1. Compute the real interest rate using the exact formula and the approximation formula for each set of assumptions listed in (a) to (c).
   a. i = 4%; p^e = 2%
   b. i = 15%; p^e = 11%
   c. i = 54%; p^e = 46%.

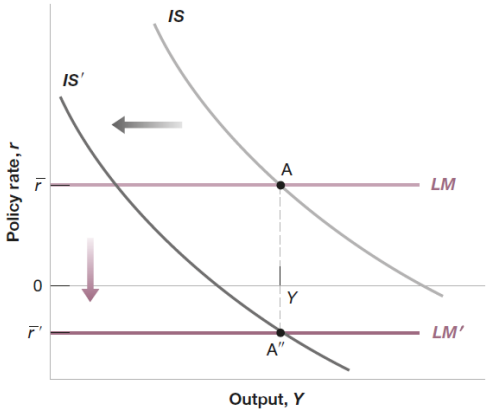
2. Fill in the table below and answer the questions related to the table's data.

Situation	Nominal policy interest rate	Expected inflation	Real policy interest rate	Risk premium	Nominal borrowing interest rate	Real borrowing interest
A	3	0	3	0		
B	4		2	1		
C	0	2		4		
D				2	6	3
E	0	-2				5

   a. Which situations correspond to a liquidity trap?
   b. Which situations correspond to the case where the nominal policy interest rate is at the zero lower bound?
   c. Which situation has the highest risk premium? What two factors in bond markets lead to a positive risk premium?
   d. Why is it so important when the nominal policy interest rate is at the zero lower bound to maintain a positive expected inflation rate?

3. Consider a simple bank that has assets of 100, capital of 20 and demand deposits of 80. Deposit accounts are liabilities of a bank.
   a. Set up the bank's balance sheet.
   b. Now, suppose that the perceived value of the bank's assets falls by 10. What is the new value of the bank's capital? What is the bank's leverage ratio?
   c. Suppose the government insures the deposits. Despite the decline in the value of bank capital, is there any immediate reason for depositors to withdraw their funds from the bank? Would your answer change if the perceived value of the bank's assets fell by 15? 20? 25? Explain.

4. Consider an economy described by Figure:



   a. What are the units on the vertical axis of the Figure above?

b. If the nominal policy interest rate is 5% and the expected inflation rate is 3%, what is the value for the vertical intercept of the LM curve?
c. Suppose the nominal policy interest rate is 5%. If expected inflation decreases from 3% to 2%, in order to keep the LM curve from shifting in the Figure above, what must the central bank do to the nominal policy rate of interest?
d. If the expected inflation rate were to decrease from 3% to 2%, would the IS curve shift?
e. If the expected inflation rate were to decrease from 3% to 2%, would the LM curve shift?
f. If the risk premium on risky bonds increases from 5% to 6%, does the LM curve shift?
g. If the risk premium on risky bonds increases from 5% to 6%, does the IS curve shift?
h. What are the fiscal policy options that prevent an increase in the risk premium on risky bonds from decreasing the level of output?
i. What are the monetary policy options that prevent an increase in the risk premium on risky bonds from decreasing the level of output?

5. Nominal and real interest rates around the world analyses.
   a. There are a few episodes of negative nominal interest rates worldwide. Some may or may not be in play as you read this book. The Swiss nominal policy rate, the Swiss equivalent of the federal funds rate, is series IRSTCI01CHM156N from the FRED database maintained at the Federal Reserve Bank of St. Louis; it was negative in 2014 and 2015. If so, why not hold cash instead of bonds? Explain. In the United States, the Federal Reserve has not (yet) set the nominal policy rate below zero.
   b. The real rate of interest is frequently negative. Under what circumstances can it be negative? If so, why not just hold cash instead of bonds?
   c. What are the effects of a negative real interest rate on borrowing and lending?

6. Consider a bank that has assets of 100, capital of 20 and short-term credit of 80. Among the bank's assets are securitised assets whose value depends on the price of houses. These assets have a value of 50.
   a. Set up the bank's balance sheet.

   Suppose that due to a housing price decline, the value of the bank's securitised assets falls by an undetermined amount, so these assets are now worth somewhere between 25 and 45. Call the securitised assets 'troubled assets'. The value of the other assets remains at 50. As a result of the uncertainty about the value of the bank's assets, lenders are reluctant to provide any short-term credit to the bank.

   b. Given the uncertainty about the value of the bank's assets, what is the range in the value of the bank's capital? As a response to this problem, the government considers purchasing the troubled assets, with the intention of reselling them again when the markets stabilise. (This is the original version of the TARP.)

c. If the government pays 25 for the troubled assets, what will be the value of the bank's capital? How much would the government have to pay for the troubled assets to ensure that the bank's capital does not have a negative value? If the government pays 45 for the troubled assets, but the true value turns out to be much lower, who bears the cost of this mistaken valuation? Explain.

