An Actuarial Review for Fiscal Year 1995 of the Federal Housing Administration's Mutual Mortgage Insurance Fund

Final Report

June 5, 1996

Price Waterhouse LLP

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June 5, 1996

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

Dear Mr. Retsinas:

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. We have completed the Fiscal Year 1995 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 $7.086 billion at the end of fiscal year (FY) 1995 and that the capital ratio was 2.05 percent. We project that in FY 2000 the Fund's economic value will be $13.032 billion and that the capital ratio will be 3.24 percent.

The estimates presented here require projections of events thirty 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 actuarial report explains these projections and the reasons for the significant 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 LLP

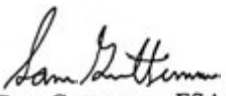
FEDERAL HOUSING ADMINISTRATION'S MUTUAL MORTGAGE INSURANCE FUND

ACTUARIAL REVIEW FOR FISCAL YEAR 1995

I have reviewed the "Actuarial Review for Fiscal Year 1995 of the Federal Housing Administration's Mutual Mortgage Insurance Fund", dated June 5, 1996 (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
June 5, 1996

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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) 1995.

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.

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 1994 was 1.99 percent and that it would exceed 2.00 percent during FY 1995. This year, as a result of continued strengthening in the Fund, we estimate that the FY 1995 capital ratio has increased to 2.05 percent. Thus the Fund has already met the FY 2000 statutory requirements of NAHA. We also estimate that the FY 2000 capital ratio will be 3.24 percent, substantially above the level required by NAHA. 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 (IIF). 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 (GAO) used in its April 1996 report on the status of the Fund. Our estimate of the FY 1995 capital ratio using amortized IIF is 2.17 percent and our estimate of the FY 2000 capital ratio is 3.66 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 1994 to FY 1995

We estimate the economic value of the MMI Fund to be $7.086 billion at the end of FY 1995, which represents an increase of $404 million over our estimate of the FY 1994 value reported last year. This 6.0 percent increase in the estimated economic value of the MMI Fund, which accompanied a 3.0 percent increase in the unamortized IIF, resulted in the capital ratio increasing by 0.06 percentage points from 1.99 percent to 2.05 percent.

Exhibit ES-1

Projected MMI Fund Performance for FYs 1995 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
1995	$7,086	2.05%	$38,402	$345,278	$543	n/a
1996	$8,173	2.34%	$46,932	$349,411	$875	$213
1997	$9,231	2.56%	$42,412	$360,102	$813	$245
1998	$10,354	2.78%	$43,191	$372,041	$845	$277
1999	$11,625	3.02%	$47,644	$384,838	$961	$311
2000	$13,032	3.24%	$53,688	$402,290	$1,058	$349

*All values are as of the end of each fiscal year. The economic value for future years (FYs 1996 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 1995 Economic Value Compared with the Estimate Presented in the FY 1994 Actuarial Review

This year's estimate of the FY 1995 economic value is $627 million lower than the economic value projected for FY 1995 in the FY 1994 Actuarial Review. The difference is primarily attributable to accounting adjustments in FY 1995, which are not specifically related to any economic or financial changes in the Fund. These adjustments, which accounted for a $522 million reduction in economic value, consist of a reduction of $286 million as a result of the reclassification of Borrowings from the Treasury, which were previously not included as a liability in the calculation of FHA's capital resources, a reduction of $261 million resulting from changes

in the assumptions used to establish the allowance for loss on mortgage notes receivable, and a $25 million increase resulting from an audit adjustment to FHA's FY 1994 net receivables and payables. The combined effect of all other changes, including changes in data, estimates of current and future origination volumes, technical refinements, and economic forecasts, resulted in a net decrease of $105 million in the Fund's estimated FY 1995 economic value. Table ES-2 provides a breakdown of the changes in the Fund's economic value between FY 1994 and FY 1995.

Exhibit ES-2

Summary of Changes in MMI Fund Estimated Economic Value between FY 1994 and FY 1995 ($ Millions)

	Change in FY 1995 Economic Value	FY 1995 Economic Value	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1994 Economic Value Presented in the FY 1994 Review:		**$6,682**		**3.03%**
Plus: Forecasted Value of FY 1995 Book of Business and Interest on Previous Business Presented in the FY 1994 Review	$1,031			
Equals: **FY 1995 Economic Value Presented in the FY 1994 Actuarial Review**		**$7,713**		**3.03%**
Plus: FHA Data and Origination Volume Updates and FY 1995 Experience	$13	$7,726	+0.07%	3.10%
Plus: Model Refinements and Forecasts	-$439	$7,287	+0.25%	3.35%
Plus: Accounting Changes	-$522	$6,765	-0.24%	3.11%
Plus: Adjustments to Financial and Cash Flow Assumptions	+$321	$7,086	+0.13%	3.24%
Equals: **Estimate of FY 1995 Economic Value**	**-$627**	**$7,086**	**+0.21%**	**3.24%**

The financial position of the Fund continues to be strengthened by the addition of new business and the capital ratio is likely to continue growing by approximately 0.20 percentage points each year, over the next five years. As a result, in the absence of any major changes in economic conditions or FHA policies, the MMI Fund will exceed the mandated FY 2000 capital ratio requirement of 2.00 percent by a wide margin.

Although the combined effect of changes in data, estimates of current and future origination volumes, technical refinements, and economic forecasts, contributed to a net decrease of only $105 million below the FY 1995 economic value estimated in the FY 1994 Review, when viewed individually there were several significant sources of change.

The net effect of all data and origination volume changes was a net increase in the FY 1995 economic value of $13 million. Updates to the volume and composition of FY 1994 originations resulted in an increase of $9 million in the estimated FY 1995 economic value, and updates to the actual volume and composition of FY 1995 originations from the projections in the FY 1994 Review resulted in a decrease in the economic value of $121 million, and an increase in the FY 1995 capital ratio of 0.06 percentage points. These changes are due to the smaller than expected size of the FY 1995 book of business. The FY 1995 book was the smallest since FY 1988, and was $15.202 billion, or 28 percent smaller than projected in the FY 1994 Review. Updates to the historical claim and prepayment information contained in FHA's A-43 database, and the substitution of actual for predicted FY 1995 termination rates resulted in an increase in the estimated FY 1995 economic value of $125 million and a corresponding increase in the FY 1995 capital ratio of 0.05 percentage points.

The net effect of model refinements and changes in the economic forecasts resulted in a net decrease of $439 million in the estimated FY 1995 economic value. The effect of new economic forecasts provided by DRI/McGraw Hill (DRI) resulted in a reduction of $51 million in the FY 1995 economic value and a corresponding 0.02 reduction in the FY 1995 capital ratio, and the effect of technical refinements was a decrease of $388 in the FY 1995 economic value and a corresponding 0.10 percentage point reduction in the FY 2000 capital ratio.

The technical refinements described above included changes to the econometric models used to forecast claim and prepayment rates for adjustable-rate mortgages (ARMs) and streamline refinancings (SR), changes in the methodology used to estimate and forecast house price dispersion, changes in the methodology used to forecast future mortgage originations, and the reclassification of loans based on the relative price of the underlying house, as opposed to the actual size of the mortgage.

The last category of change, the effect of changes in financial and cash flow assumptions, resulted in a net increase in the estimated FY 1995 economic value of $321 million, resulting in an increase in the estimated FY 1995 capital ratio of 0.09 percentage points. These changes in the financial cash flow assumptions included adjustments to the time lags, claim settlement factors, and loss rates applied to the acquisition and disposition of properties and mortgage notes held by the Department of Housing and Urban Development (HUD); refinements to the assignment loss rate model; and the incorporation of loss rates specific to FHA's Pre-foreclosure Sales Program.

Change in Estimated Future Insurance-in-Force (IIF)

Our FY 1995 estimates of the Fund's IIF in FYs 1995 and 2000 are lower than our estimates presented in the FY 1994 Actuarial Review. This decrease in the estimated IIF is due to a smaller than expected volume of originations in FY 1995, a decrease in our forecasts of future origination volumes, and lower interest rate forecasts which have resulted in higher projected prepayment rates. In FY 1994, we assumed that the dollar volume of purchase money mortgage originations would increase by approximately 3.00 percent per year, or the estimated level of price inflation. This year, our forecasts of future purchase money mortgage originations are based on a series of econometric models designed to forecast future demand for FHA originations based on economic and policy variables. These models have produced lower estimates of future originations than were used in last year's Review because of the relatively low rate of growth forecasted for house prices and household income, and marginal declines in FHA's share of the insured mortgage market. The effect of these new origination volume forecasts on future IIF is a decrease of between $6 and $15 billion in each year below the projections in the FY 1994 Actuarial Review. Additionally, the reduction in interest rate forecasts for FYs 1996 to 2000 from between 8.35 percent to 8.69 percent in FY 1994 to between 7.09 to 7.60 percent in the current Review have resulted in an increase in predicted prepayment rates which have lowered projections of future IIF and increased the estimated FY 2000 capital ratio.

More Favorable Loss Rates

Although the Fund's overall performance was largely consistent with last year's projections, there was notable improvement in one area: the estimated losses that FHA experiences on claim terminations. The loss rates FHA is likely to experience on future claims are assumed to be lower in this Actuarial Review than in the FY 1994 Actuarial Review as a result of several developments. First, updated FY 1995 data indicate that the actual loss rates experienced by FHA on conveyed properties continue to decline. The average conveyance loss rate experienced by loans that terminated in FY 1995 was 33 percent, a 3 percentage point reduction from the 36 percent loss rate experienced by FY 1994 terminations, and a continuation of the steady decline in loss rates that FHA has experienced since FY 1988, when the average loss rate was over 41 percent. This reduction in loss rates has been fueled by a steady increase in FHA's ability to recover losses by disposing of properties more rapidly and continued improvement in regional housing markets.

Elimination of the Assignment Program and Loss Mitigation

Legislation recently passed by Congress contains a provision for the termination of the Single-Family Mortgage Assignment Program (the "Assignment Program"). Previous studies by HUD

and GAO have found that the losses incurred by FHA on assigned mortgage notes are significantly greater than losses on conveyed properties, and our own analysis suggests that the loss rate on future mortgage assignments is likely to be 49 percent, compared to 35 percent for future property conveyances. (This represents an increase from our estimate of 42 percent for assignments in last year's Review). Thus the discontinuation of the Assignment Program has had a significant positive impact on our assessment of the Fund's current economic value. We estimate that the economic value of the Fund as of the end of FY 1995 would be $513 million lower, and the FY 1995 capital ratio would be 0.15 percentage points lower if FHA had retained the assignment program in its current form.

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 makes it difficult for us to provide a dollar estimate of the effects they will have on the MMI Fund.

However, we are able to provide such estimates for the Pre-foreclosure Sales Program, which began as a demonstration program in October 1991, and 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, versus 35 percent for properties conveyed over the same time period (as a percent of unpaid principal balance the estimated loss rates are 27 percent and 40 percent, respectively, which are identical to the rates reported by HUD in its 1994 report on the demonstration program). Since November, 1994, when the Pre-foreclosure Sales Program became a national program, FHA has successfully resolved 2.3 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 once the assignment program is terminated, we have assumed that FHA will 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. These projections are lower than those provided by HUD in which 24 percent of claim terminations in FY 1997 and beyond were projected to be resolved through pre-foreclosure sales and other loss mitigation techniques. Based on these assumptions, we have estimated that the current and future use of pre-foreclosure sales will increase the estimated economic value of the Fund in FY 1995 by $155 million and the FY 1995 capital ratio by 0.05 percentage points due to.

Additional Comments

The estimates presented here require projections of events more than thirty 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, premium or underwriting policies. To the extent these assumptions, or others, 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 in December, 1995. While we have reviewed the integrity and consistency of this data 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, are 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 on 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 and claims as mortgages mature.

The base case results in this report are based on DRI's control forecast as of April 1996 for interest rates, constant quality house prices, and inflation rates. We considered two other scenarios based on DRI forecasts: 1) a pessimistic forecast which projects lower real growth in

house prices and median household income, and higher inflation and interest rates; and 2) an optimistic forecast, which projects higher real growth in house prices and median household income, and lower inflation and interest rates. 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 ($ Billions)			
	Pessimistic	**Base Case**	**Optimistic**
Current Economic Value (FY 1995)	$6.542	$7.086	$7.430
Current Capital Ratio (FY 1995)	1.89%	2.05%	2.15%
Projected Capital Ratio (FY 2000)	2.81%	3.24%	3.73%

Estimated FY 1995 economic values under the different scenarios vary by approximately $888 million, and the estimated FY 1995 capital ratio varies from 1.89 percent to 2.15 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 its construction, 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. This is because 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 a better indication of the overall quality and profitability of future business. These two measures, the "initial" and "converging" capital ratios of a given book, represent respectively, the present value of profits per dollar of insurance originated (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 2.12 percent and that the converging capital ratio was 4.70 percent. This year, we estimate that the initial capital ratio of the FY 2000 book of business remains relatively unchanged from that estimated last year at 2.17 percent, and that the contemporaneous capital ratio is 5.28 percent. This increase in the contemporaneous capital ratio is largely due to 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.

E. Volatility in Fund Performance

Despite the continued 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 68 percent of outstanding insurance-in-force (IIF) contained in books that are less than four years old. In particular, 44 percent of the outstanding IIF is contained within the FYs 1993 and 1994 books of business. 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, because of the relatively large upfront premium and the absence of annual premiums on these loans, this is not the case with originations in or after FY 1992 (including future originations). For loans with loan-to-value ratios over 95 percent, and 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 to 1995 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 7 years, instead of 30. Thus, while the Fund is unlikely to experience any losses as a result of interest rate movements, the FYs 1992 to 1995 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 affect on the economic value of the Fund. This approach provides information on 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 we conducted included:

- alternative economic scenarios
- alternative interest rate scenarios
- alternative assumptions regarding the effects of FHA's loss mitigation efforts
- alternative assumptions regarding future loan size limits

Under all of the these sensitivity analyses, the estimated economic value of the Fund still significantly exceeded 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 1995. This report represents our evaluation of the actuarial soundness of the Fund as of September 30, 1995 (the end of HUD's FY 1995) and includes an assessment of the Fund's current and forecasted capital ratios based on government 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, in which the recommended capital ratio requirements were calculated using unamortized insurance-in-force as conventionally defined.

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

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 which increased the percentage of closing costs that could be financed from 57.25 percent to 100 percent. The effect of the change should be to 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 it further increased to $155,250. These changes are likely to increase the value of the Fund, as both an increased volume of loans is insured and the average

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

size of the individual loans insured increases. FHA's historical experience has shown that, all else being equal, larger loans tend to have lower conditional claim rates and lower loss rates. As a result, 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), not solely to 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 the MMI Fund surpassed the NAHA mandated capital ratio during FY 1995, FHA management has provided no indication that it will pay distributive shares in the near future.

B. Recent FHA Policy Developments and Underwriting Changes

During FY 1995 and early FY 1996, 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 policy developments is summarized below.

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

HUD announced in early December, 1995 that it would raise the single-family FHA loan limit by 1.9 percent on January 1, 1996. This change in FHA's loan ceiling results from the 1.9 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. The estimated effect of the loan limit increase is an $81 million increase in the FY 2000 economic value.

2. Elimination of the Single-Family Mortgage Assignment Program

Legislation recently passed by Congress 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, and our own analysis suggests that the loss rate on future mortgage assignments is likely to be 49 percent, compared to 35 percent for future property conveyances. 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. We estimate 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.

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.

However, we are able to provide such estimates for the Pre-foreclosure Sales Program, which began as a demonstration program in October 1991, and 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, versus 35 percent for properties conveyed over the same time period (as a percent of unpaid principal balance the estimated loss rates are 27 percent and 40 percent, respectively, which are identical to the rates reported by HUD in its 1994 report on the demonstration program). Since November, 1994, when the Pre-foreclosure Sales Program became a national program, FHA has successfully resolved 2.3 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 once the assignment program is terminated, we have assumed that FHA will 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. Based on these assumptions, we have estimated that the economic value of the Fund in FY 1995 is higher by $155 million due to the current and future use of pre-foreclosure sales. These projections are slightly lower than those provided by HUD in its projected use of pre-foreclosure sales and other loss mitigation techniques. HUD estimated that FHA would resolve approximately 24 percent of claim terminations in FY 1997 and beyond using pre-foreclosure sales.

C. Trends in Housing Finance

The first and second quarters of FY 1995 were characterized by mortgage interest rates that were almost 1.50 to 2.00 percentage points higher than at the beginning of FY 1994. As a result of higher interest rates, FHA's monthly origination volume in FY 1995 slowed considerably compared to a year before. The heavy refinancing activity experienced in early FY 1994 was almost non-existent in FY 1995 as higher interest rates significantly reduced the attractiveness of refinancing. Although interest rates declined in the third and fourth quarters, a large proportion of higher interest rate loans had already refinanced at lower rates before FY 1995, further reducing the incentive for borrowers to refinance their mortgages. The volume of streamline refinancings (SRs) plummeted from nearly 40 percent of all FHA-insured originations in FY 1994 to 4 percent in FY 1995. Although modest gains in loan refinancing are expected over the next several years as interest rates are expected to continue a gradual decline, the boom in refinancing experienced between 1992 and 1994 is not likely to be repeated in the near future.

The share of total FHA originations consisting of 30-year fixed-rate mortgages (FRMs) increased from 42 percent in the FY 1994 book to 65 percent in the FY 1995 book. The increase in the proportion of 30-year FRMs was largely due to the reduction in refinancings and 15-year mortgages.

Other notable developments in the housing market include the rapidly expanding role of alternative mortgage products (*i.e.*, products other than conventional 30-year FRMs). These products, in particular adjustable-rate mortgages (ARMs), have risen from under 5 percent in FY 1991 to 29 percent of new FHA-insured mortgage originations in FY 1995. If recent trends continue, FHA's share of the total ARM market is likely to correspond with its share of the total 30-year FRM market. As a result, over a quarter of FHA's future business is likely to consist of ARMs.

Another recent trend in the conventional mortgage market has been higher than normal default and foreclosure rates on loans made in 1994 and 1995. Several credit agencies predict these loan quality problems, which may stem from aggressive underwriting, will persist in the months ahead. However, recent data indicate that FHA maintained a high level of loan quality throughout FYs 1994 and 1995 and has not been affected by the high levels of defaults and foreclosures currently being experienced by conventional insurers. It should be noted that such an assessment is preliminary as these are relatively new loans with which FHA has only limited experience.

FHA's share of the new home market, which surged during the refinancing wave in 1993 and

1994, had fallen to around 10 percent in the last quarter of FY 1995. This appears to be the result of a decline in purchases by first-time home buyers and reduced demand for high loan-to-value products. In the absence of policy or premium changes, we estimate that FHA's market share will decline slightly over the next few years.

D. Current and Future Economic Environment

As of the date of the Actuarial Review, the U.S. economy was continuing to expand at a modest pace, with long-term mortgage interest rates slowly edging up in response to greater than expected growth in the economy. If, as many observers predict, growth moderates, interest rates will drift down over the course of the year and originations of both purchase money mortgages and refinancings will increase. Furthermore, given the prevailing view that inflation remains under control, it is likely that the continued focus on reducing the budget deficit will further reduce long-term rates over the next few years. House price growth has also remained stable over the past few quarters, with existing home prices posting 5 percent annualized gains in past months. In total, current economic conditions are conducive to continued growth of the Fund' s value, although at a more moderate pace than projected last year.

In general, the 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 February and April 1996 forecasts, have mortgage interest rates decreasing by almost 1.00 percentage point between FY 1995 and FY 1996 and then increasing by approximately 0.10 percentage points during FY 1996. Similarly, annual growth rates in the constant quality house price index (CQHPI) are projected to increase by 1.70 percentage points from now through the end of FY 1996, and by 2.20 percentage points in FY 1997. These forecasts are presented in greater detail in Section II, 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 thirty 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 assumptions, or others, 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 in December, 1995. 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 1994 Actuarial Review - presents the Fund's estimated economic value, capital ratio, and insurance-in-force for FYs 1995 through 2000. This section also provides a reconciliation and explanation of the major differences between the FY 1994 Review and the FY 1995 Review;

III. Current Status of the Fund - presents the estimated economic value and capital ratio for the Fund for the end of FY 1995 and provides an analysis of the performance of the FYs 1975 through 1995 books of business;

IV. Characteristics of the FY 1995 Book of Business - describes the FY 1995 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 1994 Review to the FY 1995 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 1994 Actuarial Review

This section presents the economic value and capital ratios of the Fund for Fiscal Year (FY) 1995 and presents an explanation of how the results of this year's Review compare with those of last year.

A. The FY 1995 Actuarial Review

The FY 1995 Actuarial Review assesses the actuarial soundness of the MMI Fund as of the end of FY 1995 (September 30, 1995) 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 1995 analysis for 30-year and 15-year fixed-rate mortgages (FRMs) are similar to those used in the FY 1995 Review, but reflect data on the Fund's experience through September, 1995. These models also incorporate an updated set of economic assumptions and forecasts. The models used for adjustable-rate mortgages (ARMs), and streamline refinancings (SRs) are different from those used in last year's Review as they allow for more refined estimation of each loan type's claim, prepayment, and loss rates (see Appendices A through C for a complete description of our modelling approach). Our major findings are as follows:

- as of the end of FY 1995, the MMI Fund had an estimated economic value of **$7.086 billion** and an unamortized insurance-in-force (IIF) of **$345 billion**;

- the FY 1995 book of business has added an estimated **$543 million** in present value to the economic value of the MMI Fund;

- we estimate that the capital ratio was **2.05 percent** as of September 30, 1995, and project that it will be **3.24 percent** by September 30, 2000. We estimate that FHA has achieved the 2.00 percent capital ratio that NAHA mandated by FY 2000 *during this past fiscal year* (FY 1995).

Our current projections indicate that the Fund's economic value will continue to increase in the future, rising by an average of 13 percent in each successive fiscal year until FY 2000. These projections also indicate that the Fund's reported capital ratio will increase by approximately 0.20 percentage points in 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 1995 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
1995	$7,086	2.05%	$38,402	$345,278	$543	n/a
1996	$8,173	2.34%	$46,932	$349,411	$875	$213
1997	$9,231	2.56%	$42,412	$360,102	$813	$245
1998	$10,354	2.78%	$43,191	$372,041	$845	$277
1999	$11,625	3.02%	$47,644	$384,838	$961	$311
2000	$13,032	3.24%	$53,688	$402,290	$1,058	$349

*All values are as of the end of each fiscal year. The economic value for future years (FYs 1996 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 1995 Review and the FY 1994 Review. The FY 1994 Review estimated that the Fund

Exhibit II-2

Estimates of MMI Fund Economic Value End of FY 1994 and End of FY 1995 ($ Millions)		
	End of FY 1994[a]	End of FY 1995[b]
Capital Resources		
Cash	$ 1,277	$ 1,232
Investments	5,665	6,587
Properties	1,187	1,001
Mortgages	3,134	3,410
Net Receivables and Payables	-503	-1,638
Total Capital Resources[c]	**$10,760**	**$10,592**
PV of Future Cash Flows		
Pre-1975 Business	$21	$18
1975-1992 Business	-3,089	-2,197
1993 Business	-634	-597
1994 Business	-462	-470
1995 Business	n/a	-360
Total PV Future Cash Flows	**-$4,164**	**-$3,606**
Additional FY 1995 Upfront Premium[d]	$86	$100
Economic Value	**$6,682**	**$7,086**
Unamortized Insurance-in-Force	$335,073	$345,278
Current Capital Ratio	**1.99%**	**2.05%**

[a]Cash flows are from the FY 1994 Review and are valued as of the end of FY 1994.
[b]Cash flows for FY 1995 Review are valued as of the end of FY 1995.
[c]From FY 1995 Audited Financial Statements. The value for FY 1994 does not include accounting adjustments. These adjustments lowered the FY 1994 Capital Ratio to $10,499 billion.
[d]Upfront premiums associated with loans originated in FY 1995, but endorsed in FY 1996.

had total capital resources of $10.760 billion at the end of FY 1994, that the present value of future cash flows was -$4.164 billion, and that the Fund had collected additional upfront premiums of $86 million from loans originated in FY 1994, but endorsed in FY 1995. These additional upfront premiums are added to our estimates of economic value because the Actuarial Review groups loans based on origination date, not endorsement date, which is the basis used in the financial statements. Thus, the upfront premiums associated with these loans are not included in the FY 1995 capital resource values obtained from FHA's financial statements.

Thus, as of September 30, 1994, the Fund had $6.682 billion more in capital resources than was needed to cover the present value of projected remaining cash flows from the FY 1994 and prior books. The FY 1995 Review estimates 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 collected additional upfront premium income of $100 million from loans originated in FY 1995, but endorsed in FY 1996. Thus, 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.

As seen in Exhibit II-2, this improvement in the Fund's capitalization is due in part to a increase in the estimated present value of the future cash flows of the FYs 1975 to 1992 books. The detail by book included in Exhibit II-3 shows that virtually all of the improvement occurred in the FYs 1985 to 1992 books. A major reason for this increase is that since FY 1994 an additional year of claims and prepayments has resulted in less volume remaining that may ultimately claim. This also explains the reduction in the estimated present value of the future cash flows associated with the FYs 1975 to 1983 books. However, these books, unlike the FYs 1984 to 1991 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.

C. Decomposition of Changes from FY 1994 Review to FY 1995 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 1994 Review to the FY 1995 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 prevents us from identifying and analyzing these as purely individual 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 1994 to FY 1995. Second, it explains changes between the current estimates of the economic value and capital ratio in FY 1995 and the estimates for FY 1995 that were presented in the FY 1994 Review.

1. Change in Economic Value from FY 1994 to FY 1995

The FY 1994 Review estimated the economic value of the Fund as of the end of FY 1994 would be $6.682 billion, and projected the FYs 1995 and 2000 capital ratios to be 2.12 percent and 3.03 percent, respectively. We estimate the current economic value of the MMI Fund to be $7.086 billion, which represents an increase of $404 million over the estimated FY 1994 economic value. This 6.0 percent increase in the estimated economic value of the MMI Fund, which accompanied a 3.0 percent increase in the unamortized IIF, resulted in the capital ratio increasing by 0.06 percentage points from 1.99 percent at the end of FY 1994 to 2.05 percent at the end of FY 1995.

Exhibit II-3

Present Value of Future Cash Flows by Book of Business, FY 1994 Review, FY 1995 Review, and Difference ($ Millions)

Book of Business	1994 Review[a]	1995 Review[b]	Difference
pre-1975	$21	$18	-$3
1975	10	9	-1
1976	14	13	-1
1977	22	21	-1
1978	41	36	-5
1979	63	57	-6
1980	42	40	-2
1981	13	8	-5
1982	2	-1	-3
1983	12	10	-2
1984	-61	-45	16
1985	-96	-52	44
1986	-463	-257	206
1987	-662	-493	169
1988	-342	-282	60
1989	-365	-305	60
1990	-485	-370	115
1991	-464	-287	177
1992	-370	-299	71
1993	-634	-597	37
1994	-462	-470	-8
1995	n/a	-360	n/a
Total	**-$4164**	**-$3,606**	**$918**

[a] Values as of the end of FY 1994
[b] Values as of the end of FY 1995

2. Current Estimate of FY 1995 Economic Value Compared with the Estimate Presented in the FY 1994 Actuarial Review

The FY 1994 Review projected that the FY 1995 book of business and interest on the Fund's balances would add $797 million of economic value to the Fund, resulting in a projected FY 1995 economic value of $7.713 billion. This year's estimate of the FY 1995 economic value is $627 million lower than the economic value projected for FY 1995 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 1994 Review to the FY 1995 Review. The difference is primarily attributable to accounting adjustments in FY 1995, which are not specifically related to any economic or financial changes in the Fund. These adjustments, which accounted for a $522 million reduction in economic value, consisted of a reduction of $286 million as a result of the reclassification of borrowings from the Treasury, which were previously not included as a liability in the calculation of FHA's capital resources; a reduction of $261 million resulting from changes in the assumptions used to establish the allowance for loss on mortgage notes receivable; and a $25 million increase resulting from an audit adjustment to FHA's FY 1994 net receivables and payables. The combined effect of all other changes, including changes in data, estimates of current and future origination volumes, economic forecasts, and technical refinements, resulted in a net decrease of $105 million in the Fund's estimated FY 1995 economic value.

The change in the estimated status of the Fund that resulted from incorporating the changes that occurred during FY 1995 and new economic forecasts is decomposed into seventeen component pieces. These changes are grouped into four categories: changes due to FHA data and origination volume updates and FY 1995 experience, changes resulting from model refinements and economic forecasts, changes due to accounting changes, and changes resulting from modifications to financial and cash flow assumptions. Exhibit II-4 summarizes the cumulative effects of these four 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 1995 and 2000.

Exhibit II-4

Summary of Changes in MMI Fund Estimated Economic Value Between FY 1994 and FY 1995 ($ Millions)					
		Change in FY 1995 Economic Value	FY 1995 Economic Value	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1994 Economic Value Presented in the FY 1994 Review:			**$6,682**		**3.03%**
Plus:	Forecasted Value of 1995 Book of Business and Interest on Previous Business Presented in the FY 1994 Review	$1,031			
Equals:	**FY 1995 Economic Value Presented in the FY 1994 Actuarial Review**		**$7,713**		**3.03%**
Plus:	FHA Data and Origination Volume Updates and FY 1995 Experience	$13	$7,726	+0.07%	3.10%
Plus:	Model Refinements and Forecasts	-$439	$7,287	+0.25%	3.35%
Plus:	Accounting Changes	-$522	$6,765	-0.24%	3.11%
Plus:	Adjustments to Financial and Cash Flow Assumptions	+$321	$7,086	-0.13%	3.24%
Equals: **Estimate of FY 1995 Economic Value**		-$627	$7,086	+0.21%	3.24%

3. Changes due to FHA Data and Origination Volume Updates and FY 1995 Experience

Exhibit II-5 depicts changes in the Fund's economic value and capital ratio resulting from new FHA data and volume assumptions, and FY 1995 experience. 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 1995 origination volume. These adjustments also included updating the volume of FY 1994 originations.

Exhibit II-5

Change in MMI Fund Estimated Economic Value Between FY 1994 and FY 1995 Resulting From FHA Data and Origination Volume Updates and FY 1995 Experience ($ Millions)

	Change in FY 1995 Economic Value	FY 1995 Economic Value	Change in FY 1995 Capital Ratio	Corresponding FY 1995 Capital ratio	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
Estimated FY 1995 Economic Value Presented in the FY 1994 Review	n/a	$7,713	n/a	2.12%	n/a	3.03%
Plus: Updates to 1994 Volume	+$9	$7,722	+0.00%	2.12%	0.00%	3.03%
Plus: Updates to Actual 1995 Volume	-$213	$7,509	+0.03%	2.15%	+0.01%	3.04%
Plus: Updates to Actual 1995 Loan Composition	+$92	$7,601	+0.03%	2.18%	+0.02%	3.06%
Plus: Updates to FHA 1994 Termination Data and Actual 1995 Terminations	+$125	$7,726	+0.05%	2.23%	+0.06%	3.12%
Plus: Changes in Estimates to Future Originations and Volume	n/a	$7,726	n/a	2.23%	-0.02%	3.10%
Estimates after FHA Data Updates and FY 1995 Experience	$13	$7,726	0.11%	2.23%	+0.07%	3.10%

The effects of updates in loan volume have been further 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, refinements to the approach used to forecast the future volume of originations resulted in changes to the estimated capital ratio in FYs 1996 to 2000. These changes are reflected in Exhibit II-5.

a. Additional FY 1994 Volume and Lower than Expected Volume in FY 1995

The FY 1994 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 1994 Review did not include information on all terminations and loan volume during the last quarter of the year. Adding this

information increased the estimated FY 1995 economic value by $9 million. The FY 1995 book, which consisted mostly of 30-year fixed-rate mortgages (FRMs) and adjustable rate mortgages (ARMs), was 28 percent smaller than projected in the FY 1994 Review. This significant reduction in the FY 1995 book of business' origination volume decreased the estimated FY 1995 economic value by $213 million.

b. Updates to FY 1995 Composition

The actual composition of the FY 1995 book, particularly the higher than expected proportion of ARMs and the lower than expected proportion of streamline refinancings (SRs) resulted in a book of business with an economic value $92 million greater than last year's projection (holding total volume constant). While the FY 1995 book was 28 percent smaller than expected, it had a higher economic value per dollar of origination volume.

c. Changes in Termination Experience

The actual FY 1995 claim rates were lower than the estimated conditional claim rates in our FY 1994 Review. Exhibit II-6 compares the actual conditional claim rates for all 30-year FRMs (including SRs) in FY 1995 to predicted rates from the FY 1994 Review. The reduction in claim rates was offset, in part, by lower conditional prepayment rates resulting from higher interest rates in FY 1995. Prepayment rates for mortgages originated after 1981 exhibited higher actual conditional prepayment rates than the rates predicted last year while the reverse was experienced on loans originated prior to FY 1981. The overall effect of the lower claim and prepayment rates observed in FY 1995 was an increase of $125 million in the FY 1995 fund value, and an increase in the capital ratio by 0.06 percent in FY 2000.

d. Adjustments to Future Originations and Volume

In the FY 1994 Actuarial Review, we assumed that the dollar volume of purchase money mortgage originations would increase by 3.00 percent per year, or by the estimated level of price inflation. This year, our forecasts of future purchase money mortgage originations are based on a series of econometric models designed to forecast future demand for FHA originations based on economic and policy variables. These models have produced lower estimates of future originations than were used in last year's Review because of the relatively low rate of growth forecasted for house prices and household income, and the projected marginal decline in FHA's share of the insured mortgage market. The effect of these new origination volume forecasts is a reduction in insurance-in-force (IIF) of between $6 and $15 billion in each year compared to the projections in the FY 1994 Actuarial Review.

Exhibit II-6

Comparison of Actual and Forecasted Conditional Claim and Prepayment Rates for FY 1995 for All 30-Year Fixed-Rate Mortgages and Streamline Refinancings

Year	FY 1995 Actual Claim Rates	FY 1994 Predicted Claim Rates	FY 1995 Actual Prepayment Rates	FY 1994 Predicted Prepayment Rates
1975	0.15%	0.22%	9.15%	6.68%
1976	0.18%	0.28%	7.25%	6.87%
1977	0.18%	0.30%	7.08%	6.90%
1978	0.25%	0.40%	7.12%	5.89%
1979	0.49%	0.66%	7.43%	5.76%
1980	0.87%	0.85%	7.36%	6.35%
1981	1.23%	1.40%	6.07%	10.03%
1982	1.05%	1.96%	3.67%	24.80%
1983	1.55%	1.97%	7.42%	8.91%
1984	1.89%	2.89%	7.35%	10.25%
1985	2.62%	3.83%	8.21%	10.41%
1986	1.84%	2.33%	7.40%	8.12%
1987	1.36%	1.52%	6.38%	5.66%
1988	2.29%	2.13%	7.70%	7.63%
1989	2.55%	2.39%	8.03%	9.58%
1990	2.40%	2.53%	8.11%	7.77%
1991	2.30%	2.14%	7.67%	9.37%
1992	1.25%	1.57%	6.36%	6.47%
1993	0.60%	0.72%	4.55%	5.49%
1994	0.23%	0.25%	2.96%	2.97%
1995	0.00%	0.02%	1.80%	0.55%

Sources: A-43 database, January 1995 and December 1995 extracts.

4. Decomposition Related to Model Refinements and Economic Forecasts

Exhibit II-7 describes changes in the Fund's economic value resulting from new economic forecasts and improvements made to the econometric claim and prepayment rate models used to forecast the Fund's performance. More specifically, refinements were made to the streamline refinancing and adjustable-rate mortgage (ARM) models that were developed for the FY 1994 Review. Also, we refined the method used to estimate and forecast the dispersion of house prices, which is an important variable in the claim rate models. An additional improvement was the incorporation of relative house price categories to replace our previous loan size categories. In order to more accurately capture regional differences in median house prices, house price categories were reconstructed for certain modelling purposes based on the relative price of the underlying house as opposed to the real dollar value of the mortgage amount. Exhibit II-7 also illustrates the changes resulting from FY 1995 economic forecasts obtained from FHA and DRI.

Exhibit II-7

Change in MMI Fund Estimated Economic Value Between FY 1994 and FY 1995 Resulting From Model Refinements and Economic Forecasts ($ Millions)

	Change in FY 1995 Economic Value	FY 1995 Economic Value	Change in FY 1995 Capital Ratio	Corresponding FY 1995 Capital ratio	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1994 Estimates with Data Updates	n/a	$7,726	n/a	2.23%	n/a	3.10%
Plus: Change in House Price Categories	-$177	$7,549	-0.06%	2.17%	+0.08%	3.18%
Plus: Econometric Refinements	-$211	$7,338	-0.04%	2.13%	+0.03%	3.21%
Plus: Changes in Economic Forecasts	-$51	$7,287	-0.02%	2.11%	+0.14%	3.35%
Estimates after Model Refinements and Forecasts	-$439	$7,287	-0.22%	2.11%	+0.25%	3.35%

a. Changes Resulting from the Implementation of Relative House Price Categories

The incorporation of relative house price categories in the FY 1995 Review reduced the fund's value by $177 million in FY 1995. This reduction in the value of the fund was caused by two primary factors. First, in order to isolate sources of change, this reduction in Fund value was measured holding loss rates constant. In fact, changing to relative house price categories resulted in a shift in

loss rates which offset part of this reduction. Second, the relative house price approach captures the fact that, in some markets, large loans in absolute dollar terms are actually smaller when viewed relative to the median house price. More specifically, moderate size loans originated in areas with high median house prices would be placed in lower house price categories when using relative house price classifications. As larger loans tend to perform better than smaller loans, this has produced a subtle shift of loan volume into higher risk categories.

b. Econometric Refinements

As part of this years Review we refined our econometric claim and prepayment rate models to improve their predictive ability and enable them to better accommodate increased data. These refinements included changes to the models used to forecast claim and prepayment rates for ARMS and SRs, and changes in the methodology used to forecast house price dispersion, which is an important variable in all of our claim rate models. These refinements resulted in a net decrease in the estimated FY 1995 economic value of $211 million, and a corresponding reduction in the FY 1995 capital ratio of 0.04 percentage points.

c. Changes in Economic Environment

Another reason for the change in the projected FY 2000 capital ratio was the change in the economic environment, the resulting change in economic forecasts (Exhibit II-8), and the consequent change in the forecasted termination streams of future books. Taking into account the new economic forecasts decreased the estimated FY 1995 economic value by $51 million and conversely increased the projected FY 2000 capital ratio by 0.14 percentage points. The reduction in the estimated FY 1995 Fund value results primarily from lower house price growth and lower mean household income growth in the first few years of the forecast. Beginning in 1998, economic forecasts become more favorable compared to the FY 1994 forecasts, resulting in an increase in the FY 2000 capital ratio.

5. Adjustments to Financial and Cash Flow Assumptions

Exhibit II-9 illustrates the adjustments to FY 1994 capital resources resulting from accounting adjustments in FY 1995, differences between actual and predicted Fund performance in FY 1995, and changes in the assumptions used to model the Fund's future cash flows. These changes in financial and cash flow assumptions lowered the estimated FY 1995 economic value of the Fund by $201 million to our current FY 1995 estimate of $7,086 billion. Changes in the cash flow assumptions included adjustments to time lags, administrative expense factors, and loss rates.

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 Household Income Growth[c]		Financing Account Rate[d]	
Year	1995 Review	1994 Review	1995 Review	1994 Review	1995 Review	1994 Review	1995 Review	1994 Review	1995 Review	1994 Review
1995	1.91%	5.46%	8.71%	8.69%	8.39%	9.02%	2.12%	2.57%	7.11%	6.99%
1996	1.77%	3.27%	7.51%	8.24%	7.54%	8.51%	1.36%	0.65%	7.11%	6.99%
1997	2.17%	2.75%	7.60%	8.22%	7.63%	8.33%	1.58%	1.60%	7.11%	6.99%
1998	2.67%	2.87%	7.54%	8.31%	7.57%	8.47%	1.69%	1.69%	7.11%	6.99%
1999	3.34%	2.92%	7.25%	8.34%	7.29%	8.51%	1.51%	1.33%	7.11%	6.99%
2000	3.47%	3.18%	7.09%	8.35%	7.13%	8.52%	1.20%	1.14%	7.11%	6.99%

Source: DRI February 25-year trend forecast and April update.
[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]Mean household income is disposable income divided by the number of households.
[d]The financing account rate is set at the credit reform interest rate in effect for the last quarter of FY 1995. This rate is used to discount future cash flows.

a. Accounting Adjustments in FY 1995

One of the most significant reasons for the divergence between the FY 1995 economic value and capital ratio estimated in the FY 1994 Actuarial Review and the current values is a series of accounting adjustments made in FY 1995. These accounting changes were not specifically related to any economic or financial changes in the Fund. Three adjustments account for a net change of $522 million in the estimated FY 1995 economic value. These three changes include: a reduction in the capital resources of $286 million as a result of a reclassification of borrowings from the Treasury, which were previously not included as a liability in the FY 1994 capital resources calculation; a reduction of $261 million resulting from a change in the assumptions used to establish the loss allowance for mortgage notes receivable; and a $25 million addition resulting from an audit adjustment to FHA's FY 1994 net receivables and payables. The net effect of these changes has been to reduce the estimated FY 1995 economic value by $522 million, and reduce the FY 2000 capital ratio by 0.24 percentage points.

Exhibit II-9

Change in MMI Fund Estimated Economic Value Between FY 1994 and FY 1995 Resulting From Changes to Financial and Cash Flow Assumptions ($ Millions)

	Change in FY 1995 Economic Value	FY 1995 Economic Value	Change in FY 1995 Capital Ratio	Corresponding FY 1995 Capital ratio	Change in FY 2000 Capital Ratio	Corresponding FY 2000 Capital Ratio
FY 1994 Estimates with Data Updates, Model Refinements, and New Economic Forecasts	n/a	$7,287	n/a	2.11%	n/a	3.35%
Plus: Accounting Adjustments in FY 1995	-$522	$6,765	-0.15%	1.96%	-0.24%	3.11%
Plus: Expected Change in Capital Resources	-$594	$6,171	-0.17%	1.79%	-0.27%	2.84%
Plus: Actual Change in Capital Resources	+$185	$6,356	+0.05%	1.84%	+0.08%	2.92%
Plus: Changes in Loss Rates	+$780	$7136	+0.23%	2.07%	+0.35%	3.27%
Plus: Change in Disposition Lag	+$64	$7,200	+0.02%	2.09%	+0.03%	3.30%
Plus: Change in Default-to-Claim Lag	-$114	$7,086	-0.04%	2.05%	-0.06%	3.24%
Equals: **FY 1995 Estimates**	-$201	$7,086	-0.06%	2.05%	-0.11%	3.24%

b. Expected Change in Capital Resources

Our projections of the FY 1995 economic value in the FY 1994 Review implicitly assumed that the Fund's capital resources would increase by $594 million in FY 1995. This increase represented the sum of all cash flows, expenses, and interest earned by the Fund. This projected increase in capital resources is replaced by the actual increase in FY 1995 (given below). Thus the net effect of this adjustment and the following one captures the difference between the actual and expected changes in FY 1995 capital resources.

c. Actual Change in Capital Resources

Capital resources increased by $185 million in FY 1995. This increase is significantly less than the amount estimated in the FY 1994 Review, partially as a result of the accounting changes described above in (b). The net effect of the difference between the actual and expected growth in capital resources, is a reduction in the estimated FY 1995 economic value of $409 million, and a lowering of the FY 2000 capital ratio by 0.19 percentage points.

d. Change in Loss Rates

During FY 1995, the profit or loss FHA records upon the sale of a conveyed property was updated in the A-43 database, providing more information to measure conveyance loss rates for each loan type. Exhibit II-10 displays the current loss rates and the loss rates used in the FY 1994 Review. The reduction in these rates is part of a continuing downward trend in FHA's conveyance loss rate. This rate, which was 41 percent for terminations in FY 1988 and 36 percent in FY 1994, declined to 33 percent for terminations in FY 1995. This decline has been fueled by FHA's ability to reduce losses by disposing of properties rapidly.

The construction of relative house price categories for the FY 1995 Review 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.

Two other significant factors contributing to the reduction in loss rates are the elimination of the Single-Family Mortgage Assignment Program (the "Assignment Program") and the increased use of loss mitigation techniques. Legislation recently passed by Congress contains a provision for the termination of 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. Our own analysis suggests that the loss rate on future mortgage assignments is likely to be 49 percent, compared to 35 percent for future property conveyances. (This represents an increase from our estimate of 42 percent last year). Thus the discontinuation of the Assignment Program has had a significant positive impact on our assessment of the Funds current economic value and resulted in a significant reduction in the loss rates we apply to future claim terminations.

Exhibit II-10

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
Loss Rates for FY 1994 - FY 1994 Review								
Mortgage Type	Loan Size 1	Loan Size 2	Loan Size 3	Loan Size 4	Loan Size 5	Loan Size 6	Loan Size 7	Loan Size 8
30-year FRMs	0.50	0.42	0.37	0.32	0.29	0.28	0.33	0.48
30-year SRs	0.50	0.42	0.37	0.32	0.29	0.28	0.33	0.48
ARMs	0.45	0.35	0.36	0.32	0.29	0.28	0.33	0.55
15-year FRMs	0.47	0.37	0.36	0.25	0.28	0.28	0.27	0.15
15-year SRs	0.47	0.37	0.36	0.25	0.28	0.30	0.27	0.15
GPMs	0.44	0.48	0.34	0.33	0.30	0.34	0.43	0.65

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

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 makes it difficult for us to provide a dollar estimate of the effects they will have on the MMI Fund.

However, we are able to provide such estimates for the Pre-foreclosure Sales Program, which began as a demonstration program in October 1991, and 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, versus 35 percent for properties conveyed over the same time period (as a percent of unpaid principal balance the estimated loss rates are 27 percent and 40 percent, respectively, which are identical to the rates reported by HUD in its 1994 report on the demonstration program). Since November, 1994, when the Pre-foreclosure Sales Program became a national program, FHA has successfully resolved 2.3 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 once the assignment program is terminated, we have assumed that FHA will 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. These projections are lower than those provided by HUD in which 24 percent of claim terminations in FY 1997 and beyond were projected to be resolved through pre-foreclosure sales and other loss mitigation techniques. Using updated loss rates increased the estimated FY 1995 economic value of the Fund by $780 million and increased the FY 2000 capital ratio by 0.35 percentage points.

e. Lower Disposition Lag

The disposition lag is the amount of time that elapses from the date when FHA accepts a conveyance of 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 5.1 months in FY 1994. In the FY 1994 Review we assumed that the average disposition lag was 5.9 months, while in the FY 1995 Review we assume it will be 5.4 months, the average for terminations during FY 1992 through FY 1994. The effect of this decline in the disposition lag has been an increase in the estimated value of the Fund by $64 million and an increase in both the FY 1995 and FY 2000 capital ratios by 0.02 and 0.03 percentage points, respectively. Also, since the reduction in the conveyance loss rate, which is described above, is in part due to the change in the disposition lag, the true effect of the change in the disposition lag on the Fund can only be determined through a more extensive analysis of the change in the conveyance loss rate. Such an analysis is provided in Appendix D.

f. Higher Default-to-Claim Lag

The default-to-claim lag is the amount of time assumed to transpire 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 1995 review assumes the lag between loan default and claim payment is 14.24 months, whereas the FY 1994 Review assumed a lag of 10.76 months. The current lag is based on the average lag for all loans that terminated between FYs 1992 and 1994 and incorporates the default-to-claim lag on pre-foreclosure sales (estimated to be 9.3 months) which we assume will represent 5 percent of claim terminations in FY 1996 and 10 percent of claim terminations after FY 1996. The pre-foreclosure program was initiated by FHA on November 1, 1994 and pre-foreclosures comprised 2 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 14.24 value represents an increase from the average lag used last year, which was based on terminations of loan originations in FYs 1988 to 1994. The addition of the new lag in FY 1995 decreased the estimated fund value by $114 million and the estimated FY 1995 capital ratio by 4 percent. The FY 2000 capital ratio decreased by 0.06 percentage points.

Section III: Current Status of the MMI Fund

The estimated economic value of the Fund as of the end of fiscal year (FY) 1995 is $7.086 billion and the capital ratio is 2.05 percent. Both of these figures reflect moderate gains 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 status and the projected future performance of the FYs 1975 through 1995 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 based our estimate of this value on the level of capital resources as stated on the MMI Fund balance sheet plus the net 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 1995.

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 1995. For years prior to FY 1984, it consists of loans without LTV values 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

1995 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	$20	$4	$17	$42	$43	$38	$52	$35	$22	$275
1976	($1)	$3	$14	$35	$39	$50	$70	$58	$23	$290
1977	$25	$5	$23	$52	$68	$78	$98	$102	$33	$484
1978	$75	$7	$27	$54	$58	$75	$97	$119	$37	$549
1979	$37	$13	$50	$84	$53	$71	$12	($129)	$28	$219
1980	($55)	$15	$29	($25)	($135)	($73)	($147)	($475)	($40)	($904)
1981	($365)	$3	($21)	($166)	($139)	($85)	($208)	($494)	($192)	($1,667)
1982	($212)	$1	($29)	($128)	($86)	($82)	($216)	($391)	($166)	($1,309)
1983	($453)	$32	$5	($142)	($190)	($167)	($420)	($745)	($267)	($2,346)
1984	($71)	$9	($19)	($99)	($123)	($115)	($276)	($812)	($323)	($1,828)
1985	($40)	$11	($11)	($135)	($139)	($137)	($353)	($779)	($565)	($2,148)
1986	($25)	$66	$80	($19)	($120)	($127)	($335)	($869)	($388)	($1,737)
1987	($7)	$80	$134	$79	$20	($20)	($199)	($472)	($62)	($446)
1988	($1)	$10	$24	$14	($2)	($21)	($128)	($389)	($47)	($539)
1989	($8)	$9	$25	$15	$8	($11)	($82)	($352)	($17)	($414)
1990	($6)	$11	$27	$27	$13	($2)	($42)	($317)	$2	($286)
1991	($8)	$8	$18	$29	$10	$3	($8)	($113)	($2)	($63)
1992	$35	$17	$44	$157	$137	$193	$433	$108	$43	$1,168
1993	$184	$15	$45	$180	$160	$219	$487	$329	$55	$1,674
1994	$308	$14	$46	$177	$163	$230	$565	$426	$76	$2,005
1995	($3)	$4	$13	$57	$59	$84	$196	$103	$30	$543

[a] All values are as of the end of FY 1995.
[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, since 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.

Exhibit III-2

MMI Fund Capital Resources
End of Fiscal Year Value in FY 1991 Through FY 1995
($ Millions)

Capital Resources	FY 1991 Audit	FY 1992 Audit	FY 1993 Audit	FY 1994 Audit*	FY 1995 Audit
Cash	$114	$758	$1,242	$1,277	$1,232
Investments	6,558	5,781	5,140	5,665	6,587
Properties	988	1,271	1,281	1,187	1,001
Mortgages	1,733	2,275	2,639	3,134	3,410
Net Receivables and Payables	(449)	(582)	(604)	(503)	(1,638)
Total Capital Resources	$8,943	$9,503	$9,698	$10,760	$10,592

Source: Audited Financial Statements for FYs 1991-1995.
*This does not reflect a reclassification of $286 million in Treasury borrowings or a $25 million audit adjustment to Net Receivables and Payables that occured after the release of last year's Actuarial Review. These accounting changes reduced the FY 1994 capital resources to $10,499 million.

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

- residual surplus from insurance on loans (many of which were originated prior to 1975) that had matured by FY 1995
- 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.

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 1995. According to our financial cash flow model, the insurance endorsed between FYs 1975 and 1995 has contributed an estimated -$2859 billion to the Fund's capital resources as of the end of FY 1995 (see Exhibit III-3). In other words, the FYs 1975 to 1995 books have decreased the current total estimated capital resources of the Fund by $2.859 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 simulate the cash flows associated with each book of business through the end of FY 1995. These cash flows are added to each book's initial estimated cash balances, which are created through the payment of upfront 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 capital resources for FY 1995 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 1995 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 1995 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 1995 is -$3.624 billion. In other words, the future cash outflows from the Fund to cover claims and other costs associated with these books will be $3.624 billion less, in present value terms, than the cash inflows these books will generate through premiums, recoveries, and other income.

Exhibit III-3

Estimated Contribution to Capital Resources and Net Present Value at End of FY 1995 by Loan Type ($ Millions)

	Total MMI FY 1995		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	$266	$9	$266	$9	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1976	277	13	277	13	0	0	0	0	0	0	0	0	0	0
1977	463	21	462	21	0	0	0	0	0	0	0	0	1	0
1978	513	36	402	31	0	0	0	0	0	0	0	0	111	6
1979	162	57	(43)	34	0	0	0	0	0	0	0	0	205	23
1980	(944)	40	(721)	25	0	0	0	0	(2)	(0)	0	0	(221)	14
1981	(1,675)	8	(1,300)	6	0	0	0	0	(3)	(0)	0	0	(372)	3
1982	(1,308)	(1)	(990)	(1)	0	0	0	0	(3)	(0)	0	0	(316)	0
1983	(2,356)	10	(1,921)	8	0	0	0	0	(2)	(0)	0	0	(433)	2
1984	(1,784)	(45)	(1,476)	(38)	0	0	(0)	(0)	(28)	(0)	0	0	(279)	(6)
1985	(2,096)	(52)	(1,921)	(45)	0	0	(1)	(0)	(34)	(1)	0	0	(140)	(7)
1986	(1,480)	(257)	(1,474)	(247)	0	0	(2)	(0)	39	(4)	0	0	(42)	(5)
1987	47	(493)	(23)	(480)	0	0	16	(1)	72	(6)	0	0	(18)	(6)
1988	(258)	(282)	(262)	(276)	(6)	(0)	20	(0)	10	(3)	(0)	(0)	(20)	(2)
1989	(109)	(305)	(98)	(300)	(6)	(0)	9	(0)	8	(3)	(0)	(0)	(22)	(2)
1990	84	(370)	99	(365)	(2)	(0)	8	(0)	12	(3)	(0)	(0)	(33)	(1)
1991	224	(287)	178	(270)	4	(2)	47	(5)	14	(4)	1	(0)	(21)	(6)
1992	1,468	(299)	1,011	(250)	89	(52)	304	12	46	(2)	16	(4)	1	(3)
1993	2,270	(597)	1,150	(121)	669	(468)	300	41	30	(9)	119	(40)	2	(0)
1994	2,476	(470)	1,051	39	834	(523)	422	75	27	(9)	140	(52)	2	(0)
1995	903	(360)	582	(406)	39	(45)	263	105	9	(6)	8	(5)	1	2
Total	($2,859)	($3,624)	($4,752)	($2,616)	$1,622	($1,092)	$1,386	$225	$195	($49)	$284	($102)	($1,593)	$9

[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.

These negative present values are consistent with the premium structure, which includes relatively large upfront premiums and in some cases small annual premiums. The Fund collects most 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 amount of future cash flows, -$360 million is attributable to the projected future cash outflows of the FY 1995 book of business. However, because of its current estimated contribution to capital resources of $903 million (due primarily to the collection of upfront premiums in FY 1995), the economic value of the FY 1995 book is $543 million. Thus the FY 1995 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 1995, and the amortized IIF at the end of FY 1995 for all mortgage types.

As Exhibit III-4 indicates, the FY 1995 book of business constitutes approximately 12 percent of the Fund's total amortized IIF. Nearly two-thirds of the amortized IIF at the end of FY 1995 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 1995 and FY 2000 would be 2.17 and 3.65 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, which is the basis the General Accounting Office (GAO) used in its April 1996 report on the status of the Fund.

Exhibit III-4

Endorsements and Insurance-in-Force as of End of FY 1995 for All Mortgages ($ Thousands)			
Book of Business	New Mortgage Originations	Unamortized Insurance-in- Force*	Amortized Insurance-in-Force*
1975	$4,690,049	$1,243,950	$768,097
1976	$5,733,803	$1,637,618	$1,080,176
1977	$7,176,349	$2,481,250	$1,694,679
1978	$10,024,889	$3,579,724	$2,640,759
1979	$15,657,174	$4,902,717	$3,954,283
1980	$14,875,835	$2,908,678	$2,513,975
1981	$10,269,137	$1,260,643	$1,151,632
1982	$7,323,155	$665,877	$631,584
1983	$26,794,976	$3,112,348	$2,703,405
1984	$15,920,713	$1,695,404	$1,518,748
1985	$24,044,632	$2,578,761	$2,303,418
1986	$57,499,500	$16,010,073	$14,235,315
1987	$69,936,084	$29,840,442	$26,865,094
1988	$37,430,728	$11,924,406	$10,797,174
1989	$39,762,853	$11,995,198	$11,286,190
1990	$47,125,640	$15,389,355	$14,683,172
1991	$44,065,748	$17,344,689	$16,413,006
1992	$45,088,830	$30,680,128	$28,885,052
1993	$73,771,187	$64,204,078	$61,898,337
1994	$79,576,312	$76,398,030	$74,712,191
1995	$38,402,486	$37,894,054	$37,599,240
Total	$675,170,079	$337,747,423	$318,335,528

* 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*	Capital Ratio	Amortized Insurance in Force
1995	$7,086	2.17%	$325,867
1996	$8,173	2.51%	$325,855
1997	$9,232	2.79%	$331,376
1998	$10,354	3.06%	$337,839
1999	$11,626	3.37%	$344,895
2000	$13,026	3.65%	$356,384

*All values are as of the end of each fiscal year. The economic value for future years (FYs 1996 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 for the first 15 policy years and 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 1981 and 1986 will continue to remain high. However, over 90 percent of the total number of expected claims on these books have already been realized. As a result, the economic costs of future claims and prepayments on these books should be relatively small. In contrast, books originated after FY 1986 have experienced a lower percentage of their expected total claims, but they are expected to have significantly lower ultimate claim rates. The claim rates for books originated after FY 1986 are expected to be lower than those originated between FYs 1980 and 1986 partially because of new underwriting guidelines implemented by FHA in FY 1987. These underwriting guidelines are explained in greater detail in Appendix A. The high ultimate claim rates for the FY 1995 and 1996 books relative to the FY 1993 and 1994 books can be explained by two major factors. First, the extremely low mortgage interest rates in FYs 1993 and 1994 have and will continue to result in below average payment burdens for loans originated in these years. Second, the FYs 1993 and

1994 books contain significant numbers of refinancings which, all else being equal, are likely to experience lower claim rates in low interest rate environments due to their seasoning.

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 Cumulative 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	0.02
2	0.79	0.94	0.52	0.44	0.49	0.80	1.59	2.32	0.57	1.19	0.98	0.50	0.40	0.46	0.39	0.34	0.36	0.24	0.17	0.18	0.37	0.30
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	0.60	0.53	1.28	0.82
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	1.29	0.69	0.85	1.67	1.12
5	0.62	0.47	0.36	0.45	0.92	1.55	3.39	5.57	3.33	6.70	5.48	2.16	1.40	1.89	1.94	2.28	2.31	1.21	1.01	0.87	1.90	1.37
6	0.39	0.33	0.28	0.51	0.82	1.55	3.21	6.36	4.70	5.85	4.18	1.99	1.39	1.89	2.43	2.40	1.77	1.54	1.07	0.84	1.98	1.47
7	0.29	0.28	0.30	0.42	0.82	1.52	3.88	6.27	4.07	4.10	3.53	1.79	1.29	2.19	2.55	2.24	1.61	1.38	0.93	0.73	1.73	1.27
8	0.21	0.29	0.24	0.43	0.84	1.85	4.38	4.23	2.85	3.19	3.15	1.66	1.40	2.29	2.42	2.12	1.65	1.50	1.14	0.75	1.85	1.50
9	0.27	0.26	0.26	0.43	0.97	2.27	3.24	2.84	2.43	2.84	3.05	1.81	1.36	2.13	2.32	2.04	1.54	1.40	1.07	0.67	1.78	1.48
10	0.22	0.21	0.26	0.48	1.19	1.92	2.56	2.17	2.19	2.43	2.87	1.84	1.22	1.91	2.10	1.78	1.32	1.21	0.90	0.57	1.56	1.24
11	0.22	0.23	0.29	0.64	1.07	1.57	2.06	1.84	1.90	2.38	2.62	1.63	1.15	1.79	1.93	1.61	1.18	1.07	0.82	0.52	1.40	1.10
12	0.19	0.24	0.39	0.62	0.91	1.35	1.72	1.41	1.86	1.89	2.31	1.46	1.04	1.60	1.70	1.41	1.08	1.03	0.85	0.48	1.33	1.07
13	0.21	0.34	0.39	0.55	0.82	1.17	1.49	1.32	1.55	2.21	2.12	1.37	0.95	1.47	1.56	1.30	1.01	0.96	0.76	0.43	1.21	0.98
14	0.26	0.34	0.38	0.49	0.70	1.12	1.33	1.05	1.57	2.29	2.24	1.35	0.92	1.38	1.45	1.23	0.95	0.89	0.70	0.39	1.11	0.92
15	0.27	0.34	0.32	0.39	0.60	1.02	1.23	1.80	1.36	1.99	1.91	1.12	0.75	1.16	1.24	1.03	0.80	0.75	0.57	0.32	0.94	0.77
Cum	5.59	5.61	4.93	6.68	10.92	15.70	21.81	19.75	15.74	19.90	18.05	13.83	10.76	11.86	10.47	8.88	6.80	7.00	6.03	6.02	9.89	9.43

Shaded values indicate actual experience.

