FY 1989

An Actuarial Review of the Federal Housing Administration's Mutual Mortgage Insurance Fund

June 6, 1990

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The Honorable Jack Kemp
Secretary of Housing and Urban Development
Washington, D.C. 20410

Dear Mr. Secretary:

We are pleased to present this report on our review of the soundness of FHA's Mutual Mortgage Insurance Fund. Our analysis finds that the Fund is currently solvent due to a large surplus that was inherited from the 1970's. However, we believe that continuation of present policies will eventually lead to insolvency because new business written under existing policies is unsound.

We recommend that the MMI Fund change its policies so that it attains a capital to insurance-in-force ratio of 1.25 percent. To meet this goal, FHA needs to increase its value by about $1.35 billion relative to its financial position today.

Our report identifies alternative policies that will improve new business such that it will provide additional capital consistent with this target. These policies include:

- Increase the premium from 3.8 percent to 6.0 percent.
- Require a minimum downpayment of 11 percent of home price, premium, and closing costs.
- Restructure the premium to a 1.6 percent up-front premium and 0.5 percent annually through the term of the mortgage.
- Charge all borrowers the current 3.8 percent up-front premium and require an additional 0.5 percent annual premium to high LTV borrowers. The annual premium would be charged for the following periods:

Initial LTV	Years
0 - 90%	0
90 - 93%	4
93 - 95%	10
> 95%	15

These policies were designed to ensure that future business meets the proposed capital standard and allows continued payment of distributive shares. Smaller premium increases or lower downpayment requirements would be sufficient to meet the proposed capital standard if distributive share payments were suspended.

Our analysis is dependent to some degree on the quality of data provided to us by FHA and the forecasts of economic conditions available from various organizations. The analysis was conducted using economic models that are by their nature subject to some degree of error and may not exactly predict future behavior. These limitations are addressed in the technical appendices.

This report was prepared with the assistance of Mr. Samuel Gutterman, FSA, an actuary employed by Price Waterhouse, and Dr. Patric Hendershott of Ohio State University. If you have any questions about this report, please call Mr. Thomas Craren or Mr. James Waddell at (202) 296-0800.

Very truly yours,

Price Waterhouse

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Executive Summary

This report evaluates the soundness of the Federal Housing Administration's Mutual Mortgage Insurance (MMI) Fund. The soundness of the Fund is a concern due to the magnitude of losses that FHA has recently reported. Indeed, declining house price appreciation, a major recession, and severe stress in the "oil-patch" states have caused substantial losses through the 1980's. Combine this with past poor management practices and lax monitoring, and one is left with a Fund that may not survive even moderately poor conditions, much less a major economic problem. The lessons learned from the 1980's are important. No longer can (or should) FHA rely on inflation or rapid house appreciation to save mortgages that are poorly underwritten, improperly monitored, and excessively risky.

This study was undertaken to learn why MMI suffered these large losses, to assess the likelihood of MMI suffering more losses from its 1980's business, and to determine whether the combination of recent losses and anticipated future losses have rendered MMI fundamentally unsound. The value of business currently being written is estimated, and policy options to strengthen the Fund are considered.

Any analysis of the MMI Fund must recognize that FHA's public purpose can be, and often is, at odds with its statutory requirement to be sound. But taking on risks that the revenue of the Fund simply cannot support will eventually lead to the Fund's reliance on the Treasury or on budget appropriations to sustain its operations. While reliance on the Treasury to cover catastrophic conditions might be appropriate in the most severe circumstances, we believe that, given current statutory requirements, MMI must (at a minimum) maintain enough equity to withstand, on its own, moderately severe economic conditions.

In order to evaluate the soundness of the Fund, we developed detailed statistical models that quantify the effect of loan characteristics and economic factors on defaults and prepayments. Default is explained primarily by the equity position of the borrower, which depends on the initial downpayment of the borrower and changes in house prices and, to some extent, interest rates after purchase. Prepayments are determined to a large extent by changes in interest rates.

The economic climate that underlies our analysis was derived from projections by the National Association of Realtors, the Mortgage Bankers Association, the Congressional Budget Office (CBO), and the Office of Management and Budget (OMB). These organizations publish forecasts of interest rates, house price inflation rates, and unemployment rates, although CBO and OMB publish consumer price rather than house price inflation rates. Because all of these forecasts were in a narrow range, we refer to the baseline forecast as the "consensus" economic scenario.

Based on our analysis of defaults, prepayments, and MMI's financial position, we have concluded the following:

- The Fund is currently solvent under consensus economics. That is, the Fund will have a positive value if it writes no new business and uses its current resources to pay claims expected to occur over the life of the existing loans.

- The portfolio of insurance-in-force has a positive value only because it had developed a substantial equity position from the business written before 1980. As of the

beginning of the 1980's, business already insured by MMI had an economic value of $3.4 billion. This represented 5.3 percent of unamortized insurance-in-force. Invested at one-year Treasury rates, this value would have grown to $8.0 billion by the end of the 1980's. However, this potential value has been eroded to about $2.6 billion in 1989 (see Exhibit ES-1) or only one percent of unamortized insurance-in-force.

- There is no single standard of actuarial soundness. We have derived guidelines for MMI's soundness based on the need to withstand adverse conditions. These guidelines require MMI to have positive economic value even if adverse economic conditions develop. The capital required to meet this test, with some margin for error, is $3.75 billion or 1.25 percent of insurance-in-force. Current economic value of $2.6 billion is short of this requirement. That is, the MMI Fund is not currently sound.

- The MMI Fund is currently paying distributive shares on pre-1989 business (primarily relating to years 1979 and prior). The present value of these expected future payments is $1.3 billion. To the extent payment of distributive shares is continued, terms on new business will have to be tightened further in order to cover the payments and continue to build equity at the 1.25 percent level.

- The business written each year is unsound. Under the consensus economic scenario, the 1990 business is expected to have a value of negative $208 million. Under a less favorable -- but reasonably possible -- scenario the business will have a value of negative $667 million. Business written beyond 1990 of similar size and risk composition will also face losses.

- It is crucial that new business be put on a sound footing as soon as possible. To comply with the above guideline and suspension of distributive shares, the present value of new business each year must improve by about $625 million. If distributive shares are continued, another $135 million will be needed. This both offsets the $208 million loss and allows equity to build by 1.25 percent of the net additional business ($48 billion new insurance less $15 billion estimated terminations). Alternative policies that would approximately achieve this result including the payment of distributive shares are:

  - Increase the premium from 3.8 percent to 6.0 percent

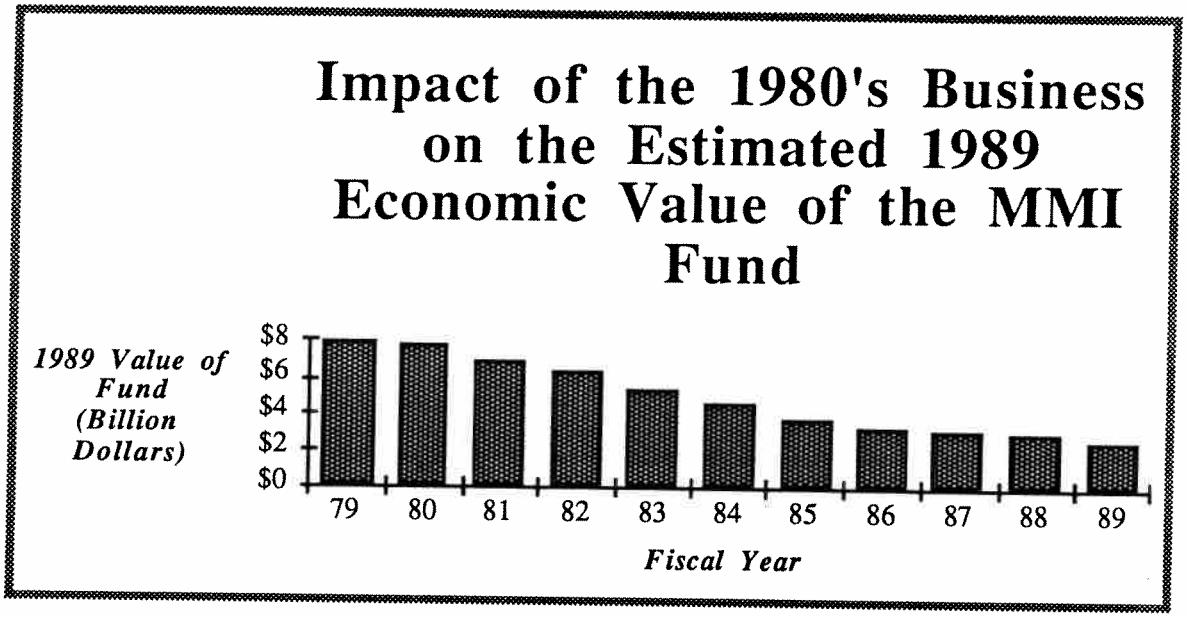
  - Require a 11 percent downpayment on the house price, premium, and closing costs

  - Restructure the premium to be 1.60 percent up-front and 0.5 percent annually through the term of the mortgage.

  - Charge the 3.8 percent up-front premium to all borrowers and an additional annual premium of 0.5 percent based on the riskiness of the loan. Loans with FHA-defined LTVs less than 90% would pay no additional premium, loans with LTVs between 90% and 93% would pay the annual premium for four years, LTVs between 93% and 95% would pay the annual premium for ten years, and LTVs greater than 95% would pay the annual premium for fifteen years.

- Management reforms could significantly reduce the losses on the disposition of properties. Such reforms could both improve the soundness of the existing Fund and could lead to lower premiums on new MMI business. Their implementation should receive high priority at FHA.

EXHIBIT ES-1



Note: This exhibit illustrates the estimated economic value of the portfolio as of the end of the year indicated, plus interest earned between that year and 1989. This exhibit excludes the effect of distributive shares.

I. INTRODUCTION

A. Background and Purpose of this Study

FHA's mission is to expand homeownership opportunities. FHA's MMI Fund plays a major role in this endeavor by insuring low-downpayment mortgages on single-family homes, thus making credit available to individuals who would otherwise have difficulty obtaining it. However, in addition to providing better access to mortgage credit, MMI must by statute be operated in accord with sound actuarial and accounting practices. Balancing the need to expand homeownership with the requirement to do so in a sound manner can be difficult, particularly if economic conditions and the credit risk MMI accepts combine to cause substantial losses. Moreover, the substantial losses suffered by other Federal credit programs, including those now apparent in other FHA programs, make it essential to understand why and how the MMI Fund incurs losses, in order to provide a basis from which corrective measures can be taken.

The MMI Fund has recently begun to report losses of increasing magnitude. While some have contended that these losses primarily resulted from a simple change in accounting policies, in fact the losses resulted from a real deterioration in the Fund's operations. For example, a review of the insurance written by MMI from 1980 through 1985 reveals that premiums collected for this insurance are not even sufficient to cover claims paid to date, much less provide equity to cover future losses. When premiums collected for a particular year's business are not sufficient to cover resultant losses, equity built up from more successful years is eroded. If insurance written between 1986 and 1989 also loses money, as we estimate it will, then the financial viability of the MMI Fund becomes a paramount concern.

Any institution or entity seeking to be "sound" should have capital or, in FHA's case, equity sufficient to protect against adverse risks. Charging a fee that covers outflows only in an optimistic or even expected scenario does nothing to build a cushion against the possibility that operating conditions may worsen. Adverse risks can range from cyclical economic downturns, to structural changes in the markets served, to fraud. The relative strength of many financial institutions in the private sector is judged, and indeed the cost of their capital is determined, by their ability to withstand such adverse risks. While the MMI Fund is unique and not wholly comparable to a private sector counterpart, the need to provide a cushion -- at least against a reasonably poor economic scenario -- is fundamental to actuarial soundness.

Finding the right size of the cushion given the MMI Fund's implicit public purpose presents a particular challenge. Too little equity risks making MMI reliant on the Treasury (and ultimately the taxpayer) in even moderately adverse conditions. Moreover, Federal credit reform proposals currently being considered by Congress and the Administration would probably require appropriations in the event that the MMI Fund's equity were to go negative. If the equity target is set too high, the resulting high premiums may make ownership unaffordable and potentially exclude those individuals most in need of the services FHA was meant to provide. An objective of this study is to provide guidelines under which the MMI Fund can restore its eroding equity to protect against a reasonable degree of adverse risk. At the same time, equity consistent with these guidelines will not be adequate under catastrophic conditions. Therefore, the policy options and observations in this study assume that under catastrophic conditions MMI must rely on the backing of the Federal government.

B. Scope of the Study

Our approach to this study was to 1) find the present position of the MMI Fund -- claims paid in relation to premiums collected -- for each year or "book" of business currently in force, 2) construct and estimate an econometric model to identify the factors causing claims and prepayments, 3) use the model and assumptions regarding future economic conditions to predict future claims and prepayments, and 4) translate these predictions into an estimate of the current economic value of each year's book of business. We estimated the Fund's economic value as an investor would evaluate the market value of a company, as the net present value of its future cash flows. These flows include premium receipts, claim payments, proceeds from property sales, premium refunds (when mortgages are prepaid), and administrative expenses. We then analyze how the economic value of the Fund would change as economic conditions change. A similar analysis is applied to the business the MMI is currently writing, and the sensitivity of the economic value of this new business to alternative constraints on the risks taken by MMI and premiums charged is computed.

In our evaluation, the value of MMI Fund depends on a number of factors, most notably:

- ***The nature of the risk FHA insures.*** *Among the more important considerations is the mix of the insurance by loan-to-value ratio, and particularly, whether insurance is becoming concentrated in higher loan-to-value loans -- those loans with very low downpayments.*

- ***Forecasts of the economic factors that have a significant impact on the financial position of the MMI Fund.*** *Of great importance here are those factors that create homeowner equity -- most particularly house price appreciation.*

- ***Historical relationships.*** *This analysis involves correlating historical claim and prepayment experience to business and economic conditions. It is also necessary to determine how relevant historical experience is to the future performance of the Fund.*

- ***FHA Management efficiency.*** *Historically, FHA has recovered about 63 percent of the claim amount when it sells an insured property. Improvements in this 37 percent loss rate -- through quicker sales of property, at higher prices -- would significantly increase the value of the Fund.*

Based on this analysis of the MMI Fund value, we then identify the approximate value that the Fund should currently maintain so that it will not become negative during adverse economic scenarios. Finally, we developed policy reforms that, if adopted by FHA, would enable the Fund to achieve the prescribed level of capital for its new business.

C. What is Actuarial Soundness?

The term "Actuarial Soundness" has taken on an increasingly important meaning as the MMI Fund has begun to face substantial losses. Yet neither housing legislation nor internal or external studies of FHA have adequately defined the term. Further, the actuarial profession cautions against the use of this and other ill-defined terms.

An internal study conducted by HUD staff in 1975 defined actuarial soundness as a situation wherein "premium income should be expected to cover expected administrative expenses and the benefits provided to lenders in the case of foreclosures." We believe this definition is inadequate. Sound actuarial practices would require that premium income be sufficient to provide protection against potentially adverse circumstances, such as economic downturns.

In the legislation pertaining to the Federal Housing Administration and its Mutual Mortgage Insurance Fund, the phrase "sound actuarial and accounting practice" first appeared in 1938 in the old Section 205(b) of the National Housing Act. Later the same phrase was used as a guide to the internal allocation of income and losses between the two components of MMI's equity that were legislatively created in 1954: the General Surplus Account and Participating Reserve Account. Finally, when the one-time premium was established by the Omnibus Budget Reconciliation Act of 1982, the premium was required to be "actuarially sound". Despite the use of these terms in the legislation, they have come to be collectively known simply as "actuarial soundness" with no attempt to define what that term means either qualitatively or quantitatively. Later, when MMI is compared to private mortgages insurance companies (MICs), we note that state regulatory authorities have developed detailed quantitative criteria under which MICs must operate.

Given the confusion surrounding the term and how it might be applied to MMI, we recommend that more specific requirements be developed. These specific requirements are stated in section III. The general principles reflected in these requirements are consistent with accepted actuarial practice. In our view, "actuarial soundness" implies more than simply providing for the current best-estimate of future experience. Although the FHA is a federal agency, we do not believe that it is appropriate to rely on Treasury bail-outs for the Fund unless experience develops that is significantly more adverse than is currently expected. These beliefs are based on the following:

- The commitments the Fund has undertaken are long-term in nature, with guarantees up to 30 years in duration. Thus, to determine adequate funding levels, it is necessary to reflect more than just the current cash position. Equity, or the value of the Fund, taking into account the present value of expected future cash flows for the current in-force business, is the appropriate measure on which to focus attention.

- Future economic conditions affecting the financial position of the Fund will not precisely correspond to currently estimated consensus economic conditions. A significant degree of uncertainty will always exist concerning such conditions.

- Sound actuarial practices require that a financial security program with such a degree of uncertainty be funded on a reasonably conservative basis. Therefore, it is sound actuarial and accounting practice to provide for experience somewhat more adverse than currently expected. Given the type of contingencies involved, we believe that the most reasonable approach is to determine the ability of the Fund to operate in a soundly based manner under a range of reasonably probable alternative economic conditions.

- It takes a reasonably long period of time, from two to six years, to determine whether structural changes in the economic system in which the Fund operates have occurred that would adversely impact the finances of the Fund. We are hopeful that improved monitoring and analytical capability will be in place in order to measure such experience. However, it still takes a considerable amount of time to interpret and communicate the implications of adverse experience.

- In addition, it may take a considerable amount of time to "fix" the situation once adverse conditions are recognized. Certain changes may require Congressional action, while many others require the development of a significant degree of consensus. While catastrophic conditions would likely result in relatively quick action, the more likely scenario of relatively moderate adverse conditions may take several years before changes to the program are possible.

The conclusion that the Fund should provide for more than our best estimate of future losses is consistent with the current discussion draft of the Society of Actuaries' Committee on Actuarial Principles, dated March 1990, that states:

> ***Principle 4.5:*** *The actuarial value of a financial security system relative to a given actuarial model is the combined actuarial value of the net cash flows generated by the assets, obligations and considerations of the system, taking account of the uncertainty involved in the risk variables and the process of combining them.*
>
> ***Principle 4.6:*** *The best-estimate actuarial value of a financial security system must be made greater than zero in order for the system to be actuarially sound (paraphrased as: "Due to experience fluctuations, surplus and margins are needed to make a financial security system actuarially sound.")*

On the other hand, the value of the Fund need not be sufficient to withstand all conceivable future economic conditions. We do not believe it is possible to build MMI's equity to a level needed to cover catastrophic risk. To do so would require premiums at levels that would impair MMI's social purposes. Catastrophic risk is implicitly covered through the backing of the U.S. Treasury.

An effective way to establish an easily understandable guideline -- one similar to those established by state insurance regulators -- would be to define equity requirements as a percentage of insurance-in-force. The percentage required can and should be designed to provide enough equity to cover a reasonably adverse, but not catastrophic, economic situation. Section III provides our recommendations on appropriate guidelines for establishing this percentage.

In proposing these new requirements, we wish to emphasize that analysis of experience and the level and structure of the premium should be a dynamic exercise. Ultimately FHA must have the ability to formulate and implement corrective actions quickly.

D. Comparison to Private Mortgage Insurance Companies

Having briefly discussed some aspects of MMI Fund operations, it is useful to compare MMI operations and operating requirements to those of Mortgage Insurance Companies (MICs). In this manner we can make some observations about aspects of private mortgage insurance that might prove useful to FHA.

The real estate boom of the 1920's led to the significant expansion of mortgage guarantee companies that had existed in some form since the 1890's. During their peak years (1925-1932), as many as 50 of these companies were in operation. The prevailing viewpoint during this period was that real estate values would continue to appreciate, and if any lax

underwriting or appraising occurred, the resulting questionable mortgage would be saved by inflation. Due to the general optimism about the economy and the lack of attention by the government, these mortgage guaranty companies were virtually unregulated. The absence of regulation often led to poor underwriting, self-dealing, fraud, and ultimately to a lack of adequate reserves to meet any meaningful emergency. The collapse of real estate prices resulting from the Great Depression led to the failure of these companies. Private mortgage insurance did not reappear for almost 25 years.

When MICs did reappear in the 1950's, they were accompanied by strong regulatory control. This regulatory control entailed more than just a broad requirement that MICs be "actuarially sound". Rather, State Regulatory authorities developed specific requirements under which MICs must operate. Today these requirements address not only levels of capital required for the aggregate amount of risk taken by a particular insurer, but also terms and conditions for risk taken on individual transactions.

The specific regulations vary among the states but generally provide that a MIC can insure one- to four-family mortgage loans that do not exceed 95 percent of the fair market value. Before a MIC can begin insuring loans, it must meet minimum limits for paid-in capital and surplus. Its insurance exposure is limited to 25 times the value of the capital -- that is, capital must be four percent of insurance exposure. Furthermore, MICs can generally only insure 20-25 percent of the mortgage in contrast to the MMI Fund, which insures 100% of the mortgage.

Three types of reserves must be maintained by MICs:

- ***Unearned Premium Reserve***. Premiums received but as yet unearned are placed in this reserve. Further, depending on the length of the policy, the manner in which unearned premiums are recognized as income is established by regulation. The MMI Fund similarly has an unearned premium reserve since the entire premium for most of its insurance is collected at closing.

- ***Loss Reserve***. This reserve is established for losses or potential losses on a case-by-case basis as the company learns of defaults and foreclosures. It also includes a reserve for losses that have been incurred, but not yet reported to the company. In 1987, the MMI Fund began for the first time to record loss reserves for defaults from which claims were likely to result.

- ***Contingency Reserve***. This is a special reserve required by law to protect against the type of catastrophic loss that can occur in severe economic periods. Half of each premium dollar received goes into this reserve and cannot be used by a MIC for 10 years, unless losses in a calendar year exceed 35 percent of earned premiums and the insurance commissioner of the state where the insurer is domiciled concurs in the withdrawal. Normally this reserve is a component of capital for financial reporting purposes. The MMI Fund has no such reserve, nor any requirement that a portion of its premium be set aside for losses that could occur during a severe economic period. The MMI Fund's "general surplus" account is roughly analogous to a contingency reserve, although there is no statutory or regulatory requirement as to the levels at which this equity must be maintained.

E. How the MMI Fund Differs from MICs

The MMI and MICs have many similarities. Both protect lenders against losses from defaults by borrowers and both serve to expand the supply of capital flowing to single-family housing. But there are also many differences that are important to highlight. These differences can be summarized as follows:

- ***Premium structure.*** Currently, the MMI Fund's premium for a 30-year conventional mortgage is 3.8 percent of the initial loan. This one-time premium is collected up-front and in the majority of cases is financed. Further, the premium percentage does not vary based on the initial LTV, i.e., it is the same regardless of the percentage downpayment. MICs typically charge a yearly premium that is higher in the first year, and the premium rates are larger for borrowers making smaller downpayments. Further, MICs do not allow financing of the premium they charge.

- ***Degree of Coverage.*** MICs generally insure about 20% of the mortgage amount, while FHA insures 100%. Because MICs insure a smaller amount of the mortgage, they often utilize an optional claim settlement, whereby the insured portion of the defaulted mortgage is paid, relieving the MIC of the responsibility for disposing of foreclosed property. By contrast, MMI pays the full claim amount and then in most cases takes possession of the foreclosed property. It is then responsible for selling the property, a costly and time-consuming process.

- ***Loan-to-value ratios.*** MICs cannot insure mortgages with loan-to-value ratios greater than 95%. FHA often insures mortgages with initial loan-to-value ratios greater than 95%. In fact, FHA often insures mortgages with loan-to-value ratios that are greater than 100%, if FHA were to calculate loan-to-value in a manner similar to MICs. Later in the report, we illustrate the differences in the way the loan-to-value ratio is calculated by FHA as opposed to MICs.

Several observations can be made about these differences. First, FHA's lack of differential premium pricing will tend to undercharge borrowers who make only a small downpayment (who tend to default more often) and overcharge those with larger downpayments. Thus, if FHA were to raise premiums across the board, it may find that less risky borrowers who make higher downpayments will opt for conventional loans. This could mean that FHA will increasingly insure only more risky borrowers, for whom claim rates would be greater. This principle of adverse selection poses serious risks for the Fund. As FHA becomes less attractive for less risky borrowers, the remaining borrowers will face still higher premiums if the Fund is to attain a sound position.

Second, since MICs insure only about 20% of the mortgage and do so only for loans with downpayments of 5% or more, FHA's loss exposure is much higher. FHA's risk is exacerbated by the fact that its true loan-to-value ratio often exceeds 100% for low downpayment borrowers. However, the difference between the 20% per loan risk taken by MICs versus the 100% per loan risk taken by FHA also renders use of the MICs 4% capital-to-risk requirement less meaningful to FHA.

Third, the fact that FHA finances virtually the entire premium means that little is collected from borrowers who default.

II. PAST PERFORMANCE OF THE FUND

In theory, the borrower's decision to default is based primarily on the equity position of the property relative to the value of the mortgage. It is necessary to analyze the past performance of the Fund to test this proposition. This analysis would determine whether historical factors directly affecting buyer equity explain past defaults. Such factors include the amount of the downpayment and house price appreciation. More specifically we consider the following:

- The correlation between claim rates and economic factors: For example, how did changes in interest rates and house price appreciation affect claim rates? And how are claim rates affected by regional stress?

- Loan-to-value ratios: What is the correlation between lower downpayments and defaults?

For factors shown to affect defaults, we will then consider how they might be used to help predict the portfolio's future performance.

A. Historical Performance of FHA-Insured Mortgage Loans since 1961

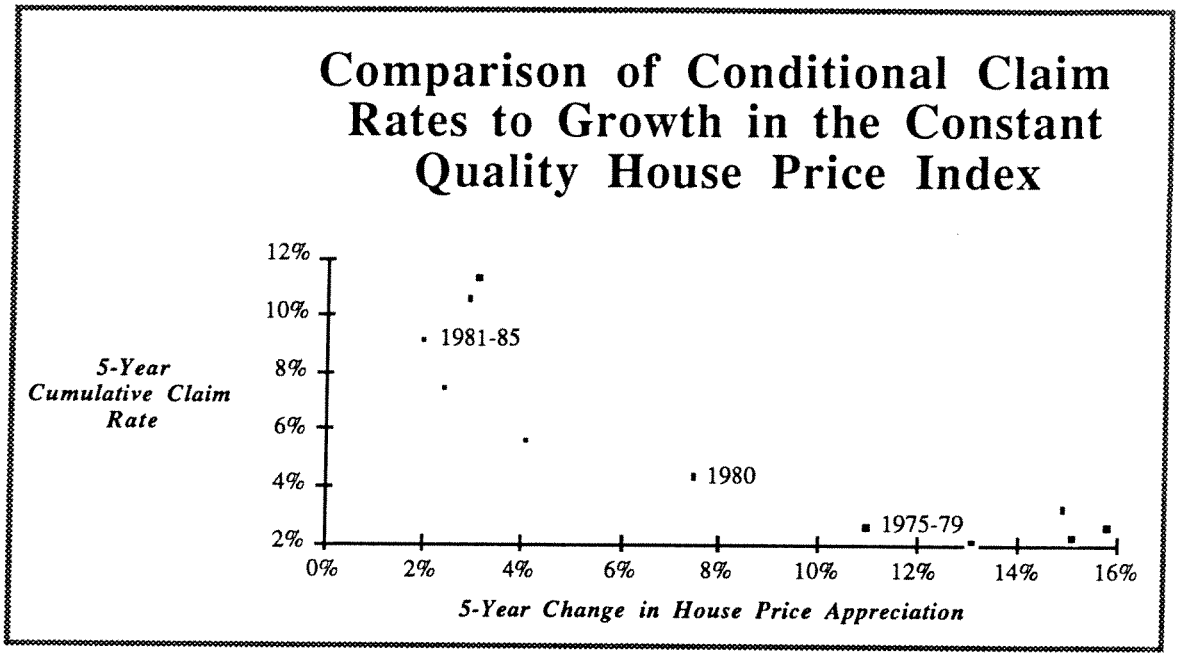
In evaluating the past performance of the MMI Fund there are three fundamental factors that affect its financial position: (1) claim rates, (2) prepayment rates, and (3) loss rates. Analyzing the factors that affect these historical rates will help provide a basis for projecting future rates. Our approach was to identify the economic factors and loan characteristics that have influenced default, prepayment, and losses during the 1975 through 1989 period. The analysis was conducted using econometric models. These models are described in Appendix A. In this section, we illustrate the general relationships of these variables to economic conditions and loan characteristics using historical averages.

1. Claims

The late 1960's and most of the 1970's was a period of comparatively high inflation and a consistent rise in house prices. Claim rates for the MMI Fund were very low during this period, despite FHA's low downpayment requirements, and the Fund reported substantial excesses of premium revenue over claim cost and expenses. Prior to 1980, house price appreciation was high and claim rates relatively low. Since 1980, house prices have increased less than 3 percent per year and default rates have risen significantly.

Exhibit II-1 presents a comparison between the average annual rate of house price appreciation and cumulative claim rates over a five-year period. The exhibit shows a striking inverse relationship between the house price appreciation rate and defaults. During the late 1970's rapidly rising house prices resulted in low default rates. Defaults surged during the 1980's as house price appreciation slowed.

EXHIBIT II-1

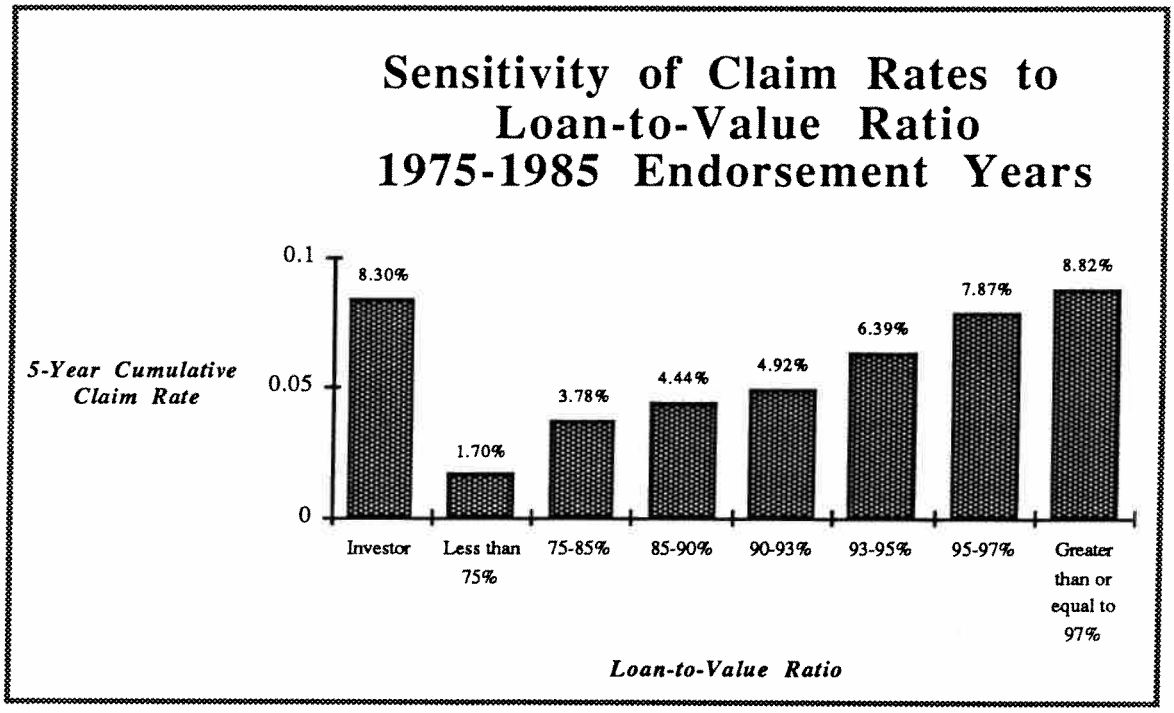


Source: House price appreciation: U.S. Department of Commerce, Bureau of the Census
Claim rates: FHA's A-43 Database

These trends demonstrate a relationship found in most studies of default: default is most likely to occur when a borrower has a negative equity position in the property -- normally because the value of the property has fallen below the loan balance. Some contend that default is caused by factors beyond the borrower's control, such as illness, divorce, or unemployment. While it is recognized that such life changes may provoke a default, borrowers in these circumstances are likely to sell their homes rather than default if their equity position is positive.

The borrower's equity position is determined by a variety of factors, but most significantly by the initial loan-to-value ratio and subsequent house price appreciation. Exhibit II-2 illustrates how claim rates for the first five years of a mortgage have varied by loan-to-value (LTV) category during the 1975 - 1985 period. The chart clearly shows that higher downpayments (lower LTVs) result in lower default rates. In fact, borrowers with an initial downpayment of 3 percent or less had a claim rate more than five times higher than the rate for those with more than 25 percent down. The FHA experience indicates that homeowners have higher likelihood of default and foreclosure as the LTV increases with the effect accelerating when the LTV moves above 90 percent. Conversely, borrowers with low LTVs, and thus a significant equity investment at the time of the loan origination, are much less likely to "walk away" from the mortgage.

EXHIBIT II-2



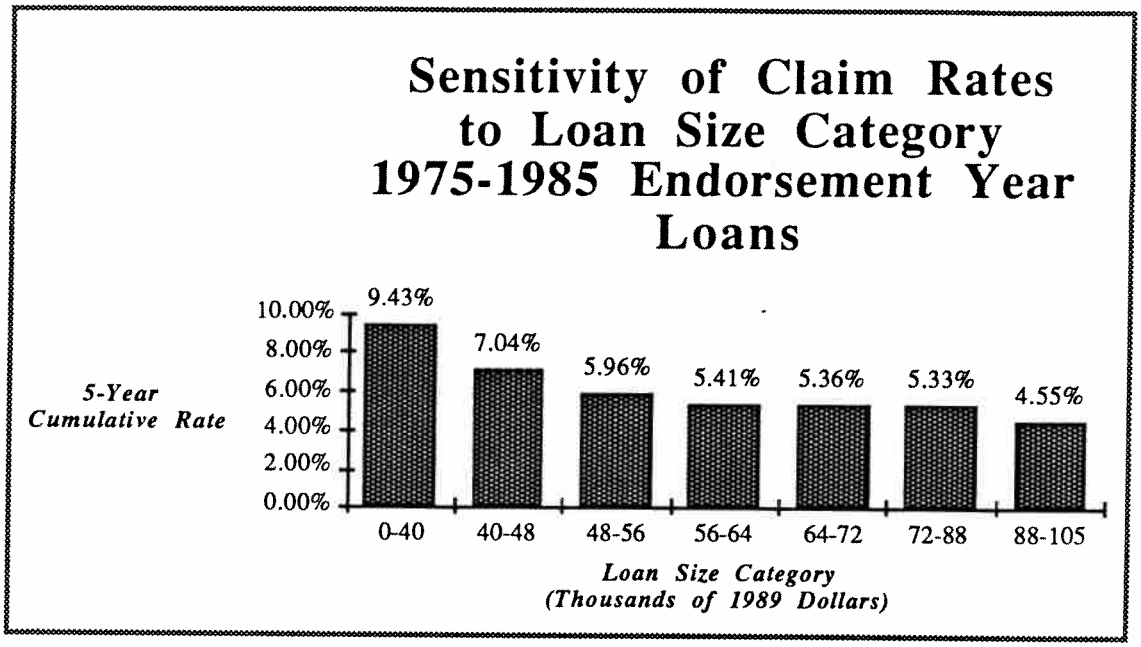
The historical effects of LTV and house price appreciation on defaults are consistent with the view that equity plays a major role in explaining defaults. Other factors that were found to have a statistically significant influence on default included:

- House price variation
- Loan size

While house price appreciation obviously has an important role in defaults, not all borrowers are affected by the same national average changes in house prices. To incorporate regional variations in prices, we also considered the variation of house prices across geographic regions. Intuitively, if there is a significant variation among regions, some locations must have much lower increases than the national average thus making borrowers in those regions more likely to default. During the 1980's, for example, house prices in the South (especially Texas) rose much more slowly than in other areas, resulting in higher defaults in that region. Measuring the variation of house prices among regions for modelling purposes, then, captures the effect of regional stress on aggregate default.

Exhibit II-3 demonstrates the sensitivity of claim rates to loan size. Within the FHA portfolio, higher valued loans tend to have a lower probability of default. Most of this effect is captured by the higher default rates in the $0 - $40,000 and $40,000 - $48,000 categories. For loans above $48,000, the effect is minimal and is not statistically significant. Data from the private mortgage insurers seem to indicate that default rates above the FHA ceiling are relatively constant, although they increase substantially at about $180,000.

EXHIBIT II-3

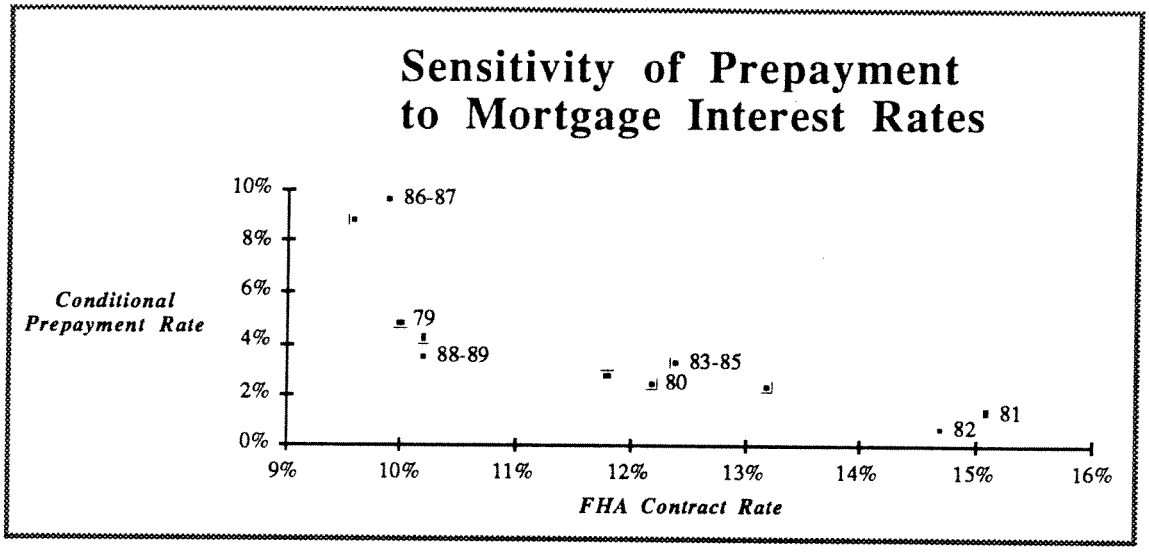


2. Prepayments

A prepayment causes an outflow of cash from FHA as the unearned portion of the up-front premium is refunded to the borrower. On the other hand, prepayment eliminates the possibility of a claim. Given these offsetting effects, prepayments are not as significant in the performance of the Fund as claims.

Borrowers prepay their mortgages either because they plan to sell the property or because they want to refinance their mortgages. Prepayments are influenced by interest rates, as refinancing activity usually follows a reduction in interest rates. Exhibit II-4 demonstrates that periods of lower interest rates are associated with higher prepayment rates. Borrowers holding mortgages with interest rates above the current market rate will find it advantageous to prepay and refinance with new mortgage terms. Conversely, increasing interest rates discourage prepayment, because homeowners will perceive that their existing mortgage is relatively less costly than a new mortgage.

