Asymmetric Information in Finance Explained
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20 May 2024

Introduction

My name is Raghavendra Rau and I'm a professor at the University of Cambridge. This is the fifth in a series of Gresham lectures this year on the big ideas of finance. The lectures this year are drawn from my textbook A short introduction to corporate finance, published by Cambridge University Press.

As I said before, there are only six major ideas in finance, five of which have won their originators Nobel prizes in economics. What are these ideas?

1. **Net Present Value (NPV):** NPV is the key principle in investment decision-making, where the objective is to maximize the present value of future payoffs. It involves three steps: computing cash flows, discounting those flows to a single present value using a discount rate, and deciding the financing method, which affects taxes.

2. **Portfolio Theory and the Capital Asset Pricing Model (CAPM)**

- The interest rate or discount rate in NPV is determined by investors, based on available investment opportunities. Markowitz and Sharpe, Nobel laureates, proposed that individual investments are parts of portfolios. They combined portfolios with risk-free assets to determine the market portfolio. The discount rate is determined using the CAPM formula.

3. **Capital Structure Theory:**

- Capital structure explains how the discount rate changes based on the firm's financing decision – whether to go with debt or equity. Modigliani and Miller, Nobel winners, posited that in a perfect world, financing form doesn't affect firm value. But with real-world imperfections (like taxes), it does matter.

4. **Option Pricing Theory:**

- This theory discusses how to price options, which are contracts that give rights (but not obligations) to buy or sell assets. Black, Scholes, and Merton, with the latter two winning a Nobel, provided a solution based on the no-free lunch principle. They matched the cost of a portfolio replicating an option's payoff to the option's cost.

5. **Asymmetric Information:**

- This is the idea we are discussing in this lecture. This lecture deals with information imbalances in transactions, where one party has more information than the other. Akerlof, Spence, and Stiglitz, Nobel laureates, developed the key concepts in this area, illustrating how information imbalances affect markets from used cars to financial policies.

6. **Market Efficiency:**

- The last lecture discusses how markets reflect all available information. The debate lies in the relationship between market prices and NPV. Three Nobel winners, Kahneman, Fama, and Shiller, contributed pioneering ideas on this topic, discussing market behavior and efficiency.

In essence, corporate finance revolves around six central ideas, with five of them recognized by Nobel Prizes.

What is asymmetric information?

In the first four lectures in this series, we have made two basic assumptions. The first is that everyone has symmetric access to all the information necessary to make a decision. The second is that each person rationally uses all this information to make a decision.

In the last two lectures, we relax these assumptions. In this lecture, we explore what happens if we do not have the same amount of information as the people on the other side of the trade. How does this affect us?

Asymmetric information occurs where one person in a deal knows more than the other. This happens all the time. Imagine you're buying a (used) smartphone online, or maybe you're hiring a babysitter. In each case, one side has more info than the other. The seller knows if the phone has a glitch, and the babysitter knows if they're really as experienced as they claim.

Asymmetric information examples are everywhere:

1. **Health Insurance**: Consider the health insurance market. Insurance companies struggle to price premiums because they don't know as much about your health habits as you do. If only people who think they will need it soon buy health insurance, this leads to higher costs for the insurers which then increases the premiums further.

2. **Financial Markets**: In financial markets, consider the stock market. Some investors have more up-to-date information or insider knowledge about a company's prospects, which they use to their advantage. This can be risky for regular investors who don't have access to the same information.

3. **Online Shopping**: When shopping online, sellers often know more about the quality of the product than buyers. A product might look perfect in a professionally edited photo but could be of lower quality when it arrives.

4. **Job Market**: In the job market, resumes and interviews are tools used by job seekers to signal their qualifications and experience. However, the true nature of their work ethic and compatibility with company culture is often hidden, leading to potential mismatches.

5. **Real Estate**: Buying a house? The seller knows more about the house's quirks and issues than you do. This could range from old plumbing to frequent electrical problems that aren't immediately apparent.

Problems of asymmetric information

This imbalance of information can lead to various inefficiencies and problems, such as adverse selection and moral hazard.

- **Adverse Selection**: This happens when deals go sour because one side uses their informational advantage before a transaction. Like when the worst cars (lemons) are more likely to be sold because sellers know the issues but buyers don't.

