Mortgage prepayment in India

By Raymond Struyk and Genevieve Kenny

THE prepayment of home mortgages prior to the end of the mortgage loan term has become a closely studied phenomenon in many western countries. Mortgages and secondary mortgage facilities have large financial stakes in being able to predict the likelihood of prepayment and to adjust points paid at closing and prepayment penalties so as to compensate them for this type of risk. Indeed, a new type of mortgage-backed security — the collateralised mortgage obligation — has been developed explicitly to deal with this risk.

In contrast, mortgage prepayment patterns in developing countries have received almost no attention. This neglect may stem from an assumption that prepayment is either a rare event among the lucky minority of households who succeed in obtaining formal mortgage financing in these countries, or that it is not systematic in the sense of borrowers responding to financial incentives to prepay their loans.

For several reasons this lack of information may be a serious impediment to the development of viable financial intermediaries in the housing sector. First, studies of prepayment patterns in the US attribute much of thrift institutions' financial problems of recent years to mispricing of prepayments. Hence, without such analysis in developing countries it may be impossible to define the risks involved with expected duration mismatching. Evidence on whether households respond to economic incentives with respect to prepayment would allow a much better understanding of the risks of intermediation.

Second, besides households responding to financial incentives, studies for the US show that household characteristics can be very important in the prepayment decisions. If this is so in India, which, like most developing countries, has a highly segmented credit system that rations credit, this type of analysis could allow lenders to discriminate in such a way that their rationed funds could be allocated to households who are more or less likely to prepay. Thus, this type of information could be important for institutional profitability and growth.

Other reasons for housing finance institutions to have a direct interest in prepayment can be mustered. For one, if these institutions could predict the pattern of prepayment with some accuracy, then they could more efficiently plan their lending programmes. On the other hand, if they are constantly "surprised" by prepayment, then it is likely that they are originating fewer mortgages than they might otherwise. They may also be mispricing the mortgages that they do originate.

Possible initiation of secondary mortgage markets is another reason for housing finance firms to consider prepayments seriously. A key attribute of interest to potential investors in "pass through certificates", one of the simplest secondary instruments and therefore a strong candidate as an early offering, is the likely pattern of prepayments. The greater the uncertainty about or lack of information on the volume of prepayments, the less attractive such instruments will be for investors who do not want to be constantly reinvesting the unexpected proceeds from prepaid loans.

A broader reason for interest in prepayments concerns financial deepening. One of the objectives of developing a market-oriented housing finance system in India is the hope that the extension of more financial services to households will help encourage the continuation of the growth of financial assets as a share of savings (Chakravarty, 1985).

Empirical analysis of whether and how households' mortgage prepayments respond to economic incentives from the financial market relative to other forms of wealth holding (e.g., gold) can help assess the impact that supplying mortgage credit could have on financial deepening. The question that can be answered is: Do the expected returns on non-financial and financial assets affect household demands for financial instruments such as mortgages?

This article presents the results of analysing mortgage prepayment in India. The data used come from the Housing Development Finance Corporation (HDFC), far and away the country's largest private originator of home mortgages. HDFC began operations in 1977-78 with about 250 individual loans. For its 1986-87 fiscal year it originated about 25,500 individual mortgages, for a cumulative total of 103,000 such mortgages. Over its decade of operations, HDFC has financed about 53,000 additional units under loans to corporations.

HDFC has achieved impressive expansion and has an excellent record of loan collections and management (Buckley *et al*, 1985; Boléat, 1985). The data analysed are for individual home mortgages originated from the start of operations in 1978

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through the end of 1985; prepayment experience on these mortgages until July 1987 is analysed.

Expectations

Since the prepayment experience of the United States is perhaps the best documented and analysed, we can use it to point out important characteristics of India's situation. In the United States the primary reasons for prepayments are declines in mortgage interest rates, which can make refinancing attractive, and residential mobility (both local and long distance), which in turn depends on the state of the economy and demographic patterns. In contrast, neither of these factors is likely to be very important in India. Residential mobility rates in India are extremely low — apparently under 2% per year. Rates for homeowners are significantly below the overall average. A recent study of housing in Ahmedabad, for example, found that 65% of all households had never moved from the dwelling occupied at the time the household was formed (Mehta and Mehta, 1987).

As to the interest rate environment, stability is the hallmark of India's highly managed economy. This stability is reflected in the data in Table 1 on movements in interest rates on various savings alternatives over the 1979-80 to 1985-86 period.

Thus, in general we expect the prepayment decision for HDFC borrowers to be much more associated with their attributes and those of the mortgage loans than is the case in the United States. A number of Indians involved in housing finance have stated that Indians feel much more strongly about extinguishing debt on their homes than other forms of debt.

