The Impact of Inflation on Long-Term Housing Loans

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The extension of long-term loans, e.g. to finance housing, is adversely affected by inflation. For one thing, the higher nominal interest rates charged by the banks in response to inflation mean that borrowers have to make (nominally) higher interest payments, which unnecessarily reduces their borrowing capacity. For another, long-term loans with variable interest rates increase the probability that borrowers will become unable to meet their payment obligations.

The present paper examines these two assertions in detail. At the same time, it presents a concept for substantially reducing the weaknesses of conventional lending methodologies. We start by investigating the consequences of a stable inflation rate on the borrowing capacity of credit clients, then go on to analyze the impact of fluctuating inflation rates on the risk of default.

1. The Impact of Stable Inflation on Borrowing Capacity

For the purposes of the present analysis, borrowing capacity is defined as the loan amount which a borrower can afford to pay back at a certain monthly rate. How does inflation affect borrowing capacity?

First of all, the empirical evidence suggests that there is a very close correlation between nominal interest rates and inflation rates, i.e. that in most countries the real interest rate is relatively constant. Loans are normally paid off in (nominally) constant installment amounts. Accordingly, the maximum amount which a given customer is able to borrow (i.e. his or her borrowing capacity) is determined on the basis of the nominal interest rate. If, for example, the real interest rate is 10% and the inflation rate is 10%, a bank will determine the permissible size of the loan by calculating the cash value of a monthly installment that the borrower can afford, given a certain maturity and a (nominal) interest rate of 20%. If the borrower can afford to pay back, say, 1,700

currency units (CU) per month, and is willing to pay this amount over a 20-year period, his or her borrowing capacity works out to precisely CU 100,000.

The problem with this method of computation is that, although less than 0.5% of the loan amount is repaid within the first year in nominal terms, inflation reduces its value in real terms by 9.5%. If there were no inflation, installments of this size would only be necessary if a loan of the same size and subject to the same real rate of interest had a maturity of less than 8 years; if the maturity were to remain at 20 years, the required monthly installment would drop to only CU 965, i.e. inflation causes the installments to be 75% larger than they would otherwise need to be (see fig. 1).

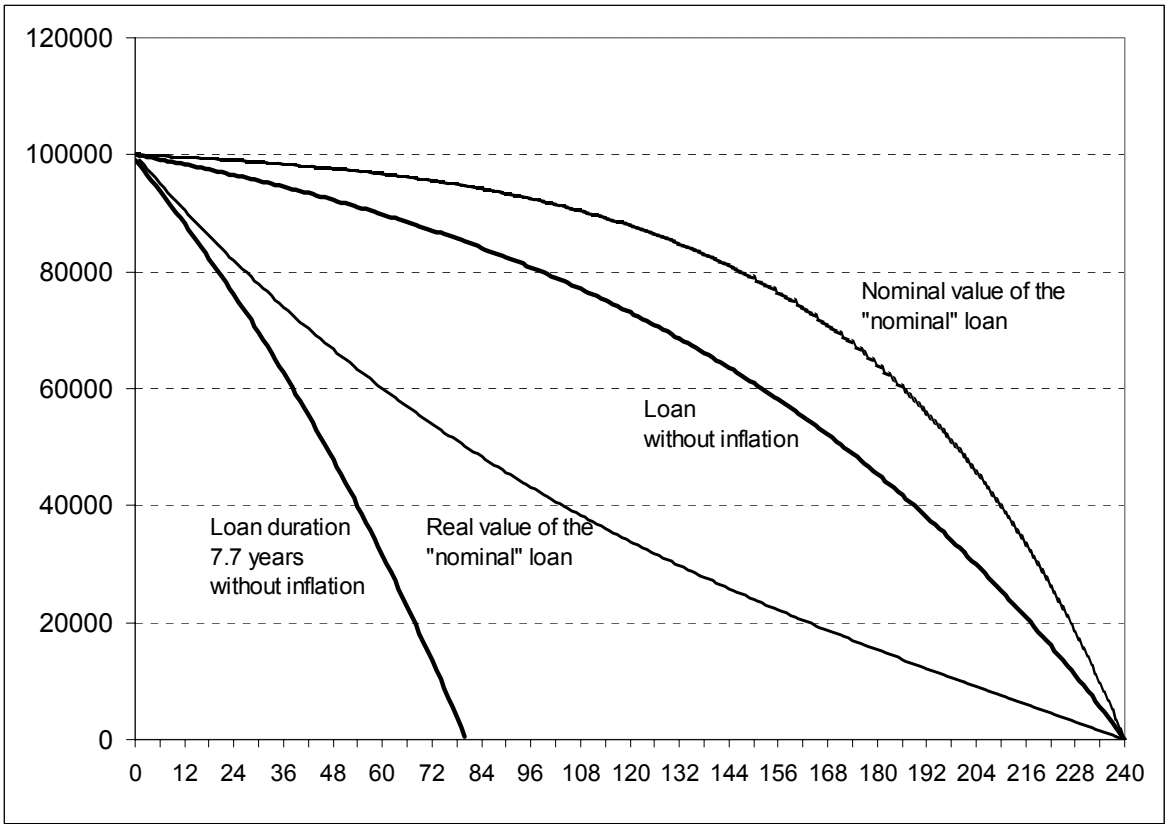

Fig. 1: Evolution of the Outstanding Balance Over Time, inflation rate of 10%

In fig. 1, note first how the outstanding balance declines over time on a CU 100,000 loan subject to an interest rate (both real and nominal) of 10% and a maturity of 20 years ("Loan without inflation"). In the early part of the term, interest accounts for the bulk of each installment, so that the outstanding balance declines only slowly at first, but picks up speed as time goes on.

