The Role of Information to Market Study

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Abstract

Access to informations represent an challenging issue in today insurance market. One can only consider in ideal conditions that all the market participants have access to complete informations. But in real life, individuals take economical decisions on the limited sets of informations that are available in the given moment. In other words, one part can hide the informations that might bring it some disadvantages and prefere to keep them private (that can't be made public, or are hard to get) and the other part can't access them.

Key words: *information, decision, good faith, market, cars*

Introduction

If we are to consider the liquid market of second-hand cars, it is understandabel that the buyer is taking a big risk when buying one because there are big chances that this autovehicle have hiden vices that can't be identifyied when buying the car. Because of this missinformations for the buyer, the second-hand auto market can be divided in one with seller of good-faith that sell quality cars and one of sellers that sell used cars. Because the information related to the used cars are not transparent, this affects the sellers of good-faith to lower the price of its qualitative car, or even to decide not the sell it at all, as one might consider the received price much under its estimated value. Otherwise, the good-faith seller might give the buyer a limited guarantee or an independent technological expertise (but both cases imply additional costs that will in the end diminish the expected gain of transaction).

Different access to informations directly influences the process of decision making, and that is when we are talking of asimetric information. In the specialised literature, asimetric informations can be dealt with in two manners, the adverse selection and the moral hazard.

Literature review

Anghelache and Anghel (2014) develop on the instruments of economic modeling. Bariviera et.al. (2014) approach the efficiency of information in markets in distress, focused on the corporate bonds from Europe. Cipollone and Giordani (2016) analyze the business angel market. Doga-Mãrzac and Naval (2014) research the evaluation of business incubators. Dragotă, Semenescu and Pele (2008) are preoccupied with the valuation of investments projects. He and Kondor (2012) treat the inneficient investments. Parker (2014) develops on the crowdfunding, cascades and informed investors. Sturzenegger and Zettelmeyer (2008) analyze the losses of investors in the case of sovereign debt restructuring. Upper (2011) approaches the valuation of contagion hazard in interbank markets. Voineagu, Carp, Dumitrescu and Soare (Dumitrescu) (2012) present some approaches on social security models.

Methodology and data

An clasical exemple is when we consider a market where any second-hand car is selled at the same price. This situation would give an unfair advantage to the sellers of Bad cars compared to the sellers of quality cars, having as effect an growing number of second-hand bad cars on the market. This exemple from Rotschild and Stiglitz (1976) was analised by George Akerlof, receiving the Nobel prize for it.

Let's presume a case when we limit the analysis on a sole category of drivers included by the insurer in the same risk category, and from the adverse selection perspective, we can guess that all drivers are alike excepting their loss probability. If a loss will appear, it has an fix dimmension that can be noted with L. Let's presume that every driver knows its own loss probability, meanwhile the insurance company can't fiind out the driver's typology, so it base its calculations on a mare statistical distribution of population.

In this cathegory, we can distinguish between two types of drivers: good ones and weak ones, each with a loss probability of P_G, respectively P_B, where $0<P_G<P_B<1$.

• Common contracts

Until now we only considered the disponibility of integral insurances, but we can also consider partial contracts. We can therefore presume that an insurance contract is caractherised by the pair (insurance premium P and the level of compensation α, where the compensation is determined through αL. The equilibrum known as Rotschild-Stiglitz on such an market can be defined as following:

A set of contracts is an equilibrate one if

- All pair of offered contracts generate an ZERO estimated profit;
- We can not add more contracts to the given sets of contracts in equilibrum in order to generate an pozitive estimated profit.

Taking into account the integral insurance contracts described before, in order to determinate the ones with a lower risk to ask for a contract, their final wealth with insurance should exceed their wealth without insurance. In this case, for the good drivers we could have an contingent claim that would satisfy the ineguality $(w\text{-}P,\ w\text{-}P\text{-}L+\alpha L)_G\ (w,w\text{-}L)$ where „G" represents the prefered election of good drivers. This ineguality represents the so called „individual rational restriction" for the good drivers, in fact the limit situation to make one of those to conclude an insurance contract.

