ECON3123
Macroeconomic Theory I

Tutorial #4: Financial markets and monetary policy

Today's tutorial

- Introducing financial markets into our models
  - Bonds and money
- Monetary policy: how central banks set interest rates
- Examples and exercises

Where we've got to so far

- So far, we've looked at the Keynesian Cross model
  - A model with one market (goods & services)
  - To explain the level of real GDP
  - To show how changes in consumption, investment and government spending affect real GDP
    - Autonomous spending and saving
    - The Marginal Propensity to Consume
    - The role of Saving
    - The multiplier effect
  - Fiscal Policy:
    - Changes in government spending and taxation to affect real GDP

Where we go now

- Re-call:
  - Fiscal policy decisions usually take a long time to decide
  - Effective, but slow
- Do policy-makers have a set of tools to affect real GDP that can be decided and implemented more quickly?
  - Monetary Policy
    - Setting interest rates

Where we go now

- We now introduce a second market into our analysis:
  - The financial market
- From now on, our models will consist of (at least) two markets
  - Goods and services (as in the Keynesian Cross)
  - The financial market
- A more sophisticated way to look at what determines real GDP, including the role of monetary policy

Background information: who sets interest rates in an economy?

- A quick quiz:
- Question 1: Which institution is responsible for conduction monetary policy (including setting interest rates) in a country/bloc?
- Question 2: Fill in the gaps

Country/Bloc	Responsible Institution
US	
Hong Kong	
China	
Japan	
Euro Zone	

- Question 3: Which country has the oldest such institution?

Introduction to monetary policy: recent policy decisions

The New York Times

Fed Makes Emergency Rate Cut, but Markets Continue Tumbling

The central bank cut interest rates by half a percentage point, its biggest single cut in more than a decade, as a pre-emptive move to protect the economy from the coronavirus.

CNBC

CHINA ECONOMY

China's central bank cuts rate for medium-term loans to support virus-hit economy

PUBLISHED SUN, FEB 16 2020•9:59 PM EST

Source: New York Times, CNBC

The financial market: money and bonds

- We now introduce a second market into our analysis:
  - We assume that there are two assets:

Asset	Symbol	Who controls the supply of the asset?
Money		
Government bonds		

The financial market: money and bonds

- The money supply
  - Assume that the central bank controls the supply of money:

$$M^s = M$$

- Bonds and the interest rate
  - Assume that bonds pay an interest rate of i per year
  - The price of a bond paying i that matures in one year is given by:

The financial market: money and bonds

- Bond Price: example
- What is the price of a bond with the following characteristics?
  - Principal = 100
  - Interest rate per year = 10%
  - Maturity = 1 year
- Price =

- The important point:
  - Demand for bonds given by $B^D = B^D(\dots, \overset{+}{i}, \dots)$
  - So demand increases with a higher interest rate

The financial market: money and bonds

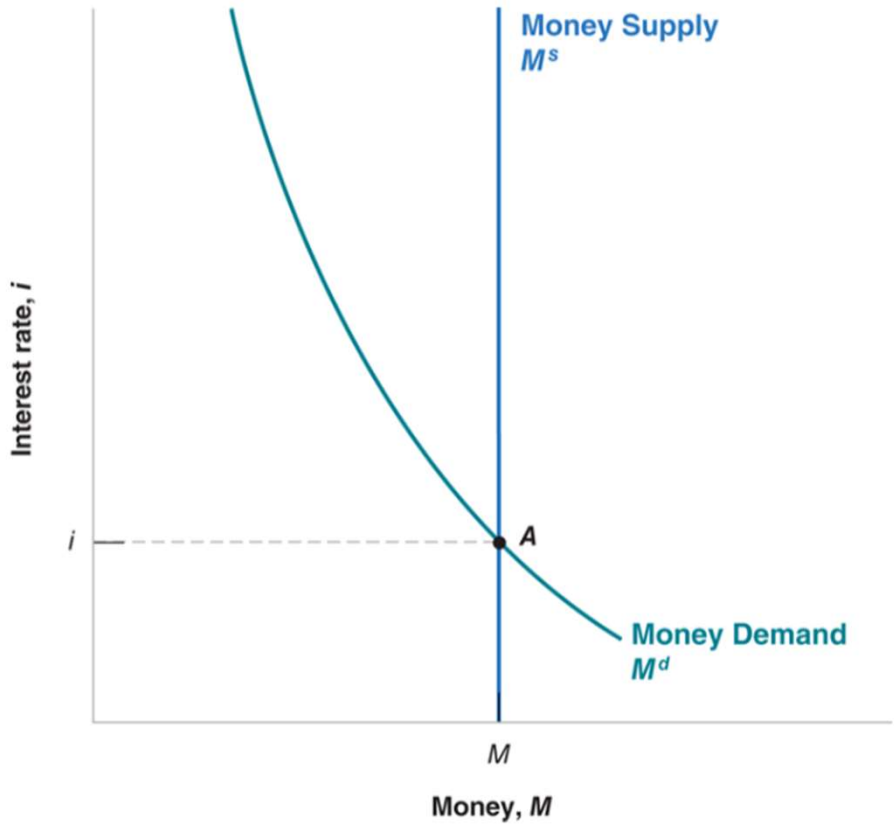
- The demand for money:
  - We hold money for two main reasons:
    - To make transactions
      - Depends on?:
    - To hold in case we need a versatile asset that can be used immediately
- We assume:
  - Money does not pay any interest
  - In our model, there are two assets that may be chosen
    - Money
    - Bonds

