage originations deflated by a house price index and divided by total population, i.e., the real purchase originations per capita.

The decision to purchase a house is influenced by numerous economic and demographic factors. Purchase decisions are affected by house price levels and housing availability; the relative cost of owning versus renting; personal income and wealth; and the constraints imposed by FHA and/or PMI policies. The explanatory variables used in the purchase mortgage originations model include per capita income, unemployment rate, seasonal dummies, FHA eligibility criteria, user cost of capital and change in mortgage interest rate.

FHA Eligibility Criteria

A potential borrower's decision to purchase an FHA-insured mortgage will be affected by the underwriting criteria of FHA insurance and those of PMI insurance. To the extent that FHA provides home ownership opportunities to households that could not otherwise consider purchasing a home, FHA's underwriting criteria would have an influence on mortgage demand, particularly among low- and moderate-income borrowers. We would expect that, in general, any change in FHA's underwriting criteria that expands the number of households able to qualify for mortgage financing will increase aggregate mortgage demand. To capture this effect, we calculated *FHAELIG*, which was defined as the number of households eligible for FHA insurance given FHA's maximum PTI ratio of 29% and minimum down payment of 3%.

User Cost of Capital for Homeowners

A potential borrower's decision to invest in housing is influenced by the cost of investing in housing, which may be measured by the real user cost of capital for homeowners. The user cost of capital is defined as the after-tax interest cost and property tax a homeowner actually pays, plus the estimated cost associated with depreciation, less expected house price appreciation. As the user cost of capital decreases, we would expect the volume of mortgage originations to increase.

Price Index of FHA Mortgage Insurance

Since FHA mortgage insurance premiums include an annual and an up-front premium, we have defined the price of a mortgage insurance policy as the present value of the future stream of mortgage insurance payments net of the premiums refunded at prepayment. However, future

streams of mortgage insurance payments are subject to uncertainty regarding future interest rate activity as well as borrower mobility. In order to capture the underlying uncertainty of future premium payments, we have created indices to measure the cost of FHA insurance. These indices were constructed from premium rate schedules provided by FHA as well as the conditional prepayment rates obtained from the Fiscal Year 1995 Actuarial Review. As the net present value of FHA premiums increases, we would expect a decrease in the volume of mortgage originations.

Model Specification

The purchase mortgage origination model is as follows:

$$\ln(PERPSVOL_t)=\beta_0+\beta_1\ln(PERINC_{t-3})+\beta_2 SPRSUM_t+\beta_3 FHAELIG_t+ \beta_4 UNEMPLOY_t+\beta_5 USERCOST_{t-1}+\beta_6 RATECHNG_{t-1}+\epsilon_t \quad (2)$$

where

$\ln(PERPSVOL_t)\equiv$ log of the per capita purchase dollar volume deflated by a house price index,

$PERINC_t \equiv$ per capita disposable income at time t deflated by a house price index,

$SPRSUM_t \equiv$ dummy variable for the months from March to September,

$FHAELIG_t \equiv$ number of recently-moved households eligible for FHA-insured mortgages under current FHA underwriting constraints (in thousands),

$UNEMPLOY_t \equiv$ unemployment rate at time t,

$USERCOST_t \equiv$ the after-tax cost of capital for homeowners at time t, and

$RATECHNG_t \equiv$ the ratio of 30-year mortgage interest rate at time t over the average of the previous four periods.

Results

Variables used in the purchase originations and refinance originations models were taken from the Bureau of Economic Analysis, the AHS, the SIPP, the SMLA, and the National Association of Realtors existing home sales data series. The dollar volume of purchase and refinance originations were calculated from the total originations volume obtained from SMLA and the shares of purchase originations obtained from the Mortgage Bankers' Association. The sample

data used for the regression contain 92 monthly observations spanning from March 1987 to December 1994.

The results of the purchase mortgage originations regression are reported in Exhibit F-1. The Durbin-Watson statistic for the model (92 observations and 11 regressors) was 0.743, indicating significant positive serial correlation. After correcting for the AR(1) error, all of the variables had the expected signs and the R^2 improved from 0.485 to 0.710. In the AR(1) model, the effects of per capita income, the season, and FHA eligible borrowers were positive; those of unemployment rate and user cost were negative. The most significant variables (in terms of t-values) in the purchase originations model appeared to be the seasonal dummy (spring and summer).

Exhibit F-1

Regression Results for Purchase Mortgage Originations Model (t-statistics are in parentheses)		
Variable	***OLS Estimates.***	***First-order Corrected Estimates***
Constant	-4.312 (-2.520)	-4.836 (-1.702)
PERINC	0.120 (0.429)	0.718 (0.943)
SPRSUM	0.125 (3.698)	0.137 (4.341)
FHAELIG	0.007 (0.674)	0.001 (0.077)
UNEMPLOY	0.022 (0.647)	-0.041 (-0.672)
USERCOST	-0.076 (-1.839)	-0.103 (-1.859)
R-square	0.485	0.710
Rho	N/A	0.706

B. Aggregate Refinance Volume Model

We would expect that the major factors influencing the value of refinance mortgage originations would be current and past interest rate levels, outstanding mortgage balances, house price levels,

and FHA streamline refinance (SR) program. These four factors and the variables constructed to capture their effects on refinancing are discussed below.

First, mortgage interest rate is probably the most important one among the four factors mentioned above. Lower current mortgage interest rates and higher past mortgage interest rates would be expected to increase current refinancing volume. When current mortgage interest rates fall below the contract interest rates on existing mortgages, and the potential interest cost savings exceeds the refinancing costs, borrowers can benefit from refinancing.

Second, we might expect the balance on the existing mortgages to be positively correlated with refinancing activities. To capture this relationship between outstanding balances and refinance volumes, we have defined the dependent variable in this model as the conditional refinancing rate, the refinancing dollar volume divided by the outstanding mortgage balance.

To capture the effects of mortgage interest rate decline on refinancing when the current mortgage interest rate is at the lowest level since origination, three variables defined as the product of mortgage balance and the dummies for mortgage rate changes were constructed (denoted as *DROP015*, *DROP1530*, and *DROPGT30*). The variable for mortgage interest rate declines between 0-15% is defined as

$$DROP015_t = \sum_{l=1}^{360} DUM015_{t-l,t} * DUMMIN_{t-l,t} * UNBAL_{t-l,t} \qquad (3)$$

where $DUM015_{t-l,t}$ is a dummy which equals 1 if $0 < (r_{t-l} - r_t)/r_t \le 0.15$, and zero otherwise ($r_t$ denotes the mortgage rate at time t); $DUMMIN_{t-l,t}$ is a dummy for the mortgages originated at time $t-l$ which equals 1 if r_t is the lowest rate since origination time, and zero otherwise; and $UNBAL_{t-l,t}$ is the outstanding balance at time t for mortgages originated at time $t-l$. The variables $DROP1530_{t-l,t}$ and $DROPGT30_{t-l,t}$ are defined similarly for mortgage rate declines between 15-30% and greater than 30% respectively.

When the current mortgage rate is not the lowest since origination, the effect of mortgage rate declines on refinance is expected to be smaller than the effect when the current is the lowest since origination. Three variables, $NMIN015_t$, $NMIN1530_t$, and $NMINGT30_t$, have been constructed to capture the burn-out effect. For interest rate declining between 0-15%, the variable is defined as

$$DROP015_t = \sum_{l=1}^{360} DUM015_{t-l,t} * (1 - DUMMIN_{t-l,t}) * UNBAL_{t-l,t} \qquad (4)$$

The timing of refinancing is determined by borrowers' expectation regarding future mortgage interest rate movements. In the refinance mortgage origination model, we have constructed two variables, $LAG3RATE_t$ and $LAG12RATE_t$, defined as the ratios of current rate to the average of the rates in the past three and twelve months, respectively. To the extent that mortgage rates exhibit positive serial correlation in the short term and negative serial correlation in the long run, we would expect both $LAG3RATE_t$ and $LAG12RATE_t$ to have a positive effect on refinancing, with the three-month rate change, $LAG3RATE_t$, having a stronger effect.

Third, higher levels of house price growth tend to be correlated with higher volumes of refinance mortgage originations for two reasons. First, higher growth will make it more likely that the average borrower will have experienced an increase in equity and will be eligible to refinance. Second, higher house price growth will enable eligible borrowers to obtain larger, cash-out refinances. An increase in the house price level is expected to have a positive effect on the level of refinancing activities. The detrended house price index used in the purchase origination model is included in the refinance model to capture this effect.

Fourth, FHA streamline refinance program, which allows borrowers to refinance their FHA-insured loans at low cost and with minimum paper work, is expected to have a positive effect on the volume of refinance. In order to capture the SR effect, we have included a dummy variable ($FHASRF91_t$) representing the years since 1991 when the program became active. The volume of FHA SR was near zero before 1991.

The specification of the purchase mortgage origination model is:

$$\begin{aligned} CREFRATE_t = {} & \beta_0 + \beta_1 DROP015_t + \beta_2 DROP1530_{t-1} + \beta_3 DROPGT30_t + \beta_4 NMIN015_t + \\ & \beta_5 NMIN1530_t + \beta_6 NMINGT30_t + \beta_7 FHASRF91_t + \beta_8 LAG3RATE_t + \\ & \beta_9 LAG12RATE_t + \beta_{10} DETRHPI_t + \epsilon_t \end{aligned} \quad (5)$$

where $CREFRATE_t$ is the conditional refinancing rate calculated as refinance volume divided by mortgage balance,

Results

The results of the Aggregate Refinance Model are presented in Exhibit F-2. There were significant differences between the coefficients and the R^2 estimated based on the model with assumed independent identical distributed (i.i.d.) errors and those estimated based on the model assuming first-order autocorrelated (AR(1)) errors. This was because of the high autocorrelation in the disturbances, which was estimated to be 0.954. While all the explanatory variables were

significant in the i.i.d. error model, only *DROP1530*, *NMIN015*, and *LAG3RATE* were significant at the 5% level in the AR(1) error model. The R^2 increased from 0.642 in the i.i.d. error model to 0.936 in the AR(1) model. The difference between the i.i.d. model and the AR(1) model can be attributed to the fact that the mortgage interest rates move only slightly in a short period of time. Thus, for short-term forecasting when the mortgage interest rates are expected to remain around the current level, we would like to use the AR(1) model. However, when interest rates are projected to experience wide fluctuations in the future, we would prefer to use the i.i.d. model. The prediction power of the AR(1) error component, which depends on the current error, decreases exponentially with time; therefore we would also use the i.i.d. model for long-term forecasting..

The coefficients of *LAG3RATE* in both the i.i.d. error model and the AR(1) error model all had the expected signs. The coefficient was positive and significant, indicating that borrowers are more likely to refinance after a short-term rate rise.

Exhibit F-2

Regression Results for Refinance Mortgage Originations Model (t-statistics are in parentheses)		
Variable	*Initial Maximum Likelihood Estimates.*	*First-order Corrected Estimates*
Constant	-0.123 (-5.988)	-0.033 (-1.568)
DROP015	0.009 (2.470)	0.0025 (1.125)
DROP1530	0.0234 (4.750)	0.0099 (2.504)
DROPGT30	0.034 (5.401)	0.0084 (1.408)
NMIN015	0.012 (3.338)	0.0050 (2.193)
NMIN1530	0.020 (3.888)	0.0059 (1.491)
NMINGT30	0.030 (3.944)	0.0110 (1.756)
FHASRF91	0.0046 (3.622)	0.0011 (1.108)
LAG3RATE	0.033 (3.706)	0.0139 (2.756)
LAG12RATE	0.029 (2.445)	0.0065 (0.591)
DETRHPI	0.045 (4.212)	0.0118 (0.796)
R-square	0.642	0.936
Rho	N/A	0.954

VI. Purchase Mortgage Origination Module

This section describes the five choice models associated with the Purchase Mortgage Origination Module. These models include the following:

- housing demand
- LTV and Loan Size Choice
- mortgage insurance choice
- mortgage product choice

Each of these will be discussed in order below.

A. Housing Demand

One of the most fundamental components of the demand for FHA insurance is the demand for housing. However, estimating the demand for housing is problematic because many households presumably decide to rent or buy a less desirable house than they would prefer due to income, wealth, or credit constraints. Thus, housing demand is interrelated with the tenure choice decision--the decision regarding whether to rent or buy. Consequently, any attempt to model the relationship between personal and financial characteristics and the demand for FHA insurance must also consider how these characteristics affect the tenure choice decision.

The specification of the housing demand model involves estimating the purchase value a household would choose in the absence of underwriting constraints. This purchase price may be referred to as the optimal or unconstrained house value. Since this value is not observable for constrained households, which are forced to rent or to buy a smaller house than would be preferred, it is estimated using data for households that are identified as unconstrained by conventional underwriting criteria. For these households, we may presume that the desired level of housing has been chosen independently of any external constraints.

The data used for the statistical analysis were the households in the AHS/SIPP linked data file that moved into owner-occupied houses within two years of the survey. The AHS is the primary data source with the linked SIPP supplementing households' wealth data. The AHS data used includes the 1985, 1987, 1991, and 1993 surveys. An OLS regression, in which housing demand is explained by user cost, income, wealth, marital status, age, and education level, was performed separately for previous homeowners and previous renters. An OLS regression was also performed on the two subsets together and the resulting signs and t-statistics were similar. The regression results indicated that while user cost had a negative effect on the demand for housing, marriage, wealth, income, age, and education all had positive relationships with the optimal house value a borrower is able to purchase.

B. *LTV and Loan Size Choice*

In modeling the demand for FHA-insurance, a key task is to explain the house price and LTV choices among borrowers. These two choices, which may be viewed as outcomes of the demand for housing and the demand for mortgage debt respectively, are interrelated and simultaneous with the mortgage insurance and mortgage product choices. They are particularly important for estimating future demand for FHA insurance, as borrowers who obtain relatively small loans with high-LTV ratios are significantly more likely to obtain FHA insurance than other borrowers. This is the result of FHA's restrictive loan size limits and lenient downpayment requirements. Thus, it will be important for the loan size and LTV choice models to accurately capture the same financial and economic policy variables that are expected to influence mortgage product and insurance choice.

Determinants of Loan Size and LTV Choice

Although from FHA's perspective loan size and LTV choices are both important, most borrowers may be viewed as choosing house size first, and LTV (or loan size) second. This is because borrowers may be presumed to gain utility from housing consumption and not from mortgage debt. Thus, the demand for mortgage debt is a consequence of the demand for housing. According to economic theory, a borrower attempts to choose his or her housing consumption such that the marginal utility from additional housing consumption equals the marginal utility from all other goods, subject to the underwriting constraints imposed by lenders regarding accumulated wealth, income, and credit history. In other words, the individual household's preference for a particular house size will affect the amount of leverage the household is willing to assume to offset the limitations of its income and wealth. This implies that borrowers who are constrained in their housing consumption choice by underwriting standards will act differently than borrowers who are not constrained. Unconstrained borrowers will choose their LTV in accordance with their preferences for risk and asset liquidity and the after-tax cost of mortgage debt. Constrained borrowers, however, will be more likely to choose an LTV that enables them either to increase the house size they can afford or to decrease the cost of financing a house.

For the LTV choice estimation, we have constructed a variable, *MAXLTV*, defined as the LTV that a constrained borrower chooses in order to maximize housing consumption. This variable is likely to be positively correlated with a borrower's chosen LTV.

In addition to maximum LTV, income, and wealth, determinants of LTV choice should include mortgage interest rates, measures of household risk and liquidity preferences, demographic characteristics, and measures of the marginal cost of mortgage capital. The reason mortgage interest rates are expected to influence LTV choice is because they increase a borrower's cost of

debt, and will therefore reduce the amount of debt that the borrower is willing to incur. Moreover, higher mortgage interest rates may have negative effects on the demand for housing. By affecting both the demand for debt and for housing, the mortgage interest rate is expected to be negatively correlated with LTV choice. The marginal cost variables refer to the insurance costs associated with obtaining a higher LTV loan. These variables have been designed to capture the marginal increase in the borrowing costs associated with mortgage insurance premiums.

Loan Size Choice

Once house price and LTV are obtained for a given borrower, we know the resulting loan size because loan size is the product of house price and the LTV ratio. However, in order to obtain house price we have to use the results of the mortgage product and insurance decisions. For a given borrower, we determine the maximum house price obtainable based on the predicted LTV, mortgage product, mortgage insurance choices, and the borrowers' actual income and wealth. This determination also explicitly accounts for changes in the FHA loan size limit or other changes in FHA or conventional underwriting criteria. We then compare this maximum house price to the predicted housing demand for the borrower and assume that he or she obtains the lesser of the two potential house prices. From this constrained housing demand, we obtain the loan size by multiplying by the predicted LTV ratio.

A Sequential Binomial Logit Model of LTV Choice

A borrower's LTV choice is analyzed with a sequence of binomial logit (BNL) models, in which the dependent variable takes the value of zero or one, depending on whether the chosen LTV is above or below a critical value. The critical values increase from 80 percent to 95 percent, and the data is censored with each iteration, thereby sorting the population into each LTV category in ascending order. Specifically, the first estimation is performed using all observations with a critical value of 80 percent. The second estimation, which is performed only on observations with LTV ratios above 80 percent, has a critical value of 90 percent. The third estimation, which is only performed on observations with LTV ratios above 90 percent, has a critical value above 95 percent. This process enables us to assign all observations into one of four LTV categories.

Specification of the Explanatory Variables

To estimate a borrower's LTV choice taking into account FHA policy variables, economic, and demographic variables, we employ the following model specification:

$$X_i\beta_y = \alpha + \beta_1(IPDIF_{yi}) + \beta_2 INCRATIO_i + \beta_3 WLTHRATIO_i + \beta_4 MAXLTVDM_{yi} + \beta_5 FRMRATE_i + \beta_6 EDUDUM_i + \beta_7 LNAGE_i + \beta_8 FRSTHO_i + \beta_9 CHILD_i + \beta_{10} MARDUM_i + \beta_{11} DUM86 + \epsilon_{y,i} \quad (6)$$

$IPDIF_{yi}$ ≡ the difference between the weighted averages of the present values of the FHA and PMI insurance premiums for the LTV categories just above and just below the critical value y, given historical averages for the proportion of FHA and PMI market share,

$INCRATIO_i$ ≡ household income divided by the constrained housing demand,

$WLTHRATIO_i$ ≡ household wealth divided by the constrained housing demand ,

$MAXLTVDM_{yi}$ ≡ dummy variable that equals one if $MAXLTV_i > y$, and 0 otherwise, where y is the critical LTV value for the dependent variable,

$FRMRATE_i$ ≡ the FRM mortgage rate,

$EDUDM_i$ ≡ dummy variable for college education,

$LNAGE_i$ ≡ log of age of borrower I,

$FRSTHO_i$ ≡ dummy variable for first time homeowner,

$CHILD_i$ ≡ number of children,

$MARDM_i$ ≡ dummy variable for marital status, and

$DUM86$ ≡ dummy variable for mortgages originated after 1986.

The premium variables and the constraint variables are the key FHA policy variables in the LTV model. The former will be affected directly by changes in FHA's premiums, while the latter will be affected by changes in the PTI ratios. An increase in the maximum PTI ratio will enable income-constrained borrowers to obtain larger mortgages and thereby have higher LTVs. An increase in the maximum allowable LTV for FHA loans will have stronger impacts on those borrowers who chose an LTV equal to or close to the maximum allowable LTV. The *DUM86* variable is designed to capture the effect of the 1986 tax reform that eliminated the tax

deductibility of nonmortgage consumer debt; *DUM86* measures whether demand for mortgage debt increased due to this tax change.

Model Results

The primary source of data for the LTV and mortgage type choices estimation is the AHS for the survey years of 1985, 1987, 1991 and 1993. Due to the lack of wealth information in the AHS data, it is supplemented with the wealth data from the linking SIPP. The mortgage borrowers selected from AHS/SIPP linked data were those who moved within the last two years of the survey. After screening for appropriate observations, the data sample used for estimation consists of 5509 observations, of which 1240 were FHA FRMs, 129 were FHA ARMs, 3417 were conventional FRMs, and 733 were conventional ARMs. As for LTV ratio breakdown, 1703 were mortgages with LTV ratios lower than 80%, 1278 with LTV ratios between 80% and 90%, 1067 with LTV ratios between 90% and 95%, and 1461 with LTV ratios higher than 95%.

The insurance premium incurred for a mortgage varies with its LTV ratio, insurance status, and interest rate risk profile. The insurance premium variable used in the LTV regression was calculated by taking the weighted average of the premiums for FHA mortgages and conventional FRMs and ARMs. For the mortgage insurance and product choices regression, the premium variable was the weighted average of the premiums across different LTV categories.

The empirical results for the sequential BNL models are reported in Exhibit F-3. The likelihood ratio Chi-squares for the three sequential models were all significant indicating the model fit the data well. For LTV below 95%, higher insurance premiums had a negative effect on the mortgage choice in high-LTV categories. However, for the LTV choice between 90-95% and over 95%, the estimated coefficient of the insurance premium did not have the expected sign. This was probably caused by the little variation in the difference of the premiums between these two LTV categories. During the sample period, the PMI premium for LTV 90-95% were the same as that for LTV above 95%, and there was no difference for FHA premiums between these two LTV categories except in 1992 and 1993.

An increase in *INCRATIO* increases the probability that a borrower will choose a high-LTV mortgage, and the effect decreases as LTV increases. The wealth ratio, *WLTHRATIO* should lower the probability that a borrower chooses a high-LTV mortgage, although the model estimates were mixed and insignificant. This result was likely due to the error contained in the linked wealth data (see Section III for a description of the problems with wealth data).

The effects of *MAXLTV* on the LTV choice were consistent with the economic theories discussed above, and were significant in some of the models, although not in all of the models. Education and first-time homeownership were significant in all three models. Both the effects of education

and first home ownership were significant in all the three models. Borrowers with higher education tend to choose lower LTVs, and first-time homeowners tend to obtain higher LTV loans. Within the category of loans with LTV below 90 percent, older borrowers are more inclined to choose loans with lower LTV. However, for loans with LTV above 90 percent, they are more inclined to choose loans with higher LTVs. Age is positively correlated with wealth and the demand for housing. For the lower LTV borrowers, the effect of wealth outweighs that of the housing demand. However, for the higher LTV borrowers, the relationship between age and wealth is weak, and the demand for housing has a greater effect on LTV choice than wealth does. The results also show that married borrowers are more likely to choose lower LTV loans than the single borrowers do; and borrowers with more children are more likely to choose higher LTV loans.

Exhibit F-3

Log of Likelihood Ratio Estimates for Sequential LTV Choice Models (t-statistics in parentheses)			
Model Estimates	***LTV<80 / LTV>80***	***LTV<90 / LTV>90)***	***LTV<95 / LTV>95***
Constant	-5.24601 (-6.89)	-2.35634 (-2.76)	1.22644 (1.28)
IPDIF	0.50748 (2.99)	0.11450 (0.55)	-0.71214 (-0.66)
INCRATIO	-0.45252 (-12.07)	-0.18755 (-4.84)	-0.05782 (-1.33)
WLTHRATIO	-0.01524 (-0.69)	0.02543 (1.22)	-0.03715 (-1.21)
MAXLTVDM	-0.15999 (-2.31)	-0.03783 (-0.45)	-0.23089 (-2.09)
FRMRATE	3.16649 (1.05)	4.20363 (1.09)	-2.04977 (-0.43)
EDUDUM	0.24710 (3.89)	0.30272 (4.16)	0.40416 (4.79)
LNAGE	1.16820 (8.49)	0.40947 (2.47)	-0.30431 (-1.54)
FRSTHO	-0.22604 (-3.22)	-0.27979 (-3.41)	-0.29638 (-3.04)
MARDM	0.05478 (0.79)	0.08981 (1.11)	0.21796 (2.27)
CHILD	-0.06791 (-2.33)	-0.13632 (-4.00)	-0.06466 (-1.68)
DUM86	-0.25961 (-2.57)	0.10284 (0.94)	-0.21433 (-1.62)

C. *Mortgage Insurance Choice*

The estimation of borrowers' mortgage insurance choice (FHA versus conventional) and mortgage product choice (FRM versus ARM) is a fundamental component of the Demand Analysis Model (DAM). Given aggregate mortgage demand, the mortgage choice model will

provide estimates of future total purchase origination volumes that are either FHA-insured FRMs or ARMs.

A borrower's mortgage insurance and product choices are simultaneous and interrelated; thus we have combined these two decisions in one model. While the determinants of these two choices are not the same, as discussed below, the estimation of the mortgage product choice cannot be viewed independently of the mortgage insurance choice because the FRM/ARM choice probabilities may be systematically different for FHA borrowers and for conventional borrowers. This is evidenced by the fact that, historically, the ARM share in the FHA business has been much lower than that in the conventional mortgages. Thus, we cannot view a borrower's mortgage product choice without considering the outcome of his or her mortgage insurance choice.

Determinants of Mortgage Insurance Choice

A borrower's decision to obtain an FHA-insured versus an insured or uninsured conventional mortgage depends on the relative cost of different types of mortgages and mortgage insurance, the underwriting criteria of FHA and private insurers, and the characteristics of the borrower.

The difference between FHA and PMI insurance premiums (the FHA-PMI differential) is expected to have a negative effect on FHA's market share. Furthermore, the effects of FHA insurance premiums are likely to differ depending on the desired LTV of the mortgage. In order to construct a premium price variable that allows for comparisons between FHA and PMI insurance, we calculate the present value of the expected premium payments for FHA, PMI FRMs (PMIFRM), PMI ARMs (PMIARM), and for different LTV categories based on the premium structure, the historic prepayment rates, and the prevailing mortgage rate. The premium rates for PMIs are obtained by taking the weighted average of PMIFRM and PMIARM premiums using past mortgage volumes as weights.

Mortgage underwriting criteria are different for PMI and FHA loans, and therefore they affect borrowers' insurance choices. These underwriting criteria include the minimum downpayment, or maximum loan-to-value (LTV) ratio; the maximum payment-to-income (PTI) ratio and debt-to-income ratio (DTI); and the FHA loan limit. The greater constraint a borrower faces under PMI or FHA underwriting criteria, the less likely the borrower will choose a PMI or FHA loan. To capture the effects of PTI and LTV ratio requirements, we have created FHA and PMI constraint variables to measure the extent that a borrower's desired housing exceeds the maximum housing obtainable under the FHA and PMI underwriting criteria.

Other factors that affect borrowers' mortgage insurance include housing market conditions, income, wealth, and demographic variables. When house prices are higher, an average borrower is more likely to be constrained and will have a higher probability of choosing an FHA loan.

Borrowers with lower income and wealth are more likely to be constrained by conventional underwriting criteria, and may be more likely to have poor credit histories; therefore they have a higher likelihood of choosing FHA loans.

D. Mortgage Product Choice

A borrower's decision whether to choose an FRM or an ARM mortgage is determined by the FRM-ARM rate differential, the mortgage interest rate level, the level of house prices, the loan sizes and borrower characteristics. The higher the FRM-ARM rate differential and mortgage interest rate level, the more likely that a borrower will choose an ARM over an FRM.

The borrower characteristics that most influence mortgage product choice are income and wealth. We might expect that if housing demand were held constant, borrowers with higher income and wealth would be relatively insensitive to interest rate risk, and more inclined to choose ARMs. Other factors that increase the risk aversion of borrowers will decrease the likelihood that they opt for ARM loans. For example, married couples are regarded as more risk-averse than single borrowers and are thus expected to obtain ARMs less likely. Similarly, older households are likely to be more risk averse and less mobile than younger households, and thus will have lower likelihoods of choosing ARM loans. Finally, borrowers with more years of education are more likely to have higher future income growth, and thus are more likely to choose ARMs.

Specification of the Explanatory Variables

A borrower's mortgage insurance and mortgage product choices are analyzed with a multinomial logit (MNL) model. The dependent variable in this model takes four discrete values with each value associated with one response; i.e., (FHA, FRM), (FHA, ARM), (CON, FRM), and (CON, ARM), where CON denotes a conventional mortgage.

The explanatory variables x_i for the MNL model are specified as:

$$\begin{aligned}\beta_j' x_i = {} & \beta_{j0} + \beta_{j1} IPDIF_i + \beta_{j2} DFINCOME_i + \beta_{j3} DFWEALTH_i + \beta_{j4} HIGHCOST_i + \\ & \beta_{j5} PMICNSTR_i + \beta_{j6} FHACNSTR_i + \beta_{j7} HPINDEX_i + \beta_{j8} FRMRATE_i + \\ & \beta_{j9} RATESPRD + \beta_{j10} EDUDM_i + \beta_{j11} LNAGE_i + \beta_{j12} FRSTHO_i + \\ & \beta_{j13} MARDUM_i + \beta_{j14} CHILD_i\end{aligned} \tag{7}$$

where

$IPDIF_i$ ≡ FHA insurance premium minus PMI premium given borrower i's LTV choice,

$DFINCOME_i$ ≡ income deflated by house price index,

$DFWEALTH_i$ ≡ wealth deflated by house price index,

$HIGHCOST_i$ ≡ this variable takes a value of zero for all borrowers in non-high-cost areas where the FHA loan limit is below the maximum allowable for high-cost areas; and for borrowers in high-cost areas (areas at the maximum allowable FHA limit), this variable is defined as the ratio of the house price index over the FHA loan limit,

$PMICNSTR_i$ ≡ this variable takes a value of zero for all borrowers not constrained by PMI FRM underwriting criteria, and the difference between the desired housing and maximum housing obtainable for constrained borrowers,

$FHACNSTR_i$ ≡ this variable will take a value of zero for all borrowers not constrained by FHA FRM underwriting criteria. For constrained borrowers, this variable is defined as the difference between the desired housing and maximum housing obtainable,

$HPINDEX_i$ ≡ the detrended house price index,

$FRMRATE_i$ ≡ the FRM mortgage rate,

$RATESPRD_i$ ≡ the FRM-ARM rate spread,

$EDUDM_i$ ≡ dummy variable for college education,

$LNAGE_i$ ≡ log age of borrower I,

$FRSTHO_i$ ≡ dummy variable for first time homeowner,

$MARDUM_i$ ≡ dummy variable for marital status,

$CHILD_i$ ≡ number of children.

$FHACNSTR_i$ is a policy variable influenced by FHA's underwriting criteria. An increase in the maximum PTI ratio for FHA loans will decrease $FHACNSTR_i$ and will increase the FHA choice

probability. FHA choice probabilities are expected to be higher for households with higher $PMICNSTR_i$ because of the more lenient FHA requirements. First-time home buyers and younger borrowers are likely to be more income and wealth constrained than previous homeowners and older borrowers, and are more inclined to choose FHA loans.

Model Estimates

The mortgage insurance/product choice model is estimated for each of the four LTV categories (<80%, 80-90%, 90-95%, >95%). Estimating the choice model separately for each LTV category enables us to take into account the varying impacts of the explanatory variables in different LTV categories and to provide more accurate forecasting results. The empirical estimates of the choice model are presented in Exhibit F-4 through F-7. The figures shown in the Exhibits are the differences between a pair of choices. The log odds-ratio for a pair of choice for one observation can be obtained by taking the inner product of the explanatory variables and the estimates in the Exhibits. The estimates for *IPDIF* were mixed and insignificant, suggesting that, during the sample period, the mortgage insurance premium was not an important factor in determining borrowers' FHA/conventional choices. In general, *DFINCOME*, *FHACNSTR*, *LNAGE*, and *MARDUM* lower the probabilities of borrowers' FHA choices. The significantly positive coefficient of *FRSTHO* for the category with LTV greater than 95% was consistent with the fact that first-time homeowners taking out high LTV loans tend to be FHA borrowers. The positive coefficient for *HPINDEX* for the FHAFRM/CONFRM choice indicated that borrowers are less likely to qualify for conventional loans when house prices are higher. The *FRMRATE* coefficients for the FHAFRM/CONFRM choice were significantly negative when LTV>90%. This is because, in high interest rate environment, qualified borrowers tend to have relatively higher income and are more likely to choose conventional over FHA loans.

The most significant variables in the choice between the fixed and adjusted rate mortgages are FRM rate and the FRM-ARM rate spread. The FRM/ARM choices for FHA borrowers are less sensitive to mortgage rate level than to mortgage rate spread. The geographic variable, *HIGHCOST*, increases the probability of choosing ARM over FRM because borrowers in high cost areas need to take out larger loans and choosing ARMs will enable them to qualify for loans that they otherwise would not be able to obtain. Most of the demographic variables were insignificant in explaining the FRM/ARM choice, with the exception of *FRSTHO* for the LTV>95% category, which indicates that first-time homeowners are more likely to choose FRMs over ARMs.

Exhibit F-4

Mortgage Choice Model Estimates for Borrowers with LTV Below 80%

Variable	FHA FRM/ CON FRM	FHA FRM/ CON ARM	FHA ARM/ CON FRM	FHA ARM/ CON ARM	FHA FRM/ FHA ARM	CON FRM/ CON ARM
Constant	-3.360 (-0.46)	10.9 (1.3)	-19.2 (-1.08)	-4.938 (-0.27)	15.84 (0.84)	14.26 (2.84)
IPDIF	-0.193 (-0.64)	-0.215 (-0.63)	-0.387 (-0.58)	-0.408 (-0.59)	0.193 (0.27)	-0.022 (-0.11)
DFINCOME	-1.245 (-2.18)	-0.877 (-1.42)	-1.108 (-0.89)	-0.741 (-0.59)	-0.136 (-0.1)	0.368 (1.25)
DFWEALTH	-0.297 (-1.36)	-0.075 (-0.31)	0.187 (1.10)	0.409 (1.97)	-0.484 (-1.75)	0.221 (1.84)
HIGHCOST	0.157 (0.6)	-0.135 (-0.48)	0.596 (1.14)	0.311 (0.58)	-0.446 (-0.78)	-0.286 (-1.77)
PMICNSTR	-0.689 (-0.47)	0.802 (0.45)	-7.409 (-1.11)	-5.918 (-0.87)	6.72 (0.98)	1.491 (1.27)
FHACNSTR	-2.541 (-1.24)	-3.851 (-1.66)	9.282 (1.40)	7.792 (1.19)	-11.82 (-1.71)	-1.31 (-1.01)
HPINDEX	5.092 (0.76)	-6.59 (-0.86)	24.655 (1.51)	12.964 (0.77)	-19.56 (-1.12)	-11.68 (-2.57)
FRMRATE	-7.535 (-0.84)	-4.175 (-0.42)	-71.19 (-2.39)	-67.83 (-2.26)	63.654 (2.06)	3.36 (0.62)
RATESPRD	-17.67 (-0.8)	-60.35 (-2.34)	155.225 (2.67)	112.572 (1.89)	-172.9 (-2.81)	-42.67 (-2.65)
EDUDUM	-0.2482 (-1.17)	-0.309 (-1.28)	-0.051 (-0.1)	-0.112 (-0.22)	-0.197 (-0.37)	-0.061 (-0.43)
LNAGE	-0.515 (-1.15)	-0.657 (-1.32)	-1.359 (-1.30)	-1.502 (-1.41)	0.845 (0.75)	-0.142 (-0.52)
FRSTHO	0.416 (1.65)	0.563 (2.01)	0.55 (0.91)	0.697 (1.14)	-0.134 (-0.21)	0.148 (0.95)
MAR	-0.037 (-0.15)	0.024 (0.09)	-0.209 (-0.4)	-0.149 (-0.28)	0.173 (0.3)	0.060 (0.39)
CHILDDM	0.127 (1.31)	0.018 (0.17)	0.193 (0.97)	0.084 (0.41)	-0.066 (-0.3)	-0.108 (-1.76)

Note: The figures in this table are the differences between the coefficients of a pair of choices. The t-statistics are shown in parentheses.

Exhibit F-5

Mortgage Choice Model Estimates for Borrowers with LTV Between 80% and 90%

Variable	FHA FRM/ CON FRM	FHA FRM/ CON ARM	FHA ARM/ CON FRM	FHA ARM/ CON ARM	FHA FRM/ FHA ARM	CON FRM/ CON ARM
Constant	-2.706 (-0.51)	-0.232 (-0.03)	-4.465 (-0.31)	-1.991 (-0.13)	1.760 (0.12)	2.474 (0.49)
IPDIF	-0.182 (-0.98)	0.058 (0.25)	-0.170 (-0.36)	0.071 (0.14)	-0.013 (-0.03)	0.241 (1.38)
DFINCOME	-1.235 (-2.65)	-1.860 (-3.49)	-3.759 (-2.43)	-4.384 (-2.80)	-2.524 (1.59)	-0.625 (-1.82)
DFWEALTH	0.008 (0.2)	0.021 (0.41)	-0.025 (-0.07)	-0.012 (-0.03)	0.033 (0.09)	0.013 (0.35)
HIGHCOST	0.137 (0.62)	-0.444 (-1.74)	1.033 (2.12)	0.452 (0.90)	-0.896 (-1.74)	-0.580 (-3.12)
PMICNSTR	-1.613 (-1.18)	-1.655 (-0.96)	-1.878 (-0.53)	-1.921 (-0.52)	0.266 (0.07)	-0.043 (-0.03)
FHACNSTR	-0.8769 (-0.49)	0.5479 (0.24)	-2.989 (-0.53)	-1.564 (-0.27)	2.112 (0.36)	1.425 (0.89)
HPINDEX	0.053 (0.01)	1.579 (0.22)	-7.099 (-0.45)	-5.573 (-0.34)	7.152 (0.43)	1.526 (0.28)
FRMRATE	10.112 (1.07)	-15.37 (-1.33)	22.647 (0.9)	-2.847 (-0.11)	-12.53 (-0.48)	-25.49 (-2.95)
RATESPRD	6.768 (0.37)	-60.36 (-2.52)	86.373 (1.48)	19.242 (0.32)	-79.6 (-1.32)	-67.13 (-3.55)
EDUDUM	0.119 (0.65)	0.082 (0.36)	0.655 (1.27)	0.617 (1.16)	-0.536 (-1.0)	-0.038 (-0.22)
LNAGE	0.13 (0.33)	0.622 (1.24)	1.034 (1.09)	1.526 (1.53)	-0.904 (-0.91)	0.491 (1.27)
FRSTHO	-0.108 (-0.53)	0.155 (0.62)	1.013 (1.60)	1.275 (1.97)	-1.121 (-1.72)	0.2621 (1.40)
MARDUM	-0.103 (-0.5)	0.151 (0.6)	0.252 (0.49)	0.506 (0.94)	-0.355 (-0.66)	0.254 (1.31)
CHILDDM	0.082 (1.01)	-0.019 (-0.19)	-0.117 (-0.48)	-0.218 (-0.87)	0.199 (0.79)	-0.102 (-1.31)

Note: The figures in this table are the differences between the coefficients of a pair of choices. The t-statistics are shown in parentheses.

Exhibit F-6

Mortgage Choice Model Estimates for Borrowers with LTV Between 90% and 95%

Variable	FHA FRM/ CON FRM	FHA FRM/ CON ARM	FHA ARM/ CON FRM	FHA ARM/ CON ARM	FHA FRM/ FHA ARM	CON FRM/ CON ARM
Constant	-17.4 (-4.01)	-11.75 (-1.77)	20.59 (1.49)	26.24 (1.79)	-37.99 (-2.71)	5.561 (0.91)
IPDIF	0.116 (1.2)	0.099 (0.65)	-0.243 (-0.85)	-0.260 (-0.84)	0.359 (1.23)	-0.017 (-0.12)
DFINCOME	-0.420 (-1.08)	-1.636 (-2.92)	-0.102 (-0.08)	-1.318 (-0.99)	-0.318 (-0.25)	-1.216 (-2.39)
DFWEALTH	-0.041 (-0.41)	0.398 (1.8)	-0.556 (-1.1)	-0.118 (-0.22)	0.516 (1.01)	0.438 (2.07)
HIGHCOST	0.131 (0.62)	-0.094 (-0.31)	1.409 (2.93)	1.184 (2.25)	-1.278 (-2.59)	-0.225 (-0.81)
PMICNSTR	-2.653 (-2.31)	-1.716 (-0.96)	-0.727 (-0.29)	0.21 (0.07)	-1.926 (-0.74)	0.9369 (0.59)
FHACNSTR	-0.298 (-0.2)	7.086 (1.76)	-5.669 (-0.91)	1.715 (0.24)	5.371 (0.85)	7.384 (1.9)
HPINDEX	22.375 (4.64)	21.292 (2.91)	-19.19 (-1.23)	-20.27 (-1.23)	41.561 (2.62)	-1.085 (-0.16)
FRMRATE	-34.13 (-4.19)	-48.96 (-4.09)	15.164 (0.6)	0.330 (0.01)	-49.29 (-1.92)	-14.83 (-1.36)
RATESPRD	2.073 (0.12)	-23.1 (-0.83)	83.562 (1.34)	58.392 (0.88)	-81.49 (-1.29)	-25.17 (-0.94)
EDUDUM	-0.072 (-0.47)	-0.089 (-0.38)	0.2287 (0.51)	0.212 (0.440	-0.301 (-0.66)	-0.017 (-0.08)
LNAGE	-0.412 (-1.14)	-0.654 (-1.16)	-2.175 (-1.88)	-2.417 (-1.96)	1.763 (1.51)	-0.243 (-0.46)
FRSTHO	-0.038 (-0.22)	-0.054 (-0.21)	-0.709 (-1.52)	-0.725 (-1.44)	0.671 (1.41)	-0.017 (-0.07)
MARDUM	-0.347 (-1.94)	0.125 (0.46)	-0.480 (-1.0)	-0.007 (-0.01)	0.133 (0.27)	0.473 (1.83)
CHILDUM	-0.039 (-0.55)	-0.041 (-0.38)	-0.048 (-0.24)	-0.051 (-0.23)	0.01 (0.05)	-0.002 (-0.02)

Note: The figures in this table are the differences between the coefficients of a pair of choices. The t-statistics are shown in parentheses.

Exhibit F-7

Mortgage Choice Model Estimates for Borrowers with LTV Above 95%

Variable	FHA FRM/ CON FRM	FHA FRM/ CON ARM	FHA ARM/ CON FRM	FHA ARM/ CON ARM	FHA FRM/ FHA ARM	CON FRM/ CON ARM
Constant	-1.883 (-0.54)	7.668 (1.10)	7.329 (0.80)	16.88 (1.54)	-9.212 ((-1.01)	9.551 (1.38)
IPDIF	0.034 (0.51)	-0.302 (-2.13)	0.125 (0.78)	-0.211 (-1.03)	-0.091 (-0.57)	-0.336 (-2.38)
DFINCOME	0.186 (0.55)	0.523 (0.8)	-0.78 (-0.83)	-0.443 (-0.4)	0.965 (1.03)	0.337 (0.52)
DFWEALTH	0.028 (0.23)	-0.129 (-0.58)	0.285 (1.15)	0.128 (0.41)	-0.257 (-1.04)	-0.158 (-0.71)
HIGHCOST	0.223 (1.1)	-0.731 (-2.21)	-0.244 (-0.44)	-1.198 (-1.96)	0.467 (0.86)	-0.954 (-2.85)
PMICNSTR	-0.313 (-0.44)	-0.956 (-0.65)	-1.612 (-0.94)	-2.255 (-1.05)	1.299 (0.76)	-0.643 (-0.44)
FHACNSTR	-2.888 (-2.96)	0.727 (0.33)	-1.147 (-0.5)	2.469 (0.81)	-1.742 (-0.75)	3.616 (1.68)
HPINDEX	5.253 (1.38)	-4.457 (-0.59)	-3.59 (-0.36)	-13.3 (-1.11)	8.844 (0.89)	-9.711 (-1.3)
FRMRATE	-18.71 (-2.93)	-25.20 (-2.17)	-25.41 (-1.47)	-31.89 (-1.61)	6.694 (0.39)	-6.486 (-0.57)
RATESPRD	-22.59 (-1.67)	7.743 (0.26)	-13.89 (-0.38)	16.441 (0.36)	-8.694 (-0.24)	30.331 (1.03)
EDUDUM	0.511 (4.24)	0.049 (0.2)	0.541 (1.84)	0.079 (0.22)	-0.03 (-0.1)	-0.462 (-1.94)
LNAGE	-0.357 (-1.3)	0.198 (0.36)	-0.793 (-1.21)	-0.238 (-0.29)	0.436 (0.66)	0.555 (1.03)
FRSTHO	0.389 (2.72)	0.929 (3.5)	0.221 (0.62)	0.761 (1.8)	0.168 (0.47)	0.54 (2.07)
MARDUM	-0.365 (-2.59)	-0.5 (-1.73)	-0.803 (-2.54)	-0.938 (-2.32)	0.438 (1.4)	-0.136 (-0.47)
CHILDDM	0.019 (0.36)	0.085 (0.79)	-0.08 (-0.56)	-0.014 (-0.08)	0.099 (0.7)	0.066 (0.62)

Note: The figures in this table are the differences between the coefficients of a pair of choices. The t-statistics are shown in parentheses.

VII. Refinance Mortgage Origination Module (RMOM)

Projecting future demand for FHA-insurance will require forecasts of purchase mortgage originations as well as refinance mortgage originations. The decision to purchase a new home and the decision to refinance an existing property are sufficiently dissimilar as to require separate models. In this section, we discuss the determinants of refinancing activity, paying particular attention to the recapture rate, which is the incidence of those currently insured by FHA refinancing within the Mutual Mortgage Insurance (MMI) Fund as opposed to seeking conventional refinancing. We present the econometric specification of the RMOM, which is designed to estimate future recapture rates, and the results from the regression analysis.

Determinants of Refinancing Activity

Traditionally, homeowners' decisions about refinancing existing mortgage debt have been motivated by two major factors: lower mortgage interest rates and increased property values. Preliminary research has yielded promising results based on house price indices for new and existing homes and fixed-rate mortgage interest rates. In particular, we would expect the number of refinancings to increase as mortgage interest rates decrease and allow borrowers to take advantage of lower monthly payments. We would also expect the level of refinancing to increase as property values rise, since rising property values both increase a household's ability to qualify for a refinancing and expand the number of households that will pursue cash-out refinancings (or home equity loans). When analyzing homeowners with insured mortgages, additional factors must also be considered. For example, FHA's premium refund policy will obviously affect a borrower's decision to prepay and refinance.

We are concerned not only with overall refinancing activity within the MMI pool of mortgages, but particularly with those borrowers that stay within the Fund as opposed to those who seek refinancing in the conventional market. The decision to stay within the Fund will depend on two important factors: equity growth and the difference in costs between FHA and private mortgage insurance (PMI). As borrowers experience increases in equity level, their likelihood of refinancing with FHA decreases. More importantly, however, is the difference in premiums. Obviously, the more competitively priced FHA premiums are, the more likely borrowers are to stay within the MMI Fund.

Refinance Model Specification

The specification of our refinancing model employs a cell-based approach similar to that used in the existing models of claim and prepayment behavior used for the Actuarial Review. We define cells according to origination year, policy year of observation, and relative house price category. Separate equations have been estimated for each loan-to-value (LTV) category using ordinary

least squares techniques. Our specified model of refinancing activity follows, taking into account both the incentives to refinance and the decision to stay within the MMI Fund:

$$RECAPx_{y,t,l} = \sum_{l=1}^{n} \alpha P_{l,t} + \beta_1 NPVPREMx_{y,t} + \beta_2 CQHPI_{y,t} + \beta_3 HPDISP_t + \epsilon_{y,t} \quad (8)$$

where

$RECAPx_{y,t,l}$ ≡ the fraction of FHA-insured mortgages of LTV category x, of loan size category I, originated in fiscal year y, that refinance within the MMI Fund in policy year t,

$P_{l,t}$ ≡ n policy year dummy variables constructed so that $P_{l,t} = 1$ when policy year $(t) = l$ and $P_{l,t} = 0$ otherwise,

$NPVPREMx_{y,t}$ ≡ the net present value of premiums (including refunds and origination costs) expected to be paid on a conventional refinancing minus the net present value of premiums expected to be paid if one remained with FHA in policy year t a loan originated in fiscal year y of LTV category x,

$CQHPI_{y,t}$ ≡ the constant quality house price index in policy year t, indexed to its value in the base year y, and

$HPDISP_{y,t}$ ≡ house price dispersion index for loans originated in year y and observed in policy year t-1 (lagged one year).

Model Results

The expected effect of the policy year variable is that as a loan matures, the equity a borrower will have in his or her home will increase, thereby increasing the accessibility of a conventional loan and decreasing the recapture rate. We expect this trend to increase in the first few policy years, and then flatten out as time goes on. The policy year variable constructed above indicates that this is the likely effect of time on the recapture rate.

Since the net present value (NPV) of premiums is the NPV of premiums of refinancing conventionally minus the NPV of refinancing within FHA, we expect the recapture rate to

increase as this variable increases. As FHA decreases its premiums, the NPV of the premiums from refinancing with FHA decreases, causing the total NPV of premiums to increase (move closer to zero if negative), and the recapture rate to increase. The effect of the estimated net present value premium on recapture rates is as expected.

As the rate of house price growth increases, the equity accumulation a borrower experiences will increase. This will in turn increase a borrower's likelihood of qualifying for a conventional loan and leaving FHA. As the dispersion of house prices increases, the number of FHA homeowners who experience lower than average house price appreciation increases. These borrowers achieve less equity growth, and are therefore less likely to obtain a conventional loan and more likely to remain with FHA. Both variables were significant and moved in the expected direction. Exhibit F-8 provides a summary of the coefficients obtained in the regression analysis and the overall fit of the equations.