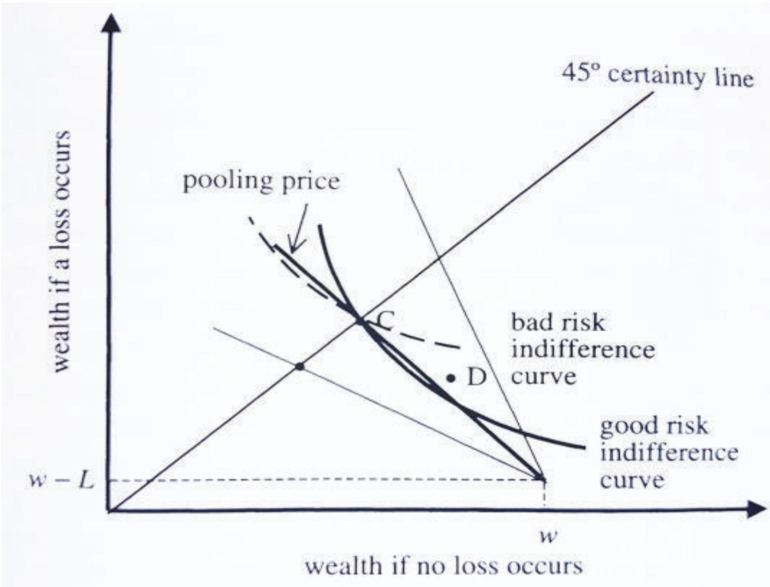
In order to analyse the profit of the Insurer, let's assume that there is an available public information regarding the proportion of weak drivers from population, that will be noted with λ and that is $0 < \lambda < 1$. So the integral insurance premium can be expressed by $P_\lambda=[\lambda p_b+(1-\lambda)P_G]L$. Such an contract will reach the rentability level if both types of drivers would by this type of contract. It is understandable that weak drivers willwant to buy such contracts, because the price is smaller than what is fair, but if the only buyers will be the weak drivers, than this situationwill bring inevitably loses to the insurance company. But, if the good drivers will consider that buying such a contract is better than not having one at all, than this contract will generate profit. Considering the definition of Pλ, integrated insurance contracts would generate and zero estimated profit. This type of contracts to be bought by both types of drivers are known as „comon contracts".

Let's analyse the situation presented in Fig.1. The insurance contract with integral covering drive sus to a pretended conditionated wealth C, that covers integral insurance for both categories at the same prime value P^. In point C, insurer do not make any profit. The ones with lower risk, tend to prefer C for zero coverage, because pretended conditionated wealth C is positionated higher than the indiference curve (*w,w-L*), resulting that comon contracts with full coverage can't be in equilibrum

But if we consider an partial insurance contract, as the one that brings us to an pretended conditionated wealth D, this one would be prefered by the good drivers compared with common contracts with full coverage, but will not be wanted by the weak drivers. As long as D is under the fair price line in the case of good drivers, this partial contract will generate an positive expected profit. To conclude, the equilibrum state can't include common contracts with full coverage.

No pooling equilibrium

Figure 1



The problem is common similar for nay contract with fair price, not only for the ones with full coverage. As long as the indiference curve, in the case of lower risk will always be more abrupt than the indiference curve for high risk anyway allong the ligne of fair price for common contracts, we could allways fiind a new contract that will atract only the good drivers, and that can make the expected profit. Therefore, we arrive at concluding that „Into an Rothschild-Stiglitz equilibrum under adverse selection, there cannot exist a common equilibrum".

• Separate contracts

As long as the expected benefit (EU) of the good drivers is different from the weak ones, we can build a set of contracts so any type of drivers can choose individually an different type of contract in the equilibrum that is right for it. This type of equilibrum is called „equilibrum in separation". As long as each individual is free to choose its own desired contract, this mechanism is known as „unveilling mechanism", because by auto-selection of the individual type of contracts it unveills its own type of insurred.

