THE CHANGING FORTUNES OF FHA'S MUTUAL MORTGAGE
INSURANCE FUND AND THE LEGISLATIVE RESPONSE

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ABSTRACT

The 1980s was a bad decade for FHA's Mutual Mortgage
Insurance (MMI) program, the mainstay of FHA's single family
mortgage insurance. While the MMI Fund is required by statute to
be actuarially sound, the Fund lost close to $6 billion dollars,
and its economic value declined from 5.3 percent of
insurance-in-force to under one percent. This study documents
the decline in the soundness of the MMI Fund in the 1980s and
describes the legislation enacted in October 1990 to shore up the
Fund.

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The Changing Fortunes of FHA's Mutual Mortgage Insurance Fund
and the Legislative Response

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The Federal Housing Authority was established in 1934. While its
purpose/role is multifaceted and has evolved over time, the current goal of
its Mutual Mortgage Insurance (MMI) Program is to increase homeownership
opportunities in an actuarially sound manner. We emphasize two aspects of
this goal. First, the MMI program can only enlarge ownership opportunities;
it cannot dictate homeownership results. Many, far stronger, forces affect
homeownership outcomes. Second, by statute the MMI Fund must be actuarially
sound. While some FHA programs are designed to be operated at a loss (to
convey a subsidy), the MMI program is not.

The first 40 plus years of the MMI program appear to have been an
unmitigated success. The 30-year fixed rate mortgage was firmly
established, a great improvement over financing with 5 or 10 year fully
amortizing loans; the aggregate homeownership rate increased by nearly 20
percentage points; and the MMI Fund built substantial reserves. The 1980s
have been a far different story. FHA has not developed a popular new
mortgage product (the FHA adjustable rate mortgage flopped, in marked
contrast to the conventional ARM); the aggregate homeownership rate has
declined; and MMI reserves have eroded at an alarming rate.[1] The MMI Fund
lost $5.5 to $6.0 billion, causing its economic value to decline from 5.3
percent of insurance-in-force to under one percent.

This paper is about the severe deterioration in the MMI Fund in the
1980s and the need for and actual steps taken in October 1990 to shore up
the Fund. We begin by explaining why mortgage defaults increased so
dramatically in the 1980s and by documenting the different responses of the
private mortgage insurers and FHA to the increases. We then present

analyses of the solvency and soundness of the FHA MMI Fund in the summer of
1990 (the Fund was solvent, but not sound). Lastly, we summarize steps
taken to shore up the Fund in October 1990.

I. The 1980s Surge in Defaults and Insurers' Responses

In theory, a borrower's decision to default is based primarily on his
equity position -- the value of the property insured relative to the value
of the mortgage (Foster and Van Order, 1984). At any point in time, the
borrower's equity position is determined most significantly by the initial
loan-to-value (LTV) ratio and the movement in the house price following the
loan's origination. The importance of the initial LTV is illustrated in
Exhibit 1, which contains FHA claim rates during the first five years of
mortgages in different LTV ranges endorsed 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 three
percent or less had a claim rate more than five times higher than the rate
for those who put 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.
Moreover, investment loans are about as risky as the highest LTV noninvestor
loans.

While the composition of FHA loans by initial LTV did not change
significantly in the 1980s, the other determinant of default -- the movement
in house prices since loan origination -- did. Exhibit 2 indicates how
average house price appreciation varied during the 1964-89 period.
Appreciation rose from 4.0 percent in the second half of the 1960s to 8.2
percent in the 1970-76 span and surged further to 12.0 percent during the
1976-81 period before plummeting to under 3 percent in the 1980s. Not
surprisingly, claim rates for the MMI Fund were very low during the 1970s,

despite FHA's low downpayment requirements, and the Fund reported
substantial excesses of premium revenue over claim cost and expenses. With
the sharp deceleration in house prices since 1980, default rates have risen
significantly. Exhibit 3 illustrates the dependency of default on house
price appreciation by comparing the average annual rate of house price
appreciation and FHA cumulative claim rates over the first five years of
each year's business. The inverse relationship is striking.