The financial market: money and bonds

- If the interest rate on bonds increases:
  - Bonds are more attractive than money
    - Demand for bonds increases
    - Demand for money falls

Asset	Supply	Demand
Money		
Government bonds		

The financial market: money and bonds



- The money supply curve:
  - Vertical – why?
- The money demand curve:
  - Downward sloping – why?
- Equilibrium in the money market
- Equilibrium condition:
  - $M = M^S = M^D$
- Occurs at point A

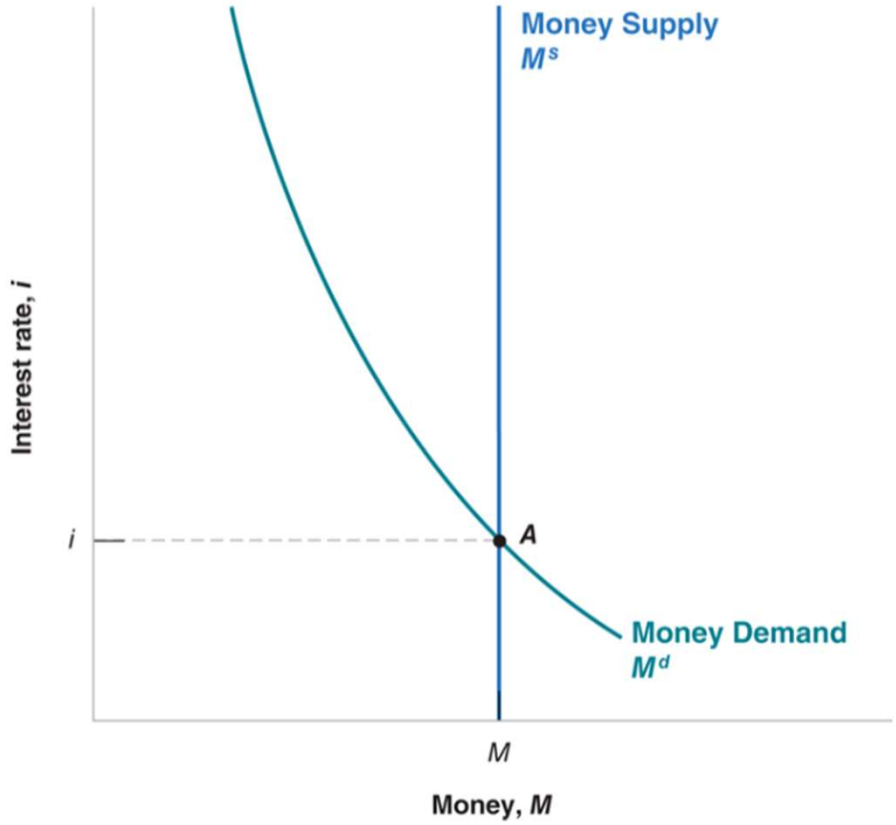
How does the central bank change interest rates?

- Open Market Operations: central bank buying or selling bonds to change interest rates
- How does this work?
- Example:
  - Assume that the central bank wants to lower interest rates
  - It buys bonds from bond holders, and gives them money in return
    - ie it increases the money supply, M^S
  - The bond buying causes bond prices to rise, and therefore interest rates to fall
    - To incentivize bond holders to hold more money, bonds have to become less attractive

      ie their interest rate has to fall
- The overall result: M^S higher, i lower

How does the central bank change interest rates?

