Exercise 2 continued

- Calculate the present value of £1,000 due at the end of 15 years.
  - Calculate the annual effective rate of discount implied by the transaction above.
- A continuous payment stream is received at a rate of $20e^{-0.01t}$ units per annum between $t = 10$ and $t = 15$. Calculate the present value of the payment stream.

Exercise 3 - Tutorial 5 Q1

- The force of interest, $\delta(t)$, is a function of time and at any time $t$ (measured in years) is given by:
  - $\delta(t) = 0.07 - 0.005t$ for $t \leq 8$
  - $\delta(t) = 0.06$ for $t > 8$
- Calculate the present value at time $t = 0$ of a continuous cash flow paid at the rate of £$200e^{0.1t}$ paid from $t = 10$ to $t = 18$.
Example 7

- A continuous cash flow is received for 12 years and the rate of payment at time \( t \) is \( 10e^{0.05t} \). The force of interest, \( \delta(t) \) is constant at 0.07.
- Calculate the accumulated value of the cash flow after 12 years.

Example 8

- The force of interest, \( \delta(t) \), is a function of time and, at any time \( t \) (measured in years) is given by the formula:
  - \( \delta(t) = 0.06 \) for \( 0 \leq t \leq 4 \)
  - \( \delta(t) = 0.1 - 0.01t \) for \( 4 < t \leq 7 \)
  - \( \delta(t) = 0.01t - 0.04 \) for \( 7 < t \)
- Calculate the discounted value at time \( t=5 \) of £1,000 due for payment at time \( t=10 \).
Lecture 5 summary: discounted values continued

- Discounted value at time $t_1$ of any cash flow is:

$$
\text{discounted value} = \sum_{t} C_t \times \frac{v(t)}{v(t_1)} + \int_{0}^{T} \rho(t) \times \frac{v(t)}{v(t_1)} dt
$$

- where
  - $C_t$ are the discrete cash flows, and
  - $\rho_t$ are the continuously payable cash flows.

Lecture 5 summary: accumulated amount

- For a continuous cash flow paid at rate $\rho(t)$ and received from time $a$ to time $b$, the accumulated value at time $b$ is:

$$
\int_{a}^{b} \rho(t) \times \exp\left(\int_{t}^{b} \delta(s) ds\right) dt
= \int_{a}^{b} \rho(t) A(t, b) dt
$$