Of course, not all house prices rise or fall at the same rate. While
the average property could be experiencing significant appreciation, some
borrowers could still default because their regional or individual housing
market experienced falling prices. It is the borrowers in the lower tail in
the national house price appreciation distribution who pose the greatest
risk of default. Exhibit 2 indicates that not only did house price
appreciation decline in the 1980s, but house price dispersion across regions
increased. This further contributed to defaults in the 1980s.

Private mortgage insurers responded in 1984 and 1985 to heightened
1980s defaults. After having been constant for a quarter century, default
premiums were raised multiple times. Moreover, insurers took numerous steps
to reduce the riskiness of the loans insured. They ceased insuring loans to
investors, loans with deep buydowns, and refinance loans where borrowers
withdraw equity. Also, insurers did not pursue business aggressively in
those parts of the country (the oil patch states) where business was
perceived as being relatively more risky. Nonetheless, some insurers failed
and others had to be substantially recapitalized. As a result, the private
mortgage insurers are in relatively solid shape today (Simpson, SMM, Spring
1989).

Congress and the Administration managed FHA far differently. Not only
were insurance premiums not raised, in late 1983 FHA switched from its

traditional annual fee (a half percent of the mortgage balance) to a one-time 3.8 percentage point upfront borrowable premium. This shift likely increased defaults and certainly disguised the deterioration of FHA finances. Moreover, rather than reducing the riskiness of their loans, FHA lowered the required down payment on loans between $25,000 and $50,000 and also eased qualification standards. (Not until 1988 did FHA finally cease insuring investor loans.)

The fluctuation in the distribution of loan originations across the LTV categories during the 1980s is illustrated in Exhibit 4. Since 1983, demand for high LTV loans, 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 LTV loans rose sharply in 1988-89 while those under 85 percent LTVs were halved. Overall, investor loans and business above a 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 with LTV below 95 percent (see Exhibit 1), the 1988-89 business is riskier than the 1980-87 business.

II. Is the FHA MMI Fund Solvent?

To analyze the financial viability of the MMI Fund, we estimate econometric models to explain household default and prepayment behavior. We then use these models to project future cash flows and thus to assess whether the MMI Fund is solvent -- has positive economic value -- under conditions that are reasonably expected to occur. The interested reader can find details on the models and projections in appendices to the Price-Waterhouse Report (1990).

A. Summary of Methodology

Mortgage borrowers have three basic options each month: 1) make their scheduled mortgage payment, 2) prepay the entire mortgage principal amount, or 3) default. The default option is, of course, critical to an insurer. In our models, borrowers make the choice that maximizes their wealth.

The default model explains conditional probabilities of default for selected loan categories based on the initial LTV position of the borrower. The borrower's equity position is the most significant determinant of default. This position depends on the initial LTV, the extent of price appreciation in the property, the market value of the mortgage, and the amortization of the loan (years from origination). 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 particularly sensitive to downward movements in interest rates because rational borrowers will refinance when rates decline significantly below their coupon rate and will prepay less rapidly when rates rise significantly above their coupon.

The analysis treats graduate payment mortgages and 30-year, 20-year and 15-year fixed-rate mortgages separately. Because GPMs comprise such a small portion of the MMI portfolio, they are 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 rate, the regional dispersion of property values about the mean, interest rates and unemployment rates. The number of defaults and prepayments are computed from the estimated probability of default or prepayment.