2. Historical and Estimated Prepayment Rate

The historical and forecasted conditional prepayment rates for the first 15 policy years and 30-year cumulative 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 dramatic decrease in prepayment rates experienced in FY 1995 as a result of higher interest rates. Our economic forecasts predict a steady decrease in interest rates into FY 1996, so our conditional prepayment rate forecasts for FY 1996 increase considerably. Our predictions for conditional prepayments for the FY 1982 book of business show a marked increase over actual FY 1995 performance. This is because the FY 1982 book has virtually no volume remaining in it and the average contract interest rate on that remaining volume is above

15 percent. Due to its size, the performance of this book has virtually no effect on the Fund's economic value or capital ratio.

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 Cumulative 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	1.77	0.34
2	1.88	3.39	3.25	2.46	0.82	0.92	0.42	17.40	0.92	1.41	11.17	3.72	1.02	1.50	2.01	2.06	5.45	7.25	4.01	1.91	5.56	1.88
3	6.76	8.39	6.18	2.05	0.68	0.34	7.09	9.34	2.19	18.62	23.32	2.67	1.74	3.06	4.12	9.71	25.91	16.58	3.83	5.44	7.97	4.57
4	9.97	8.98	3.53	1.32	0.36	1.76	4.75	12.29	17.62	25.70	10.58	3.18	2.85	4.60	14.94	29.44	29.81	6.14	13.83	6.08	11.63	8.83
5	8.96	4.73	1.82	0.75	1.42	2.03	6.02	28.98	26.75	11.30	8.49	4.47	3.42	14.29	28.60	29.35	7.64	19.60	12.15	6.85	15.68	11.12
6	4.48	2.41	0.79	1.99	1.64	2.65	19.36	26.15	10.80	9.16	10.31	5.49	8.49	26.86	27.65	8.11	26.13	13.82	11.89	8.16	15.85	10.28
7	2.35	1.00	2.69	2.07	2.04	9.20	21.55	11.70	8.43	9.91	12.37	14.41	19.65	26.13	8.03	20.61	19.37	15.38	15.85	9.44	16.07	12.58
8	1.15	3.25	2.76	2.40	4.81	14.11	9.77	8.23	9.73	10.49	21.55	26.40	21.02	7.70	20.79	15.48	18.37	17.25	16.75	9.32	16.60	13.73
9	3.30	3.34	3.15	5.28	7.58	7.23	7.23	6.55	11.71	16.16	23.06	25.36	6.38	13.20	12.71	12.07	16.50	14.47	13.52	8.18	14.45	11.07
10	3.37	3.59	5.79	7.66	5.48	5.86	7.07	5.96	19.25	17.36	22.61	7.40	8.51	8.20	9.80	10.63	13.20	10.90	10.93	6.92	10.71	8.29
11	3.59	6.09	7.65	5.63	5.17	6.57	7.31	7.22	19.09	18.47	8.21	13.42	6.54	7.44	9.96	10.09	11.72	10.85	11.26	6.54	9.65	7.95
12	5.89	7.89	5.73	5.17	5.52	7.27	11.01	7.44	19.33	7.35	20.62	10.22	6.24	7.84	9.70	9.21	10.99	10.08	9.12	5.64	8.24	7.04
13	7.72	5.86	5.23	5.41	5.28	13.65	12.74	7.51	7.42	16.01	13.67	9.15	6.30	7.23	8.39	8.65	10.43	9.02	8.35	5.31	7.90	6.90
14	5.74	5.32	5.47	5.28	8.78	16.07	13.22	3.67	13.52	11.30	12.11	9.69	6.44	6.68	8.24	8.62	9.64	8.52	8.30	5.56	7.92	6.90
15	5.23	5.47	5.23	7.28	13.78	16.63	6.07	30.01	10.28	9.95	11.87	9.69	6.34	6.80	8.38	8.24	9.22	8.57	9.00	5.98	7.99	7.09
Cum	79.59	79.84	79.22	75.07	71.97	71.99	71.66	78.31	80.07	76.30	79.43	79.99	75.89	79.73	84.48	86.61	90.38	88.14	88.51	77.69	84.24	81.33

Shaded values indicate actual experience.

Section IV: Characteristics of the Fiscal Year 1995 Book of Business

This section provides a description of the fiscal year (FY) 1995 book of business, including an analysis of the origination volume and composition in terms of mortgage types, purchase mortgages versus refinancings, and the distribution of loans among house price and loan-to-value (LTV) categories. It also compares the FY 1995 book to previous books and explains how the unique characteristics of the FY 1995 book are likely to influence future performance.

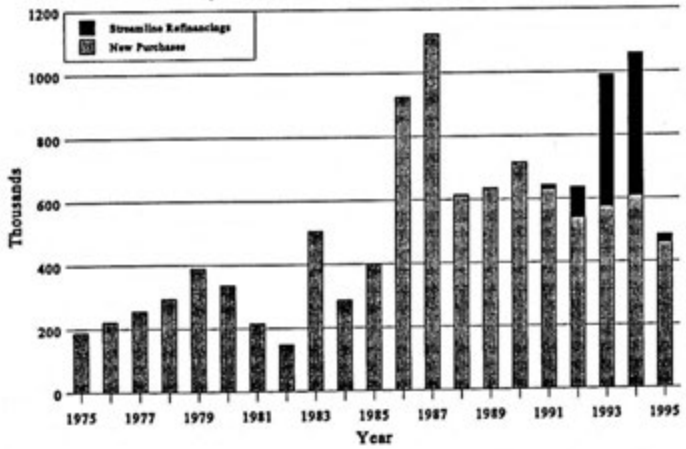
A. Volume of Mortgage Originations

In FY 1995, FHA insured $38 billion in single family mortgages, bringing total fund unamortized insurance-in-force (IIF) to $345 billion. As illustrated below, the FY 1995 book of business was substantially smaller than the FY 1994 book, which was the largest book, in terms of volume, in FHA's history. The decline in mortgage originations in FY 1995 can be largely attributed to a steady rise in interest rates resulting in a significant decrease in both purchase money mortgages and streamline refinancings. Exhibit IV-1 shows the number of loans originated by FHA

Exhibit IV-1

Total Count of FHA-Insured Originations

By Streamline Refinancing Status



Source: A-43 database, December 1995 extract.

during the FY 1975 to 1995 period and the numbers that were streamline refinancings (SRs). Although FHA insures loans in each of the 50 states and U.S. territories such as Puerto Rico, more than half of FHAs total dollar volume in FY 1995 was originated in ten states. Exhibit IV-2 illustrates the percent of FHA's total dollar volume originated in these states between FYs 1992 and 1995.

Exhibit IV-2

Percentage of FHA Dollar Volume Originated Between FY 1992 and FY 1995				
State	1992	1993	1994	1995
California	8.92%	11.79%	13.62%	15.04%
Colorado	4.90%	5.39%	4.32%	3.44%
D.C.	2.65%	3.50%	3.28%	3.10%
Florida	5.77%	5.48%	6.34%	6.03%
Georgia	3.80%	4.04%	3.69%	3.39%
Illinois	5.17%	3.99%	4.27%	5.20%
New York	4.10%	3.76%	4.00%	4.91%
Pennsylvania	3.49%	3.03%	3.03%	3.41%
Tennessee	2.66%	2.61%	2.71%	3.21%
Texas	7.88%	8.46%	8.65%	6.60%
% of Total	**49.33%**	**52.06%**	**53.90%**	**54.33%**

Source: A-43 database, December 1995 extract.

As Exhibit IV-2 illustrates, since FY 1992, an increasing proportion of FHA's origination volume has come from the 10 states in which FHA does most of its business. Particularly striking is the fact that the percentage of FHA-insured loan volume originated in California has increased by 6.12 percentage points since FY 1992, making almost one in six FY 1995 originations a California mortgage. However, this is consistent with trends in the conventional market where California loans accounted for approximately 17 percent of the total market in 1994.

B. Originations by Mortgage Type

As Exhibit IV-3 indicates, 30-year FRMs have historically constituted the bulk of FHA business. Graduated-payment mortgages (GPMs), which were over a quarter of the business between FYs 1979 to 1981 when interest rates were very high, have decreased markedly and now represent an insignificant volume of FHA business. Similarly, 15-year FRMs became an increasingly large share of new business during FYs 1992 to 1994 because they were a popular choice for refinancers who, because of the reduction in interest rates, were able to switch to a 15-year term with a minimal or no increase in monthly payments. However, the popularity of 15-

year FRMs has diminished as interest rates have increased and refinancings slowed. 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 FHA business; however, since FY 1992 ARMs have comprised 12 to 17 percent of all originations and nearly 30 percent of purchase originations in FY 1995. The SR program, which began to see significant use in FY 1991, has also experienced rapid growth. In particular, SRs constituted 40 percent of FHA's business in both FY 1993 and FY 1994. However, SRs were minimal in the FY 1995 book of business due to the relatively high level of interest rates and the large number of borrowers who previously refinanced during FYs 1992 through 1994.

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%

Source: A-43 database, December 1995 extract.

C. Initial Loan-to-Value Distributions

Prior econometric studies of mortgage termination behavior have shown that the borrower's equity position is a major determinant of default behavior. The larger the equity position, the greater the incentive to avoid a default on the loan. Exhibit IV-3 shows the distribution of 30-year FRMs among initial LTV categories.

As Exhibit IV-4 indicates, the LTV distribution of FY 1995 originations is remarkably similar to the LTV distribution of FY 1994 originations. Nearly 60 percent of the purchase mortgages originated in FY 1995 have LTV ratios of 95 percent or more and over 80 percent have LTV ratios above 90 percent. Changes in the distribution of loans in all LTV categories 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 component of the value of the property. As a result, the LTV ratios of borrowers who finance 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 allows for comparisons between the LTV distribution from FYs 1975 to 1990 and the LTV distribution in FYs 1991 to 1995, 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, within the period from FYs 1992 to 1995, there was a fairly steady increase in volume in the high LTV categories. In particular, the 97-100% LTV category increased from 12 percent to 27 percent.

D. Initial House Price Distributions

For the FY 1995 Actuarial Review, Price Waterhouse LLP has constructed relative house price categories to replace the loan size categories we had 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 the 44 largest metropolitan statistical areas (MSA's) and the 50 states. House price category eight is defined to represent all originations in areas with limits exceeding the FHA maximum limit, as well as loans missing MSA or state identifiers. Such loans are comprised of 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.

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%

Source: A-43 database, December 1995 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.

Exhibit IV-5 shows the percentage of new originations within each relative house price category. The use of relative house price categories in the FY 1995 Actuarial Review has produced a noticeable shift in the volume of originations from higher loan size categories towards lower house price categories. This shift becomes evident when comparing the relative house price categories to the loan size categories used in the FY 1994 Review (Exhibit IV-6). The implementation of relative house price categories eliminates the upward bias inherent in using absolute loan size categories to classify loans in higher-cost areas. In particular, high-cost states including Illinois and California, which have a significant number of FHA originations, have higher median house prices and subsequently loans originated in these states tend to have higher original mortgage amounts. Since the majority of FHA originations are in areas where median

house prices are higher than the national average, the resulting loan size distribution is skewed upward. Accounting for regional and sub-regional differences in median house price using relative house price categories provides a more accurate method for classifying FHA originations.

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. Territories*
1975	13%	11%	14%	23%	13%	12%	12%	1%
1976	17%	14%	16%	23%	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%	24%	14%	13%	13%	1%
1981	11%	11%	15%	25%	14%	12%	12%	1%
1982	11%	9%	13%	22%	13%	13%	18%	1%
1983	7%	8%	11%	21%	14%	15%	22%	0%
1984	8%	8%	11%	21%	15%	16%	22%	1%
1985	7%	7%	9%	19%	14%	18%	26%	1%
1986	5%	6%	9%	19%	15%	19%	25%	1%
1987	7%	7%	11%	19%	16%	18%	21%	1%
1988	12%	10%	12%	20%	15%	15%	15%	1%
1989	14%	10%	11%	19%	13%	14%	18%	1%
1990	14%	9%	11%	18%	13%	14%	19%	1%
1991	13%	10%	11%	19%	13%	14%	18%	1%
1992	14%	11%	14%	22%	14%	13%	11%	1%
1993	14%	12%	15%	23%	14%	12%	9%	1%
1994	16%	13%	16%	22%	12%	11%	8%	2%
1995	14%	11%	14%	22%	13%	13%	11%	2%

Source: A-43 database, December 1995 extract.
*Includes loans originated in U.S. territories or that do not fall within the 94 regional categories.

Exhibit IV-6

Distribution of Originations by Loan Size Category in Real Dollars
(Percentage of FHA-Insured Mortgages by Dollar Volume)

Book of Business	Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Category 7	Category 8
1975	7%	9%	11%	15%	16%	28%	14%	1%
1976	9%	9%	13%	17%	16%	26%	9%	1%
1977	9%	9%	15%	18%	18%	24%	7%	1%
1978	7%	9%	12%	15%	15%	22%	19%	0%
1979	6%	7%	11%	14%	15%	27%	20%	0%
1980	6%	7%	11%	14%	16%	36%	10%	1%
1981	8%	7%	11%	13%	15%	28%	16%	1%
1982	9%	8%	12%	13%	14%	28%	14%	2%
1983	6%	7%	11%	13%	15%	29%	18%	2%
1984	8%	8%	10%	13%	14%	27%	17%	3%
1985	7%	6%	9%	12%	14%	27%	22%	4%
1986	6%	7%	10%	13%	15%	28%	17%	3%
1987	8%	9%	13%	15%	17%	26%	11%	3%
1988	11%	11%	13%	15%	15%	24%	10%	1%
1989	12%	11%	13%	15%	14%	22%	12%	1%
1990	11%	10%	13%	14%	13%	21%	18%	1%
1991	10%	10%	12%	14%	13%	20%	22%	1%
1992	8%	9%	12%	14%	13%	21%	21%	1%
1993	7%	8%	12%	14%	15%	22%	22%	1%
1994	8%	9%	12%	14%	14%	20%	21%	1%
1995	8%	8%	11%	13%	13%	19%	27%	1%

Source: A-43 database, December 1995 extract.

FHA experience indicates that, all else being equal, larger loans tend to perform better than smaller loans in two respects. Larger loans claim at a lower rate, and the percentage loss when a claim occurs 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. 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 better experience of larger size loans, the increases in the loan limit in FYs 1990 and 1993 and the recent policy change that ties FHA's limit to changes in the Federal Housing Finance Board's house price index have improved the risk characteristics of FHA's recent originations. Furthermore, larger average loan sizes may provide insight into the risk characteristics of

different mortgages types. As will be discussed later in the Review, in the absence of rising interest rates Adjustable Rate Mortgages (ARMs) have been estimated to have a claim rate about 35 percent less than fixed-rate mortgages (FRMs). This can be explained, in part, by the fact that ARM originations tend to be larger than FRM originations. Exhibit IV-7 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 these loans are uniquely classified.

Exhibit IV-7

Average Loan Size by Mortgage Type and Relative House Price Category in FY 1995 ($)

Mortgage Type	House Price Category							
	1	2	3	4	5	6	7	8
30-Year Fixed Rate	52,139	65,719	74,195	82,796	89,056	95,560	103,983	66,571
30-Year Streamline	58,055	70,180	78,435	86,253	91,749	100,797	108,757	51,020
Adjustable Rate Mortgage	64,661	79,023	88,939	99,660	102,656	108,112	116,002	n/a
15-Year Fixed-Rate	36,137	50,417	57,347	64,477	73,048	79,419	89,390	50,061
15-Year Streamline	41,599	53,389	57,854	62,778	67,990	74,332	80,822	33,974
Graduated Payment Mortgage	70,074	94,321	106,185	115,238	113,840	113,401	133,494	n/a

Source: A-43 database, December 1995 extract.

E. Initial Contract Interest Rate

Research has shown that in the case of fixed-rate mortgages, a lower contract rate will generally result in fewer claims. Exhibit IV-8 displays the average contract rate by mortgage type since FY 1975. FHA FYs 1993 and 1994 loan originations for 30-year fixed-rate mortgages (FRMs) have the lowest average contract rates in the last 20 years, 7.8 and 7.6 percent respectively, which resulted in low conditional claim rates relative to other books (see Exhibit IV-8). The average contract rate on 30-year FRMs increased to 8.4 percent in FY 1995, indicating a likely increase in claim rates in the near term.

Exhibit IV-8

Average Contract Interest Rates by Loan Type and Aggregate							
Year	F30s	F15s	ARMs	GPMs	S30s	S15s	Total
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	8.41%	8.36%	7.21%	8.13%	8.41%	8.56%	8.12%

Source: A-43 database, December 1995 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 to the extent that the interest rate caps bind.

Exhibit IV-8

Source: A-43 database, December 1995 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 FY 1995 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 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 include

- alternative economic scenarios
- alternative interest rate scenarios
- higher than anticipated loss rates
- changes in the assignment program
- changes in the FHA loan size limit.

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), the FHLMC commitment rate (which we use to estimate FHA's contract interest rate, as explained in Appendix E), and mean household income growth.

To conduct tests of 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 lower 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 which assumes higher inflation and interest rates, and lower growth in both median household income and house prices. The DRI forecasted values of the economic variables used to produce each of these sensitivity scenarios are included in Exhibit V-1.

[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 April 1996.

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
1995	1.91%	1.91%	1.91%	8.41%	8.41%	8.41%	2.11%	2.11%	2.11%
1996	1.77%	2.77%	0.77%	7.39%	7.23%	7.82%	1.36%	1.45%	0.76%
1997	2.17%	3.17%	1.17%	7.48%	6.44%	8.06%	1.58%	1.88%	0.68%
1998	2.67%	3.67%	1.67%	7.42%	6.76%	8.30%	1.69%	1.89%	1.99%
1999	3.34%	4.34%	2.34%	7.14%	6.50%	7.98%	1.51%	1.51%	1.51%
2000	3.47%	4.47%	2.47%	6.98%	6.36%	7.81%	1.20%	1.20%	1.20%

Exhibit VI-2 depicts the estimated economic values of the Fund that correspond to these optimistic, base case, and pessimistic scenarios. The estimated current economic value of the Fund varies by nearly $888 million between the scenarios, from a high of $7.430 billion for the optimistic scenario to a low of $6.542 billion for the pessimistic scenario. This exhibit also displays the impact of the three economic scenarios on the Fund's FYs 1995 and 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
1995	$6,542	1.89%	$345,278	$532	n/a
1996	$7,560	2.11%	$358,318	$822	$196
1997	$8,575	2.29%	$374,623	$788	$227
1998	$9,641	2.45%	$393,816	$809	$257
1999	$10,870	2.64%	$412,481	$940	$289
2000	$12,214	2.81%	$434,537	$1,019	$326
Base Case Scenario ($ millions)					
Fiscal Year	Economic Value of the Fund*	Capital Ratio	Insurance in Force*	Economic Value of New Books of Business	Interest on Fund Balances
1995	$7,086	2.05%	$345,278	$543	n/a
1996	$8,173	2.34%	$349,411	$875	$213
1997	$9,231	2.56%	$360,102	$813	$245
1998	$10,354	2.78%	$372,041	$845	$277
1999	$11,625	3.02%	$384,838	$961	$311
2000	$13,032	3.24%	$402,290	$1,058	$349
Optimistic Scenario ($ millions)					
Fiscal Year	Economic Value of the Fund*	Capital Ratio	Insurance in Force*	Economic Value of New Book of Business	Interest on Fund Balances
1995	$7,430	2.15%	$345,278	$557	n/a
1996	$8,545	2.46%	$347,676	$891	$223
1997	$9,873	2.95%	$334,756	$1,072	$256
1998	$11,073	3.24%	$341,438	$904	$296
1999	$12,331	3.52%	$350,330	$926	$332
2000	$13,636	3.73%	$365,926	$936	$370

*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 chosen to 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
1995	8.41%	8.41%	8.41%	8.41%	8.41%	8.41%	8.41%
1996	7.39%	8.91%	9.41%	11.41%	7.91%	7.41%	5.41%
1997	7.48%	9.41%	10.41%	11.41%	7.41%	6.41%	5.41%
1998	7.42%	9.91%	11.41%	11.41%	6.91%	5.41%	5.41%
1999	7.14%	10.41%	12.41%	11.41%	6.41%	4.41%	5.41%
2000	6.98%	10.91%	13.41%	11.41%	5.91%	5.41%	5.41%
2001	6.97%	11.41%	12.41%	10.41%	5.41%	6.41%	6.41%
2002	6.87%	11.91%	11.41%	9.41%	4.91%	6.87%	6.87%
2003	6.62%	12.41%	10.41%	8.41%	4.41%	6.62%	6.62%
2004	6.61%	12.91%	9.41%	7.41%	4.91%	6.61%	6.61%
2005	6.63%	13.41%	8.41%	6.63%	5.41%	6.63%	6.63%

It should be noted that these interest rate sensitivity analyses were completed in stylized fashion. To be specific, interest rate movements would 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 identify the effect of interest rate movements alone on the Fund.

When interest rates increase above original contract rates, conditional claim rates tend to decrease on 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 do. 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 upfront 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 losses 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 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 1995) 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 from FYs 1995 through 1999, although the FY 2000 capital ratio is 0.08 percentage points lower than the FY 2000 capital ratio of 3.24 percent projected in the base

case. The reason for these changes is largely due to the lower claim and prepayment rates which increase economic values as well as 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
1995	$7,990	2.31%	$38,402	$345,278	$964	n/a
1996	$9,325	2.54%	$40,376	$367,590	$1,095	$240
1997	$10,668	2.72%	$39,275	$391,941	$1,063	$280
1998	$12,074	2.89%	$40,594	$417,759	$1,086	$320
1999	$13,595	3.04%	$44,192	$447,231	$1,159	$362
2000	$15,257	3.16%	$50,132	$482,110	$1,253	$408

The results from the rapid increase in interest rates show the estimated FY 1995 capital ratio increasing and the FY 2000 capital ratio decreasing. This can be largely attributed to the reductions in the projected economic values of the FYs 1995 to 2000 books that occur due to higher contract interest rates. Nonetheless, the FY 2000 capital ratio still exceeds the NAHA mandated capital ratio of 2.00 percent by a wide margin. 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
1995	$8,329	2.41%	$38,402	$345,278	$985	n/a
1996	$9,614	2.60%	$40,252	$370,447	$1,035	$250
1997	$10,837	2.72%	$39,252	$397,829	$934	$288
1998	$12,051	2.82%	$40,592	$426,961	$889	$325
1999	$13,268	2.88%	$44,192	$459,974	$855	$362
2000	$14,461	2.90%	$50,132	$498,556	$794	$398

Exhibit V-6 shows the results of the rate shock scenario. In this case the FY 1995 capital ratio increases to 2.44 percent, which is much higher than the corresponding capital ratio of 2.05 percent in the base case. This effect occurs largely as a result of lower claim rates on fixed-rate mortgages and lower prepayment from the FY 1992 to 1995 books. However, the growth in the

capital ratio is significantly reduced in this scenario due to the reductions in the projected economic values of the FY 1996 to 2000 books that result from higher contract interest rates. Thus, the estimated FY 2000 capital ratio is substantially lower in this scenario than under the base case.

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
1995	$8,418	2.44%	$38,402	$345,278	$959	n/a
1996	$9,434	2.51%	$40,185	$375,480	$764	$253
1997	$10,480	2.59%	$39,252	$404,690	$763	$283
1998	$11,572	2.67%	$40,592	$432,689	$777	$314
1999	$12,727	2.76%	$44,192	$461,921	$808	$347
2000	$13,928	2.82%	$50,132	$494,379	$820	$382

When interest rates decrease below the original contract rates, conditional claim rates on FRMs tend to increase while 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 all future years. The capital ratios estimated for FYs 1995 and 2000 exceeded the base case by 0.10

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
1995	$7,417	2.15%	$38,402	$345,278	$598	n/a
1996	$8,374	2.34%	$42,516	$358,317	$735	$223
1997	$9,383	2.56%	$43,073	$367,189	$757	$251
1998	$10,479	2.83%	$47,565	$370,026	$815	$281
1999	$11,700	3.16%	$54,366	$369,957	$906	$314
2000	$12,813	3.46%	$62,182	$370,835	$762	$351

percentage points and 0.22 percentage points, respectively. Although the capital ratios in FYs 1995 and 1996 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 higher FY 1995 capital ratio as compared to the base case scenario. Also, the capital ratio increases at a much faster rate than under the base case, reaching 4.71 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
1995	$7,540	2.18%	$38,402	$345,278	$551	n/a
1996	$8,457	2.41%	$46,242	$350,951	$691	$226
1997	$9,599	2.84%	$54,521	$338,469	$888	$254
1998	$11,095	3.55%	$60,802	$312,716	$1,208	$288
1999	$12,845	4.43%	$62,226	$290,205	$1,417	$333
2000	$14,654	4.71%	$55,665	$311,228	$1,424	$385

The results from the shock drop scenario mirror those from the rapid decrease scenario, with a capital ratio in FY 1995 of 2.14 percent compared to 2.18 percent. Also, estimates of future capital ratios increase at a faster rate in this scenario until FY 2000, when the estimated capital ratio reaches 4.90 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
1995	$7,387	2.14%	$38,402	$345,278	$520	n/a
1996	$9,258	3.12%	$72,673	$296,781	$1,649	$222
1997	$10,885	3.84%	$55,768	$283,546	$1,350	$278
1998	$12,479	4.36%	$49,350	$286,125	$1,268	$327
1999	$14,167	4.69%	$48,811	$301,757	$1,314	$374
2000	$16,030	4.90%	$52,615	$326,895	$1,438	$425

C. Higher Loss Rates

In our analysis, the loss rate is defined as the percentage of claim amounts not recovered through the sale of conveyed properties or assigned mortgages. Since losses on claims are the largest expense to the Fund, we analyzed two situations in which loss rates were higher than predicted. In the first scenario, we increased the loss rates on all conveyances for all mortgage types by 10 percent (*i.e.*, the average conveyance loss rate went from 35.0 percent to 38.5 in FY 1996). As a result of this increase in loss rates, the Fund experienced a reduction in the estimated economic values, and the FYs 1995 and 2000 capital ratios decreased to 1.89 percent and 2.98 percent, respectively. Exhibit V-10 displays the complete results from this analysis.

Exhibit V-10

Projected MMI Fund Performance with 10 Percent Increase in Loss Rates ($ 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
1995	$6,534	1.89%	$38,402	$345,278	$473	$0
1996	$7,529	2.15%	$46,932	$349,411	$798	$196
1997	$8,500	2.36%	$42,412	$360,102	$746	$226
1998	$9,535	2.56%	$43,191	$372,041	$780	$255
1999	$10,713	2.78%	$47,644	$384,838	$891	$286
2000	$12,006	2.98%	$53,688	$402,290	$972	$321

The second loss rate scenario involved an increase in the estimated loss rate for pre-foreclosure sales. We increased the current loss rate from 24.75 percent to 40.0 percent. The Fund's estimated capital ratios for FYs 1995 and 2000 were 1.94 and 3.08 percent, respectively, in this scenario. Exhibit V-11 displays the results from this analysis.

D. Changes in the Assignment Program

As discussed previously in Section I, Congress has 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, and our own analysis predicts losses on future mortgage assignments of 49 percent, compared to 35 percent for future property conveyances. Thus, the discontinuation of the Assignment Program has had a significant positive impact on our

assessment of the Fund's current economic value. As illustrated in Exhibit V-12, we estimate that the economic value of the Fund would be $513 million lower and the capital ratio would be 0.15 percentage points lower than the base case in FY 1995 if the Assignment Program was maintained in its current form.

Exhibit V-11

Projected MMI Fund Performance with High Pre-foreclosure Loss Rate ($ 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
1995	$6,692	1.94%	$38,402	$345,278	$507	n/a
1996	$7,730	2.21%	$46,932	$349,411	$837	$201
1997	$8,743	2.43%	$42,412	$360,102	$780	$232
1998	$9,818	2.64%	$43,191	$372,041	$813	$262
1999	$11,040	2.87%	$47,644	$384,838	$927	$295
2000	$12,384	3.08%	$53,688	$402,290	$1,012	$331

Exhibit V-12

Projected MMI Fund Performance - Keep Assignment Program ($ 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
1995	$6,573	1.90%	$38,402	$345,278	$489	$0
1996	$7,585	2.17%	$46,932	$349,411	$814	$197
1997	$8,572	2.38%	$42,412	$360,102	$760	$228
1998	$9,623	2.59%	$43,191	$372,041	$794	$257
1999	$10,817	2.81%	$47,644	$384,838	$906	$289
2000	$12,131	3.02%	$53,688	$402,290	$989	$325

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 24.75 percent, versus 35 percent for properties conveyed over the same time period (as a percent of unpaid principal balance the estimated loss rates are 27 percent and 40 percent, respectively). Exhibit V-13 provides estimates of the Fund's economic value and capital ratio from FY 1995 through FY 2000 if FHA were to resolve all future claims through foreclosure and conveyance (and thus utilize no loss mitigation techniques). We estimate that the economic value of the Fund in FY 1995 would be $181 million lower if FHA resolved all future claims through foreclosure and conveyance. Furthermore, the capital ratio would decrease by 0.05 percentage points in FY 1995 and 0.10 percentage points in FY 2000.

Exhibit V-13

Projected MMI Fund Performance - All Foreclosure ($ in 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
1995	$6,905	2.00%	$38,402	$345,278	$512	$0
1996	$7,952	2.28%	$46,932	$349,411	$840	$207
1997	$8,972	2.49%	$42,412	$360,102	$782	$239
1998	$10,057	2.70%	$43,191	$372,041	$815	$269
1999	$11,287	2.93%	$47,644	$384,838	$929	$302
2000	$12,640	3.14%	$53,688	$402,290	$1,014	$339

E. Effect of Changes in the Maximum FHA Loan Size Limit

In FY 1995, FHA's maximum loan size limit was changed from a fixed value ($151,725) to a variable limit indexed to the conforming loan limit used by Fannie Mae and Freddie Mac. This change resulted in an increase of the FHA maximum loan limit to $152,362 in FY 1995 and $155,250 in FY 1996. Since on average, larger loans have lower claim and loss rates, we expect this change to increase the future economic value of the Fund. However, this effect will only be experienced gradually as house prices increase. For example, even by FY 2000, we estimate that

the volume of new originations would only decline by $1.8 billion, or 3.46 percent if the loan size remained the same. Exhibit V-14 illustrates the Fund's estimated economic values and capital ratios if the loan limit were held constant at its current level. As indicated, this scenario is estimated to increase the FY 2000 economic value of the Fund by $89 million. The reason the FY 2000 capital ratio decreases slightly in this scenario is that the reduction in origination volume reduces insurance-in-force (IIF), the denominator in the capital ratio.

Exhibit V-14

Projected MMI Fund Performance - Assuming Constant Loan Size Limit ($ 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
1995	$7,086	2.05%	$38,402	$345,278	$543	n/a
1996	$8,170	2.34%	$46,779	$349,257	$872	$213
1997	$9,222	2.56%	$42,086	$359,625	$807	$245
1998	$10,333	2.79%	$42,577	$370,964	$833	$277
1999	$11,581	3.03%	$46,586	$382,750	$939	$310
2000	$12,943	3.25%	$51,917	$398,543	$1,015	$347

Section VI: Performance of Future Books

This section describes the performance of future books of business for FYs 1996 through 2000 and presents our 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 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 1996 to 2000 ($ millions)					
Fiscal Year	Economic Value of New Book of Business*	Interest on Fund Balances	Economic Value of Fund	Capital Ratio of Fund	Total Insurance-in-Force
1996	$875	$213	$8,173	2.34%	$349,411
1997	$813	$245	$9,231	2.56%	$360,102
1998	$845	$277	$10,354	2.78%	$372,041
1999	$961	$311	$11,625	3.02%	$384,838
2000	$1,058	$349	$13,032	3.24%	$402,290

*All values are as of the end of each fiscal year. The economic value for future years (FYs 1996 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 1997 book of business has a slightly lower estimated economic value than the other years in the FY 1996 through 2000 period due primarily to the projected increase in the FHA contract rate from 7.51 percent in FY 1996 to 7.60 percent in FY 1997. This increase in the contract rate combined with other interest rate forecasts results in higher levels of predicted claims and prepayments for this book, particularly in the first seven years. Both of these effects tend to reduce the estimated economic value. Conversely, the increase in the estimated economic

values of the FY 1999 and FY 2000 books is due primarily to a forecasted decrease in interest rates after FY 1997.

The capital ratio of the Fund is essentially determined by the weighted average of the capital ratios of each book of business plus the 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 1995 book will have the same economic value stated in 1995 dollars in FY 1995 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 (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, and the Fund's capital ratio, 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 aggregate capital ratio may not be related to the underlying quality or soundness of future mortgage originations as the Fund's capital resources may be independent of the profitability of new books of business. This is because 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 better indications of the overall quality and profitability of future business. These two measures, the "initial" and "converging" capital ratios of a given book, represent respectively, the present value of profits per dollar of insurance originated (excluding refinancings) and 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 refinancings will involve reductions in the IIF in previous books and thus any gain in the current books 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 2.12 percent and that the converging capital ratio was 4.70 percent. This year, we estimate that the initial capital ratio of the FY 2000 book of business remains virtually unchanged at 2.17 percent, and that the contemporaneous capital ratio is 5.47 percent. This increase in the converging capital ratio is largely due to continued acceleration in prepayment rates, as opposed to a reduction in claim rates. Nonetheless, it is strong evidence that the Funds 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 initial and converging capital ratios estimated for the FY 2000 book in the FYs 1994 and 1995 Reviews, respectively. Our estimates of the economic value and purchase money mortgage origination volumes for future books suggest an initial capital ratio on new books of business of approximately 2.1 percent for FYs 1996 to 2000.

Exhibit VI-2

Estimated Capital Ratio for the FY 2000 Book of Business ($ millions)				
Policy Year	FY 1994 Actuarial Review*		FY 1995 Actuarial Review*	
	Insurance-in-Force	Capital Ratio	Insurance-in-Force	Capital Ratio
1	$56,560	2.12%	$50,132	2.17%
2	$56,386	2.12%	$50,004	2.17%
3	$55,017	2.18%	$48,853	2.23%
4	$52,200	2.29%	$45,947	2.37%
5	$48,539	2.47%	$41,005	2.65%
6	$44,575	2.69%	$35,919	3.03%
7	$40,977	2.92%	$31,881	3.41%
8	$37,212	3.22%	$27,994	3.88%
9	$33,696	3.55%	$24,500	4.44%
10	$30,869	3.88%	$21,819	4.98%
11	$28,561	4.19%	$19,884	5.47%
12	$26,497	4.52%	$18,204	5.97%
13	$24,744	4.84%	$16,852	6.45%
14	$23,139	5.17%	$15,645	6.95%
15	$21,643	5.53%	$14,529	7.48%

*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 distinguish purchase money mortgage originations from refinancings and estimate each group seperately. In the FY 1994 Review, we assumed that the dollar volume of purchase money mortgage originations would increase by approximately 3.00 percent per year, or the estimated level of price inflation. This year, our forecasts of future purchase money mortgage originations are based on a series of econometric models designed to forecast future demand for FHA originations based on economic and policy variables. These models have produced lower estimates of future originations than were used in last year's Review because of the relatively low rate of growth forecasted for house prices and household income, and the projected decline in FHA's share of the insured mortgage market. Appendix F describes these models in detail. Our projections of future refinancings are based on the estimated volume of prepayments and the underlying mobility rate of the borrower population. The methods used to forecast future refinance volume are discussed in Section VIII. 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**
1996	$40,182	$6,750	$46,932
1997	$39,252	$3,160	$42,412
1998	$40,592	$2,599	$43,191
1999	$44,192	$3,452	$47,644
2000	$50,132	$3,556	$53,688

VII. Summary of Methodology

This section presents a brief overview of our modelling approach. It also highlights the differences between our FY 1994 models and our FY 1995 models. A complete description of our current models is provided in our 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. Our projections of these future cash flows, which include cash inflows from insurance premiums and loss recoveries, and cash outflows for claim payments, refunds and Fund administration, are discounted to provide estimates of the Fund's current and future net present values.

We have produced claim estimates using econometric models that are based on the hypothesis that claim behavior can be explained to a significant degree by a borrower's equity position. The equity position varies with factors such as house price appreciation rates and changes in interest rates relative to rates at loan origination. To control for the possibility that house price appreciation rates may vary greatly across regions of the country, a regional house price dispersion measure is also included in the model.

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

We developed our models by applying regression analysis to 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:

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

Our results are therefore sensitive to changes in these assumptions.

B. Cash Flow Analysis

Once claim and prepayment rates are estimated by our econometric models, we estimate future cash flows and discount them to determine the present value of future cash flows. The cash flow model applies 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 1995 to determine the resources the Fund would need today in order to meet its obligations for its existing business through the scheduled maturity of the FY 1995 book of business.

C. Technical Refinements

The models used for this year's Review follow conceptually from those used in last year's Review. Last year's Review was the first to model separate loan types. We continue to estimate five different sets of econometric models, each tailored to 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 are only small number of graduated-payment mortgages (GPMs), we have not developed a distinct model to estimate conditional claim and prepayment rates related to these loans. They 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 business.

1. Changes to the Conditional Claim Rate Model

Price Waterhouse's conceptual estimation technique remains identical to last year's, including the dependent variable transformation and the correction for first-order serial correlation. Refinements to the 30-year FRM model have focused on developing a better method to estimate and forecast house price dispersion and classify loans.

In previous reviews we used a measure of dispersion that was based on the different rates of growth in the four regions used by the Bureau of the Census. This year we have developed a measure of dispersion that is based on house price changes in all fifty states. This measure better captures the magnitude of regional house price differences and allows for greater variation in forecasts.

We have also changed one of the parameters that we use to classify loans. In past Reviews we grouped loans by their size, in real dollars. This year, we have grouped them by the relative size of the underlying house. 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 better 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.

We have also made refinements to the 30-year SR model and the ARM model. In the SR model, we added an "equity-shift" variable that captures the estimated differences in equity accumulation between loans that refinance with FHA and those that do not; and in the ARM model we increased the level of aggregation to improve model fit. Complete specifications and variable definitions can be found in the technical appendices.

2. Changes to the Cash Flow Model

Aside from changes to the financial assumptions used in the cash flow model, which are described in Appendix E, the only major refinement to the cash flow model was the incorporation of a loss rate specific to claim terminations that result in pre-foreclosure sales. Using the limited data available on pre-foreclosure sales, we estimated a loss rate of 24.75 percent on these loans, and allowed the percentage of future claims that are resolved using this process to vary in the future.

3. Changes in the Method Used to Project Future Volumes and Distributions

Unlike past Actuarial Reviews, the FY 1995 Review used a sophisticated system of models to forecast future origination volume. These models distinguish between purchase money mortgage originations and refinancings, and project each group separately. The forecasts of future purchase money mortgage originations are based on a series of econometric models designed to forecast future demand for FHA originations based on economic and policy variables. These models project the total national volume of purchase money mortgage originations in the future and then divide that volume into LTV, house price, mortgage type, and insurance (FHA and conventional)

categories (see Appendix F for more information). The results of these models provide estimates of FHA's share of the total purchase money mortgage origination market.

Our projection method for refinancings involves a similar approach, although we assume that all FHA-insured refinancings were FHA-insured prior to refinancing. We project total refinancings of FHA-insured mortgages from each book of business based on the volume of prepayments and the composition of each book. We divide prepayments into two broad categories: *mobility induced* prepayments that are related primarily to factors other than interest rates, and *refinancings* that are primarily interest rate driven. However, only a portion of all prepayers who refinance do so with FHA. The remainder either obtain private mortgage insurance or forgo mortgage insurance altogether. We refer to the refinancings that return to FHA as those *recaptured* by the Fund and we have developed a recapture rate model to estimate this rate for each book of business and LTV category.

We distinguish three types of prepayments that are recaptured by FHA:

- streamline refinancings
- prepayments with a new purchase financed through FHA
- other (non-streamline) refinancings

Our estimation method focuses on the first of these groups. The other two, both considerably smaller in size for FYs 1992 through 1995, are combined with purchase originations due to data limitations.

We estimate new origination volume of streamline refinancings (SRs) using a five-step method. More specifically, we estimate mobility-induced prepayments; calculate total refinancings by subtracting mobility induced prepayments from total prepayments; estimate FHA's recapture rate for each loan cohort based on policy and economic variables; apply this estimated recapture rate to our projections of future refinancings to arrive at an SR number; and then divide SRs into 30-year, 15-year, and repeat refinancings.

We use our econometric model to estimate the conditional prepayment rate that would occur absent any changes in interest rates (the conditional mobility rate). This prepayment rate, which is an estimate of the level of mobility-induced conditional prepayments, is used to estimate the level of prepayments that are not refinancings. By subtracting mobility-induced prepayment dollars by book of business from total prepayment dollars, we obtain an estimate of the volumes of total refinancings by book of business, LTV, and house price category.

Based on FHA's historical experience, we used econometric analysis to estimate the relationship between FHA's recapture rate for each loan cohort and a series of economic and policy variables. These economic and policy variables included the age of the loan, the net present value of the difference between FHA and private market insurance premiums, and the estimated growth in house prices since loan origination.

Our approach provides an estimate of the total volume of SRs. However, these refinancings must be divided into two different categories: 30-year SRs and 15-year SRs. We estimated the historical proportions of these two loan types to be 85 percent and 15 percent, respectively. Additionally, a certain component of each cohort of SRs was assumed to represent repeat refinancings from previous SR books. We estimated that these repeat refinancings are approximately 14 percent of each SR book.

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 1995 the MMI Fund had an economic value of $7.086 billion and unamortized insurance-in-force of $345.278 billion, resulting in a capital ratio of 2.05 percent. Furthermore, we project that by FY 2000 the capital ratio will increase to 3.24 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.

Although total FHA originations were substantially less in FY 1995 than experienced in FY 1994 as a result of the significant reduction in refinancing 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 has significantly reduced 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 1995. 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 1995 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 1995.

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 subsample, 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 in the general 30-year FRM model. However, as experience with the SR program has accumulated, it has become increasingly difficult to justify such an approach. Therefore, in this year's as in last year's review, 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 very 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 1994 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):

$$F30CCRx_{t,y,t} = \sum_{t=1}^{15} \alpha_t P_{t,t} + \sum_{m=1}^{8} \gamma_m (LSC_{m,t} \cdot EMx_{y,t-1}) + \sum_{n=1}^{10} \lambda_n EFFINT_{n,y} + \beta_1 PAYMENT_{y,t} + \beta_2 HPDISP_{y,t-1} + \beta_3 HPSKEW_{y,t-1} + \beta_4 EQ82\_86_y + \beta_5 EQPOST86_y + \beta_6 CMPPAY_{\cdot\cdot} + \varepsilon_{\cdot\cdot\cdot} \quad (1)$$

where

$F30CCRx_{t,y,t}$ ≡ the Cox transformed conditional claim rate for 30-year FRMs in

[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 Nonequity Determinants of FHA Single Family Mortgage Foreclosures in the 1980s," *AREUEA Journal*, Vol 21(4) 1993, pp. 405-430.

LTV category x, of loan size category i, originated in fiscal year y, and observed in policy year t,

$P_{l,t}$ ≡ thirteen policy year dummy 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 dummy 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 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),

$HPSKEW_{y,t-1}$ ≡ house price skewness measure 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,

[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.

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

The independent variables can be grouped under four main types:

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

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, $\ln(\rho/1\text{-}\rho)$ where ρ is the probability that a particular event will occur (in the present case, that a borrower will 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 $\ln(\rho/1\text{-}\rho)$ 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 loan size 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.

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[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 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 default may 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 $HPDISP_{y,t}$ and $HPSKEW_{y,t}$ capture general housing market trends which shape the distribution of $EMx_{y,t-1}$.

i. Market Equity Index[8]

Price Waterhouse's equity index is defined as

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

[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 represents 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 origintated 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 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 $BV1\$_{y,t,T}$), the value of their future payment liabilities (represented by $MV1\$_{y,t,T}$) 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 default 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.

As part of the FY 1995 Actuarial Review, we have changed the parameters that we use to classify loans. In past Reviews we grouped loans by their size, in real dollars. This year, we have grouped them by the relative size of the underlying house. Thus, 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 better 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 default 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 dummies, $LSC_{m,t}$.

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 default. 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 accompanies increases 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 reflect 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, 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:

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

where *CQDEF* is the CQHP is 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 mineral 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.

iv. House Price Skewness

One weakness of $HPDISP_{y,t}$ is its inability to account for asymmetric trends in house price appreciation rates. Worse, it may mis-represent positive trends and/or dilute negative ones. If a particular region experiences unusually robust or unusually poor growth in house prices while the rest of the nation continues to follow the general trend, the growth distribution will be skewed towards the upper end or lower end, respectively. This event will be detected by $HPDISP_{y,t}$ as an increase in the variance of the distribution without any indication of whether the variance is due to favorable or unfavorable conditions.

To help distinguish between such asymmetric trends, we include the variable $HPSKEW_{y,t}$. Our skewness variable is defined as

$$HPSKEW_{y,t} = \frac{n}{(n-1)(n-2)} \sum_{i=1}^{n} \frac{(x_{i,y,t} - \bar{x}_{y,t})^3}{s_{y,t}^3} \quad (5)$$

where there are n different regional indices; $x_{i,y,t}$ is the CQHPI in region i for loans originated in fiscal year y and observed in policy year t; $\bar{x}_{y,t}$ is the mean of the regional CQHPIs similarly indexed; and $s_{y,t}$ is the standard deviation of the regional CQHPIs also similarly indexed. Large asymmetric deviations about the mean will now show up as either positive or negative skewness values (when the distribution is skewed to the upper end, so that a particular region is experiencing strong growth in house prices, skewness will be positive).

Future values of house price skewness are held constant at the historical mean value. In constructing the future skewness value, Price Waterhouse uses the same historical time period as used in estimating future house price dispersion, FYs 1963 through 1984.

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

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 +

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.

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 becomes 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

[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.

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 Dummy 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. 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 default is fairly low (if default 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 default then decreases. Over time, home owners may develop non-trivial attachments to their properties which lessen the likelihood of default. The policy year dummy 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 with 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 inclusion of 51 state house price indices improved the significance of this variable from last year's Review. $HPSKEW_{y,t-1}$ also works well. For high-LTV borrowers (*i.e.*, for those borrowers with low equity levels), claim levels drop when the house price distribution is skewed towards high growth rates. This may be explained as a result of a limited number of high-growth states masking the relatively low rate of house price growth in several other states.

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 less negative coefficient values (in some cases, positive 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 less 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*
$P_{1,t}$	-3.3808 -(5.8481)	-1.4972 -(1.7456)	-6.6010 -(10.6134)	-9.1627 -(19.5030)	-9.9607 -(20.6093)	-12.6748 -(27.1489)	-14.1479 -(32.1432)	-12.4628 -(29.8939)	-7.5907 -(13.3267)
$P_{2,t}$	-6.8741 -(5.8829)	-5.2496 -(2.6033)	-17.2842 -(11.0016)	-14.2213 -(11.5727)	-14.9706 -(11.6301)	-14.2668 -(11.2617)	-14.4247 -(11.9181)	-13.1316 -(12.7165)	-15.9015 -(11.9711)
$P_{3,t}$	-8.8200 -(7.3159)	-3.6094 -(1.6826)	-15.9487 -(9.5585)	-12.8121 -(10.0095)	-12.4305 -(9.3594)	-11.9453 -(9.2155)	-12.6020 -(10.2150)	-11.5117 -(10.9291)	-12.7805 -(9.1323)
$P_{4,t}$	-8.3980 -(6.6701)	-0.6051 -(0.2638)	-14.7970 -(8.3312)	-10.9667 -(8.0244)	-10.9181 -(7.7644)	-10.1668 -(7.4249)	-10.9434 -(8.4049)	-10.0449 -(9.1133)	-10.6541 -(7.2184)
$P_{5,t}$	-7.5920 -(5.4774)	1.2402 (0.5103)	-13.8956 -(7.3436)	-10.0680 -(6.7426)	-9.8136 -(6.3437)	-8.8474 -(5.7908)	-9.7413 -(6.7054)	-8.8591 -(7.4710)	-10.1713 -(6.4511)
$P_{6,t}$	-5.7995 -(3.9043)	1.0466 (0.4200)	-13.9535 -(7.1075)	-10.0324 -(6.3833)	-9.5958 -(5.8657)	-8.1279 -(4.9977)	-9.0070 -(5.8422)	-7.2666 -(5.7357)	-9.7072 -(5.8827)
$P_{7,t}$	-5.6632 -(3.8101)	1.0501 (0.4228)	-14.0566 -(7.1817)	-10.1449 -(6.4750)	-9.6703 -(5.9239)	-8.1475 -(5.0217)	-9.0721 -(5.9038)	-7.3306 -(5.8038)	-9.8483 -(5.9836)
$P_{8,t}$	-2.2605 -(1.3821)	1.3026 (0.5244)	-10.4407 -(5.2710)	-9.0923 -(5.6490)	-8.2723 -(4.8947)	-6.3114 -(3.7199)	-7.2137 -(4.5430)	-5.1494 -(3.9699)	-7.0092 -(4.1928)
$P_{9,t}$	-2.2025 -(1.3465)	1.5056 (0.6077)	-10.3583 -(5.2469)	-9.0090 -(5.6163)	-8.1466 -(4.8405)	-6.2790 -(3.7159)	-7.1641 -(4.5296)	-5.1128 -(3.9612)	-6.9314 -(4.1551)
$P_{10,t}$	-1.1739 -(0.6927)	6.3780 (2.4813)	-9.3769 -(4.5802)	-7.6816 -(4.6804)	-8.8137 -(5.1612)	-6.9311 -(4.0327)	-7.2381 -(4.4752)	-5.6548 -(4.3738)	-7.6034 -(4.4558)
$P_{11,t}$	-1.1001 -(0.6494)	6.3972 (2.4852)	-9.4984 -(4.6302)	-7.7439 -(4.7192)	-8.8633 -(5.1920)	-6.8583 -(3.9930)	-7.2545 -(4.4915)	-5.5895 -(4.3342)	-7.5979 -(4.4480)
$P_{12,t}$	0.2454 (0.1427)	6.9883 (2.8124)	-9.4337 -(4.7280)	-7.2506 -(4.5795)	-7.0411 -(4.2277)	-5.2393 -(3.1206)	-7.1848 -(4.6216)	-4.3292 -(3.5140)	-7.6654 -(4.6575)
$P_{13,t}$	0.2337 (0.1362)	7.1073 (2.8776)	-9.3932 -(4.7299)	-7.1815 -(4.5527)	-6.9822 -(4.2064)	-5.1806 -(3.0953)	-7.1090 -(4.5922)	-4.2682 -(3.4823)	-7.6762 -(4.6805)
$LSC_{1,t}$ * $EMx_{y,t-1}$	-1.2762 -(4.1434)	-3.5843 -(5.7021)	-1.7021 -(4.8525)	-2.3540 -(9.5862)	-2.7625 -(11.3994)	-2.3856 -(10.1839)	-1.9675 -(9.2280)	-2.6414 -(15.5495)	-1.9864 -(8.2751)
$LSC_{2,t}$ * $EMx_{y,t-1}$	-2.5357 -(8.0399)	-4.0380 -(6.4387)	-2.1223 -(6.0004)	-3.1003 -(12.3737)	-3.9249 -(15.8528)	-3.3193 -(14.0297)	-2.9903 -(13.7122)	-3.6761 -(20.7494)	-2.6115 -(10.5333)
$LSC_{3,t}$ * $EMx_{y,t-1}$	-3.0711 -(9.6967)	-4.4299 -(7.1163)	-2.6280 -(7.6079)	-3.6992 -(15.3204)	-4.4437 -(18.9648)	-3.9473 -(17.4853)	-3.4689 -(16.2799)	-3.9809 -(22.4646)	-2.9981 -(12.2410)
$LSC_{4,t}$ * $EMx_{y,t-1}$	-3.5278 -(11.1782)	-5.1597 -(8.3695)	-3.0941 -(9.2424)	-4.4845 -(19.5830)	-4.8070 -(21.6563)	-4.4694 -(20.8373)	-3.9561 -(19.3583)	-4.3338 -(24.5918)	-3.4357 -(14.4482)

$LSC_{5,t}$ * $EMx_{y,s-1}$	-4.0543 -(12.2261)	-5.1021 -(8.2486)	-2.9323 -(8.6443)	-4.5233 -(19.1168)	-5.1323 -(22.1701)	-4.8314 -(21.5305)	-4.2941 -(19.3584)	-4.6059 -(22.7212)	-3.5451 -(14.3056)
$LSC_{6,t}$ * $EMx_{y,s-1}$	-4.0711 -(11.9027)	-5.1809 -(8.3973)	-3.1800 -(9.4300)	-4.8646 -(20.6623)	-5.3968 -(23.2545)	-4.7955 -(20.9847)	-4.3609 -(18.6833)	-4.6599 -(20.9594)	-3.6674 -(14.7581)
$LSC_{7,t}$ * $EMx_{y,s-1}$	-3.7730 -(10.0939)	-4.5273 -(7.3896)	-3.4867 -(10.5073)	-4.8627 -(20.7575)	-5.4477 -(23.0467)	-4.7645 -(19.8036)	-4.3935 -(17.1068)	-4.5458 -(16.5273)	-3.4022 -(13.8129)
$LSC_{8,t}$ * $EMx_{y,s-1}$	-3.3018 -(8.0722)	-4.9282 -(7.8662)	-3.8450 -(10.1732)	-4.0369 -(11.4833)	-4.2103 -(10.0815)	-2.7246 -(6.1316)	-3.3835 -(7.1565)	-4.4246 -(12.4975)	-3.9683 -(11.9926)
$PAYMENT_{y,t}$	9.6556 (2.9249)	3.7501 (0.6994)	25.2812 (5.8550)	15.5367 (4.4290)	13.8298 (3.7764)	11.1202 (3.0596)	13.0668 (3.7458)	10.0871 (3.4824)	18.5905 (5.1869)
$HPDISP_{y,s-1}$	4.3435 (9.2484)	2.9617 (3.9007)	7.6702 (12.9727)	4.6508 (9.8675)	4.0479 (8.4387)	4.0074 (8.4360)	4.3555 (9.4537)	4.2739 (11.4200)	5.0878 (10.8235)
$HPSKEW_{y,s-1}$	0.0390 (1.3238)	-0.0262 -(0.7326)	0.0424 (1.5471)	0.0331 (1.5330)	0.0259 (1.1668)	0.0177 (0.8207)	0.0553 (2.8055)	0.0526 (3.0195)	0.0727 (3.1649)
$EQ82\_86_y$	-0.3217 -(5.2659)	-1.2027 -(12.9931)	-0.3153 -(4.4167)	-0.0702 -(1.2502)	-0.0737 -(1.3420)	-0.1963 -(3.6100)	-0.0447 -(0.8572)	-0.3608 -(8.7212)	0.0916 (1.6029)
$EQPOST86_y$	-0.1376 -(1.5463)	-1.0642 -(10.6937)	-0.1041 -(1.3759)	-0.2049 -(3.5670)	-0.4506 -(8.0783)	-0.4337 -(8.0959)	-0.4487 -(8.7409)	-0.7636 -(18.3741)	-0.2781 -(4.6500)
$EFFINT_{1,y}$	-0.6823 -(3.0850)	-0.4827 -(1.7018)	0.1750 (0.7536)	0.9724 (5.4732)	1.1643 (6.0607)	2.4470 (13.1496)	2.9879 (17.2582)	2.5060 (14.7850)	0.7829 (3.8781)
$EFFINT_{2,y}$	0.5523 (2.4661)	1.2814 (4.2605)	2.0977 (8.5807)	2.2012 (11.8453)	2.6043 (13.0539)	2.8763 (14.8943)	2.6862 (14.9555)	2.8120 (15.8730)	3.0322 (14.3564)
$EFFINT_{3,y}$	1.6649 (7.3823)	0.9491 (3.0289)	1.9164 (7.5205)	2.0879 (10.7669)	2.0194 (9.7326)	2.3644 (11.7800)	2.3633 (12.6037)	2.5219 (13.6540)	2.1606 (9.8922)
$EFFINT_{4,y}$	1.4969 (5.9660)	-0.1982 -(0.5403)	1.4967 (5.0181)	1.4188 (5.9248)	1.5192 (5.9319)	1.7496 (6.8428)	1.7601 (7.2539)	1.9708 (8.7766)	1.3330 (5.3247)
$EFFINT_{5,y}$	1.1857 (4.0899)	-0.9925 -(2.2497)	1.0627 (2.9712)	1.0463 (3.5444)	1.0919 (3.5079)	1.2294 (3.8653)	1.2724 (4.1938)	1.4654 (5.6954)	1.0871 (3.7239)
$EFFINT_{6,y}$	0.4487 (1.5383)	-0.9271 -(2.0642)	1.0397 (2.8651)	1.0253 (3.4531)	1.0040 (3.3058)	0.9400 (3.0434)	0.9662 (3.3356)	0.7679 (3.2114)	0.8641 (2.9401)
$EFFINT_{7,y}$	-0.9616 -(2.5255)	-1.0456 -(2.0208)	-0.4613 -(1.0771)	0.5872 (1.6180)	0.4143 (1.1068)	0.1558 (0.4066)	0.1863 (0.5247)	-0.1690 -(0.5902)	-0.3559 -(1.0340)
$EFFINT_{8,y}$	-1.4113 -(3.3523)	-2.9110 -(5.0747)	-0.7839 -(1.6228)	0.0960 (0.2392)	0.6856 (1.6825)	0.4234 (1.0089)	0.2230 (0.5722)	0.0458 (0.1506)	-0.0510 -(0.1365)
$EFFINT_{9,y}$	-1.9561 -(4.4955)	-3.1267 -(6.3874)	-0.8197 -(1.8860)	-0.1296 -(0.3612)	-0.0497 -(0.1328)	-0.2425 -(0.6264)	0.1892 (0.5470)	-0.4929 -(1.8559)	-0.0300 -(0.0911)
$EFFINT_{10,y}$	-1.9501 -(4.4710)	-3.0427 -(6.0507)	-0.6291 -(1.4243)	-0.0264 -(0.0730)	0.0411 (0.1094)	-0.1976 -(0.5090)	0.2056 (0.5894)	-0.4736 -(1.7635)	0.1372 (0.4126)
$CMPPAY_{y,t}$	-2.3182 -(7.0207)	-2.5188 -(9.6236)	-1.7034 -(7.7668)	-1.4225 -(6.9531)	-0.9362 -(4.6487)	-1.3933 -(6.5471)	-1.3221 -(6.6562)	-1.3164 -(8.5723)	-2.3424 -(8.0438)

Summary of Regression Statistics									
Adjusted-R^2	0.969	0.966	0.974	0.982	0.978	0.982	0.984	0.985	0.975
F-statistic	1548.160	1413.632	1856.261	2700.092	2200.315	2664.580	3145.878	3189.679	1918.929

*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 $MV1\$_{y,i,T}$ is replaced by $BV1\$_{y,i,T}$, the book value. The resulting variable is referred to as book equity and is formally defined as

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

with $BV1\$_{y,i,T}$ 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 $LSC_{m,t}$. 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. PVDIFxxx$_{y,t}$ *Variables*

The $PVDIFxxx_{y,t}$ variables are an estimate 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 disimilar. $PVDIFPOS_{y,t}$ 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 absolute 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 regressions 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 his 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.

[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 $EFFINT_{x,y}$ 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 phenonmena.

