SUNY-Binghamton **Name** _____

Spring 2025 Economics 450

No calculators. Total points on exam: 215. Good luck! Look over the entire exam before you begin. If I ask you to explain your answer, your grade for the question will depend on your *explanation.*

1) Consider a zero-coupon bond that you buy today, in May 2025, for a price P_t. The bond will pay \$1000 thirty years from today, in May 2055 (maturity n=30). Ten years from today, in May 2035, you sell the bond for a price P_{t+10}.

a) 5 pts Write down a formula (do not solve) that defines the bond's yield (to maturity) in May 2025.

b) 5 pts Write down (do not solve) a formula that defines the bond's yield (to maturity) in May 2035.

c) 5 pts Write down (do not solve) a formula that defines the rate of return you receive from buying the bond in 2025 and selling it in 2035.

2) Consider a two-year coupon bond that you can buy today in May 2025. The bond will make coupon payments in May 2026 and May 2027, and also pay off its face value (par value) in May 2027. The face value is \$36. The coupon rate, expressed as a fraction, is 1/3 (as a percent that's 33.3333333....) You look on a website and see that current yields to maturity on "zero coupon" bonds are:

200% for bonds paying off in May 2026

100% for bonds paying off in May 2027

a) 5 pts Calculate the highest price anyone should be willing to pay for this bond. I am looking for an actual dollar value. You can do it!

b) 5 pts. Using the price you calculated in a) and as many actual numbers as possible, write down (do not solve) a formula that defines the bond's yield to maturity. Point out which symbol stands for yield to maturity.

3) 20 pts. Suppose the "expectations hypothesis" of the yield curve is correct (there are no term premiums). Today, the Fed's target overnight rate is 3%. People are sure it will remain 3% for a year, and after that:

-With a probability of 1/3, the Fed will keep the rate at 3% for several more years.

-With a probability of 1/3, the Fed will cut the target rate to 0% and keep it there for several more years.

-With a probability of 1/3, the Fed will raise raise the target to 6 percent, hold it at 6% for a year, then raise the target again to 9% and hold it at 9% for several years.

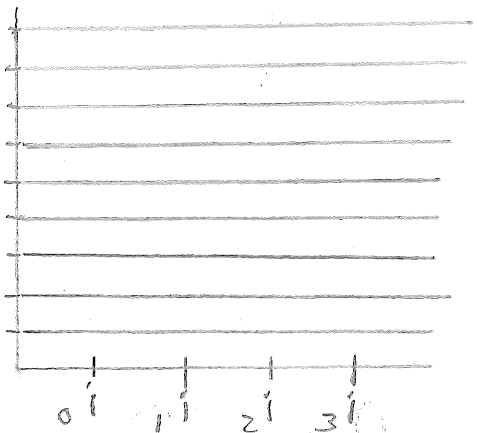
Figure out what yields will be for one-year, two-year and three-year zero-coupon Treasury bonds and plot the yield curve.

a) What is ${}_1i$? _____ percent

b) What is ${}_2i$? _____percent

c) What is ${}_3i$? _____percent

d) Yield curve



4) 10 pts. Suppose the "expectations hypothesis" is correct: people care only about the expected value of the return on an investment. Suppose also that Argentina has issued zero-coupon bonds in dollars. Financial market participants believe there is a chance Argentina will default (totally) on these bonds because, Argentina. What is today's yield (to maturity) on an Argentine bond if:
- today's yield on one-year zero-coupon Treasury bonds is 50 percent
- the perceived probablity that Argentina will default is 1/4 percent. _____per cent
Show your work!

5) 10 pts. In the context of lending by a financial intermediary, explain the difference between "screening" and "monitoring + restrictive covenants."

6) Consider an economy with no banks and no central bank. A person faces a situation similar to that described by the standard Baumol-Tobin model. As in that model,

Y is annual income, received at the beginning of the year

i is the annual interest rate or bond yield (expressed as a fraction, as in class)

N is the number of financial transactions the person engages in.