To see how this type of contract is built, we must introduce an new restriction, called „restriction stimulate-compatibility". This restriction in the Rothschild-Stiglitz can be ilustrated by the fact that each driver prefer its own type of contract against other types. If we note with (P_t,α_t) the contract bought by the type of driver t, where t=B,G and by ≥t we note the order for preference of type t. This way, in the insurance model we canidentify two types of restrictions, one for each type pf risks.

- $(P_B,\alpha_B) \geq B\ (P_G, \alpha_G)$
- $(P_G, \alpha_G) \geq G\ (P_B, \alpha_B)$

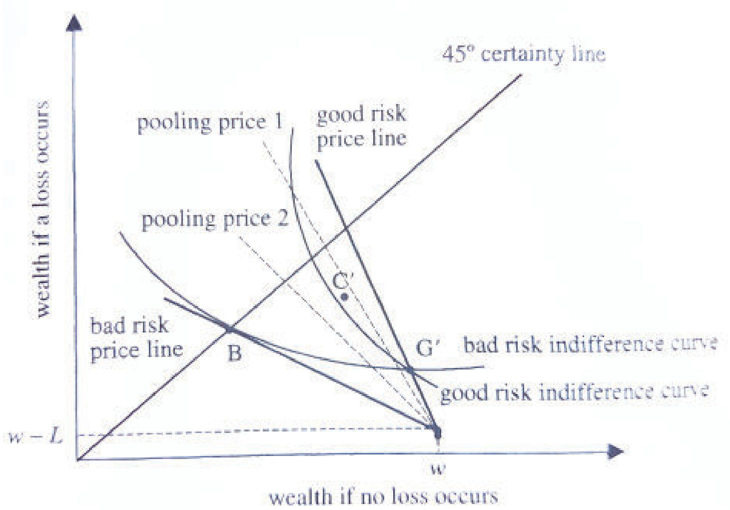
Taking into account that each type of offered contract shoul generate zero profit, the weak drivers should be offered integrated insurances at a fair price, α_B=1 and P_B=p_BL. On the long term competition will lead to the situation where weak drivers will be offered only integrated insurance at a fair price, with a pretended probable wealth in B.

On the other hand, the contract with lower risk must be built in order not to be atractive for weak drivers, and insurers to be determined to offer as much as possible contract at a fair price for good drivers. That is why the restriction stimulate-compatibility for weak drivers (a) should be compulsory. Good drivers would benefit from contracts with an probable pretended wealth yield in G'. This type of contract will lead to the indiference of weak drivers with integral insurance, and we presume that they will opt for contracts with probable wealth B. So by this pair of contracts, the two types of drivers choosing the adequate contract for them, are in the situation of unveilling their own type.

In the particular case in witch we presume that the procent of weak drivers λ is relatively low, so actuarial, the common fair price is represented by the „Pooling price 1". In this case we can consider that the common contract will determine an pretended probable wealth in C'. This type of contract will be prefered from both actegories of individuals in comparation with separate contracts of each and so on weak drivers and the good drivers as well would buy this contract if it would be offered as alternative to their separate contracts. More, taking into account the expected pretention C' is positioned under „Pooling price 1", it would generate profit if both types of drivers would buy. Of course we allready understood from that there cannot exist equilibrum in common. Therefore, in this situation, the Rothschild-Stiglitz equilibrum cannot exist.

Separating equilibrum

Figure 2



If the percentage of weak drivers λ is relatively high, through the ligne „Pooling price 2", then there is not any contract at an equitable price that can be atractive for good drivers. Therefore, the separate contract defined earlier is indeed in equilibrum, and the results of the discussed topics here can be described in the following way:

If there are enough weak drivers in the population, than an Rothschild-Stiglitz equilibrum is defined by separate contracts where weak drivers receive integral insurance at an equitable price, and good drivers receive partial cover at an equitable price. In this situation, the number of weak drivers is high enough as the common contracts at an atractiv price are not convenient for good drivers.

