WEEK 3 – TIME VALUE OF MONEY

PRINCIPLE 3: Risk requires a reward

- The risk is that you could lose purchasing power over time (due to inflation) plus you may require premiums for other risks over time such as the risk of default, risks faced with a longer term to maturity and loss of liquidity over time.

PRINCIPLE 2: Money has a time value

- A dollar today is worth more than a dollar tomorrow
    - Your money makes money from interest rate it receives

E.g. $100,000 today or $100,000 next year

- Preference would be to use it today (current consumption) rather than deferred consumption (a year from now)
- Individuals deserve a form of reward/compensation for parting with their money
- Reward is the required rate of return (simple or compounded)

Investing $100,000 today you earn interest on that amount.

The future value (FV) of your $100,000 would be the principal plus interest

So, getting $100,000 today is worth more than getting $100,000 in the future

E.g. 10% pa.

VALUE = $100,000 (today) + 10% (of $100,000) = $110,000 in one year

So, $110,000 is the opportunity cost of spending $100,000 today

SIMPLE INTEREST:

Annual Percentage Rate (APR) also called simple interest

- Indicates the amount of interest earned in one year **without the effect of compounding**
- Return is earned only on principal invested (interest does not change each year)

Because the APR does not reflect the true amount you will earn over one year, the APR itself cannot be used as a discount rate.

COMPOUND INTEREST:

- The return that is earned on the principal invested and interest earned on that interest

Future value (FV)

- Determining the future value of an investment in x amount of time

Formula:

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

e.g.

$1,000, 6% p.a. compounded, 5 years

FV = $1000 \times (1 + 0.06)^5 = \$1338.23$

Present value (PV)

- Present value of lump sum cash flow
- When you are finding the present value (deposited etc.) the terminology used for interest date is discounted rate

Formula

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

e.g. value of $105,000 benefit received one year from now, interest 10% p.a

FV = $105,000

i = 10% p.a

n = 1 yr.

PV = $95,454.55 – value that needs to be invested today

COMPOUNDING WITH NON-ANNUAL PERIODS

Interest isn't earned or paid annually, i.e. paid monthly, quarterly, half yearly

Formula to determine FV of compounding an investment m times a year for n years

$$FV = PV \times (1 + i/m)^{m \times n}$$

EFFECTIVE ANNUAL RATE (EAR)

- Known as compound interest represents the total amount of interest that will be earned at the end of one year
- **True interest rate** expressed as if it were compounded once per year
  e.g. converting a quarterly rate to an annual rate – taking in account compounding that has occurred quarterly within the year

Formula

$$\mathbf{EAR = (1 + i / m)^{m} - 1}$$

Calculator

i = interest rate in decimal e.g. 12% - 0.12

m = times compounded per year e.g. 2 (semi-annually)

0.12 / 2 = 0.06

0.06 + 1 = 1.06

1.06 ^2 = 1.1236 – 1

= 0.1236

12.36%

Other types of interest rates

- **Nominal interest rates** the rate at which your money will grow if invested for a certain period (also referred to Annual Percentage Rate APR)
  - Most commonly used when financial products are quoted
  - Does not include compounding and inflation
- **Real interest rate**
  - Accounts for inflation or loss of purchasing power
    Approximately = nominal rate = inflation rate
- **Effective rate** is the rate at which your money will grow if invested compounded on a non-annual basis (i.e. weekly, monthly, quarterly, half yearly etc.)
  - Includes the effect of compounding

NOMINAL RATE = nominal risk free rate + premiums

REAL RATE = real risk-free rate + premiums