B. Assumptions Underlying the Analysis

Our evaluation of the future performance of the existing insurance-in-
force depends not only on how house prices, interest rates, etc., have moved
since the loans were originated but also on how these variables will move in
the future. That is, we need forecasts of these variables to project the
claim and prepayment rates and the resulting cash flows of the Fund through
the term of all existing loans. Our 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. The key assumptions for the period
from 1990 through 2018 are:

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

The measure of house price appreciation is the rate of change in the
median 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 the prices of insured houses. To adjust
for this historically, we employ the Constant-Quality House Price Index
rather than the median sales price. This index is published by the Bureau
of the Census and 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. In translating forecasted median house price
appreciation into constant-quality appreciation, two percent was deducted
from the annual median house price appreciation forecast, based on
historical averages (Hendershott and Thibodeau, 1990).

Three other key non-economic assumptions are made. The FHA loss ratio
on disposed properties is assumed to be 37 percent, the average expected
loss on property disposition to the average claim payout on FHA acquired
properties observed during the 1980s. Claim settlement is assumed to 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.

C. Results

In the consensus economic environment, constant quality house prices
are assumed to increase by 3.25 percent. Under this assumption, the
September 1990 value of the MMI Fund is estimated to be $2.3 billion. This
value reflects the current cash available to the Fund, plus the present
value of future premium receipts and receipts from property disposal, less
the present value of future claim payments, premium refunds, and
administrative expenses.

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 5 shows that the financial
position of each year of business written from 1980 to 1985 is already
negative. While the years 1986-1989 are in a strong positive cash position,
this is only because the up-front premium has been collected but
insufficient time as passed to observe many claims.

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 5. For the 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. Because the value of business written with up-front premiums (since 1984) already reflects all premiums that will be received, this business can only deteriorate from its current position.

Under the consensus economic forecast, the ultimate claim rate on the 1980s insured loans rises significantly above the experience of the prior years. Exhibit 5 predicts that loans originating after 1985 will have an ultimate claim rate of 11 to 13 percent. While this represents a significant drop from the early 1980s, our analysis indicates that the level of expected claim terminations will ultimately result in a net outflow of cash for each endorsement year. Further, the loans originated after 1985 represent about 75 percent of the current insurance-in-force.

The net result of this analysis is that business written between 1975 and 1990 has contributed $2,458 million in cash reserves to the existing Fund, but has an ultimate value of negative $3,662 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 by $6.1 billion in present value terms from its current level through the term of the loans.

Somewhat more than this amount has been provided for in the MMI Fund accounting statements through the unearned premium ($3.9 billion) and loss reserves ($2.7 billion). The $0.5 billion difference between the reserves ($6.6 billion) and the present value of expected cash outflows ($6.1 billion) represents the expected excess of the economic value of the Fund over the end of 1988 accounting equity position ($1.8 billion). Thus, we estimate the economic value of the current portfolio, including all cash reserves, to be about $2.3 billion. That is, the MMI Fund is solvent.

The impact of the 1980s business on the financial position of the MMI Fund is summarized in Exhibit 6. This exhibit plots the ratio of economic value to insurance in force. As can be seen, this ratio has declined from 5.3 percent to 0.8 percent.

The 2.3 billion estimate of economic is potentially subject to downward revision based on the policy of distributive share payments. Under this policy, when mortgages from a profitable year's business are prepaid, borrowers receive a partial rebate on their premium. The present value of these expected future payments, which largely relate to years prior to 1980, is $1.3 billion. Thus, if these distributive shares are not cancelled, the economic value of the Fund is only $1.0 billion. In the analysis presented below, we assume that distributive shares are cancelled.

Because the future economic climate is uncertain, sensitivity tests are presented in Exhibit 7 with respect to two key economic assumptions. When the assumed constant quality house price appreciation rate is varied 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. Greater regional price dispersion would lower the economic value by $1.0 to $1.5 billion. Thus, the combination of greater regional price variation and low house price appreciation is sufficient to push the value of the Fund below zero.

III. Is the FHA MMI Fund Actuarially Sound?

While the Fund is solvent, the law requires that the fund be actuarially sound. We begin by defining actuarial soundness and then use our models to determine a specific soundness requirement in terms of the ratio of the economic value of the Fund to the volume of insurance-in-force.