When there is an equilibrum, the adverse selection does not influence the wealth of weak drivers. This ones preffer integral insurance at an fair price, as is the situation when the complete information would have been available. Only the good drivers are affected by accepting insurances other than integral. Similarly, as the owners of luxurious cars must support the cost of showingthat they have good cars, the good drivers must, through buying partial insurances, support the cost of signaling that they are not weak drivers.

The moral hazard

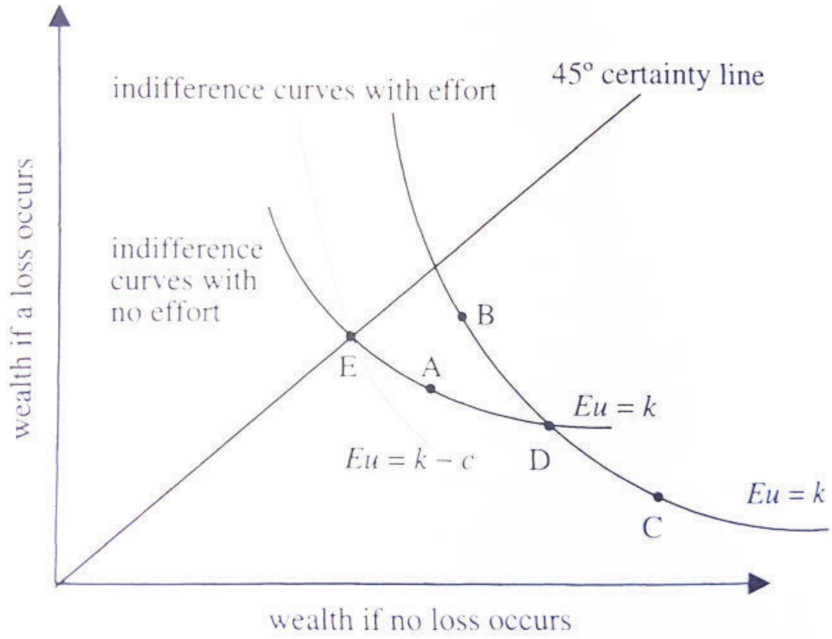
The moral hazard is associated with hidden actions or with the fact that the effort is not ussualy observable. As an example, an individual with insurance might drive with less attention than in the case when it should pay for the losses caused by an accident. If we consider the existance of an airbag, one might drive with less precausion as it considers that there is a system that might protect it in the case of an accident.

The fact that someone choices would lead to stimulents that would modify how other person acts is an general problem of „moral hazard". To understand how it works, we have to analyse the simpliest case, where we assume that on the insurance market would exist just two states of possible loss: no loss, or loss with dimension L. In this context we will take into account just one person, but with two levels of possible efforts. Without an effort, the probability of an accident is P_N and with effort the probability is P_E, where we presume that $1<P_E<P_N<1$. Additionally, we considered that ther is an cost existing for making an effort that is measeured in terms of utility/ beneifts for individuals, and realizing an effort willgenerate an cost c to the unities of benefits for the insured one.

We consider the indifference curve through the probable presumed wealth as beeing the line of certitude, as is the case in the E point. Knowing that the wealth in point E is similar for both states, the probability P_E and P_N doesn't play any role in calculating EU of wealth. Presuming that EU in E point without effort equals k, but because the effort has utility cost c, for the individual EU with effort is k-c. Knowing that $P_E<P_N$, results that the indiference curve is more inclined in the case of probable wealth when an effort is made. This happens on the curve that passes through BDC.

Indifference curves and effort

Figure 3



Following, let's consider the possibility that the individual to choose to make or not an effort. For revendicating in B in above figure, the individual has K units of utilities when it makes an effort, and on the other hand, B is bellow the indifference curve for k units of utilities without effort (indifference curve that passes through EAD points). Therefore, the probable pretended wealth beeing in B aswell, the individual will decide to make no effort and obtain an utility that is larger than k. Similarly we can consider that the probable pretended wealth A, for witch we obtain k units of efortless utilities. If the individual with the pretended probable wealth in A will decide to make an effort, this one will be positioned on an indifference curve lower than BDC. Indeed we can observe that by making effort there will result an utility situated between k-c curve and k. So when the pretended probable wealth of the individual was in A, this one will not make an effort.

