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WORKING PAPER NO. 90-183

A REAL, AFFORDABLE MORTGAGE

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Working Paper #90-183

December 1990

A Real, Affordable Mortgage

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Homeownership has long been a cherished American goal. Using various tax and financial policies, governments at all levels have fostered homeownership for decades. As a result, the homeownership rate rose steadily and strongly from the 1940s through the 1970s.

But many now feel that their dream of homeownership has turned into a nightmare. The National Association of Realtors estimates that the median household income of potential first-time homebuyers is only about three-quarters that required to afford the median-priced starter home. Those who are able to acquire homes often find that a painfully large part of their income is initially devoted to housing expenses. As a consequence, the 1980s was the first decade that the aggregate homeownership rate fell since the Great Depression. Declines in homeownership rates were particularly large for younger households.

The inability of millions of households to purchase what is deemed to be reasonable housing has been termed the "affordability crisis" in housing. The term "affordability" typically refers to the cash flow burden of the mortgage rather than the price of the house, being based on a comparison of the size of the initial mortgage payment to the level of current homebuyer income. Thus, while the amount of housing a household can "afford" does depend on house

prices, it also depends on household incomes and on housing finance conditions.

Since the 1930s, the dominant vehicle for financing home purchases has been the long-term, fixed-rate mortgage (FRM). When it was introduced and in the decades immediately thereafter, inflation over the life of the mortgage was expected to be negligible. In the absence of inflation, incomes tended to rise quite slowly. This made the FRM a sensible way to finance homeownership: the burden on the household budget of making payments remained relatively low and steady over the life of the mortgage.

But the level-payment feature is also what makes the FRM (and all other existing mortgages in this country) ill-suited to a world where even a moderate amount of inflation is expected (and where some is unexpected). The combination of inflation and level-payment mortgages is primarily responsible for the housing affordability crisis. Such mortgages impose an artificial constraint that prevents many households from purchasing houses of a quality consistent with their lifetime income and consumption levels. The problem is that these households are constrained by the current cash flow burden of level-payment mortgages relative to their current income. They are constrained in that they are either unable to purchase homes, able only to own homes of a lower quality than their lifetime resources warrant, or able to become homeowners only by devoting an unnecessarily large share of their current incomes to make mortgage payments. It is not that the economic cost of housing is "too high," that average real payments are "too high," or that lifetime real income is "too low," but that existing mortgage designs make the real payment burden in the early years of the mortgage unnecessarily high. In

that sense, the problem is more accurately termed a "housing finance crisis."

Fortunately, much of the crisis in housing not only arises from, but also has a ready remedy in, housing finance. The solution will not raise incomes or bring down house prices.[1] However, it can be expected to make housing finance, and thus housing, more affordable for more families. The solution does not require government subsidies; it can be undertaken entirely by the private sector. The solution does not require concessions by financial institutions; it does lie in offering prospective homebuyers a fundamentally different and more sensible type of mortgage: the Price Level Adjusted Mortgage.

The Price Level Adjusted Mortgage (PLAM) represents a genuine and substantial advance in housing finance. PLAMs rearrange the timing of the mortgage payments so that they are constant in real rather than nominal terms. Rather than real payments being high at the beginning and low at the end of the mortgage's life as with a standard level (nominal) payment mortgage, real payments on a PLAM are constant. Thus, PLAMs can be offered with payments that for several years are substantially below those on fixed-rate or adjustable-rate mortgages. Other things equal, this rearrangement of the real payment burden will allow more potential homebuyers to qualify for mortgages. And for those who can qualify for standard level-payment mortgages, adding PLAMs to the mortgage menu will allow them the option of purchasing larger houses sooner or shifting some of the payment burden into the future when their incomes are likely to be higher.

PLAMs are also likely to benefit mortgage originators, the construction industry, pension funds, and savers. First, traditional lenders can avoid the inflation risk associated with fixed-rate, level-payment mortgages. An added benefit to borrowers of this reduced risk exposure is that lenders should be willing to provide PLAMs at a lower cost than for level-payment mortgages. In addition, PLAMs are likely to remain within reach of potential homebuyers even when higher nominal interest rates put payments on traditional mortgages beyond their reach. This would likely smooth out the pattern over time of effective housing demand and mortgage originations, and therefore of house prices and construction. Since defined-benefit pension plans' liabilities are in effect tied to future inflation, regardless of whether it had been anticipated, PLAM's inflation-proof, fixed real rate of return would be beneficial to pension plans. A guaranteed real rate of return would be attractive to many individual savers as well. Given the potential benefits to both lenders and borrowers and the fact that this mortgage reduces the cost of homeownership to about the same cost as renting, even for low-income households, the PLAM may represent one of the most effective, private-sector solutions to the homeownership problem millions now face.

I. Affordability and Homeownership

Homeownership is a key ingredient of the "American Dream." As former President Reagan said, "Owning one's own home means far more than merely having shelter. It is a concept deeply rooted in the hearts of our people, for it carries with it a whole constellation of values--family, neighborhood, community, independence, self-reliance, citizenship, faith in our country and

its future."[2] Because of this widely shared view, public policies have facilitated homeownership since the 1930s. Income tax policies have given preferential treatment to homeowners through property tax and mortgage interest deductions. By insuring and purchasing long-term mortgages, government agencies have played an integral role in the development and maturation of both primary and secondary mortgage markets.

Figure 1 shows the pattern of homeownership since the turn of the century. The aggregate homeownership rate showed no particular trend before World War II and the proportion of households that owned their home never reached 50 percent. The homeownership rate then rose dramatically for the next three decades. By 1980, it was over 65 percent, about one and one-half times the rate before World War II. Over the past decade, however, the aggregate homeownership rate has fallen.[3] Indeed, only the shifting age distribution that resulted from the enormous number of baby boomers entering the typical homebuying ages kept the aggregate homeownership rate from falling considerably during the 1980s.

Recent movements in age-specific homeownership rates are more revealing. Although it rose for those over 65 years old, the homeownership rate for every other age group fell over the past ten years. In general, the younger the households, the more severe the decline in the rate. In fact, the homeownership rates for those under 45 years old are lower now than they were 20 years ago. Figure 2 shows homeownership rates for households with heads under 25 years old and for those aged 25 to 34. By 1989, the ownership rate for the under-25 group had declined by nearly 20 percent from its 1970 value

and by one-third from its 1980 peak. The declines for the 25-34 group over the same periods were 9 and 18 percent, respectively.

Figure 3 shows a measure of the expected real, after-tax total (or "economic") costs that new homebuyers have faced since the mid-1960s.[4] The economic cost consists of mortgage interest payments, utility costs, maintenance and repair costs, property taxes, insurance, and the forgone earnings on (opportunity costs of) the down payment, less the tax savings from homeownership and less the expected capital gains arising from a change in the house price. The dashed line in Figure 3 shows this economic cost as a percentage of the median income of married-couple renters aged 25 to 29, a key group of potential first-time homebuyers.

Figure 3 suggests that the lower age-specific homeownership rates in the 1980s compared to the 1970s correspond to the higher economic cost of homeownership. Yet the decline in economic costs during the 1980s was associated with a decline in homeownership rates for most age groups. Furthermore, the decade-long decline in the economic costs of homeownership in the 1970s brought virtually no increase in homeownership rates for younger age groups until the end of the decade. And that temporary surge roughly corresponded with a sharp rise in economic costs. This suggests that, although economic cost may be an important influence on homeownership, it is unlikely to be the only one.

Another factor that may affect the amount of housing that buyers demand is the imposition of financing constraints apart from that associated with

borrowers' expected lifetime resources. A prospective homebuyer faces two constraints set by lenders that limit the amount of the mortgage: minimum down payment and maximum payment-to-income requirements. Potential homebuyers may find themselves bound by either constraint. This article focuses on the latter constraint whereby level-payment mortgages inappropriately constrain mortgage size, and thus the demand for housing, when even a modest amount of inflation occurs.[5]

Given the payment-to-income requirement imposed by lenders, one of the most commonly used measures of the ability of prospective buyers to "afford" a home compares the (after-tax) cash-flow requirements of the associated mortgage to the buyer's income. However, this cash cost ignores some aspects of economic costs. In particular, it omits the forgone earnings on the down payment and the capital gain (or loss) expected from changes in the price of the house. Figure 3 plots the cash cost relative to the income of potential first-time homebuyers as a solid line.

Until the late 1960s, the cash and economic costs of homeownership closely tracked each other because the low expected inflation rate meant that expected capital gains on houses were typically small.[6] The divergence between the economic and cash costs beginning in the late 1960s corresponded with the divergence between the financial circumstances of the "haves" and the "have nots." The generally higher level of cash costs since the mid-1970s coincides with the eventual decrease in homeownership rates. Those who already owned homes in the 1970s benefited from the fall in the economic costs of homeownership. The higher cash costs, on the other hand, made it more

difficult for prospective buyers to qualify for mortgages commensurate with the economic cost of homeownership and their expected lifetime resources. In this sense, prospective buyers were barred from homeownership by a borrowing, or liquidity, constraint.[7]

The primary reason that interest rates have been higher since the late 1960s is higher inflation. By raising interest rates, inflation reduces the amount that a homebuyer can borrow with a level-payment mortgage, whether fixed or adjustable rate. This reflects lenders' practice of determining the maximum size of the mortgage obtainable based on the interest rate and the homebuyer's income at the time of origination.[8]

Although inflation affects them both, interest rates and income respond very differently to inflation, as Figure 4 indicates. The onset of inflation tends to raise interest rates rather abruptly to a higher level. The associated mortgage payments also step up and remain at the higher level. By contrast, incomes, and prices of goods and services generally (including rent), start from their original levels and begin, and continue, to rise. Since payments are likely to have risen considerably more than income, the maximum mortgage that can be "afforded" will be reduced.

To demonstrate how this happens, suppose that at a zero inflation rate, a homebuyer earning gross monthly income of $2,148 borrows $100,000 with a 30-year, 5 percent, fixed-rate mortgage. The monthly payments of $537 imply a 25 percent payment-to-income ratio, as long as income does not change. Now suppose that the inflation rate and the mortgage interest rate each rise by 5

percentage points, thereby leaving the real interest rate unchanged.[9] (Note that a 5 percentage point increase in both inflation and interest rates approximates actual changes since the 1950s.) A $100,000, 10 percent, 30-year mortgage requires monthly payments at a level of $878 for the entire term of the mortgage. Even though the real interest rate and thus the real cost of housing remain unchanged, mortgage payments are 64 percent higher.[10]

Inflation would affect income as well, but in a very different way. Figure 4 shows that monthly income gradually and continually rises from its initial level of $2,148. One year after the 5 percent inflation began, the borrowers' monthly income would be $2,255 (= $2,148 x 1.05). The borrower is now faced with the predicament that mortgage payments have risen 64 percent while incomes have only risen 5 percent. Housing expenses as a share of the household budget have risen more than 50 percent. Presuming no increase in real income, the continuing 5 percent inflation will raise income by 5 percent each year. With the mortgage payment remaining constant at $878, the payment-to-income ratio will slowly decline from nearly 40 percent to only 10 percent over the life of the mortgage. This pattern of the initial heavy burden of mortgage payments being eased by rising incomes associated with inflation is familiar to those who have had mortgages during the past 25 years.

Although these 10-percent mortgage payments represent the same <u>average</u> share of income over the life of the mortgage as in the zero-inflation, 5-percent mortgage case, it is the large initial payments that pose an unnecessarily heavy cash flow burden. It would not be correct to infer that this problem can be overcome by waiting. It cannot. A potential homebuyer

who waited the ten-plus years required for income to "catch up" to the 64 percent higher mortgage payments would find that payments had risen even further (by about as much as incomes), not because of higher mortgage rates, but because house prices rose over time due to inflation.