- Example: A decrease in interest rates

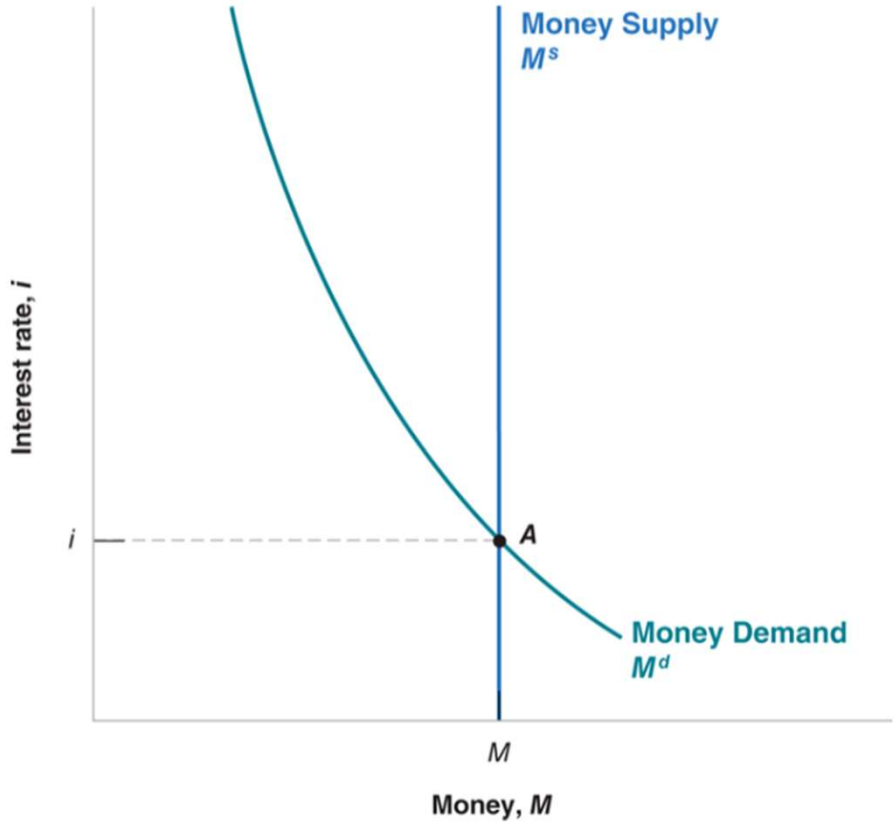


How does the central bank change interest rates?

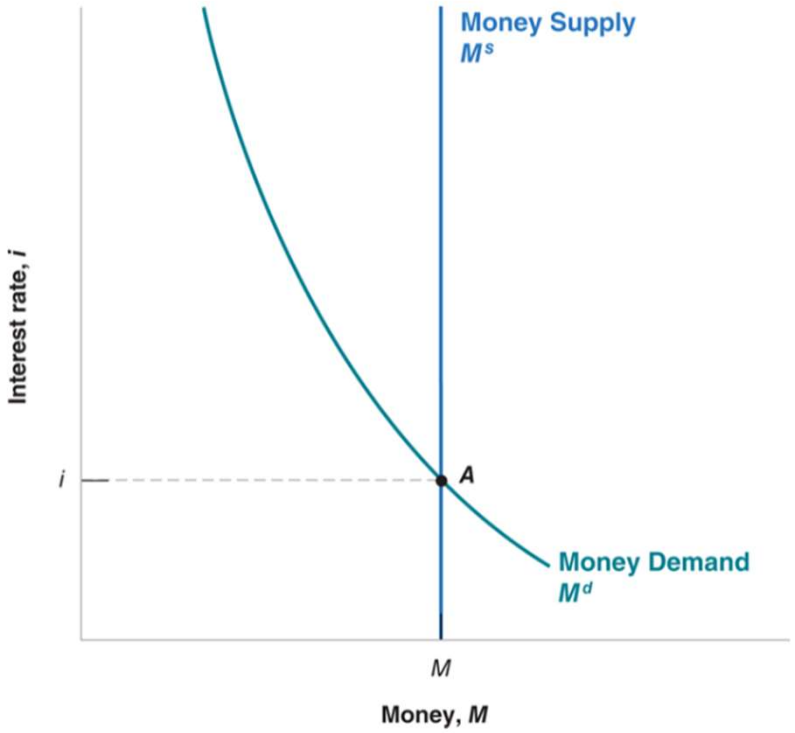
- What about the opposite case: the central bank wants to increase interest rates?
  - It _____ bonds _____bond holders, and _____money in return
    - ie it _____ ___the money supply, M^S
  - The bond _____ causes bond prices to _____, and therefore interest rates to _____
    - To incentivize bond holders to hold _____ money, bonds have to become _____attractive ie their interest rate has to _____
- The overall result: M^S _____, i _____

How does the central bank change interest rates?

