

QUESTION

The rate of interest is 8%. What will £100 be worth in three years' time using

- (a) simple interest
- (b) annual compound interest.

You may assume that the UK will not join EMU in that time.

ANSWER

- (a) Simple interest pays only on the original amount M_0 . Thus if the rate is r ,

$$M_1 = M_0 + M_0r; M_2 = M_1 + M_0r; M_3 = M_2 + M_0r$$

or after T periods of interest

$$M_T = M_{T-1} + rM_0 \Rightarrow M_T = M_0(1 + rT)$$

Thus if $r = 0.08(8\%)$, $T = 3$, $M_0 = 100$

$$M_3 = 100 \times (1 + 0.08 \times 3) = \text{£}124$$

- (b) Compound interest pays on the original investment M_0 plus any interest so far. Thus if the quoted annual rate is r ,

$$M_1 = M_0(1+r); M_2 = M_1(1+r); \dots; M_n = M_{n-1}(1+r) \Rightarrow M_t = M_0(1+r)^T$$

Clearly compound interest pays more than simple interest, since

$$\underbrace{(1+r)^T}_{\text{compound}} = \underbrace{1+rT}_{\text{simple}} + \underbrace{\frac{T(T-1)T^2}{2}}_{\text{other extra stuff}} + \dots$$

Therefore

$$M_3 = 100(1 + 0.08)^3 = \text{£}125.97 (> \text{£}124)$$