Figure 4 does provide a hint as to the solution to the problem of high initial payments: arrange payments to fit homebuyers' ability to pay. Prospective homebuyers often find that they cannot nearly afford housing of the calibre that they rent. How can they afford the rent? A principal reason is that rent payments are not level over time, but tend to rise with the general levels of prices and incomes. For it is no coincidence that a "crisis" has developed during a time of inflation (a general escalation of prices and incomes), with FRM payments being the only important part of household expenses that does not rise with the overall price level.

The borrowing constraint hypothesis helps explain why the rise in homeownership rates in the 1970s slowed more for younger households than for older households. Younger households tend to have incomes that are lower relative to other households and lower relative to the incomes that they reasonably expect for themselves in the future. When lenders apply the same lending criteria without regard to borrowers' ages, the young are more likely to be "liquidity constrained."[11] Second, higher interest rates directly affect homebuyers, as opposed to homeowners. Since older households are more likely to own homes already, relatively fewer of them will seek new financing. Increases in interest rates then are likely to inappropriately constrain the young more severely.

These characteristics contribute to the following notable features of the housing market when inflation occurs. First, homeownership rates seem to respond significantly to the purely cash flow, "non-economic" aspects of costs. The sharp increase in the mortgage interest rate was the dominant factor in the dramatic increase in cash costs shown in Figure 3. Nominal interest rate increases, however, especially in the 1970s, have often coincided with decreases in expected real interest rates, and therefore should have been associated with increased demand for homeownership. Though economic costs halved during the 1970s, homeownership rates rose only slightly. Increases were smallest for young households, the group more likely to be borrowing-constrained.

Second, a pervasive "moving up" phenomenon occurs in real estate markets. Only a few years after struggling to get into and beginning to make payments on their first home, their rising incomes allow homeowners to borrow more and thereby consume housing more in line with their lifetime resources and tastes. This "moving up" in mortgage size and house quality involves substantial pecuniary and non-pecuniary costs. Nonetheless, it often happens several times in a lifetime, even in the absence of any significant revision of lifetime earnings prospects.

Table 1 displays some of the factors that affected homeownership "affordability" over the past quarter-century. Column 3 shows that, while house prices have risen markedly, they have not greatly outstripped the rise in incomes of potential first-time homebuyers.[12] Over the entire 1965-89 period, the ratio of house prices to incomes rose by less than 3 percent.

Measured from 1970 to 1989, however, the increase is much larger: 24 percent. Column 5 shows the monthly mortgage payment required on a 10 percent down, 30-year mortgage based on the house prices in column 1 and the mortgage rates in column 4. Column 6 shows the corresponding payment-to-income ratio. That ratio rose slightly in the late 1960s, nearly doubled between 1970 and 1980, and then receded.

Columns 8 and 9 assign the change in the payment-to-income ratio in column 7 to its determinants: the change in the market, or nominal, mortgage interest rate and the change in the ratio of house prices to incomes. Between 1965 and 1975, interest rates rose enough to raise the payment-to-income ratio even though house prices rose less than incomes. Between 1975 and 1980, the price-to-income ratio and interest rate increases combined to raise the payment-to-income ratio by two-thirds. Since 1980, the price-to-income ratio has fallen nearly to its 1965 level, while interest rates have remained historically high. Thus, the higher interest rate accounts for almost all of the 56 percent increase in the payment-to-income ratio since the mid-1960s.

II. "For Everything There is a Season . . . "

The level-payment mortgage was not designed for a world with inflation and it is not well suited to it. When inflation was low and steady enough to be negligible, the long-term, fixed-rate mortgage (FRM) was a sensible instrument for borrowers and lenders alike. In the absence of inflation, the level payments of an FRM allowed borrowers to spread evenly over time the real burden of housing expenses.

Inflation erodes this principal attraction of level-payment mortgages. Figure 5 shows the pattern of the real, or price-level-adjusted, levels of monthly payments on $100,000 FRMs. These payments are shown for inflation rates of 0, 5, and 10 percent and for mortgage rates of 5, 10, and 15 percent. The real rate of interest is 5 percent, and thus the real payment on average over the life of the loan is the same for each inflation rate scenario.[13] Figure 5 shows the important, real difference that inflation does make, even when real interest rates and thus the average real burden of mortgage payments is unchanged: the higher the inflation rate that is incorporated into mortgage rates, the higher the real burden of initial payments. The 5 percent mortgage entails a monthly payment of $537, which is level in real as well as in nominal terms over the life of the mortgage when the inflation rate is zero. The 10 percent mortgage associated with a 5 percent inflation rate has an initial monthly payment of $878. In real terms, its payments will fall by 5 percent each year; they "tilt" down as shown in Figure 5. The 15 percent mortgage has payments of $1,264 per month.

Although these payments will erode over time in real terms due to inflation, the payments in the early years are very burdensome. At the beginning of the mortgage, the real burden of the payments is fully 235 percent of that in the zero inflation case. In fact, those payments are so burdensome that typically both borrower and lender respond by reducing the size of the mortgage, even though the real borrowing cost over the life of the mortgage would be no different than in the zero inflation, 5 percent mortgage case.

Given the typical upward tilt in household real income, especially for younger households, this seems a particularly badly arranged state of financial affairs: when family real income is lower, real mortgage payments are higher. And the higher the inflation rate, and therefore the steeper the upward trend in household dollar income, the more burdensome are the initial years' payments.

When inflation is widely anticipated, lenders and borrowers reasonably expect incomes, and the ability to make mortgage payments, to rise with the overall level of prices. This is especially true for young, potential homebuyers since, on average, real incomes rise over most of one's working life. Thus, the young reasonably anticipate future income that not only keeps pace with, but that grows faster than, the overall level of prices. Their initially low, but rising, ability to pay is particularly badly matched to constant, fixed-rate mortgage payments.[14]

Those higher real costs in the early years of the mortgage are balanced by lower real costs later on. The higher real payments in the early years brought on by inflation also mean that the real value of the remaining principal falls faster the higher the inflation rate, as shown in Figure 6. Thus in real terms, inflation forces FRM borrowers to accelerate their repayment of the loan. "Forced" because borrowers can always choose shorter mortgage terms if they want faster repayment and are willing to make larger payments. Most do not. Most choose longer terms to reduce payments. Our concern is not for those who can and do make larger payments than lenders insist on, but for those who are not currently in a position to overcome the

effects of inflation that operate through level-payment mortgages. That is, those unable to leap the underwriting hurdle placed in the path to homeownership by level-payment mortgages in an inflationary environment.

Another way to see the real effects of inflation is to calculate the reduction in the size of the mortgage that inflation produces. Suppose lenders cap the size of the mortgage they are willing to originate by setting a ceiling of 25 percent on the implied mortgage payment-to-income ratio.[15] What does this mean for a household with an annual income of $30,000? It can borrow $116,426 when the inflation rate is zero. At 5 percent inflation, the resulting 10 percent mortgage rate and payment-to-income ceiling limit the mortgage to $71,219. Thus, even at 5 percent inflation, the household faces a borrowing limit that is 39 percent below the zero inflation case. And at 10 percent inflation and a 15 percent mortgage interest rate, only $49,429 can be borrowed.

Payment-to-income requirements could rise and fall somewhat with inflation, but that would not solve the fundamental problem. In practice, it is the real size of the mortgages originated that changes. This change is also a reflection of the borrower's self-imposition of a reduced borrowing level when only level-payment mortgages are available. Even if borrowers and lenders agree that higher inflation alone should not reduce real borrowing, the higher real initial mortgage payments leave less real cash flow for other household purchases early in the term of the mortgage. It is not that the economic cost is high, that average real payments are high, or that lifetime real income is low, but that the real burden of mortgage payments in the early

years has been raised. Thus, inflation removes one of the primary benefits of credit generally, and of the long-term mortgage in particular: the distribution of the costs over time in order to more closely parallel the flows of housing services and borrower incomes, thereby making homeownership more affordable.[16]

The "tilt" problem with FRMs in an inflationary environment has long been recognized (for example, Poole 1972; Lessard and Modigliani 1975; Cohn and Fischer 1975). In practice, one response to higher inflation and nominal interest rates has been to extend the maturity of mortgages. Though that does not remove the "tilt," longer mortgage terms do reduce the real payment burden in the early years. Another response has been to ease qualification standards by raising payment-to-income ceilings. This allows borrowers to qualify for larger loans, but only at even higher payment levels and thus even heavier initial payment burdens.

Alternative mortgage instruments have been developed to generate lower initial payments. The most popular innovation has been adjustable (or variable) rate mortgages (ARMs). The attraction of ARMs is that on average their interest rate is lower. Borrowers pay for that lower rate by taking on interest rate risk.[17] However, since ARM rates are based on nominal rather than real interest rates, they still do not eliminate the fundamental problem - that the initial real payments are raised substantially by even low rates of inflation.

The graduated payment mortgage (GPM) addresses the tilt problem by

offering lower, but rising, initial payments, and higher level payments later on. With constant inflation, a GPM whose payments are set to rise at the inflation rate over the entire life of the mortgage would have constant real payments. In theory, the tilt would be eliminated if payment increases were at a rate equal to the average inflation rate over the life of the mortgage. In practice, that has not happened. The average inflation rate has proven difficult to predict. Furthermore, GPMs have been structured with fairly steep graduation (payment increase) schedules that span only the first few years of the mortgage term. This prevents GPM payment schedules from achieving the equal and smooth burden of the zero inflation case.

III. Price Level Adjusted Mortgages

Price Level Adjusted Mortgages (PLAMs) are long-term, fully amortizing mortgages whose monthly payments are constant in real, or price-level-adjusted terms. Borrowers pay and savers earn a known, constant, real rate of interest. The mechanics of the PLAM are quite simple. At the end of each period, both the nominal payment and the nominal loan balance outstanding are increased by the increase in the price level during the period.

The payment pattern over time of the PLAM differs fundamentally from all other existing mortgages. The way in which it differs is its chief advantage: typically, PLAM payments start much lower than fixed-rate (or adjustable rate) mortgage payments and remain considerably below them for a number of years. Although dollar PLAM payments are expected to rise eventually above fixed-rate mortgage payments, in real terms they remain low

and constant. Thus, the PLAM allows a rearranging of payments to fit the financial circumstances of homebuyers. It allows nominal payments to be tilted upward in a fashion similar to the way that nominal household income tilts upward. Even if a household's income grows no faster than the general price level, the payment-to-income ratio (the payment burden) does not rise. If inflation turns out to be higher or lower than originally expected, payments still track the overall cost of living and the real rate paid is the same as originally agreed.

When the price level is constant, the PLAM is equivalent to an FRM. In this case, inflation is zero and the primary deficiency of FRMs vanishes. The important difference with PLAMs is that inflation does not affect the pattern of real payments. Rather than lifting all payments equally, inflation raises payments over time only to the extent that prices rise, thereby leaving real payments constant. Thus, PLAM payments start at the low level that zero inflation would bring FRM payments to, and rise the same as the typical prices households pay for goods and services.

Tables 2 and 3 present a comparison of conventional fixed-rate and PLAM mortgages. The tables show the pattern over time of payments, the remaining principal, the loan-to-value ratio, and the homeowner's equity.[18] In each table, a $100,000 mortgage and a 10 percent down payment are used to purchase a $111,111 house. The general price level and the level of house prices are assumed to rise 5 percent each year. The real FRM interest rate is 5 percent (10 percent less 5 percent inflation). The PLAM rate is 4 percent.[19] In Table 2, data for a 10 percent, 30-year fixed-rate mortgage are shown. In

Table 3, data for a real 4 percent, 20-year PLAM are shown.

