

I Link ^{Identical expectation for a given asset} ^{same price} btw [identical future expectation] & [identical price] ^(in a situation, period, individual, other things constant) ^(across individuals) ^{expectation is individual} • asset belong to risk-class k

① Price = $PV = FV / (1+r)$ ✓ ^{Expected value in use = present value} ^{risk-adjusted return} ^{x quantity} < price comes from sales in P/L > per unit

② $PV = \sum \left[\frac{E(CF_t)}{(1+r)^t} \right]$ ✓ ^{from pro forma income statement}

③ $NPV = \sum \left[\frac{E(CF_t)}{(1+r)^t} \right]$ ✓ ^{price for equity}

our expectation changes because of new information (surprise)
price is function of future expectation; past changes do not affect price ^{used to predict price}

↳ ④ debt holders should get benefit too: fixed payment, uncertainty ↓ → add value to collateral
belongs to shareholders because they get residual after initial investment < if debt financing >

II Meaning of [high risk, high return]

① high risk, high actual (ex-post) return ✗

② high risk, high / equilibrium (ex-ante) return ✓ } capm is equilibrium return

③ high risk, high 'expected' (required) return ✓ }
"cost of equity < required return for equity >" ^{Opportunity cost}
↳ predicted return < not actual > ^{minimum}

All individual seek to maximize their expected utility

5 axioms of choice: minimum set of conditions for rational & consistent behavior

necessary but not sufficient condition

① Comparability (completeness): able to rank and compare uncertain outcome

② Transitivity (consistency)

③ Independence: same prob, compare outcome

④ Measurability → certainty equivalent: can always identify CE or price for any gamble

⑤ Ranking: diff prob, same outcome - can quantify their choice

Session 8

Information Problems and Agency Problems

Objective

By the end of this session, students are expected to exhibit a critical understanding of the information problems and their implications on economic exchanges.

Introduction

The materials in this session are drawn from Chapter 12 in Copeland, Weston and Shastri (2005).

In an ideal world of perfect information where all economic agents behave according to the same rational approach to decision making, all economic agents will have identical expectation about the future. In other words, the price each agent puts on a given asset will be identical.

Handwritten notes:
 - Everyone has same info → thus, have same expected future cash flow → weighted payoff by probability
 - average get expected cash flow
 - 5 axioms of choice under uncertainty
 - will expect the same payoff for the given asset
 - expect same payoff/return in terms of risks
 - same expectation
 - same expectation = same price

This condition implies that all market participants would:

- be able to observe each other's actions;
 - be in the position to make decisions in their best interests; and
 - be able to perfectly protect their respective interests.
- Handwritten notes:*
 - wealth, cannot lie / cheat each other → no overpriced asset

In such a world, no single agent would expect to be either better or worse off than any other. It is also safe to say that *cheating* would not be feasible.

In this session, we will first look at the role of information asymmetry (whatever it is, for now) in economic transactions. This is because asymmetric information is one of the main cause of conflicts of interest in an *agent-principal* relationship (whatever this means, for now). We will then the agency problems.

Information Asymmetry and Transactions

In reality, the world is characterized by asymmetric or imperfect information (also generally referred to as *information asymmetry*). With asymmetric information, participants are not fully informed of the others' behavior or expectation.

Handwritten notes:
 - make transaction / sign contract
 - two sides don't have same info / not fully inform
 - e.g. 2nd hand car

What do you think could be an implication(s) of information asymmetry on transactions between economic agents, economic relationship, or business operations?

How would the buyer and seller to a transaction form their expectation about the payoff that accrues to them?

Handwritten notes:
 - buyer / seller know more about payoff than another party
 - doesn't represent the way asset look like
 - if asymmetry is serious (i.e. a net loss due to informational disadvantage expected)
 - → significant discount on the asset to compensate for their expected loss
 - → no trade

The informationally disadvantaged party may require a significant discount on the asset to compensate for his/her expected loss. That is, for an equilibrium to occur, the asset must be sold (exchanged) at a discounted price.

Anyway, why would the informationally disadvantaged party expect a net loss?