For clarity, we will presume that the individual will make an effort in the conditions when for him it is indifferent if it makes or not effort. Generally speaking, the claims that are closer to the 45 degree line of certitude will lead to take no effort, because for such claims, the difference of benefits between the states of loss and without loss can be clusterised in the category „Not worth the effort”. On the other hand, for situations as the one from C, where the difference is significantly larger between the state without loss and the one with loss, the individual will fiind a cost of effort that worth be taken. In other words, the expected monetary recompense for reducting the probability of the state of loss will grow EU (expected utility) with more than c (cost of effort).

It is interesting to compare the sollution of moral hazard presented here with the sollution of separate equilibrum from the model of adverse selection. In both cases, the consumer has, in essence, the possibility to choose from two contracts: one that offers a capped coverd sum for a lower price and another with integral covering but at a higher price. In the adverse selection model, contracts with limited coverage are structured in such a way that enable separating good risc, as it is the case of those with lower probability to risk. In the model with moral hazard, the contracts with limited coverage are structured to separate good behaviours, as the ones that can reduce the loss probability.

Let’s consider an individual or a firm that has two final levels of wealth X1 and X2, where X1>X2. The probability for the situation s is ps for α=1,2. We will reffer to this individual or the firm as beeing the „Principal”. In manny cases, it is possible for him to hire someone that would grow the probability to arrive at state 1. For example someone that have been sued, and hire an attorney that will help him win the case. The attorney is the perfect exemplification for the „Agent”. Therefore, the agent works in the name of the principal for growing the probability to reach the state 1 (or in other words to lower the chances to arrive in the state 2). If we pay an fix onorary to the agent, what stimulents would make the agent make an effort? If the effort can be quantified, we can put an clause in the contract for refusing the payment if there is no effort. But if the effort cannot be observed or verified, the principal cannot allone, even if ex-post, if there have been or note efort from the agent. There are two cases:

To maintaign the model as simple as possible, we’ll presume that the agent has 2 choices: to make the effort or not to make the effort, efort that can be quantified and that have a direct cost c na that can in terms of EU to reduce utility with quantity c. Of course, if the agent doesn’t make an effort, the principal will not pay annything and the agent will have to fiind reasons for working for the principal. The indemnisation form with „fixed onorary” will not determine the agent to make an effort if this one connot be quantified/measured. Therefore we can determine the agent to make an effort if we offer a conditionate indemnization. If we note with (α1, α2) the conditionated indemnization payed to the agent (where α1, α2 >=0), the principal remaining therefore with the wealth (X1- α1, X2- α2). Even if the principal remains with less benefits in all cases, after it payes the agent, the principal will have the bigger probability to reach in state 1, contracting the agent (under the suspending clause for the agent not to dodge itself). Of course, if we don't have α1> α2, there have not been another stimulous for the agent for him to make an effort. On the other hand if α1 if high enough to reach α2, then in the conditions X1- α1 < X2- α2, the principal have not motivation to hire an agent.

To make it functional, the model principal – agent, we presume that the agent is offered a contract with a utility identical with the level of benefits that it would obtain from alternative offers. Let's note this level of utility with k. The level of effort is noted with e (presumed to be zero or one), and the cost / value of the effort noted with c. The probability of state s is PS(e) with $p_2(e) = 1-p_1(e)$.

We've presumed that $p_1(1)>p_1(0)$.