[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 $PVDIFPOS_{x,r}$. 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*
$P_{1,t}$	-3.7808 -(5.6512)	-7.0400 -(13.7038)	-4.3637 -(8.8537)	-3.4309 -(7.4575)	-3.2274 -(6.3783)	-1.6004 -(3.0553)	-1.4212 -(2.9391)	-3.0349 -(5.9426)	-6.2664 -(11.3346)
$P_{2,t}$	0.4806 (0.7082)	-5.2173 -(10.0110)	-4.0458 -(8.1775)	-2.0110 -(4.3949)	-1.1789 -(2.3588)	0.2923 (0.5684)	1.2875 (2.7057)	0.0336 (0.0658)	-4.2626 -(7.7401)
$P_{3,t}$	3.7740 (5.6961)	-4.3398 -(8.1977)	-2.6928 -(5.2766)	-0.2499 -(0.5361)	0.4979 (0.9809)	2.0470 (3.9550)	2.9779 (6.2324)	2.4845 (4.7196)	-2.2319 -(3.8857)
$P_{4,t}$	3.5887 (5.2496)	-4.3614 -(7.7646)	-2.5177 -(4.5564)	0.0579 (0.1077)	1.4631 (2.4658)	2.9981 (4.7606)	4.0153 (6.7968)	4.9372 (8.0544)	-1.0508 -(1.6938)
$P_{5,t}$	4.6131 (5.9517)	-3.2542 -(5.1647)	-1.4379 -(2.2671)	0.9316 (1.4338)	2.6274 (3.7099)	4.2941 (5.5280)	5.2232 (7.1047)	4.9918 (7.2871)	0.2572 (0.3792)
$P_{6,t}$	4.0011 (4.9492)	-0.0675 -(0.1134)	1.2112 (2.0358)	1.8107 (2.9266)	2.6807 (4.0363)	3.5867 (4.8836)	4.7075 (6.7934)	4.4838 (6.8935)	1.7453 (2.7780)
$P_{7,t}$	5.2295 (7.0357)	2.9629 (5.4188)	3.9772 (7.4486)	4.4451 (7.9269)	4.8006 (7.8969)	5.6049 (8.3396)	6.8616 (10.8608)	5.6323 (9.4287)	4.0107 (7.1377)
$P_{8,t}$	4.1903 (4.9682)	4.1177 (6.5717)	4.6565 (7.5211)	4.7934 (7.2679)	4.6621 (6.4964)	5.3729 (6.6895)	6.5744 (8.7689)	5.4937 (7.7476)	4.9789 (7.6868)
$P_{9,t}$	4.0678 (4.8314)	3.8154 (6.0416)	4.3297 (6.9636)	4.4929 (6.7976)	4.4205 (6.1579)	5.1360 (6.3943)	6.2894 (8.3816)	5.2747 (7.4397)	4.7000 (7.2392)
$P_{10,t}$	3.1634 (3.6320)	0.6919 (0.8088)	2.2425 (2.7434)	3.8399 (4.7935)	4.3473 (5.3108)	5.0379 (5.6254)	5.2775 (6.2036)	4.1250 (5.2809)	3.6571 (4.4741)
$P_{11,t}$	2.9685 (3.4011)	0.5815 (0.6672)	2.1620 (2.5910)	3.7696 (4.6417)	4.3111 (5.2126)	4.9428 (5.4812)	5.1774 (6.0416)	4.0145 (5.1092)	3.6443 (4.3794)
$P_{12,t}$	1.2763 (1.5637)	1.5364 (1.9178)	2.7190 (3.5208)	3.0621 (4.1734)	2.9645 (3.9631)	3.7873 (4.6618)	3.6671 (4.8244)	1.9938 (2.8788)	3.6380 (4.6986)
$P_{13,t}$	1.1110 (1.3624)	1.4764 (1.8538)	2.6155 (3.4149)	2.9733 (4.0863)	2.8707 (3.8699)	3.6561 (4.5342)	3.5591 (4.7202)	1.8908 (2.7500)	3.5920 (4.6819)
$LSC_{1,t} * EBx_{y,t-1}$	1.8465 (5.1592)	0.4714 (0.9158)	1.1529 (3.0989)	1.2022 (3.7459)	1.7194 (5.4628)	2.1802 (6.5498)	2.1348 (6.9734)	2.3792 (9.0201)	0.2824 (0.8482)
$LSC_{2,t} * EBx_{y,t-1}$	2.1389 (5.8831)	0.5769 (1.1228)	1.3619 (3.6563)	1.5985 (4.9420)	2.1537 (6.7847)	2.5411 (7.6031)	2.4854 (8.0463)	2.6413 (9.8011)	0.5826 (1.7290)
$LSC_{3,t} * EBx_{y,t-1}$	2.1285 (5.8277)	0.7261 (1.4176)	1.5211 (4.1213)	1.7041 (5.3481)	2.2384 (7.2260)	2.6473 (8.1085)	2.5804 (8.4406)	2.6801 (9.9415)	0.6291 (1.8759)
$LSC_{4,t} * EBx_{y,t-1}$	2.1107 (5.7857)	0.7867 (1.5422)	1.6452 (4.5154)	1.7769 (5.7028)	2.1971 (7.2899)	2.5653 (8.0730)	2.6163 (8.7658)	2.6590 (9.8852)	0.6947 (2.0953)

$LSC_{8,t}$ * $EBx_{y,t-1}$	2.0895 (5.5459)	0.7988 (1.5646)	1.6517 (4.5175)	1.7950 (5.7029)	2.1699 (7.0868)	2.4690 (7.6475)	2.6190 (8.4782)	2.6822 (9.2551)	0.6601 (1.9614)
$LSC_{4,t}$ * $EBx_{y,t-1}$	1.8955 (4.9504)	0.8213 (1.6101)	1.7065 (4.6830)	1.8101 (5.7611)	2.2742 (7.4274)	2.5421 (7.8328)	2.6999 (8.5416)	2.6756 (8.8336)	0.6526 (1.9361)
$LSC_{7,t}$ * $EBx_{y,t-1}$	1.8580 (4.6066)	0.7849 (1.5436)	1.7844 (4.9340)	1.8703 (5.9843)	2.2514 (7.3422)	2.5809 (7.8129)	2.8397 (8.6109)	2.6425 (7.7849)	0.5764 (1.7190)
$LSC_{8,t}$ * $EBx_{y,t-1}$	0.2569 (0.5826)	-0.1943 -(0.3783)	0.0062 (0.0163)	0.0295 (0.0775)	0.2520 (0.5878)	0.4655 (0.9410)	0.2447 (0.4798)	0.1809 (0.4250)	-1.1280 -(2.8705)
MA_RATE_t	1.7353 (6.3254)	3.1083 (14.0238)	2.8023 (12.4271)	2.7643 (12.2438)	2.3576 (9.9908)	2.2920 (9.0444)	2.4143 (9.9673)	1.3584 (6.0322)	2.2984 (9.8336)
$PVDIFPOS_{y,t}$	12.5194 (17.4508)	13.6852 (26.5680)	17.6526 (32.0032)	20.6442 (35.2181)	22.8265 (35.7773)	23.3481 (33.1517)	23.2379 (35.1866)	22.9077 (36.8721)	17.8749 (30.6053)
$PVDIFNEG_{y,t}$	16.9607 (27.8423)	8.9485 (14.4784)	11.1596 (17.6157)	13.0282 (20.8352)	13.8729 (21.6185)	14.5675 (21.1825)	14.4495 (22.0963)	14.3023 (24.5809)	10.1467 (15.3985)
$INTRA\_INT_t$	-3.2880 -(7.5410)	-0.9855 -(3.1901)	-1.9915 -(6.4027)	-2.3869 -(7.7274)	-2.3719 -(7.0517)	-3.2429 -(9.1623)	-3.5894 -(10.9473)	-2.5070 -(7.7409)	-1.7395 -(5.0960)
$EFFINT_{1,y}$	-0.1483 -(0.7452)	0.0762 (0.5058)	-0.6666 -(4.0948)	-1.0620 -(6.8163)	-1.1725 -(6.7166)	-1.5786 -(8.5542)	-1.5440 -(9.0383)	-0.8232 -(4.4558)	0.2282 (1.2203)
$EFFINT_{2,y}$	-1.1570 -(5.6506)	-0.0565 -(0.3648)	-0.1917 -(1.1437)	-0.9720 -(6.0202)	-1.2855 -(7.1232)	-1.5834 -(8.3147)	-1.9216 -(10.8801)	-1.3853 -(7.2537)	0.0145 (0.0753)
$EFFINT_{3,y}$	-2.3245 -(10.9050)	-0.3060 -(1.8718)	-0.6380 -(3.6108)	-1.5216 -(8.8921)	-1.7332 -(9.0356)	-2.0465 -(10.0618)	-2.3730 -(12.5509)	-2.1574 -(10.6062)	-0.6919 -(3.3839)
$EFFINT_{4,y}$	-2.1199 -(8.8153)	-0.3112 -(1.6195)	-0.6982 -(3.3600)	-1.5971 -(7.4121)	-2.0541 -(8.5496)	-2.3574 -(8.9678)	-2.7189 -(11.0077)	-3.0864 -(12.4537)	-1.1391 -(5.0029)
$EFFINT_{5,y}$	-2.5605 -(9.4370)	-0.8123 -(3.7129)	-1.1872 -(5.0219)	-1.9961 -(7.8864)	-2.5771 -(9.2317)	-2.9375 -(9.3959)	-3.2460 -(10.9905)	-3.1206 -(11.1941)	-1.6838 -(6.7489)
$EFFINT_{6,y}$	-2.3098 -(9.2800)	-2.1631 -(11.9417)	-2.3314 -(11.9018)	-2.4127 -(11.3510)	-2.6432 -(11.4028)	-2.6822 -(10.2494)	-3.0758 -(12.4774)	-2.9428 -(12.6881)	-2.3305 -(11.3273)
$EFFINT_{7,y}$	-1.9326 -(6.6134)	-2.6269 -(11.5903)	-2.6130 -(10.6846)	-2.5645 -(9.7591)	-2.5978 -(9.1980)	-2.6130 -(8.1762)	-2.9891 -(9.9421)	-2.9261 -(10.4308)	-2.7073 -(10.5611)
$EFFINT_{8,y}$	-1.5723 -(4.9051)	-1.4304 -(4.7713)	-1.8746 -(5.9708)	-2.3977 -(7.5559)	-2.6853 -(8.1837)	-2.6761 -(7.3509)	-2.6578 -(7.6929)	-2.5363 -(7.9971)	-2.3597 -(7.4382)
$EFFINT_{9,y}$	-0.8946 -(3.2463)	-1.8357 -(7.3987)	-2.1222 -(7.9305)	-2.1283 -(7.9171)	-2.1445 -(7.6634)	-2.2047 -(7.0819)	-2.0393 -(7.0127)	-1.7059 -(6.4578)	-2.3810 -(8.6724)
$EFFINT_{10,y}$	-0.9163 -(3.2988)	-1.7665 -(6.8838)	-2.0729 -(7.5176)	-2.1268 -(7.7181)	-2.1602 -(7.5721)	-2.2400 -(7.0747)	-2.0785 -(7.0298)	-1.7292 -(6.4642)	-2.3617 -(8.3905)
$ARMSHR_y$	0.0028 (2.3496)	-0.0063 -(9.0651)	-0.0078 -(10.4119)	-0.0085 -(10.8244)	-0.0084 -(9.6539)	-0.0090 -(9.5411)	-0.0093 -(10.7832)	-0.0057 -(6.9204)	-0.0071 -(8.9730)

Summary Regression Statistics									
Adjusted-R^2	0.958	0.959	0.962	0.966	0.962	0.962	0.969	0.968	0.957
F-statistic	1185.882	1215.062	1289.091	1442.373	1316.303	1292.680	1605.651	1562.263	1144.357

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

E. Simulating Loan Performance

We use 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 counts for claims and prepayments from FY 1995 forward for each of the defined loan categories and for each origination year from FY 1975 through 1995.

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 1995 to evaluate the ability of the model 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 yields 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 model was 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 98 percent of the actual value and total prepayments to be 104 percent of the actual value. Both models

Exhibit A-4

Simulation of 30-Year FRM Claims and Prepayments for the Period 1975-94 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	50756	48677	96%	279425	288481	103%
0-65%	4214	4951	117%	130737	135886	104%
65-80%	19837	19798	100%	306946	318251	104%
80-90%	43448	42183	97%	440137	457293	104%
90-93%	41877	40627	97%	345712	357292	103%
93-95%	44273	43246	98%	341467	354481	104%
95-97%	116566	113609	97%	718486	749917	104%
97-100%	262661	259073	99%	1299131	1345448	104%
Investor*	82782	81548	99%	414756	422100	102%
Loan Size						
1	158762	139654	88%	548501	673911	123%
2	89520	80646	90%	432411	489139	113%
3	92631	87544	95%	534828	576539	108%
4	126235	123604	98%	870705	889428	102%
5	69680	72568	104%	564251	549623	97%
6	63450	70811	112%	593716	564247	95%
7	62285	71741	115%	688446	647938	94%
8	3851	7144	185%	43939	38326	87%
Total	666,414	653,712	98%	4,276,797	4,429,151	104%

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

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

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	88	81%	380	675	178%
1976	1710	1025	60%	4119	5551	135%
1977	4307	3269	76%	20641	25823	125%
1978	5037	5859	116%	43486	36890	85%
1979	5208	6286	121%	52785	34448	65%
1980	5350	7610	142%	30483	21236	70%
1981	7629	9030	118%	18401	12598	68%
1982	10597	10850	102%	9353	13484	144%
1983	17480	13459	77%	60338	65925	109%
1984	18972	25261	133%	48057	45539	95%
1985	25964	25612	99%	62904	72775	116%
1986	34381	37323	109%	265320	268090	101%
1987	48174	57277	119%	355941	475104	133%
1988	64071	58985	92%	159729	149898	94%
1989	64893	52845	81%	144958	163638	113%
1990	60021	55080	92%	181762	191943	106%
1991	60688	58646	97%	220048	257095	117%
1992	64300	65358	102%	536251	563252	105%
1993	62543	65510	105%	1007273	996042	99%
1994	57569	52951	92%	826165	730122	88%
1995	47411	41388	87%	228403	299023	131%
Total	666,414	653,712	98%	4,276,797	4,429,151	104%

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 1995 policy year, use actual counts of surviving loans to the start of FY 1995 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 determine 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 1988 through 1996 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 1988 through 1996

Policy Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.013	0.015	0.007	0.011	0.008	0.006	0.002	0.003	0.017
2	0.459	0.385	0.343	0.355	0.238	0.172	0.182	0.369	0.298
3	1.256	1.219	1.168	1.216	0.835	0.602	0.534	1.280	0.815
4	1.663	1.709	1.727	1.928	1.292	0.688	0.846	1.674	1.119
5	1.893	1.936	2.279	2.306	1.208	1.011	0.866	1.903	1.368
6	1.887	2.430	2.398	1.768	1.536	1.066	0.838	1.984	1.468
7	2.191	2.552	2.240	1.612	1.377	0.929	0.725	1.725	1.270
8	2.288	2.419	2.115	1.646	1.495	1.136	0.747	1.854	1.496
9	2.126	2.318	2.035	1.542	1.397	1.074	0.672	1.778	1.480
10	1.914	2.102	1.784	1.323	1.206	0.898	0.573	1.561	1.241
11	1.790	1.932	1.609	1.180	1.070	0.820	0.522	1.404	1.104
Ultimate	11.861	10.467	8.880	6.795	6.996	6.026	6.022	9.888	9.431

Source: A-43 database, December 1995 extract.

Exhibit A-7

Forecast of Conditional Prepayment Rates for 30-Year FRMs for FYs 1988 through 1996

Policy Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.374	0.451	0.381	0.374	0.364	0.630	0.299	1.772	0.340
2	1.498	2.013	2.061	5.453	7.248	4.008	1.913	5.561	1.877
3	3.062	4.122	9.711	25.905	16.575	3.828	5.435	7.966	4.572
4	4.597	14.935	29.437	29.812	6.138	13.830	6.082	11.626	8.829
5	14.285	28.596	29.347	7.643	19.602	12.151	6.848	15.676	11.120
6	26.860	27.647	8.113	26.132	13.817	11.886	8.163	15.848	10.279
7	26.126	8.029	20.608	19.373	15.379	15.847	9.436	16.073	12.584
8	7.697	20.790	15.482	18.373	17.254	16.747	9.318	16.602	13.732
9	13.203	12.707	12.071	16.501	14.474	13.517	8.180	14.452	11.068
10	8.196	9.802	10.625	13.202	10.898	10.933	6.920	10.709	8.287
11	7.436	9.959	10.085	11.720	10.847	11.262	6.541	9.647	7.947
Ultimate	79.730	84.483	86.614	90.375	88.136	88.507	77.685	84.236	81.330

Source: A-43 database, December 1995 extract.

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.

In this year's Review, we classified 15-year FRMs as loans with a term of 15 years or less, as opposed to 22.5 years or less in previous Reviews, due to the difference in premiums applied to the two types of loans. 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 when the data were divided into the usual eight categories. Furthermore, limitations in the number of observations in earlier years led us to use only FYs 1985 through 1995 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

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

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

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-8 and A-9, 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-8

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*
Constant	-0.0026 (-1.8353)	-0.000 (-0.2761)	-0.002 (-1.0461)	-0.0004 (-1.430)	0.0004 (0.7059)	-0.0010 (-1.2143)	-0.0010 (-1.3102)	-0.0017 (-2.8586)	-0.0005 (-1.3633)
$F30CCRx_{y,t}$	0.4169 (10.6144)	0.1829 (10.0809)	0.2784 (16.0423)	0.3891 (22.8108)	0.3631 (14.0574)	0.4777 (12.8740)	0.4908 (17.0835)	0.5207 (26.6417)	0.3440 (24.4717)
Summary Regression Statistics									
R^2	0.554	0.528	0.740	0.852	0.686	0.647	0.764	0.887	0.869
F-statistic	112.665	101.625	257.357	520.331	197.609	165.740	291.847	709.781	598.862

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

Exhibit A-9

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*
Constant	0.02183 (2.2116)	0.0096 (2.1410)	0.0107 (2.6159)	0.0126 (3.8437)	0.0142 (4.2219)	0.0157 (4.5453)	0.0144 (5.1655)	0.01393 (4.8792)	0.0068 (2.1529)
$F30CPR_{x,t}$	0.7411 (12.6058)	0.7879 (26.8232)	0.7988 (29.1349)	0.8132 (36.5446)	0.8143 (34.8316)	0.8217 (32.8198)	0.8076 (37.4709)	0.8384 (35.5544)	0.8913 (36.0619)
Summary Regression Statistics									
R^2	0.637	0.889	0.904	0.937	0.931	0.923	0.940	0.933	0.935
F-statistic	158.906	719.485	848.844	1335.506	1213.239	1077.141	1404.068	1264.112	1300.463

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

3. Simulating Loan Performance

We use 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 95 percent for claims and 99 percent for prepayments. Exhibit A-10 shows the breakdown of the predicted versus the actual claim and prepayment counts across all LTV categories.

Exhibit A-10

Simulation of 15-Year FRM Claims and Prepayments for the Period 1983-95 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	493	544	110%	8125	7804	96%
0-65%	260	234	90%	37998	37839	100%
65-80%	899	847	94%	43779	43548	99%
80-90%	1480	1363	92%	33752	33423	99%
90-93%	875	833	95%	13994	13838	99%
93-95%	793	704	89%	10235	10149	99%
95-97%	1907	1700	89%	18835	18737	99%
97-100%	3270	3067	94%	28728	29019	101%
Investor*	2350	2384	101%	34090	33374	98%
Total	12327	11675	95%	229536	227731	99%

*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-11. 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-11

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	222	82%	1151	2220	193%
1986	616	476	77%	9462	13767	145%
1987	1099	898	82%	20073	21263	106%
1988	1675	1449	87%	10391	11001	106%
1989	1670	1524	91%	10786	10662	99%
1990	1473	1337	91%	14339	12833	89%
1991	1364	1259	92%	17394	15059	87%
1992	1335	1233	92%	34274	31213	91%
1993	1085	1157	107%	49815	51057	102%
1994	954	1114	117%	44297	43300	98%
1995	722	964	134%	17053	13685	80%
Totals	12327	11675	95%	229536	227731	99%

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. Full forecasts are available in Appendix F. Exhibits A-12 and A-13 show conditional claim and prepayment rates for the FY 1988 to 1996.

Exhibit A-12

Forecast of Conditional Claim Rates for 15-Year FRMs for FYs 1988 through 1996

Policy Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.007	0.009	0.000	0.000	0.000	0.004	0.000	0.011	0.005
2	0.168	0.177	0.150	0.129	0.078	0.055	0.060	0.070	0.043
3	0.501	0.470	0.516	0.402	0.406	0.229	0.125	0.392	0.290
4	0.738	0.705	0.612	0.632	0.334	0.199	0.226	0.539	0.437
5	0.818	0.814	0.678	0.595	0.402	0.306	0.229	0.614	0.559
6	0.680	0.632	0.677	0.590	0.506	0.316	0.214	0.629	0.614
7	0.617	0.581	0.727	0.527	0.445	0.266	0.176	0.539	0.522
8	0.617	0.788	0.687	0.545	0.492	0.339	0.184	0.591	0.638
9	0.685	0.760	0.665	0.514	0.465	0.326	0.165	0.757	0.632
10	0.631	0.708	0.595	0.455	0.421	0.298	0.155	0.546	0.516
11	0.580	0.637	0.524	0.391	0.365	0.263	0.134	0.482	0.455
Ultimate	4.489	4.011	3.322	2.511	2.468	1.837	1.391	3.259	3.569

Source: A43 database, December 1995 extract.

Exhibit A-13

Forecast of Conditional Prepayment Rates for 15-Year FRMs for FYs 1988 through 1996

Policy Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.542	0.502	0.584	0.670	0.639	0.777	0.774	1.244	1.670
2	1.875	2.427	2.855	4.747	6.316	4.914	2.920	6.753	2.928
3	3.721	4.337	9.183	18.925	13.864	5.601	6.238	8.166	5.131
4	5.401	12.088	23.005	24.719	7.907	11.497	6.142	10.217	8.615
5	11.641	21.494	24.424	9.378	16.099	10.241	6.628	13.083	10.469
6	20.014	22.680	9.112	22.347	12.621	11.114	8.342	14.218	9.777
7	21.272	9.516	19.050	18.017	14.711	15.372	10.186	15.293	11.642
8	8.731	19.708	15.462	17.687	16.897	17.093	10.617	16.326	12.581
9	12.633	12.431	11.928	15.420	13.966	13.456	8.935	13.666	10.403
10	8.255	9.540	10.252	12.162	10.361	10.347	7.221	9.922	8.122
11	7.582	9.561	9.738	10.891	10.203	10.530	6.816	9.004	7.836
Ultimate	72.971	79.612	82.212	86.275	80.363	77.884	64.033	77.869	69.116

Source: A-43 database December 1995 extract.

Appendix B: Econometric Analysis of Adjustable Rate Mortgages

This section describes analyses performed specifically for the FY 1995 Review as well as technical refinements made to the econometric models developed last year. FY 1994 was the first year Price Waterhouse developed a unique econometric model to explain historical loan termination rates for adjustable-rate mortgages (ARMs). This appendix describes the econometric analysis we have performed on 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 ARMs were issued. Thus, there is relatively limited data on ARMs, and the available data is heavily skewed towards recent originations.

Our ARM modelling approach follows that described in the previous section on the fixed-rate mortgage (FRM) section. 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. Third, the number of initial LTV cell categories was reduced to 2 -- 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 Rates

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

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

$PAYINC_{y,t}$ ≡ 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).

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 VI. 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 0.63 and the payment to income ratio has a coefficient of 0.023. Thus in the absence of rising interest rates, ARMs are calculated to claim at about a 37 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 (-1.803)
$F30CCR_{i,j,k,t}$	0.631 (6.066)
$PAYINC_{k,t}$	0.023 (2.454)
$P_{3,t}$	0.002 (1.521)
$P_{4,t}$	0.004 (2.004)
$P_{5,t}$	0.008 (3.778)
$P_{6,t}$	0.006 (2.619)
$P_{7,t}$	0.004 (1.703)
$P_{>8,t}$	0.002 (0.802)
$LTV_{i,j}$	-0.001 (-0.977)
Summary Regression Statistics	
Adjusted R^2	0.558
F-statistic	25.526

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 1995. 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 Loan Size Category in FY 1995

Mortgage Type	House Price Category							
	1	2	3	4	5	6	7	8
30-Year Fixed Rate	52,139	65,719	74,195	82,796	89,056	95,560	103,983	66,571
30-Year Streamline	58,055	70,180	78,435	86,253	91,749	100,797	108,757	51,020
Adjustable Rate Mortgage	**64,661**	**79,023**	**88,939**	**99,660**	**102,656**	**108,112**	**116,002**	**n/a**
15-Year Fixed-Rate	36,137	50,417	57,347	64,477	73,048	79,419	89,390	50,061
15-Year Streamline	41,599	53,389	57,854	62,778	67,990	74,332	80,822	33,974
Graduated Payment Mortgage	70,074	94,321	106,185	115,238	113,840	113,401	133,494	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

[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.

associated with ARMs. Furthermore, this allows us to attribute the larger ARM origination 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 1988 and 1995, representing almost 63 percent of ARM dollar volume in FY 1995.

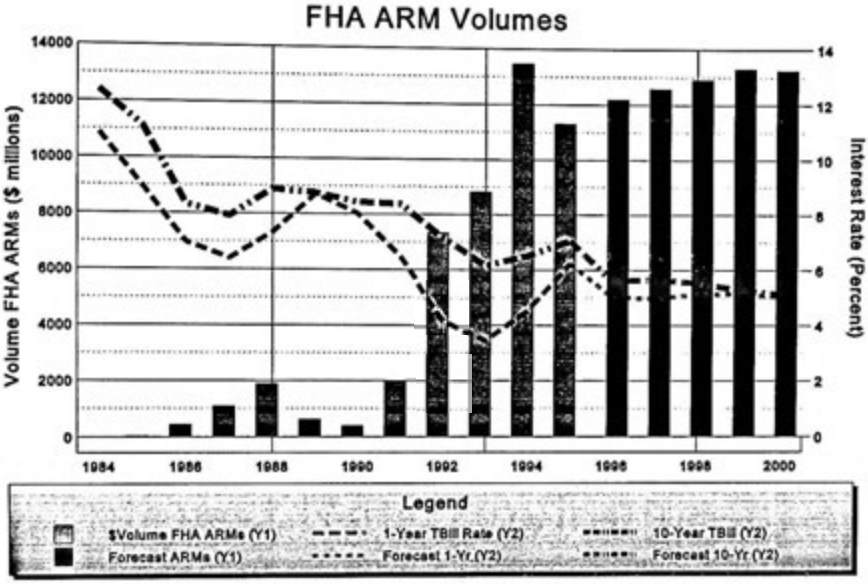
Exhibit B-3

Percentage of ARM Dollar Volume Originated Between FY 1988 and FY 1995								
State	1988	1989	1990	1991	1992	1993	1994	1995
Arizona	3.86%	2.61%	1.67%	2.93%	3.57%	3.19%	3.34%	3.87%
California	9.70%	9.54%	9.51%	10.91%	12.36%	20.18%	26.43%	22.39%
Colorado	3.93%	4.42%	3.42%	4.07%	4.80%	4.71%	4.07%	5.20%
D.C.	3.22%	2.24%	2.13%	3.38%	4.67%	5.88%	4.20%	3.51%
Florida	4.25%	3.88%	1.69%	3.53%	4.25%	3.91%	3.73%	3.94%
Georgia	4.09%	3.07%	2.31%	2.98%	3.05%	2.23%	2.49%	3.03%
Illinois	4.37%	4.53%	11.27%	11.42%	9.77%	9.04%	8.49%	10.13%
Maryland	3.71%	3.57%	4.03%	5.47%	4.41%	3.79%	3.53%	3.61%
Minnesota	5.11%	2.99%	11.43%	10.60%	7.49%	7.01%	5.37%	3.19%
Washington	5.19%	6.18%	2.81%	4.58%	4.08%	4.52%	4.20%	3.84%

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 1995, along with forecasted values for FYs 1995 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 Model

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

A. 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

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

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 modelling 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 0.26, suggesting that FHA ARMs are 26 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	0.054 (19.206)
$F30CPR_{i,j,k,t}$	0.264 (21.179)
$P_{1,t}$	-0.057 (-15.088)
$P_{2,t}$	-0.042 (-11.643)
$P_{3,t}$	-0.026 (-7.646)
$P_{4,t}$	-0.014 (-4.026)
$LTV_{4,j}$	0.011 (5.025)
Summary of Regression Statistics	
Adjusted R^2	0.889
F-statistc	278.348

IV. Technical Refinements

Improvements were made to the econometric models used to estimate the performance of ARMs allowing us to create regressions using various house price and loan-to-value (LTV) aggregates. Additional refinements were incorporated to facilitate the construction of regression equations using various policy year and LTV dummy variables. These additions to last year's models improved our regression results as measured by the adjusted standard error which indicates the level of fit between actual and predicted values.

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.

The FY 1994 Review was the first to distinguish between the behavior of SRs and that of purchase mortgages, and in this year's Review we refined these models. Below, we discuss our data source, the difficulties inherent in analyzing SRs, our modelling 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, then 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, loan size 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 loan size categories.[5] Furthermore, whereas in the main 30-year FRM model, separate equations are estimated for each of nine LTV categories, the SR

[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.

econometric model consists of only one equation estimated across 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 1995. 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:

$$S30CCR_{y,r,t} = \sum_{m=1}^{6} \alpha_m S_{m,y,r} + \sum_{n=1}^{4} \gamma_n P_{n,t} + \beta_1 EM_{y,t-1} \cdot EQADJ_{y,t-1} + \beta_2 HPDISP_{y,t-1} + \beta_3 PAYMENT_{y,t} \cdot (1 - ADJ_{y,r}) + \varepsilon_{y,r,t} \quad (1)$$

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),

$HPDISP_{y,t-1}$ ≡ house price dispersion index experienced by loans originated in 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. Exhibit C-1 displays the differences in equity growth for the two loan types.

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 ($1-ADJ_{y,r}$) 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)	
$S_{1,y,r}$	0.1541 (0.1850)
$S_{2,y,r}$	-0.0341 (-0.0504)
$S_{3,y,r}$	-0.1639 (-0.3000)
$S_{4,y,r}$	-0.1893 (-0.4375)
$S_{5,y,r}$	-0.3411 (-0.9563)
$S_{6,y,r}$	-0.3244 (-1.1307)
$P_{1,t}$	-17.1595 (-12.9452)
$P_{2,t}$	-15.0553 (-11.2784)
$P_{3,t}$	-14.1331 (-10.1484)
$P_{4,t}$	-13.6775 (-9.1695)
$EM_{y,t-1} * EQADJ_{y,t-1}$	-5.1018 (-1.9247)
$HPDISP_{y,t-1}$	15.2321 (3.4101)
$PAYMENT_{y,t} * (1 - ADJ_{y,t})$	28.2737 (5.9250)
Summary Regression Statistics	
Adjusted-R^2	0.828
F-statistic	41.145

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 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)	
$S_{1,y,r}$	0.1122 (0.5559)
$S_{2,y,r}$	-0.0035 (-0.171)
$S_{3,y,r}$	-0.2482 (-1.230)
$S_{4,y,r}$	-0.2566 (-1.272)
$S_{5,y,r}$	-0.4264 (-2.1134)
$S_{6,y,r}$	-0.3849 (-1.9075)
$P_{1,t}$	-3.132 (-20.8550)
$P_{2,t}$	-1.8698 (-9.3683)
$P_{3,t}$	-1.7393 (-7.3966)
$P_{4,t}$	-2.3958 (-11.2343)
$PVDIFPOS_{r,t}$	34.3546 (8.3388)
$PVDIFNEG_{r,t}$	32.4278 (4.5539)
Summary Regression Statistics	
Adjusted-R^2	0.797
F-statistic	36.636

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
$S30CxR_{n,t}$	0.1942 (26.1366)	0.6648 (17.6060)
Summary Regression Statistics		
Adjusted-R^2	0.961	0.889
F-statistic	344.116	111.668

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 have 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 should facilitate 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 current 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 does not capture the significant decreases in loss rates that occurred in FYs 1994 and 1995. Also, while the results of this analysis are applicable to other types of claim settlement, 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 December 1994, there were no linked observations for FY 1995 terminations and an insufficient number of FY 1994 terminations to permit detailed loss rate analysis for these two years. However, there were sufficient loss data in the A-43 and A-43C databases to permit analysis of aggregate loss rates and time lags for FYs 1994 and 1995, which are described in Section III of this appendix.

III. Trends in Historical Data

While the long-term objective of this analysis is to create a model that predicts future loss rates, an intermediate 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 is encouraging 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, while the acquisition cost is the amount FHA pays out directly to the lender. 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 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 skew 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. This reduction can be attributed to 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 a 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 Loss Rates by Relative House Price Category and Termination Year (in percentage)								
Termination Year	House Price Category 1	House Price Category 2	House Price Category 3	House Price Category 4	House Price Category 5	House Price Category 6	House Price Category 7	House Price Category 8
1975	33.20	30.42	27.89	24.87	33.45	29.39	25.73	n/a
1976	37.13	30.64	27.35	26.71	25.20	22.28	25.92	22.69
1977	37.52	30.43	29.43	28.58	23.58	22.30	29.34	17.11
1978	43.25	33.68	35.54	30.27	30.31	22.74	36.35	26.22
1979	44.78	37.80	36.75	35.71	25.89	25.52	28.77	35.95
1980	47.82	38.79	38.61	33.46	33.54	27.42	34.38	38.97
1981	47.15	41.79	39.71	36.18	36.27	34.53	35.49	41.16
1982	48.16	41.21	36.70	35.16	34.24	34.82	34.13	41.44
1983	45.56	36.75	31.95	29.70	29.47	26.95	29.80	32.72
1984	46.91	37.49	35.29	33.66	32.98	33.45	35.77	34.02
1985	46.69	38.38	34.83	32.94	32.47	32.01	32.97	31.48
1986	50.91	42.00	38.79	35.40	34.59	31.84	35.95	24.60
1987	54.39	45.34	42.50	39.00	36.56	35.55	38.55	20.31
1988	54.61	46.27	41.99	38.95	37.18	36.39	40.40	20.99
1989	51.79	42.74	39.69	36.82	35.62	35.25	39.43	14.05
1990	48.84	42.42	39.05	35.61	33.62	33.16	37.59	7.58
1991	50.15	43.77	39.09	35.17	32.58	31.61	34.02	14.90
1992	51.02	44.17	39.69	34.60	31.78	29.49	31.69	16.40
1993	50.99	42.87	38.50	33.82	30.47	27.37	28.29	4.86
1994	49.46	43.29	38.14	33.13	29.88	26.76	26.89	7.64
1995	44.84	38.17	34.06	29.61	27.11	22.53	23.98	4.65

Source: A-43 database, December 1995 extract.

Exhibit D-2

Historical Loss Rates by Loan Type and Termination Year (in percentage)						
Termination Year	30-year FRMs	30-year SRs	ARMs	15-year FRMs	15-year SRs	GPMs
1975	30.17	n/a	n/a	n/a	n/a	n/a
1976	30.94	n/a	n/a	101.32	n/a	n/a
1977	31.62	n/a	n/a	70.06	n/a	n/a
1978	36.09	n/a	n/a	79.65	n/a	n/a
1979	38.11	n/a	n/a	78.85	n/a	20.60
1980	40.05	n/a	n/a	78.20	n/a	30.34
1981	40.99	n/a	n/a	64.47	n/a	35.30
1982	40.00	n/a	n/a	59.46	n/a	34.20
1983	35.26	n/a	n/a	49.70	n/a	27.73
1984	38.18	n/a	n/a	42.19	n/a	31.87
1985	37.44	n/a	n/a	40.27	n/a	30.64
1986	39.62	n/a	39.83	40.48	n/a	33.27
1987	42.02	n/a	41.18	43.11	n/a	36.53
1988	42.01	41.05	39.83	42.38	n/a	36.68
1989	39.96	40.43	38.01	39.13	39.05	33.88
1990	38.23	41.60	33.33	37.78	65.61	31.90
1991	37.55	38.52	33.21	37.76	39.39	31.30
1992	37.27	36.82	33.41	37.04	30.85	33.32
1993	36.47	34.49	34.74	37.42	29.29	34.56
1994	36.43	34.39	35.25	34.44	35.67	38.31
1995	32.34	32.98	33.70	27.16	30.87	36.62

Source: A-43 database, December 1995 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	15.85	3.77

Source: A-43 database, December 1995 extract.

IV. Loss Rate Model Specification

For the purposes of our analysis, loss rates 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.

In Exhibit D-4 the loss rate components and total loss rate as a percentage of acquisition cost are given by termination year. The reduction in loss rates over time is largely reflected in changes in the asset value, the largest component of loss rates.

Exhibit D-4

Loss Rate and its Components as a Percentage of Acquisition Cost by Termination Year[1] (in percentage)

Termination Year	Holding Costs	Foreclosure Costs	Foregone Interest Cost	Loss on Asset Value	Total Loss Rate
1986	5.79	3.68	6.72	22.13	38.32
1987	13.55	3.49	5.46	18.55	41.05
1988	10.27	4.25	7.38	19.35	41.25
1989	8.49	3.77	7.67	19.38	39.31
1990	4.79	5.02	9.62	18.29	37.72
1991	5.31	5.35	10.14	16.36	37.16
1992	6.29	5.78	10.33	14.62	37.02
1993	6.14	6.43	10.76	13.01	36.34
1994	6.15	7.68	11.86	10.70	36.39
1995	6.84	6.81	11.82	7.07	32.54

[1]There was insufficient data to calculate values for all termination years.
Source: A-43 database, December 1995 extract; A-43C database, January 1996 extract; SAMS database, December 1994 extract.

A. Estimation of Foreclosure Cost

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

$$FCRPB = \alpha + \beta_1 TLAG + \beta_2 JUD + \beta_3 PYR + \beta_4 PYRSQ \quad (1)$$

where

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

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

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

PYR ≡ policy year, and

PYRSQ ≡ the square of policy year.

The results of this regression are given in Exhibit D-5. 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 0.004 on the termination lag variable.

Exhibit D-5

Regression Results for Estimating Foreclosure Costs as a Percentage of RPB (t-statistics in parentheses)				
CONSTANT	TLAG	JUD	PYR	PYRSQ
0.0186 (5.854)	0.004 (53.307)	0.0261 (19.557)	-0.011 (-13.035)	0.001 (21.791)

B. Estimation of the Holding Cost

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

$$Holding\ cost = Nettax + Repair + Mando + Disb + F63mopex + Reclmop - Rtlinc - Othinc - Rec - Lbox \quad (2)$$

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,

Disb ≡ disbursements,

F63mopex ≡ sum of maintenance and operation expenses that HUD paid on behalf of the property while its accounting was done by F63,

Reclmop ≡ the amount of money previously classified as another expense but now reclassified as maintenance and operation expense,

Rtlinc ≡ sum of money that HUD received if it rented out the property during the time it owned it,

Othinc ≡ any income not previously mentioned that HUD received on behalf of a property,

Rec ≡ the amount of money that is due HUD on behalf of a property but has not yet been received, and

Lbox ≡ the amount of money that HUD has received on behalf 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 principal balance and

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

Exhibit D-6 shows the results of this regression. The constant has a coefficient of 0.032 while the disposition lag has a coefficient of 0.006. This shows that the longer FHA takes to sell a property, the greater the holding cost.

Exhibit D-6

Regression Results for Estimating Holding Costs as a Percentage of RPB (t-statistics in parentheses)	
CONSTANT	DLAG
0.032 (29.139)	0.006 (50.670)

C. The Change in Asset Value Component

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

$$AVUPB = \alpha + \beta_1 DLAG + \beta_2 JUD + \beta_3 PYR + \beta_4 PYRSQ + \beta_5 LSIZE + \beta_6 HPDISP + \beta_7 LT0 + \beta_8 LT1 + \beta_9 LT2 + \beta_{10} LT4 + \beta_{11} HLS1 + \beta_{12} HLS2 + \beta_{13} HLS3 + \beta_{14} HLS4 + \beta_{15} HLS5 + \beta_{16} HLS6 + \beta_{17} HLS7 + \beta_{18} HLS8 \quad (4)$$

where, in addition to previously mentioned variables,

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

LSIZE ≡ the original mortgage amount in dollars,

HPDISP ≡ house price dispersion index by disposition year,

LT0 ≡ dummy variable equal to 1 if a GPM resulted in the claim and 0 otherwise,

LT1 ≡ dummy variable equal to 1 if an ARM resulted in the claim and 0 otherwise,

LT2 ≡ dummy variable equal to 1 if a F15 resulted in the claim and 0 otherwise,

LT4 ≡ dummy variable equal to 1 if a S30 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-7 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 -0.009685, 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, dummy variables for all loan types except 30-year FRMs and 15-year SRs were included to allow us to forecast loss rates for each loan type.

Exhibit D-7

Regression Results for Estimating the Loss on Asset Value as a Percentage of RPB		
Variable	**Coefficient**	**T-statistic**
CONSTANT	0.465	12.975
DLAG	0.009	22.336
JUD	0.033	7.012
PYR	-0.010	-2.014
PYRSQ	-0.001	-2.711
LSIZE	-0.000004	-37.529
HPDISP	0.645	9.482
LT0	-0.075	-6.454
LT1	-0.017	-0.929
LT2	-0.069	-6.217
LT4	-0.094	-1.409
HLS1	-0.099	-3.524
HLS2	-0.101	-3.546
HLS3	-0.112	-3.939
HLS4	-0.102	-3.596
HLS5	-0.104	-3.644
HLS6	-0.110	-3.853
HLS7	-0.100	-3.507
HLS8	-0.041	-0.797

V. Forecasting Loss Rates

Since the available loss rate data did not contain a sufficient amount of information on loan terminations in FY 1994 and FY 1995, and these two years displayed significant declines in loss rates from previous years, no attempt was made to forecast loss rates. However, in future analyses, the model described in this appendix will represent the primary means for forecasting future loss rates.

Appendix E: Cash Flow Analysis

I. Introduction

The purpose of the actuarial analysis is to assess the Mutual Mortgage Insurance Fund's ability to withstand future losses from both 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 were used to evaluate the financial viability of the Fund.

In evaluating the Fund's value, we examined the Fund in a manner similar to how 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 which incorporates projections of loan performance and information about its insurance-in-force to project the Fund's major cash flows. The discounted value of these cash flows equals the current value of changes in the Fund's equity.

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 for each cross-sectional category of loan-to-value (LTV) ratio and house price on an origination year/post-origination 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 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 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 (IIF):** 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.

- **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.

- **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. They reflect the average contract rate for all originations during that fiscal year. For adjustable rate mortgages, this is the initial mortgage interest rate. For future years, we use April 1996 DRI forecasts. These values are shown in Exhibit E-2.

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	7.39%	7.39%	7.39%	7.39%

*Shaded values indicate forecast values. 1996 Forecasts are from DRI February 1996 Control Forecasts. The FHA Contract Interest Rate is a linear function of the Freddie Mac Commitment Rate, which is provided by DRI. See Appendix D for more information on the computation of the FHA Contract Interest Rate.

- **Termination Year:** 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 only six months long (i.e., it ends at the end of the first fiscal year). The 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 of the mortgage; for 30-year mortgages, the model has 31 fiscal policy years.

B. Premiums

The insurance premium is the primary revenue source collected by the Fund. If the Fund's mortgages are 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 fiscal year 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 upfront premium be collected. In addition, an

annual renewal premium is assessed on the outstanding balance for a period that depends on the initial LTV of the loan.

- As of April 17th, 1994, FHA lowered the upfront 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 different upfront premium rates for FY 1994. In addition, FHA has maintained the FY 1994 NAHA annual premium schedule into the future.

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

Exhibit E-3

Upfront 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 16th, 1994	2.0%	3.0%
April 17th 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 LTV's	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 streamline refinancings 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 1 July 1991)	3.8% Upfront Premium - No Annual Premiums	2.4% Upfront Premium - No Annual Premiums
FY 1992	3.8% Upfront Premium - Annual Premiums 7 Years	3.8% Upfront Premium - Annual Premiums 7 Years
FY 1993	3.0% Upfront Premium - Annual Premiums 7 Years	2.0% Upfront Premium - No Annual Premiums
1994 until April 17, 1994	3.0% Upfront Premium - Annual Premiums 7 Years	2.0% Upfront Premium - No Annual Premiums
April 17, 1994 until end of FY 1994	2.25% Upfront Premium - Annual Premiums 7 Years	2.0% Upfront Premium - No Annual Premiums
FY 1995 through FY 2000	2.25% Upfront Premium - Annual Premiums 7 Years	2.0% Upfront Premium - No Annual Premiums

Calculating the Premiums

The upfront premium is calculated as follows:

> ***Premium Amount = Origination Amount (excluding any financed upfront premium)* Mortgage Insurance Premium Rate (percentage)***

The upfront premiums calculated by our model may not be equivalent to the upfront premiums received by FHA in a particular fiscal year due to limitations inherent in the data we were 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 1995 included in FHA's FY 1995 financial statements. For example, in FY 1995, the data from the A-43 database produced a larger volume of originations than the endorsements on FHA's financial statements. This is primarily due to originations in FY 1995 not being endorsed until FY 1996. To adjust for this time lag in the future, we have included in our estimates of premium income an adjustment of $100 million in FY 1995 to reflect the upfront premiums for loans endorsed in FY 1996, but originated in FY 1995. Since our model already includes all other future cash flows associated with these loans in our estimate of the FY 1995 book's economic value, this change makes our upfront premium calculation consistent with our other cash flow predictions.

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

However, when a mortgage defaults, FHA must pay a claim consisting of the unamortized portion of both the mortgage and financed premium. Therefore, FHA effectively collects very little of the upfront premium on mortgages that default 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 calendar year. The general annual premium calculation is as follows:

*Annual Premium = Amortized Insurance in Force (excluding any upfront premiums) * Annual Insurance Premium Rate (percentage)*

Even though FHA is responsible for insuring financed upfront premiums, the annual premium is not assessed on the financed upfront premium.

C. Losses Associated with Claims

Losses due to claims are the largest expense to the Fund. 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 additional 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:

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

In our analysis, we assumed that the primary cost associated with claims was 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 14.24 months. Thus, the additional mortgagee costs were estimated as interest income lost on the outstanding balance of the mortgage for 14.24 months.

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 1988 to be 7 percent, which is what we assume for all future claims settled by foreclosure and conveyance. However, we also assume that the cost of claims settlement factor on pre-foreclosure sale will be 3 percent, since many of the legal and administrative costs associated with foreclosure will be avoided.

Net 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 have used an average of the last three years. This is approximately 5.35 months. Proceeds received in fiscal year *t* are calculated as follows:

$$\textit{Net Proceeds}_t = (\textit{Property Disposition Lag}/12) \times \textit{Claim Payments}_{t-1} \times (1-\textit{Loss Rate}) + ((12 - \textit{Property Disposition Lag})/12) * \textit{Claim Payments} (1 - \textit{Loss Rate})_t$$

The definition of a loss rate is as follows:

$$\textit{Loss Rate on Claim Amount} = \textit{Loss Amount}/\textit{Acquisition Cost}$$

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. This will include the holding costs that FHA incurs until FHA sells the property.

The loss ratios were calculated based on data from the December 1995 data cut of the A-43 database. We examined the data for different trends in loss rates. Specifically, we analyzed loss rates by different cross sections of 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.

For the FY 1995 Actuarial Review, Price Waterhouse LLP has constructed relative house price categories 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 (MSA's) and the 50 states. House price category eight is defined to represent all originations in areas that exceed the FHA limit, as well as loans missing MSA or state identifiers. Such loans are comprised of 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. The decline in loss rates between FYs 1994 and 1995 can be explained by FHA's ability to reduce losses by disposing of properties more quickly. For our future projections, we have used an average of FHA's loss rates from FYs 1992 though 1994 by house price and LTV category. Exhibit E-6 presents a summary of loss rates used for 30-year FRM mortgages by loan size and termination year status.

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	0.45	0.38	0.34	0.29	0.27	0.22	0.24	0.05
Streamline 30s	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
Fixed 15s	0.38	0.25	0.20	0.21	0.18	0.24	0.21	n/a
Streamline 15s	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.

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

Legislation recently passed by Congress 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, and our own analysis suggests that the loss rate on future mortgage assignments is likely to be 49 percent, compared to 35 percent for future property conveyances. (This represents an increase from our estimate of 42 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. As mentioned in the Executive Summary, we estimate that the economic value of the Fund would be $513 million lower, and the FY 1995 capital ratio would be 0.15 percentage points lower if FHA retained the assignment program in its current form.

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 makes it difficult for us to provide a dollar estimate of the effects they will have on the MMI Fund.

However, we are able to provide such estimates for the Pre-foreclosure Sales Program, which began as a demonstration program in October 1991, and 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 24.75 percent, versus 35 percent for properties conveyed over the same time period (as a percent of unpaid principal balance the estimated loss rates are 27 percent and 40 percent, respectively, which are identical to the rates reported by HUD in its 1994 report on the demonstration program). Since November, 1994, when the Pre-foreclosure Sales Program became a national program, FHA has successfully resolved 2.3 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 once the assignment program is terminated, we have assumed that FHA will 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. Based on these assumptions, we have estimated that the economic value of the

Fund in FY 1995 is higher by $155 million and the capital ratio is higher by 0.05 percentage points due to the current and future use of pre-foreclosure sales.

D. Refunded Premiums

With the initiation of the upfront premium in FY 1984, FHA began refunding a portion of the premium when borrowers prepaid their mortgages. The upfront 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 upfront premium.

The refunded dollars are calculated as follows:

Refund Dollars = Unamortized Insurance in Force (excluding upfront premium) *Prepayment Rate * Refund Rate * Adjustment factor for Overstatement of Refunds

The refund adjustment factor has been approximately 94 percent in past years, and we assume it will remain at 94 percent in future years. This adjustment factor can be attributed to the data and timing problems. We assume that a prepayment occurs in the middle of a fiscal policy year and we 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 will no longer receive a refund of their upfront premium after January 1, 1994.

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 this analysis is 0.1128 percent.

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 premium collected is more than sufficient to cover the costs of insuring the

Exhibit E-7

Percentage of Upfront 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		

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 until the Fund reaches its targeted capital ratio. This suspension is assumed to continue indefinitely, even though we estimate that the Fund has already achieved its capital ratio goals.

III. Economic Value and Capital Ratio

A. Historical Portfolio Rates

For years prior to FY 1992, we revised our interest rate series to reflect properly the interest that FHA accumulates on its investments. We were able to obtain actual FHA portfolio rates for FYs 1983 through 1995. Estimates of the rates were used prior to FY 1983. 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%		

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 fixed-rate mortgages (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 initial effective interest 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 effective 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
1996	7.54%	7.39%
1997	7.63%	7.48%
1998	7.57%	7.42%
1999	7.29%	7.14%
2000	7.13%	6.98%

Sources: A-43 December 1995 Extract and DRI Forecasting.

C. Credit Reform Act and Interest Rate Forecasts

The Federal Credit Reform Act of 1990 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 an account termed the "liquidating account." For books of business originating in FY 1992 or later, cash flows are processed through an account termed the "financing account."

The interest rates associated with the financing account will be generally lower than the interest rates associated with the liquidating account. These interest rates are based on ten-year Treasury bonds. 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 1995, the economic value is calculated by first determining the present value of the future cash flows for all previous books of business. This value is 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 are sufficiently seasoned that economic conditions will not affect their performance significantly.

For fiscal years beyond 1995, the economic value of the fund is 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 projected prepayment experience; the projected claims experience; the projected loss severity, and the size and composition of future books of business. The future capital ratios of the MMI fund depend not only on the performance of the current insurance-in-force but also on the performance of the future books of business.

Estimates of future Fund capital ratios may be viewed as a weighted average of the capital ratios of current and future books of business. The impact of the future books of business on the capital ratio depends on the changes in the economic environment. For example, if house prices were to fall following a recent rally, new books of business originated right before or at the beginning of the 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 overestimation of the future capital ratios. The composition of future books of business is also an important determinant of the Fund's future performance. If a larger percentage of high LTV loans originated in the future, we would expect future capital ratios to be lower than otherwise. 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.

FY 1995 was the first year Price Waterhouse developed a Demand Analysis Model (DAM) 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 on the demand for FHA products. For a given economic scenario, the DAM produces the demand for FHA mortgage insurance for each LTV, loan size, and mortgage product category, and for each income, wealth, and age category.

II. Overview of the Demand Analysis Model

The DAM was designed to achieve two objectives: consistency with the current Actuarial Review models and the ability 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

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1 These segments include insurance status (FHA versus conventional), product type (fixed versus adjustable 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.

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 decision from the choice of LTV ratio to 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. Additionally, the PMOM will produce estimates of the number of borrowers in each income, wealth, and age cohort, thereby allowing FHA to assess its ability to target specific borrower populations.

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 FHA's A-43.

American Housing Survey

The AHS is a biannual weighted borrower survey of approximately 50,000 households. It 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 also 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.

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, 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 according to education, income, tenure, marital status, and age. The second step was to match the cells in each survey according to income. 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 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 is 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 if 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, is transformed into a stationary time series. This is done by taking the ratio of per capita origination dollar volume to a house price index as dependent variable. A Durbin-

Watson test is then performed to estimate the autocorrelation of the disturbances. The model is 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, utilize 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 0 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 non-stationary and positively correlated with house price level and total population, the dependent variable used in the purchase mortgage originations regression is 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, population composition, mobility rate and those that are discussed below.

House Price Level

The intertemporal variation of house prices has an effect on the volume of mortgage purchase originations because higher house prices reduce households' ability to purchase homes. When house prices are relatively high, we expect real purchase volume (i.e., purchase dollar volume deflated by a house price index) to decrease although the dollar volume may increase. To capture the intertemporal variation of house prices, we construct a detrended house price index calculated as a house price index divided by a house price trend index.

Eligibility Criteria

A potential borrower's decision to purchase an FHA-insured mortgage will be affected by the underwriting criteria of FHA insurance and that 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

calculate *FHAELIG*, which is defined as the number of households eligible for FHA insurance given FHA's maximum payment-to-income 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 upfront 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:

$$\begin{aligned}\ln(PERPSVOL_t) = {} & \beta_0 + \beta_1 \ln(PERINC_{t-3}) + \beta_2 DETRHPI_{t-3} + \beta_3 \ln(PERSTART_{t-18}) + \\ & \beta 4 RATIO2545_t + \beta_5 SPRSUMR_t + \beta_6 FHAELIG_t + \beta_7 FHAPREM_t + \\ & \beta_8 UNEMPLOY_{t-3} + \beta_9 MOBSHR_t + \beta_{10} USERCOST_{t-3} + \epsilon_t\end{aligned} \qquad (2)$$

where

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

$PERINC_t \equiv$ per capita income at time t,

$DETRHPI_{t-3}$ ≡ a detrended house price index at time $t-3$,

$PERSTART_t$ ≡ the ratio of housing starts to total population at time t,

$RATIO2545_t$ ≡ the ratio of population age 24-45 to the total population,

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

$FHAELIG_t$ ≡ number of recently-moved households eligible for FHA-insured mortgages under current FHA underwriting constraints,

$FHAPREM_t$ ≡ the net present cost of FHA-insured mortgages,

$MOBSHR_t$ ≡ the ratio of recent movers to the total population, and

$USERCOST_{t-3}$ ≡ the after-tax cost of capital for homeowners at time $t-3$.

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 are 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) is 1.098, indicating significant positive serial correlation. After correcting for the AR(1) error, all of the variables have the expected signs and the R^2 improves from 0.617 to 0.716. In the AR(1) model, the effects of per capita income, housing starts, the ratio of the population between ages 25 and 45, the season, FHA eligible borrowers, and mobility are all positive; those of detrended house price index, FHA premiums, unemployment rate, and user cost are all negative. The most significant variables (in terms of t-values) in the purchase originations model appear to be the amount of new housing construction and the season (spring and summer).

Exhibit F-1

Regression Results for Purchase Mortgage Originations Model (t-statistics in parentheses)		
Variable	*Initial Maximum Likelihood Estimates.*	*First-order Corrected Estimates*
Constant	-37.667 (-2.474)	4.459 (0.302)
PERINC	-2.0 (-1.710)	0.922 (0.763)
DETRHPI	1.273 (1.028)	-2.293 (-1.865)
PERSTART	0.271 (2.726)	0.250 (2.607)
POP2545	38.148 (1.846)	3.814 (0.126)
SPRSUM	0.079 (1.907)	0.084 (2.260)
FHAELIG	0.581 (3.568)	0.144 (0.704)
FHAPREM	-32.756 (-2.685)	-1.500 (-0.107)
UNEMPLOY	0.077 (1.280)	-0.049 (-0.721)
MOBSHR	16.690 (3.30)	8.991 (1.292)
USERCOST	-0.047 (-1.119)	-0.049 (-1.276)
R^2	0.617	0.716
Rho	N/A	0.643

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

First, the mortgage interest rate is probably the most important among the four factors mentioned above. In a time with low current mortgage interest rates and high past mortgage interest rates, we would expect an increase in 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, which is 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, have been 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 $NMINGT30_t$, are constructed to capture the burn-out effect. For interest rate declining between 0-15%, the variable is defined as

$$NMIN015_t = \sum_{l=1}^{360} DUM015_{t-l,t} * (1 - DUMMIN_{t-l,t}) * UNBAL_{t-l,t} \qquad (4)$$

The timing of refinancing is determined by borrowers' expectation regarding future mortgage interest rate movements. In the RMOM, we have constructed two variables, $LAG3RATE_t$ and $LAG12RATE_t$, defined as the ratios of the current rate to the average of the rates in the past three and 12 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 will 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 those borrowers who are eligible 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's SR 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 widely used. The volume of FHA SRs was near zero before 1991.

The specification of the purchase mortgage origination model is:

$$\begin{aligned} CREFRATE_t = {} & \beta_0 + \beta_1 DROP015_t + \beta_2 DROP1530_{t-1} + \beta_3 DROPGT30_t + \beta_4 NMIN015_t + \\ & \beta_5 NMIN1530_t + \beta_6 NMINGT30_t + \beta_7 FHASRF91_t + \beta_8 LAG3RATE_t + \\ & \beta_9 LAG12RATE_t + \beta_{10} DETRHPI_t + \epsilon_t \end{aligned} \qquad (5)$$

where *CREFRATE*, 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 are 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 is because of the high autocorrelation in the disturbances, which is estimated to be 0.954. While all the explanatory variables are significant in the i.i.d. error model, only *DROP1530*, *NMIN015*, and *LAG3RATE* are significant at the 5% level in the AR(1) error model. The R^2 increases 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 the 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 for long-term forecasting we would also use the i.i.d. model.

The coefficients of *LAG3RATE* in both the i.i.d. error model and the AR(1) error model have the expected signs. The coefficient is 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 in parentheses)		
Variable	*Initial Maximum Likelihood Estimate.*	*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^2	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 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 (i.e. the payment-to-income ratio is less than 0.28, the LTV is less than 0.80, and the ratio of household wealth to the house price is greater than 0.25). 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 are 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, is 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 indicate that while user cost has a negative effect on the demand for housing, marriage, wealth, income, age, and education all have 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 loan size 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 down payment 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 loan size and LTV choices are both important from FHA's perspective, 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 will attempt 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 since it 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 the predicted house price 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 and economic and demographic variables, we employ the following model specification:

$$X_i\beta_y = \alpha + \beta_1(IPDIF_{yi}) + \beta_2 INCRATIO_i + \beta_3 WLTHRATIO_i + \beta_4 MAXLTVDM_{yi} + \beta_5 FRMRATE + \beta_6 EDUDUM_i + \beta_7 AGE_i + \beta_8 FRSTHO_i + \beta_9 CHILD_i + \beta_{10} MARDUM_i + \beta_{11} DUM86 + \epsilon_{y,i} \quad (6)$$

$IPDIF_{yi}$ ≡ 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 unconstrained housing demand,

$WLTHRATIO_i$ ≡ household wealth divided by the unconstrained 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,

$LNAGE_i$ ≡ 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 deductability 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 linked SIPP. The mortgage borrowers selected from the 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 is 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 is 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 results indicate that higher insurance premiums have a negative effect on the mortgage choice in high-LTV categories, with the magnitude of the effect increasing with the LTV category. 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 are mixed and insignificant. This result is 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* and mortgage rate on the LTV choice are all consistent with the economic theories discussed above, and are significant in some of the models, although not in all of the models. Education and first-time home ownership are significant in all 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 a lower LTV. However, for loans with LTV above 90 percent, they are more inclined to choose loans with higher LTVs. This indicates that age and wealth are positively correlated for low LTV borrowers, and are negatively correlated for high LTV borrowers.

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	-4.60281 (-6.13)	-2.97040 (-4.01)	0.56033 (0.70)
IPDIF	0.11981 (0.94)	0.22292 (1.35)	0.61067 (3.21)
INCRATIO	-0.45464 (-12.23)	-0.21622 (-5.55)	-0.04991 (-1.16)
WLTHRATIO	-0.02004 (-0.90)	0.02287 (1.09)	-0.04597 (-1.47)
MAXLTVDM	-0.16116 (-2.33)	-0.03759 (-0.45)	-0.27266 (-2.48)
FRMRATE	1.40323 (0.62)	9.04842 (3.54)	2.61875 (0.98)
EDUDUM	0.25413 (4.00)	0.32051 (4.38)	0.41479 (4.89)
LNAGE	1.17187 (8.52)	0.42036 (2.53)	-0.27674 (-1.40)
FRSTHO	-0.22011 (-3.14)	-0.26577 (-3.23)	-0.29564 (-3.03)
MARDM	0.05307 (0.76)	0.09281 (1.14)	0.21961 (2.28)
CHILD	-0.06757 (-2.31)	-0.13940 (-4.07)	-0.06197 (-1.61)
DUM86	-0.14584 (-1.32)	0.11048 (1.06)	-0.15112 (-1.43)

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 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 volume 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.

FHA's loan limit requirement precludes borrowers with higher housing demand from obtaining FHA loans. An increase in the loan limit will increase the likelihood that a given borrower would choose an FHA loan, particularly if that borrower is in a high cost area where median house prices are significantly higher than the maximum allowable FHA-insured loan.

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 be less likely to obtain ARMs. Similarly, older households are likely to be more risk averse and less mobile than younger households, and thus will have a lower likelihood 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 is 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:

$$\begin{aligned}\beta_j' x_i = {} & \beta_{j0} + \beta_{j1} IPDIF_i + \beta_{j2} DFINCOME_i + \beta_{j3} DFWEALTH_i + \beta_{j4} LLCNSTR_i + \\ & \beta_{j5} PMICNSTR_i + \beta_{j6} FHACNSTR_i + \beta_{j7} HPINDEX_i + \beta_{j8} FRMRATE_i + \\ & \beta_{j9} RATESPRD + \beta_{j10} EDUDM_i + \beta_{j11} LNAGE_i + \beta_{j12} FRSTHO_i + \\ & \beta_{j13} MARDUM_i + \beta_{j14} CHILD_i\end{aligned} \tag{7}$$

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,

$LLCNSTR_i$ ≡ this variable takes a value of zero for all borrowers in 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,

$MARDUM_i$ ≡ dummy variable for marital status,

$LNAGE_i$ ≡ log age of borrower *i*,

$FRSTHO_i$ ≡ dummy variable for first time homeowner, and

$CHILD_i$ ≡ number of children.