Exhibit F-8

Regression Results for Recapture Rate Model by LTV Category (t-statistics in parenthesis)

Variable	Unknown LTV	0-65%	65-80%	80-90%	90-93%	93-95%	95-97%	97-100%	Investor*
Constant	-0.486 (-0.430)	5.197 (4.614)	4.008 (3.805)	3.206 (3.409)	1.304 (1.304)	4.954 (4.959)	5.036 (5.143)	4.923 (5.564)	2.738 (3.553)
$P_{1,t}$	1.072 (2.962)	-1.147 (-3.070)	-0.806 (-2.332)	-0.632 (-2.063)	-0.004 (-0.012)	-0.844 (-2.633)	-1.140 (-3.613)	-1.110 (-3.820)	0.053 (0.198)
$P_{2,t}$	1.048 (3.023)	-0.463 (-1.331)	-0.604 (-1.892)	-0.552 (-1.925)	-0.254 (-0.852)	-1.026 (-3.374)	-1.058 (-3.533)	-0.769 (-2.826)	0.082 (0.345)
$P_{3,t}$	1.018 (3.049)	-0.735 (-2.192)	-0.955 (-3.100)	-0.880 (-3.186)	-0.392 (-1.366)	-1.061 (-3.629)	-1.131 (-3.930)	-0.808 (-3.089)	-0.113 (-0.498)
$P_{4,t}$	0.891 (2.771)	-0.863 (-2.699)	-1.025 (-3.470)	-1.067 (-4.027)	-0.591 (-2.149)	-1.257 (-4.84)	-1.318 (-4.778)	-1.037 (-4.152)	-0.257 (-1.181)
$P_{5,t}$	0.288 (0.921)	-0.733 (-2.370)	-0.875 (-3.154)	-1.023 (-4.084)	-0.500 (-1.920)	-1.059 (-4.006)	-1.146 (-4.421)	-1.082 (-4.543)	-0.262 (-1.255)
$P_{6,t}$	0.149 (0.532)	-0.828 (-3.038)	-0.932 (-3.740)	-1.157 (-5.175)	-0.614 (-2.643)	-1.096 (-4.633)	-1.105 (-4.726)	-0.968 (-4.568)	-0.130 (-0.709)
$P_{7,t}$	-0.872 (-3.504)	-0.717 (-2.972)	-0.605 (-2.733)	-0.842 (-4.240)	-0.475 (-2.303)	-0.863 (-4.113)	-0.834 (-4.038)	-0.735 (-3.921)	0.007 (0.038)
$P_{8,t}$	-0.594 (-2.815)	-0.742 (-3.499)	-0.624 (-3.236)	-0.750 (-4.329)	-0.427 (-2.370)	-0.737 (-4.032)	-0.695 (-3.863)	-0.637 (-3.893)	-0.680 (-0.480)
$P_{9,t}$	-0.097 (-0.537)	-0.570 (-3.146)	-0.478 (-2.910)	-0.586 (-3.966)	-0.225 (-1.454)	-0.447 (-2.873)	-0.562 (-3.622)	-0.328 (-2.347)	-0.086 (-0.706)
$P_{10,t}$	0.191 (1.167)	-0.244 (-1.465)	-0.101 (-0.672)	-0.344 (-2.584)	-0.076 (-0.534)	-0.231 (-1.626)	-0.138 (-1.005)	-0.124 (-0.988)	0.072 (0.661)
$NPVPREM_{y,t}$	0.0002 (3.740)	0.003 (6.554)	0.0003 (6.166)	0.0002 (5.099)	0.0001 (2.819)	0.0002 (5.332)	0.0001 (3.544)	0.0001 (1.939)	0.0001 (3.455)
$CQHPI_{y,t}$	-0.002 (-0.003)	-3.683 (-4.963)	-2.900 (-4.147)	-2.266 (-3.615)	-1.208 (-1.866)	-3.626 (-5.461)	-3.873 (-5.926)	-3.954 (-6.697)	-2.412 (-4.692)
$HPDISP_{y,t}$	1.339 (2.499)	0.621 (1.213)	0.783 (1.647)	0.105 (0.244)	1.111 (2.494)	1.063 (2.384)	0.753 (1.728)	0.368 (0.903)	0.543 (1.542)
Summary Regression Statistics									
Adjusted-R^2	0.468	0.317	0.161	0.182	0.093	0.192	0.173	0.289	0.420
F-statistic	26.206	13.246	6.799	7.880	4.127	8.236	7.422	13.459	22.872
D-W statistic	1.084	1.348	1.352	1.226	1.183	1.211	1.207	1.299	1.160

* Investor loans and loans with two or more dwelling units.

VIII. Forecasting Methodology and Results

In order to project future FHA-insured originations, a forecasting structure was constructed to accommodate changes in the underlying population. This structure is based on cells defined by economic and demographic factors (as opposed to actual micro data observations), where each cell is defined in such a way as to capture important differences between subpopulations. Each cell is intended to represent a group of homogenous individuals, all of whom are assumed to behave the same.

A further consideration in defining the cell structure was how to best capture the potential influence of exogenous factors that are likely to affect the future composition of FHA-insured mortgages. Factors are considered exogenous if they cannot be directly affected by policy decisions made by FHA. In order to develop an understanding of the effects of exogenous factors such as age and education, we have examined recent trends in the characteristics of homeowners and renters obtained from the AHS/SIPP linked data. We extracted all observations from the linked data of households that moved within the last two years in order to capture another exogenous variable, the mobility rate. These observations were separated into 1,200 categories according to wealth, income, marital status, age, education, living cost, and first time homeownership. For each cell, a weight representing the percentage of all new borrowers contained within a given cell was calculated by summing up all the weights of the observations in that cell. To obtain the representative purchase sample for the future years, the income and wealth levels in each cell were adjusted according to a house price index.

Once future purchase originations have been estimated from the AMOM, the origination volume will be divided into cells based on recent mobility rate trends. Thus, a percentage of the total originations will be assigned to each wealth, income, marital status, age, and level of education category. The origination volume in each of these cells will then be divided among the LTV, mortgage product, mortgage insurance, and relative house price categories, based on the projections made in the PMOM. This will enable the model to measure FHA's share in the mortgage lending market in terms of both mortgage and borrower characteristics.

Given the distribution of purchase originations across LTV, relative house price, mortgage product, and mortgage insurance for each cell, the distribution of the originations for a sub market can be obtained by adding up all the cells in that market. Thus the DAM model provides the purchase origination volume for each LTV, relative house price, and mortgage product category for FHA and for the conventional market as well.

Exhibit F-9

Projected FHA Purchase Volume and Market Share (Billions)

Year	FHA Purchase Originations	FHA Market Share	FHA's FRM Market Share	FHA's ARM Market Share
1995	39.32	8.24%	8.47%	7.69%
1996	45.03	8.87%	8.97%	8.61%
1997	38.66	7.07%	7.30%	6.51%
1998	38.53	6.86%	6.85%	6.88%
1999	39.48	6.92%	6.77%	7.33%
2000	43.37	7.02%	6.89%	7.39%

Note: FHA purchase originations exclude graduated payment mortgages. FHA market share is the percentage of FHA purchase originations to the total market originations. FHA's FRM (ARM) market share is the percentage of FHA FRM (ARM) originations to the total FRM (ARM) originations.

Exhibit F-9 displays FHA's purchase origination dollar volume and its market shares projected by the DAM. The market shares of FHA purchase originations in the FRM, ARM, and the entire market were generated by the PMOM, and the purchase originations were produced by multiplying FHA's market shares with the total purchase originations projected from the AMOM. The projections indicated that after the increase in 1996, FHA's purchase volume will decrease to $39 billion in 1997 and maintain at that level until 1999. The DAM projected FHA's purchase volume in 2000 to grow at 10% because of lower interest in that period. FHA's market share tends to increase when interest rate are low and mortgage lending is expanding. This is consistent with the fact that lower mortgage rates will enable low- and moderate income borrowers to qualify for loans and they are more likely to acquire FHA loans.

Exhibit F-10 displays the projections of FHA refinance volume and its share in the refinance market. The FHA refinance volumes were generated by using the prepayment model described in Appendix A to estimate prepayments and the RMOM to estimate FHA recapture rates. FHA's refinance volume reached an historical high of $30 billion in 1993 and 1994; then dropped to less than $2 billion in 1995. FHA's refinance volume was projected to be $6.75 billion in 1996 before dropping to around $3 billion from 1997 to 2000. Exhibit F-10 also indicates that FHA's refinance market share increases when refinancings are booming as was the case in 1993 and 1994, and as was forecasted for 1996.

Exhibit F-10

Projected FHA Refinance Volume and Market Share ($Billions)			
Fiscal Year	FHA Refinance Volume	Total Market Refinance	FHA's Refinance Market Share
1991	$0.77	$185.74	0.42%
1992	$6.59	$447.83	1.47%
1993	$30.36	$525.77	5.77%
1994	$31.21	$406.28	7.68%
1995	$1.59	$100.56	1.58%
1996	$6.75	$324.27	2.08%
1997	$3.16	$266.62	1.19%
1998	$2.60	$148.15	1.75%
1999	$3.45	$120.15	2.87%
2000	$3.56	$108.66	3.27%

1996 Actuarial Review
Projected MMI Fund Performance for FYs 1996 to 2000
($Millions)

Fiscal Year	Economic Value of the Fund	Capital Ratio	Volume of New Endorsements	Insurance in Force	Economic Value of New Book of Business	Interest on Fund Balances
1996	$9,397	2.54%	$58,863	$370,484	$1,377	n/a
1997	$10,670	2.80%	$41,210	$381,671	$990	$282
1998	$11,947	3.05%	$40,796	$392,076	$957	$320
1999	$13,306	3.31%	$42,082	$402,027	$1,001	$358
2000	$14,825	3.57%	$45,904	$414,734	$1,120	$399

1996 Actuarial Review
All Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 96	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1996	NPV of Final Cash Balance 1996 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1996 Dollars
1975	$4,690,049	$314,387	4%	71%	$1,139,028	$321,019	5%	$6,632
1976	$5,733,815	$369,738	5%	69%	$1,478,867	$379,927	5%	$10,189
1977	$7,176,389	$588,012	4%	63%	$2,266,307	$605,455	4%	$17,443
1978	$10,025,103	$661,144	6%	61%	$3,222,893	$691,039	6%	$29,895
1979	$15,657,126	$209,985	9%	62%	$4,323,289	$256,710	10%	$46,725
1980	$14,875,812	($1,147,686)	14%	67%	$2,581,110	($1,119,404)	15%	$28,282
1981	$10,269,001	($1,958,134)	19%	68%	$1,169,756	($1,951,620)	20%	$6,514
1982	$7,322,800	($1,589,075)	18%	72%	$641,313	($1,593,070)	19%	($3,995)
1983	$26,795,607	($2,790,922)	14%	74%	$2,788,584	($2,780,746)	15%	$10,176
1984	$15,921,794	($2,170,202)	17%	70%	$1,526,136	($2,215,279)	18%	($45,077)
1985	$24,047,176	($2,462,752)	15%	72%	$2,301,794	($2,513,150)	16%	($50,398)
1986	$57,515,839	($1,711,846)	11%	62%	$14,027,210	($1,899,561)	12%	($187,715)
1987	$69,943,517	$21,222	8%	52%	$26,546,190	($291,858)	9%	($313,080)
1988	$37,431,316	($238,425)	8%	60%	$10,374,144	($448,907)	11%	($210,483)
1989	$39,763,058	($102,055)	7%	63%	$10,301,010	($319,078)	9%	($217,023)
1990	$47,126,046	$66,330	6%	62%	$13,047,096	($233,355)	8%	($299,685)
1991	$44,066,667	$193,810	4%	59%	$14,699,797	($37,272)	6%	($231,082)
1992	$45,091,810	$1,573,176	3%	37%	$26,747,609	$1,482,860	5%	($90,316)
1993	$73,786,677	$2,333,297	1%	20%	$58,313,448	$2,124,353	5%	($208,945)
1994	$79,654,034	$2,508,882	1%	11%	$70,652,725	$2,092,801	6%	($416,081)
1995	$41,155,571	$1,064,211	0%	12%	$36,251,054	$929,944	6%	($134,267)
1996	$58,863,309	$1,435,120	0%	1%	$58,553,118	$1,376,684	7%	($58,436)
1997	$41,209,966	$0	0%	0%	$0	$989,955	6%	$989,955
1998	$40,796,382	$0	0%	0%	$0	$957,121	7%	$957,121
1999	$42,081,883	$0	0%	0%	$0	$1,000,552	7%	$1,000,552
2000	$45,904,455	$0	0%	0%	$0	$1,119,790	6%	$1,119,790

1996 Actuarial Review
30 Year Fixed Rate Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 96	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1996	NPV of Final Cash Balance 1996 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1996 Dollars
1975	$4,677,337	$314,387	4%	71%	$1,139,028	$321,019	5%	$6,632
1976	$5,721,491	$369,738	5%	69%	$1,478,867	$379,927	5%	$10,189
1977	$7,157,186	$586,824	4%	63%	$2,263,788	$604,246	4%	$17,422
1978	$8,632,516	$546,097	6%	60%	$2,867,821	$572,331	6%	$26,234
1979	$10,079,801	$74,268	10%	59%	$3,032,078	$105,789	10%	$31,520
1980	$9,717,259	($690,643)	14%	64%	$1,915,201	($671,142)	15%	$19,502
1981	$7,448,522	($1,348,072)	20%	65%	$953,805	($1,343,519)	21%	$4,553
1982	$5,650,311	($1,079,083)	18%	72%	$525,828	($1,082,353)	18%	($3,270)
1983	$21,916,308	($2,053,188)	14%	74%	$2,288,883	($2,044,646)	15%	$8,542
1984	$13,046,233	($1,630,334)	17%	70%	$1,255,578	($1,670,646)	19%	($40,312)
1985	$20,818,121	($2,151,451)	16%	72%	$1,889,197	($2,198,046)	17%	($46,595)
1986	$51,411,306	($1,653,033)	12%	62%	$12,454,079	($1,836,940)	13%	($183,907)
1987	$63,526,427	($26,239)	8%	52%	$24,060,148	($333,451)	10%	($307,212)
1988	$33,675,974	($232,762)	9%	61%	$8,965,083	($436,837)	11%	($204,074)
1989	$37,722,954	($75,808)	7%	63%	$9,581,431	($290,668)	9%	($214,860)
1990	$44,956,101	$90,867	6%	63%	$12,276,352	($206,558)	8%	($297,425)
1991	$39,500,549	$162,752	4%	60%	$12,560,387	($57,168)	6%	($219,920)
1992	$29,909,774	$1,103,749	3%	36%	$17,943,901	$1,051,697	5%	($52,052)
1993	$33,031,256	$1,244,308	1%	15%	$27,705,194	$1,407,829	4%	$163,521
1994	$33,449,079	$1,125,673	1%	8%	$30,509,085	$1,224,057	7%	$98,385
1995	$26,753,032	$696,916	0%	11%	$23,635,252	$619,788	6%	($77,128)
1996	$36,031,566	$856,728	0%	0%	$35,898,314	$990,359	7%	$133,631
1997	$27,298,170	$0	0%	0%	$0	$703,069	6%	$703,069
1998	$26,952,303	$0	0%	0%	$0	$672,380	7%	$672,380
1999	$27,479,244	$0	0%	0%	$0	$700,302	6%	$700,302
2000	$30,395,935	$0	0%	0%	$0	$793,484	6%	$793,484

1996 Actuarial Review
30 Year Streamline Refinancings
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 96	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1996	NPV of Final Cash Balance 1996 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1996 Dollars
1975	$0	$0	0%	0%	$0	$0	0%	$0
1976	$0	$0	0%	0%	$0	$0	0%	$0
1977	$0	$0	0%	0%	$0	$0	0%	$0
1978	$0	$0	0%	0%	$0	$0	0%	$0
1979	$0	$0	0%	0%	$0	$0	0%	$0
1980	$0	$0	0%	0%	$0	$0	0%	$0
1981	$0	$0	0%	0%	$0	$0	0%	$0
1982	$0	$0	0%	0%	$0	$0	0%	$0
1983	$0	$0	0%	0%	$0	$0	0%	$0
1984	$0	$0	0%	0%	$0	$0	0%	$0
1985	$0	$0	0%	0%	$0	$0	0%	$0
1986	$0	$0	0%	0%	$0	$0	0%	$0
1987	$0	$0	0%	0%	$0	$0	0%	$0
1988	$117,930	($4,842)	7%	74%	$19,706	($4,976)	7%	($134)
1989	$94,929	($4,898)	8%	67%	$18,015	($5,026)	8%	($127)
1990	$61,361	($2,271)	5%	62%	$15,083	($2,423)	6%	($153)
1991	$663,886	$4,450	3%	77%	$114,067	$3,092	4%	($1,357)
1992	$5,592,127	$87,253	2%	57%	$2,286,478	$50,574	3%	($36,679)
1993	$24,473,932	$633,784	1%	26%	$17,815,415	$270,054	6%	($363,730)
1994	$24,807,214	$787,006	1%	13%	$21,441,453	$306,616	7%	($480,390)
1995	$1,396,376	$40,047	0%	19%	$1,129,731	($265)	10%	($40,313)
1996	$7,815,628	$227,826	0%	2%	$7,647,264	$25,614	13%	($202,212)
1997	$2,145,452	$0	0%	0%	$0	($1,712)	12%	($1,712)
1998	$1,902,094	$0	0%	0%	$0	($4,297)	13%	($4,297)
1999	$2,189,583	$0	0%	0%	$0	($4,313)	13%	($4,313)
2000	$2,139,575	$0	0%	0%	$0	($4,367)	13%	($4,367)

1996 Actuarial Review
Adjustable Rate Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 96	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1996	NPV of Final Cash Balance 1996 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1996 Dollars
1975	$0	$0	0%	0%	$0	$0	0%	$0
1976	$0	$0	0%	0%	$0	$0	0%	$0
1977	$0	$0	0%	0%	$0	$0	0%	$0
1978	$0	$0	0%	0%	$0	$0	0%	$0
1979	$0	$0	0%	0%	$0	$0	0%	$0
1980	$0	$0	0%	0%	$0	$0	0%	$0
1981	$0	$0	0%	0%	$0	$0	0%	$0
1982	$0	$0	0%	0%	$0	$0	0%	$0
1983	$0	$0	0%	0%	$0	$0	0%	$0
1984	$1,236	$45	14%	78%	$79	$45	15%	($0)
1985	$34,030	($1,274)	19%	46%	$11,331	($1,312)	21%	($37)
1986	$425,515	($3,040)	13%	47%	$163,288	($3,611)	14%	($572)
1987	$1,073,636	$16,162	9%	45%	$482,033	$14,721	10%	($1,442)
1988	$1,878,056	$21,780	9%	46%	$820,160	$17,842	11%	($3,938)
1989	$606,113	$9,042	7%	46%	$275,552	$7,772	9%	($1,270)
1990	$376,658	$8,481	5%	42%	$203,034	$7,406	7%	($1,075)
1991	$1,955,896	$45,966	4%	32%	$1,275,384	$37,014	7%	($8,952)
1992	$7,348,236	$317,293	3%	28%	$5,133,217	$315,689	6%	($1,603)
1993	$8,817,417	$305,024	2%	21%	$6,813,934	$325,249	6%	$20,226
1994	$13,472,342	$432,015	1%	13%	$11,667,474	$440,584	6%	$8,569
1995	$12,040,354	$307,834	0%	12%	$10,605,496	$298,078	6%	($9,757)
1996	$12,978,541	$308,075	0%	1%	$12,978,540	$335,044	6%	$26,969
1997	$10,356,253	$0	0%	0%	$0	$267,186	6%	$267,186
1998	$10,587,634	$0	0%	0%	$0	$268,656	6%	$268,656
1999	$10,988,479	$0	0%	0%	$0	$281,142	6%	$281,142
2000	$11,845,291	$0	0%	0%	$0	$305,461	6%	$305,461

1996 Actuarial Review
15 Year Fixed Rate Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 96	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1996	NPV of Final Cash Balance 1996 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1996 Dollars
1975	$12,712	$0	0%	0%	$0	$0	10%	$0
1976	$12,324	$0	0%	0%	$0	$0	10%	$0
1977	$10,910	$0	0%	0%	$0	$0	6%	$0
1978	$8,654	$0	0%	0%	$0	$0	5%	$0
1979	$9,662	$0	0%	0%	$0	$0	9%	$0
1980	$14,667	$0	0%	0%	$0	$0	15%	$0
1981	$15,757	($3,189)	19%	77%	$0	($2,996)	19%	$193
1982	$26,255	($3,467)	12%	64%	$4,210	($3,467)	12%	$0
1983	$1,669,889	($22,335)	5%	77%	$240,237	($22,237)	5%	$98
1984	$892,522	($49,714)	7%	71%	$136,735	($49,824)	8%	($110)
1985	$1,757,276	($60,388)	6%	72%	$264,009	($60,692)	6%	($303)
1986	$4,769,690	$14,669	3%	67%	$1,247,922	$12,927	3%	($1,742)
1987	$4,638,352	$66,374	2%	57%	$1,769,884	$63,609	2%	($2,765)
1988	$1,379,386	$5,237	3%	57%	$474,872	$3,624	4%	($1,613)
1989	$1,000,001	$6,144	3%	57%	$334,526	$4,846	3%	($1,297)
1990	$1,257,529	$9,143	2%	57%	$435,229	$7,133	3%	($2,011)
1991	$1,353,149	$12,521	1%	52%	$545,822	$10,000	2%	($2,521)
1992	$1,067,940	$50,196	1%	34%	$668,540	$51,402	2%	$1,207
1993	$1,425,718	$29,762	1%	18%	$1,155,986	$26,197	1%	($3,565)
1994	$1,371,511	$26,621	0%	9%	$1,243,734	$20,172	2%	($6,449)
1995	$528,846	$10,226	0%	7%	$488,362	$6,997	2%	($3,229)
1996	$819,919	$15,875	0%	1%	$819,918	$10,740	2%	($5,135)
1997	$1,009,882	$0	0%	0%	$0	$16,350	2%	$16,350
1998	$997,087	$0	0%	0%	$0	$15,919	2%	$15,919
1999	$1,016,581	$0	0%	0%	$0	$18,565	2%	$18,565
2000	$1,124,483	$0	0%	0%	$0	$20,822	2%	$20,822

1996 Actuarial Review
15 Year Streamline Refinancings
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 96	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1996	NPV of Final Cash Balance 1996 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1996 Dollars
1975	$0	$0	0%	0%	$0	$0	0%	$0
1976	$0	$0	0%	0%	$0	$0	0%	$0
1977	$0	$0	0%	0%	$0	$0	0%	$0
1978	$0	$0	0%	0%	$0	$0	0%	$0
1979	$0	$0	0%	0%	$0	$0	0%	$0
1980	$0	$0	0%	0%	$0	$0	0%	$0
1981	$0	$0	0%	0%	$0	$0	0%	$0
1982	$0	$0	0%	0%	$0	$0	0%	$0
1983	$0	$0	0%	0%	$0	$0	0%	$0
1984	$0	$0	0%	0%	$0	$0	0%	$0
1985	$0	$0	0%	0%	$0	$0	0%	$0
1986	$0	$0	0%	0%	$0	$0	0%	$0
1987	$0	$0	0%	0%	$0	$0	0%	$0
1988	$9,359	($93)	2%	56%	$3,294	($100)	2%	($7)
1989	$5,170	($41)	1%	59%	$1,677	($46)	1%	($4)
1990	$5,064	($57)	1%	60%	$1,831	($63)	1%	($6)
1991	$110,692	$1,489	1%	58%	$41,907	$1,335	1%	($154)
1992	$1,001,232	$15,998	0%	38%	$607,760	$13,327	1%	($2,671)
1993	$5,925,479	$118,198	0%	20%	$4,722,763	$91,354	1%	($26,844)
1994	$6,468,944	$135,136	0%	12%	$5,710,044	$98,470	1%	($36,666)
1995	$383,243	$7,814	0%	10%	$342,604	$4,072	2%	($3,742)
1996	$1,196,057	$26,102	0%	1%	$1,187,482	$14,299	2%	($11,803)
1997	$378,609	$0	0%	0%	$0	$4,470	2%	$4,470
1998	$335,664	$0	0%	0%	$0	$3,885	3%	$3,885
1999	$386,397	$0	0%	0%	$0	$4,268	3%	$4,268
2000	$377,572	$0	0%	0%	$0	$3,789	3%	$3,789

1996 Actuarial Review
Graduated Payment Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 96	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1996	NPV of Final Cash Balance 1996 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1996 Dollars
1975	$0	$0	0%	0%	$0	$0	0%	$0
1976	$0	$0	0%	0%	$0	$0	0%	$0
1977	$8,293	$1,188	2%	68%	$2,520	$1,209	2%	$21
1978	$1,383,934	$115,047	5%	70%	$355,071	$118,709	5%	$3,662
1979	$5,567,663	$135,716	8%	69%	$1,291,211	$150,921	8%	$15,205
1980	$5,143,886	($457,043)	13%	74%	$665,908	($448,262)	14%	$8,781
1981	$2,804,722	($606,873)	17%	75%	$215,952	($605,104)	17%	$1,769
1982	$1,646,234	($506,525)	20%	73%	$111,275	($507,250)	21%	($725)
1983	$3,209,410	($715,399)	20%	72%	$259,464	($713,862)	21%	$1,537
1984	$1,981,804	($490,199)	21%	72%	$133,743	($494,855)	22%	($4,656)
1985	$1,437,748	($249,638)	17%	73%	$137,257	($253,101)	18%	($3,463)
1986	$909,327	($70,443)	14%	69%	$161,922	($71,936)	15%	($1,493)
1987	$705,102	($35,075)	12%	54%	$234,124	($36,737)	14%	($1,662)
1988	$370,610	($27,743)	16%	59%	$91,029	($28,460)	18%	($717)
1989	$333,891	($36,493)	19%	54%	$89,808	($35,956)	21%	$536
1990	$469,333	($39,833)	18%	57%	$115,566	($38,850)	20%	$983
1991	$482,496	($33,367)	14%	52%	$162,231	($31,545)	16%	$1,822
1992	$172,499	($1,312)	11%	27%	$107,713	$171	14%	$1,483
1993	$112,874	$2,220	6%	5%	$100,155	$3,668	10%	$1,448
1994	$84,944	$2,432	2%	3%	$80,934	$2,902	8%	$470
1995	$53,720	$1,373	0%	7%	$49,610	$1,275	7%	($98)
1996	$21,600	$515	0%	0%	$21,600	$629	7%	$114
1997	$21,600	$0	0%	0%	$0	$592	7%	$592
1998	$21,600	$0	0%	0%	$0	$577	7%	$577
1999	$21,600	$0	0%	0%	$0	$587	7%	$587
2000	$21,600	$0	0%	0%	$0	$601	6%	$601

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
All LTV Categories

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.06	0.11	0.05	0.03	0.03	0.03	0.10	0.15	0.02	0.04	0.03	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.02	0.02	0.02
2	0.79	0.94	0.52	0.44	0.49	0.80	1.59	2.32	0.56	1.19	0.98	0.50	0.40	0.46	0.39	0.34	0.36	0.24	0.17	0.19	0.21	0.24	0.22	0.22	0.21	0.21
3	1.17	1.01	0.66	0.61	0.94	1.43	3.58	4.49	1.71	3.12	3.49	1.87	1.14	1.26	1.22	1.17	1.22	0.84	0.61	0.62	0.85	0.67	0.65	0.68	0.66	0.68
4	0.91	0.77	0.47	0.56	0.83	1.74	3.30	5.21	2.31	4.98	6.07	2.33	1.37	1.66	1.71	1.73	1.93	1.31	0.87	1.01	1.07	0.90	0.94	1.00	1.02	1.04
5	0.62	0.47	0.36	0.45	0.92	1.55	3.39	5.57	3.33	6.71	5.48	2.16	1.40	1.89	1.94	2.28	2.33	1.30	0.80	0.94	1.05	0.93	0.98	1.09	1.08	1.07
6	0.39	0.33	0.28	0.51	0.82	1.55	3.21	6.36	4.70	5.86	4.18	1.99	1.39	1.89	2.43	2.42	2.03	0.96	0.60	0.78	0.93	0.83	0.90	0.97	0.93	0.89
7	0.29	0.28	0.30	0.42	0.82	1.52	3.88	6.27	4.07	4.11	3.54	1.79	1.29	2.19	2.58	2.06	1.47	0.77	0.51	0.70	0.84	0.78	0.83	0.88	0.82	0.75
8	0.21	0.29	0.24	0.43	0.84	1.65	4.38	4.24	2.85	3.19	3.15	1.66	1.40	2.31	2.25	1.88	1.21	0.63	0.43	0.62	0.77	0.70	0.72	0.74	0.67	0.60
9	0.27	0.26	0.26	0.43	0.97	2.27	3.24	2.84	2.43	2.84	3.06	1.81	1.38	1.99	1.78	1.64	1.09	0.61	0.41	0.62	0.77	0.68	0.69	0.68	0.60	0.55
10	0.22	0.21	0.26	0.48	1.19	1.92	2.56	2.17	2.19	2.44	2.88	1.86	1.22	1.71	1.55	1.45	1.01	0.58	0.42	0.62	0.75	0.65	0.64	0.62	0.56	0.53
11	0.22	0.23	0.29	0.64	1.07	1.57	2.06	1.84	1.91	2.38	2.67	1.56	0.82	1.43	1.32	1.28	0.92	0.55	0.40	0.56	0.68	0.57	0.55	0.54	0.50	0.47
12	0.19	0.24	0.39	0.62	0.91	1.35	1.72	1.41	1.66	1.93	1.97	1.27	0.73	1.24	1.22	1.22	0.99	0.66	0.53	0.65	0.76	0.62	0.63	0.64	0.61	0.58
13	0.21	0.34	0.39	0.55	0.82	1.17	1.49	1.32	1.57	1.67	2.05	1.12	0.65	1.16	1.16	1.20	0.99	0.64	0.50	0.60	0.69	0.58	0.59	0.61	0.57	0.55
14	0.26	0.34	0.38	0.49	0.70	1.12	1.33	1.05	1.09	2.22	1.67	0.89	0.53	0.91	0.93	0.96	0.80	0.51	0.39	0.45	0.54	0.45	0.47	0.48	0.45	0.44
15	0.27	0.34	0.32	0.39	0.60	1.02	1.24	0.73	1.31	1.97	1.48	0.79	0.48	0.84	0.88	0.89	0.72	0.45	0.35	0.40	0.48	0.41	0.42	0.43	0.41	0.40
16	0.26	0.26	0.29	0.34	0.56	0.88	0.80	1.95	1.16	1.74	1.37	0.72	0.44	0.79	0.82	0.80	0.64	0.40	0.31	0.36	0.44	0.37	0.38	0.39	0.37	0.36
17	0.22	0.26	0.24	0.31	0.50	0.59	1.16	1.68	1.03	1.58	1.27	0.67	0.41	0.73	0.74	0.70	0.56	0.36	0.29	0.32	0.40	0.33	0.35	0.35	0.34	0.33
18	0.22	0.25	0.19	0.25	0.38	0.65	1.01	1.45	0.95	1.47	1.19	0.63	0.38	0.65	0.65	0.61	0.50	0.33	0.26	0.29	0.36	0.30	0.32	0.32	0.31	0.30
19	0.19	0.20	0.18	0.21	0.42	0.58	0.90	1.29	0.88	1.38	1.11	0.58	0.34	0.57	0.57	0.54	0.45	0.30	0.24	0.27	0.33	0.28	0.29	0.29	0.28	0.27
20	0.15	0.18	0.15	0.30	0.37	0.52	0.81	1.16	0.83	1.29	1.03	0.53	0.30	0.50	0.51	0.48	0.41	0.28	0.22	0.24	0.31	0.25	0.26	0.27	0.26	0.25
21	0.15	0.11	0.23	0.27	0.33	0.48	0.74	1.06	0.79	1.20	0.95	0.47	0.26	0.44	0.47	0.44	0.38	0.26	0.21	0.22	0.29	0.23	0.24	0.25	0.24	0.23
22	0.07	0.24	0.21	0.25	0.31	0.44	0.68	0.98	0.74	1.10	0.87	0.41	0.23	0.40	0.43	0.40	0.35	0.24	0.20	0.20	0.26	0.21	0.23	0.23	0.22	0.21
23	0.24	0.22	0.20	0.23	0.29	0.42	0.63	0.88	0.68	1.00	0.79	0.37	0.21	0.36	0.39	0.36	0.32	0.23	0.18	0.19	0.24	0.20	0.21	0.21	0.21	0.20
24	0.23	0.21	0.20	0.22	0.27	0.39	0.59	0.79	0.62	0.90	0.71	0.34	0.19	0.32	0.36	0.33	0.30	0.22	0.18	0.17	0.22	0.18	0.20	0.20	0.19	0.19
25	0.22	0.20	0.19	0.21	0.25	0.36	0.53	0.69	0.57	0.81	0.66	0.30	0.17	0.29	0.33	0.30	0.28	0.20	0.17	0.16	0.21	0.17	0.18	0.18	0.18	0.18
26	0.21	0.20	0.19	0.20	0.24	0.34	0.48	0.60	0.52	0.75	0.61	0.28	0.15	0.26	0.31	0.28	0.26	0.19	0.17	0.15	0.20	0.16	0.17	0.17	0.17	0.17
27	0.20	0.19	0.18	0.19	0.22	0.31	0.44	0.53	0.48	0.68	0.57	0.26	0.14	0.24	0.28	0.26	0.24	0.19	0.17	0.14	0.19	0.15	0.16	0.16	0.17	0.16
28	0.19	0.19	0.18	0.18	0.21	0.28	0.40	0.46	0.45	0.59	0.53	0.23	0.12	0.22	0.26	0.24	0.23	0.18	0.17	0.13	0.18	0.14	0.15	0.15	0.16	0.15
29	0.19	0.19	0.18	0.17	0.19	0.26	0.37	0.40	0.42	0.54	0.49	0.22	0.11	0.20	0.25	0.22	0.22	0.17	0.17	0.12	0.17	0.13	0.15	0.15	0.15	0.15
30	0.19	0.19	0.17	0.17	0.18	0.24	0.34	0.35	0.39	0.49	0.42	0.20	0.10	0.18	0.24	0.21	0.21	0.17	0.17	0.12	0.17	0.12	0.14	0.14	0.15	0.14

= Actual Experience

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
ALL LTV Categories

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.06	0.11	0.05	0.03	0.03	0.03	0.10	0.15	0.02	0.04	0.03	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.02	0.02	0.02
2	0.84	1.05	0.56	0.47	0.51	0.83	1.69	2.45	0.58	1.23	1.01	0.51	0.41	0.47	0.40	0.35	0.37	0.25	0.18	0.19	0.21	0.25	0.24	0.24	0.23	0.22
3	1.98	2.01	1.20	1.06	1.44	2.23	5.19	6.04	2.26	4.26	4.06	2.29	1.53	1.70	1.58	1.49	1.51	1.02	0.76	0.78	0.97	0.89	0.87	0.90	0.86	0.88
4	2.79	2.67	1.62	1.59	2.24	3.90	8.07	9.62	4.44	8.05	7.95	4.41	2.83	3.25	3.15	2.98	2.83	2.01	1.55	1.71	1.86	1.73	1.73	1.82	1.79	1.82
5	3.28	3.03	1.93	2.00	3.11	5.33	10.79	12.79	6.96	11.58	10.88	6.26	4.11	4.91	4.64	4.34	3.91	2.93	2.23	2.52	2.65	2.54	2.54	2.73	2.68	2.72
6	3.57	3.28	2.17	2.46	3.88	6.72	13.13	15.15	9.44	14.11	12.60	7.86	5.32	6.30	5.93	5.33	4.77	3.52	2.67	3.14	3.26	3.21	3.22	3.47	3.38	3.40
7	3.77	3.48	2.42	2.84	4.62	8.03	15.31	16.72	11.26	15.62	14.19	9.19	6.33	7.44	6.89	6.08	5.29	3.95	3.01	3.66	3.75	3.78	3.78	4.08	3.95	3.93
8	3.91	3.69	2.61	3.22	5.37	9.44	17.15	17.59	12.38	16.62	15.23	10.22	7.20	8.31	7.64	6.67	5.65	4.25	3.26	4.08	4.14	4.26	4.23	4.55	4.36	4.30
9	4.09	3.86	2.82	3.58	6.17	10.90	18.32	18.11	13.21	17.40	15.99	11.03	7.86	8.98	8.15	7.10	5.92	4.49	3.46	4.47	4.48	4.68	4.60	4.93	4.68	4.61
10	4.22	4.00	3.01	3.98	7.08	12.02	19.14	18.46	13.85	17.93	16.51	11.64	8.40	9.48	8.54	7.43	6.12	4.69	3.64	4.82	4.76	5.05	4.92	5.25	4.96	4.88
11	4.36	4.14	3.21	4.43	7.85	12.88	19.74	18.73	14.29	18.35	16.88	12.10	8.72	9.86	8.83	7.69	6.28	4.86	3.79	5.12	5.00	5.34	5.17	5.51	5.18	5.09
12	4.47	4.29	3.47	4.85	8.46	13.53	20.20	18.93	14.63	18.62	17.12	12.43	8.99	10.16	9.06	7.91	6.43	5.03	3.96	5.45	5.23	5.65	5.43	5.79	5.43	5.33
13	4.58	4.47	3.71	5.20	8.97	14.05	20.54	19.09	14.85	18.84	17.34	12.68	9.21	10.42	9.27	8.09	6.57	5.18	4.11	5.73	5.43	5.91	5.66	6.03	5.64	5.54
14	4.71	4.65	3.93	5.50	9.38	14.48	20.80	19.21	14.99	19.09	17.50	12.86	9.38	10.60	9.41	8.23	6.66	5.29	4.21	5.93	5.57	6.10	5.83	6.21	5.80	5.69
15	4.84	4.81	4.10	5.72	9.70	14.81	21.01	19.29	15.15	19.29	17.62	13.01	9.52	10.76	9.53	8.34	6.73	5.38	4.29	6.09	5.68	6.26	5.97	6.35	5.93	5.82
16	4.96	4.93	4.25	5.90	9.96	15.04	21.14	19.49	15.27	19.45	17.72	13.12	9.64	10.89	9.64	8.44	6.79	5.44	4.35	6.23	5.78	6.40	6.08	6.48	6.03	5.92
17	5.06	5.04	4.37	6.05	10.15	15.18	21.31	19.63	15.37	19.58	17.80	13.22	9.74	11.01	9.72	8.51	6.84	5.50	4.40	6.35	5.86	6.51	6.18	6.58	6.12	6.01
18	5.14	5.14	4.45	6.15	10.28	15.32	21.44	19.73	15.45	19.70	17.87	13.30	9.83	11.11	9.79	8.57	6.88	5.55	4.45	6.45	5.93	6.61	6.26	6.67	6.20	6.08
19	5.21	5.22	4.52	6.23	10.41	15.44	21.55	19.80	15.53	19.79	17.93	13.37	9.91	11.19	9.85	8.62	6.91	5.59	4.48	6.53	5.98	6.69	6.33	6.74	6.26	6.14
20	5.26	5.27	4.57	6.33	10.52	15.54	21.64	19.86	15.59	19.88	17.98	13.43	9.97	11.26	9.90	8.66	6.94	5.62	4.51	6.61	6.03	6.76	6.39	6.81	6.31	6.20
21	5.31	5.31	4.64	6.42	10.62	15.63	21.72	19.91	15.65	19.96	18.03	13.48	10.02	11.31	9.94	8.70	6.96	5.65	4.54	6.67	6.07	6.82	6.44	6.86	6.36	6.24
22	5.33	5.37	4.71	6.49	10.70	15.70	21.79	19.96	15.69	20.02	18.07	13.52	10.06	11.36	9.98	8.73	6.98	5.67	4.56	6.72	6.11	6.88	6.48	6.91	6.39	6.28
23	5.39	5.42	4.76	6.56	10.77	15.77	21.85	19.99	15.74	20.08	18.10	13.55	10.10	11.40	10.01	8.76	7.00	5.69	4.58	6.77	6.14	6.92	6.52	6.95	6.43	6.31
24	5.44	5.47	4.81	6.61	10.83	15.83	21.91	20.02	15.78	20.13	18.13	13.58	10.13	11.44	10.04	8.78	7.01	5.71	4.59	6.81	6.17	6.96	6.55	6.98	6.46	6.34
25	5.48	5.51	4.85	6.66	10.88	15.89	21.96	20.05	15.81	20.17	18.15	13.60	10.16	11.47	10.06	8.80	7.03	5.73	4.60	6.85	6.19	6.99	6.58	7.01	6.48	6.36
26	5.53	5.55	4.89	6.71	10.93	15.94	22.00	20.07	15.84	20.21	18.18	13.62	10.18	11.50	10.08	8.82	7.04	5.74	4.62	6.88	6.21	7.02	6.61	7.04	6.50	6.38
27	5.56	5.58	4.92	6.75	10.97	15.98	22.04	20.09	15.86	20.25	18.20	13.64	10.20	11.52	10.10	8.83	7.05	5.75	4.63	6.90	6.23	7.05	6.63	7.06	6.52	6.40
28	5.59	5.61	4.95	6.78	11.01	16.02	22.07	20.10	15.89	20.28	18.22	13.66	10.22	11.54	10.12	8.85	7.06	5.76	4.63	6.93	6.25	7.07	6.65	7.08	6.54	6.42
29	5.62	5.64	4.98	6.82	11.04	16.05	22.10	20.11	15.91	20.30	18.23	13.67	10.23	11.56	10.13	8.86	7.07	5.77	4.64	6.95	6.26	7.09	6.66	7.10	6.55	6.43
30	5.65	5.66	5.00	6.84	11.07	16.08	22.12	20.13	15.93	20.33	18.25	13.68	10.25	11.58	10.15	8.87	7.07	5.78	4.65	6.97	6.28	7.11	6.68	7.11	6.57	6.44

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
All LTV Categories

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.20	0.28	0.36	0.35	0.29	0.36	0.17	0.35	0.28	0.21	0.29	0.51	0.26	0.37	0.45	0.38	0.37	0.36	0.63	0.30	1.73	0.37	0.34	0.32	0.36	0.36
2	1.88	3.40	3.25	2.46	0.82	0.92	0.42	17.40	0.92	1.41	11.18	3.72	1.02	1.50	2.01	2.06	5.46	7.27	4.02	1.97	9.10	1.77	2.36	2.46	2.68	2.83
3	6.76	8.39	6.18	2.05	0.68	0.35	7.09	9.34	2.19	18.63	23.33	2.67	1.74	3.06	4.12	9.71	25.91	16.62	3.92	5.86	6.25	3.93	5.39	5.35	6.16	5.54
4	9.97	8.98	3.53	1.32	0.36	1.76	4.75	12.29	17.62	25.72	10.59	3.18	2.85	4.60	14.94	29.44	29.83	9.30	6.80	4.85	7.98	5.50	7.03	7.38	7.07	6.46
5	8.96	4.73	1.82	0.75	1.42	2.03	6.02	28.99	26.75	11.31	8.50	4.47	3.42	14.29	28.60	29.35	7.82	10.43	9.76	5.73	10.54	6.73	9.29	7.88	7.94	7.71
6	4.48	2.41	0.79	1.99	1.64	2.65	19.37	26.16	10.80	9.17	10.33	5.49	8.49	26.87	27.66	8.25	12.52	10.53	10.01	6.18	10.95	7.20	8.33	7.26	7.77	7.68
7	2.35	1.00	2.69	2.07	2.04	9.20	21.55	11.71	8.43	9.92	12.38	14.40	19.65	26.14	8.19	12.18	15.80	12.54	12.66	7.46	13.49	7.98	9.23	8.79	9.68	9.64
8	1.15	3.25	2.76	2.40	4.81	14.11	9.78	8.24	9.74	10.50	21.57	26.40	21.02	7.85	11.04	13.71	16.09	14.68	14.71	8.44	13.22	8.35	9.94	9.59	10.69	10.63
9	3.30	3.34	3.15	5.28	7.58	7.23	7.23	6.58	11.71	16.18	23.09	25.36	6.48	10.62	12.12	11.60	15.02	13.41	14.12	7.11	10.72	7.27	8.65	8.38	9.33	9.42
10	3.37	3.59	5.79	7.66	5.49	5.86	7.08	5.98	19.26	17.40	22.67	7.54	9.48	8.15	10.20	10.72	13.65	13.11	12.58	6.34	9.47	6.70	7.97	7.70	8.74	8.78
11	3.59	6.09	7.65	5.63	5.17	6.57	7.32	7.23	19.11	18.53	8.41	10.39	6.53	7.19	9.68	9.93	12.98	11.17	11.13	5.85	8.54	6.26	7.37	7.20	8.12	8.18
12	5.89	7.89	5.73	5.17	5.52	7.27	11.02	7.45	19.37	7.56	8.51	10.77	6.62	7.64	9.95	10.48	11.69	10.34	10.50	5.76	8.25	6.19	7.27	7.02	7.88	7.91
13	7.72	5.86	5.23	5.41	5.29	13.66	12.75	7.54	7.64	7.67	11.85	9.84	6.60	7.21	9.54	8.91	10.05	9.51	10.03	5.54	7.68	6.01	6.97	6.73	7.58	7.64
14	5.75	5.33	5.47	5.28	6.79	16.09	13.27	3.83	8.45	9.10	10.77	10.27	6.90	7.46	8.71	8.31	9.73	9.44	10.29	5.71	7.81	6.20	7.15	6.92	7.83	7.97
15	5.23	5.47	5.23	7.29	13.78	16.66	6.30	3.69	8.70	7.83	9.96	10.01	6.97	6.57	7.72	7.69	9.18	9.23	10.25	5.77	7.63	6.24	7.15	6.95	7.94	8.03
16	5.40	5.31	7.04	10.50	15.21	7.59	6.40	17.72	7.76	7.07	8.98	9.82	6.37	5.85	7.07	7.20	8.72	8.96	10.36	5.80	7.46	6.28	7.17	7.02	7.98	8.06
17	5.48	7.30	9.51	12.49	7.64	8.63	7.46	14.93	7.41	6.53	8.52	8.93	5.96	5.45	6.63	6.85	8.28	8.83	10.27	5.77	7.29	6.28	7.24	7.02	7.95	7.93
18	7.45	10.04	10.93	7.30	9.00	5.62	6.40	12.59	6.82	5.87	7.06	8.05	5.64	5.05	6.16	6.41	7.92	8.59	10.22	5.77	7.14	6.35	7.25	6.99	7.85	7.84
19	9.90	10.91	7.25	8.63	6.39	5.17	5.73	10.48	6.25	4.84	5.94	7.44	5.37	4.70	5.71	6.10	7.49	8.36	10.17	5.79	7.07	6.37	7.21	6.89	7.76	7.85
20	10.99	7.45	8.25	6.93	6.14	4.91	5.09	8.73	5.37	4.04	5.14	6.93	5.15	4.37	5.38	5.76	7.12	8.15	10.15	5.83	6.94	6.38	7.07	6.80	7.76	7.84
21	9.38	9.63	8.70	6.83	6.03	4.65	4.49	6.84	4.67	3.47	4.52	6.49	4.92	4.12	5.04	5.45	6.78	7.98	10.20	5.83	6.78	6.32	6.98	6.79	7.75	7.84
22	8.00	8.21	8.65	6.88	6.01	4.43	3.90	5.67	4.25	3.12	4.10	6.16	4.80	3.92	4.79	5.22	6.55	7.91	10.16	5.83	6.55	6.26	6.96	6.76	7.73	7.83
23	7.43	8.08	8.73	6.95	5.80	3.98	3.34	4.64	3.83	2.75	3.66	5.85	4.63	3.69	4.51	4.99	6.33	7.75	10.10	5.77	6.35	6.27	6.94	6.75	7.71	7.88
24	7.35	8.07	8.89	6.84	5.45	3.62	2.94	3.86	3.48	2.44	3.30	5.55	4.47	3.50	4.29	4.81	6.09	7.59	9.94	5.72	6.24	6.28	6.92	6.74	7.76	7.93
25	7.34	8.14	8.80	6.59	5.17	3.36	2.62	3.27	3.20	2.21	3.01	5.28	4.33	3.34	4.11	4.61	5.87	7.37	9.81	5.72	6.14	6.28	6.90	6.76	7.79	7.97
26	7.43	8.00	8.56	6.39	4.97	3.15	2.38	2.82	2.98	2.02	2.77	5.05	4.21	3.21	3.93	4.45	5.64	7.19	9.78	5.72	6.06	6.28	6.91	6.77	7.81	7.99
27	7.31	7.79	8.37	6.27	4.84	3.01	2.22	2.54	2.82	1.89	2.61	4.90	4.15	3.11	3.81	4.30	5.46	7.11	9.76	5.71	6.00	6.31	6.92	6.78	7.82	8.00
28	7.13	7.59	8.25	6.17	4.71	2.87	2.07	2.27	2.67	1.73	2.46	4.76	4.05	3.01	3.66	4.16	5.34	7.03	9.74	5.71	5.98	6.34	6.93	6.79	7.83	8.01
29	6.99	7.47	8.18	6.10	4.62	2.78	1.96	2.08	2.55	1.64	2.35	4.63	3.98	2.91	3.55	4.07	5.25	6.96	9.71	5.73	5.96	6.35	6.93	6.79	7.83	8.02
30	6.90	7.39	8.10	6.04	4.55	2.70	1.87	1.95	2.48	1.57	2.23	4.54	3.91	2.84	3.49	4.01	5.18	6.92	9.71	5.73	5.94	6.36	6.92	6.78	7.81	8.00

