Midterm scores, answers on following pages

Scores out of 48

Mean   39.49296
Std. Dev.   5.21828

        Percentiles   Smallest
  1%   22.5   18
  5%   30.5   22.5
 10%   32.5   24
 25%   36.5   25
 50%   40.5
                          Largest
 75%   43   47
 90%   45   47.5
 95%   46   47.5
 99%   47.5   48

Note: Kendall and Emek did the grading. If you have questions
start with them, and then feel free to come to Jon.

Name: _____

Midterm
266: Fi. Markets and Institutions
Spring 2011
Jon Faust

Directions:

You have 1 hour and 15 minutes to do the exam unless other arrangements have been made.

You may write on the backs of the exam pages and request additional paper.

If your answer extends outside the space provided, you must label clearly where the additional portion is located.

There is a bit of CHOICE about which problems to answer. Pay attention to this.

Two points are possible for each part of each question.

There is one bonus question at the end worth 1 extra point if you get all parts right.

Formulas: I think the only one of the promised formulas that you will need is:

$$\mathrm{var}(x) = \sum pr_j(x_j - x^e)^2$$

where x_j is the jth outcome and happens with probability pr_j and x^e is the mean of x.

Good luck

1. **Do 4 of 5**. Give a brief definition of the following.

   (a) Interest rate risk.

   Answer:
   Risk that will cause an investor to experience capital gains or losses due to changes in market interest rates.

   (b) Yield curve

   Answer:
   At a given point in time, if one plots interest rates of a particular asset class (say government bonds) on the vertical axis against various maturities on the horizontal axis, the resulting curve is called the yield curve.

   (c) Arbitrage

   Answer:
   Arbitrage is a trading strategy that take advantage of a price difference between two or more markets for (near) perfect substitutes. You enter a combination of matching deals that earn you a profit based on the price difference in the two markets.

   As a side note, this process tends to drive the prices together to eliminate the riskless profit opportunity.

   (d) Coupon bond

   Answer:
   A bond that makes a periodic coupon payment for a number of periods then at maturity returns a face value and final coupon.

   Additional Comments: In US, coupon payments are made in every six months but there are other countries that coupon payments are made in yearly basis too.

(e) Securitization

Answer:
A collection of financial assets, such as mortgages, are pooled and claims to the payment stream are sold as marketable securities.

2. General

   (a) Why do we say that real interest rates (as opposed to nominal rates) are what investors should be most concerned with?

      Answer:
Real interest rates are nominal interest rates that have been adjusted for expected changes in the price level (which is expected inflation). Nominal interest rates only tell you how much money your investment will pay, whereas real rates reflect how much you will be able to buy with that money. Therefore, real interest rates more accurately reflect the true price of borrowing and are more likely to be a better predictor of the incentives to borrow and lend.

Additional Comments: The Fisher equation defines the relationship between real and nominal interest rates: $r = i - \pi$, or real interest rates, r, are equal to nominal interest rates, i, minus expected inflation, π.

   (b) True/False and explain: Variance of an asset return tells an investor most of what she needs to know about the riskiness of the asset.

      Answer:
False. Although variance provides a general estimate of the risk of an asset's returns, other measurements of risk are also important. An investor needs to know how an asset's return varies relative to other assets' returns to evaluate the overall risk of their portfolio. Covariance measures how returns vary together. If the return on the asset being considered varies negatively with the investor's current asset portfolio, then purchasing the asset will reduce the risk of their portfolio.

(c) Describe one activity that large sophisticated banks engage in that most banks do not engage in.

Answer:
Several activities are acceptable here. The main one we discussed in class is that large banks run trading accounts. They trade in financial futures, options for debt instruments, interest-rate swaps, and engage in additional sophisticated, and potentially risky, trading activities.

(d) Over the period since 1960, the real return on a broad equity portfolio has tended to be about how much higher than the real return on short-term government Treasury securities?

Answer:
Over the period since 1960, the real return on broad equity portfolio has tended to be about 5% higher than the real return on short-term government Treasury securities. Acceptable answers also include between 5 and 8 percent higher.