$(M/P)^D = \frac{Y}{2N}$ is the average money balance if the person engages in N financial transactions.

Here, however, the cost of financial transactions is different from the standard Baumol-Tobin model. A person must pay her broker a fixed annual fee equal to Z, plus an additional cost per financial transaction equal to F per transaction. Thus, if a person engaged in 5 financial transactions, the fixed part of the fee would be Z and the additional cost would be $F \times 5$. If a person engaged in 10 financial transactions, the fixed part of the fee would still be Z and the additional cost would be $F \times 10$.

a) 10 pts Derive the average real money balance that a person will choose to hold.

b) 5 pts In this model, what is the effect on the economy's market interest rate or bond yield if the supply of real money balances remains fixed, but there is an increase in Z? Explain.

7) 10 pts. What is a "swap line"?

8) 10 pts. Suppose that the weight of students in a large class is uniformly distributed between 100 and 200 pounds. I will choose a student from the class randomly, and I will pay you \$50 if the student weighs as much as you do or less. Let Z denote your own weight, which is between 100 and 200 pounts. Before I pick the random student, what is the expected value of the amount of money I will pay you?

9) Suppose the Fed does *not* pay interest on reserves, but there *are* reserve requirements. All banks in the country are identical. Each bank has the same reserve requirement, equal to *1* (one). Each bank has *$100* to divide between its reserve account and overnight lending. At 5 pm each bank will choose how much to leave in its reserve account.Between 5 and 6 pm. the Fed will clear payments between banks, adding a net sum P to each bank's reserve account. P can be a positive or negative number. That leaves $R+P$ in the bank's reserve account at 6 pm. A bank will have a *reserve shortfall* if the balance after clearing, at 6 pm, falls below (or is just equal to) the reserve requirement of *1*. A bank with a reserve shortfall must take an emergency loan from the Fed to bring the balance up to the required level. The Fed charges an interest rate r_p for such emergency loans. This interest rate is equal to *2*. From a bank's point of view, P is a random variable, uniformly distributed between a minimum value (the smallest possible net payment into the bank's reserve account) of *-1*, and a maximum value (the largest possible payment into the bank's reserve account) of *+1*. The market overnight rate is denoted r.

a) 5 pts Using the information given above, write an expression that gives the probability that a bank will have a reserve shortfall, for any given value of R., assuming r is greater than zero but less than 2.

b) 5 pts *Assuming* a bank has a reserve shortfall, what is the expected value of the amount that the bank will have to borrow from the Fed, for any given value of R?

c) 5 pts Using your answers to a) and b), write an expression that gives the expected value of the bank's profit. Remember $r_p = 2$.

d) 5 pts Using your answer to c), use calculus and algebra to find the reserve balance R^D that maximizes expected value of the bank's profit.

e) 5 pts. Suppose the target overnight rate is 1/2. What is the reserve supply per bank that will cause the market overnight rate to hit the target?

f) 5 pts. Suppose that reserve supply per bank is *-1* (negative one). Don't worry about how reserve supply could be a negative number; it just is. What will be the market overnight rate?

10) 10 pts. In the context of central banking, what is "stigma"?

11) 10 pts. To make a "mortgage backed security," a financial intermediary buys a lot of mortgages and issues a bond. The coupon payments and par value payment on the bond come from the mortgage payments. In the 1990s and early 2000s, financial intermediaries created many mortgage backed securities from "nonconforming" mortgages (mortgages whose payments were not insured by Federal agencies). Prior to the financial crisis of 2008 these bonds were very liquid. During the crisis they became illiquid. How can a bond become illiquid? Why did *these* bonds become illiquid?