EXHIBIT II-4

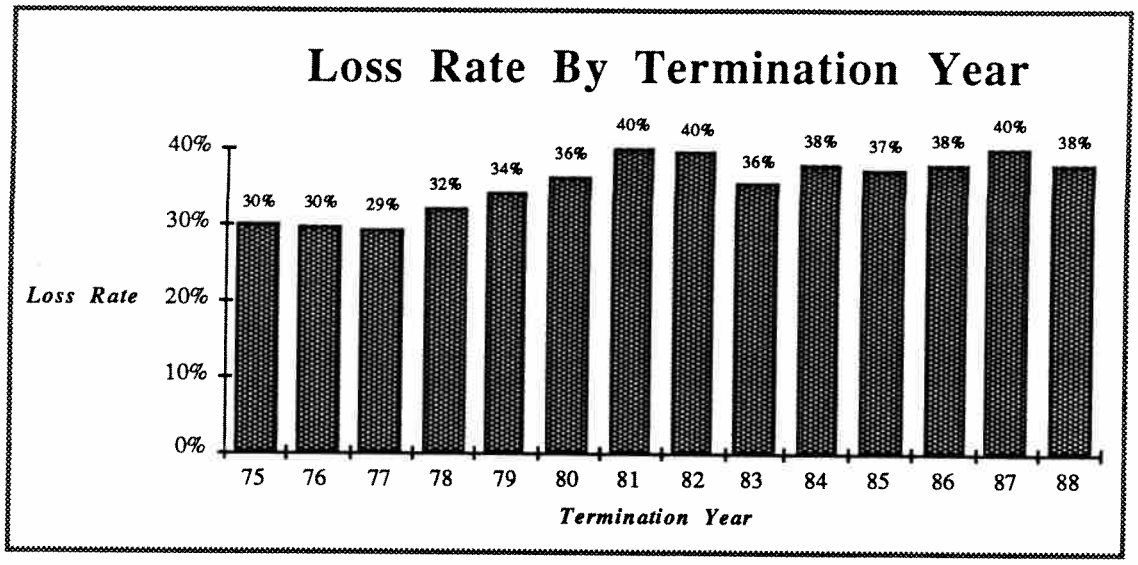


3. Loss Ratio

The loss ratio indicates the percentage of a claim payment FHA will lose because proceeds from the sale of an acquired property will be insufficient to recover the payment. One might expect that lower LTV loans might have lower loss rates. However, while a borrower with an initial downpayment of 10 percent is less likely to default than a borrower who put 5 percent down, the loss rates are similar when either defaults. The 90 percent borrower is likely to hold on to a property longer simply because he has a larger equity cushion; but if he defaults, it is unlikely that there will be more value left at the time of default.

Perhaps of greater interest is the variation of loss rates over time. Loss rates have been generally higher during the 1980's than during the 1970's, although they vary considerably as shown in Exhibit II-5. In our analysis, we have used a 37 percent loss ratio for future claims. This is a somewhat favorable figure compared to the experience of the 1980's. Our more adverse scenario uses a 40 percent value. This is the highest figure recorded in the last decade, and it occurred three times during the period.

EXHIBIT II-5



B. Trends In Characteristics of FHA-Insured Loans

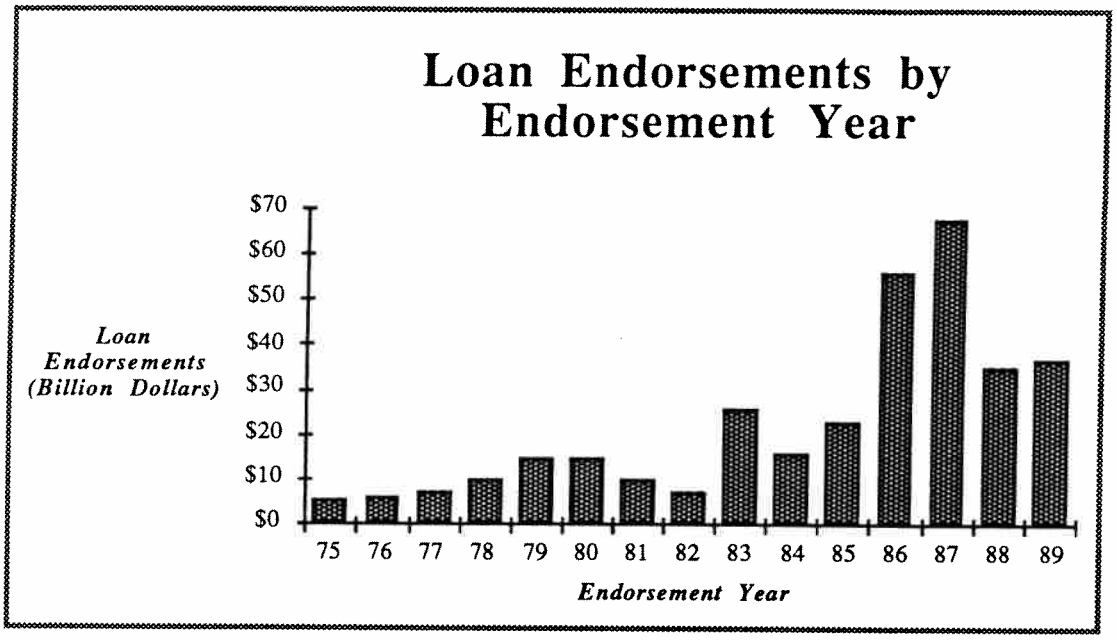
We previously described some of the significant factors that affect mortgage defaults, prepayments, and loss ratios. In particular, certain categories of loans were shown to have higher risks than other categories. In this section, we examine trends in the FHA portfolio to determine whether FHA's credit risk has shifted in recent years.

The composition of the FHA's insured loan portfolio under MMI has changed significantly over time. Changes have occurred in the total volume of loan demand, the regional variation in loan demand, and the distribution of loans across the range of FHA-allowed LTV ratios. An overview of some of the trends in the characteristics of the portfolio are provided below.

1. Trends in Demand for FHA-Insured Loans

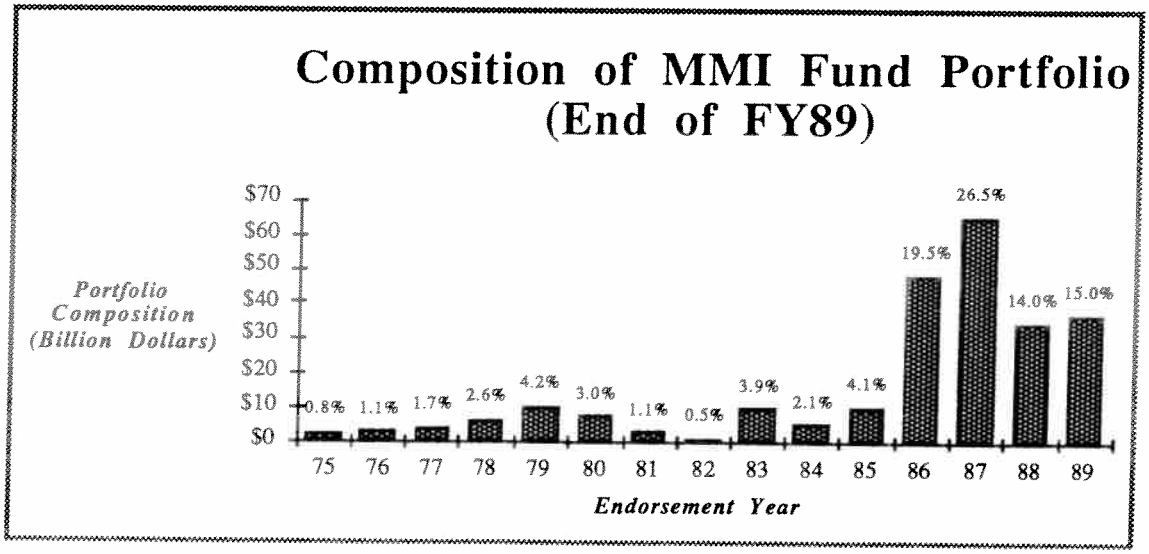
Exhibit II-6 illustrates that the volume of FHA loan origination grew dramatically since 1975, from $4.6 billion to a high of $67.5 billion in 1987. Economic factors in the late 1980's, such as falling interest rates, combined with a growing economy, contributed to the increase in demand. This demand weakened somewhat in 1988 and 1989 as interest rates increased.

EXHIBIT II-6



The increase in loan origination in the late 1980's has had a significant impact on the distribution of originating mortgages and insurance-in-force. The dollar value of mortgages that were insured in 1987 and currently survive exceeds the dollar value of surviving mortgages from endorsement years 1975 through 1985 combined, as illustrated in Exhibit II-7.

EXHIBIT II-7



2. Changes in Loan-To-Value Ratio and Loan Size Distribution

The distribution of loan originations across the LTV categories has fluctuated over the 1980's. This fluctuation is illustrated in Exhibit II-8. Since 1986 loan demand at the high LTV levels, especially in the 95-97 LTV category, has increased. The proportion of investor loans increased significantly in the 1980 to 1984 period, but has fallen recently and in 1990 virtually all investors are excluded from FHA's MMI programs. Even though participation of investors has fallen recently, somewhat reducing risk, the proportion of high loan-to-value loans in 1988-89 has risen. Overall, investor loans and business above 95 percent LTV comprised about 51 percent of the MMI Fund's 1988-89 endorsements, versus 35-45 percent in earlier years. Because these loans are so much riskier than those below 95 percent LTV (see Exhibit II-2), the 1988-89 business is riskier than the 1980-87 business.

EXHIBIT II-8

DISTRIBUTION OF LOAN ENDORSEMENTS BY LOAN-TO-VALUE

LTV Category	1980-81	1982-83	1984-85	1986-87	1988-89
Below 75%	8.7%	15.6%	10.9%	11.6%	5.6%
75 - 85%	8.6%	12.9%	7.7%	10.9%	5.4%
85 - 90%	10.9%	11.8%	10.5%	10.7%	10.0%
90 - 93%	10.5%	10.8%	10.6%	10.0%	11.6%
93 - 95%	16.2%	14.1%	13.6%	12.4%	16.5%
95 - 97%	28.9%	18.8%	22.8%	26.0%	36.7%
97 % and Above	3.2%	1.7%	4.8%	3.9%	7.0%
Investors	12.9%	14.4%	19.1%	14.6%	7.3%

An additional factor explaining changes in loan size and LTV is the change in FHA policy regarding loan-to-value. The following table summarizes these changes:

Increases in FHA Loan-to-Value Maximum since 1971

December 1971:

97% of the first	$15,000
90% of the next	$10,000
80% of the remainder	

September 1974:

97% of the first	$25,000
90% of the next	$10,000
80% of the remainder	

November 1977:

97% of the first	$25,000
95% of the next	$10,000
80% of the remainder	

July 1980:

97% of the first	$25,000
95% of the remainder	

May 1985:

97 % if appraised value is $50,000 or less
Otherwise, 97% of the first $25,000, 95% of the remainder

The changes in loan-to-value requirements in 1980 and again in 1985 were significant in that they increased the number of loans with higher risk, thus increasing default risk in the MMI Fund. Another significant change that went into effect on September 1, 1983 was the introduction of the one-time premium collected at closing. Borrowers were allowed to finance the entire premium, but this additional level of financing was excluded from the loan-to-value calculation. The premium was, in effect, paid as the mortgage amortized.

The loan-to-value ratios calculated by FHA significantly understate the true LTV. Based on the downpayment requirements just described, one would expect the LTV ratio not to exceed 97%. However, when closing costs and the financed premium are considered, the actual loan-to-value ratio can easily exceed 100%, as illustrated in Exhibit II-9. The fact that some of the FHA mortgage insurance premium is refundable acts as a partial offset to the borrower's ability to finance the insurance premium.

EXHIBIT II-9

FHA LOAN-TO-VALUE CALCULATION

	FHA	Private Insurer
Selling Price	$75,000	$75,000
Allowable Closing Costs (1)	2,250	
Maximum Allowable	77,250	75,000
Downpayment (2)	3,363	3,750
Maximum Mortgage Amount Before MIP	73,888	71,250
MIP Financed (3)	2,808	0
Total financed	$76,695	$71,250
FHA calculation of Loan-to-Value (4)	95.6%	
Actual Loan-to-Value (5)	102.3%	95%

(1) Assumed to be 3% of selling price.

(2) FHA downpayment equals 3% of the first $25,000 and 5% of the remainder ($77,250 - 25,000 * 5%); private insurers' minimum downpayment requirements are 5% of the selling price by state regulation.

(3) Mortgage Insurance Premium (MIP) is 3.8% of the maximum mortgage amount before MIP.

(4) FHA loan-to-value is the maximum mortgage amount before MIP divided by "maximum allowable" amount.

(5) Actual loan-to-value is the total amount financed divided by the selling price.

(6) Cash required for the privately insured loan includes the downpayment, closing costs, and, in many cases, an up-front insurance fee. Together these payments make the amount of cash required up-front substantially larger for privately insured loans than for FHA-insured loans.

3. Geographic Distribution of FHA Insurance

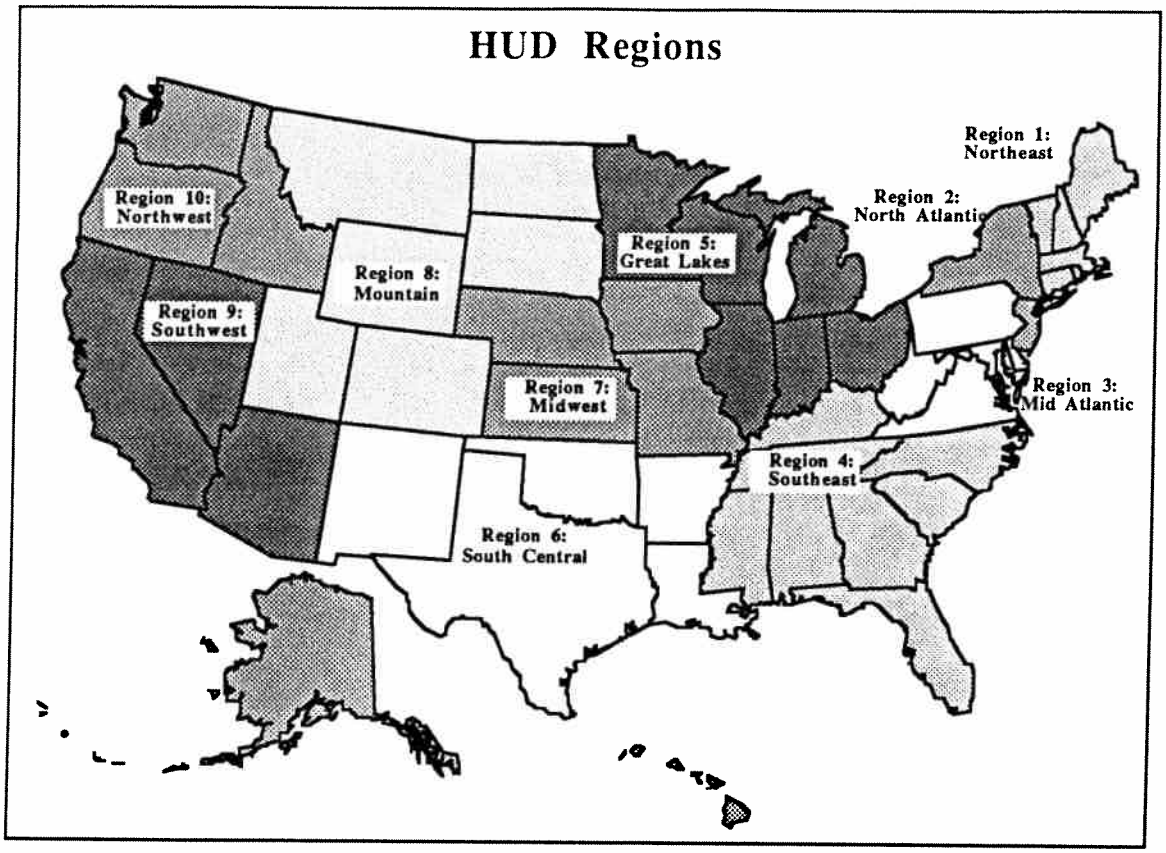
The distribution of insurance-in-force across HUD regions has shifted over time, as shown below in Exhibit II-10. Regions that have experienced above average growth in loan demand include Great Lakes, South Central, Midwest, Mountain, the Mid Atlantic, and the Northwest. The percentage of mortgages in force in the North Atlantic and the Southwest fell slightly, while that of the Northeast and Southeast were relatively stable overall. The Southwest continues to be the dominant region, with more than one fifth of the total insurance-in-force, while the Northeast and the Midwest continue to have a very small percentage of the total insurance-in-force. Exhibit II-11 defines the HUD regions.

EXHIBIT II-10

COMPOSITION OF INSURANCE-IN-FORCE ACROSS HUD REGIONS

		1980	1984	1989
1.	Northeast	0.77%	1.23%	0.51%
2.	North Atlantic	9.29%	8.20%	4.89%
3.	Mid Atlantic	6.09%	9.43%	10.27%
4.	Southeast	18.50%	15.85%	17.48%
5.	Great Lakes	12.27%	13.52%	14.45%
6.	South Central	13.38%	14.45%	14.59%
7.	Midwest	2.83%	3.09%	3.43%
8.	Mountain	7.43%	8.12%	8.23%
9.	Southwest	25.32%	22.21%	20.99%
10.	Northwest	4.05%	3.86%	5.15%

EXHIBIT II-11



Geographical distribution is significant because regional economies can vary widely and have a significant impact on claim rates. From 1964 to 1989, the average national house price appreciation rate has fluctuated between 2.7% and 12% annually. Exhibit II-12 shows that regional house price appreciation varies widely from national trends. For example, the Northeast experienced considerably higher appreciation than the rest of the country during the 1960's and 1980's; during the 1970's, the West had the greatest appreciation.

EXHIBIT II-12

CONSTANT QUALITY HOUSE PRICE APPRECIATION ACROSS REGIONS OF THE US

	National	Northeast	Midwest	South	West
1964-70	4.0%	7.2%	5.0%	3.4%	2.8%
1970-76	8.2%	7.4%	7.9%	7.9%	9.6%
1976-81	12.0%	10.5%	10.8%	11.5%	14.2%
1981-89	2.7%	8.6%	3.0%	1.8%	2.2%

Source: U.S. Department of Commerce, Bureau of the Census

The significance of the variations in regional economics just illustrated means that the Fund can incur losses even with favorable national trends. Moreover, if a particular region has an economic downturn (like that seen in the "oil states"), then losses can result even in a favorable national economic climate. Thus, a model of future performance must consider adverse regional variations from national trends.

Losses can also result if there are economic problems in a particular state and MMI has a disproportionately large share of its business in that state. To highlight the areas of risk, Exhibit II-13 shows insurance-in-force in the top ten states.

EXHIBIT II-13

UNAMORTIZED INSURANCE-IN-FORCE FOR THE TEN LARGEST STATES
(Origination Years 1975-1989)

Rank	State	Amount of Insurance-in-force ($ Billions)	Percent of Total
1	California	$39.73	16.2%
2	Texas	$27.35	11.2%
3	Florida	$15.32	6.3%
4	Colorado	$14.12	5.8%
5	Arizona	$13.62	5.6%
6	Minnesota	$12.79	5.2%
7	Maryland	$11.49	4.7%
8	Virginia	$10.56	4.3%
9	Illinois	$9.96	4.1%
10	Washington	$9.08	3.7%
	All others	$80.89	33.0%
Total		$244.91	100.0%

Note that FHA still has high amounts of insurance-in-force in two states that have had heavy recent losses -- Texas and Colorado. Another added concern is the impact actions by the Resolution Trust Corporation (RTC) could have on FHA. For example, if the RTC has a large inventory of single-family properties in one or more of these states, their subsequent sale may depress the price FHA receives when it sells its foreclosed properties, thus increasing the loss rate. Depressed prices may also lead to higher default rates.

III. Future Performance of the Existing Fund

Having reviewed the past performance of the MMI Fund, we now assess the ability of the MMI Fund to withstand future losses emanating from the current portfolio. In particular, we focus on the sufficiency of the Fund's equity if unfavorable economic conditions occur. Finally, we develop guidelines for the Fund's soundness and evaluate the current position of the Fund against these guidelines.

A. Approach to the Analysis

In analyzing the financial viability of the MMI Fund, we developed econometric models to project operations and cash flows resulting from default and prepayment behavior under various economic conditions. A "base case" scenario was developed to assess whether the MMI Fund is sound under conditions that are reasonably expected to occur. We also tested the MMI Fund's ability to withstand an adverse -- but probable -- economic scenario. Below we discuss the economic and financial models used and the tests applied. A summary of findings concludes this section.

1. Summary of Methodology

The behavioral assumptions in our models view borrowers as making decisions about their mortgage obligations so as to optimize their wealth. Mortgage holders in servicing their mortgage obligations have three basic options: 1) pay as scheduled, 2) prepay the entire principal amount, or 3) default. The decision to exercise any one of these options will be made based primarily on the equity position in the property relative to the value of the mortgage. Distinctions are made for the borrowers' decisions when modeling defaults and prepayments.

- Default Model - The default model is specified to estimate directly conditional probabilities of default and in turn claim terminations for selected categories of borrowers. These categories relate to the loan-to-value (LTV) position of the borrower. The variable most significant in explaining defaults is the borrower's equity position. The equity position in the home will be determined by the initial LTV, the extent of price appreciation in the property, the market value of the mortgage, amortization of the loan (years from origination), and transaction costs associated with default. By estimating equity appreciation over time for properties financed by different classes of mortgages, the model directly estimates conditional default probabilities and the volume of defaults for a portfolio of mortgages.

- Prepayment Model - The prepayment model incorporates a similar model specification to estimate the number of prepayments for specified categories of initial loan size and LTV. Prepayment behavior is expected to be sensitive to downward movements in interest rates as rational borrowers will refinance a mortgage following a significant reduction in the prevailing mortgage interest rate. Changes in interest rates will alter the perceived mortgage value to the borrower measured as the discounted value of the future stream of payments. The conditional probability of prepayment is specified as a function of the borrower's valuation of the mortgage liability such that a fall

(increase) in interest rates will increase (decrease) the mortgage liability and increase (decrease) the prepayment probability.

The analysis separates 30-year and 15-year mortgages. Graduated Payment Mortgages (GPMs) comprise a small portion of the MMI portfolio and were analyzed by comparing their historic claim rates to those of fixed-rate mortgages. The models are then used to simulate and forecast numbers of defaults and prepayments under specified economic conditions. To forecast defaults, it is necessary to posit the average equity appreciation and regional dispersion of property values about the mean. The number of defaults and prepayments are computed from the estimated probability of default or prepayment. Prepayment forecasts require projections of interest rates.

2. Assumptions Underlying the Analysis

Our evaluation of the future performance of the existing insurance-in-force incorporated a base economic forecast to project the claim and prepayment rates and the resulting cash flows of the Fund through the term of all existing loans. This economic forecast is derived from the forecasts of several organizations and includes projections for overall house price appreciation, variability of house price appreciation, mortgage interest rates, and unemployment rates. Because loan performance is sensitive to fluctuations in the economic climate, alternative scenarios were also established and tested.

a. Consensus Economic Climate

The baseline economic climate is established from a review of near-term forecasts published by the National Association of Realtors (NAR), the Mortgage Banker's Association of America (MBAA), the Office of Management and Budget (OMB), and the Congressional Budget Office (CBO). The key assumptions for consensus economic trends for the period from 1990 through 2018 are:

House Price Appreciation	4.5%
Mortgage Interest Rates	10.0%
Unemployment Rates	5.5%

These forecasts reflect an average economic climate for the future based on published economic forecasts. Below are the published economic projections and the 1989 values:

	Median House Price Appreciation	Mortgage Interest Rates	Unemployment Rates
NAR	4.6%	9.8%	5.4%
MBAA	4.5%	9.7%	5.6%
OMB	3.0 - 4.0% *	7.0 - 10.0%	5.0 - 5.4%
CBO	4.3%*	8.8 - 9.5%	5.5%
Actual (1989 rate)	4.5%	10.3%	5.3%

*These are CPI forecasts; no house price forecast is available.

The measure of house price appreciation that is reported by NAR and MBAA is the rate of change in median sales price. This index thus reflects the price of houses actually sold. Because new houses tend to be larger over time and to have more amenities (such as central air conditioning and more bathrooms) and existing houses are occasionally renovated, median sales prices will increase faster than prices for insured houses.

The Constant-Quality House Price Index is published by the Bureau of the Census. It is designed to measure changes over time in sales prices of single-family houses that are the same with respect to ten important physical characteristics as the houses sold in 1982. This index excludes price increases that result from improvements in house quality. As a result, this index provides a better measure of changes in the price that a current owner could receive for his house. The relevant consideration for an individual is how much his house value has changed since purchase, not how the average value of a generally rising quality house stock has changed. In translating median house price appreciation into constant-quality appreciation, 1.25 percent was deducted from the annual median house price appreciation, based on historical averages.

Our analysis is concerned with the performance of loans over an extended period, while most published forecasts are for two to five years. In all cases, the near-term projections are extended to the end of the forecast horizon (30 years). While this may not reflect the views of the published reports, extending these forecasts represents a plausible economic climate. In any case, the near-term economic climate will have a more significant impact on the Fund because most defaults take place in the first ten years of the mortgage.

b. Assumptions for Non-economic Factors used in the Analysis

Three other key non-economic assumptions are made. The FHA loss ratio on disposed properties is assumed to be 37 percent. This represents the average expected loss on

property disposition as a percentage of the claim payout on FHA acquired properties. Future changes in the loss ratio will be tied largely to management policy. To evaluate the impact and the uncertainty of future loss ratios on the Fund alternative scenarios have been developed using loss ratios of 35 percent and 40 percent.

The two other assumptions built into our model pertain to the timing between default and claim settlement and the time required for FHA to dispose of acquired properties. It is assumed that claim settlement will occur on average 15 months following initial default on the mortgage. Further, FHA is expected to be able to dispose of properties eight months after acquiring the property through claim settlement. These values are averages of recent experience.

B. Results Under Consensus Economic Climate

In the consensus economic environment, constant quality house prices are assumed to increase by 3.25 percent. Under this assumption, it is projected that the current value of the MMI Fund is $2.6 billion. This $2.6 billion value reflects the current cash available to the Fund, plus the present value of periodic premium receipts and receipts from property disposal, less the present value of claim payments, premium refunds, and administrative expenses. This valuation is greater than the GAAP accounting net equity position recorded at the end of fiscal year 1988 by $755 million. GAAP accounting does not allow recording future revenues until they are realized. However, any deficiency must be recorded as soon as it can be estimated.

This estimate of economic value is prepared by first analyzing the current cash position of all loans originated since 1975, by year of origination. The cash generated to date, for each year of business, reflects the historical experience of the business and is not dependent on the model. The left-hand side of Exhibit III-1 shows that the financial position of each year of business written from 1980 - 1985 is already negative. While the years 1986 - 1988 would appear to be in a strong positive cash position, this is because the up-front premium has been collected but insufficient time has passed to observe many claims.

EXHIBIT III-1

Current and Projected Present Value of
Endorsement Years 1975 - 1989

Endorsement Year	End of FY88 Cumulative Claim Rate	End of FY88 Cash Reserves (Millions)	Ultimate Cumulative Claim Rate	Ultimate Cash Reserves (Millions)
1975	3.89%	$206	4.48%	$240
1976	3.66%	236	4.35%	283
1977	2.86%	358	3.91%	429
1978	3.69%	417	5.88%	521
1979	5.99%	299	10.03%	434
1980	9.96%	(315)	14.65%	(241)
1981	16.02%	(828)	19.41%	(801)
1982	16.26%	(646)	18.84%	(628)
1983	9.18%	(941)	14.61%	(886)
1984	11.05%	(618)	17.86%	(791)
1985	7.47%	(526)	15.34%	(874)
1986	2.10%	1,168	10.98%	(379)
1987	0.37%	2,358	10.78%	(186)
1988	0.01%	1,292	12.76%	(294)
1989	--	--	12.72%	(283)
Total		$2,458		($3,454)

For each year of business, we then project claim and prepayment experience to the term of the mortgages endorsed in each year and compute the present value of the business based on these projections. These computations are shown in the last two columns of Exhibit III-1. For some years prior to 1984, future results are expected to improve the value of the business because future premium receipts are expected to exceed losses associated with claims. The value of business written with up-front premiums (since 1984) already reflects all premiums that will be received. Thus, it can only deteriorate from its current position.

The net result of this analysis is that 1975 - 1989 business has contributed $2,458 million in cash reserves to the existing Fund, but has an ultimate value of negative $3,454 million. Business written before 1975 contributes a positive $131 million to the present value of the Fund, because of additional collections of periodic premiums. As a result, we expect the Fund's cash reserves to deteriorate $5.8 billion in present value terms from their current levels through the term of the loans. Somewhat more than this amount has been provided for in the financial statements, through the unearned premium ($3.9 billion) and loss reserves ($2.7 billion). The difference between the reserves (positive $6.6 billion) and the present value of cash outflows ($5.8 billion) represents the expected increase in the economic value of the Fund. When added to the previous accounting equity position ($1.8 billion), we estimate the economic value of the current portfolio, including all cash reserves, to be about

$2.6 billion. This estimate, however, is subject to downward revision based on the policy of distributive share payments, discussed below.

In view of the uncertainty regarding the future economic climate, sensitivity tests are presented about this consensus economic forecast. Exhibit III-2 shows the impact of varying these economic assumptions. When the constant quality house price appreciation rate varies between 1.25 percent and 6.25 percent per annum the economic value of the Fund is projected to range between $1.0 billion and $4.0 billion. The combination of greater regional price variation and low house price appreciation is sufficient to push the value of the Fund below zero.

EXHIBIT III-2

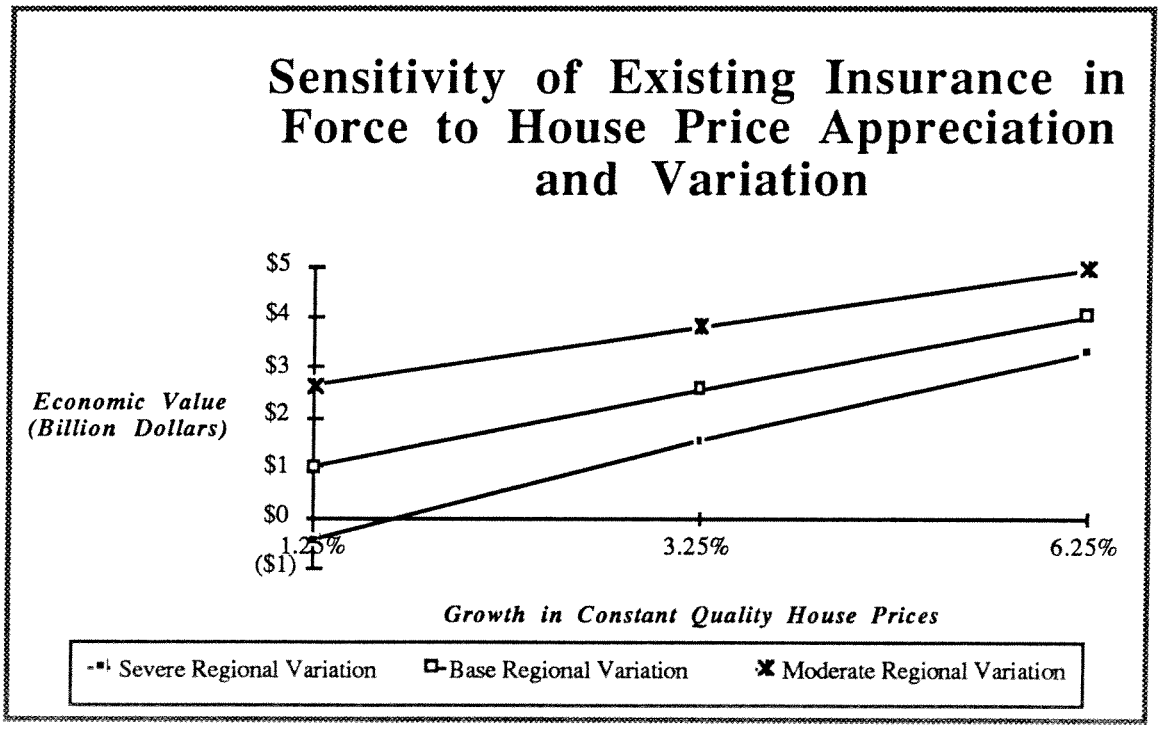
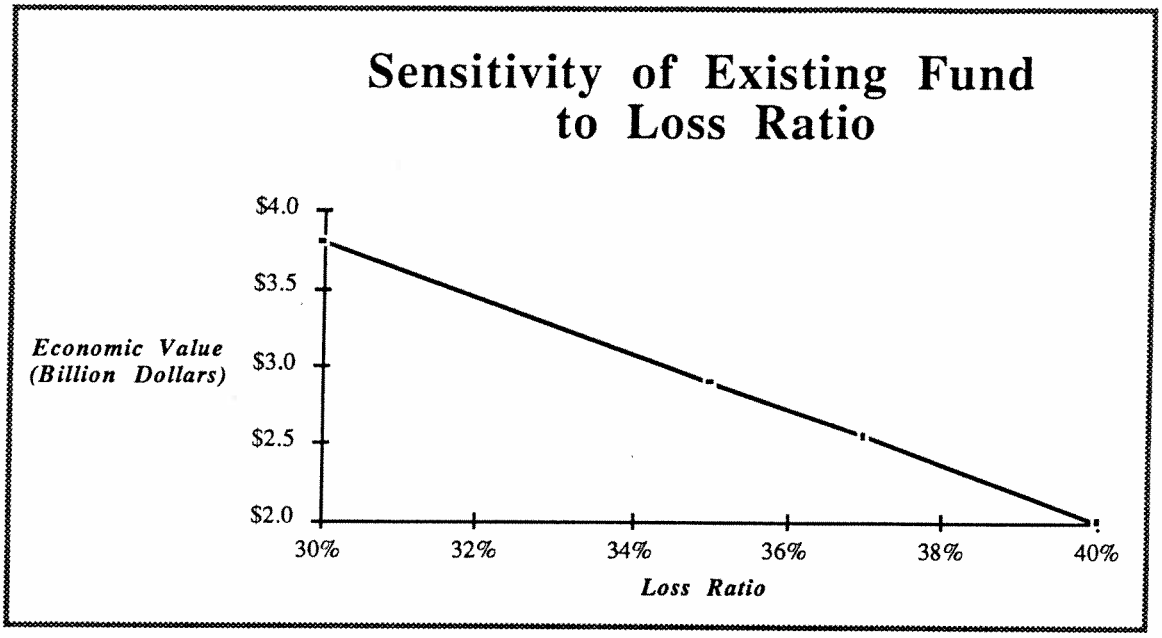


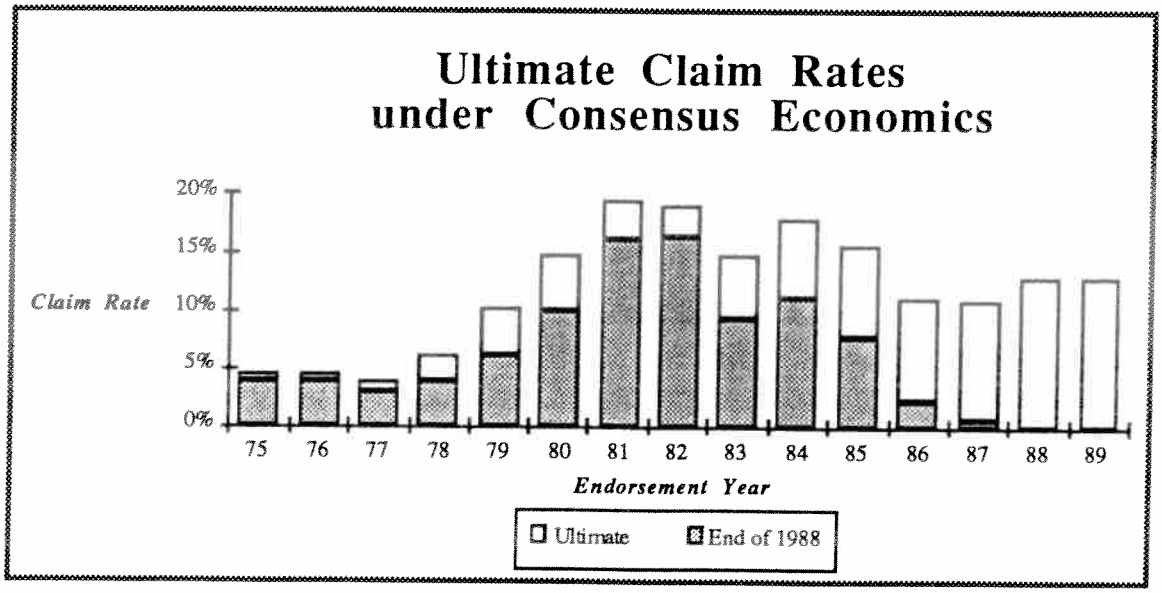
Exhibit III-3 shows the impact of alternative assumptions for the loss ratio. Increasing the loss ratio to 40 percent will reduce the projected value of the Fund to $2.0 billion, while lowering the loss ratio to 30 percent, the value recorded in the middle seventies, would raise the Fund value to $3.8 billion.

EXHIBIT III-3



In applying the consensus economic forecast, the ultimate claim rate on the 1980's insured loans will rise significantly above the experience of the prior years. Exhibit III-4 shows that loans originating after 1985 will have an ultimate claim rate of 11 - 13 percent. While this represents a significant drop from the early 1980's, our analysis indicates that the level of expected claim terminations will ultimately result in a net outflow of cash for each endorsement year. Further, this portion of the FHA-insured loans represents about 75 percent of the current insurance-in-force.

EXHIBIT III-4



The relatively low claims so far recorded against the 1987 through 1989 business have lead some to conclude that the generally lower claim rates of the 1970's may be a more appropriate indicator of claim rates for 1987 through 1989 endorsements. This view overlooks the fact that the 1970's business benefitted from the higher inflationary environment of the late seventies and early eighties. We do not expect this environment to recur. The policies of the Administration and the Federal Reserve Board are consistent with a low inflationary environment. For this reason, the relatively low early claim rates for the 1987 - 1989 business are not inconsistent with the ultimate claim rates that are projected.

C. Major Economic Changes

One approach to assessing the soundness of the MMI Fund is to follow the methodology employed by bond rating agencies. In the process of developing bond ratings, agencies assess the adequacy of the capital (equity) buffer between bondholders and the bankruptcy courts. The capital buffer is necessarily viewed in light of risks specific to the company/industry being reviewed. Thus, when agencies develop a bond rating, they also implicitly assess the capital adequacy of a firm.

Because FHA is essentially an insurer of mortgages, the credit rating approach reflects this methodology for issuing bond ratings for private mortgage insurers. This methodology is applied through a stress test using a most detrimental scenario to determine how long an insurer (FHA) would survive a Great Depression scenario. This scenario includes four consecutive years of 10 percent nominal declines in house prices, a rise in the unemployment rate to 20 percent, and 5 percentage point declines in interest rates. In our model, both the rise in unemployment and the decline in house value trigger sharply greater default. In fact, we estimate that the economic value of the existing business would fall to -$17.2 billion. As noted above, we assume that the social purpose of the Fund is such that it should not be expected to withstand such a calamity.