- Example: An increase in interest rates



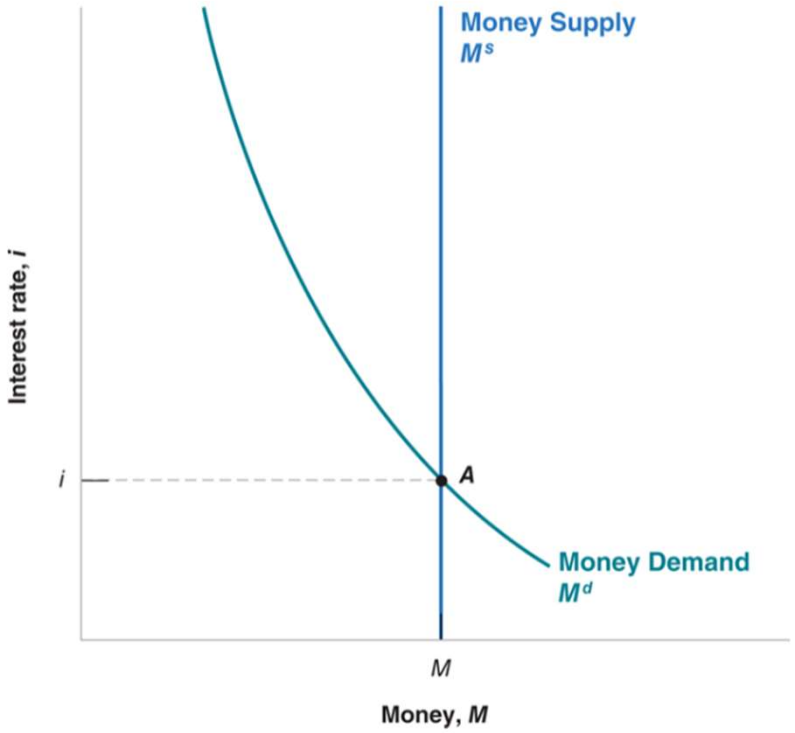
Example 1: Open Market Operations



- Example (adapted from Blanchard ch.4 Q4):
- Suppose that the money demand and money supply functions in an economy are given by:
- $M^S = 8{,}000$
- $M^D = 40{,}000(0.25 - i)$

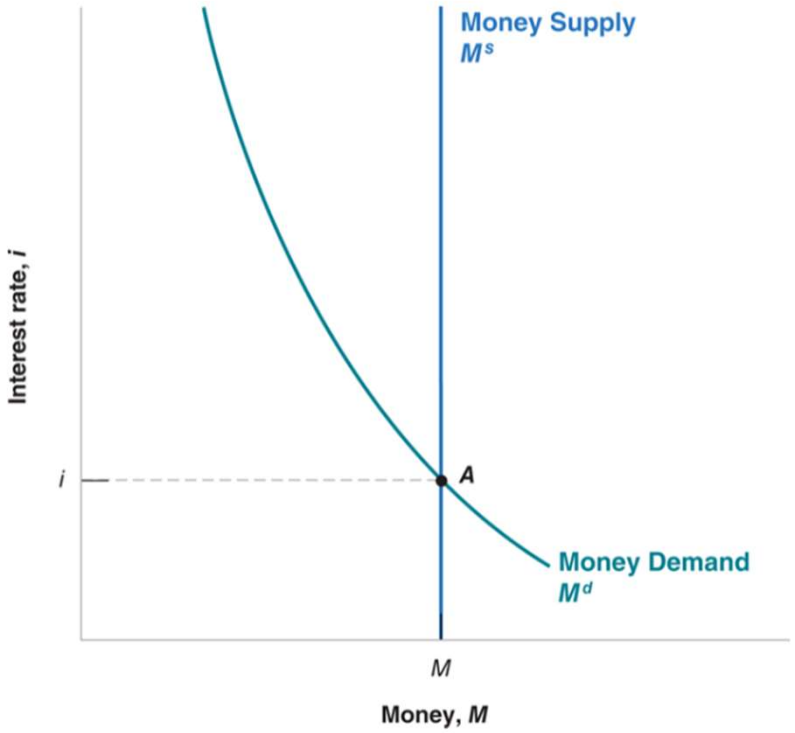
- Calculate the equilibrium interest rate

Example 2: Open Market Operations



- $M^S = 8{,}000$
- $M^D = 40{,}000(0.25 - i)$
- What policy should the central bank follow if it wants to increase interest rates to 10%?
- Increase/Decrease money supply?
- By how much?

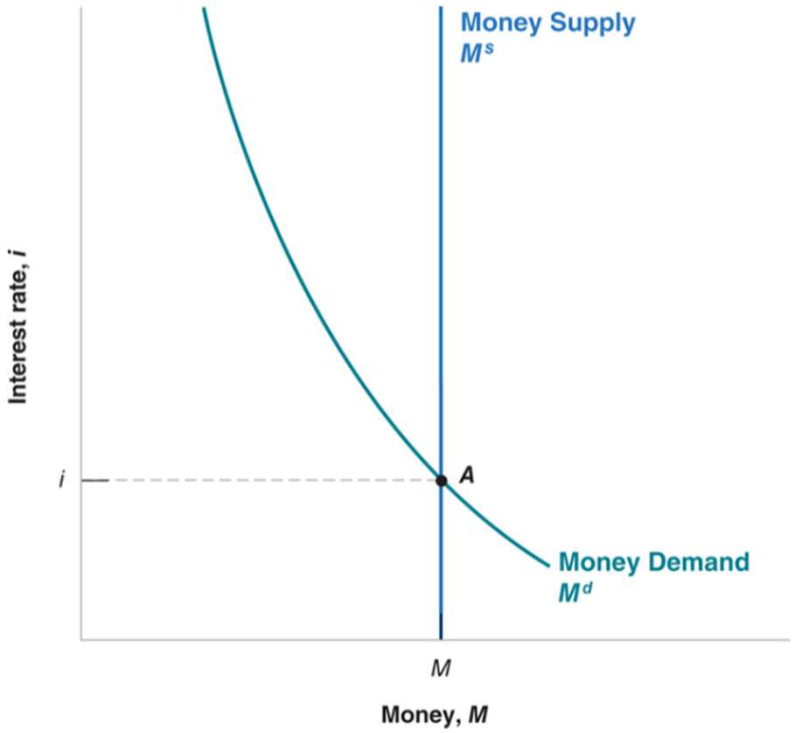
Example 2: Open Market Operations



- Suppose that the money demand and money supply functions in an economy are given by:
- $M^S = 10{,}000$
- $M^D = 50{,}000(0.225 - i)$