- **Moral Hazard**: This one occurs after the deal is done. An example would be if someone rents your apartment and then doesn't take care of it because they don't own it.

These issues affect the market, making it less efficient, which can be a headache for everyone involved.

To understand how asymmetric information works, let's discuss the used car market above. There are great cars and there are not-so-great cars. The great cars we'll call "plums" and the not-so-great cars "lemons." You, as the buyer, want a plum, but it's hard to tell which cars are plums and which are lemons just by looking at them.

This is where George Akerlof, an economist, stepped in with his famous explanation known as "The Market for Lemons" for which he got a Nobel Prize. His model helps us understand why these where sellers know more than buyers often perform poorly.

The Setup

1. **Sellers Know More**: In Akerlof's model, car sellers know if their car is a lemon or a plum. Buyers,

however, can't tell the difference—at least not until they've owned the car for a while.

2. **Buyers' Dilemma**: Because buyers can't tell which cars are good and which are bad, they're not willing to pay top dollar. They fear ending up with a lemon. So, they offer a price that reflects an average value of what's available (somewhere between a lemon and a plum).

3. **Sellers' Response**: Sellers of plums know their cars are worth more than the average price buyers are willing to pay. So, they decide not to sell their cars. Why accept a low price for a great car?

4. **What Happens Next**: The good cars (plums) start disappearing from the market. Only lemons are left because those sellers are still willing to sell at or above the average price. This leads to even lower offers from buyers, who become even more worried that only lemons are for sale.

The end result? A bad market where good products (plums) are hard to find and lemons dominate. This is what economists call "adverse selection." The bad products push out the good ones because of the information imbalance.

Akerlof's lemon model isn't just about used cars. It applies to many situations where quality is hard to spot upfront:

- **Job Market**: Companies might worry about hiring because it's tough to tell top performers from mediocre ones just from interviews and resumes.

- **Insurance**: People who know they'll need to use health insurance soon are more likely to buy it, which can drive up costs for everyone.

- **Finance**: Investors might be wary of investing in bonds or stocks if they think insiders know negative information they don't.

There are a few ways markets try to fix the lemon problem:

- **Warranties**: Sellers offer a warranty to assure buyers of the quality of their product.

- **Certifications**: Third parties check the quality of a product or service and certify that it's up to standard.

- **Reputation**: Sellers build a reputation for quality over time, reassuring buyers through consistent customer satisfaction.

Interestingly, a parallel can be made between Akerlof's example and something that the founder of this college is most famous for – Gresham's Law.

Gresham's Law states that "bad money drives out good" in a scenario where there are two forms of circulating currency: one perceived as having greater value (good money) and one perceived as lesser value (bad money). When both forms of money are accepted as legal tender for the same nominal value, people tend to spend the "bad" money and hoard the "good" money. This behavior stems from the desire to get rid of less valuable currency while retaining something of more enduring value. Over time, the good money is withdrawn from circulation, leaving predominantly bad money in use.

Both Akerlof's and Gresham's theories revolve around the impact of perceived value and how it affects the circulation (or transaction) of goods (be it cars or currency) in a market:

1. **Information Asymmetry and Perception**: In both theories, the key problem arises from a disparity in information or perception about the true value of items in exchange—be it cars or types of money. In the car market, the buyer's inability to accurately assess the value due to lack of information leads to undervaluation of good cars. In the currency market, the common acceptance of both good and bad money at the same face value causes undervaluation of good money when used in regular transactions.

2. **Withdrawal of High-Quality Goods**: In response to their goods being undervalued, holders of high-quality items (plums or good money) withdraw them from circulation. This withdrawal is a protective action to prevent loss on what they correctly perceive as more valuable.

3. **Dominance of Lower Quality**: As a result of high-quality items being withheld, the market or circulation becomes flooded with lower-quality items (lemons or bad money), which are less desirable but become the norm due to the absence of better alternatives.

4. **Market and Currency Deterioration**: The predominance of lower-quality goods leads to a decline

in the overall quality of the market or currency system, potentially causing market failure or economic inefficiencies.

A third example of odd behaviour that might arise from asymmetric information comes from banks. Joseph Stiglitz won the Nobel Prize (partly) for analyzing the problem of asymmetric information in credit markets. His credit rationing model explains why some seemingly creditworthy borrowers may be denied loans, even when they are willing to pay higher interest rates.