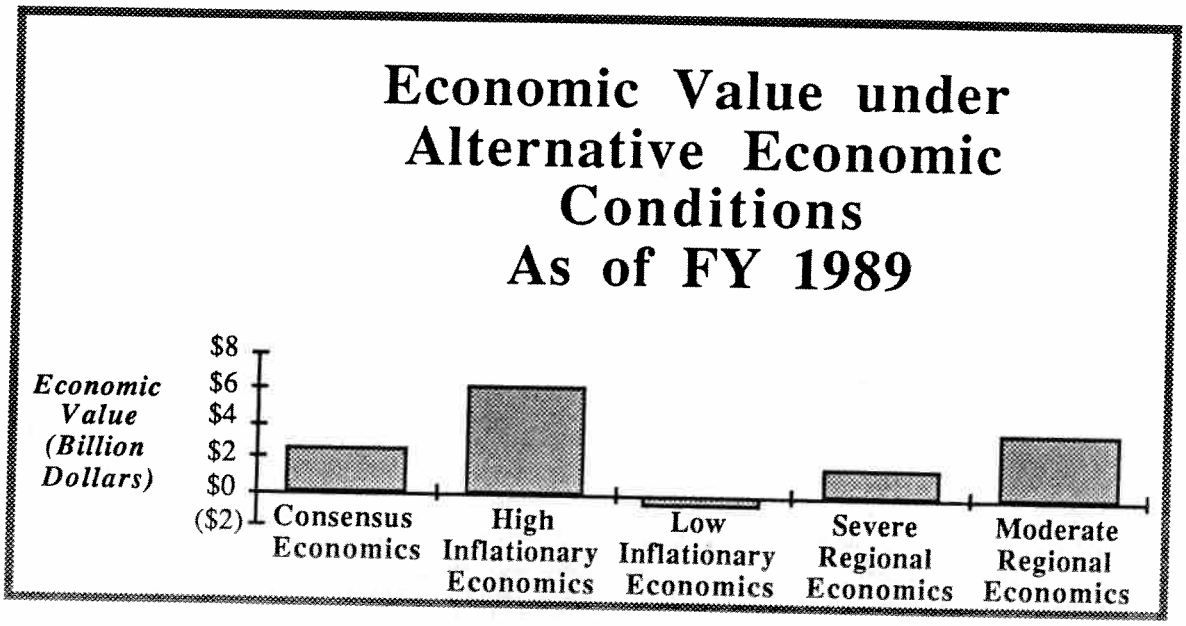
To evaluate the impact of lesser economic swings on the financial position of the Fund, two economic cycles were tested. The first is an extended period of rising interest rates coupled with rising inflation and house price appreciation followed by a period that reverses this trend. Such an economic climate would be comparable to the late 1970's and early 1980's. Ironically, economic conditions of this type that may be detrimental to the well-being of the macro economy are favorable to the mortgage insurers, including FHA. Rising inflation builds equity into the property and reduces the real mortgage debt obligation, thus reducing incentives to default on the properties.

The second cycle incorporates a period of low house price appreciation and interest rates and then an increase to today's levels. Such a period is expected to have a considerably adverse effect on the financial position of the Fund. Low house price appreciation will require a longer period in which the homeowner needs to build equity in the home sufficient to deter mortgage default. More specifically the cycles are:

	Low Inflation			High Inflation		
	House Price Appreciation	Mortgage Rate	Unemployment Rate	House Price Appreciation	Mortgage Rate	Unemployment Rate
1990-96	4.0-1.0%	9.5-6.5%	6.0%	6.0-14.0%	11.5-19.5%	5.0-7.0%
1997-04	1.0-4.0%	6.5-9.5%	6.0-5.5%	12.0-4.0%	17.5-9.5%	5.5-10.0%

Exhibit III-5 shows the economic value of the Fund under these two cycles in comparison to the earlier computed values for the consensus economics base case and the moderate and severe house price variation cases. As can be seen,the high inflation cycle would raise the value to $6.1 billion, while the low inflation cycle could reduce the value to -$0.7 billion.

EXHIBIT III-5



D. Recommendations for the Continued Soundness of the MMI Fund

We recommend that the MMI Fund have sufficient equity to survive an economic scenario that is more adverse than the base case. How large equity must be depends on how risky the insurance terms are (e.g., maximum loan-to-value ratio) and how adverse the scenario is.

The appropriate level of surplus, then, is the sum of two amounts:

- The loss of value of the current portfolio if adverse economic conditions occur. For purposes of our analysis, the current portfolio is defined to be the insurance-in-force at the end of fiscal year 1989.

- The value under adverse conditions of additional business written before current policies are changed. We assume, optimistically, that changes can be made during the current fiscal year. Thus, the value of the Fund must also be sufficient to offset the losses associated with adverse economics on an additional year of business, which in our analysis was taken to be 1990.

In conducting this analysis, we considered two adverse scenarios. The first is a downward revision of our baseline economics. The second is a moderate recession that is generally consistent with post-1951 recessions, although not as substantial as the cycles in the 1980's.

The downward revision scenario is somewhat less favorable than the consensus economics, but has a reasonable probability of occurring. The downward revision is:

- House price appreciation rates at 2.5 percent per year instead of 3.25 percent.
- House price dispersion rates calculated as the average of the 1975-89 rates and the 1980-89 rates. In contrast, the baseline dispersion rates are 90 percent of the 1980-89 rates, reflecting less price dispersion.
- Loss ratio at 40 percent, rather than 37 percent as in the baseline scenario.

These changes are assumed to persist throughout the term of the mortgages.

We emphasize that all of these components are not only possible but have occurred in the last ten years. Specifically, the downward revision assumes an average increase in constant quality house prices of 2.5 percent per year; the 1985 - 1989 average was 2.0 percent. The house price dispersion rates used in the downward revision are more favorable than the 1980's experience. The loss ratio of 40 percent used in this adverse scenario occurred three times in the 1980's. Exhibits III-6 and III-7 display the adverse house price appreciation and loss rates relative to their historical and baseline values.

EXHIBIT III-6

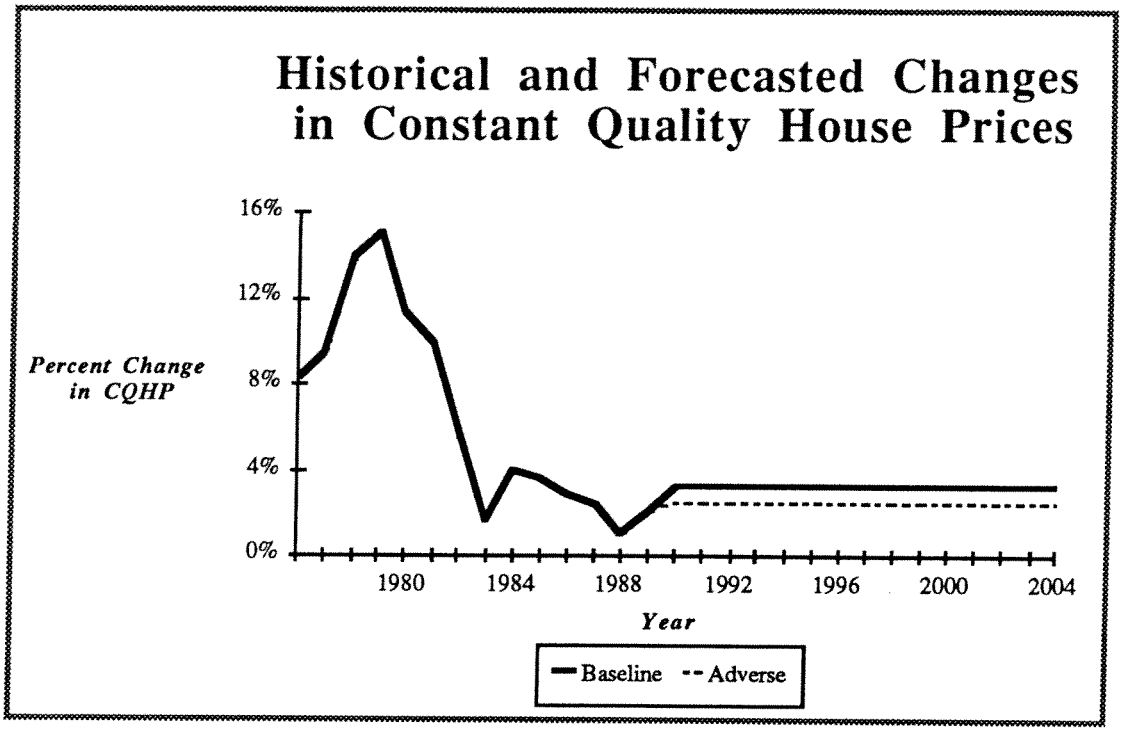
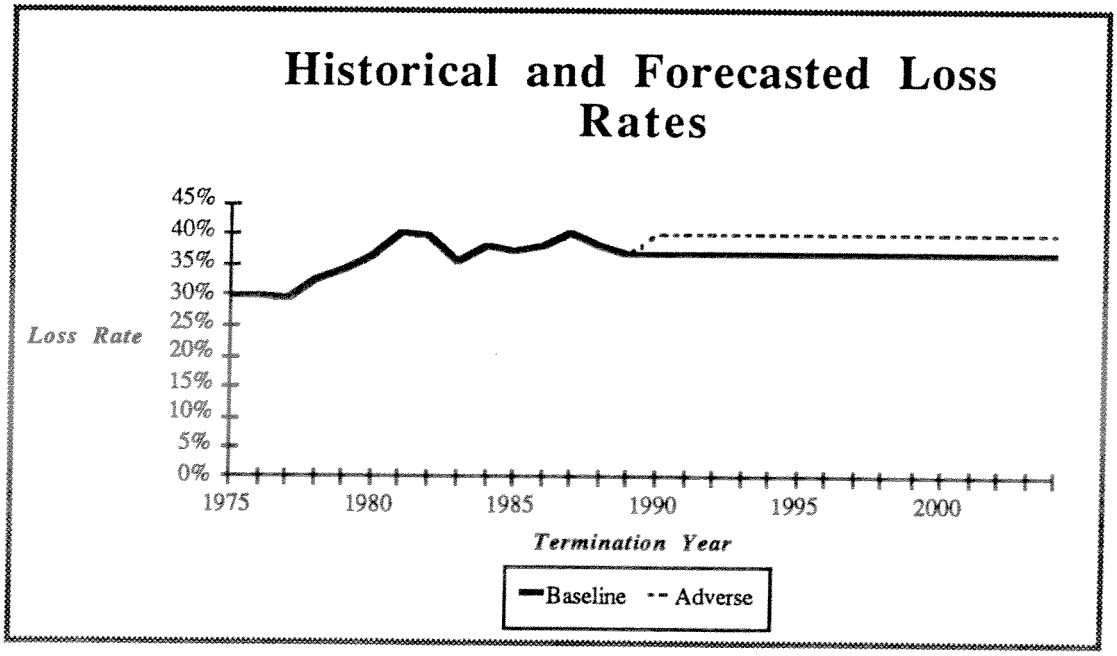


EXHIBIT III-7



Under the adverse economic conditions, the Fund's estimated value declines by $2.35 billion relative to the value estimated under consensus economics. Adverse economics will reduce the value of the 1990 business from -$208 million to -$667 million. This suggests that the Fund should have a value of $3.0 billion today, in order to remain solvent under this adverse scenario. This value is derived as the loss of value in the portfolio ($2.35 billion) plus the loss of value on the 1990 insurance ($0.67 billion).

The second scenario is what we term a moderate recession. In this we assume the following changes relative to the base case:

- Lower house price appreciation by 2 percentage points
- Lower interest rates by 1.5 percentage points
- Higher unemployment rates by 3 percentage points

These changes occur over two years and are phased out by the fifth year. At that time, the values return to the baseline economic scenario.

Under this recession scenario, the Fund's existing portfolio declines in value by $2.1 billion and the new business has a value of -$876 million. That is, the result is very similar to the adverse scenario in that market-value capital of $3.0 billion is required.

Based on this analysis of two potential adverse scenarios, the Fund should have an economic value of about $3.0 billion. At the end of fiscal year 1990, there will be roughly $300 billion insurance-in-force. Thus, the required ratio of capital to unamortized insurance could be set at one percent. However, our basic model slightly underpredicts defaults, and the response of default to the economic variables is estimated with some uncertainty. To be conservative, we allow for a 25 percent cushion in the $3.0 billion and set a capital standard of 1.25 percent of insurance-in-force. With $300 billion insurance-in-force, this translates into required economic capital of $3.75 billion. As of the end of fiscal year 1990, the Fund is expected to have an economic value of $2.4 billion, which is $1.35 billion short of the minimum 1.25 percent capital ratio.

The 1.25 percent is not a desired ratio, but a minimum ratio. As we saw in the 1980's, when the capital ratio declined from 5.3 percent to one percent, far more than 1.25 percent capital could be needed.

The market value of the Fund is based on the net present value of all future inflows and outflows expected to result from the current portfolio. Book value differs somewhat because GAAP precludes current recognition of future inflows. Today, book value is only about 75 percent of market value ($1.8 / $2.4). Thus, GAAP-equity of one percent of unamortized insurance-in-force is currently equivalent to an economic value of about 1.25 percent of insurance-in-force.

We would recommend, however, that this guideline be reviewed over time to reflect changing economic conditions. For example, if policies are changed and adverse conditions do not develop, equity in the Fund will build over time relative to amortized insurance-in-force. On the other hand, an even worse economic scenario could develop. Either event would call for a reassessment of the MMI insurance terms.

Similarly, future changes in the Fund portfolio or economic conditions will cause changes in the relationship between book value and market value. While market value is a better measure of the Fund's ability to withstand changes in the economic climate, book value is a more widely reported value and is based on the financial statements. For these reasons, the relationship between market and book value should be monitored periodically.

E. Present Position

In order to be in a long-term sound financial position, the Fund requires a value of $3.75 billion, compared to its current economic value of $2.4 billion. That is, even without the payment of distributive shares, the Fund is substantially short.

Of equal concern is that additional business written by the Fund has a value of -$208 million under consensus economics. That is, new business is likely to erode equity rather than building it as desired. In the next section, we examine policies that enable FHA to meet the capital adequacy standards on the new business.

IV. FHA Policy Options for Insuring New Mortgages

In the previous two sections we recommended that the MMI Fund maintain equity equal to 1.25 percent of insurance-in-force. In this section we present various policy options designed to allow new business to add economic value equal to 1.25 percent of insurance written. We also indicate policies that will both do this and allow payment of distributive shares.

These policy options are suggested in light of the following:

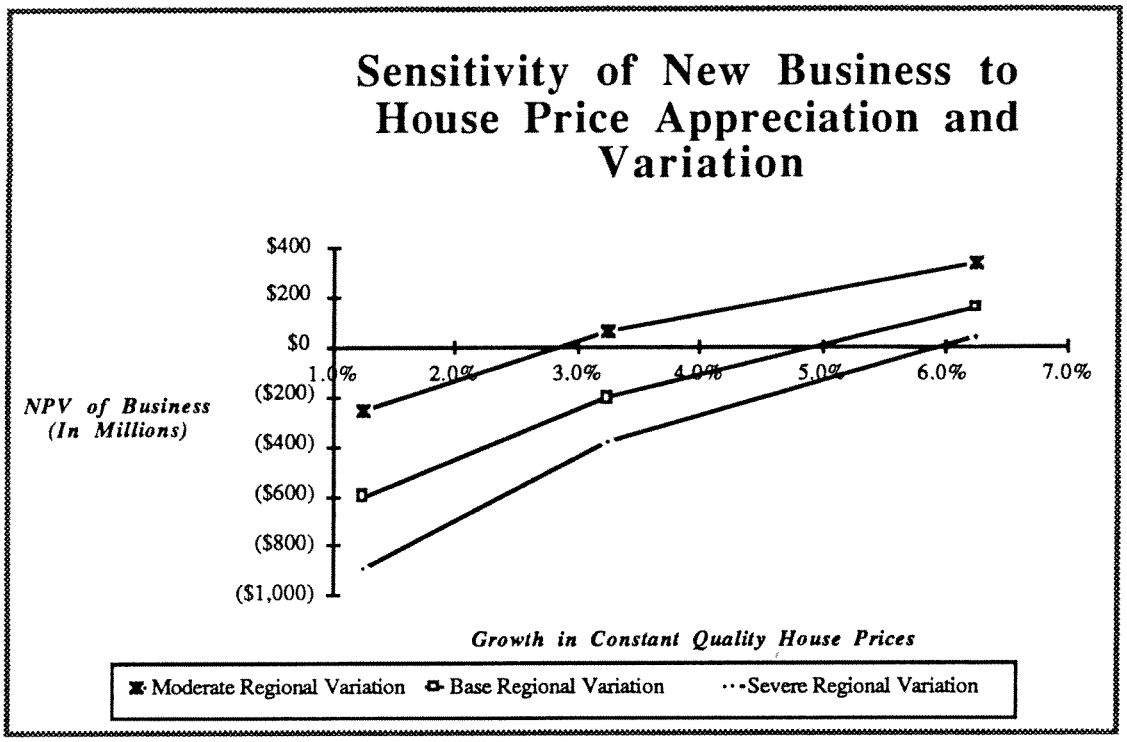
- *Under consensus economic conditions, each additional year of new business will reduce the value of the Fund by about $200 million if current policies are maintained.*
- *Reasonably possible, but adverse, economic scenarios would result in the Fund's economic value quickly becoming negative .*

A. Current Conditions

We estimated the value to the Fund of FHA's 1990 business under existing terms and conditions. This analysis was based on consensus economic conditions and a distribution of business by loan size and loan-to-value that is similar to the business written in 1989. Under these assumptions, we estimate that 11.6 percent of loans insured by FHA in 1990 will default at some time during their lives. This business has a present economic value to FHA of -$208 million. In other words, loans insured during 1990 under current policies are expected to reduce the value of the Fund by $208 million.

Like our earlier results, this figure is sensitive to the assumptions made about the economic climate over the next 30 years. Exhibit IV-1 shows the expected results under alternative house price appreciation and regional variation assumptions. While the exact values vary depending on the nature of the economy, the expected value of the 1990 business is negative under most reasonable assumptions. The 1990 business will break even only if constant quality house prices increase at the rate of about 4.6 percent per year for a thirty-year period. This seems unlikely since the constant quality house price inflation rate since 1981 has averaged 2.7 percent and has been only 2.1 percent since 1985.

EXHIBIT IV-1



B. Alternative Policies Affecting the Terms and Conditions of Insurance

In order to avoid insolvency, the terms of FHA insurance must be revised. Based on our previous analysis, the policy options needed to strengthen the Fund are fairly straightforward and can be categorized as follows:

- Raise the premium
- Restructure the premium
- Raise the minimum downpayment
- Reduce the losses experienced when a property defaults

The last policy is affected by management practices and state laws requiring waiting periods between default and foreclosure. Although there is substantial room for improvement in management practices and reduction in losses per property, we have not assumed that considerable changes will occur. We have assumed a loss ratio of 37 percent which represents a slight improvement over the loss ratio of the most recent years. Exhibit II-5, which showed that the loss ratio remained high throughout the 1980's, does not provide an historical basis for assuming strong improvements in the loss ratio. This, coupled with the potential impact of RTC property sales, cautions against optimistic property sale assumptions as a basis for improving the MMI Fund's equity position. Further, such improvements are

normally slow to implement and difficult to achieve. As a result, it is prudent to focus on the terms and conditions of insurance than have a more direct and measurable effect on the Fund's financial soundness.

The following chart summarizes the various policy measures to achieve two different goals under consensus economics: (1) build equity equal to 1.25 percent of the net new business added ($48 billion written less $15 billion terminated), and (2) build this equity and earn sufficient revenue to continue paying distributive shares. Building equity necessitates a $625 million improvement in value (to $415 million) and building equity and paying distributive share requires a $760 million increase (to $550 million).

	Build Equity	Build Equity & Pay Distributive Shares
1) Raise Premium to:	5.6%	6.0%
2) Raise Required Downpayment to:	10%	11%
3) Restructure the Premium to an Up-front / annual premium	1.35% up-front 0.5% annually for the mortgage life	1.6% up-front 0.5% annually for the mortgage life
4) Charge 3.8% up-front to all borrowers and 0.5% annual premium for a varying length depending on the initial LTV:		
0-90%	0 years	0 years
90-93%	4 years	4 years
93-95%	7 years	10 years
> 95%	11 years	15 years

These policy measures will enable the Fund to build equity to 1.25 percent on new business. They will not, however, enable the Fund to meet the capital requirements on existing business. To do so, these policy options would have to be even stronger. For instance, MMI might consider charging a premium that would enable FHA to build equity on new business and pay distributive shares but use the distributive share capital to build equity on the existing business. In this manner, the Fund would reach its capital requirements slowly over time. Charging the higher premium -- whether it is used to pay distributive shares or to build equity for the existing book -- places the burden of correcting the errors of the 1980's on the new business.

The policies examined tend to raise the cash required by borrowers and/or eliminate certain categories of very risky loans. In some cases, potential homebuyers may have to wait longer to purchase a home due to the increased cash needed at closing. When measures require purchasers to put up more cash, we anticipate that purchasers who would otherwise have borrowed less than the maximum amount will increase their loan to provide the additional cash. Our calculations reflect this behavioral response.

Following is a discussion of each policy scenario.

Policy Scenario 1 -- Raise the Premium

One obvious method to improve the financial position of new business is simply to increase the insurance premium. If the premium can be raised high enough to offset expected losses, the business can be made profitable. Increasing the premium would also temporarily increase Federal budget receipts.

Advantages:

- Administratively simple -- charging a higher premium does not involve many internal operation charges.
- Requires only a minimal increase in household up-front cash contribution.

Disadvantages:

- Because the premium can be financed, an increase in the premium reduces the quality of the business written. Mortgagors are assumed to borrow the additional premium amount and increase their "true" loan-to-value ratios. The premium must be raised even higher to offset the additional default risk.
- FHA will become somewhat less competitive with the private mortgage insurers. Adverse selection should be anticipated as lower risk borrowers might be able to obtain better terms from private insurers. The greater risk encountered at higher premium levels is exacerbated by FHA's policy of charging one premium to all borrowers, regardless of risk. The private insurers offer lower premiums for better quality loans and may be more attractive to FHA's lower risk borrowers. Because we have not built adverse selection into our calculation, the premium should be increased by greater amounts than we have indicated.

Under this policy option, the premium required to break-even assuming distributive shares are suspended is approximately 4.4%. If distributive shares are suspended, the build-equity premium required is 5.6% and the build-plus-pay distributive shares premium is 6.0%. Because the premium can be financed, the "true" loan-to-value ratio increases, as does the ultimate claim rate. The following table illustrates the impact of this policy on ultimate claim rates and the present value of the business.

	Ultimate Claim Rate	Net Present Value of Business
Premium = 3.8%	11.5%	($208) M
Premium = 4.5%	11.7%	$36 M
Premium = 5.0%	11.9%	$209 M
Premium = 5.5%	12.0%	$381 M
Premium = 6.0%	12.1%	$550 M

As illustrated, although the net value of the business has improved under the 6.0% premium policy, the risk of this business has increased because the ultimate claim rate is 0.6 percent higher than currently. The increased risk of this policy serves to deteriorate the net worth of the business under more adverse economic conditions.

Policy Scenario 2 -- Raise the Required Downpayment

The Fund's financial position can also be improved by restricting FHA from writing high risk loans. Because risk is most directly reflected in the loan-to-value ratio, this policy would require a higher minimum downpayment . By excluding riskier loans, the premium charge is more consistent with individual loan risk (the cross subsidization from low LTV borrowers is reduced).

Advantages:

- Improves the equity position of the borrower and thus reduces the risk of default.
- Will not induce adverse selection because the downpayment is raised least for the least risky current borrowers.

Disadvantages:

- Requires an increased cash investment for the borrower at closing. During fiscal year 1989, approximately 215,000 borrowers put less than 5 percent down and another 168,000 put between 5 and 10 percent down. These borrowers account for 40 and 32 percent, respectively, of MMI loans endorsed in 1989. Depending on the severity of the new downpayment requirement, these borrowers would have to accumulate anywhere from $1,000 - $7,000 more in up-front cash. This will require potential homebuyers to wait longer to buy a home.

In order for MMI to break even under this policy option, the required downpayment would have to be about 5.75% of the home value, premium, and closing costs. To build equity equal to 1.25 percent of the net increase in insurance-in-force, roughly a 10% downpayment would be required. To do this and continue to pay distributive shares, the downpayment requirement must be increased to approximately 11%. The following table illustrates the effect on the up-front cash requirement of homebuyers when downpayment requirements are raised.

	Ultimate Claim Rate	Net Present Value of Business	Increase in Cash Required Up-front
Current Policy	11.5%	($208) M	--
Downpayment = 5%	10.2%	($86)M	1.3% -- 2.3% *
Downpayment = 7%	9.5%	$47 M	3.5% -- 4.5% *
Downpayment = 10%	5.4%	$430 M	6.7% -- 7.7% *

*Percentage of the mortgage amount; values given for $100,000 and $50,000.

Under all of the policies that increase downpayment requirements, the borrower is still allowed to finance the majority of the premium and closing costs. Thus, the true LTV is approximately 6.8 percentage points higher than the FHA-defined LTV. In comparison, private mortgage insurers insure loans with a minimum downpayment requirement of 5.0% but do not allow financing of the premium or closing costs and, therefore, their loans have a maximum true LTV of 95%.

Policy Scenario 3 -- Restructure the Premium

In 1983, the FHA insurance premium was changed from a "pay-as-you-go" structure to an up-front payment. Because the up-front premium can be financed, the impact on the borrower is minimized. However, FHA receives cash earlier under the current policy.

As discussed earlier, the major problems with the up-front premium are: (1) the ability to finance the premium may somewhat erode the borrower's equity, and (2) because the premium is financed, FHA effectively collects virtually none of the premium when a loan defaults.

One policy option is to reduce the up-front premium and return to a more "pay-as-you-go" structure. The alternative we examined requires an initial, non-refundable fee and an annual payment of one-half of one percent of the remaining loan balance.

Advantages:

- The premium is not financed.
- Borrowers defaulting in the third year will have paid a 2.25 to 2.60 percent premium, as opposed to almost nothing under current policy.
- Eliminates entirely the need to refund the premium when loans are refinanced.
- Provides flexibility. For example, if FHA finds that this structure brings in too much revenue, the annual charge can be stopped after a given number of years. Alternatively, excess premiums can be distributed back to borrowers.
- Would not substantially increase the initial cash required by the borrower.

Disadvantages:

- Some adverse selection might be expected. (Lower LTV borrowers are more likely to shift to conventional loans than are higher LTV borrowers.) To minimize adverse selection, a variation of this policy that allows for a risk-based premium structure could be developed.
- Moving away from an up-front premium will substantially decrease cash inflows to the Treasury. The resulting impact on the government's deficit is unfavorable. To lessen the impact on the budget, we suggest a phase-in of this policy over five years.

We estimate that if one percent is paid in cash up-front and one-half of one percent is paid annually for fourteen years, the value of new business will be positive. To build equity, 1.35 percent must be paid up-front and 0.5 percent must be paid over the full term of the mortgage. Another 0.25 percent is needed up-front to pay distributive shares. The impact of alternative combinations on the claim rate, NPV of the business, and the up-front cash required is:

	Ultimate Claim Rate	Net Present Value of Business	Increase in Cash Required Up-front
Current Policy	11.5%	-$208 M	--
1% Up-front / 0.5% annually for 14 years	11.7%	$11 M	1%*
1.25% Up-front / 0.5% annually for 30 years	11.5%	$350 M	1.25%*
1.5% Up-front / 0.5% annually for 30 years	11.1%	$494 M	1.5%*

*Percentage of the mortgage amount.

This restructuring can be implemented gradually. One possible phase-in schedule is detailed below:

Year	Cash Up-front	Financed Up-front Premium	Annual Premium
1	1.25%	3.2%	0.1%
2	1.25%	2.4%	0.2%
3	1.25%	1.6%	0.3%
4	1.25%	0.8%	0.4%
5	1.25%	0.0%	0.5%

The above schedule provides for an equal net present value of premiums for each of five phase-in years, while preventing a large, immediate drop in cash flows. The long-term benefits of the 1.25 percent up-front / 0.5 percent annual premium are preserved, and the possible short-term negative effects on the Fund's cash position and therefore on the government's deficit are minimized.

Policy Scenario 4 -- Set Risk-based Premiums

MMI could improve the financial performance of its new business by setting premiums based on loan risk. This policy would allow MMI to increase the premium required for loans that are most risky, while not increasing the burden on its less risky, more profitable business. Thus, a major disadvantage of increasing the premium -- causing adverse selection -- is circumvented.

In analyzing such a policy, we categorized the loans into four risk classes based on their initial LTV: (1) less than 90%, (2) 90% - 93%, (3) 93% - 95%, and (4) greater than 95%. We maintain the basic 3.8 percent up-front premium but add a 0.5 percent annual premium to higher LTV loans for a number of years. The years of the 0.5 percent premium is paid for two alternative policies are listed below.

	Build Equity		Build Equity and Pay Distributive Shares	
LTV	Years of 0.5% Premium	Present Value of Premium	Years of 0.5% Premium	Present Value of Premium
Option 1:				
< 93%	0	3.8%	0	3.8%
> 93%	11	7.1%	15	7.5%
Option 2:				
<90%	0	3.8%	0	3.8%
90% - 93%	4	5.4%	4	5.4%
93% - 95%	7	6.3%	10	6.9%
> 95%	11	7.1%	15	7.5%

The reduction in the cross-subsidy among different LTV borrowers caused by these variations in the premium are indicated below. The cost of the insurance relative to the premium received is approximated by the ratio of the historic average claim rate to the present value of the premium paid, where a higher value indicates a better deal for the borrower. Under current policy, higher LTV borrowers have a much better deal than lower LTV borrowers. In fact, those with LTVs over 95 percent pay less than half as much per unit risk as those with LTVs under 90 percent. With the risk-varying premiums, the cross subsidies are sharply reduced.

		Claim Rate / Present Value of Premium		
LTV	Claim Rate*	Current Policy	Build Equity	Build Equity & Pay Dist. Shares
Option 1:				
< 93%	4.0	1.05	1.05	1.05
> 93%	7.6	2.00	1.08	1.01
Option 2:				
<90%	3.5	0.92	0.92	0.92
90% - 93%	4.9	1.29	0.90	0.90
93% - 95%	6.4	1.68	1.02	0.93
> 95%	8.0	2.11	1.13	1.06

*Claim rates from Exhibit II-2; where averages of weights are calculated, we use the distribution of the 1988-89 business from Exhibit II-8.

Policy Scenario 5 -- Raise the Loan Limits

Loans above $101,250 are less risky than smaller loans under current FHA policy because the minimum downpayment requirement on that part of the loan above $101,250 is 10 percent. In addition, our analysis of the FHA portfolio found that the risk of default declines slightly with the size of the loan. Most of this effect, however, is found as loan sizes increase from the smallest loans up to $40,000. Very little difference is found between $50,000 and $100,000 loans.

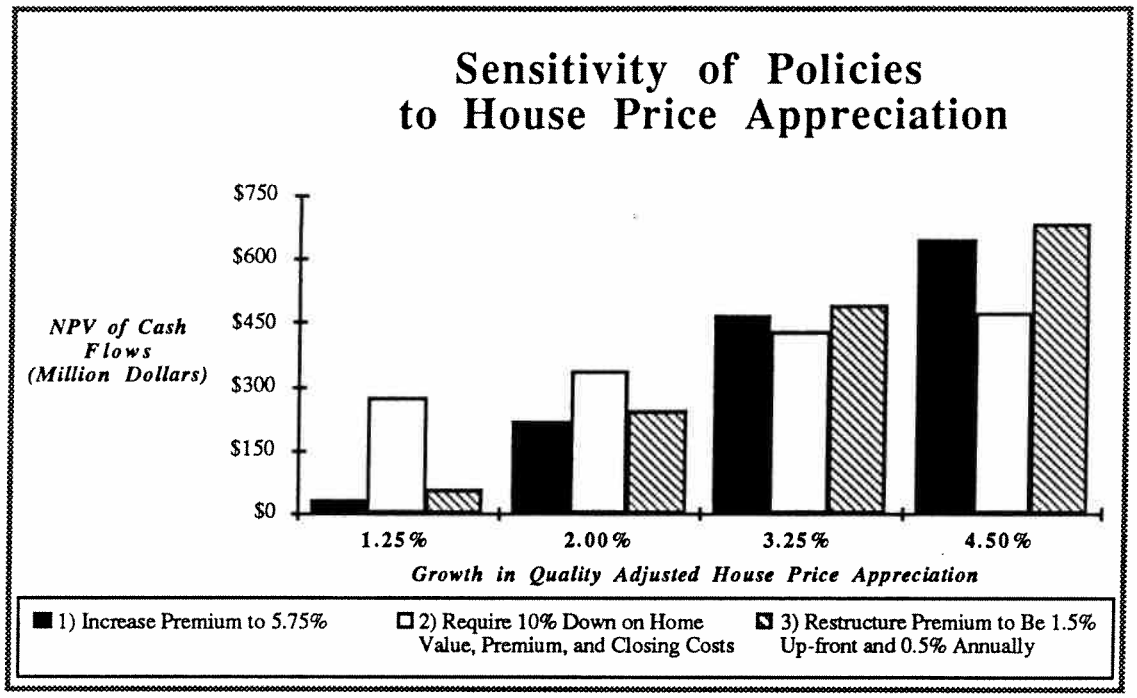
Increasing the loan limit to 95% of the state median house price is estimated to increase FHA 1990 business from $48 billion to $54 billion. Under FHA's current policies, the loan limit is 95% of an area's median home price limited to $125,000. With the higher loan limit, a policy of charging a 1.5% non-refundable cash premium up-front and 0.5% of the outstanding mortgage balance over the life of the loan is estimated to produce a 1990 book of business with equity of $572 million or $78 million more than the same policy produces without the higher loan limit. While increasing the loan limit would increase the value of the Fund under the policy analyzed, the $6 billion in additional business means that the Fund is subject to greater risk. In fact, $75 million of the $78 million additional capital produced by this policy is required as additional capital to meet the 1.25 percent of insurance standard.

Raising the loan limit raises another issue. One can rationalize having MMI premiums that build only enough capital to withstand a recession, while most private insurers must have sufficient capital to withstand a depression, on the basis of the social purpose of the MMI Fund. However, as the MMI insures higher and higher income households, the social purpose argument becomes less compelling, and, thus higher capital standards and insurance premiums become more appropriate.

C. Relative Sensitivity of Alternative Policies to Changes in Economic Conditions

The ability of the Fund to build equity under these policy options depends heavily on the economic conditions assumed. These policies were calibrated to provide roughly the same $450 million assuming consensus economics (3.25 percent quality-adjusted house price appreciation). Exhibit IV-2 illustrates the sensitivity of the net present value of the 1990 business to changes in quality-adjusted house price appreciation.

EXHIBIT IV-2



As can be seen, the Fund value is far less sensitive to economic conditions if the option of raising the downpayment is adopted rather than if the premium increase / restructure options are chosen. If the downpayment option were adopted, the required capital standard on new business for MMI could arguably be lowered to, say, one percent of insurance-in-force and thus the required increase in the downpayment would be less.

D. Conclusions

The policy options discussed above improve the financial performance of new business by increasing revenues generated by new business and/or reducing losses incurred by new business. Raising the insurance premium is a simple method to generate higher revenue. However, because MMI allows the premium to be financed, the true LTV of these loans is increased and, thus, risk also increases.

Similarly, restructuring the premium can increase the Fund's revenue. In addition, because borrowers are required to put down the up-front portion in cash, this policy enables FHA to collect a larger portion of the premium on those loans that default. However, this policy does very little to reduce the risk of the business. When possible, borrowers who are forced to put cash up-front for the premium will use cash from their current downpayment and consequently will not reduce the amount of their mortgage. In addition, borrowers view the annual mortgage premium as an increased mortgage obligation, and therefore, their equity is reduced. As illustrated in Exhibit IV-2, both raising and restructuring the premium are very sensitive to changes in economic conditions because they do not reduce the risk of the new

business. In addition, both of these policies could lead to adverse selection (less risky borrowers opting for conventional loans).

In contrast, raising the downpayment requirement reduces the sensitivity to changes in economic conditions. Because their initial equity is much stronger under this policy, borrowers are not as sensitive to changes in house price appreciation. Of course, unlike raising or restructuring the premium, this policy requires substantially more up-front cash from borrowers. Finally, neither raising the downpayment nor raising the premium only for riskier borrowers will lead to adverse selection.

APPENDIX A: ANALYSIS OF LOAN PERFORMANCE

This appendix focuses on the behavior of conditional claim rates and conditional prepayment rates for 30-year fixed-rate loans originated between 1975 and 1989. Economic models are developed to explain the probability of claim and non-claim termination and in turn are used to project claims and prepayments over the life of the mortgage. The forecasts of claims and prepayments under alternative economic scenarios are incorporated into the cash flow and financial analysis of the MMI Fund.

I. APPROACH AND METHODOLOGY TO ESTIMATE CONDITIONAL CLAIM RATES

An economic model is formulated for conditional claim rates of FHA-insured loans and estimated to determine the sensitivity of economic and policy factors that impact loan performance. The model is estimated using data for loan origination years 1975 through 1987 and associated historical policy years through 1989. The results of this estimated model are used to project FHA-insured loan conditional claim rates for the 1975-89 loan origination years and their associated future policy years.

A. Economic Model

The economic model is developed from the theory of consumer choice to identify expected mortgage borrower's behavior under an objective of maximizing the expected wealth at termination of the mortgage. Four choices are available to borrowers in the course of meeting their mortgage obligations:

1) default on mortgage,
2) prepay through refinancing,
3) prepay through sale, and
4) continue paying mortgage.

The borrowers choose the option that maximizes the discounted value of expected wealth over time. We initially focus on the loan default option. The prepayment options are considered in the next section.

Using this wealth maximizing approach, borrowers' decision to default will be determined largely by their perceptions of home equity and whether or not they desire or are forced to move. Specifically, when real estate markets experience significant and sustained declines, homeowners may be able to maximize their wealth by walking away from the property. This choice will be exercised when the resale value of the home falls sufficiently below the market value of the remaining mortgage balance to outweigh the costs of default, both economic and non-economic. Alternatively, when a household is forced to move, a resale value net

of selling costs that exceeds the value of the mortgage may be sufficient to trigger default. Thus events such as divorce and unemployment that can cause households to move are likely to be associated with higher default rates.

The conditional claim rate, $CCR_{j,t}$, for FHA insured mortgages originated in year *j* that have been foreclosed in year *t* can be expressed as

$$CCR_{j,t} = f(E_{j,t}, U_{t-1}, SD\_RCQHP_t, D_1 \ldots D_n) \quad 1)$$

where:

- $E_{j,t}$ - the net equity as a percent of the current market value in the property,
- U_{t-1} - the unemployment rate lagged one policy year,
- SD_RCQHP_t - a house price dispersion index defined as the standard error of the regional percentage changes in constant quality house price index since the mortgage was originated divided by one plus the percentage change in the national constant quality house price index since mortgage origination,
- D_n - dummy variable for each of *n* policy years taking on a value of one in the respective policy year and zero otherwise.

The conditional claim rate model employs information about economic conditions and specific loan characteristics to explain borrower default behavior. The conditional claim rate is used instead of a default rate measure because the model explains the rate of FHA claim payment on mortgages that have moved from default to bank foreclosure. Default rates summarize the economic events associated with the consumer choice concerning mortgage payment. A portion of mortgage defaults will be cured thus not generating a claim filing on the part of the bank. However, the rate of claim payout follows directly from default and occurs with a lag due to administrative and statutory considerations. Therefore, a default rate model can be used to estimate claim rates with appropriate lag specification.

B. Measure of Net Equity

In general, increases in net equity in properties will lower the expected default incidence. Higher home price appreciation will increase homeowner equity, as will decreases in the market value of the mortgage liability. The mortgage can be viewed as an obligation to make periodic principal and interest payments with the expectation that prepayment of the mortgage will occur before maturity. The present value is obtained for these payments using the current mortgage interest rate as the discount rate. When the current interest rate falls below (rises above) the original loan contract rate, the market value of the mortgage rises above (falls below) the remaining balance.

