

30. Solution: D

The present value of the liability at 5% is \$822,702.48 ($\$1,000,000 / (1.05^4)$).

The future value of the bond, including coupons reinvested at 5%, is \$1,000,000.

If interest rates drop by $\frac{1}{2}\%$, the coupons will be reinvested at an interest rate 4.5%. Annual coupon payments = $822,703 \times .05 = 41,135$. Accumulated value at 12/31/2007 will be

$41,135 + [41,135 \times (1.045)] + [41,135 \times (1.045^2)] + [41,135 \times (1.045^3)] + 822,703 = \$998,687$. The amount of the liability payment at 12/31/2007 is \$1,000,000, so the shortfall = $998,687 - 1,000,000 = -1,313$ (loss)

If interest rates increase, the coupons could be reinvested at an interest rate of 5.5%, leading to an accumulation of more than the \$1,000,000 needed to fund the liability. Accumulated value at 12/31/2007 will be $41,135 + [41,135 \times (1.055)] + [41,135 \times (1.055^2)] + [41,135 \times (1.055^3)] + 822,703 = \$1,001,323$. The amount of the liability is \$1,000,000, so the surplus or profit = $1,001,323 - 1,000,000 = +1,323$ profit.