Reading 1: The Time Value of Money

How an Interest Rate is determined

Risk Premium:

- Default risk premium -- Can he pay me back?
- Liquidity risk premium -- How easy is it to convert to cash?
- Maturity risk premium -- How long does he take to pay me back?

Nominal Risk-free Rate: (min return an investor expects for any investment)

- Inflation Premium -- How much inflation is expected over this period
- Real risk-free rate -- Single-period interest rate for a risk-free security when there is no inflation

Required Interest Rate on a security = Nominal Risk-free Rate + Risk Premium

---

Interpretation of Interest Rate

Key factors when interpreting interest rate:

(can be same or slightly different depending on context)

1. **Required Rate of Return**

   Required rate of return is the minimum rate of return an investor would wish to earn to postpone current consumption.

2. **Opportunity Cost** *(note that it might be slightly different than interest rate)*

   Opportunity cost is a key factor in interpreting interest rates. It refers to the interest foregone when investors opt for an alternate option, such as spending on current consumption instead of saving or investing

3. **Discount Rate**

   The discount rate refers to the interest rate used to discount future cash flows to reach the present value.

Calculate FV of a single Cash Flow

Future Value of a single cash flow

$$FV = PV(1+r)^N$$

FV = Future Value

PV = Present Value

r = periodic interest rate

N = number of periods

$(1+r)^N$ = Future Value Factor

Make sure the r and N corresponds to the right time period. The default of "interest rate" often refers to annual interest rate.

"p.a" = per annum ===> "4.95% p.a" = an annual interest rate of 4.95%

Also, be careful when asked "total interest earned" or "how much total interest can someone expect to earn":

Total Interest Earned = $FV - PV$

Effective Annual Rate (EAR) / Effective Annual Yield (EAY)

Effective Annual Rate (EAR) -- how much interest is effectively being paid in a whole year

$$EAR = (1+r)^N - 1$$

EAR allows us to compare interests that are compounded at different frequencies on an even platform.

E.g. It can be used to compare which bank has a better deal (they might have different p.a and different pay periods).

Continuous Compounding

Continuous Compounding -- The compound frequency becomes infinite

$$EAR_{cont} = e^r - 1$$
$$FV_{cont} = PV \times e^{rN}$$

Present Value of a single cash flow