The FHA 3.8 percent up-front premium payment policy initiated in 1984 has an asset value to the borrower associated with the policy to refund the unearned portion of the paid-in premium. Thus the asset value of the premium refund is included in the determination of the net equity index. The asset value of the premium refund depreciates quickly in accordance with the refund policy as the FHA recognizes as "earned revenue" the up-front premium cash receipts; after seven years the refund value diminishes to less than one percent.

The net equity index in policy year t for properties purchased in year j is

$$EI_{j,t} = \frac{P_0 * (1 + r_{j,t} - 0.01)^t + M_0 * PREM_{j,t} - M_0 * MV_{j,t}}{P_0 * (1 + r_{j,t} - 0.01)^t} \quad 2)$$

where:

P_0 - the purchase price of the property,

$r_{j,t}$ - the annual rate of change in the constant quality price index from loan origination to policy year t which, net of one percent depreciation, is used to grow property value over time,

$PREM_{j,t}$ - the refund value of the premium expressed as a percent of the total loan amount,

M_0 - the total mortgage amount including the financed premium amount,

$MV_{j,t}$ - the discounted value of amortized mortgage payments plus a future prepayment amount for a one dollar mortgage.

Cancelling P_0 and substituting LTV_c for M_0 / P_0, the conventional definition of the loan-to-value ratio, yields,

$$EI_{j,t} = \frac{(1 + r_{j,t} - 0.01)^t + LTV_c * PREM_{j,t} - LTV_c * MV_{j,t}}{(1 + r_{j,t} - 0.01)^t} \quad 3)$$

FHA policy allows one to borrow both a fraction, LTV_f, of the value of the property, allowed closing costs and the insurance premium equal to 3.8 percent of the former. If allowable closing costs equal c percent of P_0 and the premium is borrowed, then,

$$M_0 = LTV_f * (1 + c) * (1.038) * P_0 \quad 4)$$

Dividing by P_0, the relationship between the conventional LTV_c and the FHA loan-to-value ratio, LTV_f, is:

$$LTV_c = LTV_f * (1 + c) * (1.038) \quad 5)$$

Assuming that allowable closing costs are 3.0% on the property value, the effective loan-to-value, LTV_c, is 1.069 times the FHA definition. That is, the maximum FHA LTV_f of 97% is equivalent to a LTV_c of 103.7% and as such gives the borrower a negative net equity position at loan origination, before consideration of the remaining premium refund value. The measure of contemporaneous net equity for the borrower can thus be expressed as

$$EI_{j,t} = \frac{(1 + r_{j,t} - 0.01)^t + LTV_f * (1.0694) * (PREM_{j,t} - MV_{j,t})}{(1 + r_{j,t} - 0.01)^t} \quad 6)$$

The market value of an original one-dollar mortgage, $MV_{j,t}$, is formally defined as the discounted value of expected future principal and interest payments plus the present value of an expected future prepayment of the remaining balance on the mortgage[1]. It is presumed that the borrower will not hold the mortgage for the full term, but rather will prepay at 40% of the remaining life.

Large drops in prevailing interest rates below the original contract rate could lead to default. Defaulting, however, is not the only, or even generally the preferred way to end a high coupon mortgage. Such a mortgage can be refinanced. To account for this, if the current coupon falls over 3 percentage points below the original loan contract rate, we use the original contract rate less three points as the discount rate.

Table A.1 shows, for loans that originated in 1983, the fluctuations in net equity index from 1983 through 1989. The higher LTV loans have a precariously low if not negative equity position for some time. Further, when current mortgage interest rates move above or below the contract rate, this carries through to the net equity value index. Over time the longer term tendency toward increasing house prices (captured by growth in constant quality house prices) coupled with the amortization of the mortgage balance (measured by the mortgage value) begins to dominate, and the equity index increases significantly. Not surprisingly, the experience with loan default is that the risk is most pronounced in the early years and diminishes significantly in the later years.

TABLE A.1

EQUITY INDEX FOR 1983 ORIGINATED LOANS BY LTV
Original Mortgage Contract Rate: 12.4%

YEAR	POLICY YEAR	NEW ISSUE RATE	MORTGAGE VALUE	GROWTH CONSTANT QUALITY HP	LTV 80%	87.5%	91.5%	94%	96%
1983	1	13.4	0.971	1.015	0.212	0.138	0.098	0.074	0.054
1984	2	13.8	0.945	1.043	0.254	0.184	0.146	0.123	0.104
1985	3	12.9	0.989	1.067	0.236	0.164	0.126	0.102	0.083
1986	4	10.7	1.109	1.085	0.157	0.078	0.036	0.010	-0.011
1987	5	9.9	1.153	1.092	0.130	0.048	0.005	-0.022	-0.044
1988	6	10.5	1.111	1.098	0.166	0.088	0.046	0.020	-0.001
1989	7	10.5	1.094	1.112	0.190	0.114	0.073	0.048	0.027
1990	8	10.3	1.095	1.129	0.201	0.126	0.086	0.061	0.041

[1]It is assumed that the up-front premium was financed and therefore, included in the total mortgage. This increases the annual mortgage liability payments. For mortgages originated before 1984 a 0.5 percent annual premium policy was in effect. In our analysis the 0.5 percent premium was added to the mortgage coupon each year in determining the mortgage payments and thus market value of the mortgage. This procedure is also followed in our analysis of the policy re-introducing the 0.5 percent premium.

The contemporaneous net equity index captures the joint effects of house price fluctuations, interest rate movements and initial LTV. Higher LTV ratios at loan origination will lower the net equity position and thus will increase the risk of loan default. The experience of FHA-insured loans indicates that the default rates not only increase for higher LTVs also accelerate at levels above 90%. The acceleration effect will not be captured in this specification. Therefore, separate regression models are estimated for each of the LTV categories.

C. Variability in Regional House Price Appreciation

The analysis of loan default focuses on explaining default behavior for groups of borrowers based on characteristics deemed to be important to determining the probability of loan default. In doing so, a national measure of the average rate of change in house prices has been employed in computing the equity index. While house prices have increased consistently when measured on a national aggregate basis, when viewed in terms of the four census regions, more variability in house price movements occur. Further disaggregation into twelve regions shows even more pronounced fluctuations in house price movements in both a positive and negative direction. It is expected that the low or negative price movements in selected regions will have a greater contribution to the likelihood of default and foreclosure; macro indicators will not capture adequately the causal relationship between weak house price appreciation in localized areas and the probability of default and foreclosure.

While the average property is experiencing positive growth in house value so that widespread borrower default is not likely, there may be some borrowers who are at risk because their regional or individual housing market is experiencing falling house prices. It is the borrowers in the tail of a distribution for national house price appreciation that are at greatest risk of default. Increased volatility of house price movements will have an associated increase in properties that have small or negative changes in their house value. This dispersion in house price appreciation over time should be directly linked to fluctuations in the aggregate variation in default rates associated with the concentration of default incidence in regionally stressed areas.

To test the effects of the dispersion in house price appreciation across regions on aggregate default rates, an index has be constructed using the four regional constant quality house price indexes from the Bureau of the Census. First, for each of the regions and the nation in aggregate, the ratio of the constant quality house price index in year t to the value in the origination year is computed. Then for each loan origination year and policy year the standard deviation of these regional ratios is computed and divided by the national ratio to provide a measure of relative dispersion in house price appreciation. Deflating the standard deviation in house price variation by a national ratio adjusts for the general overall trend in house prices.

Table A.2 presents the dispersion index. The average for each policy year is reported in the far right column[2]. As can be seen by concentrating on the data between the jagged lines, for all loan origination years the index jumps for the policy years between 1985 and 1987, reflecting the experience in the oil patch states.

TABLE A.2

HISTORICAL DISPERSION IN HOUSE PRICE APPRECIATION
Across Four Census Regions Using Constant Quality House Prices

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	AVERAGE
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	2.1	3.0	3.3	1.5	2.1	1.5	1.2	2.9	3.3	4.2	7.9	4.6	2.7	1.9	3.0
3	4.9	6.3	4.4	3.3	2.1	2.3	2.3	5.2	7.0	12.4	13.1	6.5	2.5		5.6
4	8.0	7.3	5.6	2.8	2.4	3.3	4.7	9.6	15.7	17.9	14.7	6.6			8.2
5	8.9	8.2	4.3	2.5	4.3	6.0	9.0	18.7	21.6	19.4	14.8				10.7
6	9.5	6.6	3.7	4.8	6.1	10.1	17.9	24.8	23.3	19.6					12.6
7	7.9	6.1	4.9	6.1	10.4	19.0	23.9	26.4	23.4						14.2
8	7.6	6.3	4.4	10.6	19.0	25.0	25.5	26.5							15.6
9	7.1	4.3	8.4	19.2	24.9	26.6	25.6								16.6
10	4.5	6.8	16.6	25.2	26.4	26.7									17.7
11	5.5	14.2	22.4	26.6	26.5										19.0
12	12.0	19.6	23.6	26.8											20.5
13	17.2	20.7	23.9												20.6
14	18.2	21.2													19.7
15	18.7														18.7

D. Additional Economic Indicators Used in the Analysis

Some of the other raw data used in the estimation are reported in Table A.3; the claim, prepayment and conditional probabilities are listed at the end of Appendix C.

[2]An index computed from data supplied on 12 Census sub-regions looks very similar to that in Table A.2. Forecast scenarios of house price dispersion are developed with reference to the average dispersion over the period 1975-89. Specifically, for the baseline case 90 percent of the average dispersion was applied; for the moderate 70 percent of average was applied; and for the severe case 100 percent was applied for the first 5 years, 110 percent above the 1975-88 average for the next 2 years, 120 percent above average for policy years 8 through 12 and 130 percent for the remaining policy years.

TABLE A.3

HISTORICAL DATA OF ECONOMIC VARIABLES USED IN THE ANALYSIS
Referenced on a Fiscal Year Basis

YEAR	CONSTANT QUALITY HOUSE PRICES	FHA CONTRACT INTEREST RATE	FREDDIE MAC COMMITMENT RATE	UNEMPLOYMENT RATE
1975	49.8	8.63%	9.20%	8.1%
1976	54.0	8.50	8.94	7.8
1977	59.1	8.25	8.82	7.3
1978	67.3	9.02	9.34	6.0
1979	77.4	9.96	10.61	5.8
1980	86.2	12.23	13.23	6.8
1981	94.7	15.10	15.76	7.4
1982	100.1	14.71	17.02	9.1
1983	101.8	12.38	13.37	10.1
1984	105.9	13.18	13.82	7.8
1985	109.7	11.85	12.91	7.3
1986	112.9	9.64	10.70	7.0
1987	115.6	9.87	9.90	6.4
1988	116.8	10.22	10.45	5.6
1989	119.2	10.16	10.47	5.3

E. Level of Aggregation in the Analysis

The conditional claim rate model employs data aggregated from the individual loan records to specified loan categories. The analysis is conducted by pooling the time series of loan performance over the 1975-89 policy years for individual specified loan categories of loan size, LTV and the 1975-87 loan origination years. The time series of loan performance for each loan origination year extends from loan origination to the present (1989) comprising up to fifteen policy years. The 1988 and 1989 loan origination years were excluded because there is insufficient claim history to be included in the analysis. Also excluded are the claim rates in the loan origination year. These claim rates are consistently about 0.015 percent and including this data in the analysis could distort the overall results without providing any meaningful information.

In estimating the claim rate profile the loan data are disaggregated across seven loan size categories and six LTV categories. The loan size categories are established with reference to the 1979 nominal price of properties. The loan size categories in subsequent years will increase or decrease according to changes in the constant quality house price index. This will enable comparisons of loans over time as the nominal value of the loans changes.

The LTV categories are defined so as to capture the expected acceleration in the conditional claim rate at the higher LTVs. A wider LTV category definition has been established for the lower LTVs from 75-90 percent, while smaller demarcations have been setup for the LTVs between 90-97 percent. All loans that have an LTV below 75 percent, comprising about 12 percent of loans, were excluded directly from the model estimation because of suspect LTV measurement.

These were later included in the forecast simulation as part of the 75-85 percent LTV category because their default rates approximated those of the 75-85 percent category. The FHA experience suggests that the conditional claim rates accelerate when the original LTV moves above 90 percent. Separate models are estimated for each of the six LTV categories. The pooling of data for each equation is shown in Table A.4 below.

TABLE A.4

GROUPING OF DATA ACROSS LOAN SIZE CATEGORY AND POLICY YEAR

ORIGINATION YEAR	(000) NUMBER OF MORTGAGES	(1) POLICY YEARS	(2) LOAN SIZE CATEGORIES	(3)=(1)*(2) NUMBER OF OBSERVATIONS
1975	185	14	7	98
1976	219	13	7	91
1977	252	12	7	84
1978	259	11	7	77
1979	267	10	7	70
1980	230	9	7	63
1981	163	8	7	56
1982	118	7	7	49
1983	410	6	7	42
1984	234	5	7	35
1985	324	4	7	28
1986	770	3	7	21
1987	923	2	7	14
TOTAL OBSERVATIONS FOR EACH ESTIMATED MODEL				728

F. Model Estimation

Preliminary review of the data suggests that the conditional claim rate profile takes the shape of a lognormal distribution thus supporting our basis for the semi-log transformation. The semi-log functional form for the above general model specification is estimated. The transformed model can be stated as:

$$\log(CR)_{j,t} = \beta_{0,j} + \Sigma\, \beta_{i,j} * X_{i,j,t} + e_{j,t} \qquad 7)$$

Time series data of conditional claim rates for thirteen loan origination years, j, and up to fifteen policy years, t, are combined with cross sections of data, j, defined by six LTV categories and seven loan amount categories. A generalized least squares (GLS) estimator with weights taken as the number of surviving loans to each policy year for each of the loan origination years and specific loan category was applied. While the estimated transformed model can be used to simulate and forecast $CR_{j,t}$, the statistical results are optimized only for simulating $\ln(CR)_{j,t}$. That is, on average the predicted $\ln(CR)_{j,t}$ is equal to the average of $\ln(CR)_{j,t}$, while the average predicted $CR_{j,t}$ will not necessarily equal the average $CR_{j,t}$. Therefore, the semi-log specification may introduce a bias into the projections of claim rates for the different cross sections and time periods.

G. Results for the Analysis on Conditional Claim Rates

The estimates of the coefficients in the claim rate model are presented in Table A.5. In general, the results support prior expectations about the economic forces causing claim termination. Specifically, the conditional claim rate profile over policy years and across pre-defined loan categories can be explained largely by changes in net equity, house price dispersion and unemployment.

These results further indicate that the influence of equity has varied across LTV categories. The negative coefficients on the equity variables indicate that increases in equity will reduce the probability of claim termination. Larger negative coefficients on the equity variable are associated with a lower likelihood of default. Comparison of the separate regression results across LTV categories shows that the negative effect of the equity variable increases for higher LTVs (takes a smaller negative value). Further, when estimating the additional effects of equity for lower valued loans (loan size categories 1 and 2 with 1979 prices less than $30,000), the positive coefficients add to the default risk. These basic results reflect the fact that low valued loans and loans with high LTVs have significantly higher risk of default and claim termination.

Examination of the residuals in preliminary regressions revealed a substantial over-prediction of defaults in the 1975-78 period and offsetting under-prediction in later years. Allowing for a structural shift in the propensity to default for a given level of equity after 1978 indicated a substantial difference; for a given level of equity the borrower is at least 60 to 120 percent more likely to default in the post-1978 period than earlier. This shift in default proclivity in the 1980s is even more pronounced for higher LTVs.

A dynamic adjustment of claim termination has been identified for the period after 1978 and was captured by including a one-year lag effect of equity on the conditional claim rate. These results indicate that the decision to exercise the option to default tends to be postponed or extended. The lag adjustment effect is only significant for loans with above 90 percent LTVs where the risk of default are the highest.

Table A.5

REGRESSION RESULTS FOR CONDITIONAL CLAIM RATE MODELS
Six Loan-To-Value Categories

INDEPENDENT VARIABLES	LTV 75-85%	LTV 85-90%	LTV 90-93%	LTV 93-95%	LTV 95-97%	LTV INVESTOR
INTERCEPT	-4.935	-5.717	-1.469	-2.142	-1.043	-1.844
	(1.45)	(0.87)	(0.65)	(0.53)	(0.34)	(0.74)
POLICY YEAR:						
TWO	3.885	3.738	0.031	0.846	-0.065	0.840
	(1.29)	(0.74)	(0.56)	(0.46)	(0.30)	(0.64)
THREE	5.173	4.668	1.063	1.841	0.879	1.856
	(1.26)	(0.72)	(0.54)	(0.45)	(0.29)	(0.63)
FOUR	5.480	4.721	1.311	2.038	1.075	2.040
	(1.24)	(0.70)	(0.52)	(0.43)	(0.28)	(0.61)
FIVE	5.273	4.311	1.107	1.876	0.896	1.817
	(1.22)	(0.68)	(0.51)	(0.43)	(0.27)	(0.60)
SIX	5.501	3.723	1.022	1.707	0.645	1.740
	(1.21)	(0.68)	(0.50)	(0.42)	(0.27)	(0.60)
SEVEN	5.127	3.640	0.689	1.431	0.456	1.451
	(1.20)	(0.67)	(0.50)	(0.42)	(0.27)	(0.59)
EIGHT	4.923	2.923	0.448	1.164	0.251	1.112
	(1.20)	(0.67)	(0.50)	(0.42)	(0.27)	(0.59)
NINE	4.263	2.718	0.168	1.010	0.141	0.959
	(1.20)	(0.67)	(0.50)	(0.42)	(0.27)	(0.59)
TEN	4.610	2.496	-0.477	0.813	-0.030	0.558
	(1.20)	(0.67)	(0.49)	(0.41)	(0.26)	(0.59)
ELEVEN	3.770	1.873	-0.143	0.613	-0.035	0.397
	(1.21)	(0.67)	(0.49)	(0.41)	(0.27)	(0.59)
TWELVE	2.439	0.698	-0.267	0.156	-0.049	-0.132
	(1.23)	(0.68)	(0.50)	(0.42)	(0.27)	(0.61)
THIRTEEN	3.424	1.191	-0.092	0.123	-0.102	-0.959
	(1.28)	(0.70)	(0.51)	(0.43)	(0.28)	(0.63)
FOURTEEN	2.127	0.066	-0.971	-0.571	-0.115	-1.350
	(1.38)	(0.76)	(0.55)	(0.46)	(0.30)	(0.67)

Table A.5(Cont'd)

REGRESSION RESULTS FOR CONDITIONAL CLAIM RATE MODELS
Across Six Loan-To-Value Categories

INDEPENDENT VARIABLES	LTV 75-85%	LTV 85-90%	LTV 90-93%	LTV 93-95%	LTV 95-97%	LTV INVESTOR
EQUITY:						
OVERALL	-5.055	-2.812	-2.386	-2.728	-1.896	-4.187
	(0.75)	(0.46)	(0.69)	(0.55)	(0.36)	(0.36)
PRE 1978 PERIOD ONLY	-3.028	-1.216	-2.174	-1.386	-2.217	0.144
[1975-77=1, 1978=0.5]	(0.49)	(0.33)	(0.75)	(0.60)	(0.40)	(0.26)
EQUITY(t-1) POST 1978	.	.	-1.138	-0.788	-1.651	.
			(0.79)	(0.63)	(0.42)	
EQUITY BY SIZE CATEGORY:						
ONE	2.787	3.539	2.902	2.540	1.946	2.097
	(0.51)	(0.38)	(0.29)	(0.20)	(0.12)	(0.26)
TWO	.	1.524	1.247	1.481	1.108	1.594
		(0.41)	(0.31)	(0.22)	(0.12)	(0.28)
SEVEN	-2.126	-3.365	-1.463	-6.220	-5.772	-3.621
PRE 1978 PERIOD ONLY	(0.71)	(0.39)	(0.27)	(0.39)	(0.43)	(0.39)
UNEMPLOYMENT RATE(t-1)	0.082	0.151	0.125	0.135	0.164	0.148
	(0.06)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)
HOUSE PRICE DISPERSION	5.038	12.947	7.003	7.239	5.658	6.138
	(1.93)	(1.30)	(0.98)	(0.78)	(0.51)	(1.04)
SUMMARY STATISTICS						
Adjusted R-squared	0.58	0.69	0.71	0.78	0.83	0.68
Root Mean Squared Error	73.8	61.7	50.3	47.4	41.9	47.7
F-Statistic	53.6	81.2	85.7	122.9	173.9	78.6
Obs	728	728	728	728	728	728

Unemployment rates lagged one year have a positive impact on claim termination that is more influential at the higher LTV categories. This is consistent with the expectation that the likelihood of default increases when individuals become unemployed. Losing a job is not necessarily the basis for individuals to default on their mortgage. However, when considered in the context of a prolonged period of unemployment coupled with few alternate sources of cash equity in which to meet debt servicing requirements and/or little or no equity in the home, may force a decision to default. It is expected that changes in unemployment will accelerate (decelerate) the borrower's decision to default (continue paying) on the mortgage.

Impact of Policy Years using the zero-one indicator for each policy year following origination of the loan displays the expected profile of claim rates. The general profile shows that conditional claim rates increase to a peak in the fourth policy year. The consistency of this experience should be determined largely by economic information contained in the model. The inclusion of the zero-one indicator captures additional information concerning the underlying claim rate profile not

explained by the economic variables. The impact of the zero-one indicator variables becomes smaller and less significant for the higher LTV categories. Only in the generally risky policy years, two through seven, are the coefficients statistically significant across each of the regressions.

II. APPROACH AND METHODOLOGY TO ESTIMATE CONDITIONAL PREPAYMENT RATES

A model for conditional prepayment rates was developed to explain borrowers' decision to prepay their mortgage. The prepayment model is then used to project prepayment rates over future policy years.

A. Economic Model

An economic model for borrower prepayment behavior employs the same wealth maximizing consumer choice model used to formulate the claim rate model. In considering the four options for meeting their mortgage debt obligations, borrowers will choose the prepayment option when they expect this option to maximize their future real wealth. Consistent with the development of the conditional claim rate model, it is hypothesized that for a set of economic events we can estimate a conditional probability of exercising the option to prepay the mortgage. Aggregating across a class of borrowers, we formulate a model to explain the conditional rate of prepayment.

The model used to explain the prepayment rate or non-claim termination rate for FHA-insured loans in period *t* is

$$CPR_{j,t} = f(MV_t, RCURAVER_t, RCURMIN_t, D_1, \ldots D_n) \quad 8)$$

where:

$CPR_{j,t}$ - is the conditional prepayment rate measured as the ratio of the number of non-claim terminations in a policy year to the number of loans surviving to that policy year,

MV_t - the same as defined above,

$RCURAVER_t$ - the ratio of the current new issue coupon to the average coupon since origination or during the last six years, whichever is shorter,

$RCURMIN_T$ - the ratio of the current new issue coupon to the minimum coupon rate on FHA mortgage since origination,

D_n - Dummy variable for each of n policy years taking on a value of one in the respective policy year and zero otherwise.

The decision to prepay the mortgage loan depends on both the underlying mobility

of borrowers and the path of interest rates since the loan was originated. To capture the underlying mobility effect, zero-one indicator variables are included for each of the policy years following loan origination.

The impacts of the current interest rate level to prior period averages and/or levels have been captured through three constructed variables. The first is the ratio of the current market value of the mortgage to the current book value. If the market value of the debt exceeds the book value, owing to declines in interest rates, borrowers have an incentive to refinance (replace the current market value with debt equal in value to the current book value). The market value is computed as in the homeowner equity calculation, except here the discount rate is not constrained to the original coupon rate less three percent.

The specific time path of mortgage coupon rates since origination may also matter. For example, if rates initially rise for a while, this will discourage the normal prepayment of a mortgage because borrowers will not want to give up what has become a below market rate. Also, a decline in interest rates to, say, three percentage points below the original coupon may have a smaller impact on prepayment if this decline has previously occurred in the life of the mortgage (more sensitive prepayers will have already prepaid).

To capture these effects, we employ two additional variables: the ratio of the current new issue coupon to the average coupon over the previous six years (or shorter span if the mortgage is less than seven years old) and the ratio of the current new issue coupon to the lowest value coupon rates have taken on since the mortgage was originated. To allow different responses to rises and falls in rates, we estimate different coefficients for values of the variables above and below unity.

B. Data Disaggregation in the Analysis of Conditional Prepayment Rates

The analysis on loan prepayment pools the time series of policy years 1979-89 for nine loan origination years 1979-87 for seven loan size and six LTV categories. Table A.6 shows the distribution of data used in the analysis for each loan origination year, identifying the number of loan categories and possible policy years available.

Table A.6

GROUPING OF DATA ACROSS LOAN SIZE CATEGORY AND POLICY YEAR

ORIGINATION YEAR	(000) NUMBER OF MORTGAGES	(1) POLICY YEARS	(2) CATEGORIES LOAN SIZE	(3) LTV	(4)=(1)*(2)*(3) NUMBER OF OBSERVATION
1979	267	11	7	6	462
1980	230	10	7	6	420
1981	163	9	7	6	378
1982	118	8	7	6	336
1983	410	7	7	6	294
1984	234	6	7	6	252
1985	324	5	7	6	210
1986	770	4	7	6	168
1987	923	3	7	6	126
TOTAL OBSERVATIONS AVAILABLE					2,646

The conditional prepayment model is estimated using a semi-log functional form. Preliminary estimation suggested differential behavior of mortgages with LTVs above and below 93 percent and of loans partitioned into four loan sizes. Thus, eight different cross sectional groupings across LTV and loan size categories are reported below. The range of observations varies from 126 to 504. A weighted least squares estimator is applied using as weights the number of loans that survive to the beginning of the policy year in each of the defined loan categories.

C. Results of the Estimation for the Conditional Prepayment Rate Model

The results of our estimated model shown in Table A.7 support the view that the probability of prepayment can be explained largely by the effects of changes in the current mortgage interest rates relative to both the mortgage contract rate at loan origination and the path of rates since origination. The positive relationship with the conditional prepayment rate indicates that increases (decreases) in the market value of the financial liability will raise (lower) the probability of loan prepayment. The mortgage value effect is stronger for loans at the higher LTV and loan size categories indicating a greater propensity to prepay for a given mortgage liability value.

Zero-one Indicators for policy years are used to capture an underlying profile of prepayment rates not reflected in the economic indicators. The coefficients show the additive effect of prepayment rates in each policy year to that measured by all other economic factors in the model. The results show that prepayment rates increase to a peak in the fourth to sixth policy year following loan origination and then gradually decrease in policy years thereafter.

Table A.7

CONDITIONAL PREPAYMENT RATE MODEL
For Specified Categories of Loan Size and LTV

LOAN SIZE CATEGORIES:	1	2 & 3	4 & 5	6 & 7	1	2 & 3	4 & 5	6 & 7
LTV RATIOS:	75-93%*	75-93%*	75-93%*	75-93%*	93-97%	93-97%	93-97%	93-97%
INDEPENDENT VARIABLES								
INTERCEPT	3.560	6.056	7.012	7.582	1.969	3.901	5.751	6.065
	(1.88)	(1.33)	(1.55)	(1.83)	(1.34)	(1.31)	(1.52)	(2.04)
POLICY YEAR:								
ONE	-2.545	-2.747	-2.815	-3.342	-2.774	-3.508	-3.518	-4.041
	(0.54)	(0.35)	(0.42)	(0.49)	(0.32)	(0.29)	(0.33)	(0.47)
TWO	-0.918	-1.062	-1.178	-1.480	-1.213	-1.686	-1.785	-2.111
	(0.54)	(0.35)	(0.41)	(0.49)	(0.31)	(0.28)	(0.33)	(0.47)
THREE	-0.475	-0.611	-0.741	-0.851	-0.710	-0.972	-1.115	-1.236
	(0.53)	(0.34)	(0.41)	(0.48)	(0.31)	(0.27)	(0.32)	(0.46)
FOUR	-0.274	-0.359	-0.480	-0.541	-0.418	-0.746	-0.782	-0.826
	(0.52)	(0.34)	(0.40)	(0.48)	(0.30)	(0.27)	(0.31)	(0.45)
FIVE	-0.258	-0.272	-0.439	-0.584	-0.277	-0.623	-0.736	-0.844
	(0.53)	(0.34)	(0.41)	(0.48)	(0.30)	(0.27)	(0.31)	(0.45)
SIX	-0.376	-0.402	-0.569	-0.714	-0.291	-0.600	-0.730	-0.954
	(0.54)	(0.35)	(0.41)	(0.49)	(0.31)	(0.27)	(0.32)	(0.46)
SEVEN	-0.525	-0.564	-0.736	-0.845	-0.407	-0.726	-0.881	-1.059
	(0.54)	(0.35)	(0.42)	(0.49)	(0.31)	(0.28)	(0.32)	(0.47)
EIGHT	-0.738	-0.846	-0.912	-0.890	-0.540	-0.823	-0.887	-0.869
	(0.57)	(0.38)	(0.45)	(0.53)	(0.33)	(0.30)	(0.35)	(0.51)
NINE	-0.628	-0.754	-0.800	-0.756	-0.510	-0.729	-0.814	-0.775
	(0.58)	(0.38)	(0.45)	(0.53)	(0.33)	(0.30)	(0.35)	(0.50)
TEN	-0.437	-0.302	-0.370	-0.408	-0.246	-0.336	-0.401	-0.351
	(0.60)	(0.39)	(0.46)	(0.55)	(0.34)	(0.30)	(0.35)	(0.51)
MORTGAGE VALUE	2.798	3.537	4.217	4.599	2.984	4.251	4.694	5.547
	(0.77)	(0.55)	(0.65)	(0.78)	(0.53)	(0.52)	(0.62)	(0.87)
CURRENT NEW ISSUE RATE RELATIVE TO:								
PRIOR 6 YEAR MOVING AVERAGE	-4.377	-4.687	-4.780	-3.473	-3.142	-3.377	-3.410	-2.182
LIMITED TO MAX VALUE OF 1.0	(1.63)	(1.15)	(1.34)	(1.57)	(1.20)	(1.15)	(1.33)	(1.76)
PRIOR MINIMUM NEW ISSUE RATE	-0.948	-2.412	-3.427	-4.437	-1.187	-3.007	-4.411	-5.583
LIMITED TO MAX VALUE OF 1.0	(1.75)	(1.25)	(1.44)	(1.67)	(1.34)	(1.30)	(1.50)	(1.92)
PRIOR MINIMUM NEW ISSUE RATE	0.240	-1.012	-1.398	-2.254	0.466	-0.244	-0.908	-1.671
LIMITED TO MIN VALUE OF 1.0	(0.70)	(0.46)	(0.54)	(0.63)	(0.45)	(0.41)	(0.47)	(0.65)
SUMMARY STATISTICS								
Adjusted R-Squared	0.748	0.812	0.791	0.773	0.910	0.902	0.890	0.868
Root Mean Squared Error	44.5	39.6	48.5	63.0	34.3	42.2	48.3	65.7
F-Statistic	54.2	155.9	137.3	123.4	90.8	166.1	145.6	110.8
Number of Observations	252	504	504	504	126	252	252	252

* Investor loans are included in this category.

III. FORECASTING FHA LOAN PERFORMANCE

The estimated econometric models for conditional claim rates and prepayment rates are used to simulate the history of loan performance and to develop projections of future loan performance under alternative economic scenarios. The simulation analysis is used to project the number of claims and prepayments over the historical period from 1979 through 1989 for specified levels of disaggregation of loan size, LTV, loan origination year and termination year. The forecast analysis develops conditional claim and prepayment rates for up to the first fifteen policy years after 1989 for each of the defined loan categories and for each loan origination year from 1976 through 1990[3]. Using different economic scenarios, the sensitivity of future conditional claim and prepayment rate can be evaluated.

A. Dynamic Simulation of Historical Claims and Prepayments

To evaluate the ability of the model to explain and forecast the conditional claim and prepayment rates, a dynamic simulation of the number of claims and prepayments was conducted across the historical period from 1979 through 1989. The simulation is dynamic in the sense that the number of claims and prepayments in a policy year are computed recursively from the computed number of loans surviving to the start of the policy year and the separate prediction of the conditional claim and prepayment rates for that policy year. The predicted conditional probability rates are multiplied by the number of loans that survived to the beginning of the policy year to compute the predicted number of claims and prepayments in that policy year. The sum of claim and non-claim terminations for each year is used to compute a projection of the number of loans that survive to the beginning of the next policy year. While, the conditional claim and prepayment rate models provide independent predictions of "conditional probability rates" in each year, the estimated numbers of claims and prepayments is determined dynamically through a recursive computation of surviving loans followed by "termination counts". In producing *ex-ante* forecasts to estimate the number of claim and non-claim terminations in future years to support the associated cash flows forecast analysis, this type of dynamic simulation is conducted. Therefore, it will be instrumental to evaluate the dynamic simulation performance using the *ex-post* forecast of the conditional claim and prepayment rates.

Predictive accuracy is determined by comparing the predicted numbers of claims

[3]In using the zero-one indicator variables for policy years one through fifteen it is not possible to directly project the conditional claim rates after the 15th policy year without making assumptions with respect the impact of additional indicator variables for the subsequent years. It is expected that conditional claim rates will be small and close to a steady state level by the 15th policy year so that projections after the fifteenth year are estimated using a declining trend from the 15th policy year to the 30th policy year.

and prepayments with the actual claims and prepayments across selected categories of loans. Differences between actual and predicted values have been aggregated across LTV, loan size, termination year and loan origination year. These summary statistics provide an indication of the model's predictive ability across specified loan category, loan origination years and termination years. Tables A.8 and A.9 below present the results of the dynamic simulation exercise for the conditional claim and prepayment rate model.

Table A.8

DYNAMIC SIMULATION OF CLAIMS AND PREPAYMENTS
FOR THE PERIOD 1979-89
Across loan Size and LTV Categories

LOAN SIZE	LTV CATEGORY	CLAIMS ACTUAL	CLAIMS PREDICTED	CLAIMS ERROR	PREPAYMENT ACTUAL	PREPAYMENT PREDICTED	PREPAYMENT ERROR
	75-85%	13,790	14,680	-890	99,603	83,228	16,375
	85-90%	20,488	21,456	-968	104,732	96,895	7,837
	90-93%	25,137	23,639	1,498	92,983	93,341	-358
	93-95%	44,871	42,866	2,005	113,035	104,674	8,361
	95-97%	90,120	83,625	6,495	180,114	169,460	10,654
	> 97%	37,326	35,145	2,181	119,002	112,540	6,462
1		44,907	43,307	1,600	66,091	65,329	762
2		29,001	27,503	1,498	65,050	66,055	-1,005
3		31,434	28,722	2,712	87,824	80,192	7,632
4		31,448	28,454	2,994	97,862	94,970	2,892
5		29,803	28,094	1,709	102,856	92,050	10,806
6		47,041	43,257	3,784	181,444	175,238	6,206
7		18,098	22,075	-3,977	108,342	86,303	22,039
TOTALS		231,732	221,412	10,320	709,469	660,138	49,331

Table A.9

DYNAMIC SIMULATION OF CLAIMS AND PREPAYMENTS
FOR THE PERIOD 1979-89
Across Loan Origination and Termination Year

ORIG YEAR	TERM YEAR	CLAIMS ACTUAL	CLAIMS PREDICTED	CLAIMS ERROR	PREPAYMENT ACTUAL	PREPAYMENT PREDICTED	PREPAYMENT ERROR
	79	.	.		580	459	121
	80	1,020	876	144	2,430	1,526	904
	81	3,725	2,744	981	3,349	2,480	-231
	82	7,054	4,734	2,320	2,142	3,948	-1,806
	83	13,270	10,212	3,058	31,452	39,146	-7,694
	84	15,373	16,208	-835	22,203	22,029	174
	85	21,548	17,006	4,542	32,759	43,744	-10,985
	86	28,750	26,414	2,336	181,663	225,265	-43,602
	87	39,931	41,434	-1,503	247,279	174,624	72,655
	88	51,652	52,473	-821	100,999	75,541	25,458
	89	49,409	49,310	99	84,613	71,377	13,236
79		18,470	20,047	-1,577	59,114	54,696	4,418
80		24,940	23,074	1,866	66,772	82,978	-16,206
81		27,704	19,071	8,633	68,231	99,267	-31,036
82		19,053	14,006	5,047	60,834	67,352	-6,518
83		43,156	49,465	-6,309	162,278	149,647	12,631
84		28,083	24,427	3,656	93,323	80,702	12,621
85		30,713	29,027	1,686	119,246	62,991	56,255
86		28,565	27,387	1,178	59,214	39,328	19,886
87		11,048	14,908	-3,860	20,457	23,178	-2,721
TOTALS		231,732	221,412	10,320	709,469	660,138	49,330

The model simulation across all loan size categories and across time predicts 96 percent of the actual number of claim and 93 percent of the number of prepayments. In general, the claims are well explained. For no LTV category, loan size category, termination year or origination year is the absolute difference between actual and predicted claims as great as 9 thousand. Prepayment results by origination and termination year are far less satisfactory (but also less important to determining the financial position of FHA). Prepayments are over-predicted by 44,000 (24 percent) in 1986 and under-predicted by 73,000 (29 percent) in 1987. Regarding origination year, prepayments of the 1980-81 books are over-predicted by 47,000 (35 percent), while prepayments of the 1985-86 books are under-predicted by 67,000 (43 percent).

The PD&R staff at HUD suggested that a reversion back to the low defaulting 1970s occurred in 1986, referring to some work reported by researchers at OMB. We see no reason why this should have occurred: the economic advantages of default that have been learned are unlikely to be unlearned. Further, no significant evidence for over-prediction of defaults on the post-1985 books of business come out of our simulations. Referring to Table A.8, claims on the 1986 book of business are under-predicted by 1,200 and those in 1987 are over-

predicted by 3,900.

Nonetheless, equations were re-estimated allowing for different responses on post-1985 books of business. The evidence was mixed. Simulations with the revised equations did reduce the 1987 overprediction by 1,000 but the 1986 under-prediction was increased by 4,200. Thus we see no reason to believe that the basic proclivity to default for a given equity position has declined since 1985.

B. Forecasting Conditional Claim and Prepayment Rates

The models are used to forecast conditional claim and prepayment rates over the thirty-year term life of the mortgage under alternative economic scenarios in order to assess the reasonableness of the results and to determine the sensitivity of the projections to changes in select components of the economic forecasts.

In Table A.10 the forecasts of conditional claim and prepayment rates on the 1986-90 books of business are summarized for each of the first ten policy years (numbers above the step bar represent actual conditional claim rates for each origination year) and for the ultimate claim rate. These forecasts assume a base line forecast of 3.25 percent for constant quality house price appreciation, a 10 percent FHA contract rate, and an unemployment rate of 5.5 percent.

TABLE A.10

FORECAST OF CONDITIONAL CLAIM RATES 1986-90
Assuming Baseline Economics

POLICY YEAR	1986	1987	1988	1989	1990
1	0.01%	0.01%	0.01%	0.02%	0.02%
2	0.51	0.39	0.46	0.50	0.47
3	1.88	1.13	1.46	1.55	1.42
4	2.31	1.57	2.13	2.06	1.90
5	1.50	1.70	1.91	1.85	1.72
6	1.51	1.56	1.70	1.64	1.53
7	1.22	1.25	1.39	1.35	1.26
8	0.94	0.98	1.10	1.07	1.00
9	0.76	0.80	0.93	0.91	0.84
10	0.62	0.65	0.75	0.74	0.68
ULTIMATE	12.03%	11.67%	13.60%	13.57%	12.57%

The results indicate that for baseline economic conditions the conditional claim rates are expected to remain high. The variability between the 1986 to 1990 books of business is associated more with the distribution in loans across LTV and loan size categories than with differences in economic conditions. The moderately low ultimate claim rate forecast for loans originated in 1987 (9.65 percent) follows

directly from the combined effect of favorable housing economic conditions in that year and the relatively low proportion of loans above 95 percent LTV. The marked upturn in predicted claim termination rates in 1988 and 1989 is attributable to the shift in loan distribution toward higher LTVs. The reversal in conditional claim rate projection for 1990 is associated with the expanded loan ceiling. Not only are loans just below the new ceiling expected to have lower claim rates than the claim experience of the largest loans categories used in our estimation, holding LTV constant, but these loans are required by law to have an incrementally lower LTV. The effective maximum LTV on for loans between $101,250 and $124,750 ranges from 95 to 96 percent.

