Problem 1. Here, match some stuff.

Definitions

(a) decreases in the general price level
(b) decreases in the inflation rate
(c) increases in the general price level
(d) nominal interest rate minus expected inflation rate
(e) the interest rate charged on a loan

Terms

(i) inflation
(ii) real interest rate
(iii) deflation
(iv) ex-ante real interest rate
(v) disinflation
(vi) nominal interest rate
(vii) recession

Answer 1.

(a) **Deflation** is a general decrease in the price level

(b) **Disinflation** is a decrease in the inflation rate

(c) **Inflation** is an increase in the general price level.

(d) The **ex-ante real interest rate** is the nominal interest rate minus the *expected* inflation rate. *Ex-ante* refers to the fact that we use the *expected* inflation rate because we don't know how prices will rise into the future.

(e) **Nominal interest rate** is the rate applied to the dollar amount of loans.

The *rate of inflation*, denoted π for some reason, is the percentage at which a price level changes from one time period to the next, say, from P_1 to P_2. It is given by the growth rate formula

$$\pi = \frac{P_2 - P_1}{P_1} \times 100.$$

Problem 2. What is the relationship between the real interest rate, the nominal interest rate, and inflation?

Answer 2. First we need to distinguish between *ex-ante* and *ex-post*.

Suppose we are in year 1. We do not know for certain what the price level will be in year 2, and hence we are uncertain about what inflation will be over that time period. Instead, we have an *expectation* about the period 2 price level, and thus an expectation about inflation. With that in mind, the *ex-ante* real interest rate is given by

$$r^e = R - \pi^e.$$

This says that the *ex-ante* real interest rate is the nominal interest rate minus whatever amount we expect inflation to be over the course of the next year.

Now suppose we are in year 2. We know for sure what the price level now is, and hence we know what inflation was over the course of the last year. The ex-post real interest rate is given by

$$r = R - \pi.$$

In other words, the *ex-post* real interest rate is the nominal interest rate minus whatever amount inflation actually turned out to be over the course of the last year.

These equations are sometimes called the (approximate) *Fisher equation*.

Problem 3. Consider the following statistics of an economy:

nominal interest rate in 2017:	6%
general price level in 2017:	100
general price level expected in 2018:	104
actual general price level in 2018:	107

Find the expected one-year rate of inflation in 2017.

Answer 3. We expect the price level to be 104 one year from now. Hence we expect inflation over this period to be

$$\frac{104 - 100}{100} \times 100 = 4\%.$$

Problem 4. Consider the following statistics of an economy:

nominal interest rate in 2017:	6%
general price level in 2017:	100
general price level expected in 2018:	104
actual general price level in 2018:	107

Find the ex-ante real interest rate in 2017.

Answer 4. The ex-ante real interest rate is the nominal interest rate minus the expected inflation rate. The Fisher equation $r^e = R - \pi^e$ gives

$$6\% - 4\% = 2\%.$$

Problem 5. Consider the following statistics of an economy:

nominal interest rate in 2017:	6%
general price level in 2017:	100
general price level expected in 2018:	104
actual general price level in 2018:	107

Find the ex-post real interest rate in 2017.

Answer 5. The ex-post real interest rate is the nominal interest rate minus actual the inflation rate—so we can only calculate this after time has passed and we know how the price level has actually changed. The Fisher equation $r = R - \pi$ gives

$$6\% - 7\% = -1\%.$$

Problem 6. Leopnard and Brad both expect 4% inflation over the next year. Brad borrows some money from Leopnard at the interest rate of 7%. Next year, the inflation rate turns out to be only 2%. In this story

(a) Leopnard will be better off than expected

(b) Leopnard will be worse off than expected

(c) Brad will be better off than expected

(d) Both will be worse off than expected

(e) "Leopnard" is a really funny name.

Answer 6: a and e, but mostly a. The ex-ante real interest rate Brad and Leopnard agreed to was $7\% - 4\% = 3\%$. However, one year later actual inflation turned out to be only 2%, so the ex-post real interest rate was $7\% - 2\% = 5\%$. Leopnard therefore receives 3% more real return than expected; Brad pays 3% more in real interest payments than expected. The moral of the story is

- below-expected inflation benefits lenders and hurts borrowers;
- above-expected inflation benefits borrowers and hurts lenders.

Problem 7. Schtolteheim Reinbach III inherits some cash from his aunt and deposits it in his checking account. He realized that inflation is going to erode the purchasing power of those deposits. His financial adviser tells him to buy gold coins and put them in a safe deposit box. The fee Schtolteheim pays the adviser, plus the cost of the safe deposit box, is

(a) menu costs

(b) shoe-leather costs

(c) hedging costs

(d) inflation costs

(e) none of the above

(f) above of the none

Answer 7: b. The phrase **shoe-leather costs** refers broadly to the costs people incur to protect the purchasing power of their money holdings.

