

# Concepts of Asymmetric Information: A Review

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## 1. Introduction

Information is central in understanding and solving problems. Information Economics and study in Asymmetric Information (AI) brought a new approach to analyze problems. In this respect a number of studies contributed to augment knowledge. Early economists had awareness about the problems of information [1]. Arrow and Debreu (1954) formulated standard version of general equilibrium theory, and assumed perfect information. However, assumption of perfect information no longer holds. Raiffa (1968) searched for transaction costs and the degree of imperfect information. Akorlof worked on the market for lemons (1970), Spence worked on signaling in labor markets through education (1973), and Stiglitz (& Rothschild) worked on self-screening in the insurance markets [2]. Understanding how information is obtained and disseminated is critical for understanding how economies function. Practitioners are interested in real world economic and policy problems. This paper tries to answer what is meant by asymmetric information (AI), theoretical and practical reasons for studying AI, and economic & management implications of asymmetric information. The study in AI has considerable theoretical and empirical significance. This is to integrate knowledge from different studies, which can be employed in the process of management of resources.

**Objectives:** The objective of the study is to review the research relating to asymmetric information. Various concepts have been explored. The specific objectives are:

- (i) To explore the knowledge framework of Asymmetric Information;
- (ii) To identify the relevant concepts for generating usable knowledge; and
- (iii) To identify how this knowledge can be better utilized in our context.

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**Methodology:** Finding a strategy to create categories of variables of interest is the responsibility of investigators in order to understand and formulate a line of study. A number of concepts revolve around the knowledge framework of Asymmetric Information. These concepts have significant relation with asymmetric information. The relationships may be characterized as visible and invisible. The interactions among themselves are not always measurable. However, these can be conceptualized through logical analysis and description of the context, needs, and results. In this study, these concepts are grouped as Principal & Agent, Markets, Economic-Indicators (Vectors), Decision, Learning, Information, and Consequences. Concepts in a framework are shown in table # 1.

**Table 1: Asymmetric Information: Concepts and Components**

Sl	Concepts	Components
1	Principal and Agent	Principal, Agents, Buyers, Sellers, Employers, Employee
2	Markets	Government Contracts, Auction and Bidding, Insurance Markets, Capital Markets, Stock Markets, Credit Markets
3	Economic-Indicators (Vectors)	Interest, Repayments, Price, Wages, Employment, Skills
4	Decision	Decision Making, Risk, Uncertainty, Rationality, Rational Expectation, Bounded Rationality, Near Rationality
5	Learning	Information Problems, Employers' Learning Problem, Background Information, Screening Problem, Signaling
6	Information	Imperfect Information, Cost of Information, Information Incompleteness, Information Flows, Private Information
7	Consequences	Adverse Selection, Moral Hazard, Enforcement Problem, Incentives Problems

Principal and Agent (Government, Organizations, Buyers, and Sellers) operate in a market. They consider Critical Success Factors (CSFs) and strive to gain in transaction. Decision process of Principals or Agents needs information, learning, and experience. Learning process suffers from inability to search for information (cognitive capability), and willingness to learn. Imperfect information, cost of information, and information incompleteness influence learning. So, consequences suffer from Adverse Selection, Moral Hazard, Enforcement Problem, Incentives Problems etc. These suffocate the principal or agent towards uncertainty, show different behavior towards risk, and deviate from rationality towards bounded rationality. However, this paper does not cover details of AI and only key concepts are explored in the following sections.

## 2. Key Concepts of Asymmetric Information

Asymmetric Information represents a situation when some parties know more than others. When one party to an exchange knows something relevant to the transaction that the other party does not know such a situation is known as asymmetries of information (McAfee and McMillan, 1987, p.699). AI characterizes many business situations. It explains the phenomena of variables (product quality, skill and abilities of worker, firm's cost, competitive position, and investment opportunities) in many institutional arrangements in a society. It also helps to understand warranties offered (on parts & services), incentives and rewards (in contracts signed by firm and employees), monitoring the behavior of managers (by shareholders) etc. AI can lead to market failure. To overcome the problem, sellers may provide signal to potential buyers about the quality of products. Adverse Selection and Moral Hazard are two important terms that allow us to understand the problems of AI. Arrow invented the concept of moral hazard (1971), educational signaling (1973), and risk bearing (1964). The constraints imposed by information asymmetries can be as significant as any resource constraints. Concepts deserve exploration.

