New Financial Instruments for Financial Risk in Inflationary Conditions
Financial Index Linked Loans

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Summary

This paper refers to "Financial Index Linked Loans" as a way to reduce the exposition to interest rate risk pointing out several important aspects related to indebtedness capacity, evolution of payments in real terms and their relationship to the evolution of the salaries of individuals.

It indicates a proposed system for loans in inflationary conditions as a way to coordinate the lender profitability and the borrower capacity to afford payments during the loan term.

Résumé

Nouveaux Instruments Financiers pour le Risque Financier dans des Conditions Inflationnistes
"Prêts Financiers Indexés"

Cet article traite des "Prêts financiers indexés" comme une façon de réduire l'exposition au risque de taux, soulignant plusieurs aspects importants liés à la capacité d'endettement, l'évolution des paiements en monnaie constante et leur relation avec l'évolution des salaires des individus.

Il présente un système proposé pour les prêts dans des conditions inflationnistes comme une façon de coordonner la profitabilité de prêteur et la capacité de l'emprunteur à pouvoir effectuer les paiements pendant la durée du prêt.

1.- Introduction

Last year I submitted to the 1st AFIR International
Colloquium a paper on "Issue and Analysis of Bonds in
Inflationary Conditions", where different index clauses
and their consequencies in the valuation process were
considered.

Now it is my intention to discuss medium and long term
loans to individuals with "financial index clause", as a
way to reduce the exposure to Interest Rate Risk for the
Financial Institutions, where the duration of the assets
is longer than that of the liabilities, and also to take
into account the credit risk.

2.- Nature of the problem

In countries with a relative stable economy it is usual
that medium and long term loans, such as Mortgage Loans,
are traded considering the following repayment systems
of the principal always with periodical(monthly) payments
of interest computed on the outstanding principal:

a) payment of the principal at the end of the term.
b) equal payments of principal
c) equal installments, including principal plus interest.

When inflationary conditions appear, the rates of interest are adjusted according to the level of the inflation and also on account of the uncertainty and the monetary policy. So it is necessary to consider the new situation in the former systems in order to take care of the economical, financial and social factors.

Practice shows these alternatives:

A.-to use the same described systems with floating rates of interest.

B.-to employ financial index clauses to the traditional repayment systems.

C.-to defer interest payments, that is to say that each periodical payment includes only a portion of the interest of the current period, adding the remaining portion of interest to the principal.

Each of these has different effects on:

a) indebtedness capacity of the credit applicant
b) the amount of future loans payments and funding (cash flow or financial aspect in current and real terms.),
c) the periodical "spread" between the rates of interest for loans and deposits and cost of legal reserves requirements, (benefits or economical aspects)

d) the evolution of relative prices:

      d-1) salary (social and credit risk factor)

      d-2) collaterals (outstanding principal vs. value of the collaterals).

The purpose of this paper is to show the consequencies of the above effects and to propose a repayment system that may take into account all of these aspects.

3.- Loans with floating rate of interest

In economic terms the floating rate of interest includes the rate of inflation and a real rate of interest. In the practice the rate of interest used in loans is not directly obtained through the rate of inflation, it is a result of the bid and offer rates of the money market where the Government puts into practice its monetary policies, generally increasing the level of the rates of interest by generating illiquidity.

It is important to note that the inflationary conditions will produce three effects in real terms:

a) an uncertain rate of real return. Because interest rates do not evolve equally to inflation.

b) an uncertain cash flow, because payments of interest includes inflation compensation plus real return.

c) a potential credit risk, because salaries do no evolve in the same proportion that interest rate does. An increase in the rate of interest may cause an increment in the periodical payments that would be higher than the inflation level. This is because the relative change of

the floating rate of interest may be higher than the rate
of inflation (or the rate of nominal increment of
salaries).

Another aspect to deal with is the indebtedness capacity
of the applicant because in this case the first payment
of interest is a proportion of the principal equal to the
interest rate, which level is according to the inflation.
High rates of inflation produce high amounts of interest
and this causes a small indebtedness capacity in terms of
number of monthly salaries.