$FHACNSTR_i$ and $LLCNSTR_i$ are variables that are influenced by FHA policies. An increase in the maximum PTI ratio for FHA loans will decrease $FHACNSTR_i$ and will increase the FHA choice probability. An increase in FHA loan limit decreases $LLCNSTR_i$ and is expected to increase 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 homebuyers 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 MNL log of odds-ratio estimates are presented in Exhibit F-4. Each column represents the log odds ratio for one-pair of choices. As expected, the results indicate that *IPDIF*, *DFINCOME*, *LLCNSTR*, and *LNAGE* lower the probabilities of FHA choice. The significantly positive coefficient for *FRSTHO* is consistent with the fact that first-time homeowners tend to be FHA borrowers. The positive coefficient for *HPINDEX* indicates that borrowers are less likely to qualify for conventional loans when house prices are higher. *PMICNSTR* is the constraint that a borrower faces in order to obtain a PMI FRM loan. An increase in *PMICNSTR* raises the likelihood of choosing FHAFRM over CONFRM because borrowers choose FHA loans, but lowers the probability of choosing FHAFRM over CONARM and that of choosing CONFRM over CONARM because borrowers are more inclined to opt for ARMs to relieve the constraint. An increase in *FHACNSTR* lowers the probability of choosing FHAFRM over CONFRM. However, *FHACNSTR* increases the odds ratio of FHAFRM over CONARM and the odds ratio of CONFRM over CONARM. This is somewhat counterintuitive and is possibly due to the fact that borrowers constrained by FHA PTI and LTV criteria would also be constrained by PMI criteria.

The effects of income on FRM/ARM choice are different for conventional and for FHA borrowers. For conventional borrowers, income has a positive effect on ARM choice; for FHA

borrowers the effect is negative. In high cost areas (represented by *LLCNSTR*), households are more likely to choose ARMs, as evidenced by the significantly negative odds ratios of FHAFRM/CONARM, FHAFRM/FHAARM, and CONFRM/CONARM. The FRM rate and the FRM-ARM rate spread are found to be significant for conventional loans, but only the FRM-ARM spread is significant for FHA loans. The results indicate that from 1983-1993, the FRM/ARM choices for FHA borrowers are less sensitive to mortgage rate level than to mortgage rate spread. Most of the demographic variables are insignificant in explaining the FRM/ARM choice, with the exception of the education dummy, which indicates that more years of education raises the probability of choosing CONFRM over CONARM.

In constructing the FHA loan limit constraint variable *LLCNSTR* for the high cost areas, we take a national house price index and divide it by the FHA loan limit. We do not distinguish the house prices across the high cost areas. Since borrowers in higher cost areas are more likely to be constrained by the FHA loan limit, it is desirable to use the local median house price instead of the national price level to construct *LLCNSTR*. Similarly, house price indices for local areas would perform better than the national index *HPINDEX* used here.

Exhibit F-4

Log of Likelihood Ratio Estimates for Mortgage Choice Model (t-statistics in parentheses)						
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	-0.032 (-0.02)	7.834 (2.72)	5.398 (1.01)	13.26 (2.31)	-5.431 (-0.99)	7.867 (3.10)
IPDIF	-0.177 (-2.30)	-0.220 (-1.84)	-0.060 (-0.31)	-0.103 (-0.48)	-0.117 (-0.57)	-0.042 (-0.40)
DFINCOME	-0.336 (-1.97)	-0.807 (-3.62)	-1.012 (-1.92)	-1.483 (-2.72)	0.677 (1.25)	-0.471 (-2.61)
DFWEALTH	-0.029 (-0.65)	-0.059 (0.85)	-0.009 (-0.08)	0.079 (0.59)	-0.019 (-0.15)	-0.088 (1.46)
LLCNSTR	-0.200 (-2.06)	-0.648 (-5.10)	0.434 (1.83)	-0.014 (-0.06)	-0.634 (-2.58)	-0.448 (-4.25)
PMICNSTR	0.204 (1.48)	-0.229 (-1.54)	0.130 (0.35)	-0.303 (-0.80)	0.075 (0.20)	-0.433 (-3.03)
FHACNSTR	-0.583 (-1.70)	0.888 (2.00)	-1.147 (-1.26)	0.325 (0.34)	0.563 (0.61)	1.471 (3.56)
HPINDEX	3.361 (2.06)	-0.189 (-0.08)	-4.002 (-0.86)	-7.552 (-1.52)	7.363 (1.54)	-3.550 (-1.68)
FRMRATE	-18.29 (-5.20)	-36.58 (-7.89)	-6.77 (-0.65)	-25.07 (-2.33)	-11.51 (-1.08)	-18.30 (-4.80)
RATESPRD	4.606 (1.23)	-15.65 (-3.01)	30.29 (2.71)	10.03 (0.86)	-25.68 (-2.23)	-20.25 (-4.59)
EDUDUM	0.055 (0.77)	-0.217 (-2.06)	0.317 (1.59)	0.045 (0.21)	-0.262 (-1.27)	-0.272 (-2.95)
LNAGE	-0.657 (-4.19)	-0.549 (-2.47)	-1.090 (-2.58)	-0.982 (-2.18)	0.434 (0.99)	0.108 (0.57)

VII. Refinance Mortgage Origination Module

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 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 are FHA premiums, 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 loan size 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 are significant and move in the expected direction. Exhibit F-5 provides a summary of the coefficients obtained in the regression analysis and the overall fit of the equations.

Exhibit F-5

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)
$NPVPREM_{p,t}$	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)
$CQHPI_{p,t}$	-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)
$HPDISP_{p,t}$	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 in the same manner.

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 were estimated from the AMOM, the origination volume was divided into cells based on recent mobility rate trends. Thus, a percentage of the total originations were assigned to each wealth, income, marital status, age, and level of education category. The origination volume in each of these cells was then divided among the LTV, mortgage product, mortgage insurance, and loan size categories, based on the projections made in the PMOM. This enabled 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, loan size, mortgage product, and mortgage insurance for each cell, the distribution of the originations for a sub market was obtained by adding up all the cells in that market. Thus the DAM model provides the purchase origination volume for each LTV, loan size, and mortgage product category for FHA and for the conventional market as well.

Exhibit F-6

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
1994	41.05	8.17%	8.52%	6.75%
1995	34.23	7.18%	7.74%	3.71%
1996	40.13	8.80%	9.20%	5.68%
1997	39.20	8.06%	8.37%	5.55%
1998	40.54	7.75%	7.95%	6.03%
1999	44.14	7.64%	7.74%	6.72%
2000	50.08	7.68%	7.75%	7.05%

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-6 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 are generated by the PMOM, and the purchase originations are produced by multiplying FHA's market shares with the total purchase originations projected from the AMOM. The projections indicate that after the decline in 1995, FHA's purchase volume will increase to $40 billion in 1996 due to a continued drop in mortgage interest rates and will remain at that level until 1998. The DAM projected FHA's purchase volume in 1999 and 2000 to grow at 10% because of lower interest rates in that period. FHA's market share, especially its ARM market share, tends to increase when interest rates 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 these borrowers are more likely to acquire FHA loans.

Exhibit F-7 displays the projections of FHA refinance volume and its share in the refinance market. The FHA refinance volumes are 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 is projected to be $6.75 billion in 1996 before dropping to around $3 billion from 1997 to 2000. Exhibit F-7 also indicates that FHA's refinance market share increases when refinancings are booming as was the case in 1993 and 1994, and as is forecasted for 1996.

Exhibit F-7

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%

1995 Actuarial Review
Projected MMI Fund Performance for FYs 1995 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
1995	$7,086	2.05%	$38,402	$345,278	$543	n/a
1996	$8,173	2.34%	$46,932	$349,411	$875	$213
1997	$9,232	2.56%	$42,412	$360,102	$813	$245
1998	$10,354	2.78%	$43,191	$372,041	$845	$277
1999	$11,626	3.02%	$47,644	$384,838	$961	$311
2000	$13,026	3.24%	$53,688	$402,290	$1,051	$349

1995 Actuarial Review
All Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 95	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance In Force EOY 1995	NPV of Final Cash Balance 1995 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1995 Dollars
1975	$4,690,049	$265,620	4%	69%	$1,243,950	$274,193	5%	$8,572
1976	$5,733,803	$276,762	4%	66%	$1,637,618	$289,318	5%	$12,556
1977	$7,176,349	$463,457	4%	60%	$2,481,250	$484,191	4%	$20,734
1978	$10,024,889	$512,503	5%	58%	$3,579,724	$548,994	6%	$36,491
1979	$15,657,174	$161,558	9%	59%	$4,902,717	$218,555	10%	$56,998
1980	$14,875,835	($944,250)	14%	65%	$2,908,678	($904,396)	14%	$39,854
1981	$10,269,137	($1,675,098)	19%	67%	$1,260,643	($1,666,618)	19%	$8,480
1982	$7,323,155	($1,308,455)	18%	72%	$665,877	($1,309,467)	19%	($1,012)
1983	$26,794,976	($2,356,393)	14%	73%	$3,112,348	($2,346,094)	15%	$10,299
1984	$15,920,713	($1,783,682)	17%	69%	$1,695,404	($1,828,280)	18%	($44,597)
1985	$24,044,632	($2,095,785)	15%	71%	$2,578,761	($2,147,891)	16%	($52,106)
1986	$57,499,500	($1,480,072)	11%	59%	$16,010,073	($1,737,037)	12%	($256,965)
1987	$69,936,084	$47,472	7%	48%	$29,840,442	($445,514)	10%	($492,986)
1988	$37,430,728	($257,652)	8%	57%	$11,924,406	($539,397)	11%	($281,744)
1989	$39,762,853	($108,912)	6%	59%	$11,995,198	($414,023)	9%	($305,111)
1990	$47,125,640	$83,987	5%	58%	$15,389,355	($286,357)	8%	($370,344)
1991	$44,065,748	$224,005	3%	54%	$17,344,689	($63,231)	6%	($287,237)
1992	$45,088,830	$1,467,584	2%	29%	$30,680,128	$1,168,395	6%	($299,189)
1993	$73,771,187	$2,270,216	1%	12%	$64,204,078	$1,673,548	5%	($596,668)
1994	$79,576,312	$2,475,552	0%	4%	$76,398,030	$2,005,487	5%	($470,064)
1995	$38,402,486	$903,023	0%	2%	$37,894,054	$543,305	8%	($359,719)
1996	$46,932,459	$0	0%	0%	$0	$875,234	7%	$875,234
1997	$42,412,224	$0	0%	0%	$0	$813,266	7%	$813,266
1998	$43,190,863	$0	0%	0%	$0	$845,466	7%	$845,466
1999	$47,644,297	$0	0%	0%	$0	$960,856	7%	$960,856
2000	$53,688,485	$0	0%	0%	$0	$1,051,077	7%	$1,051,077

1995 Actuarial Review
30 Year Fixed Rate Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 95	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1995	NPV of Final Cash Balance 1995 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1995 Dollars
1975	$4,677,337	$265,620	4%	69%	$1,243,950	$274,193	5%	$8,572
1976	$5,721,479	$276,762	4%	66%	$1,637,618	$289,318	5%	$12,556
1977	$7,157,146	$462,447	4%	60%	$2,478,482	$483,150	4%	$20,703
1978	$8,632,397	$401,641	6%	56%	$3,162,570	$432,303	6%	$30,662
1979	$10,079,877	($43,400)	10%	56%	$3,371,798	($9,264)	10%	$34,135
1980	$9,717,260	($721,083)	14%	62%	$2,124,649	($695,827)	15%	$25,256
1981	$7,448,614	($1,299,923)	20%	64%	$1,029,056	($1,294,407)	20%	$5,517
1982	$5,650,600	($990,124)	18%	72%	$547,196	($991,507)	18%	($1,383)
1983	$21,915,781	($1,921,489)	14%	73%	$2,529,064	($1,913,891)	15%	$7,598
1984	$13,045,369	($1,476,485)	17%	69%	$1,391,270	($1,514,347)	18%	($37,862)
1985	$20,816,017	($1,921,138)	16%	71%	$2,124,664	($1,965,830)	17%	($44,692)
1986	$51,397,205	($1,474,349)	11%	59%	$14,211,026	($1,721,820)	13%	($247,471)
1987	$63,519,734	($22,509)	8%	48%	$27,022,596	($502,447)	10%	($479,938)
1988	$33,675,386	($261,750)	8%	58%	$10,333,513	($537,804)	11%	($276,054)
1989	$37,722,727	($97,807)	6%	60%	$11,154,611	($397,875)	10%	($300,068)
1990	$44,955,798	$98,848	5%	59%	$14,452,630	($266,480)	8%	($365,328)
1991	$39,499,647	$178,205	4%	55%	$14,833,707	($91,541)	6%	($269,746)
1992	$29,908,973	$1,011,365	2%	29%	$20,406,736	$761,106	7%	($250,259)
1993	$33,045,379	$1,150,234	1%	8%	$30,018,658	$1,029,431	6%	($120,803)
1994	$33,444,760	$1,050,999	0%	2%	$32,655,133	$1,090,120	6%	$39,121
1995	$24,955,867	$581,905	0%	2%	$24,483,856	$175,603	10%	($406,302)
1996	$26,918,827	$0	0%	0%	$0	$422,402	9%	$422,402
1997	$25,655,711	$0	0%	0%	$0	$380,941	9%	$380,941
1998	$26,628,004	$0	0%	0%	$0	$404,469	8%	$404,469
1999	$29,726,722	$0	0%	0%	$0	$513,923	8%	$513,923
2000	$35,502,692	$0	0%	0%	$0	$640,983	7%	$640,983

1995 Actuarial Review
30 Year Streamline Refinancings
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 95	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1995	NPV of Final Cash Balance 1995 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1995 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	($5,503)	6%	71%	$22,992	($5,526)	7%	($23)
1989	$94,929	($5,526)	7%	65%	$20,749	($5,731)	8%	($205)
1990	$61,328	($2,302)	5%	60%	$17,221	($2,422)	6%	($120)
1991	$664,003	$4,275	3%	73%	$140,728	$2,061	4%	($2,213)
1992	$5,589,531	$88,963	1%	51%	$2,669,394	$36,718	3%	($52,244)
1993	$24,443,680	$668,650	1%	19%	$19,691,505	$200,390	6%	($468,260)
1994	$24,747,731	$834,251	0%	6%	$23,152,551	$310,761	5%	($523,489)
1995	$1,228,356	$39,405	0%	2%	$1,199,066	($5,860)	7%	($45,265)
1996	$5,737,867	$0	0%	0%	$0	$40,286	7%	$40,286
1997	$2,686,041	$0	0%	0%	$0	$16,703	7%	$16,703
1998	$2,208,927	$0	0%	0%	$0	$12,015	7%	$12,015
1999	$2,934,406	$0	0%	0%	$0	($431)	8%	($431)
2000	$3,022,846	$0	0%	0%	$0	($36,616)	11%	($36,616)

1995 Actuarial Review
Adjustable Rate Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 95	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1995	NPV of Final Cash Balance 1995 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1995 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	($81)	14%	78%	$79	($81)	14%	($0)
1985	$34,030	($1,332)	19%	45%	$11,828	($1,340)	19%	($8)
1986	$425,080	($2,138)	12%	45%	$176,190	($2,370)	13%	($232)
1987	$1,073,636	$16,049	9%	41%	$526,838	$15,333	9%	($716)
1988	$1,878,056	$19,943	8%	42%	$903,550	$19,543	9%	($401)
1989	$606,113	$8,603	7%	42%	$307,941	$8,421	7%	($182)
1990	$376,587	$8,470	4%	34%	$237,509	$8,161	4%	($309)
1991	$1,955,825	$46,890	3%	23%	$1,461,255	$41,763	4%	($5,127)
1992	$7,348,970	$304,076	2%	17%	$6,021,245	$315,890	5%	$11,814
1993	$8,819,484	$300,421	1%	9%	$7,950,446	$341,091	6%	$40,670
1994	$13,464,660	$421,776	0%	3%	$13,069,060	$496,847	5%	$75,072
1995	$11,311,177	$263,125	0%	2%	$11,311,175	$367,828	3%	$104,703
1996	$12,201,357	$0	0%	0%	$0	$388,151	5%	$388,151
1997	$12,581,919	$0	0%	0%	$0	$399,105	5%	$399,105
1998	$12,913,129	$0	0%	0%	$0	$413,021	4%	$413,021
1999	$13,298,143	$0	0%	0%	$0	$427,110	4%	$427,110
2000	$13,245,540	$0	0%	0%	$0	$425,428	5%	$425,428

1995 Actuarial Review
15 Year Fixed Rate Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 95	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance In Force EOY 1995	NPV of Final Cash Balance 1995 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1995 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	($1,956)	15%	83%	$0	($1,824)	15%	$132
1981	$15,757	($3,122)	19%	55%	$3,438	($3,122)	19%	$0
1982	$26,255	($2,558)	12%	63%	$4,463	($2,558)	12%	$1
1983	$1,669,859	($1,713)	5%	75%	$282,077	($1,492)	5%	$221
1984	$892,494	($28,049)	7%	69%	$154,622	($28,305)	8%	($257)
1985	$1,757,014	($33,617)	6%	71%	$294,519	($34,395)	6%	($778)
1986	$4,768,486	$38,623	3%	63%	$1,429,822	$34,777	4%	($3,847)
1987	$4,637,691	$71,618	2%	52%	$2,009,965	$65,486	3%	($6,132)
1988	$1,379,386	$9,611	3%	52%	$538,478	$6,835	4%	($2,776)
1989	$1,000,022	$8,368	3%	52%	$381,388	$5,813	4%	($2,555)
1990	$1,257,529	$11,530	2%	51%	$502,894	$8,095	3%	($3,435)
1991	$1,353,084	$13,781	1%	46%	$630,522	$9,401	2%	($4,380)
1992	$1,068,403	$46,406	1%	26%	$760,229	$44,861	2%	($1,545)
1993	$1,435,305	$29,707	0%	11%	$1,271,284	$21,178	2%	($8,529)
1994	$1,375,063	$26,577	0%	4%	$1,324,704	$17,458	1%	($9,119)
1995	$495,966	$9,484	0%	1%	$495,966	$3,426	3%	($6,058)
1996	$1,009,752	$0	0%	0%	$0	$11,822	4%	$11,822
1997	$962,456	$0	0%	0%	$0	$10,941	4%	$10,941
1998	$998,902	$0	0%	0%	$0	$11,496	3%	$11,496
1999	$1,115,099	$0	0%	0%	$0	$16,045	3%	$16,045
2000	$1,331,872	$0	0%	0%	$0	$19,516	3%	$19,516

1995 Actuarial Review
15 Year Streamline Refinancings
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 95	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1995	NPV of Final Cash Balance 1995 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1995 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	($158)	2%	54%	$3,533	($170)	2%	($12)
1989	$5,170	($68)	1%	53%	$2,006	($76)	2%	($8)
1990	$5,064	($54)	1%	60%	$1,805	($63)	1%	($8)
1991	$110,692	$1,452	1%	53%	$47,365	$1,201	1%	($251)
1992	$1,000,454	$16,036	0%	31%	$684,618	$11,664	1%	($4,372)
1993	$5,914,465	$118,901	0%	13%	$5,161,056	$79,181	1%	($39,720)
1994	$6,459,228	$139,563	0%	5%	$6,111,721	$87,517	1%	($52,046)
1995	$359,028	$7,879	0%	2%	$351,905	$2,623	2%	($5,257)
1996	$1,012,565	$0	0%	0%	$0	$11,877	2%	$11,877
1997	$474,007	$0	0%	0%	$0	$4,963	2%	$4,963
1998	$389,811	$0	0%	0%	$0	$3,848	2%	$3,848
1999	$517,836	$0	0%	0%	$0	$3,445	2%	$3,445
2000	$533,443	$0	0%	0%	$0	$949	3%	$949

1995 Actuarial Review
Graduated Payment Mortgages
Base Case Scenario
($ Thousands)

Book of Business	Mortgage Originations	Cash Balance EOY 95	Cumulative Claim Rate ($) EOY	Cumulative Prepayment Rate ($) EOY	Insurance in Force EOY 1995	NPV of Final Cash Balance 1995 Dollars	Ultimate Claim Rate ($)	PV of Future Cash Flows 1995 Dollars
1975	$0	$0	0%	0%	$0	$0	0%	$0
1976	$0	$0	0%	0%	$0	$0	0%	$0
1977	$8,293	$1,011	2%	65%	$2,768	$1,041	2%	$30
1978	$1,383,838	$110,862	4%	66%	$417,154	$116,691	5%	$5,829
1979	$5,567,635	$204,957	8%	65%	$1,530,919	$227,819	9%	$22,862
1980	$5,143,908	($221,211)	13%	71%	$784,029	($206,746)	13%	$14,465
1981	$2,804,767	($372,052)	17%	74%	$228,149	($369,089)	17%	$2,963
1982	$1,646,300	($315,773)	20%	73%	$114,218	($315,402)	21%	$371
1983	$3,209,336	($433,191)	20%	70%	$301,206	($430,711)	20%	$2,480
1984	$1,981,613	($279,068)	21%	70%	$149,433	($285,546)	22%	($6,478)
1985	$1,437,571	($139,697)	16%	71%	$147,749	($146,326)	18%	($6,629)
1986	$908,730	($42,208)	13%	66%	$193,036	($47,623)	15%	($5,416)
1987	$705,022	($17,685)	11%	51%	$281,042	($23,886)	15%	($6,201)
1988	$370,610	($19,795)	14%	56%	$122,340	($22,275)	19%	($2,479)
1989	$333,891	($22,481)	16%	52%	$128,504	($24,574)	22%	($2,093)
1990	$469,333	($32,505)	14%	53%	$177,295	($33,648)	21%	($1,143)
1991	$482,496	($20,598)	10%	47%	$231,113	($26,117)	18%	($5,519)
1992	$172,499	$739	6%	19%	$137,906	($1,845)	18%	($2,584)
1993	$112,874	$2,303	2%	3%	$111,129	$2,277	15%	($26)
1994	$84,869	$2,387	1%	0%	$84,861	$2,784	10%	$398
1995	$52,091	$1,225	0%	1%	$52,085	($315)	23%	($1,540)
1996	$52,091	$0	0%	0%	$0	$697	18%	$697
1997	$52,091	$0	0%	0%	$0	$613	19%	$613
1998	$52,091	$0	0%	0%	$0	$617	19%	$617
1999	$52,091	$0	0%	0%	$0	$765	18%	$765
2000	$52,091	$0	0%	0%	$0	$815	17%	$815

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	0.02	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	0.57	1.19	0.98	0.50	0.40	0.46	0.39	0.34	0.36	0.24	0.17	0.18	0.37	0.30	0.30	0.29	0.26	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	0.60	0.53	1.28	0.82	0.83	0.83	0.72	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	1.29	0.69	0.85	1.67	1.12	1.19	1.15	1.00	0.98
5	0.62	0.47	0.36	0.45	0.92	1.55	3.39	5.57	3.33	6.70	5.48	2.16	1.40	1.89	1.94	2.28	2.31	1.21	1.01	0.87	1.90	1.37	1.40	1.34	1.23	1.25
6	0.39	0.33	0.28	0.51	0.82	1.55	3.21	6.36	4.70	5.85	4.18	1.99	1.39	1.89	2.43	2.40	1.77	1.54	1.07	0.84	1.98	1.47	1.48	1.47	1.42	1.35
7	0.29	0.28	0.30	0.42	0.82	1.52	3.88	6.27	4.07	4.10	3.53	1.79	1.29	2.19	2.55	2.24	1.61	1.38	0.93	0.73	1.73	1.27	1.33	1.37	1.23	1.16
8	0.21	0.29	0.24	0.43	0.84	1.85	4.38	4.23	2.85	3.19	3.15	1.66	1.40	2.29	2.42	2.12	1.65	1.50	1.14	0.75	1.85	1.50	1.61	1.58	1.45	1.36
9	0.27	0.26	0.26	0.43	0.97	2.27	3.24	2.84	2.43	2.84	3.05	1.81	1.36	2.13	2.32	2.04	1.54	1.40	1.07	0.67	1.78	1.48	1.51	1.46	1.33	1.27
10	0.22	0.21	0.26	0.48	1.19	1.92	2.56	2.17	2.19	2.43	2.87	1.84	1.22	1.91	2.10	1.78	1.32	1.21	0.90	0.57	1.56	1.24	1.26	1.22	1.12	1.09
11	0.22	0.23	0.29	0.64	1.07	1.57	2.06	1.84	1.90	2.33	2.62	1.63	1.15	1.79	1.93	1.61	1.18	1.07	0.82	0.52	1.40	1.10	1.11	1.09	1.03	1.00
12	0.19	0.24	0.39	0.62	0.91	1.35	1.72	1.41	1.86	1.89	2.31	1.46	1.04	1.60	1.70	1.41	1.08	1.03	0.85	0.48	1.33	1.07	1.09	1.09	1.05	1.03
13	0.21	0.34	0.39	0.55	0.82	1.17	1.49	1.32	1.55	2.21	2.12	1.37	0.95	1.47	1.56	1.30	1.01	0.96	0.76	0.43	1.21	0.98	1.01	1.02	0.97	0.96
14	0.26	0.34	0.38	0.49	0.70	1.12	1.33	1.05	1.57	2.29	2.24	1.35	0.92	1.38	1.45	1.23	0.95	0.89	0.70	0.39	1.11	0.92	0.95	0.96	0.92	0.90
15	0.27	0.34	0.32	0.39	0.60	1.02	1.23	1.80	1.36	1.99	1.91	1.12	0.75	1.16	1.24	1.03	0.80	0.75	0.57	0.32	0.94	0.77	0.80	0.81	0.78	0.76
16	0.26	0.26	0.29	0.34	0.56	0.87	1.25	1.49	1.19	1.70	1.61	0.92	0.62	0.98	1.04	0.86	0.68	0.62	0.48	0.28	0.80	0.65	0.68	0.69	0.66	0.65
17	0.22	0.26	0.24	0.31	0.49	0.59	1.02	1.24	1.00	1.40	1.31	0.74	0.50	0.80	0.85	0.69	0.55	0.51	0.40	0.24	0.66	0.54	0.56	0.57	0.55	0.54
18	0.22	0.25	0.19	0.25	0.47	0.49	0.85	1.00	0.83	1.15	1.08	0.61	0.40	0.65	0.69	0.56	0.45	0.42	0.33	0.20	0.55	0.44	0.46	0.47	0.46	0.45
19	0.19	0.20	0.18	0.28	0.40	0.41	0.70	0.81	0.70	0.97	0.92	0.49	0.32	0.52	0.56	0.45	0.38	0.35	0.28	0.17	0.46	0.37	0.39	0.40	0.39	0.38
20	0.15	0.18	0.22	0.24	0.33	0.35	0.58	0.65	0.59	0.82	0.79	0.40	0.25	0.42	0.45	0.38	0.32	0.30	0.24	0.15	0.38	0.31	0.32	0.33	0.33	0.32
21	0.15	0.21	0.20	0.21	0.28	0.29	0.49	0.53	0.51	0.71	0.65	0.33	0.20	0.34	0.38	0.32	0.28	0.25	0.20	0.13	0.32	0.26	0.28	0.29	0.28	0.27
22	0.18	0.19	0.17	0.18	0.24	0.25	0.42	0.44	0.45	0.61	0.55	0.27	0.16	0.28	0.33	0.27	0.25	0.22	0.18	0.11	0.28	0.23	0.24	0.25	0.24	0.23
23	0.17	0.17	0.16	0.16	0.20	0.21	0.37	0.36	0.40	0.50	0.45	0.22	0.13	0.24	0.28	0.24	0.22	0.19	0.16	0.10	0.25	0.20	0.21	0.22	0.21	0.19
24	0.16	0.16	0.14	0.14	0.18	0.19	0.32	0.29	0.35	0.40	0.39	0.19	0.11	0.20	0.25	0.21	0.20	0.17	0.14	0.09	0.22	0.17	0.19	0.19	0.18	0.17
25	0.15	0.15	0.13	0.12	0.15	0.16	0.27	0.23	0.31	0.35	0.32	0.16	0.09	0.17	0.22	0.18	0.18	0.15	0.13	0.08	0.19	0.15	0.17	0.17	0.16	0.15
26	0.14	0.14	0.12	0.12	0.14	0.15	0.24	0.18	0.28	0.31	0.28	0.14	0.08	0.15	0.20	0.16	0.17	0.14	0.12	0.08	0.18	0.14	0.14	0.15	0.15	0.14
27	0.13	0.13	0.12	0.11	0.12	0.13	0.22	0.15	0.26	0.27	0.23	0.12	0.07	0.13	0.17	0.15	0.16	0.13	0.11	0.07	0.16	0.12	0.13	0.14	0.14	0.13
28	0.13	0.13	0.11	0.10	0.11	0.12	0.17	0.12	0.24	0.22	0.21	0.11	0.06	0.12	0.16	0.14	0.15	0.13	0.11	0.06	0.15	0.11	0.13	0.13	0.13	0.12
29	0.13	0.13	0.11	0.09	0.10	0.11	0.16	0.09	0.23	0.20	0.18	0.10	0.05	0.11	0.15	0.13	0.14	0.12	0.11	0.06	0.14	0.10	0.12	0.13	0.12	0.11
30	0.13	0.12	0.11	0.09	0.10	0.11	0.14	0.07	0.22	0.16	0.16	0.10	0.05	0.10	0.15	0.12	0.14	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
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	0.02	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	0.59	1.23	1.01	0.51	0.41	0.47	0.40	0.35	0.37	0.25	0.18	0.18	0.37	0.31	0.32	0.30	0.27	0.26
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	0.75	0.71	1.55	1.11	1.12	1.10	0.97	0.90
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	2.00	1.38	1.48	2.95	2.14	2.19	2.13	1.88	1.79
5	3.28	3.03	1.93	2.00	3.11	5.33	10.79	12.79	6.96	11.58	10.88	6.27	4.11	4.91	4.64	4.34	3.90	2.85	2.16	2.22	4.34	3.28	3.31	3.17	2.86	2.77
6	3.57	3.28	2.17	2.46	3.88	6.72	13.13	15.15	9.44	14.11	12.80	7.86	5.32	6.30	5.93	5.32	4.65	3.71	2.88	2.88	5.53	4.34	4.32	4.16	3.81	3.67
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	6.88	6.14	5.13	4.36	3.43	3.40	6.37	5.16	5.11	4.93	4.51	4.34
8	3.91	3.69	2.61	3.22	5.37	9.44	17.15	17.59	12.38	16.82	15.23	10.22	7.20	8.30	7.69	6.73	5.53	4.95	3.98	3.88	7.13	5.98	5.91	5.66	5.20	5.00
9	4.09	3.86	2.82	3.58	6.17	10.90	18.32	18.10	13.21	17.40	15.99	11.03	7.85	9.02	8.28	7.20	5.82	5.39	4.42	4.27	7.71	6.68	6.53	6.23	5.74	5.52
10	4.22	4.00	3.01	3.96	7.08	12.02	19.14	18.46	13.85	17.93	16.52	11.63	8.39	9.56	8.74	7.56	6.03	5.72	4.72	4.58	8.14	7.19	6.98	6.64	6.12	5.91
11	4.36	4.14	3.21	4.43	7.85	12.86	19.74	18.73	14.29	18.35	16.87	12.11	8.85	10.02	9.11	7.84	6.19	5.97	4.97	4.83	8.48	7.60	7.34	6.96	6.44	6.22
12	4.47	4.29	3.47	4.85	8.46	13.53	20.20	18.93	14.63	18.82	17.16	12.48	9.23	10.40	9.39	8.06	6.32	6.18	5.20	5.05	8.77	7.96	7.66	7.25	6.73	6.51
13	4.58	4.47	3.71	5.20	8.97	14.05	20.54	19.09	14.85	18.90	17.36	12.79	9.56	10.71	9.63	8.24	6.42	6.36	5.38	5.23	9.01	8.26	7.93	7.50	6.97	6.75
14	4.71	4.65	3.93	5.50	9.38	14.48	20.80	19.21	15.05	19.14	17.53	13.06	9.85	10.97	9.82	8.39	6.51	6.51	5.53	5.39	9.20	8.52	8.16	7.71	7.18	6.96
15	4.84	4.81	4.10	5.72	9.70	14.81	21.01	19.40	15.20	19.32	17.66	13.25	10.07	11.18	9.97	8.50	6.57	6.62	5.64	5.51	9.36	8.72	8.34	7.88	7.34	7.13
16	4.96	4.93	4.25	5.90	9.96	15.03	21.21	19.51	15.32	19.45	17.76	13.40	10.24	11.34	10.09	8.59	6.62	6.71	5.73	5.61	9.47	8.88	8.48	8.00	7.47	7.25
17	5.06	5.04	4.37	6.05	10.14	15.18	21.34	19.58	15.41	19.55	17.82	13.50	10.37	11.46	10.17	8.66	6.66	6.77	5.79	5.69	9.56	9.00	8.58	8.10	7.57	7.35
18	5.14	5.14	4.45	6.15	10.31	15.28	21.45	19.63	15.47	19.63	17.87	13.58	10.47	11.55	10.24	8.70	6.68	6.82	5.84	5.75	9.63	9.09	8.66	8.18	7.64	7.42
19	5.21	5.22	4.52	6.25	10.44	15.37	21.52	19.66	15.52	19.68	17.91	13.64	10.54	11.62	10.28	8.74	6.71	6.85	5.88	5.80	9.68	9.16	8.73	8.23	7.70	7.48
20	5.26	5.27	4.59	6.34	10.54	15.43	21.58	19.68	15.56	19.73	17.94	13.68	10.59	11.67	10.32	8.77	6.72	6.88	5.91	5.84	9.72	9.22	8.77	8.28	7.74	7.53
21	5.31	5.33	4.66	6.41	10.62	15.49	21.63	19.70	15.60	19.76	17.97	13.71	10.63	11.71	10.35	8.79	6.74	6.90	5.93	5.87	9.75	9.26	8.81	8.31	7.78	7.56
22	5.36	5.38	4.71	6.46	10.68	15.53	21.66	19.71	15.62	19.79	17.98	13.74	10.66	11.74	10.37	8.81	6.75	6.92	5.95	5.90	9.78	9.30	8.84	8.34	7.81	7.59
23	5.40	5.43	4.75	6.51	10.73	15.56	21.70	19.72	15.65	19.82	18.00	13.76	10.69	11.77	10.39	8.82	6.76	6.94	5.97	5.92	9.80	9.33	8.87	8.37	7.83	7.61
24	5.43	5.46	4.79	6.55	10.77	15.59	21.72	19.73	15.66	19.84	18.01	13.78	10.71	11.79	10.41	8.84	6.76	6.95	5.98	5.94	9.82	9.35	8.89	8.39	7.85	7.63
25	5.47	5.49	4.82	6.58	10.81	15.62	21.74	19.73	15.68	19.85	18.02	13.79	10.72	11.81	10.42	8.85	6.77	6.96	5.99	5.96	9.84	9.37	8.91	8.40	7.87	7.65
26	5.49	5.52	4.85	6.60	10.84	15.64	21.76	19.74	15.69	19.86	18.03	13.80	10.73	11.82	10.43	8.85	6.78	6.97	6.00	5.98	9.85	9.39	8.92	8.42	7.88	7.66
27	5.52	5.54	4.87	6.63	10.86	15.66	21.78	19.74	15.71	19.87	18.04	13.81	10.74	11.83	10.44	8.86	6.78	6.98	6.01	5.99	9.86	9.40	8.94	8.43	7.89	7.67
28	5.54	5.57	4.89	6.65	10.88	15.67	21.79	19.74	15.72	19.88	18.04	13.82	10.75	11.84	10.45	8.87	6.79	6.98	6.01	6.00	9.87	9.41	8.95	8.44	7.90	7.68
29	5.56	5.59	4.91	6.67	10.90	15.69	21.80	19.74	15.73	19.89	18.05	13.82	10.76	11.85	10.46	8.88	6.79	6.99	6.02	6.01	9.88	9.42	8.96	8.45	7.91	7.69
30	5.59	5.61	4.93	6.68	10.92	15.70	21.81	19.75	15.74	19.90	18.05	13.83	10.76	11.86	10.47	8.88	6.80	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
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	1.77	0.34	0.31	0.33	0.34	0.34
2	1.88	3.39	3.25	2.46	0.82	0.92	0.42	17.40	0.92	1.41	11.17	3.72	1.02	1.50	2.01	2.06	5.45	7.25	4.01	1.91	5.56	1.88	2.16	2.78	2.59	2.33
3	6.76	8.39	6.18	2.05	0.68	0.34	7.09	9.34	2.19	18.82	23.32	2.67	1.74	3.06	4.12	9.71	25.91	16.58	3.83	5.44	7.97	4.57	6.34	7.06	6.02	6.24
4	9.97	8.98	3.53	1.32	0.36	1.76	4.75	12.29	17.62	25.70	10.58	3.18	2.85	4.60	14.94	29.44	29.81	6.14	13.83	6.08	11.63	8.83	10.84	10.69	10.81	12.14
5	8.96	4.73	1.82	0.75	1.42	2.03	6.02	28.98	26.75	11.30	8.49	4.47	3.42	14.29	28.60	29.35	7.64	19.60	12.15	6.85	15.68	11.12	11.89	13.41	14.86	13.69
6	4.48	2.41	0.79	1.99	1.64	2.65	19.36	26.15	10.80	9.16	10.31	5.49	8.49	26.86	27.65	8.11	26.13	13.82	11.89	8.16	15.85	10.28	12.32	14.81	13.49	12.25
7	2.35	1.00	2.69	2.07	2.04	9.20	21.55	11.70	8.43	9.91	12.37	14.41	19.65	26.13	8.03	20.61	19.37	15.38	15.85	9.44	16.07	12.58	15.25	15.64	14.70	14.15
8	1.15	3.25	2.76	2.40	4.81	14.11	9.77	8.23	9.73	10.49	21.55	26.40	21.02	7.70	20.79	15.48	18.37	17.25	16.75	9.32	16.60	13.73	14.76	14.92	14.48	14.87
9	3.30	3.34	3.15	5.28	7.58	7.23	7.23	6.55	11.71	16.16	23.06	25.36	6.38	13.20	12.71	12.07	16.50	14.47	13.52	8.18	14.45	11.07	11.65	12.05	12.55	12.94
10	3.37	3.59	5.79	7.66	5.48	5.86	7.07	5.96	19.25	17.36	22.61	7.40	8.51	8.20	9.80	10.63	13.20	10.90	10.93	6.92	10.71	8.29	8.84	9.67	10.05	9.95
11	3.59	6.09	7.65	5.63	5.17	6.57	7.31	7.22	19.09	18.47	8.21	13.42	6.54	7.44	9.96	10.09	11.72	10.85	11.26	6.54	9.65	7.95	8.91	9.68	9.71	9.45
12	5.89	7.89	5.73	5.17	5.52	7.27	11.01	7.44	19.33	7.35	20.62	10.22	6.24	7.84	9.70	9.21	10.99	10.08	9.12	5.64	8.24	7.04	7.77	8.04	7.80	7.74
13	7.72	5.86	5.23	5.41	5.28	13.65	12.74	7.51	7.42	16.01	13.67	9.15	6.30	7.23	8.39	8.65	10.43	9.02	8.35	5.31	7.90	6.90	7.30	7.40	7.40	7.36
14	5.74	5.32	5.47	5.28	8.78	16.07	13.22	3.67	13.52	11.30	12.11	9.69	6.44	6.68	8.24	8.62	9.64	8.52	8.30	5.56	7.92	6.90	7.13	7.39	7.44	7.42
15	5.23	5.47	5.23	7.28	13.78	16.63	6.07	30.01	10.28	9.95	11.87	9.69	6.34	6.80	8.38	8.24	9.22	8.57	9.00	5.98	7.99	7.09	7.43	7.68	7.79	7.75
16	5.39	5.30	7.04	10.50	15.19	7.36	13.37	21.50	9.47	9.53	10.85	9.25	6.59	6.86	7.92	7.83	9.00	9.03	9.58	6.23	7.93	7.43	7.72	7.98	8.10	8.18
17	5.48	7.30	9.50	12.46	7.43	8.18	9.27	17.34	8.66	8.13	8.94	8.52	6.14	5.93	6.79	6.87	8.23	8.29	8.71	5.59	7.12	6.77	7.00	7.16	7.35	7.38
18	7.45	10.03	10.92	7.12	7.69	6.23	7.87	14.72	7.70	6.71	7.91	8.02	5.65	5.28	6.15	6.55	7.75	7.81	8.29	5.45	6.72	6.58	6.72	6.93	7.12	7.18
19	9.89	10.89	7.08	7.67	6.20	5.68	7.04	11.95	6.65	5.87	6.94	7.19	5.19	4.79	5.80	6.14	7.14	7.30	8.06	5.30	6.38	6.38	6.54	6.70	6.93	7.02
20	10.96	7.25	8.84	6.36	5.90	5.37	6.06	9.45	6.06	5.06	5.85	6.45	4.85	4.53	5.37	5.64	6.52	6.94	7.79	5.16	6.02	6.22	6.32	6.48	6.75	6.86
21	9.15	8.55	7.40	6.19	5.74	4.90	5.17	7.87	5.36	4.24	4.91	5.89	4.69	4.20	4.91	5.15	6.08	6.58	7.55	5.00	5.74	6.05	6.13	6.28	6.59	6.75
22	7.87	7.17	7.29	6.15	5.52	4.53	4.79	6.71	4.80	3.69	4.36	5.67	4.51	3.92	4.55	4.88	5.75	6.35	7.36	4.91	5.53	5.93	5.98	6.14	6.49	6.66
23	6.62	6.98	7.20	5.93	5.21	4.27	4.14	5.40	4.20	3.15	3.87	5.27	4.25	3.59	4.22	4.55	5.40	6.04	7.16	4.78	5.29	5.80	5.83	6.01	6.38	6.56
24	6.49	6.81	6.97	5.73	5.13	3.88	3.59	4.40	3.76	2.78	3.43	4.88	3.99	3.35	3.92	4.27	5.08	5.81	6.98	4.68	5.09	5.69	5.73	5.90	6.28	6.47
25	6.32	6.55	6.77	5.73	4.79	3.54	3.14	3.69	3.50	2.46	3.03	4.53	3.82	3.14	3.69	4.02	4.83	5.60	6.83	4.59	4.92	5.60	5.62	5.79	6.18	6.39
26	6.09	6.33	6.80	5.41	4.54	3.26	2.83	3.24	3.20	2.21	2.71	4.29	3.66	2.97	3.48	3.84	4.61	5.43	6.69	4.51	4.80	5.53	5.53	5.69	6.10	6.30
27	5.94	6.37	6.47	5.24	4.37	3.11	2.71	2.91	3.01	2.03	2.52	4.12	3.57	2.87	3.36	3.72	4.48	5.32	6.61	4.48	4.72	5.47	5.47	5.62	6.03	6.25
28	5.97	6.01	6.25	5.07	4.22	3.01	2.46	2.59	2.82	1.87	2.34	3.96	3.46	2.76	3.24	3.60	4.35	5.20	6.54	4.43	4.63	5.42	5.40	5.55	5.96	6.18
29	5.65	5.83	6.07	4.96	4.21	2.88	2.33	2.37	2.70	1.75	2.21	3.84	3.39	2.69	3.17	3.53	4.26	5.15	6.49	4.40	4.57	5.38	5.35	5.49	5.91	6.13
30	5.43	5.59	5.89	4.91	4.02	2.74	2.18	2.20	2.57	1.64	2.09	3.70	3.29	2.60	3.06	3.41	4.13	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
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	1.77	0.34	0.31	0.33	0.34	0.34
2	2.08	3.66	3.59	2.80	1.11	1.28	0.59	17.66	1.20	1.61	11.43	4.22	1.27	1.87	2.46	2.43	5.81	7.59	4.61	2.21	7.23	2.21	2.47	3.10	2.92	2.66
3	8.64	11.65	9.52	4.78	1.78	1.61	7.52	25.12	3.34	19.70	31.86	6.76	2.98	4.86	6.46	11.88	30.11	22.86	8.26	7.51	14.59	6.67	8.63	9.92	8.75	8.72
4	17.55	19.40	12.67	6.02	2.13	3.31	11.67	33.58	19.98	39.24	38.64	9.65	5.70	9.15	20.19	37.38	50.50	27.54	20.84	13.09	24.34	14.81	18.41	19.44	18.51	19.69
5	24.69	23.09	14.23	6.71	3.49	5.19	16.50	50.04	40.19	45.20	43.17	13.49	8.83	21.67	42.11	54.88	54.07	41.35	30.29	18.94	35.74	24.05	27.85	29.95	30.33	30.44
6	27.91	24.87	14.90	8.53	5.02	7.56	30.57	59.76	45.90	49.18	47.91	17.89	16.22	41.39	56.84	58.19	65.05	49.06	38.32	25.38	45.24	31.52	36.33	39.86	39.35	38.62
7	29.52	25.59	17.13	10.38	6.87	15.44	42.70	62.69	49.66	52.80	52.77	28.59	31.63	55.06	59.82	65.71	70.92	56.32	47.64	32.15	53.15	39.59	45.38	48.61	47.71	46.78
8	30.29	27.90	19.35	12.45	11.13	26.24	46.81	64.39	53.46	56.11	59.89	45.01	44.67	57.94	66.75	70.07	75.32	63.11	55.83	38.15	59.87	47.18	52.68	55.54	54.62	54.05
9	32.46	30.18	21.81	16.91	17.46	30.89	49.41	65.57	57.46	60.52	65.63	56.38	47.74	62.40	69.99	72.87	78.48	67.73	61.26	42.90	64.64	52.36	57.51	60.22	59.67	59.35
10	34.60	32.55	26.18	23.00	21.65	34.30	51.69	66.54	63.11	64.35	69.79	58.78	51.52	64.74	72.12	74.99	80.55	70.66	65.02	46.55	67.60	55.75	60.69	63.46	63.14	62.84
11	36.79	36.41	31.59	27.11	25.33	37.82	53.82	67.62	67.51	67.62	70.91	62.75	54.14	66.65	74.03	76.75	82.13	73.22	68.43	49.75	69.94	58.70	63.57	66.36	66.13	65.80
12	40.26	41.10	35.33	30.65	29.01	41.41	56.73	68.64	71.03	68.65	73.43	65.32	56.45	68.48	75.67	78.17	83.41	75.32	70.85	52.31	71.72	61.07	65.83	68.50	68.27	67.96
13	44.53	44.30	38.53	34.14	32.32	47.56	59.67	69.57	72.09	70.69	74.72	67.35	58.61	70.01	76.92	79.36	84.48	76.99	72.85	54.57	73.26	63.21	67.77	70.30	70.12	69.84
14	47.45	47.03	41.69	37.34	37.47	53.73	62.29	69.99	73.86	71.87	75.68	69.28	60.66	71.30	78.03	80.43	85.36	78.41	74.66	56.81	74.66	65.18	69.50	71.94	71.82	71.58
15	49.95	49.67	44.53	41.51	44.79	59.01	63.31	73.23	75.00	72.76	76.48	70.99	62.53	72.50	79.05	81.35	86.11	79.70	76.44	59.07	75.95	67.04	71.16	73.50	73.46	73.24
16	52.39	52.09	48.15	47.05	51.70	60.94	65.41	74.81	75.92	73.52	77.12	72.45	64.33	73.62	79.92	82.14	86.77	80.94	78.16	61.27	77.12	68.84	72.74	74.99	75.01	74.85
17	54.73	55.22	52.67	52.91	54.55	62.91	66.65	75.80	76.68	74.09	77.58	73.65	65.89	74.51	80.59	82.78	87.31	81.96	79.56	63.12	78.07	70.35	74.06	76.20	76.30	76.17
18	57.72	59.21	57.36	55.83	57.27	64.27	67.60	76.48	77.29	74.51	77.94	74.68	67.23	75.25	81.16	83.34	87.78	82.84	80.77	64.82	78.90	71.71	75.23	77.29	77.45	77.35
19	61.39	63.09	60.06	58.75	59.28	65.43	68.37	76.94	77.77	74.86	78.23	75.53	68.39	75.89	81.66	83.83	88.17	83.59	81.85	66.38	79.64	72.93	76.28	78.27	78.48	78.42
20	65.05	65.39	63.19	60.97	61.06	66.46	68.98	77.26	78.18	75.13	78.46	76.23	69.41	76.45	82.09	84.25	88.51	84.26	82.81	67.82	80.28	74.05	77.23	79.14	79.42	79.39
21	67.77	67.89	65.58	63.00	62.70	67.35	69.47	77.51	78.51	75.35	78.63	76.82	70.35	76.95	82.47	84.61	88.80	84.84	83.66	69.13	80.85	75.06	78.08	79.93	80.26	80.27
22	69.89	69.81	67.75	64.88	64.17	68.13	69.89	77.69	78.80	75.53	78.78	77.36	71.21	77.40	82.79	84.93	89.06	85.37	84.43	70.36	81.37	75.99	78.87	80.65	81.04	81.08
23	71.53	71.55	69.73	66.58	65.48	68.83	70.24	77.83	79.03	75.68	78.91	77.83	71.98	77.79	83.08	85.21	89.28	85.83	85.11	71.50	81.84	76.84	79.58	81.32	81.75	81.82
24	73.02	73.11	71.51	68.12	66.70	69.43	70.53	77.94	79.23	75.81	79.01	78.24	72.67	78.14	83.34	85.47	89.48	86.25	85.74	72.55	82.27	77.63	80.25	81.92	82.40	82.51
25	74.38	74.52	73.11	69.57	67.78	69.96	70.78	78.03	79.41	75.91	79.10	78.60	73.31	78.45	83.57	85.70	89.66	86.63	86.30	73.54	82.66	78.36	80.86	82.49	83.01	83.14
26	75.61	75.78	74.61	70.86	68.75	70.43	70.99	78.10	79.57	76.01	79.18	78.92	73.89	78.74	83.78	85.91	89.83	86.98	86.82	74.47	83.02	79.04	81.42	83.00	83.56	83.72
27	76.73	76.97	75.94	72.04	69.64	70.86	71.18	78.16	79.71	76.09	79.25	79.22	74.44	79.01	83.97	86.10	89.98	87.30	87.29	75.34	83.35	79.67	81.95	83.49	84.08	84.26
28	77.79	78.03	77.14	73.12	70.47	71.27	71.36	78.22	79.84	76.17	79.32	79.50	74.95	79.27	84.15	86.28	90.12	87.60	87.73	76.17	83.67	80.26	82.44	83.93	84.56	84.76
29	78.73	78.98	78.23	74.13	71.25	71.65	71.52	78.27	79.96	76.23	79.37	79.76	75.44	79.51	84.32	86.46	90.25	87.88	88.14	76.95	83.96	80.82	82.90	84.35	85.00	85.22
30	79.59	79.84	79.22	75.07	71.97	71.99	71.66	78.31	80.07	76.30	79.43	79.99	75.89	79.73	84.48	86.61	90.38	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	0.12	0.00	0.00	0.01	0.01	0.05	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07
2	1.41	1.94	1.27	0.70	0.73	0.54	1.53	2.81	0.45	2.42	3.90	3.06	2.39	0.89	1.20	0.75	0.39	1.14	0.23	0.28	1.13	1.09	1.09	1.07	1.05	1.04
3	1.71	1.59	1.16	0.86	1.03	1.16	3.10	4.76	1.63	5.90	8.86	10.34	3.35	1.36	5.09	1.98	1.85	2.06	1.31	1.08	2.01	1.40	1.41	1.42	1.29	1.23
4	1.10	1.07	0.69	0.72	0.87	1.59	2.72	5.20	2.25	7.14	12.55	6.78	1.57	4.12	3.79	2.60	2.67	1.97	1.11	1.24	2.05	1.38	1.46	1.43	1.28	1.26
5	0.71	0.66	0.52	0.54	0.85	1.37	2.94	5.45	3.25	9.82	10.13	2.01	4.31	1.62	5.47	3.04	3.00	1.39	1.33	1.14	2.44	1.66	1.71	1.65	1.54	1.57
6	0.39	0.37	0.31	0.61	0.75	1.34	2.71	5.85	4.57	6.90	4.93	5.91	2.16	2.35	4.47	3.16	1.66	1.89	1.71	1.27	3.03	2.07	2.10	2.12	2.09	2.03
7	0.31	0.35	0.39	0.50	0.78	1.24	3.27	5.29	3.89	3.57	5.12	1.12	1.37	2.07	3.62	2.64	1.70	1.94	1.84	1.35	3.34	2.15	2.25	2.33	2.17	2.09
8	0.26	0.35	0.27	0.59	0.74	1.56	3.66	3.39	2.76	3.67	2.35	0.93	1.45	1.49	3.00	2.65	1.87	2.47	2.98	1.75	4.53	3.19	3.40	3.40	3.31	3.23
9	0.33	0.28	0.34	0.50	0.90	1.79	2.92	2.29	2.48	3.34	2.00	1.96	2.58	3.06	2.75	2.51	1.70	2.26	2.88	1.64	4.51	3.11	3.16	3.14	3.04	3.00
10	0.27	0.26	0.35	0.47	1.05	1.49	2.09	2.21	2.14	2.87	2.25	4.48	2.67	2.66	2.21	2.19	1.47	2.06	2.89	1.57	4.45	2.97	2.99	2.98	2.96	3.00
11	0.26	0.31	0.36	0.72	0.94	1.12	1.67	1.92	1.72	2.34	2.94	2.48	2.73	2.59	2.08	2.08	1.35	1.93	2.85	1.54	4.38	2.77	2.77	2.77	2.81	2.84
12	0.26	0.30	0.56	0.74	0.78	1.30	1.65	1.63	1.84	2.16	2.06	2.33	2.54	2.47	1.94	1.97	1.31	2.00	3.35	1.62	4.74	2.97	2.99	3.07	3.16	3.19
13	0.28	0.55	0.59	0.61	0.70	1.04	1.30	1.34	1.46	1.51	1.83	2.11	2.27	2.16	1.67	1.76	1.16	1.75	2.91	1.39	4.19	2.52	2.57	2.63	2.70	2.74
14	0.40	0.61	0.58	0.54	0.62	1.08	1.27	1.09	1.33	1.35	1.66	1.80	2.02	1.90	1.48	1.62	1.04	1.54	2.58	1.23	3.74	2.21	2.25	2.29	2.35	2.39
15	0.37	0.48	0.41	0.48	0.51	0.92	1.14	1.63	1.17	1.18	1.45	1.54	1.74	1.63	1.25	1.44	0.91	1.33	2.20	1.06	3.25	1.85	1.87	1.91	1.97	2.00
16	0.41	0.38	0.40	0.42	0.50	0.81	0.86	1.42	1.03	1.01	1.24	1.30	1.49	1.40	1.06	1.23	0.80	1.15	1.89	0.93	2.84	1.55	1.56	1.60	1.64	1.67
17	0.36	0.35	0.28	0.32	0.50	0.52	0.74	1.21	0.88	0.83	1.02	1.08	1.26	1.16	0.86	0.99	0.70	0.98	1.61	0.82	2.41	1.25	1.26	1.29	1.32	1.35
18	0.39	0.34	0.24	0.28	0.53	0.45	0.64	1.02	0.74	0.69	0.85	0.91	1.06	0.95	0.70	0.78	0.63	0.82	1.36	0.70	2.03	1.01	1.01	1.03	1.07	1.09
19	0.23	0.34	0.36	0.32	0.46	0.39	0.55	0.85	0.62	0.57	0.72	0.76	0.89	0.77	0.56	0.67	0.54	0.73	1.16	0.62	1.72	0.81	0.82	0.83	0.87	0.88
20	0.15	0.23	0.31	0.28	0.39	0.33	0.47	0.70	0.53	0.47	0.60	0.62	0.74	0.63	0.45	0.58	0.51	0.61	0.98	0.53	1.45	0.65	0.66	0.67	0.70	0.71
21	0.18	0.31	0.27	0.24	0.33	0.28	0.41	0.59	0.46	0.39	0.50	0.51	0.61	0.51	0.37	0.51	0.49	0.43	0.84	0.47	1.23	0.53	0.53	0.55	0.57	0.58
22	0.26	0.28	0.24	0.21	0.28	0.25	0.35	0.50	0.40	0.32	0.42	0.42	0.51	0.42	0.31	0.46	0.31	0.38	0.72	0.41	1.06	0.43	0.44	0.45	0.46	0.47
23	0.23	0.25	0.22	0.18	0.24	0.22	0.31	0.42	0.35	0.27	0.34	0.35	0.43	0.35	0.26	0.42	0.30	0.34	0.62	0.36	0.90	0.35	0.35	0.36	0.37	0.36
24	0.21	0.22	0.19	0.16	0.21	0.19	0.28	0.35	0.31	0.22	0.29	0.29	0.36	0.29	0.21	0.39	0.23	0.32	0.54	0.32	0.77	0.29	0.29	0.29	0.28	0.29
25	0.19	0.20	0.18	0.14	0.18	0.17	0.25	0.29	0.28	0.18	0.24	0.24	0.30	0.24	0.18	0.36	0.22	0.30	0.46	0.29	0.66	0.23	0.23	0.22	0.23	0.23
26	0.18	0.18	0.16	0.13	0.16	0.16	0.22	0.24	0.25	0.15	0.20	0.20	0.26	0.20	0.15	0.35	0.22	0.29	0.40	0.26	0.57	0.19	0.18	0.18	0.19	0.19
27	0.16	0.17	0.15	0.12	0.14	0.14	0.20	0.20	0.23	0.12	0.17	0.17	0.22	0.17	0.12	0.34	0.22	0.19	0.35	0.23	0.49	0.15	0.14	0.15	0.15	0.15
28	0.15	0.15	0.14	0.11	0.12	0.13	0.19	0.16	0.22	0.10	0.14	0.14	0.18	0.14	0.10	0.33	0.22	0.18	0.30	0.20	0.39	0.12	0.12	0.12	0.12	0.13
29	0.14	0.14	0.13	0.10	0.11	0.12	0.18	0.13	0.21	0.08	0.12	0.12	0.16	0.11	0.08	0.08	0.14	0.18	0.26	0.17	0.34	0.10	0.10	0.10	0.10	0.10
30	0.13	0.14	0.13	0.09	0.10	0.11	0.17	0.11	0.20	0.07	0.10	0.10	0.13	0.09	0.07	0.07	0.14	0.17	0.22	0.15	0.29	0.08	0.08	0.08	0.08	0.08

= 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	0.02	0.00	0.00	0.18	0.19	0.19	0.18	0.16
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	0.21	0.26	0.25	0.27	0.26	0.25	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	0.29	0.27	0.48	0.41	0.42	0.43	0.40	0.37
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	0.70	0.42	0.43	0.71	0.61	0.66	0.66	0.62	0.59
5	0.00	0.17	0.25	0.12	0.45	0.22	0.45	0.99	0.44	1.34	1.40	0.47	0.25	0.49	0.53	0.81	1.26	0.56	0.58	0.46	0.83	0.75	0.80	0.79	0.76	0.76
6	0.00	0.18	0.05	0.24	0.28	0.39	0.64	1.13	0.85	1.28	0.83	0.46	0.30	0.43	0.77	0.84	0.60	0.62	0.55	0.44	0.83	0.74	0.77	0.78	0.76	0.72
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	0.70	0.64	0.63	0.56	0.44	0.75	0.75	0.77	0.80	0.75	0.73
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	0.73	0.79	0.68	0.63	0.62	0.60	0.44	0.70	0.63	0.70	0.71	0.66	0.66
9	0.00	0.10	0.22	0.13	0.35	0.87	0.78	0.47	0.47	0.83	0.91	0.35	0.33	0.71	0.90	0.74	0.67	0.71	0.69	0.48	0.58	0.66	0.63	0.64	0.67	0.70
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	0.65	1.00	1.20	1.01	0.83	1.14	1.20	0.77	1.13	1.24	1.21	1.24	1.26	1.37
11	0.00	0.21	0.50	0.15	0.56	0.38	0.48	0.77	0.38	0.54	0.24	0.75	0.65	0.99	1.02	0.90	0.65	0.98	1.06	0.72	1.05	1.06	1.10	1.13	1.16	1.18
12	0.12	0.00	0.07	0.44	0.49	0.39	0.63	0.37	0.24	0.16	0.84	0.78	0.66	1.01	1.02	0.86	0.64	1.00	1.13	0.70	1.07	1.08	1.00	1.05	1.21	1.22
13	0.00	0.00	0.22	0.29	0.34	0.37	0.52	0.27	0.32	0.71	0.89	0.81	0.67	1.04	0.90	0.82	0.62	0.93	0.94	0.61	1.06	1.05	0.97	1.01	1.05	1.19
14	0.00	0.00	0.16	0.25	0.16	0.45	0.47	0.30	0.75	0.82	1.01	0.89	0.71	1.04	0.95	0.74	0.64	0.88	0.94	0.63	1.10	0.95	0.98	1.02	1.06	1.08
15	0.00	0.14	0.33	0.20	0.18	0.23	0.28	0.87	0.72	0.76	0.91	0.80	0.62	0.94	0.82	0.64	0.56	0.75	0.79	0.58	0.96	0.78	0.81	0.84	0.87	0.88
16	0.00	0.00	0.09	0.07	0.22	0.16	0.65	0.78	0.64	0.69	0.82	0.72	0.54	0.81	0.72	0.55	0.49	0.56	0.55	0.42	0.84	0.64	0.66	0.69	0.71	0.72
17	0.16	0.00	0.10	0.08	0.00	0.37	0.59	0.68	0.59	0.62	0.72	0.62	0.46	0.64	0.62	0.47	0.25	0.46	0.44	0.31	0.74	0.51	0.53	0.55	0.57	0.58
18	0.00	0.36	0.00	0.10	0.52	0.36	0.40	0.59	0.54	0.55	0.64	0.53	0.40	0.56	0.54	0.41	0.19	0.29	0.35	0.28	0.66	0.41	0.43	0.44	0.46	0.46
19	0.00	0.00	0.13	0.53	0.47	0.32	0.33	0.50	0.45	0.49	0.57	0.42	0.35	0.50	0.39	0.37	0.15	0.23	0.28	0.25	0.60	0.33	0.34	0.35	0.37	0.37
20	0.00	0.00	0.57	0.52	0.31	0.31	0.28	0.43	0.41	0.44	0.51	0.38	0.31	0.38	0.34	0.34	0.11	0.18	0.23	0.23	0.55	0.26	0.27	0.28	0.29	0.29
21	0.00	0.37	0.54	0.42	0.28	0.27	0.23	0.36	0.32	0.40	0.32	0.34	0.27	0.34	0.30	0.32	0.09	0.14	0.18	0.21	0.26	0.21	0.22	0.23	0.23	0.24
22	0.25	0.33	0.34	0.40	0.26	0.26	0.19	0.30	0.29	0.36	0.26	0.31	0.24	0.30	0.15	0.20	0.07	0.11	0.14	0.20	0.21	0.17	0.18	0.18	0.19	0.19
23	0.22	0.28	0.29	0.39	0.25	0.26	0.15	0.25	0.20	0.20	0.22	0.29	0.23	0.27	0.12	0.08	0.05	0.09	0.11	0.19	0.17	0.13	0.14	0.14	0.15	0.14
24	0.19	0.24	0.25	0.28	0.17	0.27	0.13	0.21	0.17	0.17	0.18	0.23	0.21	0.25	0.10	0.06	0.04	0.07	0.09	0.19	0.14	0.11	0.11	0.11	0.12	0.12
25	0.16	0.21	0.22	0.13	0.16	0.23	0.10	0.17	0.15	0.14	0.15	0.22	0.20	0.24	0.07	0.05	0.03	0.05	0.07	0.18	0.11	0.08	0.09	0.09	0.09	0.09
26	0.14	0.18	0.19	0.11	0.15	0.23	0.08	0.14	0.13	0.11	0.12	0.21	0.20	0.23	0.06	0.04	0.02	0.04	0.06	0.18	0.09	0.07	0.07	0.07	0.07	0.07
27	0.12	0.15	0.16	0.10	0.15	0.24	0.07	0.12	0.12	0.09	0.10	0.15	0.20	0.22	0.05	0.03	0.02	0.03	0.05	0.19	0.07	0.05	0.05	0.06	0.06	0.06
28	0.10	0.13	0.14	0.08	0.15	0.19	0.05	0.09	0.11	0.07	0.08	0.08	0.20	0.22	0.04	0.02	0.01	0.02	0.04	0.19	0.06	0.04	0.04	0.04	0.05	0.05
29	0.09	0.11	0.12	0.07	0.14	0.19	0.04	0.08	0.10	0.06	0.06	0.08	0.20	0.22	0.03	0.02	0.01	0.02	0.03	0.20	0.05	0.03	0.03	0.03	0.04	0.04
30	0.08	0.10	0.10	0.06	0.14	0.20	0.03	0.06	0.09	0.05	0.05	0.08	0.21	0.22	0.02	0.01	0.01	0.02	0.02	0.02	0.04	0.03	0.03	0.03	0.03	0.03