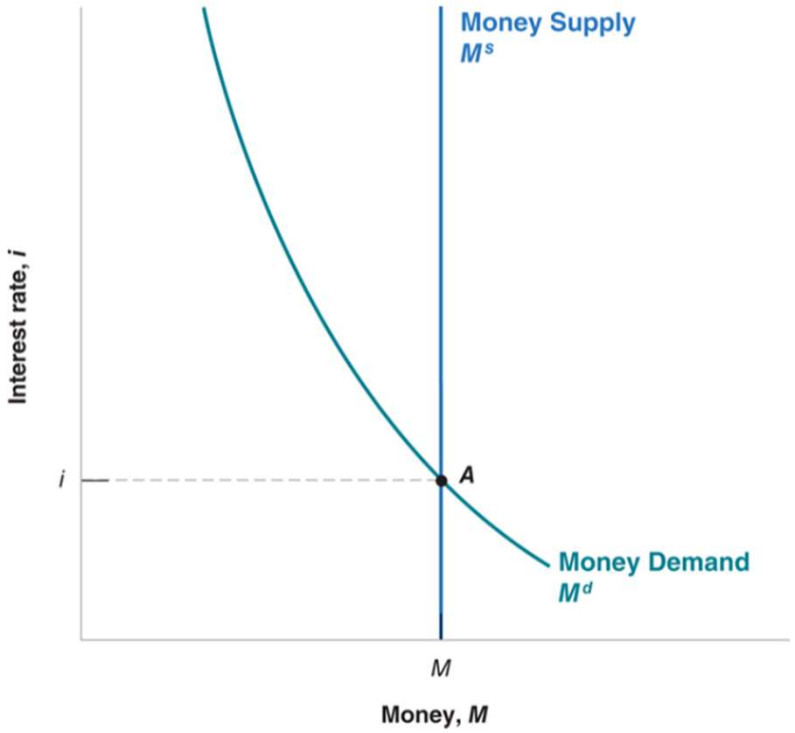
- What's the equilibrium interest rate in this case?

Example 2: Open Market Operations



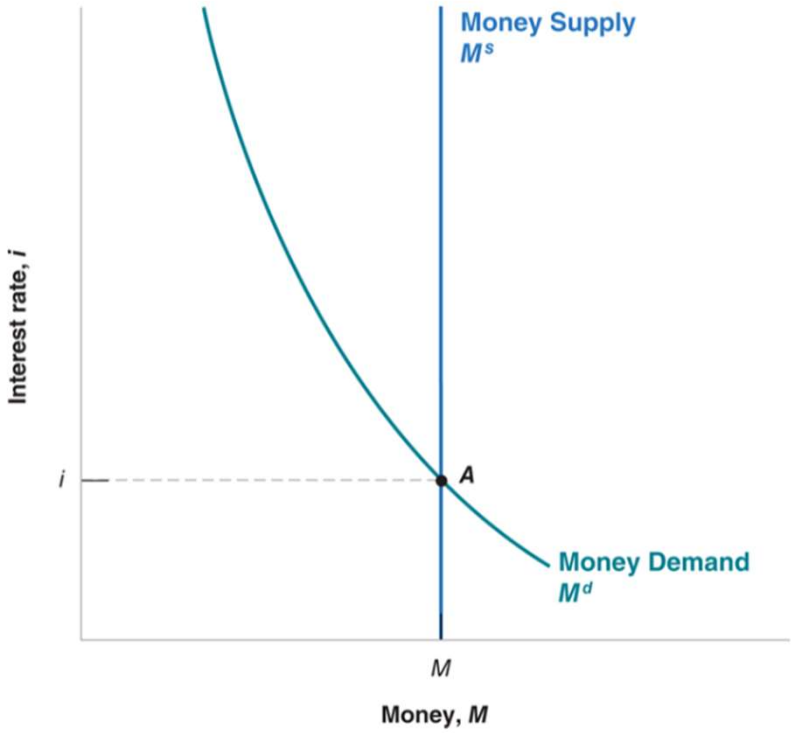
- $M^S = 10{,}000$
- $M^D = 50{,}000(0.225 - i)$
- What happens in the diagram if nominal income increases by 10,000?
- What happens to the equilibrium interest rate?

Example 2: Open Market Operations



- $M^S = 10{,}000$
- $M^D = 50{,}000(0.225 - i)$
- What could the central bank do to maintain interest rates at 2.5%?
- Show this in the diagram
- How large a change would be required?