Still, several borrower and mortgage characteristics appear to have the potential to be significantly related to prepayment. Among borrower attributes, *age* is likely to be important. Older middle-aged households have the possibility of obtaining lump sum settlements from provident fund contributions and whole life insurance policies that could be used to pay off their loans. Also, *self-employed* individuals may have greater possibilities than salaried workers for high income years to generate the funds for prepayment.

On the other hand, as documented by Kozel (1987) for the Ivory Coast, the self-employed have higher savings, some of which must be kept in accessible form as a hedge against uncertainty. If assembling the down payment for home purchase caused them to draw down their reserves to an insufficient level, then "extra income" will go to rebuilding reserves rather than to repayment.

In terms of the characteristics of the mortgage itself, we should begin by noting that with some quite minor exceptions, HDFC originates self amortising fixed interest rate mortgages. The average loan to value ratio is about 0.4, and the average term is about 13 years, with loans rarely being made for more than 15 years. Interest rates vary directly with the size of the loan from 12.5% to 14.5%. There are prepayment penalties, computed in months of interest payments on the loan. The highest penalty of 12 months' interest is applicable to borrowers who are selling their homes. Lower penalties apply to stationary borrowers.

One expects the propensity to prepay to vary directly with the *mortgage interest rate,* i.e., the lower the rate the more attractive it is to invest "extra funds" in other assets, and for the likelihood of prepayment to decline if the rates of return on other investments increased.

One also expects prepayment to be more likely the lower the *ratio of loan amount to income.* The lower this ratio, the easier it is for the household to repay if it chooses to do so.

Lastly, *loan term* may be a factor. If the loan term is quite short, then the borrower may be less anxious to eliminate this debt than if the term is long. Similarly, on a mortgage with a longer term, as the number of years to final payment becomes small, the borrower may feel less compelled about prepaying.

Not mentioned thus far, but clearly a factor, is the time since origination. The more time passes, the greater the household's opportunity to amass the funds for prepayment —

Table 1
Trends in Selected Interest Rates in India
1979-80 to 1985-86

	1978-79	*1980-81*	*1981-82*	*1982-83*	*1983-84*	*1984-85*	*1985-86*
Commercial Banks 1 year deposits	7·0	7·5	8·0	8·0	8·0	8·0	8·5
UTI dividend rate[c]	10·0	11·5	12·5	13·5	14·0	14·25	15·25
Company rates[a] 1 year deposits	9.0-13.0	9.0-13.5	9.0-13.5	9.0-15.0	10.0-15.0	9.0-15.0	10.0-15.0
Government of India bonds annual yield for 5-15 year bonds[b]	4.70-5.74	5.8-6.8	5.8-7.0	6.2-7.8	6.7-9.0	6.5-9.0	6.5-9.5

a. By "well established companies" for deposits accepted from the public.
b. Annual redemption yield calculated on assumption that average price relates to the middle of the period.
c. Unit Trust of India, a national mutual fund.
Source: *Report on Currency and Finance, 1985-86* (Bombay: Reserve Bank of India, 1987), Statement 50.

and the smaller the balance to be paid. Figure 1 illustrates the effects of "pure ageing" of mortgages on prepayment of FHA insured mortgages (Roberts, 1987, Figure 1). Prepayments are sharply higher in the first and the last years of the mortgage term.

Data employed

Two different bodies of data are used in the analysis. The computation of time profiles of prepayment use data on a random sample of approximately 5,100 mortgage originations and a random sample of about 2,000 prepayments. The samples are of all mortgages originated from the start of HDFC's operations and the end of calendar year 1985. The prepayment experience of these mortgages is followed until July 1, 1987. After various data cleaning operations, the final samples are 4,552 and 1,919 respectively.

Data on the borrower and the mortgage at the time of origination were obtained from the sanctions and disbursement file. The date of prepayment and reason for prepayment were added to the record for prepaid mortgages. Different sampling weights were used in drawing the two samples, and the tabulations presented below weight observations by the inverse of the applicable sampling rate, after correction for dropped observations.

Patterns of prepayment

The pattern of prepayment is shown in Figure 2 and in Table 2. In these, prepayments are calculated as a percentage of the remaining mortgages outstanding each year. The general pattern — which is clearest in the last column of Table 2 where unweighted averages across the years for which we have data are given — is for there to be negligible prepayments in the year the loan is originated, followed by an increasing rate of prepayments over years 1 to 3, with the rate of prepayment then levelling off.

The contrast between the prepayment patterns for HDFC loans and those for US mortgage loans insured by FHA (Figure 1) is dramatic. While prepayment rates increase in the first three years following origination in both cases, the rates accelerate to substantially higher levels in the US before stabilising.

