Problem Set 1

ECON 40364: Monetary Theory and Policy
Prof. Sims
Spring 2025

Instructions: Please answer all questions to the best of your ability. You may consult with other members of the class, but each student is expected to turn in his or her own assignment. This problem set is due in class on January 29.

1. Suppose that Fred owns a Bigfoot statue that is worth \$100. He has \$200 in a checking account and holds \$100 in cash. He also holds \$100 in credit card debt. Suppose that Ted has \$100 in a checking account and \$100 in cash. He has owns nothing else, and owes nothing to no one. Suppose that there are two banks (Bank A and Bank B) serving the economy. They hold deposits from many households (not just Fred and Ted), and invest in loans (to people other than Fred and Ted). The banks each have initial balance sheets of:

Bank A

Assets		Liabilities + Equity	
Loans	\$800	Deposits	\$800
Reserves	\$200	Equity	\$200

Bank B

Assets		Liabilities + Equity	
Loans	\$2000	Deposits	\$1500
Reserves	\$400	Equity	\$900

There is also a credit card company, Capital One. It has a balance sheet that looks like:

Capital One

Assets		Liabilities + Equity	
Loans	\$1000	Borrowings	\$500
Deposits	\$200	Equity	\$700

Fred banks with Bank A. Ted banks with Bank B.

(a) Use a T-Account to describe Fred's initial balance sheet, including his net worth.

(b) Use a T-Account to describe Ted's initial balance sheet, including his net worth.

(c) Suppose that Ted purchases the Bigfoot statue from Fred using cash. Show how the balance sheets of Fred, Ted, Bank A, Bank B, and Capital One change as a result.

(d) Suppose instead that Ted purchases the Bigfoot statue from Fred by writing a check that Fred deposits into his bank account. Show how the balance sheets of Fred, Ted, Bank A, Bank B, and Capital One change as a result.

(e) Suppose instead that Ted purchases the Bigfoot statue from Fred via credit card. As a result, Capital One deposits funds directly into Fred's checking account. Show how the balance sheets of Fred, Ted, Bank A, Bank B, and Capital One change as a result.

2. Suppose that we have an economy. There are two households: Marcus and Freeman. There is one production firm: Golden. There is one bank: Denbrock. Marcus and Freeman both own homes, financed via loans from Denbrock. Golden owns a factory and is financed via mixture of common stock and loans from Denbrock. Marcus holds all the stock in Golden, and Freeman owns all the bank stock (i.e., he owns Denbrock).

   Suppose that Marcus' home is worth \$1000. Marcus has a mortgage loan from Denbrock valued at \$800. Marcus holds \$500 in deposits with Denbrock. Marcus also holds \$200 in Golden's stock. Freeman's home is worth \$500. He has a mortgage loan from Denbrock worth \$300. He also holds \$200 in deposits with Denbrock. The factory owned by Golden is valued at \$400. Golden has a loan from Denbrock.

   (a) Write out a balance sheet for Marcus. What is his net worth / equity?

   (b) Golden has a loan from Denbrock. What must be the value of this loan (note: the net worth of Golden must equal the value of the outstanding common stock)? Write out Golden's balance sheet.

   (c) Given your answers above, what must be the net worth of the bank (Denbrock)? Write out Denbrock's balance sheet in full.

   (d) Given your answers above, write out the balance sheet for Freeman. What is his net worth?

   (e) What is the total value of non-financial assets (i.e., capital) in this economy? Verify that household net worth adds up to the total value of capital.

3. This question is based on Mishkin, Chapter 14, Applied Problem 25. The required reserve ratio is 10 percent. Suppose that currency in circulation is \$600 billion, deposits are \$900 billion, and excess reserves are \$15 billion.

   (a) Calculate the M1 money supply, the currency-deposit ratio, the excess reserve ratio, the money multiplier, and the monetary base.

   (b) Suppose the central bank conducts a large open-market purchase of \$1400 billion. Assuming the ratios you calculate in (a) remain the same, predict the change in the money supply.

   (c) Suppose the central bank conducts the same purchase as in (b), but banks choose to hold all proceeds from the sale of bonds as excess reserves for fear of a financial crisis. Assuming that currency and deposits stay the same, what happens to the amount of excess reserves, the excess reserve ratio, the money supply, and the money multiplier?

4. **The Money Multiplier: M1 vs. M2** Go to the St. Louis Fed Fred website and download for M1 (link), M2 (link), and the monetary base (link). The frequency of data should be monthly, and the sample period should run from January 1959 through November of 2024.

   (a) Produce a time series plot of both the M1 and M2 multipliers against time.

(b) Explain, in words, why the M2 multiplier is always bigger than the M1 multiplier.

(c) Comment on the behavior of the two multipliers at the onset of COVID-19. Speculate intelligently on what could be driving the pattern you observe.

5. **The Quantity Theory**

(a) Write down the equation of exchange and define each variable in it.

(b) What is the assumption that transforms the equation of exchange from an identity into a theory of money demand?

(c) Suppose that this assumption is satisfied. If output growth is 3 percent and money growth is 6 percent, what should the inflation rate be?

(d) Suppose, instead, that money demand is a decreasing function of the nominal interest rate. Based on this, how would you expect measured velocity to move with the interest rate? Explain briefly.