**2.1. Principal & Agent:** The Principal-Agent problem is a general class of problems with AI. The Principal is the uninformed party and the Agent is the informed party. Agents are better endowed than others about certain pieces of information. Asymmetric information is a problem for firm management, which can be labeled as the 'Problem of the separation of ownership and control' i.e. the Principal-Agent problem (Berle and Means 1933). In Employer and Employee relation, employee's effort can not be monitored perfectly. This is also applicable in the relations between the stockholders and the manager of a firm, between insurer and insured, between regulated firm and the regulatory agency, between supplier and the consumers of public goods, between a socialist firm and the central planner. Also, between buyer and seller when the value of the item is uncertain.

**2.2. Markets:** An owner of a car usually has better knowledge about its condition than a prospective- buyer. Such situations are fairly common and give rise to certain inefficient outcomes. The lower the difference in valuation between buyers and sellers and the higher the difference between peaches (good cars) and lemons (bad cars) in quality, the more severe are the market inefficiencies.

In insurance, regulation attempts to achieve two goals: (i) guarantee of continual fulfillment of commitments and (ii) equal access to or improved availability of

insurance. While the first can be secured by solvency regulation, premium regulation, compulsory or social insurance can attain the second. In competitive insurance market, asymmetric information may lead to dis-equilibrium, transfer from good to bad risk. Regulation may lead to welfare improvements (Eisen 1986). Competition in signaling could reduce the inefficiencies associated with it. Passive response signals involve receivers of signals simply reading them in the light of past experiences. Over-investment in the signals result inefficiency. Active response signals involve receivers anticipate the effect of their own responses on the patterns of investment in the signal with possibility of improved efficiency (Spence 1976). Auctions: A seller who does not know buyer's valuation can use an auction to sell, while a buyer does not know seller's costs can use an auction to buy. Auctions exploit strategic interaction among competing bidders to induce self-selection among the participants according to their respective values for the item. The winner's curse in an auction to buy refers where the winning bidder over-estimates the true value of the item for sale, and in auction to sell refers where the winning bidder under-estimates the true cost of providing the item. The winners curse is more severe when number of bidders is larger, and true value of the item is more uncertain.

**2.3. Economic Indicators:** The study in AI hangs around several economic indicators such as loan repayment, Interest-Rate, Product-Price, Wages, skills, and Employment. Adam Smith (1776) observed that as interest rate rises the best borrowers drop out of the market. Alfred Marshall (1890) observed that workers are not always paid on the basis of tasks performed because of the difficulty of observing exactly what they do, and argued that information imperfections would 'greatly complicate' economic analysis. The increase in interest rate is a major factor that promotes financial crises. The same interest rate charged to all borrowers attracts more high-risk borrowers, which forces the interest rate go up, which forces the number of high-risk borrowers further and this continues causing credit market failure. The increases in interest rate quickly eroded the net-worth of the already highly indebted firms (Stiglitz 1999). Calculating net-worth of a firm requires asset position, adjustments in prices of goods it sells, factors it purchases and also an estimate of how these will move through time. Lowering price without advertisement expenditure induces no new customers to launch a data search, which may result in loss in sales. Search is costly and the extent of customer's search depends on perceptions of whether the offered price deviates from that being offered by others. The changes in price, wage, interest rates occurred in many cases due to information imperfection (Stiglitz 1999).

**2.4. Decision:** Bounded Rationality: Herbert Simon (1955) was concerned with the problems of computability, and complexity of information and argued for the inevitability of bounded rationality. Conlisk (1996) identified searching costs as a fundamental source of bounded rationality in economic decision making. Uncertainty and Risk: The uncertainty arises for two reasons. First, changes in firms' circumstances (including the signal they receive) are only imperfectly known by other firms. Second, firms receiving the same information or the same shocks will react differently, depending on their circumstances and characteristics, (which is not common knowledge). The larger the disturbances to the economy, the greater the uncertainty. In uncertain situation, bidder's response depends on their attitude toward risk. In independent private values model i.e. any one bidder's valuation is independent from any other bidder's valuation, one bidder perceives any other bidder's valuation from some probability distribution. This applies to an auction of an antique and also to government contract bidding. In common-value model, the bidders perhaps, having access to different information, have different guesses on worth (objectively) of item. The bidder may change his-own valuation on learning someone else's valuation (information). But, in independent private value model, the bidder knows his own mind and learning about another's valuation probably may not cause him to change his own valuation. The benchmark model suggests that increase in the numbers of bidders increases the revenue on average of the seller. Seller prior commitment resists him to exploit additional information, because he obtains it only after having committed himself (McAfee and McMillan, 1987, p.711). For an economy under uncertainty, the fundamental theorem of welfare economics is valid if, and only if, markets are complete. However, information asymmetries and control problems usually preclude the completeness of the market system. (Hellwing 1986).