= Actual Experience

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
All LTV Categories

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.20	0.28	0.36	0.35	0.29	0.36	0.17	0.35	0.28	0.21	0.29	0.51	0.26	0.37	0.45	0.38	0.37	0.36	0.63	0.30	1.73	0.37	0.34	0.32	0.36	0.36
2	2.08	3.66	3.59	2.80	1.11	1.28	0.59	17.66	1.20	1.61	11.44	4.21	1.27	1.87	2.46	2.43	5.81	7.60	4.63	2.27	10.67	2.13	2.68	2.77	3.03	3.18
3	8.64	11.85	9.52	4.78	1.78	1.81	7.52	25.12	3.35	19.71	31.87	6.76	2.99	4.86	8.46	11.88	30.12	22.92	8.36	7.98	16.24	5.97	7.92	7.96	8.99	8.53
4	17.55	19.40	12.67	6.02	2.13	3.31	11.67	33.58	19.98	39.26	38.65	9.65	5.70	9.15	20.20	37.38	50.51	27.71	14.54	12.41	22.85	11.10	14.33	14.69	15.36	14.38
5	24.69	23.09	14.23	6.71	3.49	5.19	16.50	50.04	40.20	45.22	43.19	13.49	8.83	21.67	42.12	54.89	54.16	35.04	22.73	17.33	30.78	16.96	22.13	21.27	21.93	20.84
6	27.91	24.87	14.90	8.53	5.02	7.56	30.58	59.76	45.90	49.18	47.94	17.89	16.22	41.40	56.84	58.25	59.41	41.58	30.24	22.28	38.07	22.76	28.40	26.78	27.79	26.71
7	29.52	25.59	17.13	10.38	6.88	15.45	42.71	62.70	49.67	52.83	52.80	28.59	31.64	55.07	59.89	62.68	65.07	48.46	38.73	27.85	45.99	28.67	34.71	32.91	34.45	33.44
8	30.29	27.90	19.35	12.45	11.13	26.24	46.81	64.40	53.48	56.14	59.92	45.01	44.68	58.01	63.56	66.97	69.84	55.45	47.30	33.63	52.63	34.31	40.82	38.96	41.04	40.10
9	32.46	30.18	21.81	16.91	17.47	30.89	49.42	65.58	57.48	60.55	65.66	56.36	47.80	61.59	67.05	70.03	73.52	60.85	54.28	38.06	57.26	38.78	45.57	43.69	46.13	45.34
10	34.60	32.55	26.18	23.00	21.65	34.30	51.70	66.56	63.12	64.39	69.82	58.82	52.00	63.99	69.58	72.48	76.33	65.40	59.60	41.70	60.89	42.56	49.54	47.64	50.43	49.74
11	36.79	36.42	31.60	27.11	25.34	37.83	53.84	67.64	67.52	67.66	70.97	61.89	54.59	65.90	71.70	74.47	78.60	68.74	63.69	44.83	63.82	45.84	52.90	51.03	54.05	53.45
12	40.26	41.11	35.33	30.65	29.02	41.42	56.75	68.65	71.05	68.72	72.00	64.69	57.01	67.75	73.63	76.34	80.37	71.47	67.11	47.71	66.40	48.86	55.94	54.08	57.26	56.73
13	44.53	44.31	38.53	34.14	32.33	47.57	59.69	69.59	72.14	69.69	73.29	66.94	59.26	69.34	75.28	77.75	81.70	73.70	70.01	50.31	68.57	51.60	58.64	56.78	60.09	59.63
14	47.45	47.04	41.69	37.35	37.49	53.75	62.31	70.03	73.24	70.73	74.30	69.03	61.43	70.85	76.63	78.92	82.84	75.70	72.67	52.82	70.60	54.23	61.19	59.36	62.77	62.40
15	49.96	49.68	44.54	41.51	44.81	59.04	63.37	70.42	74.26	71.53	75.12	70.85	63.46	72.07	77.71	79.91	83.80	77.45	75.04	55.20	72.42	56.71	63.55	61.75	65.27	64.96
16	52.39	52.10	48.16	47.05	51.73	61.02	64.37	72.25	75.08	72.18	75.77	72.43	65.18	73.08	78.61	80.76	84.63	78.99	77.18	57.44	74.06	59.03	65.73	63.99	67.56	67.32
17	54.73	55.23	52.68	52.93	54.66	63.09	65.46	73.48	75.80	72.73	76.33	73.72	66.68	73.95	79.39	81.50	85.34	80.36	79.08	59.54	75.52	61.21	67.77	66.06	69.66	69.44
18	57.73	59.22	57.38	55.93	57.82	64.31	66.30	74.35	76.40	73.18	76.74	74.77	68.01	74.71	80.06	82.14	85.96	81.58	80.77	61.51	76.85	63.25	69.66	67.97	71.56	71.37
19	61.40	63.11	60.15	59.20	59.86	65.36	67.00	74.97	76.91	73.52	77.06	75.66	69.20	75.37	80.64	82.71	86.49	82.66	82.27	63.36	78.07	65.17	71.40	69.72	73.29	73.14
20	65.07	65.47	63.06	61.59	61.69	66.31	67.59	75.43	77.32	73.79	77.32	76.42	70.28	75.96	81.15	83.20	86.96	83.61	83.62	65.12	79.18	66.97	72.97	71.32	74.88	74.76
21	67.65	68.29	65.88	63.78	63.36	67.15	68.07	75.75	77.65	74.01	77.53	77.08	71.25	76.49	81.60	83.65	87.38	84.47	84.83	66.76	80.18	68.63	74.41	72.81	76.33	76.25
22	70.00	70.46	68.43	65.83	64.92	67.92	68.47	75.99	77.93	74.20	77.71	77.66	72.15	76.97	82.01	84.05	87.75	85.26	85.91	68.31	81.08	70.17	75.74	74.18	77.67	77.63
23	71.83	72.41	70.77	67.75	66.34	68.57	68.79	76.18	78.18	74.36	77.87	78.18	72.97	77.40	82.37	84.41	88.08	85.96	86.87	69.75	81.89	71.61	76.98	75.46	78.90	78.89
24	73.51	74.20	72.95	69.51	67.59	69.13	69.07	76.33	78.39	74.49	78.00	78.64	73.73	77.79	82.69	84.74	88.38	86.59	87.72	71.10	82.64	72.95	78.12	76.64	80.04	80.07
25	75.05	75.86	74.91	71.08	68.70	69.64	69.30	76.45	78.57	74.61	78.12	79.05	74.43	78.15	82.99	85.04	88.65	87.16	88.47	72.36	83.33	74.21	79.18	77.75	81.09	81.15
26	76.50	77.34	76.64	72.51	69.72	70.09	69.51	76.55	78.74	74.72	78.22	79.42	75.08	78.48	83.27	85.31	88.90	87.67	89.15	73.55	83.96	75.40	80.16	78.78	82.06	82.15
27	77.81	78.68	78.18	73.81	70.65	70.52	69.70	76.63	78.89	74.81	78.31	79.76	75.69	78.79	83.52	85.56	89.12	88.14	89.76	74.67	84.55	76.51	81.08	79.75	82.96	83.07
28	79.00	79.87	79.58	75.01	71.52	70.90	69.87	76.71	79.03	74.90	78.40	80.07	76.26	79.08	83.75	85.80	89.32	88.57	90.31	75.72	85.10	77.55	81.93	80.64	83.78	83.91
29	80.07	80.96	80.84	76.12	72.33	71.27	70.03	76.77	79.16	74.98	78.48	80.36	76.80	79.36	83.97	86.01	89.51	88.96	90.80	76.71	85.62	78.52	82.72	81.48	84.54	84.69
30	81.06	81.95	81.99	77.15	73.08	71.61	70.18	76.83	79.29	75.05	78.55	80.63	77.31	79.62	84.18	86.22	89.69	89.33	91.24	77.65	86.10	79.44	83.45	82.25	85.23	85.40

= Actual Experience

Summary of Conditional Claim Rates
Adjustable Rate Mortgages
All LTV Categories

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.02	0.02	0.02
2	0.17	0.16	0.25	0.30	0.24	0.23	0.23	0.22	0.24	0.17	0.18	0.37	0.30	0.30	0.29	0.26	0.24
3	0.69	0.76	0.84	0.76	0.70	0.72	0.70	0.72	0.84	0.60	0.53	1.28	0.82	0.83	0.83	0.72	0.67
4	1.21	1.16	1.09	1.00	1.00	1.03	1.07	1.08	1.29	0.69	0.85	1.67	1.12	1.19	1.15	1.00	0.98
5	1.42	1.41	1.36	1.33	1.32	1.41	1.42	1.42	1.21	1.01	0.87	1.90	1.37	1.40	1.34	1.23	1.25
6	1.09	1.11	1.10	1.07	1.09	1.15	1.14	1.11	1.54	1.07	0.84	1.98	1.47	1.48	1.47	1.42	1.35
7	0.99	1.03	1.00	1.02	1.02	1.06	1.03	1.00	1.38	0.93	0.73	1.73	1.27	1.33	1.37	1.23	1.16
8	0.43	0.46	0.46	0.47	0.45	0.47	0.43	0.39	1.50	1.14	0.75	1.85	1.50	1.61	1.58	1.45	1.36
9	0.40	0.46	0.46	0.45	0.42	0.42	0.38	0.35	1.40	1.07	0.67	1.78	1.48	1.51	1.46	1.33	1.27
10	0.39	0.44	0.44	0.42	0.37	0.37	0.33	0.32	1.21	0.90	0.57	1.56	1.24	1.26	1.22	1.12	1.09
11	0.37	0.40	0.38	0.35	0.30	0.30	0.28	0.27	1.07	0.82	0.52	1.40	1.10	1.11	1.09	1.03	1.00
12	0.45	0.45	0.42	0.38	0.35	0.36	0.35	0.34	1.03	0.85	0.48	1.33	1.07	1.09	1.09	1.05	1.03
13	0.43	0.41	0.37	0.34	0.32	0.33	0.32	0.31	0.96	0.76	0.43	1.21	0.98	1.01	1.02	0.97	0.96
14	0.35	0.30	0.25	0.25	0.23	0.24	0.24	0.23	0.89	0.70	0.39	1.11	0.92	0.95	0.96	0.92	0.90
15	0.31	0.26	0.21	0.21	0.19	0.20	0.20	0.20	0.75	0.57	0.32	0.94	0.77	0.80	0.81	0.78	0.76
16	0.27	0.23	0.18	0.18	0.16	0.17	0.18	0.18	0.62	0.48	0.28	0.80	0.65	0.68	0.69	0.66	0.65
17	0.25	0.20	0.15	0.16	0.14	0.15	0.15	0.15	0.51	0.40	0.24	0.66	0.54	0.56	0.57	0.55	0.54
18	0.23	0.17	0.12	0.13	0.11	0.12	0.13	0.13	0.42	0.33	0.20	0.55	0.44	0.46	0.47	0.46	0.45
19	0.21	0.15	0.10	0.11	0.09	0.10	0.11	0.11	0.35	0.28	0.17	0.46	0.37	0.39	0.40	0.39	0.38
20	0.19	0.13	0.08	0.09	0.08	0.09	0.10	0.10	0.30	0.24	0.15	0.38	0.31	0.32	0.33	0.33	0.32
21	0.18	0.12	0.07	0.08	0.06	0.07	0.08	0.08	0.25	0.20	0.13	0.32	0.26	0.28	0.29	0.28	0.27
22	0.17	0.10	0.05	0.06	0.05	0.06	0.07	0.07	0.22	0.18	0.11	0.28	0.23	0.24	0.25	0.24	0.23
23	0.16	0.09	0.04	0.05	0.04	0.05	0.05	0.05	0.19	0.16	0.10	0.25	0.20	0.21	0.22	0.21	0.19
24	0.15	0.08	0.03	0.04	0.03	0.04	0.04	0.04	0.17	0.14	0.09	0.22	0.17	0.19	0.19	0.18	0.17
25	0.14	0.07	0.03	0.03	0.03	0.03	0.04	0.04	0.15	0.13	0.08	0.19	0.15	0.17	0.17	0.16	0.15
26	0.14	0.06	0.02	0.03	0.02	0.02	0.03	0.03	0.14	0.12	0.08	0.18	0.14	0.14	0.15	0.15	0.14
27	0.14	0.05	0.02	0.02	0.02	0.02	0.03	0.03	0.13	0.11	0.07	0.16	0.12	0.13	0.14	0.14	0.13
28	0.13	0.04	0.01	0.02	0.02	0.02	0.03	0.02	0.13	0.11	0.06	0.15	0.11	0.13	0.13	0.13	0.12
29	0.13	0.03	0.01	0.02	0.01	0.01	0.02	0.02	0.12	0.11	0.06	0.14	0.10	0.12	0.13	0.12	0.11
30	0.13	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.12	0.10	0.06	0.13	0.10	0.11	0.12	0.12	0.11

= Actual Experience

Summary of Cumulative Claim Rates
Adjustable Rate Mortgages
ALL LTV Categories

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.02	0.02	0.02
2	0.17	0.16	0.26	0.29	0.24	0.23	0.23	0.22	0.25	0.18	0.18	0.37	0.31	0.32	0.30	0.27	0.26
3	0.83	0.91	1.00	1.03	0.92	0.93	0.91	0.92	1.02	0.75	0.71	1.55	1.11	1.12	1.10	0.97	0.90
4	1.92	1.91	1.91	1.96	1.84	1.89	1.89	1.92	2.00	1.38	1.48	2.95	2.14	2.19	2.13	1.88	1.79
5	3.01	3.04	2.95	3.10	2.96	3.09	3.10	3.13	2.85	2.16	2.22	4.34	3.28	3.31	3.17	2.86	2.77
6	3.76	3.85	3.71	3.93	3.80	3.98	3.97	3.99	3.71	2.88	2.88	5.53	4.34	4.32	4.16	3.81	3.67
7	4.38	4.53	4.33	4.64	4.51	4.72	4.69	4.69	4.36	3.43	3.40	6.37	5.16	5.11	4.93	4.51	4.34
8	4.62	4.80	4.59	4.95	4.80	5.02	4.96	4.93	4.95	3.98	3.88	7.13	5.98	5.91	5.66	5.20	5.00
9	4.82	5.05	4.81	5.21	5.04	5.26	5.18	5.13	5.39	4.42	4.27	7.71	6.68	6.53	6.23	5.74	5.52
10	5.00	5.28	5.01	5.43	5.24	5.46	5.35	5.30	5.72	4.72	4.58	8.14	7.19	6.98	6.64	6.12	5.91
11	5.15	5.47	5.17	5.61	5.38	5.60	5.49	5.43	5.97	4.97	4.83	8.48	7.60	7.34	6.96	6.44	6.22
12	5.32	5.66	5.32	5.78	5.53	5.76	5.64	5.58	6.18	5.20	5.05	8.77	7.96	7.66	7.25	6.73	6.51
13	5.46	5.82	5.45	5.92	5.66	5.90	5.77	5.70	6.36	5.38	5.23	9.01	8.26	7.93	7.50	6.97	6.75
14	5.57	5.93	5.53	6.02	5.75	5.99	5.86	5.79	6.51	5.53	5.39	9.20	8.52	8.16	7.71	7.18	6.96
15	5.65	6.01	5.59	6.09	5.81	6.06	5.92	5.86	6.62	5.64	5.51	9.36	8.72	8.34	7.88	7.34	7.13
16	5.72	6.08	5.64	6.15	5.86	6.11	5.98	5.91	6.71	5.73	5.61	9.47	8.88	8.48	8.00	7.47	7.25
17	5.78	6.14	5.68	6.20	5.90	6.16	6.02	5.96	6.77	5.79	5.69	9.56	9.00	8.58	8.10	7.57	7.35
18	5.83	6.19	5.70	6.23	5.93	6.19	6.05	5.99	6.82	5.84	5.75	9.63	9.09	8.66	8.18	7.64	7.42
19	5.87	6.22	5.72	6.26	5.96	6.21	6.08	6.02	6.85	5.88	5.80	9.68	9.16	8.73	8.23	7.70	7.48
20	5.90	6.25	5.74	6.28	5.97	6.23	6.10	6.04	6.88	5.91	5.84	9.72	9.22	8.77	8.28	7.74	7.53
21	5.93	6.27	5.75	6.30	5.98	6.25	6.12	6.05	6.90	5.93	5.87	9.75	9.26	8.81	8.31	7.78	7.56
22	5.95	6.29	5.76	6.31	5.99	6.26	6.13	6.07	6.92	5.95	5.90	9.78	9.30	8.84	8.34	7.81	7.59
23	5.98	6.31	5.77	6.32	6.00	6.27	6.14	6.08	6.94	5.97	5.92	9.80	9.33	8.87	8.37	7.83	7.61
24	5.99	6.32	5.77	6.33	6.01	6.27	6.15	6.08	6.95	5.98	5.94	9.82	9.35	8.89	8.39	7.85	7.63
25	6.01	6.33	5.77	6.33	6.01	6.28	6.15	6.09	6.96	5.99	5.96	9.84	9.37	8.91	8.40	7.87	7.65
26	6.02	6.34	5.78	6.34	6.01	6.28	6.16	6.09	6.97	6.00	5.98	9.85	9.39	8.92	8.42	7.88	7.66
27	6.04	6.34	5.78	6.34	6.02	6.28	6.16	6.09	6.98	6.01	5.99	9.86	9.40	8.94	8.43	7.89	7.67
28	6.05	6.35	5.78	6.34	6.02	6.29	6.16	6.10	6.98	6.01	6.00	9.87	9.41	8.95	8.44	7.90	7.68
29	6.06	6.35	5.78	6.34	6.02	6.29	6.17	6.10	6.99	6.02	6.01	9.88	9.42	8.96	8.45	7.91	7.69
30	6.06	6.35	5.78	6.35	6.02	6.29	6.17	6.10	7.00	6.03	6.02	9.89	9.43	8.97	8.46	7.92	7.69

= Actual Experience

Summary of Conditional Prepayment Rates
Adjustable Rate Mortgages
All LTV Categories

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.48	0.32	1.62	0.56	0.09	0.09	0.09	0.09	0.36	0.63	0.30	1.77	0.34	0.31	0.33	0.34	0.34
2	3.56	2.59	9.85	1.89	2.02	2.04	2.10	2.13	7.25	4.01	1.91	5.56	1.88	2.16	2.78	2.59	2.33
3	5.57	9.90	4.75	4.17	4.52	4.50	4.70	4.55	16.58	3.83	5.44	7.97	4.57	6.34	7.06	6.02	6.24
4	13.04	6.54	7.32	6.71	7.08	7.15	7.07	6.91	6.14	13.83	6.08	11.63	8.83	10.84	10.69	10.81	12.14
5	8.52	7.53	8.74	7.78	8.41	8.05	8.06	8.00	19.60	12.15	6.85	15.68	11.12	11.89	13.41	14.86	13.69
6	8.61	7.64	8.85	7.90	8.17	7.89	8.01	7.99	13.82	11.89	8.16	15.85	10.28	12.32	14.81	13.49	12.25
7	9.28	7.97	9.50	8.10	8.38	8.26	8.48	8.47	15.38	15.85	9.44	16.07	12.58	15.25	15.64	14.70	14.15
8	9.80	8.21	9.43	8.19	8.55	8.45	8.72	8.71	17.25	16.75	9.32	16.60	13.73	14.76	14.92	14.48	14.87
9	9.66	7.88	8.80	7.92	8.25	8.17	8.41	8.43	14.47	13.52	8.18	14.45	11.07	11.65	12.05	12.55	12.94
10	9.29	7.69	8.50	7.79	8.11	8.04	8.30	8.31	10.90	10.93	6.92	10.71	8.29	8.84	9.67	10.05	9.95
11	8.93	7.57	8.28	7.68	7.97	7.92	8.16	8.17	10.85	11.26	6.54	9.65	7.95	8.91	9.68	9.71	9.45
12	8.78	7.55	8.21	7.67	7.94	7.87	8.10	8.10	10.08	9.12	5.64	8.24	7.04	7.77	8.04	7.80	7.74
13	8.67	7.50	8.07	7.63	7.87	7.81	8.03	8.04	9.02	8.35	5.31	7.90	6.90	7.30	7.40	7.40	7.36
14	8.74	7.54	8.10	7.68	7.92	7.85	8.09	8.12	8.52	8.30	5.56	7.92	6.90	7.13	7.39	7.44	7.42
15	8.73	7.56	8.06	7.69	7.92	7.87	8.13	8.15	8.57	9.00	5.98	7.99	7.09	7.43	7.68	7.79	7.75
16	8.77	7.57	8.02	7.70	7.94	7.89	8.15	8.16	9.03	9.58	6.23	7.93	7.43	7.72	7.98	8.10	8.18
17	8.75	7.56	7.98	7.70	7.95	7.89	8.14	8.13	8.29	8.71	5.59	7.12	6.77	7.00	7.16	7.35	7.38
18	8.74	7.56	7.94	7.72	7.96	7.89	8.12	8.11	7.81	8.29	5.45	6.72	6.58	6.72	6.93	7.12	7.18
19	8.72	7.57	7.92	7.72	7.95	7.86	8.10	8.11	7.30	8.06	5.30	6.38	6.38	6.54	6.70	6.93	7.02
20	8.72	7.58	7.89	7.72	7.92	7.84	8.10	8.12	6.94	7.79	5.16	6.02	6.22	6.32	6.48	6.75	6.86
21	8.74	7.58	7.85	7.71	7.90	7.84	8.10	8.12	6.58	7.55	5.00	5.74	6.05	6.13	6.28	6.59	6.75
22	8.73	7.58	7.79	7.70	7.90	7.84	8.10	8.12	6.35	7.36	4.91	5.53	5.93	5.98	6.14	6.49	6.66
23	8.72	7.56	7.74	7.70	7.89	7.84	8.10	8.14	6.04	7.16	4.78	5.29	5.80	5.83	6.01	6.38	6.56
24	8.68	7.55	7.71	7.70	7.89	7.84	8.11	8.15	5.81	6.98	4.68	5.09	5.69	5.73	5.90	6.28	6.47
25	8.65	7.55	7.69	7.70	7.89	7.85	8.13	8.17	5.60	6.83	4.59	4.92	5.60	5.62	5.79	6.18	6.39
26	8.65	7.55	7.67	7.71	7.90	7.85	8.14	8.18	5.43	6.69	4.51	4.80	5.53	5.53	5.69	6.10	6.30
27	8.64	7.55	7.65	7.71	7.90	7.86	8.15	8.19	5.32	6.61	4.48	4.72	5.47	5.47	5.62	6.03	6.25
28	8.64	7.55	7.65	7.72	7.91	7.86	8.15	8.19	5.20	6.54	4.43	4.63	5.42	5.40	5.55	5.96	6.18
29	8.64	7.55	7.64	7.73	7.91	7.87	8.15	8.20	5.15	6.49	4.40	4.57	5.38	5.35	5.49	5.91	6.13
30	8.65	7.56	7.64	7.73	7.91	7.87	8.15	8.20	5.01	6.34	4.30	4.44	5.25	5.21	5.35	5.77	5.99

= Actual Experience

Summary of Cumulative Prepayment Rates
Adjustable Rate Mortgages
All LTV Categories

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.48	0.32	1.62	0.56	0.09	0.09	0.09	0.09	0.36	0.63	0.30	1.77	0.34	0.31	0.33	0.34	0.34
2	4.02	2.90	11.31	2.44	2.11	2.13	2.19	2.22	7.59	4.61	2.21	7.23	2.21	2.47	3.10	2.92	2.66
3	9.35	12.49	15.50	6.49	6.53	6.53	6.78	6.66	22.86	8.26	7.51	14.59	6.67	8.63	9.92	8.75	8.72
4	21.07	18.16	21.62	12.69	13.07	13.15	13.30	13.04	27.54	20.84	13.09	24.34	14.81	18.41	19.44	18.51	19.69
5	27.63	24.17	28.30	19.34	20.23	19.98	20.13	19.84	41.35	30.29	18.94	35.74	24.05	27.85	29.95	30.33	30.44
6	33.60	29.74	34.39	25.47	26.50	26.05	26.29	26.00	49.06	38.32	25.38	45.24	31.52	36.33	39.86	39.35	38.62
7	39.42	35.03	40.26	31.19	32.34	31.83	32.20	31.93	56.32	47.64	32.15	53.15	39.59	45.38	48.61	47.71	46.78
8	44.92	39.99	45.49	36.44	37.74	37.19	37.70	37.44	63.11	55.83	38.15	59.87	47.18	52.68	55.54	54.62	54.05
9	49.80	44.34	49.88	41.08	42.48	41.91	42.52	42.30	67.73	61.26	42.90	64.64	52.36	57.51	60.22	59.67	59.35
10	54.01	48.23	53.74	45.27	46.74	46.15	46.87	46.67	70.66	65.02	46.55	67.60	55.75	60.69	63.46	63.14	62.84
11	57.67	51.75	57.15	49.05	50.56	49.99	50.76	50.59	73.22	68.43	49.75	69.94	58.70	63.57	66.36	66.13	65.80
12	60.94	54.98	60.24	52.53	54.06	53.48	54.31	54.16	75.32	70.85	52.31	71.72	61.07	65.83	68.50	68.27	67.96
13	63.86	57.94	63.02	55.71	57.24	56.66	57.52	57.39	76.99	72.85	54.57	73.26	63.21	67.77	70.30	70.12	69.84
14	66.54	60.67	65.58	58.65	60.18	59.60	60.49	60.39	78.41	74.66	56.81	74.66	65.18	69.50	71.94	71.82	71.58
15	68.98	63.20	67.91	61.37	62.88	62.31	63.23	63.15	79.70	76.44	59.07	75.95	67.04	71.16	73.50	73.46	73.24
16	71.20	65.53	70.03	63.88	65.36	64.81	65.74	65.67	80.94	78.16	61.27	77.12	68.84	72.74	74.99	75.01	74.85
17	73.22	67.67	71.97	66.18	67.65	67.10	68.04	67.98	81.96	79.56	63.12	78.07	70.35	74.06	76.20	76.30	76.17
18	75.05	69.65	73.75	68.31	69.76	69.21	70.15	70.10	82.84	80.77	64.82	78.90	71.71	75.23	77.29	77.45	77.35
19	76.72	71.48	75.38	70.28	71.69	71.15	72.07	72.04	83.59	81.85	66.38	79.64	72.93	76.28	78.27	78.48	78.42
20	78.24	73.17	76.87	72.09	73.46	72.92	73.84	73.82	84.26	82.81	67.82	80.28	74.05	77.23	79.14	79.42	79.39
21	79.63	74.73	78.23	73.76	75.09	74.56	75.47	75.45	84.84	83.66	69.13	80.85	75.06	78.08	79.93	80.26	80.27
22	80.89	76.17	79.48	75.29	76.58	76.06	76.96	76.96	85.37	84.43	70.36	81.37	75.99	78.87	80.65	81.04	81.08
23	82.03	77.49	80.62	76.71	77.96	77.45	78.33	78.34	85.83	85.11	71.50	81.84	76.84	79.58	81.32	81.75	81.82
24	83.07	78.72	81.67	78.02	79.22	78.72	79.59	79.61	86.25	85.74	72.55	82.27	77.63	80.25	81.92	82.40	82.51
25	84.02	79.85	82.64	79.22	80.39	79.90	80.75	80.78	86.63	86.30	73.54	82.66	78.36	80.86	82.49	83.01	83.14
26	84.88	80.89	83.53	80.34	81.46	80.99	81.81	81.85	86.98	86.82	74.47	83.02	79.04	81.42	83.00	83.56	83.72
27	85.67	81.85	84.34	81.36	82.45	81.99	82.79	82.84	87.30	87.29	75.34	83.35	79.67	81.95	83.49	84.08	84.26
28	86.39	82.75	85.10	82.31	83.36	82.91	83.69	83.74	87.60	87.73	76.17	83.67	80.26	82.44	83.93	84.56	84.76
29	87.04	83.57	85.80	83.19	84.20	83.76	84.52	84.58	87.88	88.14	76.95	83.96	80.82	82.90	84.35	85.00	85.22
30	87.64	84.33	86.44	84.00	84.98	84.54	85.28	85.34	88.14	88.51	77.69	84.24	81.33	83.33	84.74	85.41	85.64

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
Unknown LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.11	0.36	0.15	0.05	0.05	0.03	0.14	0.23	0.01	0.02	0.19	0.09	0.11	0.00	0.00	0.01	0.01	0.05	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.08
2	1.41	1.94	1.27	0.70	0.73	0.54	1.53	2.81	0.45	2.42	3.90	2.90	2.32	0.88	1.20	0.75	0.39	1.15	0.23	0.27	0.00	0.78	0.76	0.78	0.78	0.80
3	1.71	1.58	1.16	0.88	1.03	1.16	3.10	4.78	1.63	5.90	8.85	9.56	3.24	1.35	5.10	1.98	1.85	2.08	1.30	2.42	1.39	1.00	1.01	1.11	1.10	1.19
4	1.10	1.07	0.69	0.72	0.87	1.59	2.72	5.20	2.25	7.14	12.53	6.17	1.51	4.09	3.79	2.60	2.68	1.99	0.96	1.28	1.24	0.92	1.02	1.15	1.23	1.28
5	0.71	0.66	0.52	0.54	0.85	1.38	2.94	5.45	3.25	9.82	10.10	1.80	4.16	1.61	5.48	3.04	3.03	2.09	1.06	1.06	1.27	0.98	1.11	1.35	1.38	1.39
6	0.39	0.37	0.31	0.61	0.75	1.34	2.71	5.85	4.57	6.90	4.91	5.27	2.08	2.34	4.47	3.16	2.06	1.09	0.77	0.85	1.12	0.85	1.02	1.19	1.17	1.12
7	0.31	0.35	0.39	0.50	0.78	1.24	3.27	5.29	3.89	3.57	5.10	0.99	1.31	2.05	3.63	2.28	1.60	0.98	0.76	0.89	1.22	0.95	1.11	1.25	1.18	1.08
8	0.26	0.35	0.27	0.59	0.74	1.56	3.66	3.39	2.76	3.67	2.34	0.88	1.38	1.47	2.72	2.42	1.36	0.88	0.76	0.90	1.31	0.97	1.10	1.19	1.08	0.97
9	0.33	0.28	0.34	0.50	0.90	1.80	2.92	2.29	2.46	3.34	1.99	1.62	2.56	1.12	2.35	2.18	1.22	0.88	0.78	0.98	1.41	0.98	1.08	1.12	0.99	0.91
10	0.27	0.26	0.35	0.47	1.05	1.49	2.09	2.22	2.14	2.68	2.24	3.43	3.13	2.27	1.76	1.89	1.11	0.85	0.86	1.02	1.44	0.95	1.01	1.02	0.93	0.89
11	0.26	0.31	0.36	0.72	0.95	1.12	1.67	1.92	1.72	2.34	2.92	5.30	1.55	2.11	1.64	1.86	1.12	0.92	0.94	1.09	1.51	0.93	0.96	0.99	0.94	0.90
12	0.26	0.30	0.56	0.74	0.78	1.30	1.65	1.63	1.85	2.16	1.62	1.94	1.57	1.98	1.64	1.98	1.34	1.26	1.60	1.51	2.02	1.20	1.32	1.42	1.40	1.38
13	0.28	0.55	0.59	0.61	0.70	1.04	1.30	1.34	1.51	1.24	2.00	1.57	1.21	1.77	1.49	1.90	1.30	1.19	1.47	1.34	1.77	1.05	1.17	1.27	1.25	1.23
14	0.40	0.61	0.58	0.54	0.62	1.06	1.27	1.09	1.05	1.60	1.46	1.15	0.93	1.36	1.18	1.59	1.08	0.98	1.11	0.99	1.34	0.79	0.88	0.96	0.95	0.93
15	0.37	0.48	0.41	0.48	0.51	0.93	1.15	0.71	1.07	1.33	1.23	0.98	0.82	1.22	1.06	1.33	0.94	0.82	0.92	0.84	1.15	0.67	0.74	0.80	0.80	0.79
16	0.41	0.38	0.40	0.42	0.50	0.84	0.71	1.51	0.91	1.11	1.07	0.86	0.74	1.11	0.93	1.17	0.82	0.73	0.78	0.72	1.00	0.57	0.63	0.68	0.67	0.66
17	0.36	0.35	0.26	0.32	0.50	0.45	0.79	1.27	0.77	0.96	0.95	0.78	0.68	0.98	0.79	0.95	0.73	0.67	0.67	0.62	0.88	0.49	0.53	0.57	0.57	0.56
18	0.39	0.34	0.24	0.28	0.27	0.49	0.67	1.07	0.68	0.84	0.87	0.71	0.61	0.84	0.65	0.80	0.67	0.45	0.58	0.54	0.76	0.41	0.45	0.48	0.48	0.47
19	0.23	0.34	0.36	0.26	0.40	0.42	0.58	0.94	0.61	0.76	0.79	0.63	0.53	0.69	0.53	0.70	0.53	0.41	0.50	0.47	0.66	0.35	0.38	0.40	0.40	0.40
20	0.15	0.23	0.17	0.29	0.34	0.36	0.51	0.83	0.56	0.69	0.71	0.55	0.45	0.57	0.44	0.62	0.43	0.38	0.43	0.41	0.57	0.30	0.32	0.34	0.34	0.34
21	0.18	0.16	0.26	0.25	0.29	0.32	0.46	0.75	0.52	0.62	0.62	0.46	0.38	0.47	0.37	0.56	0.35	0.35	0.37	0.35	0.50	0.26	0.27	0.29	0.29	0.28
22	0.09	0.27	0.24	0.22	0.26	0.28	0.42	0.68	0.47	0.53	0.53	0.38	0.32	0.40	0.31	0.51	0.32	0.34	0.32	0.31	0.44	0.22	0.23	0.24	0.24	0.24
23	0.27	0.25	0.22	0.20	0.23	0.26	0.38	0.60	0.42	0.45	0.45	0.32	0.28	0.34	0.26	0.46	0.30	0.24	0.28	0.27	0.38	0.19	0.19	0.20	0.20	0.20
24	0.24	0.22	0.20	0.18	0.21	0.24	0.35	0.53	0.37	0.38	0.39	0.28	0.24	0.29	0.22	0.43	0.29	0.22	0.24	0.23	0.33	0.16	0.16	0.17	0.17	0.17
25	0.22	0.21	0.19	0.17	0.19	0.21	0.31	0.45	0.33	0.32	0.33	0.23	0.21	0.24	0.18	0.41	0.20	0.22	0.21	0.20	0.29	0.14	0.14	0.14	0.14	0.14
26	0.20	0.20	0.18	0.16	0.17	0.19	0.28	0.38	0.30	0.27	0.29	0.20	0.18	0.20	0.15	0.39	0.19	0.21	0.18	0.18	0.25	0.12	0.11	0.12	0.12	0.12
27	0.18	0.19	0.18	0.15	0.16	0.17	0.25	0.32	0.27	0.23	0.25	0.17	0.16	0.17	0.13	0.38	0.19	0.21	0.16	0.16	0.22	0.10	0.10	0.10	0.10	0.10
28	0.17	0.17	0.17	0.14	0.14	0.16	0.22	0.27	0.24	0.19	0.21	0.15	0.13	0.14	0.11	0.12	0.18	0.21	0.14	0.14	0.19	0.08	0.08	0.08	0.09	0.09
29	0.17	0.16	0.17	0.13	0.13	0.14	0.20	0.23	0.23	0.17	0.18	0.12	0.12	0.12	0.09	0.10	0.18	0.05	0.12	0.12	0.17	0.07	0.07	0.07	0.07	0.07
30	0.16	0.15	0.16	0.12	0.11	0.13	0.18	0.19	0.21	0.14	0.15	0.11	0.10	0.10	0.08	0.08	0.19	0.04	0.10	0.10	0.15	0.06	0.06	0.06	0.06	0.06

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
0 - 65 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.00	0.00	0.04	0.03	0.00	0.00	0.04	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.00	0.00	0.14	0.14	0.15	0.14
2	0.07	0.13	0.16	0.03	0.23	0.25	0.42	0.22	0.09	0.23	0.15	0.05	0.06	0.10	0.11	0.16	0.33	0.17	0.03	0.19	0.00	0.25	0.23	0.23	0.23	0.23
3	0.14	0.21	0.44	0.18	0.35	0.44	0.67	0.60	0.25	0.39	0.62	0.26	0.17	0.34	0.42	0.37	0.67	0.36	0.30	0.44	0.50	0.40	0.40	0.42	0.43	0.44
4	0.00	0.32	0.29	0.68	0.36	0.59	0.59	0.97	0.32	0.79	1.13	0.34	0.28	0.41	0.48	0.56	1.13	0.75	0.23	0.51	0.62	0.50	0.54	0.58	0.62	0.63
5	0.00	0.17	0.25	0.12	0.45	0.22	0.45	0.99	0.44	1.35	1.40	0.47	0.25	0.49	0.53	0.81	1.26	0.41	0.72	0.59	0.74	0.61	0.70	0.79	0.83	0.84
6	0.00	0.18	0.05	0.24	0.28	0.39	0.64	1.13	0.65	1.28	0.84	0.46	0.30	0.43	0.77	0.84	1.31	0.67	0.70	0.59	0.79	0.65	0.77	0.85	0.87	0.86
7	0.10	0.09	0.10	0.08	0.32	0.44	0.68	1.35	0.74	0.90	0.88	0.36	0.31	0.72	0.96	0.59	0.79	0.60	0.67	0.58	0.78	0.66	0.77	0.83	0.83	0.80
8	0.00	0.28	0.00	0.17	0.28	0.58	0.79	1.25	0.50	0.80	0.76	0.32	0.28	0.78	0.88	0.88	0.64	0.49	0.56	0.50	0.64	0.58	0.65	0.68	0.67	0.63
9	0.00	0.10	0.22	0.13	0.35	0.67	0.78	0.47	0.47	0.83	0.92	0.35	0.33	0.57	1.07	0.86	0.66	0.54	0.66	0.56	0.68	0.63	0.66	0.69	0.68	0.65
10	0.00	0.00	0.18	0.33	0.52	0.64	1.07	0.71	0.43	0.59	0.67	0.49	0.31	0.99	1.11	0.93	0.69	0.70	0.93	0.73	0.77	0.67	0.80	0.83	0.78	0.78
11	0.00	0.21	0.50	0.15	0.56	0.38	0.48	0.77	0.38	0.54	0.24	0.42	0.48	0.96	0.99	0.85	0.60	0.67	0.93	0.76	0.78	0.63	0.74	0.78	0.79	0.78
12	0.12	0.00	0.07	0.44	0.49	0.39	0.63	0.37	0.24	0.15	0.35	0.72	0.52	1.03	1.03	0.90	0.72	0.87	1.22	0.96	0.95	0.79	0.96	1.06	1.08	1.09
13	0.00	0.00	0.22	0.29	0.34	0.37	0.52	0.28	0.32	0.21	0.91	0.74	0.52	1.07	1.00	0.88	0.59	0.80	1.18	0.90	0.93	0.74	0.98	1.08	0.95	1.05
14	0.00	0.00	0.16	0.25	0.16	0.49	0.48	0.30	0.20	0.86	0.90	0.72	0.51	1.02	0.90	0.87	0.56	0.77	1.02	0.81	0.87	0.71	0.80	0.89	0.89	0.91
15	0.00	0.14	0.33	0.20	0.18	0.23	0.28	0.00	0.66	0.74	0.77	0.63	0.44	0.89	0.78	0.63	0.47	0.61	0.75	0.66	0.73	0.62	0.67	0.75	0.67	0.77
16	0.00	0.00	0.09	0.07	0.22	0.16	0.39	0.97	0.59	0.64	0.68	0.57	0.39	0.77	0.67	0.52	0.40	0.45	0.61	0.59	0.62	0.56	0.49	0.56	0.55	0.57
17	0.16	0.00	0.10	0.08	0.00	0.08	0.56	0.81	0.54	0.57	0.61	0.53	0.35	0.60	0.57	0.43	0.34	0.39	0.51	0.42	0.54	0.43	0.42	0.47	0.47	0.48
18	0.00	0.36	0.00	0.10	0.09	0.32	0.49	0.67	0.46	0.51	0.56	0.47	0.31	0.52	0.49	0.36	0.31	0.26	0.32	0.37	0.47	0.31	0.36	0.40	0.27	0.29
19	0.00	0.00	0.13	0.14	0.47	0.30	0.28	0.57	0.42	0.47	0.51	0.41	0.27	0.46	0.33	0.32	0.10	0.23	0.24	0.26	0.41	0.27	0.19	0.22	0.21	0.22
20	0.00	0.00	0.00	0.49	0.35	0.26	0.23	0.48	0.40	0.43	0.46	0.35	0.24	0.33	0.28	0.29	0.08	0.20	0.19	0.23	0.37	0.24	0.14	0.17	0.16	0.17
21	0.00	0.00	0.52	0.39	0.23	0.26	0.19	0.42	0.34	0.39	0.41	0.29	0.21	0.29	0.24	0.27	0.06	0.08	0.14	0.20	0.34	0.22	0.11	0.13	0.12	0.13
22	0.37	0.32	0.31	0.37	0.21	0.26	0.16	0.36	0.31	0.35	0.37	0.26	0.19	0.26	0.21	0.16	0.04	0.06	0.11	0.19	0.32	0.21	0.08	0.10	0.09	0.10
23	0.25	0.26	0.26	0.36	0.20	0.23	0.13	0.30	0.29	0.32	0.33	0.25	0.18	0.24	0.09	0.05	0.03	0.05	0.08	0.17	0.31	0.20	0.06	0.08	0.07	0.07
24	0.20	0.22	0.23	0.13	0.14	0.23	0.11	0.25	0.21	0.29	0.16	0.24	0.18	0.22	0.06	0.04	0.02	0.04	0.06	0.17	0.31	0.20	0.05	0.06	0.05	0.06
25	0.17	0.19	0.19	0.11	0.14	0.24	0.08	0.21	0.19	0.13	0.13	0.19	0.18	0.21	0.05	0.03	0.01	0.03	0.05	0.17	0.32	0.20	0.04	0.04	0.04	0.04
26	0.14	0.16	0.17	0.09	0.13	0.20	0.07	0.17	0.12	0.11	0.10	0.19	0.18	0.21	0.04	0.02	0.01	0.02	0.04	0.17	0.06	0.21	0.03	0.03	0.03	0.03
27	0.12	0.14	0.14	0.08	0.13	0.21	0.05	0.14	0.11	0.09	0.08	0.13	0.18	0.20	0.03	0.02	0.01	0.02	0.03	0.17	0.04	0.22	0.02	0.03	0.02	0.02
28	0.10	0.12	0.12	0.06	0.13	0.22	0.04	0.11	0.10	0.07	0.07	0.07	0.19	0.21	0.02	0.01	0.01	0.01	0.02	0.18	0.03	0.02	0.01	0.02	0.02	0.02
29	0.08	0.10	0.10	0.05	0.14	0.18	0.03	0.09	0.09	0.06	0.05	0.07	0.20	0.21	0.02	0.01	0.01	0.01	0.02	0.19	0.03	0.02	0.01	0.01	0.01	0.01
30	0.07	0.08	0.09	0.04	0.14	0.19	0.03	0.07	0.08	0.05	0.04	0.07	0.21	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
65 - 80 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.01	0.01	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.07	0.07	0.08	0.07
2	0.06	0.17	0.07	0.06	0.11	0.26	0.58	0.96	0.14	0.38	0.20	0.19	0.25	0.19	0.15	0.16	0.13	0.07	0.13	0.10	0.05	0.20	0.21	0.20	0.20	0.19
3	0.23	0.16	0.13	0.13	0.26	0.49	1.71	1.96	0.51	0.99	1.18	0.96	0.52	0.55	0.43	0.43	0.58	0.62	0.44	0.38	0.55	0.50	0.50	0.52	0.51	0.51
4	0.26	0.25	0.16	0.17	0.14	0.94	1.47	2.33	0.79	2.18	2.72	1.13	0.68	0.70	0.68	0.62	0.91	0.78	0.62	0.61	0.68	0.61	0.64	0.68	0.68	0.68
5	0.24	0.24	0.03	0.14	0.44	0.57	1.60	2.17	1.28	2.99	2.13	0.95	0.68	0.94	0.82	1.08	1.12	0.90	0.56	0.62	0.70	0.65	0.71	0.76	0.77	0.75
6	0.08	0.34	0.03	0.16	0.33	0.84	1.45	2.79	2.23	2.54	1.78	0.83	0.63	0.83	1.02	1.09	1.14	0.50	0.42	0.50	0.60	0.56	0.62	0.65	0.63	0.60
7	0.05	0.03	0.04	0.16	0.18	0.66	2.47	4.04	1.79	2.27	1.49	0.80	0.59	0.95	1.26	0.84	0.76	0.43	0.37	0.46	0.58	0.53	0.59	0.62	0.59	0.55
8	0.06	0.03	0.09	0.32	0.45	0.78	2.72	2.10	1.34	1.46	1.38	0.74	0.63	1.06	1.09	1.08	0.77	0.46	0.45	0.52	0.69	0.61	0.69	0.71	0.67	0.63
9	0.14	0.09	0.13	0.14	0.37	1.23	1.54	1.41	1.12	1.44	1.30	0.83	0.61	0.83	1.08	0.96	0.71	0.45	0.46	0.53	0.71	0.60	0.68	0.69	0.65	0.61
10	0.12	0.06	0.06	0.26	0.52	1.15	1.06	1.24	1.16	1.40	1.17	0.88	0.49	1.00	1.04	0.92	0.74	0.49	0.56	0.60	0.80	0.66	0.74	0.76	0.71	0.69
11	0.15	0.10	0.10	0.27	0.41	0.84	1.03	0.95	0.81	1.12	1.29	0.91	0.61	1.05	1.09	0.99	0.81	0.56	0.64	0.67	0.89	0.72	0.79	0.82	0.79	0.77
12	0.06	0.17	0.07	0.20	0.47	0.57	1.05	0.84	0.84	0.76	0.98	0.62	0.54	0.90	0.99	0.92	0.84	0.63	0.78	0.74	0.97	0.77	0.88	0.93	0.92	0.91
13	0.03	0.08	0.07	0.14	0.38	0.44	0.94	0.99	0.66	0.85	1.16	0.54	0.46	0.80	0.90	0.85	0.79	0.59	0.73	0.66	0.87	0.68	0.80	0.85	0.85	0.84
14	0.07	0.12	0.18	0.05	0.26	0.57	0.26	0.57	0.64	1.48	1.26	0.58	0.51	0.91	1.02	0.96	0.89	0.65	0.78	0.71	0.95	0.74	0.88	0.93	0.93	0.92
15	0.00	0.00	0.05	0.26	0.30	0.36	0.22	0.33	0.82	1.35	1.09	0.51	0.45	0.83	0.94	0.87	0.81	0.59	0.71	0.63	0.86	0.67	0.80	0.85	0.86	0.85
16	0.21	0.05	0.12	0.09	0.28	0.14	0.42	1.22	0.73	1.17	0.97	0.46	0.41	0.77	0.86	0.77	0.75	0.54	0.66	0.56	0.71	0.60	0.74	0.78	0.76	0.79
17	0.00	0.05	0.13	0.17	0.22	0.32	0.65	1.03	0.65	1.01	0.84	0.42	0.37	0.70	0.78	0.68	0.69	0.51	0.62	0.52	0.65	0.55	0.66	0.70	0.71	0.71
18	0.00	0.11	0.04	0.08	0.18	0.26	0.45	0.86	0.59	0.89	0.68	0.39	0.34	0.62	0.70	0.61	0.66	0.49	0.57	0.47	0.60	0.50	0.61	0.65	0.63	0.67
19	0.10	0.08	0.04	0.11	0.30	0.23	0.39	0.74	0.55	0.85	0.63	0.36	0.30	0.56	0.63	0.55	0.55	0.48	0.48	0.44	0.56	0.47	0.58	0.62	0.56	0.56
20	0.00	0.00	0.06	0.34	0.28	0.21	0.26	0.65	0.53	0.76	0.58	0.32	0.26	0.50	0.58	0.51	0.53	0.41	0.46	0.41	0.53	0.44	0.48	0.55	0.53	0.53
21	0.07	0.00	0.39	0.33	0.27	0.20	0.22	0.57	0.50	0.65	0.53	0.29	0.22	0.45	0.55	0.48	0.46	0.40	0.46	0.39	0.50	0.42	0.45	0.48	0.51	0.50
22	0.00	0.41	0.41	0.34	0.27	0.19	0.19	0.51	0.45	0.59	0.48	0.26	0.20	0.41	0.52	0.45	0.38	0.36	0.40	0.37	0.34	0.40	0.44	0.46	0.49	0.48
23	0.30	0.24	0.40	0.35	0.27	0.18	0.16	0.45	0.42	0.47	0.44	0.24	0.17	0.38	0.50	0.44	0.27	0.36	0.28	0.36	0.31	0.39	0.42	0.44	0.35	0.47
24	0.26	0.25	0.43	0.36	0.28	0.18	0.14	0.38	0.40	0.42	0.40	0.22	0.15	0.35	0.45	0.42	0.25	0.37	0.27	0.35	0.29	0.38	0.42	0.43	0.33	0.33
25	0.26	0.06	0.32	0.39	0.28	0.18	0.11	0.33	0.37	0.38	0.37	0.21	0.14	0.33	0.44	0.38	0.24	0.26	0.27	0.35	0.28	0.35	0.28	0.36	0.23	0.23
26	0.28	0.06	0.21	0.41	0.29	0.17	0.09	0.28	0.35	0.34	0.35	0.20	0.13	0.32	0.43	0.38	0.24	0.20	0.27	0.35	0.27	0.32	0.27	0.28	0.22	0.22
27	0.13	0.05	0.12	0.38	0.30	0.17	0.08	0.24	0.34	0.31	0.32	0.19	0.11	0.30	0.39	0.34	0.23	0.20	0.28	0.29	0.26	0.28	0.19	0.20	0.21	0.21
28	0.13	0.04	0.12	0.23	0.28	0.17	0.06	0.20	0.33	0.28	0.30	0.18	0.11	0.29	0.28	0.34	0.23	0.20	0.29	0.26	0.25	0.28	0.18	0.19	0.20	0.20
29	0.14	0.04	0.12	0.24	0.29	0.17	0.05	0.17	0.32	0.26	0.21	0.18	0.10	0.28	0.28	0.24	0.23	0.20	0.18	0.26	0.24	0.28	0.17	0.18	0.20	0.20
30	0.14	0.03	0.03	0.26	0.31	0.18	0.04	0.15	0.31	0.24	0.20	0.18	0.09	0.28	0.27	0.24	0.24	0.21	0.18	0.26	0.24	0.29	0.17	0.18	0.07	0.20