A. The Definition of Actuarial Soundness

The phrase "sound actuarial and accounting practice" has appeared numerous times in legislation pertaining to the Federal Housing Administration and its Mutual Mortgage Insurance Fund. The first occurrence was 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, the legislation failed
to define actuarial soundness either qualitatively or quantitatively.

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." That is, soundness requires a zero net present value
premium. However, the 3.8 percent up-front premium established in 1983 was
not determined in this way (Her zog, 1984). First, the average termination
experience (default and prepayment) over the previous 25 years, not the most
likely future experience, was used. (The previous five years experience was
used for estimates of loss rates on defaulted loans and of FHA
administrative expenses.) Second, a contingency factor was said to be built
in -- i.e., default experience could be slightly worse than the 1957-81
average without the MMI fund losing money -- because the loss rate numbers
and administrative expenses used were higher those actually experienced in
fiscal year 1983. That a contingency was, in fact, built in is
questionable; the 1983 loss rate was the lowest for the entire decade of the
1980s, so allowing for a greater rate wasn't particularly conservative.

The premium should provide for more than the best estimate of future
losses according to 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.")

An effective way to establish an easily understandable standard -- one similar to those established by state insurance regulators -- would be to define soundness as having economic value or equity greater than a specific percentage of insurance-in-force. The required percentage can and should be designed to provide enough equity to cover a reasonably adverse, but not catastrophic, economic situation. To cover catastrophic risk 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.

B. Equity Required for an Actuarially Sound Fund

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 the MMI Fund insures mortgages, the credit rating approach would reflect the 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. An AAA rating requires that private mortgage insurers survive four consecutive years of 10 percent nominal declines in house prices, a rise in the unemployment rate to 20 percent, and a 5 percentage point decline 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. To be able to withstand such a loss would require equity nearly 10 times the current level. As noted above, though, the social purpose of the Fund is such that it should not be expected to withstand such a calamity.

We consider two far less severe scenarios: a downward revision of our baseline economics and a recession similar to the average recession experienced since 1950. The downward revision scenario is based on three changes that are assumed to persist throughout the term of the mortgages:

·   House price appreciation rates set 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, not 90 percent of the 1980-89 rates.
·   Loss ratio set at 40 percent, rather than 37 percent.

We emphasize that each of these scenario components has occurred in the last decade. Specifically, the downward revision assumes an average increase in constant quality house prices of 2.5 percent per year while the 1985-1989 average was 2.0 percent; the house price dispersion rates used in the downward revision are more favorable than the 1980s experience; and the 40 percent loss ratio occurred three times in the 1980s.

Under the downward revision scenario, the fund's estimated value declines by $3.0 billion relative to the value estimated under consensus economics (the value of the 1990 business alone declines from -$208 million to -$667 million). That is, the Fund should have an economic value of $3.0 billion today, in order to remain solvent under this adverse scenario.

The second scenario is what we term a moderate recession. We assume the recession would lower house price appreciation by 2 percentage points, lower interest rates by 1.5 percentage points, and raise unemployment rates by 3 percentage points. These changes are assumed to occur over two years and then to be fully reversed by the fifth year. Under this recession

scenario, the Fund's existing portfolio again declines by $3.0 billion (the value of the 1990 new business alone declines to -$876 million).

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 is 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 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 has an economic value of $2.3 billion, which is $1.45 billion short of the minimum 1.25 percent capital ratio.[2]

IV. Shoring Up the MMI Fund

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 $2.3 billion. That is, even without the payment of distributive shares, the Fund is substantially short. Of equal concern is that the annual new business being underwritten by the fund has a value of -$208 million under consensus economics, rather than the positive $412 million needed to build equity in line with the 1.25 percent capital standard.[3] We begin by describing some policy changes that would put new business on a sound financial basis and then explain the legislative changes actually enacted.