4.- Financial Index-linked loans:

In this case the loan generally has a fixed rate of
interest to be applied to the adjusted outstanding
principal and the peridiocal payments are being linked to
the evolution of the financial index.

The index is built with the interest rates of the money
market considering a specific interest rate for deposits
or loans as a reference, also it may be built according
to the mean value of the interest rates on a group of
deposits for each period, and also include the cost of
the legal reserve requirements.

Linking loans to a financial index may present a
correlation risk according to the position of the
financial institution over the money market. But in
general, it is possible to hedge reasonably the interest
rate risk.

The credit risk appears if the periodical variation of
the index is higher than the general inflation level,

this occurs when the money market has positive interest
rates in real terms and also because salaries tend to
evolve negatively in real terms, specially when we
consider increasing rates of inflation.

Finally it is important to say that we have a higher
indebtedness capacity because the first payment of
interest is proportional to a relative small rate of
interest, which is applied to the adjusted principal
amount. This indebtedness capacity is similar to that
considered in countries without inflation.

5.- Deferring interest payments

In this case the basic idea is to pay periodically only a
portion of the interest of the period (or a fixed rate)
computed on the outstanding principal at the beginning of
the period, and to include the non-paid interest in the
outstanding principal for next period, with the condition
that at the end of the term the remaining principal is
cancelled.

When we consider a small portion of the interest to be
paid, the outstanding principal might present an
increment in real terms and this is reflected in the
subsequent payments, so they might increase
proportionally more than the salary. Appendix I shows
this aspect, which has been taken from real experience.

6.- Proposed System

An adequate system for loans in inflationary conditions
must take into account the interest rate risk and the
credit risk. The former due to uncertainty on the money

market rate and the real interest rate level, and the latter due to the decreasing real evolution of salary during inflation periods and the real rate of interest included in the evolution of the financial index.

So it would be necessary to put into practice a system which provides a suitable initial payment according to the salary and the amount of principal, and a tendency towards a decreasing evolution of the periodical payments in real terms. The idea is that payments should be a decreasing proportion of the salary and therefore they would be always affordable.

A solution I consider appropriate to treat this problem is to use:

a) an adequate financial index that in addition to the interest rate of the loan, would give a fair prospective current rate of interest,

b) a decreasing geometrical progression to determine the amounts of the periodical payments before applying the index clause. The rate of the geometrical progression should be selected in order to estimate a decreasing evolution in real terms of the periodical payments. So we have:

a) rate of interest per period of the loan: "r"
b) rate of decrease of the payments: "z"
c) number of periodical payments: "n"
d) Principal: "V(o)"
e) payments, without indexation: "c(p)", for p = 1,
                                        2, ... n

f) equation of value:

$$V(o) = c(1) \times \frac{1 - [(1-z)/(1+r)]^n}{r + z}$$

g) recursive relationship between payments:

$$c(p) = c(p-1) \times (1 - z)$$

h) financial index for each payment: " Y(p)",for p = 0, 1, ...n

i) monetary values:

    1.- payments: $c(p;p) = c(p) \times [Y(p)/Y(o)]$

$$c(p;p) = c(p-1;p-1) \times (1 - z) \times [Y(p)/Y(p-1)]$$

    2.- outstanding Adjusted Principal:

$$V(o;o) = V(o)$$

$$V(p;p) = V(p-1;p-1) \times [Y(p)/Y(p-1)] \times [1 + r] - c(p;p)$$

$$V(n;n) = 0$$

j) monetary evolution of the payment: "u(p-1,p)":

$$u(p-1,p) = [c(p;p)/c(p-1,p-1)] - 1$$

$$= (1 - z) \times [Y(p)/Y(p-1)] - 1$$

$$= (1 - z) \times [1 + wf(p-1,p)] - 1$$

u(p-1,p) = (1 - z) x [1+w(p-1,p)] x [1+ir(p-1,p)] - 1
where:
wf(p-1,p): is the rate of variation of the financial
index for period "p".
w(p-1,p): is the rate of inflation for period "p".
ir(p-1,p): is the real rate of interest contained in
"wf(p-1,p)", thus:
    ir(p-1,p) = [wf(p-1,p) - w(p-1,p)] / [1 + w(p-1,p)]

