Final Examination (150 minutes)

No calculators allowed; if calculations are needed, write the explicit equation(s). Do not write "Y = aX; solve for X." You can write "100 = 10X; solve for X." The price of extra time is 1 point/minute; e.g., if your test is handed in 5 minutes after the scheduled finish time, 5 points will be subtracted from your test score.

1. In January 2014, *Fortune* reported that "the rise in the 30-year Treasury rate to 4% at year-end from 3% as the year opened knocked 17% off the market price of a 3% 30-year bond." Why was the effect so large?

2. Briefly explain the practical implications of each of these Warren Buffet quotations. For example, for the quotation, "The rearview mirror is always clearer than the windshield," the answer might be: It is always easier to see what has happened in the past than to see what lies ahead.
    a. Our favorite holding period is forever.

    b. Be fearful when others are greedy and greedy only when others are fearful.

    c. The term "institutional investor" is becoming one of those self-contradictions called an oxymoron, comparable to "jumbo shrimp," "lady mud wrestler" and "inexpensive lawyer."

    d. May you live until Berkshire splits.

    e. A stock is a disguised bond.

3. Critically evaluate: "I have a $500,000, 3% mortgage on my million-dollar house and $2 million in my IRA. I am going to use some of my IRA money to pay off my mortgage."

4. What is the value of Tobin's q for an open-end mutual fund?

5. Critically evaluate this September 2014 commentary:

    If you've followed the market and the economy over the last few years, you've probably got a rough understanding that the Federal Reserve is propping up stocks. Maybe you're not sure exactly how it works, but the idea is just sort of out there. . . .

    Technically, the Fed isn't directly helping the stock market. It's buying long-term government bonds and mortgage securities. But by lowering the cost of credit for corporations, it's helped dump trillions into stocks as CEOs have leveraged up their balance sheet by issuing debt cheaply and using that money to repurchase their own shares.

6. In 2010, $20 million was spent to refurbish the Empire State Building, including the replacement of 6,500 windows with energy efficient windows. It was estimated that this refurbishing will reduce energy usage by 38% and save $4.4 million in energy costs in the year after the project is completed. Make a rough estimate of the long run annual rate of return from this $20 million investment.

7. Explain why this advice is logical, but not very helpful:

    It is obviously good sense to buy bonds when the Federal Reserve Banks start lowering interest rates. It is just as obviously bad sense to buy them at any time when, two or three or four months hence, the Fed is certain to start raising money rates and lowering the prices of outstanding bonds.

8. Mr. Jones is a new investment manager who wants to use modern portfolio theory to manage his clients' money. He is starting with three asset classes (1-year Treasury bills, 20-year Treasury zeros, and a Vanguard stock index fund) and wants to identify the Markowitz frontier for a 1-year investment horizon. He collected annual data over the past 20 years on the interest rate B on 1-year Treasury bills, the interest rate Z on 20-year Treasury zeros, and the annual price change S in the S&P 500. He then calculated the historical means, standard deviations, and correlations as a staring point, to be adjusted based on current market conditions. Explains his mistakes:

    a. He estimated the mean stock return from the average value of S.

    b. He estimated the correlation between Treasury-zeros and stocks from the correlation between Z and S.

    c. He estimated the Treasury-bill standard deviation from the standard deviation of B.

9. Critically evaluate this 2012 analysis by Felix Salmon, the finance blogger at Reuters, "Buybacks are considered a good thing, on the stock market. . . . [T]hey reduce the number of shares outstanding, which means that the value of the remaining shares goes up: the company is worth the same amount, so the value per share is higher."

10. Data on the profits (return on assets) of 100 firms were grouped into quartiles based on their 1930 profits: the top 25, second 25, third 25, and bottom 25. The average profits in 1930 and 1920 were then calculated for the firms in these 1930 quartiles. How would you explain the graph?
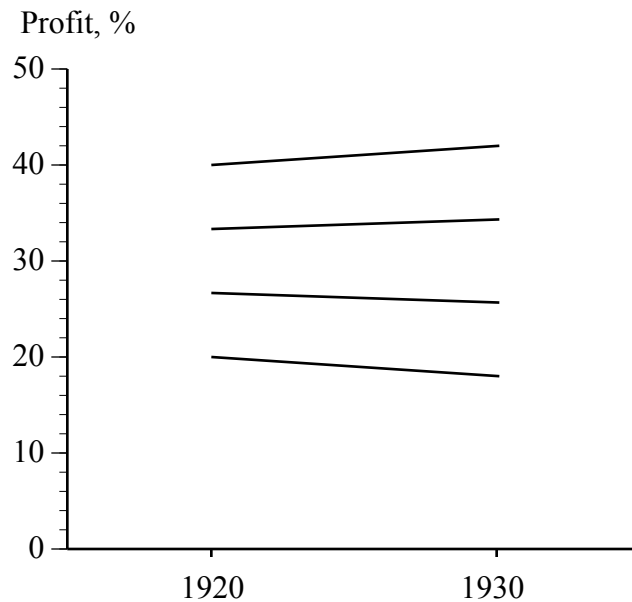
11. Critically evaluate: "We gauge whether the overall stock market is cheap or expensive by using the dividend-discount model $P = D/(R - g)$. Since our average holding period is 3 months, we use the 3-month Treasury bill rate plus a 3% risk premium as our required return."

