Course 3: Financial Markets

Intermediate Macroeconomics, Econ 102

François Geerolf

UCLA

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Financial Markets

- The multiplier is a very important idea of Keynesian economics (Keynes (1936)).
- Before we move to the IS-LM model, which is Hicks (1937)'s interpretation of Keynes (1936), we need to look at what determines interest rates on financial markets. In particular, in this lecture we shall ask: **what determines short-term interest rates?**
- We will take a very simplified view of financial markets, emphasizing the role of **liquidity**. For simplicity, we shall consider two types of short-term investments:
  - non-interest bearing instruments: cash, checkable deposits not serving interest.
  - interesting bearing instruments: money-market funds, Treasury bills.
- We shall see that the central bank is able to influence the **level of short-term interest rates** (in particular the so-called Fed Funds rate), by changing the **money supply**, or more precisely the **supply of central bank money**.

The Demand for Money

- Imagine that there are only two types of savings vehicle:
  - Money: currency and checkable deposits. (the bank deposits on which you can write checks or use a debit card)
  - Bonds. (don't take it too literally: typically, you hold bonds through money market funds)
- **Money** may be used for transactions, but pays no interest.
- On the other hand, **bonds** pay a positive interest rate i, just as your money market fund account may. However they may not be used to pay.
- Assume that buying or selling bonds implies some cost; for example, a phone call to your broker and the payment of a transaction fee. Thus, there is a **trade-off between holding money and bonds.**

What is the demand for money?

- The holding of money and bonds depends on:
  - Your level of transactions.
  - The interest rate on bonds.
- The interest rate effect:
  - How much money are you holding in your checking account? How many weeks' worth of expenses are you holding?
  - Imagine that money market funds were paying 20% interest per year, how much money would you be holding in your checking account? How many weeks' worth of expenses would you be holding?
- The level of transactions effect:
  - Imagine you spend \$1000 per month, how much money will you be holding in your checking account?
  - Imagine that you spend \$3000 per month (in a few years), how much money will you be holding in your checking account?

WARNING!

- **Money** is what can be used to pay for transactions = currency and checkable deposits.
- **Income** is what you earn from labor and capital (*flow*).
- **Saving** is the part of after-tax income that you do not spend (*flow*).
- **Savings** = what you have accumulated over time (*stock*).

- **Financial wealth**, or wealth, is the value of all your financial assets minus all your financial liabilities (*stock*).
- **Investment** is what economists refer to as the purchase of new capital goods.
- $\neq$ **Financial investment** is the purchase of shares or other financial assets.

What is the demand for money?

- Demand for money (M^d) is equal to nominal income $\$Y$ (according to a linear relation) times a decreasing function $L(.)$ of the interest rate i:

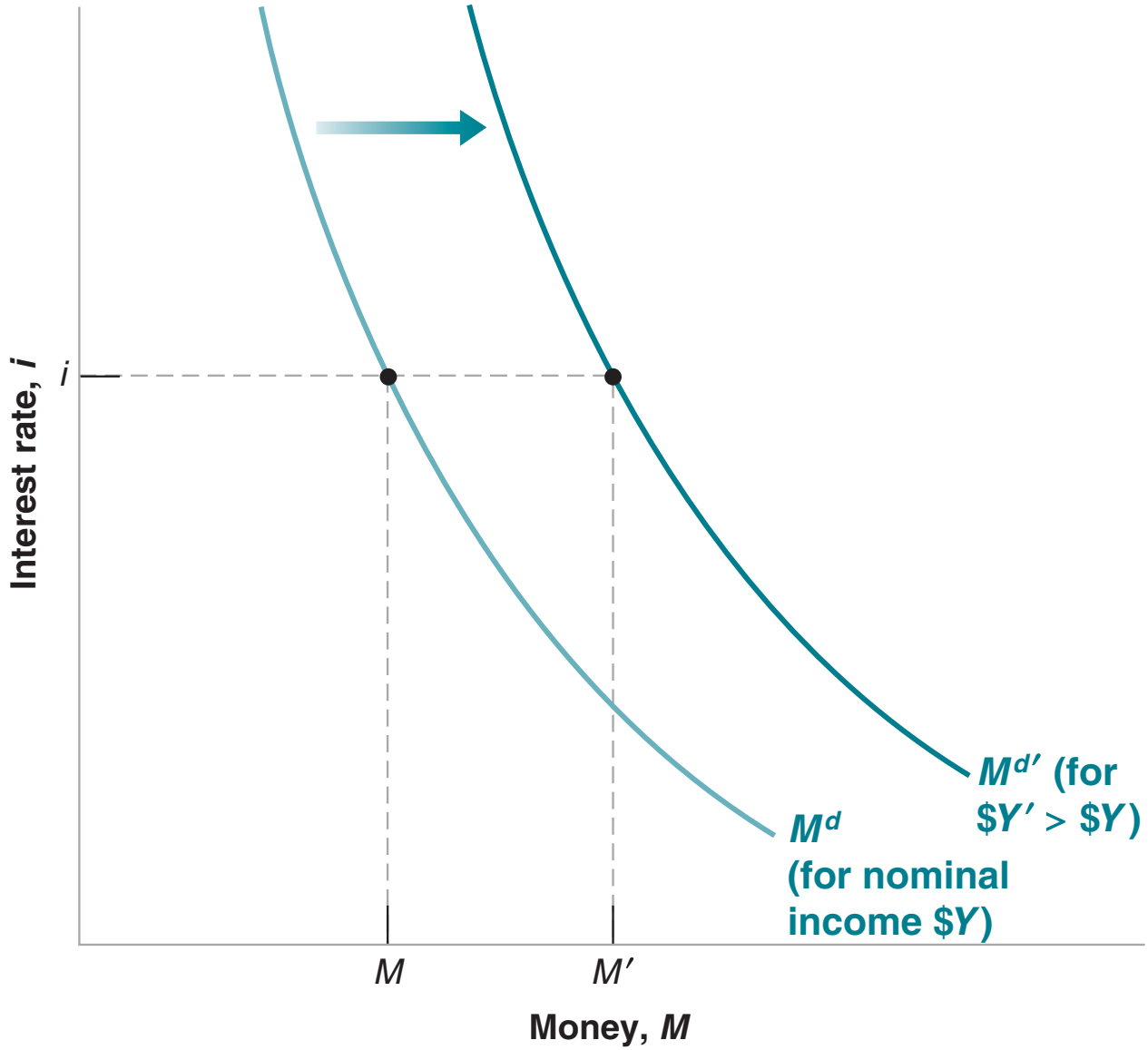
$$M^d = \$Y \times L(i), \quad L'(i) < 0.$$

- An increase in the interest rate i decreases the demand for money: the opportunity cost of holding money increases when the interest rate increases.

