NY-Binghamton **Name** ___________________________

Fall 2021 Economics 450 Monetary Economics

Second midterm exam

No calculators. Total points on exam: 145**.** 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*. If you need more room for an answer, write on the back of the exam. Good luck!

1) 15 pts. Consider a bank. The bank has taken $100 in deposits, borrowed $50 in overnight repo loans, and issued $150 worth of long-term bonds. The bank has bought $200 worth of Treasury bonds and lent $400 to local businesses. It also holds $10 in cash in its vault.

a) How much is the bank's capital? $_________________________

b) How much does the bank hold in reserves? $____________________

c) How much does the bank hold in secondary reserves? $_____________________

2) 10 pts. How could you "use" money without "holding" money?

3) 10 pts. What is "ledger money"?

4) 10 pts. In the context of financial markets, what is “contagion”? Why does it occur?

5) 15 pts. Suppose that the midday temperature in Binghamton is uniformly distributed between zero and 80 degrees. If tomorrow's temperature is 40 degrees or hotter, I will pay you $1 for every degree of temperature. (E.g., if the temperature is 55 degrees, I will pay you $55.) The expected value of the amount of money I will pay you tomorrow depends on the probability that I will pay you money. It also depends on the expected value of the money I will pay you assuming that I pay you something. What is the expected value of the amount of money I will pay you tomorrow? $______________
Show your calculations below.

7) 20 pts 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.

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

Here, however, the cost of engaging in financial transactions is different. The cost of engaging in a financial transaction increases with the number of transactions a person has already done - the more transactions, the more annoying is the next transation. Thus, the *total cost* of engaging in N financial transactions is not FN. The total cost of engaging in N financial transactions is FN^2.

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

b) Suppose the supply of real money balances is held fixed, while there is an *increase* in the parameter F. What happens to the economy's market-clearing interest rate? Explain how you know.

8) 10 pts. Hanna borrows \$200 from Bill, promising to pay him his money back whenever he asks for it, with interest *i*. She borrows another \$200 from Jane on the same terms. Hanna takes the \$400 and buys one illiquid coupon bond.

- If Bill and Jane roll over (do not withdraw) their loans, Hanna will pay each one back the \$200 plus interest earned.
- If both Bill and Jane withdraw their loans, Hanna will sell the bond immediately for a low price, just \$200, and divide up the \$200 equally between Bill and Jane - each will receive \$100.
- If one withdraws and the other rolls over, Hanna will sell the illiquid bond and gives the one who withdrew \$100. Hanna will take the remaining \$100, invest it in very short-term Treasury bills, and pay the person who rolled over the loan \$100 plus interest *j*, where *j* is less than *i.*

Portray this situation in the boxes to the right. Circle all of the outcomes that can be an equilbrium, as we defined equilibrium in class.

9) 10 pts. Now suppose that, as above, Hanna borrows \$200 from Bill, promising to pay him his money back whenever he asks for it, with interest *i*. She borrows another \$200 from Jane on the same terms. Hanna takes the \$400 and buys one illiquid coupon bond. But the possible outcomes are a bit different.

- If Bill and Jane roll over (do not withdraw) their loans, Hanna will pay each one back the \$200 plus interest.
- If both withdraw their loans, Hanna will sell the bond immediately for a low price, just \$200, and divide up the \$200 equally between Bill and Jane - each will receive \$100.
- If one lender withdraws and the other rolls over, the bond will be sold as quickly as possible for the price of \$200. The \$200 will be divided evenly between Bill and Jane. There will *also* be a difficult case in bankruptcy court. The case will cost *both* lenders - Bill and Jane - \$5 in lawyers' fees (\$5 each). And neither will earn any interest.

Portray this situation in the boxes to the right. Circle all of the outcomes that can be an equilbrium, as we defined equilibrium in class.

10) 15 pts. Consider a situation like that described by our mathematical model of reserve demand. r is the market overnight rate, r_D is the interest rate paid on excess balances in banks' reserve accounts. r_P is the interest rate charged for emergency loans to cover deficiencies in banks' reserve accounts. Read all parts of this question before beginning to answer it.

a) In a system like this, r_D is supposed to act as a floor for the market overnight rate, so that r cannot possibly fall below r_D. Explain why this would be so. I am looking for words here, *not* a graph.

b) When Fed policymakers tried to use the "floor" system of interest-rate control, they found that the market overnight rate actually fell below r_D. Explain why this was so.

c) What did Fed policymakers then do to prevent r from falling very far below r_D?

11) 30 pts. A bank has funds A to divide between overnight lending and its reserve account at the central bank. The market overnight rate is r. At 6 pm the bank decides how much to leave in its reserve account. Let R denote this balance. Between 6 and 7 pm the central bank clears the day's payments, leaving $R+P$ in the account at 7 pm. As of 6 pm, from the bank's point of view, P is a uniformly distributed random variable with a maximum possible value $+1$ and a minimum possible value -1. There is no reserve requirement, but if a bank has a negative balance in its reserve account at 7 pm - if the the bank overdraws its reserve account - the bank must borrow from the central bank to make up the shortfall. The central bank charges an interest rate $r_P = 4$ for loans to cover shortfalls. In your expressions, write this interest rate as *4* (not *0.04*).

a) Assume the market rate is greater than zero but less than 4. For a given value of R, what is the probability that a bank will overdraw its reserve account?

b) Assuming a bank does overdraw its reserve account, what is the expected value of the amount of money that the bank will have to borrow from the central bank?

c) Using your answers to a) and b), write down an expression that describes, for a given value of R, the expected value of a bank's profit from overnight lending *less* the cost of any emergency borrowing from the central bank. Simplify the expression so that it will be easy to use.

d) Use calculus and algebra to find the reserve balance R^D that maximizes the expected value from c).

d) Suppose that reserve supply per bank is 1/2. What will be the market overnight rate be equal to?

e) Suppose that reserve supply per bank is 10. What will be the market overnight rate be equal to?