

Nanyang Technological University  
School of Social Sciences

HE2002 Macroeconomics II AY23-24 SEMESTER 2

Solution to Tutorial 2

1. Chapter 4, Q2

*A numerical example illustrating the calculation of money demand and its relationships with income and the interest rate.*

Suppose that the household nominal income for a country is \$50,000 billion. The money demand function is given by

$$M^d = \$Y(0.2 - 0.8i)$$

(a)

$$i = 0.01, M^d = \$9,600\text{billion}$$

$$i = 0.05, M^d = \$8,000\text{billion}$$

- (b) When it is independent of the interest rate, an increase or decrease in income leads to the same percentage increase or decrease in money demand. This effect is independent of the interest rate.

Money demand and interest rates have an inverse relationship. As the interest rate rises, money demand declines. However, households' demand for bonds would decrease when bonds pay lower interest, making money demand more attractive.

- (c) If nominal income declines by 20%, it amounts to \$40,000 billion.

When  $i = 0.01$ ,  $M^d = \$7,680$ . Money demand falls by 20%.

When  $i = 0.05$ ,  $M^d = \$6,400$  and money demand falls by 20%.

- (d) In such cases, central banks should lower the interest rate to increase money demand.

2. Chapter 4, Q3

*A numerical example that explores the relationship between bond prices and interest rates.*

Consider a bond that promises to pay \$100 in one year.

(a)

$$i = \frac{100 - \$P_B}{\$P_B}$$

When  $\$P_B = \$75$ ,  $i = 33\%$ .

When  $\$P_B = \$85$ ,  $i = 18\%$ .

When  $\$P_B = \$95$ ,  $i = 5\%$ .

(b) When the bond price rises, the interest rate falls.

(c)

$$P_B = \frac{100}{1+i} \approx \$93$$

### 3. Chapter 4, Q11 Monetary policy in a liquidity trap

*A numerical example with the calculation of both money demand and supply, along with a discussion on the liquidity trap.*

Suppose that money demand is given by

$$M^d = \$Y(0.25 - i)$$

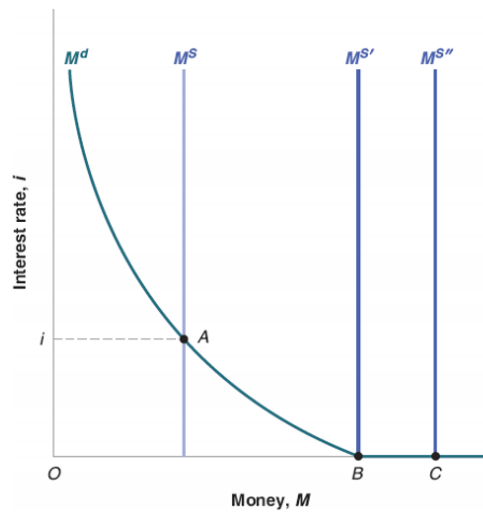
as long as interest rates are positive.

The questions below then refer to situations where the interest rate is zero.

(a)

