

Lesson Plan

NEUROHEADWAY

Neuroscience Into Education

Lesson Plan - Effective and Nominal Interest Rates

- The quantity of work is for two 45- minutes' lessons- one is for deriving the formula and understanding the concept by using the Power point presentation; the second lesson is for consolidation by solving the problems in the worksheet.

Pre-knowledge

- Substitution into a formula
- Solving algebraic equations
- Converting percentages to decimals and decimals to percentages

Aims

- To learn the basic terminology in Mathematics of Finance- effective and nominal interest rates
- To be able to convert one to another type of interest rate depending on the period of compounding
- Development of ability to make financial decisions- right choice of bank depending on the bank's offer for interest rate
- Logical thinking.

Resources

- Power Point
- Worksheet

Activities

- By following the Power Point presentation, the learners need to learn the basic formulae and do the examples together.
- In groups or individually they must solve the application problems in the worksheet.

Worksheet

The worksheet is divided into three sections:

Section A- easy questions for the lower ability pupils

Section B- middle level of difficulty questions

Section C- advanced (difficult) questions for the gifted and talented pupils.

Note: The learners are encouraged to use a calculator only once in their solution in Mathematics of Finance. Only the final answer should be rounded off.

Power point Example

TERMINOLOGY

Interest rate per year, compounded yearly (once a year) is known as an **effective interest rate**.

If the interest rate per year is compounded in smaller periods of time (eg. semi-annually, quarterly, monthly, weekly, daily, etc.), then it is a **nominal interest rate**.

Future value with **effective interest rate**:

$$F = P(1 + i_{eff})^t, \text{ where}$$

P is the present value,

t is the time in years.

Future value with **nominal interest rate**:

$$F = P\left(1 + \frac{i_{nom}}{m}\right)^n, \text{ where}$$

P is the present value,

m is the frequency of compounding per year,

$n = m \cdot t$, where t is the time in years.

If the time t is one year, then the future value from both formulae is the same.

Then $P(1 + i_{eff}) = P(1 + \frac{i_{nom}}{m})^m$ [$t = 1$; divide by P]

$$1 + i_{eff} = (1 + \frac{i_{nom}}{m})^m$$

This equation shows the relationship between the effective and the nominal rate of compound interest.

$$1 + i_{eff} = (1 + \frac{i_{nom}}{m})^m$$

1) Make i_{eff} the subject of the formula:

$$i_{eff} = (1 + \frac{i_{nom}}{m})^m - 1$$

Note: We use this formula to **convert a nominal interest rate to effective**.

Teachers Evaluation and Handouts

Effective and Nominal Interest Rates - Worksheet

In each question round your answer off to two decimal places (if necessary).

Section A.

1. Convert the given nominal interest rate to an effective:
 - (a) 6.8% per annum, compounded monthly
 - (b) 10% per annum, compounded semi-annually
 - (c) 12% per annum, compounded weekly.

2. Convert 9% per annum effective interest rate to yearly nominal, compounded
 - (a) monthly
 - (b) quarterly
 - (c) daily.

3. Convert 8.2% effective interest rate to a nominal interest rate compounded every two months.

Section B.

1. Mary would like to invest a certain amount of money into a bank account.

The bank offers her two options:

A- interest rate of 8.2% per annum, compounded quarterly

B- interest rate of 8.4% per annum, compounded semi-annually.

Which one of the two options is better?

2. You can invest £10, 000 for 7 years at an effective interest rate of 9.75% per annum or at an interest rate of 9.4% per annum, compounded monthly.
 - (a) Determine which investment is better by comparing the interest rates.
 - (b) Calculate the difference in the future values of the two options.

Section C.

1. Your bank offers a nominal interest rate of 7% p.a. compounded monthly. What would the nominal annual interest rate need to be to give the same rate of return if the compounding period were daily instead of monthly?
2. Which one of the following three plans offered by a bank is the best for investing money for one year:
 - A. An effective interest rate of 8.3% per annum
 - B. A nominal interest rate of 8.6% per annum compounded quarterly
 - C. Simple interest of 9%?
3. Inflation has been running 3% every 6 months.
 - a) What is the effective interest rate of the inflation?
 - b) A car now costs £16 000. How much would the same car have cost 5 years ago?

Answers:

Section A.

1. a) 7.02%
b) 10.25%
c) 12.73%
2. a) 8.65%
b) 8.71%

Section B.

1. The better option is B
- 2.a) First option
b) £85.79

Section C.

1. 6.98%
2. Option C
3. a) 6.09%
b) £11 905.50

c) 8.62%

3. 7.93%