

Tutorial 5

1- For an interest rate of 8% per year, determine:

- a) Effective interest rate per year if interest is compounded daily?
- b) Effective interest rate semiannually if interest is compounded daily?
- c) Effective interest rate per year if interest is compounded monthly?
- d) Effective interest rate semiannually if interest is compounded every six months?

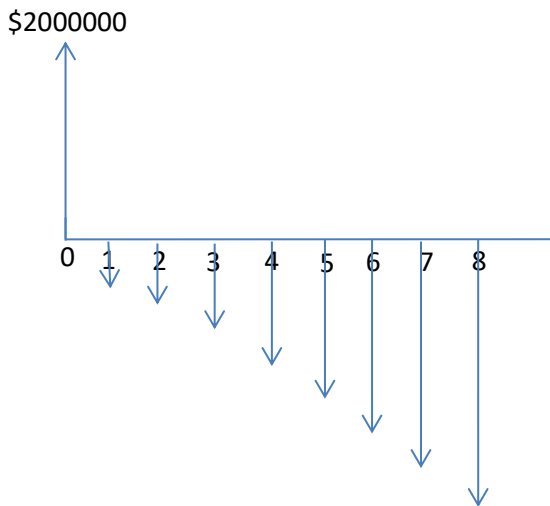
a) Effective i /year = $(1 + \frac{r}{m})^m - 1 = (1 + \frac{0.08}{365})^{365} - 1 = 8.33\%$

b) Effective i /semi-annually = $(1 + \frac{r}{m})^m - 1 = (1 + \frac{0.04}{182.5})^{182.5} - 1 = 4.081\%$

c) Effective i /year = $(1 + \frac{0.08}{12})^{12} - 1 = 8.29\%$

d) Effective i / semi-annually = $(1 + \frac{0.04}{1})^1 - 1 = 4\%$

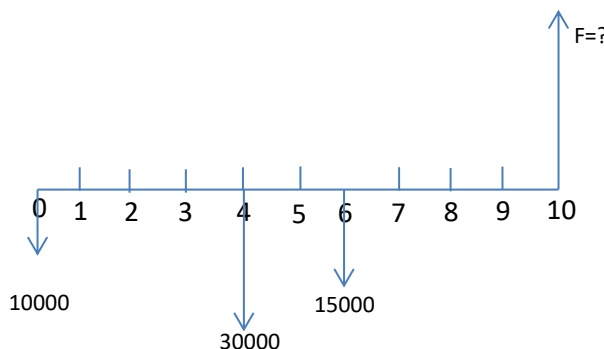
2- Fieldsaver technologies, a manufacturer of precision laboratory equipment, borrowed \$2 million to renovate one of its testing labs. The loan was repaid in 2 years through quarterly payments that increased by \$50,000 each time. At an interest rate of 3% per quarter, what was the size of the first quarterly payment?



Effective i /quarter = $(1 + \frac{r}{m})^m - 1 = (1 + \frac{0.03}{1})^1 - 1 = 3\%$

$2000000 = A (P/A, 3\%, 8) + 50000 (P/G, 3\%, 8) \longrightarrow A = \117665

3- A person intends to invest 10,000\$ now, 30,000\$ four years from now and 15,000\$ six years from now in a bank account with interest rate of 6% per year, compounded semiannually. What would be the future value of this investment in year 10?



$X = ?$

$$\text{First solution) Effective } i/\text{year} = \left(1 + \frac{r}{m}\right)^m - 1 = \left(1 + \frac{0.06}{2}\right)^2 - 1 = 6.09\%$$

$$F = 10000(F/P, 6.09\%, 10) + 30000(F/P, 6.09\%, 6) + 15000(F/P, 6.09\%, 4) = \$79837$$

$$\text{Second solution) Effective } i/\text{semi-annual} = \left(1 + \frac{0.03}{1}\right)^1 - 1 = 3\%$$

$$F = 10000(F/P, 3\%, 20) + 30000(F/P, 3\%, 12) + 15000(F/P, 3\%, 8) = \$79837$$

4-49) A Taiwan-based chemical company had to file for bankruptcy because of a nation-wide phase-out of methyl tertiary butyl ether(MTBE). If the company recognizes and invests \$50 million in a new ethanol production facility, how much money must it make each month if it wants to recover its investment in 3years at an interest rate of 2% per month, compounded continuously ?

$$\text{Effective } i/\text{month} = e^r - 1 = e^{0.02} - 1 = \%2.02$$

$$A = P (A/P, 2.02\%, 36) = 1968000$$

$$(A/P, i\%, n) = \frac{i(1+i)^n}{(1+i)^n - 1} = 0.03935$$