Problem 8. Apple Computers raises the pries of iPhones and iPads just to keep up with the general inflation. As a result, it has to modify its computer programs, issue new online catalogues, and inform the retail stores about the new prices. The costs of all these activities incurred by Apple are called

(a) menu costs

(b) shoe-leather costs

(c) inflation costs

(d) price-change costs

(e) none of the above

(f) all of the below

Answer 8: a. Menu costs include such costs as printing new catalogues by business firms and sending them to their branches, updating their websites with the new pricing information, informing their wholesale buyers, and changing their computer programs.

Problem 9. Define the following terms:

(a) surplus spending units

(b) deficit spending units

(c) direct finance

(d) indirect finance

Answer 9.

(a) When people have more money than they need to spend on consumption goods, they have surplus spending units.

(b) When people need more money than they have, they have deficit spending units.

(c) In direct finance, a person with surplus spending units lends that surplus directly to a person with deficit spending units.

(d) In indirect finance, a person with surplus spending units gives their surplus to a **financial intermediary**, e.g. a bank. Then the bank finds a suitable person with deficit spending units to lend those surplus units to.

Problem 10. Explain the following functions of a financial system:

(a) aggregation

(b) diversification

(c) provision of liquidity

(d) provision of information

(e) maturity transformation

Answer 10.

(a) *Aggregation.* Suppose a firm needs to borrow a lot of money for a major investment. They'll probably have difficulty finding one lender with enough money. Banks will package up (i.e. aggregate) smaller loans into one big loan for the firm.

(b) *Diversification.* When you put money in a bank, they're unlikely to lend all of it to just one project. They'll probably loan some if it to one project, some to another project, some to yet another project, etc. They'll essentially diversify for you.

(c) *Provision of Liquidity.* Banks provide liquid assets. If you lend your money to your sketchy cousin, chances are you won't have access to that money for a while. If you put your money into a bank, you can usually get it back pretty quickly.

(d) *Provision of Information.* Ascertaining whether a borrower is responsible or not can be difficult and time consuming. Banks are experts at it, and they'll do it better than you – they'll get better information. Similarly, they can better determine whether a project is likely to be successful or not before lending to it.

(e) *Maturity Transformation.* If someone wants to borrow money for a house, they take out a mortgage up to 30 years in length. Most people don't want to lend money for 30 years. Most people instead make short term loans to banks (e.g. checking or savings account). If the bank's quantity of deposits (regardless of the exact sources) is large enough, they can use those funds for a long-term loan.

Maturity Transformation and Financial Crises

Suppose we all deposit our money into the bank as savings accounts. The bank takes 90% of this money and loans it as a 30-year mortgage. (They 10% they keep are called *reserves*.) They are hoping that, at no given time, people will want to withdraw more than 10% of that money. Because if that happens, the bank doesn't have the money and won't for a long time – they loaned it away for 30 years.

This is called a *bank run*: when large numbers of people all simultaneously want to withdraw their money from a bank, and the bank cannot give everyone back their money because they've loaned too much of it out. This causes financial crises and was seen, for example, right before the Great Depression.

To avoid the probability of a bank run, the U.S. government created the Federal Deposit Insurance Corporation (FDIC). Even if there is a bank run and your bank can't give you back your money, the FDIC will guarantee you'll get a maximum of $250,000 back.

There is a downside to the FDIC however. Since banks know the government is going to pay people back up to $250,000 no matter what, banks will feel comfortable taking on more risk. This is an example of **moral hazard**.

Problem 11. If lenders and borrowers expect the inflation rate to increase by 2%, the Fisher effect says the equilibrium nominal interest rate will increase by how much?

Answer 11. The *Fisher effect* says that a change in expected inflation will cause a one-for-one adjustment of the nominal interest rate. So if expected inflation rises by 2%, then the nominal interest rate will increase by 2%. Then the idea is that expected inflation will not affect the *fundamentals* of the economy—the real interest rate is independent of changes in the price level—and therefore a change in π^e won't cause any change in r^e. Thus it must be the case that R changes instead. Or if you'd like,

1. Suppose inflation expectations increase, all else equal. Then $r^e = R - \pi^e$ is lower.
2. This means fewer people want to buy bonds: demand shifts to the left.
3. This also means more people want to sell bonds: supply shifts to the right.
4. The new intersection will be below the old one by $\Delta R = \Delta\pi^e$.
5. Therefore r^e is the same as it was initially.

Note that inflation and the nominal interest rate are both *nominal* variables. What we're saying here is that a change in one nominal variable, π^e, only affects the other nominal variable R but has on effect on the real variable r^e. This separation of real and nominal variables will be important later on.

I give one narrative for each shift, but the opposite cases always have opposite shift.

Shifts in Supply of Bonds (Borrowers)

(a) Expected future economic conditions. If you feel bad about the future, you act cautiously and borrow less (shift left).

(b) Uncertainty about the level of future profits. If firms are uncertain about the future, they are hesitant to borrow (shift left).

(c) Inflation volatility. If inflation is volatile, then borrowers cannot form reliable beliefs about the future and hence will not want to borrow (shift left).