If the degree of information asymmetry is serious, there may be no trade at all. In general, this information problem can be divided into two broad types: adverse selection and moral hazard.
before transaction is made
after making transaction

e.g. car insurance; buyer doesn't expect insurance seller to refuse claim

Adverse Selection

Adverse selection can also be thought of as a situation of hidden information. This situation occurs when *both* parties (buyer and seller/provider of services) to the transaction know that:

Information about true value of asset under contract

- (i) one party (e.g., seller) has information valuable to the buyer; but
- (ii) another (e.g., buyer) cannot observe the information; and
- (iii) one of the parties (seller) can make use of the information in selecting his action.

selects ask price

In the presence of adverse selection, the buyer of services is therefore typically uninformed of the seller's true color. In this situation, if the seller's action and the outcome can only be jointly observed, then the buyer cannot know whether the action was optimal given the seller's private information.

Let's consider a typical example in the context of an insurance industry. The insured knows his/her risk-type. But, the insurer does not. With adverse selection, the low-risk type is left worse-off than would be under full (perfect) information.

Because of the uncertainty surrounding the risk types insured, insurance companies will rationally set the premium on the basis of the average risk-type. Consequently, the low-risk type will pay too high a premium whereas the premium for the high-risk type is too low.

(probability) 1250
 50% 2000
 50% 500
 weighted average
 low-risk is worst-off because he has to pay 1250 instead of 500 as there's asymmetric information (lemon market)
 low risk leave the market only high-risk remain
 market will collapse
 nobody benefit
 no more insurance market!!
 It will continue until very extremely high risk left
 new premium will be set from high-risk group
 this premium is not sustainable

How do you think the low-risk type and high-risk type rationally react to this sub-optimal or inefficient premium?

Should this sub-optimal premium continue, the insurance market will at some future stage consist only of the high-risk type. At the limit, the market will collapse.

With the high-risk type remaining in the market, why would the market collapse?

Two potential solutions (not necessarily mutually exclusive) to the adverse selection problem include signaling and screening.

①

Stochastic dominance is too difficult to be used, use mean-variance
 assume normal dist.

With signaling, the informed party (i.e., the insured) chooses to take action that signals their true type to the uninformed party (i.e., the insurer). In a competitive labor market, if a worker's quality can be perfectly observed, then:

no asymmetry info

observe productivity of marginal worker

- (a) each worker will be paid for his/her marginal productivity; and
- (b) the job market will reach an efficient equilibrium.

If the employer cannot observe the marginal productivity of the workers, however, she will not be able to separate between good and bad workers. The equilibrium wage she is

good workers leave, only bad left
 willing to offer will then be based on the average ability (or, productivity), resulting in an average wage that is identical across workers. This condition/equilibrium is called a pooling equilibrium. With a pooling equilibrium, the existence of bad workers will drive good workers out of the job market. This will bring the average ability even lower. If this continues, the job market will eventually collapse.

Why would the existence of bad workers drive good workers out of the job market?

In order to improve this situation (i.e., to avoid the pooling equilibrium), good-quality workers therefore need to signal their quality in order to separate themselves from the bad ones. One way to do this is to undergo training or education. This is because training or education is costly in terms of time and money.

But, why does a signal have to be costly?

To be credible, a signal must be costly so that bad workers cannot mimic. That is, only the high-quality type can afford to send a costly signal. This is because, for the low-quality type (bad workers), the benefit from signaling falsely (i.e., mimicking) is lower than the cost of a false signal.

Ex:
 without certificate: 20k
 with certificate: 35k
 benefit from getting certificate: 15k
 (assume 1 period)

For bad workers, what are the benefit and cost of false signaling?

With a credible (costly) signal, the employer will have sufficient information and be able to separate between good and bad workers ex ante. Under this condition, there will be a separating equilibrium. In this equilibrium, workers are efficiently paid for their marginal productivity rather than on the basis of average productivity.

Naturally, if a signal is a cheap signal, it will be mimicked by the low-quality type ex ante. Consequently, the market (or, employer) will not be able to distinguish between the high- and low-quality types. A pooling equilibrium will ensue as discussed above.

Consider two firms: firm A has high intrinsic value and firm B has low intrinsic value. Suppose you own firm A, how would you "credibly" tell the market that your firm, unlike firm B, is truly a high-value firm?