Tables A.11 and A.12 show how the model forecasts conditional claim rates across the LTV categories and across the loan size categories using the 1990 loan origination year. Loan defaults are projected to rise for higher LTV ratios, with jumps occurring at 90 and 95 percent.

Table A.11

1990 FORECAST OF CONDITIONAL CLAIM RATES BY LTV
Assuming Baseline Economics

POLICY YEAR	<75%	75-85%	85-90%	90-93%	93-95%	95-97%	>97%	TOTAL
1	0.02%	0.02%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%
2	0.22	0.21	0.23	0.35	0.45	0.70	0.71	0.47
3	0.87	0.81	0.79	1.10	1.40	1.95	2.02	1.42
4	1.23	1.14	1.07	1.56	1.88	2.53	2.64	1.90
5	1.05	0.96	0.93	1.41	1.78	2.27	2.39	1.72
6	1.37	1.25	0.66	1.41	1.64	1.86	1.98	1.53
7	0.95	0.86	0.73	1.07	1.31	1.58	1.69	1.26
8	0.77	0.69	0.41	0.86	1.03	1.30	1.40	1.00
9	0.39	0.35	0.37	0.66	0.90	1.15	1.26	0.84
10	0.53	0.47	0.32	0.34	0.73	0.95	1.05	0.68
ULTIMATE	6.92%	6.30%	5.38%	10.68%	11.94%	17.74%	19.34%	12.57%

When viewing the 1990 forecast across the loan size categories, there are significantly higher claim rates for the loans less than $40,000 in 1990 nominal values. In the next higher loan size there is little variation in the conditional claim rate projections. Beginning in 1990 the loan ceiling was raised to $124,750 with the added requirement of incrementally higher downpayment requirements. This results in a further drop in the projected conditional claim rate for this category of loans.

TABLE A.12

1990 FORECAST OF CONDITIONAL CLAIM RATES BY LOAN SIZE
Assuming Baseline Economics

POLICY YEAR	$0-40K	$40-48K	$48-56K	$56-64K	$64-72K	$72-88K	$88-105K	>$105K	TOTAL
1	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
2	0.58	0.54	0.48	0.47	0.47	0.47	0.45	0.38	0.47
3	1.82	1.61	1.42	1.40	1.38	1.39	1.34	1.19	1.42
4	2.53	2.15	1.86	1.84	1.82	1.83	1.77	1.60	1.90
5	2.35	1.97	1.66	1.64	1.63	1.64	1.58	1.45	1.72
6	2.23	1.74	1.44	1.42	1.41	1.42	1.38	1.32	1.53
7	1.89	1.47	1.18	1.16	1.15	1.16	1.13	1.06	1.26
8	1.56	1.18	0.92	0.91	0.90	0.91	0.88	0.81	1.00
9	1.33	1.02	0.77	0.76	0.75	0.76	0.73	0.67	0.84
10	1.17	0.85	0.62	0.60	0.59	0.60	0.57	0.52	0.68
ULTIMATE	19.23%	15.37%	12.12%	11.89%	11.77%	11.46%	11.02%	9.66%	12.57%

It is valuable in reviewing the conditional claim rate forecast to determine the sensitivity of conditional claim rates to changes in the economic forecast assumptions. In particular, what impact would changes in house price appreciation, house price variability, FHA contract rates and unemployment have on future conditional claim rates? To answer this question, each variable is changed by a fixed percent and maintained at this level through out the term of the mortgage. The results are given in Table A.13. Note that a percentage point decline in house price appreciation or rise in unemployment increases the cumulative default rate by about 2 percentage points, while a 10 percent increase in house price dispersion raises default by 6 percentage points.

TABLE A.13

1990 FORECAST OF CONDITIONAL CLAIM RATES
For Selected Changes in the Economic Variables

POLICY YEAR	BASE LINE*	CQHP 2.25%	HP VAR +10%	UNEMPL 6.5%
1	0.02%	0.02%	0.015%	0.02%
2	0.47	0.49	0.48	0.55
3	1.42	1.51	1.45	1.65
4	1.90	2.07	1.97	2.20
5	1.72	1.92	2.03	1.99
6	1.53	1.75	2.20	1.77
7	1.26	1.47	2.32	1.46
8	1.00	1.18	1.95	1.15
9	0.84	1.01	1.77	0.97
10	0.68	0.83	1.50	0.78
ULTIMATE	12.57%	14.47%	18.63%	14.37%

* CQHP=3.25%, UNEMPL=5.5%

The projections for conditional prepayment rates are summarized for the baseline economic forecasts. In Table A.14 these projections indicate that prepayment is expected to be between 60 and 65 percent and that no significant variation in the

prepayment will be seen, given the stable forecast of interest rates through the term of all the mortgages.

TABLE A.14

FORECAST OF CONDITIONAL PREPAYMENT RATES 1986-90
Assuming Baseline Economics

POLICY YEAR	1986	1987	1988	1989	1990
1	0.51%	0.25%	0.37%	0.46%	0.19%
2	3.75	1.03	1.52	1.25	1.09
3	2.69	1.74	2.32	2.10	2.04
4	3.16	2.47	2.84	2.74	2.73
5	2.44	2.45	2.82	2.73	2.69
6	2.13	2.16	2.50	2.44	2.38
7	1.79	1.82	2.09	2.05	2.01
8	1.58	1.67	1.90	1.87	1.91
9	1.71	1.75	1.98	1.96	2.00
10	2.36	2.42	2.75	2.73	2.79
ULTIMATE	61.53%	60.46%	60.44%	60.21%	60.66%

IV. CONCLUSIONS

The analysis of loan performance for FHA-insured loans supports the hypothesis that default and prepayment behavior can be explained largely by the borrowers' equity position associated with house price appreciation and the time path of mortgage interest rates since the loan was originated.

The analysis was conducted by pooling the time series of loan performance over policy years for individual specified categories of loan size, LTV and loan origination years and suggests that there is considerable variation in loan performance across these defined categories. With respect to LTV categories, there is a pronounced acceleration of default experience when the LTV exceeds 90 percent and a further, even sharper, increase when it goes above 95 percent. Evaluating the impact of changing loan size indicates that higher loan values yield a small but measurable reduction in default rates. The less the buildup in equity as measured through LTV and house price appreciation, the higher is the likelihood of default.

The analysis conducted at the national aggregate level was able to estimate the effects on default rates associated with regional economic stress that has resulted in depressed properties values for select areas during the 1980s. It is viewed that a major contributing factor to the variation in loan defaults regionally is due to the marked increase in the volatility in house price appreciation. An index of

house price dispersion was developed which showed the extent of the increase in dispersion in house price appreciation across major US Census Regions. It was found that the house price dispersion measured over time is directly linked to the observed increased propensity to default on FHA-insured loans.

The estimated models provided a basis to forecast the future probability of claim and non-claim termination for alternative economic scenarios. The projections are sensitive to assumptions about expectations for house price appreciation and the regional dispersion of future house price appreciation.

APPENDIX B: ACTUARIAL ANALYSIS

I. INTRODUCTION

The purpose of the actuarial analysis was to assess the Fund's ability to withstand future losses from both its current portfolio of mortgages and future books of business. Specifically, we analyzed the Fund's value under alternative economic and policy assumptions 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 analyze the financial viability of the Fund.

In evaluating the Fund's value, we examined the Fund as 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 (investments) plus the present value of new business (investments) 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. Although the methodology used to analyze the value of current and future business is very similar, we analyzed the two books separately to isolate the impact of future policy changes on the Fund's value. Below the general methodology for estimating future losses is described. In the following sections, we describe the application of this methodology to analyzing the current portfolio and future business.

II. METHODOLOGY

To analyze future changes in the Fund's equity, we developed a model to project future cash flows. This model incorporates projections of loan performance and information about the 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.

Future cash flows are projected using the forecasts from the econometric models discussed in Appendix A. These models predict conditional claim and prepayment rates for each cross sectional category of loan-to-value and loan size on an endorsement year / post-endorsement year basis. Because of their construction, these models predict claim rates only through the 15th post-endorsement year and prepayment rates through the 10th year. Claim rates after the 15th year were assumed to decline at 5% per year from the 15th year rate. Prepayment rates after the 10th year were assumed to move towards a steady state conditional rate of 4.5%.

Based on these termination rates, the major components of cash flow were

projected into the future. The cash flow components analyzed are:

o	premiums,	(cash inflow)
o	net losses associated with claims,	(cash outflow)
o	refunded premiums,	(cash outflow)
o	administrative expenses, and	(cash outflow)
o	distributive shares.	(cash outflow)

Each component was projected for each cross section of loan-to-value and loan size and then aggregated to the endorsement year and fiscal year level. The following section discusses these cash flow components. First, we provide definitions of key terms used in the analysis.

- o Insurance-in-force: the unamortized value of the surviving mortgages insured by FHA.

- o Average Outstanding Balance (AOB): the principal balance outstanding divided by the original mortgage amount. The AOB is calculated based on the term of the mortgage, mortgage interest rate, and the type of the mortgage.

- o Conditional Claim Rate: the number of claims divided by the number of surviving loans.

- o Loss Ratio: the dollar loss incurred on claims divided by the claim amount.

- o Conditional Prepayment Rate: the number of prepayments divided by the number of surviving loans.

- o Refund Rate: the portion of the premium that is refunded when a loan is prepaid. The refund rate is typically defined as the dollar refund per $1000 of the mortgage value at origination. (e.g., the refund in the first year is $3.43/$1000 of the original mortgage value.)

A. Premium

The insurance premium is the primary revenue 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 two 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. After September 1, 1983 the premium was collected at the time of origination. We assumed for this analysis that the annual premium policy was in

effect through the end of fiscal year 1983.

In calculating the premiums collected on loans endorsed through 1983, we assumed a premium of 0.5% of the mortgage's average outstanding balance for the year. Thus, the mortgage premium collected during year i equals the average outstanding balance of insurance-in-force during year i times the annual premium.

$$\text{Premium}_i = \text{Insurance-in-force}_i * \text{AOB}_i * 0.5\%$$

In analyzing loans endorsed after 1983, we assumed FHA collected an up-front premium rate of 3.8% of the mortgage origination value for 30-year mortgages and 2.4% for 15-year mortgages. Thus, the mortgage premium collected on loans endorsed after 1983 equals the origination mortgage amount times the appropriate insurance premium.

$$\text{Premium}_i = \text{Origination Amount}_i * \text{Mortgage insurance premium}$$

Although FHA technically receives this premium up-front, the mortgagor is allowed to finance the premium and, therefore, the portion of the premium that is financed is included in the initial principal value of the mortgage. The original mortgage amount used above in calculating the premium excludes financed premium. However, when a mortgage defaults, FHA must pay a claim that consists of the unamortized portion of both the mortgage and financed premium. Therefore, FHA effectively collects very little premium on mortgages that default.

B. Losses Associated with Claims

Losses due to claims comprise the largest expense to the Fund in the early years of mortgages' lives. When a mortgage defaults, the lender files a claim with FHA. After FHA pays the claim, it receives the foreclosed property and must sell the property to recoup its loss. These events result in two separate cash flow: 1) the cash outflow of the claim payment, and 2) the cash inflow of the net proceeds received in selling the claimed property. Because there is typically a lag between the time of the claim payment and the receipt of proceeds from property disposition, we have analyzed 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 bank on the defaulted mortgages.

$$\text{Claim Payment}_i = \text{Insurance-in-force}_i * \text{AOB}_i * \text{Claim Rate}_i * (1 + \text{Bank Costs})$$

where the Bank Costs equal the average costs incurred by banks per dollar of outstanding balance.

In our analysis, we assumed that the primary cost associated with claims was the interest income lost by the bank between the time at which the mortgage defaults and the claim is paid. From a previous analysis performed during the FY1988 Audit, we found that the average lag between default and claim payment is 15.6 months. Thus, the additional bank costs were estimated as interest income lost on the outstanding balance of the mortgage for 15.6 months.

Net proceeds were estimated by multiplying the claim payment by one minus the loss ratio. However, because property sales typically lag claim payments by 7.8 months[1], we allocated the net proceeds cash flow to the appropriate fiscal year so that proceeds received in fiscal year i are calculated as follows:

$$\text{Net Proceeds}_i = (7.8/12) * \text{Claim Payments}_{i-1} * (1 - \text{Loss Ratio}) + (4.2/12) * \text{Claim Payments}_i * (1 - \text{Loss Ratio})$$

C. Refunded Premiums

With the initiation of the up-front premium, FHA began refunding a portion of the premium when borrowers prepaid their mortgages. The refund rate depends upon the time at which the mortgage is prepaid.

$$\text{Refund dollars}_i = \text{Insurance in Force}_i * \text{prepayment rate}_i * \text{refund rate}_i$$

The refund rates used in the analysis of the existing portfolio are those currently used by FHA.[2] In the analysis of new business, the refund rate depends on the policy analyzed. Section III will provide details such as the refund rate assumed for each of the policy options.

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[1]This figure represents the average months on hand of property. It was estimated during the Fiscal Year 1988 Financial Audit of the FHA.

[2]Herzog, Thomas, "Introducing the Single Premium Plan", *Mortgage Banking*, April 1984.

D. Administrative Expenses

In addition to estimating cash flows associated with loan performance, the 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 0.094%.[3]

E. 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 loans, a portion of the premium in excess of the costs can be returned to the borrower through a distributive shares payment. In determining the distributive share, there are two major questions: (1) is the book profitable enough to pay a distributive share, and (2) how much of the profit should be returned to the borrower relative to how much should be held as a reserve for unprofitable years?

In this analysis, we assumed that FHA will continue to pay distributive shares to the same books of business and at the same rate that it is currently paying. Table B.1 presents the distributive share rates assumed in our analysis.

[3]Middaugh, David, "Analysis of the Insurance Reserves as of September 30, 1988", Department of Housing and Urban Development.

Table B.1

Distributive Shares Allocation FY 1988
by Endorsement Year

(Dollars per $1000 of Original Mortgage Amount)

Endorsement Year	30-Year Mortgages	15-Year Mortgages	30-Year GPMs
1970	77.72	0.00	0.00
1971	28.81	0.00	0.00
1972	70.15	0.00	0.00
1973	40.48	0.00	0.00
1974	62.18	0.00	0.00
1975	24.46	0.00	0.00
1976	35.68	0.00	0.00
1977	47.73	0.00	47.26
1978	34.39	20.69	33.96
1982	0.00	17.94	0.00
1983	0.00	20.10	0.00

Mortgages that were endorsed prior to 1970 and whose term is greater than 20 years receive the entire premium paid.

Source: The Calculation of Distributive Shares under the Mutual Mortgage Insurance Fund, Herzog and Middaugh, May 1988.

Although FHA has not determined distributive shares for endorsement years after 1984, we estimated that these books will be unprofitable and therefore, FHA will not pay distributive shares to these books.

Distributive shares are paid upon prepayment or maturity of the loan. Thus, we use the projected prepayment rates to estimate the volume of distributive shares payments.

III. ANALYSIS OF THE CURRENT PORTFOLIO OF MORTGAGES

In analyzing the economic value of the Fund, we first examined those loans that FHA currently has in its portfolio. The Fund's current equity less the future value of losses expected to be generated by this business represents the Fund's value assuming FHA stops insuring new business. This value relative to the current insurance-in-force provides a measure of the Fund's financial strength. To test the Fund's ability to withstand adverse economic conditions, we analyzed the financial performance of the current portfolio under various economic scenarios.

The current portfolio of loans consists of various terms and types of mortgages. To analyze the current portfolio, we grouped the loans into three major categories: (1) 30-year fixed payment mortgages, (2) 15-year fixed payment mortgages, and (3)

graduated payment mortgages. The 30-year mortgage category includes both fixed and adjustable rate mortgages as well as loans with terms ranging from 16 to 30 years. The majority of these loans, however, are 30-year fixed rate mortgages (less than one percent are adjustable rate mortgages). Insurance in force as of the end of 1988 is presented below.

Table B.2

Insurance in Force
End of Fiscal Year 1988
(Unamortized Value in Million Dollars)

Endorsement Year	30-year Mortgages	15-year Mortgages	Graduated Payment Mortgages
Pre 1975	$20,184		
1975	$2,204	$3	--
1976	$2,898	$5	--
1977	$4,327	$4	$5
1978	$5,852	$4	$940
1979	$7,116	$5	$3,919
1980	$5,452	$6	$2,542
1981	$2,498	$7	$565
1982	$1,073	$9	$230
1983	$9,094	$926	$1,169
1984	$5,041	$453	$619
1985	$10,184	$931	$669
1986	$46,251	$3,895	$744
1987	$62,630	$3,718	$651
1988	$34,197	$650	$301
Total	$219,008	$10,616	$12,354

In analyzing the financial performance of these loans, we used the methodology described in the previous section. However, slight modifications were made in analyzing the different types of loans. These are described below.

- Graduated Payment Mortgages: The primary difference between the graduated payment and other 30-year mortgages is the payment plan used by the GPMs. Payment plans for GPMs actually increase the mortgage value outstanding for the first 5 to 10 years of the mortgage. Increasing rather than decreasing mortgage values impact the loan performance and cash flows in two ways: (1) an increasing mortgage obligation can result in negative equity during the early years of the mortgage, thus increasing the risk of default; and (2) an increasing mortgage obligation increases the potential claim amount that FHA must pay if the mortgage defaults.

  In analyzing the claim and prepayment rates of GPMs, we found that in aggregate the termination rates of GPMs are very similar to those of the other 30-year mortgages. Therefore, we applied the aggregate predicted

claim and prepayment rates of the 30-year mortgages to the graduated payment mortgages.

In predicting the claim payments associated with GPMs, we used an outstanding balance factor for a 5-year 7.5% annual growth GPM (i.e. the mortgage payment increase yearly by 7.5% for 5 years).

- 15-Year Mortgages: As for the GPMs, the major difference of the 15-year mortgages was their payment plan. Again, because we did not model the 15-year mortgages separately, we did not directly capture the impact of an accelerated reduction in principal associated with 15-year mortgages. In analyzing them more closely, we found that these mortgages tend to have claim rates approximately 2/3 of their 30-year counterparts. Therefore, we reduced the predicted claims for 30-year mortgages by 1/3 in predicting claims for the 15-year mortgages. Prepayment rates were assumed to be the same as the 30-year mortgages.

  In predicting the claim payments and associated losses for the 15-year mortgages, we applied an outstanding balance factor commensurate with the 15-year term of the mortgage.

- Mortgages endorsed prior to 1975: To analyze these loans, we used FHA's most recent survivorship tables for 30-year mortgages.[4] These mortgages are sufficiently seasoned so that economic conditions will not affect their performance significantly.

IV. ANALYSIS OF THE FUTURE PORTFOLIO OF MORTGAGES

In analyzing possible policy options, we focused on those policies that would enable FHA to improve the financial position of the Fund. Thus, the new books of business must at least break even, if not provide a surplus to increase the Fund's value. To reach a break-even point, FHA has two policy initiatives: (1) increase revenues by raising the required premium or (2) lessen losses incurred by the Fund by reducing the risk of its loans.

The policy options we analyzed focused on these initiatives. In analyzing them, we examined their impact on the financial performance of the Fund as well as on the risk of the new business. As discussed in Appendix A, a key factor that explains the risk of default is the loan-to-value ratio of the loan. FHA's current policy enables the borrower to finance the premium and closing costs on the loan. Any

[4]Survivorship and Decrement Tables for HUD/FHA Home Mortgage Insurance as of December 31, 1988, Herzog and Stasulli, January 1989.

policy that changes the amount of the premium and/or closing costs that can be financed will affect the performance of these loans.

To analyze the impact of the policies on the initial loan equity, we estimated the range of true LTVs under each of the policy scenarios. The true LTV was defined as the total mortgage amount less the value of the premium refund divided by the property value.

$$\text{"True LTV"} = \frac{\text{mortgage amount - premium refund}}{\text{property value}}$$

The value of the premium refund is deducted from the mortgage liability because it represents equity to the borrower. This equity, however, decreases rapidly as the refund rate declines over time. In measuring the initial true LTV, the refund's equity value in the years of high default risk was used.

Based on the new LTV ranges under each of the policies, we allocated the loans to the appropriate LTV categories. The econometric models specified for each of these categories were used to project claim and prepayment rates under each of the policy scenarios. The specific assumptions regarding premiums, refund rates, and required downpayments under each of the policy scenarios follow.

- o FHA's Current Policies: Under current policies, all of the 3.8% premium and closing costs assumed to equal 3.0% of the mortgage less the financed premium can be financed. To calculate the range of LTVs, we assumed the net premium to be approximately 1.8% (i.e. 3.8% premium minus 2.0% refund). Therefore, an FHA defined "97% LTV" loan would actually have an LTV of approximately 101.7%.

- o Increase the Premium: Under a policy in which FHA increases the premium yet still allows all of it to be financed, initial LTVs will increase. For this analysis, we assumed that the refund rates under this policy are the same percentage of the total premium as under the current policies (e.g. the refund rate in the middle of the 3rd and 4th year is approximately 53% of the premium). If, for instance, the premium was increased to 5.5%, the net premium would be 2.6% (5.5% less the refund of 5.5% times 53% -- 2.9%) and the actual LTV of a 97% FHA defined LTV would be approximately 102.5%. Under this policy, we assumed that all borrowers would finance the increase in the premium.

- o Raise the Required Downpayment: Such a policy restricts the amount of financing allowed on the property value, insurance premium, and closing costs. Of course, the biggest impact is on the required downpayment on the property. For instance, a policy that requires the minimum up-front borrower cash outlay to be 7% -- the maximum FHA

defined LTV is 93% -- translates to a true LTV of approximately 97.5%. Although the performance of the loans improves dramatically under this policy, FHA continues to pay claims on the financed portion of the premium, and thus, effectively collects a very small premium on those loans that default.

- Restructure the Premium: Under a policy in which FHA requires a small up-front premium in cash and monthly premium payments, the initial LTV is reduced because none of the premium is financed. The true LTV of a 97% FHA-defined LTV is approximately 100%.[5] We have assumed, alternatively, that when possible, borrowers simply increase the loan on their property to finance the cash premium. In addition, because the borrower is required to make monthly premium payments, the present value of the mortgage liability increases. Correspondingly, loans do not perform as well under this policy as they do under the previous policy, although the initial LTVs are very similar. The financial performance of the business under this policy is slightly better because the premium has effectively been increased.

- Set Risk-based Premiums: This policy assumes that all borrowers pay the current up-front premium of 3.8 percent and that those borrowers with LTVs above 90 percent pay an annual premium for a set number of years based on the loan's initial FHA-defined LTV. As under the current policy, the up-front premium can be financed, and thus, the initial true LTV of the loans does not change. However, the mortgage liability increases slightly for loans on which the annual premium is paid. Therefore, loan performance is slightly worse under this policy compared to the current policy. However, the additional premiums collected enables the financial performance of the business to be much better.

- Increase the Current Loan Ceiling: Under this policy we assumed there is no change in the downpayment requirements of the loans, except that the minimum downpayment on the portion of the loan exceeding $100,000 is 10%.

Under all but the last policy we assume that loan demand was $50 billion based on the current loan ceiling of $125,000. That is, even when the cash requirements to the borrower changed, the demand for FHA-insured loans did not.

[5]There is no premium refund under this policy.

APPENDIX C: MMI FUND DATA ANALYSIS

This appendix provides an overview of the MMI Fund analysis performed in the initial phase of this project. This analysis provides a historical statistical database of FHA-insured mortgages and creates a database for the claim rate and prepayment rate analysis and cash flow analysis. This involved extracting the data from the FHA's A-43 database and categorizing the data into subsets based on mortgage characteristics. When there were enough comparable mortgages, values for missing data were estimated. Additionally, disaggregated data were analyzed to better understand the data. In this appendix, the steps involved in developing the database are described.

I. AN OVERVIEW OF THE A-43 DATABASE

The A-43 database contains detailed information on over 11 million loans insured by the FHA Mutual Mortgage Insurance (MMI) Fund. The types of mortgages in the database include Fixed Rate, Adjustable Rate, and Graduated Payment Mortgages. Although most of the mortgages in the database are 30-year mortgages, there are also a significant number of 15, 20, and 25-year mortgages. The information on whether the mortgage has claimed, been prepaid, or remains active is maintained in the A-43 database.

When a new loan is endorsed, a loan record is entered into the database. There are over 100 variables in the A-43 database that contain information about each loan. These include the important dates at every stage of the life of the mortgage, case numbers, profile information about the borrower, and a variety of other information. For the analysis, the following key variables were selected:

- Date of Loan Origination
- Loan-to-Value (LTV) Ratio
- Mortgage Amount
- Type of Mortgage (i.e. Fixed Rate, Adjustable Rate, Graduated Payment)
- Term of the Mortgage (Number of Months)
- Status of the Loan ("A" = Active, "C" = Termination due to Claim, and "T" = Termination due to Loan Prepayment)
- Address of the Property

If there is a claim on the mortgage or the mortgage was prepaid, this information is entered on the loan record status. This information is transferred in from databases that maintain information on loan terminations. If the mortgage has terminated, our analysis will also include these variables from the A-43 database loan record:

- Date of Loan Termination
- Claim Amount

- o Profit or Loss to the FHA on Resale of the Property

These variables provide the key information used for the claim rate and prepayment rate analysis and the cash flow analysis.

II. CATEGORIZATION OF THE DATA

The 11 million loan records were condensed into a categoric database to make it more manageable. The initial step was a division of all loans into separate loan amortization years, loan size categories, LTV ratio categories, loan termination years, loan types, loan terms, and states (locations of the properties). The state data were aggregated to a regional level, based on the ten HUD regions. The regional data were used to analyze the differences in the amount of business and the loss rates for different areas of the country. For the claim rate and prepayment rate analysis, the data were aggregated to the national level based on the following categories:

o	Years of Loan Amortization	(15 categories)
o	Years of Loan Termination	(15 categories)
o	Loan-to-Value Ratio	(8 categories)
o	Loan Size	(8 categories)
o	Type of Loan	(3 categories)
o	Term of Loan	(2 categories)

Since a loan cannot claim or be prepaid prior to its amortization, there are only 120 Amortization Year and Termination Year combinations (1975: 15 termination years, 1976: 14, ... , 1989: 1). The maximum possible number of categories is 46,080 = 120 * 8 * 8 * 3 * 2. In the final analysis, there are fewer categories because of the incomplete distribution to all possible loan categories when there are few loans. For example, there were no Graduated Payment Mortgages (GPMs) prior to 1977.

A. Years of Initial Loan Amortization

The years of loan origination chosen for the analysis were Fiscal Years 1975-89, making 15 categories. The date of loan amortization is the date when the mortgage officially begins. The first payment of principal and interest is made one month later. The fiscal calendar was chosen rather than the standard calendar year to remain consistent with the FHA's accounting statements. This consistency eased the process of generating the data for the cash flow analysis.

The amortization date was chosen rather than the endorsement date because the time between the date the loan begins (amortization date) and the date that the Commissioner officially endorses the loan (endorsement date) can be significant. During the periods of high volume in 1986 and 1987, this lag time was especially significant. A sample of loans amortized in 1987 showed that the average time

between loan amortization and endorsement was 2.5 months, with a standard deviation of 3 months. Thus, a significant number of loans were not officially endorsed until over 6 months after amortization. On several occasions, borrowers defaulted on their loans before the commissioner's official endorsement.

B. Years of Loan Termination

The year of loan termination is the fiscal year in which a claim is paid by the FHA or a borrower prepays the loan. An important factor in the analysis is determining the factors that lead to the loan claim or loan prepayment. By separating each loan termination year from 1975 to 1989, the key economic changes in those years were isolated.

C. Loan-to-Value (LTV) Ratio Categories

The LTV ratios were separated into eight categories. This categorization permitted analysis of the relation between the mortgage downpayment and the probabilities of mortgage claim and prepayment. The percentage of loans for each of the LTV ratio categories for each fiscal origination year are shown in Table C-1:

Table C-1: Distribution of loans by LTV Ratio Category

Fiscal Year	LTV Ratio Categories							
	30-75%	75-85%	85-90%	90-93%	93-95%	95-97%	97-100%	Investor
1975	3.1%	4.7%	10.7%	13.1%	16.9%	32.3%	11.6%	7.5%
1976	2.5	3.7	8.1	13.0	18.3	35.3	12.1	6.9
1977	2.8	4.3	9.2	15.9	19.6	32.6	9.6	6.0
1978	3.2	4.3	8.3	15.3	18.1	35.5	8.6	6.6
1979	4.9	6.3	11.3	21.9	14.5	29.6	4.6	7.0
1980	8.2	9.7	18.1	16.4	13.2	23.0	2.8	8.6
1981	8.9	11.7	19.1	10.4	13.3	20.9	2.0	13.7
1982	13.8	13.4	14.8	10.2	13.3	18.5	1.3	14.7
1983	15.1	13.4	14.4	11.3	13.8	17.7	1.6	12.8
1984	10.4	6.0	12.5	11.0	13.1	22.3	7.4	17.5
1985	10.7	8.9	11.5	11.1	13.8	22.2	2.8	19.0
1986	11.8	10.6	11.5	10.5	12.9	23.2	3.5	15.8
1987	11.3	11.1	10.2	9.9	12.0	28.0	4.2	13.4
1988	5.9	5.9	9.4	11.4	16.1	35.8	6.9	8.7
1989	5.4	5.0	10.7	11.9	16.8	37.3	7.2	5.7
TOTAL	8.7	8.5	11.6	12.3	14.5	27.8	5.2	11.5

D. Loan Size Categories

The loan sizes were separated into eight categories in an attempt to distribute evenly the number of mortgages. As house prices have appreciated from 1975 to 1989, the loan size break points have each increased along with the national rate

of Constant-Quality House Price inflation. Table C-2 shows the upper limits of the loan size categories for each amortization year:

Table C-2: Loan Size Categories

Fiscal Year	National Constant-Quality House Price Appreciation	Loan Size Categories (Upper Limits) 1	2	3	4	5	6	7
1975	n/a	$16,085	$19,302	$22,519	$25,736	$28,953	$35,388	$45,000
1976	8.43%	$17,442	$20,930	$24,419	$27,907	$31,395	$38,372	$45,000
1977	9.44%	$19,089	$22,907	$26,725	$30,543	$34,360	$41,996	$45,000
1978	13.87%	$21,738	$26,085	$30,433	$34,780	$39,128	$47,823	$60,000
1979	15.01%	$25,000	$30,000	$35,000	$40,000	$45,000	$55,000	$67,500
1980	11.37%	$27,842	$33,411	$38,979	$44,548	$50,116	$61,253	$67,500
1981	9.86%	$30,588	$36,705	$42,823	$48,941	$55,058	$67,293	$90,000
1982	5.70%	$32,332	$38,798	$45,265	$51,731	$58,198	$71,130	$90,000
1983	1.70%	$32,881	$39,457	$46,034	$52,610	$59,186	$72,339	$90,000
1984	4.03%	$35,505	$42,606	$49,707	$56,808	$63,909	$78,112	$93,420
1985	3.59%	$36,779	$44,135	$51,491	$58,847	$66,203	$80,914	$93,420
1986	2.92%	$37,852	$45,423	$52,993	$60,563	$68,134	$83,275	$93,420
1987	2.39%	$38,757	$46,509	$54,260	$62,012	$69,763	$85,266	$93,420
1988	1.04%	$39,160	$46,992	$54,824	$62,656	$70,487	$86,151	$105,098
1989	2.05%	$39,964	$47,957	$55,950	$63,943	$71,936	$87,922	$105,098

Since Fiscal Year 1984, the 3.8 percent premium could be financed with the mortgage; therefore, the loan size categories since FY 1984 have all been multiplied by 1.038. The upper limit of loan size category 7 is the FHA loan ceiling. Additionally, there is a loan size category 8, which includes all loans that exceed the official FHA ceiling. In certain cases, the closing costs may also be borrowed. If the mortgage amount equalled the FHA ceiling and the premium and closing costs were financed, the loan would fall into loan size category 8.

E. Type of Mortgage

There are three types of mortgages in the MMI Fund:

- Fixed Rate Mortgages (FRMs)
- Adjustable Rate Mortgages (ARMs)
- Graduated Payment Mortgages (GPMs)

The ARM program originated in July 1984. This program comprises a small percentage of the FHA business. In 1987, the year with the largest percentage of ARMs, this program accounted for approximately 4 percent of the insured mortgages. The advent of the ARM program is far too recent to allow econometric analysis. ARMs have simply been left with FRMs for the purposes of analysis.

GPMs accounted for approximately 7 percent of the loans endorsed between 1975 and 1989, but less than 0.5 percent of loans amortized in Fiscal Year 1989.

F. Term of Mortgage

The term of the mortgage is the period of time from the date of loan amortization until its maturity. Most of the mortgages in the MMI Fund are 30-year mortgages. The 15-year mortgages were separated out. The 20 and 25-year mortgages were grouped in with the 30-year mortgages. There were also a few mortgages with unreasonable mortgage terms (2 months, for example). These mortgages, probably the result of data errors in the A-43 database, were also grouped in with the 30-year mortgages. Table C-3 shows the percentage of non-GPM mortgages by loan term for each amortization year:

Table C-3: Distribution of Mortgages by Term

Fiscal Amortization Year	30-Year Mortgages	25-Year Mortgages	20-Year Mortgages	15-Year Mortgages	Other Terms
1975	89.6%	7.1%	2.7%	0.4%	0.2%
1976	90.6	6.6	2.3	0.3	0.2
1977	91.3	6.2	2.0	0.2	0.3
1978	92.1	5.9	1.5	0.2	0.3
1979	91.5	6.6	1.5	0.2	0.2
1980	92.4	5.5	1.7	0.3	0.1
1981	93.7	3.9	1.7	0.4	0.3
1982	91.3	3.7	2.9	0.7	1.4
1983	86.6	2.3	2.1	7.6	1.4
1984	87.9	2.7	1.6	7.1	0.7
1985	88.4	1.3	1.0	8.7	0.6
1986	87.6	1.6	1.0	9.6	0.2
1987	87.1	3.4	1.0	7.8	0.7
1988	91.3	1.4	0.8	4.8	1.7
1989	93.0	1.0	0.8	3.4	1.8
1975-82	91.6	5.9	2.0	0.3	0.3
1983-89	88.7	2.1	1.1	7.2	1.0

The 15-year mortgages, which were trivial prior to 1983, have averaged 7.2 percent of FRMs since then. The 25-year mortgages, which were common in the late 1970's, are used much less often today.

III. ADJUSTMENTS TO THE DATA

Close examination of the A-43 database revealed significant data problems. Certain loan records contained missing data, while others contained data that were unreasonable (such as the loan with the 2-month term). Rather than deleting all of the loan records with potentially erroneous data, estimation techniques were used wherever possible. Given a significant amount of data in similar categories, interpolation techniques were used to estimate the values for missing or unreasonable values. Such values relate to claim amount and LTV ratio. Corrected data were estimated using other data from the same loan categories:

A. Estimating Missing Claim Dollars

The claim amount is the dollar amount paid to the bank on a defaulted loan in exchange for the deed to the property. Data on loan terminations are transferred into the A-43 database from another FHA database. It appears that these data are not always transferred. Occasionally, A-43 database loan records contain information that there has been a claim on the loan, but the information about the size of the claim was missing. On other occasions, the values for these variables were unreasonable.

A common problem is the failure of the information on the profit or loss on the resale of the property to get transferred to the A-43 database. Especially in the last few years, there are a significant number of loan records with claim amounts but without information on the resale of the property. Therefore, in our calculations of the loss ratios, only the loans with data on the loss (or profit) are included. This method gives the most accurate figures given the available data, but the loss ratios are essentially based on a sample of loan records.

1. Unreasonable Claim or Profit/Loss Dollars

In the analysis, the dollar amounts on foreclosed loans were considered "unreasonable" under the following criteria:

- The loss on the resale of the property exceeded nine tenths of the claim amount
- The profit or loss on resale of the property exceeded the original amount of the loan
- The claim amount was less than zero
- The claim amount exceeded twice the original mortgage amount

These broad standards were designed to correct only the data that seemed especially improbable. From 1975 to 1982, 0.8 percent of all loans were corrected because their data were unreasonable under these criteria. From 1983 to 1989, data for only 0.1 percent of all loans were re-estimated because of these standards.

2. Correcting Claim Dollars

To correct the loan records with missing and unreasonable claim amounts, the claim amount was calculated based on the average ratio of the claim amounts to the mortgage amounts for each loan category. For example, suppose the loan category consisted of loans that:

- Were amortized in 1987
- Claimed in 1988
- Were in the smallest loan size category
- Had LTV ratios of 75-85 percent

- Were 30-year fixed rate mortgages

Suppose that one of these loans had claimed and was missing the claim amount, but the other nine loans in the loan category, had this information:

# of Loans	Average Claim Amount	Average Mortgage Amount	Claim to Mortgage Ratio
9	$36,000	$30,000	1.2
1	(missing)	$20,000	n/a

Using the ratio (claim amount divided by mortgage amount) of 1.2 from the loan records with the data, the claim amount for the loan with missing data is estimated:

# of Loans	Average Claim Amount	Average Mortgage Amount	Claim to Mortgage Ratio
9	$36,000	$30,000	1.2
1	$24,000	$20,000	1.2

Our analysis showed that the ratio of claim amounts to mortgage amounts is stable within specific loan categories. If all loans with claims in a specific loan category had missing claim amounts, the claim amounts were assumed to be 20 percent greater than the mortgage amounts. This rate reflects an average ratio of claim amounts to mortgage amounts.

B. Estimating Missing LTV Ratios

The A-43 database contains records for loans dating as far back as 30 years. The reliability of the older data had to be considered in choosing the years of data that would be suitable for the analysis. The Loan-to-Value (LTV) ratio is a critical component of the analysis, and it would have been problematic to include years with a large proportion of loans missing their LTV ratios. With a limited number of records with missing LTV ratios, the values can be estimated from records with LTV ratios. With too many missing values, this is not a reasonable procedure. Table C-4 shows the percentages of loan records with missing data on the LTV ratio.

Table C-4: Percentage of Loans with Missing LTV Ratios

Fiscal Year		Fiscal Year	
1974	63.7%	1982	17.3%
1975	20.1%	1983	20.2%
1976	20.2%	1984	2.8%
1977	12.5%	1985	1.1%
1978	17.5%	1986	0.3%
1979	23.1%	1987	0.1%
1980	12.0%	1988	0.1%
1981	27.4%	1989	0.5%

Due to the excessive number of loan records with missing LTV ratios in 1974 (and earlier), only loans originating in Fiscal Years 1975 - 1989 were selected for the analysis. This subset contains approximately 6.5 million loan records. In 1984, the percentage of loan records with missing LTV ratios dropped significantly.

