

No calculators. Total points on exam: 210. 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) 5 pts. You buy a 30-year coupon bond today for \$10. After one year, you sell it for \$11. In the meantime, you receive a coupon payment of \$1. What rate of return did you receive?

_____ percent

2) 5 pts. A zero-coupon bond will pay \$90 in May 2023, exactly two years from now. The current price of the bond is \$10. What is the yield to maturity on this bond?

_____ percent

3) Suppose that current market yields to maturity for "zero-coupon" bonds are:

${}_1i$ percent for bonds paying off May 2022 (one-year zero coupon bonds)

${}_2i$ percent for bonds paying off May 2023 (two-year zero-coupon bonds)

${}_3i$ percent for bonds paying off May 2024 (three-year zero-coupon bonds)

You are offered a bond that will make a payment of \$50 in May 2022, \$60 in May 2023, and \$70 in May 2024.

a) 5 pts. Write a formula that defines the highest price anyone should be willing to pay for the bond.

b) 5 pts. Suppose that today's market price of the bond is \$130. Write a formula that defines the "yield to maturity" on the bond. Circle the symbol that stands for yield to maturity, everywhere it appears.

4) 10 pts. Suppose people care only about the expected value of the return on an investment. The yield on a one-year zero-coupon Treasury bond is 50% (0.50 or 1/2). XYZ corporation has issued a bond which promises to pay \$300 in one year (IOU is \$300). XYZ might default on the bonds (not pay at all). Everyone believes the probability that XYZ will default is 1/2. What is today's market price of the XYZ bond? \$ _____

5) A bank has taken \$10m in deposits and borrowed \$2m by issuing bills. It holds \$2m in cash and \$6m worth of long-term Treasury bonds. It has made \$6m in loans to local businesses.

a) 5 pts. What is the bank's capital? \$ _____

b) 5 pts How much does the bank have in "secondary reserves"? \$ _____

6) 10 pts. What is a "credit default swap"?

7) 10 pts. Suppose that Chemung Canal Bank made a big profit in the year 1845, back before there were regulatory capital requirements or deposit insurance. Some of the owners of the bank wanted to pay it all out to the owners in dividends. Other owners wanted to use the profit to buy more bonds and make more loans to be held by the bank, increasing the bank's capital. What would have been the possible benefit to the owners of increasing the bank's capital?

8) 10 pts. What are "Bagehot's rules"?

9) 10 pts. In the context of monetary policy, what are "anchored expectations"?

10) 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.

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

Here, however, the cost of engaging in one financial transaction is not F . Here the cost of engaging in a financial transaction is *lower* for a person with a higher income, because the staff in the bond brokerage are nicer to rich people. The cost of engaging in one financial transaction is f/Y . The total cost of engaging in N financial transactions is $(f/Y)N$.

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

b) 10 pts. Suppose the supply of money and the price level are fixed. What happens to the interest rate in this economy if there is an increase in income Y ? Explain, using your answer to a). Use a graph if you want.

11) Billy is broke, but he has a plan. Tonight he will borrow \$100 from each of his two room-mates, Jack and Tom, then drive to the Krispy-Kreme place in Scranton and spend the \$200 on doughnuts. Tomorrow afternoon, he will sell the doughnuts in front of LH 4 just before Econ 160 which has many doughnut lovers willing to pay a pretty penny for Krispy Kremes. Tomorrow evening, Billy says, he will pay Jack and Tom each \$150 (keeping a nice profit for himself). Jack and Tom hesitate to lend. Each fears that he may need cash tomorrow morning, *before* Econ 160. To persuade them to lend, Billy promises to pay back \$100 to anyone who asks for his money back tomorrow morning. In fact, however, if either Jack or Tom or both asks for money back tomorrow morning, Billy will have to sell the doughnuts *immediately* around the dorm, which is full of people who don't like doughnuts very much; in that case Billy will get just \$100 for the doughnuts - not enough to pay \$100 to both Jack and Tom.

a) 10 pts. Suppose Jack and Tom believe that, if one of them asks for his money back in the morning and the other waits until evening, the one who asks for his money back in the morning will get \$100, the other will get nothing; if both ask for their money back in the morning, both will get \$50. Fill in boxes to describe this. Circle the outcome(s) that can actually occur (equilibrium).

