Asymmetric information in case of decision under risk

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Abstract

The differentiated access level to the information is one of the key issue in the decision making process under risk. Typical cases with asymmetry of information are: the sale-purchase of goods, the insurance market (auto, health, life), the financial sector (loan contract), the labour market and others. Information asymmetry is considered the source of economic inefficiency, and therefore is more focus is put on the study of its effect. In this paper we analysed different aspects related to the information asymmetry, such as the adverse selection, the moral hazard, the principal-agent problem. Also we studied various involvement of the parties in each situation by analysing particular scenarios, and try to build simple models which illustrates the essence and the implication of the information asymmetry on the decision making process. Finally, we tried to identify optimal solutions where both involved party would have higher benefits, and also their expected behaviour to reach that state.

Keywords: *Information asymmetry, risk, decision making, insurance, adverse selection, moral hazard, principal-agent problem, expected utility*

JEL Classification: *D80, D82*

Introduction

The access to the relevant information is a challenging issue in the decisions making process. Only in ideal cases, we can suppose the all participants have access to a complete set off information, and this cases are used mainly to build simplified models for better understanding of the basic of the decision making process. In the real world people are making their decisions based on a limited set of information which are available for them in a certain moment in time. In other words, participants can have different access level to the market information, meaning that some private information are available for only some of them but it is difficult to get known by the other, or even impossible. On the other hand, those is possessing the information

not willing to disclose it to others, the access to the information becoming a differentiating factor in competitive market economy.

Asymmetric information refers to the situation in which some persons possesses information while the other part involved in the same deal has not. Typically, is the case when the buyer knows a limited set of information about the good he intends to purchase. If the price is not reflecting correctly the quality of the good or service, and the buyer do not have access to all details the seller knows, this can place the buyer at a disadvantage.

Typical cases where the information asymmetry is often present are such as: the sale-purchase of goods - where the buyer usually has less information as the seller; the insurance market – where the insurer do not know the real risk profile of the individual; the labour market – where the employer cannot know all the professional details of the future employee; the financial sector – where the applicant for a loan would show an "improved" financial situation to the bank in order to get better conditions; and we can continue also with other examples, from all areas of the economic.

Let's take the case of second-hand cars (also called as "used cars") as example. Buying such a car, bears a certain risk for the buyer, because some cars could have hidden problems, which are very hard to be identified by the buyer before the transaction is closed, but on the other hand the seller is not really willing to disclose such information, because it might affect the selling price. Lack of transparent information about the cars' real status might conduct to the division of the used cars market. Part of them offers for sale high-quality cars with provable track record, whilst others offer doubtable or low-quality, but well prepared for sale (the problems might arise after a while the transaction is closed). Since the real quality of the car is not accessible for the buyer the presence of bad-cars causes a price distortion of the market, meaning that it pushes down the price of the quality-cars, where the sellers can decide in extremis not to sale anymore for such low price, actually below their expected return value. On the other hand, the quality-car sellers might include into the price some additional premiums in order to show to the buyer their good-faith, such like a limited warranty time, or a quality certificate from an authorised mechanic; both cases imply an additional expense for the seller, which actually reduces the net gain on the transaction.

It might be the case, that in the sale-purchase process a third party intermediary person is involved, which is empowered by the buyer to purchase a car reflecting its expectation. That intermediary could have a different agenda, that those of the person hired him. The behaviour of the agent could be different depending on the information he has access compared with the other persons involved in the deal, and also by the reputation the agent has. It could

be the case when his own interest could push him to cross the loyalty of the person who employed him, and get with any means the higher return regardless of the short term implication. On the other hand the buyer is determined to pay additional incentive, in order to assure that the intermediary will act correctly. What is the warranty that the intermediary will act correctly and transparently in front of the buyer, and not willing to cheat? How much incentive should the buyer pay for in order to play correctly? These are only basic questions which supposed to be analysed in the decision making process, and each alternatives assumes a certain level of risk, and different level of knowledge (information) which is accessible to the parties involved in the decisional process.