Table 2 shows that constant monthly payments of $884 for 30 years are required to service the fixed-rate mortgage loan. Table 3 shows that the first-year PLAM payment is only $644, 25 percent less than the FRM payment despite the PLAM's 10 year shorter length. Because in this example the cost of living is assumed to rise 5 percent each year, so do PLAM payments. Thus, the second-year payment is 1.05 times that for year 1: $676 = 1.05 x $644. The third-year payment is 1.05 times that for year 2: $710 = 1.05 x $676. The real, or price-level-adjusted, payment is constant for the entire life of the loan at $644. Different assumptions about the real interest rate, term to maturity, down payment, and inflation will affect some of these magnitudes for a PLAM. Regardless, the loan is fully amortizing, payments rise no faster and no slower than the overall cost of living, and the real balance of the mortgage loan falls with each payment.

While a PLAM can ease one of the two major financing constraints on affordability, the payment-to-income ratio, it does not address the other, the down payment constraint. To the extent that lenders perceive PLAMs as being more risky because of the potential for higher loan-to-value ratios in the early years of the mortgage term, they may require larger down payments. For "move-up" buyers who have accrued capital gains on their previous home, the down payment problem is much less likely to be a binding constraint. For those facing a binding down payment constraint, mortgage insurance may substitute for a higher down payment. While this will raise the monthly payment somewhat until the loan-to-value ratio declines sufficiently to

discontinue insurance coverage, the initial payments including the insurance premium will still be well below those on the corresponding noninsured FRM.

IV. Benefits and Costs of PLAMs

PLAMs can be expected to have a number of advantages: lower initial payments, larger origination amounts, less payment shock, and lower interest costs.

An earlier example showed how the initial payments on the 20-year PLAM could be more than 25 percent lower than on the 30-year FRM. Or, for the same initial payment required for an FRM, a household could obtain a 25 percent larger PLAM. Most borrowers would probably choose a point in between, with a larger mortgage (and house) and a lower payment-to-income ceiling, thereby reducing the financial pressure on the remainder of the household budget. By allowing first-time homebuyers to obtain more expensive homes, the number of lifetime moves per household, and the transaction costs associated with them, could be reduced.

And, unlike an ARM (especially of the teaser type), this increased borrowing capacity is highly unlikely to subject the borrower to dramatic payment shock. ARM payments are tied to nominal interest rates, and therefore may change substantially when the expected inflation rate rises. PLAM payments cannot go up or down any more than the average price of what households typically buy. In that regard, real PLAM payments can be expected to fluctuate less than real rents, for example.

PLAMs are also likely to entail lower real borrowing costs for two reasons. PLAMs allow both borrowers and lenders to avoid the gamble on long-term inflation that they now take, however unwittingly, by setting payments on the basis of actual, rather than expected, circumstances. Thus, the borrower no longer pays an inflation risk premium. Second, PLAMs are much less likely to be prepaid. Prepayments are affected by the relation of the interest rate on outstanding mortgages relative to the currently prevailing rate. PLAMs lock in a real, as opposed to a nominal, interest rate. Since long-term interest rates vary relatively little compared to nominal, or market, interest rates, PLAM prepayments are much less likely to occur.

PLAMs entail more risks to the borrower than do fixed-rate mortgages, but are likely to involve fewer risks than do ARMs. While FRMs allocate all interest rate risk to lenders, uncapped ARMs shift it all to borrowers. If interest rate adjustments are capped, as is the case today with most ARMs, borrowers absorb the risk of interest rate fluctuations within the caps and lenders absorb the risk of interest rates exceeding the caps. PLAMs also distribute the interest rate risk between borrowers and lenders. Real interest rate risk is borne by lenders and the inflation risk by borrowers. Because wages and salaries tend to rise with, and normally faster than, the general price level, homeowners seem to be well positioned to handle the inflation risk in PLAMs.

PLAM payments are fixed in real terms. Future payments depend on the future level of prices and therefore cannot be known ahead of time. Nor can income. The risk to borrowers is not that payments will rise, but that they

will rise faster than incomes. In practice, incomes and the general price level track each other fairly closely. Incomes and the level of nominal interest rates do not. This makes PLAM risks for borrowers considerably smaller than those of ARMs. Although an individual borrower has no guarantee that income will keep up with the general price level, even a gradual erosion in real income will not have a dramatic effect on the payment-to-income ratio. Suppose one's real income were to fall at 2 percent per year for ten straight years. This would represent a truly extraordinary long-term income decline. Even so, under such a scenario a payment-to-income ratio that was initially 25 percent would still be less than 31 percent at the end of the 10 year period. To put this in perspective, note that this is a much smaller increase in the payment-to-income ratio than experienced by an ARM borrower with a 2 percentage point teaser that vanishes after one year.

The outcomes associated with PLAMs need to be evaluated in light of the alternatives. While the likelihood of the PLAM payment burden increasing is less than that for an ARM, it is greater than for an FRM. But many potential homebuyers find the FRM to be an irrelevant alternative. When the choice is to become a PLAM borrower or to remain a renter, there may be similar (or even less) risk with PLAMs than with rent payments. Rents do not remain constant. They rise, on average, with the general price level, as does virtually everything else in the household budget. In fact, as can be seen in Figure 7, FRM payments are about the only category in a household's budget whose cost remains constant.

The positive correlations of PLAM payments, incomes and house prices are

apparent in Figure 7. They closely track the general price level. It is their ratios to the price level, or real values, that tend to be stable over time. Although relative price changes do occur, in the long run real shifts tend to be reversed much more than nominal ones. Thus, changes in payment-to-income ratios would, for the most part, be of relatively short duration, although supply shocks that result in a reduction in the real wage, such as sharp increases in oil prices, could present a problem.

Of course, borrower-specific income shocks can cause payment difficulties. But such problems are not specific to PLAMs. Those who become unemployed, for example, often have problems making mortgage payments whether on a PLAM, an ARM, or an FRM (or, for that matter, rent).

The loan-to-value ratio is the key determinant of defaults. If the loan-to-value ratio rises above unity, the loan is no longer fully secured and the borrower may have enough incentive to default. Lower initial payments mean that the equity for a PLAM borrower will build more slowly. With a fixed-rate mortgage, most defaults occur within the first three or four years, while the loan-to-value ratio is still high. As the years pass, house price appreciation and loan amortization can add substantially to the homeowner's equity. If house prices move proportionately with the general level of prices, the PLAM's loan-to-value ratio will continually fall. If house prices rise more slowly, the loan-to-value ratio will not fall as fast, and may rise. Still, it will take a substantial and sustained fall in real house prices to overcome the effects of real amortization on the loan-to value ratio. Table 4 repeats the Table 3 scenario with one difference: nominal

house prices remain constant causing real house prices to decline 5 percent each year. Even with such a dramatic, sustained decline in relative house prices, the loan-to-value ratio of the PLAM never exceeds 94 percent.

Higher down payments or shorter maturities can reduce PLAM default risk to approximately that of FRMs. Figure 8 shows the loan-to-value ratios for a 30-year, 10 percent down payment FRM and a 20-year, 20 percent down payment PLAM in an environment where both house prices and the general price level are rising at 5 percent per year. There the PLAM loan-to-value ratio, and thus default risk, is always below that for the FRM. If house prices remain constant while the general price level rises at a 5 percent rate, real house prices collapse, falling 62 percent in real terms over the 20 year term of the PLAM. Even so, as shown in Figure 8, the PLAM loan-to-value ratio reaches a maximum of 84 percent, still well below the initial 90 percent ratio of the FRM.

Although PLAMs help lenders avoid the inflation risk, they still must face real interest rate risk. This risk could be reduced if lenders issue Price Level Adjusted Deposits (PLADs). Even so, they will have a maturity mismatch if their deposits are short-term and their PLAMs are long-term. Because PLAM payments are not front-loaded like FRM payments, the duration (average life) of a PLAM is longer than that of an FRM of the same term, aggravating the maturity mismatch problems faced by financial intermediaries with short-term liabilities. In addition, the expected duration of a PLAM is lengthened further since, as discussed above, a PLAM is less likely to prepay than an FRM.

PLAM lenders will also face a cash flow, or liquidity, risk, especially during the transition of their mortgage portfolio from FRMs and ARMs to PLAMs. As the FRMs in the lender's portfolio age, the front-loaded pattern in their payments becomes a problem when they are replaced with the evenly loaded payment stream of PLAMs. Even after the transition, lenders that rely on short-term nominal deposits will be squeezed when the expected inflation rate increases. The nominal interest rates paid on deposits jump immediately, yet the nominal payments on their PLAM assets rise only gradually over time as the price level actually rises. In a sense, the "tilt" problem has been shifted from the borrower to the lender.

The tax treatment of PLAM interest compounds the cash flow problems for lenders. While the borrower is allowed to deduct the entire PLAM payment until the mortgage balance declines below the initial loan amount, lenders are taxed on the entire accrued interest (interest payment plus negative amortization), even though this substantially exceeds their cash receipts in the early years of a PLAM.

V. The Market for PLAMs: Back to the Future

Why have PLAMs not yet appeared in the United States? It is generally not possible to know with certainty why a specific, known product has not yet surfaced or succeeded. Business history is replete with examples of products that succeeded only after previous unsuccessful attempts or succeeded only after having been re-introduced after a substantial time had elapsed. The elements of change and timing should not be underestimated in this regard. To

give a familiar example, diet beer was a product failure, in the sense that it was introduced, promoted, and proved unprofitable. "Lite" beer, which seems no different in substance from diet beer, has been an equally resounding success.

Price-level adjustments in financial arrangements other than mortgages are now generally more widespread than in previous decades. But few of them arose quickly in response to inflation. Indexing of social security benefits began in the mid-1970s. Indexing of income tax brackets began in the mid-1980s. Commercial leases that specify payments as a percentage of sales are effectively indexed to the price level (as well as other factors) and became common only after inflation had continued for some years. Financing commercial or rental property with PLAMs would help match such lease or rental cash flows, thereby drastically reducing the negative cash flow that is common in the early years of such projects.

Closer to the topic at hand is the example of home equity loans. In their previous incarnation as "second mortgages," home equity loans were neither widely used nor particularly well regarded. That product was anything but glamorous. By the end of the 1980s, the size and image of that market had changed. Several reasons can be offered for the current popularity of home equity loans, but some are especially instructive with regard to mortgage design and to PLAMs in particular. First, homeowners now appear to have much less resistance to negative amortization, that is, an increase in the mortgage balance remaining, than had been presumed. Second, many, having become homeowners, willingly slow the repayment of their mortgage debt in order to

have more access to cash. By lowering payments for several years, PLAMs do this automatically.

PLAMs do exist. They exist in countries with economic circumstances and financial markets and institutional arrangements much like those of the United States, as well as in countries with substantially higher inflation rates. In the United Kingdom, the central government issues price-level-adjusted bonds, in addition to bonds that do not guarantee inflation protection. PLAMs exist in Canada, Australia, Brazil, Colombia, Paraguay, Peru, and Finland. The World Bank has helped introduce PLAMs in Mexico, Argentina, Chile, Ecuador, Ghana, and Turkey.[20] PLAMs are the only form of mortgage available in Israel. And Hungary may soon join the list of PLAM countries.

Why don't PLAMs exist in the United States? Until recently, there has been considerable uncertainty about whether and how various tax laws, interest rate ceiling, and disclosure rules and regulations might apply to PLAMs. Now various agencies of the federal government have published tax rulings and other regulations involving disclosure, rate caps, and other mortgage features that pertain to PLAMs. The stumbling blocks posed by these uncertainties have now been pushed aside.

Other reasons are sometimes given for the absence of PLAMs in the United States. One is that homeowners prefer not to have negative amortization. PLAMs do not allow for negative amortization in real terms, though it may well occur in dollar terms. Most homeowners who refinance their homes do choose to raise the remaining balance. Home equity loans also effectively raise the

amount that a home is mortgaged. Many adjustable rate mortgages permit the outstanding balance in dollar terms and in real terms to rise above its current and even its original balance. In fact, most of those mortgages have a clause that requires the mortgage payment to be raised above the level otherwise dictated by the level of interest rates if the remaining balance comes to exceed 125 percent of the original balance. Last, though many may prefer not to have negative amortization, many would-be and current homeowners would willingly choose the PLAM amortization schedule in order to be able to more easily afford homeownership. Thus, the possibility of negative amortization probably should no longer be regarded as a major deterrent to PLAMs.