The curve labeled “Nominal value of the ‘nominal’ loan” shows the evolution of a loan of the same initial size, also with a 20-year term and a real interest rate of 10%, but costing a nominal interest rate of 20% on account of a 10% inflation rate. As mentioned above, the installments on this loan have to be 75% higher than on the loan without inflation. However, as the interest rate is 100% higher, the outstanding balance declines correspondingly more slowly in the first few years, but then more rapidly near the end of the term.

It is now interesting to note the evolution of the outstanding balance in real terms (“Real value of the ‘nominal’ loan”). In contrast to the other two curves, this one is not concave but convex, i.e. in the first few years a particularly large portion of the outstanding principal is paid off (in real terms). The initial repayment amount in real terms corresponds to that of a loan issued at the same rate of interest but with a maturity of less than 8 years, provided that there is no inflation (“Loan duration 7.7 years without inflation”).

How does this convex repayment curve come about? To understand this better, consider the evolution of the monthly installment payments (fig. 2). Whereas the *nominal* value of these payments remains constant over time, regardless of whether the interest rate is adjusted for inflation, the *real* value of installment payments on the loan issued under inflation decreases from an initial CU 1,700 to a mere CU 250 in the last month before the loan matures (in terms of currency units at their real value of 20 years previously). This means that, because of inflation, the payment capacity of the borrower is utilized to an ever decreasing extent, which explains the convex repayment curve.

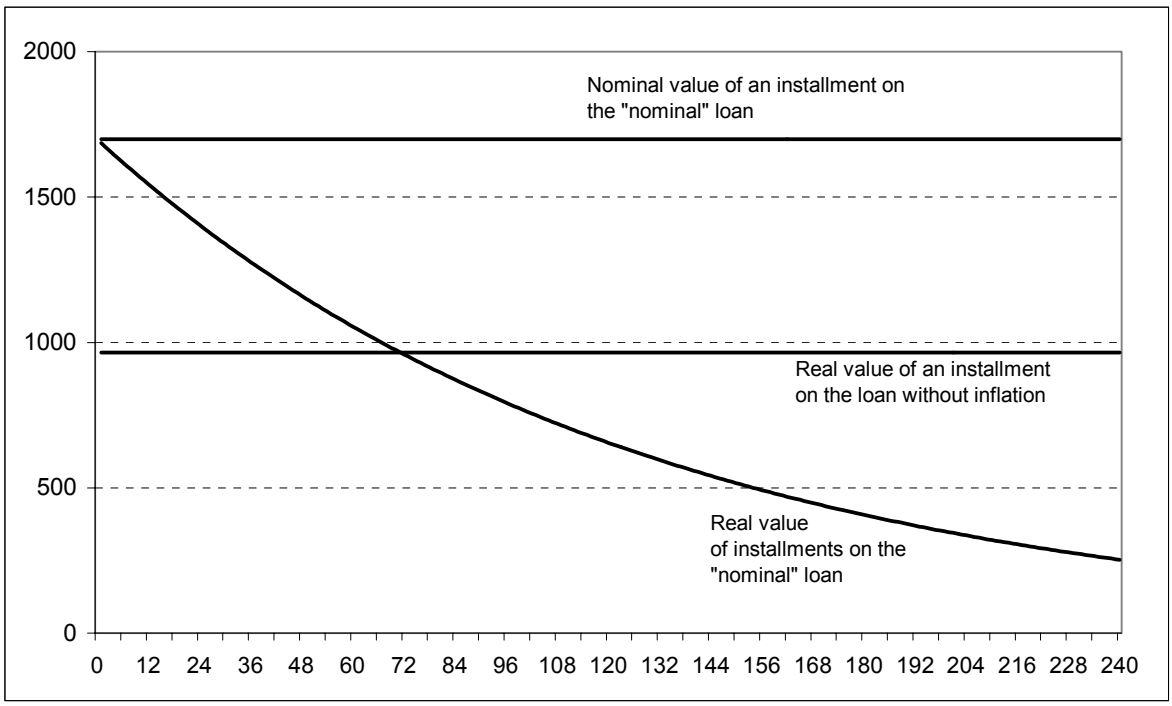

Fig. 2: Evolution of Monthly Installment Amounts Over Time

These adverse effects of inflation on the borrowing capacity of the client can be avoided by issuing loans "in real terms". "Loans issued in real terms", or "real loans" for short, are defined as loans on which the repayment installments are adjusted for inflation in order to make full use of the borrower's payment capacity. The first installments are calculated on the basis of the real interest rate, which is 10% in our example, i.e. on a CU 100,000 loan the borrower has to pay monthly installments of CU 965. The nominal interest rate is still 20%, i.e. at the beginning, interest payments of CU 1,666 per month would be due. Clearly, not all of this amount is covered by the monthly installments, the outstanding (nominal) balance rises. In real terms, however, the value of the outstanding balance declines.