A. Making New Business Actuarially Sound

A number of alternative changes to the MMI structure would convert new business from having negative net present value to adding economic value equal to 1.25 percent of the net insurance written. One simple alternative

is to not make any loans with downpayments under 10 percent. A second is to
raise the flat 3.8 percent upfront premium to 5.6 percent or by almost 50
percent. However, neither of these options is consistent with the MMI
mission. The first would directly conflict with the social purpose,
increasing homeownership opportunities. The second would probably not make
the MMI Fund actuarially sound because many less risky, higher downpayment
borrowers would shift from FHA to private mortgage insurance, leaving FHA
with predominately risky borrowers.

One way to achieve soundness while still making high LTV loans is to
charge a higher insurance premium for the riskier high LTV loans. Exhibit 8
illustrates how this might be done. Column 1 gives the average claim rate
for the first five years of the mortgage life for all loans in different LTV
ranges endorsed between 1975 and 1985. As was noted earlier, claim rates
are more than twice as high for loans with LTVs over 95 percent as for loans
with LTVs under 90 percent. The premium could be linked to the risk
involved by charging an extra half-percent-of-loan-balance premium for a
longer number of years the higher is the initial LTV. Column 2 gives some
illustrative years. Columns 3 and 4, respectively, give the ratio of the
claim rate in column 1 to the present value of the basic 3.8 percent upfront
premium charged and to the present value of the premium including the
additional annual component. This scheme builds sufficient equity without
raising the premium on loans with LTVs under 90 percent by effectively
eliminating the cross-subsidization from low LTV to high LTV borrowers.

B. The Legislation Passed

The Cranston-Gonzalez National Affordable Housing Act was passed by
Congress in October 1990. Title III of the Act includes several major
provisions affecting the business underwritten by the MMI Fund. These

provisions define "actuarial soundness," as this ·requirement affects the Fund, and modifies the terms and conditions of insurance to achieve the soundness requirement.

Under Section 332 of the Act, the MMI Fund must attain a capital ratio of 1.25 percent of unamortized insurance in force within two years of the date of enactment. Within ten years, the capital ratio must be at least 2.0 percent. That is, new borrowers are being required to pay premiums sufficient to compensate for old borrowers being under-charged. If these targets are not met, the Secretary of Housing and Urban Development may increase the insurance premiums. To determine whether the fund's operations are likely to meet the specified ratios, the Act requires that an independent actuarial study be conducted each year.

The Act also changes the terms and conditions of insurance. First, only 57 percent of previously-eligible closing costs can be borrowed. Second, the mortgage insurance premium is increased, with a higher premium being charged the greater is the initial loan-to-value ratio. While the higher premiums reduce the existing cross-subsidization of high LTV borrowers, significant cross-subsidization remains. Beginning in 1995, the borrower is required to pay a 2.25% premium at the time of purchase and 0.5 or 0.55 percent annual premiums based on a percentage of the remaining insurance principal balance.[4] The 0.5 annual premium must be paid for 11 years if the initial LTV is below 90 percent and for 30 years if the LTV is between 90 and 95 percent. For loans with initial LTV above 95 percent, an annual premium of 0.55 percent must be paid for 30 years. In present value terms, the 3.8 percentage point premium is estimated to be increased by 45 percent (under 90 percent LTV) to 84 percent (over 95 percent LTV).

Third, the Act will reduce the distribution of surplus to previous borrowers. Under the mutuality provisions of the Fund, premiums that are in excess of the Funds' requirements are distributed to those borrowers with mortgages that have been fully paid. Prior to passage of the Act, the Fund's requirements were defined for each endorsement year. That is, because the 1970s books of business had low defaults, the surplus of premiums over claims has been distributed to borrowers as loans have been prepaid. This distribution was scheduled to continue even though the overall MMI fund is no longer actuarially sound. Under the Act, these distributions will be paid only when the entire fund is deemed to be actuarially sound.

