SUNY-Binghamton **Name** _____
Spring 2016 Economics 450
Monetary Economics
Final exam

No calculators. Total points on exam: 198**.** 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.** Suppose you buy a two-year zero-coupon bond for $100. The "IOU" on the bond is $900. What is the yield on the bond?

_____ percent

2) **5 pts.** Suppose you buy a two-year zero-coupon bond for $100. The "IOU" on the bond is $400. After one year you sell the bond for $90. What rate of return did you receive?

_____ percent

3) **5 pts.** Suppose that current market yields to maturity for "zero-coupon" bonds are:
3 percent for bonds paying off May 2017 (one-year zero coupon bonds)
4 percent for bonds paying off May 2018 (two-year zero-coupon bonds)
7 percent for bonds paying off May 2019 (three-year zero-coupon bonds)
Consider a coupon bond that pays its face value in May 2019. The face value is $1000. Its coupon rate is 5 percent. The current price of the bond is $950.
Write a formula that defines the *yield to maturity* on the coupon bond.

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 the city of Binghamton has issued bonds. Financial market participants believe there is a chance Binghamton will default (totally default) on its bonds, due to population loss and disappearance of tax base. What is the perceived probability that Binghamton will default if:
- today's yield on one-year zero-coupon Treasury bonds is 50 percent
- today's market price of a one-year zero-coupon Binghamton bond promising to pay $300 in one year is $100.

_____ (probability of default)

5) Below I list the three functions of money. Briefly define each.
a) **3 pts.** Store of value

b) **3 pts.** Unit of account.

c) **3 pts.** Medium of exchange.

6) **10 pts**. A firm that wants to issue a bond will pay a bond rating company (like S&P) to give the bond a rating (e.g. AAA, BAA) that indicates the bond rater's estimate of the probability the issuer will default on the bond. Why are bond issuers willing to pay for a bond rating?

7) Suppose the Fed follows a "Taylor rule" in setting the target overnight (fed funds) rate. The "NAIRU" or natural rate of unemployment is 5 percent. The target inflation rate is two percent. Draw what the yield curve will look like under each of the following sets of circumstances. With a dotted line, draw the "expectations hypothesis" yield curve. With a solid line, draw the "true" yeld curve, that is what the yield curve will really look like. Assume the target overnight rate specified by the Taylor rule is always well above zero; there is no "zero bound" problem.

a) **5 pts.** Unemployment is 7 percent, inflation is 2 percent. People believe that in the long run, unemployment will be 5 percent and inflation will be 2 percent.

b) **5 pts.** Unemployment is 3 percent, inflation is 4 percent. People believe that in the long run, unemployment will be 5 percent and inflation will be 2 percent.

c) **5 pts.** Unemployment is 5 percent, inflation is 2 percent. People believe that next year unemployment will rise to 7, before eventually falling back to 5 percent, while inflation will fall to 1 percent, before eventually rising back to 2 percent.

8) **20 pts.** Consider an economy with no banks and no central bank. Inflation behaves according to an "expectations augmented Phillips curve." Expectations are anchored: the expected value of future inflation is always zero (though people know inflation may actually turn out to be higher or lower). The natural rate of interest $\bar{r}$ is 3 percent.

a) Suppose that, in year 1, the money supply is such that output is equal to potential output (also known as the natural rate of output). Draw what this situation looks like in the graph to the right (note the numbers!). Label the money supply M_1 and the interest rate i_1 .

b) In year 2, there is an unexpected decrease in the money supply. Show what happens in year 2. Label the year-2 money supply M_2 and the interest rate i_2 .

c) In the long run, this economy is going to return to an equilibrium with output equal to potential output and the interest rate equal to the value it was in year 1. Explain how this will happen. Use a graph or graphs if you want.