The differentiated access level to the information or the volume of information you possess, actually is affecting the way of making decisions. In case of seller-buyer each of them has different set of information, which in the literature is referred as asymmetric information. Usually the theoretical study of asymmetric information is well-structured around two approaches, namely the Adverse Selection and the Moral hazard. The case on involvement of an intermediary in the transaction / decision making process is usually referred as Principal-Agent problem.

In this paper we will analyse these cases, and try to sustain with mathematical support the practical, real world situations.

Literature review

The information asymmetry was studied and described first by Akerlof (1970), and the adverse selection and the moral hazard have been explored in a vast body of research. Among these, the most significant ones refer to Spence (1973), and Rothschild and Stiglitz (1976). Akerlof (1970) describes the information asymmetry in case of product market, with examples from the perspective of the buyer of a used car, Spence (1973) refer to similar mechanism when workers sell their labour experience to a company, and Rothschild and Stiglitz (1976) analyses the insurance market in which private information favours the buyer, who is better aware of her health condition or driving skills.

The moral hazard was widely studied by scholars, among them key contributions to the literature have by Ross (1973), Holmström (1979), Grossman and Hart (1983) and Mirrlees (1999). Mirrlees considers the car insurance market, where after the contract is signed the company cannot observe the real behaviour of the driver, but can consider the historical record in the determination of the future profile and differentiate the premium based on such calculations.

The principal-Agent problem was further investigate by Holmström (1979) looking for kind of relation of the agent long term reputation and cases

of irrational decisions, whilst Harbaugh (2003) show, that the model can be further extended and includes the probability weighting related to the agent behaviour.

In 1996, the Nobel Prize was awarded to James Mirrlees and William Vickerly for their contribution of theory related to asymmetric information, and introduction of incentives in the decision making process. The same Prize was granted to George A. Ackerlof, Michael A. Spence and Joseph E. Stiglitz for their analysis of the asymmetric information involvement of the market evolution.

Further studies as of Chiappori and Salanie (2000), Chiappori et al. (2002) shows that information asymmetry in case of insurance market has no consistent effect on decision makers, and contradict earlier conclusion that information asymmetry creates problem in the insurance market. This is the result of continuous data collection from the insurance companies, and also making historical record available for other market players reduces the information asymmetry. Anghelache, Anghelache,., Anghel and Niţă (2016) present some considerations on the banking risk. Anghelache, Anghel and Diaconu (2016) develop on risk aversion. Anghelache and Anghel (2014) approach the risk in portfolio selection, while Păunică (2014) approaches the risk associated to infrastructure projects.

The Adverse selection

The adverse selection refers to the situation when two or more parties are negotiating a transaction, and one of them has some information that the others do not have. This "hidden information" put the party have it in a privileged situation and it might take some decision which actually harms others, or create a disadvantage for them. Therefore, the possession of more information creates a potential competitive advantage for those having it.

To illustrate this case, let suppose that in the second-hand car market, all the cars are traded on the same price. This situation the price of the transaction is offering less benefit for the high-quality car sellers compared with those selling doubtable or worst quality cars who really getting a better return on the deal. This situation might force the high-quality car sellers to withdrawn from the market, since they do not get the expected benefit.

Let's take the case of car insurance to see how the individual and the insurance company are facing the transaction from the perspective of the information they have. Usually the company does not know the real profile of the individual, and it is hard for them to identify all detail, in order to offer a price which, cover all potential risks and would not create a loss for the company. For the company only information visible are details about the

car and the driver past history. On the other hand, the individual not willing to disclose to the company some of its risky behaviours which if it would be known by the company it might increase the insurance policy price.

To easily understand the problem, let suppose that all drivers on the market are classified by the insurance company in a single category, and from the adverse selection perspective we can suppose that all of them are the same, expecting their probability of loss. In this view we can distinguish "good" drivers and "bad" drivers, each of them having a probability of loss p_G respective p_B, where we assume that $0 < p_G < p_B < 1$. A loss, if occurs, for simplicity we consider to have a fixed size *L*.