12. The economic value added (EVA) model says that firms create value for their stockholders by earning profits that exceed the stockholder's required return. Suppose that a firm has no debt and that all earnings are paid out as dividends. It has assets K that earn an annual rate of return ρ, and shareholder's required rate of return is R. Which of these equations for the value of the firm is most consistent with EVA analysis? Explain your reasoning.
   a. $P = (\rho K - RK)/R$
   b. $P = K + (\rho K - RK)/R$
   c. $P = K$
   d. $P = \text{sum of } (\rho K - RK)$

13. Critically evaluate this excerpt from Wikipedia: "If the stock does not currently pay a dividend, like many growth stocks, more general versions of the discounted dividend model must be used to value the stock. One common technique is to assume that the Miller-Modigliani hypothesis of dividend irrelevance is true, and therefore replace the stock's dividend D with E earnings per share. However, this requires the use of earnings growth rather than dividend growth, which might be different."

14. In a stock picking contest, a student picked stock X. He wrote that, "X has a beta of 0.90 which means it is a very stable stock." Explain why this either is or is not true.

15. "My husband and I are in the process of securing a $32,000 home equity loan through an out-of-state lender at an interest rate of 12.5%....[T]he processing costs will be about $5,000. Does that sound reasonable?" Calculate the effective interest rate, assuming a 15-year amortized loan. (Just set up.)

16. The [Motley] Fool School:
    Imagine you're looking at a newfangled invention called the "dollar machine." Once a year, for ten years, it spits out a brand-new dollar bill. How would you value this contraption?.... Let's say you expect a rate of return equal to the stock market's historic rate of about 11 percent growth per year. If so, you might decide to pay just $3.52 for the machine. $3.52 invested for ten years earning 11 percent annually becomes $10 [that is, $3.52(1.11)^{10} = $10].
    Carefully explain why, if you have an 11% required return, you would pay (a) $3.52, (b) more than $3.52, or (c) less than $3.52 for this dollar machine. Do not make any calculations to answer this question.

17. Charles de Vaulx, a self-described value investor explained why 7% of his fund's assets were invested in gold bullion: "My final thought on gold is that we are value investors, after all, so why would we want to own something that has gone up sevenfold since July 2001? And I think the paradox with gold is that even though the price has gone up so much, it is still under-owned." What would a true value investor say in reply?

18. Explain the logic underlying this 1996 observation by Ian MacKinnon, Senior Vice President of the Vanguard Fixed Income Group: "With . . . a [dividend] yield of just over 2% on the Standard & Poor's 500 Index and nearly 7% on ten-year Treasury bonds—that's a gap of 400 to 500 basis points a year that the stockholder has to hope to make up by price appreciation and dividend increases." If we let x be the annual price appreciation and y be the annual dividend increase, does the phrase "price appreciation and dividend increases" mean (a) x = y = 400 to 500 basis points, or (b) x + y = 400 to 500 basis points? Explain your reasoning.

19. For each of the following pairs, identify the asset with the longer duration: (Assume that each is priced to give a 10% required return)
    a. a stock with a dividend that will always equal $1 or a stock with a dividend that is currently $1 and will grow by 5% a year.

    b. a stock with a dividend that is currently $2 and will grow by 3% a year or a stock with a dividend that is currently $1 and will grow by 5% a year.

    c. a consol bond with a $10 quarterly coupon or a no-growth stock that will pay a $5 quarterly dividend forever.

20. In his 1959 book, *Portfolio Selection: Efficient Diversification of Investments*, Harry Markowitz, draws the mean-variance graph with the mean on the horizontal axis and the variance on the vertical axis:
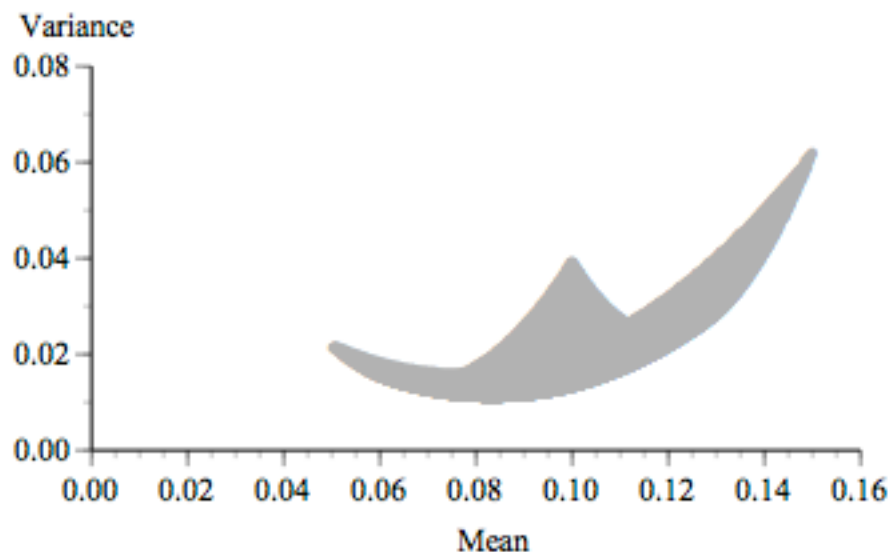
Draw the Markowitz Frontier in this graph. Does Tobin's Separation Theorem still hold?