3. Rates of return, I.

(a) You own shares in Meltdown Nuclear Corp. You buy for $93 and sell 37 months later for $72. What was your annualized rate of capital gain or loss in percent?

Answer:
The holding period must be annualized as 37months/12months per year.

$$(1+i) = \left(\frac{\text{proceeds}}{\text{cost today}} \right)^{\frac{1}{\text{holding period}}}$$

$$(1+i) = \left(\frac{72}{93} \right)^{\frac{1}{\frac{37}{12}}}$$

$$(1+i) = \left(\frac{72}{93} \right)^{\frac{12}{37}}$$

$$i = \left(\frac{72}{93} \right)^{\frac{12}{37}} - 1$$

$$i \approx -0.0797$$

So, the annualized rate of capital loss is approximately 7.97%.

(b) The 2-year zero coupon bond rate is currently 1 percent. The 3-year forward rate for 2 years from now is 2.5 percent. What is the current 5-year zero-coupon rate?

Answer:
Applying the formula from class:

$$(1 + i_{2,t})^2 (1 + i_{3,t+2})^3 = (1 + i_{5,t})^5$$

$$(1 + 0.01)^2 (1 + 0.025)^3 = (1 + i_{5,t})^5$$

$$[(1.01)^2 (1.025)^3]^{\frac{1}{5}} = 1 + i_{5,t}$$

$$[(1.01)^2 (1.025)^3]^{\frac{1}{5}} - 1 = i_{5,t}$$

$$i_{5,t} \approx 0.0190$$

The current 5-year zero-coupon rate must be about 1.9 percent.

(c) Continue with previous part. Under the expectations theory of the term structure, what is the market expectation for the 3-year rate 2 years in the future?

Answer:
One way of stating the expectations hypothesis is that forward rates are expected future spot rates. Thus, the market expectations for the 3-year rate 2 years in the future is 2.5 percent.

4. Rates of return, II.

(a) Take a 10-year, zero coupon bond, with a face value of $100 that currently sells for $82. What is the yield to maturity of this bond?

Answer: The yield to maturity is the i that solves:

$$P_t = \frac{F}{(1 + i)^M},$$

where P_t is the price today, M is the holding period, and F is the face value of the bond. Rearranging this equation we can arrive at the following equation:

$$(1 + i) = \left(\frac{\text{proceeds}}{\text{cost today}} \right)^{\frac{1}{\text{holding period}}}$$

$$(1 + i) = \left(\frac{F}{P_t} \right)^{\frac{1}{10 \text{ years}}}$$

$$(1 + i) = \left(\frac{100}{82} \right)^{\frac{1}{10}}$$

$$i = \left(\frac{100}{82} \right)^{\frac{1}{10}} - 1$$

$$i \approx 0.02$$

The yield to maturity of this bond about 2 percent.

(b) Continuing with the same bond. The bond has default risk. With 5 percent probability the bond defaults and the holders only get \$15. With 95 percent probability the bond pays in full. What is the expected return on this bond?

Answer:
Using the formula from class:

$$(1 + i^e) = \left(\frac{\text{expected future proceeds}}{\text{cost today}} \right)^{\frac{1}{\text{holding period}}}$$

Let s_1 be the event that the bond defaults. Then s_2 is the event that the bond is paid in full and no default occurs.

$$(1 + i^e) = \left(\frac{Prob(s_1) * (\text{payoff in } s_1) + Prob(s_2) * (\text{payoff in } s_2)}{\text{cost today}} \right)^{\frac{1}{\text{holding period}}}$$

$$(1 + i^e) = \left(\frac{0.05 * 15 + 0.95 * 100}{82} \right)^{\frac{1}{10}}$$

$$i^e = \left(\frac{95.75}{82} \right)^{\frac{1}{10}} - 1$$

$$i^e \approx 0.0156$$

The expected return on the bond is 1.56 percent.

