A Call to ARMs: Adjustable Rate Mortgages in the 1980s

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Adjustable rate mortgages, long-term loans that provide for interest rate changes at regular intervals over their lifetimes, have recently become an important source of residential mortgage financing in this country. Widely available for some years in Australia, France, Great Britain, and West Germany, among others, adjustable rate mortgages became a viable option for U.S. borrowers nationwide only in the early 1980s. For the prior half-century, the United States relied almost exclusively on fixed-rate, long-term, level-payment mortgage instruments.

Attempts in 1971 and 1974 by the Federal Home Loan Bank Board (FHLBB) to authorize residential ARMs met with stiff resistance by Congress (Cassidy 1984). Opposition was widespread among consumer groups and labor unions, who feared borrowers would be subjected to unmanageable increases in their mortgage payments. By the end of the 1970s, however, as the condition of the thrift industry rapidly deteriorated, the political climate began to change (Guttentag 1984). In December 1978 the FHLBB allowed federal savings and loan institutions in California to originate variable rate loans in competition with state-chartered institutions. This authority was expanded nationwide in 1979, but still with severe interest rate limitations. These limitations were eased slightly in 1980 and in April 1981 the FHLBB substantially relaxed its restrictions on ARMs originated by thrifts.[1] In March of 1981, the Comptroller of the Currency authorized national banks to originate ARMs for owner-occupied one- to four-family homes.

Chart 1 shows the ARM share of residential mortgages originated in the United States. By early 1982, the share had jumped to 40 percent of originations, and it rose as high as 68 percent in August 1984 and 69 percent in December 1987. As the chart shows, however, the growth was not uninterrupted. The share fell below 30 percent during four

months of 1983 and to 21 percent in June 1986. The share had again fallen to 21 percent by December 1989. Nevertheless, the growth in originations led to an expanding stock of ARMs in lenders' portfolios. Whereas ARMs accounted for 9 percent of total home mortgage debt at the end of 1983 (Nothaft 1984), by mid-1985 this share had risen to almost 20 percent (Goodman and Luckett 1985), and today this share is probably close to 25 percent.

While ARMs have grown to be an important factor in mortgage lending, their variety and complexity have led to confusion. The purpose of this article is to discuss the advantages and disadvantages of ARMs to both lenders and borrowers, and to highlight the nature of the risks involved. The article then explores the basic characteristics of ARMs and the development of the ARM market in the 1980s. The evidence indicates that lenders have enthusiastically embraced the ARM concept. Borrowers, on the other hand, have been reluctant, and this has forced lenders to offer low initial interest rates and restrictions on interest rate movements in order to sell their product.

I. The Attraction of ARMs for Lenders

The role of financial intermediaries is to improve the efficiency of capital markets by linking those who save and those who borrow. They perform this intermediary service by converting their assets into forms better suited to the preferences of their creditors in terms of denomination, liquidity, maturity, and risk characteristics. Traditionally, thrift institutions have done so by accepting deposits with relatively short terms that represented a safe, liquid asset for savers, while providing long-term mortgages collateralized by long-lived residential structures.[2]

An intermediary earns most of its income as compensation for providing intermediary services. Thrifts have engaged in three types of intermediation: credit (default), maturity, and interest rate. Each of these has an associated risk. Credit intermediation consists of providing safe deposits to small savers while making loans subject to default risk. Maturity intermediation consists of lending long term while borrowing short term. The borrower from the thrift avoids the risk and transaction costs of refinancing a series of shorter-maturity loans, while the thrift takes the risk that liquidity needs may force it to sell the loan before it matures, suffering any transaction costs. Interest rate intermediation consists of holding assets that reprice at lengthier intervals than do liabilities.[3] For example, if a thrift issues six-month certificates of deposit to fund thirty-year fixed-rate mortgages, its assets would reprice each thirty years while its liabilities were repricing each six months. The thrift would be exposed to interest rate risk because the interest and price sensitivities of its assets and liabilities are not matched: an increase in interest rates would reduce the value of the mortgages by more than the certificates of deposit.

Heavy reliance on the standard fixed-payment, fully amortizing, long-term mortgage in combination with liabilities dominated by short-term, highly liquid deposits subjects thrifts to substantial interest rate risk. The rising and increasingly volatile interest rates of the postwar period (at least until the early 1980s) caused thrifts to suffer increasingly severe liquidity and solvency crises. Because liabilities repriced much more frequently than assets, thrifts' expenses were more responsive to changes in market interest rates than were their receipts. A sharp rise in interest rates would cause a rapid deterioration in thrifts' operating income as the costs of deposits rose more quickly than the returns on their portfolio of long-term loans. Furthermore, the rise in market interest rates would reduce the market value of fixed-income assets such as fixed-rate mortgages (FRMs) so that if the rise in rates were large enough, a thrift's net worth would become negative. Consequently, fluctuating interest rates put thrifts' income and net worth on a roller coaster ride, with their liquidity and net worth hitting low points simultaneously.

The liquidity and solvency risks to which thrifts are subjected present related, but not identical, problems. When making a fixed-rate long-term loan, the thrift attempts to set the interest rate at a level that will cover the average cost of funds (including overhead expenses) over the life of the loan, with the thrift showing positive and negative cash flows over

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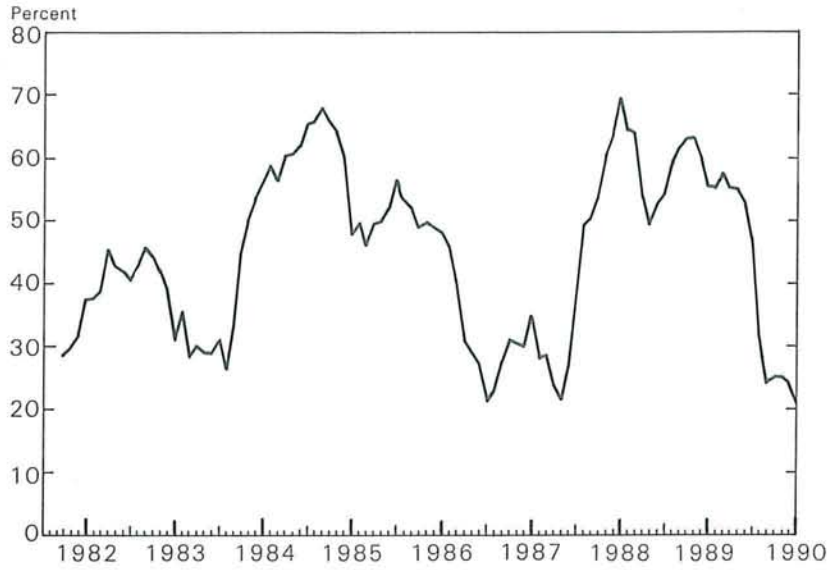
Chart 1