Example 2: Open Market Operations

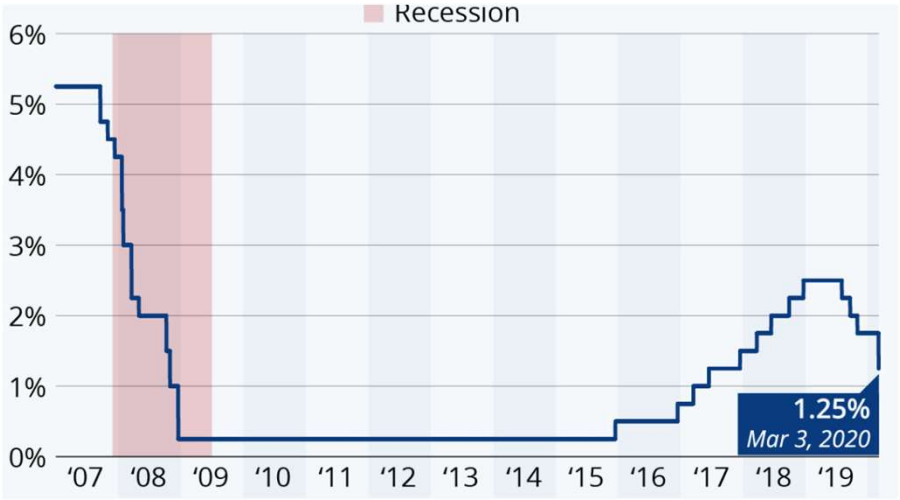


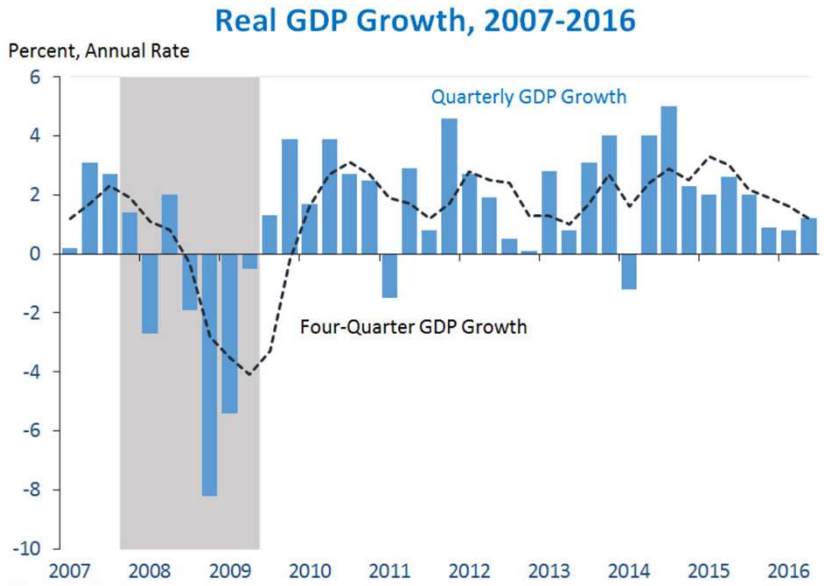
- A key point:
- $M^D = 50{,}000(0.225 - i)$
- Changes in what cause our money demand function to shift?

- Changes in what do not cause the money demand curve to shift?

Open Market Operations in context

Fed funds target rate

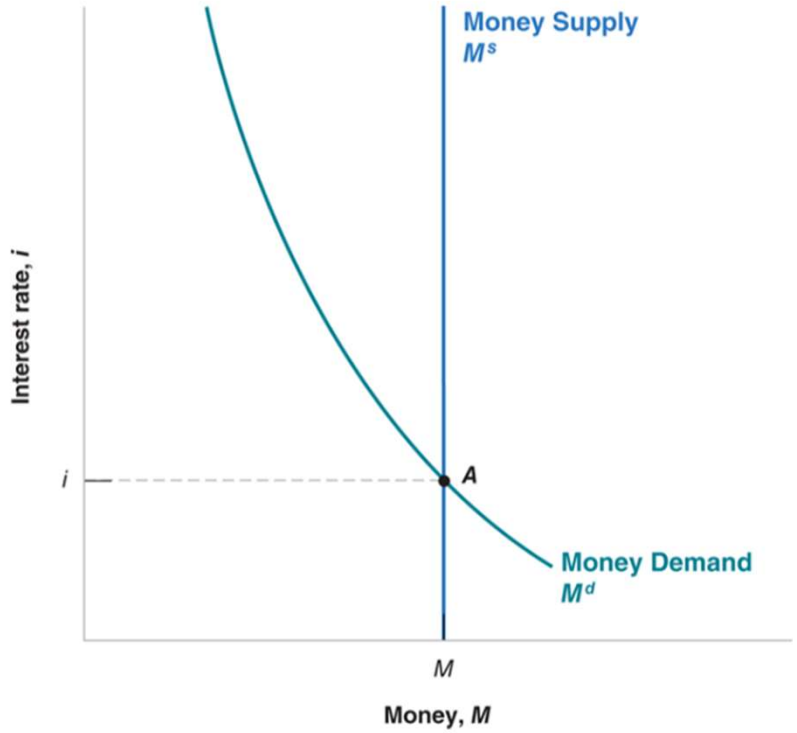




- What Open Market Operations do you think the Federal Reserve was conducting between 2008 and 2015?