To enable the borrower to pay back the loan at some stage, the installments are raised in line with inflation. This is not a major problem for the borrower, though, because his or her nominal income also rises. In the following we shall assume for the moment that the borrowers' real incomes remain constant, i.e. that their nominal incomes rise at the same pace as inflation. Optimal use can be made of the borrowers' payment capacity if the installments are also raised in proportion to inflation. Fig. 3 shows the evolution of nominal and real installments under the conditions we have just described, and also under traditional loan terms and conditions.

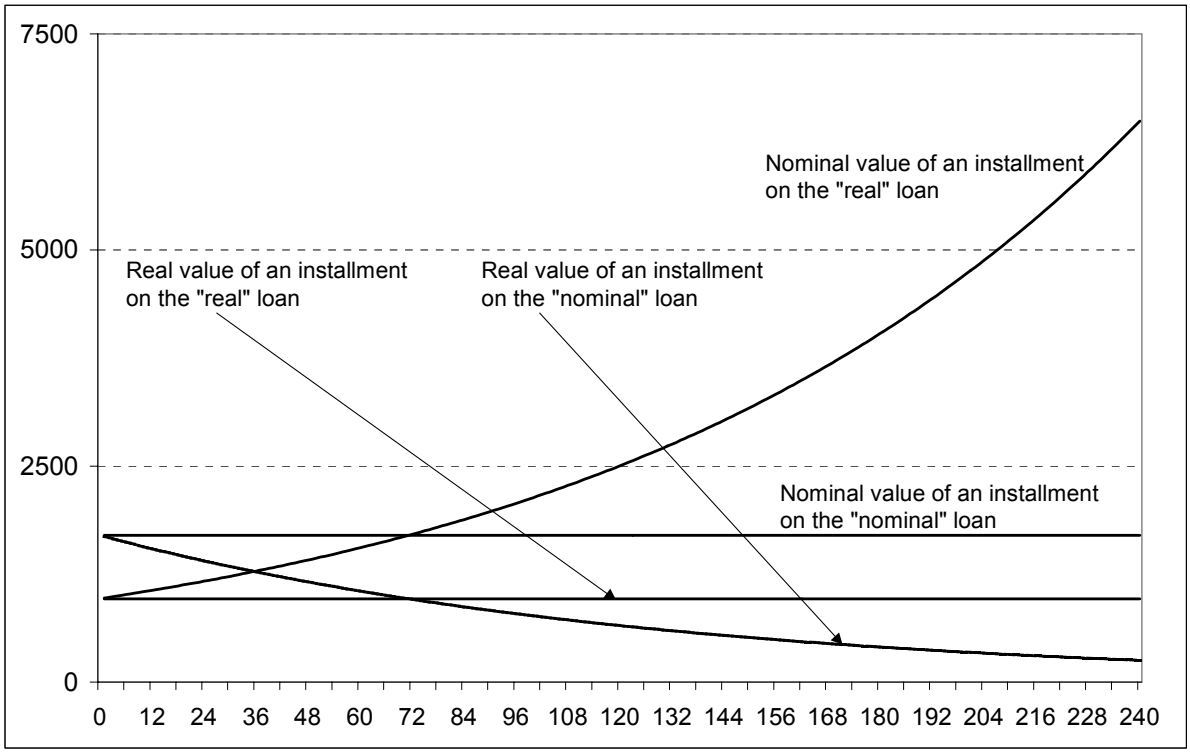

Fig. 3: Evolution of Installments Payable on a Loan "Issued in Real Terms"

The evolution of installments on loans issued using traditional methods of calculation was already depicted in fig. 2, and is shown again here merely for comparison. By lending according to the new system, i.e. "in real terms", it becomes possible to keep the real value of the installments constant throughout the duration of the loan ("Real value of an installment on the 'real' loan"). Because of inflation the nominal value of the payments naturally rises, which is no problem for the borrowers because their nominal incomes also rise so that the monthly cost of borrowing remains constant relative to their incomes.

What happens to the outstanding balance of a loan issued "in real terms"? As mentioned above, the installment payments are not even enough to cover the (nominal) interest due. So can loans ever be paid off at all under this system? The evolution of the outstanding balance is shown in fig. 4.

