Chapter 11 Practice Problems

Answers

1. Would you be more willing to lend to a friend if she put all of her life savings into her business than you would if she had not done so? Why?

This problem is intended to make students think of moral hazard. By putting her life savings into her business, the owner is less likely to take on excessive risk that endangers your money. The idea is simple, without investing her money in the business, if the business fails the owner does not lose (much) personally and hence does not act in a way to protect against business failure.

Possibly, by not having any money in reserve, the owner would be subject to random profit shocks that makes her business more risky. Therefore, some amount of money between no savings and total life savings may be optimal to require the owner to invest.

2. How can the existence of asymmetric information provide a rationale for government regulation of financial markets?

In the presence of asymmetric information, markets will not function well or, possibly, will not function at all. By requiring publicly traded firms to release information about themselves, the government reduces the asymmetric information problem and encourages financial markets to work better.

3. Imagine that there are twenty of each of two types of people in the world: safe and risky. Safe people have access to a project that, given $1000 will automatically return $1200. Risky people can invest their $1000 and get a return 30% of the time of $1400, 50% of the time of $1000, and 20% of the time $0. For ease of computation, assume that you (the banker) do not accept collateral on any loans and the borrowers do not have any money of their own. Finally, imagine that in the case of default, the borrower ends up with neither a loss or a gain; in other words the lender loses the amount lent and the borrower pays no bankruptcy costs.

a. Plot the demand curve for loans (with interest rates on the vertical axis and quantity of $ on the horizontal axis).

The demand curve appears as:
b. Imagine that you have $40,000 to lend. Plot the supply curve of loans against the demand curve. What is the equilibrium interest rate(s) in this market? If this market for loans was perfectly competitive (meaning lenders make zero expected profits), what interest rate would prevail? Too low an interest rate results in negative bank profits so banks would not choose to supply funds at these rates. The lowest possible interest rate a bank would charge and make zero profits is given by the equation: 

\[ 20 \times 1000i + 20 \times (0.3 \times 1000i + 0 - 0.2 \times 1000) = 0. \]

Solving for \( i \) gives \( i = 15.38\% \). The supply and demand curves are:

The equilibrium interest rate is any interest rate between 15.38% and 20%. In a zero-profit market, the prevailing interest rate would be 15.38% and $40,000 worth of loans would be made.

c. Without taking into account the information asymmetries, what is the theoretical impact on the interest rate and quantity of funds lent/borrowed given a decrease in the supply of funds? A decrease in the loanable funds supplied should raise interest rates and lower the loans traded.

d. Imagine that instead of having $40,000 to lend, you have only $20,000. Plot the new supply curve of loans against the demand curve. What is the equilibrium interest rate(s) in this market? Is this the interest rate you would charge as a lender? Why or why not? The new picture would appear as:

The new picture would appear as:
The equilibrium level of interest rates is between 20 and 40% where $20,000 of loans will be made. However, at any of these interest rates, only risky borrowers take loans out and, even at 40% interest, the bank makes negative profits: 

\[ 20 \times (.3 \times 1000 \times .4 + 0 - .2 \times 1000) = -1600. \]

However, it is possible for a bank to make a positive profit in this case. By randomly assigning loans to people (and charging an interest rate less than 20%), the bank will, on average, make 10 loans to risky individuals and 10 loans to safe individuals. At an interest rate of 20%, this would generate profits of:

\[ 10 \times 1000 \times .2 + 10 \times (.3 \times 1000 \times .2 + 0 - .2 \times 1000) = 600. \]

Notice, at interest rate of 20%, 40 individuals demand loans and only 20 are made. Thus, we are not in an economic equilibrium but we are in a situation that is better for the bank.

e. Many politicians realize the power banks have in stimulating the economy. For instance, if, during recessions, banks were to lend more money then the economy would more quickly expand. One such policy of raising lending is to give businesses tax breaks for receiving borrowed funds. The hope is to increase demand for loans, raise total borrowing, and increase economic output. In the case of credit rationing presented in part d, do governmental policies of increasing demand for loans actually stimulate the economy? Why or why not?