9) Suppose the FOMC's target overnight rate (fed funds rate) is 4 percent. Suppose also that there is an accidental factor, unpredictable by Fed staff, that affects reserve demand on a given day. The factor can increase reserve demand (push reserve demand to the right), or decrease reserve demand (push reserve demand to the left).

a) **7 pts**. Suppose also that the Fed is using a "tunnel" method, so that the target overnight rate is halfway between the interest rate paid on reserve balances and the interest rate charged for emergency loans to cover reserve shortfalls. One day the unpredictable factor *increases* reserve demand. What is likely to happen to the market overnight rate on that day? Will it be greater than, less than or about equal to 4 percent? _____ (greater than, less than, equal)
Explain. Illustrate with a graph.

b) **7 pts.** Now suppose the Fed is using a "floor" method to keep the market overnight rate at the target level, so that the target overnight rate is equal to the interest rate paid on reserve balances. One day the unpredictable factor *decreases* reserve demand. What is likely to happen to the market overnight rate on that day? Will it be greater than, less than or about equal to 4 percent? _____ (greater than, less than, equal)
Explain. Illustrate with a graph.

10) **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, Donald Trump is elected president and immediately announces that when he takes office in a few months he will ask Congress to eliminate the federal income tax, without raising other taxes or reducing government spending. Everyone believes Congress may go along with it. 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 on Monday you had owned bonds, and you had received results of a secret poll that showed Trump would win on Tuesday. Would sell your bonds, buy more bonds, or neither? Explain.

11) **10 pts.** In the context of financial markets, what is a "fire sale"?

12) **15 pts.** Suppose you receive all your income for the year on January 1st. Let *Y* stand for your real income. Every day in the following year you spend exactly 1/365th of your income on stuff. You cannot buy bonds. But you can keep funds in a bank, in a checking account and/or a savings account. The checking account pays i_C . The savings account pays a *higher* rate of interest i_S . You cannot pay for things with the funds in your savings account. You CAN pay for things with the funds in your checking account (using a debit card). Every time you make a deposit into the bank or transfer funds between accounts, you must pay a fee *F*. Derive an equation that shows the *average real balance* you will keep in your checking account over the year. Use *D/P* to stand for your average real checking-account balance.

13) After the financial crisis, while the target overnight rate was stuck at the "zero bound," the Fed bought lots and lots of Treasury bonds.
a) **10 pts**. Why did the Fed do this?

b) **5 pts.** Assuming the Fed's bond purchases had the intended effect, how would they have affected the dollar's rates of foreign exchange against foreign currencies - appreciate, depreciate, or no effect? Explain.

c) **5 pts.** Assuming the Fed's bond purchases affected exchange rates as you stated in b), how did they affect inflation? Explain.

14) The last reading in the coursepack is "After the first rate hike" by John Williams. In it, Williams writes about "the concept of the 'neutral' fed funds rate - that is, the federal funds rate that balances monetary policy so that it's neither accommodative nor contractionary." By "accomodative" he means tending to push up on inflation; by "contractionary" he means tending to push down on inflation.

a) **5 pts.** Translate Williams into the language we used in class. What does he mean by the "neutral" fed funds rate?

b) **10 pts.** Williams says the long-run average value of this "neutral" rate is likely to be lower in the future, after the economy fully recovers, than it was in the years prior to the financial crisis: "compared with the pre-recesson 'normal' funds rate of, say, between 4 and 4.5%, we may now see...a ['normal'] fed funds rate of around 3-3/1% instead...it could even be below 3%." Many economists agree with Williams here. They argue that this means the Fed should raise its inflation target above 2 percent. Explain.

15) Suppose the Fed does not pay interest on reserves. There is no reserve requirement. The Fed charges an interest rate for emergency loans r_P to cover overdrafts. This interest rate is equal to *4.* All banks in the country are identical. 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 postive or negative number. That leaves *R+P* in the bank's reserve account at 6 pm. A bank will have overdrawn its reserve account if the balance after clearing, at 6 pm, falls below zero. A bank that overdraws its reserve account must take an emergency loan from the Fed to cover the overdraft, to bring its reserve account up to a zero balance. 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 run an overdraft in its reserve account, for any given value of *R,* assuming *r* is greater than zero but less than 4.

b) **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, for any given value of *R*?

c) **5 pts** Using your answers to a) and b), write an expression that gives, for any value of *R*, the expected value of the bank's profit. Remember $r_P = 4$.

d) **10 pts.** Using your answer to c) and calculus and algebra, find the reserve balance R^D that a bank would choose to leave in its reserve account at 5 pm, as a function of *r*.

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?