Shifts in the Demand for Bonds (Lenders)

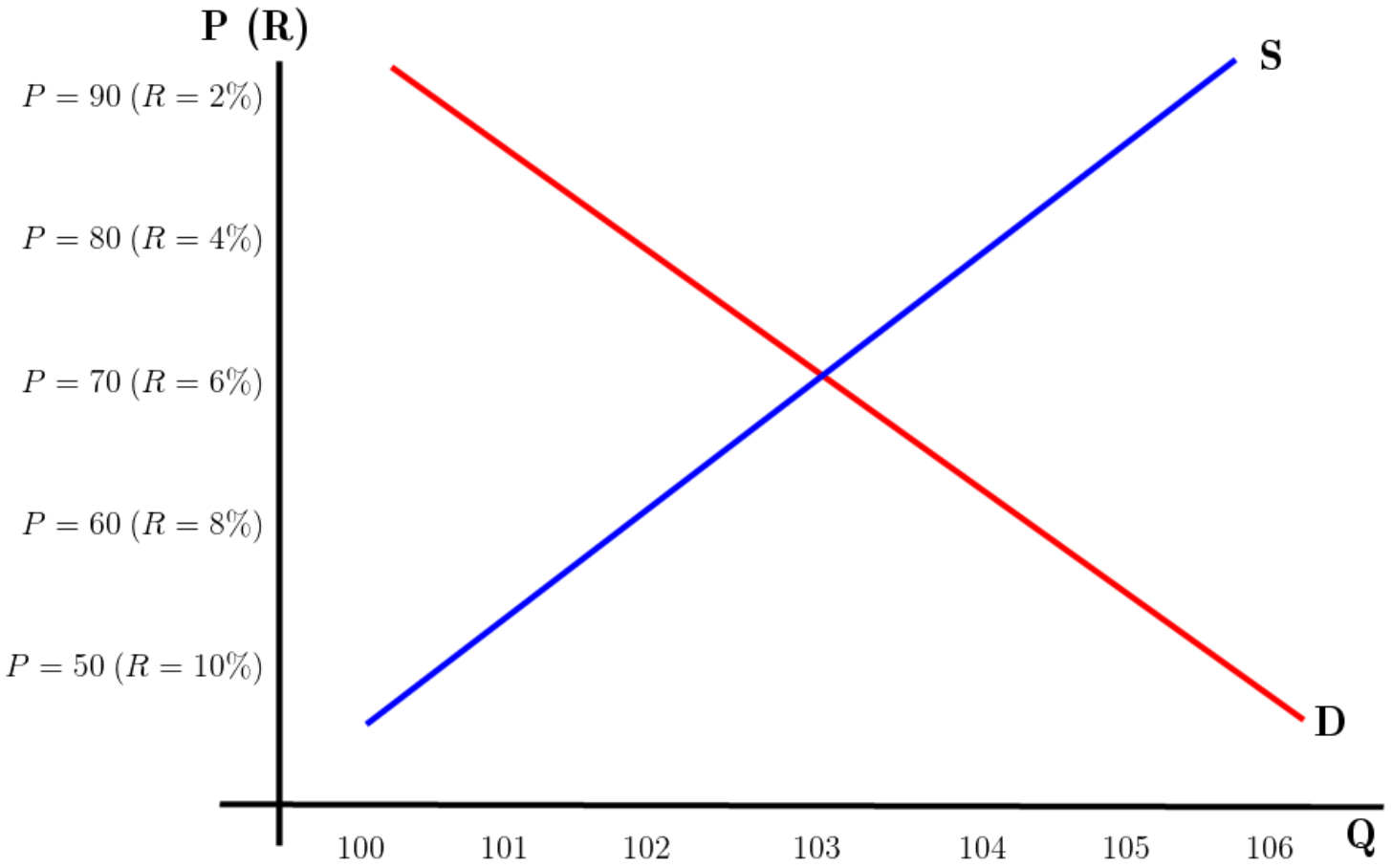
(a) Income and wealth. As the income and wealth of households decreases, they buy fewer bonds (shift left).

(b) Credit risk. If lending is riskier, then lenders don't lend out as much, i.e. lenders buy fewer bonds (shift left).

(c) Inflation volatility. If inflation is volatile, then lenders cannot form reliable beliefs about the future and hence will not want to lend (shift left).

Note that both curves shift left when inflation volatility increases. This implies lower quantity in equilibrium, but the effect on price depends on which curve shifts more.

Problem 12. The bond market shown below is for (safe) Treasury bonds. Suppose the market for (risky) corporate bonds exhibits the same supply and demand structure, and that the risk premium is 2%. What is the quantity of corporate bonds in equilibrium? (Numbers will be "nice" even if the graph isn't: use the closest integer.)



Answer 12. Because corporate bonds are risky, there is less demand for them. The demand will be less such that the intersection for corporate bonds will be 2% more than the rate on bonds apropos the 2% risk premium. That is, the rate of T-bonds is at 6% interest, therefore the rate of corporate bonds must be 8%. It follows that the green line must be demand for corporate bonds. So quantity of corporate bonds is 102.