Our objective in tis case ist o fiind the contract that will solve the following problem:

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

subject to

$$p_1(e)u(a_1)+ p_2(e)u(a_2) - ce = k$$

$$p_1(1)u(a_1)+ p_2(1)u(a_2) - c >=p_1(0)u(a_1)+ p_2(0)u(a_2)$$

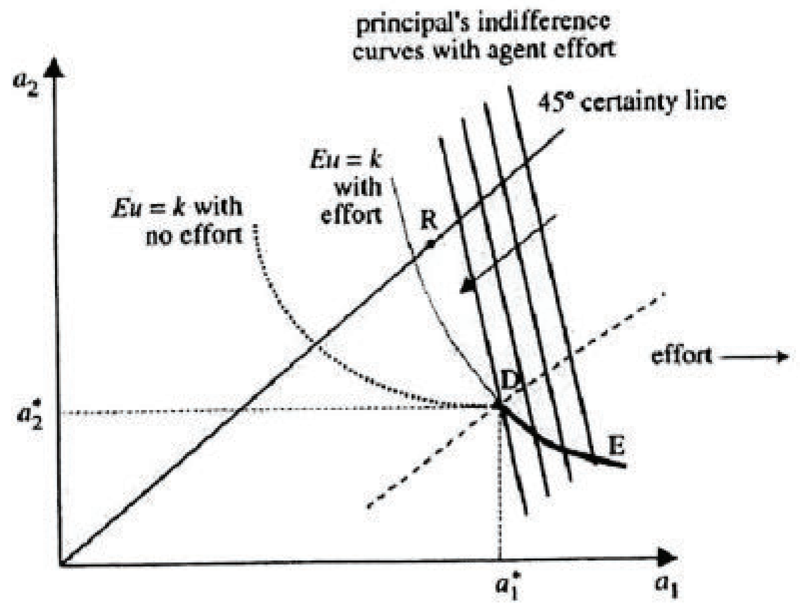
Therefore, the principal choose to pay under condition the agent (α1, α2) and indirectly the effort of agent e, so it can maximize the profit. Restriction is the constraingt individual-rationale of the agent, that should win as much as if he had chosen another offer. In the principal-agent scheme, this restriction is known as the „restriction for participation" for the agent.

The restriction is the one of stimulating – compatibility of the agent, that guarantee the agents wish to make an effort is at least equal with the one for dodging. In fact, even if the principal cannot observe the agent's effort (e), it can result e=1 making the best choice between α1 and α2.

We've illustrated the sollution to this problem, considering the payments for the agent to be conditionated. The contraction stimulating-compatibility puts our optimal sollution (α1, α2) in the „with-effort" sollution of conditionated payments. The participation restriction oblidge us to positionate on the indifference curve of the agent where EU=k, in this area with conditionate „with-effort" payments. Contracts that estimates both conditions are situated on the DE curve. Conditionated payments to agent that maximyze the benefit of the principal, is for sure one that minimize the expected payments to the agent. This fac tis illustrated by the indifference curve of the principal, that are lines parallel with the -p1(1)/p2(1). Both the principal and the agent will receive the same benefits wherever on this lines as long as the agent makes an effort.

Principal-agent model with risk – neutral principal

Figure 4



We can consider the sollution from as beeing efficient from a Pareto point of view: we maximize the principal's EU (in conditions of neutrality to risk) according with the level of k given by the EU of the agent. As long as we are Pareto efficient in a restraigned set of possibilities (satisfaying both restrictions, the sollution is most of the times mentioned as „the second best" sollution.

Following, let's consider the case where the effort can be observed, and in this world with complete informations, we can be interested in conditionate payments to the agent (α_1*, α_2*) that will reflect its effort. Let's take into consideration the contract with conditionated payments R, where the principal as the agent are happy, or are richer. The conditionated payment in D is Pareto dominant by sharing the risk. But a contract as the R one is not one that is stimulant-compatible, therefore R is not dominant to D, in the world where effort is not observable. Compared with the first best case with complete informations, and efficient risk sharring, the principal will have to pay well the agent in order to determine it to make effort. In the previous example, the attorney receive the onoray extremely high if he win the case, but little or nothing if he loose the trial.