By giving tax breaks, politicians are increasing the demand for loans. In typical markets, this increases the quantity borrowed and raises the equilibrium price of loans. In the presence of credit rationing though, higher demand for loans may not translate into lenders acting differently if they can make higher profits at an interest rate outside of equilibrium. In other words, governmental policies may not alter lending behavior and may not stimulate the economy.

4. As a banker, you know that your clients have two opportunities: borrow $1000 and invest it into an opportunity which guarantees a return of $1200 or borrow $1000 and invest it into a risky opportunity which returns $2500 20% of the time, $1200 50% of the time, or $0 the other 30% of the time. Finally, assume the market interest rate is 15%.

a. Calculate the expected returns for your clients if they take the safe opportunity versus the risky opportunity. From the bank’s perspective, which opportunity would the bank desire their customers to undertake (Hint: Calculate the bank’s expected return assuming that the bank receives nothing if the borrower defaults).

The expected returns to the borrower for the safe project is $1200 – 1.15 \times 1000 = 50$

The expected returns to the borrower for the risky project is $0.2 \times (2500 - 1000 \times 1.15) + 0.5 \times (1200 - 1000 \times 1.15) = 295$. This assumes the borrower does not lose anything in the case of the 0 payback.
As long as the borrower is not (extremely) risk averse, the borrower would choose the risky activity to the detriment of the banker.

b. As a banker, you have the opportunity to collect collateral which, if the borrower defaults, you keep. What is the minimum amount of collateral you need to collect to guarantee the borrower chooses the safe option and not the risky option?

Two different ways of answering this question exist. One is to assume that collateral is collected up front, stored in a safe place, and only taken if the borrower defaults. The second case is when the bank requires the borrower to invest some personal funds in the project. I will answer in both cases.

The expected return to the risky borrower when collateral is held by the bank is:

\[0.2 \times (2500 - 1000 \times 1.15) + 0.5 \times (1200 - 1000 \times 1.15) - 0.3c\]

where \(c\) represents the collateral lost if the borrower does not repay the loan. If the bank picks \(c\) correctly, then the expected returns from the safe project will be less than the expected returns from the risky project thus guaranteeing the borrower chooses the safe project. This occurs when:

\[50 > 0.2 \times (2500 - 1000 \times 1.15) + 0.5 \times (1200 - 1000 \times 1.15) - 0.3c\]

Solving for \(c\) gives \(c > 816.66\).

The second way to answer this question is for the bank to require \(c\) dollars to be invested alongside the bank’s funds. In this case, the amount borrowed falls from $1000 to $1000 – \(c\). The safe project’s expected return (meaning the amount earned above the collateral that the borrower started with) is thus \(1200 - 1.15 \times (1000 - c) - c\) and the risky project’s is:

\[0.2 \times (2500 - (1000-c) \times 1.15 - c) + 0.5 \times (1200 - (1000-c) \times 1.15 - c) - 0.3c\]

Again, the bank will choose \(c\) such that the expected return from the risky project is less than the safe project. In this case \(c > 710.14\).

c. What is the relationship between the market interest rate and the minimum amount of collateral required to guarantee the safe option?

Replacing 1.15 with \(1+i\) in the above equations (the second of the two collateral options) and solving for \(c\), I find:

\[c = \frac{666.66 + 1000i}{1+i}\]

With a little work, one can show that:

\[
\frac{dc}{di} = -\frac{333}{(1+i)^2}
\]

which is always positive for any value of \(i\). Thus, higher interest rates induce banks to hold more collateral.

5. Explain how requiring collateral reduces the adverse selection problem inherent in debt.

Adverse selection is an asymmetric information problem that occurs prior to the transaction taking place. With regards to debt, adverse selection implies that individuals needing debt may be the ones who are most risky. This could be because of prior history (their past risks didn’t pay off so they need debt now) or could be because there is no downside risk for a debtor to undertake excessively risky projects which, when they payoff, enrich the debtor but when they fail only negatively impact the lender. In this second case, collateral can reduce or eliminate the adverse selection problem. By asking for collateral, a lender changes a debtor’s incentives and makes the debtor less likely to gamble with the lender’s money (since, if the gamble does not payoff, the debtor loses the collateral). Hence, borrowers who are less risky will be likely to apply for a loan.
6. Rich people often worry that others will seek to marry them only for their money. Is this a problem of adverse selection?