Other provisions in the Act also affect they types of business insured by the MMI Fund. Mortgages for second homes can only be insured to avoid undue hardship to the mortgager. Further, the mortgage ceiling in high cost areas was permanently increased to 125 percent of the national median. This increase had been instituted on a temporary basis in 1989.

These changes to MMI insurance will increase the value of future business. Increased effective downpayment requirements (the only 57 percent borrowing of eligible closing costs) will reduce the risk of default and subsequent claim payments. Higher premium levels will increase the Fund's expected revenues. Taken together, the economic value of future insurance should increase substantially. From the borrower's perspective, however, more up-front cash is now required and the cost of insurance has increased. Borrowers may find such insurance unattractive, and FHA's business volume may decline. While the risk-differentiation of premiums should reduce the loss of business to private insurers relative to an equivalent uniform increase in the premium, a significant loss of the less risky business should be expected.

Footnotes

1. The decline in homeownership illustrates the limited effect FHA has.
Arguably, FHA overcharged for insurance in the 1970s, when ownership grew,
and undercharged in the 1980s, when ownership fell.

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

3. This assumes that $33 billion of net new business is insured.

4. The decline in the upfront premium is phased-in over the next four
years.

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Herzog, Thomas N., "Introducing Single Premium Plan Premier," Mortgage Banking, April 1984.)

Price Waterhouse, "An Actuarial Review of the Federal Housing Administration's Mutual Mortgage Insurance Fund," June 6, 1990.

EXHIBIT 1

Sensitivity of Claim Rates to
Loan-to-Value Ratio
1975-1985 Endorsement Year Loans
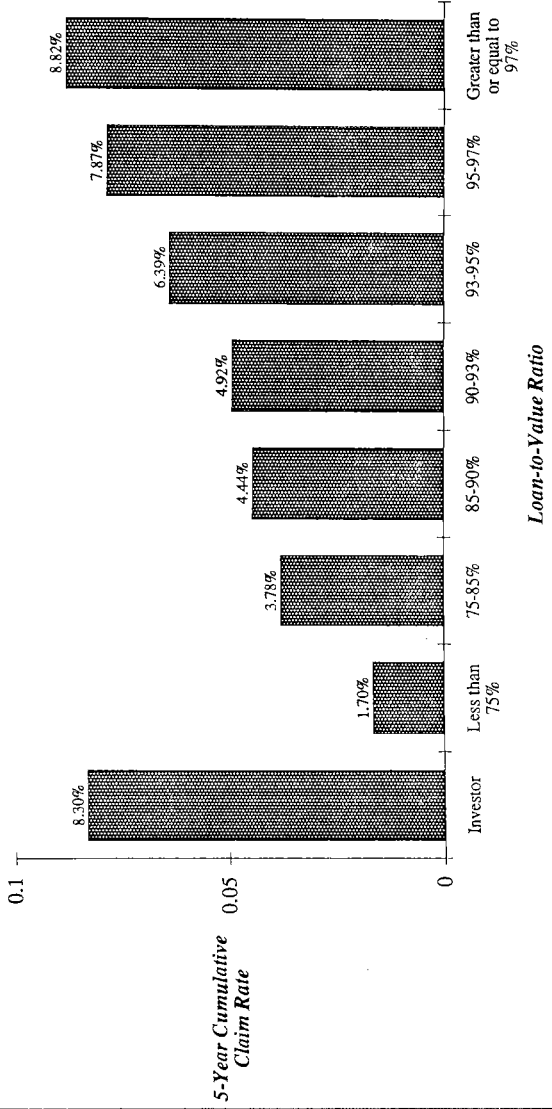
EXHIBIT 2

