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Principles of Finance I

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Mathematics of Finance 4-6 Practice Problems

Note #4

1. What is the present value of a lease payment of $560,000, due in 6 months. Assume interest rates are 6%, compounded monthly.

$\frac{6\%}{12} = .005$

$PV_t = v^t M = \left(\frac{1}{1+i}\right)^t M$

$PV_6 = v^6 \cdot \$560{,}000 = \left(\frac{1}{1+.005}\right)^6 \cdot \$560{,}000$

$= v^6 \cdot 560{,}000 = \left(\frac{1}{1.005}\right)^6 \cdot 560{,}000$

$= \$543{,}490.19$

2. Suppose a company has to pay a contractor $200,000 one year from now, and $300,000 two years from now as part of a contract. If interest rates are 8.5%, what is the present value of that liability?

$PV = v^1 \cdot 200{,}000 + v^2 \cdot 300{,}000$

$= \left(\frac{1}{1.085}\right)^1 \cdot 200{,}000 + \left(\frac{1}{1.085}\right)^2 \cdot 300{,}000$

$= 184{,}331.80 + 254{,}836.59$

$= \$439{,}168.39$

3. Suppose you must make a payment of $2,500 in five years. The bank is paying 6% promotional interest in the first year of deposit, and 5% interest after the first year. What is the amount of the deposit you should make today to have the required funds in 5 years?

$PV = v_{6\%}^1 \cdot v_{5\%}^4 \cdot \$2{,}500$

$= \left(\frac{1}{1.06}\right)^1 \cdot \left(\frac{1}{1.05}\right)^4 \cdot 2{,}500$

$= \$1{,}940.54$

Note #5

1. $\$2500a_{\overline{240}|.005}$

(This is the present value of 240 payments of 2500, when interest rates are .5% per period. For example, it could represent the present value of a 20 year mortgage with an interest rate of 6%, compounded monthly.) $v = \left(\frac{1}{1+i}\right)$ $i = .5\%$ or $.005$

$2500 a_{\overline{240}|.005} = 2500 \dfrac{(1 - v^{240})}{i}$

$= 2500 \dfrac{1 - .30210}{.005} \rightarrow 2,500 \cdot 139.58 = 348,950$

2. $\$40a_{\overline{20}|.05}$

(This is the present value of 20 payments of $40, when interest rates are 5% per period. For example, it could represent the present value of $40 interest coupons on a 10 year corporate bond, evaluated when the interest rate environment is 10%, compounded semi-annually.) $v = \left(\frac{1}{1+i}\right)$ $i = 5\%$ or $.05$

$40 a_{\overline{20}|.05} = 40 \dfrac{(1 - v^{20})}{i}$

$\hookrightarrow 40 \dfrac{1 - .37689}{.05} \rightarrow 40 \cdot 12.4622 = \$498.49$

3. $\$250a_{\overline{120}|.0025}$

(This is the present value of 120 payments of $250, calculated with an interest rate of ¼% per period. For example, it might be the present value of your student loans, paid off over 10 years at an interest rate of 3%, compounded monthly.) $v = \left(\frac{1}{1+i}\right)$ $i = \frac{1}{4}\%$ or $.0025$

$250 a_{\overline{120}|.0025} = 250 \dfrac{(1 - v^{120})}{i}$

$\hookrightarrow 250 \dfrac{1 - .74110}{.0025} \rightarrow 250 \cdot 103.56 = \$25,890$