(c) What is the variance of the return on this bond?

Answer:
First, compute the deviation of the returns in different states from the mean. To do this, we need to know the return of the bond for each state. We have already solved for this in 4(a) for the state in which the bond is paid in full. Let us call the return when the bond is paid in full i_2, which we know is $i_2 = 0.02$. The return on the bond when we assume the bond will default follows:

$$(1+i) = \left(\frac{\text{proceeds}}{\text{cost today}} \right)^{\frac{1}{\text{holding period}}}$$

$$(1+i_1) = \left(\frac{15}{82} \right)^{\frac{1}{10}}$$

$$i_1 = \left(\frac{15}{82} \right)^{\frac{1}{10}} - 1$$

$$i_1 \approx -0.1562$$

Deviation is defined as $d_s = i_s - i^e$, where $s = 1$ or $s = 2$ depending on the state. Deviation for state 1 (default):

$$d_1 = i_1 - i^e$$

$$d_1 \approx -0.1562 - 0.0156 = -0.1718$$

Deviation for state 2 (no default; paid in full):

$$d_2 = i_2 - i^e$$

$$d_2 \approx 0.02 - 0.0156 = 0.0044$$

Then the variance of the return may be computed using the variance formula provided. $prob_1$ is the probability of being in state 1 (default):

$$var(i) = \sum_{s=1}^{2} prob_s * d_s^2$$

$$var(i) = prob_1 * d_1^2 + prob_2 * d_2^2$$

$$var(i) \approx 0.05 * (-0.1718)^2 + 0.95 * (0.0044)^2 \approx 0.00149$$

Then the variance of the return on this bond is 0.0015.

5. Banking/liquidity

   (a) Why is a long-term bond considered less liquid than a short-term bond?

   Answer:
   From duration analysis we know that longer duration bonds face bigger capital gains or losses than short-duration bonds in the face of any interest rate change. It is this price variability that is the main factor making the bonds less liquid.

   Additional Comments: Intuitively, say, you need to make a $100 payment in a week. If you park the money in short term bonds, you are very likely to have at least $100 when the payment comes due. In long-term bonds, this is much less certain.

   (b) List three main assets of a commercial bank in order of liquidity (from more liquid to less liquid).

   Answer:
   Here is the order for only the asset side of the bank balance sheet

      i. Excess reserves (or reserves for short but do not confuse this with required reserves)
      ii. Securities
      iii. Loans

   (c) Fill in the blanks on the balance sheet of Armstrong Bank (ticker: EPO):

   Answer:

<div align="center">

Balance Sheet: Armstong Bank

A		L	
Reserves	10	Deposits	305
Securities	110	Borrowings	20
Loans	233		
Phys. Capital	5		
Total Assets:	358	Total Liab.:	325
		Net worth:	33

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   Note: Amounts in $millions.

(d) What is the leverage of Armstrong Bank (measured as A/NW)?

Answer:

$$\frac{A}{NW} = \frac{358}{33} \approx 10.84$$

(e) Armstrong has a deposit outflow of \$100. It funds this outflow by selling securities. How does the balance sheet look after this activity? Fill in all the blanks.

Answer:

Balance Sheet: Armstong Bank

A		L	
Reserves	10	Deposits	205
Securities	10	Borrowings	20
Loans	233		
Phys. Capital	5		
Total Assets:	258	Total Liab.:	225
		Net worth:	33

Note: Amounts in \$millions.

(f) Now what is leverage (same measure as above)?

Answer:

$$\frac{A}{NW} = \frac{258}{33} \approx 7.81$$

(g) The ALM committee of the bank was comfortable with both the capital and liquidity position of the bank before the deposit outflow. What steps might they recommend in light of the state of the balance sheet after the outflow?

Answer:
After deposit outflow, there is a significant decline in the liquid assets that Armstrong Bank holds in its balance sheet. The bank could restore its prior position in both liquidity and leverage by attracting deposits and purchasing securities. It could attract deposits by offering more interest (compared to other banks) to deposit holder. Then, this cash can be used to buy more liquid assets (like treasury securities) or hold as excess reserves.