**2.5. Learning:** Leon Walras (1874) noted that the problem of attainment is at least partly an information-processing problem. The auctioneer gathers the various responses to the proposed price vectors in order to adjust the price vector toward the general equilibrium, all prior to any market trading taking place (Rosser 2003, p.14). Friedrich Hayek (1945) worked on dispersed and tacit information in the socialist planning controversy. He argued that to plan efficiently, the central planner would never be able to learn the information that is dispersed throughout the economy in a tacit way.

**Signaling:** Lemons by their presence cause a negative externality to peach (good car) owners causing severe market inefficiencies. One way to restore efficiency is

by signaling. Signaling means providing reliable guide to quality or provide warranty. Candidates' initiative in acquiring good grades / taking special training is the signaling. In selling, the informed party initiates the move. Signaling refers to an action initiated by the better-informed party to communicate its characteristics in a credible way to the less-informed party. Signaling is credible only if it induces self-selection among the better-informed parties (e.g. buy back offers by sellers). The cost of the signal must be sufficiently lower for parties with superior characteristics than for parties with inferior characteristics. In signaling models, the party which possesses the private information, offers the terms of exchange which the other party can either accept or reject.

**Screening:** Screening is an initiative of the party with less information, while signaling is the initiative of the party with better information. Potential employer initiates the move i.e. to select candidates devises an entrance test and earned grades. Screening is the initiative of a less-informed party to indirectly elicit the other party's characteristics. This indirect method works only if the less informed party can identify and control some variables that the better-informed parties are differently sensitive to. The less informed party must develop alternatives around that variable to induce self-selection. He needs as many differentiating variables (policies) as there are characteristics (careless, risk aversion) that it can not observe.

**2.6. Information:** There are many information problems i.e. instance of prices and qualities of the various objects that are for sale in the market, the quality and efforts of workers they hire, the return of investment projects (Stiglitz 2001, p.483). Information leakage problem affects dealing. In order to overcome information leakage problem, the seller of information (signaling procedure) may prefer to sell noisier versions of information and to sell different signals to different traders (Admati and Paul, 1986). The bargaining ability of the auctioneer is limited by the asymmetries of information because he does not know any bidder's valuation of the items. Thus auctioneers' ability to extract surplus is more limited (McAfee and McMillan, 1987, p.704). More on information problems are given below.

**Imperfect Information:** Arrow (1974) expressed that imperfect information can lead to incomplete contracts, which cause inefficiencies. The monetary policy maker's objectives shift through time causing asymmetries in information. Imprecise control procedures cause imperfect information (Cukierman and Allan, 1986). The absence of certain knowledge is also called imperfect information. When one party has better information than other i.e. the distribution of

information is asymmetric, then other party may have imperfect information and hence bear risk. Risk (uncertainty about benefits or costs) arises whenever there is imperfect information about something that affects benefits or costs. A market could be perfectly competitive even when buyers and sellers have imperfect information, as long as they all have the same imperfect information. Parties with imperfect information bear risk.

**Private information:** In bidding, it is important to a bidder that his information to be private than that to be precise. Having private information raises a bidder's profit. A bidder who has information because he has already drilled near wells, gains from superior information. The gains from superior information is less if a rival also has superior information (McAfee and McMillan, 1987, p.731).

**Information Cost:** Vickery (1961) observed that because gathering information is costly, it is optimal to be less than fully informed. Williamson (1979) identified transaction costs as a source of incomplete information. In full information case (separating equilibrium-SE), lemon seller can not offer warranty, peach seller can offer a warranty to ensure that this is a good product but social welfare is lower because of the additional cost to the sellers of servicing their warranties. In a pooling equilibrium (PE) the price received by the peach seller does not cover his valuation for the car and the warranty cost. A lemon owner benefits while a peach owner is harmed in a pooling equilibrium (PE) relative to a separating equilibrium (SE) (Dhami 2003, p.3). Negative correlation exists between signaling costs and productive capability. Grade in schools is positively correlated with productive work capability (Spence 1973, p.21).

**2.7. Consequences:** Symmetric information sharing is not a commonly observed feature in the real world. So, one enjoys an informational advantage over others. Adverse Selection, Moral Hazard, Enforcement Problems and Incentive Problems are major factors for consequences.

