Aston Business School

Week 3 Financial Decision making

BN2255 – Business Analytics in Practice

Topics of this presentation

- Interest rates and inflation
  - The time-value of money
- Compounding formula
- Present value and NPV

Interest and inflation

- A given amount of money is worth more **now** than in the future. Why?
  - future is uncertain
  - inflation
  - opportunity cost – we could always take the money now, invest it and withdraw a higher amount in the future
- The value of money over time is given by the interest rate
  - $P_n = P_0*(1+i)$, where
    - P_n is the principal at the end of the investment
    - P_0 is the starting principal (starting capital)
    - i is the interest rate for the whole investment
- When taking inflation into account:
  - Real interest rate = nominal (actual) interest rate – inflation rate

Compounding formula

- For multiple time periods:
  - $P_n = P_0*(1+i)\text{\textasciicircum}n$, where
    - n is number of period our starting capital is compounded
  - known as the compound interest formula, the cornerstone of financial decision-making
- Can be rearranged to derive:
  - the sum we must invest now in order to be able to withdraw a given sum after a given number of periods
    - $P_0 = P_n / ((1+i)\text{\textasciicircum}n)$
  - the rate of interest that will increase the starting capital to a given future sum after a given number of periods
    - $i = (P_n / P_0)\text{\textasciicircum}(1/n) -1$

Present value

- Present value: the value of a future payment in today's money
  - How much is £1000 in two year's time worth **now**?
  - $PV = P_x / ((1+i)^{(n_x)})$
- Assumes:
  - No risk involved in waiting
  - Stable (constant) interest rates
  - No inflation (although we can accommodate a constant rate of inflation)
- PV essentially converts all payments to a common value, ie money valued in the present
- Necessary for valuating investments!

Net present value (NPV)

- Most common approach on investment valuation
- Steps:
  - Calculate the sum of the present value of all future inflows from the investment
    - Include the residual value of the investment!
  - Calculate the sum of the present value of all outflows (present and future)
    - Include the actual cost of the investment!
  - The difference of the two is the net present value of the investment
    - If positive, the investment is worthwhile; if negative, the investment should not be undertaken
- Main issue: how to derive an appropriate interest rate?
  - use cost of capital
    - the costs required to finance the investment (eg the bank's interest rate)
    - the opportunity cost of the capital (what return would we expect if we invested that amount to another project/product?)

Extra reading…

- Financial decision-making is covered in most textbooks that deal with quantitative techniques in business

- See for example:

  - **Quantitative Methods for Decision Makers**, Wisniewski – Chapter 15

  - **Quantitative Methods: for Business, Management and Finance**, Swift & Piff – Business Modelling – Chapters 4

  - **Quantitative Methods For Business Decisions**, Curwin & Slater – Chapters 19