Nor is the argument compelling that the uncertainty of future prices, and therefore mortgage payments, prevents the PLAM market from being viable. In the current economic life of renters, for example, probably not a single important item exists whose future price can be known with much certainty. By design, PLAM payments track the average cost of living. They cannot go up more (or less) than that. That is more certainty than can be attached to prices for food, medical care, transportation, or indeed, to rent. In practice, increases in income levels tend to track, and somewhat exceed, increases in the aggregate price level. Thus, a PLAM is likely to deliver less "payment shock" than do ARMs. It is, of course, true that an FRM delivers the most certain dollar payment requirement, but FRMs are unsatisfactory on other counts.

Through the mid-1950s, an era with little inflation, mortgages with 4 1/2

to 5 1/2 percent interest rates and maturities of 20 years were common.[21] In the current economic environment, PLAMs might well be similarly structured. A viable PLAM for the 1990s might have the following characteristics: a 4 percent real interest rate, a 20-year term, 20 percent initial payment-to-income ceiling, and a 20 percent down payment (the "20/20/20 PLAM").[22]

Why anticipate a 4 percent real interest rate for the PLAM? Comparison of recent FRM interest rates (about 10 percent) and the expected 10-year average inflation rates (about 4 1/2 percent) suggests a 5 1/2 percent real interest rate for recently originated FRMs.[23] That 5 1/2 percent FRM real rate may contain a prepayment premium about 1 full percentage point above that PLAMs would carry (see, for example, Hendershott and Buser 1984; Handorf and Sachlis 1990, Woodward 1990). PLAM borrowers could probably save at least another full percentage point through a lower inflation risk premium (see, for example, Sharplin and Mabry 1982). Thus, 1 1/2 percentage points appears to be a conservative estimate of the reduction in the real interest rate achieved by going from FRMs to PLAMs.[24]

To a large degree, the easing of FRM qualification criteria over the past two decades represents attempts to avoid the distorting effects of inflation on level-payment mortgages. Payment-to-income ceilings were typically 20 percent before inflation became a consideration, but were raised to 25 and then to 28 percent, and have sometimes gone considerably higher (see McCulloch 1986). PLAMs are likely to be underwritten with qualification criteria more like those observed in the pre-inflation era since inflation cannot be

expected to reduce the payment-to-income or loan-to-value ratios.

Similarly, as nominal interest rates rose in response to higher inflation, the maturity of the typical FRM lengthened as borrowers sought to reduce the real cash-flow burden of initial payments (Figure 9). Since PLAMs remove this incentive, many borrowers are likely to find that they need not stretch the mortgage term beyond 20 years.

When PLAMs are issued in the United States, who will hold them? The most natural owners of PLAM assets are those institutions that have, in effect, inflation-indexed liabilities: defined-benefit pension plans.[25] In fact, the price-level-adjusted bonds issued by the government of the United Kingdom are typically held by pension funds and insurance companies, although they can, of course, be held by individuals as inflation-proof investments. Cash-flow considerations and some aspects of income tax regulations make it unlikely that PLAMs will be held by banks, thrifts, or other originators. The ability to originate and then sell such mortgages would have even more appeal to originators at a time when concern about capital is so prevalent.

Pension plans, on the other hand, do not face the same income tax considerations. Nor, importantly, do they face the same cash flow considerations as deposit intermediaries. By holding the appropriate share of their portfolios in PLAMs, defined benefit pension plans, being effectively inflation indexed, could not only increase the long-run inflation protection offered to their members but, at the same time, reduce the inflation-risk that the plan sponsors now bear.

This would simultaneously address the problems caused by inflation for potential first-time home buyers and for those retired individuals who rely on private-sector pensions. The combination of PLAMs and indexed pensions would remove both the real mortgage payment "tilt" and the real private pension benefit "tilt," helping individuals during the most vulnerable parts of their lifetimes, when they are very young and very old. At the same time, this combination would not involve a financial intermediary taking on substantial inflation risk by offering only PLAMs or only indexed pensions and annuities.

VI. Conclusions

In spite of two decades of non-negligible inflation, financial markets have adapted to it only partially. Rather than directly addressing the distortions brought on by inflation, they have made approximate, indirect, and incomplete adjustments. Economists have long advocated a more direct, effective, and simple response to the reality of a rising price level: the Price Level Adjusted Mortgage. PLAMs eliminate the unintentional, but all too real, pain of inflation. They do so by tailoring mortgage payments more closely to the ability to pay. In this way they eliminate the underwriting hurdle placed in the paths of potential homebuyers by level-payment mortgages in an inflationary environment.

Public policy might usefully support the initiation of a market in PLAMs, but on economic grounds alone no compelling case can be made for a long-standing government commitment to PLAMs. In that sense, however, the opportunity to "jump start" the market represents an attractive use of public

policy, much as that implemented much earlier with the introduction of long-term fixed-rate mortgages. Public policy could act as a catalyst for innovation and improvement without taking on an uncertain commitment. The public sector could "declare victory and withdraw" once a sufficient push toward development of the PLAM market had been achieved. If PLAMs then do not pass the market test, further involvement may not be justified.

This start could be accomplished in various ways. The federal government might agree to provide, for a pre-specified period, actuarially appropriate mortgage insurance. Or, as it has done with a program called the "Reverse Annuity Mortgage," it could run a demonstration project to provide information to the private sector. Such stimulation could also be expected to lead to development of a secondary market in PLAMs. Since the originators and the ultimate PLAM lenders are unlikely to be the same entities, a secondary market is especially attractive, and quite likely necessary.

The introduction of PLAMs can simultaneously help people during the financially most vulnerable times of their lives: when they are young and when they are not-so-young. PLAMs put more housing within the reach of more families of all ages. Young families are especially likely to benefit from this advance. But PLAMs can also benefit the not-so-young. PLAMs make available an inflation-proof asset for pension funds and other saving institutions and thereby make it feasible for them to offer completely inflation-proof benefits and savings plans. Pension plan members, including those who look forward to retirement benefits as well as those already retired, can gain from this development. In this regard, PLAMs preserve the

ability of the young to provide themselves with appropriate housing and retirement saving options, just as the indexing of Social Security benefits safeguards the living standards of the old. Given our public policy of protecting older Americans from the adverse effects of inflation, it may be time to offer equal protection to younger Americans.

Footnotes

[1]In fact, by opening the housing market to many households previously excluded based on current cash flow requirements, housing demand would be increased. Thus house prices would likely rise somewhat.

[2]Quoted in The Report of the President's Commission on Housing, page 71.

[3]Homeownership rates really understate the severity of the problem in that they only measure "attainability," that is, whether or not a household has been able to attain homeowner status. Many households that are able to purchase homes are restricted to buying lower-quality houses than their lifetime incomes warrant. They then face extremely heavy cash flow payment burdens during the early years of the mortgage term and face transactions costs as they buy and sell a sequence of homes and gradually raise the quality of their housing to a level consistent with their lifetime resources.

[4]This economic cost measure and the cash cost measure discussed later are based on data contained in The State of the Nation's Housing 1990, Table A-1.

[5]In the text, FRM refers to a long-term, level-payment, fixed-rate mortgage. An adjustable rate mortgage can, in a sense, be thought of as a very short-term, level-payment, fixed-rate mortgage. Our arguments regarding the unsuitability of the FRM during inflationary periods apply equally well to ARMs since they, too, base their payments on nominal interest rates and are mortgages whose payments are expected typically to fluctuate around an

unchanging level.

[6]Survey measures of the expected inflation rate show it to have been fairly low and steady until the late 1960s. One reason for this was that actual inflation had been low and steady. The low level of long-term nominal interest rates also suggests that expected longer-term inflation was low, as was the inflation risk premium.

[7]Though economics always focuses on action subject to constraints, this particular liquidity constraint is one that operates in addition to economic considerations. In the case at hand, it arises as an unintentional or unrecognized effect. In that sense, it is an artificial constraint caused by the use of a financing instrument not well-suited to the (inflationary) environment. See, for example, Wilcox (1989).

[8]In choosing ceilings, lenders may make some allowance for increases in incomes and the resulting declines in the payment-to-income ratio that can be expected as careers (and inflation) continue.

[9]Technically, the relationship between the nominal (i) and real (r) interest rates is $(1 + r) = (1 + i)/(1 + \pi)$, where π is the inflation rate. Thus, $i = r + \pi + r\pi$. The interaction term, $r\pi$, is typically ignored, being of second-order magnitude. Similarly, the <u>expected</u> real rate is equal to the nominal rate less the <u>expected</u> inflation rate. We also ignore income tax considerations for the time being, though they are likely to be relevant in practice. See, for example, Peek and Wilcox (1984).

[10]This, and all other examples below, is on a pretax basis. If pretax real interest rates are unchanged, the tax deductibility of interest payments would actually reduce the after-tax cost as inflation rises.

[11]The relatively large number of young people (the baby boom cohort) during this period may have also depressed their per capita earnings relative to what they would have been otherwise and had an effect on their demand for housing through this channel. It may have also lowered their early-career earnings relative to what they can expect later on.

[12]The house price series is based on the Census Bureau quality adjusted series (1982 base year). The income series is the median money income for male, year-round, full-time workers aged 25-34. We have chosen this series rather than a measure of household or family income to abstract from the effects of increased labor force participation.

It is the authors' opinion that column 1 is likely to overstate the increase in house prices of fixed "quality," perhaps substantially. If so, the price of houses relative to income has risen less than column 3 indicates.

[13]Technically, for the hypothetical cases given, the after-tax real cost of the mortgages would decline as the inflation rate rose for those individuals who itemize deductions since the entire interest payment, including any inflation premium, is deductible, not just the real interest component.

[14]Of course, with perfect capital markets and no transactions costs, cash flow might be irrelevant and the timing of the payment stream would not be an

issue. The household could finance the higher real mortgage payments in the early years by borrowing against its higher expected future income.

[15]This ignores the down payment and other-debt constraints.

[16]This argument applies to long-term financing generally.

[17]ARMs often had "teaser" rates that provided temporarily lower initial rates and thereby enhanced their affordability and attractiveness to borrowers. These "teasers" largely disappeared from the market after the Savings and Loan clean-up began in earnest. See Peek (1990).

[18]For simplicity, the calculations are based on a single payment being made at the end of each year rather than the traditional monthly payments. Since monthly rather than annual payment levels are more familiar, we have divided the annual payments by 12 and refer to them as "monthly" payments in the discussion.

[19]A percentage point may well be an underestimate of the real rate differential between FRMs and PLAMs due to the lower prepayment and inflation risk premiums, as discussed below.

[20]See Woodward (1990).

[21]FHA-insured mortgages often carried interest rates that were about one-quarter percentage point lower and maturities that were a few years

longer. See Guttentag and Beck (1970) for a more detailed description of mortgage terms in the 1950s.

[22]McCulloch (1986) proposes somewhat looser underwriting criteria, with terms of 20, 25 and 30 years corresponding to down payments of 5, 10, and 20 percent, all with initial payment-to-income ratios of 20 percent. He finds such PLAMs to be safer than either the standard FRM, the GPM or the ARM. At the same time, the lower initial payment associated with any given size of loan allows the homebuyer to qualify for a larger loan, even with the lower payment-to-income ceiling.

[23]The expected inflation rate is taken from the Decision-Makers Survey conducted by Richard Hoey. Since the expected life of a 30-year FRM is in the vicinity of 10 years, the 10-year term for the expected inflation rate is appropriate for calculating the real interest rate for FRMs.

[24]The attractiveness of holding PLAMs in investor portfolios may lead to an even greater real interest differential between fixed-rate and real-rate mortgages. See Bodie (1990) for evidence suggesting that it could be much larger.