The key idea behind Stiglitz's model is that lenders (like banks) have limited information about the riskiness of potential borrowers. This asymmetric information can lead to adverse selection, where the pool of borrowers willing to pay the highest interest rates is disproportionately composed of the riskiest borrowers.

Imagine a bank offering loans at a certain interest rate. There are two types of potential borrowers - safe borrowers with low-risk projects and riskier borrowers with high-risk projects.

The safe borrowers, knowing their projects have a good chance of success, may only be willing to pay relatively low interest rates. They don't want to take on excessive debt costs. In contrast, the riskier borrowers with less promising projects might be willing to pay much higher interest rates. Since their projects are more likely to fail, they have less to lose by taking on more debt at higher rates.

So as the bank raises its interest rate, seeking to earn higher profits, an adverse selection problem emerges. The pool of borrowers willing to borrow at those high rates becomes riskier on average. From the bank's perspective, raising interest rates doesn't just increase their potential return on each loan - it also increases the probability of the borrower defaulting and the bank not getting repaid at all. At a certain point, the bank may decide that raising rates further is not worthwhile, because the higher default risk outweighs the benefit of charging more interest to borrowers.

This is where credit rationing comes in. Rather than simply raising interest rates, the bank may opt to deny loans to all borrowers above a certain risk threshold, even if those borrowers are willing to pay higher rates. By rationing credit in this way, the bank avoids taking on an excessively risky pool of borrowers attracted by ever-higher interest rates. It protects its portfolio and profitability.

Stiglitz's model helps explain certain lending behaviors like:

- Higher collateral requirements to screen out riskier borrowers
- Loans being denied to some borrowers regardless of interest rate offered
- Interest rates rising only to a point before credit rationing kicks in

It demonstrates how asymmetric information in credit markets can lead to market failures and non-price rationing behaviors by lenders.

The implications are that some creditworthy borrowers may be unable to access loans that could allow them to make productive investments. And lenders may forego some profitable lending opportunities to manage overall portfolio risk.

To fix these issues, economists have discussed two main strategies: signaling and screening.

- **Signaling**: This is when the better-informed party, like a job applicant, uses something costly to show they're the real deal, like getting a degree from a tough-to-get-into university.
- **Screening**: This is when the less-informed party, like an employer, sets up a test or condition to sift out the good from the not-so-good. This could be a probation period at a new job or a demo period for a software.

Signaling

To understand signaling models work, imagine you're looking for a job, and you know you've got what it takes to be a star employee. The challenge? How do you prove this to potential employers who don't know you personally and can't immediately see your skills and potential? This is the problem Michael Spence tackled in his famous job market signaling model (for which he shared the Nobel prize), which helps explain how job candidates can demonstrate their worth in a competitive market. Spence's model is all about communication, specifically how potential employees communicate their value to employers. He introduced the idea that education and other credentials function as a "signal" in the job market. A signal is essentially

a way to reduce uncertainty for employers about who's a good hire.

How Spence's model works:

1. **Two Types of Workers**: Spence's model categorizes workers into two types—high ability and low ability. High-ability workers are more productive and beneficial for companies, but from the outside, it's hard to tell the difference between a high-ability worker and a low-ability worker just by looking at them.

2. **The Signal**: Education, such as a college degree, serves as a signal. The idea is that obtaining a degree is less costly (in terms of effort, not just money) for a high-ability individual than it is for a low-ability individual. High-ability individuals can handle the coursework more easily, perform better, and are more likely to complete their degree efficiently.

3. **Employers' Perspective**: Employers see a degree as a sign of likely higher productivity. They reason that if a candidate has invested time and effort into obtaining a degree, this individual is likely more capable and committed. Thus, employers are willing to offer higher wages to these applicants.

Spence's signaling model helps explain why people invest in education beyond just the skills they learn. It's about proving your potential to employers. It also explains why employers place such a high value on credentials, even if the job doesn't directly require the skills learned in school.

Implications of the Model

- **Education as a Tool**: Education is not only about acquiring knowledge but also about signaling ability to the job market. This dual role of education can lead to overeducation, where people earn degrees primarily to compete in the job market, not necessarily to perform their job functions.

- **Economic Efficiency**: The signaling model can lead to inefficiencies. For instance, it might encourage people to pursue higher education when they might not otherwise need to, just to stand out in the job market. This can lead to a credential inflation where higher and higher degrees are needed for positions that previously required less education.