Now let's extend our model to the more real situation where the agent's effort can be considered continuous and can have any level e>=0, and to note with v utility of risk aversion of the principal. We presume that the effort toghether with p1€ have the tendency to grow and are concave , otherwise the marginal gain of the agent is reducing with the effort. To avoid limit solutions, we'll consider P1(e) <1 for any e, so we cannot guarantee with certitude State 1, indifferent of the effort made. The cost of the effort is considered c units for every unit of effort made. We can formulate our principal objective, as following:

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

Subject to

$p_1(e)u(a_1)+ p_2(e)u(a_2) – ce >= k$

$p'_1(e)[u(a_1)-u(a_2)] – c = 0$

Inequality is the individual rationale constraingned as it was presented before. The ecuation is the stimulent-compatibility restriction. As long as it allow for a continous range of effortthis ecuation indicates the optimum level of the agent (α1, α2), ecuation that is a first rang condition for maximising the e effort of the agent. Even if the agent cannot observe or verify directly the effort of the agent, through established datas the principal will push to optimum the effort of the agent through choosing a conditionate payment scheme. Nor the principal nor the agent won't have the motives to enter in a contract if there is not (α1> α2). (X1- α1)>(X2- α2). In the case of optimal risk sharing between the principal and the agent, it results:

$$\mathrm{MRS}_v \equiv \frac{p_1(e)v'(X_1 - a_1)}{p_2(e)v'(X_2 - a_2)} > \frac{p_1(e)u'(a_1)}{p_2(e)u'(a_2)} \equiv \mathrm{MRS}_u$$

Where MRSv and MRSu rpreent the marginal rate for substitution for the principal and the agent, both beeing valuated at the optimal value of the payments toward the agent (α^*_1, α^*_2).

Conclusions

This inequality implies that the principal as the agent will both gain in the condition of an efficient risk sharing if the agent negociate some wealth for state 1 in exchange with of some wealth from state 2. By reducing payments to the agent according to state 1, there will be a reduction of the agent's effort. Therefore, we can observe that the best second option implyes a suplimentary payment to the agent in state 1, in order to stimulate it to make an suplimentary effort.

Bibliography

1. Anghelache, C. Anghel M.G. (2014). *Modelare economică. Concepte, teorie şi studii de caz*, Editura Economică, Bucureşti
2. Bariviera, A.F. et.al. (2014). *Informational Efficiency in Distressed Markets: The Case of European Corporate Bonds*, Economic and Social Review, Volume (Year): 45 (2014), Issue (Month): 3, Pages: 349-369
3. Cipollone, A., Giordani, P.E. (2016). *When Entrepreneurs Meet Financiers: Evidence from the Business Angel Market*, University Library of Munich, Germany in its series MPRA Paper with number 69545
4. Doga-Mārzac, M., Naval, E. (2014). *Theoretical and Methodological Approaches on the Evaluation of Business Incubators*, Journal of Financial and Monetary Economics, Volume (Year): 1 (2014), Issue (Month): 1, Pages: 252-256
5. Dragotă, V., Semenescu, A., Pele, D.T. (2008). *Some considerations on investment projects valuation*, Annals of University of Craiova - Economic Sciences Series, University of Craiova, Faculty of Economics and Business Administration, vol. 2, pp. 481-488
6. He, Z.; Kondor, P. (2012). *Inefficient investment waves*, Working Paper 18217
7. Parker, S.C. (2014). *Crowdfunding, Cascades and Informed Investors*, Institute for the Study of Labor (IZA) in its series IZA Discussion Papers with number 7994
8. Sturzenegger, F., Zettelmeyer, J. (2008*). Haircuts: Estimating investor losses in sovereign debt restructurings, 1998–2005*, Journal of International Money and Finance 27 (5), Pages:780–805.
9. Upper, Ch. (2011). *Simulation methods to assess the danger of contagion in interbank markets*, Journal of Financial Stability, 7 (3), Pages:111–125.
10. Voineagu, V., Carp, A., Dumitrescu, D., Soare (Dumitrescu) D.V. (2012). *Scientific International Approaches on Social Security Models*, Revista Română de Statistică – Supliment Trim IV/2012, pg. 342-353