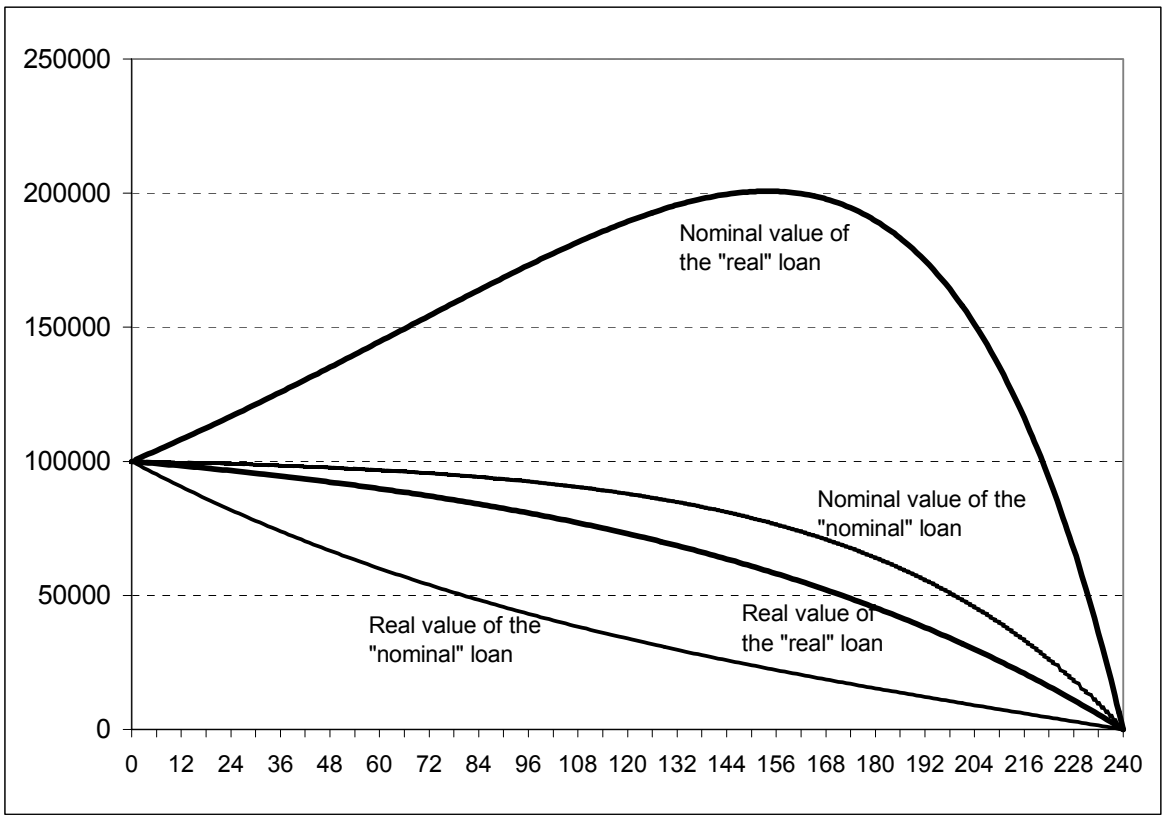

Fig. 4: Evolution of the Outstanding Balance of a Loan "Issued in Real Terms"

Fig. 4 also includes, for the purpose of comparison, the curves of the outstanding balance of a loan issued using traditional methods of installment calculation. With loans issued "in real terms", the real value of the outstanding balance declines exactly as though there were no inflation at all. The nominal value, however, continues to rise for many years – as long as the installments are smaller than the nominal amount of interest due monthly to the bank. For a number of years, the rise in the nominal installment amount is offset by the bank's new compound interest claims, which accounts for the almost linear increase in the nominal outstanding balance during the first few years.

Under the assumed conditions, i.e. a maturity of 20 years, a real interest rate of 10% and a constant inflation rate of 10%, the nominal outstanding loan balance rises for almost 13 years, peaking at twice the amount (in nominal terms) that was originally disbursed. In real terms, however, more than 40% of the loan has already been paid off at this point in time. Accordingly, the nominal value of the outstanding balance drops very steeply during the remaining years to maturity.

After precisely 20 years this loan is also paid off. The advantage of this system is that either borrowers have to pay a much lower installment during the early – critical –

years, or alternatively, if they opt to pay installments as large as they would under the traditional system, they can afford to borrow a 75% larger amount. In other words, the system substantially increases the customer's borrowing capacity.

Of course, the scale of the effects described above are a function of the inflation rate. Higher inflation rates produce stronger effects, while lower inflation rates produce less pronounced effects. Yet even if the inflation rate is only 4%, given a real interest rate of 10% the customer's borrowing capacity increases by more than 27%. If the real interest rate is only 5% and the inflation rate 4%, borrowing capacity increases by as much as 35%. In other words, even if inflation rates were relatively low, introducing the "real loan" system would make a significant positive difference to the customers' borrowing capacity.

2. The Impact of Fluctuating Inflation Rates on the Credit Risk

So far we have only analyzed how a constant inflation rate influences borrowing capacity. However, the assumption that inflation will remain constant is extremely unrealistic, and served merely to illustrate the point we were making. Let us now abandon this assumption.

In many developing countries, inflation rates have fallen over the past few years and in some cases are on a similar level to those in industrialized countries. Nonetheless, there is simultaneously a relatively high degree of uncertainty regarding the future development of inflation rates, and this uncertainty is repeatedly fuelled by instances of sudden devaluation accompanied by a surge of inflation.

To guard against uncertain inflationary expectations, banks issue long-term loans – which they typically finance with short-term deposits – subject to variable interest rates. As a rule, real interest rates, especially for short-term deposits, tend to be relatively constant. If the inflation rate rises, and with it the nominal interest rate on deposits, the terms of the loan agreement allow the banks to adjust the interest rate payable on loans to reflect the increases on the deposit side.

However, this practice is rather risky, not only for the banks but also for the borrowers, as shown below. Fig. 5 shows the evolution of monthly installments both under traditional lending methods and under lending in "real terms". Here it is assumed that

the loans are issued at a time when the inflation rate is 0. After a year the inflation rate rises to 24%, falling to 12% in the third year. This cycle is then repeated every three years, i.e. the inflation rate is 0, then 24%, then 12%, then 0, etc.