= 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	0.09	0.10	0.10	0.09	0.09
2	0.06	0.17	0.07	0.06	0.11	0.26	0.58	0.96	0.15	0.38	0.20	0.19	0.25	0.19	0.15	0.16	0.13	0.07	0.13	0.10	0.29	0.28	0.29	0.28	0.26	0.25
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	0.42	0.29	0.69	0.56	0.57	0.56	0.52	0.50
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	0.77	0.40	0.35	0.82	0.67	0.69	0.68	0.63	0.63
5	0.24	0.24	0.03	0.14	0.44	0.57	1.80	2.17	1.28	2.96	2.13	0.95	0.68	0.94	0.82	1.08	1.10	0.63	0.45	0.32	0.85	0.72	0.74	0.73	0.71	0.73
6	0.08	0.34	0.03	0.16	0.33	0.84	1.45	2.79	2.23	2.59	1.78	0.83	0.63	0.83	1.02	1.09	0.83	0.62	0.39	0.27	0.78	0.67	0.68	0.70	0.69	0.67
7	0.05	0.03	0.04	0.16	0.18	0.66	2.47	4.03	1.79	2.27	1.49	0.80	0.59	0.95	1.26	1.04	0.73	0.56	0.34	0.23	0.71	0.60	0.64	0.68	0.64	0.61
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	1.04	1.27	1.05	0.88	0.74	0.54	0.28	0.97	0.93	1.02	1.05	1.03	1.00
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	0.60	1.14	1.20	1.01	0.84	0.72	0.54	0.27	1.01	0.98	1.05	1.07	1.03	1.01
10	0.12	0.06	0.08	0.26	0.52	1.15	1.06	1.23	1.16	1.40	1.16	0.87	0.83	1.22	1.34	1.10	0.94	0.83	0.65	0.31	1.24	1.20	1.27	1.26	1.28	1.29
11	0.15	0.10	0.10	0.27	0.41	0.64	1.03	0.95	0.79	1.12	1.26	0.64	0.66	1.00	1.08	0.87	0.77	0.69	0.56	0.27	1.06	1.02	1.04	1.07	1.08	1.13
12	0.06	0.17	0.07	0.20	0.47	0.57	1.05	0.84	0.84	0.76	1.05	0.55	0.58	0.88	0.94	0.76	0.71	0.65	0.54	0.24	0.93	0.94	0.93	0.94	1.04	1.09
13	0.03	0.08	0.07	0.14	0.38	0.44	0.94	0.98	0.66	0.97	0.95	0.50	0.52	0.79	0.86	0.70	0.70	0.62	0.52	0.23	0.84	0.86	0.86	0.91	0.93	1.03
14	0.07	0.12	0.18	0.05	0.26	0.57	0.26	0.57	0.81	1.27	1.12	0.64	0.65	1.01	1.10	0.91	0.88	0.77	0.62	0.27	1.03	0.98	1.08	1.14	1.16	1.20
15	0.00	0.00	0.05	0.26	0.30	0.36	0.22	0.95	0.69	0.97	0.93	0.52	0.52	0.85	0.95	0.79	0.79	0.68	0.56	0.25	0.90	0.87	0.96	1.01	1.03	1.05
16	0.21	0.05	0.12	0.09	0.28	0.14	0.69	0.73	0.59	0.84	0.79	0.42	0.42	0.73	0.82	0.67	0.72	0.60	0.52	0.24	0.76	0.77	0.79	0.85	0.92	0.93
17	0.00	0.05	0.13	0.17	0.22	0.27	0.48	0.57	0.49	0.65	0.55	0.33	0.34	0.60	0.68	0.56	0.57	0.54	0.46	0.23	0.60	0.68	0.69	0.65	0.74	0.81
18	0.00	0.11	0.04	0.08	0.30	0.23	0.30	0.43	0.42	0.55	0.46	0.28	0.27	0.49	0.58	0.48	0.47	0.43	0.37	0.22	0.46	0.54	0.45	0.48	0.58	0.66
19	0.10	0.06	0.04	0.31	0.27	0.20	0.22	0.32	0.36	0.35	0.40	0.23	0.21	0.41	0.51	0.42	0.37	0.41	0.36	0.22	0.40	0.48	0.38	0.40	0.42	0.51
20	0.00	0.00	0.33	0.29	0.25	0.18	0.16	0.24	0.33	0.29	0.35	0.20	0.17	0.34	0.45	0.39	0.25	0.36	0.35	0.22	0.34	0.29	0.32	0.35	0.36	0.37
21	0.07	0.35	0.34	0.29	0.24	0.17	0.12	0.18	0.31	0.25	0.30	0.17	0.13	0.30	0.42	0.37	0.23	0.35	0.30	0.22	0.31	0.25	0.29	0.31	0.31	0.31
22	0.25	0.33	0.35	0.30	0.24	0.17	0.09	0.14	0.30	0.21	0.27	0.15	0.11	0.27	0.41	0.36	0.21	0.29	0.25	0.23	0.28	0.23	0.26	0.28	0.28	0.28
23	0.20	0.19	0.38	0.31	0.24	0.16	0.07	0.11	0.29	0.18	0.25	0.14	0.09	0.25	0.36	0.35	0.20	0.23	0.18	0.23	0.27	0.21	0.24	0.12	0.25	0.23
24	0.21	0.20	0.36	0.32	0.25	0.17	0.05	0.09	0.28	0.16	0.23	0.13	0.08	0.24	0.36	0.32	0.20	0.17	0.19	0.24	0.25	0.19	0.09	0.10	0.09	0.21
25	0.22	0.12	0.32	0.34	0.26	0.17	0.04	0.06	0.28	0.14	0.15	0.13	0.07	0.23	0.32	0.28	0.20	0.16	0.19	0.25	0.25	0.18	0.07	0.06	0.07	0.20
26	0.16	0.02	0.28	0.36	0.27	0.17	0.03	0.05	0.23	0.13	0.05	0.13	0.06	0.22	0.32	0.29	0.20	0.16	0.20	0.23	0.24	0.18	0.05	0.05	0.05	0.05
27	0.09	0.01	0.17	0.33	0.25	0.18	0.02	0.04	0.23	0.12	0.04	0.13	0.06	0.22	0.22	0.24	0.20	0.17	0.20	0.17	0.24	0.04	0.04	0.04	0.04	0.04
28	0.10	0.01	0.08	0.29	0.26	0.18	0.01	0.03	0.24	0.03	0.03	0.13	0.06	0.22	0.22	0.20	0.09	0.17	0.22	0.18	0.24	0.03	0.03	0.03	0.03	0.03
29	0.10	0.01	0.08	0.20	0.28	0.19	0.01	0.02	0.24	0.03	0.03	0.13	0.05	0.22	0.22	0.20	0.09	0.18	0.23	0.19	0.13	0.02	0.02	0.02	0.03	0.03
30	0.11	0.01	0.09	0.21	0.29	0.19	0.01	0.02	0.24	0.02	0.02	0.13	0.05	0.22	0.22	0.21	0.09	0.19	0.24	0.20	0.14	0.02	0.02	0.02	0.02	0.02

= 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	0.00	0.03	0.03	0.03	0.03	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	0.27	0.23	0.23	0.22	0.21	0.20
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	0.60	0.41	0.95	0.64	0.65	0.65	0.58	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	1.47	1.13	0.58	0.66	1.32	0.93	0.97	0.95	0.85	0.85
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	1.80	0.97	0.79	0.65	1.46	1.08	1.11	1.07	1.01	1.04
6	0.21	0.18	0.16	0.23	0.33	0.75	2.26	5.10	3.35	4.49	3.17	1.45	1.05	1.37	1.93	1.82	1.36	1.12	0.73	0.58	1.40	1.04	1.05	1.06	1.02	0.98
7	0.15	0.14	0.11	0.26	0.38	0.97	2.80	4.71	3.07	3.22	2.52	1.25	0.96	1.49	2.06	1.33	1.17	0.96	0.60	0.47	1.17	0.87	0.91	0.95	0.86	0.81
8	0.14	0.16	0.12	0.20	0.50	1.21	3.83	3.37	2.10	2.55	2.46	1.16	1.02	1.74	1.47	1.23	1.16	0.96	0.66	0.46	1.19	0.93	1.01	1.00	0.91	0.86
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	0.99	1.43	1.40	1.18	1.11	0.91	0.64	0.42	1.19	0.96	0.98	0.96	0.87	0.83
10	0.13	0.14	0.13	0.26	0.57	1.32	2.31	1.81	1.66	2.17	2.29	1.33	1.04	1.49	1.49	1.22	1.19	1.03	0.76	0.48	1.40	1.14	1.16	1.14	1.06	1.05
11	0.05	0.15	0.12	0.39	0.70	1.13	1.98	1.35	1.71	1.80	1.57	1.03	0.90	1.26	1.24	0.99	0.97	0.85	0.65	0.41	1.17	0.94	0.96	0.95	0.91	0.91
12	0.04	0.07	0.14	0.28	0.60	0.97	1.54	1.58	1.33	1.69	1.72	0.87	0.77	1.07	1.04	0.83	0.85	0.77	0.61	0.35	1.05	0.85	0.87	0.89	0.86	0.85
13	0.07	0.13	0.14	0.25	0.55	0.78	1.28	1.05	1.09	1.74	1.61	0.82	0.71	0.99	0.96	0.76	0.80	0.72	0.56	0.32	0.97	0.79	0.83	0.85	0.82	0.81
14	0.13	0.11	0.20	0.13	0.38	0.55	1.00	0.33	1.33	1.91	1.78	0.87	0.74	1.05	1.02	0.82	0.86	0.75	0.58	0.33	1.02	0.84	0.89	0.90	0.88	0.87
15	0.08	0.12	0.13	0.14	0.43	0.56	0.65	1.57	1.14	1.60	1.46	0.71	0.60	0.88	0.88	0.70	0.74	0.63	0.48	0.28	0.86	0.72	0.76	0.78	0.76	0.75
16	0.12	0.14	0.19	0.14	0.37	0.68	1.07	1.30	0.99	1.30	1.21	0.58	0.49	0.75	0.75	0.60	0.63	0.53	0.41	0.24	0.75	0.62	0.66	0.68	0.66	0.65
17	0.07	0.10	0.09	0.14	0.20	0.36	0.79	1.07	0.84	1.08	1.02	0.47	0.39	0.61	0.63	0.50	0.53	0.43	0.35	0.21	0.63	0.53	0.56	0.58	0.56	0.56
18	0.06	0.12	0.15	0.07	0.28	0.30	0.66	0.86	0.70	0.76	0.73	0.38	0.32	0.50	0.53	0.42	0.46	0.36	0.30	0.18	0.54	0.45	0.48	0.49	0.49	0.48
19	0.06	0.09	0.07	0.20	0.24	0.25	0.55	0.68	0.60	0.62	0.61	0.32	0.25	0.41	0.46	0.36	0.40	0.32	0.26	0.16	0.47	0.39	0.42	0.44	0.43	0.42
20	0.00	0.11	0.17	0.19	0.21	0.21	0.34	0.53	0.52	0.50	0.51	0.26	0.20	0.34	0.40	0.32	0.37	0.28	0.23	0.14	0.41	0.34	0.37	0.39	0.38	0.38
21	0.11	0.19	0.16	0.18	0.19	0.18	0.26	0.42	0.46	0.41	0.43	0.22	0.16	0.29	0.36	0.30	0.34	0.25	0.21	0.12	0.37	0.30	0.33	0.35	0.35	0.34
22	0.17	0.19	0.16	0.17	0.17	0.16	0.20	0.34	0.42	0.33	0.29	0.18	0.13	0.25	0.34	0.28	0.33	0.23	0.20	0.11	0.34	0.28	0.31	0.33	0.32	0.31
23	0.17	0.19	0.16	0.16	0.16	0.15	0.16	0.27	0.38	0.26	0.23	0.16	0.10	0.22	0.32	0.27	0.32	0.21	0.19	0.10	0.31	0.26	0.29	0.31	0.30	0.28
24	0.18	0.20	0.16	0.16	0.15	0.13	0.12	0.21	0.35	0.21	0.18	0.14	0.09	0.20	0.31	0.26	0.31	0.20	0.18	0.10	0.30	0.25	0.28	0.30	0.28	0.27
25	0.19	0.21	0.17	0.16	0.14	0.13	0.09	0.17	0.33	0.17	0.15	0.13	0.07	0.18	0.30	0.26	0.31	0.19	0.18	0.09	0.28	0.24	0.27	0.28	0.28	0.26
26	0.20	0.22	0.18	0.16	0.14	0.12	0.07	0.13	0.32	0.13	0.12	0.12	0.06	0.17	0.29	0.26	0.31	0.19	0.18	0.09	0.28	0.23	0.26	0.28	0.28	0.26
27	0.21	0.23	0.19	0.17	0.14	0.12	0.05	0.10	0.31	0.11	0.09	0.11	0.05	0.16	0.29	0.26	0.32	0.19	0.18	0.08	0.27	0.22	0.26	0.25	0.28	0.27
28	0.19	0.24	0.18	0.17	0.14	0.11	0.04	0.07	0.30	0.08	0.07	0.11	0.05	0.15	0.29	0.26	0.32	0.19	0.19	0.08	0.27	0.23	0.26	0.26	0.26	0.24
29	0.21	0.26	0.19	0.16	0.15	0.11	0.03	0.06	0.25	0.07	0.06	0.11	0.04	0.14	0.30	0.27	0.33	0.20	0.20	0.08	0.27	0.23	0.24	0.26	0.27	0.22
30	0.22	0.28	0.20	0.17	0.15	0.11	0.02	0.04	0.24	0.05	0.05	0.11	0.04	0.14	0.30	0.28	0.31	0.20	0.20	0.08	0.25	0.24	0.25	0.24	0.28	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	0.02	0.02	0.02	0.02	0.02
2	0.26	0.30	0.19	0.18	0.18	0.61	1.11	1.60	0.66	0.78	0.54	0.34	0.23	0.27	0.19	0.18	0.23	0.18	0.16	0.13	0.24	0.20	0.20	0.19	0.17	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	0.70	0.57	0.41	1.01	0.64	0.65	0.66	0.58	0.55
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	1.26	0.57	0.71	1.41	0.94	1.00	0.97	0.85	0.83
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	2.12	1.04	0.89	0.76	1.65	1.19	1.21	1.15	1.07	1.10
6	0.29	0.19	0.15	0.22	0.67	1.27	2.67	6.55	4.59	4.73	3.32	1.78	1.21	1.66	2.26	2.25	1.47	1.28	0.85	0.69	1.61	1.17	1.17	1.17	1.12	1.06
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	2.47	1.55	1.31	1.12	0.73	0.59	1.36	0.99	1.03	1.06	0.95	0.88
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	1.99	1.63	1.43	1.31	1.15	0.82	0.58	1.39	1.08	1.17	1.13	1.02	0.96
9	0.12	0.16	0.12	0.34	0.76	2.06	2.99	3.30	2.48	2.46	3.48	1.90	1.20	1.63	1.64	1.45	1.31	1.13	0.82	0.56	1.41	1.14	1.16	1.11	1.00	0.95
10	0.12	0.08	0.13	0.37	1.08	1.73	2.62	1.17	2.16	2.41	2.52	1.69	0.96	1.39	1.42	1.22	1.07	0.88	0.62	0.44	1.15	0.88	0.89	0.85	0.76	0.74
11	0.10	0.15	0.13	0.45	0.89	1.57	1.93	1.86	1.58	1.81	2.33	1.30	0.85	1.19	1.19	1.00	0.88	0.73	0.53	0.38	0.96	0.73	0.73	0.71	0.65	0.63
12	0.11	0.08	0.30	0.34	0.79	1.08	1.55	0.39	2.27	1.62	2.09	1.28	0.84	1.14	1.13	0.95	0.91	0.82	0.66	0.40	1.06	0.84	0.85	0.86	0.81	0.79
13	0.12	0.17	0.12	0.44	0.61	0.95	1.08	0.64	1.58	2.05	1.83	1.19	0.76	1.03	1.02	0.86	0.85	0.75	0.59	0.35	0.95	0.75	0.79	0.79	0.75	0.73
14	0.15	0.18	0.22	0.22	0.49	1.08	1.58	1.15	1.64	2.12	2.04	1.24	0.77	1.05	1.06	0.90	0.89	0.76	0.59	0.35	0.97	0.78	0.81	0.82	0.77	0.75
15	0.11	0.26	0.12	0.23	0.37	0.92	0.85	1.70	1.43	1.85	1.73	1.01	0.62	0.87	0.91	0.76	0.77	0.63	0.48	0.29	0.82	0.65	0.69	0.69	0.66	0.63
16	0.08	0.13	0.06	0.26	0.46	0.75	1.21	1.43	1.27	1.48	1.33	0.82	0.50	0.74	0.78	0.63	0.67	0.53	0.41	0.25	0.71	0.56	0.59	0.60	0.56	0.54
17	0.08	0.17	0.20	0.26	0.33	0.56	0.97	1.20	1.10	1.13	1.02	0.66	0.40	0.61	0.65	0.52	0.58	0.44	0.35	0.22	0.60	0.46	0.50	0.50	0.47	0.46
18	0.10	0.13	0.07	0.22	0.37	0.46	0.79	0.97	0.95	0.90	0.82	0.54	0.32	0.50	0.55	0.43	0.51	0.37	0.30	0.19	0.52	0.39	0.42	0.43	0.40	0.38
19	0.02	0.23	0.10	0.22	0.32	0.40	0.63	0.78	0.78	0.73	0.67	0.44	0.26	0.41	0.47	0.37	0.47	0.33	0.27	0.16	0.46	0.33	0.36	0.37	0.35	0.33
20	0.06	0.10	0.16	0.20	0.28	0.33	0.49	0.62	0.68	0.60	0.54	0.36	0.21	0.34	0.39	0.33	0.44	0.28	0.24	0.14	0.41	0.28	0.32	0.33	0.31	0.28
21	0.02	0.19	0.15	0.18	0.25	0.28	0.39	0.50	0.62	0.48	0.44	0.30	0.16	0.29	0.35	0.29	0.42	0.25	0.22	0.13	0.37	0.25	0.29	0.30	0.27	0.25
22	0.17	0.19	0.14	0.16	0.22	0.24	0.30	0.40	0.57	0.39	0.35	0.25	0.13	0.25	0.32	0.27	0.41	0.23	0.21	0.12	0.35	0.22	0.26	0.27	0.25	0.22
23	0.17	0.19	0.14	0.15	0.20	0.21	0.24	0.32	0.47	0.31	0.27	0.21	0.11	0.22	0.30	0.26	0.41	0.22	0.19	0.11	0.33	0.20	0.24	0.26	0.23	0.19
24	0.17	0.19	0.13	0.14	0.18	0.19	0.19	0.25	0.34	0.24	0.21	0.18	0.09	0.20	0.29	0.24	0.35	0.21	0.18	0.10	0.32	0.19	0.23	0.24	0.21	0.18
25	0.18	0.19	0.13	0.14	0.17	0.18	0.15	0.20	0.31	0.19	0.17	0.16	0.08	0.19	0.28	0.24	0.30	0.21	0.18	0.10	0.28	0.18	0.22	0.23	0.20	0.17
26	0.19	0.20	0.14	0.14	0.16	0.17	0.11	0.15	0.29	0.15	0.14	0.15	0.07	0.18	0.27	0.23	0.25	0.20	0.18	0.09	0.28	0.17	0.21	0.22	0.20	0.16
27	0.17	0.21	0.14	0.14	0.16	0.16	0.09	0.12	0.27	0.12	0.11	0.14	0.06	0.17	0.27	0.23	0.25	0.21	0.19	0.09	0.28	0.16	0.21	0.22	0.20	0.16
28	0.18	0.22	0.15	0.14	0.16	0.15	0.06	0.09	0.26	0.09	0.08	0.13	0.06	0.16	0.27	0.23	0.21	0.21	0.19	0.09	0.28	0.16	0.21	0.23	0.20	0.16
29	0.19	0.23	0.15	0.14	0.16	0.14	0.05	0.07	0.25	0.07	0.07	0.13	0.05	0.16	0.28	0.24	0.21	0.22	0.20	0.09	0.28	0.16	0.22	0.23	0.20	0.16
30	0.20	0.25	0.16	0.15	0.16	0.14	0.04	0.05	0.25	0.06	0.05	0.12	0.05	0.16	0.28	0.24	0.22	0.22	0.21	0.09	0.29	0.16	0.22	0.24	0.21	0.16

= 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	0.01	0.02	0.02	0.01	0.01
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	0.15	0.25	0.20	0.20	0.19	0.17	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	0.55	0.42	1.00	0.63	0.64	0.64	0.56	0.52
4	0.58	0.45	0.31	0.37	0.81	1.52	2.48	4.70	2.27	3.90	4.99	2.15	1.20	1.42	1.46	1.54	1.82	1.19	0.59	0.75	1.46	0.96	1.02	0.99	0.86	0.84
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	2.11	1.12	0.95	0.82	1.77	1.26	1.30	1.23	1.14	1.16
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	1.89	2.38	2.17	1.71	1.50	1.01	0.82	1.90	1.38	1.39	1.38	1.33	1.26
7	0.28	0.16	0.22	0.24	0.71	1.36	4.78	7.08	4.01	3.59	3.52	1.95	1.44	2.23	2.52	1.80	1.64	1.40	0.92	0.74	1.72	1.25	1.31	1.35	1.20	1.13
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	1.91	1.66	1.65	1.49	1.11	0.75	1.82	1.44	1.55	1.52	1.38	1.30
9	0.14	0.16	0.16	0.28	0.81	1.99	3.23	3.40	2.64	2.84	3.01	2.07	1.40	1.83	1.78	1.55	1.52	1.36	1.02	0.67	1.71	1.40	1.43	1.38	1.25	1.20
10	0.14	0.03	0.16	0.35	1.05	2.02	2.44	2.11	2.07	2.10	3.15	2.01	1.15	1.61	1.57	1.32	1.25	1.08	0.79	0.53	1.41	1.11	1.12	1.08	0.98	0.95
11	0.09	0.09	0.17	0.43	0.95	1.52	2.14	2.79	2.32	2.70	3.31	1.44	1.17	1.57	1.49	1.23	1.17	1.01	0.76	0.51	1.34	1.04	1.05	1.02	0.95	0.92
12	0.15	0.18	0.24	0.30	0.81	1.33	2.12	2.26	2.06	1.80	2.36	1.38	1.13	1.47	1.37	1.14	1.16	1.08	0.90	0.53	1.41	1.15	1.18	1.18	1.13	1.10
13	0.15	0.18	0.22	0.39	0.57	1.12	1.62	1.33	1.91	2.40	2.12	1.30	1.04	1.35	1.25	1.03	1.08	0.99	0.80	0.46	1.28	1.05	1.09	1.10	1.04	1.02
14	0.13	0.18	0.22	0.35	0.64	0.94	1.49	0.80	1.75	2.27	2.14	1.24	0.97	1.27	1.18	0.99	1.03	0.92	0.74	0.43	1.19	1.00	1.04	1.04	0.99	0.97
15	0.16	0.16	0.20	0.25	0.57	0.98	1.73	1.95	1.55	1.95	1.84	1.03	0.79	1.07	1.00	0.83	0.88	0.76	0.60	0.35	1.00	0.85	0.88	0.88	0.84	0.82
16	0.13	0.10	0.16	0.20	0.47	1.10	1.30	1.66	1.39	1.64	1.47	0.85	0.65	0.91	0.85	0.69	0.75	0.63	0.50	0.30	0.85	0.72	0.75	0.76	0.72	0.70
17	0.12	0.18	0.08	0.32	0.31	0.59	1.06	1.41	1.20	1.28	1.12	0.69	0.53	0.75	0.70	0.56	0.62	0.51	0.42	0.26	0.71	0.60	0.63	0.63	0.60	0.59
18	0.11	0.14	0.14	0.13	0.40	0.50	0.87	1.16	1.04	1.05	0.91	0.57	0.43	0.61	0.58	0.46	0.53	0.42	0.35	0.22	0.59	0.49	0.52	0.53	0.50	0.49
19	0.23	0.09	0.07	0.23	0.35	0.43	0.70	0.95	0.91	0.86	0.76	0.47	0.35	0.49	0.48	0.38	0.46	0.35	0.30	0.19	0.50	0.41	0.44	0.45	0.43	0.41
20	0.09	0.16	0.16	0.20	0.30	0.37	0.56	0.76	0.75	0.72	0.62	0.38	0.28	0.40	0.41	0.33	0.41	0.30	0.25	0.16	0.43	0.34	0.37	0.38	0.36	0.35
21	0.15	0.16	0.15	0.18	0.26	0.32	0.44	0.62	0.68	0.59	0.50	0.32	0.22	0.33	0.35	0.29	0.38	0.25	0.22	0.14	0.37	0.29	0.32	0.33	0.31	0.30
22	0.16	0.16	0.13	0.16	0.23	0.28	0.35	0.51	0.61	0.48	0.40	0.26	0.18	0.28	0.31	0.25	0.35	0.22	0.20	0.12	0.32	0.26	0.28	0.29	0.27	0.26
23	0.17	0.16	0.12	0.15	0.20	0.24	0.28	0.41	0.56	0.39	0.32	0.22	0.15	0.24	0.28	0.23	0.33	0.19	0.18	0.11	0.29	0.22	0.25	0.26	0.24	0.21
24	0.17	0.16	0.12	0.14	0.19	0.22	0.22	0.33	0.52	0.31	0.26	0.19	0.12	0.21	0.26	0.21	0.32	0.17	0.16	0.10	0.26	0.19	0.22	0.23	0.20	0.18
25	0.17	0.16	0.11	0.13	0.17	0.21	0.17	0.26	0.42	0.25	0.21	0.17	0.10	0.18	0.24	0.19	0.31	0.16	0.15	0.09	0.22	0.17	0.20	0.20	0.18	0.16
26	0.17	0.16	0.11	0.12	0.16	0.19	0.13	0.21	0.39	0.20	0.17	0.15	0.09	0.16	0.22	0.18	0.30	0.15	0.15	0.08	0.21	0.16	0.18	0.18	0.17	0.15
27	0.18	0.17	0.11	0.12	0.15	0.18	0.10	0.16	0.28	0.16	0.13	0.14	0.08	0.14	0.21	0.18	0.30	0.14	0.14	0.08	0.19	0.14	0.16	0.17	0.16	0.14
28	0.19	0.17	0.12	0.12	0.15	0.17	0.08	0.12	0.26	0.13	0.10	0.13	0.07	0.13	0.21	0.17	0.31	0.13	0.14	0.07	0.18	0.13	0.16	0.17	0.15	0.13
29	0.19	0.18	0.12	0.12	0.15	0.17	0.06	0.10	0.25	0.10	0.08	0.12	0.06	0.12	0.20	0.17	0.31	0.13	0.13	0.06	0.17	0.12	0.15	0.16	0.14	0.12
30	0.20	0.19	0.12	0.12	0.15	0.17	0.05	0.07	0.24	0.08	0.06	0.12	0.06	0.12	0.20	0.17	0.32	0.13	0.13	0.06	0.17	0.12	0.15	0.16	0.14	0.12

= 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	0.01	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	0.18	0.22	0.36	0.29	0.29	0.28	0.25	0.24
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	0.55	1.28	0.83	0.84	0.83	0.74	0.69
4	0.75	0.55	0.43	0.48	0.76	1.78	3.55	6.02	3.06	5.47	6.11	2.51	1.58	1.69	1.79	1.71	1.91	1.25	0.72	0.87	1.70	1.16	1.21	1.18	1.04	1.02
5	0.53	0.40	0.33	0.37	0.81	1.68	3.58	7.18	4.49	7.28	5.77	2.60	1.65	2.02	1.97	2.33	2.32	1.31	1.08	0.92	1.99	1.45	1.48	1.42	1.32	1.35
6	0.42	0.32	0.24	0.51	0.86	1.68	3.72	8.49	6.23	3.82	4.89	2.44	1.64	1.97	2.57	2.44	1.91	1.68	1.14	0.89	2.09	1.56	1.56	1.57	1.52	1.46
7	0.29	0.25	0.29	0.44	0.85	1.83	4.68	9.26	5.06	4.66	4.14	2.30	1.49	2.33	2.53	2.00	1.72	1.50	0.99	0.77	1.82	1.35	1.42	1.46	1.33	1.26
8	0.20	0.26	0.24	0.42	0.93	2.13	5.59	6.05	3.91	3.62	3.71	2.14	1.64	2.45	2.31	1.88	1.77	1.63	1.22	0.80	1.98	1.62	1.74	1.71	1.58	1.51
9	0.24	0.27	0.24	0.36	1.11	2.75	4.07	4.33	3.41	3.39	3.64	2.17	1.59	2.23	2.16	1.78	1.65	1.50	1.15	0.72	1.90	1.60	1.63	1.59	1.46	1.41
10	0.19	0.21	0.23	0.50	1.20	2.17	3.39	2.65	2.99	2.67	3.20	2.23	1.45	2.01	1.98	1.57	1.44	1.30	0.98	0.63	1.70	1.40	1.41	1.37	1.28	1.27
11	0.20	0.16	0.27	0.60	1.05	1.82	2.54	2.42	2.60	2.91	3.09	1.90	1.33	1.80	1.73	1.34	1.23	1.12	0.87	0.55	1.48	1.21	1.22	1.20	1.14	1.13
12	0.16	0.24	0.36	0.50	0.99	1.41	1.98	1.78	2.64	2.24	2.78	1.66	1.19	1.59	1.49	1.14	1.07	0.99	0.79	0.47	1.30	1.06	1.07	1.08	1.03	1.02
13	0.19	0.29	0.31	0.48	0.92	1.36	2.27	1.44	2.13	2.99	2.69	1.59	1.11	1.48	1.38	1.06	1.02	0.93	0.72	0.42	1.20	0.98	1.02	1.03	0.98	0.97
14	0.15	0.24	0.25	0.44	0.74	1.37	1.37	1.47	2.09	2.78	2.54	1.42	0.97	1.31	1.23	0.95	0.91	0.82	0.63	0.37	1.05	0.88	0.92	0.92	0.89	0.88
15	0.22	0.25	0.22	0.33	0.63	1.14	1.77	2.36	1.80	2.49	2.24	1.17	0.80	1.10	1.04	0.80	0.77	0.68	0.52	0.30	0.88	0.75	0.78	0.78	0.76	0.75
16	0.19	0.20	0.19	0.31	0.58	0.86	1.83	2.01	1.58	2.20	1.96	0.97	0.66	0.93	0.88	0.67	0.65	0.56	0.43	0.26	0.75	0.64	0.66	0.67	0.65	0.64
17	0.15	0.16	0.25	0.21	0.45	0.64	1.53	1.69	1.33	1.89	1.61	0.78	0.54	0.76	0.71	0.54	0.53	0.45	0.36	0.22	0.62	0.53	0.55	0.56	0.54	0.53
18	0.17	0.18	0.20	0.25	0.42	0.53	1.26	1.39	1.11	1.53	1.41	0.64	0.44	0.62	0.58	0.43	0.44	0.37	0.30	0.18	0.51	0.43	0.45	0.46	0.45	0.45
19	0.14	0.13	0.17	0.24	0.35	0.44	1.00	1.13	0.92	1.32	1.14	0.52	0.35	0.50	0.46	0.35	0.37	0.31	0.25	0.16	0.42	0.36	0.38	0.38	0.38	0.37
20	0.11	0.14	0.17	0.21	0.29	0.36	0.83	0.91	0.78	1.10	1.00	0.42	0.28	0.40	0.38	0.29	0.32	0.25	0.21	0.13	0.35	0.30	0.31	0.32	0.32	0.31
21	0.07	0.15	0.15	0.18	0.24	0.30	0.71	0.75	0.68	0.97	0.75	0.34	0.22	0.32	0.31	0.24	0.28	0.21	0.18	0.11	0.30	0.25	0.27	0.27	0.27	0.27
22	0.14	0.14	0.13	0.15	0.20	0.25	0.62	0.62	0.59	0.81	0.60	0.28	0.18	0.27	0.27	0.21	0.25	0.18	0.15	0.10	0.25	0.22	0.23	0.24	0.23	0.23
23	0.13	0.12	0.12	0.13	0.17	0.21	0.55	0.51	0.51	0.71	0.51	0.23	0.14	0.22	0.23	0.18	0.22	0.16	0.13	0.09	0.22	0.18	0.20	0.20	0.20	0.18
24	0.13	0.11	0.11	0.12	0.15	0.18	0.49	0.42	0.45	0.44	0.39	0.19	0.12	0.19	0.20	0.15	0.21	0.14	0.12	0.08	0.19	0.16	0.17	0.18	0.16	0.16
25	0.12	0.11	0.10	0.10	0.13	0.16	0.35	0.34	0.40	0.37	0.33	0.16	0.10	0.16	0.17	0.13	0.19	0.12	0.10	0.07	0.16	0.14	0.15	0.14	0.14	0.14
26	0.12	0.10	0.10	0.10	0.11	0.14	0.31	0.27	0.36	0.31	0.29	0.14	0.08	0.13	0.15	0.12	0.18	0.11	0.10	0.06	0.15	0.12	0.12	0.13	0.12	0.12
27	0.12	0.10	0.09	0.09	0.10	0.12	0.28	0.21	0.33	0.27	0.25	0.12	0.07	0.11	0.14	0.11	0.16	0.10	0.09	0.05	0.13	0.10	0.11	0.11	0.11	0.11
28	0.12	0.10	0.09	0.08	0.09	0.11	0.10	0.17	0.30	0.23	0.22	0.11	0.06	0.10	0.12	0.10	0.15	0.09	0.08	0.05	0.11	0.09	0.10	0.10	0.10	0.10
29	0.13	0.10	0.09	0.08	0.08	0.10	0.08	0.14	0.28	0.20	0.19	0.10	0.05	0.09	0.11	0.09	0.15	0.08	0.08	0.04	0.10	0.08	0.09	0.10	0.09	0.09
30	0.13	0.11	0.09	0.08	0.08	0.09	0.06	0.11	0.27	0.18	0.17	0.09	0.04	0.08	0.11	0.09	0.15	0.08	0.07	0.04	0.10	0.07	0.08	0.09	0.09	0.08

= 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	0.08	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	0.20	0.49	0.40	0.39	0.38	0.34	0.33
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	0.65	0.66	1.60	0.98	1.00	1.00	0.87	0.81
4	1.20	0.90	0.60	0.67	1.07	2.55	5.05	7.97	3.92	6.39	6.97	3.05	1.84	2.04	2.09	2.11	2.15	1.56	0.78	1.00	1.97	1.26	1.34	1.30	1.11	1.09
5	0.79	0.48	0.47	0.53	1.24	2.24	5.06	8.27	5.13	6.14	6.42	2.88	1.79	2.26	2.25	2.65	2.54	1.43	1.15	0.99	2.19	1.51	1.55	1.46	1.33	1.36
6	0.45	0.38	0.39	0.61	1.06	2.19	4.56	8.23	6.64	8.58	4.97	2.60	1.78	2.23	2.70	2.71	2.01	1.91	1.30	0.99	2.35	1.71	1.71	1.70	1.64	1.57
7	0.33	0.33	0.41	0.49	1.05	2.10	5.15	8.33	5.14	4.94	4.19	2.27	1.67	2.49	2.85	2.96	1.83	1.72	1.13	0.86	2.04	1.47	1.53	1.58	1.41	1.33
8	0.24	0.33	0.31	0.48	1.11	2.51	5.69	5.49	3.85	3.90	3.69	2.08	1.79	2.60	3.17	2.81	1.85	1.88	1.42	0.89	2.19	1.74	1.86	1.82	1.67	1.59
9	0.33	0.32	0.35	0.54	1.20	2.93	4.44	3.78	3.21	3.43	3.49	2.23	1.80	2.62	3.04	2.70	1.71	1.73	1.32	0.78	2.06	1.68	1.70	1.64	1.50	1.45
10	0.27	0.26	0.34	0.58	1.53	2.49	3.47	3.17	2.92	3.00	3.30	2.27	1.43	2.30	2.69	2.31	1.40	1.39	1.01	0.62	1.68	1.31	1.31	1.26	1.16	1.14
11	0.28	0.27	0.38	0.78	1.39	2.12	2.92	2.20	2.50	2.94	3.24	2.29	1.45	2.25	2.59	2.17	1.29	1.30	0.97	0.59	1.58	1.21	1.20	1.17	1.11	1.08
12	0.24	0.29	0.50	0.81	1.13	1.85	2.18	1.51	2.28	2.42	2.72	2.08	1.33	2.01	2.29	1.92	1.18	1.30	1.04	0.56	1.53	1.21	1.21	1.22	1.17	1.14
13	0.26	0.37	0.56	0.68	1.08	1.56	1.78	2.09	2.00	2.41	2.61	1.99	1.24	1.86	2.11	1.77	1.10	1.20	0.93	0.49	1.38	1.08	1.11	1.11	1.06	1.05
14	0.33	0.39	0.54	0.62	0.93	1.46	1.73	1.59	1.80	2.26	2.47	1.80	1.10	1.66	1.89	1.61	0.98	1.07	0.81	0.43	1.21	0.97	0.99	0.99	0.95	0.94
15	0.35	0.44	0.47	0.48	0.77	1.35	1.57	1.74	1.57	2.02	2.16	1.51	0.91	1.40	1.61	1.36	0.81	0.90	0.66	0.35	1.01	0.80	0.82	0.82	0.79	0.78
16	0.33	0.33	0.42	0.42	0.70	1.12	1.69	1.49	1.38	1.77	1.86	1.24	0.75	1.18	1.35	1.13	0.67	0.74	0.55	0.30	0.85	0.67	0.68	0.69	0.66	0.65
17	0.25	0.32	0.32	0.40	0.61	0.78	1.44	1.25	1.16	1.49	1.57	1.01	0.61	0.96	1.09	0.90	0.53	0.60	0.45	0.25	0.69	0.54	0.56	0.55	0.54	0.53
18	0.25	0.30	0.23	0.32	0.53	0.64	1.23	1.03	0.96	1.26	1.33	0.82	0.49	0.77	0.87	0.72	0.43	0.50	0.37	0.21	0.56	0.43	0.45	0.45	0.44	0.43
19	0.26	0.19	0.21	0.30	0.44	0.53	1.02	0.83	0.79	1.09	1.16	0.67	0.39	0.62	0.69	0.57	0.35	0.41	0.30	0.18	0.46	0.35	0.36	0.37	0.36	0.36
20	0.24	0.19	0.22	0.25	0.37	0.44	0.86	0.66	0.66	0.93	1.01	0.53	0.31	0.49	0.55	0.46	0.28	0.35	0.25	0.15	0.38	0.29	0.30	0.30	0.30	0.29
21	0.21	0.18	0.20	0.21	0.30	0.36	0.74	0.54	0.56	0.81	0.86	0.43	0.24	0.39	0.45	0.38	0.24	0.29	0.21	0.12	0.32	0.24	0.25	0.25	0.25	0.24
22	0.15	0.16	0.17	0.18	0.25	0.29	0.65	0.44	0.48	0.72	0.77	0.34	0.19	0.32	0.37	0.31	0.20	0.25	0.18	0.11	0.27	0.20	0.21	0.21	0.21	0.21
23	0.13	0.14	0.14	0.15	0.20	0.24	0.58	0.36	0.42	0.62	0.63	0.28	0.15	0.26	0.30	0.26	0.17	0.22	0.15	0.09	0.22	0.17	0.18	0.18	0.18	0.17
24	0.12	0.12	0.12	0.12	0.17	0.20	0.52	0.28	0.36	0.55	0.56	0.22	0.13	0.21	0.25	0.21	0.14	0.19	0.13	0.08	0.19	0.14	0.15	0.16	0.15	0.14
25	0.10	0.11	0.11	0.10	0.14	0.17	0.47	0.22	0.31	0.50	0.52	0.18	0.10	0.17	0.21	0.17	0.12	0.16	0.12	0.07	0.17	0.12	0.13	0.13	0.13	0.12
26	0.09	0.09	0.09	0.09	0.12	0.14	0.43	0.18	0.28	0.46	0.48	0.15	0.08	0.14	0.17	0.15	0.11	0.15	0.11	0.06	0.15	0.11	0.11	0.12	0.11	0.11
27	0.08	0.08	0.08	0.08	0.10	0.12	0.40	0.14	0.25	0.43	0.35	0.13	0.07	0.12	0.15	0.12	0.10	0.14	0.10	0.05	0.13	0.09	0.10	0.11	0.10	0.10
28	0.08	0.08	0.07	0.07	0.08	0.10	0.31	0.10	0.23	0.38	0.32	0.10	0.05	0.10	0.12	0.10	0.09	0.13	0.09	0.05	0.12	0.08	0.09	0.10	0.09	0.09
29	0.07	0.07	0.06	0.06	0.07	0.08	0.29	0.08	0.20	0.32	0.26	0.09	0.04	0.08	0.11	0.09	0.08	0.12	0.08	0.04	0.11	0.07	0.08	0.09	0.09	0.09
30	0.07	0.07	0.06	0.05	0.06	0.07	0.21	0.06	0.19	0.25	0.24	0.08	0.04	0.07	0.09	0.08	0.08	0.11	0.08	0.04	0.10	0.07	0.08	0.09	0.09	0.08

= 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	0.04	0.04	0.04	0.04	0.04
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	0.40	0.31	0.31	0.30	0.27	0.26
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	0.54	0.66	1.41	0.99	1.00	0.99	0.89	0.86
4	0.90	0.84	0.47	0.59	0.66	1.60	4.31	6.22	2.62	5.06	6.07	2.96	1.46	1.80	1.58	1.46	2.02	1.50	0.92	0.94	1.86	1.37	1.41	1.39	1.27	1.28
5	0.77	0.64	0.33	0.44	0.75	1.55	4.11	6.34	3.42	5.71	6.76	2.34	1.50	1.88	1.85	2.10	2.97	1.30	1.00	0.81	1.80	1.36	1.39	1.36	1.30	1.35
6	0.59	0.42	0.36	0.49	0.68	1.66	3.80	6.29	4.58	7.76	4.77	2.06	1.37	1.90	2.49	2.53	1.69	1.42	0.96	0.71	1.74	1.32	1.34	1.37	1.36	1.33
7	0.44	0.38	0.22	0.36	0.79	1.42	3.99	5.42	5.80	4.26	4.07	1.84	1.26	2.18	2.77	1.78	1.42	1.18	0.77	0.56	1.43	1.08	1.15	1.20	1.12	1.08
8	0.27	0.34	0.30	0.42	0.61	1.44	3.79	4.53	3.00	2.92	3.46	1.63	1.28	2.34	1.88	1.58	1.44	1.32	1.01	0.60	1.63	1.38	1.50	1.52	1.46	1.42
9	0.44	0.25	0.26	0.34	0.67	1.88	2.62	2.74	2.29	2.61	3.22	1.76	1.23	1.78	1.73	1.45	1.34	1.23	0.97	0.54	1.61	1.37	1.43	1.44	1.38	1.36
10	0.25	0.20	0.18	0.37	1.06	1.73	2.24	2.07	2.29	2.21	3.34	1.84	1.12	1.59	1.57	1.26	1.16	1.05	0.81	0.46	1.44	1.15	1.19	1.19	1.14	1.16
11	0.29	0.25	0.27	0.49	0.87	1.31	1.77	1.58	2.01	2.30	2.63	1.67	1.01	1.43	1.37	1.07	1.03	0.94	0.75	0.42	1.30	1.02	1.05	1.06	1.05	1.07
12	0.23	0.27	0.30	0.43	0.76	0.99	1.31	1.37	1.82	1.71	2.52	1.40	0.86	1.22	1.15	0.89	0.92	0.84	0.69	0.36	1.14	0.87	0.91	0.95	0.94	0.95
13	0.17	0.28	0.22	0.34	0.55	0.97	1.31	1.16	1.71	2.48	2.13	1.20	0.72	1.02	0.96	0.75	0.84	0.76	0.61	0.31	1.00	0.75	0.80	0.84	0.83	0.83
14	0.26	0.17	0.20	0.49	0.54	0.81	1.30	1.00	2.03	3.16	2.76	1.46	0.86	1.25	1.16	0.91	1.00	0.89	0.71	0.36	1.17	0.89	0.96	1.00	0.99	0.98
15	0.34	0.23	0.18	0.28	0.50	0.90	1.18	2.70	1.66	2.70	2.30	1.16	0.69	1.02	0.97	0.75	0.89	0.78	0.62	0.31	1.02	0.77	0.82	0.86	0.86	0.85
16	0.24	0.16	0.19	0.27	0.52	0.86	1.27	2.13	1.40	2.26	1.89	0.93	0.55	0.85	0.81	0.61	0.72	0.70	0.58	0.28	0.92	0.67	0.72	0.76	0.73	0.74
17	0.25	0.24	0.19	0.23	0.52	0.41	1.01	1.68	1.11	1.82	1.52	0.72	0.43	0.68	0.65	0.49	0.51	0.55	0.55	0.26	0.82	0.57	0.62	0.66	0.63	0.64
18	0.19	0.13	0.23	0.11	0.33	0.32	0.83	1.30	0.89	1.49	1.26	0.58	0.34	0.54	0.53	0.40	0.45	0.46	0.49	0.24	0.64	0.50	0.55	0.58	0.56	0.57
19	0.21	0.31	0.15	0.24	0.27	0.26	0.69	0.99	0.71	1.25	1.07	0.46	0.26	0.43	0.43	0.33	0.28	0.37	0.38	0.23	0.53	0.45	0.50	0.50	0.51	0.52
20	0.16	0.21	0.23	0.21	0.23	0.22	0.58	0.75	0.58	1.07	0.91	0.36	0.21	0.35	0.37	0.28	0.24	0.35	0.31	0.22	0.36	0.41	0.43	0.47	0.47	0.49
21	0.13	0.23	0.22	0.18	0.19	0.18	0.51	0.58	0.49	0.94	0.79	0.29	0.16	0.28	0.32	0.26	0.22	0.26	0.23	0.22	0.32	0.36	0.41	0.41	0.41	0.43
22	0.20	0.22	0.21	0.17	0.17	0.16	0.46	0.46	0.42	0.82	0.70	0.23	0.13	0.24	0.29	0.24	0.20	0.25	0.23	0.22	0.29	0.36	0.32	0.31	0.32	0.32
23	0.20	0.20	0.20	0.16	0.15	0.14	0.43	0.37	0.36	0.67	0.56	0.19	0.10	0.21	0.27	0.22	0.19	0.16	0.14	0.22	0.20	0.35	0.32	0.30	0.30	0.30
24	0.20	0.19	0.20	0.15	0.14	0.13	0.38	0.28	0.32	0.54	0.51	0.16	0.08	0.18	0.26	0.21	0.19	0.15	0.14	0.23	0.18	0.28	0.27	0.29	0.29	0.24
25	0.18	0.20	0.21	0.15	0.14	0.12	0.32	0.22	0.28	0.48	0.41	0.14	0.07	0.17	0.25	0.21	0.19	0.15	0.14	0.24	0.17	0.23	0.27	0.23	0.24	0.24
26	0.18	0.20	0.21	0.15	0.13	0.12	0.28	0.17	0.26	0.43	0.38	0.12	0.06	0.15	0.25	0.21	0.03	0.15	0.15	0.25	0.16	0.24	0.21	0.23	0.24	0.18
27	0.19	0.21	0.23	0.15	0.13	0.11	0.27	0.13	0.24	0.36	0.36	0.11	0.05	0.14	0.25	0.21	0.02	0.16	0.02	0.26	0.15	0.24	0.21	0.17	0.18	0.18
28	0.20	0.22	0.24	0.16	0.13	0.11	0.26	0.10	0.23	0.30	0.34	0.10	0.05	0.13	0.25	0.22	0.02	0.02	0.02	0.28	0.15	0.19	0.22	0.10	0.10	0.11
29	0.21	0.24	0.26	0.16	0.13	0.11	0.26	0.08	0.22	0.28	0.33	0.09	0.04	0.13	0.26	0.22	0.01	0.01	0.01	0.29	0.15	0.20	0.16	0.10	0.11	0.11
30	0.23	0.25	0.28	0.17	0.14	0.11	0.26	0.06	0.21	0.26	0.28	0.09	0.04	0.12	0.26	0.23	0.01	0.01	0.01	0.31	0.02	0.21	0.09	0.10	0.11	0.11

= 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	6.14	9.58	5.05	6.80	4.58	1.65	1.00	14.71	17.35	28.70	0.47	0.42	0.43	0.43	0.43
2	1.75	3.84	2.66	1.87	0.94	0.54	0.36	16.90	0.73	1.84	21.92	27.00	4.79	17.52	18.44	19.89	14.75	10.43	29.66	11.05	7.29	3.46	4.01	4.73	4.55	4.21
3	6.05	8.22	5.07	1.64	0.71	0.24	4.73	9.20	1.72	23.65	35.80	6.52	3.35	6.25	17.00	33.60	27.91	18.86	9.18	11.19	11.51	9.04	11.25	12.01	11.42	12.07
4	9.07	8.50	3.17	1.06	0.37	1.73	3.73	12.10	15.86	26.88	10.09	6.67	1.42	5.00	27.91	40.52	30.06	6.16	18.68	11.80	14.99	13.66	15.15	15.12	15.78	16.69
5	7.84	4.61	1.66	0.62	1.56	2.02	5.10	25.83	26.41	9.66	7.98	3.75	3.08	15.86	33.31	37.62	7.49	25.64	16.62	12.96	18.48	16.57	17.17	18.71	19.90	19.30
6	4.06	2.57	0.85	1.89	1.74	2.90	18.70	22.76	10.72	7.37	7.02	8.38	6.65	21.96	33.77	12.31	29.11	19.39	16.22	14.22	18.58	15.80	17.64	19.21	18.67	17.96
7	2.25	1.17	2.63	1.97	2.05	11.14	20.95	9.73	8.54	8.75	8.69	12.42	16.77	28.50	13.40	17.50	16.37	15.31	14.36	11.59	14.45	13.85	14.95	15.32	15.27	15.25
8	1.17	3.10	2.78	2.23	4.97	16.75	9.59	6.86	10.07	8.66	14.92	23.26	25.06	11.94	15.86	12.35	13.93	13.54	12.06	9.88	12.85	11.82	12.29	12.47	12.53	13.00
9	3.34	3.28	2.78	5.16	7.80	8.39	6.72	5.38	12.40	10.99	16.53	43.52	7.58	13.24	11.61	11.26	13.54	12.84	11.35	9.83	12.24	11.05	11.39	11.72	12.31	12.54
10	3.31	3.44	5.25	7.86	5.70	6.67	7.18	4.45	19.84	12.52	21.11	13.45	10.98	10.67	10.59	11.45	12.84	11.64	10.67	9.31	11.08	9.86	10.27	10.96	11.18	11.18
11	3.44	5.52	6.97	5.58	5.38	7.37	7.12	5.99	19.60	14.22	10.16	11.90	7.90	9.13	9.49	9.81	10.72	10.52	9.48	8.08	9.41	8.65	9.34	9.74	9.83	9.74
12	5.81	7.36	5.68	5.21	5.52	8.06	11.08	6.90	19.18	5.07	15.81	8.74	7.03	8.94	8.89	8.83	9.77	8.72	7.31	6.71	7.83	7.19	7.56	7.71	7.55	7.54
13	7.26	5.38	4.87	5.35	5.29	14.94	13.54	6.30	7.46	14.04	11.13	7.66	6.46	7.84	7.65	8.03	8.53	7.58	6.45	6.02	7.18	6.53	6.76	6.81	6.81	6.80
14	5.23	4.97	5.06	5.26	8.33	17.23	13.44	3.30	12.28	10.73	10.30	7.47	6.38	7.49	7.69	7.80	8.14	7.39	6.47	6.27	7.17	6.57	6.70	6.86	6.87	6.88
15	5.05	4.96	4.75	7.06	13.12	16.96	6.17	17.72	9.81	10.31	10.34	7.59	6.50	7.88	7.75	7.79	8.12	7.63	6.99	6.60	7.36	6.80	7.01	7.15	7.20	7.20
16	4.94	4.74	6.07	10.52	14.17	6.89	10.90	13.57	9.57	10.21	10.03	7.60	6.95	7.90	7.68	7.63	8.23	8.17	7.32	6.89	7.48	7.13	7.30	7.46	7.50	7.56
17	5.07	6.70	8.36	12.14	7.33	7.48	7.94	11.75	8.83	9.17	8.95	7.33	6.45	7.22	7.00	6.92	7.86	7.65	6.85	6.40	6.98	6.67	6.82	6.92	6.99	7.03
18	6.88	9.03	9.75	7.05	7.12	5.92	7.20	10.50	8.15	8.30	8.58	6.95	6.19	6.81	6.68	6.76	7.59	7.37	6.69	6.33	6.79	6.60	6.69	6.80	6.88	6.93
19	9.00	9.96	6.57	7.22	5.82	5.66	6.67	9.11	7.46	7.89	7.81	6.57	5.93	6.51	6.60	6.50	7.23	7.15	6.62	6.25	6.64	6.51	6.60	6.69	6.79	6.85
20	10.34	6.85	7.78	6.00	5.69	5.44	6.01	7.82	7.18	7.10	7.09	6.21	5.75	6.43	6.31	6.24	6.91	6.89	6.51	6.18	6.46	6.43	6.49	6.58	6.70	6.77
21	8.23	7.72	6.51	5.94	5.54	5.12	5.41	7.05	6.50	6.41	6.45	5.94	5.76	6.15	6.04	5.97	6.71	6.50	6.43	6.09	6.31	6.34	6.39	6.48	6.61	6.72
22	7.35	6.47	6.49	5.86	5.36	4.91	5.23	6.22	6.06	5.92	6.06	5.93	5.61	5.95	5.81	5.84	6.25	6.42	6.35	6.04	6.20	6.29	6.32	6.40	6.57	6.67
23	6.17	6.40	6.36	5.68	5.19	4.86	4.65	5.36	5.57	5.44	5.79	5.66	5.44	5.68	5.62	5.65	6.08	6.28	6.27	5.96	6.07	6.22	6.23	6.34	6.51	6.62
24	6.12	6.24	6.18	5.56	5.24	4.49	4.22	4.67	5.21	5.18	5.36	5.44	5.27	5.51	5.42	5.51	5.82	6.18	6.20	5.91	5.97	6.16	6.19	6.28	6.45	6.57
25	5.95	6.02	6.08	5.67	4.91	4.25	3.86	4.15	5.04	4.79	5.03	5.24	5.18	5.34	5.28	5.37	5.68	6.09	6.13	5.85	5.87	6.12	6.13	6.22	6.40	6.53
26	5.76	5.90	6.21	5.35	4.73	4.05	3.61	3.85	4.74	4.49	4.74	5.12	5.08	5.21	5.14	5.27	5.58	6.01	6.08	5.80	5.80	6.08	6.08	6.16	6.36	6.48
27	5.67	6.03	5.88	5.23	4.62	3.96	3.56	3.57	4.58	4.30	4.60	5.03	5.04	5.13	5.07	5.22	5.52	5.82	6.04	5.79	5.77	6.06	6.05	6.13	6.32	6.45
28	5.79	5.68	5.74	5.11	4.53	3.96	3.36	3.31	4.41	4.15	4.44	4.95	4.98	5.05	5.00	5.17	5.46	5.77	6.02	5.77	5.72	6.03	6.01	6.09	6.29	6.42
29	5.45	5.55	5.63	5.05	4.58	3.83	3.24	3.13	4.34	4.04	4.35	4.90	4.94	5.01	4.96	4.80	5.30	5.77	6.00	5.76	5.69	6.02	5.99	6.06	6.26	6.39
30	5.28	5.37	5.50	5.05	4.39	3.71	3.10	2.98	4.19	3.90	4.20	4.78	4.84	4.90	4.85	4.69	5.21	5.67	5.90	5.66	5.59	5.91	5.88	5.95	6.15	6.28