[25]See Lovell (1981) and Munnell and Grolnic (1986).

References

Bodie, Zvi. 1990. "Inflation, Indexed-Linked Bonds, and Asset Allocation." Journal of Portfolio Management, Winter, pp. 48-53.

Cohn, Richard A. and Stanley Fischer. 1975. "Alternative Mortgage Designs." In New Mortgage Designs for an Inflationary Environment, Federal Reserve Bank of Boston Conference Series No. 14, pp. 47-74.

Guttentag, Jack M. and Morris Beck. 1970. New Series on Home Mortgage Yields Since 1951. New York: Columbia University Press.

Handorf, William C., and J. Minor Sachlis. 1990. "Setting Coupon Rates for Financing the Purchase and Sale of Real Estate." Real Estate Review, Spring, pp. 33-40.

Hendershott, Patric H., and Stephen A. Buser. 1984. "Spotting Prepayment Premiums." Secondary Mortgage Markets, August, pp. 21-25.

Lessard, Donald and Franco Modigliani. 1975. "Inflation and the Housing Market: Problems and Potential Solutions." In New Mortgage Designs for an Inflationary Environment, Federal Reserve Bank of Boston Conference Series No. 14, pp. 13-45.

Lovell, Michael C. 1981. "Unraveling the Real-Payment Twist." Brookings Papers on Economic Activity, No. 1, pp. 283-97.

McCulloch, J. Huston. 1986. "Risk Characteristics and Underwriting Standards for Price Level Adjusted Mortgages Versus Other Mortgages Instruments." Housing Finance Review, Fall, pp. 65-97.

Munnell, Alicia H., and Joseph B. Grolnic. 1986. "Should the U.S. Government Issue Index Bonds?" New England Economic Review, September/October, pp. 3-21.

Peek, Joe. 1990. "A Call to ARMs: Adjustable Rate Mortgages in the 1980s." New England Economic Review, March/April, pp. 47-61.

Peek, Joe and James A. Wilcox. 1984. "The Degree of Fiscal Illusion in Interest Rates: Some Direct Estimates." American Economic Review, December, pp. 1061-66.

Poole, William. 1972. "Housing Finance Under Inflationary Conditions." In Ways to Moderate Fluctuations in Housing Construction, Board of Governors of the Federal Reserve System, pp. 355-76.

Sharplin, A.D., and R.H. Mabry. 1982. "Leveling the Tilt: Real Dollar Paybacks." Mortgage Banking, October, pp. 25-36.

Wilcox, James A. 1989. "Liquidity Constraints on Consumption: The Real Effects of "Real" Lending Policies." Federal Reserve Bank of San Francisco Economic Review, Fall, pp. 39-52.

Woodward, Susan. 1990. "The Price Level Adjusted Mortgage." U.S. Department of Housing and Urban Development, 1990.

Woodward, Susan and David Crowe. 1988. "A Power-Packed Mortgage." Secondary Mortgage Markets, Fall, pp. 2-7.

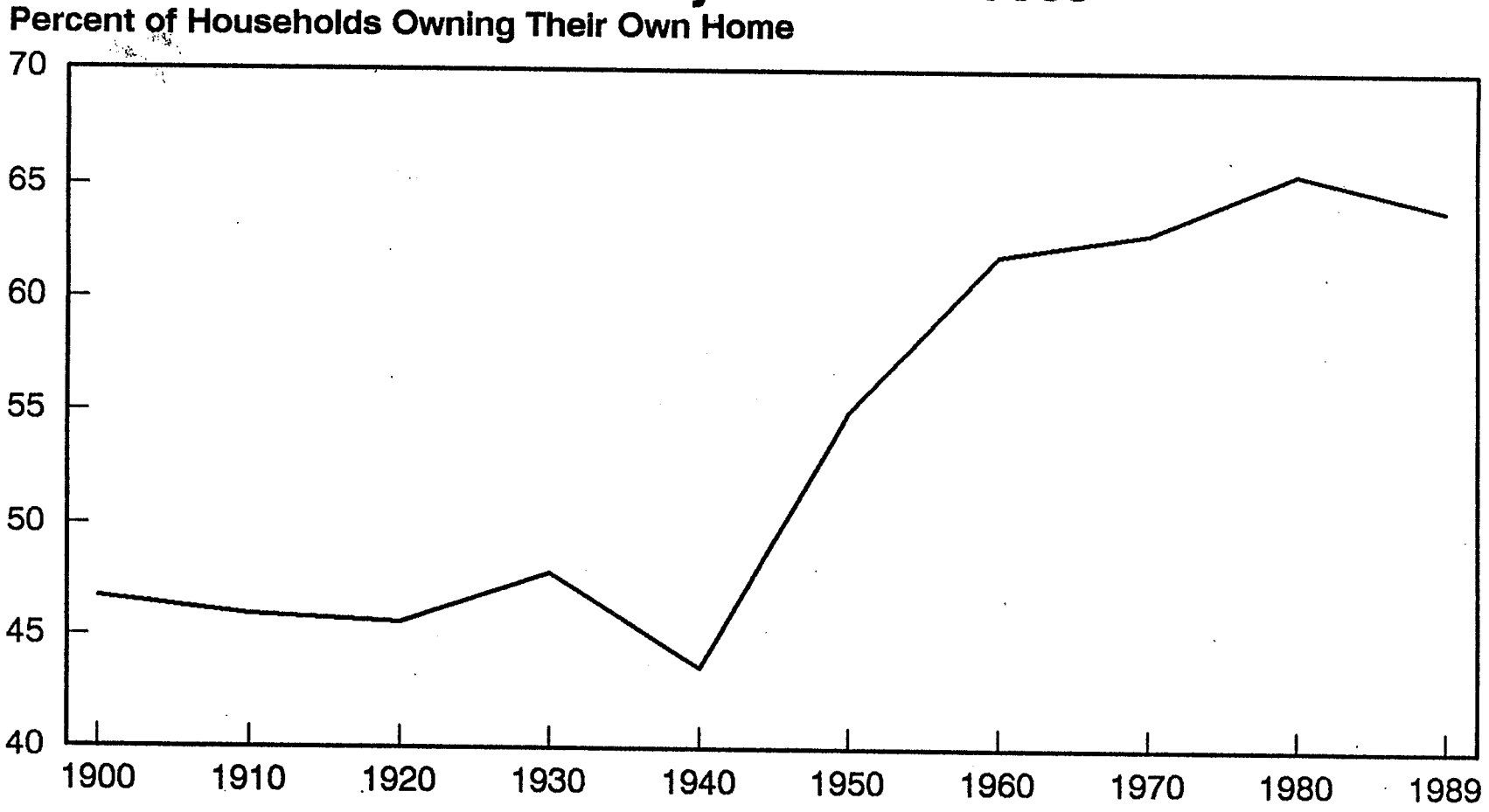
Woodward, G. Thomas. 1990. "The Real Thing: A Dynamic Profile of the Term Structure of Real Interest Rates and Inflation Expectations in the United Kingdom, 1982-89." Journal of Business, July, pp. 373-98.

The Report of the President's Commission on Housing. 1982. Washington, D.C. U.S. Government Printing: Office.

The State of the Nation's Housing 1990, Joint Center for Housing Studies of Harvard University.

Figure 1

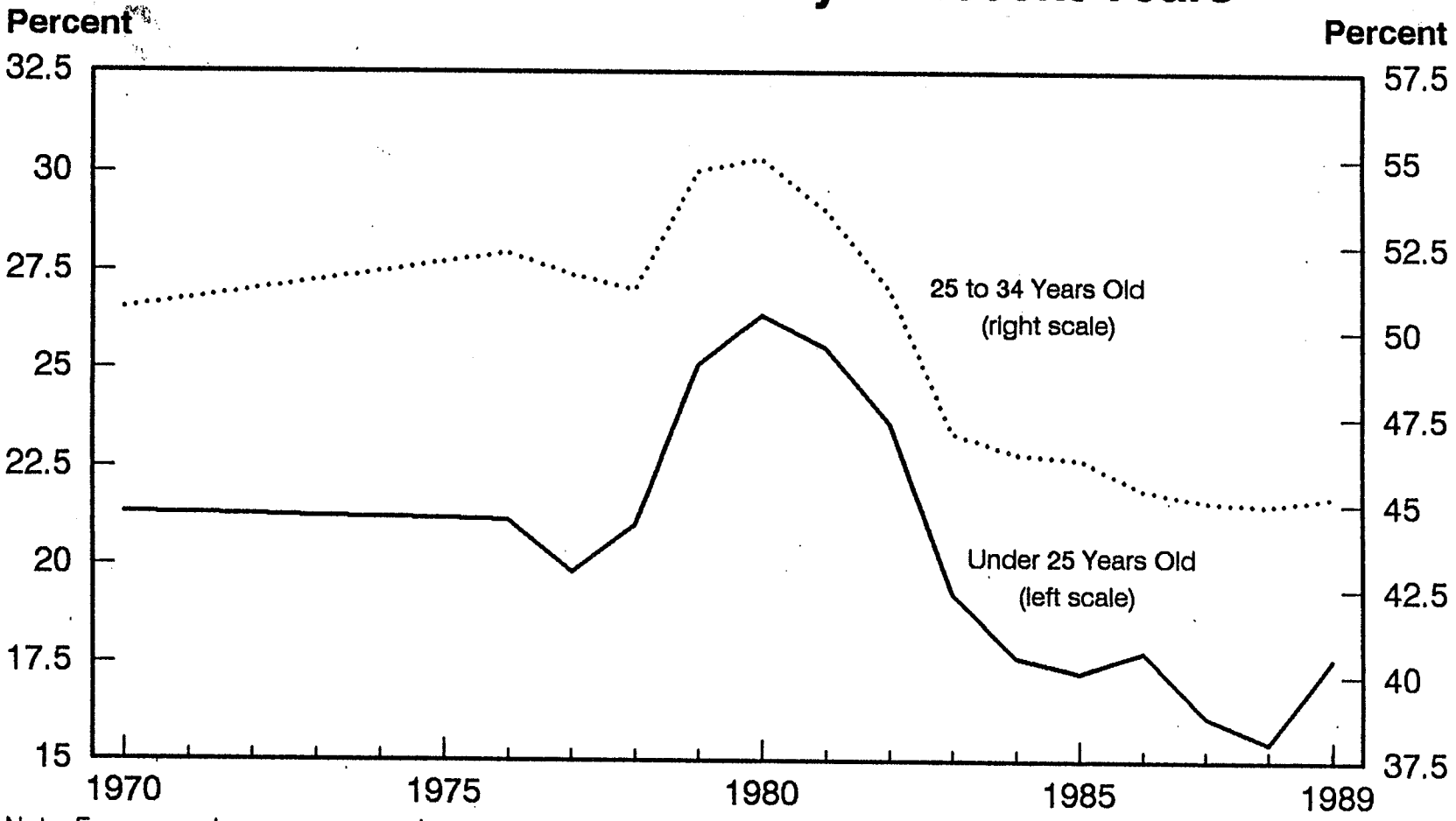
Aggregate Homeownership Rate Rose Substantially Until the 1980s



Source: U.S. Bureau of the Census.