ARM Share of Mortgage Originations



Source: Federal Home Loan Bank of Boston, Office of Economic Research.

shorter subperiods while the loan is outstanding. The more serious problem threatening the solvency of thrifts is not interest rate fluctuations per se, but *unexpected* changes in interest rates that prevent a thrift from covering its costs over the life of the loan.

The rise in interest rates in the 1960s and 1970s greatly outstripped any expected rise embedded in the long-term interest rates on the mortgages held in thrift portfolios and therefore contributed importantly to the insolvency problems of thrifts. Had thrifts issued variable-rate rather than fixed-rate loans during this period, loan rates and deposit rates would have risen and fallen in tandem as loans and deposits repriced at roughly the same frequency. With thrifts less engaged in interest rate intermediation, the cycle in thrift earnings would have been mitigated. More important, the insolvency risk associated with unexpected increases in interest rates would have been eliminated. Interest rates on assets would have automatically adjusted with changes in market rates, whether those changes had been forecasted or not.

Thus, the most important benefit to thrifts from issuing adjustable rate mortgages is the shifting of part of the interest rate risk from the lender to the borrower. Traditional long-term, fixed-rate mortgages place all of the interest rate risk on the lender and give borrowers the option to refinance cheaply when interest rates decline. This risk is one-sided: if interest rates rise, lenders lose; if rates fall, borrowers gain (and lenders lose again) by exercising their option to refinance at the lower rates.[4]

A portfolio of ARMs would mitigate the liquidity squeeze on thrifts since as short-term interest rates (and hence the cost of funds) rose, so would revenues. In addition to smoothing the cycle in thrifts' net income, ARMs would also lessen the sensitivity of asset values to fluctuating interest rates. To the extent that the interest rates on outstanding ARMs repriced frequently and fully to market rates, their market values would deviate little from their par (face) values, reducing the solvency risk of a portfolio of long-term mortgages.[5]

The danger for thrifts holding ARMs is that the reduction in interest rate risk may be achieved at the expense of increased default risk. When interest rates rise, borrowers faced with sharp increases in their mortgage payments are more likely to default than those with fixed-rate mortgages and level payments. Perhaps more important, with fully adjusting ARMs thrifts will not be performing an interest rate intermediation service and hence will not be compensated for such a service. Credit and maturity intermediation alone may provide a very limited potential for income that can supplement servicing fees.

II. The Usefulness of ARMs to Borrowers

Some of the same features that make adjustable rate mortgages attractive to lenders make them unattractive to borrowers. In particular, the interest rate risk that lenders avoid is shifted to borrowers. For borrowers to willingly choose ARMs over FRMs, ARMs must provide compensating advantages. First, the average interest rate over the life of the ARM mortgage should be lower than that on the corresponding FRM, since the ARM rate includes a smaller interest rate risk premium (zero, if the interest rate risk is fully shifted to the borrower rather than shared with the lender) and because of the reduced value of the borrower's prepayment option compared to that on an FRM. Second, ARMs allow the borrower to benefit from lower interest rates in the future without incurring the cost of refinancing. Third, ARMs appeal to households that expect their income to be positively correlated with interest rate fluctuations so that their payments and their ability to make those payments would tend to rise and fall together. Fourth, and perhaps most important, ARMs normally have lower initial interest rates than FRMs.

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Because borrowers typically qualify for mortgages based on the ratio of their initial mortgage payment to their current income, lower initial rates are an important advantage for many borrowers. For example, younger households with current income well below future levels are often constrained in their borrowing power, based on a qualification rule that depends on current rather than expected future income. To the extent lenders use similar loan qualification criteria for FRMs and ARMs, the lower initial interest rate, by reducing initial mortgage payments, eases this constraint and allows the household to qualify for a larger mortgage.[6] Thus, some households can avoid delaying their home purchase or purchase a more expensive home more compatible with their longer-run desired housing consumption path, saving the transaction costs associated with trading up to a more expensive home later. Borrowers planning to terminate the mortgage after only a short time, perhaps because they plan to resell the house, also find the low initial ARM rates attractive.

While ARMs provide benefits to borrowers, they also pose problems. An important risk for borrowers with ARMs is payment shock, a sharp upward adjustment in their mortgage payment. For most households, the timing (and magnitude) of payment adjustments will not correspond exactly with changes in income. For example, if a sudden 2 percentage point increase in the expected inflation rate causes the ARM rate to increase from 8 percent to 10, the amount of the mortgage payment would immediately jump by approximately 25 percent, yet the increment to the inflation rate would be expected to make nominal income grow only 2 percent faster than before.

Another drawback of the typical ARM is its complexity, which makes it difficult for many borrowers to fully understand all of the contingencies and to compare one ARM with another or with an FRM. Even so, the basic idea underlying adjustable rate mortgages is relatively straightforward, and financial instruments and contracts with adjustable features are already a familiar aspect of non-mortgage transactions. For example, wages, rents, and pensions are in some instances indexed to the Consumer Price Index, and many business loans and home equity loans adjust with changes in the prime rate.

III. What Exactly Are ARMs?

The relaxation of restrictions on ARMs nationwide in 1981 was followed by a period of experimentation with the various allowable ARM features to find those most acceptable to lenders and borrowers. This led to a proliferation of specific ARM instruments, thought by many to be excessive.[7] The variety of ARM types, and perhaps their novelty, make it difficult for potential borrowers to compare the risks and benefits of various ARM programs with FRMs as well as with each other. This has increased the "shopping" or information costs associated with selecting a mortgage.