We can assume also, that all drivers know exactly their own risk profile and probability of loss, whilst this information which is not available for the insurance company at individual level, but they have access to aggregated statistical information about the market segmentation.

Full Insurance

First, let suppose that p_G and p_B are **public information**, and the insurer offers different type of contract for each category. The market is considered to be in a long-term competitive equilibrium, so that each insurance company has the expected profit on each type of contract equal to zero. We also know, that if available, the full-insurance is the optimal solution both for the insurer and the individual. This implies that it would be a different full-insurance policy for each type of driver, which means that the "good" driver will pay a premium $P_G = p_G L$, whilst the "bad" drivers will pay a premium $P_B = p_B L$.

On contrary, if we suppose that the driver type is **private information**, (meaning that the driver knows his profile, but this information is not available for the insurer) and the insurer will continue to offer two type of insurance contract with different prices P_G respective P_B, where $P_G < P_B$, it is expected that all drivers to pretend to be "good" drivers in order to pay less (meaning P_G). In such situation all insurers will lose money and the market would collapse. In order to survive the insurers might pretend from all drivers to pay P_B, but this situation would not be convenient for the "good" drivers, considering the price to high, and as a consequence either they would give up the insurance and assume the full risk, or accept the higher premium considering that any insurance is better that not having at all. This last situation could turn to the extremis where, only "bad" drivers would buy an insurance policy, which it is not really desirable for them because it would reveal the driver risk profile also.

Pooling contracts

Until now we assumed, that only full insurance is available, but we can consider also the case of partial insurance contracts. Such contracts can be characterised by the insurance premium P and the indemnity level α, and the indemnity in absolute value is αL.

In the case of full insurance contracts presented before, in order to push the "good" drivers to buy an insurance policy, the insurer should offer a premium which would be attractive for them, and the final wealth with this insurance is better than with no insurance. This contingent claim can be described the inequality, which is also known as "individual rational constraint" to make the deal:

$$(w - P, w - P - L + \alpha L) \succeq_G (w, w - L)$$

where „$\succeq_G$" describe the most probable decision of the good driver.

From the insurer perspective, if there is public information available which statistically represents the drivers' behaviour they will use it to get profitable. Let consider λ represent the percentage of bad drivers from the total number of drivers, where 0<λ<1. In this case the full coverage insurance premium can be described by: $P_\lambda \equiv [\lambda p_B + (1 - \lambda) p_G] L$. Such contracts would break even on average, only if both types of drivers would buy it. Indeed, the bad drivers will prefer to buy, because the price seems fair enough to determine them to buy, but if the good drivers will not buy it, then the company will show loses inevitable. However, if the good drivers will by this contract (having in mind that any insurance is better than no insurance) this type of contract will generate profit. Taking into account how P_λ was defined, and since both categories of drivers would buy only this single contract, they are called "pooling contracts". As real life example for such contracts we can refer to the mandatory car insurance, imposed by the government in most of the countries.

Obviously, such contracts will not be liked by the "good" drivers, since they will pay a higher price since the full insurance $P_G = p_G L$ is not available. They will be demotivated and the obligation to buy such contracts will create frustration for them. Therefore, the good drivers most probable will seek for a partial insurance contract, which by pretending the premium will increase their expected utility (EU), whilst the bad drivers will continue to look for full insurance.

Separating contracts

As we show beforehand, the EU of good drivers differs from those of the bad drivers, we can build a pair of contracts which would be attractive

for both type of drivers, and within that each driver can select the contract he prefers. As long as each individual can select freely the desired contract type, this mechanism is often called as "self-selection mechanism", and on the other hand it is called as "revelation mechanism" because choosing a certain type of contract the driver reveals its type to the insurer.