The proposed system has two important applications, one
is for long term loans, such as Mortgage Loans, and the
other is for medium term loans. The former case allows to
an adquate indebtedness capacity with estimated
decreasing payments in real terms it the origin. The
latter gives alternatives between loans with floating
rates of interest and financial index linked loans,
because the amount of the first payment of principal
and interest may be chosen between the corresponding
amount of those signalled.

Appendix II shows the relationships above described.

7.- Final Remarks

We have considered several aspects of loans in
inflationary conditions and signalled the interest rate
risk and the credit risk in loans for individuals, such
as mortgage loans.

It is important to remark that the analysis of loan
conditions much consider the effect of the inflation on
the social and economic background in the long term, and
that not necessarily traditional loans or index-linked

versions are suitable for loans for individuals.

The selection of a financial index is a very important task, and it is desired that it consider the cost of funding in an objective manner and in a prospective way, independently of the level of the interest rates of the market and costs of legal reserves requeriments and taxes.

APPENDIX I

Argentine Experience in Deferring Interest Payments

From 1978 to 1982 several loan and savings companies put into practice Mortgage Loans for home purposes with deferring interest payment and individuals were granted loans for approximately 10 years in monthly installments. The Loans considered floating interest rates which were determined by adding to the market mean rate of interest for certificates of deposit in general 2% points monthly.

The borrowers were obliged to pay only a small proportion of the interests of each month, i.e. 0,50% of the accumulated amount of outstanding principal and deferred interests. So in each month, the additional accumulated amount of deferred interest was a result of the floating rate of interest less 0,50% points.

This practice allowed to a relative large indebtedness capacity, because the first payment of interest was only of 0,50% of the principal. Note that usual loans granted by commercial banks considered by this time index linked loans with an annual rate of interest of at least 12%, so the first payment of interest were at least of 1% of the principal.

As there was a long period of positive rates of interest in real terms or at least close to inflation rates for certificates of deposit, payments became difficult to be afforded and borrowers had to sell their houses to pay the loans, and also as the outstanding debt had increased in real terms sometimes this was not enough to cancel the debt.

This illustrates the risks of deferring interest payments during inflationary conditions, and that it is important to take into account prospective evolution of the payments in real terms according to their proportion in respect to the borrower's salary.

APPENDIX II

Examples on the Proposed System

A.- Periodic payments of a loan as a function of the term, "n", and the rate of decrease, "z", of the payments.

Principal: $V(0) = 100.000$

Monthly rate of interest: $r = 1\%$

Term in months.

First and Last Payments including interest and repayment of principal:

n \ z	0%		2%		4%	
12	8,885	8,885	9,881	7,912	10,959	6,994
36	3,321	3,321	4,530	2,234	5,958	1,428
120	1,435	1,435	3,083	279	-.-	-.-

B.- Remarks:

1.- The first column considers equal monthly installments ubject to a financial index clause. For a 120 months loan the monthly installment prior to indexation is equal to 1,435.

2.- When the rate of decrease "z" is introduced, the initial payment is greater, i.e. for z = 2% varying from 3,083 to 279 and the payment number 38 is the first one smaller than 1,435, always prior to indexation.

3.-If we consider as an example a monthly current rate of interest of 6%, the fixed installment would be of 11,928 for a 12 months loan, and of course, in inflationary conditions, it would be subjet to adjustments due to a floating interest rate clause. The different values of "z" give a range of alternative payments, according to the desired evolution of the payments in real terms and the desired indebtedness capacity.