Jack

		Withdraw in morning	Wait
		Tom	
Withdraw in morning			
Wait			

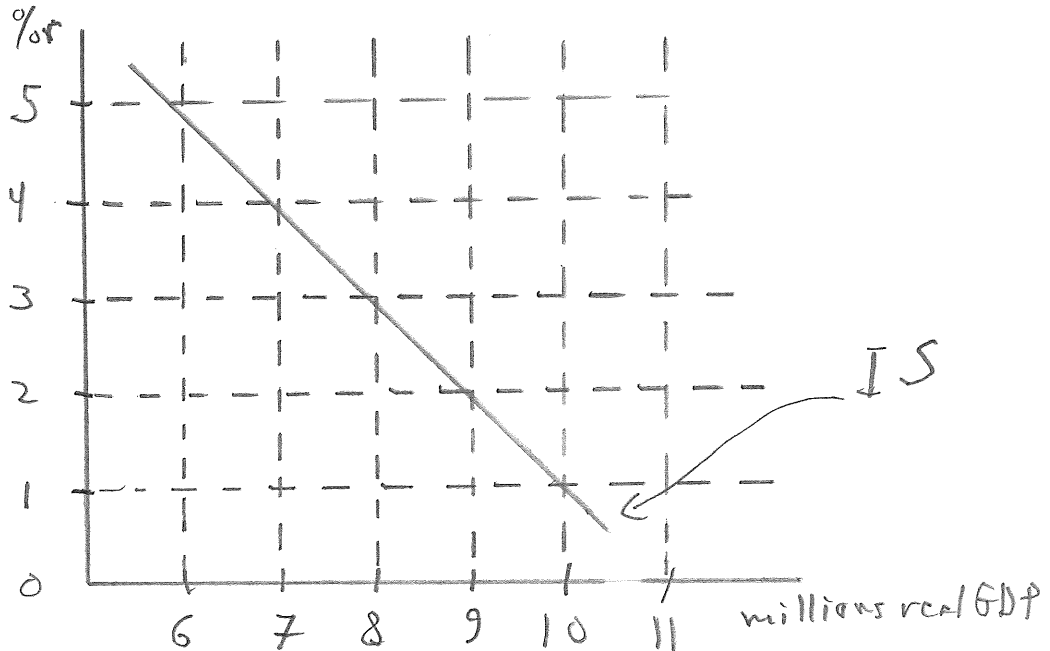
b) 10 pts. Now suppose Jack and Tom have different beliefs. As before, Billy promises to pay Jack and Tom each \$150 tomorrow evening. But everyone knows Jack is Billy's best friend. If both Jack and Tom ask for their money back in the morning, Jack will get \$100; Tom will get nothing. If Tom asks for his money back in the morning and Jack waits until evening, both Tom and Jack will get \$50. If Jack asks for his money back in the morning and Tom waits until evening, Jack will get \$90; Tom will get \$10. Fill in boxes to describe this. Circle the outcome(s) that can actually occur (which can be an equilibrium).

Jack

		Withdraw in morning	Wait
		Tom	
Withdraw in morning			
Wait			

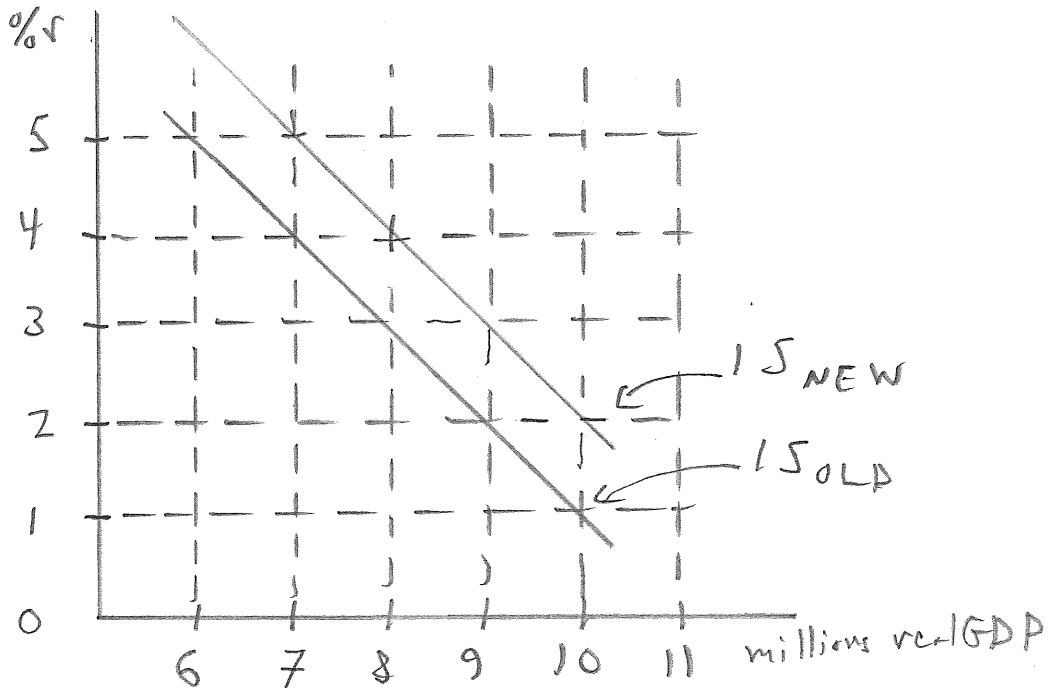
12) Suppose the Fed is following an "inflation targeting" strategy. The Fed's target inflation rate π^T is 2 percent. The natural rate of unemployment (or NAIRU) is 5 percent. When the unemployment rate is 5 percent, real GDP is equal to 8 million units of output. Expected future inflation is 2 percent. For simplicity, assume that there is just one nominal interest rate, denoted i , and the Fed can control it.