With screening, the uninformed party (employer) offers a contract that can distinguish among different types of informed parties (job applicants). An entrepreneur/employer may offer to their potential manager a performance-related contract.

Why would this work?

While the high-quality type will ex ante accept such a contract, low-quality applicants will refuse to share with the employer the firm's residual income.

Why would the high-quality type be willing, or even prefer, to accept a performance-based contract?

asymmetric info
adverse selection can also lead to moral hazard

Moral Hazard ^{cannot observe, verify & incontractible} ^{incentive, afford, action}

lead to the same thing
good incentive → good afford → good action
afford / incentive

Moral hazard can also be thought of as a situation of *hidden action* and arises when:

- (a) ^{no problem before signing contract} both parties to the contract (e.g., employer and worker) share *identical information* up to the point at which one of the parties (worker) selects his/her action; and
- (b) thereafter, the ^{there's already asymmetry information} less informed party (employer) can observe *only the outcome or payoff, not the action or true efforts*, of the better informed party (worker).
_{cannot be enforced in court of law}

In the presence of this information problem, the employer is typically uninformed of the worker's choice of efforts. For example, the employer cannot hope to know if the worker's afternoon absence is actually due to a true headache (sickness) or desire for a siesta after a good meal. Alternatively, the general manager cannot observe their floor managers' *daily actions*, but can observe only the reported periodic profitability of the divisions.

Essentially, moral hazard is a situation where *one party* to the contract expects that the other party has incentives to deviate from the agreed terms and conditions of the contract at the time of the signing of the contract. The problem with such incentives is that they are *not verifiable*, and as a result, they are *incontractible*. As with adverse selection, expectation of moral hazard leads the *less informed party to demand a discount on the asset under the contract* (i.e., to price-protect itself). Both adverse selection and moral hazard are information problems: adverse selection is the problem expected before the signing of the contract whereas moral hazard is the problem expected after the signing of the contract.

Another important feature of the moral hazard problem is the *relationship-specific investments to be committed by the parties*. When parties to a contract are required to make such investments as part of the contract/transaction, moral hazard (if severe) is likely to result in the *parties holding back from making the transaction*. That is, there is no deal, and the parties end up underinvesting. Consider a simplified example below.

Suppose Firm A and Firm B are firms in the same demand-supply chain. Firm A is strong in sales and marketing, and Firm B is strong in production. The two firms have clear potential to develop a new cutting-edge product by entering into a contract to share their know-how (i.e., proprietary information). However, both firms expect that the other has incentives to *misuse the shared information to its own advantage*, and *such incentives are incontractible/unverifiable*. Consequently, one or both of them may rationally decide that their share of profit from the new production is not worth their ex ante loss of proprietary information.

If incentives and efforts were contractible, it would be possible to *write a contract* in which *payoffs to the parties are determined by the observed or ex post profitability*. In reality, this is very often not the case. Let's recall the employment contract example above. The *feasibility* of a complete contract depends on the employer's knowledge about the *precise relationship between the worker's efforts and profitability*. Given unobservability/unverifiability/incontractibility of incentives and true efforts, one

Common outcome ⇒ hold-up problem
lead to (no employment → use of family members')
family business

potential solution to the moral hazard problem is to have the property rights over the asset under the contract allocated between the parties to the contract. As we explore corporate financing activities in subsequent sessions, the presence of moral hazard still leaves material inefficiency in contractual arrangements despite attempts to allocate the property rights.

P/L & BS are used to examine the performance of firm

Information problems within a firm

Now, let's summarize the information problems (both adverse selection and moral hazard) in terms of a common business representation. An income statement serves as a useful illustration. A business operation is generally represented by financial statements, and the bottom-line effect of the information problems is on profitability whether or not the effect is observable. As shown below, the manager can choose among three alternative efforts levels (Level 1, Level 2 or Level 3). Of course, efforts are the manager's private information. For ease of exposition but without loss of generality, we can assume no tax.

