Econ 156
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Midterm Answers

1. The asset with the longer duration:
   a. a 15-year zero with an 8% yield to maturity.
   b. a 10-year zero with a 10% yield to maturity.
   c. a 10-year zero with a 6% yield to maturity.

2. The stock is not undervalued if q is less than 1, or overvalued if q is greater than 1. Tobin's q is less than 1 if the firm's profit rate is lower than the shareholders' required return, and greater than 1 if the reverse is true.

3. Let X_0 be the initial investment, X_t the net inflows (contributions minus withdrawals) each year, and let V the current value of the portfolio. The effective annual return is given by the present value equation:

$$X_0 = \frac{X_1}{(1+R)^1} + \frac{X_2}{(1+R)^2} + \ldots + \frac{X_{n-1}}{(1+R)^{n-1}} + \frac{F}{(1+R)^n}$$

4. a. Using the Expectations Hypothesis:

$$(1+R_{20})^{20} = (1+R_5)^5\left[1+R_{15}^{+5}\right]^{15}$$

$$(1.05)^{20} = (1.04)^5\left[1+R_{15}^{+5}\right]^{15}$$

$$\left[1+R_{15}^{+5}\right]^{15} = \frac{(1.05)^{20}}{(1.04)^5}$$

$$R_{15}^{+5} = 0.05335 \ (5.335\%)$$

   b. The current price of the 20-year zero is

$$P_0 = \frac{X}{(1.05)^{20}}$$

   You expect the price of the 20-year zero 5 years from now to be

$$P_5 = \frac{X}{(1.04)^{15}}$$

   Your annual rate of return will be

$$(1+R)^5 = \frac{P_5}{P_0} = \frac{\dfrac{X}{(1.04)^{15}}}{\dfrac{X}{(1.05)^{20}}} = \frac{(1.05)^{20}}{(1.04)^{15}}$$

$$R = 0.08058$$

   c. For a 20-year zero with a 5% yield and a 5-year zero with a 4% yield to do equally well, future interest rates will have to rise above 5%. If you expect the 15-year rate 5 years from now to be only 4%, then you will do better buying the 20-year zero and selling it in 5 years than buying the 5-year zero. Thus your return will be greater than 4%.

5. As the stock goes ex-dividend, the price of the stock will drop by (approximately) the size of the dividend.

6. It is true that bond prices rise when interest rates fall; but if the Fed is certain to do something, then this anticipated action will already be reflected in bond prices (more specifically, in the term structure, so that no strategy makes abnormal profits).

7. The answer is typically true, but not always. There are some required returns for which the 30-year loan is better. For example, with a 20% required return, the PVs are $61,556 for the 30-year loan and $62,632 for the 15-year loan. At any required return above 17.91%, the 30-year loan has the lower PV. The conclusion is certainly wrong in general, in that the loan with the lower APR is not necessarily better; for example, a 1-day loan at 1% versus a 30-year loan at 1.1%.

8. (Peter A McKay, "The Darker Side of Growth,"(The Wall street Journal, September 23-24, 2006.) The fundamental values of all securities are sensitive to interest rates because the present value of the cash flow depends on required rates of return, which are influenced by interest rates.

9. [Jeremy Siegel, "Big-Cap Tech Stocks Are a Sucker Bet," The Wall Street Journal, March 14, 2000; Henry N. Goldstein, "a 'Buy' or a 'Steal'?," letter to the editor.] Goldstein assumes that the stock's price is constant for 10 years. Because the stock pays no dividends, shareholders would then have a 0% return for 10 years. Siegel assumes that investors in such a risky stock require a 15% return, which they get from the stock's price increasing 15% a year. Siegel's approach makes more sense.

10. The growth rate is $g = (1 - d)\square = 0.6(0.10) = 0.06$.
    a. Using the constant-growth model, the present value of the dividend stream is

$$
\begin{aligned}
V &= \frac{D_1}{(1+R)^1} + \frac{D_2}{(1+R)^2} + \ldots \\
&= \frac{D_1}{R - g} \\
&= \frac{4}{0.08 - 0.06} \\
&= 200
\end{aligned}
$$

b. With the same constant growth rate for earnings and assets, the economic value added model gives

$$
\begin{aligned}
V &= K_0 + \frac{E_1 - RK_0}{(1+R)^1} + \frac{E_2 - RK_1}{(1+R)^2} + \ldots \\
&= K_0 + \frac{E_1 - RK_0}{(1+R)^1} + \frac{(1+g)E_1 - (1+g)RK_0}{(1+R)^2} + \ldots \\
&= K_0 + \frac{E_1 - RK_0}{(1+R)^1} + \frac{(1+g)\left(E_1 - RK_0\right)}{(1+R)^2} + \ldots
\end{aligned}
$$

Using the same math that underlies the constant-dividend-growth model,

$$
\begin{aligned}
V &= K_0 + \frac{E_1 - RK_0}{R - g} \\
&= \frac{K_0(R - g) + E_1 - RK_0}{R - g} \\
&= \frac{E_1 - gK_0}{R - g}
\end{aligned}
$$

Remembering that $g = (1 - d)\rho$,

$$
\begin{aligned}
V &= \frac{E_1 - gK_0}{R - g} \\
&= \frac{E_1 - (1 - d)\rho K_0}{R - g} \\
&= \frac{E_1 - (1 - d)E_1}{R - g} \\
&= \frac{dE_1}{R - g} \\
&= \frac{D_1}{R - g}
\end{aligned}
$$

c. Thus these two models give the same value of the firm, which is what we expect since the two models are consistent with each other.