While ARMs may appear quite complex to the consumer faced with choosing among a variety of programs, the basic ARM concept is relatively straightforward. The great diversity of ARMs available in the market is created by variations (many only in degree) in a few basic provisions. The next section

describes the basic or "pure" ARM. The following section then discusses the "bells and whistles" commonly attached to the basic ARM form.

The "Pure" Adjustable Rate Mortgage

The adjustable rate mortgage can be thought of as a sequence of short-term mortgages with maturities equal to the adjustment period, based on a single long-term amortization period. The contract interest rate on an ARM is the sum of an index rate and a fixed margin. The variation in the contract rate thus comes from movements in the index rate. The adjustment period is the length of time between changes in the contract rate. At the end of each adjustment period the ARM rate, and usually the mortgage payment (see below), are adjusted in line with the change in the index rate since the previous adjustment. The basic ARM has four key features that are not shared by fixed-rate mortgages: the frequency of adjustment, the index, the method of adjustment, and the margin. Each of these features is discussed in turn below.

The adjustment period. Most ARMs have adjustment periods of between six months and five years, with one-year ARMs currently the most common. The length of the adjustment period affects the extent to which the lender and the borrower share the interest rate risk. The shorter the adjustment period, the more interest rate risk borrowers face and, given the relatively short-term nature of deposits, the less risk faced by lenders. Ideally, lenders would like to match the repricing frequency of their assets to that of their liabilities, in order to minimize their risk exposure. Furthermore, since a longer adjustment period will allow market rates to deviate further from slowly adjusting contract rates, lenders are subjected to more prepayment risk.

The index rate. The index rate is a market-related interest rate not under the direct control of the lender. The most common indexes are interest rates on Treasury securities and cost-of-funds indexes, measures of the average cost to thrifts of their liability portfolios. ARMs with Treasury indexes typically use Treasury securities with maturities matching the length of the adjustment period (one-year ARMs indexed to one-year Treasury rates, three-year ARMs to three-year Treasuries, and so on). Lenders prefer indexes with shorter-term maturities for much the same reason they prefer shorter adjustment periods: short-term rates will be more highly correlated with their cost of funds than the less volatile longer-term rates.

Thrifts minimize their interest rate risk by matching the interest sensitivity of their assets to that of their liabilities. This suggests that portfolio lenders that are attempting to limit their interest rate risk exposure might prefer a cost-of-funds index. If the cost-of-funds index were perfectly correlated with the lender's average cost of funds, the lender could lock in a spread and, with a short adjustment period, essentially assure profitability over the life of the ARM. The problem with this scenario, of course, is that the national or regional measures used as cost-of-funds indexes are not perfectly correlated with the average cost of funds for any specific institution, being affected by differences in the mix of liabilities (for example, core versus brokered deposits) and differences in the interest rates paid on those liabilities across localities. In fact, for some institutions a short-term Treasury index might be more highly correlated with their cost of funds than would be the popular national and Eleventh FHLB District cost-of-funds indexes. Furthermore, such an index reflects the average cost of funds for a prior period rather than the contemporaneous period. Thus movements in such an index would always lag behind current market conditions, subjecting the lender to short-run interest rate risk even with relatively short adjustment periods.

The method of adjustment. The most straightforward way to adjust the mortgage payment at the end of each interest rate adjustment period is to set the payment so that the mortgage fully amortizes at the new contract rate. That is, if the contract interest rate has jumped from 10 percent to 12 percent, the mortgage payment would rise by roughly 20 percent. While this is the most common adjustment method, the mortgage payment can also be adjusted either less frequently than the interest rate or by a smaller amount than that required to fully amortize the mortgage over its remaining term. When the payment adjustment is insufficient to raise the current

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payment to that required to fully amortize the mortgage over the current term at the current contract rate, the change in the contract rate must be accommodated by an extension of the maturity of the mortgage, an increase in the outstanding principal of the mortgage (negative amortization), or both.[8]

Selecting an adjustment method involves a trade-off. An increase in the ARM index will typically be accompanied by an increase in the lender's cost of funds that will likely not be matched by a jump in the borrower's income. Compared to FRMs, ARMs with either negative amortization or payment adjustments will reduce the solvency risk of the lender by mitigating the decline in the market value of the mortgage when market interest rates rise. The problem with negative amortization ARMs is that they do not reduce the liquidity risk faced by lenders. If payments do not adjust, the lender's cash inflow will not rise with the increase in its interest payments on deposits as its cost of funds rises.[9] Essentially, the lender is making an additional loan to the borrower equal to the difference between the payment and the interest due on the mortgage principal. At the other extreme, the lender's liquidity risk will be reduced if mortgage payments fully adjust to the increase in the contract rate. In that instance, however, borrowers will face payment shock, with the possibility that the mortgage payment will rise beyond the borrower's ability to pay. Thus, this type of ARM reduces the lender's interest rate risk at the expense of an increase in its default risk that perhaps even exceeds the reduction in interest rate risk.

Payment shock can be reduced by allowing maturity extension or negative amortization to limit the increase in mortgage payments. Such adjustment methods also affect default risk, but in a slightly different way. Switching from payment adjustment to negative amortization would in a sense decrease flow default risk while increasing stock default risk, or perhaps more appropriately, decrease borrower default risk while increasing property default risk. Negative amortization increases the mortgage principal and thus reduces the borrower's equity, other things equal. This increase in the current loan-to-value ratio subjects the lender to increased default risk. The higher this ratio, the more likely a decline in the house price or further negative amortization could push this ratio above unity, giving the borrower a strong incentive to default. If the borrower cannot make the mortgage payment but still has substantial equity in the property, he is unlikely to walk away from the property. But if the borrower's mortgage principal exceeds the property's current value, the borrower might default on the loan even if he or she can afford the payments.

The margin. The fixed margin, which is added to the index rate to obtain the contract rate for an ARM, serves two purposes. First, it compensates the lender for the intermediary services it performs and the risk it faces by making the mortgage loan. The more risk shifted from borrower to lender, the larger the margin. Second, a portion of the margin compensates the lender for its operating costs, including servicing fees (larger for ARMs than for FRMs) and a competitive return to its capital.[10] From the borrower's viewpoint, the margin represents a payment for the intermediary services provided by the lender, in particular, an insurance premium paid in return for allowing the borrower to shift certain risks to the lender.

