Econ 450 Hanes Fall 2024 First midterm grade distribution

A	115-68
B	67-47
C	46-25
D,F	24-10

SUNY-Binghamton
Fall 2024

Name _____

Economics 450
Monetary Economics
First midterm exam

No calculators. Total points on exam: 115. Look over the entire exam before you begin. If I ask you to "explain," your grade for the question will depend on your explanation. If I ask you to figure out a number, **show your work**. Good luck!

1) Consider a zero-coupon bond that you buy today, in September 2024, for a price P_t. The bond will pay \$1000 thirty years from today, in September 2054. Ten years from today, in September 2034, you sell the bond for a price P_{t+10}.

a) 5 pts Write down a formula (do not solve it) that defines the bond's yield in September 2024.

II) D) 4)

b) 5 pts Write down (do not solve) a formula that defines the bond's yield in September 2034.

II) D) 4)

c) 5 pts Write down (do not solve) a formula that defines the rate of return you receive from buying the bond in 2024 and selling it in 2034.

III) B) 1) a)

2) Consider a coupon bond that you can buy today in September 2024. The bond will make coupon payments once a year, in September 2025, September 2026, September 2027, and also pays off its face value (or principle) in September 2027. The face value is \$500. The coupon rate is 5% ("%" means percent). You look on your Bloomberg terminal and see that current market yields to maturity for "zero coupon" (single-payment) bonds are as follows:

7% for bonds paying off in September 2025 (one year zero-coupon bonds)
8% for bonds paying off in September 2026 (two-year zero-coupon bonds)
12% for bonds paying off September 2027 (three-year zero-coupon bonds)

a) 5 pts. Write a formula that shows the highest price anyone should be willing to pay for this bond. *Plug in actual numbers wherever you can* but do not try to solve the formula to get a number for the price.

II) D) 5) c) & E) 3)

b) 5 pts. Now suppose that today's market value of the bond is \$300. Write a formula that defines the coupon bond's yield to maturity. Again, use all the information I gave you, plug in numbers where you can, but do not try to solve the formula. **Point out which symbol in the formula stands for the yield to maturity.**

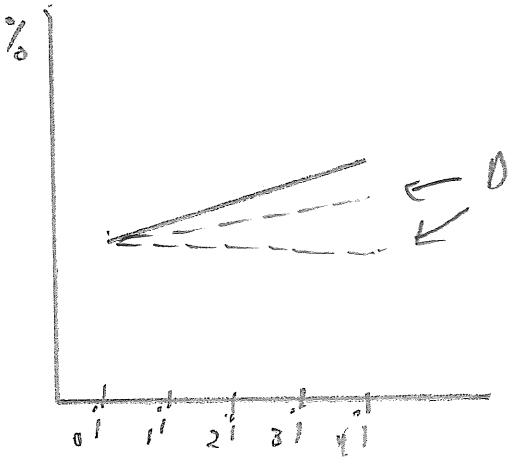
II) D) 5) b) & E) 3)

c) 5 pts. Suppose that today's market price for the bond, $300, is less than the value that comes out of the formula you wrote down for part a) of this question. What could you do to make a lot of money very fast?

II) D) 5) d)

3) The figures below depict (approximately) the Treasury yield curve that *actually existed*, what you would have seen on a financial news website, on some randomly chosen days within the last 30 years. For each yield curve, describe what might have been true on that day with respect to people's expectations of future overnight rates.

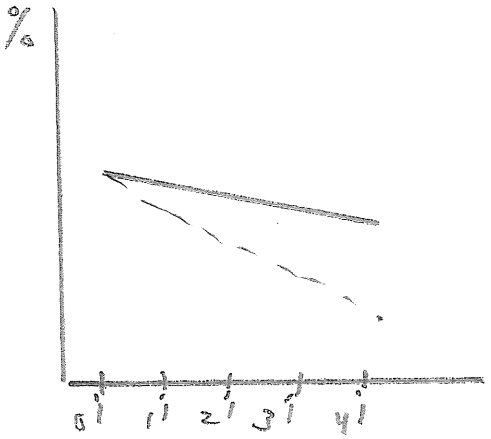
a) 5 pts.