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
80 - 90 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.02	0.02	0.00	0.01	0.01	0.00	0.02	0.06	0.01	0.01	0.02	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.02	0.02	0.02
2	0.20	0.22	0.12	0.12	0.14	0.30	0.66	1.25	0.28	0.53	0.60	0.24	0.23	0.29	0.25	0.20	0.25	0.17	0.15	0.14	0.20	0.19	0.18	0.18	0.17	0.17
3	0.28	0.32	0.27	0.24	0.45	0.76	1.86	2.53	1.04	2.62	2.41	1.11	0.76	0.78	0.73	0.70	0.83	0.70	0.61	0.49	0.68	0.55	0.54	0.56	0.54	0.55
4	0.38	0.35	0.21	0.31	0.39	0.85	2.32	3.18	1.44	3.69	4.65	1.55	0.95	1.10	1.12	1.19	1.48	1.16	0.78	0.88	0.95	0.81	0.84	0.89	0.91	0.92
5	0.25	0.35	0.12	0.27	0.41	0.89	2.19	3.38	2.32	5.57	4.17	1.50	1.02	1.25	1.46	1.51	1.81	1.31	0.76	0.86	0.97	0.86	0.91	1.00	0.99	0.98
6	0.21	0.18	0.16	0.23	0.33	0.75	2.26	5.10	3.35	4.50	3.17	1.45	1.05	1.37	1.93	1.86	1.62	0.82	0.53	0.69	0.82	0.73	0.78	0.83	0.79	0.76
7	0.15	0.14	0.11	0.26	0.38	0.97	2.80	4.71	3.07	3.23	2.52	1.25	0.96	1.50	2.09	1.59	1.19	0.65	0.45	0.60	0.74	0.67	0.71	0.74	0.69	0.64
8	0.14	0.16	0.12	0.20	0.50	1.21	3.83	3.37	2.10	2.56	2.46	1.16	1.02	1.74	1.69	1.33	0.94	0.49	0.33	0.49	0.62	0.55	0.56	0.56	0.50	0.46
9	0.14	0.08	0.07	0.19	0.61	1.65	2.58	2.10	1.78	2.33	2.34	1.36	1.00	1.38	1.33	1.17	0.85	0.47	0.32	0.49	0.63	0.53	0.53	0.52	0.46	0.43
10	0.13	0.14	0.13	0.26	0.57	1.32	2.31	1.81	1.66	2.18	2.31	1.35	0.89	1.45	1.31	1.17	0.93	0.56	0.43	0.60	0.76	0.63	0.63	0.62	0.56	0.53
11	0.05	0.15	0.12	0.39	0.70	1.13	1.98	1.35	1.71	1.54	1.62	1.01	0.71	1.18	1.08	0.99	0.81	0.51	0.40	0.53	0.67	0.54	0.53	0.53	0.49	0.47
12	0.04	0.07	0.14	0.28	0.60	0.97	1.54	1.58	1.33	1.78	0.99	0.83	0.60	0.98	0.95	0.88	0.81	0.57	0.49	0.57	0.70	0.56	0.58	0.59	0.56	0.54
13	0.07	0.13	0.14	0.25	0.55	0.78	1.28	1.05	1.11	1.05	1.75	0.76	0.55	0.93	0.92	0.88	0.82	0.56	0.48	0.54	0.67	0.53	0.56	0.57	0.55	0.53
14	0.13	0.11	0.20	0.13	0.38	0.55	1.00	0.33	0.59	2.01	1.50	0.64	0.48	0.82	0.84	0.80	0.74	0.50	0.42	0.46	0.58	0.46	0.49	0.51	0.48	0.47
15	0.08	0.12	0.13	0.14	0.43	0.56	0.70	0.56	1.19	1.84	1.34	0.58	0.44	0.77	0.80	0.74	0.68	0.45	0.37	0.42	0.53	0.42	0.45	0.46	0.44	0.43
16	0.12	0.14	0.19	0.14	0.37	0.68	0.43	1.81	1.07	1.58	1.27	0.53	0.41	0.73	0.75	0.67	0.61	0.40	0.34	0.38	0.49	0.39	0.41	0.42	0.41	0.40
17	0.07	0.10	0.09	0.14	0.20	0.41	0.95	1.60	0.97	1.37	1.22	0.50	0.38	0.68	0.69	0.60	0.55	0.37	0.32	0.35	0.45	0.35	0.38	0.39	0.38	0.37
18	0.06	0.12	0.15	0.08	0.21	0.40	0.86	1.42	0.90	1.29	1.14	0.47	0.35	0.62	0.63	0.54	0.51	0.34	0.30	0.32	0.42	0.32	0.35	0.36	0.35	0.34
19	0.06	0.09	0.07	0.11	0.27	0.35	0.79	1.28	0.85	1.23	1.00	0.44	0.32	0.55	0.57	0.50	0.47	0.32	0.28	0.29	0.39	0.30	0.32	0.33	0.32	0.32
20	0.00	0.13	0.10	0.23	0.25	0.31	0.63	1.17	0.81	1.03	0.90	0.40	0.28	0.49	0.53	0.46	0.44	0.30	0.27	0.27	0.37	0.27	0.30	0.31	0.30	0.30
21	0.11	0.04	0.19	0.22	0.23	0.29	0.58	1.09	0.77	0.95	0.84	0.36	0.25	0.45	0.50	0.43	0.42	0.28	0.26	0.25	0.34	0.25	0.28	0.29	0.29	0.28
22	0.11	0.22	0.20	0.21	0.22	0.27	0.44	1.01	0.73	0.87	0.68	0.32	0.22	0.41	0.47	0.41	0.40	0.27	0.25	0.23	0.33	0.23	0.26	0.27	0.27	0.26
23	0.21	0.23	0.20	0.21	0.22	0.25	0.40	0.92	0.69	0.78	0.62	0.30	0.20	0.38	0.45	0.39	0.39	0.26	0.24	0.21	0.31	0.22	0.25	0.25	0.26	0.25
24	0.22	0.23	0.21	0.21	0.21	0.23	0.36	0.83	0.64	0.70	0.56	0.27	0.18	0.35	0.43	0.37	0.37	0.25	0.24	0.20	0.30	0.20	0.24	0.24	0.25	0.24
25	0.22	0.25	0.22	0.22	0.21	0.22	0.31	0.73	0.59	0.62	0.52	0.25	0.16	0.32	0.41	0.36	0.37	0.25	0.24	0.19	0.29	0.19	0.22	0.23	0.24	0.23
26	0.23	0.26	0.23	0.22	0.20	0.20	0.27	0.64	0.56	0.56	0.47	0.24	0.15	0.30	0.40	0.35	0.36	0.24	0.25	0.18	0.28	0.18	0.22	0.22	0.23	0.23
27	0.22	0.28	0.23	0.23	0.20	0.19	0.23	0.57	0.52	0.51	0.37	0.22	0.13	0.28	0.39	0.34	0.36	0.24	0.25	0.17	0.27	0.17	0.21	0.21	0.23	0.22
28	0.23	0.30	0.24	0.23	0.20	0.18	0.20	0.50	0.49	0.45	0.33	0.21	0.12	0.26	0.39	0.34	0.36	0.24	0.26	0.16	0.26	0.16	0.20	0.21	0.23	0.22
29	0.24	0.32	0.26	0.22	0.20	0.17	0.18	0.44	0.47	0.40	0.30	0.20	0.11	0.25	0.38	0.34	0.37	0.25	0.28	0.15	0.26	0.16	0.20	0.20	0.23	0.22
30	0.26	0.30	0.28	0.22	0.20	0.16	0.15	0.39	0.45	0.36	0.26	0.19	0.10	0.24	0.38	0.34	0.37	0.25	0.29	0.15	0.26	0.15	0.20	0.20	0.24	0.23

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
90 - 93 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.02	0.01	0.01	0.02	0.00	0.01	0.05	0.06	0.02	0.06	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.03	0.03	0.03	0.03
2	0.26	0.30	0.19	0.18	0.18	0.61	1.11	1.60	0.68	0.78	0.54	0.34	0.23	0.27	0.19	0.18	0.23	0.18	0.16	0.14	0.17	0.18	0.17	0.17	0.16	0.16
3	0.58	0.50	0.33	0.32	0.70	0.98	2.41	3.52	1.36	2.03	2.39	1.42	0.80	0.88	0.70	0.79	0.99	0.71	0.59	0.54	0.73	0.56	0.56	0.60	0.58	0.61
4	0.52	0.46	0.17	0.24	0.43	1.29	2.46	3.99	1.90	4.05	4.86	1.95	1.10	1.28	1.28	1.39	1.73	1.28	0.86	0.89	0.95	0.78	0.84	0.92	0.96	0.98
5	0.39	0.30	0.19	0.25	0.59	1.19	2.81	4.66	3.03	5.66	4.66	1.98	1.25	1.50	1.56	2.03	2.14	1.23	0.78	0.86	0.98	0.87	0.93	1.07	1.08	1.08
6	0.29	0.19	0.15	0.22	0.67	1.27	2.67	6.55	4.59	4.76	3.32	1.78	1.21	1.66	2.26	2.27	1.79	0.88	0.54	0.69	0.84	0.74	0.83	0.91	0.88	0.84
7	0.19	0.17	0.16	0.28	0.59	1.26	3.62	6.25	3.50	3.74	3.02	1.73	1.15	2.08	2.49	1.87	1.34	0.69	0.45	0.62	0.77	0.71	0.77	0.83	0.78	0.72
8	0.14	0.16	0.12	0.19	0.52	1.75	4.52	4.55	2.63	2.69	2.87	1.68	1.38	2.01	2.08	1.69	1.09	0.54	0.37	0.53	0.70	0.63	0.66	0.69	0.61	0.55
9	0.12	0.16	0.12	0.34	0.76	2.07	2.99	3.30	2.48	2.46	3.48	1.90	1.22	1.96	1.70	1.56	1.04	0.56	0.39	0.58	0.75	0.66	0.67	0.67	0.59	0.54
10	0.12	0.08	0.13	0.37	1.08	1.73	2.62	1.17	2.16	2.41	2.52	1.72	1.14	1.60	1.43	1.32	0.91	0.49	0.36	0.54	0.68	0.58	0.57	0.56	0.50	0.47
11	0.10	0.15	0.13	0.45	0.89	1.57	1.93	1.87	1.58	1.82	2.39	1.57	0.69	1.27	1.17	1.12	0.80	0.46	0.33	0.48	0.60	0.49	0.48	0.48	0.44	0.41
12	0.11	0.08	0.30	0.34	0.79	1.08	1.55	0.39	2.27	1.62	2.04	1.23	0.65	1.15	1.13	1.13	0.94	0.62	0.52	0.62	0.76	0.61	0.63	0.65	0.62	0.60
13	0.12	0.17	0.12	0.44	0.61	0.95	1.08	0.64	1.59	1.40	2.11	1.08	0.58	1.05	1.08	1.10	0.94	0.60	0.49	0.57	0.68	0.56	0.59	0.61	0.59	0.56
14	0.15	0.18	0.22	0.22	0.49	1.08	1.58	1.15	1.20	2.42	1.83	0.92	0.50	0.94	1.00	1.02	0.88	0.54	0.43	0.48	0.60	0.50	0.53	0.55	0.53	0.50
15	0.11	0.26	0.12	0.23	0.37	0.92	0.85	0.64	1.53	2.14	1.54	0.82	0.45	0.87	0.95	0.94	0.80	0.47	0.38	0.42	0.54	0.44	0.48	0.49	0.48	0.46
16	0.08	0.13	0.06	0.26	0.46	0.75	0.94	2.25	1.37	1.81	1.44	0.74	0.42	0.82	0.89	0.84	0.71	0.42	0.34	0.38	0.49	0.40	0.43	0.45	0.44	0.42
17	0.08	0.17	0.20	0.26	0.33	0.48	1.25	1.97	1.23	1.65	1.30	0.69	0.39	0.75	0.80	0.73	0.64	0.38	0.31	0.34	0.45	0.36	0.39	0.41	0.40	0.38
18	0.10	0.13	0.07	0.22	0.20	0.62	0.99	1.73	1.15	1.47	1.19	0.65	0.36	0.67	0.69	0.64	0.59	0.35	0.29	0.31	0.41	0.33	0.36	0.37	0.37	0.36
19	0.02	0.23	0.10	0.09	0.36	0.55	0.86	1.56	1.08	1.30	0.99	0.60	0.32	0.59	0.62	0.57	0.55	0.33	0.28	0.28	0.38	0.30	0.33	0.35	0.35	0.33
20	0.06	0.12	0.08	0.24	0.33	0.49	0.77	1.42	1.04	1.21	0.92	0.55	0.28	0.51	0.56	0.52	0.52	0.31	0.27	0.25	0.35	0.27	0.31	0.32	0.33	0.31
21	0.02	0.07	0.17	0.23	0.30	0.45	0.70	1.32	1.00	1.12	0.83	0.48	0.24	0.45	0.51	0.48	0.50	0.29	0.26	0.23	0.33	0.25	0.29	0.30	0.32	0.30
22	0.10	0.21	0.17	0.21	0.29	0.42	0.64	1.23	0.96	1.01	0.73	0.43	0.21	0.41	0.48	0.44	0.48	0.28	0.26	0.21	0.32	0.23	0.27	0.29	0.31	0.29
23	0.21	0.22	0.17	0.21	0.27	0.39	0.58	1.12	0.85	0.89	0.64	0.39	0.19	0.37	0.45	0.41	0.47	0.26	0.26	0.20	0.30	0.21	0.26	0.27	0.30	0.28
24	0.21	0.22	0.17	0.20	0.26	0.37	0.53	1.00	0.79	0.77	0.56	0.35	0.17	0.34	0.42	0.38	0.47	0.26	0.24	0.18	0.29	0.20	0.25	0.27	0.30	0.28
25	0.22	0.23	0.18	0.20	0.26	0.34	0.47	0.88	0.74	0.68	0.50	0.32	0.15	0.31	0.40	0.36	0.46	0.25	0.25	0.17	0.28	0.19	0.24	0.26	0.30	0.28
26	0.20	0.24	0.19	0.20	0.25	0.32	0.41	0.76	0.69	0.60	0.45	0.30	0.14	0.29	0.39	0.35	0.47	0.25	0.26	0.16	0.28	0.18	0.24	0.26	0.30	0.28
27	0.21	0.25	0.19	0.20	0.24	0.29	0.35	0.67	0.59	0.53	0.39	0.28	0.13	0.27	0.38	0.34	0.36	0.26	0.27	0.16	0.28	0.17	0.24	0.26	0.31	0.29
28	0.21	0.27	0.21	0.20	0.24	0.27	0.30	0.58	0.56	0.46	0.34	0.26	0.12	0.23	0.37	0.33	0.31	0.26	0.28	0.15	0.28	0.16	0.24	0.26	0.32	0.30
29	0.22	0.29	0.22	0.21	0.23	0.25	0.26	0.50	0.45	0.40	0.30	0.24	0.11	0.22	0.36	0.32	0.31	0.27	0.31	0.15	0.28	0.16	0.24	0.26	0.30	0.31
30	0.23	0.31	0.23	0.21	0.23	0.24	0.23	0.44	0.42	0.35	0.26	0.23	0.10	0.21	0.36	0.32	0.26	0.28	0.29	0.14	0.28	0.16	0.24	0.27	0.28	0.26

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
93 - 95 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.04	0.04	0.01	0.03	0.01	0.01	0.05	0.09	0.02	0.04	0.02	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
2	0.31	0.35	0.19	0.28	0.25	0.62	1.02	1.50	0.52	0.83	0.68	0.35	0.31	0.34	0.26	0.21	0.26	0.18	0.13	0.18	0.19	0.19	0.17	0.17	0.16	0.16
3	0.64	0.43	0.40	0.37	0.70	1.18	2.84	3.98	1.60	2.19	2.54	1.51	0.94	0.94	0.92	0.94	1.02	0.68	0.56	0.61	0.72	0.56	0.55	0.58	0.56	0.58
4	0.58	0.45	0.31	0.37	0.81	1.52	2.48	4.70	2.27	3.89	4.99	2.15	1.20	1.42	1.46	1.54	1.82	1.21	0.89	0.95	1.02	0.84	0.91	0.97	1.00	1.02
5	0.46	0.28	0.24	0.34	0.78	1.35	2.99	5.03	3.52	5.94	5.06	2.11	1.22	1.71	1.94	2.15	2.15	1.24	0.77	0.88	1.00	0.87	0.94	1.07	1.06	1.05
6	0.37	0.21	0.16	0.29	0.75	1.40	3.35	7.29	4.81	5.26	4.24	2.13	1.46	1.69	2.39	2.19	1.91	0.94	0.55	0.72	0.88	0.76	0.85	0.93	0.88	0.84
7	0.28	0.16	0.22	0.24	0.71	1.36	4.78	7.08	4.01	3.61	3.53	1.95	1.44	2.23	2.53	1.81	1.51	0.76	0.47	0.66	0.82	0.74	0.81	0.86	0.80	0.73
8	0.12	0.26	0.15	0.30	0.68	1.87	5.11	4.67	3.14	3.46	3.36	1.89	1.52	2.19	2.19	1.82	1.23	0.61	0.39	0.57	0.75	0.65	0.70	0.72	0.64	0.57
9	0.14	0.16	0.16	0.28	0.81	1.99	3.24	3.40	2.64	2.84	3.02	2.07	1.43	2.01	1.70	1.53	1.06	0.56	0.37	0.56	0.73	0.62	0.65	0.64	0.56	0.52
10	0.14	0.03	0.16	0.35	1.05	2.02	2.44	2.11	2.07	2.10	3.15	2.06	1.36	1.71	1.47	1.33	0.96	0.51	0.35	0.53	0.68	0.56	0.56	0.55	0.49	0.46
11	0.09	0.09	0.17	0.43	0.95	1.52	2.14	2.78	2.32	2.70	3.32	1.85	0.83	1.45	1.27	1.19	0.88	0.50	0.34	0.50	0.63	0.50	0.50	0.50	0.45	0.43
12	0.15	0.18	0.24	0.30	0.81	1.33	2.12	2.26	2.06	1.85	2.50	1.33	0.81	1.34	1.24	1.21	1.04	0.68	0.53	0.65	0.80	0.62	0.66	0.68	0.64	0.62
13	0.15	0.16	0.22	0.39	0.57	1.12	1.62	1.33	1.91	2.29	2.48	1.16	0.71	1.22	1.15	1.15	1.01	0.63	0.49	0.58	0.71	0.56	0.61	0.63	0.60	0.57
14	0.13	0.18	0.22	0.35	0.64	0.94	1.49	0.80	1.53	2.68	1.80	0.86	0.54	0.94	0.93	0.92	0.82	0.50	0.38	0.44	0.55	0.43	0.48	0.50	0.47	0.45
15	0.16	0.16	0.20	0.25	0.57	0.98	1.74	1.12	1.69	2.40	1.63	0.77	0.49	0.88	0.87	0.85	0.74	0.44	0.33	0.38	0.49	0.39	0.44	0.45	0.43	0.41
16	0.13	0.10	0.16	0.20	0.48	1.10	0.63	2.63	1.52	2.00	1.52	0.70	0.45	0.82	0.81	0.76	0.66	0.38	0.30	0.34	0.44	0.35	0.39	0.41	0.39	0.37
17	0.12	0.18	0.08	0.32	0.33	0.47	1.31	2.32	1.38	1.83	1.38	0.66	0.42	0.76	0.73	0.66	0.58	0.34	0.27	0.31	0.41	0.31	0.36	0.37	0.36	0.34
18	0.11	0.14	0.14	0.13	0.48	0.65	1.13	2.05	1.29	1.69	1.27	0.62	0.39	0.68	0.64	0.57	0.52	0.31	0.25	0.28	0.37	0.28	0.33	0.34	0.33	0.31
19	0.23	0.09	0.07	0.06	0.37	0.58	0.99	1.86	1.22	1.60	1.15	0.57	0.35	0.59	0.57	0.50	0.48	0.28	0.23	0.25	0.34	0.26	0.30	0.31	0.30	0.29
20	0.09	0.16	0.08	0.24	0.34	0.52	0.88	1.70	1.17	1.42	0.98	0.52	0.30	0.51	0.51	0.45	0.45	0.26	0.22	0.23	0.31	0.23	0.27	0.28	0.28	0.27
21	0.15	0.06	0.17	0.22	0.31	0.48	0.79	1.58	1.12	1.32	0.88	0.46	0.26	0.45	0.46	0.41	0.42	0.24	0.20	0.21	0.29	0.21	0.25	0.26	0.26	0.25
22	0.04	0.19	0.16	0.21	0.29	0.44	0.72	1.47	1.07	1.19	0.78	0.41	0.23	0.40	0.42	0.38	0.39	0.23	0.20	0.19	0.27	0.19	0.23	0.25	0.25	0.24
23	0.21	0.19	0.16	0.20	0.28	0.41	0.66	1.34	0.95	1.06	0.69	0.37	0.21	0.36	0.39	0.34	0.37	0.21	0.19	0.17	0.25	0.18	0.22	0.23	0.24	0.22
24	0.20	0.19	0.16	0.20	0.27	0.39	0.59	1.20	0.88	0.94	0.61	0.34	0.19	0.33	0.36	0.32	0.36	0.20	0.18	0.16	0.23	0.16	0.21	0.22	0.23	0.21
25	0.20	0.19	0.16	0.19	0.25	0.36	0.52	1.06	0.82	0.83	0.54	0.31	0.17	0.29	0.34	0.29	0.35	0.18	0.18	0.15	0.22	0.15	0.19	0.20	0.22	0.21
26	0.21	0.20	0.16	0.19	0.24	0.34	0.45	0.93	0.77	0.74	0.49	0.28	0.15	0.26	0.32	0.27	0.34	0.18	0.18	0.14	0.21	0.14	0.18	0.20	0.21	0.20
27	0.21	0.21	0.16	0.18	0.24	0.31	0.39	0.82	0.66	0.66	0.43	0.26	0.14	0.24	0.30	0.26	0.33	0.17	0.19	0.13	0.20	0.13	0.18	0.19	0.21	0.20
28	0.22	0.21	0.17	0.18	0.23	0.29	0.34	0.72	0.62	0.58	0.38	0.24	0.12	0.22	0.29	0.25	0.33	0.17	0.19	0.12	0.19	0.12	0.17	0.18	0.21	0.20
29	0.22	0.22	0.17	0.18	0.22	0.27	0.29	0.63	0.58	0.51	0.33	0.23	0.11	0.20	0.28	0.24	0.33	0.17	0.20	0.11	0.19	0.12	0.17	0.18	0.21	0.20
30	0.23	0.23	0.18	0.18	0.21	0.26	0.25	0.55	0.55	0.45	0.29	0.22	0.10	0.19	0.27	0.23	0.33	0.17	0.19	0.11	0.18	0.11	0.16	0.18	0.21	0.20

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
95 - 97 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.03	0.01	0.02	0.03	0.02	0.03	0.06	0.15	0.03	0.06	0.03	0.03	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01
2	0.43	0.43	0.30	0.32	0.36	0.76	1.39	2.15	0.63	1.23	0.96	0.51	0.46	0.48	0.36	0.31	0.31	0.20	0.19	0.22	0.20	0.23	0.21	0.21	0.19	0.19
3	0.77	0.60	0.53	0.45	0.85	1.44	3.52	4.63	2.16	3.22	3.55	1.95	1.33	1.29	1.20	1.18	1.15	0.80	0.62	0.62	0.83	0.67	0.65	0.67	0.64	0.66
4	0.75	0.55	0.43	0.48	0.76	1.78	3.55	6.02	3.06	5.47	6.11	2.50	1.58	1.69	1.79	1.71	1.91	1.26	0.91	1.03	1.09	0.93	0.97	1.02	1.04	1.05
5	0.53	0.40	0.33	0.37	0.81	1.68	3.58	7.19	4.49	7.29	5.77	2.60	1.65	2.02	1.97	2.33	2.34	1.33	0.84	0.99	1.09	0.99	1.03	1.14	1.13	1.12
6	0.42	0.32	0.24	0.51	0.86	1.68	3.72	8.48	6.23	5.88	4.89	2.44	1.64	1.97	2.57	2.48	2.09	0.99	0.60	0.81	0.94	0.86	0.92	0.98	0.94	0.90
7	0.29	0.25	0.29	0.44	0.85	1.83	4.68	9.27	5.06	4.66	4.14	2.30	1.49	2.33	2.55	2.16	1.47	0.80	0.51	0.73	0.85	0.82	0.85	0.90	0.83	0.77
8	0.20	0.26	0.24	0.42	0.93	2.13	5.59	6.06	3.92	3.62	3.72	2.14	1.64	2.46	2.27	1.96	1.24	0.66	0.43	0.65	0.78	0.74	0.75	0.76	0.68	0.61
9	0.24	0.27	0.24	0.36	1.11	2.75	4.07	4.34	3.41	3.39	3.65	2.17	1.61	2.03	1.81	1.70	1.10	0.62	0.41	0.64	0.77	0.71	0.70	0.69	0.61	0.56
10	0.19	0.21	0.23	0.50	1.20	2.17	3.39	2.68	2.99	2.68	3.21	2.26	1.34	1.76	1.59	1.50	1.01	0.59	0.41	0.63	0.74	0.67	0.65	0.63	0.56	0.53
11	0.20	0.18	0.27	0.60	1.05	1.82	2.54	2.42	2.60	2.92	3.17	1.83	0.86	1.39	1.28	1.25	0.87	0.53	0.37	0.55	0.64	0.56	0.53	0.52	0.48	0.45
12	0.16	0.24	0.36	0.50	0.99	1.41	1.98	1.79	2.64	2.27	2.27	1.34	0.74	1.17	1.14	1.14	0.87	0.56	0.42	0.57	0.64	0.56	0.55	0.55	0.52	0.49
13	0.19	0.29	0.31	0.48	0.92	1.36	2.27	1.44	2.14	1.50	2.43	1.25	0.69	1.12	1.12	1.15	0.89	0.56	0.41	0.54	0.60	0.53	0.54	0.54	0.50	0.48
14	0.15	0.24	0.25	0.44	0.74	1.37	1.37	1.48	1.34	2.50	1.73	0.86	0.49	0.80	0.83	0.86	0.67	0.41	0.30	0.38	0.43	0.38	0.39	0.39	0.37	0.35
15	0.22	0.25	0.22	0.33	0.63	1.14	1.77	0.98	1.64	2.28	1.60	0.79	0.45	0.76	0.79	0.81	0.62	0.37	0.27	0.34	0.39	0.35	0.36	0.36	0.34	0.32
16	0.19	0.20	0.19	0.31	0.58	0.86	0.83	2.65	1.50	2.11	1.52	0.73	0.42	0.72	0.75	0.74	0.56	0.33	0.24	0.31	0.36	0.32	0.33	0.33	0.31	0.30
17	0.15	0.16	0.25	0.21	0.46	0.71	1.67	2.42	1.38	1.99	1.47	0.70	0.40	0.67	0.68	0.66	0.50	0.30	0.22	0.28	0.33	0.29	0.30	0.30	0.28	0.27
18	0.17	0.18	0.20	0.25	0.48	0.81	1.55	2.22	1.29	1.91	1.44	0.67	0.38	0.61	0.62	0.59	0.46	0.28	0.21	0.26	0.30	0.27	0.28	0.28	0.26	0.25
19	0.14	0.13	0.17	0.18	0.42	0.74	1.45	2.08	1.23	1.86	1.42	0.63	0.34	0.55	0.55	0.53	0.43	0.26	0.19	0.24	0.28	0.25	0.26	0.25	0.24	0.23
20	0.11	0.15	0.07	0.27	0.38	0.68	1.39	1.96	1.18	1.74	1.31	0.58	0.31	0.48	0.50	0.48	0.40	0.24	0.18	0.22	0.26	0.23	0.24	0.23	0.22	0.21
21	0.07	0.09	0.18	0.25	0.35	0.64	1.26	1.87	1.14	1.64	1.25	0.52	0.27	0.43	0.46	0.44	0.37	0.22	0.17	0.20	0.24	0.21	0.22	0.22	0.21	0.20
22	0.06	0.19	0.17	0.24	0.33	0.60	1.22	1.79	1.09	1.55	1.19	0.47	0.25	0.39	0.42	0.41	0.35	0.21	0.16	0.19	0.22	0.19	0.21	0.20	0.19	0.19
23	0.21	0.18	0.16	0.23	0.32	0.57	1.10	1.68	1.03	1.45	1.12	0.43	0.22	0.36	0.39	0.37	0.33	0.19	0.15	0.17	0.21	0.18	0.19	0.19	0.18	0.17
24	0.20	0.17	0.16	0.22	0.30	0.55	1.05	1.56	0.96	1.29	0.96	0.40	0.20	0.33	0.36	0.34	0.31	0.18	0.14	0.16	0.20	0.17	0.18	0.17	0.17	0.16
25	0.20	0.17	0.16	0.21	0.29	0.51	0.98	1.43	0.89	1.20	0.91	0.36	0.19	0.29	0.33	0.31	0.30	0.17	0.14	0.15	0.18	0.16	0.17	0.16	0.16	0.15
26	0.19	0.17	0.16	0.21	0.28	0.48	0.92	1.30	0.83	1.13	0.86	0.34	0.17	0.27	0.31	0.29	0.28	0.17	0.13	0.14	0.17	0.14	0.16	0.15	0.15	0.14
27	0.19	0.17	0.16	0.20	0.26	0.45	0.86	1.19	0.78	1.02	0.82	0.31	0.16	0.25	0.28	0.27	0.26	0.16	0.13	0.13	0.16	0.13	0.15	0.14	0.14	0.14
28	0.19	0.17	0.16	0.19	0.25	0.41	0.80	1.08	0.73	0.76	0.77	0.29	0.14	0.22	0.26	0.25	0.25	0.15	0.13	0.12	0.15	0.13	0.14	0.13	0.14	0.13
29	0.20	0.17	0.16	0.19	0.24	0.39	0.75	0.99	0.69	0.70	0.74	0.27	0.13	0.20	0.25	0.24	0.24	0.15	0.13	0.11	0.14	0.12	0.13	0.13	0.13	0.12
30	0.20	0.17	0.15	0.18	0.22	0.36	0.71	0.89	0.65	0.64	0.53	0.25	0.12	0.19	0.23	0.22	0.23	0.14	0.13	0.10	0.14	0.11	0.12	0.12	0.12	0.12

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
97 - 100 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.06	0.09	0.06	0.04	0.03	0.06	0.20	0.30	0.06	0.07	0.04	0.02	0.01	0.02	0.03	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01
2	1.10	1.09	0.67	0.54	0.62	1.42	2.71	4.06	1.14	1.73	1.23	0.72	0.57	0.59	0.53	0.47	0.47	0.34	0.21	0.21	0.26	0.32	0.29	0.28	0.27	0.26
3	1.59	1.24	0.83	0.77	1.21	2.29	5.86	6.96	3.12	4.15	4.27	2.42	1.56	1.58	1.59	1.51	1.45	1.09	0.66	0.71	1.02	0.78	0.74	0.79	0.75	0.79
4	1.20	0.90	0.60	0.67	1.07	2.55	5.05	7.97	3.92	6.36	6.97	3.05	1.84	2.04	2.09	2.11	2.15	1.57	0.91	1.11	1.17	0.96	0.98	1.05	1.08	1.09
5	0.79	0.48	0.47	0.53	1.24	2.24	5.06	8.27	5.13	8.14	6.42	2.87	1.79	2.26	2.25	2.66	2.57	1.31	0.81	0.97	1.08	0.95	0.97	1.10	1.08	1.07
6	0.45	0.36	0.39	0.61	1.06	2.19	4.56	8.24	6.64	6.58	4.98	2.60	1.78	2.23	2.70	2.73	2.22	1.13	0.65	0.85	1.00	0.89	0.95	1.04	1.00	0.96
7	0.33	0.33	0.41	0.49	1.05	2.10	5.16	8.34	5.14	4.95	4.19	2.27	1.67	2.49	2.87	2.32	1.63	0.89	0.54	0.74	0.89	0.83	0.86	0.93	0.86	0.79
8	0.24	0.33	0.31	0.48	1.11	2.51	5.69	5.49	3.85	3.96	3.70	2.08	1.79	2.63	2.53	2.15	1.33	0.73	0.46	0.66	0.82	0.75	0.76	0.78	0.70	0.63
9	0.33	0.32	0.35	0.54	1.20	2.93	4.44	3.79	3.21	3.43	3.50	2.23	1.82	2.23	2.00	1.86	1.18	0.70	0.45	0.67	0.82	0.73	0.71	0.71	0.62	0.57
10	0.27	0.26	0.34	0.58	1.53	2.49	3.46	3.18	2.92	3.00	3.31	2.29	1.57	1.91	1.71	1.62	1.06	0.65	0.44	0.64	0.77	0.68	0.63	0.61	0.55	0.52
11	0.28	0.27	0.38	0.78	1.39	2.12	2.92	2.20	2.51	2.94	3.33	1.90	0.97	1.62	1.49	1.46	0.98	0.64	0.43	0.61	0.72	0.61	0.55	0.54	0.50	0.47
12	0.24	0.29	0.50	0.81	1.13	1.85	2.18	1.52	2.28	2.48	2.36	1.66	0.87	1.41	1.37	1.40	1.08	0.81	0.61	0.73	0.84	0.70	0.67	0.68	0.65	0.62
13	0.26	0.37	0.56	0.68	1.08	1.56	1.78	2.10	2.02	2.33	2.38	1.51	0.80	1.33	1.33	1.39	1.09	0.79	0.59	0.68	0.76	0.65	0.63	0.65	0.61	0.59
14	0.33	0.39	0.54	0.62	0.93	1.46	1.73	1.59	1.50	2.24	1.66	1.05	0.57	0.96	0.99	1.05	0.82	0.59	0.43	0.48	0.55	0.48	0.46	0.47	0.45	0.43
15	0.35	0.44	0.47	0.48	0.77	1.35	1.60	0.97	1.54	1.99	1.50	0.94	0.52	0.89	0.93	0.97	0.73	0.52	0.37	0.42	0.49	0.43	0.41	0.42	0.40	0.39
16	0.33	0.33	0.42	0.42	0.70	1.13	1.10	2.12	1.38	1.79	1.39	0.86	0.48	0.84	0.87	0.87	0.64	0.46	0.33	0.38	0.44	0.38	0.37	0.38	0.36	0.35
17	0.25	0.32	0.32	0.40	0.63	0.84	1.67	1.89	1.24	1.65	1.31	0.80	0.46	0.77	0.78	0.75	0.55	0.41	0.30	0.34	0.40	0.35	0.33	0.34	0.32	0.31
18	0.25	0.30	0.23	0.32	0.45	0.88	1.50	1.69	1.15	1.54	1.26	0.76	0.42	0.69	0.68	0.65	0.49	0.37	0.27	0.31	0.36	0.31	0.30	0.30	0.29	0.28
19	0.26	0.19	0.21	0.28	0.50	0.78	1.38	1.54	1.07	1.47	1.22	0.70	0.38	0.60	0.59	0.57	0.43	0.34	0.25	0.28	0.33	0.28	0.27	0.27	0.26	0.25
20	0.24	0.20	0.22	0.34	0.44	0.70	1.25	1.42	1.02	1.41	1.16	0.64	0.33	0.52	0.52	0.50	0.39	0.32	0.23	0.25	0.30	0.26	0.24	0.24	0.23	0.22
21	0.21	0.12	0.25	0.31	0.40	0.64	1.18	1.33	0.97	1.33	1.09	0.56	0.29	0.45	0.46	0.45	0.35	0.29	0.21	0.23	0.27	0.23	0.22	0.22	0.21	0.20
22	0.06	0.24	0.23	0.28	0.37	0.59	1.12	1.26	0.91	1.24	1.01	0.49	0.25	0.40	0.41	0.40	0.32	0.27	0.19	0.20	0.25	0.21	0.20	0.20	0.19	0.18
23	0.25	0.23	0.21	0.26	0.34	0.55	1.07	1.16	0.84	1.13	0.93	0.44	0.23	0.36	0.37	0.35	0.28	0.25	0.18	0.18	0.22	0.19	0.18	0.18	0.17	0.17
24	0.23	0.21	0.20	0.24	0.32	0.51	1.01	1.05	0.77	1.03	0.86	0.39	0.20	0.32	0.33	0.31	0.26	0.24	0.17	0.17	0.21	0.17	0.16	0.16	0.16	0.16
25	0.22	0.20	0.19	0.23	0.30	0.47	0.92	0.94	0.70	0.94	0.81	0.35	0.18	0.28	0.29	0.28	0.23	0.23	0.16	0.15	0.19	0.16	0.15	0.15	0.15	0.14
26	0.20	0.19	0.18	0.21	0.28	0.43	0.85	0.83	0.64	0.87	0.77	0.31	0.16	0.25	0.26	0.25	0.21	0.21	0.15	0.14	0.18	0.15	0.14	0.14	0.14	0.13
27	0.19	0.18	0.18	0.20	0.25	0.39	0.78	0.73	0.59	0.81	0.72	0.28	0.14	0.22	0.23	0.22	0.19	0.20	0.15	0.13	0.16	0.13	0.13	0.13	0.13	0.12
28	0.19	0.18	0.17	0.19	0.23	0.34	0.71	0.64	0.53	0.74	0.68	0.25	0.13	0.19	0.21	0.20	0.18	0.19	0.14	0.12	0.15	0.12	0.12	0.12	0.12	0.12
29	0.18	0.17	0.16	0.17	0.21	0.31	0.66	0.57	0.49	0.69	0.64	0.23	0.11	0.17	0.19	0.18	0.16	0.18	0.14	0.11	0.14	0.11	0.11	0.11	0.12	0.11
30	0.17	0.16	0.15	0.16	0.19	0.28	0.62	0.50	0.45	0.64	0.61	0.21	0.10	0.15	0.17	0.16	0.15	0.18	0.14	0.10	0.14	0.11	0.11	0.10	0.11	0.11

= Actual Experience

Summary of Conditional Claim Rates
30-Year Fixed-Rate Mortgages
Investors LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.01	0.00	0.02	0.01	0.00	0.01	0.03	0.13	0.01	0.02	0.04	0.01	0.01	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.05	0.05
2	0.24	0.40	0.28	0.24	0.25	0.50	1.85	2.88	0.66	1.20	1.48	0.73	0.39	0.46	0.30	0.24	0.22	0.21	0.07	0.15	0.11	0.27	0.25	0.25	0.23	0.23
3	0.87	0.88	0.50	0.44	0.69	1.17	4.47	5.75	1.93	3.42	4.86	2.68	1.29	1.35	1.12	0.84	1.07	0.72	0.57	0.48	1.05	0.89	0.85	0.89	0.86	0.88
4	0.90	0.84	0.47	0.59	0.66	1.60	4.31	6.22	2.62	5.08	8.07	2.96	1.46	1.80	1.58	1.46	2.02	1.52	0.80	1.19	1.28	1.11	1.15	1.23	1.25	1.27
5	0.77	0.64	0.33	0.44	0.75	1.55	4.11	6.34	3.42	6.72	6.76	2.34	1.50	1.88	1.85	2.10	3.00	1.64	0.96	1.08	1.22	1.11	1.16	1.29	1.29	1.28
6	0.59	0.42	0.36	0.49	0.68	1.66	3.79	6.29	4.58	7.77	4.77	2.07	1.37	1.90	2.50	2.55	2.99	1.04	0.78	0.93	1.12	1.01	1.10	1.20	1.16	1.12
7	0.44	0.38	0.22	0.36	0.79	1.42	3.99	5.42	5.60	4.26	4.07	1.84	1.26	2.18	2.82	2.27	1.39	0.81	0.64	0.79	0.98	0.90	0.98	1.04	0.98	0.92
8	0.27	0.34	0.30	0.42	0.61	1.44	3.79	4.53	3.00	2.93	3.47	1.63	1.29	2.36	2.53	1.63	1.23	0.77	0.68	0.80	1.04	0.92	1.00	1.05	0.98	0.92
9	0.44	0.25	0.26	0.34	0.67	1.88	2.62	2.74	2.29	2.62	3.22	1.76	1.24	2.32	1.61	1.40	1.10	0.74	0.68	0.80	1.06	0.89	0.96	0.98	0.90	0.86
10	0.25	0.20	0.18	0.37	1.06	1.73	2.24	2.07	2.29	2.22	3.34	1.86	1.19	1.60	1.44	1.25	1.05	0.72	0.70	0.80	1.05	0.85	0.89	0.91	0.85	0.82
11	0.29	0.25	0.27	0.49	0.87	1.31	1.77	1.58	2.01	2.32	2.67	1.46	0.80	1.31	1.18	1.05	0.95	0.68	0.66	0.72	0.95	0.73	0.77	0.79	0.75	0.74
12	0.23	0.27	0.30	0.43	0.76	0.99	1.31	1.37	1.82	1.72	2.13	1.27	0.70	1.13	1.07	0.97	0.96	0.72	0.74	0.74	0.96	0.72	0.79	0.82	0.80	0.79
13	0.17	0.28	0.22	0.34	0.55	0.97	1.32	1.16	1.74	1.46	1.83	0.98	0.54	0.91	0.88	0.81	0.86	0.64	0.64	0.60	0.79	0.59	0.65	0.69	0.68	0.67
14	0.26	0.17	0.20	0.49	0.54	0.81	1.30	1.00	1.05	2.58	1.94	1.00	0.57	0.97	0.95	0.87	0.94	0.68	0.67	0.62	0.82	0.61	0.68	0.72	0.71	0.70
15	0.34	0.23	0.18	0.28	0.50	0.91	1.18	0.74	1.45	2.24	1.68	0.88	0.50	0.88	0.87	0.77	0.88	0.62	0.61	0.54	0.74	0.54	0.61	0.65	0.64	0.64
16	0.24	0.16	0.19	0.27	0.52	0.90	0.86	2.39	1.25	1.95	1.50	0.78	0.45	0.80	0.78	0.67	0.73	0.59	0.58	0.49	0.68	0.48	0.55	0.59	0.59	0.59
17	0.25	0.24	0.19	0.24	0.52	0.33	0.96	2.03	1.08	1.75	1.37	0.71	0.41	0.72	0.69	0.58	0.55	0.56	0.56	0.44	0.63	0.44	0.51	0.54	0.55	0.53
18	0.19	0.13	0.23	0.12	0.48	0.38	0.83	1.71	0.96	1.60	1.27	0.64	0.37	0.63	0.61	0.50	0.51	0.52	0.56	0.41	0.59	0.40	0.47	0.50	0.52	0.50
19	0.21	0.31	0.15	0.17	0.29	0.33	0.73	1.48	0.87	1.49	1.19	0.58	0.32	0.55	0.54	0.45	0.35	0.43	0.52	0.38	0.57	0.36	0.44	0.48	0.47	0.48
20	0.16	0.21	0.21	0.24	0.26	0.28	0.66	1.30	0.80	1.39	1.09	0.51	0.27	0.47	0.48	0.40	0.32	0.36	0.43	0.35	0.55	0.34	0.42	0.45	0.45	0.46
21	0.16	0.17	0.25	0.23	0.23	0.25	0.60	1.15	0.73	1.29	0.99	0.44	0.23	0.41	0.44	0.37	0.30	0.29	0.30	0.34	0.54	0.32	0.41	0.41	0.44	0.46
22	0.08	0.26	0.24	0.21	0.21	0.23	0.56	1.03	0.67	1.18	0.90	0.38	0.20	0.37	0.42	0.35	0.28	0.29	0.30	0.33	0.54	0.31	0.41	0.40	0.41	0.42
23	0.26	0.24	0.24	0.20	0.20	0.21	0.53	0.91	0.60	1.07	0.81	0.33	0.17	0.33	0.39	0.33	0.26	0.28	0.21	0.32	0.39	0.30	0.37	0.40	0.37	0.33
24	0.24	0.24	0.25	0.20	0.19	0.19	0.49	0.78	0.53	0.97	0.74	0.29	0.15	0.30	0.38	0.32	0.26	0.19	0.21	0.32	0.27	0.29	0.34	0.36	0.32	0.33
25	0.24	0.25	0.26	0.20	0.18	0.18	0.43	0.67	0.48	0.89	0.68	0.26	0.13	0.27	0.37	0.32	0.09	0.19	0.21	0.32	0.26	0.29	0.35	0.37	0.33	0.34
26	0.24	0.26	0.27	0.20	0.18	0.17	0.40	0.57	0.43	0.82	0.64	0.23	0.12	0.25	0.36	0.31	0.07	0.19	0.07	0.33	0.26	0.30	0.27	0.29	0.21	0.22
27	0.25	0.27	0.29	0.20	0.18	0.16	0.38	0.48	0.39	0.77	0.60	0.21	0.10	0.24	0.36	0.32	0.06	0.19	0.06	0.34	0.18	0.31	0.27	0.29	0.21	0.22
28	0.26	0.29	0.32	0.21	0.17	0.15	0.33	0.41	0.36	0.65	0.56	0.19	0.09	0.22	0.37	0.32	0.05	0.05	0.05	0.36	0.17	0.32	0.28	0.24	0.14	0.15
29	0.28	0.31	0.34	0.21	0.17	0.14	0.31	0.35	0.33	0.61	0.53	0.17	0.08	0.21	0.37	0.33	0.04	0.04	0.04	0.38	0.17	0.34	0.18	0.19	0.14	0.15
30	0.30	0.34	0.38	0.22	0.17	0.14	0.27	0.30	0.31	0.51	0.45	0.16	0.08	0.20	0.38	0.34	0.04	0.03	0.04	0.35	0.16	0.37	0.18	0.19	0.14	0.15

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
Unknown LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.15	0.45	0.32	0.24	0.45	0.26	0.22	0.37	0.22	0.34	1.10	5.63	9.27	5.03	6.83	4.58	1.64	1.01	14.73	16.48	24.46	2.72	0.37	0.37	0.37	0.38
2	1.75	3.84	2.66	1.87	0.94	0.54	0.36	16.89	0.73	1.84	21.90	25.55	4.64	17.44	18.45	19.89	14.75	10.46	29.77	10.81	29.19	2.82	3.73	4.11	4.12	4.37
3	6.05	8.22	5.07	1.64	0.71	0.24	4.73	9.20	1.72	23.66	35.76	6.03	3.24	6.22	17.00	33.60	27.92	18.88	9.09	5.26	11.28	7.21	10.14	10.78	11.34	10.38
4	9.07	8.50	3.17	1.06	0.37	1.73	3.73	12.10	15.86	26.93	10.07	6.07	1.37	4.97	27.93	40.52	30.06	6.32	8.06	11.12	15.39	11.12	14.53	15.41	14.13	13.05
5	7.84	4.61	1.66	0.62	1.56	2.02	5.10	25.84	26.41	9.68	7.96	3.37	2.97	15.76	33.33	37.62	7.66	9.55	16.36	11.80	17.46	12.77	16.47	15.55	14.36	14.07
6	4.06	2.57	0.85	1.89	1.74	2.90	18.70	22.76	10.72	7.41	7.00	7.60	6.40	21.79	33.82	12.37	11.73	19.87	17.15	13.21	18.42	13.96	15.71	14.78	14.39	14.37
7	2.25	1.17	2.63	1.97	2.06	11.14	20.95	9.73	8.55	8.80	8.66	10.98	16.42	28.21	13.43	16.06	17.06	17.14	16.15	12.00	16.09	11.43	13.05	12.96	12.98	13.11
8	1.17	3.10	2.78	2.23	4.97	16.75	9.60	6.86	10.09	8.67	14.86	20.22	23.89	11.77	12.70	12.68	15.11	15.75	14.96	11.14	13.62	9.77	11.41	11.48	11.59	11.60
9	3.34	3.28	2.78	5.16	7.81	8.39	6.71	5.38	12.41	11.00	16.45	36.27	7.24	14.66	12.05	11.87	14.74	15.55	14.61	10.21	12.33	9.25	10.88	11.04	11.09	11.24
10	3.31	3.44	5.25	7.86	5.71	6.67	7.20	4.48	19.86	12.54	20.98	10.93	10.70	10.36	10.98	11.90	14.54	14.78	13.09	9.33	11.43	8.85	10.34	10.39	10.53	10.56
11	3.44	5.52	6.97	5.58	5.38	7.37	7.13	5.99	19.63	14.25	10.08	12.47	8.42	8.91	9.74	10.43	12.54	12.14	11.13	8.11	9.93	7.86	9.07	9.22	9.29	9.33
12	5.81	7.36	5.68	5.21	5.52	8.06	11.09	6.90	19.21	5.41	8.29	9.74	7.87	8.66	9.41	9.78	10.54	9.81	8.90	7.00	8.52	6.79	7.72	7.72	7.70	7.70
13	7.26	5.39	4.88	5.36	5.29	14.94	13.56	6.34	7.62	6.21	10.15	8.27	6.82	7.80	8.26	8.08	8.75	8.54	7.98	6.32	7.54	6.17	6.91	6.92	6.94	6.98
14	5.23	4.97	5.07	5.26	8.33	17.25	13.51	3.49	8.23	8.77	9.33	8.16	6.87	7.53	7.56	7.45	8.32	8.39	7.97	6.29	7.44	6.16	6.86	6.89	6.96	7.08
15	5.05	4.97	4.78	7.06	13.13	17.00	6.39	3.29	8.64	8.18	9.03	8.29	6.85	7.08	7.11	6.98	8.15	8.39	8.07	6.45	7.45	6.30	6.96	7.03	7.20	7.27
16	4.94	4.74	6.07	10.53	14.19	7.17	6.89	11.74	8.13	7.80	8.75	8.14	6.56	6.67	6.85	6.86	8.10	8.42	8.22	6.57	7.47	6.43	7.10	7.23	7.36	7.42
17	5.07	6.71	8.38	12.17	7.57	9.05	6.48	10.30	7.63	7.37	8.09	7.49	6.13	6.32	6.55	6.53	7.81	8.24	8.06	6.44	7.26	6.35	7.03	7.12	7.25	7.20
18	6.88	9.05	9.76	7.28	8.73	5.36	5.83	9.10	7.26	6.73	7.18	6.97	5.91	6.08	6.33	6.33	7.64	7.73	8.03	6.44	7.19	6.43	7.01	7.12	7.16	7.12
19	9.01	9.99	6.80	6.82	5.91	5.08	5.35	8.10	6.66	5.93	6.39	6.63	5.75	5.87	6.09	6.18	7.24	7.63	8.00	6.47	7.16	6.46	7.01	7.02	7.08	7.16
20	10.35	7.02	6.02	6.39	5.74	4.87	4.98	6.98	5.95	5.24	5.82	6.36	5.61	5.65	5.89	6.00	6.94	7.53	8.01	6.52	7.07	6.48	6.92	6.92	7.09	7.17
21	8.42	9.01	7.41	6.32	5.63	4.76	4.47	5.84	5.33	4.73	5.36	6.13	5.47	5.48	5.68	5.84	6.68	7.48	8.03	6.51	7.00	6.43	6.82	6.92	7.10	7.19
22	7.93	7.14	7.36	6.29	5.68	4.51	4.03	5.07	4.96	4.41	5.04	5.95	5.38	5.33	5.53	5.72	6.59	7.46	8.00	6.52	6.88	6.36	6.80	6.90	7.10	7.19
23	6.61	7.05	7.33	6.40	5.44	4.20	3.58	4.37	4.61	4.06	4.68	5.76	5.26	5.16	5.36	5.62	6.49	7.19	8.00	6.47	6.74	6.38	6.79	6.89	7.11	7.26
24	6.55	6.99	7.50	6.22	5.20	3.92	3.25	3.83	4.31	3.75	4.39	5.58	5.15	5.02	5.23	5.53	6.36	7.16	7.93	6.40	6.69	6.40	6.78	6.89	7.17	7.33
25	6.49	7.12	7.31	6.05	4.98	3.72	2.99	3.39	4.04	3.50	4.12	5.42	5.05	4.90	5.12	5.42	6.13	7.06	7.83	6.41	6.64	6.41	6.77	6.93	7.22	7.39
26	6.63	6.91	7.17	5.88	4.83	3.57	2.78	3.04	3.84	3.29	3.90	5.28	4.99	4.81	4.99	5.36	6.01	6.95	7.82	6.41	6.60	6.43	6.80	6.96	7.26	7.44
27	6.44	6.77	7.02	5.79	4.74	3.47	2.65	2.82	3.69	3.14	3.75	5.20	4.95	4.73	4.94	5.29	5.90	6.93	7.81	6.41	6.57	6.46	6.82	6.98	7.29	7.47
28	6.32	6.60	6.92	5.72	4.65	3.36	2.50	2.60	3.55	3.00	3.61	5.12	4.87	4.67	4.84	4.83	5.85	6.91	7.80	6.41	6.56	6.49	6.83	7.00	7.32	7.50
29	6.20	6.50	6.87	5.67	4.58	3.29	2.40	2.44	3.44	2.90	3.51	5.03	4.85	4.60	4.75	4.79	5.82	6.61	7.78	6.43	6.56	6.52	6.84	7.01	7.33	7.52
30	6.10	6.43	6.81	5.61	4.52	3.22	2.32	2.31	3.36	2.82	3.40	4.99	4.79	4.51	4.69	4.74	5.78	6.57	7.76	6.42	6.53	6.51	6.82	6.99	7.31	7.50