a) 5 pts. Suppose the IS curve in the economy is the one plotted to the right, and the Fed's economists correctly estimate the position of the IS curve.



What value will the FOMC set for the nominal interest rate i ? _____ percent
 Will the unemployment rate probably turn out to be greater than, less than or equal to 5 percent? _____
 Will inflation probably turn out to be greater than, less than or equal to 2 percent? _____

b) 5 pts. Suppose that the IS curve in the economy changes, as plotted to the right, and the Fed's economists *correctly* estimate the shift in the IS curve.

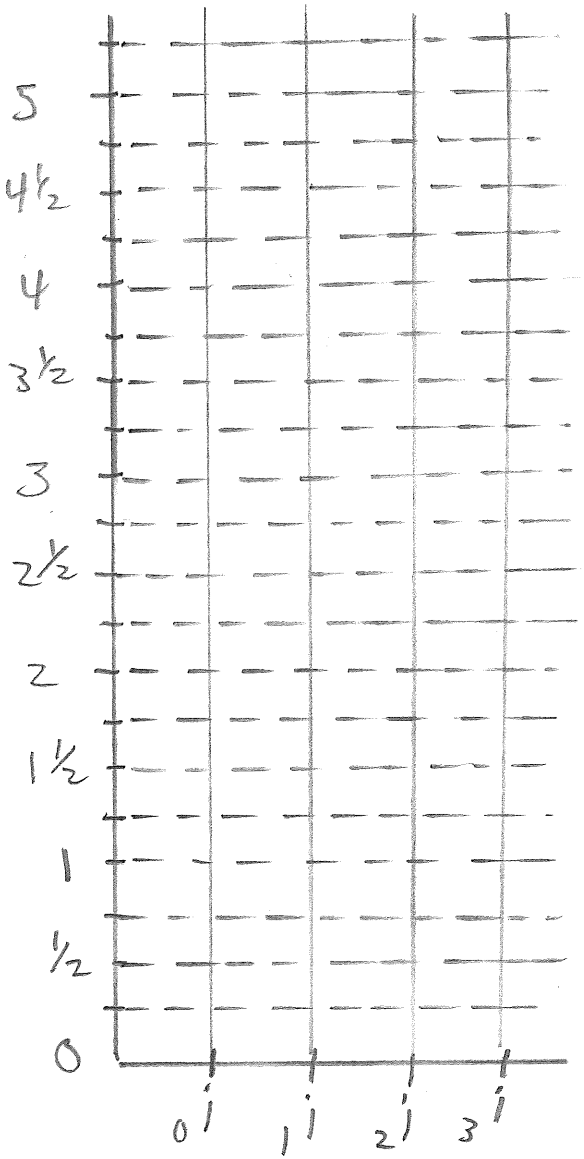


Now what value will the FOMC set for the nominal interest rate i ? _____ percent
 Will the unemployment rate probably turn out to be greater than, less than or equal to 5 percent? _____
 Will inflation probably turn out to be greater than, less than or equal to 2 percent? _____

c) 5 pts. Suppose that the IS curve changes as in b), but the Fed's economists *do not know* this is happening. They *continue* to believe that the IS curve is as in a).

Now what value will the FOMC set for the nominal interest rate i ? _____ percent
 Will the unemployment rate probably turn out to be greater than, less than or equal to 5 percent? _____
 Will inflation probably turn out to be greater than, less than or equal to 2 percent? _____

13) 15 pts. Suppose that the conditions assumed for the "expectations hypothesis" are true: all that people care about is the expected value of the return to an investment. On the graph below, draw what the yield curve will look like under the following circumstances. At present, the overnight rate is 1%. It is certain to remain 1% for one year. After that, two things can happen. With a probability of one-half, the overnight rate will remain 1%. Or, also with a probability of one half, the overnight rate will rise to 3% in year two, remain 3% for all of that year, then rise to 5% in year three and remain 5% for all of that year.