- The above equation is a way of expressing both:
  - The interest rate effect.
  - The level of transactions effect.

- Graphically, the money demand curve traces out the money demand and interest rates (M^d, i) consistent with a given level of income. For $\$Y' > \$Y$, the curve shifts out in a (M^d, i) plane.

Graphical Interpretation



Who holds US Currency?

- According to households surveys, in 2006, the average US household held **$1600** in currency. (bills and coins) Multiplying by the # of households (about 110 million), this means that the total amount of currency was about **$170 Bn**.
- The amount of currency in circulation in 2006 was **$750 Bn**, according to the Federal Reserve.
- U.S. firms held another $80 Bn.
- Foreigners abroad held $500 billion, or 66% of the total, for transactions, especially in countries suffering from high inflation in the past. Implications: free loan to the US! Examples:
  - Ecuador, El Salvador.
  - Argentina, Russia: had high inflation in the past.

Determination of the Interest Rate

- Again, let us keep the above shortcut for now in assuming that all money in the economy consists of currency supplied by the central bank. We shall relax that assumption later, allowing for checkable deposits.
- Suppose the central bank decides to supply an amount of money equal to M:

$$M^s = M.$$

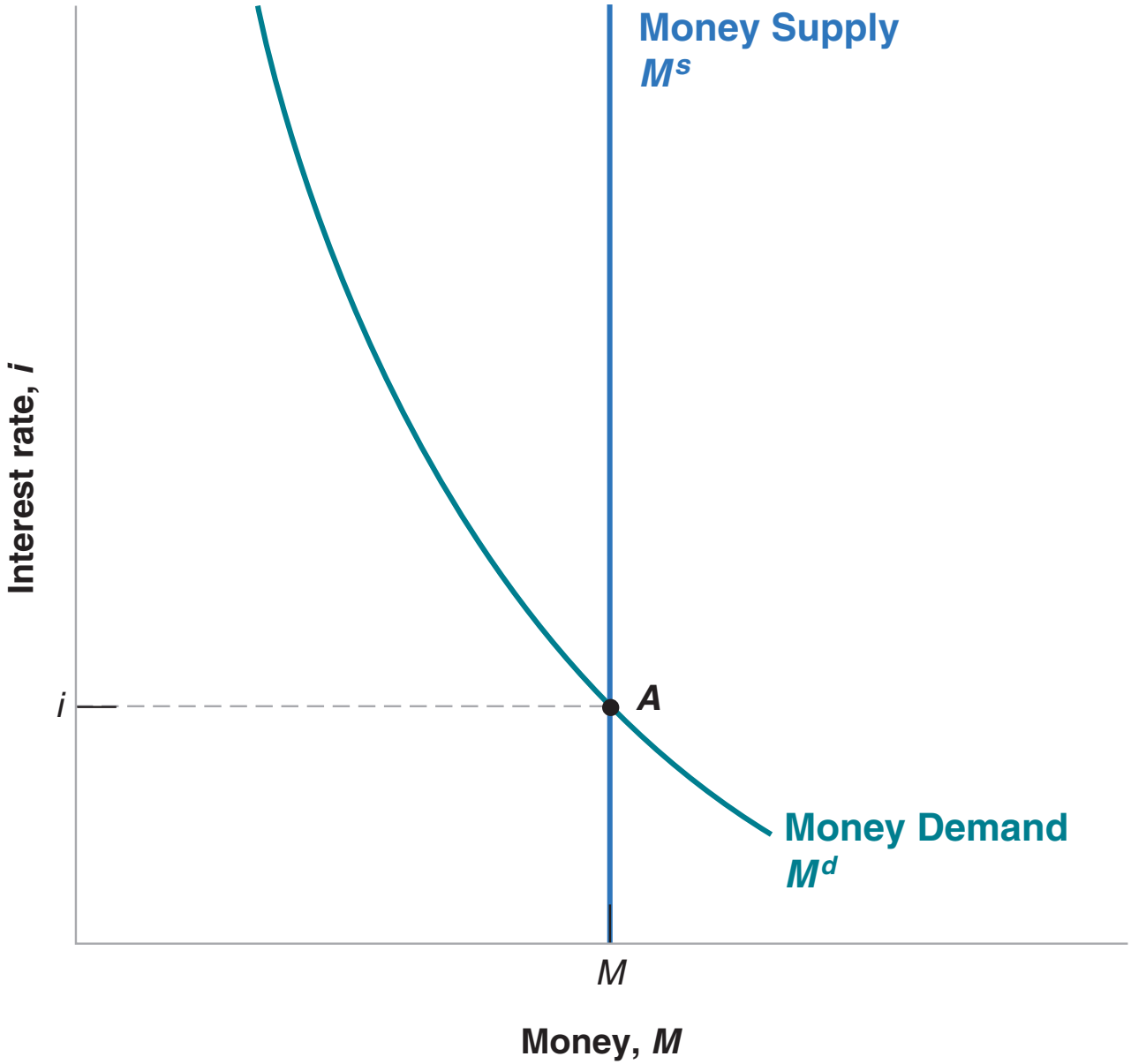
- Equilibrium in financial markets requires that:

$$M^s = M^d = M.$$

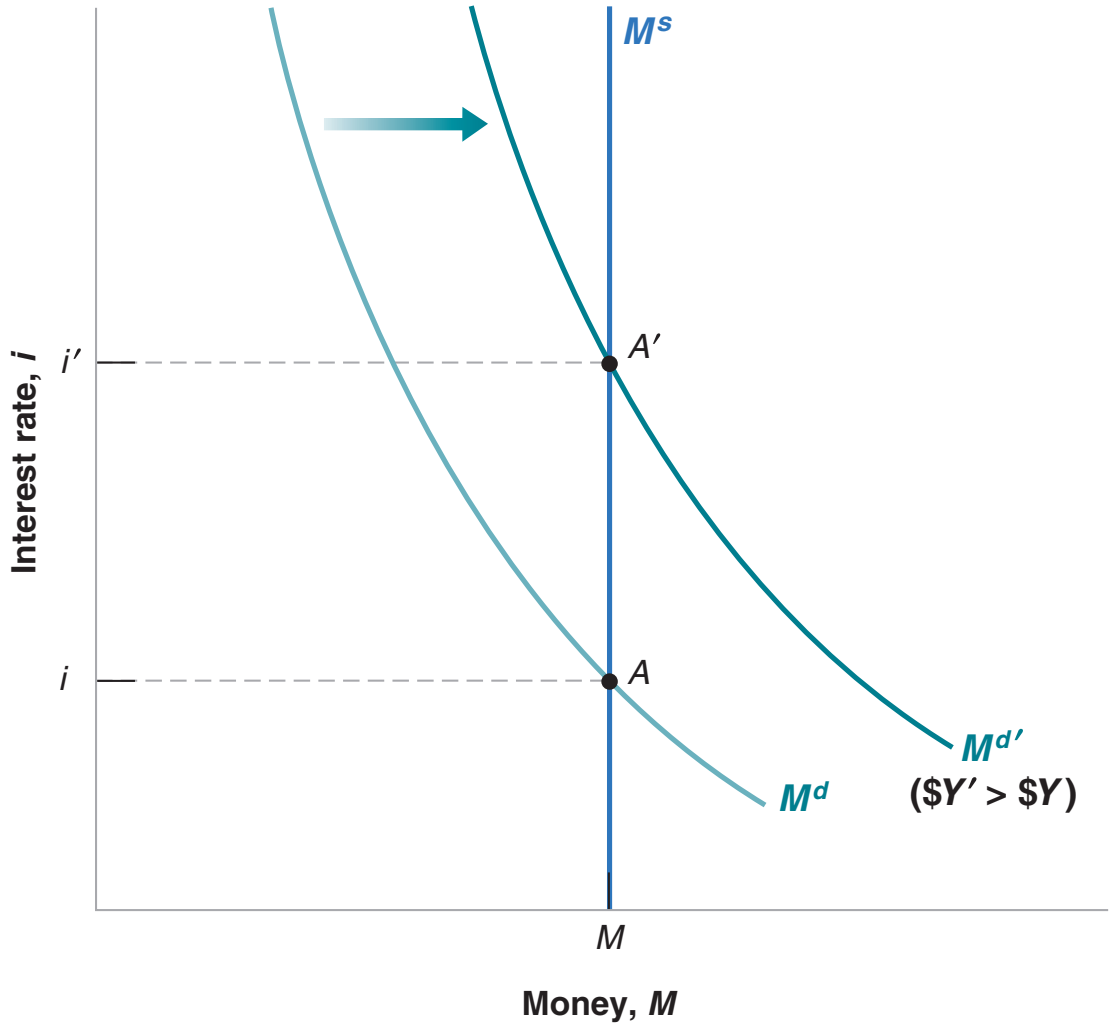
- Therefore:

$$M = \$Y \times L(i).$$

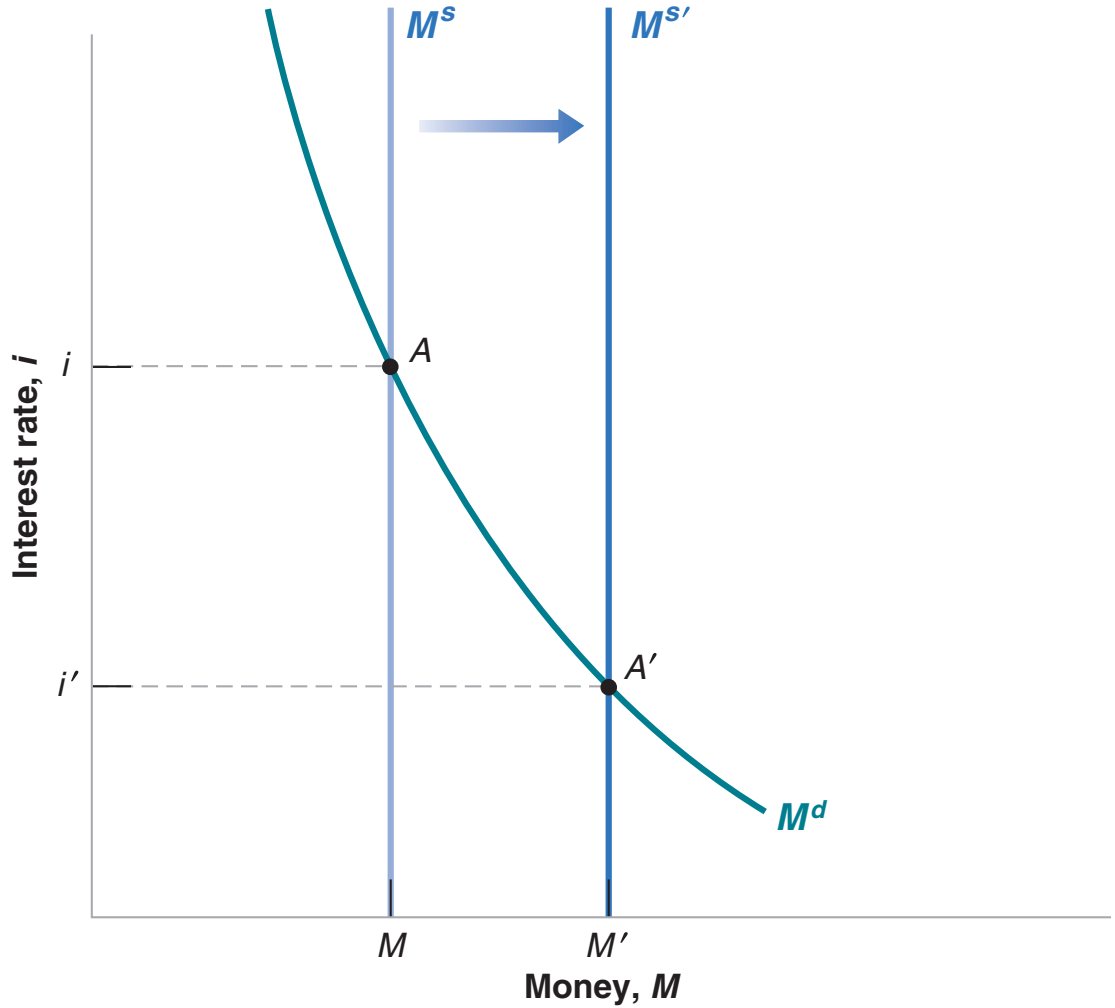
The Determination of the Interest Rate



The Effects of an Increase in Nominal Income on the Interest Rate



The Effects of an Increase in the Money Supply on the Interest Rate



Comparative Statics

- For a given money supply, an increase in nominal income leads to an increase in the interest rate: if the M^d curve shifts towards the upper-right corner, then the nominal interest rate increases.
- This may also be seen using some algebra. Assuming a constant money supply M^s, then a rise in income $\$Y$ means that $L(i)$ needs to decrease to keep the product constant:

$$M^s = \$Y \times L(i).$$

- Since $L(.)$ is a monotonically decreasing function of the interest rate, the only way that $L(i)$ may decrease is if i increases.
- Conversely, an increase in the supply of money by the central bank leads to a decrease in the interest rate. This is because if $\$Y$ stays constant, then $L(i)$ must decline to keep M^s and $\$Y \times L(i)$ constant.

How do central banks change the money supply?

- During "normal times", central banks typically change the supply of money by buying or selling bonds in the bond market – these are called **open market operations**:
  - in an **expansionary** open market operation, the central bank expands the supply of money by buying bonds. It pays for these bonds by creating money.
  - in a **contractionary** open market operation, the central bank contracts the supply of money by selling bonds. It removes from circulation the money it receives in exchange for the bonds.

The Balance Sheet of the Central Bank and the Effects of an Expansionary Open Market Operation

Central Bank Balance Sheet

Assets	Liabilities
Bonds	Money (currency)

The Effects of an Expansionary Open Market Operation

Assets	Liabilities
Change in bond holdings: +$1 million	Change in money stock: +$1 million

Price of Treasury bills?

- Suppose a bond such as a **Treasury bill**, or **T-bill**, promises to pay \$100 a year from now.
- If the price of the bond today is $\$P_B$, then the interest rate on the bond is:
$$i = \frac{\$100 - \$P_B}{\$P_B} = \frac{\$100}{\$P_B} - 1.$$
- The higher the price of the bond, the lower the interest rate. The higher the interest rate, the lower the price today.
- Rather than the money supply, the central bank could have chosen the interest rate and then adjusted the money supply so as to achieve the interest rate it had chosen.
- Choosing the interest rate, instead of the money supply, is what modern central banks, including the Fed, typically do.

Different types of institutions

- In practice, all money in the economy does not consist of currency supplied by the central bank. Money does not just include currency but also checkable deposits.
- It's useful first to examine what banks really do in an economy. **Financial intermediaries** are institutions that receive funds from people and firms and use these funds to buy financial assets or to make loans to other people and firms. Banks are particular financial intermediaries that **have money**, in the form of *checkable deposits*, as their liabilities.
- For this reason, banks need to keep as **reserves** some of the funds they receive. Otherwise, there could be a bank run (if the bank only had "illiquid loans"). These are held:
  - partly in cash.
  - parly in an account that banks have at the central bank, which they can draw on when they need to.

The Balance Sheet of Banks, and the Balance Sheet of the Central Bank Revisited

(a) **Central Bank**

Assets	**Liabilities**
Bonds	Central Bank Money = Reserves + Currency

(b) **Banks**

Assets	**Liabilities**
Reserves Loans Bonds	Checkable deposits

Reserve requirements

- In the United States, reserve requirements are set by the Fed. In the U.S., banks are required to hold at least 10% of the value of the checkable deposits. They can use the rest to make loans or buy bonds.
- Assume people hold no currency so the demand for money by people is the demand for checkable deposits:

$$M^d = \$Y \times L(i), \quad L'(i) < 0.$$

- The demand for reserves by banks depends on the amount of checkable deposits (H is meant to represent **high-powered money**):