If the lender were to make ARM loans indexed to its own cost of funds with continuous and contemporaneous adjustment of the mortgage payments to any change in the cost of funds, the required margin would be quite small, needing to cover only operating costs and default risk.[11] However, since ARMs do not adjust continuously and allowable indexes are not perfectly correlated with a particular lender's cost of funds, lenders cannot lock in a guaranteed wedge between their flow of interest receipts and interest expenses. Even if a lender's liability composition and deposit rates exactly mimicked those underlying a particular regional or national cost-of-funds index, the index would adjust with a lag to the lender's current cost of funds since the current period's index is based on the cost of funds calculated for a previous period. The larger the discrepancy between the repricing frequency of the ARM rate and the lender's source of funds, the greater the interest rate risk exposure and thus the larger the required margin.

The fixed margin compensates the lender for the intermediary services it performs, the risk it faces, and its operating costs.

Furthermore, for a given discrepancy, the more volatile are interest rates, the greater the degree of

interest rate risk. If negative amortization were substituted for payment adjustment, the margin would have to reflect the net effect of the associated increases in liquidity risk and property default risk and the reduction in borrower default risk. In general, the more volatile are interest rates, the greater the liquidity risk; the more highly and positively correlated are nominal house prices and nominal interest rates (both being correlated with inflation, for example), the lower the property default risk; and the more highly and positively correlated are personal incomes and interest rates, the lower the borrower default risk. Finally, the longer the adjustment period, the higher the prepayment risk, since the current market rate (and hence new ARM rates) could diverge further from the current contract rate on an existing ARM.

"Impurities" Often Added to ARMs

Two categories of deviations from the pure ARM have been widespread: adjustment restrictions and initial rate discounts (initial rates below contract rates). The adjustment restrictions place limits on one or more of the following: contract rate changes per adjustment (periodic rate cap); contract rate changes over the life of the ARM (lifetime rate cap); payment changes per adjustment; total amount of negative amortization; and lengthening of ARM maturity.

Adjustment restrictions. Periodic and lifetime rate caps limit the amount of interest rate risk ARMs shift from lenders to borrowers. For example, a typical one-year ARM might have a 2 percent periodic rate cap and a 5 or 6 percent lifetime cap, with the caps limiting both upward and downward movements. Over time, rate caps have become increasingly popular. In any case, the Competitive Equality Banking Act of 1987 requires that all one- to four-family residential ARMs originated after December 8, 1987 have lifetime rate caps. Periodic rate caps are measured from the rate in effect during the previous adjustment period, while the lifetime cap is relative to either the initial rate or the value of the fully indexed rate at the time of origination. Borrowers would absorb all of the interest rate risk for moderate interest rate fluctuations as long as the caps did not become binding. The consequences of interest rate movements above that allowed by the caps would be borne entirely by the lender. If one thinks of the lender as providing interest rate insurance in return for a premium, FRMs would correspond to borrowers' coverage with no deductible, capped ARMs to catastrophic insurance, and pure ARMs to no coverage.

Some ARMs cap payments instead of, or in addition to, rates, with the typical cap allowing a payment increase of 7.5 percent per year. If the payment cap limits the adjustment so that the new payment is not sufficient to pay the current interest on the mortgage, the difference is added to the mortgage balance as negative amortization. However, negative amortization is also capped at some level, with the legal maximum being 125 percent of the original appraised value of the property. When this limit is reached, the mortgage would be "recast," that is, the payment would be raised to the point that the mortgage would be fully amortized over its remaining term. Finally, forty years from the date of origination is the upper limit allowed by law for lengthening the maturity of a mortgage, at which time adjustment to further increases in interest rates must occur through negative amortization or payment increases. ARMs with payment caps were prevalent in California, especially in the 1970s. More recently, a movement away from payment caps and negative amortization has occurred.

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Rate caps differ from the other types of caps in that any excess of the index plus margin above the capped rate is lost to the lender. With payment, negative amortization and maturity caps, the interest associated with the contract rate continues to accrue, being recovered by the lender through later, higher payments or payments in addition to those originally scheduled. Thus, rate caps determine *whether* the borrower will be liable for increased interest payments when the index rises, while the other types of

caps determine when the increased interest associated with a rise in the index will be paid. Furthermore, such caps provide only limited protection from payment shock. If the limits are reached so that the mortgage must be recast, the new payment can be substantially larger than the payment prior to recasting.

Initial rate discounts. Initial interest rates on ARMs can be, and often are, lower than the sum of the index at the time of origination and the margin. The discount typically lasts for only a short time, often as little as one adjustment period, before the ARM rate jumps up to its fully adjusted level (index plus margin). The initial rate discount may be a result of a "seller buydown," whereby the seller pays a fee to the lender to compensate the lender for accepting a below-market interest rate during the initial adjustment period(s). The seller then recaptures the cost of the buydown (and perhaps more) since the attractive financing package allows the seller to obtain a higher home price than otherwise. But more commonly, the initial rate discount is a marketing technique used by lenders to induce borrowers to select ARMs rather than FRMs.

Why might borrowers find discounted ARMs so attractive? The most obvious answer is the lower initial mortgage payment, but the benefits go deeper. If the lender uses the low initial rate to qualify the borrower, it would allow the borrower to qualify for a larger loan and thus a more expensive home, or even make the difference as to whether an individual has to defer the purchase entirely. Furthermore, if rate caps are tied to the initial rather than the fully adjusted rate, a lower initial rate translates into a lower lifetime rate cap. However, associated with these benefits to the borrower are some drawbacks. The discounted initial rates may be accompanied by larger loan origination fees and larger margins, and once the discount period ends the borrower could be subjected to severe payment shock as the interest rate returns to its fully adjusted level (although periodic rate caps may slow this process).

