Finance II: Annuities Pre-Work (SOLUTIONS)

Overview:

This session continues the coverage of financial math with financial instruments consisting of a finite series of equal periodic payments.

1. What is the present value of an annuity in which $2,000 is paid each year for 5 years, assuming a discount rate of 5% and the first payment is received one year from now?

   Approach 1: Compute PV for each payment and sum result

   PV of first payment = $2,000/1.05 = 1,904.76$
   PV of second payment = $2,000/1.05^2 = 1,814.06$
   PV of third payment = $2,000/1.05^3 = 1,727.68$
   PV of fourth payment = $2,000/1.05^4 = 1,645.40$
   PV of fifth payment = $2,000/1.05^5 = 1,567.05$

   PV = *$8.658.95*

   Approach 2: Use direct formula

   $PV = (2,000/0.05) * [1 – (1/1.05)^5]$
   $= 40,000 * (1 – 0.7835)$
   $= 40,000,000 * 0.2165$
   $= \$8,658.95$

2. What is the present value of an annuity in which $2,000 is paid each year for 5 years, assuming a discount rate of 9% and the first payment is received one year from now? How does the value of this annuity compare to your result from the previous exercise. Why?

   Approach 1: Compute PV for each payment and sum result

   PV of first payment = $2,000/1.09 = 1,834.86$
   PV of second payment = $2,000/1.09^2 = 1,683.36$
   PV of third payment = $2,000/1.09^3 = 1,544.37$
   PV of fourth payment = $2,000/1.09^4 = 1,416.85$
   PV of fifth payment = $2,000/1.09^5 = 1,299.86$

   PV = *$7,779.30*

   Approach 2: Use direct formula

   $PV = (2,000/0.09) * [1 – (1/1.09)^5]$
   $= 22,222.22 * (1 – 0.6499)$
   $= 22,222.22 * 0.3501$
   $= \$7,779.30$

   Because of the higher discount rate, note that the annuity value in this exercise is lower than the annuity value in the previous exercise.