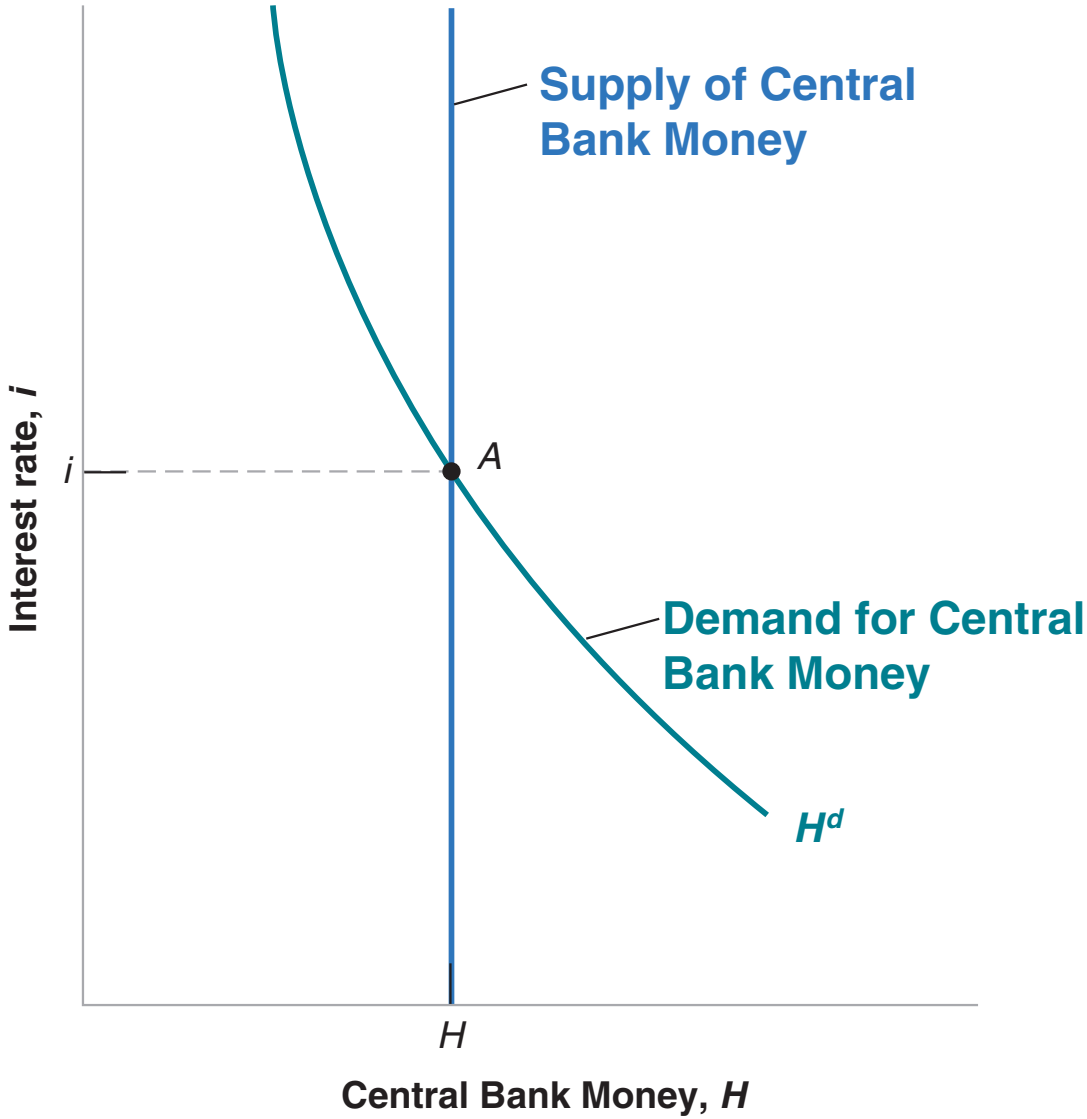
$$H^d = \theta M^d = \theta \times \$Y \times L(i).$$

- θ is the reserve ratio, and H^d is the demand for high-powered money or the monetary base.

Equilibrium with Checkable Deposits

- Let H denote the supply of central bank money, then the equilibrium condition is given by:
$$H = H^d$$
- The demand for central bank money, which depends on the required or chosen reserve requirement, has to be equal to its supply:
$$H = \theta \times \$Y \times L(i).$$
- For the same reason as previously, an increase in H leads to a decrease in the interest rate, and a decrease in H leads to an increase in the interest rate. The only difference is that there is now a "money multiplier", coming from the fact that banks need to keep only part of the money they create as reserves.

Equilibrium in the Market for Central Bank Money and the Determination of the Interest Rate



Federal Funds Rate

- You may be wondering whether there is an actual market for reserves.
- The **federal funds market** is an actual market for bank reserves.
- The **federal funds rate** is the interest rate determined in the federal funds market.
- The federal funds rate is the main indicator of U.S. monetary policy because the Fed can choose the federal funds rate it wants by changing H. Changes in the federal funds rate typically make front page news.

Currency + Checkable Deposits

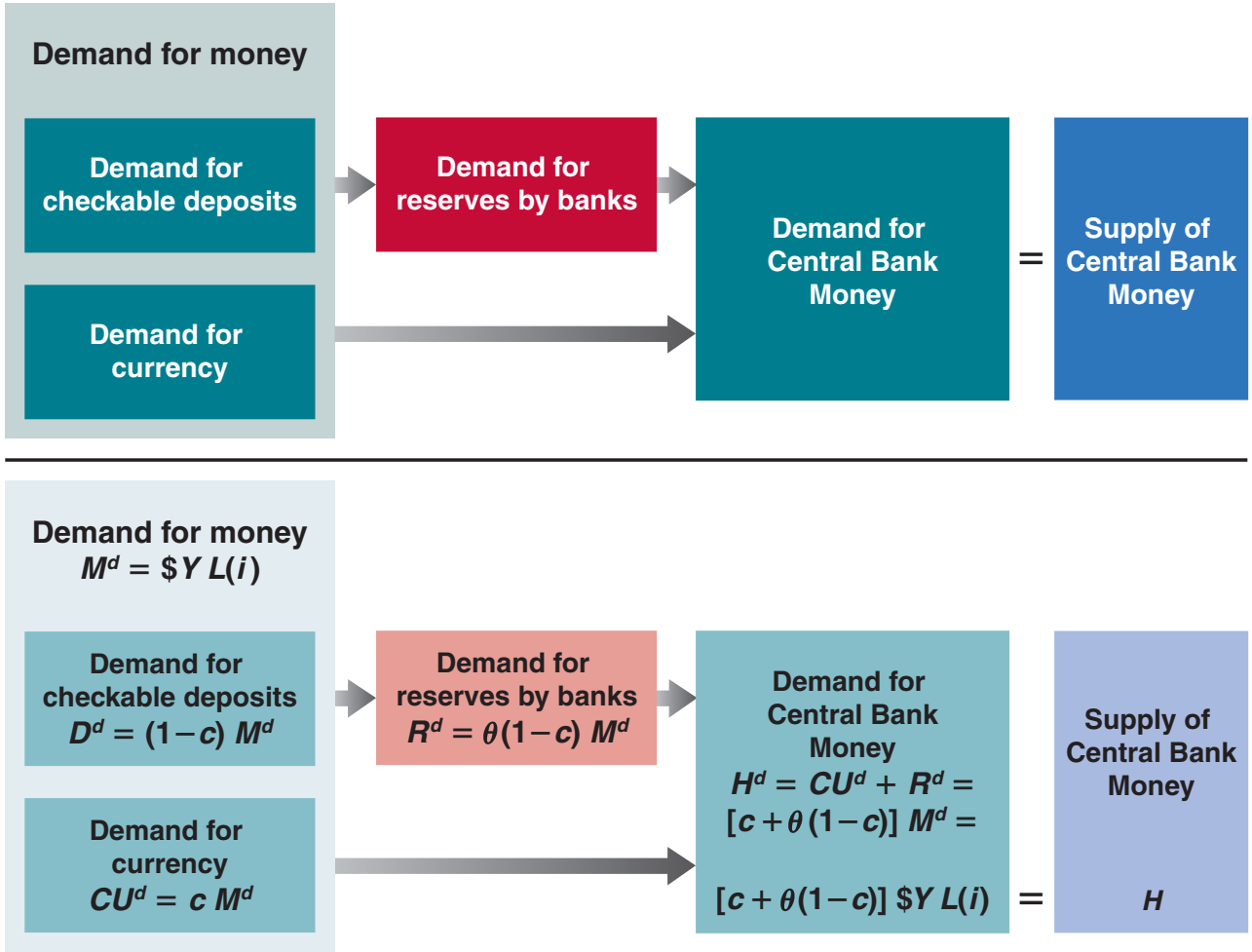
- Assume that overall money demand is:

$$M^d = \$Y \times L(i)$$

- Also assume that people hold a fixed proportion c of their money in currency, and a proportion $(1-c)$ in checkable deposits, so the demand for currency and the demand for checkable deposits are respectively:

$$CU^d = cM^d$$
$$D^d = (1-c)M^d.$$

The Determination of the Interest Rate When People Hold Both Currency and Checkable Deposits



The Determination of the Interest Rate When People Hold Both Currency and Checkable Deposits

- Let R be the reserves of banks, D be the dollar amount checkable deposits, and θ be the reserve ratio:

$$R = \theta D$$

- Therefore:

$$R^d = \theta(1-c)M^d$$

- Demand for central bank money is:

$$H^d = CU^d + R^d$$

so that:

$$H^d = cM^d + \theta(1-c)M^d = [c + \theta(1-c)]\, M^d$$

which gives the demand for central bank money:

$$H^d = [c + \theta(1-c)]\, \$Y \times L(i).$$

The Determination of the Interest Rate When People Hold Both Currency and Checkable Deposits

- The equilibrium condition is that the supply of central bank money be equal to the demand for central bank money:

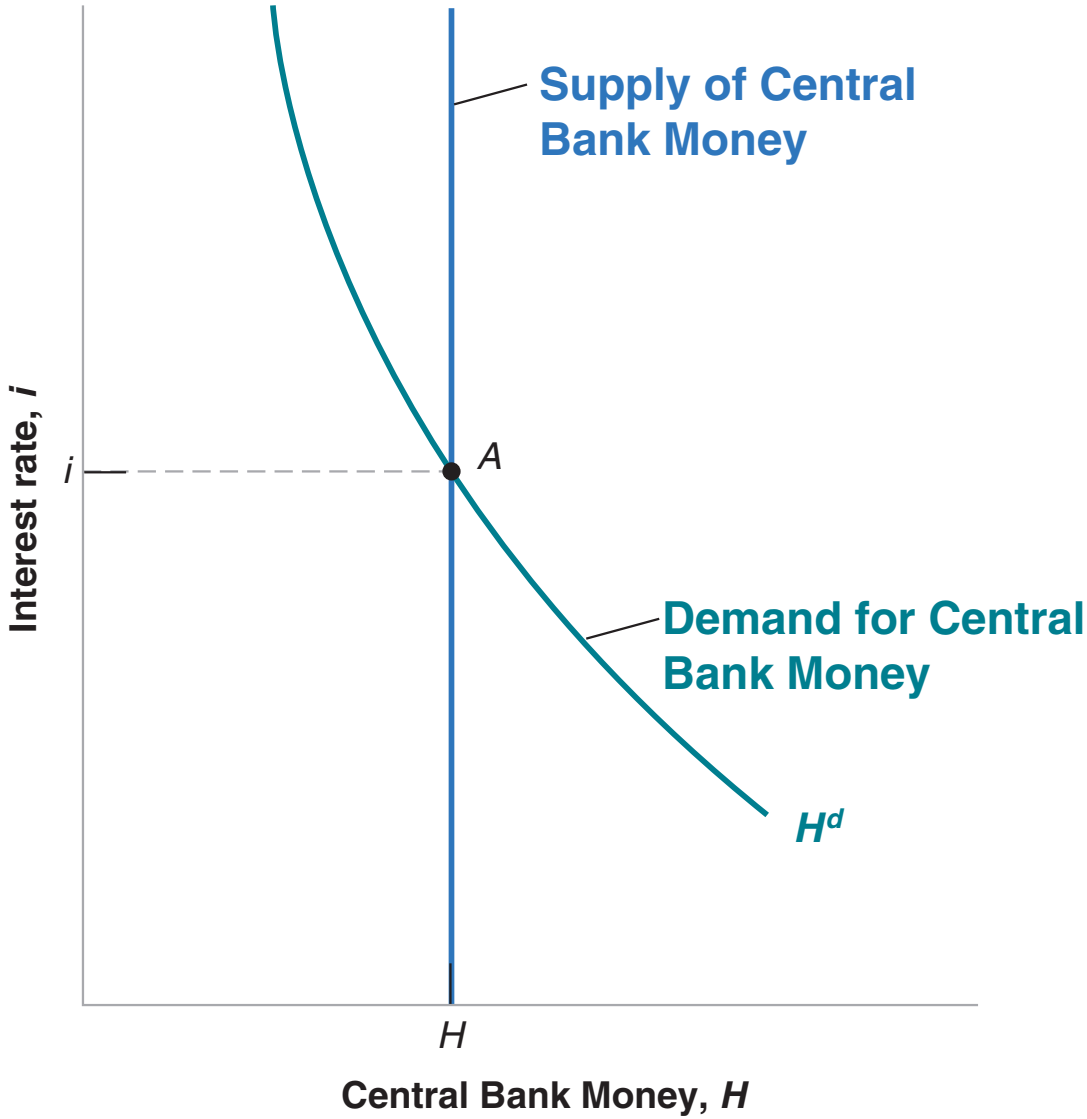
$$H = H^d$$

and therefore:

$$H = [c + \theta(1 - c)]\,\$Y \times L(i)$$

- The supply of central bank money is equal to the demand for central bank money , which is equal to the term in brackets, times the overall demand for money.

