

Midterm (75 minutes)

No calculators allowed; if calculations are needed, write the explicit equation(s), identifying the variables. Do not write “ $Y = aX$ ; solve for  $X$ .” You can write “ $100 = 10X$ ; solve for  $X$ .” If you want extra time, you can buy time at a price of 1 point a minute; for example, if your test is handed in 10 minutes after the scheduled finish time, 10 points will be subtracted from your test score.

1. In 2018, a financial columnist wrote that, “since its market introduction in 1996, [Berkshire Hathaway] stock averages 12.3% annual returns. [An S&P 500 index fund] over the same timeframe averages 9.5%. Granted, Berkshire stock obviously has the better performance, but it’s not *that* much better.” How much difference would it make to a \$10,000 investment made in 1996?
2. Bonds can be bought on margin—30 percent for corporate bonds and as little as 5 percent for Treasury bonds. Why would anyone want to buy Treasury bonds on margin, since the loan rate charged by the broker is presumably higher than the interest rate on Treasury bonds?
3. The dividend yield (dividend/price) is usually less than the interest rate on Treasury bonds. Why?
4. Prudential-Bache’s Director of Economics & Fixed Income Research once proposed that the Fed target a flat term structure: if the interest rates on long-term zeros are 5%, use monetary policy to set short-term interest rates on zeros at 5% too. If the liquidity preference hypothesis is correct, what interest rate expectations are consistent with a flat term structure?

5. In 1988, a bank offered selected individuals a \$35,000 line of credit, allowing them to borrow up to \$35,000 whenever they wanted at a monthly interest rate of 2.0%, compounded daily. What is the effective annual interest rate? (Assume twelve months of 30 days each.)
6. Legendary fund manager Peter Lynch popularized the PEG ratio (the ratio of a stock's P/E to its percentage growth rate) as a way of gauging whether a stock is cheap or expensive. Lynch argues that a fairly priced stock has a PEG of 1, while a stock with a PEG greater than 1 is overpriced and a stock with a PEG less than 1 is underpriced. For example, a company with a 20% growth rate that is selling for 10 times earnings would have a PEG of 0.5, "a very attractive ratio that would make the company an immediate buy." Explain the general logic of comparing the price-earning ratio to the growth rate. Then use the constant-growth model to show that a company with a value ratio of 0.5 is not necessarily an "immediate buy."

7. In 1988, the president of a community college wrote a letter to *The Wall Street Journal*, arguing that federal aid to college students is a great investment for the government:

*If the average cost of a bachelor's degree is \$36,800 and the average additional earnings resulting from it are \$640,000, a 30% tax bracket would produce \$192,000 in additional taxes from the degree holder. That's over 500% return on investment.*

Explain why his calculations are misleading, and, assuming his numbers are correct, show how you would calculate the government return.

8. Robert Barro, a Harvard economics professor, wrote an opinion piece in the *Wall Street Journal* in 1991 titled, "Pray for High Interest Rates." He argued that if the Federal Reserve were to lower interest rates, stock prices would most likely drop: "It is true historically that an increase in real interest rates has usually signaled good economic times, while a decrease in rates has typically signaled economic decline." Explain why you either agree or disagree.

9. Can Tobin's  $q$  ever be negative? When?

10. For each of the following pairs, identify the asset with the longer duration:

- 30-year amortized mortgage at 8% or 15-year zero with an 8% yield to maturity.
- 30-year amortized \$400,000 mortgage at 6% or 30-year amortized \$800,000 mortgage at 6%.
- 5-year zero with a 5% yield to maturity or 10-year zero with a 10% yield to maturity.
- 10-year 7%-coupon bond with a 5% yield to maturity or 10-year zero with a 6% yield to maturity.
- a stock with an annual dividend that is currently \$2 and will grow by 5% annually, or a stock with an annual dividend that is currently \$1 and will grow by 10% annually.