Figure 2

Homeownership Rates for Young Households Have Fallen Substantially in Recent Years

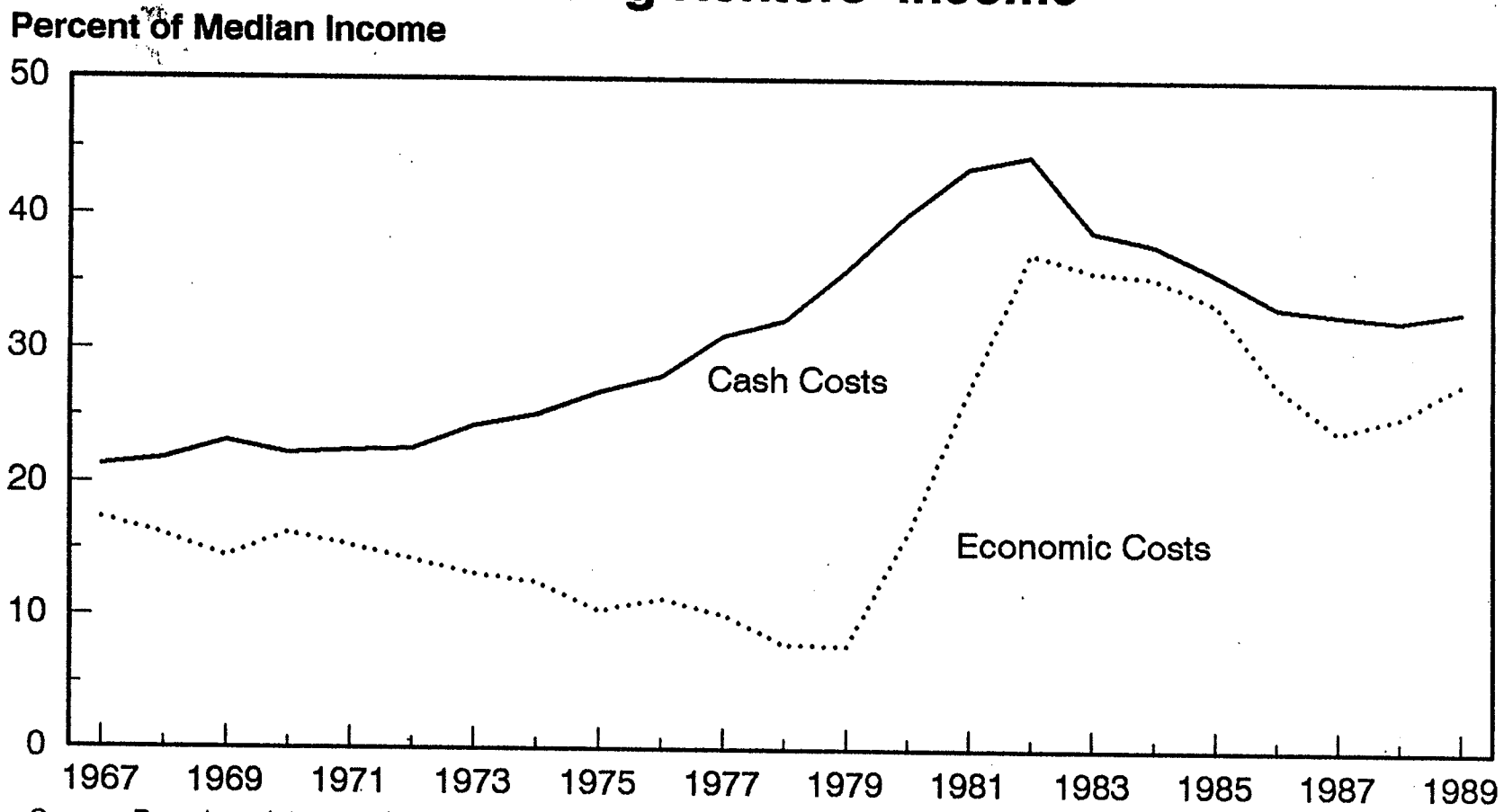


Note: For comparison purposes only.

Source: Current Population Reports, Series P-20,"Household and Family Characteristics."

Figure 3

Ownership Costs Have Risen Relative to Young Renters' Income

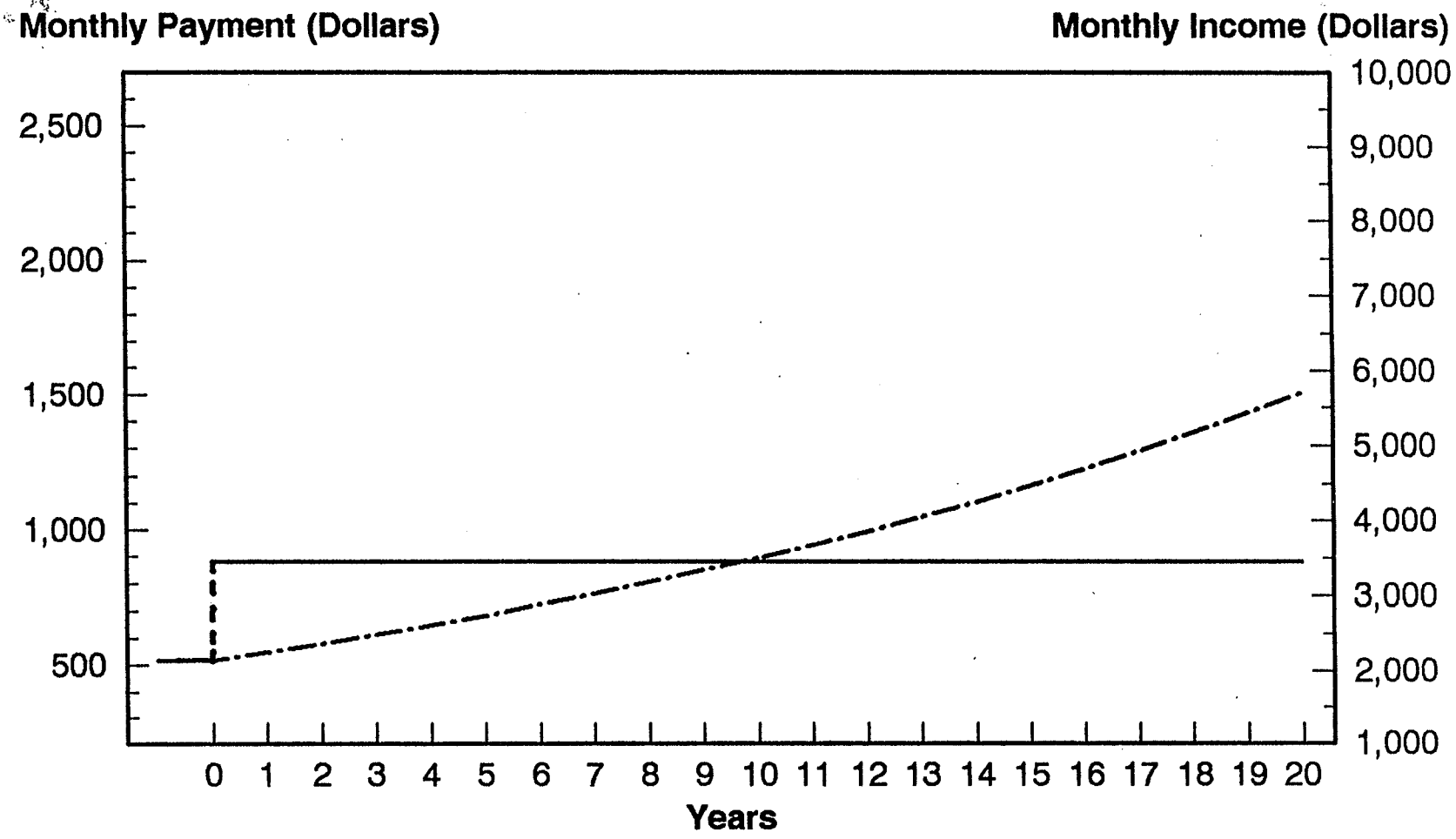


Source: Based on data contained in Table A-1, The State of the Nation's Housing 1990, Joint Center for Housing Studies of Harvard University.

Note: Ownership costs are calculated as a percentage of the median income of married-couple renters aged 25-29.

Figure 4

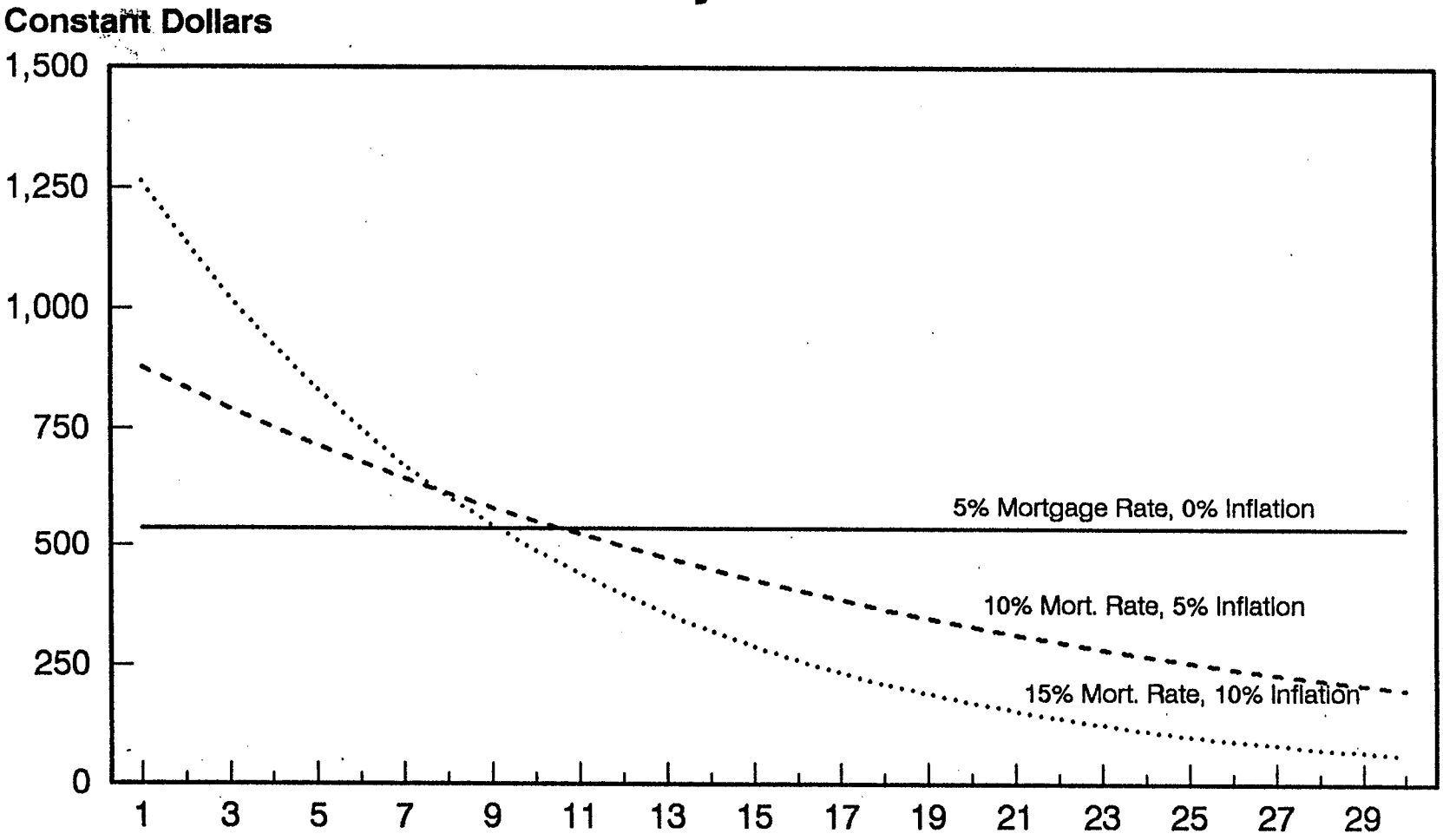
Mortgage Payments and Income Respond Differently to an Increase in the Inflation Rate



Source: Author's calculations.