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

EXHIBIT 3

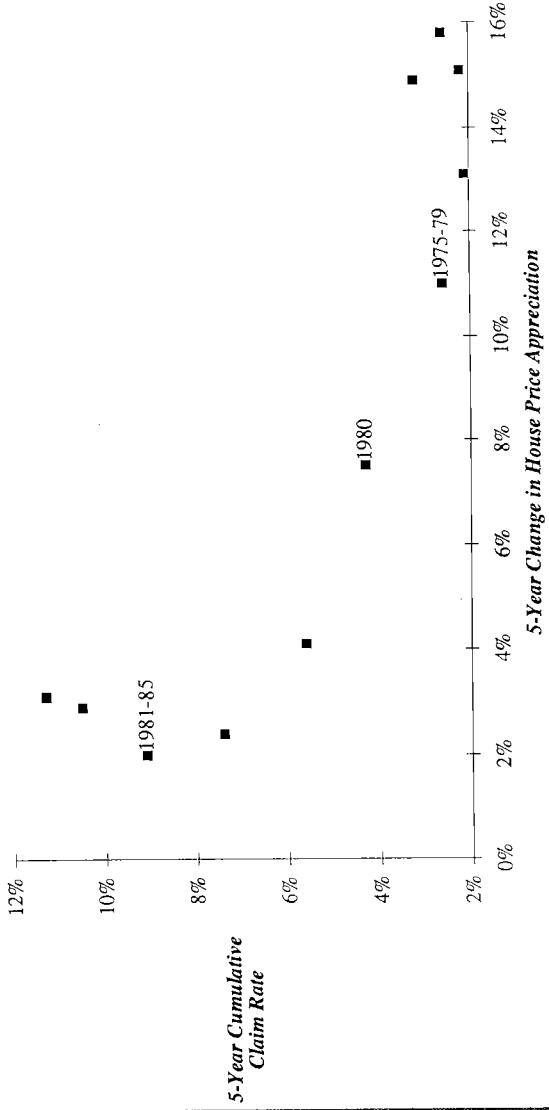# Comparison of Conditional Claim Rates to Growth in the Constant Quality House Price Index

■1981-85

■1980

■1975-79

5-Year Cumulative Claim Rate

5-Year Change in House Price Appreciation

EXHIBIT 4

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%

EXHIBIT 5

Current and Projected Present Value of
Endorsement Years 1975 - 1989

Endorsement Year	End of FY88		Ultimate	
	Cumulative Claim Rate	Cash Reserves (Millions)	Cumulative Claim Rate	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)

EXHIBIT 6

Capital Ratio

The Ratio of Net Worth to Insurance-in-Force
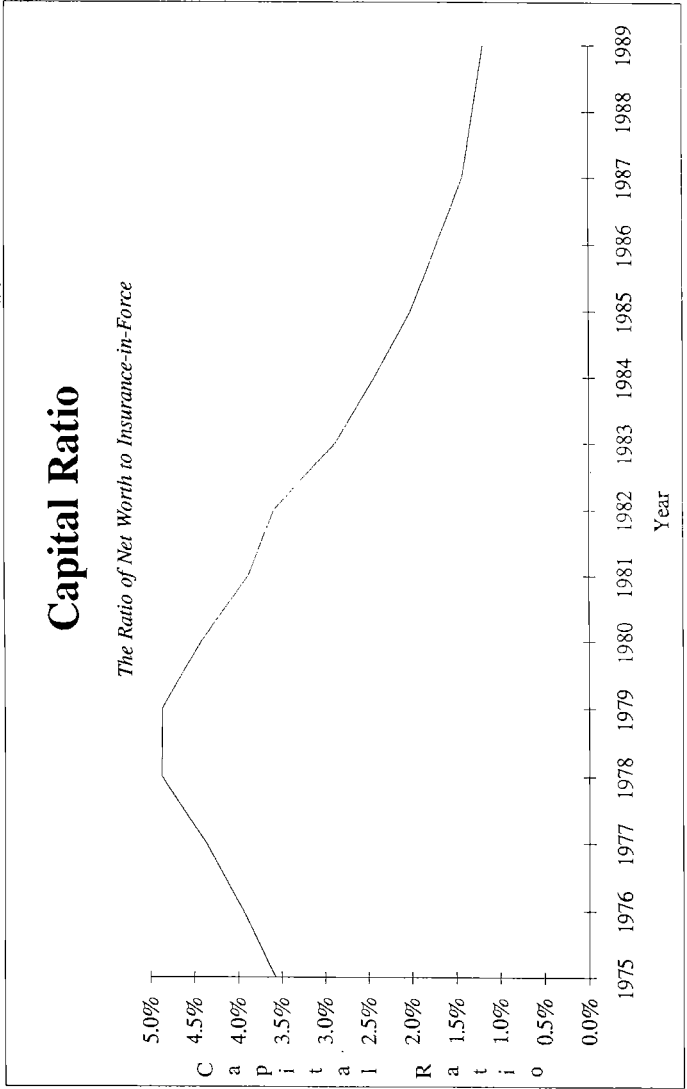
Sensitivity of Existing Insurance in Force to House Price Appreciation and Variation

