Research Department
Federal Reserve
Bank of
San Francisco

July 11, 1980

FRBSF Weekly Letter

Mortgage Innovation?

A recent survey by the U.S. League of Savings Associations showed that San Francisco has the highest housing costs among the 20 largest metropolitan areas, with an average (mean) of $90,000 for single-family houses in the second quarter of 1979. But San Francisco is a distant second to another area—Honolulu County (which covers the island of Oahu)—with its $144,000 average price for single-family houses in 1979. This raises the question of how Hawaiians can actually afford to live in Hawaii. But it also raises the broader issue of how inflation and heavy population pressures jointly affect home prices in booming Sunbelt communities—and how the mortgage-finance industry can cope with the problem.

Inflation and mortgage rates

In the good old days of price stability (*circa* 1955), one might have obtained a mortgage in Hawaii (or elsewhere) at an interest rate of around 3 percent. By 1970, mortgage rates had risen to 9 percent. But in April 1980, rates ranged as high as 17 percent and indeed, it was difficult to find a conventional mortgage at any price. Mortgage rates have now fallen to 12-13 percent, but many analysts predict that they will rise again when the economy recovers.

The direct cause of this rate escalation has been inflation. Consider a lender subject, at the margin, to a 30 percent tax rate. To obtain a 2-percent real (inflation adjusted) after-tax return on his/her loan, the lender must charge a nominal, gross interest rate of 2.86 percent when there is no inflation, 10.14 percent when the inflation rate reaches 5 percent (as it did in 1970), and 17.43 percent when the underlying inflation rate hits 10 percent (as it has in 1980). With this schedule of rates, a lender would be unaffected by inflation, and so presumably would be prepared to lend the same amount irrespective of the actual rate of inflation.

The only hitch is that the borrower finds it very difficult to pay such astronomical mortgage rates, especially when applied to astronomically rising home prices. Consider the case of an experienced Honolulu public-school teacher, with a salary of $18,807 for the coming academic year—i.e. $1,567.25 a month—subject, at the margin, to a 30 percent (federal plus state) tax rate. Under the typical rule of thumb, with payments equalling no more than 25 percent of income, our public-school teacher will be allowed a maximum mortgage payment of $391.81 a month. That means that the borrower can obtain $94,655 at a gross nominal interest rate of 2.86 percent—but only $44,126 at a 10.14-percent rate, and a mere $26,825 at a 17.43-percent rate. The higher the mortgage rate, the smaller the loan. Clearly, then, the borrower is far from indifferent about the rate of inflation and its effect on the nominal rate of interest.

Housing costs and income

Our teacher's plight may be illustrated in another way. In 1970, if our teacher had wanted to buy an average ($50,000) house with a 9-percent mortgage and 25-percent down, his/her monthly payments would have been $301.73 for a 30-year loan. An experienced teacher with a $946.10-a-month salary in 1970 would have been entitled to a $236.53-month mortgage payment, enabling him/her to borrow $29,396 or 59 percent of the purchase price.

In 1980, in contrast, if our Honolulu teacher wants to buy an average (now $150,000) house with a 16-percent mortgage and 25-percent down, his/her monthly payments would be $1,512.85 a month. But as we have seen, the typical lender in Hawaii would allow a maximum monthly payment of only $391.81 a month. At 16-percent interest, this monthly payment raises a loan of $29,136, which is $260 *less* than our teacher could borrow in 1970, despite the 66-percent rise in

Research Department
Federal Reserve
Bank of
San Francisco

the salary scale since then. In 1980, our teacher can borrow only 19 percent of the purchase price of an average single-family home.

Clearly, our teacher's prospects of buying an average Honolulu house are bleak, in large part because of the high nominal interest rate on a conventional mortgage. But, the lender too is worse off with a 16-percent interest rate and 10 percent inflation than with a 2.86-percent rate and stable prices. Clearly, both the borrower and the lender are losers from inflation.

Inflation and loan maturities

Inflation, in effect, accelerates repayment of the loan principal. A borrower obtains a 30-year loan in order to spread the loan repayment out over 30 years, but inflation effectively shortens that repayment period. For example, the buyer of an average $150,000 house with a $112,500 mortgage loan would pay $1,643.07 a month at an interest rate of 17.43 percent and 10-percent inflation. After one year, the remaining balance outstanding on the $112,000 loan would be $112,381, i.e. only $119 is repaid. But those calculations fail to take account of the 10-percent inflation, which boosts the buyer's equity and reduces the price-level adjusted or "real" loan balance to $102,165—in other words $10,335 is really paid off during the first year of the mortgage.

At 2.86-percent interest and no inflation, the monthly payment on the $112,500 mortgage would be $465.68. After one year, the balance outstanding would be $110,095, i.e., $2,405 is repaid. Thus, the borrower would repay over four times as much principal in the case of 10-percent inflation than in the zero inflation case. Of course, the real value of the mortgage debt outstanding falls much faster under inflation, but this is simply because repayment of the loan principal is much faster too. The snag is that a teacher earning $18,807 a year just cannot afford to repay mortgage principal at an annual rate of $10,335.

Accelerated effective repayment—the mortgage "tilt" effect—clearly reduces the attractiveness and hence the demand for mortgage loans. This effect is only partially offset by the benefit of a shorter effective loan maturity. Both lenders and borrowers are worse off because, by accelerating the repayment of principal, inflation destroys the most important attribute—the 30-year maturity—of the conventional mortgage. Inflation weakens the capital market with its traditional financial instruments.