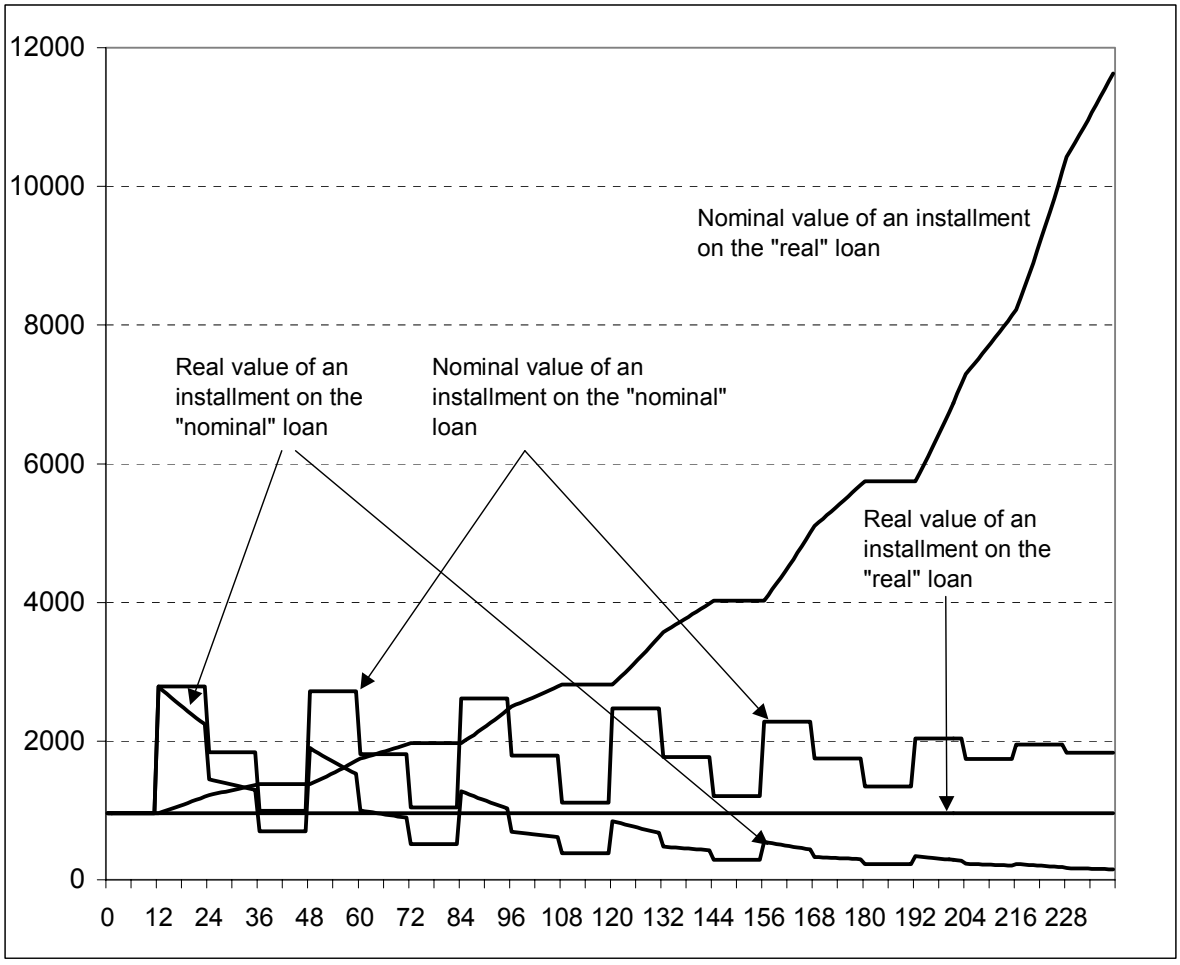

Fig. 5: Evolution of Installments Under Changing Rates of Inflation

Each time the rate of interest has to be changed in response to inflation, a bank using the traditional method calculates the size of installment that would be needed to exactly pay back the loan by the maturity date if the new rate of interest were charged throughout the remaining term to maturity. In the first year, because the inflation rate is 0, the size of the installments is the same irrespective of the method of computation. However, in the second year, when inflation rises to 24%, the size of the installment payable under the traditional method increases by 190% from one month to the next. Assuming that the income of the borrower also increases, but only by 24% (i.e. already at the average rate for the year), the portion of his or her income required to pay off the loan would increase by more than 130%. Thus, a borrower who was having to spend 25% of her

income on loan repayment installments when inflation was 0 would now find herself having to spend nearly 60% of her income on installments. She will probably not be able to spare that much from her income and is therefore likely to default.

A large percentage of borrowers will be in the same situation, i.e. unable to pay because of higher inflation. The banks will have to seize and sell collateral, which in the case of mortgage loans means the borrower's house. Yet while the supply of houses suddenly increases, demand for them falls because potential buyers would now have to pay higher interest rates on mortgages; as a consequence, real estate prices will fall sharply. This in turn means that the banks are not able to raise enough by selling the collateral to cover the full amount of the loans still outstanding. So, despite losing their houses, the borrowers remain in debt to the banks, yet these debts are no longer backed by any kind of security, leaving the banks with little alternative but to write off a large percentage of the loans. In this respect, the rise in the inflation rate deals a very painful blow to banks and borrowers alike.