In order to understand the construction of such contract, we introduce a new restriction, so called "incentive-compatibility constraint", where each type of driver prefers the much suitable contract for them and dislikes the other one. Let note the contract preferred by each type of driver as: (P_B, α_B) the contract preferred by the bad drivers and (P_G, α_G) that for good drivers, then the pair of insurance contracts can be described as:

(i) $(P_B, \alpha_B) \succsim_B (P_G, \alpha_G)$
(ii) $(P_G, \alpha_G) \succsim_G (P_B, \alpha_B)$

where $\succsim_G$, and $\succsim_B$ describe the most preferable selection of the "good" drivers, respectively the "bad" drivers.

Since each type of contract is constructed to generate at least zero profit, therefore for the bad drivers must be offered the full insurance at the fair price ($\alpha_B = 1$ and $P_B = p_B L$), but if it is offered a lower level of insurance the insurer's profit will increase, regardless the good driver will buy or not a policy (any policy sold to good drivers in fact will increase the profit).

On the mirror, the contract for the good drivers should be constructed in a way that would be not attractive at all for the bad drivers, and the insurer will be determined by the market competition to sell as much as possible good contracts at a fair price level for the good drivers. Therefore, the "incentive-compatibility constraint" (i) has to be maintained in place for the bad drivers, and they will be not interested in buy other type of policy with lower insurance level where their final wealth could be lower.

These two types of contracts as they are constructed, putting the drivers to choose between the preferred contract, in fact forces the drivers to reveal their risk profile to the insurer.

Generally speaking, the separate contracts seems to be the best option for the insurer. In particular, let suppose the common contracts where the percentage of bad drivers λ is relatively low. It turns out, that in this case if both category of drivers purchasing such contract, could be an alternative to the separated contracts, since both category expected wealth might be higher than in case of separating contract. On the other hand, if the proportion of bad drivers λ is relatively high, then the good drivers are not attracted by the common contracts, and the separated contract is preferred instead.

As conclusion, we can notice that the adverse selection is not affecting the wealth of the bad drivers, which certainly will prefer the benefit of a full insurance; therefore, the information asymmetry is not applicable for them, their decision is similar to the complete information case. Only the good drivers are affected by the information asymmetry having the possibility of choosing different insurance type, and by this are bearing the cost of signalling that it is not a bad driver.

In the similar way we can judge in case of sale-purchase of a used car. Only the good-quality car sellers have to show the quality of the car in order to get a high enough fair price, but also it have to bear the cost of expertise or additional warranty in order to differentiate in the market.

Moral hazard

The moral hazard is related to the situation, when "hidden actions" are taken by one party involved in the deal, but the real effort is not observable. Typically, we speaking about moral hazard in information asymmetry after the transactions are concluded, but one of the participant take less care compared with the case before deal was closed. Let take the example of an individual, which might drive less carefully having an insurance policy in force, compared with the case he have to cover the whole loss in case of accident. Or another example, we suppose that the driver knowing that his car has a performant crash-protection system installed, it might determine him to rely on that system, to feel more protected and to drive less carefully than it would not be any protection. The moral hazard usually deals with the case, when the choices made by an individual lead to the possibility of changes in its behaviour.

For understand the situation and to try to model it, let suppose the simplest case when in the insurance market there are only two possible outcomes: either it is no loss, or the loss occurs and its size is L. Also, we consider an individual, which has two alternatives to choose: either takes no effort to prevent the accident (loss) or not taking any effort. We notice with p_N probability with no effort, and with p_E, the probability with effort, where we suppose that $0 < p_E < p_N < 1$. To further refine the model, we suppose effort is not costless, and taking effort will bear a cost of c for the individual.