12) 15 pts. Assume the Fed follows an "inflation targeting" strategy. The FOMC's next meeting will be two months from today. The overnight rate is well above the "zero bound." The Fed's target inflation rate is 2 percent. Expected inflation is also two percent. The unemployment rate is equal to the NAIRU (natural rate).

a) Suppose that on MONDAY everyone believes that, in the future, the IS curve may shift back, or out, or remain stable - all possibilities equally likely. Draw what the yield curve looks like on MONDAY.Using a dotted line, draw the "expectations hypothesis" yield curve. Using a solid line, draw what the yield curve really looks like, given the existence of term premiums.

b) On TUESDAY, *as a surprise to everyone*, Congress passes a bill that will cut taxes while keeping government purchases of goods and services the same, and the president says he will sign the bill. Draw the CHANGE in the yield curve from Monday to Tuesday. Using a line labelled "Monday," reproduce Monday's actual yield curve from a). Using a line labelled "Tuesday," draw the yield curve that will prevail after Tuesday's news comes out.

c) Suppose that back on MONDAY you had owned bonds, and you found out the bill was going to pass because you had been accidenally added to a Signal chat among House Speaker Mike Johnson and his allies. Would sell your bonds, buy more bonds, or neither? Explain.

13) 35 pts. Suppose that you and two friends each make a ton of money playing internet poker. You each take $100,000 of your individual winnings and combine the money for a total of $300,000. You get an additional $700,000 by borrowing money overnight. With the $1,000,000 total, you "acquire financial assets," that is buy bonds and/or make loans. (Remember that when you lend money to someone, you have "acquired" that loan as an asset.)

a) What is the value of your financial intermediary's "capital"? $_____

Here is a list of the assets you and your friends can possibly acquire:
- Treasury bonds (long-term bonds issued by the US Treasury)
- Treasury bills (very short-term bonds issued by the US Treasury)
- Long-term loans (loans to businesses and people to be paid back years from now)
- Short- term loans (loans to businesses and people to be paid back in a few months)

b) Which of these assets would you acquire if you want to ensure you cannot possibly become insolvent as a result of interest-rate risk *or* suffer a liquidity crisis? List all the assets you might acquire in this case:

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c) Which of these assets would you acquire if you don't worry about interest-rate risk but want to make sure you cannot possibly suffer a liquity crisis? List all the assets you might acquire in this case:

_____

d) Which of these assets would you acquire if you want to earn the highest possible return on your assets, and you don't worry about interest-rate risk or liquidity crisis? List all the assets you might acquire in this case:

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e) On which of these assets might it be sensible to enter into "credit default swaps"? List all the assets on which it might be sensible to enter into credit default swaps.

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f) Over the course of a year you continue to repeatedly borrow $700,000 overnight, day after day, paying out the interest on these loans out of the earnings on your assets and using any net earnings to buy more assets. At the end of the year you are still borrowing $700,000 overnight, and the market value of your assets is $1,400,000. Then you and your friends sell $200,000 worth of the assets. You divide up the $200,000 among the three of you and spend it all on vacations, video games and vodka.
What is the value of your financial intermediary's "capital" now, that is at the end of the year *after* you and your friends have taken out the $200,000?

$_____

g) You and your friends *could* have taken out *more* than $200,000. In fact, one of your friends argued that you three should have sold and divided up all $400,000 of the increase in the value of your assets over the course of the year. You argued that taking out just $200,000 could actually increase your firm's profits next year. Explain what you had in mind. *More room for your answer on next page.*

14) 15 pts. Your little brother Aloysius comes to Binghamton as a freshman. Like many little brothers he is annoying and overly sceptical. On your advice he starts out as an economics major and takes introductory macro (Econ 162). At the end of the semester he tells you that it is obviously nonsense. "The professor told me that there is an IS curve, so that an increase in the real interest rate makes real GDP fall and the unemployment rate go up. But I know that the Fed has been raising nominal interest rates over the last three years. Surveys show that expected future inflation has been two percent through all that time, so real interest rates must have been increasing. But real GDP has not fallen and the unemployment rate has not gone up. This IS curve business is for the birds. My professor is a big fat liar." Aloysius is wrong, of course. Explain why Aloysius is wrong.