Name: Answer Key

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DEPARTMENT OF MATHEMATICS

Math 370 (Z) Prof. Rick Gorvett
Exam 2/FM Preparation Fall 2007

Inflation, Duration, and Immunization
Summary Quiz

(1) An insurer must make payments to a policyholder at the end of each of the next 30 years. The first payment, one year from now, will be \$1,000, and thereafter payments will increase at an annual inflation rate of 3%. The annual real rate of interest is 7%. Find the present value of this stream of payments.

$i = (1.03)(1.07) - 1 = .102100$

(A) 12,048 (B) 12,148 (C) 12,248 (D) 12,348 (E) 12,448

$$PV = 1000\left[\frac{1-\left(\frac{1.03}{1.1021}\right)^{30}}{1.1021-.03}\right] = 12,048$$

or: $PV = \left(\frac{1000}{1.03}\right) a_{\overline{30}|.07} = 12,048$

(2) Find the modified duration (or "volatility") of a three-year, 1000-par value, 8% annual coupon bond. Assume an effective annual interest rate of 7%.

(A) 2.4 (B) 2.5 (C) 2.6 (D) 2.7 (E) 2.8

$$\bar{d} = \frac{80v^1 + 80(2)v^2 + 1080v^3(3)}{80v^1 + 80v^2 + 1080v^3} = 2.716203$$

$$\bar{v} = \bar{d}/(1+i) = 2.60$$

(3) A company must pay liabilities of 2,000 at the end of each of the next 2 years. The company purchases a combination of the following two bonds at a total cost of X in order to exactly match its obligation:

(i) 1-year 6% annual coupon bond with a yield rate of 6%.
(ii) 2-year 8% annual coupon bond with a yield rate of 8%.

Assume both bonds have par values of 1,000. Find X.

(A) 3,499 (B) 3,599 (C) 3,699 (D) 3,799 (E) 3,899

$n_2 = 2000/1080 = 1.851852$

$n_1 = \frac{2000 - n_2(80)}{1060} = 1.747030$

$X = n_1(1000) + n_2(1000)$

$= 3,598.88$