If we consider the expected utility to be k, then EU = k in case of no effort, and EU = $k - c$ in case effort is taken. In such circumstances we ask the question: When will be the individual motivated to take effort? This can be described by the equation representing the contingent wealth of the individual as:

$$(w - P, w - P - L - c) \geq (w - P, w - P - L)$$
$$(w - p_E L, w - p_E L - L - c) \geq (w - p_N L, w - p_N L - L),$$

where $p_E < p_N$

This means that it worth to make effort when: $p_E L + c \leq p_N L$, when the cost of the effort correlated with the lower probability of loss is less than the possible loss without effort. In other words, if the outcome of making effort is not significantly different (in positive sense) from the case without effort, the individual most probably will consider that it is "not worth" to take effort. In the situation that the individual observe a considerable difference between the wealth in case of no-loss compared with the case of loss, the individual will find a certain level of cost of effort, which is worth to take, meaning the increase of the EU with effort will be higher than the cost invested.

From the insurer perspective, the effort taken is not visible at all. They presume the worst, that the drivers will not take any effort, therefore the best fitting for them it is the full insurance: $P = p_N L$. If the level of insurance is low enough, it might determine the individual to take effort. If the level of insurance is higher, the individual might not take any effort, which would increase the probability of loss for the insurer. There is a level of indemnity α which determine the individual to take or not effort, we noted this α_E, which is the most preferred level of insurance offered at the lowest "with effort" price. Therefore, the insurer would promote differentiated nonlinear pricing structure as described below:

$$P(\alpha) = \begin{cases} \alpha\, p_E L & \text{for } \alpha \leq \alpha_E \\ \alpha\, p_N L & \text{for } \alpha > \alpha_E \end{cases}$$

These two cases leads to the extreme, where with no effort the full insurance is the best case $\alpha = 1$, and with effort $\alpha = \alpha_E$.

As conclusion we can notice some similitudes between the moral hazard and the adverse selection models. In both cases the individual has the possibility to choose between two variants: a low value contract which offers a limited coverage and another with higher value offering full coverage. In the adverse selection contracts are constructed in a way that separates the "good risk", whilst the case of moral hazard, they are constructed to separate the "good behaviour".

The Principal-Agent problem

The Principal-Agent problem refers to the situation, when one individual – *the principal* – want to hire another individual – *the agent* – to perform a given task, or conclude a deal. In return the agent will receive a return - *incentive* - for the tasks performed or the effort made in order to achieve the principal's expected result. As typical example we can illustrate, is the case of a lawyer which is hired by a customer to increase the probability

of winning the case, for that will receive a premium agreed in advance. The customer is the Principal, the lawyer is the Agent and the premium is the Incentive. Whatever is the outcome of the case, the principal cannot observe clearly if the agent takes any effort or not.

Let suppose that the principal has two states of wealth X_1 and X_2 where we suppose that $X_1 > X_2$. The probability for one of the situation is p_1, respectivelly p_2. The principal hires the agent which is expected to increase of the probability of reaching state 1 (or in other words, to reduce the chance to get into state 2.). If we suppose to pay the agent with a fixed fee, then how can be sure, that the agent will take any effort to influence the events, and will not imitate only taking effort? For example, we can win the lawsuit case, without the lawyer making anything additional effort. For sure, if the effort is observable and measureable, we can build the incentive dependent on the effort, and if no effort is taken, then no incentive is paid. But if the effort is not observable, the principal cannot be sure if effort was taken or not. Let analyse two borderline cases in order to better understand this.

Binary effort with Risk-neutral Principal

In order to keep simple, the model, and in the sense of what it was described beforehand in the moral hazard case, we can suppose that the agent has two possible choices: either to take effort or not. Taking effort can be quantified as an additional cost c, which in the context of expected utility (EU) will reduce the final utility with c. For sure, the principal wiling not to pay the agent if it not making any effort. On the other hand, the agent's effort is not really observable by the principal, and this cannot be sure if the agent takes real effort or just simulating it. In case of the fixed-fee, the agent is not stimulated to make effort, and on the other hand the principal cannot observe the effort, therefore we have to determine if there is a way to stimulate the agent to take effort by offering a premium cased on contingent-claim.