Suppose instead of buying the troubled assets, the government provides capital to the bank by purchasing ownership shares, with the intention of reselling the shares when the markets stabilise. (This is what the TARP ultimately became.) The government exchanges Treasury bonds (which become assets for the bank) for ownership shares.

d. Suppose the government exchanges 25 Treasury bonds for ownership shares. Assuming the worst-case scenario (so that the troubled assets are worth only 25), set up the new balance sheet of the bank. (Remember that the firm now has three assets: 50 of untroubled assets, 25 of troubled assets and 25 of Treasury bonds.) What is the total value of the bank's capital? Will the bank be insolvent?
e. Bank capital is now 20, and the bank is not insolvent. Given your answers and the material in the text, why might recapitalisation be a better policy than buying troubled assets?

7. Calculating the risk premium on bonds. The text presents a formula where:

$$(1 + i) = (1 - p)(1 + i + x) + p(0), \text{ where}$$

p is the probability that the bond does not pay at all (the bond issuer is bankrupt) and has a zero return; i is the nominal policy interest rate; and x is the risk premium.

a. If the probability of bankruptcy is zero, what is the interest rate on the risky bond?
b. Calculate the probability of bankruptcy when the nominal interest rate for a risky borrower is 8%, and the nominal policy rate of interest is 3%.
c. Calculate the nominal interest rate for a borrower when the probability of bankruptcy is 1%, and the nominal policy rate of interest is 4%.
d. Calculate the nominal interest rate for a borrower when the probability of bankruptcy is 5%, and the nominal policy rate of interest is 4%.
e. The formula assumes that payment upon default is zero. In fact, it is often positive. How would you change the formula in this case?

8. Unconventional monetary policy: financial policy and quantitative easing
We have written the IS-LM model in the following terms:

IS relation: $Y = C(Y - T) + I(Y, r + x) + G$
LM relation: $r = r$

Interpret the interest rate as the federal funds rate adjusted for expected inflation, the real policy interest rate of the Federal Reserve. Assume that the rate at which firms can borrow is much higher than the federal funds rate, equivalently that the premium, x, in the IS equation is high.

a. Suppose that the government takes action to improve the solvency of the financial system. If the government's action is successful and banks become more willing to lend – both to one another and to non-financial firms – what is likely to happen to the premium? What will happen to the IS-LM diagram? Can we consider the financial policy as a kind of macroeconomic policy?
b. Faced with a zero nominal interest rate, suppose the Fed decides to purchase securities directly to facilitate the flow of credit in the financial markets. This policy is called quantitative easing. If quantitative easing is successful, it becomes easier for financial and non-financial firms to obtain credit; what is likely to happen to the premium? What effect will this have on the IS-LM diagram? If quantitative easing has some effect, is it true that the Fed has no policy options to stimulate the economy when the federal funds rate is zero?
c. We will see later that one argument for quantitative easing is that it increases expected inflation. Suppose quantitative easing does increase expected inflation. How does that affect the LM curve?

ADDITIONAL QUESTIONS:

Label each of the following statements true, false or uncertain. Explain briefly.

a. The nominal interest rate is measured in terms of goods; the real interest rate is measured in terms of money.
b. As long as expected inflation remains roughly constant, the movements in the real interest rate are approximately equal to the movements in the nominal interest rate.
c. The nominal policy interest rate was at the zero lower bound in the United States in 2013.
d. When expected inflation increases, the real rate of interest falls.
e. All bonds have an equal risk of default and thus pay equal interest rates.
f. The central bank sets the nominal policy interest rate.
g. An increase in a bank's leverage ratio tends to increase both the expected profit of the bank and the risk of the bank going bankrupt.
h. The real borrowing rate and the real policy rate always move in the same direction.
i. It can be challenging to value the assets of banks and other financial intermediaries, particularly in a financial crisis.
j. When a bank has high leverage and low liquidity, it may have to sell assets at fire-sale prices.
k. Banks and other financial intermediaries have less liquid assets than their liabilities.
l. House prices have risen constantly since the year 2000.
m. The fiscal stimulus plan adopted by the United States in response to the financial crisis helped offset the decline in aggregate demand and reduce the size of the recession.