IV. The Pricing of Adjustable Rate Mortgages

The size of the margin attached to any particular ARM depends on two sets of factors: (1) the characteristics of the mortgage (for example, adjustment period, index, caps, initial rate discount) and (2) the economic environment (for example, slope of the term structure of interest rates, interest rate volatility). One cannot place an exact value on a particular ARM characteristic without also specifying the economic environment. Much of the research on ARM pricing has used an options-based simulation framework (for example, Asay 1984; Buser, Hendershott, and Sanders 1985) whereby assumptions must be made regarding the drift and volatility of interest rates in order to simulate alternative future interest rate paths. Others rely on data for a particular set of ARM mortgages originated during a specific time period (for example, Lea 1985; Sa-Aadu and Sirmans 1989). In either case the specific values obtained for ARM characteristics would not be applicable in general, although the results would imply relevant qualitative results (for example, margins would tend to rise the tighter are lifetime rate caps, other things equal).[12] In general, the size of the margin depends on, among other things, the length of the adjustment period (larger, the longer the period); periodic and lifetime rate caps (larger, the tighter the caps); the particular index used; the number of points paid at origination (larger, the fewer points); the initial loan-to-value ratio (larger, the larger the ratio); the expected future path of interest rates (larger, the more rates are expected to rise and the more volatile rates are expected to be); and other factors such as prepayment, assumability and conversion clauses (Sa-Aadu and Sirmans 1989).

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Since ARM margins reflect risk premiums, the presence or absence of the various caps should affect the size of margins. Payment caps increase a lender's liquidity risk by allowing the borrower to defer payment increases, while negative amortization caps tend to decrease liquidity risk by forcing a recasting of the mortgage payment when the cap is reached. Maturity caps decrease liquidity risk if payments are increased when the cap is reached; they do not affect liquidity risk if, instead, negative amortization occurs

(except to the extent it causes negative amortization caps to be reached earlier). At the same time, these caps affect default risk, with payment caps decreasing borrower default risk and increasing property default risk through negative amortization. Negative amortization caps would have the opposite effects.

Rate caps, on the other hand, affect the solvency risk as well as the liquidity risk of the lender, and represent a trade-off between interest rate risk (which rises for the lender) and default risk (which falls). The margin should be larger, the greater the probability that the rate cap will become binding (presuming that the reduction in default risk is swamped by the increases in the other types of risk). Thus the margin will be larger the tighter the caps, the greater the expected volatility of short-term interest rates, or the more future short-term interest rates are expected to rise relative to current short-term rates (as might be reflected in the slope of the term structure curve).

Rate caps also affect prepayment risk. As rate caps become binding, prepayments would be expected to fall. At the same time, binding rate floors would provide borrowers with an incentive to refinance. Furthermore, with rate caps based on initial rates, even with the same index, margin, and size of caps, ARMs with different initial rates reach their caps at different levels of the index rate. Thus as interest rates fall, a borrower would still have an incentive to refinance into an ARM with the same index and an identical margin if the new ARM has a lower initial rate than the current ARM, because the new ARM would have a lower lifetime rate cap.

When lenders provide an initial rate discount, margins tend to be higher for two reasons (with seller buydowns, only the second reason is relevant). First, the lender must recover the discounted amount over the expected life of the loan in order to obtain the same expected return from discounted and nondiscounted ARMs. Second, because discounted ARMs subject borrowers to more severe payment shock, they are more risky than nondiscounted ARMs and thus should have larger risk premiums embedded in their margins.[13]

Finally, lenders that use higher margins in an attempt to recover the lost interest payments from the rate discount face higher prepayment risk. With periodic rate caps and rising interest rates it can take several adjustment periods before the mortgage rate attains its fully indexed level, but once this occurs the borrower has an incentive to prepay the loan before the lender can recover the initial discount. The borrower could refinance into another ARM with a smaller margin or, if available, into another steeply discounted ARM and repeat the cycle. The dilemma for the lender is that the larger the margin, the higher the probability of prepayment, and the shorter the expected life of the loan, the larger the margin must be to fully recover the discount.

V. From Theory to Practice

Evidence from the 1980s suggests that many lenders have, indeed, heard the call to ARMs and have responded. Borrowers, on the other hand, appear to have been more reluctant participants in the ARM market. In theory a price differential can be set between ARMs and FRMs sufficient to induce borrowers to select an ARM rather than an FRM. In practice the important question becomes whether ARMs remain profitable to lenders at that price. That is, in their efforts to increase the share of ARMs in their portfolios, have lenders resorted to originating ARMs with negative expected profits? If so, rather than saving the thrift industry by promoting profitability and profit stability, ARMs will contribute to reduced profits.

Evidence suggests several important factors that influence the borrower's choice between ARMs and FRMs. Dhillon, Shilling, and Sirmans (1987) show that pricing variables play a dominant role while borrower characteristics are relatively unimportant. Goodman and Luckett (1985) and Brueckner and Follain (1988) find that the general level of FRM interest rates and the FRM–ARM rate differential explain much of the variation in the ARM share. This evidence is consistent with the prior discussion. Because an ARM transfers some of the interest rate risk from lender to borrower, the borrower must be

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compensated for being exposed to this risk since no such exposure occurs with the FRM. The more averse to this risk is the borrower, the larger the required initial rate advantage on the ARM, other things equal. The level of rates is important, because at relatively high rates many potential borrowers are unable to qualify for the size of mortgage loan they desire. ARMs have a further advantage if borrowers expect these relatively high rates to fall in the future: the mortgage payments will fall as interest rates decline without the trouble and expense of refinancing their mortgage.

Based on the available evidence, a strategy to increase the volume of ARM originations appears both straightforward and potentially dangerous. For an ARM program to be successful, it must do more than attract borrowers. It must also cover the lender's costs. Many observers (for example, Lea 1985; Willax 1988) are concerned that in their rush to restructure their portfolios lenders have focussed more on attracting borrowers than on covering costs. Because of factors such as economies of scale, diversification, specialization, and familiarity with sophisticated financial instruments and techniques, financial institutions are quite likely able to handle risks better than individual borrowers. Thus, concessions to borrowers required to induce a large ARM volume could very well reduce lenders' incomes by more than the value of the risk reduction associated with holding ARMs rather than FRMs. This concern about covering costs has been fueled by episodes of substantial and widespread initial rate discounts on ARMs, even in the presence of fairly tight rate caps. The deterioration in the qualification standards used by many lenders in order to increase their ARM origination volume may have further compromised future profitability.