6. The financial press has lately had much analysis like the following:

'Treasurys rose on Friday for the first time in three sessions as demand increased for safe-haven assets on . . . signs of escalating political turmoil in the Middle East and North Africa.' (WSJ, March 4, 2011)

This is a quote about U.S. Government Treasury securities

(a) From the reason stated, does 'Treasurys rose' refer to prices or yields on Treasurys?

Answer:
'Treasurys rose' refers to prices on Treasurys.

If demand increased for safe-haven assets, then prices on those assets must rise. Because prices and yields have an inverse relationship, if prices rise, yields must decline. Then, 'Treasurys rose' cannot refer to yields.

(b) Using a supply and demand figure for Treasury IOUs, depict what the quote indicated happened in the Treasury market.

Answer

Market for Treasurys
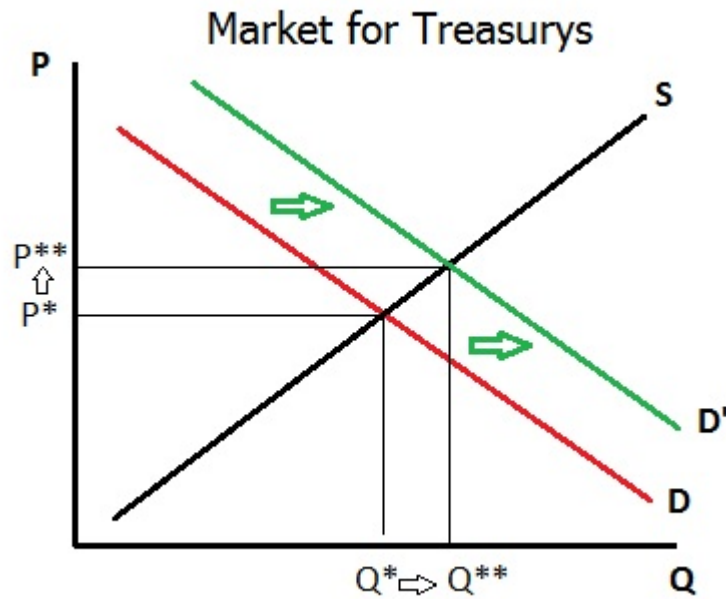
An increase in the riskiness of other assets causes an increase in demand for riskless assets, which is in this case government securities. Then using our usual supply and demand framework, demand shifts up. This increases the equilibrium price and quantity of Treasurys.

(c) Explain briefly why turmoil in the Middle East and North Africa might be expected to have this effect on the Treasury market.

Answer:
Uncertainty in the Middle East could make the payoff of almost any asset less certain. When general uncertainty rises, people tend to shift funds generally toward safer assets and U.S. Treasurys are currently viewed as the safest (nominal) return in the market.

7. Bonus Question: For each part, choose choice (I) or (II).

    (a) Your investment advisor tells you that his sense is that the market is headed up and (for a fee) he'll invest your money to take advantage of this. You should,

    I) Let him invest your money, I mean, like, hey, you don't want to miss out, or

    II) Ask him for data on what return his clients have earned (after fees) from following his advice.

    Answer:
    II

    (b) Your investment advisor shows you 4 years of data showing that his clients have consistently beaten the market for the last 4 years. You should,

    I) Let him invest your money, I mean, like, hey, you don't want to miss out, or

    II) Remind yourself of that time you flipped 4 heads in a row while flipping coins. It was pretty cool, but you were not foolish enough to think you were an expert 'head flipper.'

    Answer:
    II

    (c) Your investment advisor offers to throw in the 'Ab Miracle' exercise device that will give you those six pack abs in just 10 minutes a day of exercise.

    I) Let him invest your money, I mean, like, hey, you don't want to miss out. And who doesn't want six-pack abs?

    II) You remind yourself that most publicly available investment advice belongs in the same category as late night informercials.

    Answer:
    II