	Level 1 THB	Level 2 THB	Level 3 THB
Revenue	1,000	1,250	1,250
Cost of goods sold	500	450	500
Manager wage (fixed)	300	400	400
Operating income (EBIT)	200	400	350
Interest expense	50	50	50
Net profit available to shareholders	150	350	300

การทำ transaction ด้วยใจงาตามาก
ทำให้ต้นทุนไม่ลด on the job consumption

Arm-length transaction

ธุรกรรมระหว่างคู่สัญญาสองฝ่ายที่มีความสัมพันธ์หรือเป็นเครือญาติกัน แต่ดำเนินการธุรกรรมเสมือนไม่ได้มีความเกี่ยวข้องกัน ด้วยเหตุนี้จึงไม่มีปัญหาเรื่องผลประโยชน์ทับซ้อน

With Level 1 taken as the base-line level of efforts, Level 2 represents greater efforts by the manager (the agent) and the resulting 130% increase in the net profit available to shareholders (i.e., shareholder wealth). The manager also gets paid more at Level 2. The difference between Level 2 and Level 3 is that, at Level 3, the manager extracts a private benefit worth THB 50 from his job, i.e., consumes on the job, and disguises his on-the-job consumption as part of the cost of goods sold (COGS). The manager's payoff is largest (400 + 50) at Level 3. Assuming that the manager is risk-averse, s/he will therefore choose efforts Level 3 as long as the risk of getting caught is not too high. Of course, Level 2 is obviously best for shareholders (the principal). So, shareholders are faced with wealth-related questions such as the following.

from in control of operation
↓
private benefit of control
↓
doesn't share this benefit with shdr

we may use industry average as proxy but it is not specific
↓
firm is specific

Which manager will choose efforts Level 3? Can, and how can, shareholders identify the right manager to hire? Once shareholders have selected their manager, how can they know that their manager's choice of efforts is Level 2 or Level 3?

Are these questions to do with adverse selection or moral hazard?

How can shareholders even tell in the first place whether the difference in profitability between Level 1 and Level 2 is not a fluke? Also, how can shareholders prove that the THB 50 increase in COGS at Level 3 is the manager's on-the-job consumption?

What about these questions – adverse selection or moral hazard?

It is important to distinguish between the two sets of information problems because in practice they demand different solutions.

Agency Problems

As seen above, the existence of information asymmetry allows **one party** (e.g., seller or worker) to the transaction (or, any economic relationship) to **deviate from the best interests** (a priori expectation) of the other party (e.g., buyer or employer). When such deviation occurs, a conflict of interests will arise and lead to a deadweight loss. Such a conflict can be called the *agency problem* or *conflict*, and the loss called the *agency cost*.

Let's take a look at an example. A land owner wants to maximize the value of her land and hence her wealth, but has zero skills in farming. On the other hand, a farmer has lots of farming skills and experience, but insufficient wealth to own a piece of land.

What do you think is likely to happen such that both the landlady and farmer become better off?

That's right. A business relationship will happen on the land. Assuming that economic agents are *utility maximizers*, we also have potential *agency problems* that come with the business relationship. The landlady wants to maximize profits that will accrue to her. At the same time, the farmer wants to maximize his share of profits. This situation should not be surprising.

Holding constant the farm's revenue, the larger the share of profits that accrue to the farmer, the greater is the *agency cost* borne by the landlady. Now, let's say the *residual* profit (return) to the landlady is still positive even after deducting the agency cost.

Given the increasing return to scale, do you think the landlady will rationally hire more farmers? The answer is a clear 'yes'.

As a result, the **farm gets LARGER and LARGER**. Hence, there will be more **complex** economic arrangements/activities taking place on the land. Such arrangements will be:

- (i) between the landlady and each of the farmers; as well as
- (ii) among the hired farmers.

These **complex** arrangements symbolize a more concrete business being operated on the land – which can be viewed as a **nexus of contracts** (either verbal or written). For example, an employment contract to make *optimal utilization* of farming skills exists between the landlady and each of the farmers. Specifically, the farmers' contractual obligation is (i.e., the farmers are employed) to *act on behalf and in the best interest of the landlady*. Multiple co-ordination contracts exist among the **multiple farmers**. There are also contracts between the landlady and the farm's suppliers as well as customers. The landlady and the Government are also in a taxation contract.