For an ARM program to be successful, it must do more than attract borrowers. It must also cover the lender's costs.

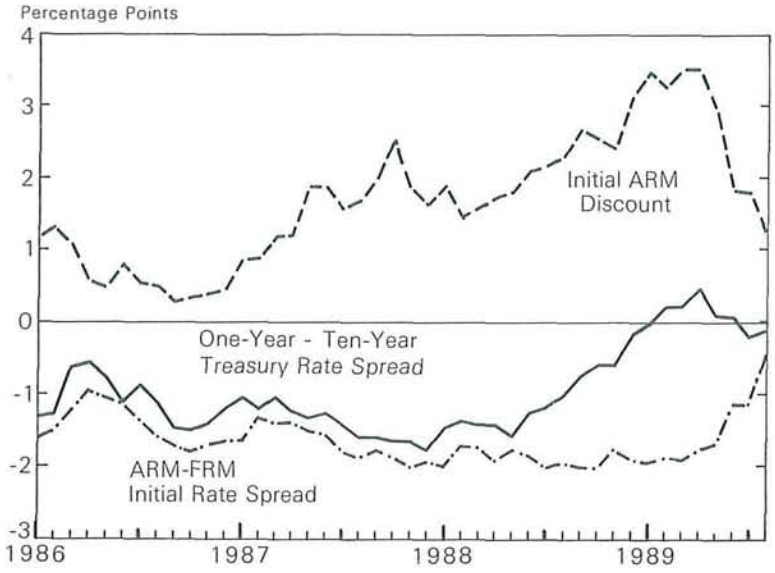
Initial period discounts, commonly known as "teaser" rates, of as much as 3 to 6 percentage points below the fully indexed ARM rates, were offered in 1983 and early 1984 to stimulate ARM originations. Large discounts were much less prevalent in late 1984 and 1985 because of three factors. First, lenders realized that such discounts tended to make the loans unprofitable. Second, lenders feared regulatory reaction to consumer complaints of misleading lending practices. Third, the term structure of interest rates steepened, enabling lenders to offer ARMs with essentially the same initial rate advantage over FRMs without teasers (Goodman and Luckett 1985). Initial period discounts jumped again in early 1987 and rose further during 1988 and early 1989 (Gordon, Luytjes, and Feid 1989). These two episodes of large initial rate discounts correspond roughly to the two high-water marks for ARM originations shown in chart 1, 1984 and late 1987–88.

Consistent with the Goodman and Luckett evidence for 1984–85, Gordon, Luytjes and Feid found that the average discount on one-year Treasury-indexed ARMs was nearly perfectly correlated with the difference between the fully indexed ARM and FRM rates for the period 1986 to early 1989. Chart 2 shows the relationship between the ARM–FRM initial rate spread, the term structure (one-year Treasury bill rate less ten-year Treasury bond rate) and the initial discount on one-year Treasury-indexed ARMs. Clearly, the initial mortgage rate spread has not reflected the fluctuations in the term structure spread.[14] Rather, as the term structure slope flattened in 1988–89, the size of the initial discount on ARMs increased to maintain a roughly stable initial rate advantage for ARMs compared to FRMs. However, with the recent reduction in the size of initial rate discounts the ARM rate advantage has been reduced sharply and, consequently, the ARM share of originations has plummeted as shown in chart 1.

Unless other ARM features are adjusted to compensate for the teaser rate, large initial discounts will lower the expected returns to ARM lenders because of the reduced interest payments in the initial period(s) and the increased credit risk associated with borrowers qualified for loans based on the lower initial payment level. Lea (1985) finds that lenders attempt to compensate for teaser rates through increased margins, but not by charging higher points. Gordon, Luytjes and Feid find that the margins and points charged on their sample of one-year Treasury-indexed ARMs were relatively constant during the 1986 to early 1989 period of rising discounts. However, they do find that the size of the lifetime cap tends to increase with larger discounts. The fact that caps are altered to help compensate for initial rate

Chart 2

Relationship between ARM Discounts and Interest Rate Spreads



Source: J.Douglas Gordon, Office of Thrift Supervision. Data are updated series from Gordon, Luytjes, and Feid (1989).

discounts is particularly important, since the lifetime caps typically are tied to the initial rate rather than the fully indexed rate at the time of origination. Thus, a 6 percent lifetime cap on an ARM with a 2 percentage point discount would have only a 4 percent lifetime cap over the fully indexed rate at the time of origination. This tightening of the effective lifetime cap through teaser rates would limit the extent to which the lender shifts the interest rate risk exposure to the borrower. However, even with the rate caps and the widespread, and at times dramatic, initial rate discounts associated with ARM originations, several recent studies have cast some doubt on the aggressive underpricing hypothesis (for example, Brueckner and Follain 1988; Gordon, Luytjes, and Feid 1989).

The relaxed criteria for loan qualification used in the early 1980s resulted from a combination of lenders' general attempt to increase loan volume (and the associated interest and fee income) in the face of declining housing affordability and to their particular attempt to rapidly increase the share of ARMs in their mortgage portfolios. With fixed underwriting standards, the borrower income level required to qualify for a mortgage rises proportionately with the level of the monthly mortgage payments. As mortgage interest rates rise faster than incomes, fewer households are able to qualify for mortgages. The impact of higher rates on housing affordability in the early 1980s was partially offset, however, by relaxing the standard qualification rule that mortgage and other housing costs should not exceed 25 percent of household income. By 1982, this percentage was approaching 40 percent at some institutions (Jones 1982). Qualification standards for ARMs were further relaxed by qualifying borrowers based on the initial payment of teaser ARMs rather than on the payment associated with the fully indexed rate. In mid-1984, private mortgage insurance companies responded by raising the insurance premiums on ARMs one-third or more above that on FRMs and raised the qualification criteria for ARM borrowers (Goodman and Luckett 1985). In October 1985 the Federal National Mortgage Association adopted more stringent qualification criteria for the low-down-payment mortgages it purchased, requiring that the borrower's payment not exceed 25 percent of income at a time when a 28 percent ratio was standard.