Source: Statistica

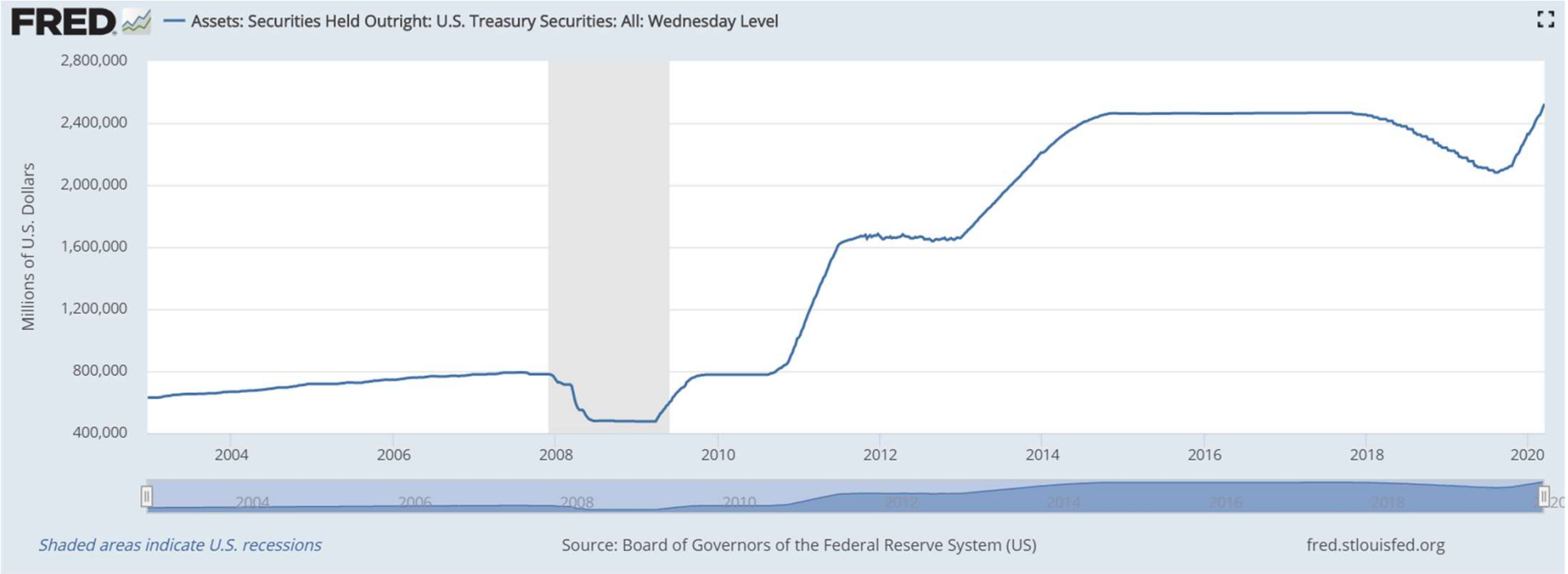
Open Market Operations in context



- What Open Market Operations do you think the Federal Reserve was conducting between 2008 and 2015?

- What did this policy do to the amount of bonds the Fed held on its balance sheet?

