FINANCE

01 SEPTEMBER 2014

Lesson Description

In this lesson we:

- Revise the definitions: simple and compound interest.
- Work with the formulae for appreciation and depreciation to calculate interest
- Calculate nominal and effective rates.

Summary

Simple Interest

Simple interest is calculated as a percentage per annum of the total amount borrowed.

The amount of interest charged is the same each year if the annual interest rate remains the same.

Simple Interest Formulae

$A = P (1 + i \cdot n)$

- P is the amount borrowed or invested and is called the principal amount.
- i is the interest rate per annum.
- n is the number of years for which the money is invested or borrowed.
- A is the accumulated amount, which includes P together with the interest.

Compound Interest

Compound interest is calculated on the amount in the account at the end of each compounding period. This amount comes from the principal amount together with the interest earned at the end of each period.

Compound Interest Formulae

$A = P (1 + i) n$

- P is the amount borrowed or invested and is called the principal amount.
- i is the interest rate per annum.
- n is the number of years for which the money is invested or borrowed.
- A is the accumulated amount, which includes P together with the interest earned.

Compound Interest over different time periods

- Annually Interest is calculated and added at the end of each year.
- Semi-annually (half-yearly). Interest is calculated and added at the end of every six months.
- Quarterly Interest is calculated and added at the end of every three months.
- Monthly Interest is calculated and added at the end of every month.
- Daily Interest is calculated and added at the end of every day.
- The compound interest formula needs to be adapted when interest is added more frequently than just once a year.

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Depreciation is the loss of value of an asset through use or age

Depreciation

Is normally calculated in two different ways, depending on the type of asset.

- Straight line depreciation is calculated as a percentage of the original value of the asset and is the same each year. The value of the asset reduces to zero over time.
- Reducing balance depreciation is calculated as a percentage of the previous year's value. In this case the depreciation changes each year and decreases as the asset loses value. With reducing balance depreciation the asset always retains some value.

Book value is the value of the asset after depreciation has been taken into account

A nominal interest rate is one where the interest rate quoted and the compounding periods are different. Examples of nominal interest rates:

- 12% per annum compounded quarterly
- 9% per annum compounded monthly

It is common practice to quote interest rates per annum, but the compounding period can be quarterly or monthly or daily. These interest rates are called nominal interest rates.

An effective interest rate is one where the interest rate quoted and the compounding period is the same. Examples of effective interest rates:

- 12% per annum compounded annually
- 1% per month compounded monthly
- 2,5% per quarter compounded quarterly

$$1 + i_e = \left(\frac{i_n}{m}\right)^m$$

i_e is the effective annual interest rate.

i_n is the nominal interest rate.

m is the number of compounding periods in one year.

Test Yourself

Question 1

Lerato invests R12 500 for 5 years at 12% p.a. compounded monthly for the first 2 years and 14% p.a. compounded semi-annually for the next 3 years. How much will Lerato receive in total after 5 years?

Question 2

R55 000 is invested for 10 years.

- The interest rate for the first five years is 8% p.a. compounded annually.
- The interest rate is then increased to 12,5% p.a. compounded quarterly for the next two years.
- Thereafter it is decreased to 11% p.a. compounded monthly, for the remaining time.
- An amount of R8 000 was withdrawn 8 years after the investment was made.

Calculate the value of the investment at the end of 10 years.

Question 3

A man decided to start saving money for his daughter's future education. He immediately deposited R4 000 into a savings account. Three years later, he deposited a further R5 000 into the account. One year later, he withdrew R2 000 in order to do repairs around the house. His daughter needed the money four years after his withdrawal of R2 000. The interest rate for the first three years was 15% per annum compounded monthly. The interest rate for the remaining 5 years was 16% per annum compounded quarterly. Calculate the future value of his money at the end of the savings period which lasted 8 years.

Question 4

Which of the following interest rates would be the best investment over a period of five years?

    a.) 14,2% p.a. compounded annually
    b.) 13,9% p.a. compounded quarterly
    c.) 13,7% p.a. compounded daily
    d.) 13,85% p.a. compounded monthly

Improve your Skills

Question 1

Thabo sells his business for R430 000 when he is 32 years old. He decides to save the money for his retirement. He deposits the money into a pension fund where the interest earned is 14% p.a. compounded annually. Calculate how much money he will have saved by the time he is 65 years old, assuming that the money was invested for 33 years.

Question 2

A car rental company buys a fleet of cars at a cost of R3,2 million.

    a) Calculate the book value of the fleet of cars after five years if the depreciation is calculated at 16% p.a. on a reducing balance.
    b) Calculate the cost of replacing the cars at the end of five years if the price of new cars is expected to escalate at a rate of 8,5% p.a.

Question 3

Kate deposits R3 500 into a savings account.

Three years later, she adds R 4 000 to the savings account. The interest rate for the first two years is 8% per annum, compounded monthly. Thereafter, the interest rate changes to 10% per annum compounded half yearly.

Calculate the value of the savings at the end of the sixth year.

Question 4

Tsholofelo invests R39 000 for 5years.

She receives interest of 12% p.a. compounded monthly during the first two years.

The interest rate changes to 14% p.a. compounded semi-annually for the remaining term.

Calculate the value of the investment at the end of 5 years.

Question 5

Sam invests R50 000 at 14% p.a. compounded annually. Ben invests R50 000 at 13,7% p.a. compounded monthly. Determine:

    a) who had the most money at the end of 20 years
    b) the difference in their investments after 20 years.