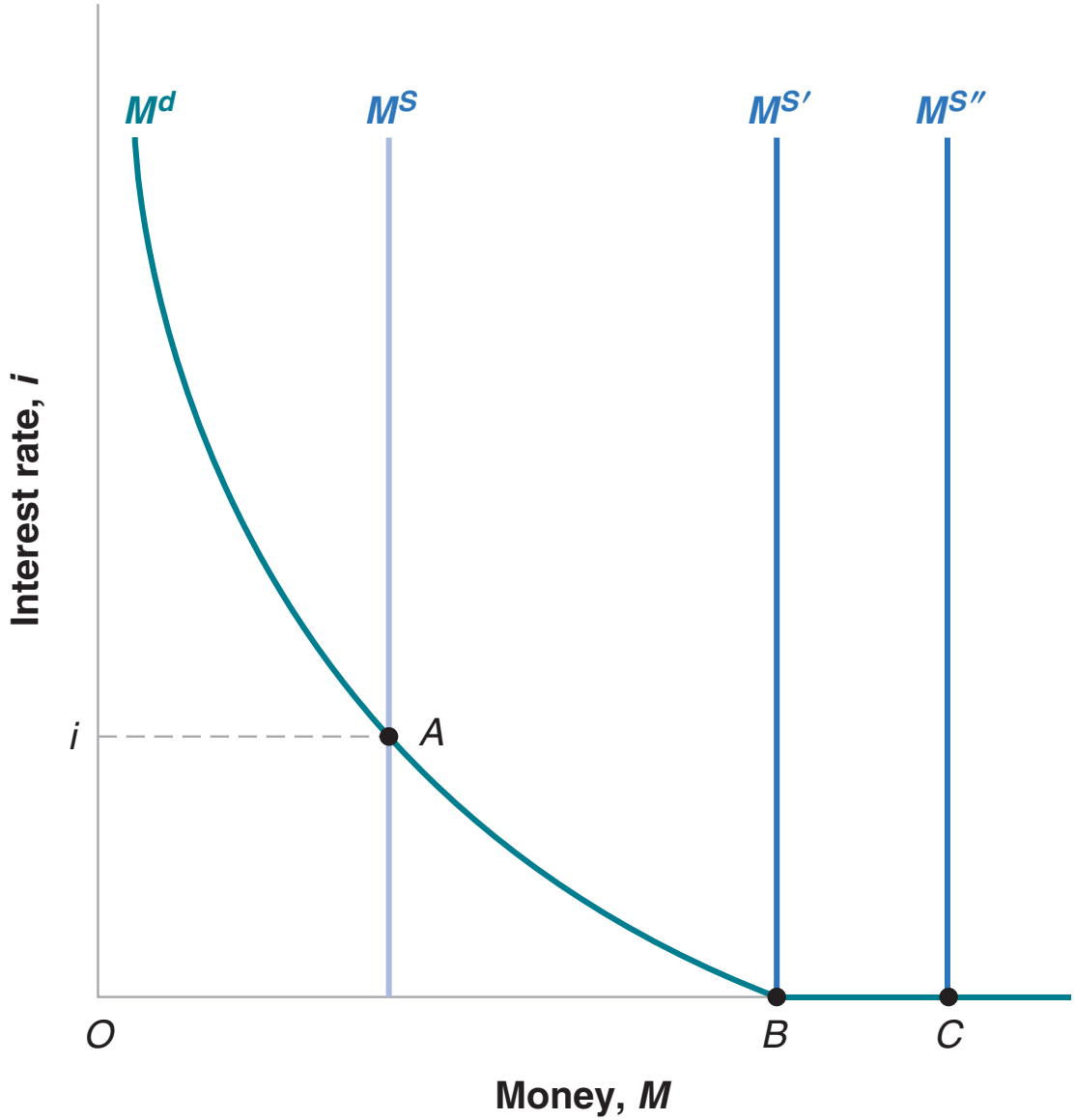
Same as before (with H^d a bit more complex)