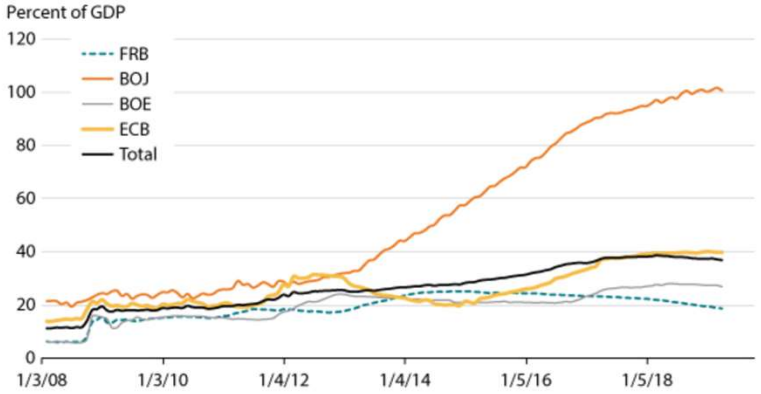
Open Market Operations in context



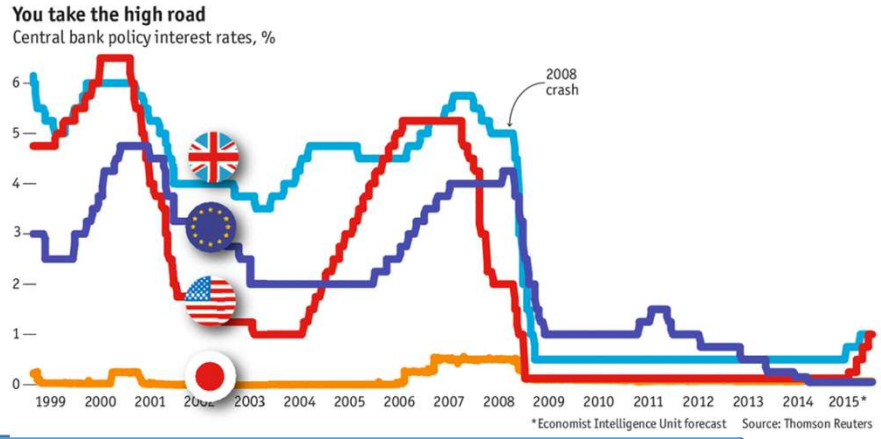
- Fed monetary policy since the financial crisis has involved a massive accumulation of bonds held on its balance sheet

Open Market Operations in context

Figure 1
Central Bank Asset Holdings as a Percentage of GDP



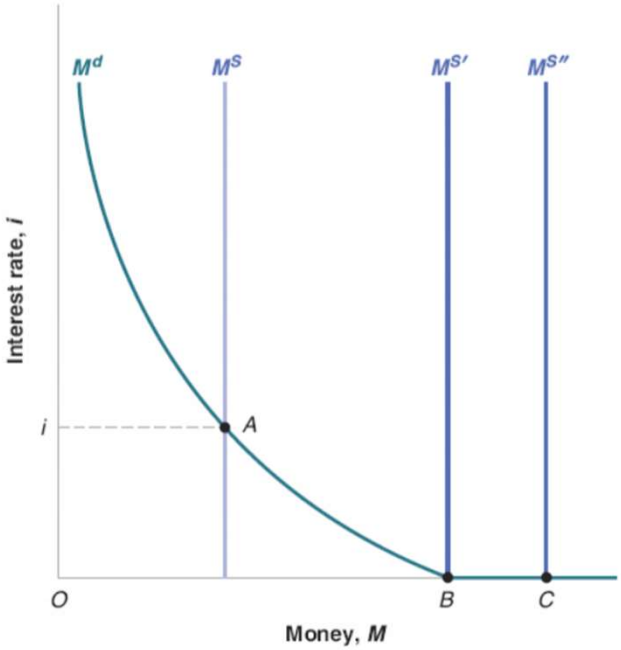
SOURCE: Bank of England (BOE), Bank of Japan (BOJ), European Central Bank (ECB), Federal Reserve Board (FRB), Organisation for Economic Co-operation and Development, Haver Analytics, FRED®, and author's calculations.



- The Fed is not alone: the accumulation of government debt has been a major aspect of monetary policy since the financial crisis
- The Bank of Japan is easily the largest holder of government debt as a % of GDP
  - Reflects zero/negative interest rates in Japan for many years

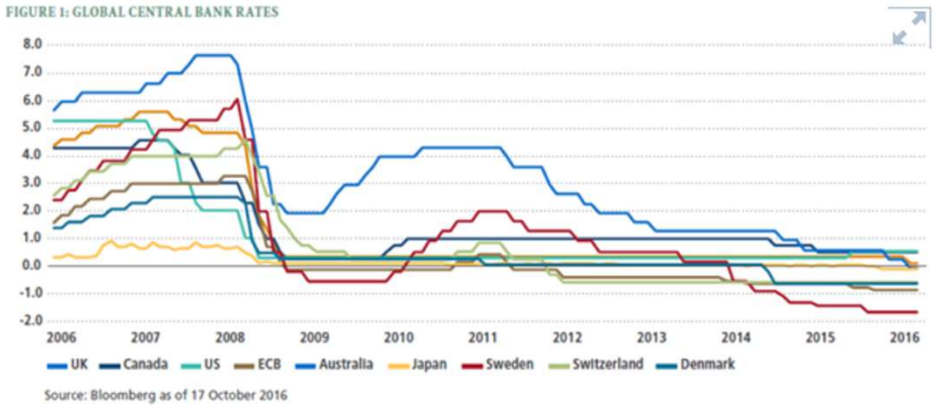
Source: Bank of England, Thomson Reuters

Monetary Theory before the financial crisis: the zero lower bound and the liquidity trap



- We used to think that the central bank could not drive interest rates to zero or even negative
  - That investors would not buy bonds if the return was zero or negative (their has to be a reason for holding bonds!)
- So the central bank can buy all the bonds it wants at zero interest rates
  - Investors will sell any amount of bonds at a zero interest rate, so the central bank can increase the money supply as much as it likes
- But interest rates never go below zero…
- …Then the financial crisis happened…

Monetary Theory before the financial crisis: the zero lower bound and the liquidity trap



- Why are investors prepared to hold bonds with a negative yield?

Country	2 years (%)	10 years (%)
US	0.51	0.94
Italy	-0.16	1.76
Germany	-0.89	-0.55
Japan	-0.19	0.00

Source: Bank of England, Investing.com