We assume that the contingent claim paid by the principal to the agent, is described by (a_1,a_2), where $a_1,a_2 \geq 0$, then the principal will remain with the wealth (X_1-a_1,X_2-a_2). In both cases the principal will remain with less wealth, but he expects that hiring the agent the probability to reach state 1 to increase. Indeed, if we assume that $a_1 > a_2$, then it would be no other incentive for the agent to take effort. On the other end if we assume a_1 is much higher than a_2, this it can lead to the situation where the principal final wealth would be $X_1-a_1 < X_2-a_2$, meaning that it is not motivated at all to hire the agent.

If we note the expected utility of the agent k, and the effort taken by the agent with e (this is assumed to be either 1 or 0), while the cost of effort is noted with c. The probabilities to reach stage 1 or 2 are described by

$p_1(e)$ and $p_2(e)$ where $p_2(e)=1-p_1(e)$, and also we assume that $p_1(1)>p_1(0)$. In this context we want to find a contract (a_1,a_2) which maximises the expected payoff:

$$\max_{a_1,a_2,e} p_1(e)(X_1 - a_1) + p_2(e)(X_2 - a_2)$$

where we have the following two constraints:

$$p_1(e)u(a_1) + p_1(e)u(a_2) - ce = k$$
$$p_1(1)u(a_1) + p_1(1)u(a_2) - c \geq p_1(0)u(a_1) + p_1(0)u(a_2)$$

This means in other word that the principal is willing to pay (a_1,a_2) to the agent, in order to determine to take the effort e, which maximises the payoff for both of them.

The first constraint refers to the individual-rational constraint of the agent, and represents the level of incentive which will motivate the agent to buy-in the deal (also referred in the literature as "participation constraint"). The second constraint is the agent's incentive-compatibility constraint, which (similar to the adverse selection where was the case of assuming or not risk) will guarantee, that the agent equally will or will not take effort. As consequence we can assume, that the agent will take the effort, and e = 1, meaning that even the effort is not observable directly by the principal, the construction (a_1,a_2) will determine the agent to take the effort. In other word, the principal pays the agent good enough to determine this to take effort in his case. Considering the market competition, the agent is assured to get from the principal the best incentive to work for, compared to any other competitive offer from others.

On the other end, let consider the world, where the effort is observable, and in this world of complete information we can consider conditional payments to the agent as (a_1^*,a_2^*). In this case, since the effort is observable, the agent if not making effort, will receive nothing, and we can conclude, that in this case both the principal and also the agent has better results (the principal pays less, the agent saves the cost of effort). But not this is the solution both of they want. The principal wants to pay the agent to get it into stage 2 (with higher expected wealth), the agent wants to collect as high as possible the incentive from the principal for the effort he made. In the context of complete information, and based on risk sharing efficiency, the principal should pay good-enough the agent in order to determine to take the effort. In the real word, this situation we can illustrate with the example of the lawyer paid by "success-fee", who receive a significant reward is wins the case, but barely nothing if the case is lost.

Continuous effort with Risk-averse principal

In the previous section we considered the principal as risk-neutral, which is less probable in the real word. Hereby we extend the model considering that principal is risk-averse, its utility function is described by *v*), and the agents 'effort could be considered continue ($e \geq 0$) with $p_1(e)$ increasing (meaning $p_1'(e)>0$). Since we cannot guarantee state 1 (with highest wealth) regardless how much effort is made by the agent, meaning that $p_1(e)<1 \ \forall e$. Than the principal's problem is to

$$\max \ p_1(e)v(X_1 - a_1) + p_2(e)\, v(X_2 - a_2)$$

Subject to the following two constraints:

$$p_1(e)u(a_1) + p_1(e)u(a_2) - ce \geq k$$
$$p_1'(e)[u(a_1) - u(a_2)] - c = 0$$

These two constraints have the same significance as it was presented in the section before, the first is the individual-rational constraint, and the second is the incentive-compatibility constraint.