$$M^d = 80 \times (0.25 - 0) = \$20$$

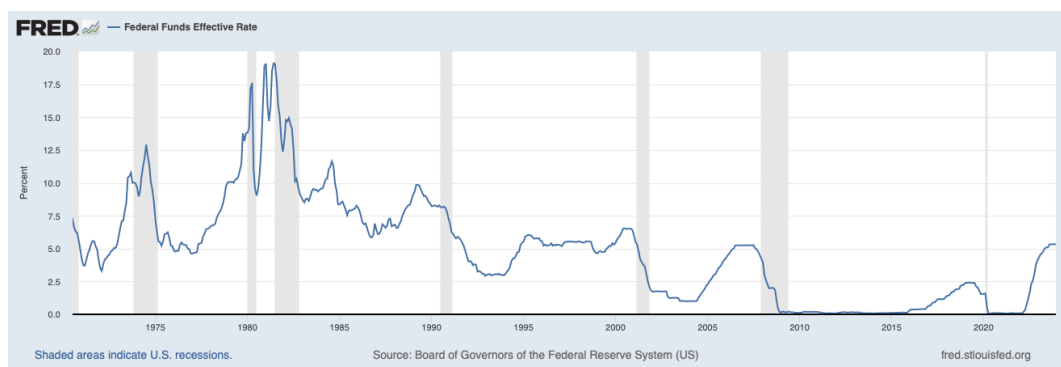
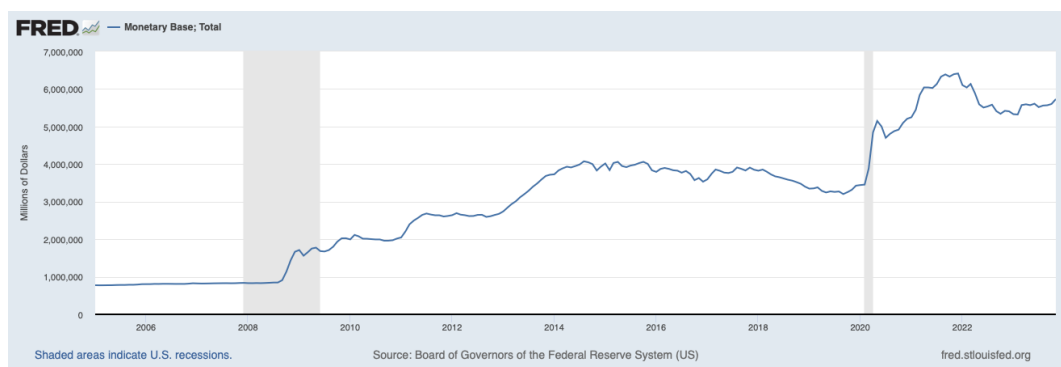
(b) \$ 20



(c) Yes, the central bank can continue to increase the money supply. But interest rates will not fall any further.

(d) Go to the database at the Federal Reserve Bank of St. Louis known as FRED. Find the series BOGMBASE (the central bank money, also called the monetary base) and look at its behavior from 2010 to 2015.

Interest rate remained at zero while the money supply continuously expanded.



#### 4. Chapter 4, Q8 Money and the banking system (Optional)

*A numerical example that illustrates the demand and supply of central bank money, alongside the overall money supply and demand, and studies the determination of the interest rate.*

*(Please read Section 4-3 Determining the Interest Rate: II in the textbook or Slide 23 “The Role of Financial Intermediaries” to Slide 32 “The Federal Funds Rate” of Slides of Lecture 2 before you attempt this question. )*

Consider a monetary system that included simple banks (Case 2 in the updated Slides of Lecture 2). Assume the following:

- i. The public holds no currency
- ii. The ratio of reserves to deposits is 0.1.
- iii. The demand for money is given by

$$M^d = \$Y(0.8 - 4i)$$

Initially, the supply of central bank money  $H$  is \$ 100 billion, and nominal income is \$ 5 trillion.

- (a) The public holds no currency, so all money is in the checking accounts. The demand for central bank money equals the demand for reserves:

$$H^d = \theta M^d = 0.1(\$Y)(0.8 - 4i).$$

- (b) Set  $0.1(\$Y)(0.8 - 4i) = 0.1(\$5000)(0.8 - 4i) = \$100$  (in billion), and we can solve for the equilibrium interest rate  $i = 15\%$ .

- (c) Since the public holds no currency, the money multiplier is given by  $1/\text{reserve ratio} = 1/0.1 = 10$ . The overall supply of money is  $M = (10)(\$100) = \$1,000$  billion. At the interest rate derived in part (b), the overall demand for money equals the overall supply, i.e.,  $M = M^d$ .
- (d) If the supply of central bank money is \$300 billion, solve the equation  $(0.1)(\$5,000)(0.8 - 4i) = \$300$  to get the new interest rate  $i = 5\%$ . The equilibrium interest rate falls.
- (e) The increase in the overall money supply from \$1,000 billion to \$3,000 billion implies that the central bank money has been increased to \$300 billion, as the reserve ratio is unchanged. Thus the interest rate will be the same as in part (d), falling to 5%.