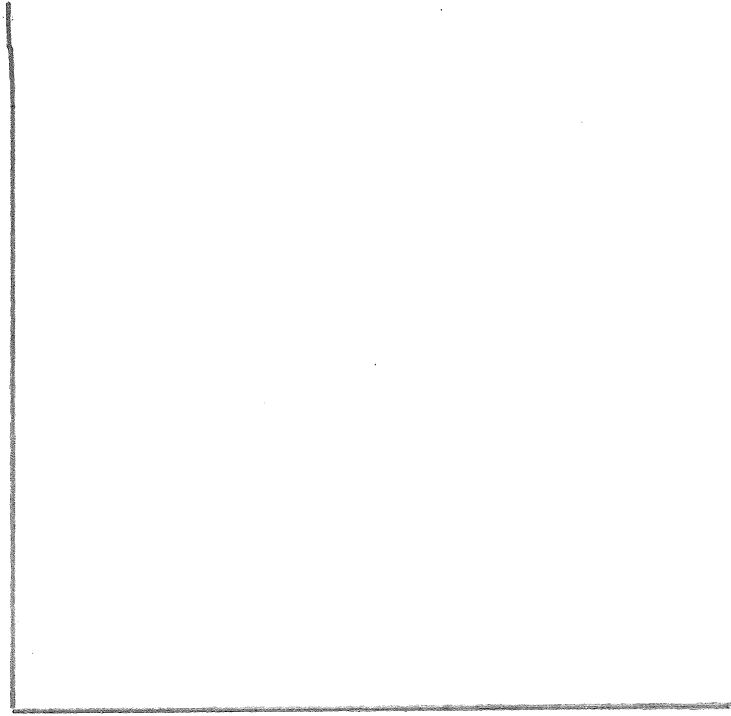
14) In the years following the financial crisis of 2008, when the Fed had cut the target fed funds rate to “practically zero,” it followed “unconventional monetary policies” to boost real GDP.

a) 5 pts. One of these unconventional monetary policies was “forward guidance.” Explain what forward guidance was, *and* how Fed policymakers thought that forward guidance could help boost real GDP.

b) 5 pts. Another unconventional monetary policy was “quantitative easing” (QE), also called “Large-Scale Asset Purchases” (LSAP’s). Explain what QE was, *and* how Fed policymakers thought that QE could help boost real GDP.

15) In 2009 the Federal Reserve system began to use a "floor" system of interest-rate control.

a) 5 pts On this graph, *show* how the floor system was supposed to work *in theory*. Label the axes, and use r_T to denote the target overnight rate, r to denote the actual overnight rate, r_D to denote the interest rate paid on reserves and r_p to denote the interest rate charged for emergency loans to cover reserve shortfalls.



b) 5 pts In practice, the market overnight rate turned out to be less than it was supposed to be in theory. Explain why this was true.

16) Suppose there is no reserve requirement and the Fed does not pay interest on reserves ($r_D = 0$). The Fed charges an interest rate $r_p = 4$ for emergency loans to cover overdrafts. The market overnight rate is r . All banks in the country are identical. Each bank has \$100 to divide between its reserve account and overnight lending. At 6 pm each bank will choose how much to leave in its reserve account. Between 6 and 7 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 7 pm. A bank will have overdrawn its reserve account if the balance after clearing, at 7 pm, falls below zero. A bank that overdraws its reserve account must take an emergency loan from the Fed to cover the overdraft. 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 -4 , and a maximum value (the largest possible payment into the bank's reserve account) of $+4$.

a) 5 pts. Suppose a bank wants to make absolutely sure it cannot possibly run an overdraft in its reserve account. How big does R need to be?

b) 5 pts Write an expression that gives the probability that a bank will run an overdraft in its reserve account for given R , (assuming $r_D < r < r_p$).

c) 5 pts Write an expression that gives the probability that a bank will *not* run an overdraft in its reserve account (assuming $r_D < r < r_p$).

d) 5 pts Assuming a bank runs an overdraft in its reserve account, what is the expected value of the amount that the bank will have to borrow from the Fed (assuming $r_D < r < r_p$)?

e) 5 pts Assuming a bank does *not* run an overdraft in its reserve account, what is the expected value of the amount that the bank will have in its reserve account (assuming $r_D < r < r_p$)?

f) 5 pts. Write an expression that gives the expected value of a bank's profit.

g) 5 pts. Using your answer to f) and calculus and algebra, find the reserve balance R^D that a bank would choose to leave in its reserve account at 6 pm.

h) 5 pts Suppose reserve supply per bank is 3. What will the market overnight rate r be?

i) 5 pts Suppose reserve supply per bank is 10. What will the market rate r be?