Prepayment rates in the US — driven by high mobility rates and shifting interest rates — are over 8% by the fourth year, compared with an average rate of about half that for the HDFC mortgages. The US pattern is for a gradual but clear decline thereafter, while the parallel pattern for HDFC is not yet clear.

Lastly, note the cumulative percentage of loans prepaid for each year of origination (last row on Table 2). Even after allowing for the loans originated in 1979 prepaying at an unusually high rate, it appears that a quarter of all loans originated will

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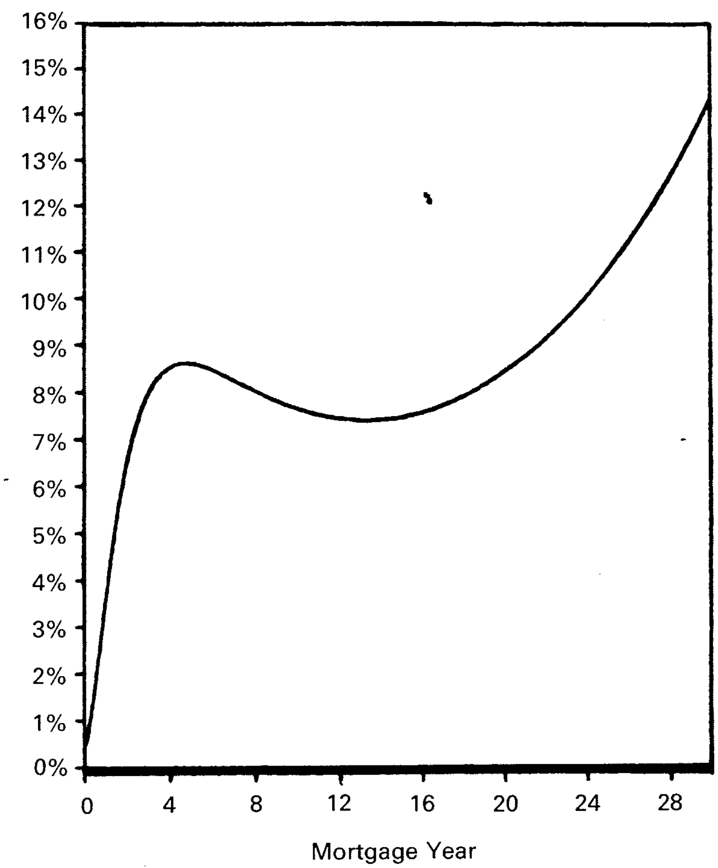
Figure 1
The Pure Ageing Effect:
Annualised Percentage Pre-pay Rates



Note: Pre-payment rate defined as pre-payments as a percentage of outstanding balance yearly.
Source: Roberts (1987), Figure 1.

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pay off in the first eight years after origination. Hence, early prepayments can be expected to be a major source of funds for additional lending by HDFC and probably other housing finance institutions in India.

Statistical analysis

Beyond the simple patterns just described, we have conducted substantial analyses of the determinants of the likelihood that a mortgage will prepay, which are detailed in the full paper. In summary, the pattern of prepayments was found to be significantly related to several borrower and mortgage attributes, but such relationships were established less frequently than we had anticipated.