= 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	0.91	1.56	1.07	2.52	1.15	1.12	1.13	1.12	1.11
2	5.69	7.95	6.45	5.78	2.42	1.76	1.54	29.19	2.84	3.95	19.59	6.88	2.70	3.98	4.43	4.07	12.41	9.99	7.36	3.29	10.57	4.43	4.96	6.00	5.43	4.83
3	10.89	10.75	8.14	3.66	2.05	1.19	15.73	15.92	5.33	28.14	32.84	4.87	3.66	5.30	6.93	12.63	23.23	18.91	5.72	8.50	10.47	6.81	8.89	9.30	7.71	7.71
4	11.07	7.50	4.07	2.09	0.58	4.52	9.66	19.07	26.68	32.55	13.39	4.98	4.42	6.96	16.60	25.81	26.52	7.46	10.40	6.82	9.99	8.24	9.44	8.73	8.19	9.11
5	8.15	3.68	2.50	0.82	3.32	4.14	10.13	36.13	34.79	13.63	9.38	5.98	5.02	17.44	24.59	27.90	7.52	15.31	9.69	7.23	12.49	9.84	9.88	10.21	10.91	9.88
6	5.53	2.49	1.39	3.39	2.96	4.61	26.61	29.51	13.38	9.73	10.90	7.36	11.83	26.92	26.11	8.50	26.66	17.08	15.80	11.87	17.72	14.40	15.83	18.51	16.93	15.50
7	2.73	1.92	2.92	2.95	3.68	12.50	27.89	13.83	9.69	9.44	14.17	19.20	23.43	25.84	9.54	26.02	26.00	22.97	24.80	16.14	20.34	20.92	23.27	23.37	22.54	22.41
8	1.87	3.83	3.77	3.21	6.82	17.55	12.11	9.78	10.29	10.74	24.96	31.42	24.94	8.57	27.67	24.05	28.31	29.59	32.27	18.77	23.20	25.81	26.43	26.45	26.44	27.75
9	3.92	3.99	3.92	6.64	9.95	8.85	8.60	6.30	13.05	18.59	22.75	28.80	8.07	16.91	17.42	17.21	22.07	22.54	23.06	14.29	16.70	18.71	18.28	18.54	19.93	21.20
10	4.30	5.18	5.89	8.11	6.63	6.90	9.28	7.36	23.53	17.46	20.62	8.76	10.98	10.61	11.91	12.99	13.74	12.22	11.28	8.82	9.72	9.64	9.58	9.89	10.04	10.19
11	3.46	6.21	8.32	5.68	6.23	7.79	10.99	10.42	20.34	18.38	6.75	13.75	8.63	9.13	10.74	11.40	11.32	10.73	10.58	7.69	8.36	8.40	8.82	9.20	9.07	8.85
12	5.01	8.81	6.88	5.49	6.72	8.79	12.86	9.63	16.68	7.04	15.25	12.21	8.65	9.66	10.86	10.95	11.76	12.24	11.81	8.05	8.78	9.61	9.84	9.99	10.22	10.17
13	8.18	6.02	6.00	5.55	6.75	17.59	11.75	8.37	6.55	11.64	11.84	11.02	8.59	9.02	9.29	9.95	11.33	10.92	10.24	7.29	8.24	9.33	9.25	9.28	9.37	9.66
14	5.48	6.54	5.86	6.32	10.84	18.48	13.27	4.51	14.69	11.16	12.67	13.32	10.12	9.72	10.47	11.24	12.32	11.63	11.40	8.49	9.42	10.24	10.32	10.47	10.60	10.58
15	5.65	6.14	6.23	8.48	15.69	15.57	5.77	24.99	12.07	10.01	12.41	13.12	9.74	9.42	10.44	10.55	11.54	11.24	11.47	8.61	9.12	10.08	10.23	10.39	10.54	10.50
16	5.84	5.64	8.80	10.58	14.75	7.71	12.89	19.80	10.88	9.63	11.60	12.39	9.62	9.25	9.73	9.84	10.95	10.77	11.33	8.17	8.74	10.01	10.15	10.28	10.43	10.51
17	6.20	8.89	12.29	15.46	9.69	9.87	10.18	16.74	10.18	8.64	10.10	11.38	9.21	8.08	8.74	8.97	9.75	10.31	10.69	7.50	8.28	9.48	9.56	9.65	9.90	9.94
18	10.63	11.70	13.59	6.96	10.29	8.26	8.48	14.89	9.27	7.50	9.10	10.89	8.54	7.35	8.05	8.52	9.32	9.65	10.22	7.28	7.95	9.18	9.21	9.37	9.61	9.68
19	9.75	12.90	7.09	9.74	8.86	7.51	7.82	12.74	8.09	6.69	8.39	9.82	7.90	6.78	7.41	8.13	8.74	9.14	9.89	7.08	7.63	8.88	8.96	9.08	9.36	9.45
20	11.88	6.25	10.67	8.73	8.07	7.22	6.99	10.55	7.34	6.10	7.36	8.97	7.42	6.29	7.03	7.62	8.15	8.74	9.58	6.88	7.31	8.67	8.69	8.82	9.13	9.26
21	12.99	9.61	9.67	8.23	7.93	6.71	6.10	8.95	6.65	5.32	6.20	8.31	7.13	5.97	6.57	7.11	7.69	8.38	9.28	6.68	6.69	8.44	8.46	8.59	8.94	9.11
22	9.05	8.73	8.92	8.24	7.71	6.27	5.57	8.00	6.02	4.75	5.64	7.98	6.91	5.65	6.04	6.58	7.35	8.09	9.01	6.56	6.47	8.26	8.27	8.42	8.80	8.97
23	8.23	8.45	8.91	8.09	7.31	5.89	5.04	6.66	5.27	4.05	5.15	7.58	6.57	5.28	5.68	6.09	6.96	7.76	8.79	6.41	6.24	8.08	8.09	8.26	8.66	8.85
24	7.99	8.38	8.77	7.69	6.93	5.59	4.44	5.58	4.76	3.68	4.72	7.04	6.23	5.00	5.36	5.78	6.61	7.51	8.56	6.29	6.05	7.94	7.95	8.11	8.54	8.74
25	7.93	8.21	8.54	7.22	6.70	5.12	3.93	4.77	4.42	3.36	4.30	6.63	5.99	4.75	5.08	5.49	6.34	7.27	8.37	6.18	5.88	7.81	7.82	7.98	8.43	8.63
26	7.78	7.98	8.41	7.07	6.37	4.77	3.55	4.21	4.11	3.06	3.94	6.33	5.77	4.54	4.83	5.27	6.09	7.07	8.20	6.09	5.74	7.71	7.70	7.87	8.32	8.54
27	7.61	7.86	8.29	6.85	6.11	4.56	3.34	3.84	3.88	2.85	3.72	6.00	5.61	4.38	4.67	5.11	5.92	6.92	8.07	6.03	5.64	7.62	7.61	7.77	8.23	8.45
28	7.50	7.71	8.05	6.62	5.89	4.34	3.11	3.44	3.63	2.67	3.50	5.68	5.45	4.24	4.50	4.95	5.74	6.77	7.96	5.98	5.54	7.54	7.52	7.68	8.15	8.37
29	7.37	7.49	7.83	6.47	5.79	4.20	2.92	3.15	3.47	2.52	3.32	5.50	5.34	4.13	4.38	4.82	5.61	6.66	7.86	5.94	5.46	7.46	7.44	7.60	8.07	8.30
30	7.18	7.28	7.67	6.40	5.67	4.07	2.77	2.95	3.33	2.41	3.18	5.36	5.23	4.05	4.27	4.71	5.50	6.56	7.77	5.84	5.39	7.38	7.36	7.52	7.99	8.22

= 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	1.58	1.20	2.57	0.97	0.92	0.94	0.96	0.95
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	3.00	7.27	9.02	6.34	3.14	8.30	2.98	3.39	4.20	3.78	3.35
3	8.20	8.93	7.49	3.20	1.13	0.55	13.46	14.36	3.54	27.69	31.78	3.85	2.67	3.89	4.92	11.63	24.74	17.18	4.73	6.36	8.52	5.05	6.79	7.25	5.97	6.05
4	9.98	8.19	3.75	1.73	0.44	2.75	8.59	16.75	25.05	34.04	12.43	3.98	3.46	5.14	16.34	26.92	27.45	6.67	9.35	5.39	9.04	6.84	8.07	7.58	7.20	7.98
5	8.28	5.01	2.00	0.93	2.21	3.07	9.79	36.08	35.05	12.86	9.34	4.81	3.99	16.01	27.79	27.59	7.79	14.51	8.43	5.86	11.70	8.38	8.62	9.20	9.78	8.83
6	4.42	2.14	1.05	2.98	2.14	3.80	26.25	29.35	12.96	9.52	10.48	6.11	9.91	26.77	27.49	8.34	25.05	14.21	12.55	9.09	15.50	11.27	12.86	15.21	13.78	12.52
7	2.19	1.06	3.30	2.51	2.66	12.24	28.18	11.52	9.54	10.48	13.54	17.76	23.06	26.82	8.77	24.90	23.87	19.71	20.60	12.88	19.44	17.13	19.91	20.14	19.12	18.55
8	1.05	2.31	2.78	3.20	6.49	18.49	12.11	8.04	10.36	11.62	24.38	31.39	23.68	7.79	25.93	20.79	24.72	24.17	24.79	14.09	21.88	21.12	22.04	22.10	21.77	22.36
9	3.19	3.25	3.64	6.44	9.83	8.44	8.78	6.24	13.52	17.90	26.00	28.76	7.16	15.03	15.12	14.73	19.72	18.39	18.08	10.93	17.00	15.41	15.83	16.18	16.82	17.39
10	3.39	3.55	6.69	8.43	6.31	6.95	7.98	6.22	21.69	18.75	21.26	8.24	9.35	8.61	10.23	11.08	13.11	10.93	10.62	7.24	9.97	8.78	9.15	9.58	9.89	9.74
11	4.02	6.03	8.04	6.20	6.24	7.48	8.61	8.31	20.47	18.67	7.53	13.49	7.29	7.72	10.14	10.37	11.61	10.51	10.62	6.68	8.83	8.23	8.82	9.35	9.24	9.07
12	6.42	7.43	6.41	5.84	6.31	9.28	13.14	6.64	18.98	6.48	17.50	11.11	7.25	8.15	10.10	9.86	11.94	11.56	11.26	6.83	8.75	9.16	9.64	9.76	9.88	9.95
13	8.77	6.53	5.40	6.08	6.10	17.30	12.04	5.97	6.49	12.86	11.88	9.74	7.08	7.34	8.60	8.93	11.09	10.14	10.02	6.20	7.95	8.61	8.72	8.81	8.89	9.11
14	5.77	6.19	6.39	5.76	11.58	19.07	13.78	2.44	14.13	11.02	11.71	11.47	8.10	7.78	9.55	10.16	11.68	10.86	11.07	7.19	8.90	9.40	9.58	9.84	9.97	9.95
15	5.15	7.17	5.51	9.62	17.75	18.16	5.56	28.79	10.95	9.46	11.29	11.39	7.91	7.70	9.54	9.54	10.95	10.63	11.47	7.44	8.70	9.41	9.70	9.96	10.13	10.09
16	6.54	5.83	8.74	12.31	18.48	7.90	12.76	21.45	9.94	9.09	10.43	10.83	8.05	7.66	8.88	8.90	10.45	10.78	11.77	7.48	8.25	9.55	9.64	9.87	10.23	10.32
17	6.00	9.04	11.51	14.72	7.69	8.99	8.92	17.36	8.99	7.66	8.34	9.80	7.43	6.62	7.64	7.82	9.30	9.94	10.59	6.76	7.39	8.78	8.81	8.77	9.24	9.44
18	8.58	10.86	11.85	7.84	9.30	7.02	7.37	14.85	7.96	6.43	7.42	9.22	6.81	5.90	6.91	7.37	8.61	9.12	9.74	6.50	6.82	8.34	8.03	8.23	8.71	8.99
19	13.14	12.44	6.77	9.42	7.65	6.36	6.61	12.12	6.84	5.43	6.61	8.27	6.23	5.35	6.48	6.90	7.81	8.52	9.38	6.26	6.45	8.03	7.77	7.93	8.22	8.55
20	12.42	8.25	10.97	8.00	7.21	6.01	5.70	9.55	6.14	4.76	5.63	7.42	5.79	5.03	6.03	6.35	6.92	7.97	9.02	6.04	6.09	7.44	7.50	7.66	7.98	8.11
21	10.06	10.45	9.44	7.71	7.01	5.52	4.81	7.83	5.47	4.02	4.81	6.78	5.56	4.68	5.54	5.83	6.47	7.58	8.56	5.81	5.80	7.21	7.26	7.42	7.78	7.95
22	9.46	8.92	9.20	7.65	6.73	5.09	4.36	6.69	4.87	3.50	4.30	6.50	5.33	4.37	5.15	5.51	6.13	7.16	8.11	5.66	5.57	7.04	7.07	7.25	7.64	7.82
23	8.04	8.24	9.12	7.41	6.33	4.76	3.78	5.31	4.25	3.03	3.88	6.06	5.01	4.02	4.75	5.16	5.76	6.71	7.73	5.49	5.34	6.87	6.89	6.85	7.49	7.69
24	7.79	8.07	8.79	7.13	6.14	4.38	3.23	4.26	3.79	2.72	3.48	5.63	4.71	3.76	4.44	4.80	5.43	6.32	7.51	5.35	5.13	6.72	6.53	6.70	7.12	7.57
25	7.63	7.62	8.35	7.04	5.82	4.00	2.79	3.51	3.50	2.42	3.03	5.24	4.50	3.54	4.13	4.48	5.17	6.09	7.32	5.22	4.96	6.61	6.39	6.56	6.99	7.46
26	7.23	7.09	8.14	6.77	5.50	3.69	2.47	3.02	3.16	2.17	2.65	4.96	4.30	3.35	3.92	4.28	4.94	5.89	7.15	5.07	4.83	6.50	6.27	6.43	6.88	7.10
27	6.88	7.03	7.59	6.43	5.22	3.50	2.31	2.68	2.96	2.00	2.48	4.76	4.17	3.22	3.65	4.08	4.79	5.76	7.03	4.89	4.73	6.20	6.17	6.34	6.78	7.01
28	6.81	6.73	7.19	6.10	5.03	3.38	2.11	2.35	2.77	1.78	2.30	4.57	4.03	3.10	3.51	3.88	4.48	5.62	6.93	4.82	4.64	6.12	6.08	6.24	6.69	6.93
29	6.54	6.50	6.96	5.78	4.97	3.24	1.96	2.11	2.64	1.67	2.17	4.42	3.94	3.01	3.41	3.77	4.37	5.53	6.85	4.76	4.41	6.04	6.00	6.15	6.61	6.85
30	6.30	6.25	6.76	5.72	4.80	3.10	1.83	1.94	2.52	1.57	2.06	4.27	3.82	2.92	3.31	3.67	4.26	5.42	6.74	4.68	4.32	5.93	5.88	6.04	6.49	6.73

= 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	2.04	0.58	0.53	0.55	0.57	0.58
2	2.79	4.30	3.74	3.34	0.93	0.60	0.47	21.07	0.98	1.62	14.71	4.25	1.25	1.65	2.03	2.07	6.77	8.65	5.30	2.42	7.56	2.47	2.84	3.64	3.33	2.95
3	7.72	8.47	6.14	2.35	0.68	0.32	10.38	10.80	2.58	23.47	27.31	2.97	1.98	3.29	4.62	11.75	28.05	17.49	4.25	6.40	9.18	5.18	7.20	7.87	6.53	6.70
4	10.17	7.89	3.39	1.22	0.38	1.99	5.80	15.48	22.12	29.31	11.06	3.34	3.00	4.92	17.61	32.33	30.06	6.01	11.96	5.90	10.89	7.98	9.65	9.17	8.91	10.06
5	8.35	3.82	1.56	0.69	1.77	2.37	8.34	36.84	31.80	11.93	9.26	4.63	3.56	16.27	30.83	30.86	7.75	17.69	10.33	6.41	14.33	9.75	10.16	11.10	12.09	10.92
6	3.94	1.99	0.56	2.26	1.87	3.05	24.26	30.60	12.30	9.36	10.90	5.61	8.87	28.96	29.02	7.86	26.32	13.65	11.53	8.31	15.64	10.07	11.79	14.15	12.61	11.32
7	1.90	0.74	2.79	2.25	2.36	11.18	25.21	12.65	9.67	10.71	14.06	16.08	20.80	27.56	8.00	24.17	22.23	17.38	17.68	10.90	17.97	14.21	16.94	17.13	15.98	15.36
8	0.73	3.04	2.75	2.90	5.76	18.47	10.57	8.80	10.45	11.85	25.83	29.59	22.29	7.76	24.90	19.12	22.26	20.73	20.23	11.44	19.60	16.77	17.69	17.69	17.10	17.52
9	2.94	2.93	3.26	6.63	8.92	8.11	8.42	7.36	13.17	17.82	26.12	27.68	6.60	14.61	14.55	14.01	18.63	16.46	15.34	9.32	15.99	12.63	13.07	13.35	13.76	14.19
10	3.74	3.49	6.03	8.55	6.35	6.57	6.80	6.32	21.51	18.37	23.73	7.91	9.32	8.93	10.91	11.98	14.55	12.15	12.15	7.75	11.60	9.28	9.75	10.48	10.83	10.68
11	3.58	6.41	8.88	6.24	5.80	7.09	7.99	9.09	19.60	19.69	8.61	14.63	7.18	8.11	11.10	11.41	12.99	11.97	12.48	7.28	10.40	8.82	9.71	10.43	10.39	10.08
12	5.89	8.62	6.29	5.62	5.78	8.41	12.47	6.93	19.97	7.14	20.92	10.94	6.69	8.30	10.54	10.19	12.15	11.38	10.70	6.41	9.08	8.16	8.91	9.16	8.92	8.83
13	8.49	5.99	6.04	5.41	5.77	16.00	14.54	7.27	7.15	15.21	13.84	9.75	6.73	7.61	9.08	9.46	11.51	10.15	9.71	5.96	8.57	7.94	8.31	8.38	8.40	8.34
14	6.24	5.28	5.38	5.36	10.98	17.89	12.81	2.37	14.27	10.89	12.25	10.40	6.94	7.21	9.10	9.71	10.88	9.86	9.85	6.36	8.82	8.15	8.35	8.59	8.66	8.62
15	5.26	5.97	5.85	8.63	17.19	18.41	5.53	34.51	10.64	9.38	11.77	10.34	6.78	7.19	9.14	9.11	10.17	9.69	10.37	6.67	8.69	8.19	8.50	8.74	8.86	8.79
16	5.14	5.81	8.05	12.01	17.06	7.37	14.10	25.24	9.60	8.68	10.62	9.80	6.97	7.18	8.49	8.50	9.69	9.95	10.77	6.78	8.43	8.38	8.64	8.87	9.00	9.06
17	5.83	8.28	10.79	14.02	7.43	8.69	9.68	20.40	8.74	7.44	8.80	8.98	6.49	6.21	7.30	7.47	8.89	9.21	9.86	6.14	7.62	7.71	7.91	8.05	8.28	8.30
18	8.15	11.81	11.59	6.80	8.56	6.60	8.09	17.30	7.67	5.89	7.45	8.44	5.95	5.50	6.57	7.07	8.34	8.64	9.33	5.93	7.17	7.46	7.57	7.78	8.00	8.05
19	11.51	12.14	7.01	8.56	6.90	5.96	7.21	13.87	6.50	5.13	6.56	7.53	5.43	4.97	6.16	6.60	7.65	8.05	9.01	5.74	6.77	7.19	7.33	7.50	7.77	7.85
20	11.80	7.72	9.99	7.13	6.50	5.62	5.93	10.67	5.80	4.42	5.49	6.72	5.04	4.67	5.71	6.05	6.97	7.62	8.67	5.55	6.37	7.00	7.08	7.25	7.55	7.67
21	8.44	9.69	8.44	6.90	6.33	5.11	4.92	8.58	5.10	3.65	4.61	6.11	4.86	4.32	5.21	5.52	6.47	7.21	8.36	5.34	6.05	6.79	6.85	7.02	7.37	7.54
22	8.72	8.19	8.27	6.88	6.07	4.89	4.43	7.19	4.50	3.14	3.98	5.86	4.66	4.03	4.82	5.21	6.10	6.92	8.09	5.22	5.80	6.64	6.68	6.86	7.26	7.43
23	7.39	7.94	8.20	6.65	5.68	4.38	3.77	5.55	3.87	2.66	3.54	5.44	4.37	3.68	4.47	4.85	5.71	6.57	7.85	5.07	5.54	6.47	6.51	6.71	7.13	7.31
24	7.20	7.79	7.98	6.39	5.52	3.98	3.17	4.34	3.41	2.35	3.12	5.03	4.10	3.43	4.16	4.55	5.35	6.31	7.62	4.94	5.32	6.34	6.39	6.58	7.02	7.22
25	7.06	7.52	7.74	6.34	5.18	3.60	2.69	3.49	3.13	2.06	2.75	4.66	3.90	3.20	3.90	4.28	5.08	6.06	7.42	4.83	5.13	6.24	6.27	6.46	6.92	7.13
26	6.83	7.27	7.73	6.04	4.86	3.29	2.35	2.95	2.84	1.82	2.45	4.39	3.73	3.02	3.69	4.08	4.85	5.86	7.24	4.73	4.99	6.15	6.17	6.36	6.83	7.05
27	6.66	7.26	7.43	5.83	4.64	3.11	2.19	2.58	2.66	1.66	2.28	4.21	3.62	2.90	3.56	3.95	4.70	5.72	7.12	4.67	4.89	6.09	6.10	6.23	6.76	6.99
28	6.62	6.93	7.16	5.61	4.45	3.00	1.98	2.22	2.47	1.52	2.10	4.04	3.50	2.79	3.43	3.82	4.55	5.58	7.02	4.61	4.79	6.03	6.03	6.16	6.63	6.89
29	6.33	6.70	6.93	5.45	4.41	2.85	1.83	1.98	2.30	1.42	1.98	3.91	3.42	2.71	3.34	3.73	4.45	5.50	6.94	4.56	4.71	5.98	5.92	6.10	6.58	6.77
30	6.10	6.45	6.74	5.40	4.23	2.72	1.69	1.80	2.19	1.33	1.86	3.77	3.32	2.62	3.24	3.62	4.28	5.37	6.80	4.48	4.57	5.88	5.82	5.93	6.48	6.66

= 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	0.28	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	1.85	0.37	0.34	0.35	0.37	0.37
2	2.14	3.70	3.25	2.88	0.70	0.61	0.20	16.38	0.67	1.44	12.18	3.19	0.83	1.19	1.68	1.59	5.49	7.38	4.16	1.81	5.98	1.96	2.25	2.92	2.70	2.41
3	6.77	7.84	6.00	2.23	0.55	0.29	8.05	8.50	1.95	22.38	25.65	2.44	1.60	2.86	4.24	11.02	28.58	17.06	3.74	5.66	8.57	4.68	6.57	7.30	6.08	6.23
4	10.10	8.69	3.17	1.11	0.43	1.73	5.15	13.07	19.60	29.19	11.18	3.14	2.81	4.77	17.16	32.83	32.11	5.85	13.06	6.08	11.78	8.51	10.48	10.14	9.94	11.28
5	8.67	4.20	1.41	0.66	1.33	1.99	6.35	34.81	28.33	12.30	8.55	4.36	3.37	16.11	32.05	31.77	7.68	19.81	11.91	6.87	16.18	10.97	11.64	12.92	14.30	13.02
6	4.35	1.95	0.69	2.04	1.57	2.88	21.06	28.53	11.65	9.86	11.20	5.44	8.71	29.42	29.35	8.28	28.11	14.31	11.95	8.39	16.68	10.38	12.35	15.00	13.44	12.10
7	1.92	0.83	2.58	2.00	1.99	9.82	21.83	11.59	8.71	10.81	12.95	14.91	20.72	27.64	8.06	22.31	20.81	15.79	16.05	9.70	16.79	12.73	15.54	15.84	14.74	14.14
8	0.81	3.09	2.81	2.19	5.25	16.11	9.56	8.71	10.32	11.34	24.20	27.41	22.02	8.11	22.88	17.14	20.14	18.12	17.19	9.71	17.51	14.22	15.20	15.26	14.65	15.00
9	2.89	3.07	3.16	5.84	8.31	7.62	6.87	6.67	13.25	17.82	24.30	25.96	6.46	14.40	14.18	13.46	18.34	15.60	14.08	8.59	15.58	11.56	12.11	12.44	12.77	13.19
10	3.01	3.59	6.45	8.75	5.78	6.00	7.04	5.08	21.32	16.62	24.09	7.14	8.72	8.65	10.58	11.65	14.71	12.11	12.20	7.59	11.90	9.14	9.72	10.57	11.01	10.87
11	3.76	7.12	9.16	6.44	5.30	9.80	7.93	6.92	20.38	19.88	7.82	14.88	6.97	8.20	11.36	11.65	13.73	12.57	13.29	7.51	11.20	9.14	10.20	11.10	11.11	10.77
12	6.55	8.80	6.10	5.54	6.03	7.89	12.50	7.88	20.57	6.63	23.34	11.00	6.50	8.55	10.88	10.41	12.65	11.54	10.60	6.37	9.40	7.95	8.82	9.11	8.82	8.69
13	8.32	6.64	5.81	5.93	5.86	14.69	14.28	7.32	7.10	17.30	14.82	9.82	6.64	7.90	9.39	9.73	12.16	10.40	9.74	6.00	9.00	7.85	8.31	8.41	8.39	8.31
14	6.55	5.74	6.16	5.78	10.13	17.95	14.79	3.46	15.21	11.67	12.80	10.23	6.67	7.24	9.14	9.76	11.19	9.88	9.73	6.30	9.12	7.92	8.18	8.45	8.50	8.44
15	5.38	5.45	5.51	8.29	16.31	17.52	4.98	38.54	11.30	10.08	12.43	10.28	6.58	7.30	9.32	9.25	10.58	9.87	10.45	6.75	9.13	8.08	8.45	8.73	8.83	8.74
16	5.86	5.94	8.29	12.18	17.86	7.81	14.26	28.44	10.20	9.34	10.88	9.79	6.85	7.39	8.72	8.69	10.21	10.30	11.09	6.98	8.99	8.38	8.72	8.99	9.11	9.15
17	5.73	7.90	10.90	13.78	8.08	8.81	9.95	22.74	9.25	7.72	8.73	8.92	6.38	6.34	7.43	7.57	9.31	9.49	10.08	6.27	8.06	7.65	7.90	8.07	8.29	8.28
18	8.26	11.81	12.15	7.06	8.56	6.64	8.24	19.11	8.08	6.31	7.67	8.40	5.84	5.60	6.68	7.16	8.76	8.93	9.58	6.08	7.60	7.41	7.57	7.80	8.01	8.04
19	10.34	12.97	7.68	8.56	6.87	5.96	7.28	15.10	6.71	5.43	6.71	7.47	5.33	5.05	6.26	6.69	8.04	8.32	9.29	5.90	7.19	7.16	7.35	7.53	7.78	7.84
20	12.09	7.80	10.04	7.12	6.46	5.61	6.12	11.39	5.95	4.65	5.56	6.65	4.96	4.74	5.77	6.12	7.32	7.87	8.97	5.72	6.77	6.97	7.09	7.27	7.56	7.66
21	8.81	9.73	8.48	6.88	6.29	5.08	5.00	9.00	5.22	3.80	4.62	6.03	4.78	4.38	5.24	5.56	6.79	7.46	8.67	5.52	6.44	6.77	6.86	7.04	7.38	7.53
22	8.68	8.22	8.30	6.85	6.02	4.64	4.47	7.45	4.60	3.24	4.05	5.78	4.59	4.08	4.85	5.24	6.42	7.18	8.43	5.41	6.20	6.62	6.69	6.88	7.27	7.42
23	7.35	7.95	8.23	6.61	5.62	4.32	3.76	5.64	3.87	2.72	3.58	5.35	4.31	3.72	4.48	4.87	6.01	6.82	8.18	5.26	5.92	6.46	6.52	6.73	7.13	7.30
24	7.15	7.79	7.99	6.34	5.46	3.91	3.13	4.32	3.30	2.38	3.12	4.94	4.04	3.46	4.15	4.56	5.56	6.55	7.96	5.14	5.70	6.33	6.40	6.60	7.02	7.20
25	6.99	7.50	7.73	6.29	5.11	3.52	2.63	3.42	3.01	2.07	2.73	4.56	3.85	3.23	3.89	4.29	5.19	6.30	7.77	5.03	5.47	6.23	6.28	6.47	6.91	7.11
26	6.74	7.23	7.72	5.98	4.79	3.21	2.28	2.85	2.72	1.81	2.42	4.30	3.68	3.05	3.67	4.08	4.88	6.10	7.60	4.94	5.33	6.14	6.18	6.37	6.82	7.02
27	6.54	7.22	7.40	5.76	4.57	3.04	2.12	2.47	2.53	1.65	2.24	4.13	3.58	2.94	3.54	3.95	4.73	5.97	7.50	4.89	5.23	6.08	6.11	6.30	6.75	6.96
28	6.52	6.87	7.15	5.55	4.39	2.93	1.90	2.11	2.35	1.51	2.06	3.96	3.47	2.82	3.41	3.82	4.52	5.84	7.42	4.84	5.14	6.02	6.04	6.22	6.68	6.89
29	6.21	6.64	6.93	5.41	4.35	2.78	1.76	1.87	2.23	1.41	1.94	3.84	3.40	2.75	3.33	3.73	4.42	5.76	7.35	4.80	5.07	5.97	5.98	6.16	6.63	6.83
30	5.96	6.37	6.71	5.34	4.16	2.65	1.62	1.69	2.12	1.31	1.82	3.69	3.29	2.65	3.22	3.61	4.29	5.62	7.19	4.70	4.95	5.84	5.85	6.03	6.49	6.69

= 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	0.29	0.57	0.23	1.90	0.31	0.28	0.30	0.31	0.31
2	1.84	3.56	3.20	2.42	0.58	0.30	0.29	13.27	0.61	1.17	10.45	2.98	0.61	1.09	1.43	1.37	4.68	7.10	4.08	1.81	5.45	1.75	2.04	2.66	2.47	2.22
3	7.21	8.16	6.17	1.96	0.56	0.26	7.21	7.45	1.73	19.82	23.71	2.32	1.44	2.68	3.57	9.23	27.57	17.37	3.88	5.39	8.00	4.47	6.29	7.02	5.93	6.16
4	9.85	9.03	3.29	1.28	0.34	1.59	4.41	11.32	17.48	26.83	10.73	2.92	2.65	4.34	15.39	31.84	31.63	6.11	13.33	5.70	11.26	8.24	10.18	9.96	9.98	11.22
5	9.00	4.55	1.54	0.69	1.11	1.79	5.71	33.11	26.03	11.85	8.35	4.24	3.08	14.39	30.50	30.95	7.60	20.11	12.05	6.60	15.71	10.86	11.62	13.18	14.58	13.34
6	4.34	2.06	0.64	1.85	1.65	2.44	20.68	27.78	10.32	8.97	10.09	5.09	8.25	28.26	28.98	8.30	26.83	13.14	10.97	7.56	15.18	9.42	11.41	13.76	12.35	11.13
7	1.99	0.68	2.64	1.99	1.99	3.18	22.90	11.62	8.41	10.96	13.01	13.73	19.51	27.22	7.79	20.39	18.56	14.09	14.22	8.45	14.86	11.32	13.76	14.08	13.12	12.61
8	0.79	3.25	2.81	2.27	5.27	14.34	9.10	7.25	10.04	11.45	22.28	26.06	20.83	7.48	20.26	14.68	17.50	15.63	14.69	8.22	15.21	12.11	13.03	13.13	12.64	13.04
9	3.33	3.59	3.01	5.80	8.67	7.49	7.07	6.73	11.61	17.64	23.97	24.55	6.13	12.72	12.29	11.76	16.14	13.64	12.27	7.49	13.63	10.03	10.57	10.91	11.31	11.64
10	3.09	3.82	6.44	8.42	5.99	6.03	6.27	6.51	19.24	19.21	23.28	7.24	7.99	7.69	9.61	10.58	13.44	11.03	11.16	6.81	10.82	8.23	8.82	9.70	10.08	9.95
11	3.93	7.07	8.22	6.16	5.44	8.57	6.62	7.71	19.67	19.12	8.68	13.29	5.88	6.97	9.81	10.05	11.97	11.05	11.48	6.44	9.73	7.88	8.90	9.69	9.71	9.40
12	6.53	9.65	6.52	5.43	5.68	7.44	11.36	8.61	19.44	7.38	21.82	9.89	5.74	7.54	9.74	9.37	11.69	10.61	9.76	5.77	8.65	7.35	8.16	8.47	8.22	8.13
13	8.54	6.72	5.57	5.82	5.58	14.33	14.58	8.45	6.88	15.64	13.05	8.63	5.69	6.76	8.20	8.63	10.82	9.32	8.75	5.31	8.14	7.05	7.50	7.62	7.64	7.58
14	6.46	5.99	5.83	5.66	9.96	18.16	12.49	4.28	13.21	9.76	10.90	8.64	5.50	5.98	7.80	8.27	9.63	8.60	8.54	5.47	7.98	6.93	7.18	7.46	7.54	7.51
15	5.72	5.96	5.61	7.69	15.02	17.10	6.43	36.73	9.56	8.43	10.65	8.73	5.49	6.17	7.94	7.91	9.21	8.71	9.36	5.91	8.09	7.15	7.52	7.80	7.95	7.89
16	5.95	5.89	8.19	11.26	16.09	7.77	13.05	26.04	8.74	8.01	9.48	8.42	5.85	6.23	7.52	7.52	9.00	9.27	10.02	6.19	8.07	7.53	7.86	8.15	8.31	8.37
17	5.70	8.21	10.97	13.60	8.14	7.94	8.73	20.66	7.85	6.55	7.50	7.72	5.35	5.33	6.37	6.53	8.21	8.45	9.05	5.51	7.19	6.82	7.07	7.26	7.49	7.50
18	8.32	10.87	12.54	7.26	7.86	5.79	7.24	17.20	6.84	5.35	6.66	7.19	4.92	4.72	5.74	6.24	7.70	7.96	8.61	5.37	6.79	6.63	6.79	7.02	7.25	7.29
19	11.55	12.98	7.72	8.05	6.10	5.23	6.37	13.46	5.78	4.65	5.74	6.41	4.50	4.26	5.43	5.81	7.07	7.44	8.38	5.22	6.44	6.42	6.59	6.78	7.05	7.12
20	11.67	7.18	9.53	6.46	5.77	4.91	5.31	10.10	5.11	3.92	4.75	5.71	4.20	4.03	5.01	5.32	6.43	7.07	8.10	5.07	6.07	6.26	6.37	6.56	6.86	6.97
21	8.79	9.23	7.78	6.28	5.59	4.43	4.34	8.02	4.43	3.20	3.94	5.19	4.08	3.71	4.56	4.84	5.98	6.69	7.86	4.91	5.78	6.08	6.17	6.35	6.69	6.85
22	8.23	7.54	7.65	6.23	5.34	4.06	3.92	6.55	3.90	2.73	3.46	5.03	3.91	3.46	4.22	4.57	5.65	6.46	7.65	4.82	5.57	5.96	6.03	6.21	6.60	6.76
23	6.74	7.33	7.54	5.98	4.99	3.83	3.26	4.93	3.36	2.29	3.07	4.64	3.68	3.16	3.91	4.25	5.30	6.14	7.45	4.69	5.32	5.82	5.88	6.09	6.48	6.66
24	6.58	7.13	7.28	5.75	4.90	3.43	2.70	3.77	2.97	2.02	2.67	4.28	3.45	2.94	3.63	3.99	4.97	5.91	7.27	4.59	5.12	5.71	5.78	5.97	6.39	6.57
25	6.40	6.82	7.05	5.76	4.53	3.10	2.27	2.99	2.67	1.74	2.34	3.96	3.30	2.75	3.41	3.75	4.72	5.69	7.11	4.50	4.93	5.63	5.67	5.86	6.29	6.49
26	6.13	6.58	7.11	5.40	4.25	2.83	1.97	2.50	2.41	1.53	2.07	3.75	3.16	2.60	3.22	3.58	4.52	5.51	6.97	4.42	4.81	5.55	5.58	5.76	6.21	6.41
27	5.97	6.64	6.72	5.21	4.06	2.69	1.85	2.16	2.16	1.40	1.93	3.60	3.08	2.51	3.11	3.47	4.40	5.40	6.88	4.39	4.73	5.50	5.52	5.70	6.15	6.35
28	6.02	6.22	6.48	5.01	3.91	2.61	1.66	1.85	2.01	1.28	1.78	3.47	2.99	2.41	3.00	3.36	4.27	5.29	6.82	4.35	4.64	5.45	5.46	5.63	6.09	6.30
29	5.66	6.00	6.28	4.89	3.90	2.48	1.53	1.64	1.92	1.20	1.68	3.37	2.94	2.36	2.93	3.29	4.19	5.23	6.76	4.32	4.59	5.41	5.41	5.58	6.04	6.25
30	5.41	5.73	6.07	4.84	3.70	2.35	1.41	1.49	1.81	1.12	1.58	3.24	2.84	2.27	2.83	3.17	4.08	5.08	6.59	4.22	4.46	5.28	5.28	5.44	5.89	6.10

= 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	0.30	0.61	0.21	1.80	0.31	0.27	0.29	0.30	0.30
2	1.71	3.26	3.33	2.41	0.55	0.34	0.25	11.76	0.47	0.76	8.91	2.66	0.59	1.09	1.58	1.50	4.63	7.77	4.08	1.74	5.57	1.79	2.10	2.75	2.58	2.33
3	7.28	8.89	6.36	1.91	0.46	0.25	5.54	6.27	1.37	16.71	20.72	2.08	1.33	2.58	3.71	8.91	27.01	18.34	3.77	5.29	7.70	4.42	6.24	6.99	5.96	6.26
4	11.13	9.82	3.56	1.17	0.29	1.37	3.95	9.66	14.53	24.19	9.74	2.72	2.46	4.19	14.39	29.87	31.46	6.37	13.92	5.57	11.01	8.31	10.26	10.08	10.28	11.60
5	9.93	4.62	1.71	0.65	1.14	1.57	5.25	30.32	22.91	10.43	8.01	4.11	3.15	13.84	28.68	29.97	7.95	20.65	12.64	6.64	15.79	11.19	11.98	13.70	15.29	14.04
6	4.44	2.32	0.67	1.89	1.40	2.14	18.34	25.97	9.25	8.44	10.10	5.07	7.91	26.74	27.88	8.13	26.79	13.43	11.79	7.70	15.42	9.89	12.04	14.56	13.24	11.99
7	2.26	0.84	2.66	2.13	1.78	8.33	19.81	11.41	7.57	9.30	11.91	13.10	18.68	25.73	7.84	20.13	18.69	14.86	15.74	8.85	15.52	12.33	14.89	15.34	14.51	14.05
8	1.16	3.37	2.74	2.40	4.76	12.70	8.37	8.83	8.96	10.42	20.66	24.28	20.04	7.60	19.47	14.10	17.40	16.17	15.94	8.48	15.71	12.89	13.85	14.04	13.73	14.30
9	3.19	3.34	3.25	5.30	7.17	6.46	6.36	6.45	10.06	17.06	23.34	24.03	6.24	11.57	11.12	10.81	15.28	13.46	12.74	7.41	13.37	10.19	10.73	11.15	11.76	12.17
10	3.50	3.80	6.21	7.97	5.23	5.26	6.58	6.50	17.48	18.65	23.28	6.84	7.49	7.00	8.78	9.73	12.35	10.16	10.35	6.28	9.93	7.56	8.09	8.93	9.27	9.16
11	3.68	6.74	8.09	5.65	4.86	6.15	6.82	7.20	18.47	19.56	8.42	12.49	5.42	6.34	8.91	9.20	10.98	10.20	10.57	5.91	8.90	7.22	8.17	8.88	8.91	8.64
12	5.95	8.66	5.93	5.28	5.45	7.00	11.00	9.03	20.79	7.81	20.84	9.04	5.24	6.79	8.76	8.50	10.52	9.37	8.50	5.11	7.62	6.42	7.11	7.36	7.12	7.04
13	8.13	6.05	5.52	5.47	5.38	13.09	12.58	9.31	8.01	15.80	13.05	8.12	5.32	6.23	7.57	8.06	9.93	8.43	7.81	4.83	7.38	6.30	6.70	6.79	6.79	6.73
14	6.15	5.75	5.75	5.17	8.94	16.36	14.04	3.78	12.65	9.81	10.77	8.07	5.10	5.48	7.18	7.63	8.78	7.74	7.58	4.96	7.18	6.16	6.37	6.61	6.66	6.64
15	5.09	6.07	5.44	7.35	14.21	16.62	6.75	36.53	9.01	8.74	10.73	8.17	5.11	5.70	7.29	7.32	8.40	7.85	8.36	5.36	7.30	6.37	6.69	6.93	7.04	6.99
16	5.83	5.73	7.57	10.14	16.04	7.70	15.06	25.67	8.25	8.46	9.92	7.91	5.49	5.74	6.91	6.98	8.23	8.41	8.95	5.63	7.29	6.73	7.01	7.25	7.37	7.43
17	5.71	7.76	10.16	12.97	7.54	7.81	9.58	20.46	7.41	7.11	7.95	7.30	5.01	4.92	5.87	6.08	7.55	7.67	8.11	5.03	6.51	6.10	6.32	6.47	6.65	6.67
18	7.92	11.17	11.21	6.84	7.56	5.62	7.82	17.06	6.43	5.69	7.11	6.78	4.81	4.36	5.30	5.83	7.07	7.24	7.73	4.91	6.15	5.94	6.07	6.27	6.45	6.50
19	10.41	11.37	7.12	7.61	5.79	5.09	6.72	13.36	5.42	5.01	5.96	6.06	4.23	3.95	5.03	5.43	6.50	6.77	7.53	4.78	5.85	5.77	5.91	6.06	6.29	6.36
20	11.60	7.32	8.88	6.03	5.50	4.77	5.63	10.06	4.88	4.17	4.97	5.40	3.96	3.76	4.63	4.98	5.91	6.44	7.29	4.66	5.52	5.63	5.71	5.87	6.12	6.22
21	9.61	8.79	7.15	5.88	5.32	4.30	4.64	8.05	4.20	3.46	4.02	4.92	3.87	3.46	4.22	4.53	5.50	6.12	7.08	4.51	5.26	5.48	5.54	5.69	5.98	6.13
22	7.88	7.07	7.06	5.83	5.07	3.95	4.24	6.55	3.68	2.94	3.49	4.79	3.70	3.23	3.90	4.29	5.20	5.91	6.91	4.43	5.07	5.37	5.42	5.57	5.90	6.05
23	6.35	6.88	6.94	5.58	4.75	3.74	3.55	4.95	3.15	2.52	3.13	4.41	3.49	2.95	3.61	3.99	4.87	5.63	6.73	4.32	4.85	5.25	5.28	5.46	5.80	5.96
24	6.22	6.68	6.70	5.37	4.69	3.32	2.99	3.80	2.77	2.06	2.67	4.08	3.27	2.75	3.35	3.74	4.57	5.41	6.57	4.24	4.67	5.15	5.19	5.35	5.71	5.89
25	6.03	6.38	6.49	5.41	4.31	3.00	2.45	3.01	2.55	1.79	2.36	3.78	3.14	2.57	3.15	3.52	4.34	5.22	6.42	4.15	4.51	5.09	5.10	5.25	5.63	5.82
26	5.77	6.15	6.58	5.05	4.04	2.73	2.15	2.54	2.29	1.58	2.10	3.58	3.01	2.43	2.97	3.35	4.14	5.06	6.30	4.09	4.39	5.02	5.02	5.17	5.56	5.75
27	5.62	6.23	6.19	4.87	3.86	2.59	2.04	2.19	2.14	1.45	1.97	3.44	2.94	2.35	2.87	3.25	4.02	4.96	6.22	4.06	4.32	4.98	4.97	5.11	5.50	5.70
28	5.68	5.80	5.97	4.68	3.72	2.53	1.70	1.88	1.99	1.35	1.82	3.32	2.86	2.26	2.77	3.15	3.90	4.86	6.17	4.02	4.25	4.93	4.91	5.05	5.45	5.65
29	5.31	5.59	5.78	4.57	3.72	2.39	1.57	1.67	1.91	1.27	1.73	3.23	2.81	2.21	2.71	3.09	3.82	4.81	6.13	4.00	4.20	4.89	4.86	5.00	5.40	5.61
30	5.07	5.33	5.58	4.54	3.51	2.26	1.45	1.52	1.81	1.19	1.63	3.10	2.72	2.12	2.60	2.98	3.70	4.67	5.97	3.90	4.08	4.77	4.74	4.87	5.27	5.47

= 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	0.23	0.40	0.23	1.46	0.25	0.23	0.27	0.28	0.28
2	1.53	2.86	3.15	2.24	0.68	0.49	0.27	10.83	0.39	0.74	7.93	2.48	0.69	1.28	1.91	1.74	4.36	4.37	3.02	1.89	4.54	1.72	1.95	2.46	2.33	2.12
3	6.76	8.66	6.56	2.10	0.63	0.26	5.46	6.10	1.34	14.21	19.08	2.13	1.41	3.02	3.92	8.54	24.23	11.26	3.69	5.10	7.68	4.58	6.22	6.99	6.10	6.29
4	10.49	9.58	3.93	1.45	0.33	1.35	3.46	8.81	13.27	21.69	9.97	2.90	2.77	4.55	13.80	27.86	28.76	5.98	15.69	6.88	13.01	10.34	12.68	12.79	13.15	14.77
5	9.95	5.33	2.11	0.82	1.21	1.58	4.67	22.17	21.04	10.59	8.51	4.48	3.40	13.29	27.34	28.15	7.57	19.46	13.06	7.40	16.51	12.03	13.04	14.73	16.34	15.31
6	5.15	2.67	0.87	1.95	1.43	2.07	16.14	25.28	9.44	9.19	10.47	5.50	8.28	25.69	26.74	8.01	25.46	13.96	12.37	8.54	16.47	11.01	13.17	15.80	14.69	13.59
7	2.77	1.07	2.73	2.00	1.79	7.13	18.39	11.91	7.64	9.62	12.23	13.01	18.42	25.47	7.92	19.31	18.43	14.26	15.10	9.26	15.79	12.42	15.19	15.70	14.89	14.45
8	1.33	3.45	2.66	2.30	4.19	11.15	8.72	8.20	8.91	9.88	20.32	23.98	19.54	7.61	19.24	14.08	17.01	15.55	15.49	8.89	15.83	13.24	14.32	14.59	14.29	14.78
9	3.57	3.35	3.16	4.94	6.79	6.01	6.84	7.07	10.52	14.54	21.91	23.42	6.16	13.12	12.39	11.53	16.03	13.89	13.26	8.23	14.60	11.28	11.96	12.45	13.04	13.56
10	3.40	3.55	5.40	7.00	5.00	5.14	6.45	6.11	16.58	16.93	22.30	7.14	8.03	8.37	9.78	10.40	12.95	10.37	10.48	6.98	10.79	8.30	8.92	9.77	10.16	10.06
11	3.49	5.70	6.93	5.27	4.76	5.88	6.47	6.54	17.50	18.45	8.58	12.63	6.07	7.50	9.87	9.80	11.44	10.20	10.74	6.56	9.65	7.89	8.88	9.69	9.72	9.45
12	5.74	7.28	5.20	4.92	5.28	8.11	9.62	7.04	18.61	7.65	23.49	9.44	5.74	7.98	9.62	8.91	10.49	8.97	8.01	5.40	7.86	6.49	7.24	7.48	7.18	7.08
13	7.36	5.56	4.84	5.21	4.94	11.32	11.65	8.54	7.89	19.25	15.55	8.51	5.88	7.41	8.39	8.43	10.10	8.16	7.46	5.15	7.62	6.47	6.90	6.99	6.91	6.84
14	5.46	4.99	5.14	5.17	8.14	14.24	12.86	4.57	14.70	13.05	13.32	8.81	5.89	6.79	8.20	8.40	9.33	7.80	7.52	5.44	7.73	6.57	6.83	7.06	7.05	7.00
15	5.09	5.15	5.04	6.93	12.80	15.78	6.36	37.58	11.04	11.59	13.31	8.98	5.92	7.00	8.46	8.13	9.01	7.95	8.25	5.93	7.90	6.84	7.21	7.44	7.48	7.41
16	5.21	5.13	6.30	10.03	14.78	7.15	16.54	27.56	10.12	11.26	12.36	8.72	6.31	7.17	8.09	7.82	8.88	8.46	8.91	6.27	7.94	7.26	7.59	7.83	7.88	7.91
17	5.40	6.83	8.62	11.91	7.27	8.23	11.15	22.10	9.14	9.48	10.07	8.01	5.86	6.20	6.94	6.86	8.11	7.80	8.12	5.63	7.13	6.61	6.86	7.01	7.13	7.13
18	7.05	9.37	10.38	7.28	7.53	6.24	9.21	18.56	7.99	7.76	8.88	7.56	5.44	5.55	6.30	6.56	7.67	7.40	7.79	5.51	6.77	6.46	6.63	6.82	6.94	6.97
19	9.21	10.20	7.04	7.35	6.08	5.66	8.06	14.68	6.75	6.75	7.75	6.81	5.03	5.05	5.96	6.16	7.08	6.96	7.62	5.39	6.46	6.30	6.47	6.61	6.78	6.83
20	10.34	7.18	8.25	6.13	5.76	5.33	6.77	11.13	6.03	5.75	6.49	6.12	4.73	4.79	5.54	5.68	6.47	6.64	7.41	5.27	6.12	6.17	6.27	6.42	6.62	6.71
21	8.99	8.15	6.99	5.97	5.60	4.84	5.58	8.86	5.25	4.77	5.42	5.60	4.60	4.45	5.07	5.20	6.03	6.33	7.22	5.12	5.85	6.02	6.10	6.24	6.48	6.62
22	7.45	6.90	6.88	5.94	5.38	4.45	5.06	7.33	4.63	4.14	4.82	5.42	4.44	4.17	4.71	4.93	5.72	6.13	7.06	5.05	5.65	5.92	5.98	6.12	6.41	6.54
23	6.32	6.71	6.80	5.72	5.04	4.17	4.28	5.59	3.98	3.52	4.24	5.04	4.20	3.83	4.37	4.60	5.37	5.86	6.90	4.94	5.43	5.80	5.84	6.00	6.30	6.45
24	6.18	6.55	6.59	5.51	4.93	3.77	3.63	4.33	3.50	3.14	3.75	4.68	3.97	3.58	4.08	4.33	5.05	5.65	6.75	4.85	5.24	5.70	5.75	5.89	6.22	6.38
25	6.01	6.28	6.39	5.49	4.59	3.42	3.12	3.45	3.20	2.77	3.34	4.35	3.81	3.36	3.84	4.09	4.80	5.45	6.62	4.77	5.07	5.63	5.65	5.79	6.13	6.31
26	5.78	6.05	6.42	5.19	4.34	3.13	2.76	2.90	2.89	2.48	3.02	4.13	3.66	3.19	3.63	3.91	4.59	5.29	6.51	4.70	4.95	5.56	5.57	5.70	6.06	6.24
27	5.63	6.07	6.11	5.03	4.17	2.99	2.62	2.53	2.71	2.31	2.73	3.99	3.59	3.08	3.52	3.80	4.47	5.20	6.45	4.67	4.88	5.52	5.51	5.65	6.01	6.20
28	5.64	5.73	5.92	4.87	4.02	2.89	2.31	2.18	2.52	2.13	2.55	3.85	3.51	2.98	3.40	3.69	4.35	5.10	6.40	4.63	4.80	5.48	5.46	5.58	5.95	6.15
29	5.33	5.54	5.76	4.77	4.00	2.75	2.17	1.95	2.40	1.99	2.39	3.76	3.45	2.92	3.33	3.62	4.27	5.05	6.36	4.61	4.75	5.44	5.41	5.54	5.91	6.11
30	5.11	5.31	5.57	4.69	3.80	2.61	1.96	1.77	2.27	1.82	2.26	3.61	3.34	2.81	3.21	3.49	4.13	4.91	6.21	4.50	4.61	5.31	5.27	5.39	5.76	5.96

= 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	0.31	0.35	0.70	0.32	0.85	1.03	0.51	0.36	0.40	0.54	0.18	2.07	0.51	0.48	0.49	0.49	0.48
2	1.90	2.89	2.84	2.60	1.09	4.01	0.51	19.41	1.25	1.88	10.03	4.37	1.31	2.57	2.82	2.47	5.17	6.21	3.67	1.30	5.81	2.10	2.34	2.84	2.55	2.28
3	4.97	6.19	4.88	2.14	0.88	0.51	8.20	11.42	2.49	16.62	22.60	2.95	1.88	3.79	4.70	10.47	23.03	15.42	2.69	4.97	7.02	4.01	5.26	5.60	4.65	4.69
4	7.03	6.15	2.50	1.52	0.45	1.93	6.27	12.42	13.83	25.66	10.52	3.14	2.72	4.82	15.26	26.93	26.89	4.66	8.90	5.13	8.83	6.46	7.56	7.17	6.87	7.62
5	6.41	3.31	1.86	1.00	1.79	2.56	6.86	23.32	24.63	11.64	8.01	4.29	3.12	14.64	28.24	29.57	6.37	14.29	9.16	6.15	12.48	8.69	8.94	9.53	10.23	9.35
6	3.25	1.95	1.06	1.98	2.17	3.04	17.75	23.95	10.63	9.42	9.57	5.10	7.60	27.02	27.63	7.99	21.66	12.92	11.52	8.46	14.85	10.05	11.40	13.33	12.11	11.06
7	2.12	1.20	2.42	2.43	2.89	9.04	23.05	12.97	7.83	9.85	10.87	13.45	18.74	26.13	8.54	20.92	20.26	16.77	17.52	11.26	17.63	14.11	16.38	16.47	15.52	14.98
8	1.34	2.87	3.17	2.94	4.75	14.42	12.20	9.00	9.42	10.11	18.89	25.39	21.14	7.92	23.21	18.86	22.51	22.21	22.98	13.25	21.42	18.82	19.57	19.54	19.12	19.53
9	2.97	3.75	3.47	4.72	7.51	8.55	8.77	7.14	10.12	15.94	21.35	25.35	6.03	14.02	14.27	13.88	18.69	17.53	17.38	10.63	17.40	14.10	14.43	14.65	15.12	15.60
10	3.32	3.53	5.38	7.50	5.84	6.35	8.17	6.63	17.70	15.69	22.13	7.47	9.23	9.14	10.88	11.82	14.53	12.68	13.00	8.55	12.43	9.94	10.29	10.88	11.22	11.10
11	3.56	6.04	7.63	5.89	5.63	7.00	8.08	6.81	18.55	17.01	7.77	13.87	7.70	8.65	11.37	11.64	13.58	12.84	13.73	8.32	11.65	9.74	10.47	11.11	11.10	10.82
12	5.09	7.57	5.67	5.17	5.47	7.15	10.19	6.86	19.17	7.71	17.19	10.96	7.24	8.73	10.75	10.48	13.01	12.88	12.92	7.75	10.79	9.60	10.32	10.57	10.45	10.40
13	7.07	6.50	5.13	5.45	5.07	13.83	10.58	6.95	7.68	12.82	12.51	10.03	7.36	8.18	9.51	9.87	12.64	11.82	12.01	7.34	10.36	9.45	9.79	9.87	9.99	9.96
14	5.61	5.81	5.77	5.02	7.66	18.43	11.96	4.04	12.31	10.15	11.71	10.85	7.70	7.94	9.67	10.32	12.31	11.72	12.32	7.85	10.83	9.79	9.95	10.20	10.38	10.35
15	5.95	5.87	4.88	6.28	12.22	15.98	5.54	25.72	9.53	8.91	11.34	10.57	7.36	7.71	9.51	9.53	11.42	11.32	12.58	8.02	10.51	9.61	9.87	10.12	10.35	10.29
16	5.35	5.12	6.55	9.82	13.47	6.96	11.32	19.08	8.55	8.44	10.31	9.85	7.33	7.55	8.69	8.75	10.46	11.32	12.76	7.96	10.07	9.56	9.78	10.01	10.22	10.32
17	5.45	7.56	8.85	11.24	6.77	7.51	8.57	16.10	8.15	7.58	8.97	9.38	7.13	6.84	7.82	8.03	9.65	10.68	12.25	7.56	9.56	9.21	9.38	9.55	9.86	9.92
18	6.72	9.74	10.30	6.85	7.94	6.06	7.33	13.96	7.30	6.43	8.03	8.95	6.62	6.15	7.12	7.62	9.20	10.07	11.62	7.38	8.90	8.99	9.08	9.33	9.63	9.74
19	9.54	10.59	6.75	8.21	6.73	5.56	6.64	11.49	6.33	5.70	7.22	8.12	6.12	5.61	6.70	7.19	8.27	9.38	10.99	7.21	8.38	8.74	8.88	9.04	9.44	9.58
20	11.14	7.79	9.90	7.18	6.43	5.32	5.77	9.12	5.71	5.05	6.19	7.36	5.73	5.29	6.27	6.67	7.68	9.00	10.52	7.03	7.72	8.57	8.61	8.82	9.26	9.44
21	12.50	9.51	8.78	7.02	6.32	4.92	4.91	7.51	5.12	4.32	5.32	6.77	5.53	4.95	5.77	6.15	7.23	8.45	10.04	6.84	7.43	8.35	8.40	8.53	9.01	9.25
22	8.57	8.43	8.70	7.05	6.12	4.56	4.49	6.46	4.58	3.82	4.79	6.50	5.33	4.65	5.39	5.83	6.90	8.19	9.81	6.74	7.20	8.21	8.07	8.17	8.69	8.93
23	7.62	8.26	8.73	6.89	5.79	4.28	3.94	5.14	4.00	3.27	4.26	6.09	5.04	4.29	5.02	5.47	6.52	7.65	9.34	6.60	6.78	8.06	7.91	8.05	8.58	8.85
24	7.50	8.20	8.60	6.68	5.64	3.96	3.37	4.13	3.57	2.89	3.84	5.68	4.76	4.02	4.70	5.16	6.18	7.41	9.15	6.48	6.57	7.76	7.69	7.93	8.49	8.63
25	7.43	8.03	8.42	6.63	5.36	3.63	2.91	3.41	3.28	2.60	3.39	5.30	4.55	3.78	4.43	4.88	5.91	7.18	8.98	6.38	6.38	7.57	7.58	7.70	8.27	8.56
26	7.28	7.83	8.43	6.40	5.08	3.35	2.57	2.92	3.00	2.35	3.08	5.02	4.37	3.58	4.19	4.66	5.44	7.00	8.84	6.30	6.24	7.48	7.37	7.60	8.19	8.33
27	7.16	7.84	8.23	6.22	4.87	3.18	2.42	2.59	2.81	2.14	2.90	4.83	4.24	3.44	4.05	4.51	5.27	6.87	8.46	6.26	6.15	7.43	7.30	7.38	7.96	8.27
28	7.16	7.59	8.02	6.02	4.70	3.06	2.23	2.26	2.62	1.95	2.72	4.63	4.11	3.31	3.90	4.37	5.11	6.50	8.37	6.22	6.05	7.25	7.23	7.14	7.71	8.01
29	6.96	7.40	7.84	5.90	4.64	2.93	2.09	2.03	2.49	1.84	2.58	4.48	4.01	3.21	3.79	4.26	4.99	6.41	8.29	6.19	5.98	7.20	7.02	7.08	7.66	7.97
30	6.80	7.23	7.72	5.87	4.51	2.82	1.98	1.87	2.39	1.76	2.43	4.36	3.93	3.13	3.70	4.17	4.89	6.32	8.21	6.15	5.70	7.13	6.79	7.01	7.59	7.90

= 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	0.11	0.36	0.15	0.05	0.05	0.03	0.14	0.23	0.01	0.02	0.19	0.09	0.12	0.00	0.00	0.01	0.01	0.05	0.00	0.00	0.00	0.07	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	4.04	2.96	2.28	0.84	1.12	0.73	0.39	1.18	0.20	0.23	0.81	1.16	1.15	1.14	1.12	1.11
3	3.17	3.76	2.51	1.59	1.78	1.71	4.69	6.82	2.07	8.06	10.52	9.74	5.08	1.89	4.94	2.22	1.94	2.98	0.98	1.02	2.12	2.48	2.49	2.47	2.33	2.26
4	4.14	4.66	3.13	2.27	2.61	3.26	7.14	10.40	4.22	12.86	15.61	13.44	6.31	4.84	7.15	3.49	3.50	4.34	1.57	1.81	3.28	3.66	3.69	3.63	3.38	3.30
5	4.71	5.17	3.58	2.77	3.42	4.55	9.62	13.49	6.75	17.22	18.78	14.39	9.58	5.89	9.33	4.34	4.69	5.23	2.14	2.45	4.42	4.85	4.87	4.75	4.43	4.35
6	4.99	5.43	3.85	3.32	4.11	5.77	11.71	15.77	9.26	19.68	20.05	17.01	11.10	7.16	10.42	4.86	5.27	6.10	2.75	3.06	5.54	6.08	6.04	5.89	5.54	5.43
7	5.21	5.68	4.17	3.77	4.82	6.85	13.71	17.24	11.06	20.77	21.21	17.44	11.97	8.00	10.97	5.22	5.69	6.81	3.28	3.61	6.51	7.12	7.05	6.88	6.46	6.31
8	5.39	5.92	4.39	4.29	5.47	8.04	15.39	18.05	12.19	21.76	21.66	17.75	12.73	8.42	11.34	5.52	6.06	7.56	4.00	4.23	7.59	8.42	8.31	8.07	7.62	7.45
9	5.61	6.10	4.66	4.71	6.22	9.16	16.56	18.53	13.06	22.54	21.99	18.23	13.73	9.17	11.62	5.75	6.35	8.13	4.59	4.74	8.48	9.50	9.30	8.99	8.51	8.33
10	5.79	6.27	4.92	5.09	7.01	9.99	17.32	18.97	13.70	23.08	22.28	18.85	14.65	9.71	11.81	5.93	6.56	8.57	5.10	5.17	9.21	10.38	10.10	9.74	9.25	9.08
11	5.95	6.46	5.18	5.62	7.67	10.56	17.87	19.32	14.11	23.48	22.58	19.12	15.47	10.17	11.97	6.08	6.72	8.93	5.54	5.55	9.82	11.10	10.74	10.33	9.85	9.68
12	6.11	6.64	5.56	6.13	8.19	11.18	18.36	19.59	14.45	23.79	22.76	19.35	16.15	10.56	12.10	6.20	6.86	9.26	5.99	5.91	10.39	11.78	11.35	10.91	10.44	10.28
13	6.26	6.93	5.92	6.52	8.62	11.62	18.70	19.80	14.67	23.99	22.89	19.53	16.69	10.86	12.20	6.30	6.98	9.51	6.34	6.20	10.83	12.30	11.81	11.35	10.89	10.73
14	6.47	7.24	6.27	6.84	8.98	12.01	18.98	19.95	14.84	24.14	22.99	19.66	17.14	11.09	12.28	6.38	7.07	9.71	6.62	6.43	11.17	12.72	12.18	11.70	11.24	11.09
15	6.65	7.47	6.49	7.12	9.25	12.27	19.20	20.18	14.98	24.25	23.07	19.77	17.49	11.28	12.34	6.45	7.14	9.87	6.83	6.61	11.44	13.03	12.47	11.96	11.51	11.36
16	6.84	7.64	6.70	7.34	9.48	12.47	19.35	20.33	15.08	24.34	23.13	19.85	17.77	11.42	12.39	6.50	7.19	10.00	7.00	6.76	11.65	13.27	12.68	12.17	11.72	11.57
17	7.00	7.79	6.84	7.49	9.67	12.58	19.47	20.45	15.16	24.41	23.18	19.92	17.98	11.53	12.42	6.53	7.24	10.10	7.13	6.89	11.81	13.45	12.84	12.31	11.87	11.72
18	7.16	7.93	6.95	7.61	9.86	12.67	19.56	20.53	15.23	24.45	23.21	19.96	18.15	11.61	12.45	6.56	7.28	10.17	7.23	6.98	11.93	13.58	12.95	12.42	11.98	11.83
19	7.25	8.05	7.10	7.73	10.02	12.75	19.63	20.59	15.27	24.49	23.24	20.00	18.28	11.67	12.47	6.58	7.31	10.23	7.31	7.06	12.03	13.68	13.04	12.50	12.06	11.92
20	7.30	8.13	7.21	7.83	10.14	12.81	19.69	20.63	15.31	24.52	23.25	20.03	18.38	11.71	12.48	6.60	7.33	10.28	7.37	7.13	12.10	13.76	13.10	12.56	12.12	11.98
21	7.36	8.22	7.31	7.91	10.23	12.85	19.73	20.67	15.34	24.54	23.27	20.05	18.45	11.75	12.49	6.61	7.35	10.31	7.42	7.18	12.15	13.81	13.15	12.61	12.17	12.03
22	7.43	8.30	7.39	7.98	10.31	12.89	19.77	20.70	15.36	24.55	23.28	20.07	18.51	11.77	12.50	6.62	7.37	10.33	7.46	7.22	12.20	13.85	13.19	12.64	12.20	12.06
23	7.49	8.36	7.45	8.03	10.37	12.93	19.80	20.72	15.38	24.57	23.29	20.08	18.56	11.79	12.51	6.63	7.38	10.35	7.49	7.26	12.24	13.89	13.22	12.67	12.23	12.09
24	7.55	8.42	7.51	8.07	10.42	12.95	19.83	20.74	15.40	24.58	23.30	20.09	18.60	11.81	12.51	6.64	7.39	10.37	7.52	7.29	12.26	13.91	13.24	12.69	12.25	12.11
25	7.59	8.46	7.55	8.11	10.47	12.98	19.85	20.75	15.41	24.58	23.30	20.10	18.63	11.82	12.52	6.65	7.40	10.39	7.54	7.31	12.29	13.93	13.26	12.70	12.26	12.12
26	7.63	8.50	7.59	8.14	10.50	13.00	19.87	20.76	15.42	24.59	23.31	20.10	18.65	11.83	12.52	6.66	7.40	10.40	7.56	7.33	12.30	13.94	13.27	12.71	12.27	12.13
27	7.66	8.53	7.63	8.17	10.53	13.02	19.89	20.77	15.43	24.59	23.31	20.11	18.67	11.84	12.52	6.66	7.41	10.41	7.57	7.35	12.32	13.95	13.28	12.72	12.28	12.14
28	7.69	8.56	7.66	8.19	10.55	13.03	19.90	20.77	15.44	24.60	23.31	20.11	18.69	11.85	12.53	6.67	7.42	10.42	7.58	7.36	12.33	13.96	13.28	12.72	12.29	12.14
29	7.72	8.58	7.69	8.21	10.57	13.04	19.91	20.78	15.45	24.60	23.31	20.12	18.70	11.85	12.53	6.67	7.42	10.43	7.59	7.37	12.34	13.97	13.29	12.73	12.29	12.15
30	7.74	8.61	7.71	8.23	10.59	13.06	19.93	20.78	15.46	24.60	23.32	20.12	18.71	11.86	12.53	6.67	7.42	10.43	7.60	7.38	12.35	13.97	13.29	12.73	12.29	12.15