Figure 5

Inflation Initially Raises and then Lowers the FRM Payment Burden

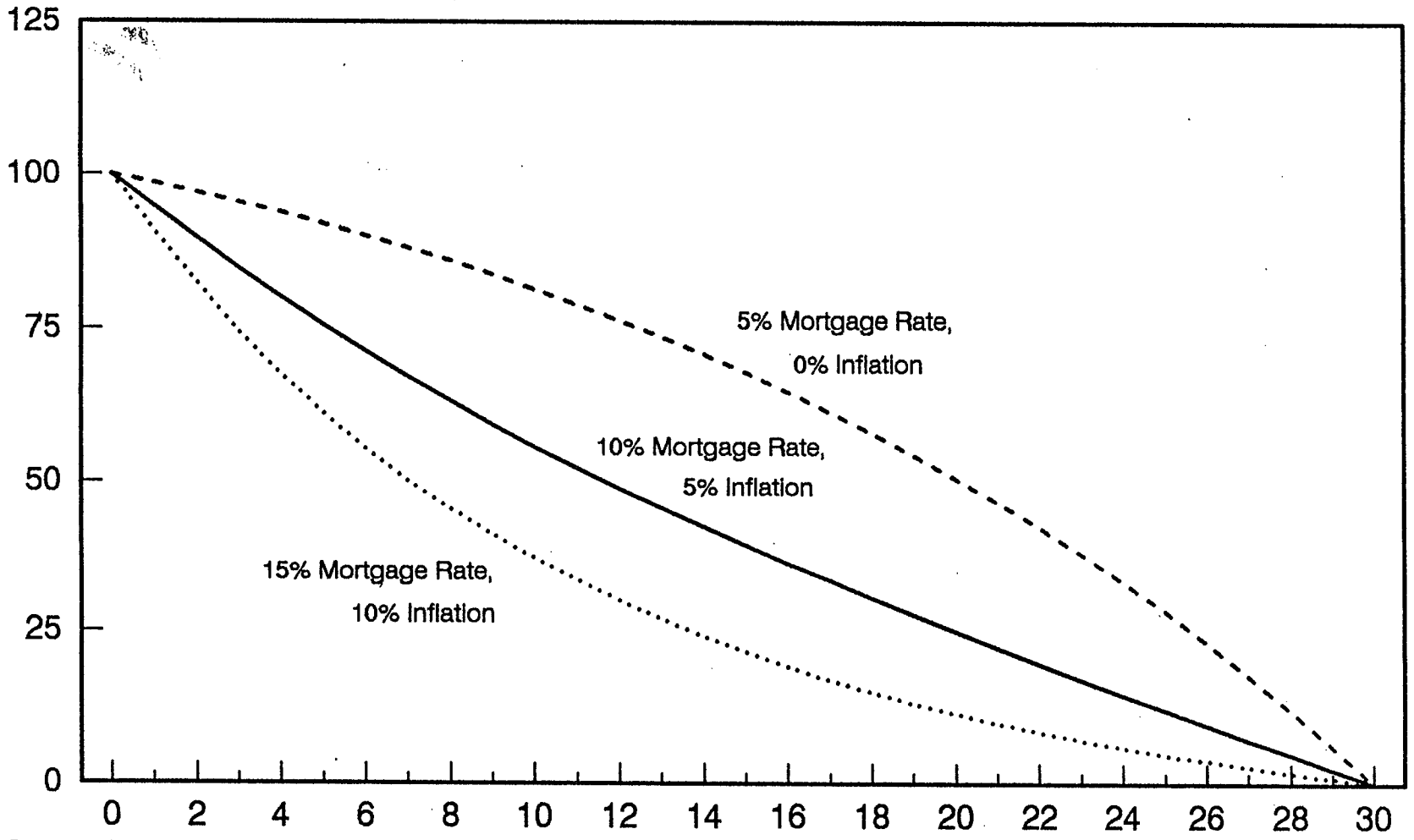


Source: Author's calculations.

Figure 6

FRM Real Mortgage Balance Outstanding

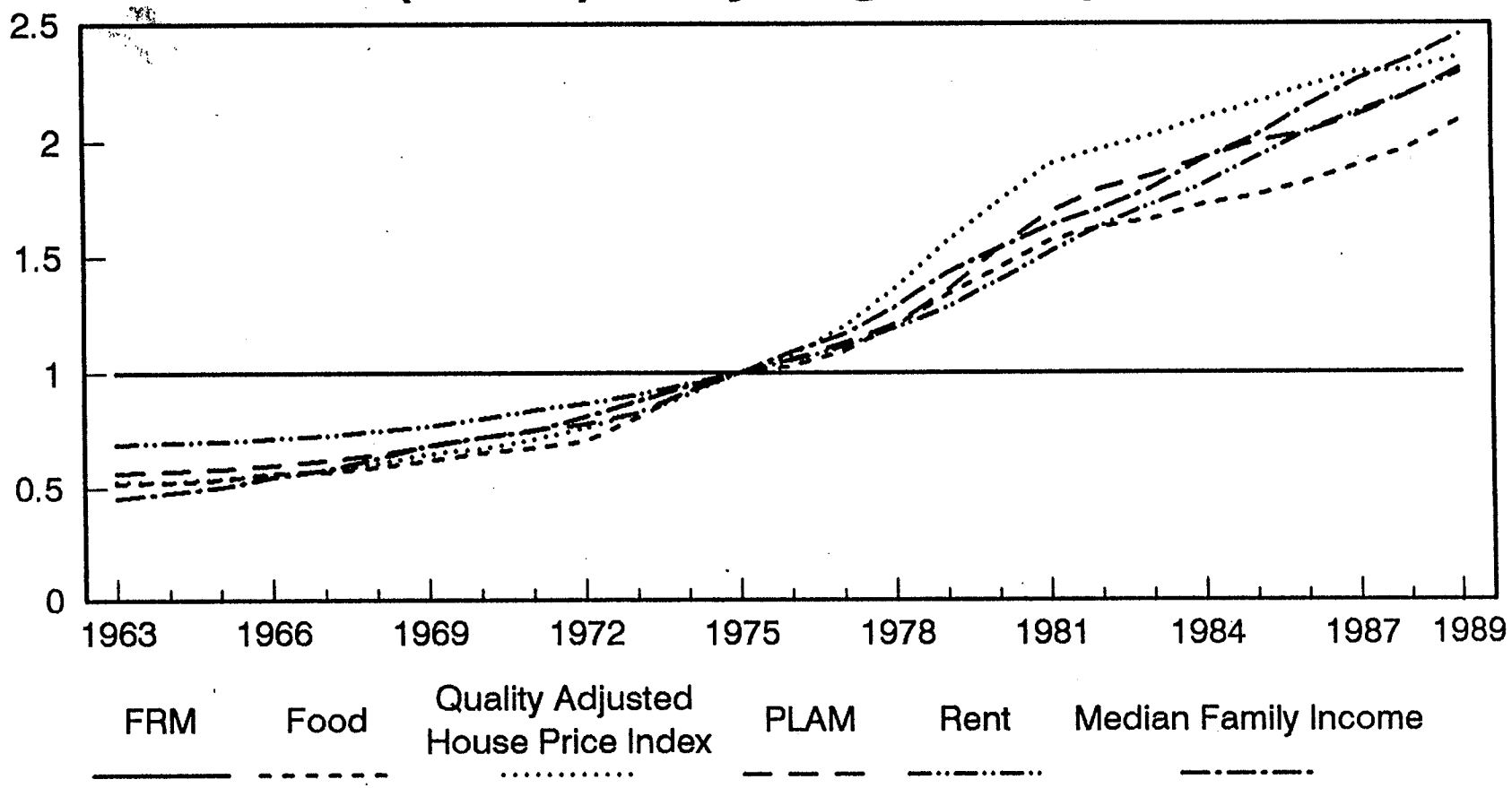
Thousands of Constant Dollars



Source: Author's calculations.

Figure 7

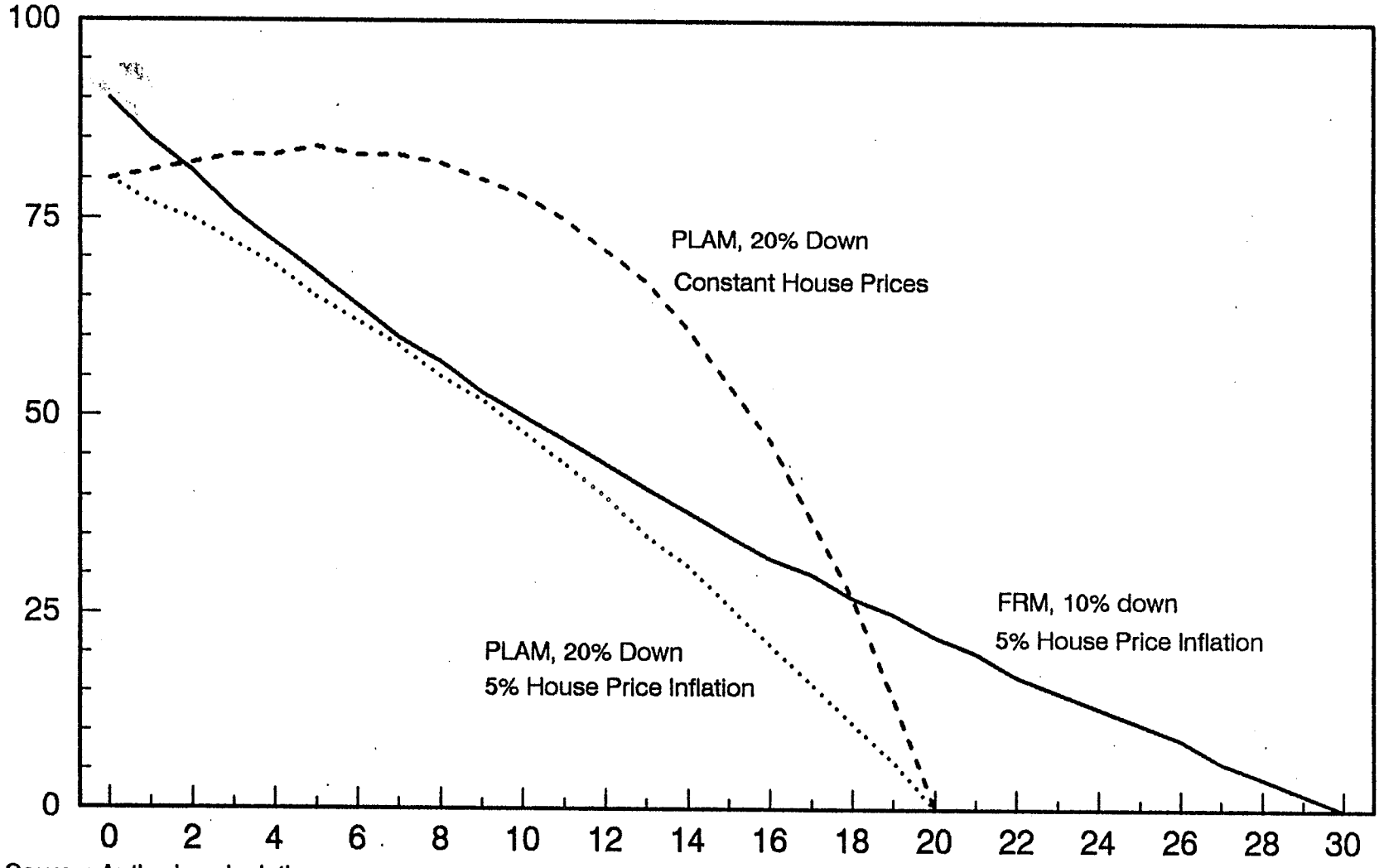
Over The Years, The Cost of (almost) Everything Goes Up



Sources: Economic Report of the President 1990, Data Resources, Inc., and Bureau of the Census.

