

Debt Retirement Methods

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Types of Amortization Methods

Bullet loan – The entire principal of the loan is due at the end of the loan term. This is an **interest-only loan**. The payments prior to maturity are only to offset the interests.

Constant-payment loan - A sequence of equal-size payments, each of which is composed of the interest due plus a portion of the principal.

Constant-principal loan - The principal amortizations is constant throughout the life of the loan.

Total Number of Payments is determined by

- the term of the loan.
- the payment frequency.

(**e.g.** A 30 year loan financed with monthly payments will require 360 payments over the life of the loan.)

Amortization of Debts and Amortization of Schedules

Log term Amortization – constant payment loan
(example home mortgage)

- the interest at each payment → slowly decrease;
- the portion going to the principal → slowly increase



- ❑ Early in the life of the loan → Principal is large → the amount going to pay interest will make up most of the payment.
- ❑ Near the end of the loan → Principal is quite small → the amount going to the principal will make up most of the payment.



Lending institution will often provide the borrower with an

Amortization Schedule



- Details every payment and how it is split between principal and interest.
 - Gives the outstanding balance at any given payment.
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Amortization of Debts and Amortization of Schedules

List of terms needed to know in order to set up a home mortgage:

1) Cash Price (of a home or car) → the price actually paid (including taxes). That cash is always present value or current value

(e.g. A home may be advertised for 129.000€, but if you can buy it with an offer of 125.000€, that is the cash price.)

2) Down Payment (for a home loan) → the actual amount of money paid on the home before borrowing any money. Unless related costs are added to the loan, this will be the present value of the loan annuity.

(e.g. Conventional loans through banks often require that 20% of the cash price be paid as down payment. Hence, a 125.000€ house might require a 25.000€ down payment.)

3) Closing Costs (for a loan) → charges associated with the borrowing process; the lending institution will charge an origination fee to process the paperwork and to pay their staff. Sometimes the lender will charge a percent of the principal.

Amortization of Debts and Amortization of Schedules

List of terms needed to know in order to set up a home mortgage:

- 4) Payment (for a loan)** → is based on the compounded interest rate and the term of the loan. The principal borrowed is simply the present value of an ordinary annuity, from which we calculate the resulting payment.
- 5) Amortization Schedule** → table giving five entries at each payment: the number of the payment (or date); the euro value of the payment; the interest due at that payment; the amount that will go to principal; and the balance. → *Main purpose*: show how the payment is split between principal and interest and the balance left on the loan

(e.g. First 5 lines of an amortization table for a 100.000 € loan at 8%(12) for 30 years.)

Payment No.	Payment	Interest Paid	Principal Paid	Balance
0				100.000,00 €
1	733,77€	666,67€	67,10 €	99.932,90 €
2	733,77€	666,22€	67,55 €	99.865,35 €
3	733,77€	665,77€	68,00 €	99.797,35 €

Outstanding Balance during the Term of a Loan

Most home mortgages are not continued for the entire term because either they are refinanced or the property is sold

In order to Refinance a Loan, **Outstanding Balance** must be known.

(Definition) → is the principal still to be paid, and is often the amount of the new loan.

Most common reason people refinance their mortgage:

Lower the interest rate
(if the mortgage was taken out during a time of high rates but current rates are now lower → refinancing will be an excellent choice.)

These must be deducted from the actual savings in interest charges

Cost of refinancing will usually include:

All the typical closing costs.

The length of a loan's term that remains after refinancing will also have a bearing on the choice to refinance

People refinance in order to change the term of their loan:

- Decrease the term of their loan → save interest by paying the loan more quickly.
- Increase the term of their loan → they find that their payment is too large for their income level.

Outstanding Balance during the Term of a Loan

Approaches for finding out the Outstanding Balance:

1) Find the Present Value of the remaining payments:

Finding the present value of the remaining payment is often referred to as the **Prospective Method**. The prospective method is forward looking. It calculates the loan balance as the present value of all future payments to be made.

Outstanding balance of the m remaining payments and a total number of n payments:

$$\text{Balance}_m = P * a_{(n-m)|i}$$

2) Find the difference between the accumulated value of what has actually paid and the original principal accumulated to the date of the refinancing:

This method is often referred to as the **Retrospective Method**. The retrospective method is backward looking. It calculates the loan balance as the accumulated value of the loan at the time of evaluation minus the accumulated value of all installments paid up to the time of evaluation.

Outstanding balance after m payments:

$$\text{Balance}_0 \times (1 + i)^m - P \times s_{m|i}$$

Example

A house loan of 400,000€ was to be repaid over 20 years (240 months) by monthly constant payments of an annuity-immediate at the nominal rate of 5%(12) per year. After the 24th payment was made, the lender was decided to repay the remaining loan.

Example

The amount of the monthly payments is:

$$P = 400,000 / (a_{240|0.05/12}) = 400,000 / 151.525 = 2,639.82\text{€}.$$

By the Prospective Method, after the 24th payment the loan would be redeemed with a 216-payment annuity-immediate so that the balance is:

$$P \times a_{216|0.05/12} = 2,639.82 \times 142.241 = 375,490.64\text{€}$$

By the Retrospective Method:

$$\begin{aligned} 400,000 \times (1+0.05/12)^{24} - 2,639.82 \times s_{24|0.05/12} &= \\ &= 441,976.53 - 2,639.82 \times 25,186 = 375,490.02 \text{ €} \end{aligned}$$