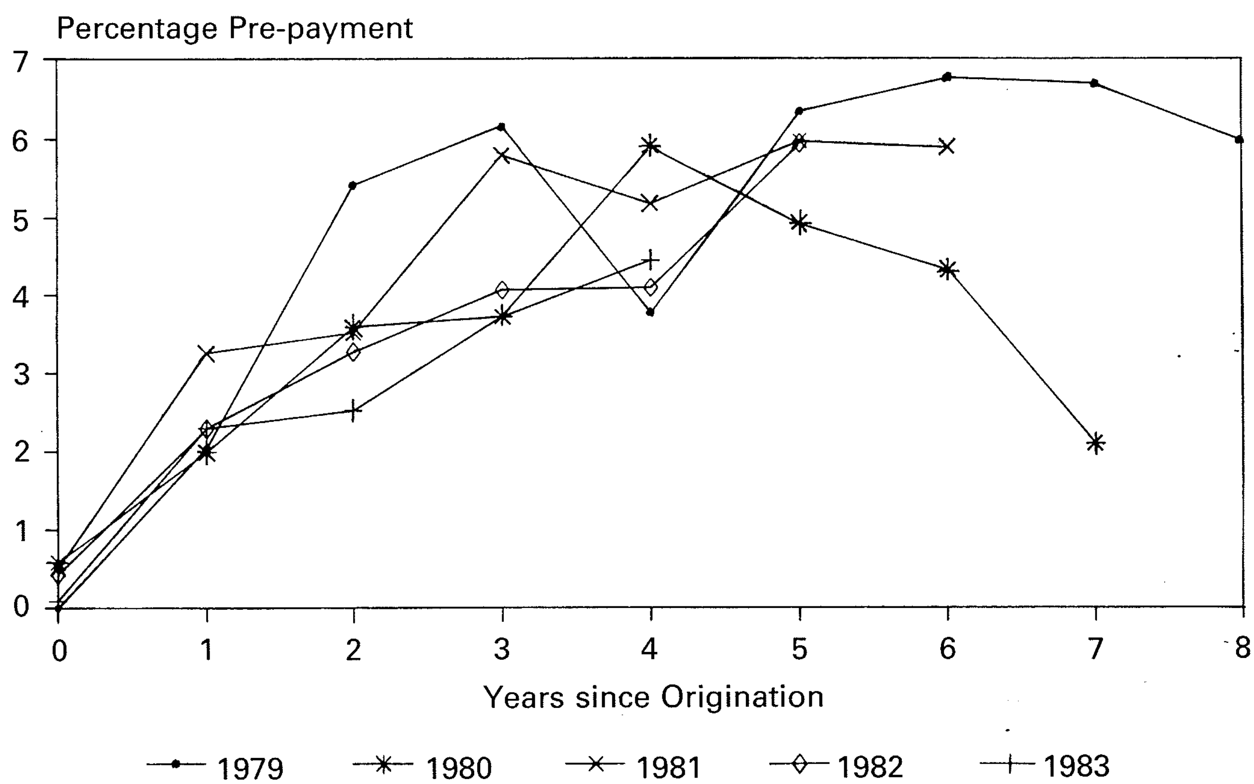
Prominent among the factors significantly related to the likelihood that a mortgage would be prepaid are: the length of the loan term, the time since the loan was originated, the age of the borrower, and the location within India where the loan was originated.

At the same time, the results show a strong negative relationship between the likelihood of prepayment and changes in the interest paid on widely held assets — a relationship which probably captures the effects of broader macroeconomic changes on prepayment as well as the pure interest rate effect.

All of the relationships just noted are strongest for the first couple of years following loan origination. In later years only the results for the term of the loan and the location of origination continue to be significant.

Finally, those prepaying are predominantly relying on some type of savings or the receipt of payments from provident or insurance funds.

Figure 2
Percentage of Pre-payments by Year of Origination



HDFC STUDY Project 3641-07

Conclusions

This analysis clearly demonstrates that mortgage prepayments are a potent factor in housing lending at HDFC and presumably at other finance institutions in India. For loans originated by HDFC in 1979, some 34% had been prepaid by mid-1987. Obviously, prepayments of this magnitude have important impacts on effective interest rates, on the match between the terms (or "durations") of mortgages and liabilities raised to finance the loans, and on the ability of the institution to make loans in the future.

As far as we know, this is the first analysis done of mortgage prepayments in a developing country. As noted, the patterns uncovered have immediate implications for efficient management of housing finance institutions. Replicating this analysis for other countries to determine if the experience of HDFC is repeated elsewhere could pay large dividends in terms of the kind of advice which could be given to housing finance institutions in many countries. ■

Table 2
Percentage of Outstanding Mortgage Prepaying Each Year, by Years of Origination[a]

Years since origination	Origination year 1979	1980	1981	1982	1983	Unweighted average
0	—	0.58	0.50	0.43	0.08	0.32
1	2.04	1.99	3.25	2.28	2.29	2.37
2	5.41	3.58	3.50	3.26	2.51	3.65
3	6.16	3.71	5.80	4.05	3.71	4.68
4	3.75	5.91	5.17	4.08	4.44	4.67
5	6.33	4.91	5.97	5.94		5.78
6	6.76	4.31	5.88			5.65
7	6.69	2.10				4.39
8	5.98					5.98
Number of loans originated[b]	892	3,129	5,063	8,483	12,880	
Cumulative percentage prepaid	33.8	23.3	24.2	15.9	10.3	

a. Last year figures are annualised rates based on first six months.
b. Based on weighted observations in the final analysis file.
c. Actual experience to July 1, 1987.
Source: Urban Institute tabulations of HDFC data.

RAYMOND STRUYK is director, International Activities Centre, The Urban Institute, Washington DC, USA, and GENEVIEVE KENNY works for the Institute. This article summarises a more complete report of the same title available from the clearinghouse/Library, The Urban Institute, 2100 M Street, NW, Washington, DC 20037. Data used in this analysis was assembled by the Housing Development Finance Corporation Ltd, of Bombay, India. Staff at HDFC also provided a number of important insights into their lending operations and the Indian housing market. The capable research assistance of Mark Friedman and Robert Dymowski is acknowledged. Charles Calhoun, Robert Buckley and Michael Lee gave useful advice at various stages of the analysis. The work reported here was partially supported by the India Mission of the US Agency for International Development.

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