In this case, when we considered the effort continuous, and the level of contingent payment to the agent (a_1, a_2), this equation describes the agent's best option which maximises its effort *e*. Even the principal cannot observe the real effort level, but with the proper contingent payment construction of (a_1, a_2) can determine the agent to take effort, which is optimal for him. Therefore, both the principal and the agent has a common objective which simultaneously satisfy the conditions $a_1 > a_2$, respectively $(X_1-a_1)>(X_2-a_2)$, and maximises the conditional payment to the agent as (a_1^*, a_2^*).

This means that, very similar to the previous case, by reducing the incentive payments to the agents related to succeeding into stage 1, will reduce simultaneously the agent's level of effort in the proportional manner. More we pay the agent, his effort will increase proportionally. Returning to the case of lawyer, with continuous effort taken the incentive paid by the principal should be higher if the lawyer's shows higher effort and succeed to obtain better result for the customer.

Conclusions

In this paper we analysed several cases where the information is not available in the same extend to all participants to the market, situations which are typically referred "asymmetric information". Decisions taken under such conditions are affected by the level of risk associated with the lack of information. In ideal world, with "perfect information" the decisions can be easily predicted a properly modelled, but this is not the case with the real world.

Consumers cannot possess al available information about all the transaction the individual is involved, rather the decisions are based on a limited set of information which is available for the decision maker in a certain moment in time. Some persons or organisations can obtain more information than others, and due to this they could have a better position in the negotiations with others, or could be better positioned compared with the competitors.

In this paper we described three major problems related to the information asymmetry – the adverse selection, the moral hazard and the Principal-Agent problem. Beside the description with simple examples we tried to demonstrate the differences between these cases and also to we described the simple modelling of the essence of these information asymmetry problem.

The adverse selection occurs when buyers and sellers are basing their decision on imperfect information, where the sellers possess some hidden information which would not like to disclose to the buyer – so called "hidden information". This situation results in the market polarisation in good product and bad doubtful products. In order to convince the buyer about the high quality the seller must invest in showing evidence to the buyer about the quality of good, but this bear an additional cost which actually reduces the net benefit of the seller, but on the other hand assures the buyer to meet his expectation. In particular, we analysed three different types of insurance contracts, the full insurance, the pooling contracts, and the separate contracts, in each of these cases we analysed the possible behaviour of good and bad drivers. We can conclude that full insurance is preferred by the bad drivers, whilst the good ones will prefer any alternative with a lower price and limited risk sharing.

The moral hazard, exist when after a deal is concluded, one person undertakes actions which is in detriment of the other party – so called "hidden actions". The problem is that the harmed person is unaware about the other's action, and cannot take any measure to influence this. We described the case when the incentive given by the insurer is high enough in order to push the driver to take any effort to reduce the probability of loss. Taking effort is applicable mainly for good drivers in the exchange of an additional benefit, whilst the bad drivers prefer the full insurance.

The principal-agent problem describes the situation when an intermediary (the agent) is involved in the transaction, having the role to get better result for the individual (the principal). In this case we analysed the level of incentive which determine the agent to take effort, and also the level of incentive the principal afford to pay for. As the incentive increases, the certainty of the good transaction increases, but the additional cost will reduces the net gain (expected utility) of the principal on that transaction. We

concluded that as the incentive level increases the agent will most likely take additional effort, and described the function which maximises the return of both the principal and the agent.

Obtaining more information, involves additional cost for those interested in collecting relevant information about products, technical details, services, availability of the respective resources, but the risks related to uncertainty if a decision is more likely reduced. For those who intend to benefit in long-term of more and more information are more likely motivated to spend more resource in information collection (and processing) in a certain moment in time in order to collect additional benefits later. The time dependency, and the relation between the risk and information is not part of the present study and will be analysed apart.

The presence of information asymmetry and the impact in various market could be the source of economic inefficiency, and therefore is more focus is put on the study of economic decisions and their effect. Despite this, the recent evolution of the wide data collection and processing effort from many of the economic agents, also called as "big data" fade the case of information asymmetry and drives the situation to the more perfect information situation, where more and more information is available for the market players, and they can base their decision sustained by real evidences. This evolution is making place for further studies and researches.

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