Economic Value
(Billion Dollars)

Growth in Constant Quality House Prices

■ Severe Regional Variation   ☐ Base Regional Variation   ✳ Moderate Regional Variation
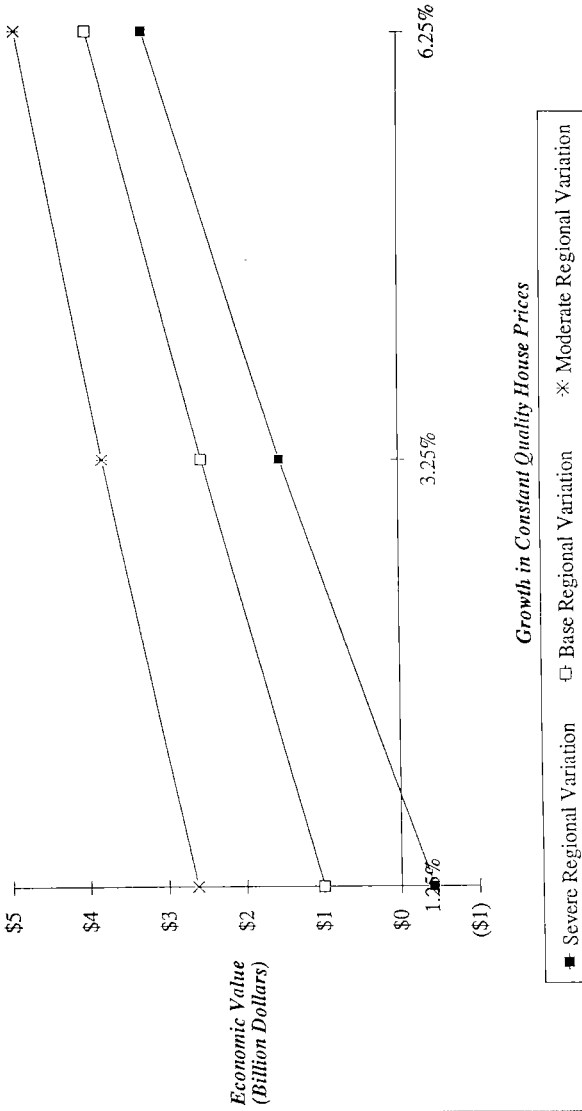
EXHIBIT 8

RISK BASED PREMIA

LTV	Claim Rate*	Years of 0.5% Annual Premium	Claim Rate/PV of Premium Current Policy	Claim Rate/PV of Premium Build Equity
<90%	3.5	0	0.92	0.92
90% - 93%	4.9	4	1.29	0.90
93% - 95%	6.4	7	1.68	1.02
>95%	8.0	11	2.11	1.13

* Claim rates from Exhibit 1; where averages of weights are calculated, use the distribution of the 1988-89 business from Exhibit 4.