**Adverse Selection:** In Adverse Selection, the effort is unobservable (employer can not observe). Adverse selection occurs when the potential insurer is unable to determine the exact status of the insurer's health or the interviewer is unable to determine the candidate's ability (here health / ability is the hidden information). In adverse selection, the party with relatively poor information draws a selection with relatively less attractive characteristics. The used car market and the loan market are the two live examples of adverse selection. In the used car market, quality of car is unknown before the customer buys it, price reflects average quality in pool, sellers of bad cars win, sellers of good cars lose, some sellers of

good cars might withdraw theirs and adverse selection of cars remains in pool. Severe adverse selection can cause a market to fail, and price changes do not help to restore equilibrium. In the loan market, expected income and honesty of borrower is unknown before loan is disbursed. Interest rate reflects average quality in pool, high-income borrowers get good deal, low-income borrowers get bad deal. Some high-income borrowers do not borrow, adverse selection of borrowers remains, and this leads to failure in loan market. Bank must check up on borrowers. Bank must be careful in selecting borrowers about whom there is a lot of asymmetric information.

**Moral Hazard:** Stiglitz (1976) introduced the concept of screening to address asymmetric information problems leading to both adverse selection and moral hazard in insurance market. The screening offer a variety of contracts that encourage agents in revealing accurate information about their risk ness through a process of self-selection. The lower risk agents will tend to select contracts that charge lower premiums (p.21). Moral hazard problem arises due to the fact that the auctioneer cannot control what the winning bidder does afterward (McAfee and McMillan, 1987, p.717). There are many examples. In oil extraction, if the royalty rate is high, then less oil will be extracted. The sales of a book vary with the amount of publicity the publisher chooses. The production costs incurred by a contractor in part depend on how much effort he makes to hold costs down. The car insurance market and the stock market are two most important examples of moral hazard. In the car insurance market, insurance company can not control how careful the driver is After the contract is signed, the insured driver becomes more reckless than the uninsured, premium must go up and thus drivers may end up not insuring themselves. Government should impose strict regulation for solution. In the stock market, stockholders can not control whether manager prudently spends money or wastes funds, managers who have a lot of funds waste them, investors become reluctant to provide funds, firm ends up not getting needed funds and useful activities are not undertaken.

### **3. Observation of Application of Knowledge in Bangladesh**

Top issues, which relate to Asymmetric Information, are outlined. Borrowers, after getting loan, do not invest in project as stipulated in the project proposal and as documented with bank (in many cases). Bankers, who sanction credit to a project, their inability to observe the credit-worthiness of the borrower might cause the lending market to cease (worsen). The credit market is hindered by the inability of the banker to obtain borrowers' current status including financial,



management setup and owners' detail information including their financial involvement. Bankers cannot control what the borrower set their line of business to do after getting the loan causing moral hazard problems. Inability to control the activities of the borrowers is also referred to as enforcement problem for the bankers. In civil construction, supply and services to government agencies, the weaknesses in bidding procedures are serious issues that remained unresolved since long. Management of natural resources, contracting procedures, and inability to develop natural resource based industry are serious problems. Moral degradation of officials, adoption of unfair means in transactions are both moral hazard and enforcement problems. Inability of the administrator to direct and regulate their officials caused principal-agent problems. Ill Motive of the public representatives in acquiring resources, direct and indirect facilities and money involve principal-agent problems. Problems of knowledge management in government agencies, corporations, research institutes, universities, and application suffer seriously causing information problems.

#### **4. Conclusion**

Asymmetric Information refers to a situation when two or more parties to a transaction, at least one of the parties has access to information that the other parties do not possess. Adverse Selection exists before the two enter into a relationship and Moral Hazard occurs after the parties enter into a relationship. Asymmetric Information raises many problems, which plague most economic transactions. The problems of AI can be resolved directly through appraisal method for observable phenomena or indirectly through screening, signaling or contingent payment methods for unobservable phenomena. The world is yet uncertain about the problems raised in the study of AI. We must relate the major concepts and components in respect of our major problems such as poverty reduction, social discrimination, employment generation, industrialization, capital and money market, and application of derived knowledge. Asymmetric Information is a rapidly expanding field. To me, understanding and application of concepts have far reaching impact. Concepts cross-cut many social science fields, and have theoretical and practical value for economists, administrators and businesses. We must try to resolve the major economic, social, and business problems considering the concepts and knowledge of Asymmetric Information. This review is very selective and brief. Interested readers may find it profitable to consult the references.

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### **Endnotes**

- [1]. Among them are Adam Smith (1776), Simonde de Sismondi (1814), John Stuart Mill (1848), Alfred Marshall (1890), Leon Walras (1874), Arrow and Debreu (1954), Friedrich Hayek (1945), Herbert Simon (1955), Berle and Means (1933) are prominent (Rosser 2003).
- [2]. William Vickerey (1961) and James Mirrlees (1971) were given a Nobel Prize for work on asymmetric information in 1997. George A. Akerlof, A. Michael Spence, and Joseph E. Stiglitz were awarded again a Nobel Prize for work on the economic implications of asymmetric information in 2001.