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
0 - 65 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	1.16	1.71	1.69	1.36	0.95	0.67	0.75	1.08	0.95	0.74	1.01	1.13	0.69	1.32	0.86	1.17	1.08	0.94	1.60	1.09	2.54	1.39	1.12	1.08	1.15	1.14
2	5.69	7.95	6.45	5.78	2.42	1.78	1.54	29.19	2.84	3.95	19.61	6.88	2.70	3.98	4.43	4.07	12.41	10.04	7.39	3.41	7.92	3.75	4.94	5.20	5.25	5.59
3	10.89	10.75	8.14	3.86	2.05	1.19	15.73	15.92	5.33	28.15	32.87	4.88	3.66	5.31	6.93	12.63	23.24	19.07	5.90	6.40	8.05	5.70	7.73	7.56	8.34	7.33
4	11.07	7.50	4.07	2.09	0.58	4.52	9.66	19.07	26.69	32.57	13.42	4.98	4.43	6.96	16.60	25.81	26.58	7.62	6.02	5.85	7.79	6.30	7.79	8.26	7.50	6.75
5	8.15	3.68	2.50	0.82	3.32	4.14	10.13	36.13	34.79	13.64	9.40	5.99	5.02	17.45	24.61	27.90	7.69	10.88	7.88	6.12	8.96	6.82	9.22	7.95	7.53	7.19
6	5.53	2.49	1.39	3.39	2.96	4.61	26.64	29.51	13.38	9.74	10.92	7.36	11.83	26.92	26.12	8.65	10.05	12.56	11.83	8.58	11.73	9.64	11.21	10.05	10.35	10.16
7	2.73	1.92	2.92	2.95	3.68	12.50	27.94	13.63	9.70	9.45	14.22	19.20	23.43	25.87	9.60	11.36	21.50	18.28	18.62	12.50	17.06	13.15	15.76	15.37	16.31	16.13
8	1.87	3.83	3.77	3.21	6.82	17.55	12.13	9.78	10.30	10.75	25.01	31.44	24.96	8.77	12.31	21.70	24.78	24.51	26.16	16.71	19.45	16.31	20.25	19.95	21.55	21.53
9	3.92	3.99	3.92	6.64	9.95	8.87	8.61	6.39	13.06	18.60	22.82	28.83	8.17	10.52	16.08	15.90	19.52	19.04	21.33	12.30	13.97	12.33	15.15	14.95	16.15	16.39
10	4.30	5.18	5.89	8.11	6.63	6.90	9.29	7.37	23.54	17.47	20.75	8.95	10.93	10.66	11.97	12.68	13.72	13.15	11.82	7.97	8.70	7.81	9.50	9.24	9.76	9.71
11	3.46	6.21	8.32	5.68	6.23	7.80	11.09	10.43	20.35	18.52	6.97	10.92	8.28	8.81	10.23	10.68	11.93	10.53	9.85	6.86	7.38	6.64	8.09	7.98	8.51	8.47
12	5.01	8.81	6.68	5.49	6.72	8.80	12.89	9.64	16.69	7.14	7.41	11.96	8.58	9.25	10.39	11.45	12.42	12.16	12.24	8.12	8.36	7.85	9.97	9.87	10.73	10.78
13	8.18	6.02	6.00	5.55	6.75	17.59	11.78	8.52	6.73	6.08	10.39	10.99	8.46	8.77	9.95	10.03	10.78	11.04	11.46	7.55	7.84	7.46	9.61	9.51	9.94	10.23
14	5.48	6.54	5.86	6.32	10.84	18.53	13.32	4.97	7.24	8.43	10.08	11.73	8.98	9.32	9.51	9.95	10.86	11.32	11.54	7.78	8.13	7.82	9.70	9.60	10.43	10.61
15	5.85	6.14	6.23	8.48	15.69	15.59	6.07	1.96	9.27	7.50	9.58	11.41	9.11	8.38	8.77	9.02	10.29	10.73	10.93	7.60	7.87	7.71	9.58	9.49	10.09	10.54
16	5.84	5.64	8.80	10.58	14.75	7.69	6.19	14.40	8.37	7.01	8.89	11.36	8.46	7.64	8.20	8.50	9.76	10.08	10.83	7.49	7.62	7.60	9.19	9.18	10.02	10.07
17	6.20	8.89	12.29	15.46	9.76	8.76	8.00	13.36	8.61	7.01	9.17	11.17	8.53	7.48	8.28	8.64	9.97	10.60	11.44	7.68	8.08	7.91	9.80	9.72	10.52	10.50
18	10.63	11.70	13.59	7.05	8.29	7.40	7.27	12.16	8.16	6.76	8.24	10.60	8.36	7.23	8.03	8.42	9.90	10.29	11.36	7.83	8.16	7.96	10.01	9.84	10.24	10.27
19	9.75	12.90	7.09	9.77	9.18	7.06	6.60	10.84	7.94	6.02	7.51	10.15	8.21	7.00	7.56	8.31	9.27	10.31	11.48	7.78	8.30	8.14	9.77	9.55	10.32	10.42
20	12.10	6.25	7.89	9.69	8.76	6.92	6.15	9.83	7.18	5.44	6.94	9.78	8.08	6.64	7.41	8.15	9.11	10.32	11.59	7.95	8.38	8.25	9.76	9.61	10.45	10.54
21	13.02	13.42	11.48	9.41	8.62	6.75	5.82	8.32	6.51	4.98	6.45	9.38	7.95	6.50	7.23	7.98	8.95	10.12	11.76	8.09	8.39	8.30	9.81	9.71	10.55	10.66
22	7.33	10.48	10.82	9.63	8.66	6.75	5.28	7.36	6.16	4.67	6.11	9.17	7.93	6.38	7.10	7.63	8.84	10.19	11.87	8.16	8.34	8.37	9.89	9.77	10.64	10.77
23	10.05	10.42	11.05	9.78	8.73	6.26	4.78	6.42	5.76	4.33	5.72	8.98	7.84	6.22	6.78	7.34	8.75	10.18	11.89	8.18	8.32	8.49	9.96	9.85	10.75	10.96
24	10.00	10.58	11.24	9.36	8.25	5.95	4.38	5.66	5.33	4.03	5.19	8.77	7.75	6.07	6.62	7.24	8.63	10.10	11.82	8.23	8.36	8.58	10.03	9.93	10.91	11.12
25	10.14	10.70	11.47	9.15	8.04	5.72	4.05	5.04	5.04	3.64	4.91	8.47	7.66	5.95	6.50	7.13	8.47	9.98	11.81	8.32	8.39	8.69	10.11	10.07	11.06	11.27
26	10.26	10.86	11.28	9.06	7.89	5.46	3.78	4.53	4.74	3.43	4.67	8.30	7.60	5.87	6.38	6.99	8.29	9.90	11.86	8.39	7.94	8.79	10.23	10.18	11.18	11.40
27	10.43	10.66	11.22	9.01	7.81	5.35	3.61	4.24	4.59	3.30	4.51	8.05	7.60	5.81	6.27	6.85	8.18	9.89	11.88	8.46	7.95	8.94	10.34	10.28	11.29	11.50
28	10.25	10.58	11.20	8.98	7.72	5.23	3.44	3.92	4.42	3.15	4.35	7.83	7.56	5.71	6.13	6.74	8.09	9.86	11.91	8.54	8.01	8.67	10.43	10.37	11.38	11.60
29	10.19	10.54	11.20	8.96	7.66	5.09	3.31	3.67	4.30	3.04	4.24	7.75	7.51	5.61	6.03	6.67	8.02	9.84	11.95	8.66	8.06	8.74	10.51	10.44	11.46	11.68
30	10.18	10.55	11.23	8.98	7.69	5.06	3.23	3.52	4.23	2.99	4.17	7.69	7.48	5.28	6.00	6.65	8.01	9.88	12.07	8.43	8.14	8.84	10.61	10.53	11.56	11.78

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
65 - 80 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.69	0.86	1.09	1.50	0.72	0.66	0.31	0.51	0.53	0.38	0.74	0.93	0.58	0.78	0.71	0.79	0.69	0.81	1.57	1.21	2.45	0.98	0.89	0.86	0.94	0.94
2	4.03	5.81	5.39	5.25	1.67	1.63	1.02	26.63	1.64	2.59	18.31	5.99	1.91	2.70	2.81	3.01	7.27	9.06	6.40	3.33	9.42	2.64	3.49	3.61	3.76	3.95
3	8.20	8.93	7.49	3.20	1.13	0.55	13.45	14.36	3.54	27.69	31.79	3.85	2.67	3.89	4.92	11.63	24.75	17.27	4.82	6.72	6.47	4.34	5.89	5.73	6.39	5.58
4	9.98	8.19	3.75	1.73	0.44	2.75	8.59	16.75	25.05	34.07	12.44	3.98	3.46	5.14	16.34	26.93	27.48	6.83	7.53	4.60	6.83	5.20	6.49	6.75	6.17	5.50
5	6.28	5.01	2.00	0.93	2.21	3.07	9.79	36.09	35.05	12.87	9.34	4.81	3.99	16.01	27.79	27.60	8.01	10.17	6.89	4.93	8.10	5.80	7.81	6.51	6.23	5.93
6	4.42	2.14	1.05	2.98	2.14	3.80	26.24	29.36	12.96	9.52	10.51	6.11	9.91	26.79	27.49	8.45	11.11	10.33	9.68	6.57	10.23	7.70	8.83	7.66	8.01	7.86
7	2.19	1.06	3.30	2.51	2.66	12.24	28.19	11.57	9.55	10.48	13.55	17.76	23.07	26.84	8.95	11.32	18.89	15.48	15.62	9.93	15.54	10.70	12.49	11.92	12.90	12.78
8	1.05	2.31	2.78	3.20	6.49	18.49	12.11	8.10	10.37	11.63	24.40	31.40	23.69	7.93	11.37	17.67	20.53	19.37	20.00	12.17	16.74	12.17	14.66	14.17	15.58	15.51
9	3.19	3.25	3.64	6.44	9.83	8.44	8.78	6.30	13.52	17.94	26.03	26.78	7.27	10.68	13.44	13.14	16.53	15.47	16.60	9.02	12.05	9.32	11.29	10.95	12.03	12.13
10	3.39	3.55	6.69	8.43	6.31	6.95	7.98	6.24	21.70	18.81	21.31	8.39	10.11	8.19	9.91	10.41	12.31	11.44	10.42	6.18	8.17	6.54	7.81	7.51	8.25	8.21
11	4.02	6.03	8.04	6.20	6.24	7.48	8.61	8.33	20.50	16.72	7.71	10.99	6.74	6.91	8.94	9.23	11.22	9.44	8.87	5.43	7.03	5.79	6.89	6.71	7.35	7.32
12	6.42	7.43	6.41	5.84	6.31	9.28	13.14	6.66	19.00	6.57	8.93	11.10	7.32	7.58	9.69	10.40	11.95	11.18	11.93	6.72	8.54	7.19	8.89	8.69	9.70	9.77
13	8.77	6.53	5.40	6.08	6.14	17.30	12.04	5.99	6.77	6.85	10.16	9.96	7.11	7.04	9.15	8.84	10.32	10.15	11.12	6.30	7.78	6.82	8.37	8.19	9.16	9.25
14	5.77	6.19	6.39	5.76	11.60	19.09	13.78	2.45	7.07	8.04	9.55	10.63	7.63	7.47	8.69	8.57	10.30	10.42	11.62	6.62	8.09	7.21	8.83	8.64	9.70	9.89
15	5.15	7.17	5.51	9.62	17.76	18.26	5.64	2.60	8.40	7.07	8.85	10.44	7.72	6.68	7.85	8.00	9.75	10.12	11.44	6.62	7.85	7.17	8.80	8.63	9.78	9.92
16	6.54	5.83	8.74	12.31	18.52	8.14	5.65	15.49	7.51	6.47	8.04	10.30	7.12	6.05	7.26	7.51	9.25	9.79	11.41	6.57	7.37	7.13	8.78	8.68	9.68	9.89
17	6.00	9.04	11.55	14.75	7.79	8.29	6.80	13.29	7.21	5.98	7.58	9.39	6.68	5.73	6.93	7.25	8.95	9.77	11.44	6.62	7.35	7.21	8.84	8.67	9.72	9.70
18	8.58	10.86	11.86	8.00	9.61	5.96	5.72	11.43	6.68	5.40	6.22	8.58	6.36	5.38	6.53	6.87	8.67	9.58	11.24	6.62	7.24	7.28	8.88	8.65	9.49	9.63
19	13.14	12.50	6.77	9.65	7.48	5.51	5.19	9.68	6.20	4.57	5.38	8.00	6.11	5.07	6.15	6.62	8.13	9.39	10.87	6.63	7.21	7.30	8.85	8.55	9.28	9.40
20	12.42	8.68	9.51	8.47	7.19	5.29	4.55	8.22	5.35	3.89	4.77	7.53	5.88	4.78	5.88	6.33	7.83	9.01	10.85	6.68	7.11	7.30	8.49	8.36	9.30	9.41
21	10.20	11.83	10.80	8.33	7.11	5.06	4.09	6.50	4.70	3.34	4.27	7.12	5.67	4.58	5.60	6.07	7.43	8.87	10.91	6.68	6.98	7.23	8.41	8.25	9.31	9.43
22	8.48	10.28	10.70	8.41	7.10	4.89	3.56	5.43	4.29	3.04	3.93	6.82	5.56	4.40	5.39	5.87	7.12	8.71	10.69	6.66	6.47	7.17	8.41	8.24	9.31	9.44
23	9.26	9.56	10.72	8.50	6.97	4.44	3.07	4.47	3.89	2.65	3.56	6.54	5.39	4.20	5.16	5.67	6.71	8.59	10.18	6.60	6.32	7.17	8.41	8.24	8.98	9.55
24	8.98	9.56	10.91	8.48	6.57	4.09	2.71	3.74	3.57	2.38	3.28	6.25	5.23	4.03	4.91	5.52	6.52	8.45	10.04	6.54	6.24	7.17	8.41	8.25	9.05	9.26
25	8.98	9.03	10.45	8.19	6.28	3.83	2.42	3.18	3.29	2.18	3.03	6.00	5.10	3.88	4.76	5.30	6.34	7.97	9.93	6.53	6.17	7.10	8.10	8.17	8.86	9.06
26	9.08	8.96	9.76	7.99	6.08	3.63	2.19	2.74	3.09	2.00	2.82	5.79	4.99	3.77	4.62	5.15	6.13	7.66	9.91	6.53	6.10	7.03	8.15	8.05	8.91	9.11
27	8.61	8.70	9.40	7.73	5.95	3.50	2.04	2.48	2.95	1.89	2.68	5.65	4.93	3.68	4.45	4.95	5.99	7.60	9.88	6.38	6.06	6.98	7.97	7.88	8.94	9.15
28	8.37	8.50	9.27	7.30	5.79	3.36	1.90	2.22	2.80	1.77	2.54	5.53	4.85	3.59	4.17	4.82	5.88	7.53	9.87	6.30	6.06	7.01	8.00	7.90	8.97	9.18
29	8.21	8.37	9.19	7.24	5.70	3.28	1.79	2.03	2.69	1.69	2.36	5.41	4.78	3.49	4.06	4.60	5.80	7.48	9.50	6.33	6.05	7.04	8.02	7.92	8.99	9.19
30	8.10	8.29	8.85	7.20	5.66	3.21	1.71	1.90	2.62	1.64	2.29	5.33	4.70	3.43	4.02	4.55	5.76	7.46	9.55	6.36	6.06	7.07	8.04	7.94	8.69	9.22

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
80 - 90 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.31	0.49	0.54	0.67	0.25	0.33	0.14	0.20	0.27	0.20	0.33	0.61	0.30	0.48	0.44	0.37	0.49	0.50	0.95	0.52	2.02	0.60	0.52	0.50	0.56	0.57
2	2.79	4.30	3.74	3.34	0.93	0.60	0.47	21.07	0.98	1.62	14.72	4.25	1.25	1.65	2.03	2.07	6.78	8.69	5.33	2.49	9.60	2.18	2.92	3.06	3.28	3.49
3	7.72	8.47	6.14	2.35	0.68	0.32	10.38	10.81	2.58	23.50	27.31	2.97	1.98	3.29	4.62	11.76	28.06	17.55	4.36	5.92	6.80	4.27	5.92	5.83	6.70	5.90
4	10.17	7.88	3.39	1.22	0.38	1.99	5.80	15.47	22.12	29.85	11.07	3.34	3.00	4.93	17.61	32.34	30.07	6.19	6.69	4.67	7.45	5.31	6.69	7.05	6.53	5.85
5	8.35	3.82	1.56	0.69	1.78	2.37	8.34	36.84	31.82	11.94	9.28	4.63	3.56	16.27	30.84	30.87	7.93	10.26	7.81	5.14	9.18	6.08	8.32	6.94	6.75	6.45
6	3.94	1.99	0.56	2.26	1.67	3.05	24.27	30.60	12.30	9.40	10.92	5.61	8.87	28.97	29.03	8.06	12.46	9.74	8.83	5.91	10.02	6.96	7.89	6.80	7.14	6.98
7	1.90	0.74	2.79	2.25	2.37	11.18	25.24	12.65	9.67	10.73	14.08	16.09	20.81	27.58	8.17	11.94	17.52	13.50	13.19	8.29	14.33	8.94	10.24	9.72	10.54	10.39
8	0.73	3.04	2.75	2.90	5.76	16.47	10.58	8.80	10.46	11.87	25.87	29.60	22.30	7.91	11.30	16.51	18.77	16.85	16.67	10.10	15.12	10.01	11.81	11.34	12.49	12.37
9	2.94	2.93	3.26	6.63	8.92	8.12	8.43	7.36	13.18	17.86	26.17	27.70	6.70	10.83	13.33	12.86	15.96	14.19	14.73	7.84	11.34	8.04	9.49	9.15	10.07	10.13
10	3.74	3.49	6.03	8.55	8.35	6.57	6.80	6.38	21.53	18.42	23.78	8.02	9.70	8.62	10.73	11.36	13.84	13.19	12.37	6.65	9.50	6.99	8.28	7.98	8.97	8.98
11	3.58	6.41	8.88	6.24	5.80	7.11	7.99	9.10	19.64	19.75	8.60	11.14	6.87	7.54	10.12	10.48	13.20	11.24	10.92	6.09	8.48	6.45	7.60	7.43	8.29	8.30
12	5.89	8.62	6.29	5.62	5.80	8.44	12.48	6.93	20.04	7.35	8.72	11.21	6.93	7.93	10.35	11.12	12.38	11.06	11.44	6.35	8.68	6.74	8.05	7.82	8.77	8.81
13	8.49	6.00	6.04	5.44	5.77	16.01	14.56	7.28	7.37	7.68	12.15	10.30	6.96	7.57	10.09	9.61	10.86	10.31	10.99	6.14	8.13	6.60	7.79	7.57	8.51	8.58
14	6.24	5.28	5.38	5.36	11.00	17.90	12.63	2.37	6.29	8.64	10.66	10.48	7.10	7.64	9.00	8.77	10.24	10.08	11.03	6.18	8.10	6.68	7.85	7.64	8.62	8.79
15	5.26	5.99	5.85	8.64	17.22	18.49	5.79	2.81	8.78	7.45	9.78	10.23	7.19	6.74	8.01	8.11	9.58	9.76	10.88	6.20	7.86	6.66	7.80	7.61	8.69	8.80
16	5.14	5.81	8.07	12.01	17.09	7.63	6.25	19.59	7.71	6.65	8.89	10.06	6.56	6.02	7.33	7.56	9.01	9.40	10.88	6.17	7.62	6.64	7.76	7.65	8.68	8.75
17	5.83	8.28	10.81	14.02	7.64	8.91	7.73	16.61	7.39	5.99	8.48	9.11	6.13	5.65	6.93	7.23	8.64	9.36	10.90	6.21	7.54	6.71	7.91	7.72	8.71	8.67
18	8.15	11.62	11.60	6.97	9.38	5.87	6.60	14.04	6.74	5.41	6.98	8.22	5.80	5.25	6.46	6.80	8.29	9.14	10.85	6.21	7.40	6.78	7.94	7.68	8.59	8.59
19	11.58	12.15	7.21	8.81	6.98	5.37	5.91	11.59	6.17	4.47	5.78	7.59	5.54	4.90	6.03	6.49	7.90	8.92	10.80	6.23	7.34	6.81	7.89	7.57	8.51	8.61
20	11.85	7.91	8.48	7.70	6.69	5.11	5.09	9.60	5.22	3.56	4.94	7.08	5.31	4.58	5.71	6.16	7.53	8.72	10.77	6.28	7.22	6.81	7.75	7.49	8.52	8.61
21	8.61	9.37	9.78	7.58	6.60	4.85	4.50	7.35	4.49	3.05	4.35	6.64	5.08	4.34	5.38	5.86	7.20	8.55	10.83	6.28	7.05	6.74	7.66	7.48	8.50	8.61
22	8.17	9.40	9.71	7.67	6.58	4.65	3.72	5.98	4.06	2.71	3.83	6.31	4.96	4.14	5.14	5.64	6.97	8.49	10.80	6.27	6.83	6.68	7.65	7.46	8.49	8.61
23	8.42	9.26	9.85	7.75	6.42	4.16	3.13	4.77	3.62	2.37	3.41	6.01	4.79	3.92	4.87	5.41	6.76	8.33	10.72	6.21	6.64	6.69	7.63	7.45	8.50	8.69
24	8.31	9.30	10.05	7.72	6.01	3.78	2.70	3.87	3.27	2.09	3.08	5.70	4.63	3.72	4.65	5.23	6.52	8.17	10.53	6.15	6.53	6.69	7.61	7.44	8.57	8.76
25	8.34	9.41	10.06	7.43	5.70	3.50	2.37	3.20	2.98	1.87	2.80	5.44	4.49	3.57	4.49	5.05	6.30	7.94	10.39	6.15	6.43	6.69	7.61	7.49	8.62	8.82
26	8.46	9.34	9.78	7.22	5.48	3.28	2.10	2.69	2.77	1.69	2.56	5.21	4.38	3.44	4.32	4.88	6.06	7.76	10.35	6.14	6.35	6.69	7.65	7.52	8.67	8.87
27	8.39	9.09	9.58	7.10	5.34	3.14	1.94	2.39	2.62	1.57	2.34	5.07	4.32	3.34	4.20	4.73	5.89	7.67	10.31	6.13	6.29	6.73	7.67	7.55	8.69	8.90
28	8.17	8.89	9.46	7.01	5.21	3.00	1.78	2.09	2.47	1.45	2.19	4.94	4.23	3.24	4.05	4.59	5.77	7.59	10.27	6.13	6.28	6.75	7.69	7.57	8.72	8.93
29	8.03	8.78	9.40	6.92	5.10	2.90	1.66	1.88	2.36	1.37	2.08	4.81	4.17	3.14	3.94	4.51	5.67	7.52	10.24	6.16	6.26	6.77	7.71	7.58	8.74	8.94
30	7.95	8.63	9.37	6.87	5.06	2.83	1.58	1.74	2.29	1.32	2.00	4.73	4.09	3.08	3.89	4.46	5.62	7.49	10.27	6.18	6.26	6.79	7.73	7.60	8.75	8.96

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
90 - 93 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.23	0.29	0.37	0.45	0.26	0.15	0.07	0.10	0.14	0.16	0.21	0.39	0.16	0.27	0.30	0.23	0.24	0.36	0.65	0.21	1.79	0.38	0.34	0.33	0.37	0.38
2	2.14	3.70	3.25	2.88	0.70	0.61	0.20	16.38	0.67	1.44	12.19	3.19	0.83	1.19	1.68	1.59	5.49	7.39	4.17	1.90	9.06	1.81	2.40	2.51	2.72	2.90
3	6.77	7.84	6.00	2.23	0.55	0.29	8.05	8.50	1.95	22.37	25.66	2.44	1.60	2.87	4.23	11.02	28.59	17.11	3.84	5.55	6.49	4.02	5.52	5.42	6.28	5.59
4	10.10	8.69	3.17	1.11	0.43	1.73	5.15	13.07	19.61	29.22	11.19	3.14	2.81	4.78	17.15	32.83	32.14	6.06	6.97	4.94	8.16	5.66	7.14	7.53	7.12	6.44
5	8.67	4.20	1.41	0.66	1.33	1.99	6.35	34.81	28.34	12.32	8.54	4.36	3.37	16.11	32.05	31.78	7.90	10.54	9.36	5.65	10.51	6.69	9.28	7.76	7.75	7.47
6	4.35	1.95	0.69	2.04	1.57	2.88	21.07	28.53	11.65	9.67	11.21	5.43	8.71	29.41	29.37	8.46	13.00	10.68	9.93	6.26	11.13	7.38	8.45	7.30	7.79	7.65
7	1.92	0.83	2.58	2.00	1.99	9.83	21.84	11.64	8.71	10.84	12.95	14.91	20.73	27.64	8.23	12.05	16.59	12.72	12.65	7.53	13.83	8.14	9.34	8.85	9.73	9.65
8	0.81	3.09	2.81	2.19	5.25	16.12	9.56	8.71	10.33	11.37	24.24	27.42	22.03	8.34	11.58	14.93	17.23	15.15	14.65	8.68	13.71	8.60	10.08	9.64	10.71	10.62
9	2.89	3.07	3.16	5.84	8.31	7.63	6.87	6.67	13.26	17.87	24.32	25.97	6.57	11.29	13.26	12.70	16.14	13.95	14.29	7.35	11.18	7.56	8.86	8.51	9.44	9.50
10	3.01	3.59	6.45	8.75	5.78	6.01	7.08	5.08	21.33	18.66	24.17	7.27	9.61	8.43	10.74	11.42	14.53	14.07	13.42	6.71	10.06	7.08	8.42	8.13	9.28	9.33
11	3.76	7.12	9.16	6.45	5.30	6.81	7.94	6.93	20.40	19.97	8.17	10.74	6.82	7.65	10.55	10.90	14.43	12.38	12.26	6.38	9.33	6.81	8.02	7.85	8.91	8.96
12	6.55	8.60	6.10	5.54	6.03	7.89	12.54	7.89	20.61	6.93	8.17	11.52	6.86	8.14	10.79	11.59	13.12	11.50	11.81	6.35	9.10	6.77	8.00	7.75	8.77	8.81
13	8.32	6.64	5.81	5.93	5.87	14.71	14.30	7.33	7.40	6.76	13.08	10.56	6.92	7.73	10.52	9.93	11.43	10.71	11.39	6.17	8.54	6.64	7.74	7.51	8.52	8.59
14	6.55	5.74	6.16	5.78	10.13	17.97	14.81	3.58	7.89	9.24	11.49	10.91	7.14	7.92	9.43	9.09	10.89	10.63	11.64	6.31	8.64	6.83	7.92	7.68	8.75	8.92
15	5.39	5.47	5.51	8.29	16.33	17.57	5.11	4.64	9.44	7.88	10.44	10.61	7.26	6.94	8.33	8.38	10.21	10.35	11.55	6.37	8.42	6.85	7.89	7.69	8.85	8.97
16	5.86	5.94	8.29	12.18	17.88	6.13	6.64	22.55	8.24	6.93	9.37	10.43	6.60	6.16	7.60	7.80	9.62	10.01	11.63	6.37	8.19	6.86	7.89	7.75	8.88	8.96
17	5.73	7.92	10.90	13.78	8.26	8.60	8.10	18.85	7.82	6.33	8.68	9.34	6.10	5.72	7.12	7.41	9.16	9.90	11.59	6.37	8.04	6.89	8.00	7.79	8.87	8.84
18	8.26	11.81	12.17	7.21	9.59	5.92	6.58	15.69	7.04	5.55	6.99	8.34	5.75	5.28	6.57	6.92	8.76	9.64	11.54	6.37	7.88	6.97	8.03	7.75	8.76	8.77
19	10.34	12.97	7.83	8.73	7.04	5.39	5.79	12.67	6.40	4.36	5.56	7.65	5.46	4.90	6.08	6.58	8.31	9.40	11.50	6.39	7.81	7.00	7.97	7.64	8.68	8.78
20	12.11	8.04	7.96	7.77	6.73	5.10	5.01	10.29	5.35	3.57	4.75	7.08	5.21	4.55	5.72	6.20	7.89	9.17	11.48	6.44	7.67	7.00	7.83	7.56	8.69	8.78
21	9.30	10.39	9.97	7.64	6.63	4.78	4.35	7.68	4.56	3.01	4.11	6.60	4.97	4.29	5.35	5.86	7.52	8.98	11.56	6.45	7.48	6.94	7.74	7.55	8.68	8.79
22	9.36	9.48	9.92	7.73	6.57	4.56	3.67	6.12	4.09	2.65	3.69	6.24	4.84	4.08	5.09	5.62	7.27	8.91	11.54	6.44	7.24	6.88	7.72	7.53	8.67	8.79
23	8.37	9.34	10.07	7.78	6.38	4.05	3.03	4.76	3.57	2.28	3.23	5.90	4.65	3.84	4.80	5.36	7.04	8.73	11.47	6.38	7.04	6.89	7.70	7.52	8.68	8.87
24	8.26	9.38	10.23	7.74	5.95	3.65	2.58	3.78	3.20	1.98	2.88	5.57	4.48	3.63	4.56	5.17	6.79	8.54	11.27	6.33	6.93	6.90	7.69	7.52	8.75	8.94
25	8.29	9.46	10.23	7.43	5.62	3.36	2.23	3.06	2.90	1.75	2.58	5.29	4.33	3.46	4.37	4.97	6.55	8.30	11.14	6.34	6.82	6.90	7.68	7.56	8.80	9.00
26	8.34	9.38	9.94	7.20	5.38	3.13	1.96	2.52	2.68	1.57	2.34	5.04	4.22	3.33	4.19	4.78	6.29	8.11	11.12	6.33	6.73	6.91	7.72	7.60	8.85	9.05
27	8.29	9.12	9.76	7.07	5.23	2.98	1.78	2.21	2.46	1.44	2.18	4.89	4.15	3.23	4.06	4.63	5.93	8.03	11.09	6.33	6.68	6.95	7.74	7.62	8.89	9.09
28	8.07	8.91	9.64	6.97	5.09	2.83	1.62	1.91	2.31	1.32	2.02	4.75	4.06	3.10	3.91	4.48	5.72	7.94	11.07	6.33	6.66	6.99	7.77	7.65	8.92	9.12
29	7.92	8.79	9.57	6.89	4.98	2.73	1.50	1.69	2.12	1.24	1.91	4.62	3.99	3.00	3.79	4.39	5.62	7.88	11.06	6.36	6.65	7.01	7.78	7.67	8.86	9.15
30	7.83	8.73	9.52	6.83	4.92	2.66	1.42	1.55	2.05	1.18	1.83	4.53	3.91	2.93	3.74	4.34	5.48	7.84	10.96	6.38	6.65	7.03	7.80	7.68	8.83	9.03

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
93 - 95 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.15	0.17	0.31	0.38	0.14	0.17	0.06	0.04	0.13	0.13	0.11	0.35	0.09	0.20	0.24	0.18	0.25	0.28	0.57	0.23	1.85	0.29	0.27	0.26	0.30	0.31
2	1.84	3.56	3.20	2.42	0.58	0.30	0.29	13.27	0.61	1.17	10.46	2.98	0.61	1.09	1.43	1.37	4.68	7.12	4.10	1.86	9.67	1.64	2.20	2.28	2.54	2.67
3	7.21	8.16	6.17	1.96	0.56	0.26	7.21	7.45	1.73	19.83	23.71	2.32	1.44	2.68	3.57	9.24	27.58	17.42	3.98	5.87	6.20	3.84	5.28	5.20	6.03	5.36
4	9.85	9.03	3.29	1.28	0.33	1.59	4.41	11.32	17.49	26.83	10.75	2.92	2.65	4.34	15.39	31.84	31.64	6.29	6.94	4.48	7.59	5.21	6.60	6.82	6.47	5.81
5	9.00	4.55	1.54	0.69	1.11	1.79	5.71	33.11	26.04	11.87	8.36	4.24	3.08	14.39	30.49	30.95	7.73	10.79	8.99	5.24	9.94	6.32	8.65	7.14	7.17	6.90
6	4.34	2.06	0.64	1.85	1.65	2.44	20.68	27.78	10.32	8.97	10.10	5.09	6.25	28.26	28.98	8.42	12.78	9.79	9.16	5.64	10.35	6.70	7.61	6.46	6.93	6.82
7	1.99	0.68	2.64	1.99	1.99	9.18	22.92	11.62	8.41	10.98	13.01	13.73	19.51	27.22	7.85	12.25	14.67	11.39	11.32	6.65	12.40	7.16	8.10	7.58	8.41	8.35
8	0.79	3.25	2.81	2.27	5.30	14.33	9.13	7.25	10.06	11.46	22.30	26.06	20.85	7.66	10.96	12.60	14.89	13.25	12.97	7.40	11.93	7.34	8.54	8.10	9.10	9.03
9	3.33	3.59	3.01	5.81	8.68	7.49	7.08	6.73	11.62	17.88	23.99	24.56	6.24	10.33	11.47	11.01	14.25	12.59	12.81	6.38	9.87	6.59	7.69	7.34	8.22	8.27
10	3.09	3.82	6.44	8.42	5.99	6.03	6.27	6.51	19.26	19.23	23.36	7.37	8.93	7.35	9.67	10.27	13.47	13.16	12.63	6.06	9.28	6.48	7.69	7.38	8.50	8.54
11	3.93	7.07	8.22	6.18	5.44	6.57	6.63	7.71	19.69	19.15	8.91	10.51	6.00	6.63	9.40	9.78	13.10	11.41	11.36	5.70	8.54	6.20	7.27	7.06	8.08	8.13
12	6.53	9.65	6.52	5.43	5.70	7.45	11.37	8.61	19.51	7.63	8.66	10.61	6.18	7.23	9.91	10.51	12.05	10.64	10.94	5.74	8.44	6.24	7.30	7.01	7.99	8.03
13	8.54	6.72	5.57	5.62	5.58	14.33	14.60	8.45	7.12	8.60	11.60	9.45	6.04	6.71	9.27	8.69	10.11	9.60	10.27	5.43	7.71	5.95	6.86	6.59	7.54	7.61
14	6.46	5.99	5.83	5.66	9.99	16.16	12.57	4.42	9.14	8.03	9.99	9.59	6.18	6.69	8.14	7.78	9.47	9.42	10.40	5.50	7.70	6.05	6.92	6.66	7.66	7.82
15	5.72	5.98	5.61	7.69	15.03	17.10	6.81	4.54	8.34	6.90	9.30	9.45	6.26	5.87	7.18	7.21	8.95	9.26	10.42	5.59	7.56	6.11	6.96	6.73	7.82	7.92
16	5.95	5.69	8.20	11.26	16.11	8.01	5.77	21.44	7.32	5.99	8.44	9.25	5.70	5.21	6.58	6.76	8.51	9.04	10.58	5.64	7.41	6.18	7.02	6.84	7.90	7.99
17	5.70	8.21	10.97	13.60	8.33	9.22	7.10	17.69	6.86	5.44	7.65	8.17	5.20	4.79	6.12	6.39	8.04	8.85	10.44	5.58	7.20	6.15	7.06	6.81	7.84	7.82
18	8.32	10.88	12.57	7.50	9.51	5.26	5.94	14.55	6.19	4.78	6.13	7.24	4.88	4.42	5.67	5.97	7.67	8.61	10.39	5.58	7.05	6.21	7.07	6.78	7.74	7.74
19	11.55	13.02	7.95	9.28	6.28	4.79	5.18	11.71	5.54	3.83	4.96	6.61	4.63	4.10	5.25	5.66	7.26	8.38	10.35	5.60	6.98	6.23	7.03	6.69	7.65	7.75
20	11.69	7.42	8.09	6.99	5.99	4.50	4.48	9.33	4.62	3.01	4.08	6.12	4.42	3.80	4.93	5.33	6.89	8.17	10.35	5.64	6.85	6.25	6.90	6.60	7.66	7.75
21	9.04	9.43	9.06	6.88	5.87	4.24	3.83	6.88	3.91	2.52	3.51	5.70	4.21	3.58	4.60	5.03	6.56	8.01	10.42	5.64	6.68	6.19	6.80	6.60	7.65	7.76
22	7.38	8.56	8.99	6.92	5.85	4.00	3.21	5.41	3.50	2.21	3.14	5.38	4.09	3.39	4.37	4.82	6.34	7.94	10.39	5.65	6.47	6.13	6.79	6.58	7.64	7.76
23	7.52	8.43	9.08	7.01	5.61	3.54	2.62	4.17	3.04	1.89	2.74	5.08	3.93	3.19	4.11	4.60	6.13	7.78	10.35	5.60	6.26	6.14	6.77	6.57	7.65	7.82
24	7.42	8.41	9.28	6.89	5.22	3.17	2.21	3.28	2.73	1.64	2.43	4.78	3.78	3.01	3.90	4.43	5.89	7.63	10.19	5.54	6.16	6.14	6.76	6.57	7.70	7.88
25	7.41	8.53	9.17	6.60	4.90	2.91	1.90	2.64	2.47	1.44	2.17	4.53	3.65	2.87	3.74	4.25	5.69	7.41	10.05	5.55	6.07	6.15	6.75	6.60	7.75	7.93
26	7.53	8.36	8.90	6.37	4.68	2.71	1.67	2.16	2.28	1.29	1.96	4.32	3.56	2.76	3.58	4.10	5.46	7.22	10.04	5.55	5.99	6.16	6.78	6.63	7.79	7.97
27	7.40	8.11	8.69	6.24	4.55	2.58	1.51	1.89	2.08	1.18	1.82	4.19	3.50	2.67	3.48	3.96	5.30	7.15	10.03	5.54	5.94	6.19	6.80	6.65	7.81	8.00
28	7.20	7.89	8.56	6.14	4.41	2.45	1.37	1.62	1.96	1.08	1.69	4.07	3.42	2.59	3.35	3.83	5.19	7.07	10.02	5.55	5.92	6.22	6.81	6.67	7.84	8.02
29	7.05	7.76	8.49	6.06	4.31	2.36	1.27	1.44	1.86	1.01	1.60	3.95	3.36	2.51	3.24	3.76	5.11	7.02	10.01	5.57	5.91	6.24	6.82	6.68	7.85	8.04
30	6.94	7.67	8.42	6.00	4.25	2.29	1.19	1.31	1.81	0.96	1.52	3.88	3.30	2.44	3.18	3.70	5.04	6.97	10.00	5.58	5.89	6.25	6.82	6.67	7.85	8.03

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
95 - 97 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.18	0.14	0.31	0.34	0.17	0.10	0.11	0.15	0.13	0.09	0.12	0.27	0.13	0.20	0.26	0.19	0.22	0.29	0.61	0.21	1.76	0.30	0.27	0.25	0.29	0.30
2	1.71	3.26	3.33	2.41	0.55	0.34	0.25	11.76	0.47	0.77	8.91	2.66	0.59	1.09	1.58	1.50	4.63	7.78	4.09	1.79	9.74	1.63	2.22	2.30	2.60	2.74
3	7.28	6.89	6.36	1.91	0.46	0.25	5.54	6.28	1.37	16.72	20.73	2.08	1.33	2.57	3.71	8.91	27.03	18.37	3.86	6.12	5.99	3.72	5.18	5.14	6.01	5.37
4	11.13	9.82	3.56	1.17	0.29	1.37	3.95	9.67	14.54	24.20	9.75	2.72	2.46	4.19	14.39	29.88	31.48	6.53	7.05	4.24	7.18	4.94	6.33	6.55	6.25	5.63
5	9.93	4.62	1.71	0.65	1.14	1.57	5.25	30.36	22.91	10.44	6.02	4.11	3.15	13.84	28.69	29.97	8.13	11.07	9.18	5.18	9.81	6.29	8.65	7.15	7.22	6.98
6	4.44	2.32	0.67	1.89	1.39	2.14	16.34	25.99	9.26	8.45	10.10	5.07	7.91	26.75	27.90	8.22	13.29	9.99	9.80	5.75	10.57	6.85	7.86	6.70	7.26	7.18
7	2.26	0.84	2.66	2.13	1.78	8.32	19.81	11.43	7.58	9.31	11.91	13.11	18.68	25.74	7.99	12.43	14.85	11.97	12.48	7.00	12.98	7.55	8.63	8.12	9.11	9.10
8	1.16	3.37	2.74	2.40	4.76	12.70	8.39	8.84	8.97	10.43	20.67	24.29	20.04	7.75	11.00	12.25	14.89	13.75	14.17	7.67	12.36	7.65	8.98	8.57	9.73	9.71
9	3.19	3.34	3.25	5.30	7.17	6.46	6.37	6.46	10.07	17.08	23.36	24.04	6.34	10.79	10.66	10.36	13.79	12.70	13.52	6.42	9.90	6.65	7.83	7.51	8.51	8.61
10	3.50	3.80	6.22	7.98	5.23	5.27	6.62	6.51	17.49	18.72	23.33	6.96	9.43	7.07	9.29	9.93	13.07	12.72	12.26	5.87	8.96	6.30	7.44	7.13	8.22	8.27
11	3.68	6.74	8.09	5.65	4.86	6.16	8.82	7.22	18.50	19.62	8.62	9.71	5.61	6.16	8.72	9.18	12.26	10.68	10.65	5.34	7.98	5.83	6.80	6.59	7.56	7.61
12	5.95	8.66	5.93	5.28	5.46	7.01	11.01	9.05	20.81	7.84	8.76	9.95	5.77	6.73	9.25	9.85	11.20	9.78	9.98	5.29	7.75	5.78	6.69	6.41	7.30	7.33
13	8.13	6.05	5.53	5.47	5.38	13.10	12.61	9.34	8.20	8.30	11.42	9.09	5.78	6.42	8.83	8.34	9.61	9.03	9.59	5.13	7.25	5.64	6.44	6.17	7.06	7.12
14	6.16	5.75	5.75	5.17	8.94	15.38	14.10	3.93	9.10	8.14	9.98	9.19	5.91	6.36	7.73	7.44	8.97	8.83	9.68	5.17	7.22	5.72	6.48	6.22	7.15	7.29
15	5.09	6.07	5.45	7.36	14.21	16.62	6.95	4.95	7.93	6.96	9.25	9.08	5.97	5.58	6.80	6.88	8.46	8.66	9.68	5.25	7.07	5.77	6.50	6.27	7.29	7.37
16	5.83	5.74	7.58	10.14	16.08	7.98	6.67	20.96	6.93	6.31	8.40	8.86	5.43	4.93	6.21	6.44	8.03	8.44	9.82	5.29	6.93	5.83	6.55	6.37	7.35	7.43
17	5.72	7.77	10.16	12.69	7.84	8.35	7.61	17.33	6.49	5.78	7.73	7.84	4.95	4.54	5.77	6.09	7.59	8.28	9.70	5.25	6.74	5.81	6.60	6.34	7.31	7.28
18	7.92	11.19	11.22	6.98	8.96	5.07	6.36	14.26	5.86	5.08	6.28	6.94	4.65	4.18	5.35	5.69	7.24	8.05	9.66	5.25	6.60	5.88	6.61	6.33	7.21	7.19
19	10.41	11.41	7.29	8.81	5.98	4.61	5.57	11.52	5.22	4.12	5.18	6.33	4.41	3.88	4.94	5.39	6.85	7.84	9.61	5.27	6.54	5.89	6.57	6.24	7.12	7.21
20	11.61	7.48	8.63	6.56	5.71	4.33	4.87	9.17	4.32	3.32	4.35	5.86	4.21	3.60	4.63	5.07	6.49	7.64	9.61	5.31	6.41	5.91	6.45	6.15	7.12	7.21
21	9.83	9.42	8.40	6.45	5.59	4.10	4.10	6.77	3.62	2.78	3.78	5.45	4.01	3.38	4.32	4.79	6.17	7.48	9.68	5.30	6.26	5.86	6.35	6.14	7.11	7.21
22	8.18	8.07	8.35	6.49	5.59	3.85	3.47	5.33	3.22	2.48	3.41	5.14	3.90	3.21	4.10	4.58	5.96	7.42	9.64	5.31	6.05	5.79	6.34	6.12	7.10	7.20
23	7.06	7.94	8.43	6.60	5.35	3.40	2.79	4.11	2.83	2.18	3.02	4.85	3.74	3.01	3.85	4.37	5.76	7.26	9.61	5.26	5.85	5.80	6.32	6.11	7.10	7.26
24	6.97	7.92	8.66	6.46	4.98	3.04	2.38	3.24	2.53	1.87	2.61	4.57	3.60	2.84	3.65	4.20	5.53	7.13	9.45	5.21	5.76	5.81	6.30	6.10	7.14	7.31
25	6.96	8.05	8.53	6.20	4.66	2.78	2.08	2.60	2.27	1.69	2.36	4.33	3.48	2.71	3.49	4.03	5.33	6.92	9.31	5.21	5.66	5.82	6.29	6.13	7.18	7.35
26	7.10	7.86	8.28	5.97	4.45	2.58	1.85	2.13	2.08	1.54	2.16	4.12	3.38	2.60	3.33	3.88	5.11	6.74	9.29	5.21	5.59	5.82	6.31	6.15	7.21	7.38
27	6.95	7.63	8.07	5.85	4.32	2.46	1.70	1.86	1.95	1.40	2.03	4.00	3.33	2.51	3.24	3.75	4.93	6.66	9.27	5.21	5.53	5.85	6.33	6.16	7.22	7.40
28	6.76	7.41	7.95	5.75	4.19	2.33	1.57	1.60	1.83	1.12	1.91	3.88	3.25	2.44	3.11	3.61	4.82	6.59	9.25	5.21	5.52	5.88	6.34	6.18	7.24	7.41
29	6.60	7.27	7.87	5.68	4.09	2.24	1.47	1.42	1.73	1.05	1.83	3.76	3.20	2.36	3.00	3.54	4.73	6.54	9.24	5.23	5.50	5.90	6.34	6.18	7.24	7.41
30	6.50	7.19	7.78	5.62	4.02	2.17	1.40	1.30	1.67	1.01	1.59	3.70	3.14	2.29	2.94	3.49	4.67	6.49	9.24	5.24	5.48	5.91	6.33	6.17	7.22	7.40