As demonstrated in Table C-4, a significant number of loan records are missing data for the LTV ratio. For all loans amortized between 1975 and 1983, 18.8 percent of the loans had missing data on the LTV ratio, whereas between 1984 and 1989, only 0.5 percent are missing. Additionally, a few records contained LTV ratios beyond the FHA's allowable limits. Loan records with LTV ratios "out of range" constituted less than 0.2 percent of all loans. For the analysis, these ratios were treated as missing.

The information necessary to calculate the LTV ratio -- home value -- is not included in the A-43 database. Thus, the missing LTV ratios had to be estimated. This estimation procedure maintained the existing distribution of the LTV ratios in each loan category for active, prepaid, and claimed mortgages. The mortgages with missing LTV ratios were redistributed to the existing LTV ratio categories based on the percentage of loans in each existing category. The following hypothetical example demonstrates this redistribution. Suppose the loan category consisted of loans that:

- Were amortized in 1975
- Terminated or were still active in 1976
- Were in loan size category 7
- Were 30-year fixed rate mortgages

Suppose that 1,286 loans were distributed among 4 of the LTV ratio categories in the following way:

	LTV Ratio Category				
Status	75-85%	85-90%	90-93%	93-95%	Missing
Active	100	200	300	400	100
Prepaid	20	20	20	20	20
Claimed	0	10	20	30	6

The loan records with missing LTV ratios would be redistributed based on the percentage of all loans within each loan status. The result would be:

	LTV Ratio Category				
Status	75-85%	85-90%	90-93%	93-95%	Missing
Active	110	220	330	440	0
Prepaid	25	25	25	25	0
Claimed	0	11	22	33	0

This method maintains the percentage distribution of loans into the LTV ratio categories for each loan category and loan status. By maintaining the distribution of each loan status, the relation between the LTV ratio and the probabilities of

claim or prepayment was maintained.

C. Elimination of Erroneous Loan Records

Despite our attempts to use interpolation and other techniques to estimate data for missing values, certain loan records contained major errors or were missing key data. These include missing loan amount, missing or incorrect state code, and loan termination recorded as prior to loan amortization. These series constituted a very small percentage of the records and could not have been properly re-estimated.

IV. DATA USED FOR THE CLAIM AND PREPAYMENT ANALYSIS

A. Data in the Regression Analysis

Regression analysis was used to estimate equations to predict the probability of borrowers prepaying or claiming on their mortgages. This section presents the historical data subsets used for the regression analysis and the other analyses used to model the behavior of additional loan categories.

Only loans with consistent properties were used in the regression analysis. Such loans are defined as:

- Mortgages without graduated payments
- Mortgages with amounts less than or equal to the official FHA ceiling
- Mortgages with LTV ratios between 75 and 97 percent, but not at exactly 85, 90, or 95 percent (in recent years)
- Mortgages with terms of 20, 25, or 30 years

The data in these categories comprise over 75 percent of the mortgages originating between Fiscal Years 1975 and 1989.

B. Data Analyzed Independent of the Primary Regression Analysis

A number of loan categories were not analyzed in the main regression analysis because their properties were inconsistent with most of the other data. The following sections outline the reasons for separating these categories from the main regression analysis and the methodology used for including the data in the cash flow model.

1. Loans Above the FHA Ceiling

In each year, there were a number of mortgages above the official FHA ceiling, even accounting for the premium being financed along with the mortgage (since 1984). These loans are comprised of a wide variety of exceptions, such as loans in Alaska, Hawaii, special programs, and other special cases. All of the loans above the ceiling comprised less than 1 percent of all of the loans.

A variable in the A-43 database indicates if the mortgage was insured under a special program. The special programs include solar homes, housing for veterans, housing for the elderly, and other similar programs. The mortgages in these cases may exceed the FHA ceiling. In a sample of 1985 mortgages, the special programs accounted for approximately 10 percent of the business, excluding mortgages in Alaska and Hawaii.

Certain variables in the A-43 database that cannot be left blank. If a program code is omitted or inputed incorrectly, the default value is 00, which signifies no special program code. It is likely that the code was not always correctly entered in the database -- thereby understating the number of loans under the special programs.

To include these loans in the cash flow analysis, the claim rates and prepayment rates had to be estimated. Because many of these loans exceeded the FHA ceiling by a small amount, this subset of loans were treated as loans in the next highest loan size category, category 7.

2. Loans Outside the 75 to 97 Percent LTV Range

Most of the LTV ratios fell between 75 and 97 percent. The loans with LTV ratios below 75 percent are an unusual subset because the FHA does not generally need to guarantee a loan with such a large downpayment. The subset of loans with less than a 3 percent downpayment may also have unusual properties because that falls below the minimum downpayment requirement.

For the cash flow analysis, the categories consisting of loans with LTV ratios below 75 percent and above 97 percent had to be grouped with a category used in the regression equations. The criteria for the "grouping" was an analysis of the aggregated loan termination rates. Table C-5 presents the 5-year cumulative claim and prepayment rates for the LTV ratio categories:

Table C-5: Cumulative Loan Termination Rates by LTV Ratio Category

	Loan-to-Value Ratio	5-Year Cumulative Claim Rate	5-Year Cumulative Prepayment Rate
***	30 - 75%	1.65%	43.16%
	75 - 85%	3.78%	35.85%
	85 - 90%	4.44%	29.12%
	90 - 93%	4.92%	24.42%
	93 - 95%	6.39%	21.59%
	95 - 97%	7.87%	19.13%
***	97 - 100%	8.82%	18.29%
	Investor	8.33%	28.72%

*** Not in the regression analysis

The loans with 30 to 75 percent LTV ratios were grouped with the loans with LTV ratios between 75 and 85 percent because the claim and prepayment rates were the closest ones. The loans with LTV ratios of 97 to 100 percent were grouped with the loans with LTV ratios between 95 and 97 percent. Although the 8.82 percent 5-year cumulative claim rate on these 97 to 100 percent loans is closer to the 8.33 percent on "Investor" loans, the prepayment rates differ significantly. The 5-year cumulative prepayment rate of 19.13 percent (95 to 97 percent LTV) is much closer to 18.29 (97 to 100 percent LTV) than 28.72 (Investor loans).

Although there are differences between the claim rates of the categories of loans not in the regression analysis and the categories that they were grouped with, there is no significant net difference. The claim rate is understated for loans with 30 to 75 percent LTV ratios by approximately 2 percent (1.65 to 3.78 percent) whereas the claim rate is overstated for loans with 97 to 100 percent LTV ratios by approximately 1 percent (8.82 to 7.87 percent). In 1989, 5.4 percent of all loans had 30 to 75 percent LTV ratios and 7.2 percent had 97 to 100 percent LTV ratios (see Table C-1 for further details). It should be noted, though, that ARMs are more risky than FRMs and that including ARMs with FRMs could understate future default losses.

3. LTV Ratios of 85, 90, and 95 percent for Selected Years

In the late 1980's, the number of mortgages amortized increased significantly. To account for the increased business and workload, certain "short-cuts" were apparently used. The best known of these is "streamlined refinancing" -- a mortgage that is refinanced without a reappraisal, which was possible as long as the borrower did not increase the remaining size of the loan. With no reappraisal, the LTV ratio is unknown. Often it was apparently entered as exactly 85, 90, or 95 percent; normally one would expect that the original LTV ratio or the ratio of the current loan to the original house price would be recorded. If an LTV ratio of exactly 85, 90, or 95 percent was entered into the database in the late 1980's, the loan record was removed from the regression analysis.

Table C-6 reports the percentage of loans with these LTV ratios in each year. If the percentage with the specific LTV ratios rose suddenly, those loans were separated from the regression analysis. The increase in the number of 95 percent LTV loans was not as substantial as for the 85 percent and 90 percent LTV ratio loans. At its peak in 1988, only 2.9 percent of the loans had an LTV ratio of 95 percent. In 1985, 4.3 percent of the loans had an LTV ratio of 85 percent. In 1987, 6.3 percent of the loans had an LTV ratio of 90 percent.

Table C-6: Percentage of Loans with Certain Exact LTV Ratios

Year of Loan Amortization	LTV Ratio 85%	90%	95%	Year of Loan Amortization	LTV Ratio 85%	90%	95%
1975	0.2	0.9	1.8	1983	0.4	0.7	1.2
1976	0.1	0.5	1.6	1984	0.9	1.0	1.9
1977	0.1	0.5	1.5	1985	4.3	1.0	1.8
1978	0.1	0.4	1.3	1986	3.3	2.1	2.0
1979	0.1	0.4	1.1	1987	2.6	6.3	2.4
1980	0.2	0.6	1.1	1988	1.7	5.3	2.9
1981	0.5	0.5	0.9	1989	1.0	5.3	2.6
1982	0.2	0.5	1.9				

(The underlined loans have been separated from the regression analysis)

These apparent errors comprised a significant portion of the business, but were not an excessive part of the refinancings. It has been estimated that as much as 40 percent of the business in 1987 was due to refinancings. Even if all of the "streamlined" refinancings were entered into the A-43 database as 85, 90, or 95 percent, that would still only be 11.3 percent of the 1987 mortgages. In short, it appears that the "streamlined" refinancings did not have a major effect in skewing the data.

Because the proportion of loans with 85, 90, and 95 percent LTV ratios jumped after 1984, it is unlikely that these LTV ratios were accurate. In the analysis, the claim rates (and prepayment rates) were compared to those of the other LTV ratio categories. The following list describes which LTV ratio categories these apparently inaccurate 85, 90, and 95 percent LTV ratios fit into:

- 85 Percent LTV Mortgages (1985 - 1988): Performed as Investor Loans
  The high claim rates and low prepayment rates best matched with loans in the Investor category. This also remains consistent with our assumption that these loans were "streamlined" refinancings of Investor loans.

- 90 Percent LTV Mortgages (1986 - 1989): Performed as 95 to 97 Percent LTV Mortgages
  The best fit was with the loans in the 95 to 97 percent LTV ratio category. This suggests that the entry of an LTV ratio of exactly 90 percent into the A-43 database overstated the true downpayment.

- o 95 Percent LTV Mortgages (1988 - 1989): Performed as 95 to 97 Percent LTV Mortgages
  These loans appear to have been in the proper LTV ratio category originally. The increased number of mortgages with a 95 percent LTV ratio may have been solely the result of more loans with a 5 percent downpayment.

4. 15-Year Mortgages

Before 1983, 15-year mortgages accounted for an average of less than 0.5 percent of the business. From 1983 to 1987, however, 15-year mortgages accounted for over 7 percent of the business each year (see Table C-3). Our analysis of the historical performance of 15-year loans revealed that the claim rates were usually lower than on 30-year mortgages.

To maintain these mortgages in the database for the cash flow analysis, a comparison of the historical performance of these loans to the 30-year loans was performed at an aggregate level. The analysis revealed that, on average, the probability of a claim on a 15-year mortgage that originated between 1983 and 1987 was two thirds of the probability of a claim on a 30-year mortgage. The faster amortization of 15-year mortgages would account for a lower claim rate, as would a lower initial LTV ratio.

5. Graduated Payment Mortgages (GPMs)

The GPMs were specifically isolated because the mortgage amortization schedule differs significantly from the Fixed and Adjustable Rate Mortgages. Unlike a Fixed or Adjustable Rate Mortgage, the loan balance on a GPM increases over the first 5 or 10 years, depending on the specific GPM type. This difference necessitated the separation of these mortgages.

Holding the LTV ratio constant, GPMs should default more often. However, the 245a GPMs FHA began insuring in 1975 have a much higher minimum LTV ratio (almost 10 percent) thereby offsetting the impact of negative amortization on default. The 245b GPMs FHA began insuring in 1980 have the same LTV minimum as other mortgages and these have much higher default rates; consequently, the FHA cancelled that program in 1987. Because the predominant GPM business still on FHA's books and all that is being added is from the 245a program, the forecasted default experience of GPMs is assumed to be the same of that of FRMs.

V. HISTORICAL SUMMARY TABLES

The following pages contain much of the data used for the historical data analysis. The first table shows the dollar amount of mortgages amortized in each fiscal year from 1975 to 1989. The next set of tables contain data demonstrating the percentage distribution of the dollar amount of mortgages by loan size category and LTV ratio category, for each fiscal amortization year.

The next set of tables contain data for the number of mortgages, the conditional claim rates, and the conditional prepayment rates for the following subsets of data:

(8 categories)	o	30-year Fixed and Adjustable Rate Mortgages, each Loan-to-Value (LTV) ratio category
(8 categories)	o	30-year Fixed and Adjustable Rate Mortgages, each Loan Size category
(1 category)	o	15-year mortgages, Fixed and Adjustable Rate Mortgages
(1 category)	o	Graduated Payment Mortgages
(3 categories)	o	30-year Fixed and Adjustable Mortgages, each special LTV ratio category removed from the regression analysis (85, 90, and 95 percent for selected loan amortization years)

DISTRIBUTION OF MORTGAGE DOLLARS

Fiscal Amortization Year	Mortgages Originating (Billion $)
1975	4.6
1976	5.7
1977	7.1
1978	9.9
1979	15.4
1980	14.7
1981	10.2
1982	7.3
1983	26.3
1984	15.6
1985	23.5
1986	56.5
1987	68.5
1988	35.3
1989	37.0

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1975

LTV Category

Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.33	0.29	0.39	0.37	0.39	0.74	0.44	0.02	2.97
2. 75 - 85%	0.24	0.26	0.42	0.54	0.68	1.89	1.18	0.01	5.21
3. 85 - 90%	0.39	0.48	0.86	1.22	1.74	4.62	2.83	0.05	12.18
4. 90 - 93%	0.44	0.60	0.95	1.51	2.24	4.81	4.57	0.04	15.16
5. 93 - 95%	0.99	1.03	1.73	2.35	2.85	6.62	2.11	0.04	17.72
6. 95 - 97%	3.07	3.73	3.79	5.72	5.91	6.20	0.70	0.01	29.14
7. >= 97%	1.45	1.63	1.72	2.08	1.31	1.41	0.07	0.00	9.66
8. Investor	0.49	0.57	0.79	1.02	1.06	2.22	1.62	0.19	7.96
TOTAL	7.40	8.60	10.64	14.81	16.16	28.50	13.53	0.36	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1976

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.38	0.28	0.29	0.34	0.33	0.43	0.21	0.01	2.27
2. 75 - 85%	0.24	0.26	0.34	0.51	0.77	1.31	0.61	0.02	4.06
3. 85 - 90%	0.49	0.55	0.79	1.09	1.39	2.84	1.94	0.04	9.13
4. 90 - 93%	0.56	0.61	0.90	1.41	1.89	6.24	3.88	0.04	15.53
5. 93 - 95%	1.27	1.26	1.82	2.90	2.94	8.41	0.89	0.03	19.53
6. 95 - 97%	4.05	3.79	5.48	8.01	5.95	4.37	0.40	0.02	32.07
7. >= 97%	1.88	1.75	2.21	1.88	1.34	0.95	0.08	0.01	10.10
8. Investor	0.56	0.62	0.84	1.09	0.96	1.74	1.07	0.44	7.33
TOTAL	9.42	9.12	12.67	17.22	15.58	26.29	9.09	0.61	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1977

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.38	0.27	0.39	0.44	0.37	0.58	0.19	0.02	2.65
2. 75 - 85%	0.27	0.26	0.41	0.72	0.87	1.44	0.69	0.05	4.70
3. 85 - 90%	0.50	0.51	0.93	1.37	1.65	3.34	2.03	0.09	10.42
4. 90 - 93%	0.65	0.68	1.19	1.99	2.83	9.11	2.14	0.05	18.65
5. 93 - 95%	1.32	1.32	2.42	3.20	5.54	5.82	0.60	0.03	20.26
6. 95 - 97%	3.82	3.73	6.65	7.44	4.99	2.19	0.20	0.03	29.05
7. >= 97%	1.36	1.40	2.09	1.51	1.18	0.37	0.09	0.01	8.02
8. Investor	0.47	0.54	0.87	1.00	0.91	1.48	0.55	0.43	6.25
TOTAL	8.77	8.71	14.94	17.67	18.35	24.34	6.49	0.72	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1978

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.35	0.31	0.37	0.36	0.44	0.61	0.54	0.01	3.00
2. 75 - 85%	0.22	0.26	0.47	0.57	0.79	1.17	1.09	0.02	4.58
3. 85 - 90%	0.39	0.48	0.81	1.22	1.40	2.78	1.85	0.03	8.96
4. 90 - 93%	0.54	0.72	1.25	2.20	2.98	4.86	4.48	0.04	17.09
5. 93 - 95%	1.05	1.42	2.01	3.56	3.13	3.65	3.44	0.04	18.30
6. 95 - 97%	2.79	3.68	5.18	5.53	4.43	6.38	5.80	0.08	33.86
7. >= 97%	1.02	1.21	1.16	1.06	0.84	1.20	0.96	0.01	7.48
8. Investor	0.45	0.58	0.78	0.90	0.93	1.61	1.24	0.24	6.72
TOTAL	6.82	8.66	12.03	15.40	14.95	22.27	19.39	0.48	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1979

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.44	0.43	0.52	0.65	0.60	1.08	0.90	0.03	4.64
2. 75 - 85%	0.24	0.34	0.47	0.85	0.87	1.98	2.16	0.03	6.95
3. 85 - 90%	0.40	0.56	0.99	1.41	1.73	3.47	3.76	0.03	12.35
4. 90 - 93%	0.57	0.85	1.74	2.79	3.75	8.19	6.25	0.07	24.21
5. 93 - 95%	0.98	1.15	1.70	2.17	2.13	3.52	2.31	0.02	13.97
6. 95 - 97%	2.22	2.87	3.92	4.48	4.15	6.43	3.26	0.05	27.38
7. >= 97%	0.69	0.47	0.50	0.55	0.49	0.74	0.34	0.01	3.78
8. Investor	0.53	0.60	0.79	0.90	0.96	1.63	1.23	0.08	6.72
TOTAL	6.07	7.27	10.63	13.79	14.68	27.05	20.19	0.32	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1980

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.71	0.67	0.77	1.03	1.26	2.47	0.85	0.10	7.86
2. 75 - 85%	0.36	0.46	0.83	1.18	1.61	4.47	1.52	0.08	10.50
3. 85 - 90%	0.57	0.82	1.49	2.43	3.05	8.27	2.93	0.10	19.67
4. 90 - 93%	0.61	0.86	1.55	2.38	2.99	7.28	1.49	0.08	17.24
5. 93 - 95%	1.00	1.10	1.59	1.83	1.89	4.02	1.09	0.03	12.55
6. 95 - 97%	1.86	2.22	3.14	3.43	3.17	5.90	1.49	0.09	21.31
7. >= 97%	0.45	0.29	0.31	0.33	0.31	0.53	0.07	0.02	2.30
8. Investor	0.60	0.64	0.85	1.11	1.47	2.59	0.92	0.38	8.56
TOTAL	6.16	7.06	10.54	13.73	15.75	35.52	10.36	0.87	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1981

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	1.03	0.71	0.98	1.06	1.23	1.79	1.47	0.03	8.31
2. 75 - 85%	0.52	0.64	1.27	1.66	2.06	3.53	2.89	0.03	12.60
3. 85 - 90%	0.80	1.00	1.89	2.53	3.41	7.08	4.03	0.02	20.76
4. 90 - 93%	0.64	0.69	1.12	1.43	1.64	3.36	1.88	0.00	10.77
5. 93 - 95%	1.19	1.12	1.52	1.82	1.81	3.73	1.70	0.01	12.89
6. 95 - 97%	2.08	1.95	2.59	2.87	2.55	5.23	2.32	0.02	19.62
7. >= 97%	0.43	0.17	0.19	0.20	0.19	0.25	0.06	0.00	1.50
8. Investor	1.41	1.09	1.32	1.80	2.03	2.97	2.12	0.82	13.56
TOTAL	8.11	7.37	10.89	13.36	14.93	27.95	16.46	0.93	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1982

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	1.91	1.23	1.81	1.60	1.44	2.89	1.55	0.17	12.61
2. 75 - 85%	0.83	0.96	1.62	1.85	2.35	4.12	2.22	0.13	14.07
3. 85 - 90%	0.83	0.95	1.62	2.03	2.40	5.44	2.68	0.04	16.00
4. 90 - 93%	0.79	0.68	1.08	1.32	1.51	3.51	1.70	0.01	10.61
5. 93 - 95%	1.16	0.97	1.34	1.61	1.99	4.42	2.14	0.01	13.65
6. 95 - 97%	1.98	1.62	2.59	2.16	2.34	4.78	2.19	0.03	17.69
7. >= 97%	0.34	0.10	0.11	0.11	0.14	0.13	0.03	0.00	0.95
8. Investor	1.61	1.31	1.64	1.94	2.15	3.03	1.64	1.10	14.42
TOTAL	9.46	7.82	11.82	12.61	14.32	28.32	14.16	1.50	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1983

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	1.50	1.25	1.92	1.73	1.73	3.36	2.23	0.28	13.99
2. 75 - 85%	0.66	0.87	1.50	1.82	2.09	4.08	2.45	0.24	13.70
3. 85 - 90%	0.53	0.80	1.39	1.91	2.27	4.93	3.31	0.16	15.29
4. 90 - 93%	0.53	0.68	1.07	1.48	1.73	3.76	2.38	0.07	11.70
5. 93 - 95%	0.85	1.00	1.33	1.76	2.11	4.18	2.45	0.06	13.74
6. 95 - 97%	1.15	1.33	1.79	2.17	2.64	5.22	3.11	0.07	17.48
7. >= 97%	0.18	0.12	0.14	0.20	0.24	0.37	0.15	0.01	1.41
8. Investor	1.03	0.95	1.37	1.64	1.78	2.97	1.72	1.25	12.70
TOTAL	6.43	6.99	10.50	12.70	14.60	28.85	17.79	2.13	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1984

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	1.46	1.10	1.05	1.29	1.17	1.76	1.07	0.19	9.11
2. 75 - 85%	0.48	0.53	0.64	0.86	0.90	1.45	0.83	0.18	5.88
3. 85 - 90%	0.71	0.80	1.19	1.67	2.01	3.91	2.65	0.29	13.23
4. 90 - 93%	0.66	0.70	1.02	1.42	1.71	3.46	2.55	0.14	11.65
5. 93 - 95%	0.93	0.88	1.25	1.73	1.98	3.89	2.67	0.10	13.43
6. 95 - 97%	1.55	1.66	2.31	2.85	3.32	6.82	3.98	0.14	22.62
7. >= 97%	0.84	0.61	0.80	0.90	0.96	1.79	0.77	0.07	6.74
8. Investor	1.69	1.48	1.96	2.25	2.40	3.70	2.10	1.77	17.35
TOTAL	8.31	7.75	10.21	12.98	14.47	26.79	16.61	2.87	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1985

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	1.31	0.92	1.14	1.20	1.12	1.79	1.73	0.19	9.40
2. 75 - 85%	0.62	0.60	0.90	1.11	1.20	2.21	1.92	0.24	8.81
3. 85 - 90%	0.86	0.93	1.40	1.92	2.22	4.51	3.71	0.73	16.28
4. 90 - 93%	0.56	0.60	0.89	1.26	1.63	3.40	3.11	0.13	11.59
5. 93 - 95%	0.84	0.80	1.12	1.53	1.92	4.15	3.61	0.10	14.07
6. 95 - 97%	1.32	1.41	1.99	2.52	3.12	6.87	5.13	0.14	22.50
7. >= 97%	0.31	0.20	0.30	0.33	0.35	0.65	0.35	0.06	2.55
8. Investor	1.21	1.05	1.40	1.80	1.99	3.27	2.24	1.84	14.80
TOTAL	7.02	6.52	9.13	11.67	13.56	26.86	21.82	3.42	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1986

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	1.17	1.03	1.39	1.38	1.41	2.29	1.75	0.26	10.68
2. 75 - 85%	0.60	0.71	1.15	1.41	1.62	2.77	1.98	0.31	10.55
3. 85 - 90%	0.60	0.80	1.36	1.89	2.37	4.71	3.16	0.45	15.34
4. 90 - 93%	0.52	0.67	1.12	1.56	2.05	3.96	3.03	0.19	13.09
5. 93 - 95%	0.63	0.78	1.16	1.61	1.98	3.94	2.99	0.14	13.23
6. 95 - 97%	0.98	1.30	2.12	2.72	3.38	6.62	4.04	0.18	21.34
7. >= 97%	0.39	0.46	0.53	0.32	0.35	0.59	0.27	0.02	2.93
8. Investor	0.74	0.82	1.25	1.60	1.86	3.25	1.98	1.33	12.85
TOTAL	5.64	6.57	10.08	12.50	15.02	28.12	19.20	2.87	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1987

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	1.18	1.14	1.37	1.40	1.37	2.11	1.47	0.15	10.18
2. 75 - 85%	0.71	0.86	1.29	1.51	1.70	2.82	1.87	0.17	10.93
3. 85 - 90%	0.54	0.76	1.28	1.71	2.11	4.14	2.62	0.29	13.45
4. 90 - 93%	0.83	1.03	1.64	2.21	2.73	4.72	3.16	0.19	16.50
5. 93 - 95%	0.57	0.78	1.23	1.57	1.96	3.64	2.53	0.10	12.37
6. 95 - 97%	1.03	1.50	2.36	3.03	3.72	6.73	3.60	0.12	22.09
7. >= 97%	0.48	0.64	0.61	0.43	0.44	0.62	0.27	0.01	3.49
8. Investor	0.65	0.79	1.15	1.50	1.63	2.89	1.53	0.83	10.98
TOTAL	5.99	7.49	10.93	13.35	15.65	27.66	17.05	1.87	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1988

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.97	0.62	0.69	0.68	0.51	0.76	0.64	0.05	4.91
2. 75 - 85%	0.67	0.55	0.74	0.77	0.70	1.13	1.00	0.05	5.61
3. 85 - 90%	0.75	0.82	1.21	1.48	1.66	3.11	2.53	0.11	11.66
4. 90 - 93%	1.18	1.23	1.90	2.33	2.64	4.43	3.45	0.09	17.25
5. 93 - 95%	1.05	1.26	1.90	2.15	2.42	4.47	3.49	0.09	16.82
6. 95 - 97%	2.16	2.62	3.75	4.22	4.35	8.46	5.42	0.10	31.09
7. >= 97%	1.05	1.09	0.98	0.74	0.58	0.84	0.32	0.00	5.60
8. Investor	0.66	0.60	0.79	0.91	0.91	1.56	1.29	0.33	7.05
TOTAL	8.50	8.80	11.95	13.28	13.77	24.76	18.14	0.81	100.00

DISTRIBUTION OF MORTGAGE DOLLARS
BY LOAN SIZE AND LTV RATIO CATEGORIES

Loan Amortization Year 1989

LTV Category — Loan Size Category

Percent	1	2	3	4	5	6	7	8	TOTAL
1. < 75%	0.91	0.60	0.58	0.54	0.48	0.69	0.57	0.05	4.42
2. 75 - 85%	0.56	0.49	0.56	0.60	0.63	0.90	0.97	0.05	4.76
3. 85 - 90%	0.72	0.78	1.10	1.27	1.59	2.79	2.97	0.07	11.30
4. 90 - 93%	1.18	1.21	1.97	2.20	2.66	4.37	3.92	0.10	17.61
5. 93 - 95%	1.10	1.27	1.94	2.07	2.52	4.52	4.14	0.07	17.62
6. 95 - 97%	2.38	2.85	3.90	4.05	4.59	8.20	6.49	0.12	32.59
7. >= 97%	1.05	1.09	0.92	0.77	0.70	0.94	0.44	0.02	5.93
8. Investor	0.49	0.49	0.62	0.66	0.78	1.25	1.16	0.31	5.76
TOTAL	8.40	8.79	11.60	12.15	13.96	23.66	20.65	0.80	100.00

NUMBER OF MORTGAGES

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV RATIOS LESS THAN 75%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	5,717	5,416	7,111	8,316	13,023	19,588	14,415	16,720	58,532	21,642	30,843	78,938	96,391	29,115	27,590
2	5,674	5,335	7,012	8,189	12,882	19,469	14,321	16,593	58,118	21,519	30,543	78,055	95,727	28,783	
3	5,410	4,936	6,604	7,764	12,563	19,108	14,087	11,823	56,788	20,757	24,530	72,840	93,316		
4	4,922	4,440	6,084	7,483	12,328	18,880	12,125	9,906	54,181	14,705	16,225	69,278			
5	4,418	4,067	5,832	7,325	12,244	18,058	11,017	8,006	39,975	9,478	13,821				
6	4,034	3,891	5,699	7,249	11,849	17,335	9,880	5,003	25,842	8,019					
7	3,849	3,779	5,630	7,009	11,511	16,479	7,302	3,599	22,164						
8	3,767	3,721	5,453	6,828	11,122	14,265	5,268	3,093							
9	3,711	3,611	5,280	6,581	10,341	11,568	4,589								
10	3,585	3,483	5,089	6,125	9,243	10,469									
11	3,442	3,345	4,780	5,585	8,612										
12	3,318	3,131	4,376	5,255											
13	3,123	2,887	4,097												
14	2,864	2,706													
15	2,705														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV RATIOS OF 75 - 85%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	8,734	8,150	10,783	10,597	13,454	18,500	15,365	13,742	53,564	13,432	28,852	82,547	108,048	31,897	27,589
2	8,689	8,085	10,689	10,493	13,395	18,396	15,327	13,670	53,382	13,389	28,714	81,917	107,518	31,675	
3	8,379	7,630	10,149	10,034	13,234	18,151	15,116	10,312	52,656	13,062	23,835	77,379	105,534		
4	7,662	6,909	9,449	9,740	13,071	17,966	13,178	8,728	50,760	9,399	16,316	73,847			
5	6,855	6,331	9,097	9,589	12,979	17,399	11,979	7,046	38,848	6,001	13,703				
6	6,326	6,025	8,938	9,491	12,658	16,851	10,722	4,402	25,484	4,970					
7	6,054	5,885	8,869	9,235	12,373	16,152	7,807	3,019	21,533						
8	5,938	5,824	8,597	8,999	12,041	14,114	5,663	2,556							
9	5,882	5,638	8,352	8,709	11,245	11,423	4,881								
10	5,688	5,461	8,075	8,131	10,157	10,258									
11	5,479	5,254	7,571	7,399	9,468										
12	5,245	4,932	6,918	6,918											
13	4,922	4,517	6,489												
14	4,480	4,239													
15	4,224														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV RATIOS OF 85 - 90%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	19,814	17,878	23,193	20,620	22,353	25,605	17,378	13,125	50,031	24,547	36,105	94,464	104,638	53,034	61,211
2	19,760	17,800	23,104	20,535	22,293	25,566	17,357	13,109	49,929	24,508	36,014	93,979	104,439	52,884	
3	19,238	17,053	22,328	19,930	22,072	25,335	17,161	10,551	49,389	23,981	30,835	90,070	103,228		
4	17,822	15,581	20,933	19,461	21,820	25,055	15,482	9,281	47,802	17,703	21,606	86,495			
5	15,930	14,241	20,221	19,191	21,649	24,335	14,416	7,652	37,036	11,749	18,007				
6	14,476	13,603	19,890	19,033	21,222	23,542	13,113	4,665	25,084	9,654					
7	13,859	13,320	19,735	18,584	20,751	22,648	9,915	3,111	21,050						
8	13,558	13,194	19,179	18,144	20,207	19,943	7,475	2,629							
9	13,443	12,777	18,625	17,672	19,018	16,423	6,465								
10	13,049	12,413	18,041	16,578	17,294	14,843									
11	12,611	11,968	16,921	15,147	16,036										
12	12,157	11,129	15,427	14,116											
13	11,354	10,176	14,427												
14	10,420	9,524													
15	9,764														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV RATIOS OF 90 - 93%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	24,256	28,464	40,075	32,041	27,228	24,514	16,880	12,236	45,842	24,620	37,428	87,545	102,628	64,543	69,253
2	24,209	28,394	39,956	31,908	27,171	24,478	16,862	12,218	45,784	24,577	37,366	87,219	102,506	64,409	
3	23,686	27,235	38,614	31,058	26,920	24,227	16,644	10,313	45,204	24,056	33,062	84,200	101,550		
4	21,859	24,904	36,173	30,334	26,562	23,881	15,091	9,083	43,676	18,573	24,141	80,951			
5	19,601	22,533	34,910	29,876	26,263	23,140	14,100	7,630	35,073	12,689	20,324				
6	17,802	21,487	34,304	29,582	25,759	22,406	12,908	4,789	24,576	10,360					
7	16,962	20,986	34,030	28,928	25,152	21,508	9,873	3,253	20,735						
8	16,597	20,792	33,070	28,288	24,486	19,130	7,338	2,689							
9	16,447	20,086	32,098	27,564	23,003	15,871	6,340								
10	15,885	19,349	31,072	25,873	20,851	14,325									
11	15,347	18,610	29,002	23,555	19,436										
12	14,752	17,303	26,501	22,006											
13	13,786	15,664	24,730												
14	12,602	14,613													
15	11,781														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV RATIOS OF 93 - 95%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	31,282	40,259	49,441	46,331	45,673	38,020	25,652	16,451	59,800	31,984	48,741	111,446	127,126	92,541	98,831
2	31,224	40,187	49,282	46,168	45,568	37,977	25,607	16,403	59,718	31,937	48,669	111,106	126,980	92,384	
3	30,534	38,630	47,496	44,929	45,120	37,579	25,189	14,095	59,090	31,261	43,698	107,490	125,829		
4	28,093	34,910	44,189	43,846	44,515	36,954	23,046	12,571	57,000	24,922	32,786	103,092			
5	24,777	31,306	42,435	43,097	44,039	35,788	21,431	10,609	47,080	17,418	27,418				
6	22,239	29,692	41,563	42,649	43,149	34,628	19,612	6,730	34,232	14,263					
7	21,183	28,894	41,194	41,624	42,151	33,297	15,427	4,572	28,851						
8	20,630	28,567	39,996	40,573	41,023	29,873	11,829	3,700							
9	20,347	27,530	38,789	39,456	38,666	25,466	10,209								
10	19,631	26,553	37,430	37,219	35,462	23,102									
11	18,902	25,492	35,081	34,117	33,153										
12	18,163	23,769	32,181	31,984											
13	17,056	21,696	30,169												
14	15,632	20,358													
15	14,655														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV RATIOS OF 95 - 97%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	59,739	77,531	82,389	98,764	105,673	71,014	42,652	24,400	78,277	56,158	80,432	183,598	233,279	159,489	173,955
2	59,615	77,239	82,090	98,524	105,446	70,852	42,524	24,312	78,144	56,060	80,287	183,098	232,957	159,150	
3	58,053	73,994	78,924	95,884	104,076	69,631	41,376	20,703	77,010	54,642	72,703	177,079	230,251		
4	53,259	66,637	73,123	93,122	102,222	67,970	37,063	18,030	73,646	44,051	55,179	169,000			
5	47,213	59,660	69,775	91,209	100,826	65,364	34,129	15,037	60,996	30,994	45,489				
6	42,285	56,175	67,974	90,032	98,431	62,888	30,955	10,547	44,703	24,825					
7	39,962	54,447	67,131	87,753	95,997	60,226	24,508	7,099	37,253						
8	38,745	53,688	65,033	85,538	93,280	54,538	18,871	5,710							
9	38,142	51,677	63,073	83,116	88,349	46,880	16,223								
10	36,643	49,733	60,873	78,474	81,185	42,588									
11	35,313	47,856	57,362	72,466	75,819										
12	33,943	45,074	53,142	68,042											
13	31,883	41,640	50,057												
14	29,496	39,199													
15	27,810														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV RATIOS GREATER THAN OR EQUAL TO 97%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	21,408	26,582	24,137	24,222	16,394	8,632	4,027	1,815	7,157	18,738	10,070	30,086	44,299	38,944	41,627
2	21,354	26,438	24,037	24,169	16,319	8,611	4,004	1,787	7,140	18,703	10,048	30,002	44,200	38,764	
3	20,588	24,996	22,985	23,362	15,902	8,333	3,765	1,473	7,009	18,221	9,091	28,964	43,373		
4	18,716	22,369	21,226	22,669	15,421	8,003	3,328	1,221	6,627	15,120	7,021	27,392			
5	16,419	19,993	20,233	22,106	15,118	7,636	3,046	998	5,573	11,258	5,863				
6	14,662	18,807	19,680	21,727	14,631	7,311	2,782	733	4,251	9,310					
7	13,837	18,205	19,394	21,128	14,243	6,974	2,385	571	3,630						
8	13,392	17,886	18,718	20,590	13,809	6,363	1,973	479							
9	13,159	17,194	18,175	20,020	13,057	5,645	1,738								
10	12,629	16,580	17,571	19,008	12,148	5,203									
11	12,146	15,971	16,605	17,580	11,405										
12	11,716	15,031	15,503	16,559											
13	11,065	13,979	14,657												
14	10,242	13,174													
15	9,675														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LTV CATEGORY: INVESTOR)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	13,833	15,064	15,136	18,387	22,922	23,847	26,527	19,865	57,161	42,682	51,701	101,772	106,722	38,456	31,652
2	13,782	15,006	15,067	18,292	22,806	23,502	26,470	19,683	56,926	42,548	51,510	101,031	106,366	38,193	
3	13,490	14,469	14,591	17,783	22,476	22,506	25,862	15,334	55,871	41,205	45,160	95,748	104,710		
4	12,716	13,410	13,806	17,334	22,123	22,140	22,818	12,727	53,454	32,750	32,457	90,586			
5	11,712	12,445	13,390	16,987	21,874	21,352	20,543	10,383	44,760	22,513	26,429				
6	10,873	11,942	13,096	16,754	21,309	20,488	18,410	7,389	32,215	18,296					
7	10,469	11,646	12,907	16,342	20,701	19,524	14,538	5,285	27,251						
8	10,199	11,454	12,568	15,879	19,943	17,452	10,752	4,366							
9	10,038	11,086	12,138	15,358	18,876	14,678	9,063								
10	9,685	10,645	11,699	14,575	17,358	13,157									
11	9,339	10,259	11,054	13,446	16,182										
12	8,971	9,621	10,197	12,582											
13	8,493	8,892	9,593												
14	7,901	8,308													
15	7,459														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 1)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	25,542	36,944	39,358	38,243	44,559	38,445	33,069	26,249	56,484	40,880	45,468	79,188	96,195	75,753	80,966
2	25,451	36,699	39,123	38,023	44,290	38,318	32,907	26,040	56,224	40,736	45,286	78,842	95,868	75,440	
3	24,537	34,812	37,380	36,534	43,137	37,384	31,825	22,098	54,832	39,433	42,131	76,030	94,356		
4	22,709	31,779	34,699	35,062	41,826	36,212	28,764	19,268	51,986	34,386	35,727	72,281			
5	20,579	28,952	32,874	33,862	40,859	34,377	26,458	16,606	45,366	28,124	31,661				
6	18,760	27,232	31,679	33,033	39,290	32,735	24,331	12,741	37,636	24,616					
7	17,801	26,192	31,012	31,832	37,897	31,106	20,814	9,972	33,496						
8	17,156	25,565	29,835	30,710	36,414	28,882	17,548	8,496							
9	16,732	24,512	28,785	29,630	34,590	26,185	15,601								
10	15,998	23,493	27,687	28,214	32,438	24,302									
11	15,336	22,569	26,342	26,597	30,574										
12	14,650	21,418	24,860	25,206											
13	13,886	20,202	23,605												
14	13,103	19,149													
15	12,432														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 2)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	22,343	27,038	29,141	34,809	36,196	29,198	19,607	14,163	44,248	26,984	31,350	73,556	96,970	63,712	66,230
2	22,250	26,889	29,001	34,643	36,062	29,101	19,555	14,075	44,102	26,910	31,262	73,254	96,708	63,490	
3	21,498	25,491	27,805	33,393	35,466	28,569	19,080	11,255	43,269	26,150	28,296	70,647	95,279		
4	19,668	22,852	25,766	32,329	34,663	27,958	17,176	9,649	41,248	21,682	22,370	67,446			
5	17,433	20,511	24,626	31,594	34,178	26,882	15,817	8,085	34,370	16,306	19,283				
6	15,654	19,265	23,964	31,180	33,195	25,855	14,447	5,653	26,329	13,786					
7	14,810	18,627	23,636	30,229	32,214	24,679	11,692	4,118	22,722						
8	14,317	18,321	22,832	29,373	31,191	22,541	9,262	3,438							
9	14,058	17,636	22,083	28,382	29,505	19,822	8,118								
10	13,478	16,923	21,290	26,915	27,378	18,129									
11	12,949	16,241	20,115	25,069	25,697										
12	12,402	15,355	18,721	23,714											
13	11,727	14,275	17,701												
14	10,951	13,462													
15	10,404														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 3)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	23,374	31,591	42,505	40,302	41,113	33,487	22,476	16,791	54,602	29,324	36,717	97,046	122,696	71,423	74,540
2	23,302	31,483	42,339	40,141	40,974	33,373	22,423	16,731	54,436	29,262	36,584	96,581	122,376	71,162	
3	22,609	30,240	40,753	38,883	40,417	32,777	22,045	13,348	53,587	28,456	32,553	92,842	120,740		
4	20,633	27,408	37,944	37,680	39,761	32,152	19,885	11,637	51,442	22,612	24,732	88,827			
5	18,190	24,467	36,336	36,961	39,301	31,007	18,390	9,717	41,472	16,047	20,916				
6	16,302	23,094	35,509	36,557	38,363	29,850	16,798	6,684	29,566	13,229					
7	15,440	22,430	35,143	35,598	37,429	28,648	13,383	4,200	25,246						
8	15,019	22,133	34,049	34,677	36,280	25,838	10,290	3,407							
9	14,810	21,332	33,026	33,588	34,281	22,349	8,919								
10	14,253	20,605	31,918	31,744	31,564	20,401									
11	13,746	19,815	30,075	29,348	29,476										
12	13,229	18,542	27,930	27,590											
13	12,475	17,148	26,291												
14	11,551	16,099													
15	10,878														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 4)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	28,329	37,335	43,732	43,344	41,221	33,057	22,101	14,001	55,163	31,175	41,520	105,454	130,639	69,752	66,834
2	28,261	37,212	43,582	43,200	41,100	32,930	22,058	13,942	55,009	31,102	41,376	104,919	130,300	69,514	
3	27,538	35,783	42,030	41,931	40,631	32,383	21,654	10,852	54,230	30,325	36,051	100,580	128,596		
4	25,198	32,299	39,215	40,835	40,094	31,893	19,402	9,255	52,111	23,256	26,152	96,290			
5	22,238	28,936	37,730	40,172	39,684	30,898	17,959	7,612	41,429	15,572	21,812				
6	19,997	27,415	36,994	39,835	38,848	29,846	16,310	4,830	28,775	12,547					
7	18,963	26,678	36,668	38,966	37,917	28,659	12,700	3,279	24,254						
8	18,444	26,395	35,675	38,060	36,841	25,695	9,481	2,665							
9	18,202	25,429	34,640	37,073	34,666	21,778	8,168								
10	17,530	24,557	33,490	34,922	31,692	19,761									
11	16,918	23,619	31,387	32,215	29,544										
12	16,298	22,158	28,808	30,287											
13	15,334	20,357	27,016												
14	14,110	19,073													
15	13,265														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 5)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN) 1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	27,374	29,886	40,079	35,783	32,945	30,003	19,801	13,542	55,723	30,134	42,255	113,226	138,502	64,448	69,037
2	27,320	29,803	39,953	35,643	32,863	29,872	19,766	13,481	55,566	30,056	42,134	112,651	138,128	64,239	
3	26,691	28,647	38,589	34,654	32,536	29,413	19,422	10,469	54,876	29,322	36,170	107,692	136,299		
4	24,667	25,830	35,889	33,828	32,174	29,028	17,233	8,837	52,796	21,776	25,439	103,174			
5	21,948	23,253	34,515	33,324	31,928	28,169	15,948	7,121	41,042	13,954	20,875				
6	19,714	22,086	33,973	33,038	31,345	27,324	14,448	4,203	27,488	11,112					
7	18,738	21,542	33,744	32,291	30,710	26,205	10,762	2,710	22,788						
8	18,287	21,344	32,864	31,567	29,931	23,135	7,755	2,206							
9	18,097	20,636	31,967	30,751	28,193	18,960	6,537								
10	17,476	19,976	30,905	28,875	25,615	17,042									
11	16,857	19,225	28,939	26,385	23,947										
12	16,265	17,950	26,474	24,674											
13	15,242	16,363	24,772												
14	13,918	15,362													
15	12,991														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 6)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	41,373	43,337	45,971	42,038	45,307	50,635	30,289	22,813	93,263	47,543	72,429	184,368	213,721	99,946	100,799
2	41,305	43,240	45,798	41,890	45,233	50,421	30,225	22,737	93,027	47,448	72,225	183,309	213,207	99,643	
3	40,465	41,487	44,104	40,864	44,935	49,654	29,797	18,068	91,931	46,386	61,374	174,946	210,484		
4	37,441	37,561	41,054	40,051	44,516	49,096	26,398	15,641	88,790	33,745	41,346	167,589			
5	33,461	33,967	39,645	39,551	44,175	47,731	24,257	12,511	68,060	20,776	33,347				
6	30,341	32,409	39,014	39,206	43,470	46,328	21,779	6,943	43,598	16,119					
7	28,991	31,795	38,755	38,460	42,667	44,612	15,605	4,301	35,709						
8	28,407	31,540	37,693	37,671	41,721	38,867	10,542	3,515							
9	28,161	30,532	36,613	36,781	39,219	31,056	8,764								
10	27,290	29,464	35,405	34,431	35,300	27,610									
11	26,398	28,430	32,969	31,161	32,733										
12	25,421	26,400	29,778	28,990											
13	23,709	23,812	27,749												
14	21,626	22,201													
15	20,279														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 7)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	16,132	12,536	10,482	24,101	24,964	13,704	14,719	9,865	46,460	24,433	48,840	106,638	115,381	60,947	71,199
2	16,102	12,482	10,446	24,080	24,943	13,648	14,705	9,846	46,369	24,407	48,722	106,079	115,108	60,734	
3	15,737	11,823	10,062	23,832	24,836	13,516	14,555	7,858	45,931	23,919	41,687	101,012	113,269		
4	14,465	10,816	9,480	23,563	24,632	13,346	12,573	6,766	44,572	17,446	26,997	95,904			
5	12,836	9,906	9,243	23,290	24,474	12,900	11,248	5,344	34,216	9,998	21,016				
6	11,716	9,548	9,109	23,049	24,124	12,447	9,776	2,957	20,826	7,405					
7	11,225	9,339	9,041	22,623	23,686	11,885	6,466	1,773	16,605						
8	10,996	9,271	8,786	22,189	23,183	9,857	4,094	1,385							
9	10,913	8,976	8,556	21,690	21,767	7,139	3,253								
10	10,585	8,664	8,319	20,331	19,403	6,109									
11	10,198	8,328	7,754	18,004	17,856										
12	9,831	7,661	6,932	16,512											
13	9,145	6,823	6,387												
14	8,230	6,323													
15	7,683														