- **Wage Disparities**: Signaling can lead to wage disparities. Those who cannot afford to signal (even if they are high ability) might not earn wages reflective of their true productivity.

Michael Spence's job market signaling theory is a powerful tool for understanding how markets work when one party doesn't have all the information. It shows why people make certain decisions about education and career planning, and why employers value certain credentials. Understanding this model can help both job seekers and employers make better decisions about how to spend their time and resources when it comes to employment and hiring.

There are other real-life examples of signaling in the real world:

- **Money-back Guarantees**: Companies use money-back guarantees as a way to reduce the fear of getting a dud product. It's a form of screening that shifts the risk back to the seller, reassuring buyers.

- **Certifications and Licenses**: Professionals use certifications and licenses as signals of their expertise and adherence to industry standards. This helps clients make informed choices.

Screening

In contrast to signaling, screening models help the *less informed* party gather information and distinguish between different types of informed parties. By implementing screening mechanisms, the uninformed party can mitigate the effects of information asymmetry.

Let's take a look at some real-world examples to better understand how screening models work.

Example 1: The Insurance Market

In the insurance market, insurance companies often face a challenge: they have limited information about the risk profiles of potential customers. Some individuals may be more prone to accidents or health issues than others, but this information is not always apparent to the insurer.

To address this information asymmetry, insurance companies employ various screening mechanisms:

1. Medical Examinations: For life or health insurance, applicants may be required to undergo medical examinations or provide detailed medical histories. This allows the insurance company to assess the individual's health risks and screen for potential pre-existing conditions.

2. Questionnaires: Insurance applications often include detailed questionnaires that ask about an individual's lifestyle, occupation, hobbies, and other risk factors. By analyzing these responses, insurers can identify high-risk and low-risk applicants.

3. Credit Scores: For auto or home insurance, insurers may consider an applicant's credit score as a screening mechanism. A good credit score is often associated with responsible financial behavior, which may indicate a lower risk of filing claims.

By employing these screening mechanisms, insurance companies can separate applicants into different risk categories and offer tailored premium rates or coverage options accordingly. This helps ensure that higher-risk individuals pay higher premiums, while lower-risk individuals enjoy more affordable rates.

Example 2: Airlines:

Airlines employ sophisticated screening models to segment customers based on their willingness to pay for different levels of service and amenities. The screening process typically involves analyzing various data points about customers and their booking behavior to identify those who are likely to be price-insensitive or have a higher willingness to pay. For example, some of the screening mechanisms used by airlines include:

1. Advance Purchase: Airlines often offer lower fares for tickets booked well in advance, assuming that leisure travelers who can plan their trips earlier are more price-sensitive. In contrast, business travelers or those with inflexible schedules tend to book closer to the travel date and are generally willing to pay higher fares.

2. Travel Dates and Times: Airlines analyze booking patterns to identify peak travel periods, such as holidays or weekends, when demand is higher. Customers booking flights during these periods are typically less price-sensitive and may be willing to pay a premium for their desired travel times.

3. Fare Class and Ticket Restrictions: Airlines offer different fare classes with varying levels of restrictions and amenities. By monitoring the demand for each fare class, they can identify customers who are willing to pay more for features like refundability, seat selection, or frequent flyer miles.

4. Customer Data and Booking History: Airlines leverage customer data from their frequent flyer programs, corporate accounts, and past booking histories to segment customers based on their loyalty, travel patterns, and spending behavior. Customers who frequently book premium cabins or higher-priced fares are likely to be targeted for higher prices.

5. Channel of Purchase: Airlines may charge different prices for tickets purchased through different channels, such as their website, travel agencies, or online travel agencies. The assumption is that customers who book directly with the airline may be less price-sensitive or have specific preferences for amenities or services.

6. Ancillary Services: Airlines now offer a range of ancillary services, such as extra legroom seats, priority boarding, and checked baggage fees. By observing customers' willingness to pay for these additional services, airlines can identify those who are less price-sensitive and may be willing to pay more for their base fare.

In this lecture we have discussed how asymmetric information affects markets – this is the problem that one group of participants has more information than another group. In the next and final lecture in this series, we will discuss how information is used by market participants in setting prices (which in turn is driven by the first big idea of finance – NPV).

References and Further Reading

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