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
97 - 100 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.13	0.17	0.28	0.21	0.18	0.17	0.10	0.12	0.13	0.11	0.14	0.24	0.13	0.28	0.40	0.31	0.29	0.24	0.40	0.23	1.42	0.33	0.27	0.26	0.28	0.29
2	1.53	2.86	3.15	2.24	0.68	0.49	0.27	10.83	0.39	0.74	7.94	2.48	0.69	1.28	1.91	1.74	4.36	4.37	3.04	1.93	7.88	1.66	2.13	2.21	2.40	2.52
3	6.76	8.66	8.56	2.10	0.63	0.28	5.46	6.11	1.34	14.22	19.09	2.14	1.41	3.02	3.92	8.54	24.24	11.30	3.78	5.63	6.31	4.01	5.39	5.39	6.14	5.65
4	10.49	9.58	3.93	1.45	0.33	1.35	3.47	8.81	13.27	21.69	9.98	2.90	2.77	4.55	13.80	27.86	28.76	6.12	6.47	5.62	9.22	6.34	8.14	8.62	8.39	7.82
5	9.95	5.33	2.11	0.82	1.21	1.58	4.66	22.18	21.05	10.60	8.52	4.48	3.40	13.29	27.34	28.15	7.74	9.30	11.96	6.75	12.29	7.82	10.83	9.41	9.61	9.45
6	5.15	2.67	0.87	1.95	1.43	2.07	16.15	25.30	9.44	9.20	10.49	5.51	8.28	25.70	26.75	8.16	12.39	11.12	11.12	6.78	11.97	7.75	9.09	8.09	8.66	8.63
7	2.77	1.07	2.73	2.00	1.79	7.13	18.38	11.92	7.64	9.62	12.24	13.01	18.42	25.48	8.08	12.15	15.19	12.19	12.82	7.52	13.76	7.93	9.20	8.83	9.68	9.73
8	1.33	3.45	2.66	2.30	4.20	11.15	8.72	8.21	8.92	9.89	20.34	23.97	19.54	7.75	10.78	12.55	15.19	13.94	14.39	8.27	13.12	8.05	9.58	9.33	10.36	10.41
9	3.57	3.35	3.16	4.94	6.80	6.01	6.84	7.12	10.52	14.56	21.94	23.43	6.25	10.49	12.01	11.33	14.96	13.49	14.66	7.37	11.23	7.45	8.89	8.71	9.64	9.80
10	3.40	3.55	5.41	7.00	5.00	5.14	8.46	6.12	16.58	16.95	22.36	7.28	9.29	8.33	10.42	10.75	13.76	13.23	12.89	6.60	9.94	6.89	8.24	8.04	9.03	9.12
11	3.49	5.70	6.93	5.27	4.76	5.88	6.49	6.55	17.51	18.50	8.78	9.85	6.39	7.38	9.92	9.94	13.14	11.29	11.40	6.10	8.97	6.45	7.63	7.52	8.41	8.51
12	5.75	7.29	5.20	4.92	5.28	6.12	9.62	7.05	18.63	7.91	6.82	10.37	6.32	7.79	9.99	10.28	11.39	9.62	9.69	5.60	8.10	5.93	6.92	6.72	7.43	7.47
13	7.37	5.56	4.84	5.21	4.94	11.32	11.65	8.60	8.11	7.93	13.11	9.42	6.27	7.28	9.53	8.68	9.76	8.84	9.25	5.39	7.52	5.74	6.61	6.43	7.13	7.20
14	5.46	5.00	5.14	5.17	8.14	14.25	12.91	4.78	8.67	10.55	12.30	10.16	6.76	7.74	8.94	8.30	9.72	9.17	9.89	5.77	7.93	6.16	7.05	6.87	7.65	7.80
15	5.09	5.15	5.05	6.93	12.80	15.80	6.61	4.15	9.62	9.03	11.42	9.93	6.87	6.84	7.93	7.72	9.20	9.01	9.92	5.86	7.79	6.23	7.10	6.94	7.81	7.91
16	5.21	5.14	6.30	10.03	14.80	7.32	6.22	22.94	8.45	8.19	10.23	9.76	6.29	6.10	7.28	7.26	8.77	8.79	10.07	5.91	7.65	6.30	7.16	7.05	7.90	7.99
17	5.40	6.84	8.63	11.95	7.44	8.60	8.80	19.06	7.90	7.35	9.43	8.68	5.77	5.63	6.78	6.87	8.28	8.62	9.94	5.86	7.43	6.27	7.19	7.02	7.83	7.83
18	7.05	9.39	10.40	7.45	9.07	5.66	7.36	15.75	7.05	6.46	7.66	7.73	5.44	5.20	6.29	6.42	7.90	8.38	9.90	5.86	7.27	6.33	7.21	6.99	7.75	7.77
19	9.21	10.23	7.19	8.47	6.34	5.16	6.43	12.63	6.31	5.19	6.32	7.08	5.17	4.84	5.82	6.09	7.48	8.16	9.87	5.87	7.20	6.36	7.16	6.91	7.68	7.79
20	10.37	7.40	8.20	6.74	6.08	4.86	5.49	10.14	5.24	4.24	5.39	6.56	4.94	4.49	5.46	5.73	7.09	7.96	9.85	5.91	7.06	6.37	7.04	6.83	7.69	7.79
21	9.20	9.43	8.33	6.65	5.96	4.53	4.73	7.55	4.42	3.58	4.66	6.11	4.71	4.22	5.09	5.41	6.74	7.79	9.91	5.91	6.89	6.32	6.96	6.83	7.68	7.79
22	7.80	7.98	8.30	6.70	5.88	4.28	4.00	5.99	3.93	3.17	4.19	5.78	4.58	4.00	4.83	5.18	6.51	7.72	9.89	5.91	6.68	6.28	6.95	6.81	7.67	7.79
23	7.11	7.88	8.39	6.73	5.67	3.80	3.32	4.64	3.45	2.75	3.69	5.45	4.40	3.76	4.55	4.94	6.28	7.56	9.84	5.87	6.48	6.29	6.93	6.80	7.67	7.85
24	7.04	7.87	8.51	6.64	5.29	3.42	2.85	3.67	3.07	2.41	3.31	5.13	4.23	3.55	4.31	4.75	6.03	7.41	9.71	5.83	6.38	6.30	6.91	6.79	7.72	7.90
25	7.04	7.91	8.44	6.39	4.99	3.14	2.47	2.96	2.75	2.16	2.99	4.86	4.09	3.38	4.12	4.55	5.81	7.21	9.61	5.83	6.28	6.31	6.90	6.82	7.75	7.94
26	7.09	7.77	8.23	6.19	4.77	2.92	2.20	2.43	2.51	1.95	2.73	4.63	3.98	3.25	3.93	4.39	5.57	7.03	9.60	5.83	6.20	6.32	6.92	6.84	7.78	7.97
27	7.00	7.57	8.07	6.07	4.63	2.77	2.02	2.13	2.35	1.82	2.57	4.49	3.91	3.14	3.81	4.24	5.41	6.96	9.58	5.83	6.14	6.34	6.93	6.85	7.79	7.99
28	6.84	7.39	7.95	5.98	4.49	2.62	1.86	1.83	2.19	1.69	2.41	4.35	3.82	3.04	3.67	4.11	5.29	6.88	9.57	5.84	6.12	6.37	6.94	6.86	7.81	8.01
29	6.71	7.28	7.88	5.90	4.38	2.52	1.74	1.62	2.07	1.60	2.31	4.22	3.76	2.95	3.56	4.02	5.20	6.82	9.56	5.85	6.10	6.39	6.94	6.87	7.82	8.02
30	6.62	7.19	7.82	5.83	4.31	2.44	1.66	1.49	1.99	1.54	2.22	4.14	3.69	2.87	3.49	3.96	5.12	6.77	9.56	5.85	6.07	6.39	6.93	6.85	7.80	8.00

= Actual Experience

Summary of Conditional Prepayment Rates
30-Year Fixed-Rate Mortgages
Investors LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.40	0.31	0.41	0.55	0.43	1.48	0.15	0.74	0.41	0.30	0.35	0.70	0.32	0.85	1.03	0.51	0.36	0.39	0.54	0.17	1.99	0.31	0.49	0.48	0.51	0.51
2	1.90	2.89	2.84	2.60	1.09	4.01	0.51	19.41	1.25	1.88	10.04	4.37	1.31	2.57	2.82	2.47	5.17	6.22	3.68	1.33	11.56	2.13	2.61	2.73	2.85	3.02
3	4.97	6.19	4.88	2.14	0.88	0.51	8.20	11.42	2.49	16.62	22.61	2.95	1.88	3.79	4.70	10.48	23.05	15.49	2.80	5.38	5.42	3.64	4.65	4.64	5.23	4.77
4	7.03	6.15	2.50	1.52	0.45	1.93	6.26	12.42	13.84	25.68	10.52	3.14	2.72	4.82	15.26	28.93	26.92	4.82	5.40	4.44	6.49	4.87	5.86	6.34	6.07	5.63
5	6.41	3.31	1.86	1.00	1.79	2.56	6.86	23.32	24.64	11.65	8.02	4.29	3.12	14.64	28.23	29.58	6.55	9.95	7.52	5.25	8.57	6.02	7.95	7.08	7.07	6.85
6	3.25	1.95	1.06	1.98	2.17	3.04	17.76	23.95	10.63	9.42	9.59	5.10	7.60	27.04	27.63	8.11	11.98	9.80	8.97	6.29	9.87	7.30	8.29	7.59	8.01	7.84
7	2.12	1.20	2.42	2.43	2.89	9.04	23.05	12.97	7.83	9.87	10.88	13.45	18.74	26.15	8.69	12.38	17.29	13.31	13.06	8.70	14.16	9.54	10.88	10.69	11.46	11.24
8	1.34	2.66	3.17	2.94	4.75	14.43	12.20	9.00	9.43	10.14	18.92	25.40	21.15	8.05	11.42	17.74	19.89	17.95	18.13	11.62	16.82	11.86	13.79	13.57	14.72	14.60
9	2.97	3.75	3.47	4.72	7.52	8.57	8.77	7.17	10.12	15.97	21.38	25.37	6.13	10.33	13.82	13.48	16.56	14.82	15.84	9.08	12.77	9.42	10.84	10.63	11.58	11.71
10	3.32	3.53	5.38	7.50	5.84	6.35	8.19	6.67	17.71	15.75	22.18	7.64	9.27	9.53	11.21	11.93	14.30	13.52	12.94	7.65	10.56	7.94	9.05	8.89	9.85	9.89
11	3.56	6.05	7.63	5.89	5.63	7.01	8.10	6.82	18.56	17.08	7.92	10.50	7.35	8.54	10.82	11.31	14.22	12.21	12.00	7.25	9.75	7.48	8.50	8.49	9.36	9.41
12	5.09	7.57	5.67	5.17	5.49	7.13	10.19	6.87	19.22	7.85	7.92	11.09	7.35	8.79	10.94	12.05	14.08	12.99	13.93	7.94	10.50	8.21	9.60	9.59	10.71	10.84
13	7.07	6.50	5.13	5.45	5.08	13.83	10.59	6.95	7.91	7.71	10.85	10.41	7.50	8.56	11.01	10.94	12.98	12.50	13.64	7.79	10.10	8.21	9.48	9.47	10.59	10.74
14	5.61	5.81	5.79	5.02	7.68	16.44	11.99	4.26	9.33	8.31	10.00	10.79	7.78	8.92	10.31	10.40	12.64	12.42	13.78	7.93	10.27	8.43	9.68	9.66	10.82	11.07
15	5.95	5.87	4.88	6.29	12.27	15.99	5.83	3.84	7.85	7.09	9.22	10.32	7.78	7.91	9.18	9.49	11.65	11.74	13.28	7.78	9.83	8.23	9.40	9.38	10.61	10.80
16	5.35	5.12	6.58	9.82	13.50	7.19	5.84	14.77	6.84	6.42	8.29	10.07	7.10	7.06	8.30	8.64	10.45	11.11	13.02	7.58	9.40	8.02	9.13	9.18	10.33	10.47
17	5.47	7.56	8.86	11.26	7.01	8.12	7.04	13.32	6.99	6.34	8.47	9.82	7.08	6.93	8.14	8.53	10.08	11.57	13.67	7.98	9.75	8.47	9.69	9.65	10.80	10.81
18	6.76	9.74	10.34	7.05	8.44	5.66	6.18	11.66	6.55	5.94	7.36	9.14	6.83	6.49	7.64	8.08	9.81	11.33	13.80	8.07	9.70	8.64	9.81	9.68	10.76	10.82
19	9.56	10.61	6.94	7.81	7.01	5.31	5.68	9.98	6.21	5.12	6.47	8.63	6.59	6.09	7.18	7.78	9.12	10.93	13.69	8.16	9.74	8.74	9.82	9.63	10.72	10.90
20	11.19	7.94	7.87	8.01	6.84	5.16	5.15	8.65	5.47	4.47	5.78	8.16	6.36	5.74	6.87	7.46	8.82	10.63	13.35	8.29	9.71	8.81	9.74	9.61	10.79	10.96
21	12.70	12.18	10.33	7.98	6.86	4.98	4.72	6.97	4.87	3.97	5.20	7.74	6.15	5.49	6.54	7.15	8.54	10.31	12.96	8.36	9.60	8.82	9.73	9.62	10.83	11.03
22	7.69	10.02	10.42	8.17	6.89	4.88	4.20	5.91	4.50	3.63	4.80	7.43	6.06	5.28	6.29	6.92	8.35	10.30	13.03	8.41	9.43	8.82	9.77	9.64	10.75	10.96
23	9.14	10.01	10.71	8.32	6.86	4.50	3.69	4.91	4.09	3.27	4.37	7.15	5.91	5.03	6.01	6.67	8.16	10.22	12.60	8.40	8.90	8.90	9.76	9.67	10.66	10.78
24	9.13	10.19	11.00	8.41	6.56	4.19	3.30	4.12	3.75	2.97	4.04	6.86	5.76	4.82	5.77	6.48	7.95	9.78	12.52	8.40	8.56	8.95	9.69	9.61	10.61	10.89
25	9.28	10.39	11.21	8.23	6.33	3.95	2.95	3.51	3.47	2.75	3.75	6.61	5.63	4.63	5.59	6.28	7.42	9.61	12.48	8.46	8.50	9.01	9.73	9.70	10.69	10.98
26	9.46	10.50	11.08	8.10	6.17	3.75	2.69	3.03	3.25	2.56	3.50	6.38	5.52	4.49	5.40	6.09	7.18	9.49	12.05	8.50	8.45	9.08	9.54	9.50	10.35	10.63
27	9.56	10.36	11.03	8.04	6.06	3.62	2.53	2.74	3.11	2.43	3.34	6.24	5.46	4.37	5.26	5.92	7.01	9.44	12.05	8.55	8.23	9.17	9.59	9.54	10.39	10.67
28	9.44	10.28	11.03	7.99	5.95	3.49	2.34	2.45	2.95	2.23	3.18	6.10	5.37	4.24	5.09	5.76	6.88	9.03	12.06	8.60	8.24	9.27	9.64	9.42	10.15	10.42
29	9.39	10.25	11.06	7.96	5.87	3.40	2.22	2.23	2.83	2.14	3.06	5.97	5.30	4.12	4.96	5.66	6.76	8.98	12.07	8.69	8.26	9.35	9.32	9.26	10.17	10.44
30	9.43	10.31	11.16	8.00	5.88	3.36	2.12	2.11	2.77	2.03	2.93	5.92	5.26	4.07	4.94	5.64	6.74	9.02	12.20	8.70	8.33	9.48	9.41	9.34	10.26	10.53

= Actual Experience

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
Unknown LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.10	0.36	0.15	0.05	0.05	0.03	0.13	0.23	0.01	0.02	0.19	0.09	0.11	0.00	0.00	0.01	0.01	0.05	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07
2	1.51	2.28	1.41	0.75	0.77	0.57	1.66	3.02	0.46	2.43	4.03	2.81	2.22	0.84	1.12	0.73	0.39	1.18	0.19	0.23	0.00	0.76	0.83	0.85	0.85	0.87
3	3.17	3.76	2.51	1.59	1.78	1.71	4.69	6.82	2.07	8.06	10.51	9.25	4.95	1.89	4.94	2.22	1.94	2.99	0.97	2.02	0.74	1.69	1.79	1.91	1.89	1.99
4	4.14	4.66	3.13	2.27	2.61	3.26	7.14	10.40	4.22	12.85	15.60	12.76	6.14	4.82	7.15	3.49	3.51	4.36	1.48	2.90	1.33	2.48	2.65	2.87	2.91	3.06
5	4.71	5.17	3.58	2.77	3.42	4.55	9.62	13.49	6.75	17.20	18.77	13.66	9.32	5.87	9.33	4.34	4.70	5.68	2.00	3.54	1.82	3.23	3.45	3.80	3.88	4.06
6	4.99	5.43	3.85	3.32	4.11	5.77	11.72	15.77	9.26	19.66	20.03	16.15	10.80	7.13	10.42	4.86	5.43	6.30	2.31	3.98	2.17	3.78	4.05	4.49	4.57	4.73
7	5.21	5.68	4.17	3.77	4.82	6.85	13.71	17.25	11.06	20.76	21.19	16.56	11.65	7.97	10.97	5.17	5.91	6.73	2.56	4.38	2.48	4.31	4.59	5.10	5.16	5.28
8	5.39	5.92	4.39	4.29	5.47	8.04	15.39	18.05	12.19	21.74	21.65	16.87	12.39	8.39	11.30	5.45	6.25	7.05	2.77	4.73	2.76	4.78	5.05	5.60	5.62	5.71
9	5.61	6.10	4.66	4.71	6.22	9.16	16.56	18.53	13.06	22.52	21.97	17.34	13.42	8.66	11.55	5.66	6.50	7.31	2.95	5.07	3.01	5.21	5.45	6.00	5.99	6.06
10	5.79	6.27	4.92	5.09	7.01	9.99	17.32	18.97	13.70	23.06	22.26	17.95	14.55	9.14	11.71	5.81	6.69	7.53	3.11	5.38	3.23	5.58	5.78	6.33	6.30	6.36
11	5.95	6.46	5.18	5.62	7.67	10.57	17.87	19.32	14.11	23.46	22.56	18.75	15.03	9.52	11.84	5.95	6.85	7.72	3.27	5.68	3.44	5.91	6.05	6.61	6.57	6.63
12	6.11	6.64	5.55	6.13	8.19	11.18	18.36	19.59	14.45	23.77	22.70	19.00	15.47	9.84	11.95	6.07	7.02	7.96	3.51	6.06	3.68	6.29	6.39	6.97	6.94	7.00
13	6.26	6.93	5.92	6.52	8.62	11.62	18.70	19.80	14.67	23.93	22.86	19.17	15.77	10.10	12.05	6.18	7.17	8.16	3.70	6.36	3.87	6.60	6.67	7.26	7.23	7.30
14	6.47	7.24	6.26	6.84	8.98	12.01	18.98	19.96	14.81	24.13	22.96	19.28	15.99	10.27	12.11	6.26	7.28	8.30	3.84	6.57	4.00	6.82	6.86	7.47	7.44	7.50
15	6.65	7.47	6.49	7.12	9.25	12.28	19.20	20.05	14.94	24.27	23.04	19.37	16.17	10.42	12.17	6.32	7.36	8.41	3.94	6.74	4.10	6.99	7.01	7.62	7.60	7.67
16	6.84	7.64	6.70	7.34	9.48	12.48	19.33	20.25	15.04	24.38	23.10	19.44	16.31	10.54	12.21	6.36	7.43	8.50	4.02	6.87	4.18	7.13	7.12	7.74	7.72	7.79
17	7.00	7.79	6.84	7.49	9.68	12.58	19.45	20.39	15.12	24.47	23.15	19.50	16.44	10.64	12.25	6.40	7.48	8.58	4.08	6.97	4.24	7.23	7.21	7.84	7.82	7.89
18	7.16	7.93	6.95	7.61	9.77	12.68	19.56	20.50	15.18	24.54	23.19	19.55	16.54	10.72	12.27	6.43	7.53	8.62	4.12	7.05	4.30	7.32	7.28	7.91	7.90	7.96
19	7.25	8.05	7.10	7.71	9.90	12.75	19.64	20.58	15.23	24.60	23.22	19.59	16.63	10.78	12.29	6.45	7.56	8.66	4.16	7.12	4.34	7.39	7.33	7.97	7.95	8.02
20	7.30	8.13	7.16	7.81	10.01	12.82	19.70	20.65	15.27	24.64	23.25	19.62	16.70	10.83	12.31	6.47	7.59	8.69	4.19	7.18	4.37	7.44	7.38	8.01	8.00	8.07
21	7.36	8.18	7.25	7.89	10.09	12.87	19.76	20.71	15.31	24.69	23.27	19.65	16.75	10.86	12.32	6.49	7.61	8.72	4.21	7.22	4.40	7.48	7.41	8.05	8.03	8.10
22	7.38	8.25	7.32	7.95	10.16	12.92	19.81	20.76	15.34	24.72	23.29	19.67	16.79	10.89	12.33	6.50	7.62	8.74	4.23	7.26	4.42	7.52	7.44	8.08	8.06	8.13
23	7.45	8.31	7.39	8.01	10.22	12.96	19.85	20.80	15.37	24.75	23.30	19.68	16.83	10.91	12.34	6.51	7.64	8.76	4.25	7.29	4.44	7.54	7.46	8.10	8.08	8.15
24	7.51	8.37	7.44	8.06	10.27	12.99	19.89	20.83	15.39	24.77	23.32	19.69	16.85	10.93	12.34	6.52	7.65	8.77	4.26	7.31	4.45	7.56	7.47	8.11	8.10	8.17
25	7.56	8.41	7.49	8.10	10.31	13.02	19.93	20.86	15.41	24.79	23.33	19.70	16.88	10.95	12.35	6.53	7.66	8.79	4.27	7.33	4.46	7.58	7.49	8.13	8.11	8.18
26	7.60	8.45	7.53	8.14	10.35	13.05	19.95	20.88	15.43	24.80	23.33	19.71	16.90	10.96	12.35	6.54	7.66	8.80	4.28	7.35	4.47	7.59	7.50	8.14	8.12	8.19
27	7.64	8.49	7.57	8.17	10.38	13.07	19.98	20.90	15.44	24.81	23.34	19.72	16.91	10.97	12.35	6.55	7.67	8.81	4.28	7.36	4.48	7.61	7.50	8.14	8.13	8.20
28	7.67	8.52	7.60	8.19	10.41	13.09	20.00	20.91	15.45	24.82	23.35	19.72	16.92	10.97	12.36	6.55	7.68	8.82	4.29	7.37	4.48	7.61	7.51	8.15	8.14	8.21
29	7.70	8.54	7.63	8.22	10.43	13.10	20.02	20.92	15.47	24.83	23.35	19.73	16.93	10.98	12.36	6.55	7.68	8.82	4.29	7.38	4.49	7.62	7.51	8.15	8.14	8.21
30	7.73	8.56	7.66	8.24	10.45	13.12	20.03	20.93	15.48	24.84	23.35	19.73	16.94	10.98	12.36	6.55	7.69	8.82	4.29	7.38	4.49	7.63	7.52	8.16	8.15	8.22

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
0 - 65 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.00	0.00	0.04	0.03	0.00	0.00	0.04	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.14	0.14	0.15	0.14
2	0.06	0.13	0.20	0.07	0.23	0.25	0.46	0.23	0.09	0.24	0.16	0.05	0.06	0.10	0.11	0.15	0.35	0.17	0.05	0.19	0.00	0.25	0.36	0.37	0.38	0.37
3	0.19	0.32	0.60	0.24	0.57	0.68	1.11	0.65	0.33	0.61	0.65	0.29	0.22	0.43	0.51	0.50	0.92	0.49	0.32	0.61	0.45	0.63	0.74	0.76	0.78	0.78
4	0.19	0.57	0.84	0.85	0.90	1.24	1.59	1.21	0.62	1.14	1.25	0.58	0.48	0.79	0.92	0.96	1.67	1.03	0.52	1.06	0.95	1.08	1.20	1.26	1.30	1.31
5	0.19	0.70	1.04	0.95	1.33	1.44	1.91	1.67	0.92	1.75	1.88	0.97	0.70	1.20	1.31	1.45	2.26	1.29	1.08	1.55	1.51	1.59	1.76	1.88	1.95	1.98
6	0.19	0.83	1.08	1.15	1.58	1.78	2.33	2.00	1.28	2.24	2.21	1.32	0.96	1.49	1.72	1.81	2.83	1.68	1.58	2.01	2.05	2.08	2.30	2.49	2.58	2.61
7	0.26	0.89	1.16	1.22	1.85	2.15	2.66	2.28	1.55	2.55	2.53	1.58	1.19	1.85	2.11	2.04	3.13	1.98	2.00	2.42	2.51	2.53	2.78	3.02	3.11	3.13
8	0.26	1.08	1.16	1.36	2.08	2.56	2.92	2.49	1.72	2.80	2.76	1.76	1.34	2.13	2.42	2.35	3.33	2.18	2.28	2.72	2.82	2.88	3.12	3.38	3.46	3.47
9	0.26	1.14	1.32	1.46	2.36	3.07	3.15	2.57	1.86	3.02	2.96	1.90	1.48	2.32	2.75	2.58	3.47	2.35	2.53	3.01	3.08	3.19	3.39	3.67	3.74	3.75
10	0.26	1.14	1.45	1.70	2.71	3.41	3.44	2.67	1.97	3.15	3.08	2.03	1.60	2.60	3.04	2.78	3.59	2.52	2.80	3.33	3.34	3.48	3.67	3.97	4.00	4.02
11	0.26	1.27	1.77	1.80	3.07	3.60	3.55	2.77	2.04	3.25	3.11	2.14	1.76	2.85	3.26	2.94	3.69	2.67	3.03	3.63	3.57	3.72	3.90	4.22	4.24	4.26
12	0.32	1.27	1.81	2.07	3.37	3.78	3.69	2.81	2.07	3.27	3.15	2.30	1.92	3.09	3.46	3.09	3.78	2.83	3.30	3.99	3.84	4.01	4.17	4.53	4.54	4.57
13	0.32	1.27	1.93	2.24	3.56	3.93	3.78	2.84	2.12	3.30	3.26	2.44	2.07	3.31	3.63	3.23	3.85	2.96	3.53	4.29	4.07	4.26	4.42	4.81	4.77	4.83
14	0.32	1.27	2.01	2.38	3.64	4.09	3.86	2.87	2.14	3.41	3.35	2.57	2.20	3.51	3.78	3.34	3.91	3.07	3.71	4.55	4.27	4.47	4.60	5.02	4.97	5.03
15	0.32	1.33	2.17	2.48	3.72	4.15	3.90	2.87	2.21	3.49	3.42	2.66	2.31	3.65	3.88	3.42	3.95	3.15	3.82	4.73	4.42	4.65	4.74	5.18	5.10	5.19
16	0.32	1.33	2.21	2.51	3.81	4.19	3.95	2.95	2.27	3.56	3.47	2.74	2.39	3.77	3.97	3.47	3.98	3.20	3.90	4.89	4.54	4.79	4.83	5.28	5.19	5.29
17	0.39	1.33	2.25	2.55	3.81	4.21	4.02	3.02	2.32	3.61	3.52	2.80	2.46	3.86	4.04	3.51	4.01	3.24	3.96	4.99	4.64	4.89	4.89	5.36	5.26	5.36
18	0.39	1.46	2.25	2.58	3.84	4.27	4.07	3.06	2.36	3.66	3.56	2.85	2.51	3.92	4.09	3.54	4.03	3.26	3.99	5.07	4.71	4.96	4.95	5.42	5.30	5.40
19	0.39	1.46	2.29	2.62	3.96	4.32	4.10	3.09	2.39	3.70	3.59	2.88	2.56	3.98	4.12	3.57	4.03	3.28	4.01	5.12	4.77	5.01	4.97	5.45	5.33	5.43
20	0.39	1.46	2.29	2.77	4.05	4.37	4.12	3.12	2.42	3.73	3.61	2.91	2.59	4.01	4.14	3.59	4.04	3.30	4.03	5.16	4.82	5.06	4.99	5.47	5.34	5.45
21	0.39	1.46	2.43	2.88	4.10	4.41	4.14	3.13	2.44	3.76	3.63	2.93	2.62	4.04	4.16	3.61	4.04	3.30	4.04	5.20	4.86	5.09	5.00	5.49	5.35	5.46
22	0.47	1.53	2.50	2.96	4.15	4.44	4.15	3.15	2.45	3.78	3.65	2.95	2.64	4.07	4.18	3.62	4.04	3.31	4.04	5.23	4.90	5.12	5.01	5.50	5.36	5.47
23	0.53	1.58	2.55	3.04	4.18	4.47	4.16	3.16	2.47	3.80	3.67	2.97	2.66	4.09	4.18	3.62	4.04	3.31	4.05	5.25	4.93	5.15	5.01	5.50	5.37	5.47
24	0.56	1.62	2.59	3.07	4.21	4.50	4.17	3.17	2.48	3.82	3.67	2.98	2.68	4.11	4.19	3.62	4.04	3.31	4.05	5.28	4.96	5.18	5.02	5.51	5.37	5.48
25	0.59	1.65	2.63	3.09	4.23	4.53	4.18	3.18	2.49	3.83	3.68	2.99	2.70	4.12	4.19	3.63	4.04	3.31	4.05	5.30	4.98	5.20	5.02	5.51	5.37	5.48
26	0.61	1.67	2.65	3.10	4.25	4.55	4.18	3.18	2.50	3.84	3.68	3.00	2.71	4.14	4.19	3.63	4.04	3.31	4.06	5.31	4.99	5.22	5.02	5.52	5.38	5.48
27	0.63	1.69	2.67	3.11	4.27	4.57	4.18	3.19	2.50	3.84	3.68	3.00	2.73	4.15	4.20	3.63	4.04	3.31	4.06	5.33	4.99	5.24	5.02	5.52	5.38	5.48
28	0.64	1.70	2.68	3.12	4.28	4.59	4.19	3.19	2.51	3.85	3.69	3.00	2.74	4.17	4.20	3.63	4.04	3.31	4.06	5.35	4.99	5.24	5.02	5.52	5.38	5.48
29	0.65	1.71	2.69	3.13	4.30	4.61	4.19	3.19	2.51	3.85	3.69	3.01	2.76	4.18	4.20	3.63	4.04	3.31	4.06	5.36	5.00	5.24	5.02	5.52	5.38	5.48
30	0.66	1.72	2.70	3.13	4.31	4.62	4.19	3.19	2.51	3.85	3.69	3.01	2.77	4.18	4.20	3.63	4.04	3.31	4.06	5.36	5.00	5.25	5.02	5.52	5.38	5.48

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
65 - 80 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.01	0.01	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.07	0.07	0.08	0.07
2	0.06	0.17	0.07	0.06	0.10	0.26	0.60	0.98	0.14	0.39	0.21	0.19	0.28	0.20	0.16	0.16	0.13	0.07	0.12	0.11	0.05	0.20	0.28	0.27	0.27	0.26
3	0.28	0.32	0.20	0.18	0.35	0.74	2.28	2.39	0.64	1.34	1.16	1.07	0.78	0.73	0.57	0.57	0.67	0.63	0.52	0.47	0.54	0.68	0.76	0.77	0.75	0.75
4	0.50	0.53	0.34	0.33	0.49	1.65	3.50	3.79	1.38	2.84	2.64	2.08	1.42	1.37	1.19	1.09	1.29	1.20	1.07	1.01	1.09	1.24	1.33	1.37	1.36	1.36
5	0.69	0.71	0.36	0.46	0.91	2.17	4.85	4.85	2.27	4.15	3.62	2.87	2.03	2.19	1.81	1.75	1.84	1.82	1.51	1.53	1.62	1.80	1.92	2.00	1.99	1.99
6	0.74	0.97	0.39	0.60	1.21	2.92	5.81	5.69	3.26	5.09	4.35	3.53	2.57	2.78	2.36	2.23	2.35	2.12	1.82	1.93	2.04	2.25	2.38	2.50	2.47	2.46
7	0.78	0.99	0.42	0.74	1.38	3.48	6.99	6.52	3.93	5.83	4.88	4.12	3.02	3.28	2.85	2.56	2.65	2.36	2.07	2.27	2.40	2.64	2.79	2.93	2.88	2.85
8	0.81	1.01	0.49	1.00	1.77	4.06	7.89	6.88	4.37	6.25	5.30	4.56	3.39	3.68	3.22	2.94	2.89	2.57	2.32	2.61	2.75	3.04	3.20	3.37	3.29	3.24
9	0.91	1.07	0.59	1.11	2.07	4.80	8.33	7.10	4.70	6.60	5.59	4.90	3.66	3.96	3.55	3.21	3.07	2.73	2.52	2.92	3.06	3.39	3.54	3.73	3.62	3.55
10	0.98	1.11	0.64	1.31	2.46	5.42	8.60	7.27	4.99	6.88	5.78	5.15	3.87	4.26	3.82	3.43	3.22	2.88	2.73	3.23	3.36	3.73	3.87	4.08	3.94	3.86
11	1.07	1.18	0.71	1.49	2.74	5.74	8.84	7.40	5.15	7.06	5.94	5.39	4.09	4.55	4.07	3.64	3.36	3.03	2.94	3.56	3.66	4.07	4.19	4.42	4.26	4.18
12	1.11	1.28	0.75	1.61	3.04	6.00	9.05	7.50	5.28	7.15	6.06	5.53	4.27	4.78	4.28	3.82	3.49	3.19	3.17	3.89	3.96	4.41	4.52	4.79	4.60	4.53
13	1.13	1.32	0.80	1.69	3.27	6.18	9.22	7.61	5.36	7.25	6.18	5.64	4.42	4.97	4.45	3.97	3.60	3.31	3.36	4.17	4.21	4.69	4.80	5.09	4.88	4.81
14	1.17	1.39	0.89	1.72	3.42	6.37	9.26	7.67	5.43	7.42	6.29	5.74	4.56	5.16	4.62	4.11	3.71	3.43	3.54	4.45	4.45	4.98	5.07	5.39	5.16	5.09
15	1.17	1.39	0.92	1.86	3.56	6.47	9.29	7.70	5.51	7.55	6.38	5.83	4.68	5.32	4.76	4.24	3.80	3.54	3.68	4.68	4.65	5.21	5.29	5.64	5.38	5.32
16	1.26	1.41	0.98	1.90	3.68	6.50	9.34	7.82	5.58	7.65	6.45	5.89	4.78	5.46	4.88	4.33	3.87	3.62	3.80	4.87	4.81	5.41	5.47	5.84	5.57	5.51
17	1.26	1.43	1.03	1.97	3.75	6.57	9.42	7.90	5.64	7.74	6.51	5.95	4.87	5.58	4.97	4.41	3.93	3.69	3.89	5.03	4.94	5.57	5.62	6.01	5.72	5.67
18	1.26	1.47	1.05	2.00	3.81	6.62	9.47	7.96	5.69	7.81	6.55	5.99	4.94	5.68	5.06	4.48	3.98	3.75	3.97	5.17	5.05	5.71	5.75	6.15	5.84	5.80
19	1.30	1.49	1.06	2.04	3.89	6.66	9.51	8.01	5.73	7.87	6.59	6.03	4.99	5.76	5.12	4.53	4.02	3.80	4.03	5.29	5.14	5.83	5.86	6.27	5.93	5.89
20	1.30	1.49	1.08	2.14	3.96	6.69	9.54	8.04	5.76	7.92	6.62	6.06	5.04	5.83	5.18	4.58	4.06	3.84	4.08	5.39	5.22	5.93	5.94	6.37	6.02	5.97
21	1.31	1.49	1.19	2.22	4.02	6.72	9.56	8.07	5.80	7.96	6.65	6.08	5.08	5.89	5.23	4.62	4.08	3.88	4.12	5.48	5.29	6.02	6.01	6.45	6.09	6.05
22	1.31	1.59	1.30	2.31	4.08	6.75	9.57	8.10	5.83	8.00	6.67	6.11	5.11	5.94	5.28	4.66	4.10	3.91	4.16	5.56	5.34	6.10	6.07	6.52	6.15	6.11
23	1.38	1.65	1.39	2.38	4.13	6.78	9.59	8.12	5.85	8.03	6.69	6.12	5.14	5.99	5.32	4.69	4.12	3.93	4.18	5.63	5.37	6.17	6.12	6.58	6.19	6.16
24	1.43	1.69	1.48	2.46	4.18	6.80	9.60	8.13	5.87	8.05	6.71	6.14	5.16	6.03	5.36	4.72	4.13	3.96	4.19	5.70	5.41	6.24	6.17	6.63	6.22	6.19
25	1.48	1.70	1.53	2.53	4.23	6.82	9.61	8.14	5.89	8.07	6.72	6.15	5.18	6.06	5.39	4.75	4.14	3.98	4.21	5.76	5.44	6.29	6.20	6.67	6.24	6.22
26	1.53	1.71	1.57	2.60	4.28	6.84	9.61	8.16	5.91	8.09	6.74	6.16	5.19	6.10	5.42	4.77	4.15	3.99	4.23	5.82	5.46	6.34	6.23	6.70	6.26	6.23
27	1.55	1.72	1.59	2.66	4.32	6.86	9.62	8.16	5.93	8.11	6.75	6.18	5.21	6.13	5.45	4.79	4.16	4.00	4.24	5.86	5.49	6.37	6.24	6.72	6.28	6.25
28	1.57	1.73	1.60	2.69	4.36	6.88	9.63	8.17	5.94	8.12	6.76	6.19	5.22	6.16	5.46	4.81	4.17	4.01	4.25	5.90	5.51	6.41	6.26	6.74	6.29	6.26
29	1.58	1.73	1.61	2.72	4.40	6.90	9.63	8.18	5.96	8.14	6.77	6.19	5.23	6.18	5.48	4.82	4.18	4.01	4.26	5.93	5.53	6.44	6.27	6.75	6.31	6.28
30	1.60	1.74	1.62	2.75	4.44	6.92	9.63	8.18	5.97	8.15	6.78	6.20	5.24	6.21	5.50	4.84	4.18	4.02	4.26	5.96	5.55	6.47	6.28	6.76	6.31	6.29

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
80 - 90 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.02	0.02	0.00	0.01	0.01	0.00	0.02	0.05	0.01	0.01	0.02	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.02	0.02	0.02
2	0.22	0.24	0.12	0.13	0.14	0.30	0.68	1.30	0.29	0.54	0.62	0.24	0.24	0.30	0.25	0.20	0.25	0.17	0.15	0.14	0.20	0.19	0.20	0.20	0.19	0.18
3	0.49	0.54	0.38	0.36	0.58	1.05	2.51	3.26	1.32	3.10	2.65	1.29	0.99	1.05	0.96	0.88	1.02	0.80	0.72	0.61	0.80	0.73	0.72	0.73	0.70	0.71
4	0.83	0.85	0.57	0.65	0.96	1.88	4.52	5.40	2.69	5.76	5.40	2.70	1.89	2.08	1.99	1.89	1.99	1.66	1.42	1.41	1.58	1.48	1.48	1.54	1.51	1.54
5	1.03	1.13	0.67	0.90	1.36	2.72	6.26	7.24	4.37	8.43	7.49	4.00	2.82	3.18	3.09	2.75	2.80	2.57	2.04	2.15	2.30	2.22	2.23	2.36	2.33	2.36
6	1.19	1.27	0.80	1.11	1.67	3.40	7.88	8.91	5.97	10.21	8.86	5.18	3.74	4.17	4.06	3.46	3.46	3.06	2.44	2.70	2.85	2.81	2.82	3.00	2.93	2.94
7	1.29	1.37	0.89	1.34	2.02	4.26	9.34	9.90	7.20	11.31	9.80	6.12	4.50	4.93	4.80	4.01	3.88	3.42	2.74	3.15	3.30	3.31	3.31	3.52	3.41	3.40
8	1.38	1.49	0.99	1.51	2.47	5.20	10.78	10.48	7.94	12.05	10.56	6.85	5.13	5.55	5.33	4.41	4.14	3.65	2.93	3.49	3.61	3.68	3.65	3.87	3.72	3.69
9	1.47	1.55	1.04	1.67	2.98	6.25	11.62	10.80	8.49	12.64	11.08	7.44	5.60	6.00	5.69	4.69	4.34	3.83	3.09	3.79	3.88	4.00	3.94	4.17	3.97	3.92
10	1.56	1.64	1.14	1.87	3.42	7.01	12.28	11.05	8.92	13.07	11.45	7.85	5.99	6.41	5.99	4.94	4.51	4.01	3.27	4.12	4.17	4.35	4.24	4.48	4.24	4.19
11	1.59	1.74	1.23	2.15	3.91	7.61	12.79	11.22	9.27	13.32	11.64	8.13	6.27	6.71	6.22	5.12	4.64	4.16	3.41	4.40	4.40	4.62	4.48	4.72	4.46	4.40
12	1.61	1.78	1.32	2.33	4.32	8.08	13.15	11.40	9.48	13.54	11.74	8.33	6.48	6.94	6.39	5.27	4.76	4.30	3.57	4.68	4.61	4.89	4.71	4.97	4.68	4.62
13	1.65	1.86	1.41	2.49	4.66	8.43	13.41	11.51	9.62	13.66	11.91	8.50	6.67	7.14	6.54	5.39	4.85	4.42	3.71	4.92	4.80	5.12	4.92	5.19	4.88	4.81
14	1.72	1.92	1.52	2.57	4.88	8.63	13.58	11.54	9.68	13.87	12.03	8.62	6.82	7.30	6.66	5.49	4.93	4.52	3.81	5.12	4.95	5.31	5.09	5.37	5.04	4.97
15	1.76	1.98	1.59	2.65	5.10	8.80	13.68	11.59	9.81	14.04	12.12	8.72	6.94	7.44	6.76	5.58	5.00	4.60	3.89	5.28	5.07	5.47	5.23	5.52	5.17	5.10
16	1.81	2.05	1.69	2.72	5.25	8.96	13.74	11.76	9.91	14.17	12.21	8.80	7.05	7.56	6.85	5.65	5.05	4.66	3.96	5.42	5.17	5.60	5.34	5.65	5.28	5.21
17	1.85	2.09	1.73	2.78	5.32	9.05	13.86	11.87	9.99	14.28	12.28	8.87	7.14	7.66	6.92	5.71	5.09	4.72	4.01	5.54	5.26	5.72	5.44	5.75	5.37	5.30
18	1.87	2.14	1.80	2.81	5.39	9.13	13.96	11.95	10.06	14.37	12.33	8.92	7.22	7.75	6.99	5.76	5.13	4.76	4.06	5.64	5.34	5.82	5.53	5.84	5.45	5.38
19	1.89	2.17	1.82	2.85	5.47	9.20	14.05	12.01	10.12	14.45	12.38	8.97	7.29	7.82	7.04	5.80	5.16	4.80	4.10	5.73	5.40	5.90	5.60	5.92	5.52	5.45
20	1.89	2.22	1.85	2.92	5.54	9.25	14.11	12.06	10.17	14.52	12.42	9.01	7.34	7.89	7.09	5.84	5.18	4.83	4.13	5.81	5.46	5.97	5.66	5.99	5.57	5.50
21	1.92	2.23	1.92	2.99	5.60	9.30	14.17	12.10	10.22	14.57	12.46	9.05	7.39	7.94	7.13	5.87	5.20	4.86	4.16	5.87	5.51	6.03	5.71	6.05	5.62	5.55
22	1.95	2.29	1.97	3.05	5.65	9.34	14.21	12.14	10.27	14.62	12.48	9.08	7.43	7.99	7.16	5.89	5.22	4.88	4.18	5.93	5.55	6.08	5.76	6.09	5.66	5.59
23	2.01	2.34	2.02	3.10	5.70	9.38	14.24	12.17	10.31	14.67	12.51	9.10	7.46	8.03	7.19	5.92	5.24	4.90	4.21	5.98	5.59	6.13	5.80	6.14	5.70	5.63
24	2.06	2.39	2.07	3.15	5.74	9.41	14.27	12.19	10.34	14.70	12.53	9.12	7.49	8.07	7.22	5.94	5.26	4.92	4.22	6.02	5.62	6.17	5.83	6.17	5.73	5.66
25	2.10	2.44	2.11	3.20	5.78	9.44	14.30	12.21	10.37	14.74	12.55	9.14	7.52	8.10	7.25	5.96	5.27	4.93	4.24	6.06	5.65	6.21	5.86	6.21	5.76	5.69
26	2.15	2.48	2.16	3.24	5.82	9.47	14.32	12.23	10.40	14.76	12.56	9.15	7.54	8.13	7.28	5.98	5.29	4.95	4.26	6.09	5.68	6.24	5.89	6.24	5.79	5.71
27	2.18	2.53	2.19	3.28	5.85	9.50	14.34	12.25	10.42	14.79	12.57	9.17	7.56	8.15	7.30	6.00	5.30	4.96	4.27	6.12	5.70	6.26	5.91	6.26	5.81	5.73
28	2.22	2.57	2.23	3.32	5.88	9.52	14.35	12.26	10.45	14.81	12.58	9.18	7.57	8.18	7.32	6.01	5.31	4.98	4.28	6.15	5.73	6.29	5.93	6.29	5.83	5.75
29	2.26	2.61	2.26	3.36	5.91	9.54	14.36	12.27	10.47	14.83	12.59	9.19	7.59	8.20	7.34	6.03	5.32	4.99	4.29	6.17	5.75	6.31	5.95	6.31	5.85	5.77
30	2.29	2.65	2.30	3.39	5.94	9.56	14.37	12.28	10.49	14.85	12.60	9.20	7.60	8.22	7.36	6.04	5.33	5.00	4.31	6.19	5.77	6.33	5.97	6.33	5.86	5.79

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
90 - 93 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.02	0.01	0.01	0.02	0.00	0.01	0.05	0.06	0.02	0.05	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.03	0.03	0.03	0.03
2	0.28	0.30	0.20	0.20	0.18	0.61	1.16	1.66	0.70	0.84	0.55	0.35	0.24	0.28	0.20	0.17	0.24	0.19	0.17	0.14	0.17	0.18	0.19	0.20	0.19	0.19
3	0.84	0.78	0.52	0.51	0.87	1.58	3.54	4.54	2.04	2.82	2.64	1.72	1.03	1.14	0.88	0.95	1.16	0.84	0.72	0.67	0.82	0.72	0.73	0.78	0.75	0.78
4	1.31	1.19	0.67	0.73	1.29	2.83	5.71	7.41	3.85	5.81	5.68	3.52	2.09	2.35	2.07	2.15	2.31	1.81	1.50	1.48	1.61	1.45	1.50	1.62	1.61	1.66
5	1.63	1.43	0.84	0.96	1.86	3.96	8.00	10.19	6.11	8.59	8.13	5.26	3.24	3.69	3.25	3.30	3.25	2.67	2.15	2.23	2.35	2.21	2.28	2.51	2.51	2.56
6	1.84	1.57	0.96	1.17	2.50	5.12	9.97	12.56	8.47	10.51	9.65	6.72	4.31	4.90	4.39	4.16	3.95	3.22	2.56	2.78	2.90	2.81	2.91	3.20	3.17	3.21
7	1.97	1.70	1.10	1.42	3.04	6.22	12.01	14.03	9.97	11.81	10.83	8.04	5.22	5.95	5.25	4.78	4.40	3.59	2.86	3.25	3.35	3.33	3.43	3.79	3.71	3.71
8	2.07	1.81	1.19	1.59	3.52	7.58	13.92	14.91	10.96	12.60	11.77	9.10	6.08	6.66	5.89	5.27	4.70	3.85	3.08	3.62	3.70	3.75	3.84	4.22	4.09	4.06
9	2.15	1.92	1.29	1.88	4.16	8.90	15.00	15.46	11.78	13.22	12.60	9.96	6.66	7.28	6.34	5.65	4.94	4.07	3.27	3.98	4.02	4.16	4.21	4.60	4.41	4.36
10	2.23	1.98	1.39	2.17	5.00	9.90	15.85	15.64	12.38	13.71	13.03	10.52	7.16	7.72	6.66	5.92	5.11	4.24	3.42	4.29	4.28	4.48	4.49	4.89	4.66	4.60
11	2.29	2.07	1.48	2.50	5.64	10.74	16.42	15.90	12.71	14.00	13.34	10.98	7.43	8.04	6.89	6.13	5.23	4.37	3.54	4.55	4.48	4.74	4.71	5.11	4.85	4.78
12	2.36	2.12	1.68	2.73	6.17	11.27	16.84	15.95	13.09	14.20	13.57	11.30	7.66	8.30	7.09	6.30	5.36	4.53	3.71	4.86	4.71	5.04	4.97	5.39	5.10	5.03
13	2.43	2.22	1.75	3.01	6.56	11.69	17.08	16.03	13.29	14.36	13.78	11.55	7.86	8.51	7.26	6.46	5.47	4.66	3.85	5.12	4.90	5.28	5.19	5.63	5.32	5.24
14	2.50	2.32	1.88	3.14	6.85	12.10	17.39	16.15	13.43	14.62	13.94	11.73	8.02	8.69	7.39	6.58	5.55	4.77	3.95	5.33	5.05	5.49	5.37	5.83	5.49	5.41
15	2.56	2.44	1.95	3.27	7.04	12.38	17.52	16.22	13.59	14.81	14.05	11.87	8.14	8.84	7.51	6.69	5.62	4.85	4.03	5.50	5.17	5.66	5.53	6.00	5.64	5.55
16	2.59	2.50	1.98	3.41	7.24	12.56	17.67	16.44	13.72	14.97	14.15	11.99	8.26	8.97	7.61	6.77	5.68	4.92	4.10	5.64	5.27	5.80	5.65	6.13	5.75	5.66
17	2.63	2.58	2.07	3.53	7.36	12.67	17.84	16.58	13.82	15.09	14.22	12.08	8.35	9.08	7.69	6.84	5.73	4.97	4.15	5.76	5.36	5.92	5.75	6.25	5.85	5.76
18	2.67	2.63	2.10	3.61	7.43	12.80	17.97	16.68	13.91	15.19	14.29	12.17	8.43	9.17	7.75	6.89	5.76	5.01	4.19	5.86	5.43	6.02	5.84	6.34	5.94	5.84
19	2.68	2.71	2.14	3.64	7.53	12.90	18.07	16.76	13.99	15.28	14.33	12.23	8.50	9.24	7.81	6.94	5.80	5.05	4.23	5.95	5.49	6.10	5.92	6.42	6.01	5.91
20	2.70	2.75	2.16	3.72	7.62	12.99	18.15	16.82	14.05	15.35	14.38	12.29	8.56	9.31	7.85	6.97	5.82	5.08	4.26	6.02	5.54	6.17	5.98	6.49	6.07	5.97
21	2.70	2.77	2.21	3.79	7.70	13.07	18.22	16.87	14.12	15.42	14.41	12.34	8.61	9.36	7.89	7.01	5.85	5.11	4.29	6.08	5.58	6.23	6.03	6.55	6.12	6.02
22	2.73	2.82	2.26	3.85	7.77	13.14	18.29	16.91	14.17	15.47	14.44	12.38	8.64	9.40	7.93	7.03	5.87	5.13	4.31	6.14	5.62	6.29	6.08	6.61	6.17	6.07
23	2.78	2.87	2.30	3.90	7.83	13.20	18.34	16.94	14.22	15.52	14.47	12.41	8.68	9.44	7.96	7.06	5.89	5.15	4.33	6.18	5.65	6.33	6.12	6.65	6.21	6.10
24	2.83	2.91	2.34	3.95	7.88	13.25	18.39	16.97	14.26	15.56	14.49	12.44	8.71	9.48	7.98	7.08	5.91	5.17	4.35	6.22	5.69	6.37	6.16	6.69	6.25	6.14
25	2.87	2.96	2.38	4.00	7.93	13.30	18.43	16.99	14.30	15.60	14.50	12.46	8.73	9.51	8.01	7.10	5.92	5.19	4.36	6.26	5.71	6.40	6.19	6.73	6.28	6.17
26	2.91	3.00	2.41	4.04	7.97	13.34	18.46	17.01	14.33	15.63	14.52	12.48	8.75	9.53	8.03	7.12	5.94	5.20	4.38	6.29	5.74	6.43	6.22	6.77	6.32	6.20
27	2.94	3.04	2.44	4.07	8.02	13.38	18.49	17.03	14.36	15.65	14.53	12.50	8.77	9.56	8.05	7.13	5.95	5.22	4.39	6.32	5.76	6.46	6.25	6.80	6.34	6.23
28	2.98	3.07	2.47	4.11	8.05	13.41	18.52	17.05	14.38	15.67	14.55	12.51	8.78	9.58	8.07	7.15	5.96	5.23	4.40	6.34	5.78	6.48	6.27	6.83	6.37	6.26
29	3.01	3.11	2.50	4.14	8.09	13.44	18.54	17.06	14.40	15.69	14.55	12.53	8.80	9.60	8.09	7.16	5.96	5.24	4.41	6.36	5.80	6.50	6.29	6.85	6.40	6.28
30	3.04	3.14	2.53	4.17	8.12	13.47	18.56	17.07	14.42	15.71	14.56	12.54	8.81	9.61	8.10	7.17	5.97	5.25	4.42	6.38	5.82	6.52	6.32	6.88	6.42	6.30

