ISSN 1846-6168
UDK 330.322

ASIMETRIJA INFORMACIJA I MORALNA OPASNOST U FINANCIJSKOJ EKONOMIJI

INFORMATION ASYMMETRY AND MORAL HAZARD IN FINANCIAL ECONOMICS

Tomislava Majić, Boris Pongrac, Georg Richter

Prethodno priopćenje

Sažetak: *Jedna od najvažnijih neoklasičnih ekonomskih teoretskih pretpostavka je savršena informacija. Pretpostavlja potpuno vladanje potrebnim informacijama za sudjelovanje na tržištu, posebno o motivima drugih dionika. Ipak, kad god su dvoje pojedinaca u realnosti u kontaktu,nemoguće je u potpunosti znati motive i misli druge osobe. Asimetrija informacija veoma je važno pitanje na području ponašanja potrošača, osiguranja, teorije agenata i bankarskih kredita. Kako bi informacija imala pravu vrijednost, mora se smanjiti neizvjesnost dionika. Rizik pogrešnog izbora može nastati ukoliko agent zataška privatne informacije prije početka veze. Moralna opasnost nastaje u trenutku trajanja veze postoje asimetrične informacije zbog nepostojanja radnje od strane agenta koja se može potvrditi ili ako on dođe do novih informacija. Ovaj rad pokazuje modele rizika pogrešnog izbora i moralne opasnosti sa odgovarajućim područjima primjene. Jedna metoda koja bi mogla smanjiti asimetriju informacija i na taj način smanjiti trošak donošenja loših odluka, je signalizacija, koja je također prikazana u ovom radu.*

Key words: *rizik pogrešnog izbora, teorija agenata , asimetrija informacija, moralna opasnost, signalizacija*

Preliminary communication

Abstract: *One of the most important neoclassical economic theory assumption is the perfect information. It assumes complete knowledge of required information for acting in the market, especially of other party's motives. However, whenever two individuals interact in reality, complete knowledge of the other party's motives and thoughts is simply impossible. Information asymmetry is an extremely important issue in the fields of consumer behavior, insurance, agency theory and bank loans. For the information to be of real value it must reduce the uncertainty of the parties involved. Adverse selection can emerge if the agent holds private information before the relationship is begun. Moral hazard occurs at a point in time later in the relationship where asymmetric information is due to the lack of verifiable action on the side of the agent or if he obtains new information. This paper shows models of adverse selection and moral hazard, with their application areas. One method that could reduce information asymmetry and, in this way, decrease the costs of bad decision making is the signaling, also shown in this paper.*

Key words: *adverse selection, agency theory, information asymmetry, moral hazard, signaling*

1. INTRODUCTION

Whenever two individuals interact in reality, complete knowledge of the other party's motives and thoughts is impossible. This is the common pattern, which appears in different fields in business administration and economics. Many researchers, whose object of interest is the agency theory, consumer behavior or the debt market, deal with this issue, namely information asymmetry.

Information economics starts with uncertainty. The initial endowment of every individual involves beliefs about possible future states in which different actions are optimal. [1] Information changes this initial set of beliefs. If an interaction between two individuals is considered, the information must additionally be relevant. For the information to be of value it must reduce the uncertainty of the parties involved. [2]

Information asymmetry describes the fact that one party knows more about the important transaction's parameters than the other party. Information asymmetries are commonly studied in the context of the agency theory, where one party – the agent is mostly the one with the informational advantage. By definition an agency relationship is "a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent." [3] Within business literature, the principal – agent problem is considered as consequence of the separation of ownership (principal) and management (agent). In this paper is shown this particular relationship, but also the general application horizon, which is much broader.

The two main sections deal with adverse selection and moral hazard. Initially, the verbal and mathematical definitions of the respective terms are given. In advance, the collection of application areas is provided. The fourth section deals with the method that could reduce information asymmetry and respective costs: signaling. The paper concludes with a summary.

2. ADVERSE SELECTION

2.1. Definition

Adverse selection or negative selection is a term originally used in insurance. It describes a situation where an individual's demand for insurance is positively correlated with the individual's risk of loss, i. e. higher risks buy more insurance. It is due to existing private information known only to the individual (information asymmetry) or some regulations and social norms. The consequence is that the insurer cannot allow for this additional risk in the price of the insurance.