Fig. 5 also shows the evolution of installments on loans issued in "real terms". In this case the real value of the installments remains constant over the entire duration of the loan, whereas the nominal values rise in line with inflation. Even if the borrower's income does not start to rise immediately after inflation has begun to surge, he will still only have to spend 31% of his income on installments during the first year of inflation, assuming that he was paying 25% of his income during the year of zero inflation. If the increase is that small, most borrowers will still be capable of keeping up with their payments. In the following years his income will probably rise faster than inflation so that, viewed over the medium term, his income in real terms will remain relatively constant. In that case, the proportion of his income that must be spent on repaying his loan will return to 25%. Thus, full use is made of his payment capacity over the long term too, without his becoming unable to pay at any time.

The evolution of the outstanding balance is shown in fig. 6. During the first year (zero inflation) the outstanding balance declines uniformly, irrespective of the method applied. In the second year, assuming that the borrower does not default, application of the traditional method causes the curve of the real value of the outstanding balance to become convex. Using the "real terms" method, the rate of decline of the real value of the outstanding balance is exactly the same as if the inflation rate were 0, whereas the nominal value of the outstanding balance changes irregularly due to the changing

inflation rates. However, here too, as in the case of a constant inflation rate, the nominal outstanding balance increases for many years before falling sharply during the last few years so that after 20 years the loan has been repaid in full.

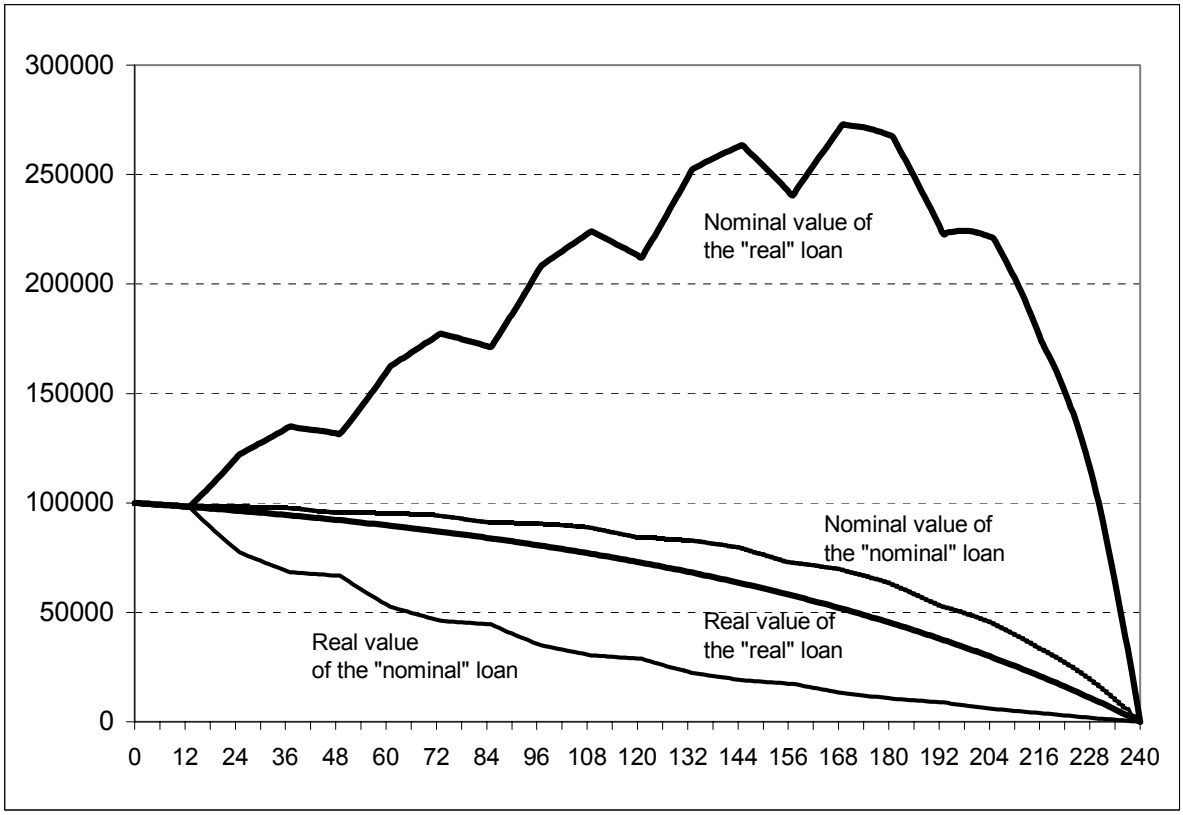

Fig. 6: Evolution of the Outstanding Balance Under Changing Inflation Rates

In the example represented in figs. 5 and 6 both the banks and the borrowers run a high risk if the traditional lending methodology is used because a sudden increase in the inflation rate can render a large number of borrowers incapable of paying. However, it is also conceivable that a loan is issued at a time when inflation is already running relatively high, so that changes in the inflation rate are likely to be downward. This scenario is modeled below: Let the inflation rate in the first year be 24%, dropping to 12% in the second and 0 in the third. As in the previous example, this progression is also repeated in three-year cycles. The evolution of the requisite repayment installment amounts is shown in fig. 7.