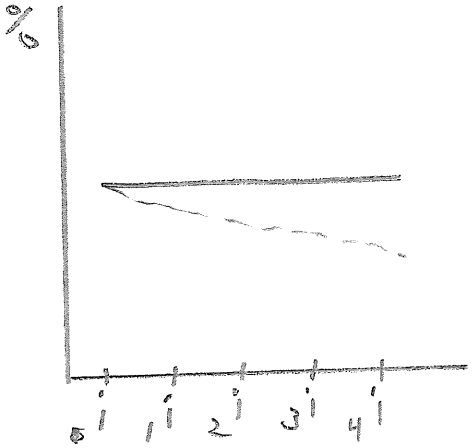
← Draw in. Either is correct.

b) 5 pts.

V) C) 4) 6) v)



c) 5 pts.



4) 10 pts. Suppose the assumption we make for the "expectations hypothesis" of the yield curve is correct, that is, all that people care about is the expected value of the return to their investments. Consider a five-year zero-coupon Treasury bond being bought and sold today. The IOU on the bond is $400. The price of the bond today is $100. Everyone believes there is a probability of 50% (1/2) that the price of the Treasury bond a year from now will be $200, and a 50% (1/2) probability the price of the Treasury bond will be $150 a year from now. What is today's yield on a one-year zero-coupon bond? SHOW YOUR WORK below.

75 percent

$$i = \frac{1}{2}\left(\frac{200}{100} - 1\right) + \frac{1}{2}\left(\frac{150}{100} - 1\right)$$

$$= \frac{3}{4}$$

5) 10 pts. Suppose the assumption we make for the "expectations hypothesis" of the yield curve is correct, that is, all that people care about is the expected value of the return to their investments.Today's yield on a two-year zero coupon bond is 2 percent. Today's overnight rate is 1 percent. People believe that the overnight rate will remain 1 percent for the rest of this year. Then it may, or may not, change. With a probability of 50% (1/2), the overnight rate *will not* change: it will remain 1 percent for at least one more year. With a probability of 50% (1/2), the overnight rate *will* change: it will rise to a higher value x and remain equal to x for at least one year. People in the economy have in mind a specific number for x, but I haven't told you what it is. Figure it out. That is, based on the information I have given you, what must x be equal to? SHOW YOUR WORK below.

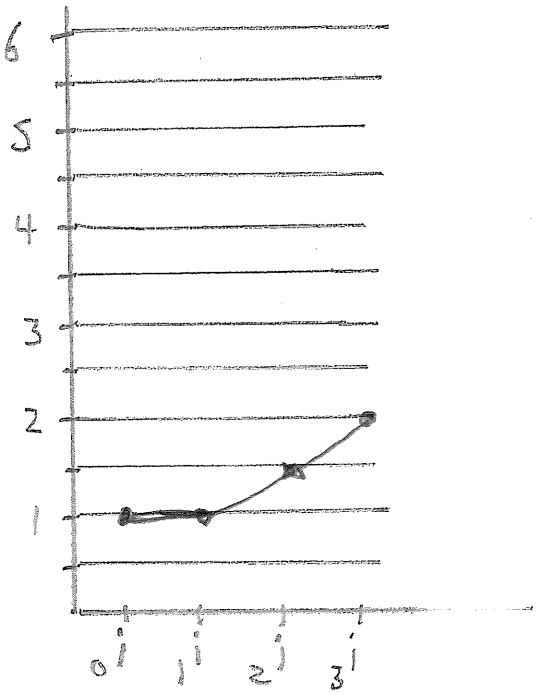
5 percent

Scenario	Prob	Avg. of
A	1/2	$\frac{1+1}{2} = 1$
B	1/2	$\frac{1+x}{2}$

$$2 = \frac{1}{2} \cdot 1 + \frac{1}{2}\left(\frac{1+x}{2}\right)$$

$$x = 5$$

6) 15 pts. Suppose the "expectations hypothesis" of the yield curve is correct (there are no term premiums). Today, the overnight rate is 1%. People are sure it will remain 1% for a whole year.
After that, they believe, there are just two things that can happen.
With a probability of 1/2, the Fed will keep the overnight rate at 1% for several more years.
With a probability of 1/2, the Fed will raise the overnight rate to 3 percent, hold it at 3% for a year, then raise the overnight rate again to 5% and hold it at 5% for several years. On the graph below, plot today's yield curve. Be precise. Exact numbers matter. Show your work.