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	0.18	0.19	0.19	0.18	0.16
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	0.21	0.25	0.43	0.45	0.44	0.42	0.39
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	0.47	0.67	0.81	0.85	0.84	0.79	0.74
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	0.99	0.68	0.84	1.22	1.35	1.41	1.39	1.32	1.25
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	1.36	1.12	1.21	1.79	1.95	2.01	1.98	1.91	1.84
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	2.52	1.70	1.50	1.54	2.29	2.47	2.54	2.51	2.44	2.34
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	2.09	2.73	1.99	1.83	1.83	2.66	2.92	2.97	2.94	2.86	2.77
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	2.11	2.39	2.28	2.87	2.21	2.08	2.06	2.93	3.22	3.27	3.23	3.15	3.06
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	2.34	2.62	2.44	2.98	2.38	2.28	2.28	3.10	3.45	3.47	3.42	3.36	3.29
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	1.73	2.61	2.86	2.62	3.09	2.60	2.54	2.57	3.37	3.80	3.78	3.72	3.68	3.63
11	0.26	1.27	1.77	1.80	3.07	3.60	3.55	2.77	2.04	3.25	3.11	2.22	1.95	2.85	3.05	2.76	3.16	2.75	2.75	2.81	3.60	4.06	4.03	3.97	3.94	3.89
12	0.32	1.27	1.81	2.07	3.37	3.78	3.69	2.81	2.07	3.27	3.21	2.39	2.15	3.07	3.21	2.87	3.22	2.90	2.94	3.03	3.81	4.30	4.24	4.17	4.18	4.13
13	0.32	1.27	1.93	2.24	3.56	3.93	3.78	2.84	2.12	3.36	3.31	2.54	2.34	3.27	3.34	2.97	3.27	3.01	3.08	3.20	4.00	4.52	4.41	4.34	4.37	4.34
14	0.32	1.27	2.01	2.38	3.64	4.08	3.86	2.87	2.21	3.46	3.40	2.69	2.52	3.45	3.46	3.05	3.32	3.11	3.20	3.36	4.17	4.69	4.58	4.50	4.53	4.51
15	0.32	1.33	2.17	2.48	3.72	4.14	3.90	2.95	2.28	3.54	3.47	2.80	2.66	3.59	3.55	3.11	3.35	3.18	3.29	3.50	4.31	4.81	4.69	4.62	4.66	4.64
16	0.32	1.33	2.21	2.51	3.81	4.18	3.98	3.00	2.33	3.60	3.53	2.89	2.77	3.70	3.62	3.15	3.38	3.23	3.35	3.59	4.42	4.90	4.78	4.70	4.74	4.73
17	0.39	1.33	2.25	2.55	3.81	4.26	4.05	3.04	2.38	3.66	3.57	2.95	2.85	3.78	3.68	3.18	3.39	3.26	3.39	3.65	4.50	4.97	4.84	4.76	4.81	4.79
18	0.39	1.46	2.25	2.58	3.96	4.33	4.09	3.06	2.42	3.70	3.61	3.00	2.92	3.85	3.72	3.21	3.40	3.28	3.41	3.70	4.57	5.02	4.88	4.80	4.85	4.83
19	0.39	1.46	2.29	2.75	4.09	4.38	4.12	3.08	2.44	3.73	3.63	3.04	2.97	3.90	3.75	3.23	3.41	3.30	3.43	3.74	4.63	5.05	4.92	4.83	4.89	4.87
20	0.39	1.46	2.45	2.91	4.16	4.43	4.14	3.10	2.47	3.76	3.66	3.07	3.01	3.94	3.77	3.25	3.41	3.31	3.45	3.78	4.68	5.08	4.94	4.85	4.91	4.89
21	0.39	1.55	2.59	3.02	4.23	4.47	4.16	3.11	2.48	3.78	3.67	3.09	3.04	3.97	3.79	3.27	3.41	3.31	3.46	3.81	4.70	5.09	4.96	4.87	4.93	4.91
22	0.45	1.63	2.67	3.12	4.28	4.51	4.18	3.12	2.50	3.81	3.68	3.11	3.07	3.99	3.80	3.28	3.42	3.32	3.47	3.84	4.72	5.11	4.97	4.88	4.94	4.92
23	0.49	1.69	2.73	3.21	4.32	4.54	4.19	3.12	2.51	3.82	3.69	3.13	3.10	4.01	3.81	3.28	3.42	3.32	3.47	3.86	4.73	5.12	4.98	4.89	4.95	4.93
24	0.53	1.74	2.78	3.27	4.35	4.57	4.19	3.13	2.51	3.82	3.69	3.14	3.12	4.03	3.81	3.29	3.42	3.33	3.48	3.88	4.74	5.12	4.98	4.90	4.95	4.93
25	0.56	1.77	2.82	3.29	4.38	4.60	4.20	3.13	2.52	3.83	3.70	3.15	3.14	4.05	3.82	3.29	3.42	3.33	3.48	3.90	4.75	5.13	4.99	4.90	4.96	4.94
26	0.58	1.80	2.85	3.31	4.40	4.62	4.21	3.13	2.53	3.84	3.70	3.16	3.16	4.06	3.82	3.29	3.42	3.33	3.48	3.92	4.75	5.13	4.99	4.90	4.96	4.94
27	0.60	1.82	2.87	3.33	4.42	4.65	4.21	3.13	2.53	3.84	3.70	3.16	3.17	4.08	3.82	3.29	3.42	3.33	3.48	3.94	4.76	5.13	4.99	4.91	4.96	4.94
28	0.61	1.84	2.89	3.34	4.44	4.67	4.21	3.14	2.53	3.84	3.71	3.17	3.19	4.09	3.82	3.29	3.42	3.33	3.48	3.96	4.76	5.14	5.00	4.91	4.97	4.94
29	0.62	1.86	2.90	3.35	4.46	4.68	4.21	3.14	2.54	3.85	3.71	3.17	3.20	4.11	3.82	3.29	3.42	3.33	3.48	3.97	4.76	5.14	5.00	4.91	4.97	4.95
30	0.63	1.87	2.91	3.35	4.48	4.70	4.22	3.14	2.54	3.85	3.71	3.17	3.22	4.12	3.82	3.29	3.42	3.33	3.48	3.97	4.76	5.14	5.00	4.91	4.97	4.95

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	0.09	0.10	0.10	0.09	0.09
2	0.06	0.17	0.07	0.06	0.10	0.26	0.60	0.98	0.15	0.39	0.21	0.19	0.28	0.20	0.16	0.16	0.13	0.07	0.12	0.11	0.28	0.37	0.38	0.37	0.35	0.33
3	0.28	0.32	0.20	0.18	0.35	0.74	2.28	2.39	0.65	1.34	1.16	1.07	0.78	0.73	0.57	0.57	0.67	0.63	0.51	0.39	0.89	0.91	0.92	0.90	0.84	0.80
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	0.86	0.70	1.56	1.52	1.53	1.50	1.40	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	1.83	1.63	1.21	0.97	2.18	2.12	2.13	2.08	1.98	1.95
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	2.20	1.99	1.50	1.18	2.67	2.63	2.62	2.58	2.49	2.45
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	3.27	2.85	2.64	2.45	2.27	1.71	1.34	3.05	3.03	3.03	3.00	2.89	2.84
8	0.81	1.01	0.49	1.00	1.77	4.06	7.89	6.88	4.38	6.25	5.30	4.56	3.39	3.67	3.29	2.95	2.67	2.56	1.98	1.51	3.46	3.54	3.54	3.50	3.40	3.36
9	0.91	1.07	0.59	1.11	2.07	4.80	8.33	7.10	4.71	6.60	5.59	4.90	3.66	4.06	3.59	3.18	2.82	2.77	2.18	1.66	3.80	3.96	3.94	3.89	3.81	3.76
10	0.98	1.11	0.64	1.31	2.46	5.42	8.60	7.27	5.00	6.88	5.78	5.15	4.00	4.41	3.87	3.39	2.96	2.97	2.37	1.80	4.13	4.38	4.35	4.28	4.21	4.17
11	1.07	1.18	0.71	1.49	2.74	5.74	8.84	7.40	5.15	7.06	5.94	5.32	4.24	4.67	4.07	3.54	3.06	3.12	2.52	1.92	4.38	4.71	4.65	4.57	4.52	4.50
12	1.11	1.28	0.75	1.61	3.04	6.00	9.05	7.50	5.28	7.15	6.06	5.44	4.44	4.88	4.23	3.65	3.14	3.24	2.65	2.02	4.58	4.99	4.89	4.80	4.78	4.78
13	1.13	1.32	0.80	1.69	3.27	6.18	9.22	7.61	5.36	7.27	6.15	5.54	4.60	5.05	4.36	3.74	3.21	3.34	2.76	2.10	4.75	5.21	5.09	5.00	4.99	5.02
14	1.17	1.39	0.89	1.72	3.42	6.37	9.26	7.67	5.45	7.40	6.24	5.65	4.79	5.25	4.51	3.85	3.28	3.46	2.87	2.20	4.93	5.45	5.32	5.22	5.23	5.26
15	1.17	1.39	0.92	1.86	3.56	6.47	9.29	7.76	5.52	7.48	6.31	5.73	4.93	5.40	4.62	3.94	3.34	3.54	2.97	2.28	5.07	5.63	5.49	5.40	5.42	5.46
16	1.26	1.41	0.98	1.90	3.68	6.50	9.38	7.82	5.57	7.55	6.36	5.79	5.03	5.52	4.71	4.00	3.39	3.61	3.04	2.35	5.18	5.78	5.63	5.53	5.57	5.61
17	1.26	1.43	1.03	1.97	3.75	6.56	9.43	7.85	5.60	7.60	6.39	5.83	5.11	5.61	4.77	4.05	3.42	3.67	3.10	2.42	5.26	5.90	5.73	5.62	5.67	5.73
18	1.26	1.47	1.05	2.00	3.84	6.60	9.46	7.87	5.63	7.63	6.41	5.86	5.16	5.68	4.83	4.09	3.45	3.71	3.14	2.47	5.32	5.98	5.79	5.68	5.75	5.81
19	1.30	1.49	1.06	2.10	3.91	6.63	9.48	7.88	5.66	7.65	6.43	5.88	5.20	5.73	4.87	4.12	3.47	3.74	3.18	2.53	5.36	6.05	5.84	5.73	5.80	5.87
20	1.30	1.49	1.17	2.19	3.98	6.66	9.49	7.89	5.67	7.67	6.45	5.90	5.23	5.77	4.90	4.15	3.48	3.77	3.21	2.58	5.40	6.09	5.88	5.76	5.83	5.91
21	1.31	1.59	1.26	2.27	4.03	6.69	9.50	7.89	5.69	7.69	6.46	5.91	5.25	5.81	4.93	4.17	3.49	3.79	3.24	2.62	5.43	6.12	5.91	5.79	5.86	5.94
22	1.38	1.67	1.35	2.34	4.09	6.71	9.51	7.90	5.71	7.70	6.47	5.93	5.27	5.84	4.96	4.19	3.50	3.81	3.26	2.67	5.46	6.14	5.93	5.82	5.89	5.97
23	1.42	1.71	1.44	2.41	4.14	6.73	9.51	7.90	5.72	7.71	6.48	5.94	5.28	5.87	4.98	4.21	3.50	3.83	3.27	2.71	5.48	6.17	5.95	5.83	5.91	5.98
24	1.46	1.75	1.52	2.48	4.18	6.75	9.52	7.90	5.73	7.71	6.49	5.95	5.29	5.89	5.00	4.23	3.51	3.83	3.28	2.75	5.50	6.18	5.96	5.84	5.92	6.00
25	1.50	1.78	1.58	2.54	4.23	6.77	9.52	7.90	5.75	7.72	6.49	5.95	5.30	5.91	5.02	4.25	3.52	3.84	3.29	2.80	5.52	6.20	5.96	5.84	5.92	6.01
26	1.53	1.78	1.63	2.61	4.27	6.79	9.52	7.90	5.76	7.73	6.50	5.96	5.31	5.93	5.04	4.26	3.52	3.85	3.30	2.83	5.54	6.21	5.97	5.84	5.93	6.02
27	1.55	1.78	1.65	2.66	4.31	6.81	9.52	7.90	5.77	7.73	6.50	5.97	5.32	5.95	5.05	4.27	3.53	3.86	3.31	2.86	5.55	6.22	5.97	5.85	5.93	6.02
28	1.56	1.78	1.67	2.71	4.35	6.83	9.52	7.91	5.78	7.73	6.50	5.98	5.32	5.97	5.06	4.28	3.53	3.87	3.32	2.88	5.57	6.22	5.97	5.85	5.93	6.02
29	1.58	1.79	1.68	2.74	4.39	6.85	9.52	7.91	5.79	7.73	6.50	5.98	5.33	5.99	5.07	4.29	3.53	3.87	3.33	2.91	5.58	6.22	5.97	5.85	5.93	6.02
30	1.59	1.79	1.69	2.77	4.43	6.87	9.53	7.91	5.79	7.73	6.50	5.99	5.34	6.01	5.08	4.30	3.53	3.88	3.34	2.93	5.58	6.22	5.97	5.85	5.93	6.02

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	0.06	0.01	0.01	0.02	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.03	0.03	0.03	0.03	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	0.27	0.26	0.26	0.25	0.23	0.22
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	0.71	0.53	1.13	0.88	0.88	0.87	0.79	0.75
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	1.65	1.23	1.12	2.20	1.73	1.75	1.70	1.55	1.51
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	2.32	1.84	1.67	3.24	2.62	2.62	2.54	2.36	2.33
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	3.45	3.35	2.95	2.34	2.13	4.08	3.39	3.36	3.27	3.07	3.02
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	4.92	4.79	3.91	3.70	3.40	2.71	2.47	4.66	3.96	3.92	3.82	3.59	3.52
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	5.25	4.22	3.96	3.78	3.04	2.75	5.14	4.48	4.43	4.30	4.05	3.96
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	6.01	5.57	4.47	4.15	4.06	3.29	2.99	5.52	4.92	4.83	4.67	4.40	4.31
10	1.56	1.64	1.14	1.87	3.42	7.01	12.28	11.05	8.92	13.07	11.44	7.85	6.05	6.42	5.86	4.68	4.31	4.32	3.54	3.23	5.89	5.37	5.24	5.05	4.78	4.69
11	1.59	1.74	1.23	2.15	3.91	7.61	12.79	11.22	9.27	13.31	11.63	8.14	6.40	6.72	6.07	4.83	4.43	4.50	3.73	3.42	6.16	5.71	5.54	5.33	5.06	4.98
12	1.61	1.78	1.32	2.33	4.32	8.08	13.15	11.40	9.48	13.53	11.81	8.34	6.68	6.96	6.23	4.94	4.51	4.65	3.88	3.57	6.37	5.98	5.79	5.57	5.30	5.22
13	1.65	1.86	1.41	2.49	4.66	8.43	13.41	11.51	9.61	13.73	11.94	8.51	6.92	7.16	6.36	5.03	4.58	4.77	4.00	3.70	6.55	6.21	6.00	5.77	5.50	5.42
14	1.72	1.92	1.52	2.57	4.88	8.63	13.58	11.54	9.77	13.91	12.07	8.67	7.15	7.35	6.48	5.11	4.65	4.88	4.12	3.82	6.71	6.44	6.20	5.96	5.70	5.62
15	1.76	1.98	1.59	2.65	5.10	8.80	13.68	11.69	9.88	14.04	12.15	8.79	7.32	7.50	6.57	5.18	4.70	4.97	4.20	3.91	6.84	6.61	6.36	6.11	5.85	5.78
16	1.81	2.05	1.69	2.72	5.25	8.96	13.82	11.76	9.96	14.14	12.21	8.87	7.45	7.61	6.64	5.23	4.74	5.03	4.27	3.99	6.94	6.75	6.48	6.23	5.97	5.90
17	1.85	2.09	1.73	2.78	5.32	9.04	13.92	11.81	10.02	14.21	12.26	8.93	7.54	7.70	6.70	5.27	4.77	5.08	4.32	4.05	7.02	6.85	6.58	6.32	6.06	6.00
18	1.87	2.14	1.80	2.81	5.41	9.10	13.99	11.84	10.07	14.25	12.29	8.98	7.62	7.77	6.74	5.30	4.79	5.11	4.35	4.10	7.08	6.94	6.65	6.39	6.14	6.07
19	1.89	2.18	1.82	2.88	5.48	9.15	14.04	11.86	10.11	14.29	12.31	9.01	7.67	7.82	6.78	5.32	4.81	5.14	4.38	4.15	7.13	7.00	6.71	6.45	6.20	6.13
20	1.89	2.21	1.88	2.95	5.54	9.19	14.07	11.87	10.14	14.32	12.33	9.04	7.71	7.86	6.80	5.34	4.82	5.16	4.41	4.18	7.17	7.05	6.76	6.50	6.25	6.18
21	1.92	2.26	1.93	3.00	5.59	9.22	14.09	11.88	10.16	14.34	12.35	9.06	7.74	7.89	6.83	5.36	4.83	5.18	4.43	4.21	7.20	7.10	6.80	6.54	6.29	6.22
22	1.97	2.31	1.97	3.05	5.63	9.24	14.10	11.89	10.19	14.35	12.36	9.08	7.76	7.92	6.85	5.38	4.85	5.19	4.44	4.23	7.23	7.14	6.84	6.57	6.32	6.25
23	2.01	2.36	2.01	3.09	5.66	9.27	14.12	11.89	10.20	14.36	12.36	9.09	7.78	7.94	6.87	5.39	4.86	5.21	4.46	4.26	7.25	7.17	6.87	6.60	6.35	6.28
24	2.05	2.40	2.05	3.13	5.70	9.28	14.13	11.90	10.22	14.37	12.37	9.10	7.79	7.96	6.88	5.40	4.87	5.22	4.47	4.27	7.28	7.20	6.90	6.63	6.38	6.31
25	2.09	2.44	2.09	3.16	5.72	9.30	14.13	11.90	10.24	14.38	12.37	9.11	7.81	7.98	6.90	5.41	4.87	5.23	4.48	4.29	7.30	7.22	6.92	6.65	6.40	6.33
26	2.13	2.48	2.13	3.20	5.75	9.32	14.14	11.90	10.25	14.39	12.37	9.12	7.82	7.99	6.91	5.43	4.88	5.24	4.50	4.31	7.31	7.25	6.94	6.67	6.42	6.35
27	2.17	2.52	2.16	3.23	5.78	9.33	14.14	11.90	10.26	14.39	12.38	9.12	7.82	8.01	6.93	5.44	4.89	5.25	4.51	4.32	7.33	7.27	6.96	6.69	6.44	6.37
28	2.20	2.56	2.19	3.26	5.80	9.35	14.14	11.90	10.28	14.40	12.38	9.13	7.83	8.02	6.94	5.45	4.90	5.26	4.52	4.33	7.35	7.29	6.98	6.71	6.46	6.39
29	2.23	2.60	2.22	3.29	5.82	9.36	14.14	11.90	10.29	14.40	12.38	9.14	7.84	8.03	6.96	5.46	4.91	5.27	4.53	4.35	7.36	7.31	7.00	6.73	6.48	6.40
30	2.26	2.64	2.25	3.32	5.85	9.37	14.15	11.90	10.29	14.40	12.38	9.14	7.84	8.04	6.97	5.47	4.92	5.28	4.54	4.36	7.38	7.33	7.02	6.74	6.50	6.42

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	0.04	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	0.01	0.02	0.02	0.01	0.01
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	0.25	0.22	0.22	0.21	0.19	0.17
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	0.56	1.17	0.83	0.84	0.83	0.73	0.68
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	1.71	1.19	1.25	2.40	1.72	1.77	1.71	1.51	1.45
5	1.86	1.40	1.06	1.33	2.49	4.55	8.53	11.70	6.97	9.12	9.02	5.65	3.54	4.15	4.04	3.76	3.42	2.50	1.93	1.95	3.70	2.79	2.81	2.70	2.43	2.37
6	2.13	1.56	1.19	1.60	3.20	5.83	11.06	14.55	9.57	11.41	11.04	7.40	4.85	5.42	5.29	4.62	4.11	3.33	2.62	2.60	4.85	3.81	3.78	3.64	3.34	3.23
7	2.33	1.68	1.38	1.82	3.86	7.03	13.80	16.35	11.40	12.74	12.48	8.89	6.00	6.59	6.20	5.25	4.59	3.99	3.18	3.14	5.72	4.64	4.58	4.42	4.04	3.91
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	6.82	5.71	4.97	4.59	3.74	3.64	6.48	5.47	5.39	5.16	4.74	4.58
9	2.50	1.98	1.64	2.32	5.16	9.81	17.06	17.94	13.58	14.61	14.40	11.07	7.66	8.01	7.27	6.06	5.25	5.03	4.18	4.05	7.07	6.17	6.02	5.74	5.28	5.11
10	2.59	2.00	1.76	2.60	5.96	11.02	17.84	18.29	14.19	15.07	14.98	11.76	8.19	8.47	7.61	6.33	5.45	5.34	4.47	4.34	7.49	6.66	6.46	6.13	5.66	5.48
11	2.65	2.06	1.89	2.92	6.64	11.85	18.46	18.70	14.74	15.52	15.43	12.20	8.67	8.88	7.90	6.54	5.60	5.58	4.72	4.61	7.83	7.07	6.83	6.46	5.98	5.79
12	2.74	2.17	2.05	3.12	7.18	12.52	19.02	19.01	15.12	15.76	15.72	12.57	9.10	9.23	8.13	6.72	5.73	5.82	4.98	4.86	8.16	7.49	7.20	6.81	6.32	6.13
13	2.83	2.26	2.18	3.38	7.54	13.04	19.39	19.16	15.39	16.05	15.91	12.87	9.47	9.52	8.32	6.86	5.84	6.01	5.18	5.07	8.42	7.84	7.51	7.10	6.60	6.41
14	2.89	2.35	2.31	3.59	7.91	13.41	19.68	19.25	15.62	16.27	16.08	13.13	9.80	9.77	8.48	6.98	5.93	6.17	5.36	5.25	8.65	8.15	7.79	7.35	6.85	6.66
15	2.97	2.43	2.42	3.74	8.21	13.72	19.97	19.45	15.79	16.44	16.20	13.32	10.04	9.97	8.61	7.08	6.00	6.28	5.48	5.39	8.81	8.39	8.00	7.54	7.04	6.85
16	3.03	2.47	2.50	3.84	8.42	14.01	20.17	19.55	15.93	16.57	16.28	13.47	10.24	10.12	8.71	7.15	6.05	6.37	5.58	5.50	8.95	8.58	8.16	7.69	7.19	7.00
17	3.08	2.55	2.54	3.99	8.53	14.15	20.30	19.62	16.04	16.66	16.34	13.58	10.38	10.24	8.78	7.20	6.09	6.44	5.65	5.59	9.05	8.72	8.29	7.81	7.30	7.11
18	3.12	2.60	2.60	4.05	8.67	14.26	20.41	19.66	16.12	16.73	16.39	13.66	10.49	10.33	8.83	7.25	6.12	6.49	5.70	5.66	9.12	8.83	8.39	7.90	7.39	7.20
19	3.21	2.63	2.62	4.13	8.77	14.35	20.48	19.69	16.19	16.78	16.42	13.72	10.58	10.40	8.88	7.28	6.15	6.52	5.74	5.72	9.18	8.91	8.46	7.97	7.46	7.27
20	3.24	2.68	2.67	4.20	8.86	14.42	20.54	19.70	16.24	16.82	16.45	13.77	10.64	10.46	8.91	7.30	6.17	6.55	5.78	5.77	9.23	8.98	8.52	8.02	7.51	7.32
21	3.28	2.72	2.72	4.26	8.93	14.48	20.58	19.72	16.29	16.85	16.47	13.80	10.69	10.50	8.94	7.32	6.18	6.58	5.80	5.80	9.27	9.03	8.57	8.07	7.56	7.36
22	3.32	2.76	2.75	4.31	8.99	14.53	20.61	19.73	16.33	16.88	16.48	13.83	10.73	10.53	8.97	7.34	6.20	6.59	5.82	5.84	9.30	9.07	8.61	8.10	7.59	7.40
23	3.36	2.80	2.79	4.35	9.04	14.57	20.63	19.74	16.36	16.90	16.49	13.85	10.76	10.56	8.99	7.36	6.21	6.61	5.84	5.86	9.33	9.11	8.64	8.13	7.62	7.42
24	3.40	2.83	2.81	4.38	9.08	14.61	20.65	19.74	16.39	16.91	16.50	13.87	10.78	10.59	9.00	7.37	6.23	6.62	5.86	5.89	9.35	9.14	8.67	8.16	7.64	7.44
25	3.43	2.86	2.84	4.41	9.12	14.64	20.67	19.75	16.41	16.92	16.51	13.89	10.80	10.60	9.02	7.38	6.24	6.63	5.87	5.91	9.37	9.16	8.69	8.18	7.66	7.46
26	3.47	2.89	2.86	4.44	9.16	14.67	20.68	19.75	16.43	16.93	16.51	13.90	10.82	10.62	9.03	7.39	6.25	6.64	5.88	5.92	9.39	9.18	8.71	8.20	7.68	7.48
27	3.50	2.92	2.88	4.47	9.19	14.69	20.69	19.75	16.45	16.94	16.52	13.91	10.83	10.64	9.05	7.40	6.26	6.65	5.89	5.94	9.40	9.20	8.73	8.21	7.69	7.49
28	3.53	2.95	2.90	4.49	9.21	14.72	20.69	19.75	16.46	16.95	16.52	13.93	10.84	10.65	9.06	7.41	6.27	6.66	5.90	5.95	9.41	9.21	8.74	8.23	7.71	7.50
29	3.56	2.98	2.92	4.52	9.24	14.74	20.70	19.76	16.47	16.95	16.52	13.93	10.85	10.66	9.07	7.42	6.28	6.67	5.91	5.97	9.42	9.22	8.76	8.24	7.72	7.51
30	3.59	3.00	2.94	4.54	9.27	14.76	20.70	19.76	16.49	16.95	16.53	13.94	10.86	10.67	9.08	7.43	6.28	6.67	5.92	5.98	9.43	9.24	8.77	8.25	7.73	7.52

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	0.03	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01	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	0.36	0.30	0.30	0.29	0.26	0.25
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	0.93	0.77	0.75	1.54	1.11	1.11	1.09	0.97	0.92
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	2.71	1.86	1.43	1.55	2.98	2.18	2.21	2.14	1.91	1.85
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	3.77	2.76	2.27	2.34	4.44	3.39	3.39	3.26	2.97	2.91
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	5.38	4.54	3.66	3.04	3.05	5.70	4.53	4.48	4.32	3.99	3.89
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	7.44	7.86	7.08	6.11	5.04	4.34	3.62	3.61	6.60	5.40	5.32	5.14	4.74	4.62
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	8.48	8.80	7.86	6.64	5.45	4.96	4.21	4.13	7.42	6.31	6.19	5.94	5.50	5.36
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	9.27	9.57	8.43	7.07	5.76	5.43	4.67	4.56	8.06	7.07	6.88	6.57	6.09	5.94
10	3.20	2.73	2.48	3.53	7.05	13.47	21.77	23.82	19.06	20.01	18.71	13.93	9.94	10.17	8.88	7.39	5.98	5.78	5.01	4.91	8.55	7.66	7.40	7.04	6.55	6.39
11	3.31	2.84	2.68	3.97	7.82	14.50	22.55	24.17	19.71	20.54	19.16	14.54	10.50	10.66	9.23	7.64	6.15	6.04	5.28	5.19	8.93	8.12	7.81	7.41	6.91	6.75
12	3.40	2.98	2.91	4.32	8.50	15.23	23.10	24.41	20.24	20.85	19.51	14.99	10.96	11.05	9.50	7.83	6.27	6.25	5.49	5.41	9.22	8.50	8.14	7.71	7.20	7.04
13	3.51	3.13	3.10	4.63	9.08	15.87	23.65	24.57	20.56	21.23	19.77	15.37	11.36	11.39	9.73	7.99	6.38	6.42	5.67	5.60	9.47	8.81	8.42	7.97	7.46	7.30
14	3.58	3.26	3.24	4.90	9.53	16.43	23.93	24.73	20.85	21.51	19.98	15.68	11.69	11.66	9.91	8.12	6.46	6.56	5.81	5.76	9.67	9.08	8.66	8.19	7.67	7.51
15	3.68	3.37	3.36	5.09	9.87	16.81	24.24	24.96	21.06	21.73	20.14	15.91	11.95	11.88	10.05	8.22	6.53	6.67	5.92	5.88	9.82	9.29	8.84	8.36	7.84	7.68
16	3.76	3.46	3.45	5.25	10.14	17.05	24.54	25.08	21.23	21.91	20.26	16.09	12.15	12.05	10.16	8.29	6.57	6.75	6.00	5.98	9.94	9.46	8.99	8.49	7.97	7.81
17	3.83	3.53	3.57	5.35	10.31	17.21	24.74	25.15	21.35	22.04	20.34	16.21	12.30	12.18	10.24	8.35	6.61	6.80	6.06	6.06	10.03	9.58	9.10	8.59	8.07	7.92
18	3.89	3.60	3.65	5.46	10.46	17.34	24.89	25.20	21.44	22.14	20.41	16.31	12.42	12.27	10.31	8.39	6.64	6.85	6.11	6.12	10.10	9.68	9.19	8.67	8.15	7.99
19	3.94	3.64	3.72	5.55	10.57	17.43	24.99	25.23	21.52	22.22	20.46	16.38	12.50	12.35	10.35	8.43	6.66	6.88	6.14	6.17	10.16	9.76	9.25	8.73	8.21	8.06
20	3.98	3.69	3.78	5.62	10.66	17.51	25.08	25.25	21.58	22.28	20.51	16.44	12.57	12.41	10.39	8.45	6.68	6.91	6.17	6.21	10.20	9.82	9.31	8.78	8.26	8.11
21	4.00	3.73	3.82	5.68	10.73	17.57	25.14	25.27	21.62	22.33	20.54	16.48	12.62	12.45	10.42	8.47	6.69	6.93	6.19	6.24	10.23	9.86	9.35	8.82	8.29	8.14
22	4.04	3.76	3.86	5.73	10.79	17.61	25.20	25.28	21.66	22.37	20.56	16.51	12.66	12.49	10.44	8.49	6.70	6.94	6.21	6.27	10.26	9.90	9.38	8.85	8.32	8.17
23	4.07	3.79	3.89	5.77	10.83	17.65	25.24	25.29	21.70	22.41	20.58	16.54	12.69	12.52	10.46	8.50	6.72	6.96	6.23	6.29	10.28	9.93	9.41	8.88	8.35	8.20
24	4.09	3.82	3.92	5.80	10.87	17.68	25.28	25.30	21.72	22.43	20.59	16.56	12.72	12.54	10.48	8.51	6.72	6.97	6.24	6.31	10.30	9.95	9.43	8.90	8.37	8.22
25	4.12	3.84	3.94	5.83	10.90	17.71	25.31	25.30	21.75	22.44	20.60	16.57	12.73	12.56	10.49	8.52	6.73	6.98	6.25	6.33	10.31	9.97	9.45	8.91	8.38	8.23
26	4.14	3.86	3.96	5.85	10.92	17.73	25.33	25.31	21.77	22.46	20.61	16.59	12.75	12.58	10.50	8.53	6.74	6.98	6.25	6.34	10.32	9.99	9.46	8.93	8.40	8.24
27	4.17	3.88	3.98	5.87	10.94	17.75	25.35	25.31	21.79	22.47	20.62	16.60	12.76	12.59	10.51	8.54	6.74	6.99	6.26	6.36	10.33	10.01	9.48	8.94	8.41	8.25
28	4.19	3.89	4.00	5.89	10.96	17.76	25.36	25.31	21.80	22.48	20.62	16.61	12.77	12.60	10.52	8.54	6.75	7.00	6.27	6.37	10.34	10.02	9.49	8.95	8.42	8.26
29	4.21	3.91	4.02	5.91	10.98	17.78	25.37	25.32	21.82	22.49	20.63	16.62	12.78	12.61	10.53	8.55	6.76	7.00	6.27	6.37	10.35	10.03	9.49	8.96	8.43	8.27
30	4.23	3.93	4.03	5.92	11.00	17.79	25.37	25.32	21.83	22.50	20.64	16.62	12.79	12.62	10.53	8.55	6.76	7.01	6.28	6.38	10.36	10.03	9.50	8.96	8.43	8.28

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	0.06	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.02	0.02	0.02	0.02	0.02
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	0.13	0.24	0.22	0.22	0.21	0.19	0.18
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	0.71	0.52	1.16	0.85	0.86	0.85	0.76	0.71
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	1.79	1.23	1.17	2.33	1.71	1.76	1.71	1.52	1.46
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	3.24	2.52	1.92	1.82	3.53	2.71	2.72	2.62	2.38	2.34
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	4.15	3.82	3.23	2.51	2.37	4.48	3.56	3.54	3.41	3.14	3.06
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	5.24	4.67	4.18	3.76	2.94	2.80	5.14	4.20	4.16	4.01	3.70	3.58
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	6.65	5.74	5.04	4.47	4.21	3.35	3.17	5.69	4.81	4.74	4.55	4.20	4.07
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	6.65	7.17	6.12	5.34	4.69	4.56	3.68	3.49	6.15	5.35	5.23	4.99	4.61	4.47
10	2.23	1.98	1.39	2.17	5.00	9.90	15.85	15.64	12.38	13.71	13.03	10.51	7.07	7.55	6.40	5.56	4.84	4.80	3.90	3.73	6.46	5.72	5.55	5.28	4.88	4.74
11	2.29	2.07	1.48	2.50	5.64	10.74	16.42	15.90	12.71	14.00	13.33	10.89	7.41	7.83	6.61	5.71	4.94	4.96	4.06	3.91	6.68	5.99	5.79	5.49	5.09	4.94
12	2.36	2.12	1.68	2.73	6.17	11.27	16.84	15.95	13.09	14.20	13.57	11.21	7.72	8.08	6.78	5.84	5.03	5.12	4.23	4.09	6.90	6.27	6.04	5.72	5.31	5.16
13	2.43	2.22	1.75	3.01	6.56	11.69	17.08	16.03	13.29	14.44	13.72	11.47	7.97	8.28	6.91	5.95	5.10	5.25	4.36	4.23	7.07	6.50	6.24	5.91	5.50	5.35
14	2.50	2.32	1.88	3.14	6.85	12.10	17.39	16.15	13.48	14.64	13.87	11.71	8.22	8.47	7.04	6.04	5.17	5.37	4.49	4.37	7.23	6.72	6.43	6.09	5.68	5.53
15	2.56	2.44	1.95	3.27	7.04	12.38	17.52	16.33	13.61	14.78	13.97	11.88	8.40	8.61	7.14	6.12	5.22	5.46	4.58	4.48	7.35	6.89	6.58	6.22	5.81	5.66
16	2.59	2.50	1.98	3.41	7.24	12.56	17.71	16.42	13.72	14.89	14.04	12.01	8.53	8.73	7.21	6.17	5.25	5.52	4.64	4.56	7.45	7.02	6.70	6.33	5.92	5.77
17	2.63	2.58	2.07	3.53	7.36	12.69	17.83	16.47	13.80	14.96	14.09	12.10	8.63	8.81	7.27	6.21	5.28	5.57	4.69	4.63	7.52	7.11	6.79	6.41	6.00	5.84
18	2.67	2.63	2.10	3.61	7.49	12.78	17.92	16.50	13.87	15.01	14.12	12.16	8.71	8.87	7.31	6.24	5.31	5.61	4.73	4.68	7.58	7.19	6.86	6.48	6.06	5.91
19	2.68	2.71	2.14	3.69	7.58	12.86	17.99	16.52	13.91	15.05	14.14	12.21	8.76	8.92	7.35	6.27	5.33	5.64	4.76	4.73	7.62	7.25	6.91	6.53	6.11	5.95
20	2.70	2.74	2.19	3.76	7.66	12.92	18.03	16.53	13.95	15.08	14.16	12.25	8.81	8.96	7.37	6.29	5.34	5.66	4.79	4.76	7.66	7.30	6.95	6.57	6.15	5.99
21	2.70	2.79	2.23	3.81	7.72	12.97	18.07	16.54	13.99	15.10	14.18	12.28	8.84	8.99	7.40	6.30	5.36	5.68	4.81	4.79	7.69	7.33	6.99	6.60	6.18	6.02
22	2.75	2.84	2.27	3.86	7.78	13.01	18.10	16.55	14.01	15.12	14.19	12.30	8.86	9.02	7.41	6.32	5.37	5.70	4.83	4.82	7.72	7.37	7.02	6.63	6.21	6.05
23	2.79	2.88	2.31	3.90	7.82	13.04	18.11	16.56	14.04	15.13	14.20	12.32	8.88	9.04	7.43	6.33	5.38	5.71	4.85	4.84	7.74	7.39	7.05	6.66	6.23	6.07
24	2.83	2.92	2.34	3.93	7.86	13.07	18.13	16.56	14.05	15.14	14.20	12.33	8.90	9.06	7.45	6.34	5.39	5.72	4.86	4.86	7.77	7.42	7.07	6.68	6.25	6.08
25	2.87	2.96	2.37	3.97	7.89	13.09	18.14	16.56	14.07	15.15	14.21	12.34	8.91	9.08	7.46	6.35	5.40	5.73	4.87	4.88	7.79	7.44	7.09	6.70	6.27	6.10
26	2.90	3.00	2.39	4.00	7.92	13.11	18.15	16.57	14.08	15.16	14.21	12.35	8.92	9.09	7.48	6.36	5.41	5.74	4.88	4.90	7.80	7.45	7.11	6.72	6.29	6.11
27	2.93	3.03	2.42	4.02	7.95	13.13	18.15	16.57	14.09	15.16	14.21	12.36	8.93	9.11	7.49	6.37	5.42	5.75	4.89	4.92	7.82	7.47	7.13	6.73	6.30	6.12
28	2.96	3.07	2.44	4.05	7.98	13.15	18.16	16.57	14.10	15.16	14.22	12.37	8.94	9.12	7.50	6.38	5.42	5.76	4.90	4.93	7.84	7.49	7.15	6.75	6.31	6.14
29	2.99	3.10	2.47	4.07	8.01	13.17	18.16	16.57	14.11	15.17	14.22	12.38	8.95	9.13	7.51	6.39	5.42	5.77	4.91	4.95	7.85	7.50	7.16	6.77	6.33	6.15
30	3.02	3.13	2.49	4.10	8.03	13.18	18.16	16.57	14.12	15.17	14.22	12.39	8.95	9.15	7.53	6.40	5.43	5.78	4.92	4.96	7.86	7.51	7.18	6.78	6.34	6.16

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	0.06	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	1.17	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	0.20	0.49	0.41	0.41	0.39	0.35	0.33
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	0.84	0.84	1.99	1.37	1.38	1.35	1.19	1.12
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	2.69	1.56	1.76	3.66	2.53	2.59	2.51	2.20	2.10
5	4.41	3.51	2.45	2.44	4.06	8.20	16.87	21.18	11.94	15.55	13.69	8.37	5.53	6.03	5.75	5.43	4.61	3.79	2.44	2.61	5.23	3.76	3.79	3.63	3.23	3.13
6	4.73	3.79	2.77	3.00	5.05	10.12	20.10	24.69	15.75	18.60	16.14	10.46	7.07	7.67	7.21	6.59	5.49	4.96	3.30	3.37	6.61	4.97	4.93	4.72	4.27	4.12
7	4.95	4.02	3.11	3.44	5.99	11.89	23.00	27.06	18.23	20.54	17.88	12.13	8.37	9.00	8.30	7.71	6.07	5.84	3.95	3.98	7.58	5.87	5.79	5.55	5.03	4.84
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	9.99	9.39	8.54	6.54	6.64	4.62	4.54	8.44	6.79	6.67	6.35	5.77	5.56
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	10.37	10.89	10.20	9.20	6.89	7.26	5.15	4.98	9.10	7.55	7.34	6.95	6.34	6.11
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	11.01	11.55	10.80	9.69	7.13	7.68	5.49	5.30	9.55	8.06	7.79	7.35	6.71	6.47
11	5.64	4.80	4.14	5.34	10.14	18.43	29.06	29.93	22.58	24.11	21.20	15.95	11.60	12.14	11.31	10.08	7.31	8.02	5.78	5.59	9.92	8.49	8.15	7.67	7.02	6.78
12	5.77	4.97	4.46	5.90	10.90	19.38	29.64	30.15	23.05	24.47	21.55	16.50	12.10	12.60	11.71	10.39	7.46	8.32	6.06	5.84	10.24	8.88	8.49	7.98	7.32	7.08
13	5.91	5.16	4.80	6.34	11.58	20.11	30.06	30.43	23.37	24.80	21.80	16.97	12.54	13.00	12.03	10.65	7.59	8.58	6.28	6.04	10.50	9.20	8.77	8.23	7.57	7.32
14	6.07	5.36	5.11	6.72	12.13	20.71	30.41	30.62	23.63	25.03	21.99	17.35	12.90	13.31	12.28	10.86	7.68	8.78	6.46	6.21	10.71	9.47	9.00	8.44	7.77	7.52
15	6.23	5.57	5.36	7.00	12.55	21.18	30.68	30.81	23.82	25.21	22.14	17.63	13.17	13.56	12.48	11.02	7.76	8.94	6.59	6.34	10.86	9.67	9.17	8.59	7.92	7.68
16	6.38	5.72	5.58	7.22	12.87	21.50	30.95	30.91	23.97	25.35	22.24	17.84	13.38	13.74	12.63	11.13	7.81	9.06	6.69	6.45	10.98	9.83	9.31	8.72	8.04	7.80
17	6.48	5.86	5.73	7.41	13.11	21.70	31.14	30.97	24.08	25.45	22.31	17.99	13.54	13.89	12.73	11.22	7.85	9.14	6.77	6.53	11.07	9.94	9.41	8.81	8.13	7.89
18	6.58	5.98	5.83	7.54	13.30	21.86	31.28	31.00	24.16	25.52	22.37	18.11	13.66	13.99	12.81	11.28	7.88	9.21	6.83	6.60	11.14	10.03	9.48	8.87	8.20	7.95
19	6.67	6.05	5.91	7.66	13.45	21.97	31.38	31.03	24.22	25.58	22.41	18.19	13.75	14.07	12.87	11.33	7.90	9.26	6.87	6.65	11.19	10.10	9.54	8.92	8.25	8.00
20	6.75	6.11	5.99	7.75	13.56	22.07	31.46	31.04	24.26	25.63	22.45	18.25	13.82	14.13	12.92	11.37	7.91	9.30	6.90	6.69	11.23	10.15	9.58	8.96	8.29	8.04
21	6.81	6.16	6.06	7.82	13.65	22.14	31.53	31.06	24.30	25.66	22.48	18.30	13.87	14.17	12.95	11.39	7.93	9.33	6.92	6.72	11.26	10.19	9.61	8.99	8.32	8.07
22	6.85	6.21	6.11	7.87	13.72	22.19	31.58	31.07	24.33	25.70	22.50	18.33	13.90	14.21	12.97	11.41	7.94	9.35	6.94	6.74	11.29	10.22	9.64	9.02	8.34	8.10
23	6.88	6.24	6.15	7.92	13.77	22.23	31.62	31.07	24.36	25.72	22.52	18.36	13.93	14.23	12.99	11.43	7.94	9.37	6.96	6.77	11.30	10.24	9.66	9.03	8.36	8.11
24	6.91	6.27	6.18	7.95	13.81	22.27	31.66	31.08	24.38	25.74	22.53	18.38	13.95	14.25	13.01	11.44	7.95	9.39	6.97	6.78	11.32	10.26	9.68	9.05	8.38	8.13
25	6.93	6.29	6.21	7.98	13.85	22.29	31.69	31.08	24.39	25.76	22.54	18.40	13.97	14.27	13.02	11.45	7.95	9.40	6.98	6.80	11.33	10.27	9.69	9.06	8.39	8.14
26	6.95	6.31	6.23	8.00	13.87	22.32	31.72	31.08	24.41	25.78	22.56	18.41	13.99	14.28	13.03	11.46	7.96	9.41	6.99	6.81	11.34	10.29	9.70	9.07	8.40	8.15
27	6.96	6.33	6.25	8.02	13.89	22.33	31.75	31.09	24.42	25.80	22.56	18.42	14.00	14.29	13.04	11.47	7.96	9.42	7.00	6.82	11.35	10.30	9.71	9.08	8.41	8.16
28	6.98	6.34	6.26	8.03	13.91	22.35	31.77	31.09	24.43	25.81	22.57	18.43	14.00	14.30	13.05	11.47	7.97	9.43	7.01	6.83	11.36	10.31	9.72	9.09	8.41	8.16
29	6.99	6.36	6.28	8.05	13.92	22.36	31.78	31.09	24.44	25.82	22.58	18.43	14.01	14.31	13.05	11.48	7.97	9.44	7.01	6.84	11.37	10.31	9.72	9.09	8.42	8.17
30	7.00	6.37	6.29	8.06	13.93	22.37	31.80	31.09	24.45	25.83	22.58	18.44	14.02	14.32	13.06	11.48	7.97	9.45	7.02	6.84	11.37	10.32	9.73	9.10	8.42	8.18

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	0.02	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	0.04	0.04	0.04	0.04	0.04
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	0.39	0.35	0.35	0.34	0.31	0.31
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	0.59	0.80	1.69	1.32	1.32	1.29	1.18	1.14
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	2.05	1.44	1.67	3.25	2.57	2.60	2.54	2.34	2.31
5	2.57	2.54	1.50	1.63	2.27	4.46	13.03	14.68	7.67	12.03	14.47	7.85	4.41	5.01	4.20	3.56	4.20	3.00	2.27	2.38	4.60	3.73	3.74	3.66	3.44	3.44
6	3.04	2.87	1.81	2.07	2.91	5.88	15.60	16.97	10.24	15.43	16.59	9.46	5.60	6.36	5.51	4.59	4.98	3.87	2.99	2.95	5.72	4.74	4.74	4.67	4.44	4.42
7	3.37	3.17	2.00	2.39	3.62	7.04	17.72	18.35	13.00	16.97	18.13	10.79	6.59	7.46	6.53	5.24	5.48	4.50	3.50	3.37	6.49	5.47	5.48	5.42	5.16	5.13
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	7.14	5.69	5.88	5.07	4.04	3.76	7.20	6.26	6.28	6.20	5.95	5.91
9	3.89	3.62	2.46	3.03	4.70	9.25	20.04	19.79	15.06	18.58	20.06	12.58	8.00	8.88	7.56	6.01	6.16	5.48	4.44	4.06	7.73	6.89	6.88	6.79	6.53	6.50
10	4.06	3.76	2.60	3.32	5.50	10.20	20.69	20.12	15.78	19.07	20.69	13.18	8.51	9.32	7.88	6.25	6.36	5.76	4.71	4.29	8.12	7.34	7.30	7.20	6.94	6.91
11	4.26	3.93	2.80	3.68	6.11	10.86	21.15	20.36	16.29	19.48	21.06	13.68	8.92	9.67	8.13	6.43	6.50	5.98	4.93	4.48	8.43	7.69	7.63	7.52	7.26	7.25
12	4.40	4.11	2.99	3.97	6.61	11.32	21.46	20.54	16.65	19.73	21.38	14.03	9.24	9.94	8.31	6.56	6.61	6.15	5.09	4.63	8.66	7.96	7.88	7.77	7.52	7.51
13	4.51	4.28	3.14	4.19	6.95	11.73	21.73	20.69	16.92	20.06	21.60	14.29	9.49	10.14	8.44	6.65	6.70	6.29	5.22	4.75	8.84	8.16	8.08	7.96	7.72	7.72
14	4.65	4.37	3.25	4.49	7.27	12.02	21.96	20.80	17.21	20.41	21.84	14.57	9.76	10.37	8.58	6.76	6.79	6.42	5.36	4.87	9.02	8.38	8.29	8.17	7.94	7.93
15	4.83	4.49	3.36	4.65	7.54	12.30	22.15	21.09	17.42	20.67	22.01	14.77	9.95	10.53	8.69	6.84	6.86	6.52	5.46	4.97	9.17	8.55	8.46	8.33	8.10	8.10
16	4.95	4.57	3.46	4.79	7.78	12.51	22.34	21.26	17.57	20.87	22.13	14.91	10.10	10.66	8.77	6.89	6.91	6.61	5.54	5.06	9.28	8.69	8.58	8.45	8.22	8.23
17	5.07	4.69	3.56	4.90	7.99	12.61	22.46	21.36	17.68	21.01	22.21	15.01	10.20	10.75	8.83	6.93	6.94	6.66	5.60	5.13	9.37	8.79	8.68	8.55	8.32	8.33
18	5.16	4.74	3.66	4.95	8.11	12.67	22.56	21.43	17.76	21.11	22.28	15.07	10.28	10.82	8.87	6.96	6.97	6.70	5.65	5.19	9.43	8.87	8.76	8.63	8.39	8.41
19	5.24	4.86	3.72	5.04	8.20	12.73	22.64	21.47	17.82	21.19	22.32	15.13	10.34	10.87	8.90	6.98	6.98	6.73	5.69	5.24	9.48	8.93	8.82	8.69	8.46	8.47
20	5.30	4.94	3.81	5.12	8.27	12.77	22.69	21.50	17.86	21.25	22.36	15.16	10.38	10.91	8.93	7.00	6.99	6.76	5.71	5.29	9.51	8.99	8.87	8.74	8.51	8.52
21	5.35	5.01	3.88	5.18	8.33	12.80	22.74	21.52	17.89	21.31	22.39	15.19	10.41	10.94	8.95	7.02	7.00	6.78	5.73	5.33	9.53	9.03	8.91	8.77	8.55	8.57
22	5.40	5.07	3.94	5.23	8.38	12.83	22.78	21.53	17.92	21.35	22.42	15.21	10.43	10.96	8.97	7.03	7.01	6.79	5.75	5.37	9.55	9.07	8.94	8.80	8.58	8.60
23	5.46	5.12	4.00	5.28	8.42	12.85	22.82	21.54	17.95	21.38	22.44	15.22	10.44	10.98	8.98	7.04	7.01	6.80	5.75	5.41	9.56	9.10	8.97	8.83	8.60	8.62
24	5.50	5.16	4.05	5.32	8.45	12.87	22.85	21.55	17.97	21.41	22.45	15.23	10.46	11.00	9.00	7.05	7.02	6.81	5.76	5.44	9.57	9.13	8.99	8.85	8.62	8.64
25	5.54	5.21	4.10	5.36	8.48	12.89	22.87	21.56	17.98	21.43	22.47	15.24	10.47	11.01	9.01	7.06	7.03	6.82	5.77	5.48	9.58	9.15	9.01	8.86	8.64	8.65
26	5.58	5.25	4.15	5.39	8.51	12.90	22.89	21.56	18.00	21.45	22.48	15.25	10.48	11.03	9.02	7.07	7.03	6.82	5.78	5.51	9.59	9.17	9.03	8.88	8.65	8.67
27	5.62	5.29	4.19	5.42	8.54	12.92	22.91	21.56	18.01	21.47	22.49	15.26	10.48	11.04	9.03	7.08	7.03	6.83	5.78	5.55	9.60	9.18	9.04	8.89	8.66	8.68
28	5.65	5.32	4.23	5.46	8.56	12.93	22.93	21.57	18.02	21.48	22.50	15.26	10.49	11.05	9.04	7.09	7.03	6.83	5.78	5.58	9.61	9.20	9.05	8.89	8.67	8.68
29	5.69	5.36	4.27	5.49	8.59	12.95	22.95	21.57	18.03	21.49	22.51	15.27	10.49	11.06	9.06	7.10	7.03	6.83	5.78	5.61	9.61	9.21	9.06	8.90	8.67	8.69
30	5.72	5.40	4.32	5.52	8.61	12.96	22.96	21.57	18.04	21.50	22.52	15.27	10.50	11.07	9.07	7.11	7.03	6.83	5.78	5.65	9.61	9.22	9.07	8.90	8.68	8.69

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	0.22	0.37	0.22	0.34	1.10	6.14	9.58	5.05	6.80	4.58	1.65	1.00	14.71	17.35	28.70	0.47	0.42	0.43	0.43	0.43
2	1.89	4.26	2.96	2.11	1.39	0.80	0.57	17.16	0.95	2.17	22.74	31.46	13.90	21.68	23.98	23.55	16.15	11.32	40.00	26.48	33.90	3.91	4.41	5.14	4.96	4.62
3	7.74	11.95	7.81	3.70	2.09	1.04	5.20	24.51	2.65	24.73	48.95	35.74	16.71	26.53	36.71	48.99	39.44	27.83	45.49	34.69	41.42	12.49	15.03	16.39	15.68	16.00
4	15.82	19.11	10.65	4.71	2.44	2.72	8.56	32.82	17.76	42.79	53.04	39.37	17.82	30.11	53.00	68.76	57.06	32.09	55.49	42.28	49.88	24.11	27.52	28.66	28.62	29.64
5	22.10	22.62	12.08	5.28	3.92	4.62	12.86	47.49	38.37	47.08	55.54	41.14	20.15	40.42	66.27	79.20	60.01	48.39	62.62	49.52	58.54	36.08	39.33	41.33	42.15	42.58
6	25.07	24.48	12.80	7.02	5.53	7.25	27.35	56.37	44.25	49.72	57.35	44.87	24.82	52.21	74.51	81.22	70.29	57.38	68.34	56.35	65.42	45.41	49.18	51.68	52.13	52.11
7	26.64	25.30	14.99	8.78	7.39	16.94	40.12	59.08	48.22	52.39	59.31	49.60	35.57	63.79	76.53	83.66	74.29	62.97	72.49	61.06	69.62	52.13	55.87	58.18	58.59	58.59
8	27.44	27.44	17.23	10.73	11.75	29.70	44.55	60.70	52.32	54.72	62.22	57.27	48.71	67.16	78.51	85.03	77.08	67.06	75.41	64.55	72.69	56.94	60.43	62.54	62.97	63.15
9	29.68	29.62	19.41	15.11	18.21	34.92	47.24	61.84	56.72	57.30	64.88	68.14	51.64	70.39	79.69	86.10	79.36	70.32	77.75	67.62	75.10	60.77	63.99	65.99	66.59	66.84
10	31.83	31.83	23.40	21.41	22.52	38.65	49.84	62.72	62.72	59.82	67.65	69.98	55.44	72.57	80.61	87.03	81.20	72.83	79.63	70.19	76.92	63.70	66.73	68.73	69.37	69.61
11	33.97	35.25	28.40	25.51	26.31	42.43	52.18	63.82	67.34	62.26	68.68	71.31	57.80	74.19	81.33	87.72	82.51	74.79	81.08	72.18	78.22	65.94	68.90	70.82	71.48	71.69
12	37.46	39.53	32.17	29.10	29.95	46.22	55.49	64.98	70.90	62.98	70.06	72.14	59.68	75.59	81.93	88.27	83.56	76.21	82.06	73.67	79.16	67.59	70.44	72.26	72.89	73.09
13	41.56	42.43	35.21	32.57	33.22	52.58	59.03	65.95	71.99	64.84	70.86	72.79	61.24	76.67	82.38	88.71	84.38	77.31	82.83	74.90	79.91	68.94	71.67	73.42	74.02	74.22
14	44.29	44.94	38.19	35.77	38.07	58.75	62.03	66.42	73.63	66.04	71.50	73.37	62.65	77.61	82.80	89.10	85.08	78.28	83.53	76.09	80.57	70.17	72.78	74.47	75.06	75.26
15	46.77	47.32	40.83	39.82	45.01	63.71	63.20	68.84	74.76	67.05	72.07	73.90	63.96	78.50	83.18	89.45	85.72	79.20	84.22	77.24	81.18	71.33	73.83	75.46	76.04	76.24
16	49.08	49.46	44.02	45.40	51.49	65.36	65.12	70.33	75.74	67.94	72.56	74.38	65.25	79.30	83.53	89.77	86.31	80.09	84.87	78.35	81.73	72.45	74.83	76.39	76.98	77.18
17	51.31	52.33	48.14	51.14	54.35	67.02	66.35	71.42	76.55	68.65	72.94	74.80	66.35	79.97	83.81	90.02	86.82	80.85	85.43	79.31	82.20	73.40	75.68	77.18	77.77	77.97
18	54.18	55.94	52.53	54.06	56.91	68.23	67.37	72.28	77.23	69.22	73.28	75.17	67.32	80.55	84.06	90.26	87.27	81.52	85.93	80.18	82.60	74.27	76.45	77.90	78.48	78.68
19	57.66	59.54	55.19	56.83	58.85	69.31	68.24	72.93	77.79	69.72	73.55	75.49	68.18	81.06	84.29	90.46	87.66	82.11	86.38	80.98	82.97	75.06	77.15	78.55	79.13	79.33
20	61.28	61.76	58.12	58.96	60.62	70.29	68.97	73.44	78.29	70.13	73.78	75.77	68.96	81.53	84.50	90.65	88.01	82.64	86.79	81.72	83.29	75.78	77.79	79.14	79.72	79.93
21	63.87	64.08	60.38	60.93	62.24	71.15	69.58	73.86	78.70	70.48	73.97	76.02	69.69	81.95	84.68	90.81	88.32	83.10	87.17	82.40	83.58	76.45	78.37	79.67	80.26	80.47
22	65.98	65.87	62.48	62.75	63.71	71.94	70.14	74.20	79.06	70.77	74.14	76.25	70.35	82.32	84.85	90.96	88.59	83.52	87.51	83.03	83.84	77.06	78.90	80.17	80.76	80.97
23	67.62	67.53	64.39	64.42	65.06	72.67	70.61	74.47	79.37	71.02	74.29	76.46	70.96	82.66	84.99	91.10	88.84	83.91	87.83	83.61	84.08	77.62	79.40	80.62	81.21	81.43
24	69.15	69.03	66.13	65.95	66.35	73.32	71.02	74.70	79.65	71.25	74.42	76.65	71.51	82.96	85.13	91.22	89.06	84.26	88.12	84.15	84.30	78.15	79.85	81.05	81.64	81.86
25	70.53	70.39	67.74	67.42	67.49	73.90	71.37	74.89	79.90	71.45	74.53	76.82	72.02	83.24	85.25	91.34	89.26	84.59	88.38	84.65	84.51	78.63	80.28	81.43	82.03	82.25
26	71.79	71.64	69.27	68.73	68.53	74.43	71.69	75.05	80.12	71.63	74.63	76.98	72.50	83.50	85.37	91.44	89.45	84.89	88.63	85.12	84.69	79.09	80.67	81.80	82.39	82.62
27	72.96	72.83	70.63	69.94	69.50	74.93	71.99	75.20	80.32	71.79	74.73	77.12	72.94	83.74	85.48	91.54	89.62	85.16	88.86	85.56	84.86	79.51	81.04	82.13	82.73	82.95
28	74.08	73.89	71.88	71.06	70.40	75.41	72.26	75.34	80.51	71.94	74.82	77.26	73.36	83.96	85.58	91.64	89.78	85.42	89.08	85.97	85.03	79.90	81.38	82.45	83.04	83.27
29	75.08	74.87	73.03	72.10	71.28	75.85	72.51	75.46	80.69	72.08	74.90	77.39	73.75	84.17	85.67	91.72	89.93	85.66	89.28	86.35	85.18	80.27	81.70	82.74	83.33	83.56
30	75.98	75.75	74.09	73.10	72.07	76.26	72.75	75.57	80.85	72.21	74.97	77.51	74.12	84.37	85.76	91.79	90.07	85.88	89.46	86.70	85.32	80.61	81.99	83.01	83.60	83.83