In the scenario presented here the real value of installments paid according to the traditional method already start falling during the first year. In the second year the inflation rate falls, by assumption, and therefore so does the nominal interest rate, not only reducing the nominal installment amount but also causing a sudden sharp decline

in the real value of the installments. This pattern is repeated in the third year. In the fourth year, when inflation leaps back up to 24%, the nominal value of the installments rises very substantially, but is not as high as it was in the first year, while the real value increases much less markedly. Thus, in this scenario, fluctuating inflation rates put neither the bank nor the borrower at risk.

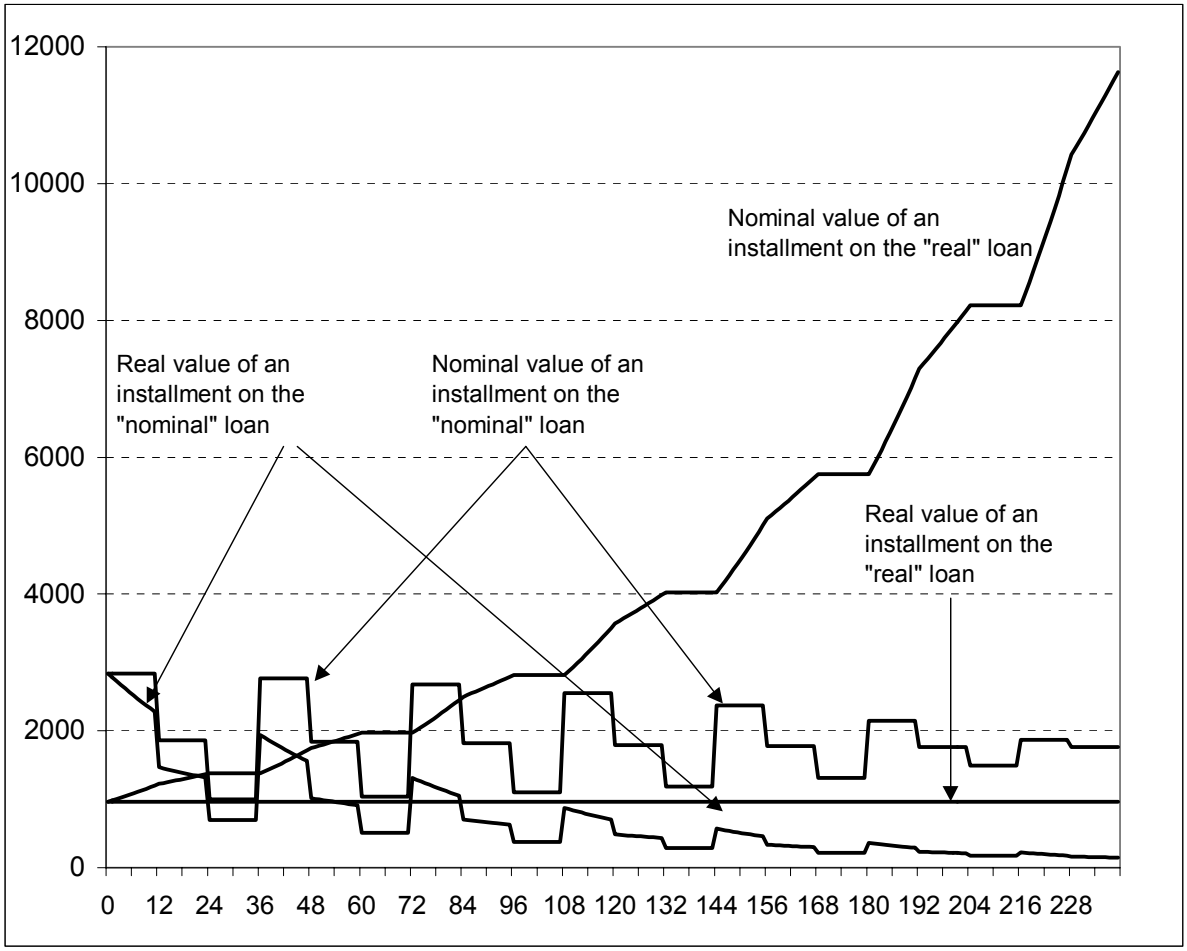

Fig. 7: Evolution of Installments Under Initially Falling Inflation Rates

Nonetheless, during the first year the loan installment costs incurred by the borrower are almost three times as high as they would be under a loan issued in real terms. In other words, the borrowing capacity of the same borrower is roughly 65% lower under the traditional method than under the “real” method, i.e. the maximum amount he or she can afford to borrow given a certain payment capacity (when the loan contract is concluded) is only one third of the amount he or she could borrow if the loan were issued in real terms. In this scenario, therefore, the problem is not the risk but the borrowing capacity of the client.

Here too, let us analyze the evolution of the outstanding balance of the loan over time. The low borrowing capacity of the customer under the traditional lending method is hardly surprising when one considers the real value of the installment that he or she must pay at the start of the credit relationship. After one year the real value of the outstanding balance has already declined by nearly 20%. Under zero inflation, a repayment of that size during the first year would not even occur on a loan with a 5-year maturity.