$i_0 = 1$

$i_1 = 1$

What is $_2i$?

Scenario	Prob	Avg $_0i$
A	1/2	$\frac{1+1}{2} = 1$
B	1/2	$\frac{1+3}{2} = 2$

$i_2 = \frac{1}{2} \cdot 1 + \frac{1}{2} \cdot 2 = 1\frac{1}{2}$

What is $_3i$?

Scenario	Prob.	Avg $_0i$
A	1/2	$\frac{1+1+1}{3} = 1$
B	1/2	$\frac{1+3+5}{3} = 3$

$_3i = \frac{1}{2} \cdot 1 + \frac{1}{2} \cdot 3 = 2$

7) 10 pts. A company that issues a bond will pay a bond-rating company (e.g. Moody's or Standard & Poor's) to rate the bond, even if the bond is sure to get a low rating (e.g. BBB or CCC). Why?

VI) F) 4) a)

8) 10 pts. Bond A and bond B both have a maturity of ten years – that is, each bond's last payment will be made ten years from now. Bond A is a *zero-coupon* bond. Bond B is a *fixed-payment bond*. Today the market price of bond A is the same as the market price of bond B. If yields rise unexpectedly tomorrow, which bond's price will fall more, or will the two prices fall by the same amount? Explain.

II) E) 3) a) & III) D) 4)

9) 15 pts. Consider two bonds, Bond A and Bond B, issued by two different companies. Based on what I have told you in class and in the notes, which of the following bonds is likely to have the widest (biggest) bid-ask spread quoted by dealers: Bond A, or bond B? Explain. Your score on this question depends on the thoroughness and clarity of your explanation.

Bond A was issued by an insurance company that operates in California. Everyone believes this company will default on its bonds if and only if there is a big earthquake in California within the next ten years. Everyone knows that geologists put the probability of this at 40 percent, that is all anyone knows about it, and that is all anyone *can* know about it.

Bond B was issued by a company in the mining services industry. Everyone knows that, on average, 10 percent of the bonds issued by companies in this industry are defaulted on. That is all most people know about bond B.

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Bond B was issued by a company in the mining services industry. Everyone knows that, on average, 10 percent of the bonds issued by companies in this industry are defaulted on. That is all most people know about bond B.

Bond B is likely to have a bigger (wider) bid-ask spread.

Bid-ask spread is based on whether the information about the default risk of a bond is asymmetric. If the information of a bond is asymmetric, then the bond will be less liquid, causing the bid-ask spread to be bigger. Because the information released about Bond A is all anyone can know about, the information is symmetric. However, the information released about Bond B is what most people know about, making information asymmetric. Other people may know more about Bond B than others which can cause a lemons problem and the bond to be less liquid, making the bid-ask spread wider.

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Great!

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Bond B was issued by a company in the mining services industry. Everyone knows that, on average, 10 percent of the bonds issued by companies in this industry are defaulted on. That is all most people know about bond B.

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Bond B will have a larger bid-ask spread because even though only 10% of the bond issued by the companies in the mining industry default, Not everyone has the same information on that bond, so there is a problem of asymmetric information which causes bonds to be less liquid and have a lower "ask" price, leading to a greater bid-ask spread.

Bond A has a higher probability of default but everyone has the same information, so investors and the bond issuer can quickly agree on a price making the bond liquid with symmetric information, and having a lower bid-ask spread

Great!

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Bond B was issued by a company in the mining services industry. Everyone knows that, on average, 10 percent of the bonds issued by companies in this industry are defaulted on. That is all most people know about bond B.

- Bond B will have the bigger bid ask spread
  Very good!
  - Bond B is more risky for dealers to hold into (it may take a long time to find a buyer) so they will charge more b/c the bond is more illiquid (harder to sell b/c asymmetric info makes people wary of buying it) Also some people have more info than others, so ↑ asymm. info

- Bond A is less risky & more liquid than Bond B b/c everyone has the same info on the bond, so there will be a large # of buyers all → willing to buy at approx. same price. Dealers won't hold onto the bond for long & therefore have lower bid ask spreads Also, no knowledgable buyers b/c any info on Bond A is known to everyone