Mortgages

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 = intrerest 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 (from the book)

Problem 1 (P.108)

A borrower obtains a fully amortizing CPM loan for \$125,000 at 11 percent interest for 10 years. What will be the monthly payment on the loan? If this loan had a maturity of 30 years, what would be the monthly payment?

Problem 1 answer

```
# 1
pmt(0.11/12, 10*12, -125000, 0) =
1721.88
```

Problem 6 (P.108)

A 30-year fully amortizing mortgage loan was made 10 years ago for \$75,000 at 6 percent interest. The borrower would like to prepay the mortgage balance by \$10,000.

1. Assuming he can reduce his monthly mortgage payments, what is the new mortgage payment?
2. Assuming the loan maturity is shortened and using the original monthly payments, what is the new loan maturity?

Problem 6 answer

```
# 6a
First, calculate payments value:
pmt(0.06, 30, -75000, 0) = 5,448.6

Then calculate PV of mortgage for the next 20 years:
pv(0.06, 20, -5448.6) = 62,495.01

Then calculate new mortgage payment, after 10,000 prepayment:
pmt(0.06, 20, -(62495.01-10000), 0) = 4,576.75


# 6b
Calculate maturity given prepayment and original pmt:
nper(0.06, -5448.6, 52495.01-10000) = 14.81
```

Problem 8 (P.108)

A fully amortizing mortgage is made for \$80,000 for 25 years. Total monthly payments will be \$900 per month. What is the interest rate on the loan?

Problem 8 answer

```
# 8
12*rate(25*12, -900, 80000) = 13%
```

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, compunded 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 advices 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. The government discusses limiting the LTV rate to 80%. If this is the case, how long will you need to save before you can buy? (assuming that you save 1000 euro/month, same as your rate payments)
2. 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 $PMT = Amortization\ (Fixed) + interest\ (changes\ with\ outstanding\ amount)$
- conditions are as before: loan value = 250,000, T = 20*12, interest = 4%.
- For more information please follow page 103 in the book.

Ex. 2. Answers

```
# 1
0.2*250000 = 50,000
nper(0.04/12,-1000, 50000)/12 =

4.56 years
(Assuming no price increase will occur in the meanwhile)
```

2. See excel sheet.

Ex .3

The bank eventually offers you a **constant payment** loan for 250,000, with a monthly payment of 1000 Euro and maturity in 40 years.

1. What interest rate does this loan represent?

It is 2008, interest rates are high and housing prices have been increasing for almost 15 years. You believe it is a good time to invest so you decide to buy. Unfortunately, in the following year the market value of the house has dropped by 15% (= 212,500).

What would be the monthly mortgage payment if you would have bought in 2009 instead of 2008?

2. Under *constant payment* loan?
3. Under *Interest only* loan?

Ex. 3. Answers

```
# 1. About 3.7%
12*RATE(480, -1000, 250000) =
3.71%

# 2.
pmt(0.04/12, 20*12, -212500, 0)
= 1,287.708

pmt(0.04/12, 20*12, -212500, 0)-
pmt(0.04/12, 20*12, -250000, 0)
= -227.242

# 3.
pmt(0.04/12, 20*12, -212500, 212500)
= 708.3333

pmt(0.04/12, 20*12, -250000, 250000)-
pmt(0.04/12, 20*12, -212500, 212500)

= -125.0
```