Chart 1 indicated the success of lenders in originating ARMs. But because mortgage originations in any period are small relative to the outstanding stock of mortgages, mortgages are often prepaid and, for individual institutions, mortgages can be resold or purchased in the secondary mortgage market, such a chart cannot indicate the extent to which lending institutions have been able to restructure their mort-

gage portfolios. Conventional ARMs as a share of one- to four-family loans and all mortgage-backed securities in thrift mortgage portfolios rose from 5.6 percent in 1980 to 13.13 percent by 1983 (Mahoney and White 1985, p. 147). The sum of balloon and adjustable rate loans as a share of first mortgage loans and pass-through securities in the portfolios of FSLIC-insured institutions doubled between the first quarter of 1984 and the first quarter of 1987 (from 22.3 percent to 44.1 percent). This share rose above 50 percent in early 1988 and stood at 56 percent by the first quarter of 1989 (Quarterly Thrift Financial Aggregates, Office of Thrift Supervision).

While thrifts have made dramatic progress in restructuring their mortgage portfolios, their profitability and profit stability may not be as insulated from interest rate fluctuations as it appears. First, the "pure" ARM has not been a factor in actual ARM originations. Rather, most ARMs in thrift portfolios have periodic and/or lifetime rate caps and in many instances the caps are based on steeply discounted initial rates. This combination substantially increases the interest rate risk exposure of ARM portfolios. ARM lenders are protected only against small rises in interest rates, since once caps are reached ARMs behave like FRMs as rates rise further. Thus, the features required for borrower acceptance have at the same time weakened the ability of ARMs to reduce the interest rate risk exposure of lenders, the primary motivation for offering ARMs in the first place.

While thrifts have made dramatic progress in restructuring their mortgage portfolios, their profitability and profit stability may not be as insulated from interest rate fluctuations as it appears.

The second factor limiting the benefits of an ARM portfolio is the increased credit risk associated with ARMs having initial rate discounts, particularly when the borrower is qualified based on the teaser rate because he or she could not qualify at the fully indexed rate. The general relaxation of qualification criteria in the early 1980s and ARMs with negative amortization and high loan-to-value ratios, although a dying breed, also contribute to increased credit risk.

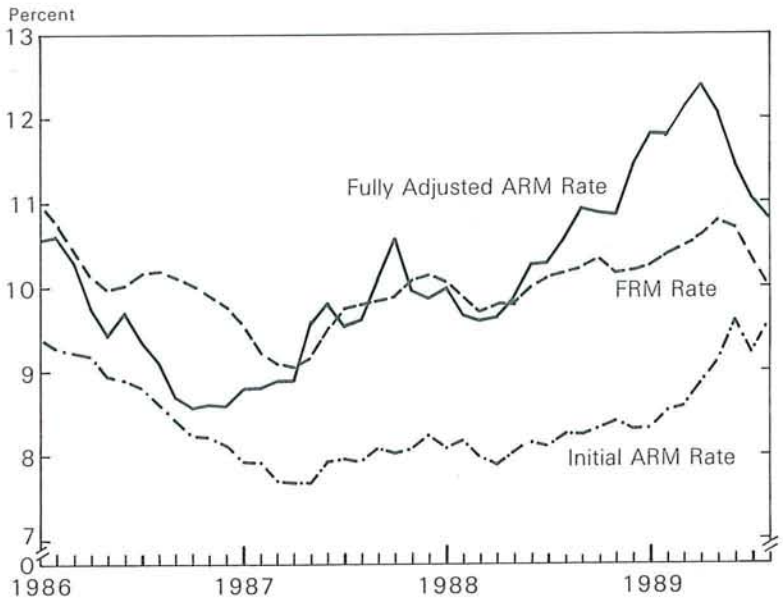
The third factor is the prepayment risk associated with ARMs having an initial rate discount. Lenders' profitability may be seriously reduced if borrowers refinance teaser ARMs, perhaps even into another teaser ARM, before their rates adjust to the higher fully indexed rates enabling lenders to recover their initial losses. A factor that suggests that many ARM borrowers do intend to refinance into an FRM is the return in 1987 of convertible ARMs and their popularity in 1988 and 1989. They accounted for as much as three-quarters of ARM originations in early 1988 (Kling 1988). These ARMs allow a borrower to convert to an FRM at the prevailing FRM rate for a modest fee. Such conversions would be expected to be prevalent when fully indexed ARM rates exceeded FRM rates. Chart 3 indicates that this has been the case for one-year Treasury-indexed ARMs since mid-1988, even though initial ARM rates remained well below FRM rates. In fact, ARM borrowers have had an incentive to refinance into new ARMs since mid-1987. If the popularity of convertible ARMs reflects a reluctance on the part of borrowers to have adjustable rate mortgages, one might expect large-scale conversions as FRM rates decline.

VI. Concluding Comments

Lenders have responded to the call to ARMs in the 1980s. However, they have had to overcome borrower reluctance to take on a loan obligation that was perceived to be complex and risky. Large ARM originations required interest rate caps limiting borrower risk and a substantial initial rate advantage compared to fixed-rate mortgages. But these same factors limited the benefits for lender profitability and profit stability, the primary motivation for offering ARMs in the first place. How will lenders resolve this dilemma? Until recently, lenders were willing to do what it took to restructure their portfolios by originating large numbers of ARMs. But in mid-1989 large initial rate discounts virtually disappeared. With the relatively flat term structure of interest rates and sharply lower initial discounts, the initial rate advantage of ARMs shrank (as can be seen in chart 3). As a consequence, the origination volume of ARMs plummeted, reaching 21 percent by December 1989 (chart 1).

Chart 3

Interest Rates on Fixed and Adjustable Rate Mortgages



Source: See Chart 2.