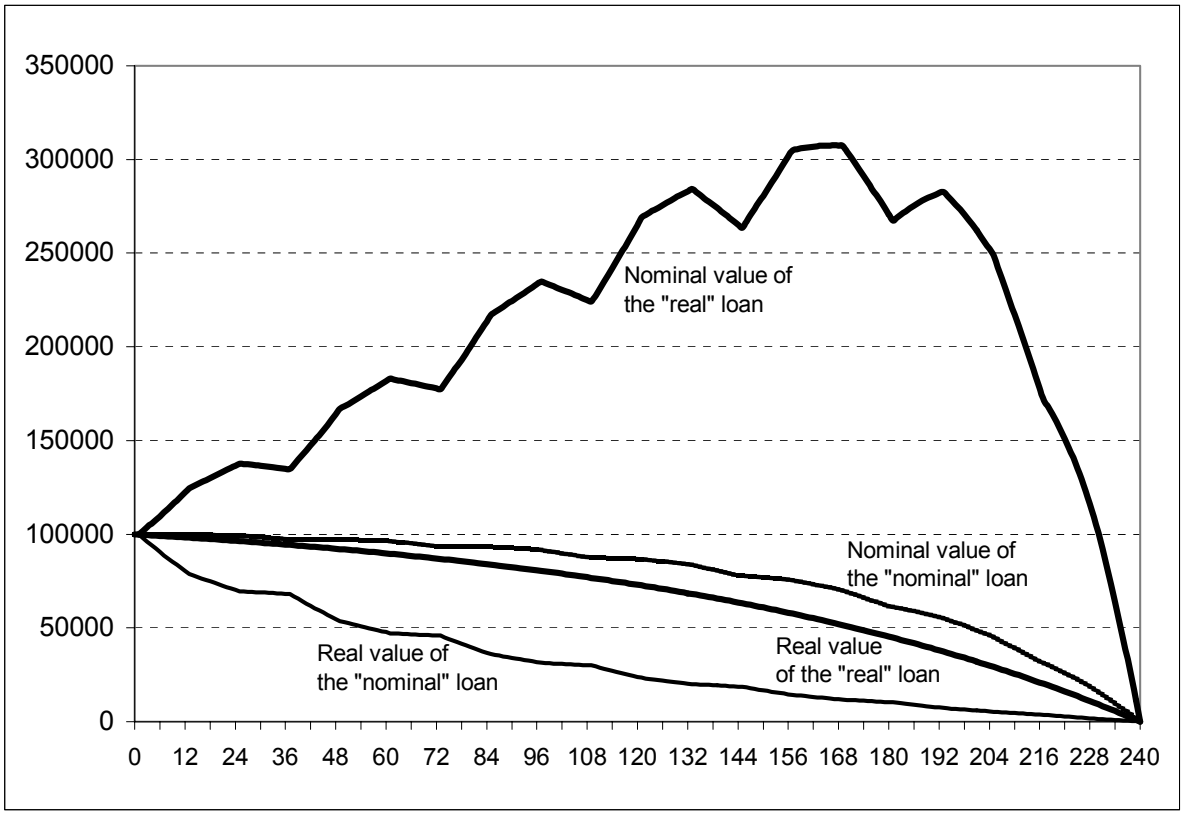

Fig. 8: Evolution of the Outstanding Balance Under Initially Falling Inflation Rates

3. Conclusions

Traditionally, repayment plans are based on nominal interest rates. If we plot the curve of the resultant outstanding balances or installment payments over time in real terms, i.e. adjusted for inflation, we can observe that inflation reduces the borrowing capacity of customers because they have to pay absurdly high repayment installments during the early years. If the inflation rate rises after a loan agreement has been concluded, and therefore – assuming that variable interest rates have been agreed – the nominal interest rate also rises, both the bank and the customers incur a disproportionately high risk of default. As a consequence, banks have to be extremely cautious when issuing long-term loans in order to avoid excessively high risks. Thus, inflation, or even the mere uncertainty caused by expectations of inflation, has a strongly adverse impact on long-term lending.

These adverse effects can be avoided if long-term loans are issued "in real terms". According to this system, the size of the installments due are calculated on the basis of the real interest rate and are adjusted for inflation throughout the life of the loan. This can mean that the nominal value of the outstanding balance increases during the first years; however, in real terms, the loan is repaid as if there were no inflation and the interest rate would correspond to the real interest rate. Compared with traditional lending methods, this not only increases the borrowing capacity of the clients, i.e. the maximum amount that they can afford to borrow given a certain payment capacity, but also the probability that the borrowers will continue to be able to pay their installments even if inflation rates go up.

A precondition for the successful application of this new concept is that charging compound interest is legally permissible. As explained above, the nominal outstanding balance can substantially exceed the original nominal loan amount. If banks were not allowed to charge compound interest, it would not be economic for them to use the new method because they would not earn any interest on a part of their outstanding loans.

In many countries, compound interest is banned in order to prevent borrowers from becoming overindebted. In the case of long-term loans in an inflationary environment, however, this ban leads not to over- but to underindebtedness. The effect this has on mortgage loans means that many families who could otherwise afford to buy a home of their own are prevented from doing so.