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
93 - 95 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.04	0.03	0.01	0.03	0.01	0.01	0.05	0.09	0.02	0.04	0.02	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
2	0.34	0.38	0.19	0.31	0.26	0.62	1.06	1.59	0.54	0.87	0.70	0.35	0.32	0.35	0.26	0.22	0.27	0.18	0.13	0.15	0.19	0.19	0.19	0.19	0.18	0.18
3	0.97	0.79	0.57	0.66	0.95	1.79	3.86	4.97	2.11	3.01	2.96	1.80	1.25	1.28	1.16	1.14	1.24	0.81	0.66	0.75	0.83	0.73	0.73	0.76	0.73	0.74
4	1.49	1.18	0.85	1.01	1.74	3.27	6.07	8.52	4.28	5.98	6.22	3.80	2.41	2.62	2.53	2.50	2.46	1.72	1.47	1.62	1.67	1.51	1.56	1.65	1.64	1.67
5	1.86	1.40	1.06	1.33	2.49	4.55	8.53	11.70	6.97	9.12	9.01	5.65	3.54	4.15	4.04	3.76	3.43	2.59	2.11	2.38	2.42	2.28	2.35	2.55	2.52	2.56
6	2.13	1.56	1.19	1.60	3.20	5.83	11.06	14.55	9.57	11.40	11.04	7.40	4.85	5.42	5.30	4.63	4.21	3.17	2.53	2.96	3.01	2.90	3.01	3.27	3.20	3.22
7	2.33	1.68	1.38	1.82	3.86	7.03	13.80	16.35	11.40	12.75	12.48	8.89	6.00	6.59	6.21	5.26	4.73	3.59	2.85	3.46	3.50	3.46	3.57	3.89	3.77	3.75
8	2.41	1.87	1.51	2.08	4.47	8.50	15.91	17.32	12.66	13.85	13.63	10.11	6.97	7.40	6.92	5.81	5.09	3.88	3.08	3.86	3.88	3.91	4.02	4.36	4.18	4.12
9	2.50	1.98	1.64	2.32	5.16	9.81	17.06	17.94	13.58	14.62	14.40	11.07	7.67	8.07	7.40	6.21	5.34	4.11	3.28	4.23	4.21	4.31	4.39	4.75	4.50	4.43
10	2.59	2.00	1.76	2.60	5.96	11.02	17.84	18.29	14.19	15.07	14.98	11.77	8.29	8.57	7.75	6.51	5.54	4.30	3.44	4.55	4.48	4.64	4.69	5.05	4.76	4.68
11	2.65	2.06	1.89	2.92	6.64	11.85	18.46	18.70	14.74	15.52	15.43	12.34	8.63	8.96	8.03	6.74	5.70	4.46	3.57	4.83	4.71	4.92	4.94	5.30	4.98	4.89
12	2.74	2.17	2.05	3.12	7.18	12.52	19.02	19.01	15.12	15.77	15.73	12.70	8.94	9.29	8.27	6.96	5.86	4.64	3.75	5.17	4.98	5.24	5.24	5.62	5.26	5.16
13	2.83	2.26	2.18	3.38	7.54	13.04	19.39	19.16	15.39	16.04	15.99	12.98	9.19	9.56	8.47	7.14	5.99	4.80	3.90	5.46	5.19	5.51	5.49	5.90	5.50	5.40
14	2.89	2.35	2.31	3.59	7.91	13.40	19.68	19.25	15.59	16.33	16.16	13.16	9.37	9.75	8.61	7.27	6.09	4.90	4.01	5.66	5.34	5.70	5.67	6.10	5.68	5.57
15	2.97	2.43	2.42	3.74	8.21	13.72	19.97	19.37	15.79	16.55	16.29	13.31	9.52	9.92	8.73	7.38	6.16	4.99	4.09	5.83	5.46	5.86	5.83	6.26	5.83	5.71
16	3.03	2.47	2.50	3.84	8.42	14.01	20.06	19.62	15.95	16.73	16.40	13.43	9.64	10.07	8.83	7.47	6.23	5.06	4.16	5.97	5.56	6.00	5.96	6.40	5.95	5.83
17	3.08	2.55	2.54	3.99	8.54	14.12	20.25	19.79	16.08	16.87	16.49	13.53	9.76	10.19	8.92	7.54	6.28	5.11	4.21	6.09	5.65	6.12	6.07	6.52	6.05	5.93
18	3.12	2.60	2.60	4.05	8.70	14.26	20.40	19.91	16.19	17.00	16.56	13.62	9.86	10.30	8.99	7.60	6.32	5.16	4.25	6.19	5.72	6.21	6.16	6.62	6.14	6.01
19	3.21	2.63	2.62	4.07	8.81	14.38	20.52	20.00	16.29	17.11	16.62	13.69	9.94	10.39	9.05	7.65	6.35	5.20	4.29	6.28	5.78	6.30	6.24	6.71	6.21	6.09
20	3.24	2.68	2.65	4.15	8.91	14.48	20.61	20.07	16.38	17.20	16.67	13.75	10.01	10.46	9.10	7.69	6.38	5.23	4.32	6.35	5.84	6.37	6.30	6.78	6.27	6.15
21	3.28	2.69	2.70	4.22	8.99	14.57	20.70	20.13	16.46	17.28	16.72	13.80	10.07	10.52	9.14	7.72	6.41	5.25	4.34	6.42	5.88	6.42	6.36	6.85	6.33	6.20
22	3.29	2.74	2.74	4.28	9.06	14.65	20.77	20.18	16.53	17.35	16.75	13.85	10.11	10.57	9.18	7.75	6.43	5.28	4.37	6.47	5.92	6.48	6.41	6.90	6.37	6.24
23	3.34	2.79	2.78	4.33	9.13	14.71	20.84	20.22	16.60	17.41	16.78	13.88	10.15	10.62	9.21	7.78	6.45	5.30	4.38	6.52	5.95	6.52	6.45	6.95	6.41	6.28
24	3.38	2.82	2.82	4.38	9.18	14.78	20.89	20.26	16.65	17.47	16.81	13.91	10.19	10.66	9.24	7.80	6.47	5.31	4.40	6.56	5.98	6.56	6.49	6.99	6.45	6.32
25	3.43	2.86	2.85	4.43	9.24	14.83	20.94	20.29	16.70	17.51	16.83	13.94	10.22	10.69	9.27	7.82	6.48	5.33	4.41	6.59	6.01	6.59	6.52	7.03	6.48	6.35
26	3.46	2.90	2.88	4.47	9.28	14.88	20.98	20.32	16.74	17.55	16.85	13.96	10.25	10.72	9.29	7.84	6.50	5.34	4.43	6.62	6.03	6.62	6.55	7.06	6.51	6.38
27	3.50	2.93	2.91	4.50	9.33	14.93	21.02	20.34	16.78	17.59	16.87	13.99	10.27	10.75	9.31	7.86	6.51	5.35	4.44	6.65	6.05	6.64	6.57	7.09	6.54	6.40
28	3.54	2.96	2.94	4.54	9.37	14.97	21.04	20.36	16.81	17.62	16.88	14.00	10.29	10.77	9.33	7.87	6.53	5.36	4.45	6.67	6.07	6.66	6.60	7.12	6.56	6.42
29	3.57	2.99	2.96	4.57	9.41	15.01	21.07	20.37	16.85	17.64	16.89	14.02	10.31	10.79	9.35	7.88	6.54	5.37	4.46	6.69	6.09	6.68	6.62	7.14	6.58	6.44
30	3.60	3.02	2.98	4.60	9.44	15.04	21.09	20.39	16.87	17.66	16.91	14.04	10.32	10.81	9.37	7.90	6.55	5.38	4.47	6.71	6.10	6.70	6.64	7.16	6.60	6.46

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
95 - 97 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.03	0.01	0.02	0.03	0.02	0.03	0.06	0.15	0.03	0.06	0.03	0.02	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01
2	0.45	0.44	0.32	0.35	0.38	0.79	1.45	2.29	0.65	1.29	0.98	0.54	0.47	0.49	0.37	0.32	0.32	0.20	0.19	0.22	0.20	0.23	0.22	0.21	0.20	0.19
3	1.20	1.02	0.83	0.79	1.22	2.21	4.91	6.26	2.78	4.44	4.18	2.42	1.78	1.76	1.54	1.47	1.42	0.94	0.78	0.83	0.93	0.89	0.85	0.87	0.82	0.83
4	1.88	1.50	1.21	1.24	1.96	3.93	8.07	10.86	5.70	8.73	8.34	4.74	3.30	3.35	3.21	2.98	2.72	1.87	1.61	1.77	1.83	1.75	1.73	1.80	1.76	1.79
5	2.30	1.81	1.49	1.59	2.74	5.51	11.03	15.49	9.22	12.74	11.65	7.02	4.82	5.15	4.74	4.38	3.78	2.78	2.31	2.63	2.65	2.63	2.61	2.77	2.70	2.74
6	2.60	2.05	1.69	2.05	3.55	7.03	13.83	18.91	12.77	15.41	14.07	9.02	6.26	6.62	6.13	5.40	4.63	3.38	2.77	3.29	3.29	3.33	3.32	3.53	3.42	3.43
7	2.79	2.23	1.93	2.45	4.34	8.63	16.58	21.36	15.21	17.22	15.81	10.76	7.45	7.86	7.09	6.18	5.13	3.80	3.11	3.84	3.80	3.95	3.91	4.18	4.01	3.98
8	2.92	2.41	2.13	2.82	5.18	10.31	19.06	22.63	16.86	18.43	17.12	12.14	8.49	8.81	7.85	6.79	5.49	4.11	3.37	4.30	4.20	4.46	4.39	4.67	4.44	4.38
9	3.07	2.60	2.31	3.13	6.12	12.15	20.61	23.40	18.11	19.40	18.09	13.16	9.29	9.50	8.38	7.24	5.75	4.35	3.57	4.71	4.54	4.91	4.79	5.08	4.78	4.70
10	3.20	2.73	2.48	3.53	7.05	13.47	21.77	23.82	19.06	20.01	18.71	13.94	9.90	10.03	8.79	7.60	5.96	4.56	3.75	5.08	4.84	5.30	5.13	5.42	5.07	4.98
11	3.31	2.84	2.68	3.97	7.82	14.50	22.55	24.17	19.71	20.54	19.17	14.52	10.25	10.41	9.08	7.86	6.11	4.72	3.89	5.39	5.07	5.61	5.38	5.68	5.30	5.20
12	3.40	2.98	2.91	4.32	8.50	15.23	23.10	24.40	20.24	20.85	19.45	14.90	10.53	10.71	9.31	8.07	6.25	4.86	4.03	5.69	5.28	5.89	5.63	5.94	5.52	5.42
13	3.51	3.13	3.10	4.63	9.09	15.87	23.65	24.57	20.57	21.04	19.73	15.21	10.78	10.97	9.52	8.26	6.37	5.00	4.15	5.95	5.46	6.15	5.85	6.17	5.72	5.61
14	3.58	3.26	3.24	4.90	9.53	16.43	23.93	24.72	20.75	21.32	19.89	15.40	10.94	11.14	9.65	8.39	6.45	5.09	4.24	6.13	5.58	6.32	6.00	6.33	5.86	5.74
15	3.68	3.37	3.36	5.09	9.87	16.81	24.24	24.82	20.95	21.55	20.03	15.55	11.08	11.29	9.77	8.50	6.52	5.16	4.30	6.28	5.68	6.47	6.13	6.46	5.98	5.86
16	3.76	3.46	3.45	5.25	10.14	17.05	24.38	25.06	21.12	21.75	20.15	15.69	11.20	11.43	9.88	8.60	6.57	5.22	4.35	6.41	5.76	6.59	6.24	6.58	6.07	5.95
17	3.83	3.53	3.57	5.35	10.32	17.23	24.62	25.23	21.25	21.91	20.25	15.80	11.31	11.54	9.96	8.67	6.62	5.26	4.40	6.52	5.84	6.70	6.33	6.68	6.16	6.03
18	3.89	3.60	3.65	5.46	10.49	17.42	24.83	25.36	21.38	22.06	20.34	15.90	11.41	11.65	10.04	8.74	6.65	5.31	4.43	6.62	5.90	6.80	6.41	6.76	6.23	6.10
19	3.94	3.64	3.72	5.53	10.62	17.58	25.01	25.46	21.48	22.19	20.42	15.99	11.50	11.73	10.10	8.79	6.69	5.34	4.46	6.70	5.95	6.88	6.48	6.83	6.29	6.16
20	3.98	3.69	3.74	5.62	10.73	17.72	25.17	25.54	21.58	22.31	20.49	16.06	11.57	11.81	10.16	8.84	6.72	5.37	4.49	6.77	6.00	6.95	6.54	6.90	6.34	6.21
21	4.00	3.71	3.80	5.71	10.83	17.84	25.30	25.61	21.67	22.42	20.55	16.12	11.63	11.87	10.20	8.88	6.74	5.40	4.51	6.83	6.04	7.01	6.59	6.95	6.38	6.25
22	4.02	3.76	3.85	5.78	10.92	17.95	25.42	25.67	21.75	22.51	20.61	16.18	11.68	11.93	10.24	8.91	6.76	5.42	4.53	6.89	6.07	7.06	6.64	7.00	6.42	6.29
23	4.06	3.80	3.89	5.84	11.00	18.05	25.53	25.72	21.82	22.60	20.66	16.22	11.73	11.98	10.28	8.95	6.78	5.44	4.55	6.93	6.10	7.11	6.68	7.04	6.46	6.32
24	4.11	3.84	3.93	5.90	11.07	18.15	25.63	25.76	21.88	22.67	20.70	16.26	11.77	12.02	10.31	8.97	6.80	5.45	4.56	6.98	6.13	7.15	6.71	7.07	6.48	6.35
25	4.15	3.87	3.96	5.95	11.14	18.23	25.72	25.80	21.94	22.73	20.74	16.30	11.80	12.06	10.34	9.00	6.81	5.47	4.57	7.01	6.15	7.18	6.74	7.10	6.51	6.37
26	4.18	3.90	4.00	6.00	11.19	18.31	25.80	25.84	21.99	22.79	20.78	16.33	11.84	12.09	10.36	9.02	6.83	5.48	4.58	7.04	6.17	7.21	6.77	7.13	6.53	6.39
27	4.22	3.93	4.03	6.04	11.25	18.38	25.87	25.87	22.04	22.85	20.81	16.35	11.86	12.12	10.39	9.03	6.84	5.49	4.59	7.07	6.19	7.24	6.79	7.16	6.55	6.41
28	4.25	3.96	4.05	6.08	11.30	18.44	25.93	25.89	22.08	22.89	20.84	16.38	11.89	12.14	10.41	9.05	6.85	5.50	4.60	7.10	6.21	7.26	6.81	7.18	6.57	6.43
29	4.28	3.98	4.08	6.12	11.34	18.49	26.00	25.92	22.12	22.92	20.87	16.40	11.91	12.17	10.43	9.07	6.86	5.51	4.61	7.12	6.22	7.28	6.83	7.20	6.58	6.44
30	4.31	4.00	4.10	6.15	11.38	18.55	26.05	25.94	22.16	22.95	20.89	16.42	11.93	12.19	10.44	9.08	6.87	5.52	4.61	7.14	6.23	7.30	6.84	7.21	6.60	6.46

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
97 - 100 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.08	0.09	0.06	0.04	0.03	0.05	0.20	0.30	0.06	0.07	0.04	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01
2	1.17	1.18	0.73	0.57	0.65	1.47	2.90	4.34	1.20	1.80	1.27	0.73	0.59	0.61	0.55	0.48	0.48	0.36	0.21	0.21	0.26	0.32	0.30	0.29	0.28	0.27
3	2.72	2.36	1.52	1.32	1.84	3.71	8.57	10.24	4.27	5.83	5.14	3.07	2.13	2.16	2.10	1.95	1.86	1.39	0.85	0.90	1.19	1.09	1.02	1.06	1.00	1.03
4	3.79	3.14	2.05	1.95	2.88	6.14	12.90	16.11	7.95	10.89	9.99	5.88	3.89	4.06	4.01	3.80	3.37	2.70	1.68	1.91	2.17	1.98	1.92	2.02	1.98	2.02
5	4.41	3.51	2.45	2.44	4.06	8.20	16.87	21.18	11.94	15.54	13.69	8.37	5.53	6.03	5.75	5.43	4.62	3.71	2.37	2.74	2.98	2.81	2.72	2.93	2.86	2.91
6	4.73	3.79	2.77	3.00	5.05	10.12	20.10	24.70	15.75	18.60	16.13	10.46	7.07	7.67	7.21	6.59	5.59	4.48	2.86	3.41	3.63	3.51	3.42	3.70	3.59	3.62
7	4.95	4.02	3.11	3.44	5.99	11.89	23.00	27.06	18.23	20.54	17.87	12.13	8.37	9.00	8.31	7.47	6.20	5.02	3.21	3.95	4.14	4.10	3.99	4.32	4.16	4.15
8	5.10	4.25	3.35	3.85	6.97	13.81	25.44	28.30	19.84	21.86	19.16	13.43	9.49	10.00	9.18	8.17	6.61	5.40	3.48	4.39	4.54	4.59	4.43	4.79	4.57	4.52
9	5.31	4.46	3.62	4.31	7.97	15.75	27.07	29.04	21.02	22.85	20.08	14.46	10.38	10.76	9.77	8.68	6.92	5.72	3.69	4.80	4.88	5.03	4.81	5.18	4.90	4.83
10	5.47	4.63	3.87	4.77	9.15	17.25	28.20	29.59	21.95	23.56	20.73	15.24	11.08	11.33	10.21	9.07	7.15	5.97	3.88	5.15	5.16	5.40	5.12	5.48	5.15	5.07
11	5.64	4.80	4.14	5.34	10.14	18.43	29.06	29.94	22.58	24.11	21.21	15.83	11.47	11.77	10.54	9.38	7.33	6.18	4.03	5.47	5.40	5.71	5.36	5.72	5.37	5.28
12	5.77	4.97	4.46	5.90	10.90	19.38	29.64	30.16	23.05	24.48	21.52	16.29	11.80	12.11	10.81	9.64	7.50	6.41	4.22	5.82	5.64	6.04	5.62	6.01	5.62	5.52
13	5.91	5.16	4.80	6.34	11.58	20.11	30.06	30.43	23.37	24.79	21.79	16.65	12.07	12.41	11.05	9.87	7.65	6.62	4.39	6.13	5.85	6.33	5.86	6.25	5.84	5.73
14	6.07	5.36	5.11	6.72	12.13	20.71	30.41	30.62	23.59	25.06	21.95	16.88	12.25	12.60	11.20	10.02	7.76	6.76	4.49	6.34	5.98	6.52	6.02	6.42	5.98	5.88
15	6.23	5.57	5.36	7.00	12.55	21.18	30.69	30.73	23.79	25.26	22.07	17.06	12.41	12.77	11.33	10.15	7.84	6.87	4.58	6.50	6.09	6.69	6.15	6.56	6.10	6.00
16	6.38	5.72	5.58	7.22	12.87	21.50	30.86	30.95	23.95	25.43	22.17	17.20	12.54	12.91	11.44	10.26	7.90	6.96	4.64	6.65	6.19	6.82	6.26	6.67	6.20	6.09
17	6.48	5.86	5.73	7.41	13.12	21.72	31.11	31.09	24.08	25.57	22.25	17.33	12.66	13.03	11.53	10.34	7.95	7.03	4.70	6.76	6.26	6.94	6.35	6.77	6.29	6.17
18	6.58	5.98	5.83	7.54	13.28	21.93	31.31	31.20	24.19	25.68	22.33	17.43	12.76	13.14	11.61	10.41	7.99	7.09	4.74	6.86	6.33	7.04	6.42	6.85	6.35	6.24
19	6.67	6.05	5.91	7.64	13.44	22.10	31.47	31.28	24.28	25.79	22.39	17.52	12.84	13.22	11.67	10.46	8.02	7.14	4.78	6.95	6.38	7.12	6.48	6.91	6.41	6.29
20	6.75	6.11	5.99	7.76	13.58	22.25	31.61	31.34	24.36	25.88	22.44	17.59	12.91	13.29	11.72	10.51	8.05	7.18	4.81	7.02	6.42	7.19	6.53	6.97	6.45	6.33
21	6.81	6.15	6.07	7.86	13.69	22.38	31.74	31.39	24.44	25.96	22.49	17.65	12.97	13.35	11.76	10.55	8.07	7.22	4.83	7.08	6.46	7.25	6.58	7.01	6.49	6.37
22	6.83	6.21	6.14	7.95	13.79	22.49	31.84	31.44	24.50	26.03	22.54	17.70	13.02	13.39	11.79	10.58	8.09	7.25	4.85	7.13	6.49	7.30	6.61	7.05	6.52	6.40
23	6.89	6.27	6.20	8.02	13.88	22.59	31.94	31.47	24.56	26.10	22.57	17.74	13.06	13.44	11.82	10.60	8.11	7.27	4.87	7.18	6.52	7.34	6.64	7.08	6.55	6.43
24	6.94	6.32	6.25	8.09	13.95	22.67	32.03	31.51	24.61	26.15	22.61	17.78	13.10	13.47	11.85	10.63	8.12	7.29	4.89	7.22	6.54	7.38	6.67	7.11	6.57	6.45
25	6.98	6.36	6.29	8.14	14.02	22.75	32.11	31.53	24.65	26.20	22.64	17.81	13.13	13.50	11.87	10.65	8.13	7.31	4.90	7.25	6.56	7.41	6.69	7.13	6.59	6.47
26	7.02	6.39	6.33	8.19	14.08	22.82	32.18	31.56	24.69	26.25	22.66	17.83	13.15	13.52	11.89	10.66	8.14	7.33	4.91	7.28	6.58	7.43	6.71	7.15	6.61	6.49
27	7.06	6.43	6.37	8.23	14.13	22.88	32.24	31.58	24.72	26.28	22.69	17.85	13.17	13.55	11.90	10.67	8.15	7.35	4.92	7.30	6.59	7.46	6.73	7.17	6.62	6.50
28	7.09	6.45	6.40	8.27	14.17	22.93	32.30	31.59	24.75	26.32	22.71	17.87	13.19	13.56	11.92	10.69	8.16	7.36	4.93	7.32	6.61	7.48	6.74	7.19	6.64	6.51
29	7.12	6.48	6.42	8.30	14.21	22.97	32.35	31.61	24.78	26.35	22.73	17.89	13.21	13.58	11.93	10.70	8.16	7.37	4.93	7.34	6.62	7.49	6.75	7.20	6.65	6.52
30	7.14	6.50	6.44	8.33	14.24	23.01	32.39	31.62	24.81	26.38	22.75	17.90	13.22	13.59	11.94	10.70	8.17	7.38	4.94	7.35	6.63	7.51	6.77	7.21	6.66	6.53

Summary of Cumulative Claim Rates
30-Year Fixed-Rate Mortgages
Investors LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.01	0.00	0.01	0.01	0.00	0.01	0.03	0.13	0.01	0.02	0.04	0.01	0.01	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.05
2	0.25	0.40	0.30	0.25	0.25	0.51	1.88	2.99	0.67	1.22	1.51	0.74	0.40	0.47	0.31	0.24	0.23	0.21	0.07	0.15	0.11	0.27	0.29	0.29	0.27	0.27
3	1.10	1.25	0.78	0.67	0.93	1.60	6.23	7.41	2.56	4.52	5.79	3.27	1.66	1.76	1.39	1.06	1.24	0.88	0.62	0.62	1.01	1.14	1.11	1.14	1.10	1.12
4	1.92	2.01	1.21	1.23	1.56	3.08	9.90	11.38	5.00	8.44	10.95	5.90	3.04	3.41	2.81	2.30	2.69	2.07	1.36	1.72	2.05	2.17	2.17	2.26	2.23	2.27
5	2.57	2.54	1.50	1.63	2.27	4.46	13.03	14.68	7.67	12.04	14.47	7.85	4.41	5.01	4.20	3.56	4.21	3.26	2.19	2.67	2.96	3.14	3.15	3.35	3.31	3.34
6	3.04	2.87	1.81	2.07	2.91	5.88	15.60	16.97	10.24	15.43	16.58	9.46	5.60	6.36	5.51	4.60	5.59	3.94	2.81	3.43	3.71	3.96	4.00	4.28	4.20	4.21
7	3.37	3.17	2.00	2.39	3.62	7.04	17.72	18.35	13.00	16.97	18.13	10.80	6.59	7.46	6.55	5.43	6.13	4.41	3.26	4.03	4.30	4.63	4.68	5.01	4.89	4.86
8	3.57	3.43	2.25	2.75	4.15	8.10	19.19	19.30	14.23	17.88	19.25	11.80	7.40	8.31	7.37	5.94	6.52	4.78	3.69	4.58	4.83	5.24	5.30	5.66	5.48	5.43
9	3.89	3.62	2.46	3.03	4.70	9.25	20.04	19.79	15.06	18.58	20.06	12.59	8.01	9.07	7.82	6.29	6.80	5.08	4.03	5.06	5.28	5.76	5.81	6.18	5.95	5.88
10	4.06	3.76	2.60	3.32	5.50	10.20	20.69	20.12	15.78	19.07	20.69	13.19	8.55	9.52	8.16	6.55	7.01	5.33	4.32	5.49	5.66	6.20	6.22	6.61	6.33	6.26
11	4.26	3.93	2.80	3.68	6.11	10.86	21.15	20.36	16.29	19.49	21.07	13.62	8.87	9.85	8.41	6.75	7.18	5.52	4.56	5.85	5.96	6.55	6.54	6.94	6.63	6.56
12	4.40	4.11	2.99	3.97	6.61	11.32	21.46	20.54	16.65	19.74	21.33	13.95	9.13	10.11	8.60	6.91	7.32	5.71	4.79	6.19	6.23	6.86	6.84	7.26	6.92	6.85
13	4.51	4.28	3.14	4.19	6.95	11.73	21.73	20.69	16.93	19.93	21.54	14.17	9.32	10.29	8.74	7.02	7.43	5.85	4.97	6.44	6.43	7.10	7.06	7.50	7.14	7.07
14	4.65	4.37	3.25	4.49	7.27	12.02	21.96	20.80	17.08	20.24	21.73	14.38	9.50	10.47	8.87	7.13	7.53	5.97	5.12	6.68	6.61	7.32	7.27	7.72	7.34	7.27
15	4.83	4.49	3.36	4.65	7.54	12.30	22.15	20.88	17.26	20.48	21.88	14.53	9.64	10.62	8.98	7.22	7.61	6.08	5.24	6.86	6.76	7.49	7.43	7.90	7.50	7.43
16	4.95	4.57	3.46	4.79	7.78	12.52	22.27	21.13	17.41	20.66	22.00	14.65	9.76	10.74	9.07	7.28	7.67	6.16	5.34	7.02	6.88	7.64	7.57	8.05	7.63	7.57
17	5.07	4.69	3.56	4.91	7.99	12.60	22.41	21.30	17.52	20.82	22.09	14.75	9.86	10.84	9.14	7.34	7.71	6.23	5.42	7.15	6.98	7.76	7.68	8.17	7.74	7.67
18	5.16	4.74	3.66	4.96	8.16	12.68	22.51	21.42	17.62	20.95	22.17	14.84	9.95	10.92	9.20	7.38	7.75	6.29	5.49	7.26	7.06	7.86	7.78	8.27	7.83	7.76
19	5.24	4.86	3.72	5.03	8.26	12.74	22.60	21.52	17.70	21.06	22.24	14.90	10.01	10.99	9.24	7.41	7.77	6.34	5.55	7.35	7.14	7.94	7.86	8.36	7.91	7.84
20	5.30	4.94	3.80	5.12	8.35	12.79	22.67	21.59	17.76	21.16	22.30	14.95	10.07	11.04	9.28	7.44	7.78	6.37	5.59	7.43	7.20	8.01	7.92	8.43	7.97	7.90
21	5.35	4.99	3.88	5.19	8.41	12.84	22.73	21.65	17.82	21.24	22.35	14.99	10.11	11.08	9.31	7.46	7.80	6.39	5.61	7.50	7.26	8.07	7.98	8.49	8.02	7.96
22	5.38	5.06	3.96	5.26	8.47	12.87	22.78	21.69	17.87	21.32	22.39	15.03	10.14	11.12	9.34	7.48	7.81	6.41	5.63	7.57	7.31	8.12	8.04	8.54	8.07	8.00
23	5.45	5.12	4.02	5.32	8.52	12.91	22.83	21.73	17.91	21.38	22.42	15.05	10.17	11.15	9.37	7.50	7.82	6.43	5.65	7.62	7.34	8.17	8.08	8.59	8.10	8.03
24	5.51	5.17	4.09	5.37	8.57	12.94	22.88	21.76	17.95	21.44	22.46	15.08	10.19	11.18	9.39	7.52	7.83	6.44	5.66	7.67	7.36	8.21	8.11	8.63	8.13	8.06
25	5.56	5.22	4.14	5.41	8.61	12.96	22.91	21.79	17.98	21.48	22.48	15.09	10.21	11.20	9.41	7.53	7.83	6.45	5.67	7.72	7.38	8.25	8.15	8.67	8.16	8.09
26	5.61	5.27	4.19	5.46	8.64	12.98	22.95	21.81	18.01	21.53	22.51	15.11	10.23	11.22	9.43	7.55	7.84	6.46	5.67	7.76	7.40	8.28	8.17	8.69	8.17	8.10
27	5.65	5.31	4.24	5.50	8.68	13.00	22.98	21.83	18.03	21.57	22.53	15.12	10.24	11.24	9.45	7.56	7.84	6.46	5.67	7.80	7.41	8.31	8.19	8.71	8.18	8.12
28	5.69	5.35	4.29	5.53	8.71	13.02	23.00	21.84	18.05	21.60	22.55	15.13	10.25	11.26	9.46	7.57	7.84	6.47	5.67	7.84	7.41	8.35	8.21	8.73	8.19	8.13
29	5.73	5.39	4.34	5.57	8.74	13.04	23.03	21.85	18.07	21.63	22.57	15.14	10.26	11.27	9.48	7.58	7.84	6.47	5.67	7.88	7.42	8.37	8.22	8.74	8.20	8.13
30	5.77	5.43	4.38	5.60	8.76	13.06	23.05	21.86	18.08	21.65	22.58	15.15	10.27	11.28	9.50	7.59	7.84	6.47	5.68	7.91	7.43	8.40	8.23	8.75	8.20	8.14

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
Unknown LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.15	0.45	0.32	0.24	0.45	0.26	0.21	0.37	0.22	0.34	1.10	5.83	9.27	5.03	6.83	4.57	1.64	1.01	14.73	16.48	24.46	2.71	0.37	0.37	0.37	0.38
2	1.89	4.26	2.96	2.11	1.39	0.80	0.57	17.15	0.95	2.17	22.72	29.86	13.47	21.59	24.01	23.55	16.15	11.36	40.12	25.51	46.51	5.46	4.08	4.46	4.48	4.73
3	7.74	11.95	7.81	3.70	2.09	1.04	5.20	24.50	2.65	24.74	48.91	33.92	16.20	26.42	36.74	48.99	39.46	27.87	45.54	29.41	52.54	12.22	13.73	14.67	15.22	14.52
4	15.82	19.11	10.65	4.70	2.44	2.72	8.56	32.81	17.76	42.84	53.00	37.37	17.28	29.98	53.03	68.76	57.07	32.24	49.85	37.03	59.73	21.80	26.00	27.52	26.93	25.41
5	22.10	22.63	12.08	5.28	3.92	4.62	12.86	47.49	38.37	47.12	55.50	39.05	19.56	40.25	66.30	79.20	60.09	38.29	57.81	44.12	66.53	31.47	37.75	38.35	37.00	35.47
6	25.07	24.48	12.79	7.01	5.53	7.25	27.36	56.37	44.25	49.77	57.30	42.65	24.10	51.99	74.54	81.23	64.22	49.42	64.70	51.03	72.36	40.58	46.99	46.90	45.51	44.17
7	26.64	25.30	14.98	8.78	7.39	16.94	40.12	59.08	48.22	52.46	59.26	47.17	34.79	63.52	76.56	83.47	69.40	57.01	70.03	56.43	76.46	46.94	53.37	53.20	51.99	50.87
8	27.44	27.44	17.23	10.72	11.75	29.71	44.55	60.70	52.33	54.78	62.17	54.51	47.58	66.88	78.15	84.91	73.13	62.72	74.13	60.80	79.33	51.70	58.17	57.99	56.95	55.95
9	29.68	29.62	19.41	15.11	18.21	34.93	47.24	61.85	56.73	57.36	64.83	64.89	50.48	70.50	79.42	86.05	76.17	67.42	77.51	64.32	81.53	55.73	62.17	62.01	61.10	60.26
10	31.83	31.83	23.39	21.41	22.52	38.66	49.85	62.73	62.73	59.89	67.60	66.83	54.35	72.66	80.41	87.04	78.69	71.15	80.06	67.17	83.30	59.19	65.52	65.33	64.57	63.82
11	33.97	35.25	28.39	25.51	26.31	42.44	52.19	63.82	67.36	62.32	68.62	68.73	56.96	74.28	81.18	87.79	80.52	73.74	81.94	69.40	84.64	61.96	68.12	67.95	67.27	66.60
12	37.46	39.54	32.16	29.10	29.96	46.23	55.51	64.99	70.92	63.08	69.35	69.95	59.17	75.69	81.83	88.40	81.85	75.56	83.25	71.14	85.65	64.14	70.12	69.91	69.29	68.66
13	41.56	42.44	35.20	32.57	33.23	52.59	59.05	65.96	72.03	63.90	70.16	70.86	60.90	76.82	82.35	88.85	82.83	76.97	84.31	72.58	86.46	65.96	71.74	71.51	70.94	70.36
14	44.29	44.95	38.18	35.78	38.08	58.77	62.06	66.46	73.13	64.97	70.81	71.68	62.50	77.80	82.77	89.22	83.66	78.22	85.26	73.91	87.18	67.65	73.22	72.97	72.46	71.94
15	46.78	47.33	40.83	39.83	45.03	63.73	63.27	66.91	74.17	65.86	71.37	72.43	63.97	78.64	83.13	89.53	84.40	79.35	86.14	75.17	87.83	69.26	74.61	74.35	73.90	73.43
16	49.08	49.47	44.02	45.42	51.51	65.46	64.47	68.44	75.05	66.63	71.86	73.09	65.28	79.37	83.46	89.82	85.07	80.38	86.96	76.36	88.44	70.79	75.91	75.65	75.26	74.84
17	51.31	52.35	48.15	51.17	54.47	67.45	65.52	69.60	75.81	67.29	72.27	73.65	66.40	80.01	83.74	90.07	85.65	81.29	87.69	77.44	88.97	72.19	77.11	76.83	76.50	76.09
18	54.18	55.95	52.54	54.18	57.60	68.52	66.40	70.51	76.47	67.85	72.60	74.13	67.42	80.58	83.99	90.29	86.18	82.08	88.35	78.44	89.46	73.51	78.21	77.92	77.62	77.23
19	57.66	59.56	55.30	57.55	59.52	69.48	67.15	71.24	77.02	68.30	72.87	74.55	68.34	81.09	84.22	90.49	86.63	82.79	88.95	79.38	89.91	74.75	79.22	78.92	78.64	78.29
20	61.29	61.83	58.31	59.77	61.28	70.34	67.81	71.81	77.49	68.67	73.09	74.92	69.18	81.55	84.43	90.68	87.03	83.43	89.50	80.26	90.31	75.91	80.15	79.83	79.60	79.27
21	63.94	64.54	60.87	61.82	62.90	71.14	68.37	72.25	77.87	68.99	73.29	75.26	69.96	81.97	84.61	90.84	87.39	84.02	90.01	81.08	90.69	76.98	81.00	80.67	80.48	80.18
22	66.21	66.49	63.22	63.72	64.43	71.86	68.84	72.61	78.21	69.27	73.46	75.56	70.67	82.35	84.78	91.00	87.72	84.56	90.47	81.84	91.02	77.97	81.79	81.45	81.29	81.02
23	67.96	68.27	65.38	65.54	65.81	72.50	69.25	72.90	78.51	69.51	73.62	75.83	71.33	82.70	84.94	91.14	88.03	85.04	90.89	82.54	91.33	78.90	82.52	82.17	82.05	81.81
24	69.57	69.90	67.42	67.18	67.06	73.07	69.60	73.14	78.77	69.73	73.75	76.08	71.94	83.02	85.08	91.27	88.30	85.49	91.28	83.20	91.61	79.76	83.20	82.84	82.76	82.55
25	71.06	71.45	69.26	68.68	68.19	73.59	69.92	73.35	79.01	69.92	73.87	76.31	72.51	83.32	85.21	91.39	88.55	85.89	91.63	83.80	91.88	80.58	83.83	83.47	83.42	83.23
26	72.47	72.84	70.93	70.04	69.22	74.07	70.20	73.52	79.22	70.09	73.98	76.52	73.04	83.59	85.33	91.50	88.78	86.26	91.95	84.37	92.12	81.34	84.42	84.05	84.03	83.87
27	73.76	74.11	72.44	71.31	70.19	74.51	70.46	73.68	79.42	70.25	74.08	76.72	73.53	83.85	85.45	91.60	88.99	86.60	92.24	84.90	92.34	82.05	84.97	84.60	84.60	84.46
28	74.93	75.26	73.82	72.48	71.09	74.93	70.70	73.82	79.60	70.40	74.17	76.90	74.00	84.09	85.55	91.69	89.18	86.92	92.51	85.40	92.55	82.72	85.49	85.10	85.13	85.01
29	76.01	76.31	75.10	73.58	71.94	75.33	70.92	73.95	79.77	70.54	74.26	77.07	74.44	84.32	85.65	91.78	89.37	87.20	92.76	85.86	92.74	83.35	85.97	85.58	85.63	85.52
30	77.00	77.28	76.27	74.60	72.74	75.70	71.13	74.07	79.93	70.67	74.34	77.23	74.85	84.53	85.75	91.86	89.54	87.46	92.99	86.30	92.93	83.94	86.41	86.01	86.08	85.99

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
0 - 65 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	1.16	1.71	1.69	1.36	0.95	0.67	0.75	1.08	0.95	0.74	1.01	1.13	0.69	1.32	0.86	1.17	1.08	0.94	1.60	1.09	2.54	1.39	1.12	1.08	1.15	1.14
2	6.78	9.52	8.03	7.06	3.35	2.41	2.27	29.96	3.76	4.66	20.42	7.93	3.37	5.24	5.25	5.19	13.35	10.89	8.87	4.46	10.26	5.09	5.99	6.22	6.34	6.66
3	16.93	19.24	15.50	10.45	5.32	3.56	17.58	41.07	8.89	31.43	46.53	12.42	6.91	10.27	11.81	17.14	33.41	27.85	14.25	10.56	17.48	10.48	13.23	13.28	14.11	13.48
4	26.10	25.27	18.91	12.32	5.87	7.89	25.43	52.18	33.11	53.57	53.62	16.77	11.02	16.49	26.36	38.40	50.86	33.31	21.10	15.76	23.87	16.08	19.93	20.37	20.50	19.27
5	32.11	28.00	20.92	13.03	8.96	11.66	32.82	69.02	56.17	59.74	57.86	21.71	15.46	30.92	44.25	55.32	54.51	40.45	27.27	20.85	30.61	21.73	27.21	26.60	26.38	24.97
6	35.85	29.78	22.00	15.95	11.61	15.66	50.21	77.67	61.91	63.49	62.25	27.40	25.38	49.19	58.47	59.06	58.86	47.77	35.75	27.51	38.57	29.13	35.17	33.78	33.80	32.40
7	37.60	31.11	24.25	18.40	14.81	25.98	63.47	80.48	65.48	66.73	67.31	41.09	42.64	61.95	62.29	63.50	67.09	57.01	47.42	36.32	48.70	38.17	45.02	43.58	44.17	42.88
8	38.76	33.71	27.06	20.98	20.49	38.59	67.58	82.17	68.87	70.03	74.85	59.11	56.66	65.13	66.68	70.98	74.47	67.06	60.65	46.56	58.19	47.84	55.59	54.24	55.53	54.50
9	41.15	36.32	29.87	26.14	28.19	43.81	70.12	83.15	72.71	75.09	79.96	70.39	60.09	68.57	71.65	75.22	78.80	72.92	68.55	52.80	63.63	53.91	61.85	60.57	62.16	61.39
10	43.67	39.56	33.92	32.01	32.80	47.48	72.60	84.20	78.70	78.91	83.51	72.87	64.29	71.67	74.71	78.04	81.23	76.17	71.97	56.32	66.53	57.26	65.15	63.87	65.49	64.78
11	45.61	43.24	39.30	35.78	36.82	51.31	75.26	85.57	82.64	82.23	84.44	75.61	67.12	73.94	76.98	80.09	83.04	78.41	74.46	59.09	68.75	59.87	67.67	66.44	68.08	67.42
12	48.32	48.13	43.36	39.21	40.86	55.27	77.99	86.69	85.19	83.27	85.36	78.27	69.79	76.09	79.04	82.03	84.69	80.71	77.21	62.11	71.06	62.73	70.51	69.34	71.05	70.47
13	52.52	51.17	46.65	42.46	44.62	62.47	80.15	87.59	86.05	84.09	86.56	80.41	72.18	77.91	80.78	83.52	85.94	82.53	79.45	64.67	73.03	65.21	72.94	71.82	73.48	73.03
14	55.10	54.29	49.66	45.96	50.24	68.70	82.29	88.06	86.91	85.15	87.58	82.42	74.49	79.66	82.26	84.84	87.04	84.17	81.41	67.09	74.89	67.60	75.14	74.06	75.75	75.37
15	57.62	57.02	52.67	50.34	57.48	72.94	83.13	88.24	87.92	86.01	88.45	84.13	76.61	81.07	83.48	85.90	87.98	85.54	83.04	69.24	76.53	69.75	77.08	76.05	77.69	77.44
16	60.08	59.37	56.64	55.33	63.20	74.75	83.93	89.52	88.75	86.74	89.17	85.63	78.39	82.24	84.52	86.81	88.76	86.68	84.46	71.19	77.98	71.69	78.75	77.77	79.42	79.19
17	62.53	62.86	61.70	61.85	66.42	76.59	84.90	90.53	89.52	87.42	89.85	86.93	80.03	83.29	85.47	87.65	89.49	87.75	85.79	73.03	79.39	73.55	80.36	79.42	81.04	80.82
18	66.47	67.05	66.60	64.36	68.89	78.01	85.71	91.31	90.19	88.03	90.40	88.02	81.50	84.21	86.32	88.40	90.13	88.68	86.96	74.75	80.70	75.27	81.83	80.91	82.44	82.24
19	69.70	71.11	68.81	67.59	71.39	79.27	86.38	91.92	90.78	88.53	90.85	88.95	82.81	85.04	87.04	89.07	90.67	89.51	87.99	76.32	81.91	76.88	83.12	82.22	83.70	83.53
20	73.32	72.83	71.09	70.47	73.55	80.40	86.97	92.41	91.27	88.95	91.24	89.75	83.99	85.77	87.70	89.67	91.15	90.25	88.92	77.80	83.03	78.37	84.29	83.40	84.85	84.69
21	76.74	76.28	74.14	72.99	75.48	81.43	87.48	92.78	91.68	89.32	91.57	90.44	85.06	86.44	88.29	90.20	91.58	90.91	89.75	79.17	84.04	79.75	85.34	84.48	85.89	85.74
22	78.42	78.61	76.68	75.31	77.25	82.38	87.93	93.08	92.04	89.64	91.86	91.04	86.04	87.04	88.82	90.68	91.97	91.50	90.49	80.45	84.97	81.02	86.29	85.46	86.82	86.69
23	80.54	80.68	78.98	77.44	78.87	83.21	88.31	93.33	92.36	89.93	92.12	91.58	86.92	87.60	89.30	91.09	92.32	92.02	91.14	81.62	85.81	82.19	87.16	86.35	87.66	87.55
24	82.44	82.55	81.06	79.27	80.27	83.94	88.64	93.53	92.64	90.18	92.34	92.06	87.73	88.10	89.73	91.48	92.63	92.50	91.71	82.70	86.59	83.28	87.95	87.16	88.42	88.33
25	84.16	84.25	82.93	80.88	81.52	84.60	88.93	93.69	92.88	90.40	92.53	92.48	88.47	88.56	90.12	91.83	92.92	92.91	92.21	83.70	87.30	84.28	88.66	87.90	89.11	89.02
26	85.72	85.78	84.56	82.33	82.64	85.20	89.19	93.83	93.10	90.59	92.71	92.86	89.14	88.99	90.49	92.14	93.17	93.29	92.65	84.63	87.91	85.21	89.30	88.57	89.72	89.65
27	87.15	87.12	85.99	83.65	83.67	85.75	89.43	93.96	93.30	90.78	92.87	93.19	89.76	89.39	90.82	92.43	93.40	93.62	93.04	85.48	88.47	86.06	89.89	89.18	90.28	90.21
28	88.40	88.30	87.26	84.83	84.60	86.25	89.65	94.07	93.49	90.95	93.02	93.49	90.32	89.76	91.13	92.70	93.60	93.93	93.39	86.26	89.00	86.82	90.42	89.73	90.77	90.71
29	89.52	89.35	88.39	85.91	85.45	86.72	89.85	94.17	93.66	91.11	93.16	93.76	90.85	90.10	91.41	92.94	93.79	94.20	93.69	86.99	89.48	87.51	90.90	90.22	91.21	91.15
30	90.52	90.30	89.39	86.90	86.24	87.16	90.04	94.27	93.82	91.26	93.29	94.01	91.32	90.40	91.67	93.17	93.96	94.44	93.96	87.63	89.93	88.15	91.33	90.67	91.61	91.55