Zero Lower Bound

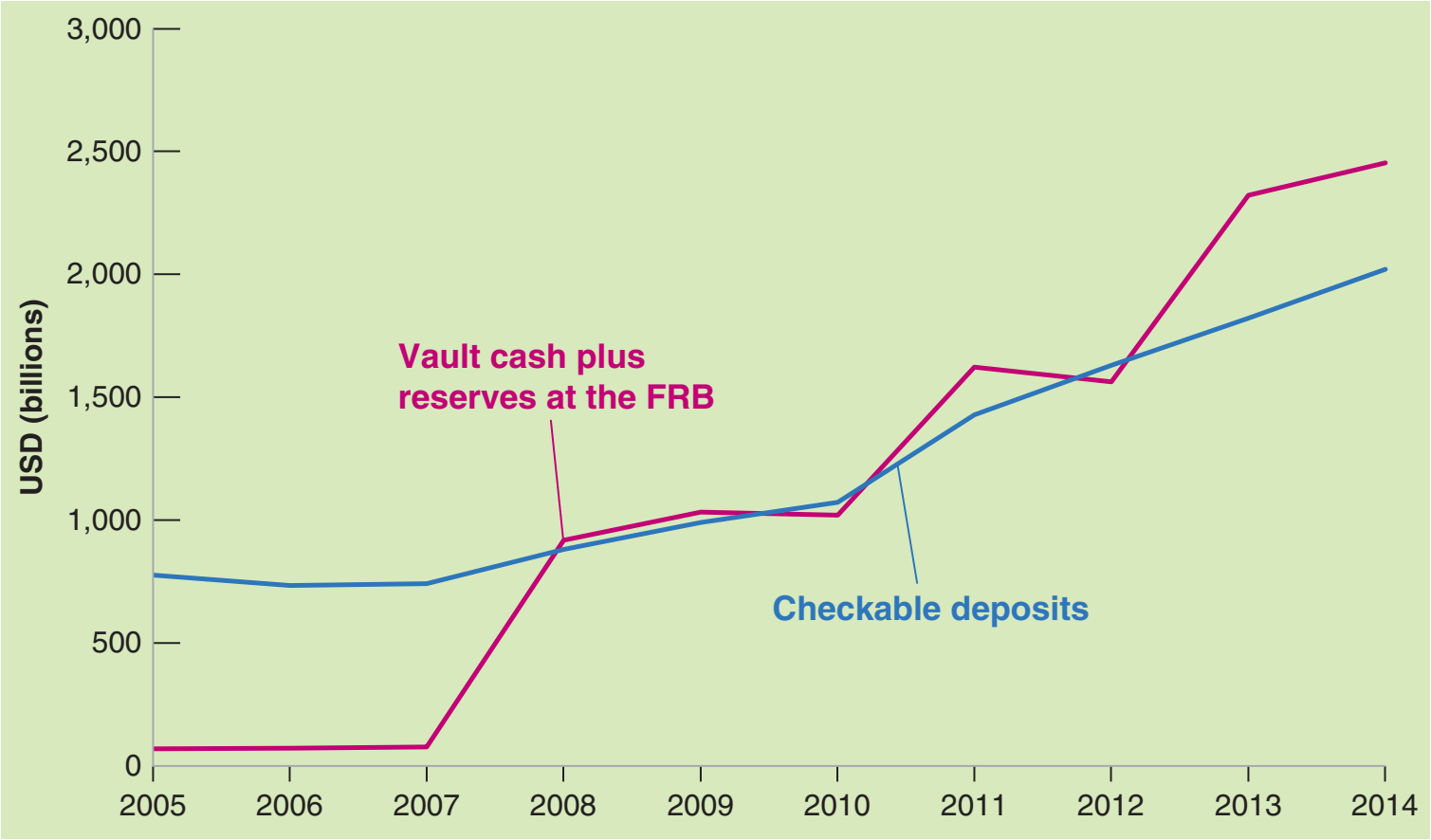
- **Zero lower bound**: The interest rate cannot go below zero.
- The economy is in a **liquidity trap** when the interest rate is down to zero, monetary policy cannot decrease it further.

Money Demand, Money Supply, and the Liquidity Trap



The Liquidity Trap in Action

- The large increase in the supply of central bank money between 2007 and 2014 was absorbed by households and banks.



Flow of Funds - Table S.61.a (Link)

			2009	2010	2011	2012	2013	2014	2015	2016	
61	**FL712000095**	**Total assets**	**2276.8**	**2462.1**	**2955.8**	**2965.6**	**4084.5**	**4566.2**	**4553.0**	**4520.5**	**61**
62	**LM712010095**	**Nonfinancial assets (4)**	**10.6**	**10.5**	**10.6**	**10.7**	**10.7**	**10.8**	**10.9**	**10.9**	**62**
63	LM715013665	Structures (nonresidential)	7.8	7.7	7.8	7.8	7.9	8.0	8.0	8.1	63
64	LM715013265	Equipment	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	64
65	LM715013765	Intellectual property products	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	65
66	**FL714090005**	**Financial assets**	**2266.2**	**2451.7**	**2945.2**	**2955.0**	**4073.8**	**4555.4**	**4542.1**	**4509.6**	**66**
67	FL713011203	Monetary gold	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	67
68	FL714000005	Currency and deposits	65.7	68.1	69.3	69.0	68.1	66.7	67.0	67.1	68
69	FL714022005	Debt securities	1844.8	2161.1	2605.1	2669.6	3756.2	4236.9	4242.0	4221.2	69
70	FL713069603	Open market paper	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70
71	FL713061103	Treasury securities	776.6	1021.5	1663.4	1666.1	2208.8	2461.4	2461.6	2463.6	71
72	FL713061705	Agency- and GSE-backed securities (2)	1068.3	1139.6	941.7	1003.4	1547.4	1775.5	1780.4	1757.6	72
73	FL714041005	Loans (short term)	249.7	98.4	130.5	9.5	0.4	1.7	1.1	5.6	73
74	FL713064103	Equity shares	25.1	26.4	0.0	0.0	0.0	0.0	0.0	0.0	74
75	FL713096105	Other accounts receivable	69.8	86.7	129.2	195.8	238.0	239.1	221.0	204.7	75
76	**FL712100005**	**Total liabilities and net worth**	**2276.8**	**2462.1**	**2955.8**	**2965.6**	**4084.5**	**4566.2**	**4553.0**	**4520.5**	**76**
77	**FL714190005**	**Liabilities**	**2240.6**	**2425.1**	**2918.3**	**2927.6**	**4046.3**	**4526.8**	**4532.1**	**4499.6**	**77**
78	FL714100005	Currency and deposits	2134.6	2308.6	2788.7	2786.7	3686.8	3982.8	3761.4	3711.3	78
79	FL712151003	Loans	77.7	59.7	99.9	107.2	315.9	509.8	712.4	725.2	79
80	FL713164003	Equity shares (stock in Federal Reserve Banks)	25.6	26.5	26.9	27.4	27.5	28.6	29.5	30.4	80
81	FL713193005	Other accounts payable	2.5	30.4	2.8	6.3	16.0	5.6	28.9	32.6	81
82	**FL712090095**	**Net worth**	**36.2**	**37.0**	**37.5**	**38.0**	**38.2**	**39.4**	**20.9**	**20.9**	**82**

Bibliography I

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