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	0.91	1.56	1.07	2.52	1.15	1.12	1.13	1.12	1.11
2	6.78	9.52	8.03	7.06	3.35	2.41	2.27	29.96	3.76	4.66	20.40	7.93	3.37	5.24	5.25	5.19	13.35	10.80	8.80	4.32	12.82	5.52	6.01	7.05	6.48	5.88
3	16.93	19.24	15.50	10.45	5.32	3.56	17.58	41.07	8.89	31.42	46.49	12.41	6.91	10.26	11.81	17.14	33.39	27.63	14.01	12.44	21.92	11.92	14.33	15.65	13.66	13.11
4	26.10	25.27	18.91	12.32	5.87	7.89	25.43	52.18	33.11	53.55	53.56	16.76	11.01	16.48	26.36	38.40	50.81	32.99	22.92	18.39	29.65	19.11	22.33	22.94	20.66	20.95
5	32.11	28.00	20.92	13.03	8.96	11.66	32.82	69.02	56.16	59.72	57.80	21.70	15.45	30.91	44.24	55.32	54.38	43.10	30.32	24.22	38.28	26.93	29.87	30.67	29.17	28.64
6	35.85	29.78	22.00	15.95	11.61	15.66	50.19	77.67	61.90	63.47	62.20	27.39	25.37	49.18	58.46	58.99	65.94	52.58	41.16	33.08	48.90	37.17	40.65	43.13	40.84	39.41
7	37.60	31.11	24.25	18.40	14.81	25.98	63.43	80.48	65.47	66.71	67.24	41.08	42.63	61.93	62.26	69.19	74.14	63.08	55.38	43.63	58.83	49.80	53.87	55.84	53.62	52.47
8	38.76	33.71	27.06	20.98	20.49	38.59	67.54	82.17	68.86	70.01	74.79	59.09	56.64	65.03	72.12	76.10	80.69	73.42	69.19	53.87	67.77	62.00	65.27	66.74	65.13	64.89
9	41.15	36.32	29.87	26.14	28.19	43.80	70.08	83.13	72.70	75.06	79.90	70.37	60.03	70.59	76.56	79.82	84.32	78.91	75.81	60.16	72.66	68.51	71.02	72.31	71.45	71.68
10	43.67	39.56	33.92	32.01	32.80	47.46	72.56	84.19	78.69	78.89	83.43	72.80	64.26	73.46	79.04	82.12	86.06	81.20	78.28	63.48	75.02	71.21	73.46	74.71	73.98	74.23
11	45.61	43.24	39.30	35.78	36.82	51.29	75.20	85.56	82.62	82.19	84.34	76.26	67.20	75.64	80.98	83.86	87.29	82.94	80.31	66.09	76.82	73.31	75.47	76.69	76.01	76.19
12	48.32	48.13	43.36	39.21	40.86	55.26	77.93	86.68	85.18	83.22	86.26	78.89	69.87	77.72	82.72	85.33	88.41	84.69	82.31	68.59	78.54	75.49	77.49	78.62	78.06	78.22
13	52.52	51.17	46.65	42.46	44.62	62.46	80.09	87.56	86.01	84.79	87.50	80.95	72.27	79.46	84.02	86.50	89.36	86.05	83.82	70.66	80.00	77.37	79.18	80.22	79.72	79.92
14	55.10	54.29	49.66	45.96	50.24	68.67	82.23	87.99	87.76	86.11	88.67	83.15	74.84	81.13	85.35	87.68	90.27	87.32	85.31	72.88	81.50	79.23	80.87	81.84	81.41	81.59
15	57.62	57.02	52.67	50.34	57.48	72.92	83.03	90.28	88.97	87.15	89.65	85.01	77.05	82.59	86.52	88.66	91.01	88.39	86.63	74.92	82.81	80.85	82.36	83.26	82.89	83.05
16	60.08	59.37	56.64	55.33	63.20	74.69	84.72	91.62	89.92	88.05	90.45	86.52	79.00	83.87	87.48	89.47	91.63	89.30	87.77	76.69	83.94	82.28	83.68	84.50	84.19	84.34
17	62.53	62.86	61.70	61.85	66.40	76.77	85.87	92.52	90.71	88.77	91.06	87.72	80.68	84.87	88.26	90.13	92.11	90.07	88.72	78.17	84.90	83.50	84.78	85.54	85.28	85.43
18	66.47	67.05	66.60	64.32	69.46	78.34	86.72	93.18	91.35	89.34	91.55	88.74	82.08	85.70	88.91	90.70	92.53	90.71	89.53	79.49	85.74	84.56	85.74	86.45	86.24	86.37
19	69.70	71.11	68.81	67.55	71.82	79.64	87.44	93.66	91.86	89.81	91.95	89.55	83.27	86.41	89.45	91.20	92.89	91.26	90.23	80.68	86.48	85.48	86.58	87.25	87.07	87.21
20	73.26	72.83	71.89	70.14	73.76	80.80	88.03	94.00	92.27	90.20	92.28	90.21	84.29	87.02	89.93	91.62	93.19	91.74	90.83	81.75	87.13	86.30	87.32	87.95	87.80	87.94
21	76.68	75.30	74.37	72.36	75.52	81.79	88.51	94.26	92.62	90.52	92.53	90.77	85.19	87.56	90.35	91.99	93.45	92.15	91.36	82.72	87.68	87.03	87.97	88.56	88.46	88.59
22	78.76	77.32	76.43	74.39	77.08	82.65	88.92	94.47	92.92	90.79	92.74	91.26	86.01	88.04	90.70	92.30	93.68	92.52	91.83	83.60	88.17	87.68	88.56	89.12	89.04	89.18
23	80.47	79.10	78.29	76.21	78.44	83.41	89.26	94.63	93.16	91.01	92.93	91.69	86.72	88.46	91.01	92.57	93.88	92.84	92.24	84.41	88.62	88.27	89.08	89.61	89.56	89.70
24	81.99	80.70	79.95	77.79	79.63	84.08	89.56	94.76	93.37	91.20	93.09	92.05	87.36	88.84	91.29	92.81	94.06	93.13	92.61	85.15	89.02	88.79	89.55	90.06	90.03	90.17
25	83.37	82.15	81.43	79.16	80.71	84.66	89.80	94.86	93.55	91.37	93.23	92.37	87.93	89.18	91.54	93.02	94.22	93.39	92.94	85.82	89.38	89.27	89.98	90.46	90.45	90.59
26	84.62	83.43	82.75	80.40	81.66	85.17	90.01	94.94	93.71	91.51	93.35	92.66	88.44	89.48	91.76	93.22	94.36	93.62	93.23	86.45	89.72	89.70	90.37	90.83	90.83	90.97
27	85.75	84.59	83.95	81.52	82.51	85.64	90.21	95.02	93.86	91.65	93.46	92.91	88.91	89.77	91.97	93.40	94.50	93.83	93.50	87.03	90.03	90.09	90.72	91.16	91.18	91.32
28	86.77	85.64	85.01	82.52	83.28	86.06	90.38	95.08	93.99	91.77	93.56	93.13	89.35	90.03	92.16	93.56	94.62	94.02	93.74	87.57	90.32	90.45	91.04	91.46	91.49	91.63
29	87.70	86.58	85.96	83.43	83.99	86.45	90.54	95.14	94.11	91.88	93.65	93.33	89.74	90.27	92.33	93.71	94.73	94.20	93.96	88.07	90.59	90.78	91.34	91.74	91.78	91.92
30	88.54	87.42	86.81	84.28	84.64	86.81	90.68	95.19	94.22	91.98	93.73	93.52	90.11	90.50	92.50	93.85	94.83	94.36	94.15	88.52	90.84	91.08	91.61	91.99	92.04	92.17

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	0.78	0.71	0.79	0.69	0.81	1.58	1.20	2.57	0.97	0.92	0.94	0.96	0.95
2	4.68	6.62	6.42	6.67	2.38	2.28	1.32	27.00	2.16	2.96	18.91	6.86	2.48	3.45	3.50	3.77	7.90	9.76	7.82	4.31	10.66	3.92	4.27	5.09	4.69	4.27
3	12.50	14.94	13.43	9.65	3.48	2.82	14.52	37.35	5.62	29.72	44.61	10.44	5.07	7.20	8.23	14.94	30.66	25.25	12.18	10.38	18.25	8.75	10.75	11.95	10.37	10.04
4	21.20	21.88	16.67	11.21	3.91	5.47	21.67	47.44	29.10	53.19	51.35	13.96	8.33	11.93	23.13	37.69	49.50	30.19	20.34	15.19	25.56	14.93	17.87	18.56	16.76	17.15
5	27.68	25.77	18.33	12.03	6.02	8.32	29.00	65.03	53.46	58.84	55.65	17.99	11.92	25.81	44.16	54.58	53.34	40.15	26.98	20.12	34.08	21.93	24.82	25.91	24.76	24.35
6	30.85	27.34	19.18	14.64	8.01	11.72	46.36	73.87	59.20	62.36	59.91	22.83	20.45	45.09	59.02	58.22	64.57	48.42	35.99	27.28	43.96	30.49	34.22	36.86	34.85	33.57
7	32.35	28.10	21.83	16.77	10.43	22.16	59.84	76.23	62.78	65.77	64.75	35.91	38.21	59.07	62.40	68.07	72.50	58.19	48.86	36.50	54.34	41.94	46.79	49.06	46.83	45.44
8	33.05	29.74	23.99	19.41	16.15	35.91	63.85	77.61	66.23	69.07	72.16	54.74	52.12	62.01	71.41	74.16	78.69	67.75	61.11	45.26	63.66	53.56	57.85	59.66	57.78	57.01
9	35.16	31.99	26.74	24.53	24.22	40.98	66.33	78.58	70.20	73.49	78.02	66.44	55.31	67.16	75.24	77.53	82.37	73.21	67.79	51.07	69.25	60.17	63.96	65.62	64.30	63.90
10	37.33	34.36	31.60	30.80	28.87	44.75	68.36	79.47	75.64	77.22	81.51	68.81	59.15	69.64	77.40	79.67	84.31	75.83	70.98	54.50	71.94	63.32	66.90	68.54	67.46	67.05
11	39.81	38.25	37.05	35.00	33.15	48.47	70.34	80.57	79.61	80.19	82.46	72.32	61.83	71.64	79.30	81.42	85.79	78.06	73.81	57.42	74.05	65.98	69.43	71.08	70.08	69.66
12	43.60	42.75	41.04	38.71	37.19	52.72	73.08	81.37	82.50	81.02	84.49	74.80	64.29	73.58	80.98	82.91	87.12	80.23	76.47	60.19	75.94	68.66	71.93	73.45	72.59	72.23
13	48.45	46.41	44.18	42.34	40.84	59.86	75.23	82.04	83.29	82.54	85.61	76.73	66.51	75.16	82.25	84.11	88.20	81.91	78.57	62.53	77.48	70.93	73.95	75.37	74.60	74.32
14	51.36	49.64	47.70	45.56	47.31	66.34	77.37	82.29	84.90	83.66	86.58	78.76	68.85	76.70	83.53	85.34	89.20	83.51	80.63	65.08	79.07	73.18	75.96	77.30	76.64	76.38
15	53.80	53.15	50.53	50.63	56.05	71.29	78.11	85.18	85.95	84.51	87.39	80.54	70.93	78.09	84.67	86.37	90.03	84.90	82.52	67.51	80.46	75.19	77.78	79.04	78.47	78.23
16	56.75	55.80	54.77	56.48	63.52	73.05	79.72	86.69	86.80	85.24	88.05	82.02	72.88	79.35	85.62	87.23	90.72	86.14	84.23	69.77	81.65	77.02	79.39	80.58	80.12	79.91
17	59.27	59.67	59.87	62.61	66.04	74.89	80.69	87.65	87.49	85.79	88.51	83.22	74.52	80.35	86.36	87.92	91.27	87.16	85.58	71.66	82.62	78.53	80.71	81.79	81.44	81.28
18	62.66	63.89	64.50	65.38	68.85	76.19	81.42	88.32	88.04	86.21	88.89	84.23	75.91	81.18	86.98	88.51	91.72	88.00	86.68	73.34	83.45	79.83	81.80	82.83	82.57	82.45
19	67.39	68.20	66.83	68.46	70.94	77.28	82.02	88.78	88.47	86.55	89.20	85.05	77.08	81.88	87.51	89.02	92.10	88.70	87.64	74.86	84.17	80.97	82.76	83.74	83.53	83.45
20	71.28	70.70	70.35	70.81	72.75	78.25	82.51	89.10	88.83	86.82	89.45	85.72	78.11	82.51	87.97	89.46	92.41	89.30	88.46	76.22	84.81	81.93	83.62	84.55	84.38	84.32
21	74.04	73.61	73.04	72.89	74.38	79.08	82.89	89.33	89.13	87.04	89.64	86.29	79.04	83.05	88.36	89.83	92.67	89.83	89.18	77.45	85.38	82.80	84.38	85.27	85.14	85.10
22	76.37	75.82	75.41	74.79	75.83	79.81	83.23	89.52	89.38	87.23	89.81	86.80	79.87	83.54	88.71	90.16	92.91	90.29	89.79	78.58	85.89	83.58	85.07	85.92	85.83	85.80
23	78.16	77.68	77.52	76.49	77.10	80.45	83.50	89.66	89.59	87.38	89.96	87.24	80.62	83.97	89.01	90.45	93.12	90.68	90.33	79.61	86.35	84.28	85.69	86.48	86.45	86.43
24	79.75	79.34	79.37	77.99	78.26	81.01	83.73	89.76	89.77	87.52	90.08	87.62	81.28	84.35	89.27	90.71	93.30	91.03	90.81	80.56	86.77	84.92	86.23	87.00	86.99	87.00
25	81.18	80.78	80.97	79.37	79.28	81.50	83.91	89.84	89.93	87.63	90.18	87.96	81.89	84.70	89.51	90.93	93.46	91.34	91.24	81.43	87.16	85.51	86.73	87.47	87.49	87.53
26	82.44	82.02	82.39	80.59	80.19	81.93	84.08	89.91	90.06	87.73	90.27	88.26	82.44	85.01	89.72	91.14	93.61	91.63	91.63	82.23	87.51	86.05	87.19	87.90	87.94	87.99
27	83.54	83.15	83.60	81.67	81.00	82.33	84.22	89.97	90.19	87.82	90.35	88.54	82.95	85.30	89.92	91.33	93.75	91.89	91.99	82.96	87.84	86.53	87.61	88.29	88.36	88.41
28	84.55	84.17	84.66	82.63	81.74	82.69	84.36	90.02	90.30	87.90	90.43	88.79	83.42	85.57	90.09	91.50	93.87	92.12	92.31	83.64	88.14	86.97	88.00	88.66	88.74	88.79
29	85.46	85.08	85.61	83.47	82.43	83.03	84.48	90.06	90.40	87.97	90.49	89.02	83.86	85.83	90.26	91.66	93.99	92.35	92.61	84.28	88.42	87.39	88.36	89.00	89.09	89.15
30	86.28	85.90	86.47	84.26	83.06	83.35	84.59	90.10	90.50	88.04	90.55	89.23	84.28	86.07	90.41	91.81	94.09	92.55	92.89	84.88	88.68	87.77	88.70	89.31	89.41	89.47

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	2.04	0.58	0.53	0.55	0.57	0.58
2	3.09	4.77	4.26	3.98	1.18	0.93	0.61	21.21	1.25	1.82	14.99	4.84	1.55	2.13	2.46	2.43	7.23	9.11	6.20	2.92	9.44	3.03	3.36	4.17	3.88	3.51
3	10.55	12.82	10.13	6.24	1.85	1.25	10.86	29.58	3.79	24.74	38.04	7.66	3.50	5.33	6.96	13.88	33.18	24.98	10.18	9.12	17.73	8.03	10.29	11.69	10.14	9.96
4	19.60	19.65	13.17	7.38	2.22	3.19	15.88	39.98	24.77	46.25	44.59	10.70	6.37	9.94	23.17	41.44	52.96	29.43	20.83	14.45	26.57	15.30	18.86	19.71	18.07	18.95
5	26.24	22.68	14.51	8.01	3.93	5.44	22.52	60.10	47.84	51.98	49.22	14.71	9.63	24.25	46.24	58.92	56.45	41.62	28.88	19.86	36.77	23.39	26.93	28.43	27.79	27.63
6	29.10	24.20	14.99	10.07	5.71	8.25	39.79	70.10	53.72	55.69	53.94	19.27	17.40	45.27	60.95	61.94	67.18	49.28	36.87	26.38	46.16	30.84	35.24	38.20	36.60	35.56
7	30.43	24.75	17.34	12.07	7.89	18.12	52.98	72.75	57.62	59.34	59.17	31.42	33.80	59.20	63.75	70.30	73.73	57.58	47.61	34.18	55.10	40.19	45.64	48.23	46.24	44.99
8	30.93	26.99	19.58	14.58	13.08	30.91	56.97	74.28	61.29	62.82	67.19	49.90	47.55	61.98	71.58	75.24	78.76	65.67	57.66	41.43	62.99	49.55	54.56	56.71	54.82	54.01
9	32.92	29.09	22.18	20.15	20.61	36.09	59.68	75.40	65.34	67.30	73.00	61.87	50.68	66.73	74.95	78.11	81.98	70.70	63.69	46.63	68.09	55.36	59.92	61.92	60.48	59.97
10	35.37	31.51	26.81	26.83	25.46	39.88	61.63	76.27	70.97	70.98	76.78	64.30	54.75	69.16	77.08	80.20	84.00	73.76	67.70	50.53	71.15	59.04	63.36	65.42	64.28	63.79
11	37.63	35.79	33.20	31.28	29.59	43.65	63.72	77.42	74.91	74.12	77.79	68.38	57.57	71.14	78.97	81.92	85.51	76.38	71.29	53.90	73.54	62.18	66.41	68.50	67.50	66.96
12	41.21	41.18	37.33	35.02	33.43	47.75	66.65	78.21	78.07	75.02	80.01	70.95	59.98	72.98	80.55	83.28	86.74	78.56	73.96	56.63	75.38	64.80	68.91	70.89	69.94	69.44
13	46.06	44.60	41.03	38.41	37.02	54.81	69.58	78.97	78.96	76.76	81.14	72.97	62.22	74.51	81.75	84.39	87.74	80.27	76.11	59.00	76.94	67.12	71.01	72.87	72.02	71.55
14	49.33	47.43	44.13	41.58	43.42	61.39	71.76	79.19	80.59	77.80	81.99	74.89	64.36	75.83	82.83	85.42	88.58	81.74	78.07	61.38	78.40	69.29	72.93	74.70	73.97	73.54
15	51.90	50.45	47.31	46.40	52.31	66.91	72.57	82.39	81.62	78.57	82.69	76.59	66.30	77.04	83.81	86.28	89.27	83.04	79.92	63.70	79.70	71.28	74.70	76.39	75.77	75.37
16	54.28	53.21	51.42	52.52	59.58	68.70	74.51	83.88	82.44	79.22	83.23	78.02	68.13	78.15	84.63	87.01	89.85	84.23	81.63	65.89	80.83	73.13	76.34	77.94	77.43	77.08
17	56.84	56.92	56.48	58.79	62.19	70.64	75.64	84.77	83.10	79.71	83.63	79.20	69.72	79.03	85.26	87.59	90.33	85.22	83.02	67.74	81.76	74.68	77.70	79.22	78.80	78.49
18	60.21	61.76	61.33	61.40	64.97	71.98	76.49	85.36	83.63	80.07	83.94	80.20	71.07	79.76	85.79	88.09	90.74	86.06	84.20	69.41	82.57	76.06	78.89	80.34	80.01	79.74
19	64.58	66.14	63.91	64.47	67.02	73.11	77.17	85.75	84.04	80.36	84.19	81.02	72.23	80.38	86.25	88.53	91.08	86.77	85.23	70.93	83.27	77.28	79.95	81.34	81.09	80.85
20	68.53	68.59	67.33	66.80	68.80	74.11	77.69	86.01	84.38	80.60	84.38	81.69	73.24	80.93	86.65	88.90	91.37	87.39	86.13	72.32	83.88	78.38	80.89	82.22	82.05	81.85
21	71.03	71.42	69.93	68.89	70.43	74.96	78.10	86.19	84.66	80.78	84.53	82.25	74.17	81.42	86.99	89.22	91.62	87.92	86.92	73.57	84.42	79.37	81.74	83.01	82.91	82.75
22	73.38	73.57	72.26	70.82	71.88	75.70	78.44	86.33	84.89	80.94	84.66	82.76	75.01	81.85	87.29	89.50	91.83	88.40	87.62	74.73	84.91	80.27	82.50	83.73	83.69	83.57
23	75.21	75.49	74.37	72.56	73.16	76.36	78.73	86.43	85.08	81.06	84.76	83.21	75.76	82.22	87.55	89.75	92.02	88.82	88.25	75.80	85.34	81.09	83.20	84.38	84.41	84.32
24	76.85	77.21	76.26	74.11	74.33	76.93	78.95	86.50	85.24	81.17	84.85	83.59	76.44	82.56	87.78	89.97	92.19	89.20	88.80	76.78	85.74	81.83	83.83	84.97	85.05	84.99
25	78.33	78.75	77.93	75.55	75.36	77.43	79.14	86.56	85.38	81.26	84.93	83.93	77.05	82.86	87.99	90.17	92.34	89.54	89.30	77.70	86.09	82.52	84.41	85.52	85.65	85.61
26	79.67	80.11	79.48	76.84	76.28	77.87	79.30	86.60	85.51	81.34	84.99	84.24	77.62	83.14	88.18	90.35	92.47	89.84	89.75	78.55	86.42	83.15	84.95	86.02	86.19	86.18
27	80.88	81.38	80.85	78.00	77.12	78.26	79.44	86.64	85.62	81.41	85.05	84.52	78.14	83.40	88.35	90.51	92.60	90.12	90.16	79.35	86.73	83.73	85.44	86.47	86.69	86.70
28	82.00	82.49	82.06	79.05	77.88	78.64	79.57	86.67	85.72	81.47	85.11	84.78	78.64	83.64	88.52	90.67	92.71	90.38	90.53	80.10	87.02	84.27	85.90	86.89	87.14	87.18
29	83.00	83.50	83.15	80.02	78.60	78.98	79.68	86.70	85.81	81.53	85.16	85.01	79.10	83.86	88.67	90.81	92.82	90.62	90.88	80.81	87.28	84.78	86.32	87.28	87.57	87.62
30	83.90	84.39	84.14	80.92	79.26	79.29	79.79	86.73	85.90	81.59	85.20	85.23	79.53	84.08	88.81	90.95	92.92	90.84	91.19	81.48	87.53	85.24	86.71	87.64	87.95	88.01

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	0.45	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	1.85	0.37	0.34	0.35	0.37	0.37
2	2.36	3.98	3.60	3.31	0.95	0.76	0.27	16.45	0.81	1.59	12.36	3.56	0.99	1.46	1.98	1.82	5.72	7.71	4.79	2.02	7.72	2.32	2.58	3.26	3.05	2.76
3	8.95	11.48	9.37	5.46	1.49	1.05	8.20	23.41	2.73	23.40	34.70	5.90	2.57	4.27	6.12	12.62	32.60	23.42	8.34	7.55	15.60	6.88	8.97	10.31	8.94	8.81
4	18.06	19.11	12.22	6.50	1.91	2.74	12.75	32.83	21.40	44.94	41.70	8.80	5.28	8.79	22.08	40.99	53.87	27.85	20.22	13.14	25.41	14.74	18.43	19.32	17.91	19.01
5	25.06	22.45	13.45	7.11	3.20	4.62	17.93	53.63	42.58	51.00	46.20	12.62	8.40	23.10	46.39	59.06	57.23	41.79	29.57	19.02	37.10	23.90	27.72	29.52	29.43	29.36
6	28.24	23.93	14.04	8.98	4.68	7.25	33.52	63.95	48.55	54.90	51.32	17.08	16.09	44.64	61.17	62.17	68.34	49.76	37.76	25.67	47.00	31.52	36.31	39.70	38.60	37.63
7	29.58	24.55	16.24	10.78	6.53	15.85	45.86	66.67	52.30	58.64	56.37	28.44	32.59	58.59	63.95	69.68	74.14	57.18	47.34	32.65	55.15	39.78	45.66	48.71	47.18	46.01
8	30.14	26.83	18.56	12.71	11.28	28.40	49.89	68.35	56.19	61.99	64.31	45.85	46.28	61.46	71.00	74.08	78.50	64.26	55.89	38.92	62.10	47.75	53.29	55.93	54.38	53.57
9	32.09	29.02	21.10	17.71	18.36	33.28	52.37	69.47	60.54	66.52	70.12	57.54	49.36	66.05	74.29	76.89	81.63	69.17	61.63	43.89	67.12	53.23	58.37	60.85	59.67	59.16
10	34.07	31.50	26.10	24.75	22.83	36.75	54.67	70.23	66.44	70.29	74.29	59.87	53.19	68.37	76.37	78.96	83.64	72.35	65.86	47.89	70.30	57.02	61.91	64.46	63.61	63.11
11	36.47	36.24	32.75	29.45	26.66	40.38	57.01	71.21	70.76	73.47	75.28	64.27	55.96	70.34	78.32	80.76	85.22	75.23	69.88	51.52	72.90	60.42	65.23	67.82	67.11	66.57
12	40.48	41.66	36.76	33.22	30.74	44.23	60.33	72.23	74.16	74.31	77.94	67.01	58.35	72.21	79.96	82.17	86.47	77.51	72.64	54.36	74.82	63.09	67.78	70.25	69.56	69.05
13	45.24	45.40	40.34	37.02	34.44	50.77	63.59	73.09	75.07	76.30	79.20	69.15	60.60	73.77	81.21	83.34	87.50	79.32	74.90	56.85	76.47	65.50	69.96	72.27	71.67	71.19
14	48.66	48.40	43.90	40.48	40.42	57.51	66.45	73.47	76.84	77.38	80.10	71.13	62.70	75.07	82.29	84.38	88.33	80.84	76.91	59.30	77.97	67.72	71.91	74.11	73.61	73.17
15	51.29	51.09	46.89	45.16	49.02	62.83	67.25	77.47	77.93	78.18	80.85	72.89	64.61	76.27	83.29	85.27	89.02	82.20	78.86	61.76	79.32	69.78	73.74	75.84	75.44	75.03
16	53.99	53.85	51.13	51.44	56.86	64.77	69.42	79.23	78.79	78.84	81.42	74.38	66.46	77.39	84.12	86.02	89.61	83.47	80.70	64.11	80.52	71.74	75.45	77.45	77.14	76.80
17	56.48	57.30	56.24	57.66	59.76	66.77	70.70	80.22	79.49	79.32	81.81	75.60	68.06	78.27	84.77	86.61	90.09	84.52	82.17	66.08	81.49	73.36	76.86	78.76	78.55	78.24
18	59.86	62.04	61.31	60.40	62.58	68.13	71.65	80.85	80.03	79.68	82.13	76.63	69.42	78.99	85.30	87.12	90.49	85.40	83.43	67.86	82.32	74.81	78.10	79.92	79.79	79.52
19	63.73	66.62	64.12	63.48	64.63	69.27	72.41	81.25	80.44	79.97	82.38	77.47	70.58	79.60	85.76	87.57	90.83	86.15	84.53	69.48	83.05	76.10	79.21	80.94	80.89	80.67
20	67.80	69.01	67.51	65.82	66.43	70.27	72.99	81.51	80.77	80.20	82.57	78.16	71.61	80.15	86.16	87.94	91.11	86.80	85.49	70.95	83.68	77.26	80.19	81.85	81.87	81.69
21	70.39	71.76	70.08	67.91	68.06	71.12	73.44	81.68	81.05	80.38	82.72	78.73	72.54	80.62	86.50	88.27	91.35	87.36	86.33	72.29	84.24	78.30	81.07	82.67	82.76	82.62
22	72.73	73.85	72.37	69.85	69.52	71.86	73.82	81.82	81.28	80.53	82.85	79.25	73.40	81.05	86.79	88.55	91.56	87.86	87.08	73.53	84.74	79.25	81.87	83.41	83.56	83.46
23	74.53	75.70	74.46	71.59	70.79	72.51	74.13	81.91	81.46	80.65	82.95	79.71	74.16	81.42	87.05	88.80	91.75	88.30	87.74	74.67	85.19	80.12	82.60	84.08	84.29	84.23
24	76.15	77.37	76.32	73.14	71.96	73.08	74.37	81.97	81.61	80.75	83.04	80.10	74.85	81.75	87.28	89.02	91.91	88.69	88.33	75.72	85.59	80.91	83.26	84.69	84.95	84.93
25	77.62	78.85	77.97	74.58	72.99	73.57	74.57	82.02	81.74	80.83	83.12	80.44	75.47	82.05	87.49	89.22	92.05	89.04	88.86	76.70	85.95	81.64	83.87	85.25	85.56	85.57
26	78.94	80.16	79.49	75.86	73.91	73.99	74.73	82.06	81.85	80.90	83.18	80.76	76.05	82.32	87.67	89.40	92.17	89.36	89.34	77.61	86.29	82.31	84.42	85.76	86.12	86.15
27	80.12	81.38	80.83	77.03	74.74	74.39	74.88	82.10	81.96	80.97	83.24	81.04	76.58	82.57	87.85	89.57	92.28	89.65	89.77	78.47	86.59	82.93	84.94	86.23	86.63	86.69
28	81.23	82.45	82.02	78.08	75.50	74.75	75.02	82.13	82.05	81.03	83.29	81.30	77.09	82.80	88.00	89.72	92.39	89.92	90.17	79.27	86.88	83.51	85.42	86.67	87.10	87.18
29	82.21	83.41	83.10	79.04	76.22	75.09	75.14	82.15	82.13	81.08	83.34	81.54	77.56	83.03	88.15	89.87	92.49	90.17	90.53	80.03	87.15	84.04	85.86	87.08	87.54	87.64
30	83.09	84.27	84.07	79.94	76.87	75.40	75.25	82.17	82.21	81.13	83.39	81.77	78.00	83.23	88.29	90.00	92.58	90.40	90.86	80.73	87.40	84.54	86.27	87.45	87.94	88.06

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	0.29	0.57	0.23	1.90	0.31	0.28	0.30	0.31	0.31
2	1.98	3.72	3.50	2.79	0.72	0.47	0.35	13.30	0.73	1.30	10.55	3.32	0.70	1.28	1.67	1.55	4.91	7.37	4.62	2.03	7.25	2.06	2.31	2.94	2.78	2.52
3	9.02	11.55	9.44	4.68	1.28	0.73	7.45	19.64	2.44	20.69	31.59	5.55	2.12	3.92	5.17	10.62	31.05	23.42	8.32	7.31	14.65	6.43	8.45	9.75	8.53	8.52
4	17.89	19.46	12.40	5.90	1.61	2.28	11.37	28.17	19.12	41.16	38.61	8.26	4.67	8.03	19.58	38.71	52.47	28.06	20.45	12.56	24.13	14.07	17.68	18.65	17.58	18.71
5	25.14	23.07	13.74	6.54	2.68	3.97	16.08	49.14	39.06	47.42	43.22	11.98	7.53	20.89	43.34	56.91	55.90	42.18	29.90	18.25	35.67	23.21	27.04	29.14	29.38	29.36
6	28.31	24.62	14.28	8.25	4.24	6.20	31.67	60.01	44.63	51.32	48.03	16.17	14.87	42.07	58.59	60.17	66.81	49.45	37.38	24.28	44.88	30.18	35.05	38.52	37.80	36.96
7	29.69	25.12	16.51	10.04	6.08	14.27	44.78	62.97	48.49	55.41	53.36	26.66	30.53	56.36	61.40	67.35	72.21	56.11	45.91	30.46	52.35	37.66	43.46	46.67	45.53	44.51
8	30.23	27.50	18.82	12.04	10.82	25.56	48.55	64.47	52.51	59.05	60.97	43.46	43.75	59.13	67.96	71.37	76.27	62.34	53.39	35.91	58.73	44.65	50.23	53.09	51.90	51.23
9	32.47	30.03	21.21	17.02	18.16	30.49	51.06	65.69	56.56	63.89	67.05	54.85	46.78	63.39	71.06	74.07	79.30	66.85	58.65	40.44	63.47	49.65	54.92	57.65	56.81	56.38
10	34.48	32.63	26.18	23.81	22.75	34.09	53.06	66.76	62.30	68.02	71.37	57.32	50.42	65.59	73.15	76.17	81.37	69.95	62.80	44.22	66.66	53.29	58.36	61.20	60.63	60.21
11	36.95	37.25	32.10	28.34	26.63	37.70	54.99	67.91	66.93	71.25	72.56	61.43	52.85	67.39	75.03	77.93	82.95	72.69	66.55	47.53	69.17	56.44	61.49	64.37	63.90	63.43
12	40.90	43.11	36.41	32.07	30.42	41.45	58.00	69.06	70.49	72.23	75.18	64.04	55.06	69.18	76.70	79.38	84.29	74.99	69.36	50.29	71.16	59.12	64.08	66.84	66.38	65.93
13	45.71	46.79	39.83	35.84	33.90	48.05	61.35	70.07	71.48	74.11	76.36	66.06	57.10	70.64	77.94	80.58	85.37	76.78	71.60	52.68	72.84	61.48	66.23	68.84	68.46	68.05
14	49.03	49.84	43.21	39.28	39.75	54.34	63.76	70.53	73.22	75.07	77.21	67.88	58.94	71.83	79.01	81.62	86.22	78.26	73.59	54.99	74.34	63.60	68.12	70.64	70.34	69.97
15	51.78	52.68	46.27	43.67	47.61	59.85	64.82	74.28	74.28	75.80	77.92	69.54	60.66	72.96	80.00	82.52	86.94	79.61	75.56	57.33	75.72	65.62	69.93	72.36	72.16	71.81
16	54.48	55.33	50.47	49.59	54.72	61.91	66.81	75.92	75.15	76.42	78.48	70.98	62.37	74.03	80.86	83.30	87.57	80.92	77.46	59.64	76.96	67.58	71.66	73.99	73.88	73.60
17	56.90	58.79	55.63	55.92	57.72	63.82	67.95	76.85	75.85	76.88	78.87	72.18	63.83	74.87	81.53	83.93	88.10	82.00	78.99	61.56	77.98	69.20	73.09	75.32	75.30	75.05
18	60.23	62.99	60.87	58.83	60.37	65.09	68.80	77.46	76.40	77.22	79.19	73.21	65.10	75.57	82.08	84.48	88.55	82.92	80.32	63.33	78.86	70.67	74.36	76.51	76.56	76.35
19	64.46	67.46	63.69	61.82	62.26	66.17	69.48	77.85	76.84	77.51	79.44	74.05	66.20	76.17	82.58	84.96	88.92	83.70	81.49	64.94	79.63	71.98	75.49	77.57	77.69	77.52
20	68.23	69.61	66.91	64.02	63.93	67.13	70.02	78.10	77.19	77.73	79.64	74.75	67.17	76.71	83.00	85.37	89.24	84.39	82.52	66.43	80.31	73.18	76.52	78.51	78.71	78.58
21	70.74	72.17	69.27	66.02	65.45	67.95	70.43	78.27	77.48	77.90	79.80	75.34	68.08	77.19	83.37	85.73	89.51	85.00	83.44	67.80	80.91	74.26	77.44	79.37	79.63	79.55
22	72.88	74.06	71.42	67.87	66.82	68.66	70.78	78.40	77.73	78.05	79.92	75.89	68.91	77.61	83.70	86.05	89.76	85.54	84.26	69.07	81.46	75.26	78.28	80.15	80.48	80.43
23	74.48	75.76	73.36	69.53	68.03	69.30	71.06	78.50	77.93	78.16	80.03	76.37	69.66	77.99	83.98	86.33	89.97	86.03	85.00	70.25	81.95	76.17	79.05	80.86	81.25	81.24
24	75.94	77.29	75.10	71.03	69.15	69.86	71.28	78.56	78.10	78.26	80.13	76.78	70.33	78.33	84.24	86.58	90.16	86.46	85.67	71.34	82.40	77.01	79.76	81.52	81.96	81.99
25	77.26	78.64	76.66	72.45	70.14	70.34	71.47	78.61	78.24	78.35	80.21	77.15	70.96	78.63	84.47	86.81	90.33	86.86	86.27	72.37	82.81	77.79	80.42	82.13	82.62	82.67
26	78.44	79.86	78.11	73.70	71.02	70.76	71.62	78.65	78.37	78.42	80.27	77.49	71.53	78.91	84.68	87.01	90.49	87.21	86.82	73.33	83.18	78.51	81.03	82.68	83.22	83.31
27	79.53	81.00	79.39	74.84	71.83	71.15	71.77	78.69	78.48	78.48	80.34	77.80	72.08	79.17	84.87	87.21	90.63	87.55	87.32	74.24	83.53	79.19	81.59	83.20	83.78	83.89
28	80.55	82.00	80.54	75.87	72.57	71.52	71.89	78.72	78.58	78.54	80.39	78.09	72.59	79.42	85.06	87.39	90.76	87.85	87.78	75.10	83.86	79.82	82.12	83.69	84.30	84.43
29	81.45	82.91	81.58	76.83	73.28	71.86	72.00	78.74	78.68	78.60	80.44	78.36	73.08	79.65	85.23	87.56	90.89	88.14	88.21	75.92	84.17	80.42	82.61	84.14	84.78	84.94
30	82.26	83.71	82.52	77.74	73.93	72.18	72.11	78.77	78.77	78.65	80.49	78.61	73.53	79.87	85.39	87.72	91.00	88.40	88.60	76.68	84.46	80.96	83.07	84.55	85.22	85.40

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	0.14	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	0.30	0.61	0.21	1.80	0.31	0.27	0.29	0.30	0.30
2	1.88	3.39	3.63	2.74	0.71	0.44	0.36	11.88	0.60	0.86	9.02	2.92	0.72	1.29	1.83	1.69	4.84	8.04	4.67	1.94	7.27	2.09	2.36	3.03	2.87	2.62
3	8.99	11.94	9.74	4.58	1.17	0.69	5.80	17.26	1.95	17.21	27.67	4.93	2.03	3.81	5.46	10.42	30.46	24.87	8.25	7.12	14.39	6.41	8.44	9.79	8.65	8.71
4	18.99	20.48	12.92	5.69	1.45	2.02	9.32	24.65	15.80	36.16	34.30	7.45	4.40	7.77	18.84	36.74	51.90	29.59	20.92	12.25	23.64	14.10	17.72	18.77	17.94	19.19
5	26.85	24.09	14.39	6.29	2.54	3.50	13.66	44.20	33.78	41.90	38.90	11.06	7.30	20.07	41.20	54.80	55.50	43.75	30.74	17.97	35.23	23.47	27.31	29.60	30.19	30.28
6	29.99	25.80	14.95	8.03	3.87	5.45	27.47	54.67	39.05	45.73	43.89	15.21	14.25	40.07	56.27	58.12	66.41	50.93	38.64	24.10	44.53	30.70	35.65	39.37	39.04	38.29
7	31.52	26.41	17.17	9.94	5.52	12.74	39.10	57.68	42.70	49.35	48.90	25.14	29.09	53.79	59.22	65.47	71.84	57.68	47.82	30.55	52.26	38.69	44.57	48.01	47.31	46.41
8	32.28	28.81	19.39	12.05	9.81	22.72	42.81	59.53	46.47	52.83	56.19	40.70	41.81	56.70	65.78	69.48	75.86	63.82	55.56	36.13	58.72	45.89	51.51	54.59	53.89	53.41
9	34.35	31.11	21.94	16.56	15.90	27.05	45.24	60.68	50.16	57.73	62.42	52.04	44.91	60.69	68.71	72.06	78.72	68.02	60.68	40.56	63.25	50.76	56.05	58.99	58.66	58.43
10	36.54	33.63	26.64	22.96	19.98	30.25	47.48	61.72	55.71	62.00	66.96	54.42	48.34	62.77	70.72	74.09	80.64	70.72	64.27	44.00	66.09	53.95	59.05	62.07	61.93	61.70
11	38.75	37.92	32.37	27.11	23.53	33.71	49.58	62.76	60.37	65.52	68.16	58.37	50.60	64.49	72.54	75.79	82.11	73.12	67.52	47.02	68.35	56.72	61.79	64.81	64.74	64.45
12	42.20	43.05	36.23	30.75	27.27	37.33	52.65	63.94	64.51	66.58	70.81	60.82	52.64	66.18	74.14	77.20	83.34	75.07	69.83	49.47	70.08	58.97	63.95	66.85	66.76	66.48
13	46.62	46.31	39.59	34.30	30.73	43.54	55.70	65.03	65.73	68.56	72.07	62.78	54.57	67.60	75.38	78.41	84.37	76.64	71.76	51.65	71.61	61.03	65.82	68.58	68.52	68.26
14	49.69	49.22	42.88	37.45	36.10	49.78	58.60	65.42	67.46	69.56	72.95	64.54	56.31	68.75	76.45	79.45	85.18	77.95	73.47	53.76	72.97	62.88	67.46	70.13	70.12	69.89
15	52.07	52.10	45.81	41.69	43.83	55.39	59.78	69.02	68.52	70.34	73.71	66.16	57.95	69.86	77.44	80.36	85.89	79.17	75.20	55.93	74.24	64.67	69.06	71.63	71.69	71.46
16	54.65	54.66	49.66	47.09	51.26	57.53	62.18	70.56	69.38	71.01	74.32	67.58	59.60	70.91	78.30	81.15	86.51	80.36	76.89	58.09	75.40	66.42	70.60	73.08	73.20	73.01
17	57.03	57.91	54.42	53.12	54.17	59.52	63.46	71.46	70.07	71.52	74.75	68.77	61.01	71.75	78.98	81.79	87.03	81.35	78.28	59.89	76.35	67.89	71.89	74.27	74.45	74.29
18	60.13	62.21	59.13	55.96	56.85	60.82	64.38	72.03	70.63	71.88	75.10	69.79	62.25	72.45	79.55	82.37	87.48	82.21	79.49	61.56	77.19	69.23	73.05	75.35	75.58	75.45
19	63.87	66.10	61.78	58.90	58.75	61.94	65.10	72.40	71.06	72.18	75.37	70.63	63.32	73.05	80.06	82.87	87.86	82.95	80.57	63.11	77.93	70.44	74.10	76.32	76.60	76.50
20	67.61	68.31	64.85	61.04	60.43	62.92	65.66	72.64	71.42	72.42	75.57	71.33	64.27	73.60	80.51	83.30	88.19	83.60	81.54	64.54	78.59	71.56	75.05	77.19	77.53	77.46
21	70.33	70.77	67.09	63.00	61.97	63.76	66.09	72.81	71.71	72.60	75.73	71.93	65.17	74.09	80.89	83.68	88.47	84.18	82.41	65.86	79.18	72.58	75.92	77.99	78.38	78.35
22	72.36	72.58	69.14	64.83	63.35	64.50	66.46	72.94	71.96	72.75	75.86	72.49	65.99	74.52	81.23	84.01	88.72	84.71	83.20	67.09	79.72	73.52	76.71	78.73	79.17	79.16
23	73.86	74.20	71.02	66.47	64.58	65.17	66.75	73.02	72.16	72.87	75.97	72.97	66.74	74.90	81.53	84.31	88.94	85.18	83.91	68.25	80.20	74.39	77.45	79.40	79.89	79.92
24	75.23	75.67	72.70	67.96	65.74	65.74	66.99	73.09	72.33	72.97	76.07	73.40	67.41	75.25	81.80	84.58	89.14	85.60	84.56	69.32	80.65	75.20	78.13	80.03	80.56	80.62
25	76.48	76.98	74.22	69.38	66.74	66.24	67.18	73.14	72.48	73.05	76.14	73.78	68.03	75.56	82.04	84.83	89.32	85.99	85.15	70.34	81.05	75.96	78.77	80.61	81.19	81.27
26	77.59	78.16	75.65	70.63	67.65	66.67	67.35	73.18	72.61	73.12	76.21	74.13	68.61	75.85	82.26	85.05	89.49	86.35	85.69	71.29	81.43	76.66	79.36	81.15	81.77	81.87
27	78.62	79.28	76.91	71.78	68.48	67.08	67.49	73.21	72.73	73.19	76.27	74.45	69.16	76.12	82.47	85.26	89.64	86.68	86.19	72.20	81.79	77.33	79.91	81.66	82.31	82.44
28	79.60	80.26	78.05	72.82	69.24	67.46	67.62	73.24	72.84	73.25	76.33	74.74	69.67	76.38	82.67	85.45	89.78	86.98	86.66	73.06	82.12	77.95	80.43	82.14	82.81	82.96
29	80.46	81.14	79.09	73.80	69.98	67.81	67.73	73.26	72.94	73.30	76.38	75.02	70.17	76.62	82.85	85.64	89.91	87.27	87.09	73.88	82.44	78.54	80.92	82.58	83.29	83.45
30	81.24	81.94	80.03	74.72	70.65	68.14	67.83	73.28	73.04	73.35	76.43	75.28	70.63	76.85	83.02	85.81	90.03	87.54	87.49	74.65	82.73	79.08	81.38	82.99	83.72	83.91

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	0.29	0.23	0.40	0.23	1.46	0.25	0.23	0.27	0.28	0.28
2	1.66	3.02	3.42	2.45	0.85	0.66	0.36	10.90	0.51	0.85	8.06	2.71	0.82	1.56	2.30	2.05	4.64	4.59	3.41	2.11	5.94	1.96	2.17	2.73	2.60	2.40
3	8.23	11.32	9.70	4.48	1.47	0.93	5.64	16.08	1.83	14.68	25.36	4.77	2.21	4.52	6.11	10.36	27.63	15.29	6.96	7.09	13.12	6.44	8.23	9.50	8.52	8.52
4	17.57	19.59	13.19	5.85	1.79	2.21	8.61	22.56	14.29	31.92	32.29	7.44	4.86	8.76	18.77	34.79	47.90	20.28	21.42	13.43	24.16	15.97	19.69	20.90	20.39	21.87
5	25.39	23.71	14.98	6.61	2.94	3.66	12.27	36.16	30.65	37.98	37.20	11.32	7.96	20.35	39.88	52.08	51.59	35.27	31.48	19.70	36.08	25.77	29.82	32.18	33.04	33.50
6	29.01	25.65	15.69	8.38	4.27	5.48	23.71	46.94	36.07	42.25	42.34	15.74	15.12	39.26	54.42	55.48	62.74	43.77	39.65	26.34	45.75	33.53	38.57	42.32	42.40	42.11
7	30.84	26.40	17.92	10.15	5.90	11.49	34.04	50.32	39.75	46.01	47.42	25.34	29.45	52.78	57.46	62.80	68.60	51.08	48.27	32.85	53.27	41.17	47.15	50.64	50.34	49.88
8	31.70	28.80	20.02	12.14	9.59	20.04	37.79	52.18	43.49	49.32	54.47	40.33	41.60	55.69	64.05	66.95	72.91	57.78	55.67	38.46	59.46	48.18	53.88	57.03	56.72	56.57
9	33.95	31.04	22.44	16.29	15.26	24.01	40.30	53.56	47.35	53.51	60.25	51.16	44.61	60.19	67.34	69.78	76.20	62.72	60.93	43.16	64.15	53.26	58.60	61.59	61.61	61.71
10	36.02	33.33	26.43	21.84	19.10	27.11	42.41	54.62	52.59	57.51	64.64	53.61	48.23	62.61	69.53	71.97	78.39	65.83	64.49	46.78	67.04	56.51	61.64	64.66	64.87	64.95
11	38.06	36.86	31.26	25.71	22.51	30.38	44.31	55.65	57.05	61.00	65.89	57.55	50.70	64.55	71.48	73.76	80.05	68.54	67.71	49.92	69.30	59.31	64.36	67.38	67.63	67.65
12	41.30	41.11	34.62	29.10	26.06	33.51	46.87	56.67	60.84	62.14	68.92	60.05	52.86	66.41	73.13	75.20	81.37	70.64	69.83	52.32	70.93	61.40	66.34	69.24	69.45	69.46
13	45.19	44.11	37.57	32.49	29.18	38.84	49.61	57.80	62.11	64.72	70.40	62.05	54.92	67.96	74.40	76.42	82.50	72.36	71.63	54.47	72.37	63.32	68.08	70.83	71.06	71.06
14	47.86	46.64	40.54	35.65	34.00	44.68	52.22	58.33	64.24	66.09	71.44	63.89	56.84	69.25	75.52	77.50	83.42	73.84	73.29	56.62	73.69	65.13	69.66	72.31	72.56	72.57
15	50.21	49.11	43.28	39.64	40.89	50.14	53.33	62.49	65.58	67.12	72.32	65.58	58.63	70.48	76.55	78.45	84.23	75.23	74.96	58.83	74.92	66.87	71.20	73.74	74.03	74.05
16	52.47	51.44	46.51	44.99	47.77	52.19	55.97	64.33	66.65	67.98	73.00	67.04	60.41	71.62	77.44	79.27	84.94	76.57	76.61	61.01	76.05	68.57	72.69	75.13	75.45	75.50
17	54.69	54.37	50.64	50.69	50.63	54.36	57.43	65.39	67.51	68.61	73.48	68.25	61.95	72.53	78.13	79.93	85.53	77.69	77.96	62.84	76.98	70.00	73.92	76.26	76.63	76.69
18	57.43	58.09	55.17	53.74	53.36	55.85	58.48	66.06	68.18	69.07	73.85	69.29	63.28	73.28	78.70	80.51	86.03	78.66	79.15	64.53	77.78	71.29	75.03	77.28	77.69	77.76
19	60.74	61.76	57.91	56.58	55.39	57.11	59.31	66.49	68.70	69.44	74.15	70.15	64.44	73.92	79.21	81.02	86.47	79.51	80.22	66.09	78.50	72.47	76.03	78.19	78.65	78.74
20	64.11	64.07	60.90	58.77	57.19	58.23	59.94	66.77	69.13	69.73	74.37	70.86	65.47	74.50	79.65	81.45	86.83	80.25	81.18	67.52	79.13	73.55	76.93	79.02	79.51	79.63
21	66.73	66.50	63.21	60.77	58.82	59.18	60.42	66.96	69.47	69.95	74.54	71.47	66.43	75.00	80.02	81.83	87.15	80.91	82.04	68.84	79.69	74.53	77.76	79.77	80.30	80.44
22	68.70	68.39	65.33	62.63	60.30	60.01	60.83	67.11	69.76	70.13	74.69	72.03	67.30	75.46	80.35	82.16	87.43	81.51	82.82	70.08	80.21	75.43	78.51	80.46	81.03	81.19
23	70.25	70.09	67.27	64.32	61.61	60.75	61.15	67.21	70.00	70.28	74.81	72.51	68.09	75.85	80.65	82.46	87.68	82.05	83.52	71.22	80.67	76.26	79.20	81.09	81.70	81.88
24	71.66	71.64	69.02	65.85	62.83	61.40	61.41	67.28	70.20	70.40	74.91	72.94	68.80	76.21	80.91	82.72	87.90	82.53	84.17	72.29	81.09	77.03	79.84	81.67	82.32	82.52
25	72.95	73.03	70.61	67.29	63.90	61.95	61.63	67.34	70.37	70.51	74.99	73.32	69.46	76.53	81.14	82.96	88.10	82.97	84.75	73.29	81.47	77.75	80.44	82.21	82.89	83.11
26	74.11	74.28	72.09	68.57	64.86	62.45	61.81	67.39	70.52	70.60	75.07	73.66	70.07	76.82	81.35	83.18	88.28	83.38	85.29	74.22	81.83	78.42	80.99	82.71	83.42	83.66
27	75.18	75.46	73.42	69.75	65.75	62.90	61.98	67.43	70.66	70.68	75.13	73.98	70.64	77.09	81.55	83.38	88.45	83.75	85.79	75.11	82.16	79.04	81.50	83.17	83.91	84.17
28	76.19	76.50	74.62	70.83	66.57	63.33	62.13	67.46	70.78	70.76	75.19	74.27	71.18	77.35	81.73	83.57	88.60	84.10	86.25	75.95	82.47	79.62	81.98	83.60	84.37	84.64
29	77.09	77.45	75.72	71.84	67.35	63.72	62.26	67.49	70.90	70.83	75.24	74.55	71.69	77.59	81.91	83.75	88.75	84.43	86.68	76.74	82.77	80.17	82.43	84.01	84.79	85.06
30	77.90	78.31	76.72	72.78	68.06	64.09	62.38	67.51	71.00	70.89	75.29	74.80	72.17	77.82	82.07	83.92	88.89	84.73	87.07	77.48	83.04	80.68	82.84	84.38	85.19	85.48

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	0.40	0.31	0.41	0.55	0.43	1.48	0.15	0.74	0.41	0.31	0.35	0.70	0.32	0.85	1.03	0.51	0.36	0.40	0.54	0.18	2.07	0.51	0.48	0.49	0.49	0.48
2	2.28	3.19	3.24	3.13	1.51	5.43	0.66	19.98	1.66	2.18	10.35	5.04	1.63	3.40	3.82	2.96	5.51	6.59	4.19	1.48	7.76	2.60	2.81	3.31	3.02	2.75
3	7.13	9.16	7.95	5.20	2.38	5.91	8.65	28.78	4.09	18.23	30.27	7.81	3.47	7.04	8.32	13.09	27.22	20.96	6.77	6.37	14.20	6.49	7.90	8.71	7.52	7.30
4	13.58	14.67	10.23	6.63	2.82	7.70	13.99	36.70	17.01	38.05	36.99	10.60	6.04	11.43	22.10	37.93	46.46	24.59	15.01	11.13	21.63	12.44	14.76	15.16	13.79	14.28
5	19.00	17.43	11.88	7.55	4.53	9.99	19.21	48.81	36.22	44.28	41.16	14.18	8.88	23.90	43.30	55.60	49.70	35.08	22.66	16.49	31.00	19.82	22.14	23.00	22.37	22.08
6	21.55	18.99	12.80	9.35	6.55	12.59	31.23	57.55	42.18	48.39	45.41	18.15	15.47	43.11	57.81	58.87	59.69	43.08	31.31	23.36	40.56	27.51	30.59	32.78	31.35	30.31
7	23.14	19.92	14.86	11.50	9.16	19.96	43.49	60.86	45.91	51.96	49.54	27.89	30.26	56.31	60.94	66.51	66.85	51.97	42.82	31.66	50.03	37.07	41.18	43.08	41.32	40.09
8	24.13	22.13	17.50	14.03	13.30	30.48	48.22	62.73	49.78	55.10	55.65	43.46	43.61	59.18	68.49	71.84	73.08	61.64	55.16	40.27	59.34	47.88	51.62	53.14	51.55	50.79
9	26.28	24.92	20.28	17.96	19.50	35.74	51.08	64.01	53.42	59.40	61.01	54.80	46.57	63.74	71.97	74.96	77.01	67.48	62.25	46.22	65.17	54.35	57.70	59.10	57.98	57.54
10	28.59	27.44	24.44	23.88	23.93	39.23	53.44	65.09	59.00	62.86	65.20	57.24	50.76	66.24	74.20	77.21	79.45	70.91	66.58	50.47	68.53	58.20	61.34	62.81	61.96	61.53
11	30.99	31.60	30.01	28.17	27.90	42.77	55.53	66.09	63.68	65.93	66.29	61.34	53.90	68.36	76.23	79.13	81.38	73.90	70.52	54.23	71.25	61.56	64.63	66.14	65.41	64.95
12	34.28	36.48	33.82	31.69	31.51	46.08	57.90	67.02	67.52	67.06	68.47	64.08	56.59	70.28	77.91	80.65	82.96	76.49	73.69	57.43	73.45	64.51	67.49	68.93	68.27	67.84
13	38.62	40.34	37.06	35.20	34.64	51.97	60.09	67.89	68.74	68.75	69.74	66.28	59.10	71.89	79.23	81.91	84.28	78.54	76.24	60.22	75.30	67.12	69.90	71.23	70.69	70.29
14	41.81	43.56	40.51	38.24	39.12	57.93	62.26	68.35	70.50	69.89	70.75	68.39	61.52	73.32	80.42	83.09	85.39	80.32	78.52	62.97	77.02	69.54	72.09	73.35	72.93	72.57
15	44.99	46.61	43.25	41.84	45.67	62.73	63.14	71.14	71.67	70.75	71.59	70.19	63.64	74.58	81.46	84.06	86.28	81.82	80.55	65.55	78.49	71.66	74.03	75.22	74.91	74.57
16	47.68	49.12	46.75	47.09	51.97	64.47	64.80	72.62	72.61	71.47	72.25	71.67	65.57	75.70	82.32	84.85	87.00	83.14	82.34	67.89	79.73	73.55	75.74	76.87	76.64	76.36
17	50.26	52.62	51.16	52.50	54.70	66.20	65.90	73.61	73.41	72.05	72.76	72.93	67.31	76.63	83.02	85.52	87.59	84.24	83.82	69.94	80.78	75.18	77.21	78.27	78.13	77.89
18	53.27	56.77	55.82	55.42	57.66	67.48	66.76	74.31	74.06	72.50	73.16	74.01	68.80	77.41	83.60	86.09	88.09	85.15	85.05	71.78	81.66	76.62	78.49	79.50	79.44	79.23
19	57.23	60.85	58.56	58.67	59.97	68.58	67.47	74.80	74.58	72.86	73.49	74.90	70.07	78.07	84.10	86.59	88.50	85.92	86.07	73.44	82.40	77.89	79.62	80.57	80.59	80.42
20	61.41	63.52	62.29	61.28	62.01	69.58	68.04	75.14	75.01	73.16	73.75	75.63	71.20	78.65	84.54	87.02	88.85	86.58	86.94	74.94	83.03	79.02	80.62	81.52	81.60	81.47
21	65.57	66.52	65.27	63.64	63.89	70.45	68.49	75.39	75.38	73.41	73.96	76.25	72.22	79.17	84.92	87.39	89.15	87.14	87.68	76.29	83.58	80.02	81.50	82.35	82.49	82.39
22	68.06	68.92	67.95	65.84	65.59	71.21	68.89	75.59	75.68	73.61	74.13	76.81	73.14	79.63	85.25	87.71	89.41	87.64	88.32	77.53	84.08	80.92	82.27	83.08	83.27	83.20
23	70.09	71.07	70.41	67.83	67.10	71.89	69.21	75.74	75.94	73.77	74.28	77.30	73.97	80.03	85.54	88.00	89.65	88.07	88.88	78.66	84.51	81.73	82.97	83.73	83.97	83.93
24	71.92	73.02	72.61	69.63	68.48	72.50	69.48	75.85	76.16	73.91	74.40	77.72	74.71	80.39	85.80	88.26	89.85	88.45	89.37	79.69	84.90	82.44	83.59	84.32	84.60	84.57
25	73.60	74.77	74.57	71.29	69.72	73.03	69.71	75.94	76.35	74.03	74.51	78.09	75.39	80.72	86.03	88.49	90.04	88.79	89.81	80.64	85.25	83.08	84.15	84.85	85.16	85.15
26	75.12	76.34	76.37	72.78	70.82	73.50	69.90	76.01	76.52	74.14	74.60	78.43	76.01	81.01	86.23	88.69	90.20	89.09	90.20	81.51	85.58	83.66	84.66	85.32	85.67	85.67
27	76.50	77.78	77.97	74.14	71.83	73.93	70.07	76.08	76.67	74.23	74.69	78.73	76.58	81.29	86.43	88.88	90.34	89.38	90.54	82.32	85.87	84.19	85.12	85.75	86.12	86.14
28	77.78	79.07	79.41	75.37	72.75	74.34	70.23	76.13	76.81	74.32	74.76	79.01	77.11	81.54	86.60	89.06	90.48	89.62	90.85	83.08	86.15	84.67	85.54	86.13	86.52	86.55
29	78.93	80.22	80.69	76.50	73.62	74.71	70.37	76.18	76.94	74.40	74.84	79.27	77.61	81.78	86.77	89.22	90.60	89.85	91.13	83.78	86.40	85.11	85.92	86.49	86.89	86.93
30	79.98	81.27	81.85	77.56	74.42	75.06	70.50	76.22	77.06	74.47	74.90	79.51	78.08	82.00	86.92	89.38	90.72	90.06	91.38	84.43	86.63	85.52	86.26	86.81	87.23	87.28