NUMBER OF 30-YEAR MORTGAGES IN FORCE (LOAN SIZE CATEGORY 8)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	316	677	997	658	415	1,191	834	930	4,421	3,330	5,593	10,920	9,027	2,038	2,103
2	316	676	995	658	415	1,188	833	923	4,408	3,320	5,562	10,772	8,998	2,020	
3	303	660	968	653	405	1,174	822	656	4,361	3,194	4,652	10,021	8,768		
4	268	615	936	641	396	1,164	700	494	4,201	2,320	2,968	9,130			
5	240	584	924	626	393	1,108	584	365	3,386	1,323	2,144				
6	213	573	902	619	373	1,064	493	247	2,169	883					
7	207	559	891	604	359	1,014	333	156	1,647						
8	200	557	880	592	350	863	197	110							
9	196	546	860	581	334	665	148								
10	185	535	836	551	308	591									
11	177	528	795	516	284										
12	169	506	742	489											
13	164	471	698												
14	148	452													
15	141														

NUMBER OF 15-YEAR MORTGAGES IN FORCE

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	630	704	533	374	429	509	515	740	33,704	17,433	30,303	79,932	74,143	17,049	15,979
2	626	702	530	373	428	509	514	736	33,631	17,380	30,221	79,493	73,823	16,963	
3	606	683	513	360	423	501	505	654	33,217	17,064	27,206	75,729	72,478		
4	568	640	486	351	413	485	459	591	32,264	14,748	21,114	72,195			
5	504	592	465	342	394	468	431	536	28,563	11,380	18,832				
6	468	564	448	334	377	447	396	426	22,273	10,013					
7	440	534	430	319	360	431	357	372	19,806						
8	424	511	404	309	354	389	320	337							
9	406	480	389	292	326	347	295								
10	384	454	375	277	292	320									
11	361	435	349	266	271										
12	335	407	327	254											
13	295	374	301												
14	262	339													
15	216														

NUMBER OF GRADUATED PAYMENT MORTGAGES (GPM) IN FORCE

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)													
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1			251	31,049	117,024	101,473	50,956	29,230	51,827	30,250	20,434	11,982	8,601	3,462	2,480
2			251	31,043	116,924	101,373	50,841	29,155	51,728	30,207	20,349	11,863	8,588	3,446	
3			250	30,836	116,433	100,801	50,373	22,378	51,280	29,543	17,599	10,959	8,458		
4			248	30,523	115,457	100,024	42,902	19,316	49,616	21,610	12,774	10,133			
5			246	30,154	114,240	97,566	38,664	15,225	38,588	14,050	10,053				
6			245	29,590	112,457	94,719	33,061	9,159	25,958	10,075					
7			243	29,013	110,480	90,713	21,168	5,690	19,990						
8			236	28,359	107,995	76,698	13,472	4,178							
9			234	27,672	101,867	59,267	10,710								
10			226	25,959	91,434	51,917									
11			208	23,346	84,036										
12			187	21,512											
13			171												
14															
15															

SPECIAL CASE: NUMBER OF 30-YEAR MORTGAGES IN FORCE (EXACTLY 85% LTV RATIO)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2											14,925	26,409	26,406	9,421	
3											14,853	26,207	26,296	9,269	
4											13,341	24,842	25,703		
5											9,614	23,186			
6											7,616				
7															
8															
9															
10															
11															
12															
13															
14															
15															

SPECIAL CASE: NUMBER OF 30-YEAR MORTGAGES IN FORCE (EXACTLY 90% LTV RATIO)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2												17,378	66,059	30,863	30,867
3												17,333	65,924	30,751	
4												16,868	65,030		
5												16,208			
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

SPECIAL CASE: NUMBER OF 30-YEAR MORTGAGES IN FORCE (EXACTLY 95% LTV RATIO)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1														16,875	15,383
2														16,740	
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

CONDITIONAL CLAIM PROBABILITY

30-YEAR MORTGAGES (LTV RATIOS LESS THAN 75%)

CONDITIONAL CLAIM PROBABILITY (%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
2	0.07	0.09	0.11	0.05	0.11	0.17	0.33	0.40	0.07	0.23	0.15	0.07	0.09	0.11	
3	0.22	0.20	0.12	0.08	0.16	0.36	0.75	1.01	0.34	0.54	0.84	0.40	0.24		
4	0.14	0.14	0.13	0.16	0.16	0.67	0.63	1.33	0.45	1.24	1.92	0.60			
5	0.14	0.17	0.07	0.12	0.34	0.33	0.87	1.42	0.67	1.98	1.59				
6	0.07	0.49	0.02	0.12	0.22	0.57	0.86	1.82	1.27	1.57					
7	0.03	0.05	0.05	0.09	0.17	0.47	1.19	2.08	1.09						
8	0.08	0.08	0.07	0.32	0.31	0.53	1.31	1.39							
9	0.05	0.11	0.11	0.06	0.34	0.87	0.81								
10	0.08	0.06	0.10	0.26	0.43	0.72									
11	0.12	0.15	0.17	0.07	0.34										
12	0.09	0.19	0.05	0.15											
13	0.03	0.03	0.07												
14	0.00	0.11													
15	0.00														

30-YEAR MORTGAGES (LTV RATIOS OF 75 - 85%)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.02	0.00	0.00	0.00	0.00	0.00	0.08	0.04	0.01	0.01	0.02	0.00	0.03	0.01	0.01
2	0.14	0.25	0.03	0.13	0.07	0.29	0.78	1.50	0.25	0.44	0.50	0.28	0.34	0.34	
3	0.38	0.24	0.12	0.17	0.44	0.65	2.12	2.69	0.85	1.68	1.85	1.23	0.80		
4	0.23	0.49	0.18	0.18	0.33	0.87	2.36	3.10	1.28	2.79	3.84	1.42			
5	0.23	0.30	0.11	0.26	0.42	0.74	2.06	2.85	2.01	4.30	3.42				
6	0.14	0.17	0.12	0.18	0.33	0.78	1.85	4.07	3.10	3.84					
7	0.13	0.08	0.07	0.22	0.28	0.79	2.52	4.24	2.74						
8	0.07	0.12	0.07	0.18	0.47	1.01	3.05	2.39							
9	0.12	0.04	0.12	0.14	0.42	1.55	1.91								
10	0.07	0.15	0.10	0.22	0.39	1.02									
11	0.05	0.10	0.12	0.32	0.43										
12	0.06	0.10	0.13	0.20											
13	0.08	0.04	0.09												
14	0.16	0.05													
15	0.00														

30-YEAR MORTGAGES (LTV RATIOS OF 85 - 90%)

CONDITIONAL CLAIM PROBABILITY (%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.02	0.02	0.01	0.01	0.00	0.00	0.03	0.06	0.02	0.02	0.02	0.01	0.01	0.01	0.01
2	0.22	0.34	0.23	0.17	0.17	0.41	0.85	1.14	0.30	0.69	0.56	0.30	0.22	0.25	
3	0.42	0.45	0.39	0.31	0.55	0.83	2.03	2.66	1.05	2.49	2.71	1.31	0.74		
4	0.46	0.42	0.20	0.32	0.37	1.07	2.05	3.59	1.64	4.16	5.32	1.83			
5	0.35	0.36	0.15	0.23	0.49	1.03	2.35	4.00	2.74	5.63	4.58				
6	0.26	0.20	0.14	0.25	0.41	0.92	2.40	5.44	3.99	4.51					
7	0.14	0.16	0.17	0.25	0.43	1.08	3.26	5.27	3.23						
8	0.16	0.20	0.10	0.16	0.46	1.51	4.11	3.31							
9	0.11	0.13	0.07	0.28	0.67	1.86	2.88								
10	0.15	0.08	0.12	0.30	0.94	1.63									
11	0.05	0.18	0.12	0.49	0.83										
12	0.09	0.05	0.22	0.35											
13	0.07	0.24	0.17												
14	0.15	0.21													
15	0.13														

30-YEAR MORTGAGES (LTV RATIOS OF 90 - 93%)

CONDITIONAL CLAIM PROBABILITY (%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.05	0.05	0.00	0.04	0.00	0.01	0.05	0.08	0.02	0.06	0.03	0.01	0.01	0.01	0.01
2	0.36	0.40	0.23	0.24	0.33	0.63	1.08	1.74	0.71	0.83	0.69	0.35	0.29	0.32	
3	0.71	0.49	0.38	0.39	0.79	1.16	2.56	4.27	1.73	2.27	2.61	1.53	0.92		
4	0.59	0.47	0.28	0.37	0.76	1.49	2.38	4.54	2.25	4.16	5.00	2.14			
5	0.46	0.30	0.23	0.33	0.74	1.35	2.84	4.90	3.45	6.28	5.17				
6	0.37	0.22	0.17	0.30	0.77	1.37	3.01	6.89	4.83	5.32					
7	0.26	0.18	0.22	0.26	0.70	1.36	4.27	6.33	3.91						
8	0.11	0.25	0.15	0.31	0.65	1.81	4.48	4.43							
9	0.13	0.13	0.17	0.33	0.77	1.93	2.84								
10	0.13	0.07	0.16	0.35	0.97	1.81									
11	0.10	0.11	0.16	0.45	0.83										
12	0.15	0.14	0.27	0.29											
13	0.15	0.15	0.18												
14	0.14	0.20													
15	0.14														

30-YEAR MORTGAGES (LTV RATIOS OF 93 - 95%)

CONDITIONAL CLAIM PROBABILITY (%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.03	0.01	0.02	0.04	0.03	0.02	0.06	0.16	0.03	0.06	0.03	0.03	0.01	0.01	0.01
2	0.49	0.53	0.36	0.35	0.39	0.72	1.38	2.36	0.60	1.32	0.99	0.53	0.36	0.37	
3	0.82	0.67	0.60	0.50	0.87	1.40	3.48	4.88	2.20	3.35	3.69	2.00	1.13		
4	0.80	0.62	0.43	0.53	0.78	1.78	3.50	6.01	3.16	5.70	6.39	2.53			
5	0.57	0.45	0.36	0.40	0.82	1.71	3.52	7.25	4.55	7.49	5.93				
6	0.38	0.31	0.24	0.53	0.89	1.71	3.60	8.20	6.38	6.04					
7	0.29	0.26	0.30	0.46	0.84	1.80	4.45	8.68	5.09						
8	0.21	0.28	0.24	0.46	0.95	2.18	5.34	5.30							
9	0.29	0.26	0.22	0.35	1.14	2.71	4.10								
10	0.21	0.23	0.24	0.50	1.20	2.16									
11	0.27	0.18	0.28	0.62	1.02										
12	0.17	0.26	0.38	0.52											
13	0.21	0.34	0.34												
14	0.17	0.26													
15	0.21														

30-YEAR MORTGAGES (LTV RATIOS OF 95 - 97%)

CONDITIONAL CLAIM PROBABILITY (%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.09	0.18	0.08	0.04	0.03	0.05	0.21	0.26	0.05	0.06	0.04	0.02	0.01	0.01	0.01
2	1.11	1.22	0.72	0.54	0.61	1.25	2.46	3.98	1.10	1.78	1.27	0.70	0.52	0.49	
3	1.65	1.27	0.87	0.85	1.15	2.12	5.40	6.68	3.09	4.29	4.31	2.36	1.44		
4	1.27	0.95	0.64	0.66	1.03	2.45	4.66	7.90	3.95	6.54	7.12	2.97			
5	0.85	0.52	0.47	0.52	1.17	2.18	4.84	8.07	5.22	8.64	6.60				
6	0.46	0.36	0.39	0.62	0.99	2.11	4.28	8.15	6.78	6.83					
7	0.33	0.32	0.45	0.53	1.01	2.02	4.84	8.18	5.27						
8	0.26	0.33	0.34	0.50	1.07	2.45	5.24	4.90							
9	0.36	0.36	0.37	0.59	1.19	2.83	4.03								
10	0.29	0.28	0.38	0.57	1.47	2.33									
11	0.29	0.30	0.40	0.83	1.36										
12	0.27	0.33	0.56	0.84											
13	0.29	0.44	0.57												
14	0.44	0.41													
15	0.41														

30-YEAR MORTGAGES (LTV RATIOS GREATER THAN OR EQUAL TO 97%)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.13	0.30	0.15	0.04	0.13	0.15	0.37	1.21	0.07	0.07	0.07	0.04	0.03	0.03	0.07
2	2.11	2.49	1.39	1.07	1.70	2.69	5.52	8.79	1.43	1.92	1.73	1.04	0.92	0.94	
3	2.38	2.13	1.31	0.92	2.14	3.74	8.50	12.42	4.27	4.58	5.68	3.48	2.25		
4	1.36	1.20	0.80	1.01	1.65	3.56	6.10	10.81	4.47	6.62	8.00	3.81			
5	0.68	0.63	0.65	0.78	1.68	2.75	5.35	11.32	6.06	8.02	6.77				
6	0.44	0.47	0.45	0.78	1.31	2.67	5.07	9.41	7.17	6.44					
7	0.33	0.47	0.41	0.53	1.36	2.55	5.28	6.65	5.84						
8	0.24	0.41	0.30	0.66	1.26	2.48	5.98	7.31							
9	0.32	0.29	0.41	0.52	1.26	3.24	5.24								
10	0.28	0.25	0.34	0.65	1.77	2.86									
11	0.25	0.33	0.43	0.78	1.41										
12	0.21	0.23	0.52	0.92											
13	0.27	0.46	0.69												
14	0.25	0.67													
15	0.36														

30-YEAR MORTGAGES (LTV CATEGORY: INVESTOR)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.01	0.00	0.05	0.01	0.00	0.01	0.04	0.16	0.01	0.02	0.03	0.01	0.01	0.01	0.02
2	0.25	0.45	0.33	0.26	0.30	0.48	1.82	2.92	0.64	1.25	1.39	0.66	0.32	0.30	
3	0.76	0.92	0.51	0.46	0.69	1.12	4.28	5.71	1.92	3.56	4.39	2.30	1.08		
4	0.83	0.87	0.51	0.58	0.67	1.60	4.10	6.12	2.65	5.21	7.49	2.63			
5	0.79	0.67	0.34	0.42	0.75	1.51	3.93	6.25	3.48	6.92	6.22				
6	0.53	0.44	0.36	0.50	0.69	1.64	3.60	6.14	4.66	7.93					
7	0.48	0.39	0.24	0.39	0.80	1.41	3.82	5.09	5.66						
8	0.26	0.34	0.29	0.43	0.56	1.44	3.69	4.21							
9	0.47	0.23	0.24	0.33	0.67	1.85	2.52								
10	0.24	0.22	0.21	0.36	1.01	1.70									
11	0.29	0.23	0.26	0.50	0.77										
12	0.27	0.30	0.31	0.41											
13	0.18	0.35	0.22												
14	0.29	0.22													
15	0.32														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 1)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.13	0.32	0.16	0.10	0.08	0.08	0.24	0.35	0.07	0.09	0.07	0.02	0.02	0.02	0.04
2	1.80	2.39	1.52	1.22	1.20	1.57	2.62	3.37	1.07	1.80	1.45	0.84	0.53	0.65	
3	2.45	2.21	1.61	1.48	1.74	2.47	4.92	5.53	2.66	4.11	4.09	2.47	1.52		
4	1.91	1.61	1.22	1.34	1.50	2.74	3.93	5.79	3.06	5.35	5.43	2.78			
5	1.34	1.00	0.90	1.12	1.63	2.18	3.62	5.65	3.52	6.04	4.89				
6	0.84	0.69	0.68	1.03	1.22	2.21	3.43	5.13	4.27	4.96					
7	0.61	0.63	0.74	0.91	1.23	1.88	3.75	5.74	3.49						
8	0.59	0.65	0.50	0.77	1.16	2.12	4.44	4.37							
9	0.68	0.62	0.63	0.80	1.38	2.23	3.59								
10	0.61	0.46	0.56	0.93	1.64	2.37									
11	0.61	0.58	0.66	1.18	1.54										
12	0.68	0.57	0.91	1.24											
13	0.61	0.84	0.92												
14	0.90	0.85													
15	0.88														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 2)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.15	0.23	0.07	0.05	0.02	0.02	0.12	0.19	0.03	0.04	0.05	0.02	0.01	0.01	0.02
2	1.45	1.55	0.77	0.62	0.61	1.05	1.98	2.67	0.78	1.50	1.19	0.61	0.47	0.58	
3	1.80	1.52	0.82	0.75	1.30	1.80	3.98	4.98	2.19	3.53	3.76	2.16	1.38		
4	1.35	1.02	0.55	0.76	1.02	1.92	3.17	5.71	2.72	4.88	5.42	2.52			
5	0.89	0.61	0.44	0.55	1.15	1.64	3.27	5.28	3.54	6.30	5.23				
6	0.50	0.43	0.44	0.80	1.00	1.61	3.08	6.10	4.66	6.09					
7	0.43	0.45	0.49	0.60	0.97	1.53	3.58	5.68	4.02						
8	0.32	0.44	0.36	0.60	0.97	1.92	3.85	4.62							
9	0.44	0.36	0.41	0.59	1.02	2.29	2.89								
10	0.38	0.34	0.35	0.57	1.21	1.90									
11	0.40	0.38	0.37	0.77	1.22										
12	0.33	0.34	0.53	0.67											
13	0.34	0.53	0.47												
14	0.37	0.50													
15	0.43														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 3)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.07	0.09	0.05	0.03	0.02	0.03	0.07	0.08	0.01	0.05	0.03	0.01	0.02	0.01	0.01
2	0.97	0.90	0.53	0.44	0.45	0.94	1.35	2.12	0.54	1.40	1.00	0.52	0.40	0.48	
3	1.29	1.04	0.62	0.62	0.93	1.58	3.30	3.85	1.60	3.59	3.47	1.90	1.13		
4	0.82	0.74	0.40	0.54	0.86	1.88	3.26	5.03	2.25	4.95	6.01	2.40			
5	0.64	0.40	0.38	0.44	0.97	1.60	3.07	5.46	3.26	6.46	5.28				
6	0.38	0.30	0.27	0.47	0.85	1.47	3.16	5.16	4.33	5.81					
7	0.21	0.29	0.35	0.38	0.84	1.58	3.53	5.40	3.77						
8	0.23	0.31	0.27	0.50	0.87	1.80	4.03	3.32							
9	0.31	0.24	0.29	0.51	0.91	2.20	2.68								
10	0.18	0.21	0.30	0.48	1.24	1.93									
11	0.16	0.19	0.28	0.70	1.01										
12	0.20	0.25	0.34	0.62											
13	0.21	0.31	0.40												
14	0.29	0.35													
15	0.20														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 4)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)													
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.04	0.04	0.02	0.02	0.01	0.02	0.08	0.08	0.02	0.03	0.02	0.02	0.01	0.01	0.00
2	0.63	0.60	0.29	0.28	0.36	0.70	1.49	1.94	0.47	1.10	1.00	0.52	0.36	0.37	
3	1.11	0.76	0.52	0.47	0.82	1.26	3.52	4.46	1.69	3.01	3.45	1.78	1.06		
4	0.85	0.59	0.37	0.46	0.75	1.53	3.22	4.78	2.26	5.05	5.89	2.18			
5	0.52	0.33	0.27	0.32	0.83	1.44	3.52	5.35	3.24	7.04	5.41				
6	0.31	0.31	0.22	0.40	0.79	1.36	3.19	6.54	4.96	5.80					
7	0.31	0.22	0.24	0.33	0.71	1.44	3.58	6.77	4.32						
8	0.16	0.20	0.20	0.36	0.84	1.72	3.85	3.94							
9	0.22	0.20	0.16	0.40	0.96	2.14	3.33								
10	0.15	0.17	0.24	0.43	1.16	1.72									
11	0.17	0.18	0.23	0.54	0.95										
12	0.13	0.18	0.34	0.52											
13	0.11	0.18	0.30												
14	0.21	0.23													
15	0.20														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 5)

CONDITIONAL CLAIM PROBABILITY (%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.03	0.03	0.01	0.02	0.02	0.01	0.03	0.05	0.02	0.03	0.02	0.01	0.01	0.01	0.01
2	0.45	0.42	0.22	0.17	0.26	0.49	1.40	2.26	0.53	1.02	0.94	0.40	0.34	0.34	
3	0.80	0.54	0.45	0.35	0.63	1.03	3.29	4.68	1.70	2.80	3.21	1.68	0.97		
4	0.73	0.57	0.31	0.30	0.57	1.38	2.63	5.44	2.45	5.30	6.23	2.12			
5	0.42	0.35	0.19	0.29	0.67	1.35	3.30	5.77	3.66	7.29	5.62				
6	0.29	0.24	0.15	0.32	0.67	1.41	3.25	8.33	5.34	6.34					
7	0.19	0.14	0.17	0.31	0.71	1.43	4.13	6.83	4.12						
8	0.10	0.19	0.14	0.33	0.82	1.67	4.91	3.99							
9	0.17	0.14	0.15	0.26	0.85	2.34	3.33								
10	0.14	0.11	0.14	0.40	1.10	1.78									
11	0.12	0.11	0.20	0.52	0.93										
12	0.08	0.14	0.21	0.42											
13	0.11	0.20	0.23												
14	0.10	0.13													
15	0.15														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 6)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.01	0.01	0.01	0.01	0.00	0.01	0.06	0.07	0.01	0.03	0.01	0.01	0.01	0.01	0.02
2	0.29	0.29	0.10	0.14	0.22	0.44	1.08	1.66	0.42	0.88	0.72	0.38	0.30	0.30	
3	0.54	0.39	0.24	0.28	0.54	0.87	3.04	3.78	1.40	2.65	3.22	1.51	0.89		
4	0.46	0.40	0.20	0.27	0.52	1.32	3.39	4.95	2.18	5.12	6.35	2.15			
5	0.33	0.29	0.15	0.18	0.57	1.28	3.49	6.44	3.66	8.15	5.90				
6	0.24	0.15	0.09	0.29	0.59	1.43	3.25	8.74	5.51	7.72					
7	0.19	0.12	0.08	0.27	0.65	1.40	4.74	7.18	5.21						
8	0.07	0.12	0.10	0.25	0.69	1.85	5.06	3.81							
9	0.10	0.10	0.08	0.26	0.92	2.40	3.07								
10	0.07	0.06	0.09	0.30	1.09	1.71									
11	0.07	0.07	0.13	0.48	0.91										
12	0.03	0.09	0.22	0.38											
13	0.08	0.13	0.14												
14	0.04	0.09													
15	0.04														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 7)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.01	0.03	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.01
2	0.14	0.20	0.07	0.14	0.15	0.23	0.75	1.45	0.31	0.56	0.48	0.26	0.24	0.17	
3	0.47	0.29	0.13	0.34	0.53	1.02	2.50	3.18	1.11	1.83	2.21	1.30	0.66		
4	0.41	0.21	0.12	0.27	0.42	1.36	3.25	3.61	1.44	3.64	5.51	1.70			
5	0.40	0.18	0.10	0.23	0.47	1.39	3.41	3.46	2.40	5.95	4.89				
6	0.19	0.09	0.08	0.23	0.56	1.28	2.98	5.04	3.40	4.25					
7	0.09	0.06	0.06	0.16	0.58	1.41	3.87	5.08	3.08						
8	0.04	0.08	0.03	0.23	0.51	1.92	4.10	2.17							
9	0.09	0.04	0.05	0.20	0.64	2.12	2.74								
10	0.08	0.02	0.08	0.19	0.81	1.74									
11	0.03	0.04	0.06	0.26	0.72										
12	0.02	0.08	0.12	0.35											
13	0.03	0.06	0.09												
14	0.02	0.06													
15	0.04														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 8)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.05	0.02	0.00	0.00
2	0.00	0.30	0.10	0.15	0.24	0.08	0.72	1.41	0.29	1.30	1.56	1.39	0.83	0.00	
3	0.66	0.61	0.72	0.15	0.25	0.60	2.07	6.25	1.86	6.29	7.91	5.34	2.10		
4	0.75	0.49	0.11	0.31	0.76	1.46	4.29	9.11	3.78	10.78	14.62	5.35			
5	0.00	0.17	0.11	0.00	0.51	1.44	5.48	9.32	5.26	14.06	10.40				
6	0.00	0.00	0.33	0.48	0.00	1.60	4.67	9.72	9.82	9.97					
7	0.00	0.18	0.00	0.33	0.56	1.48	7.81	12.18	6.86						
8	0.00	0.00	0.23	0.17	0.57	1.74	7.61	4.55							
9	0.00	0.18	0.12	0.17	0.90	3.46	4.05								
10	0.00	0.19	0.00	0.73	1.30	1.86									
11	0.00	0.00	0.25	0.78	1.76										
12	0.00	0.59	0.13	1.43											
13	0.61	0.00	0.00												
14	0.00	0.00													
15	0.00														

15-YEAR MORTGAGES

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.01
2	0.48	0.43	0.75	1.34	0.70	0.20	1.56	0.68	0.15	0.40	0.19	0.14	0.10	0.17	
3	1.16	1.46	1.56	0.00	0.95	2.79	5.94	2.45	0.59	1.13	1.17	0.55	0.32		
4	3.35	1.88	1.03	0.28	1.21	1.03	2.18	3.21	1.03	1.74	2.15	0.68			
5	1.79	1.01	0.65	1.17	1.52	0.64	3.48	1.87	1.21	2.72	1.70				
6	2.78	1.06	0.45	0.90	1.06	0.67	0.76	0.94	1.30	1.75					
7	0.91	1.12	1.16	0.00	0.00	2.78	1.40	3.49	1.09						
8	1.42	1.57	0.50	0.65	1.41	2.57	1.88	1.78							
9	0.99	0.83	0.51	0.68	0.61	0.86	1.02								
10	0.52	0.88	1.33	0.36	1.03	0.31									
11	1.94	1.15	0.00	0.75	0.37										
12	0.00	1.47	0.31	0.79											
13	1.02	1.07	0.33												
14	0.38	0.29													
15	1.39														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 2)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.27	0.32	0.41	0.43	0.35	0.31	0.15	0.43	0.30	0.23	0.23	0.39	0.26	0.34	0.36
2	1.93	3.64	3.36	2.99	1.04	0.78	0.44	17.36	1.11	1.32	8.30	2.95	1.01	1.23	
3	6.72	8.83	6.51	2.44	0.96	0.34	6.00	9.28	2.48	13.56	17.18	2.38	1.63		
4	10.02	9.23	3.87	1.51	0.38	1.93	4.74	10.50	13.95	19.91	8.38	2.79			
5	9.32	5.47	2.25	0.76	1.73	2.18	5.39	24.80	19.85	9.15	6.86				
6	4.89	2.88	0.93	2.25	1.96	2.94	15.99	21.05	9.04	7.59					
7	2.90	1.20	2.92	2.23	2.21	7.14	17.21	10.83	7.42						
8	1.49	3.30	2.92	2.77	4.43	10.14	8.50	7.97							
9	3.68	3.69	3.18	4.58	6.19	6.25	6.15								
10	3.55	3.69	5.17	6.29	4.93	5.23									
11	3.82	5.08	6.56	4.64	4.48										
12	5.11	6.69	4.91	4.42											
13	6.28	5.17	4.35												
14	4.62	4.90													
15	4.63														

GRADUATED PAYMENT MORTGAGES (GPM)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1			0.00	0.00	0.00	0.01	0.00	0.05	0.01	0.02	0.00	0.02	0.00	0.03	0.00
2			0.00	0.03	0.09	0.24	0.43	0.97	0.29	0.63	0.67	0.46	0.35	0.20	
3			0.00	0.16	0.32	0.54	1.68	3.10	1.30	2.53	2.89	1.94	0.93		
4			0.40	0.28	0.39	1.00	2.66	5.73	2.43	6.01	6.73	2.77			
5			0.00	0.30	0.61	1.23	3.88	8.47	5.29	11.49	6.75				
6			0.00	0.41	0.67	1.64	4.45	12.45	8.96	10.17					
7			0.41	0.50	0.79	1.79	6.66	12.51	7.98						
8			0.00	0.51	0.80	2.32	6.70	7.18							
9			0.43	0.42	0.97	2.77	4.18								
10			0.00	0.46	1.15	2.33									
11			0.00	0.64	1.05										
12			0.00	0.49											
13			0.00												
14															
15															

SPECIAL CASE: 30-YEAR MORTGAGES (EXACTLY 85% LTV RATIO)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2											0.07	0.03	0.02	0.01	
3											2.06	1.11	0.60	1.14	
4											6.86	4.34	2.00		
5											11.13	3.92			
6											9.26				
7															
8															
9															
10															
11															
12															
13															
14															
15															

SPECIAL CASE: 30-YEAR MORTGAGES (EXACTLY 90% LTV RATIO)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2												0.02	0.02	0.02	0.01
3												0.42	0.66	0.79	
4												1.58	1.73		
5												2.15			
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

SPECIAL CASE: 30-YEAR MORTGAGES (EXACTLY 95% LTV RATIO)

CONDITIONAL CLAIM PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2														0.05	0.06
3														0.91	
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

CONDITIONAL PREPAYMENT PROBABILITY

30-YEAR MORTGAGES (LTV RATIOS LESS THAN 75%)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.75	1.50	1.39	1.52	1.08	0.61	0.62	0.76	0.71	0.56	0.97	1.12	0.69	1.14	0.94
2	4.58	7.39	5.70	5.14	2.37	1.68	1.31	28.34	2.22	3.31	19.53	6.61	2.43	3.58	
3	8.80	9.85	7.75	3.54	1.71	0.83	13.18	15.21	4.25	28.62	33.02	4.49	3.23		
4	10.10	8.27	4.01	1.95	0.52	3.68	8.51	17.85	25.77	34.30	12.89	4.54			
5	8.56	4.16	2.21	0.91	2.88	3.68	9.45	36.09	34.68	13.41	9.38				
6	4.51	2.39	1.19	3.19	2.63	4.37	25.23	26.24	12.96	9.49					
7	2.10	1.48	3.09	2.50	3.21	12.97	26.66	11.98	9.16						
8	1.41	2.88	3.10	3.30	6.72	18.38	11.58	7.95							
9	3.34	3.43	3.50	6.87	10.28	8.63	7.89								
10	3.91	3.90	5.97	8.56	6.39	6.99									
11	3.49	6.25	8.28	5.84	6.42										
12	5.79	7.60	6.33	5.80											
13	8.26	6.23	5.69												
14	5.55	5.84													
15	5.21														

30-YEAR MORTGAGES (LTV RATIOS OF 75 - 85%)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.49	0.80	0.87	0.98	0.44	0.56	0.17	0.48	0.33	0.31	0.46	0.76	0.46	0.69	0.71
2	3.43	5.38	5.02	4.24	1.13	1.04	0.59	23.07	1.11	2.00	16.49	5.26	1.51	2.30	
3	8.18	9.21	6.78	2.76	0.79	0.37	10.70	12.67	2.75	26.37	29.70	3.33	2.21		
4	10.30	7.87	3.55	1.37	0.37	2.29	6.74	16.17	22.18	33.37	12.17	3.48			
5	7.48	4.53	1.64	0.76	2.06	2.41	8.43	34.67	32.39	12.88	9.32				
6	4.16	2.16	0.65	2.52	1.92	3.37	25.34	27.35	12.40	9.32					
7	1.78	0.95	3.00	2.34	2.40	11.83	24.94	11.10	9.40						
8	0.88	3.07	2.78	3.04	6.15	18.06	10.75	7.36							
9	3.18	3.10	3.20	6.50	9.26	8.65	8.71								
10	3.60	3.64	6.14	8.78	6.39	6.78									
11	4.22	6.03	8.51	6.18	5.93										
12	6.10	8.31	6.07	5.00											
13	8.90	6.11	5.30												
14	5.56	5.66													
15	4.73														

30-YEAR MORTGAGES (LTV RATIOS OF 85 - 90%)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.25	0.42	0.38	0.40	0.26	0.15	0.09	0.06	0.19	0.14	0.24	0.51	0.18	0.27	0.77
2	2.42	3.86	3.13	2.78	0.82	0.49	0.28	18.38	0.79	1.46	13.82	3.86	0.94	1.38	
3	6.94	8.18	5.86	2.04	0.59	0.28	7.76	9.37	2.16	23.69	27.22	2.65	1.71		
4	10.16	8.18	3.20	1.06	0.41	1.81	4.84	13.96	20.88	29.48	11.33	3.20			
5	8.78	4.12	1.48	0.59	1.48	2.23	6.69	35.04	29.53	12.20	9.17				
6	4.01	1.88	0.64	2.11	1.81	2.88	21.99	27.87	12.09	9.62					
7	2.03	0.79	2.65	2.12	2.19	10.87	21.35	10.22	9.28						
8	0.69	2.96	2.79	2.44	5.43	16.14	9.40	7.65							
9	2.82	2.72	3.07	5.91	8.39	7.76	6.43								
10	3.20	3.50	6.09	8.33	6.33	6.25									
11	3.55	6.83	8.71	6.32	5.56										
12	6.51	8.51	6.26	5.59											
13	8.16	6.17	5.82												
14	6.14	5.33													
15	5.13														