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
65 - 80 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.69	0.86	1.09	1.50	0.72	0.66	0.31	0.51	0.53	0.38	0.74	0.93	0.58	0.77	0.71	0.79	0.69	0.81	1.57	1.21	2.45	0.98	0.89	0.86	0.94	0.94
2	4.68	6.62	6.42	6.67	2.38	2.28	1.32	27.00	2.16	2.96	18.91	6.87	2.48	3.45	3.50	3.77	7.91	9.79	7.87	4.50	11.64	3.60	4.34	4.44	4.66	4.85
3	12.50	14.94	13.43	9.65	3.48	2.82	14.51	37.35	5.62	29.72	44.62	10.44	5.07	7.20	8.24	14.94	30.67	25.36	12.30	10.90	17.35	7.77	9.96	9.90	10.74	10.14
4	21.20	21.88	16.67	11.21	3.91	5.47	21.66	47.44	29.10	53.21	51.37	13.96	8.33	11.93	23.15	37.69	49.54	30.41	18.86	14.98	22.96	12.53	15.76	15.93	16.20	15.04
5	27.68	25.77	18.33	12.03	6.02	8.32	28.99	65.04	53.47	58.87	55.66	18.00	11.93	25.81	44.18	54.59	53.47	37.36	24.37	19.12	29.11	17.53	22.23	21.31	21.34	20.00
6	30.85	27.34	19.18	14.64	8.01	11.72	46.35	73.88	59.21	62.39	59.94	22.84	20.46	45.09	59.03	58.27	58.44	43.64	31.55	24.34	36.19	23.75	28.93	27.19	27.48	26.13
7	32.35	28.10	21.83	16.77	10.43	22.17	59.84	76.24	62.79	65.80	64.78	35.92	38.21	59.08	62.48	62.74	65.84	52.04	41.96	31.66	45.79	31.67	37.51	35.57	36.51	35.26
8	33.05	29.74	23.99	19.41	16.15	35.92	63.85	77.64	66.24	69.10	72.19	54.75	52.13	62.07	66.42	68.88	72.31	60.87	53.15	39.70	54.46	39.66	46.26	44.28	45.96	44.86
9	35.16	31.99	26.74	24.53	24.22	40.98	66.33	78.61	70.22	73.52	78.05	66.46	55.37	65.73	70.50	72.58	76.41	66.53	60.54	44.90	59.62	45.00	51.97	50.02	52.06	51.15
10	37.33	34.36	31.60	30.80	28.87	44.75	68.36	79.51	75.66	77.26	81.54	68.86	59.51	68.21	73.07	75.10	78.94	70.04	64.39	48.13	62.67	48.38	55.44	53.49	55.72	54.87
11	39.81	38.25	37.05	35.00	33.15	48.48	70.34	80.61	79.62	80.23	82.51	71.71	61.98	70.11	75.14	77.08	80.94	72.60	67.30	50.77	65.06	51.15	58.25	56.34	58.68	57.89
12	43.60	42.75	41.04	38.71	37.19	52.73	73.08	81.41	82.52	81.06	83.54	74.25	64.46	72.03	77.15	79.09	82.82	75.32	70.85	53.84	67.73	54.37	61.58	59.74	62.28	61.59
13	48.45	46.41	44.18	42.34	40.86	59.87	75.23	82.07	83.34	81.87	84.60	76.27	66.69	73.66	78.85	80.60	84.23	77.50	73.74	56.50	69.93	57.18	64.42	62.65	65.31	64.73
14	51.36	49.64	47.70	45.56	47.34	66.35	77.37	82.32	84.14	82.74	85.48	78.19	68.89	75.26	80.30	81.92	85.48	79.50	76.40	59.10	72.02	59.93	67.14	65.43	68.20	67.74
15	53.80	53.15	50.53	50.63	56.09	71.33	78.12	82.58	85.02	83.44	86.21	79.87	70.94	76.57	81.49	83.04	86.54	81.23	78.70	61.51	73.87	62.45	69.58	67.95	70.81	70.44
16	56.75	55.80	54.77	56.48	63.56	73.14	78.83	84.09	85.73	84.02	86.80	81.34	72.68	77.66	82.48	83.99	87.43	82.72	80.71	63.74	75.45	64.75	71.79	70.25	73.11	72.83
17	59.27	59.67	59.88	62.62	66.11	74.82	79.64	85.16	86.36	84.52	87.32	82.54	74.18	78.63	83.36	84.84	88.21	84.05	82.48	65.81	76.90	66.91	73.80	72.32	75.19	74.93
18	62.66	63.89	64.52	65.45	69.01	75.93	80.26	85.95	86.89	84.94	87.70	83.53	75.52	79.48	84.12	85.58	88.89	85.23	84.01	67.74	78.22	68.91	75.63	74.19	77.00	76.80
19	67.39	68.22	66.85	68.59	71.04	76.89	80.80	86.54	87.35	85.27	88.01	84.37	76.71	80.23	84.79	86.23	89.47	86.26	85.32	69.54	79.42	70.76	77.27	75.87	78.59	78.44
20	71.28	70.85	69.90	71.08	72.84	77.76	81.24	86.99	87.72	85.54	88.27	85.09	77.79	80.90	85.38	86.82	89.98	87.16	86.47	71.22	80.52	72.47	78.71	77.37	80.03	79.91
21	74.08	74.12	73.03	73.31	74.49	78.55	81.61	87.31	88.03	85.76	88.48	85.72	78.76	81.51	85.91	87.34	90.42	87.96	87.50	72.78	81.52	74.03	80.00	78.71	81.33	81.24
22	76.16	76.63	75.79	75.37	76.02	79.27	81.93	87.56	88.29	85.95	88.68	86.28	79.66	82.06	86.39	87.81	90.81	88.67	88.40	74.23	82.37	75.46	81.18	79.93	82.50	82.44
23	78.25	78.71	78.25	77.27	77.41	79.89	82.19	87.76	88.52	86.11	88.84	86.78	80.48	82.57	86.82	88.24	91.16	89.31	89.16	75.56	83.15	76.79	82.25	81.05	83.52	83.54
24	80.08	80.59	80.47	78.99	78.62	80.44	82.41	87.91	88.72	86.25	88.99	87.22	81.23	83.03	87.20	88.63	91.46	89.88	89.83	76.79	83.86	78.01	83.23	82.07	84.45	84.49
25	81.74	82.19	82.35	80.51	79.70	80.92	82.61	88.04	88.90	86.37	89.12	87.62	81.93	83.45	87.56	88.98	91.74	90.37	90.42	77.94	84.53	79.13	84.09	82.99	85.28	85.33
26	83.26	83.63	83.93	81.87	80.68	81.37	82.78	88.14	89.06	86.48	89.24	87.98	82.57	83.85	87.88	89.30	92.00	90.80	90.95	79.00	85.14	80.15	84.88	83.83	86.03	86.10
27	84.57	84.90	85.29	83.07	81.57	81.78	82.93	88.23	89.21	86.58	89.34	88.31	83.17	84.22	88.18	89.60	92.23	91.20	91.43	79.97	85.71	81.09	85.59	84.57	86.72	86.81
28	85.73	86.04	86.51	84.11	82.39	82.16	83.07	88.31	89.34	86.68	89.44	88.62	83.74	84.56	88.45	89.87	92.44	91.56	91.86	80.86	86.24	81.97	86.24	85.26	87.35	87.44
29	86.77	87.07	87.60	85.06	83.14	82.52	83.20	88.39	89.47	86.77	89.53	88.90	84.26	84.89	88.69	90.11	92.64	91.89	92.23	81.70	86.74	82.79	86.84	85.89	87.92	88.02
30	87.72	87.99	88.55	85.94	83.85	82.86	83.33	88.45	89.59	86.85	89.62	89.16	84.76	85.19	88.93	90.34	92.82	92.20	92.56	82.49	87.21	83.55	87.40	86.48	88.42	88.55

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
80 - 90 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.31	0.49	0.54	0.67	0.25	0.33	0.14	0.20	0.27	0.20	0.33	0.61	0.30	0.48	0.44	0.37	0.49	0.50	0.95	0.52	2.01	0.59	0.52	0.50	0.56	0.57
2	3.09	4.77	4.26	3.98	1.18	0.93	0.61	21.21	1.25	1.82	15.00	4.84	1.55	2.13	2.46	2.43	7.23	9.14	6.22	3.00	11.42	2.77	3.43	3.55	3.82	4.04
3	10.55	12.82	10.13	6.24	1.85	1.25	10.86	29.59	3.79	24.77	38.05	7.66	3.50	5.33	6.96	13.88	33.19	25.06	10.31	8.74	17.43	6.91	9.13	9.16	10.25	9.69
4	19.60	19.65	13.17	7.38	2.22	3.19	15.88	39.98	24.77	46.30	44.61	10.70	6.37	9.95	23.17	41.44	52.97	29.64	16.25	12.97	23.52	11.81	15.16	15.51	16.07	14.93
5	26.24	22.68	14.51	8.01	3.94	5.44	22.52	60.10	47.85	52.03	49.25	14.71	9.64	24.26	46.25	58.93	56.55	36.69	22.68	17.37	30.40	17.09	22.10	21.27	21.63	20.32
6	29.10	24.20	14.99	10.07	5.71	8.25	39.80	70.09	53.73	55.75	53.97	19.27	17.40	45.28	60.96	62.02	61.61	42.60	29.33	22.13	37.14	22.70	28.07	26.46	27.06	25.72
7	30.43	24.75	17.34	12.07	7.91	18.12	53.01	72.75	57.63	59.40	59.21	31.42	33.81	59.22	63.81	66.14	67.73	49.94	38.33	28.36	45.74	29.36	35.15	33.32	34.44	33.14
8	30.93	26.99	19.59	14.58	13.09	30.91	56.99	74.28	61.31	62.88	67.22	49.91	47.57	62.06	67.36	71.07	73.06	57.80	48.15	35.27	53.44	36.10	42.42	40.48	42.20	40.98
9	32.92	29.09	22.18	20.15	20.62	36.10	59.71	75.40	65.36	67.35	73.04	61.88	50.74	65.56	71.00	74.22	76.70	63.27	55.36	40.07	58.31	40.94	47.53	45.57	47.64	46.59
10	35.37	31.51	26.81	26.83	25.48	39.88	61.66	76.28	70.99	71.04	76.82	64.34	54.97	68.02	73.50	76.62	79.32	67.61	60.50	43.81	61.90	44.79	51.55	49.58	51.98	51.03
11	37.63	35.79	33.21	31.28	29.60	43.66	63.74	77.43	74.94	74.18	77.85	67.44	57.65	69.94	75.58	78.55	81.46	70.80	64.45	46.98	64.78	48.07	54.91	52.99	55.61	54.75
12	41.21	41.18	37.33	35.02	33.45	47.77	66.67	78.22	78.10	75.10	78.77	70.18	60.15	71.79	77.46	80.37	83.18	73.57	68.13	50.06	67.46	51.26	58.18	56.30	59.11	58.35
13	46.06	44.60	41.04	38.42	37.04	54.84	69.61	78.97	79.02	75.97	79.92	72.39	62.47	73.40	79.09	81.75	84.49	75.85	71.24	52.84	69.73	54.15	61.07	59.23	62.19	61.53
14	49.33	47.43	44.13	41.59	43.46	61.41	71.79	79.20	79.96	76.86	80.79	74.39	64.67	74.89	80.38	82.87	85.58	77.84	74.01	55.45	71.79	56.87	63.74	61.95	65.03	64.49
15	51.90	50.46	47.32	46.42	52.35	66.95	72.63	79.46	80.87	77.55	81.49	76.13	66.72	76.09	81.42	83.82	86.49	79.56	76.42	57.90	73.62	59.39	66.17	64.44	67.63	67.17
16	54.28	53.22	51.44	52.53	59.62	68.80	73.49	81.21	81.59	78.11	82.06	77.65	68.45	77.08	82.29	84.62	87.25	81.05	78.56	60.17	75.24	61.72	68.39	66.74	69.99	69.60
17	56.84	56.93	56.50	58.81	62.31	70.78	74.47	82.38	82.22	78.58	82.55	78.89	69.95	77.95	83.04	85.32	87.92	82.39	80.47	62.31	76.72	63.91	70.47	68.87	72.14	71.78
18	60.21	61.77	61.35	61.48	65.35	71.97	75.24	83.19	82.74	78.96	82.91	79.89	71.28	78.70	83.69	85.93	88.50	83.57	82.15	64.30	78.05	65.97	72.38	70.82	74.08	73.75
19	64.60	66.15	64.00	64.56	67.39	72.98	75.88	83.75	83.19	79.26	83.18	80.74	72.47	79.37	84.25	86.47	89.00	84.61	83.64	66.18	79.27	67.89	74.12	72.59	75.82	75.55
20	68.57	68.66	66.90	67.07	69.20	73.89	76.39	84.16	83.54	79.48	83.40	81.47	73.54	79.95	84.75	86.95	89.44	85.53	84.96	67.94	80.38	69.68	75.69	74.19	77.41	77.18
21	71.11	71.39	69.96	69.34	70.87	74.71	76.82	84.44	83.82	79.67	83.58	82.10	74.51	80.48	85.19	87.37	89.83	86.36	86.14	69.59	81.38	71.32	77.12	75.68	78.85	78.68
22	73.32	73.87	72.69	71.46	72.42	75.45	77.16	84.64	84.06	79.82	83.74	82.66	75.41	80.96	85.58	87.75	90.18	87.10	87.19	71.13	82.27	72.83	78.43	77.04	80.17	80.03
23	75.40	76.08	75.19	73.44	73.83	76.09	77.43	84.80	84.26	79.95	83.86	83.16	76.23	81.39	85.94	88.09	90.49	87.77	88.11	72.55	83.08	74.24	79.64	78.30	81.38	81.28
24	77.28	78.08	77.48	75.25	75.06	76.64	77.65	84.91	84.44	80.07	83.98	83.60	76.99	81.79	86.26	88.41	90.76	88.37	88.92	73.88	83.82	75.56	80.75	79.45	82.48	82.43
25	79.00	79.92	79.53	76.85	76.15	77.12	77.84	85.01	84.60	80.16	84.07	84.00	77.69	82.15	86.55	88.69	91.02	88.90	89.63	75.11	84.50	76.78	81.77	80.53	83.50	83.48
26	80.60	81.57	81.33	78.29	77.14	77.57	78.01	85.08	84.74	80.25	84.16	84.35	78.34	82.49	86.82	88.95	91.24	89.38	90.27	76.27	85.12	77.92	82.71	81.53	84.43	84.44
27	82.05	83.02	82.91	79.60	78.05	77.97	78.16	85.14	84.86	80.33	84.24	84.68	78.95	82.80	87.06	89.19	91.44	89.81	90.83	77.35	85.70	78.98	83.59	82.45	85.28	85.32
28	83.34	84.30	84.32	80.80	78.89	78.35	78.29	85.20	84.98	80.40	84.31	84.99	79.52	83.09	87.29	89.41	91.63	90.21	91.34	78.36	86.24	79.98	84.40	83.30	86.06	86.12
29	84.50	85.46	85.58	81.90	79.67	78.70	78.41	85.25	85.09	80.47	84.37	85.27	80.05	83.37	87.50	89.62	91.81	90.57	91.78	79.32	86.74	80.91	85.14	84.09	86.77	86.84
30	85.55	86.49	86.72	82.91	80.39	79.03	78.53	85.29	85.19	80.53	84.43	85.53	80.56	83.63	87.71	89.81	91.97	90.91	92.19	80.22	87.21	81.78	85.83	84.82	87.41	87.51

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
90 - 93 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.23	0.29	0.37	0.44	0.26	0.15	0.07	0.10	0.14	0.16	0.21	0.39	0.16	0.27	0.30	0.23	0.24	0.36	0.65	0.21	1.79	0.38	0.34	0.33	0.37	0.38
2	2.36	3.98	3.60	3.31	0.95	0.76	0.27	16.45	0.81	1.59	12.37	3.56	0.99	1.46	1.98	1.82	5.72	7.72	4.79	2.10	10.68	2.18	2.73	2.83	3.09	3.26
3	8.95	11.48	9.37	5.46	1.49	1.05	8.20	23.41	2.73	23.42	34.72	5.90	2.57	4.27	6.12	12.62	32.61	23.48	8.44	7.53	16.46	6.11	8.09	8.09	9.16	8.66
4	18.06	19.11	12.22	6.50	1.91	2.74	12.75	32.83	21.40	44.97	41.72	8.80	5.28	8.79	22.07	40.99	53.90	28.06	14.77	12.06	23.22	11.38	14.60	14.95	15.57	14.49
5	25.06	22.45	13.45	7.11	3.20	4.62	17.93	53.63	42.59	51.03	46.22	12.62	8.40	23.11	46.38	59.06	57.36	35.45	22.61	16.95	31.11	17.22	22.38	21.42	21.99	20.75
6	28.24	23.93	14.04	8.98	4.68	7.25	33.53	63.95	48.56	54.94	51.33	17.09	16.10	44.64	61.17	62.24	62.47	42.06	30.08	22.01	38.52	23.16	28.74	26.97	27.87	26.62
7	29.58	24.55	16.24	10.78	6.53	15.86	45.87	66.68	52.30	58.68	56.39	28.44	32.60	58.59	64.01	66.29	68.04	49.02	38.60	27.68	46.62	29.18	35.12	33.15	34.59	33.39
8	30.14	26.83	18.56	12.71	11.28	28.42	49.90	68.36	56.20	62.04	64.33	45.86	46.29	61.54	67.57	70.61	72.79	56.20	47.18	33.67	53.48	34.99	41.32	39.23	41.20	40.07
9	32.09	29.02	21.10	17.71	18.36	33.30	52.38	69.48	60.55	66.57	70.15	57.56	49.42	65.14	71.09	73.67	76.42	61.78	54.29	38.28	58.27	39.62	46.17	44.04	46.36	45.38
10	34.07	31.50	26.10	24.75	22.83	36.77	54.69	70.24	66.45	70.34	74.32	59.92	53.64	67.46	73.51	76.03	79.13	66.58	59.98	42.16	62.06	43.60	50.35	48.22	50.93	50.06
11	36.47	36.24	32.75	29.46	26.66	40.40	57.03	71.22	70.77	73.52	75.35	63.09	56.32	69.36	75.60	78.00	81.41	70.19	64.47	45.57	65.20	47.13	53.98	51.90	54.89	54.13
12	40.48	41.66	36.76	33.23	30.74	44.26	60.36	72.24	74.18	74.39	76.28	66.08	58.80	71.20	77.49	79.84	83.16	73.12	68.24	48.74	67.96	50.39	57.28	55.23	58.42	57.75
13	45.24	45.40	40.34	37.03	34.45	50.80	63.62	73.10	75.12	75.16	77.60	68.47	61.12	72.78	79.11	81.22	84.47	75.51	71.44	51.60	70.29	53.35	60.20	58.19	61.52	60.94
14	48.66	48.40	43.90	40.49	40.42	57.54	66.48	73.49	76.03	76.13	78.59	70.65	63.34	74.27	80.40	82.34	85.57	77.62	74.31	54.33	72.44	56.18	62.94	60.97	64.42	63.96
15	51.30	51.10	46.89	45.16	49.03	62.87	67.30	73.97	77.03	76.86	79.37	72.52	65.42	75.45	81.42	83.26	86.47	79.44	76.82	56.90	74.33	58.80	65.44	63.52	67.09	66.71
16	54.00	53.86	51.13	51.44	56.88	64.88	68.31	76.18	77.80	77.43	79.99	74.14	67.16	76.42	82.26	84.05	87.23	81.02	79.05	59.29	76.01	61.24	67.73	65.88	69.51	69.19
17	56.49	57.31	56.24	57.66	59.85	66.87	69.44	77.58	78.47	77.92	80.50	75.44	68.66	77.25	82.98	84.73	87.88	82.41	81.00	61.53	77.52	63.51	69.86	68.06	71.70	71.42
18	59.87	62.05	61.32	60.46	62.99	68.08	70.28	78.49	79.01	78.30	80.87	76.48	69.98	77.98	83.59	85.31	88.44	83.63	82.71	63.61	78.86	65.64	71.82	70.05	73.67	73.42
19	63.74	66.63	64.18	63.60	65.08	69.11	70.96	79.10	79.46	78.59	81.14	77.35	71.16	78.61	84.12	85.82	88.92	84.69	84.22	65.56	80.09	67.62	73.60	71.85	75.44	75.24
20	67.81	69.10	66.86	66.14	66.92	70.03	71.51	79.53	79.81	78.81	81.35	78.09	72.22	79.16	84.58	86.27	89.34	85.63	85.54	67.40	81.20	69.46	75.20	73.49	77.05	76.89
21	70.55	72.03	69.95	68.44	68.61	70.84	71.96	79.81	80.09	78.98	81.53	78.72	73.18	79.65	84.98	86.67	89.70	86.47	86.72	69.11	82.19	71.15	76.66	75.01	78.51	78.40
22	73.06	74.42	72.71	70.59	70.16	71.57	72.32	80.01	80.33	79.13	81.68	79.28	74.06	80.10	85.35	87.03	90.03	87.22	87.76	70.71	83.08	72.71	78.00	76.39	79.85	79.77
23	75.08	76.54	75.23	72.58	71.57	72.19	72.61	80.16	80.52	79.25	81.80	79.77	74.86	80.50	85.67	87.34	90.32	87.89	88.67	72.19	83.87	74.16	79.22	77.67	81.06	81.03
24	76.91	78.47	77.53	74.40	72.80	72.73	72.84	80.27	80.69	79.36	81.91	80.21	75.60	80.87	85.96	87.63	90.57	88.48	89.46	73.56	84.60	75.50	80.35	78.85	82.17	82.18
25	78.59	80.23	79.59	76.01	73.88	73.20	73.03	80.35	80.84	79.45	82.00	80.60	76.28	81.20	86.22	87.90	90.81	89.01	90.15	74.84	85.26	76.76	81.39	79.94	83.19	83.23
26	80.14	81.81	81.38	77.45	74.86	73.62	73.20	80.42	80.97	79.52	82.08	80.95	76.91	81.51	86.47	88.14	91.01	89.48	90.76	76.03	85.87	77.92	82.35	80.96	84.12	84.19
27	81.54	83.20	82.96	78.76	75.76	74.01	73.35	80.48	81.09	79.59	82.16	81.27	77.51	81.80	86.69	88.35	91.19	89.90	91.30	77.15	86.43	79.01	83.23	81.89	84.97	85.06
28	82.79	84.42	84.37	79.95	76.59	74.37	73.48	80.52	81.19	79.66	82.23	81.56	78.06	82.07	86.90	88.56	91.36	90.29	91.78	78.20	86.95	80.02	84.05	82.76	85.75	85.86
29	83.92	85.52	85.63	81.05	77.35	74.70	73.60	80.57	81.29	79.71	82.29	81.84	78.59	82.32	87.09	88.75	91.51	90.64	92.20	79.18	87.43	80.97	84.80	83.55	86.44	86.58
30	84.94	86.51	86.76	82.06	78.07	75.01	73.71	80.60	81.37	79.77	82.34	82.09	79.08	82.56	87.27	88.92	91.65	90.97	92.57	80.11	87.88	81.85	85.50	84.29	87.08	87.22

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
93 - 95 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.15	0.17	0.31	0.38	0.14	0.17	0.06	0.04	0.13	0.13	0.11	0.35	0.09	0.20	0.24	0.18	0.25	0.28	0.56	0.23	1.85	0.29	0.27	0.26	0.30	0.31
2	1.98	3.72	3.50	2.79	0.72	0.47	0.35	13.30	0.73	1.29	10.56	3.32	0.70	1.28	1.67	1.55	4.91	7.38	4.64	2.08	11.33	1.92	2.47	2.54	2.83	2.97
3	9.02	11.55	9.44	4.68	1.28	0.73	7.45	19.64	2.44	20.70	31.60	5.55	2.12	3.92	5.17	10.62	31.06	23.48	8.43	7.82	16.82	5.68	7.61	7.59	8.68	8.17
4	17.89	19.46	12.40	5.90	1.60	2.28	11.37	28.17	19.13	41.17	38.63	8.26	4.68	8.03	19.59	38.72	52.48	28.24	14.74	11.92	23.07	10.56	13.66	13.84	14.53	13.46
5	25.14	23.07	13.74	6.54	2.67	3.97	16.08	49.14	39.07	47.44	43.24	11.99	7.54	20.89	43.33	56.91	55.97	35.79	22.27	16.44	30.55	16.11	20.99	19.88	20.54	19.32
6	28.31	24.62	14.28	8.25	4.23	6.20	31.67	60.01	44.64	51.34	48.06	16.18	14.88	42.07	58.58	60.23	61.15	41.83	29.20	21.03	37.49	21.57	26.82	24.89	25.88	24.64
7	29.69	25.12	16.51	10.05	6.07	14.27	44.80	62.97	48.49	55.43	53.38	26.67	30.54	56.36	61.45	64.53	66.23	48.09	36.92	26.08	44.87	26.98	32.50	30.34	31.84	30.67
8	30.23	27.50	18.82	12.04	10.84	25.55	48.58	64.47	52.53	59.08	61.00	43.46	43.77	59.20	65.00	68.34	70.56	54.49	44.73	31.29	51.03	32.09	37.96	35.67	37.70	36.59
9	32.47	30.03	21.21	17.03	18.19	30.49	51.09	65.69	56.57	63.92	67.08	54.87	46.85	62.65	68.22	71.19	74.03	59.73	51.41	35.43	55.48	36.31	42.42	40.07	42.48	41.50
10	34.48	32.63	26.18	23.82	22.78	34.09	53.09	66.76	62.32	68.04	71.41	57.38	50.91	64.80	70.58	73.51	76.81	64.49	57.14	39.09	59.22	40.16	46.51	44.14	46.99	46.11
11	36.95	37.25	32.10	28.35	26.66	37.70	55.01	67.91	66.95	71.28	72.62	60.62	53.35	66.57	72.62	75.46	79.12	68.05	61.61	42.31	62.32	43.58	50.06	47.73	50.88	50.11
12	40.90	43.11	36.41	32.08	30.46	41.46	58.03	69.06	70.52	72.29	73.66	63.49	55.70	68.34	74.53	77.33	80.95	70.97	65.42	45.34	65.10	46.79	53.35	51.02	54.41	53.72
13	45.71	46.79	39.83	35.85	33.94	48.05	61.38	70.07	71.54	73.31	74.89	65.74	57.84	69.84	76.13	78.70	82.28	73.32	68.59	48.03	67.41	49.65	56.19	53.88	57.45	56.85
14	49.03	49.84	43.21	39.29	39.78	54.34	63.80	70.55	72.74	74.17	75.80	67.78	59.88	71.22	77.38	79.80	83.39	75.38	71.45	50.59	69.52	52.36	58.84	56.56	60.28	59.80
15	51.78	52.70	46.27	43.68	47.64	59.86	64.92	71.01	73.71	74.82	76.55	69.58	61.80	72.34	78.39	80.73	84.33	77.20	74.01	53.04	71.42	54.92	61.31	59.07	62.95	62.54
16	54.48	55.34	50.48	49.60	54.75	61.97	65.79	73.07	74.48	75.34	77.15	71.16	63.44	73.26	79.24	81.53	85.14	78.81	76.32	55.36	73.13	57.34	63.62	61.44	65.41	65.08
17	56.90	58.80	55.64	55.94	57.82	64.19	66.80	74.37	75.14	75.77	77.64	72.42	64.84	74.06	79.96	82.24	85.84	80.24	78.36	57.52	74.66	59.59	65.76	63.63	67.66	67.36
18	60.23	63.01	60.89	58.94	61.02	65.33	67.57	75.22	75.68	76.12	78.00	73.44	66.08	74.76	80.59	82.85	86.44	81.50	80.17	59.55	76.05	61.73	67.76	65.65	69.69	69.42
19	64.46	67.49	63.80	62.37	62.92	66.30	68.19	75.79	76.13	76.39	78.27	74.29	67.19	75.37	81.14	83.39	86.97	82.62	81.79	61.47	77.32	63.72	69.59	67.51	71.54	71.33
20	68.24	69.71	66.52	64.72	64.61	67.17	68.70	76.18	76.48	76.58	78.48	75.03	68.20	75.91	81.62	83.87	87.43	83.62	83.23	63.29	78.48	65.60	71.26	69.21	73.25	73.08
21	70.82	72.31	69.31	66.86	66.17	67.95	69.10	76.44	76.76	76.74	78.65	75.67	69.12	76.40	82.05	84.29	87.83	84.51	84.52	65.00	79.53	67.33	72.78	70.80	74.82	74.69
22	72.73	74.45	71.83	68.86	67.62	68.65	69.43	76.62	77.00	76.87	78.80	76.24	69.97	76.84	82.44	84.68	88.20	85.32	85.68	66.61	80.47	68.94	74.20	72.27	76.26	76.17
23	74.53	76.37	74.13	70.75	68.93	69.24	69.69	76.76	77.19	76.98	78.92	76.74	70.75	77.24	82.78	85.02	88.53	86.05	86.71	68.12	81.32	70.45	75.51	73.64	77.59	77.55
24	76.17	78.13	76.28	72.46	70.08	69.75	69.90	76.86	77.36	77.07	79.02	77.19	71.48	77.61	83.09	85.34	88.82	86.71	87.62	69.52	82.11	71.86	76.73	74.91	78.82	78.82
25	77.69	79.75	78.20	73.99	71.09	70.20	70.07	76.93	77.51	77.15	79.11	77.59	72.15	77.94	83.38	85.63	89.09	87.30	88.42	70.85	82.83	73.19	77.87	76.11	79.96	80.00
26	79.11	81.20	79.88	75.36	72.01	70.61	70.22	76.99	77.64	77.22	79.19	77.96	72.77	78.26	83.64	85.90	89.33	87.84	89.14	72.10	83.50	74.44	78.92	77.22	81.02	81.09
27	80.40	82.49	81.38	76.62	72.86	70.98	70.36	77.04	77.76	77.28	79.27	78.30	73.37	78.55	83.89	86.15	89.55	88.32	89.78	73.28	84.12	75.61	79.91	78.27	81.99	82.09
28	81.56	83.64	82.73	77.78	73.65	71.33	70.47	77.09	77.87	77.34	79.33	78.61	73.93	78.83	84.12	86.38	89.76	88.77	90.36	74.39	84.70	76.71	80.83	79.24	82.89	83.02
29	82.61	84.68	83.94	78.85	74.38	71.65	70.58	77.12	77.96	77.39	79.39	78.90	74.46	79.09	84.33	86.60	89.95	89.18	90.88	75.45	85.25	77.75	81.69	80.16	83.72	83.86
30	83.57	85.63	85.04	79.85	75.07	71.96	70.68	77.16	78.06	77.44	79.45	79.18	74.96	79.34	84.53	86.80	90.12	89.56	91.35	76.44	85.76	78.72	82.49	81.00	84.48	84.64

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
95 - 97 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.18	0.13	0.31	0.34	0.17	0.10	0.11	0.15	0.13	0.09	0.12	0.27	0.13	0.20	0.26	0.19	0.22	0.29	0.61	0.21	1.76	0.30	0.27	0.25	0.29	0.30
2	1.88	3.39	3.63	2.74	0.71	0.44	0.36	11.87	0.60	0.86	9.02	2.92	0.72	1.29	1.83	1.69	4.85	8.05	4.68	2.00	11.33	1.92	2.48	2.55	2.88	3.03
3	8.99	11.94	9.74	4.58	1.17	0.69	5.80	17.26	1.95	17.22	27.68	4.93	2.03	3.81	5.46	10.42	30.47	24.91	8.34	7.98	16.63	5.56	7.51	7.55	8.71	8.23
4	18.99	20.48	12.92	5.69	1.45	2.02	9.32	24.66	15.80	36.18	34.32	7.45	4.40	7.77	18.84	36.74	51.92	29.75	14.75	11.85	22.54	10.19	13.32	13.55	14.36	13.35
5	26.85	24.09	14.39	6.29	2.54	3.50	13.66	44.23	33.79	41.93	38.92	11.06	7.30	20.07	41.20	54.81	55.60	37.32	22.43	16.32	29.96	15.72	20.66	19.60	20.42	19.27
6	29.99	25.80	14.95	8.03	3.86	5.45	27.47	54.70	39.06	45.76	43.91	15.21	14.25	40.07	56.28	58.16	61.00	43.30	29.80	20.98	37.08	21.31	26.70	24.80	26.01	24.87
7	31.52	26.41	17.17	9.95	5.52	12.73	39.10	57.71	42.71	49.37	48.92	25.14	29.10	53.80	59.29	62.69	66.10	49.69	38.22	26.28	44.82	27.00	32.74	30.62	32.44	31.39
8	32.28	28.81	19.39	12.05	9.81	22.72	42.82	59.56	46.48	52.86	56.21	40.71	41.82	56.77	62.98	66.51	70.39	56.08	46.53	31.64	51.17	32.28	38.42	36.20	38.62	37.66
9	34.35	31.11	21.94	16.56	15.91	27.05	45.24	60.72	50.17	57.76	62.44	52.05	44.97	60.48	66.09	69.27	73.71	61.14	53.30	35.75	55.59	36.49	42.90	40.64	43.47	42.65
10	36.54	33.63	26.64	22.97	19.99	30.25	47.50	61.75	55.72	62.03	66.98	54.47	49.29	62.60	68.46	71.60	76.40	65.53	58.59	39.24	59.16	40.18	46.79	44.51	47.72	47.01
11	38.75	37.92	32.38	27.12	23.53	33.71	49.60	62.79	60.38	65.56	68.22	57.53	51.57	64.29	70.45	73.51	78.56	68.72	62.60	42.22	62.03	43.36	50.06	47.81	51.29	50.66
12	42.20	43.05	36.23	30.76	27.28	37.34	52.67	63.97	64.53	66.65	69.32	60.31	53.78	65.99	72.34	75.35	80.28	71.32	65.94	44.99	64.59	46.31	53.04	50.79	54.46	53.90
13	46.62	46.31	39.59	34.31	30.73	43.56	55.72	65.06	65.78	67.68	70.60	62.57	55.84	67.49	73.96	76.73	81.57	73.47	68.82	47.52	66.77	49.01	55.70	53.46	57.28	56.80
14	49.69	49.22	42.89	37.46	36.11	49.80	58.63	65.46	67.02	68.60	71.57	64.61	57.81	68.86	75.24	77.85	82.65	75.37	71.44	49.92	68.77	51.57	58.19	55.97	59.93	59.54
15	52.07	52.11	45.82	41.70	43.84	55.41	59.84	65.95	67.99	69.30	72.36	66.43	59.68	69.97	76.27	78.79	83.58	77.06	73.79	52.23	70.59	54.00	60.52	58.34	62.42	62.10
16	54.65	54.66	49.67	47.10	51.29	57.63	60.90	67.88	68.75	69.88	73.00	68.02	61.27	70.90	77.13	79.61	84.37	78.56	75.94	54.43	72.23	56.31	62.71	60.58	64.74	64.48
17	57.03	57.92	54.44	53.15	54.31	59.74	62.02	69.11	69.41	70.36	73.53	69.30	62.63	71.70	77.88	80.33	85.06	79.91	77.86	56.48	73.72	58.46	64.76	62.66	66.88	66.63
18	60.13	62.23	59.15	56.04	57.48	60.91	62.87	69.91	69.96	70.76	73.92	70.33	63.84	72.40	78.53	80.96	85.66	81.10	79.57	58.42	75.07	60.51	66.67	64.60	68.82	68.60
19	63.88	66.13	61.86	59.35	59.39	61.91	63.56	70.46	70.41	71.05	74.22	71.20	64.93	73.02	79.10	81.51	86.19	82.17	81.11	60.27	76.31	62.44	68.44	66.39	70.60	70.42
20	67.61	68.39	64.83	61.66	61.11	62.80	64.12	70.83	70.76	71.28	74.45	71.95	65.92	73.57	79.60	82.00	86.65	83.12	82.49	62.02	77.45	64.25	70.05	68.03	72.24	72.11
21	70.41	71.02	67.47	63.77	62.68	63.60	64.56	71.08	71.04	71.45	74.64	72.61	66.83	74.06	80.04	82.44	87.06	83.98	83.75	63.67	78.48	65.94	71.54	69.57	73.77	73.67
22	72.50	73.06	69.87	65.75	64.16	64.31	64.91	71.25	71.27	71.61	74.80	73.19	67.66	74.51	80.44	82.84	87.43	84.77	84.89	65.24	79.42	67.50	72.92	71.01	75.18	75.12
23	74.16	74.90	72.09	67.63	65.49	64.91	65.18	71.38	71.47	71.73	74.94	73.70	68.44	74.92	80.80	83.20	87.76	85.48	85.90	66.71	80.27	68.98	74.22	72.35	76.48	76.47
24	75.68	76.58	74.17	69.34	66.66	65.43	65.40	71.48	71.64	71.84	75.06	74.16	69.15	75.29	81.12	83.53	88.06	86.13	86.80	68.08	81.05	70.37	75.42	73.61	77.70	77.72
25	77.08	78.16	76.03	70.88	67.70	65.89	65.58	71.55	71.79	71.93	75.16	74.58	69.81	75.64	81.42	83.83	88.34	86.71	87.61	69.38	81.78	71.68	76.54	74.79	78.84	78.89
26	78.41	79.57	77.69	72.26	68.64	66.30	65.75	71.60	71.92	72.02	75.25	74.95	70.44	75.96	81.70	84.11	88.59	87.24	88.34	70.61	82.45	72.91	77.60	75.91	79.89	79.98
27	79.62	80.83	79.17	73.53	69.51	66.67	65.89	71.65	72.04	72.09	75.33	75.30	71.03	76.26	81.95	84.37	88.81	87.72	88.99	71.77	83.08	74.07	78.59	76.95	80.87	80.99
28	80.72	81.96	80.50	74.71	70.32	67.02	66.02	71.69	72.15	72.14	75.40	75.63	71.58	76.54	82.19	84.61	89.02	88.17	89.59	72.88	83.68	75.17	79.51	77.93	81.78	81.92
29	81.71	82.98	81.72	75.80	71.07	67.35	66.14	71.73	72.25	72.20	75.47	75.93	72.11	76.81	82.41	84.83	89.22	88.58	90.12	73.92	84.23	76.21	80.38	78.85	82.63	82.79
30	82.62	83.92	82.83	76.81	71.78	67.65	66.25	71.76	72.34	72.25	75.53	76.21	72.61	77.06	82.63	85.04	89.40	88.97	90.61	74.92	84.76	77.18	81.19	79.72	83.41	83.58

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
97 - 100 LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.13	0.17	0.28	0.21	0.18	0.17	0.10	0.12	0.13	0.11	0.14	0.24	0.13	0.28	0.40	0.31	0.28	0.23	0.40	0.23	1.42	0.33	0.27	0.26	0.28	0.29
2	1.66	3.02	3.42	2.45	0.85	0.66	0.36	10.90	0.52	0.85	8.06	2.71	0.82	1.56	2.30	2.04	4.63	4.60	3.42	2.16	9.18	1.98	2.39	2.46	2.67	2.80
3	8.23	11.32	9.70	4.48	1.47	0.93	5.64	16.08	1.83	14.69	25.37	4.77	2.21	4.52	6.11	10.36	27.63	15.34	7.07	7.66	14.90	5.90	7.64	7.70	8.63	8.27
4	17.57	19.59	13.19	5.85	1.79	2.21	8.61	22.57	14.29	31.93	32.30	7.44	4.86	8.76	18.78	34.79	47.91	20.44	13.03	12.80	22.64	11.80	15.07	15.57	16.21	15.37
5	25.39	23.71	14.98	6.61	2.94	3.66	12.27	36.17	30.65	38.00	37.22	11.32	7.97	20.35	39.89	52.08	51.68	27.59	23.22	18.56	31.87	18.54	24.06	23.33	24.07	23.17
6	29.01	25.65	15.69	8.38	4.28	5.48	23.71	46.96	36.07	42.27	42.37	15.75	15.13	39.27	54.43	55.54	57.10	35.23	31.50	23.89	39.67	24.64	30.72	29.30	30.39	29.55
7	30.84	26.40	17.92	10.15	5.90	11.50	34.04	50.34	39.75	46.03	47.45	25.34	29.46	52.79	57.53	60.14	62.77	42.57	39.92	29.36	47.48	30.34	36.78	35.21	36.78	36.05
8	31.70	28.80	20.02	12.14	9.60	20.04	37.79	52.19	43.50	49.34	54.50	40.33	41.61	55.75	61.21	64.21	67.48	49.88	48.10	34.88	53.82	35.61	42.45	40.85	42.90	42.27
9	33.95	31.04	22.44	16.29	15.27	24.02	40.30	53.58	47.36	53.53	60.28	51.17	44.66	59.34	64.77	67.34	71.36	55.91	55.20	39.35	58.50	40.07	47.18	45.59	47.97	47.49
10	36.02	33.33	26.44	21.85	19.10	27.11	42.41	54.64	52.60	57.54	64.67	53.67	48.84	61.83	67.42	69.91	74.34	60.99	60.50	43.04	62.14	43.85	51.13	49.54	52.23	51.84
11	38.06	36.87	31.27	25.71	22.52	30.38	44.31	55.68	57.06	61.03	65.96	56.76	51.40	63.81	69.64	72.00	76.78	64.72	64.56	46.20	65.07	47.12	54.47	52.93	55.81	55.50
12	41.30	41.12	34.63	29.10	26.07	33.51	46.88	56.69	60.85	62.21	67.09	59.60	53.74	65.72	71.62	73.92	78.59	67.52	67.61	48.91	67.46	49.92	57.25	55.71	58.69	58.43
13	45.20	44.11	37.58	32.49	29.18	38.85	49.61	57.82	62.16	63.26	68.58	61.88	55.91	67.33	73.30	75.34	79.94	69.83	70.21	51.34	69.48	52.44	59.70	58.17	61.24	61.03
14	47.87	46.65	40.54	35.65	34.01	44.69	52.24	58.38	63.41	64.52	69.77	64.06	58.07	68.90	74.69	76.57	81.15	71.99	72.73	53.80	71.44	54.98	62.13	60.61	63.76	63.62
15	50.21	49.12	43.29	39.64	40.90	50.16	53.38	58.84	64.66	65.47	70.71	65.95	60.11	70.16	75.81	77.61	82.17	73.90	74.99	56.13	73.20	57.38	64.39	62.90	66.12	66.04
16	52.48	51.45	46.52	45.00	47.79	52.26	54.37	61.23	65.64	66.22	71.45	67.61	61.84	71.20	76.75	78.50	83.05	75.59	77.04	58.34	74.78	59.65	66.50	65.05	68.31	68.27
17	54.70	54.38	50.65	50.71	50.71	54.52	55.67	62.72	66.46	66.84	72.05	68.93	63.32	72.10	77.55	79.27	83.80	77.10	78.86	60.39	76.20	61.75	68.46	67.04	70.31	70.28
18	57.44	58.11	55.19	53.83	53.99	55.86	56.64	63.70	67.13	67.33	72.49	69.99	64.62	72.87	78.24	79.94	84.45	78.43	80.49	62.32	77.47	63.73	70.28	68.87	72.12	72.11
19	60.75	61.78	57.99	57.10	56.07	57.01	57.42	64.34	67.68	67.69	72.82	70.88	65.79	73.55	78.83	80.52	85.01	79.61	81.95	64.13	78.64	65.59	71.94	70.54	73.78	73.79
20	64.13	64.16	60.95	59.48	57.92	58.02	58.03	64.79	68.10	67.97	73.07	71.64	66.85	74.14	79.35	81.04	85.51	80.66	83.25	65.84	79.70	67.33	73.46	72.08	75.30	75.35
21	66.81	66.96	63.70	61.66	59.62	58.91	58.52	65.08	68.43	68.19	73.28	72.30	67.80	74.67	79.80	81.50	85.94	81.61	84.44	67.44	80.65	68.94	74.86	73.51	76.70	76.77
22	68.87	69.11	66.21	63.70	61.19	59.72	58.91	65.29	68.71	68.37	73.46	72.88	68.68	75.15	80.21	81.91	86.33	82.47	85.50	68.95	81.51	70.43	76.15	74.84	77.99	78.09
23	70.60	71.05	68.53	65.61	62.61	60.39	59.22	65.44	68.94	68.53	73.61	73.39	69.48	75.58	80.57	82.28	86.68	83.25	86.45	70.35	82.29	71.83	77.34	76.07	79.18	79.30
24	72.18	72.84	70.68	67.36	63.85	60.97	59.47	65.55	69.14	68.66	73.73	73.85	70.22	75.97	80.90	82.62	87.00	83.95	87.29	71.66	83.00	73.14	78.45	77.21	80.28	80.43
25	73.65	74.48	72.63	68.93	64.96	61.49	59.68	65.64	69.32	68.77	73.84	74.25	70.90	76.33	81.20	82.93	87.28	84.58	88.04	72.90	83.66	74.37	79.47	78.28	81.30	81.47
26	75.03	75.97	74.36	70.35	65.96	61.95	59.86	65.71	69.47	68.87	73.94	74.62	71.54	76.66	81.47	83.21	87.54	85.15	88.72	74.05	84.27	75.52	80.43	79.28	82.24	82.43
27	76.28	77.31	75.92	71.65	66.88	62.37	60.02	65.77	69.60	68.95	74.03	74.96	72.14	76.97	81.72	83.47	87.77	85.68	89.33	75.14	84.83	76.61	81.32	80.21	83.11	83.32
28	77.42	78.51	77.33	72.85	67.74	62.76	60.16	65.82	69.73	69.04	74.11	75.27	72.70	77.25	81.96	83.71	87.98	86.16	89.88	76.17	85.35	77.62	82.15	81.07	83.91	84.13
29	78.46	79.60	78.61	73.97	68.53	63.12	60.29	65.86	69.84	69.11	74.18	75.56	73.23	77.52	82.18	83.93	88.19	86.60	90.38	77.13	85.84	78.57	82.92	81.88	84.65	84.88
30	79.42	80.61	79.78	75.00	69.27	63.46	60.42	65.90	69.95	69.18	74.25	75.83	73.73	77.78	82.38	84.15	88.37	87.01	90.83	78.04	86.30	79.46	83.64	82.63	85.33	85.57

Summary of Cumulative Prepayment Rates
30-Year Fixed-Rate Mortgages
Investors LTV

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0.39	0.30	0.41	0.54	0.43	1.48	0.15	0.74	0.41	0.30	0.35	0.70	0.32	0.85	1.03	0.51	0.36	0.39	0.54	0.17	1.99	0.30	0.49	0.47	0.51	0.51
2	2.28	3.19	3.24	3.13	1.51	5.44	0.66	19.98	1.66	2.18	10.35	5.04	1.63	3.40	3.82	2.96	5.51	6.59	4.20	1.50	13.32	2.43	3.09	3.19	3.34	3.51
3	7.13	9.16	7.95	5.20	2.38	5.92	8.65	28.78	4.09	18.24	30.28	7.81	3.47	7.04	8.32	13.09	27.24	21.03	6.87	6.80	18.01	5.97	7.58	7.66	8.38	8.10
4	13.58	14.67	10.23	6.63	2.82	7.71	13.98	36.70	17.01	38.07	37.01	10.60	6.05	11.44	22.10	37.93	46.49	24.80	11.86	10.91	23.26	10.50	12.93	13.45	13.87	13.21
5	19.00	17.43	11.88	7.55	4.53	9.99	19.20	48.81	36.22	44.30	41.18	14.18	8.88	23.91	43.30	55.61	49.82	32.08	18.39	15.50	29.66	15.75	19.68	19.41	19.80	19.00
6	21.55	18.99	12.80	9.35	6.55	12.59	31.23	57.55	42.19	48.41	45.43	18.16	15.48	43.13	57.80	58.92	55.33	38.41	25.51	20.64	36.31	21.67	26.08	25.27	25.96	25.09
7	23.14	19.92	14.86	11.50	9.16	19.96	43.49	60.86	45.91	51.98	49.56	27.90	30.27	56.33	60.99	63.44	62.09	46.08	34.87	27.25	44.80	28.77	33.68	32.80	33.96	33.03
8	24.13	22.12	17.50	14.03	13.30	30.49	48.22	62.73	49.79	55.13	55.67	43.47	43.62	59.25	64.70	68.96	68.41	54.97	46.09	35.23	53.36	36.67	42.18	41.24	42.96	42.10
9	26.28	24.92	20.28	17.96	19.51	35.76	51.08	64.02	53.43	59.44	61.03	54.81	46.62	62.60	68.56	72.34	72.56	60.93	54.04	40.70	58.70	42.14	47.87	46.89	48.93	48.24
10	28.59	27.44	24.44	23.88	23.93	39.25	53.44	65.10	59.01	62.90	65.23	57.30	50.83	65.30	71.20	74.89	75.51	65.53	59.47	44.85	62.50	46.28	52.06	51.06	53.38	52.78
11	30.99	31.60	30.01	28.17	27.90	42.79	55.54	66.10	63.69	65.98	66.34	60.40	53.81	67.45	73.44	76.99	78.00	69.09	63.81	48.44	65.61	49.83	55.61	54.65	57.15	56.64
12	34.28	36.48	33.82	31.69	31.53	46.10	57.91	67.03	67.54	67.12	67.34	63.28	56.56	69.44	75.42	78.95	80.08	72.38	68.22	52.07	68.59	53.42	59.24	58.33	61.03	60.62
13	38.62	40.34	37.06	35.20	34.67	51.99	60.10	67.90	68.79	68.13	68.57	65.65	59.13	71.19	77.18	80.49	81.72	75.12	71.90	55.33	71.14	56.68	62.46	61.59	64.42	64.12
14	41.81	43.56	40.52	38.24	39.15	57.96	62.28	68.38	70.12	69.13	69.56	67.83	61.58	72.85	78.63	81.79	83.09	77.49	75.09	58.36	73.44	59.73	65.41	64.58	67.50	67.31
15	44.99	46.61	43.26	41.84	45.72	62.76	63.20	68.80	71.13	69.88	70.36	69.67	63.83	74.16	79.78	82.84	84.18	79.43	77.71	61.08	75.40	62.44	67.98	67.17	70.17	70.05
16	47.68	49.12	46.77	47.10	52.03	64.55	64.05	70.32	71.92	70.50	71.00	71.26	65.72	75.24	80.71	83.70	85.04	81.04	79.93	63.51	77.08	64.85	70.22	69.46	72.47	72.41
17	50.27	52.62	51.18	52.51	54.85	66.41	65.01	71.46	72.67	71.06	71.60	72.64	67.45	76.21	81.54	84.47	85.77	82.52	81.95	65.86	78.64	67.18	72.38	71.63	74.62	74.57
18	53.29	56.77	55.86	55.52	57.98	67.60	65.79	72.31	73.31	71.54	72.06	73.79	69.00	77.05	82.26	85.13	86.41	83.79	83.69	68.04	80.04	69.35	74.33	73.59	76.52	76.49
19	57.26	60.86	58.67	58.60	60.36	68.65	66.46	72.93	73.87	71.93	72.43	74.77	70.39	77.78	82.87	85.72	86.95	84.88	85.17	70.05	81.29	71.34	76.09	75.33	78.20	78.21
20	61.46	63.58	61.63	61.51	62.50	69.61	67.02	73.41	74.33	72.24	72.74	75.62	71.64	78.43	83.41	86.23	87.41	85.81	86.41	71.92	82.42	73.17	77.65	76.90	79.70	79.74
21	65.68	67.41	65.20	64.18	64.50	70.48	67.51	73.76	74.72	72.50	73.00	76.35	72.76	79.01	83.89	86.68	87.82	86.62	87.45	73.65	83.41	74.83	79.06	78.31	81.03	81.10
22	67.91	70.18	68.42	66.68	66.37	71.30	67.92	74.03	75.06	72.73	73.22	76.99	73.80	79.53	84.32	87.09	88.19	87.34	88.35	75.24	84.29	76.33	80.32	79.58	82.21	82.30
23	70.35	72.66	71.38	69.01	68.09	72.01	68.26	74.24	75.34	72.92	73.42	77.56	74.75	80.00	84.70	87.45	88.51	87.98	89.11	76.68	85.04	77.72	81.46	80.73	83.24	83.35
24	72.56	74.92	74.08	71.17	69.63	72.64	68.55	74.41	75.60	73.09	73.58	78.07	75.62	80.43	85.04	87.78	88.81	88.52	89.77	78.00	85.69	78.98	82.47	81.76	84.16	84.29
25	74.60	76.99	76.53	73.10	71.01	73.21	68.81	74.54	75.82	73.24	73.73	78.52	76.41	80.81	85.35	88.07	89.06	89.01	90.34	79.21	86.28	80.13	83.39	82.69	84.99	85.13
26	76.47	78.86	78.67	74.84	72.27	73.73	69.03	74.65	76.02	73.38	73.86	78.93	77.15	81.17	85.64	88.34	89.28	89.44	90.82	80.32	86.82	81.19	84.20	83.51	85.70	85.85
27	78.19	80.50	80.56	76.43	73.42	74.21	69.23	74.75	76.21	73.50	73.99	79.30	77.84	81.51	85.89	88.58	89.48	89.83	91.24	81.34	87.29	82.16	84.93	84.25	86.33	86.49
28	79.71	81.96	82.24	77.87	74.49	74.66	69.42	74.83	76.38	73.61	74.10	79.64	78.48	81.81	86.13	88.81	89.67	90.16	91.61	82.28	87.73	83.04	85.59	84.92	86.89	87.05
29	81.08	83.26	83.73	79.19	75.47	75.07	69.58	74.91	76.54	73.71	74.20	79.95	79.08	82.10	86.35	89.01	89.83	90.46	91.94	83.13	88.13	83.84	86.17	85.50	87.39	87.56
30	82.33	84.43	85.06	80.41	76.40	75.47	69.74	74.98	76.69	73.81	74.29	80.24	79.64	82.37	86.56	89.20	89.99	90.74	92.23	83.92	88.50	84.58	86.70	86.04	87.84	88.01