Figure 8

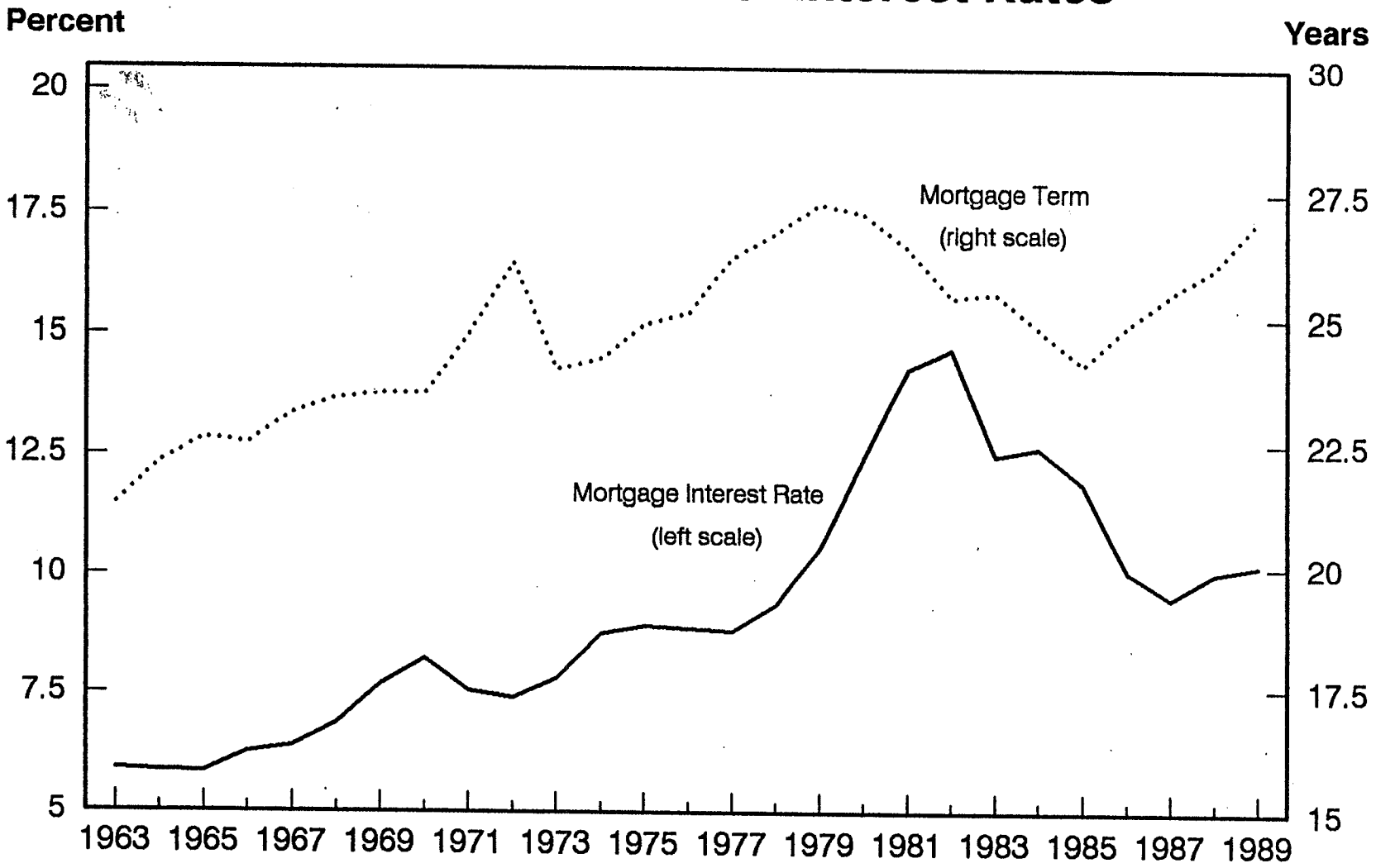
Loan-to-Value Ratios With A 5% Inflation Rate



Source: Author's calculations.

Figure 9

FRM Terms Rose With Interest Rates



Source: Mortgage Interest Rate Survey provided by Federal Home Loan Bank of Boston.

Table 1
Factors Affecting Housing Affordability

Year	House Price[a] (1)	Income[b] (2)	House Price/ Income (1)/(2) (3)	Contract Interest Rate (4)	Monthly Mortgage Payment[c] (5)	Payment-to-Income Ratio (5)/(2) (6)	Change in Col. (6) since 1965 due to:[d] Actual (7)	House Prices (8)	Interest Rates (9)
1965	20,000	6,101	3.28	5.83	1272	.208			
1970	24,783	9,126	2.72	8.22	2005	.220	.012	-.035	.057
1975	36,884	12,777	2.89	8.92	3182	.249	.041	-.024	.075
1980	64,058	17,724	3.61	12.45	7357	.415	.207	.022	.168
1985	79,710	22,321	3.57	11.93	8809	.395	.187	.019	.154
1989	86,957	25,800	3.37	10.21	8388	.325	.117	.006	.108

[a] The 1965 value is the actual median new house price. The later values are calculated using the Census Bureau quality-adjusted (1982 base year) house price index.
[b] Median money income for male, year-round, full-time workers aged 25-34. The 1989 value is estimated by the authors.
[c] Assuming 10 percent down payment and a 30-year term fixed-rate mortgage.
[d] Column 8 calculated using 1965 value of the interest rate. Column 9 calculated by constraining house prices to rise at the same rate as income. Consequently, columns 8 and 9 will not sum to the exact value of column 7.

Source: Columns (1) and (2), U.S. Bureau of the Census; Column 4, Mortgage Interest Rate Survey provided by Federal Home Loan Bank of Boston.

Table 2
Fixed-Rate Mortgage

Original Balance	$100,000	Interest Rate	10%
Term (years)	30	CPI Inflation	5%
Down Payment	10%	House Price Inflation	5%

Year	Monthly Payment	Dollar Balance	House Price	Loan-to-Value Ratio (Percent)	Owner's Equity	Real Payment	Real Balance	Relative Change in House Price (Percent)
		$100,000	$111,111	90	$11,111			
1	884	99,392	116,667	85	17,275	$842	$94,659	0
2	884	98,723	122,500	81	23,777	802	89,545	0
3	884	97,988	128,625	76	30,637	764	84,646	0
4	884	97,179	135,056	72	37,878	727	79,949	0
5	884	96,289	141,809	68	45,521	693	75,445	0
6	884	95,309	148,900	64	53,590	660	71,121	0
7	884	94,233	156,344	60	62,112	628	66,969	0
8	884	93,048	164,162	57	71,114	598	62,978	0
9	884	91,745	172,370	53	80,625	570	59,139	0
10	884	90,311	180,988	50	90,677	543	55,443	0
11	884	88,734	190,038	47	101,303	517	51,881	0
12	884	87,000	199,540	44	112,540	492	48,445	0
13	884	85,092	209,517	41	124,425	469	45,126	0
14	884	82,993	219,992	38	136,999	446	41,917	0
15	884	80,685	230,992	35	150,307	425	38,811	0
16	884	78,145	242,542	32	164,396	405	35,799	0
17	884	75,352	254,669	30	179,317	386	32,876	0
18	884	72,279	267,402	27	195,123	367	30,033	0
19	884	68,899	280,772	25	211,873	350	27,266	0
20	884	65,181	294,811	22	229,630	333	24,566	0
21	884	61,091	309,551	20	248,460	317	21,928	0
22	884	56,592	325,029	17	268,436	302	19,346	0
23	884	51,644	341,280	15	289,637	288	16,814	0
24	884	46,200	358,344	13	312,144	274	14,325	0
25	884	40,212	376,262	11	336,049	261	11,875	0
26	884	33,626	395,075	9	361,449	249	9,457	0
27	884	26,380	414,828	6	388,448	237	7,066	0
28	884	18,410	435,570	4	417,159	226	4,696	0
29	884	9,644	457,348	2	447,705	215	2,343	0
30	884	0	480,216	0	480,216	205	0	0

Note: For ease of presentation, calculations assume one payment at the end of each year rather than monthly payments. Since monthly rather than annual payment levels are more familiar, the payment entry in the table is the annual payment divided by 12. Data are rounded to nearest dollar amount.

Source: Authors' calculations.

Table 3
Price Level Adjusted Mortgage

Original Balance	$100,000	Real Interest Rate	4%
Term (years)	20	CPI Inflation	5%
Down Payment	10%	House Price Inflation	5%

Year	Monthly Payment	Dollar Balance	House Price	Loan-to-Value Ratio (Percent)	Owner's Equity	Real Payment	Real Balance	Relative Change in House Price (Percent)
		$100,000	$111,111	90	$11,111			
1	$644	101,474	116,667	87	15,193	$613	$96,642	0
2	676	102,697	122,500	84	19,803	613	93,149	0
3	710	103,627	128,625	81	24,998	613	89,517	0
4	745	104,217	135,056	77	30,839	613	85,740	0
5	783	104,414	141,809	74	37,395	613	81,811	0
6	822	104,159	148,900	70	44,740	613	77,725	0
7	863	103,388	156,344	66	52,956	613	73,476	0
8	906	102,029	164,162	62	62,133	613	69,057	0
9	951	100,000	172,370	58	72,369	613	64,461	0
10	999	97,215	180,988	54	83,774	613	59,681	0
11	1049	93,573	190,038	49	96,464	613	54,710	0
12	1101	88,968	199,540	45	110,572	613	49,541	0
13	1156	83,278	209,517	40	126,238	613	44,164	0
14	1214	76,371	219,992	35	143,621	613	38,573	0
15	1275	68,100	230,992	29	162,892	613	32,757	0
16	1338	58,303	242,542	24	184,238	613	26,709	0
17	1405	46,802	254,669	18	207,867	613	20,420	0
18	1476	33,400	267,402	12	234,003	613	13,878	0
19	1549	17,879	280,772	6	262,894	613	7,075	0
20	1627	0	294,811	0	294,811	613	0	0

Note: For ease of presentation, calculations assume one payment at the end of each year rather than monthly payments. Since monthly rather than annual payment levels are more familiar, the payment entry in the table is the annual payment divided by 12. Data are rounded to nearest dollar amount.

Source: Author's calculations.

Table 4
Price Level Adjusted Mortgage

Original Balance	$100,000	Real Interest Rate	4%
Term (years)	20	CPI Inflation	5%
Down Payment	10%	House Price Inflation	0%

Year	Monthly Payment	Dollar Balance	House Price	Loan-to-Value Ratio (Percent)	Owner's Equity	Real Payment	Real Balance	Relative Change in House Price (Percent)
		$100,000	$111,111	90	$11,111			
1	$644	101,474	111,111	91	9,637	$613	$96,642	-5
2	676	102,697	111,111	92	8,414	613	93,149	-9
3	710	103,627	111,111	93	7,484	613	89,517	-14
4	745	104,217	111,111	94	6,894	613	85,740	-18
5	783	104,414	111,111	94	6,697	613	81,811	-22
6	822	104,159	111,111	94	6,952	613	77,725	-25
7	863	103,388	111,111	93	7,723	613	73,476	-29
8	906	102,029	111,111	92	9,082	613	69,057	-32
9	951	100,000	111,111	90	11,111	613	64,461	-36
10	999	97,215	111,111	87	13,896	613	59,681	-39
11	1049	93,573	111,111	84	17,538	613	54,710	-42
12	1101	88,968	111,111	80	22,143	613	49,541	-44
13	1156	83,278	111,111	75	27,833	613	44,164	-47
14	1214	76,371	111,111	69	34,740	613	38,573	-49
15	1275	68,100	111,111	61	43,011	613	32,757	-52
16	1338	58,303	111,111	52	52,808	613	26,709	-54
17	1405	46,802	111,111	42	64,309	613	20,420	-56
18	1476	33,400	111,111	30	77,712	613	13,878	-58
19	1549	17,879	111,111	16	93,233	613	7,075	-60
20	1627	0	111,111	0	111,111	613	0	-62

Note: For ease of presentation, calculations assume one payment at the end of each year rather than monthly payments. Since monthly rather than annual payment levels are more familiar, the payment entry in the table is the annual payment divided by 12. Data are rounded to nearest dollar amount.

Source: Author's calculations.