30-YEAR MORTGAGES (LTV RATIOS OF 90 - 93%)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.14	0.20	0.29	0.37	0.21	0.13	0.06	0.07	0.11	0.12	0.14	0.37	0.11	0.20	0.26
2	1.80	3.68	3.13	2.42	0.59	0.39	0.21	13.86	0.55	1.29	10.83	3.11	0.64	1.07	
3	7.00	8.07	5.94	1.94	0.54	0.26	6.77	7.66	1.65	20.52	24.38	2.33	1.43		
4	9.74	9.05	3.22	1.14	0.36	1.61	4.19	11.46	17.45	27.52	10.82	2.94			
5	8.71	4.34	1.50	0.65	1.18	1.82	5.61	32.33	26.48	12.07	8.24				
6	4.35	2.11	0.63	1.91	1.59	2.64	20.50	25.18	10.80	8.92					
7	1.89	0.75	2.60	1.95	1.95	9.70	21.40	11.01	8.63						
8	0.79	3.15	2.79	2.24	5.41	15.23	9.12	6.77							
9	3.28	3.53	3.03	5.81	8.59	7.81	6.81								
10	3.26	3.75	6.50	8.61	5.82	5.93									
11	3.78	6.91	8.46	6.13	5.36										
12	6.40	9.33	6.41	5.18											
13	8.44	6.56	5.43												
14	6.37	5.76													
15	5.60														

30-YEAR MORTGAGES (LTV RATIOS OF 93 - 95%)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.16	0.16	0.30	0.32	0.20	0.09	0.12	0.13	0.11	0.09	0.12	0.28	0.11	0.16	0.24
2	1.72	3.34	3.26	2.33	0.60	0.32	0.25	11.71	0.45	0.79	9.22	2.72	0.55	1.05	
3	7.17	8.96	6.36	1.91	0.47	0.26	5.03	5.93	1.34	16.93	21.28	2.10	1.32		
4	11.01	9.70	3.53	1.18	0.29	1.37	3.51	9.59	14.25	24.41	9.98	2.75			
5	9.67	4.71	1.70	0.64	1.21	1.53	4.96	29.31	22.74	10.62	8.14				
6	4.37	2.38	0.65	1.87	1.43	2.14	17.73	23.86	9.34	8.54					
7	2.32	0.87	2.61	2.06	1.84	8.48	18.87	10.39	7.65						
8	1.16	3.35	2.78	2.29	4.80	12.57	8.35	8.00							
9	3.23	3.29	3.28	5.31	7.15	6.57	6.04								
10	3.50	3.77	6.04	7.84	5.31	5.19									
11	3.64	6.58	7.99	5.63	4.85										
12	5.93	8.46	5.87	5.24											
13	8.14	5.83	5.51												
14	6.08	5.58													
15	5.03														

30-YEAR MORTGAGES (LTV RATIOS OF 95 - 97%)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.12	0.19	0.29	0.20	0.19	0.18	0.09	0.10	0.11	0.11	0.14	0.25	0.13	0.20	0.28
2	1.51	2.99	3.13	2.14	0.69	0.47	0.24	10.87	0.35	0.75	8.18	2.59	0.64	1.11	
3	6.61	8.68	6.48	2.03	0.63	0.27	5.02	6.24	1.28	15.09	19.79	2.21	1.42		
4	10.08	9.52	3.94	1.39	0.34	1.39	3.25	8.70	13.23	23.10	10.44	2.97			
5	9.58	5.32	2.11	0.77	1.21	1.61	4.46	21.79	21.49	11.26	8.87				
6	5.04	2.71	0.85	1.91	1.48	2.12	16.54	24.54	9.88	9.63					
7	2.72	1.07	2.68	2.00	1.83	7.42	18.16	11.38	7.89						
8	1.30	3.42	2.68	2.33	4.22	11.59	8.79	8.00							
9	3.57	3.41	3.12	5.00	6.92	6.33	6.65								
10	3.34	3.49	5.39	7.09	5.14	5.33									
11	3.59	5.52	6.95	5.28	4.89										
12	5.80	7.29	5.25	4.95											
13	7.19	5.43	4.76												
14	5.28	4.86													
15	4.92														

30-YEAR MORTGAGES (LTV RATIOS GREATER THAN OR EQUAL TO 97%)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.12	0.24	0.27	0.18	0.33	0.09	0.20	0.33	0.17	0.11	0.15	0.24	0.19	0.43	0.77
2	1.48	2.96	2.99	2.27	0.86	0.53	0.45	8.79	0.41	0.66	7.79	2.42	0.95	1.52	
3	6.72	8.38	6.34	2.04	0.89	0.22	3.11	4.68	1.18	12.44	17.09	1.95	1.30		
4	10.91	9.42	3.88	1.47	0.32	1.02	2.37	7.45	11.44	18.92	8.49	2.42			
5	10.02	5.30	2.09	0.94	1.54	1.51	3.32	15.23	17.66	9.28	6.91				
6	5.19	2.73	1.01	1.97	1.35	1.94	9.20	12.69	7.43	8.05					
7	2.89	1.29	3.08	2.02	1.69	6.21	11.99	9.46	7.44						
8	1.50	3.46	2.60	2.11	4.19	8.80	5.93	3.97							
9	3.71	3.28	2.91	4.54	5.71	4.59	4.26								
10	3.55	3.43	5.16	6.86	4.35	4.07									
11	3.29	5.56	6.21	5.03	4.04										
12	5.34	6.77	4.93	4.69											
13	7.17	5.30	4.28												
14	5.28	4.65													
15	5.02														

30-YEAR MORTGAGES (LTV CATEGORY: INVESTOR)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.36	0.39	0.41	0.51	0.51	1.43	0.18	0.76	0.40	0.29	0.34	0.72	0.33	0.68	0.58
2	1.86	3.13	2.83	2.53	1.15	3.76	0.48	19.18	1.22	1.91	10.94	4.57	1.24	1.96	
3	4.97	6.40	4.87	2.07	0.88	0.50	7.49	11.29	2.40	16.96	23.74	3.09	1.91		
4	7.07	6.32	2.51	1.42	0.46	1.96	5.87	12.30	13.62	26.05	11.08	3.22			
5	6.38	3.37	1.86	0.95	1.83	2.53	6.45	22.59	24.55	11.81	8.42				
6	3.18	2.04	1.08	1.96	2.16	3.07	17.44	22.33	10.75	9.49					
7	2.10	1.25	2.39	2.45	2.86	9.20	22.22	12.30	7.94						
8	1.31	2.87	3.13	2.85	4.79	14.46	12.02	8.20							
9	3.05	3.75	3.38	4.77	7.37	8.52	8.43								
10	3.34	3.41	5.31	7.39	5.76	6.21									
11	3.65	5.98	7.49	5.93	5.67										
12	5.06	7.28	5.61	4.98											
13	6.79	6.22	4.87												
14	5.30	5.61													
15	5.64														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 1)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)													
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.23	0.34	0.44	0.47	0.53	0.25	0.25	0.45	0.39	0.27	0.33	0.42	0.32	0.39	0.37
2	1.79	2.75	2.94	2.70	1.40	0.86	0.67	11.77	1.41	1.40	5.52	2.73	1.04	1.39	
3	5.00	6.50	5.56	2.55	1.30	0.67	4.69	7.27	2.53	8.69	11.11	2.46	1.62		
4	7.47	7.28	4.04	2.08	0.81	2.33	4.09	8.02	9.67	12.86	5.95	2.90			
5	7.50	4.94	2.73	1.33	2.21	2.60	4.42	17.63	13.52	6.44	5.38				
6	4.27	3.13	1.42	2.61	2.32	2.77	11.02	16.61	6.73	5.69					
7	3.02	1.76	3.06	2.61	2.68	5.27	11.94	9.07	5.88						
8	1.88	3.47	3.02	2.75	3.85	7.22	6.65	6.71							
9	3.71	3.54	3.19	3.98	4.84	4.96	5.25								
10	3.53	3.47	4.29	4.81	4.10	3.91									
11	3.86	4.52	4.96	4.05	3.81										
12	4.54	5.11	4.14	3.57											
13	5.03	4.37	3.63												
14	4.22	3.79													
15	3.97														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 3)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

FISCAL YEAR (AMORTIZATION OF LOAN)

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.24	0.25	0.34	0.37	0.31	0.31	0.16	0.28	0.29	0.16	0.33	0.46	0.25	0.36	0.37
2	2.00	3.05	3.22	2.69	0.91	0.84	0.34	18.10	1.02	1.35	10.02	3.35	0.94	1.20	
3	7.45	8.32	6.27	2.47	0.69	0.33	6.50	8.97	2.40	16.95	20.55	2.43	1.53		
4	11.02	9.99	3.84	1.37	0.29	1.68	4.26	11.47	17.13	24.08	9.42	2.88			
5	9.74	5.21	1.90	0.65	1.42	2.13	5.58	25.75	25.45	11.10	7.72				
6	4.91	2.57	0.76	2.15	1.58	2.56	17.17	32.00	10.28	8.58					
7	2.51	1.03	2.77	2.20	2.23	8.23	19.58	13.48	8.11						
8	1.17	3.31	2.73	2.64	4.64	11.70	9.29	7.46							
9	3.45	3.17	3.06	4.98	7.02	6.51	6.91								
10	3.38	3.62	5.47	7.07	5.37	5.73									
11	3.60	6.24	6.86	5.30	5.04										
12	5.50	7.27	5.52	4.90											
13	7.20	5.80	4.84												
14	5.54	5.02													
15	4.96														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 4)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.20	0.29	0.32	0.32	0.28	0.37	0.11	0.34	0.26	0.20	0.32	0.49	0.24	0.33	0.42
2	1.93	3.24	3.27	2.66	0.78	0.96	0.34	20.23	0.95	1.40	11.87	3.61	0.95	1.27	
3	7.39	8.98	6.17	2.14	0.50	0.25	6.88	10.26	2.22	20.30	24.01	2.48	1.44		
4	10.90	9.83	3.41	1.16	0.28	1.59	4.22	12.98	18.24	27.99	10.71	2.85			
5	9.56	4.93	1.69	0.52	1.28	1.96	5.66	31.20	27.30	12.39	8.11				
6	4.87	2.38	0.66	1.78	1.61	2.62	18.94	25.57	10.76	9.52					
7	2.43	0.84	2.47	2.00	2.12	8.90	21.76	11.95	8.36						
8	1.15	3.46	2.70	2.23	5.06	13.52	10.00	8.86							
9	3.47	3.23	3.16	5.40	7.62	7.12	6.95								
10	3.34	3.65	6.04	7.32	5.62	6.02									
11	3.49	6.00	7.98	5.44	4.97										
12	5.79	7.95	5.88	4.81											
13	7.87	6.13	5.23												
14	5.78	5.43													
15	5.14														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 5)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.17	0.25	0.30	0.37	0.23	0.43	0.15	0.40	0.26	0.23	0.27	0.50	0.26	0.31	0.44
2	1.85	3.46	3.20	2.60	0.73	1.05	0.34	20.08	0.71	1.42	13.22	4.00	0.98	1.28	
3	6.79	9.29	6.55	2.04	0.49	0.28	7.98	10.91	2.09	22.93	26.46	2.52	1.49		
4	10.29	9.40	3.52	1.19	0.20	1.58	4.82	13.98	19.82	30.62	11.71	2.76			
5	9.76	4.67	1.38	0.57	1.15	1.65	6.11	35.21	29.37	13.08	8.88				
6	4.66	2.22	0.52	1.94	1.36	2.69	22.27	27.19	11.75	11.31					
7	2.22	0.78	2.44	1.93	1.83	10.28	23.82	11.77	9.02						
8	0.94	3.13	2.59	2.25	4.98	16.37	10.79	7.98							
9	3.27	3.06	3.17	5.84	8.29	7.77	8.35								
10	3.40	3.65	6.22	8.22	5.41	5.92									
11	3.39	6.52	8.32	5.96	5.50										
12	6.21	8.70	6.22	5.43											
13	8.57	5.92	5.91												
14	6.56	5.84													
15	5.49														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 6)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.15	0.21	0.37	0.34	0.16	0.41	0.16	0.26	0.24	0.17	0.27	0.57	0.23	0.29	0.53
2	1.75	3.77	3.60	2.31	0.44	1.08	0.34	18.87	0.76	1.36	14.31	4.18	0.97	1.50	
3	6.93	9.08	6.67	1.71	0.39	0.25	8.37	9.65	2.01	24.60	29.41	2.70	1.80		
4	10.17	9.17	3.23	0.98	0.25	1.46	4.72	15.06	21.17	33.31	12.99	3.20			
5	9.00	4.30	1.44	0.69	1.03	1.66	6.72	38.06	32.28	14.27	10.06				
6	4.21	1.74	0.57	1.61	1.26	2.28	25.10	29.31	12.59	11.60					
7	1.83	0.69	2.66	1.78	1.57	11.48	27.71	11.09	9.47						
8	0.80	3.08	2.77	2.11	5.31	18.25	11.81	8.31							
9	2.99	3.40	3.21	6.13	9.08	8.70	8.66								
10	3.20	3.44	6.79	9.19	6.18	6.82									
11	3.63	7.07	9.55	6.49	5.78										
12	6.70	9.72	6.59	6.00											
13	8.71	6.64	6.01												
14	6.19	5.81													
15	5.72														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 7)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.18	0.40	0.34	0.08	0.08	0.41	0.07	0.19	0.19	0.08	0.23	0.52	0.23	0.34	0.54
2	2.13	5.08	3.61	0.89	0.28	0.74	0.27	18.74	0.64	1.44	13.96	4.52	1.36	2.09	
3	7.61	8.23	5.65	0.79	0.29	0.24	11.12	10.72	1.85	25.23	33.03	3.76	2.82		
4	10.85	8.20	2.38	0.89	0.22	1.98	7.29	17.41	21.79	39.05	16.65	4.64			
5	8.33	3.43	1.35	0.81	0.96	2.12	9.68	41.21	36.74	19.98	14.03				
6	4.00	2.09	0.67	1.61	1.26	3.24	30.88	35.00	16.87	15.48					
7	1.95	0.66	2.77	1.76	1.54	15.65	32.82	16.81	12.21						
8	0.72	3.11	2.58	2.02	5.59	25.66	16.44	9.82							
9	2.91	3.43	2.72	6.07	10.22	12.31	10.91								
10	3.58	3.86	6.71	11.25	7.16	8.58									
11	3.57	7.97	10.54	8.03	6.98										
12	6.96	10.86	7.75	7.08											
13	9.97	7.27	6.59												
14	6.62	6.80													
15	5.70														

30-YEAR MORTGAGES (LOAN SIZE CATEGORY 8)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.00	0.15	0.20	0.00	0.00	0.25	0.12	0.75	0.29	0.27	0.55	1.31	0.30	0.88	1.24
2	4.11	2.07	2.61	0.61	2.17	1.09	0.60	27.52	0.77	2.50	14.80	5.58	1.72	4.65	
3	10.89	6.21	2.58	1.68	1.98	0.26	12.77	18.45	1.81	21.07	28.29	3.55	2.97		
4	9.70	4.55	1.18	2.03	0.00	3.35	12.29	17.00	15.62	32.20	13.14	3.92			
5	11.25	1.71	2.27	1.12	4.58	2.53	10.10	23.01	30.69	19.20	10.91				
6	2.82	2.44	0.89	1.94	3.75	3.10	27.79	27.13	14.25	13.93					
7	3.38	0.18	1.23	1.66	1.95	13.41	33.03	17.31	11.23						
8	2.00	1.97	2.05	1.69	4.00	21.21	17.26	8.18							
9	5.61	1.83	2.67	4.99	6.89	7.67	4.73								
10	4.32	1.12	4.90	5.63	6.49	5.58									
11	4.52	4.17	6.42	4.46	4.23										
12	2.96	6.32	5.80	3.48											
13	9.15	4.03	4.73												
14	4.73	4.87													
15	4.26														

15-YEAR MORTGAGES

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.63	0.28	0.56	0.27	0.23	0.00	0.19	0.54	0.21	0.29	0.27	0.55	0.43	0.50	0.53
2	2.72	2.28	2.45	2.14	0.47	1.38	0.19	10.46	1.08	1.42	9.79	4.59	1.72	1.83	
3	5.12	4.83	3.70	2.50	1.42	0.40	3.17	7.19	2.28	12.44	21.22	4.12	2.80		
4	7.92	5.63	3.29	2.28	3.39	2.47	3.92	6.09	10.44	21.10	8.66	4.69			
5	5.36	3.72	3.01	1.17	2.79	3.85	4.64	18.66	20.81	9.30	7.21				
6	3.21	4.26	3.57	3.59	3.45	2.91	9.09	11.74	9.78	7.39					
7	2.73	3.18	4.88	3.13	1.67	6.96	8.96	5.91	8.52						
8	2.83	4.50	3.22	4.85	6.50	8.23	5.94	6.82							
9	4.43	4.58	3.08	4.45	9.82	6.92	6.78								
10	5.47	3.30	5.60	3.61	6.16	4.38									
11	5.26	5.29	6.30	3.76	4.80										
12	11.94	6.63	7.65	4.72											
13	10.17	8.29	8.64												
14	17.18	10.62													
15	25.93														

GRADUATED PAYMENT MORTGAGES (GPM)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1			0.00	0.02	0.08	0.09	0.22	0.21	0.18	0.12	0.41	0.98	0.15	0.43	0.12
2			0.40	0.63	0.33	0.32	0.49	22.28	0.57	1.57	12.84	7.16	1.16	1.92	
3			0.80	0.86	0.52	0.23	13.15	10.58	1.95	24.32	24.53	5.59	3.09		
4			0.40	0.93	0.66	1.45	7.22	15.45	19.80	28.98	14.57	6.42			
5			0.41	1.57	0.95	1.69	10.61	31.38	27.44	16.80	13.49				
6			0.82	1.54	1.09	2.59	31.52	25.43	14.03	13.85					
7			2.47	1.75	1.46	13.66	29.70	14.06	9.77						
8			0.85	1.91	4.88	20.40	13.81	8.81							
9			2.99	5.77	9.27	9.63	9.58								
10			7.96	9.60	6.94	7.66									
11			10.10	7.22	6.48										
12			8.56	7.10											
13			5.26												
14															
15															

SPECIAL CASE: 30-YEAR MORTGAGES (EXACTLY 85% LTV RATIO)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2											0.42	0.74	0.39	1.60	
3											8.12	4.09	1.65	5.29	
4											21.08	2.32	1.75		
5											9.65	2.70			
6											7.17				
7															
8															
9															
10															
11															
12															
13															
14															
15															

SPECIAL CASE: 30-YEAR MORTGAGES (EXACTLY 90% LTV RATIO)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2												0.24	0.19	0.34	0.41
3												2.26	0.69	1.32	
4												2.34	1.38		
5												2.89			
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

SPECIAL CASE: 30-YEAR MORTGAGES (EXACTLY 95% LTV RATIO)

CONDITIONAL PRE-PAYMENT PROBABILITY (%)

POLICY YEAR	FISCAL YEAR (AMORTIZATION OF LOAN)														
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1															
2														0.75	1.11
3														2.41	
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

APPENDIX D: ANALYSIS OF THE REVISION TO THE CONSTANT QUALITY HOUSE PRICE INDEX

On May 3, 1990 the Bureau of the Census released a new price index for new one-family houses sold, commonly referred to as the constant quality house price index. This new price index reflects changes in the specification of the statistical regression model for each of four Census regions and changes in the regional weights used in calculating a national constant quality house price index. The changes in the reported numbers are significant. For the period from 1975 through 1989, the revised price index increases by 150 percent rather than 135 percent reported earlier. However, the variability of house price appreciation across regions has diminished. These two observed changes give rise to the possibility that had our economic and financial analysis of the MMI Fund been based on this index, our conclusions regarding the soundness of the Fund and needed changes in the insurance structure would be different. To assess the effect of the new price index, we have re-computed the equity and dispersion variables for the claims analysis, re-estimated the conditional claim rate model, developed new simulation and forecasts of claim termination and re-computed the financial impact on the MMI Fund for the consensus economic scenario. The results of our analysis are reported below.

I. REVISIONS TO THE CENSUS CONSTANT QUALITY HOUSE PRICE INDEX

The Census now employs five multiplicative models to estimate indexes for detached homes in each of four Census regions and a national index for attached homes. This statistical modeling approach replaces the previous additive model. In developing the national price index, weights based on the 1987 distribution of houses sold replaces the old weights from 1982. Further, this aggregation includes a component for attached homes that was not included previously. The results of these changes are shown in Table D.1, which presents the regional price indexes and the national price index with the weights applied in the aggregation.

Table D.1

CENSUS REGIONAL AND NATIONAL CQHP INDEXES
REVISED

	NORTHEAST	MIDWEST	SOUTH	WEST	ATTACHED	NATIONAL
WEIGHT	10.3%	34.1%	14.0%	28.0%	13.6%	
1975	35.3	46.3	45.9	41.1	47.2	43.8
1976	36.6	50.5	49.3	44.8	48.2	47.0
1977	39.1	56.6	54.0	51.9	44.7	51.5
1978	42.8	64.8	60.1	62.1	47.7	58.8
1979	49.0	72.6	69.2	72.4	57.6	67.6
1980	53.8	75.9	77.2	81.0	71.2	74.6
1981	58.4	82.9	83.9	86.1	76.9	80.6
1982	60.4	85.3	86.6	87.1	79.3	82.6
1983	64.2	85.2	89.0	88.8	85.4	84.6
1984	69.7	90.2	91.9	92.0	86.3	88.3
1985	76.7	88.7	93.8	92.7	94.6	90.1
1986	88.0	93.7	96.6	95.0	97.5	94.4
1987	100.0	100.0	100.0	100.0	100.0	100.0
1988	102.4	104.4	102.3	105.4	100.1	103.6
1989	105.5	106.8	105.2	112.0	103.9	107.5

To understand the extent of change in the price index, Table D.2 provides a comparison of the price index before and after the revision (with the old index re-based to 1987=100). In addition, a separate constant quality house price index was computed for the FHA market using the distribution of mortgages insured in 1987 rather than the Census weights of new houses sold in this period. The revised index suggests higher house price appreciation in the 1975-89 period than previously estimated. The revised index also indicates lower house price appreciation in the early 1980's and much higher appreciation since 1985. Selecting separate weights for the FHA market dampens the overall appreciation since 1975 from 150 to 143 percent, but does not appreciably change the price index from the Census revised price index even though the distribution across the four regions is markedly different as reflected in Table D.3.

Table D.2

IMPACT OF REVISION IN CONSTANT QUALITY HOUSE PRICES

YEAR	OLD CQHP	GROWTH RATES ANNUAL	CUM	REV. CQHP	GROWTH RATE ANNUAL	CUM	REVISED FHA CQHP	GROWTH RATE ANNUAL	CUM
1975	43.5			43.0			44.2		
1976	46.9	7.7%	7.7%	46.3	7.7%	7.7%	47.4	7.2%	7.2%
1977	52.2	11.3	19.8	51.5	11.3	19.8	51.8	9.4	17.3
1978	59.5	13.9	36.5	58.8	14.2	36.8	59.0	13.9	33.6
1979	68.1	14.4	56.2	67.6	15.0	57.3	68.3	15.7	54.6
1980	75.7	11.2	73.7	74.6	10.4	73.6	76.3	11.8	72.8
1981	82.8	9.4	90.0	80.6	8.0	87.6	82.3	7.9	86.4
1982	85.6	3.4	96.5	82.6	2.5	92.2	84.4	2.5	91.1
1983	88.2	3.0	102.4	84.6	2.4	96.9	86.7	2.8	96.4
1984	91.4	3.7	109.8	88.3	4.4	105.5	89.9	3.7	103.6
1985	94.2	3.0	116.1	90.1	2.0	109.7	92.0	2.3	108.3
1986	97.3	3.3	123.2	94.4	4.8	119.7	95.4	3.7	116.0
1987	100.0	2.8	129.5	100.0	5.9	132.7	100.0	4.9	126.4
1988	100.1	0.1	129.7	103.6	3.6	141.1	103.3	3.3	134.0
1989	102.7	2.7	135.8	107.5	3.8	150.2	107.4	4.0	143.3

Table D.3

WEIGHTS USED IN COMPUTING HOUSE PRICE APPRECIATION

	NORTHEAST	MIDWEST	SOUTH	WEST	ATTACHED
CENSUS 1982	10.1	11.3	54.6	24.0	
CENSUS 1987	10.3%	34.1%	14.0%	28.0%	13.6%
FHA 1987	4.5	15.9	34.5	31.5	13.6

A. Impact on Measures of Equity and Dispersion

The analysis of claim termination employs a measure of net equity to predict the conditional probability of claim termination. Key to the net equity measure is the index of constant quality house prices. A measure of dispersion of house price appreciation is also used as a predictor for conditional claim rates. Table D.4 presents the re-computed historical dispersion of house price appreciation. The far right columns give the averages for the old and new series. Using our constructed dispersion index for house price appreciation indicates that the revised constant quality house price index has greater variability in the 1975 through 1985 period. However, from 1985 to the present, the revised index has 20 percent less variability by 1989. Overall, the average dispersion rate of the new series for the first ten policy years is about ten percent less than for the old series and for the eleventh through the fifteenth policy year is twenty percent less.

Table D.4

HISTORICAL DISPERSION IN HOUSE PRICE APPRECIATION
Across Four Census Regions Using New Constant Quality House Prices

POLICY YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	AVERAGES NEW	AVERAGES OLD
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	2.4	3.5	3.9	1.6	3.0	1.2	1.0	2.6	2.4	5.0	5.5	4.2	1.5	1.7	2.8	3.0
3	5.7	7.5	4.8	4.5	2.5	2.1	3.1	4.5	7.0	10.5	10.1	3.9	2.9		5.3	5.6
4	9.6	8.2	6.5	3.8	2.7	3.7	5.1	9.7	13.0	15.3	9.4	4.3			7.6	8.2
5	10.1	9.5	5.4	3.7	4.8	5.7	10.3	15.7	18.2	14.5	9.1				9.7	10.7
6	11.0	8.3	4.6	5.7	6.0	10.6	16.4	21.0	17.3	14.1					11.5	12.6
7	9.9	7.3	5.2	6.5	11.1	16.9	21.7	20.1	16.8						12.8	14.2
8	9.0	6.9	5.0	11.4	16.9	22.2	20.7	19.6							14.0	15.6
9	8.0	5.9	9.1	16.8	21.9	21.2	20.2								14.7	16.6
10	6.6	8.1	14.0	21.8	20.9	20.5									15.3	17.7
11	7.1	11.8	18.7	20.8	20.4										15.8	19.0
12	9.7	16.2	17.9	20.4											16.1	20.5
13	13.8	15.7	17.8												15.8	20.6
14	13.4	15.9													14.7	19.7
15	13.9														13.9	18.7

II. RE-ESTIMATION OF THE CLAIM RATE MODEL

The conditional claim rate model was re-estimated using the revised net equity index measures and the house price dispersion measures. Table D.5 presents the statistical regression results. The key findings from this re-estimation indicate that the overall fit of the model has decreased slightly. The coefficients for net equity overall take on more negative values, indicating a lower propensity to default for a given level of equity. This suggests that for the later 1980's the effects of equity on the conditional claim probability will be lower than previously estimated. However, the impact of regional house price dispersion has increased significantly as indicated by the coefficients on the house price dispersion measure. In addition, the unemployment is of less importance across each of the LTV categories as seen with the smaller and statistically less significant coefficient estimates.

Table D.5

REGRESSION RESULTS FOR CONDITIONAL CLAIM RATE MODELS
Six Loan-To-Value Categories

INDEPENDENT VARIABLES	LTV 75-85%	LTV 85-90%	LTV 90-93%	LTV 93-95%	LTV 95-97%	LTV INVESTOR
Intercept	-4.096	-4.355	-0.606	-1.122	-0.159	-0.856
	(1.42)	(0.84)	(0.62)	(0.51)	(0.32)	(0.72)
POLICY YEAR:						
TWO	3.685	2.971	-0.406	0.293	-0.549	0.479
	(1.26)	(0.72)	(0.53)	(0.45)	(0.28)	(0.63)
THREE	4.953	3.879	0.614	1.296	0.420	1.489
	(1.23)	(0.70)	(0.52)	(0.43)	(0.27)	(0.61)
FOUR	5.246	3.928	0.859	1.507	0.627	1.683
	(1.22)	(0.68)	(0.50)	(0.42)	(0.26)	(0.60)
FIVE	4.990	3.475	0.622	1.320	0.431	1.440
	(1.20)	(0.67)	(0.49)	(0.42)	(0.26)	(0.59)
SIX	5.179	2.858	0.527	1.159	0.191	1.348
	(1.19)	(0.67)	(0.49)	(0.41)	(0.26)	(0.59)
SEVEN	4.819	2.806	0.224	0.923	0.030	1.078
	(1.19)	(0.67)	(0.49)	(0.41)	(0.26)	(0.59)
EIGHT	4.571	2.064	-0.027	0.649	-0.184	0.712
	(1.20)	(0.67)	(0.49)	(0.41)	(0.26)	(0.59)
NINE	3.926	1.907	-0.294	0.531	-0.249	0.597
	(1.20)	(0.67)	(0.49)	(0.41)	(0.26)	(0.59)
TEN	4.309	1.775	-0.895	0.397	-0.350	0.243
	(1.20)	(0.67)	(0.49)	(0.41)	(0.26)	(0.59)
ELEVEN	3.510	1.258	-0.484	0.283	-0.276	0.127
	(1.21)	(0.68)	(0.49)	(0.42)	(0.26)	(0.60)
TWELVE	2.266	0.263	-0.494	-0.056	-0.200	-0.317
	(1.24)	(0.69)	(0.50)	(0.42)	(0.26)	(0.61)
THIRTEEN	3.362	1.005	-0.186	0.033	-0.169	-1.036
	(1.28)	(0.71)	(0.51)	(0.43)	(0.27)	(0.63)
FOURTEEN	2.099	-0.031	-1.016	-0.609	-0.138	-1.382
	(1.39)	(0.77)	(0.56)	(0.47)	(0.29)	(0.68)

Table D.5(Cont'd)

REGRESSION RESULTS FOR CONDITIONAL CLAIM RATE MODELS
Across Six Loan-To-Value Categories

INDEPENDENT VARIABLES	LTV 75-85%	LTV 85-90%	LTV 90-93%	LTV 93-95%	LTV 95-97%	LTV INVESTOR
EQUITY:						
OVERALL	-5.286	-3.269	-2.665	-3.097	-2.412	-4.579
	(0.80)	(0.49)	(0.73)	(0.59)	(0.38)	(0.39)
PRE 1979 PERIOD ONLY [1975-99=1, 1978=0.5]	-3.173	-1.489	-2.369	-1.547	-2.193	0.053
	(0.51)	(0.34)	(0.76)	(0.62)	(0.40)	(0.27)
EQUITY(t-1) post 1978	.	.	-1.280	-0.899	-1.673	.
			(0.82)	(0.67)	(0.43)	
EQUITY BY SIZE CATEGORY						
ONE	2.713	3.545	2.920	2.575	1.991	2.084
	(0.51)	(0.38)	(0.29)	(0.21)	(0.12)	(0.26)
TWO	.	1.543	1.251	1.506	1.130	1.587
		(0.41)	(0.32)	(0.23)	(0.12)	(0.29)
SEVEN	-2.189	-3.415	-1.513	-6.365	-5.830	-3.696
PRE 1978 PERIOD ONLY	(0.72)	(0.40)	(0.27)	(0.40)	(0.43)	(0.40)
UNEMPLOYMENT RATE (t-1)	0.011	0.085	0.078	0.082	0.119	0.080
	(0.06)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)
HOUSE PRICE DISPERSION	6.703	15.888	8.631	8.296	6.279	7.461
	(2.47)	(1.68)	(1.25)	(1.01)	(0.64)	(1.33)
SUMMARY STATISTICS						
Adjusted R-Square	0.575	0.683	0.710	0.777	0.840	0.677
Root Mean Squared Error	74.075	62.169	50.314	47.546	41.022	48.020
F-Statistic	52.852	79.225	85.547	121.783	182.858	77.036
Number of Observation	728	728	728	728	728	728

III. FORECASTING CLAIM RATES WITH THE NEW MODEL

In evaluating the performance of the re-estimated claim rate model using the revised constant quality price index, the simulation analysis on loan performance through 1989 is performed and an ex-ante forecast across all policy years for the recent loan origination years is made.

A. Simulation of Claims

The results of the dynamic simulation analysis are shown in Tables D.6 and D.7. Exhibits A.8 and A.9 in Appendix A present similar results for the original index. These results indicate that the overall predictive performance of claims has diminished slightly -- the overall predictive performance of claims is 96 percent for the original index compared to 95 percent for the revised index.

Table D.6

DYNAMIC SIMULATION OF CLAIMS AND PREPAYMENTS
FOR THE PERIOD 1979-89
Across loan Size and LTV Categories

LOAN SIZE	LTV CATEGORY	CLAIMS ACTUAL	CLAIMS PREDICTED	CLAIMS ERROR	PREPAYMENT ACTUAL	PREPAYMENT PREDICTED	PREPAYMENT ERROR
	75-85%	13,790	14,375	(585)	99,603	83,054	16,549
	85-90%	20,488	20,810	(322)	104,732	96,599	8,133
	90-93%	25,137	23,472	1,665	92,983	92,998	(15)
	93-95%	44,871	42,621	2,250	113,035	104,186	8,849
	95-97%	90,120	84,360	5,760	180,114	168,647	11,467
	Investor	37,326	34,717	2,609	119,002	112,080	6,922
1		44,907	44,099	808	66,091	65,079	1,012
2		29,001	27,694	1,307	65,050	65,785	(735)
3		31,434	28,513	2,921	87,824	79,858	7,966
4		31,448	28,166	3,282	97,862	94,582	3,280
5		29,803	27,685	2,118	102,856	91,686	11,170
6		47,041	42,659	4,382	181,444	174,571	6,873
7		18,098	21,539	(3,441)	108,342	86,004	22,338
TOTALS		231,732	220,355	11,377	709,469	657,565	51,904

Table D.7

DYNAMIC SIMULATION OF CLAIMS AND PREPAYMENTS
FOR THE PERIOD 1979-89
Across Loan Origination and Termination Year

ORIG YEAR	TERM YEAR	CLAIMS ACTUAL	CLAIMS PREDICTED	CLAIMS ERROR	PREPAYMENT ACTUAL	PREPAYMENT PREDICTED	PREPAYMENT ERROR
	79	.	.		580	459	
	80	1,020	901	119	2,430	1,526	904
	81	3,725	2,901	824	3,349	2,480	869
	82	7,054	4,810	2,244	2,142	3,947	(1,805)
	83	13,270	10,065	3,205	31,452	39,133	(7,681)
	84	15,373	15,858	(485)	22,203	22,024	179
	85	21,548	18,252	3,296	32,759	43,731	(10,972)
	86	28,750	31,753	(3,003)	181,663	224,825	(43,162)
	87	39,931	42,750	(2,819)	247,279	173,341	73,938
	88	51,652	51,427	225	100,999	75,049	25,950
	89	49,409	41,638	7,771	84,613	71,051	13,562
79		18,470	19,921	(1,451)	59,114	54,689	4,425
80		24,940	24,526	414	66,772	82,555	(15,783)
81		27,704	20,967	6,737	68,231	98,249	(30,018)
82		19,053	14,152	4,901	60,834	67,159	(6,325)
83		43,156	48,902	(5,746)	162,278	149,166	13,112
84		28,083	26,437	1,646	93,323	80,223	13,100
85		30,713	26,629	4,084	119,246	63,002	56,244
86		28,565	24,489	4,076	59,214	39,344	19,870
87		11,048	14,331	(3,283)	20,457	23,178	(2,721)
TOTALS		231,732	220,355	11,377	709,469	657,565	51,904

B. Forecasting Claim Rates with Revised CQHP Appreciation Assumptions

In forecasting conditional claim rates for policy years beginning in 1990, a baseline forecast for the revised constant house price index is needed. The original baseline forecast for CQHP of 3.25 percent was tied to the recent history of CQHP appreciation. Because the revised index indicates higher appreciation in recent years, the baseline forecast is raised to 4.5 percent. The assumption for regional dispersion in house price appreciation will remain the same at 90 percent of the (new) historical average dispersion.

Tables D.8 through D.10 compares the new and old forecast results for the ultimate conditional claim rates for the recent historical period form 1986-89 and for the test policy year 1990 under the revised baseline forecast assumption for CQHP.

Table D.8

FORECAST OF CONDITIONAL CLAIM RATES 1986-90
Old and New Estimates for Ultimate Claim Rates
Assuming Baseline Economics

	1986	1987	1988	1989	1990
OLD	12.03%	11.67%	13.60%	13.57%	12.57%
NEW	11.09	10.99	13.25	13.46	12.43

Table D.9

1990 FORECAST OF CONDITIONAL CLAIM RATES BY LTV
Old and New Estimates for Ultimate Claim Rates
Assuming Baseline Economics

	<75%	75-85%	85-90%	90-93%	93-95%	95-97%	>97%	TOTAL
OLD	6.92%	6.30%	5.38%	10.68%	11.94%	17.74%	19.34%	12.57%
NEW	6.97	6.27	6.10	10.67	11.86	17.06	19.07	12.43

Table D.10

1990 FORECAST OF CONDITIONAL CLAIM RATES BY LOAN SIZE
Assuming Baseline Economics

	$0-40K	$40-48K	$48-56K	$56-64K	$64-72K	$72-88K	$88-105K	>$105K	TOTAL
OLD	19.23%	15.37%	12.12%	11.89%	11.77%	11.46%	11.02%	9.66%	12.57%
NEW	20.81	15.58	11.51	11.32	11.22	10.95	10.56	9.39	12.43

IV. FORECASTING THE FINANCIAL POSITION OF THE MMI FUND

The baseline forecast of claim and prepayment rates is then used to project the financial performance of both the existing and new business. Exhibit D.11 presents the net present value of each years business (in FY1988 dollars) under the old and new house price indices.

Table D.11

NET PRESENT VALUE OF BUSINESS
Assuming Baseline Economics

	OLD INDEX	NEW INDEX
1975	$240	$240
1976	283	279
1977	429	429
1978	521	519
1979	435	425
1980	(241)	(251)
1981	(801)	(804)
1982	(628)	(621)
1983	(886)	(817)
1984	(791)	(745)
1985	(874)	(731)
1986	(379)	(219)
1987	(186)	(61)
1988	(294)	(260)
1989	(283)	(275)
1990	(208)	(194)

As illustrated, the overall performance of the Fund is similar under both indices. The above numbers translate into a market value of the Fund including 1990 business of $2.4 billion under the old index compared to $2.9 billion the new index. The values of (new) 1990 business are extremely close.

In addition to analyzing a baseline scenario, we also analyzed an adverse scenario for the new index. This scenario assumes constant quality-adjusted house price appreciation of 3.5 percent, a loss ratio of 40 percent, and severe dispersion ranging from 100 to 130 percent of the average between 1975 and 1989. Under such a scenario, the market value of the Fund including 1990 business is $0.18 billion compared to -$0.43 billion under a similar scenario for the old index.