What is the future for ARMs? The thrift industry has been successful in restructuring mortgage portfolios to dramatically increase the share of ARMs. Although ARM origination volume fell sharply in late 1989, it will likely recover as the term structure of interest rates returns to its more normal upward-sloping shape. This will enlarge the ARM rate advantage, even without a return of the large initial discounts. Even so, the evolution of the ARM market suggests that ARM lenders may have a difficult time maintaining a large ARM portfolio. Although the relaxation of restrictions on ARM features saw a discontinuous jump from fixed-rate mortgages to the other extreme, "pure" ARMs, since that time the ARM market has moved back in the direction of FRMs with the widespread adoption of restrictions on the extent to which ARMs can adjust. Furthermore, the popularity of the convertible ARM suggests that many ARM borrowers view their situation as temporary and are just waiting for the appropriate opportunity to refinance into a fixed-rate mortgage.

[1] See Cassidy (1984) for a detailed account of the historical development of FHLBB ARM regulations.

[2] The discussion of lenders is couched primarily in terms of thrift institutions because they have been the major originators and holders of ARMs. A combination of regulatory restrictions, tax laws, and history accounts for this special role of thrifts among all financial intermediaries in housing finance. Consequently, thrifts have been the largest single direct source of residential mortgage credit, and residential mortgages have been by far the largest component in their portfolio of assets. However, in recent months mortgage originations by commercial banks have exceeded those by thrifts for the first time in nearly two decades. This shift in mortgage originations is associated in part with the new capital requirements that have led to a shrinking of the thrift industry. A similar analysis holds for commercial banks. Other mortgage holders such as pension funds and life insurance companies, which have longer-term liabilities, have been a much less important factor in the demand for ARMs.

[3] If assets and liabilities repriced only at maturity, maturity and interest rate intermediation would be identical. However, loans with variable interest rates can reprice numerous times before they mature. Although one might consider a thirty-year loan that repriced each year as having a one-year maturity, it differs from a one-year loan in that the lender has made a commitment to renew the loan at the end of the year even if lendable funds have become less available (more expensive) to the lender or the creditworthiness of the borrower has deteriorated substantially. Furthermore, if the permitted adjustments to the interest rate on the loan are limited, the loan again differs from a standard one-year instrument.

[4] The losses to lenders and benefits to borrowers may be reduced by prepayment penalties. In addition, closing costs on a new mortgage will limit the net benefits to the borrower of refinancing, so that it will not be profitable for the borrower to refinance unless interest rates decline substantially (2 percentage points being the frequently cited threshold). For lenders, points charged as origination fees can serve as an alternative to an explicit prepayment penalty.

[5] Of course, ARMs are not the only method available to limit interest rate risk. Instruments such as financial futures and options and interest rate swaps can be used to reduce risk exposure (see, for example, Morris and Merfeld 1988). Easing of regulations that restrict thrift asset and liability portfolios also can make an important contribution.

[6] Many households become constrained due to increases in nominal interest rates associated with increases in the expected inflation rate (see, for example, Wilcox 1989). With a level-nominal-payment FRM, the real burden of mortgage payments declines over the life of the mortgage as the general price level rises. This is referred to as the tilt problem. The relatively large initial real mortgage payments decline over the life of the mortgage while at the same time the household's real income (and thus ability to pay) is generally rising. Because ARM payments are based on nominal interest rates, ARMs do not solve this tilt problem, although their lower initial rates do alleviate the problem somewhat. Graduated payment ARMs, which have not accounted for a significant market share, further mitigate the tilt problem. Price-level-adjusted mortgages (PLAMs) that have level real payments have been proposed to address the tilt problem. These problems and alternative mortgage designs are discussed in Lessard and Modigliani (1975), Cohn and Fischer (1975), and Poole (1972).

[7] Guttentag (1984), among others, has emphasized the excessive diversity of ARM types that have found their way into the market, suggesting that 400 to 500 different types would be a conservative estimate as of April 1984, when new types were still appearing. He argued that monopolistic competition in the mortgage market, whereby intermediaries had an incentive to differentiate their product and promote institutional identity, was an important factor in promoting the lack of standardization of ARM instruments. At the same time, liquidity considerations would provide offsetting pressure, since acceptance in the secondary market dictates the need for some degree of standardization. In fact, survey evidence indicates that following the initial experimentation period, some standardization of ARMs has begun to occur.

[8] Maturity extension is a limited option in most instances. When the mortgage term is already relatively long, slight increases in the contract rate can require substantial increases in the mortgage term to prevent an increase in the payment, and the mortgage can quite easily reach the point where the original payment is incapable of covering even the interest portion alone. This limitation is particularly severe when the contract rate is high and in the years immediately following origination, when the mortgage payment is predominantly interest rather than principal repayment.

[9] While the lender receives no additional cash flow with which to make additional interest payments on deposits, the lender does receive an increase in income since a larger proportion of the payment is attributed to interest with a correspondingly smaller principal repayment component. Of course, if the higher deposit interest payments are automatically credited to deposit accounts and not withdrawn, the lender experiences an increase in its liabilities corresponding to the increase in assets rather than a cash flow squeeze.

[10] Technically, it is the difference between the contract rate and the lender's cost of funds rather than the difference between the contract rate and the index (that is, the margin) that is available to compensate the lender. Thus, one would expect the size of the margin on an ARM to reflect, among other things, the particular index used and any systematic difference between that index and the lender's cost of funds.

[11] This analysis is for a portfolio lender. An investor in mortgages, or an originator intending to sell to investors, would care about the correlation of the index with returns on alternative investments, for example, market interest rates.

[12] Quantitative results for the size of margins associated with different ARM characteristics under particular conditions are available (see, for example, Lea 1985; Buser, Hendershott and Sanders 1985; Hendershott and Shilling 1985; Sa-Aadu and Sirmans 1989). However, such estimates are sensitive to the particular assumptions made regarding the values of the key parameters in simulation models and to the particular economic conditions at the time of origination for studies based on actual mortgage data.

[13] For example, if the index plus margin is 12 percent and the initial rate has a 3 percentage point discount to 9 percent, the mortgage rate will jump by one-third (from 9 percent to 12 percent) at the end of the discount period in the absence of caps, even if the index does not rise. The associated default risk is magnified if the borrower has been qualified at the discounted rate, since it is then more likely that the fully adjusted rate will exceed the borrower's ability to pay. Payment caps will lessen payment shock (borrower default risk) but may increase property default risk through the associated negative amortization.

[14] Goodman and Luckett (1985, p. 826) find the same to be true for the 1984–85 period.

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