It could be. Adverse selection occurs before the market is made (in this case before the wedding takes place) and is caused by incomplete information about the characteristics of the product being purchased (in this case, a spouse). If I don’t know if my girlfriend is pursuing me for my money or because she truly recognizes me for the wonderful person I am, then I will be more hesitant to marry (this is similar to paying lower amounts for used cars when one doesn’t know if they are lemons or not).

Rich people may not marry for reasons other than adverse selection. For instance, if the information on potential spouses is so imperfect that people can’t determine if they are being pursued for their money or not, then perhaps these rich people will act in such a suspicious manner that nobody would want to marry them.

7. What moral hazard issues arise after a marriage takes place?

Incentives change after transacting in the marriage market place. For instance, upon acquiring a spouse, a husband or wife may be less likely to exercise and eat healthy (since he or she no longer needs to be as attractive to find a mate). Spouses likely buy fewer gifts for each other upon getting married as they did prior to marriage (since these gifts are signals to the worthiness of the spouse, they are no longer needed after the spouse has been acquired). Many other examples could be given.

8. In some cities, newspapers publish a weekly list of restaurants that have been cited for health code violations by local health inspectors. What information problem is this feature designed to solve? How?

This solves both adverse selection and moral hazard. People who dine out at restaurants may have a difficult time identifying restaurants that don’t meet certain health standards. Because of this, some people may not want to eat out at all. Also, restaurants don’t have an incentive to follow health regulations since diners can’t distinguish restaurants that meet the health standards from those that don’t. However, publishing the names of restaurants cited for health code violations allows people to identify unsanitary restaurants and thus holds restaurants accountable for following health regulations.

9. Indirect finance is more important than direct finance in most countries in part because of information costs associated with lending. Why are financial intermediaries relatively more effective at reducing these costs?

Financial intermediaries are specialists at screening and monitoring borrowers. For example, they develop expertise in their credit departments at assessing risks using information from loan applications and credit scoring agencies. They also have unique access to information about potential borrowers from their deposit accounts and debit card usage etc. This makes them relatively effective at avoiding adverse selection problems. They are also specialists at monitoring borrowers once loans have been extended, allowing them to mitigate moral hazard problems relatively cheaply.

10. The financial sector is heavily regulated. Explain how government regulations help to solve information problems, increasing the effectiveness of financial markets and institutions.
The government requires firms to disclose information. For example, public financial statements prepared according to standard accounting practices are required by the Securities and Exchange Commission. Investors can feel more secure in assessing the financial health of a firm given this government-mandated and standardized information, thus reducing problems associated with adverse selection. Since they know they are required to disclose certain information, firms may be less willing to engage in excessively risky behavior, reducing problems associated with moral hazard.

11. Suppose two types of firms wish to borrow in the bond market. Firms of type A are in good financial health and are relatively low risk. The appropriate premium over the risk-free rate for lending to these firms is 2%. Firms of type B are in poor financial health and are relatively high risk. The appropriate premium over the risk-free rate for lending to these firms is 6%. As an investor, you have no other information about these firms except that type A and type B firms exist in equal numbers.
   a. At what interest rate would you be willing to lend if the risk-free rate were 5%?
   b. Would this market function well? What type of asymmetric information problem does this example illustrate?

a. The appropriate interest rate for type A firms’ bonds is 7% while that for type B firms’ bonds is 11%. As investors don’t know which type of firm they are dealing with and there is an equal probability of either type of firm, they will be only be willing to lend if they receive at least the average rate of 9%.

b. No. The type A firms would not be willing to pay this interest rate and so would withdraw from the market, leaving only type B firms. This is an example of an adverse selection problem. Only the less desirable firms are willing to borrow.