

Time value of money

Real-Estate Investments - Tutorial 2

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Mortgages

Mortgages are loans designated for investments in real estate.

Mortgage pricing (or interest, i) is derived from:

- ▶ Real rate of interest (r).
- ▶ Inflation (f)
- ▶ Risk premium (p):
 - ▶ Possible future changes in interest rate or inflation rate.
 - ▶ Prepayment risks.
 - ▶ Liquidity risks
 - ▶ Risk of default.

Mortgage pricing follows : $i = r + f + p$

Mortgages - important terms

- ▶ Loan amount
- ▶ Maturity date
- ▶ Interest rates
- ▶ Periodical payment = interest payment + amortization payment

Fixed rate mortgage (FRM) mortgage loans

Type	Pay rate	Loan balance at maturity
Fully amortizing	Greater than accrual rate	Fully repaid
Partially amortizing	Greater than accrual rate	Not fully repaid
Interest only	Equal to accrual rate	Equal to amount borrowed
Negative amortizing	Less than accrual rate	Greater than amount borrowed

Amortization: The process of loan repayment over time.

Types of FRM

Fully or Partially amortizing: - *Constant payments* - A constant payment is calculated on an original loan amount, at a fixed rate of interest for a given term (= *Annuity mortgage*).

Interest only: - *Zero Amortizing* - Constant payments will be “interest only”.

Negative Amortizing: - Constant payments are lower than the periodic interest. Outstanding value at maturity is greater than borrowed.

Other: - *Constant amortization* - Payment is calculated based on a fixed amortization rate, interest is calculated based on the remaining outstanding amount (= *Linear mortgage*).

Exercises (in Excel)

Ex. 1

You are renting an apartment in the center of Amsterdam for a monthly payment of 1000 Euro. You find out that your landlord wants to sell the apartment, and you consider whether to buy it yourself.

The asking price for the property is 250,000 Euro. The bank agrees to approve a **constant payment loan** for 100% of the value, with an interest rate of 4% per year, compounded monthly, maturity in 20 years.

1. Use the *PMT* function in excel to recover what would be your monthly mortgage payment if you decide to buy.
2. You prefer to invest a monthly payment which is not higher than the value you currently pay for rent. Given the bank's offer, what would be the highest value you can pay for a house? (use Excel's *PV* function).
3. The bank advises you on different types of mortgages, in which your monthly payment can be lower. For instance, *Interest only* mortgage. What would be the monthly payment if you accept this loan?

Ex. 1. Answers

1

```
pmt(0.04/12, 20*12, -250000, 0)  
= 1,514.951
```

2

```
pv(0.04/12, 20*12, 1000)  
= 165,021.9
```

3

```
pmt(0.04/12, 20*12, -250000, 250000)  
= 833.3333
```


Ex. 2

1. Alternatively, the bank offers you a **linear mortgage**. Open an excel file and calculate - What would be your monthly payments? Remember:
 - ▶ Monthly payment *is not* constant. It is equal to $PMT = \text{Amortization (Fixed)} + \text{interest (changes with outstanding amount)}$
 - ▶ conditions are as before: loan value = 250,000, $T = 20 \cdot 12$, interest = 4%.
 - ▶ For more information please follow page 103 in the book.

Ex. 2. Answers

1. See excel sheet.

Ex .3

It is 2007, interest rates are high and housing prices have been increasing for almost 15 years. You believe it is a good time to invest, and that interest rates will remain high in the future (perhaps even increase!).

1. Which of the fixed-rate mortgage loan types (*constant payment, interest only, constant amortization*) would you prefer to accept, given your expectations? (and why?)

Ex. 3. Answers

1.

- ▶ We assume interest rates to remain stable, or increase.
- ▶ “Constant payment” and “constant amortization” loans lead to full amortization at maturity. “Interest only” loan leads to zero amortization, and the outstanding amount has to be paid in full.
- ▶ Assuming that interest rates will increase implies that mortgage payments of *all* loans will reflect gain (the difference between the loan rate and market rate), but “interest only” loan will reflect the highest gain.