PLAM: the answer?

Fortunately, there is a simple way of solving this problem—indexing the mortgage's monthly payments and principal outstanding. This financial instrument is called a price-level-adjusted mortgage (PLAM). The interest rate on a PLAM would be the real rate, e.g., 2.86 percent, regardless of the level of the inflation rate. Our Honolulu teacher on her/his income of $18,807 a year could now borrow $94,655 at a 2.86 percent real rate, representing a more respectable 63 percent of the average house price.

Consider what would happen with a PLAM in the event of constant 10 percent inflation, with the monthly payment and principal outstanding increasing by 10 percent a year—and with the homebuyer's salary and home value also increasing by 10 percent a year. At the end of 30 years, our Honolulu teacher would be earning more than $328,000 annually and would own a mortgage-free home worth $2.2 million (see table). Other points to note from the table are: (1) monthly payments remain 25 percent of income throughout the mortgage's life; (2) the nominal balance outstanding rises, but at less than 10 percent a year, to reach a maximum of $275,838 in the twenty-first year; (3) the homebuyer's own equity in the house rises continuously from 25 percent to 100 percent at a rate which always exceeds 10 percent a year.

Financial institutions in Hawaii and many other states, however, cannot offer PLAMs because of federal and state regulations. For example, Hawaii's state usury law, although amended this year, still prohibits lenders from charging interest on interest. The law interprets an increase in the outstanding balance, which a PLAM involves, as postponed interest payments. Thus interest cannot be charged on any part of that balance which exceeds the original nominal value of the loan—although, in the present case, the excess would equal 66 percent of the balance after 20 years.

The PLAM has potential advantages both to borrowers—larger loans and/or lower initial payments—and to lenders—a higher real interest rate. Many legislators, bankers and consumer groups cannot see those advantages, however, because they are suffering from a money illusion. A PLAM under inflationary conditions is identical to a conventional, fixed-interest mortgage under price stability. Perhaps the least that government can do in an inflationary atmosphere is to initiate legislative and regulatory reforms to permit PLAMs. Government agencies (e.g. Federal Housing Administration, or State Employee Retirement Funds) could be encouraged to purchase PLAMs to demonstrate their viability.

Nonetheless, PLAMs will increase demand for houses. If, as in Hawaii, supply is inelastic, the price of houses will rise yet further. Our teacher may be chasing a rainbow. Perhaps the ultimate solution to the high cost of housing in Hawaii is fewer people.

Maxwell J. Fry

(The author, Professor of Economics at the University of Hawaii, is Visiting Economist this summer at the Federal Reserve Bank of San Fancisco.)

Effect of PLAM and 10-Percent Inflation on Salary, Mortgage and Home Value

Year	Monthly Salary	Monthly Mortgage Payment	Mortgage Balance Outstanding	House Value	Equity in House
0	1,567.25	391.81	94,655	126,206	31,551
5	2,524.07	631.02	135,175	203,257	68,082
10	4,065.04	1,016.26	185,627	327,347	141,720
20	10,543.67	2,635.92	274,853	849,053	574,200
25	16,980.69	4,245.17	237,091	1,367,408	1,130,317
30	27,347.58	6,836.89	0	2,202,225	2,202,225

Research Department
Federal Reserve
Bank of
San Francisco
Alaska • Arizona • California • Hawaii
Idaho • Nevada • Oregon • Utah • Washington

BANKING DATA—TWELFTH FEDERAL RESERVE DISTRICT

(Dollar amounts in millions)

Selected Assets and Liabilities Large Commercial Banks	Amount Outstanding 6/25/80	Change from 6/18/80	Change from year ago Dollar	Percent
Loans (gross, adjusted) and investments*	136,207	31	8,038	6.3
Loans (gross, adjusted) — total#	114,736	43	9,029	8.5
Commercial and industrial	33,242	40	2,205	7.1
Real estate	46,492	53	8,032	20.9
Loans to individuals	23,699	0	1,299	5.8
Securities loans	945	– 69	– 657	– 41.0
U.S. Treasury securities*	6,304	– 19	– 1,130	– 15.2
Other securities*	15,167	7	139	0.9
Demand deposits — total#	40,935	–1,984	– 559	– 1.3
Demand deposits — adjusted	30,110	– 398	– 73	– 0.2
Savings deposits — total	27,561	154	– 2,563	– 8.5
Time deposits — total#	63,264	– 319	11,792	22.9
Individuals, part. & corp.	54,467	– 255	11,912	28.0
(Large negotiable CD's)	22,669	136	4,458	24.5

Weekly Averages of Daily Figures	Week ended 6/25/80	Week ended 6/18/80	Comparable year-ago period
Member Bank Reserve Position			
Excess Reserves (+)/Deficiency (–)	– 55	– 73	34
Borrowings	1	1	150
Net free reserves (+)/Net borrowed(–)	– 56	– 73	– 116

* Excludes trading account securities.
\# Includes items not shown separately.

Editorial comments may be addressed to the editor (William Burke) or to the author . . . . Free copies of this and other Federal Reserve publications can be obtained by calling or writing the Public Information Section, Federal Reserve Bank of San Francisco, P.O. Box 7702, San Francisco 94120. Phone (415) 544-2184.