* Given: (i) ^{incontractability} unobservability of true incentives/efforts and (ii) rational utility *
 maximization in the real world, the complexity of the business activities on the farm gives rise to self-interest seeking with guile by either the landlady or farmers, or both.
 ↳ deviation from contract ; e.g. there're 1000 contracts ⇒ 2-way contract ⇒ 2000 deviation from contract

What could the landlady do to take undue advantage of her farmers? Likewise, what could the farmer(s) do to take undue advantage of the landlady?

Note that this ^{if mkt is perfect} self-interest seeking would not be present unless ^{not sufficient} both the ^{< necessary condition >} incontractibility of incentives and rational utility maximization exist. Consonant with this well defined economic relation is the useful specific description of the agency problem/conflict by Jensen and Meckling (1976, JFE, p. 308):

^{in prospect of shdr <uninformed> but manager is informed}

"If both parties to the relationship are utility maximizers, there is a good reason to believe that the agent will not always act in the best interests of the principal".

In this definition, the *agent* is each of the farmers and the *principal* the landlady. With asymmetric information, parties to a contract are not fully informed of the others' behavior and expectation. ^{or incentive} The principal (landlady) is therefore ill-equipped to monitor her agents' (farmers) behavior. The agents have incentives to deviate from the best interest of their principal (being opportunistic) especially when the deviation leads to a marginal increase in their personal utility. $\Delta U > 0$

^{deal with true value}

In the presence of **adverse selection** (before the signing of the employment contract), the landlady is faced with a possibility that she will hire a farmer with low-quality true skills, being mistaken that she is hiring a highly skilled farmer. Likewise, a prospective farmer may well be unaware of the true working condition on the farm (e.g., many demanding tasks with little time allowed), and thus does not bargain for a larger starting wage.

^{can expect but cannot verify}

^{don't know what the other side will do}

In the presence of **moral hazard**, the landlady can never observe/verify her farmer's choice of efforts (i.e., efforts are always the farmer's private information). Similarly, there is uncertainty about the precise relationship between output and the farmer's efforts. That is, several output levels and one given choice of efforts may be jointly observed. The output level is also affected by exogenous factors. At the same time, the landlady may deny her hard-working farmers a wage increase claiming that the market price for crops has been declining and will continue to do so in the near future.

Jensen and Meckling (1976) suggest that some specific contractual arrangements may be used in an attempt to control (not eliminate) the agency problem. In the main, there are two alternative (but not mutually exclusive) mechanisms: monitoring and bonding. Of course, both mechanisms have their cost. Such cost forms integral part of what is known as the agency cost.

^{aggregate individual shdrs hire director to monitor manager/CEO}
^{another moral hazard may arise (e.g. in Thailand, director mkt is small)}

Monitoring cost is basically the cost incurred in ensuring that the terms of the contract are adhered to. **Bonding cost** is basically the cost incurred in restricting the agent's ability to act against the principal's interests.

^{he should beat this forecast in public.}
^{e.g. manager announced earning}
^{not too easy, high target}
^{set a sufficient resource for manager to manage firm}
^{if set too high div payout ratio → firm may not have enough cash to operate}

Can you think of an example of monitoring or bonding cost?

Let's go back to the income-statement example to see the components of the agency cost. In reality, we need to answer the following questions. What is the cost of reducing a marginal unit of the THB 50 private benefit of control? How much of the THB 50 private benefit of control can be *profitably* reduced? The sum of the cost of taking action to reduce the private benefit and the residual private benefit that remains gives the agency cost. In a nutshell, the agency cost is the cost of taking action to minimize the expected deviation from the contract plus the residual loss.

Note that in our discussion so far, the type of agency cost is the agency cost of equity. It is the shareholders (i.e., suppliers of equity to the firm as an independent business entity run by a manager) who are the principal with the manager being the agent. There is also another type of the agency cost. That is the agency cost of debt, which will be discussed later in the course.

Recommended Reading

Akerlof, G., 1970. The market for 'lemons', quality uncertainty and the market mechanism. *Quarterly Journal of Economics* 84, 488-500.

Spence, M., 1973. Job market signaling. *Quarterly Journal of Economics* 87, 355-374.

Jensen, M.C., Meckling, W., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.