

# TIME VALUE OF MONEY

Study Unit 10

FAC1601

# OVERVIEW

- Simple interest
- Compound interest
- Present value
- Future value
- Annuities

# SYMBOLS USED

- ⦿  $i$  = interest
- ⦿  $n$  = period
- ⦿  $PV$  = Present value
- ⦿  $FV$  = Future value

# SIMPLE INTEREST

- Interest calculated on ONLY the principal amount.

- Principal amount + interest = future value

- Example

- Invest R100 000 at 6% interest for 3 years:

- Principal 100 000

- Interest (100 000 x 0.06 x 3) 18 000

- Thus: Future value 118 000

- Thus:

- Future value = Principal x [1 + (i x n)]

- Principal = FV / [1+(i x n)]

# COMPOUND INTEREST

- Interest on interest (capitalised interest)
  - Interest is added to principal amount and ‘new’ interest is calculated on total.
- Using previous example:
  - Year 1
    - Principal amount 100 000
    - Interest (100 000 x 6%) 6 000
  - Year 2 106 000
    - Interest (106 000 x 6%) 6 360
  - Year 3 112 360
    - Interest (112 360 x 6%) 6 742
- Thus:
  - Principal (Present value) 100 000
  - Total interest 19 102
  - Future value 119 102

# PRESENT VALUE

- Current value of future cash flows
  - Use discounting rate

- If compound interest

$$PV = \left[ \frac{FV}{(1 + i)^n} \right]$$

- If simple interest

$$PV = \left[ \frac{FV}{\{1 + (i \times n)\}} \right]$$

# FUTURE VALUE

- ◉ End value of amount invested in present
- ◉ If compound interest:

$$FV = PV(1 + i)^n$$

- ◉ If simple interest

$$FV = PV[1 + (i \times n)]$$

# ANNUITIES

- ⊙ Series of equal payments
  - ⊙ Made at equal intervals of time (payment period)
- ⊙ Term
  - ⊙ Period between first & last payment
- ⊙ Various types
  - ⊙ FAC1601 → only deal with ordinary annuities
    - Payment made at the end of each period

# ANNUITIES - FUTURE VALUE

## ◉ Formula

$$FVA = Pmt \times \left[ \frac{(1 + i)^n - 1}{i} \right]$$

## ◉ Table

- Table 2: Future value of an Annuity of R1 invested for n periods.
- Use intersection between applicable period and interest rate → factor
- $FV = PV \times \text{factor}$

## ◉ HP Calculator

- $PV = 0$  (*Amounts are only invested/paid at the end of each period*)
- $PMT$  = amount paid/invested at end of each period
- $I/YR$  = interest rate
- $N$  = periods
- $FV = ?$

# ANNUITIES - PRESENT VALUE

- ◉ Value at beginning of initial period
  - ◉ Discounted value
- ◉ Formula

$$PVA = Pmt \times \frac{1 - \left[ \frac{1}{(1 + i)^n} \right]}{i}$$

- ◉ Table
  - ◉ Table 4 → Payment x factor per table
- ◉ HP
  - PMT = payment per period
  - N = number of periods
    - Number of periods per year x number of years.
  - I/YR = interest per period
    - If periods are not annual, remember to adjust rate
      - ◉ E.g. 16% per annum, but periods are quarterly, interest per period =  $16/4 = 4\%$ .
  - PV ??