Adverse selection and moral hazard differ in the timing when the asymmetric information evolves. Adverse selection can emerge if the "agent holds private information before the relationship is begun." [4] The application of the adverse selection process in the context of economics refers back to Akerlof. Akerlof analyzes the market of used cars, known as lemons problem. The broad range of qualities offered in the market is modeled with the parameter *k* which is, due to simplicity, uniformly distributed on the interval [0, 1]. Assuming that both parties buyers and sellers have the same information about the products, the result is quite intuitive. The seller, representing the agent, is willing to sell a used car at p_s k which is his personal valuation for the car. Symmetrically, p_b* k is the valuation of the buyer, representing the principal. If P is the actual price, both participants agree on the seller's utility is $U_s = P - p_s\ k$ and the buyer's utility is $U_b = p_b\ k - P$. Consequently, a deal only occurs if $p_b \geq p_s$ (alternatively $p_b\ k \geq P \geq p_s\ k$) since both participants want to benefit from the trade. In case of $p_b = p_s$ both have the same valuation and are indifferent between trading and not trading. In this case we just assume there is trading. In this constellation all cars on the market will be sold. The exact market price is hereby determined by the relative bargaining power of the participants. If the seller has all the power, the price is $P = p_b$ and the entire surplus of the trade goes to the seller. However, in case of asymmetric information, the process seems differently. Now, the buyer does not know the quality of the car. This means, that k could take values from the whole range of the interval [0, 1]. Hence, he rationally randomizes across the range calculating the average at a given price. From the previous assumption for the occurrence of a deal, we can take $P \geq p_s\ k$ leading to the average quality in the market at price P of $K = P\ /\ (2\ p_s)$. The sellers know about the randomization process of the buyers and adapt to the new valuation on the side of their buyers which must be higher as their own. Consequently, they do not sell cars with a quality higher than the average quality in the market at the given price. If we put the average quality on both sides, we obtain the average valuation of the buyers of $p_b\ K = (p_b/2\ p_s)\ P$. Knowing that $p_b \geq p_s$; this means that, in order to fulfill the condition of a beneficial deal on the buyer's side $p_b\ K \geq P$, the equation only holds if the buyers' valuation is at least two times as high as the sellers' valuation $p_b\ (k) \geq 2\ p_s\ (k)$. However, such a huge difference in valuation is highly irrational behavior which is why it can be neglected. The only price for which they are willing to buy is P = 0 since then the buyers are sure that it is the worst possible quality. Following this logic the market breaks down and there are no trades at all. [4]

2.2. Areas of application

The market of used car, explicated in the Akerlof's lemon problem, is by far not the only application field of adverse selection. In the area of life insurance, the insurer is the principal and the person to be insured is the agent. Insurance companies buy risks from the agents in exchange of an insurance premium which is initially fairly priced. The individual risks for every insured person are thereby very different. If one considers life insurance, it is cheaper for a younger person since an elderly person is more likely to die. Due to the assumed independence of the individual events, pooling of the risks reduces risk for the insurer. [5] In this constellation the elderly people are subsidized by the younger ones because the price for a single insurance is higher for them as it is with pooling. However, the younger ones with the lower risk might in expectation be better off without insurance. Consequently, the lowest risk drop out and the price of the insurance rises. It becomes less attractive for the low risks to participate in the pooling and only the high risks remain causing the market to fail in a similar way than shown above. [5] An insurance company can abate this problem by discriminating between the clients offering different contracts which are individually designed in that way that every client intuitively chooses the contract designed for him and thereby reveals his type. This model is generally applicable in case of adverse selection. [6]

Simiral situations emerge in external financing. A bank has an informational disadvantage towards its borrowers since only they know if they are able to pay the debt back. An entrepreneur who needs funds, in order to finance his project, has an informational advantage towards bank since only he knows his capability of providing this project and the quality of the project.

3. MORAL HAZARD

3.1. Definition

Moral hazard emerges when one party takes more risks because someone else bears the burden of those risks. Moral hazard occurs at a point in time later in the relationship where asymmetric information is due to the lack of verifiable action on the side of the agent or if he obtains new information.[4] An alternative way of capturing this notion is for the lack of information to be a main driver of the risk involved in the relationship. This understanding is the motivation behind Paul Krugman's definition of moral hazard: "[A]ny situation in which one person makes the decision about how much risk to take, while someone else bears the cost if things go badly." [7] A classic example of this situation is the principal-agent problem in today's listed firms. As pointed out earlier, the management performs tasks on the behalf of the owners. It is impossible (or too costly) for the owners to fully observe the behavior of the agents. The need to monitor stems from the fact that the motives of the two parties are different. Both want to maximize their utilities but for the principal this means maximizing firm value and for the agent this means maximizing salary to a given effort level. Formally, the maximization problem can be displayed as follows:

$$max_{[e,\ \{w(x_i)\}]} \quad \sum_{i=1}^{n} p_i\,(e) B[x_i - w(x_i)] \qquad (1)$$
$$\text{s.t. } \sum_{i=1}^{n} p_i\,(e) u(w(x_i)) - v(e) \geq \underline{U}^1$$

The output (x_i) depends on the effort e and a random component and is therefore also random. The utility for the principal is characterized by the output minus the wage $(w(x_i))$ he has to pay to the agent over all possible states of the economy i to which a probability $p_i(e)$ is assigned to.[2] For the agent, the utility assembles from the utility of the wages $u(w(x_i))$ minus the disutility of his effort $v(e)$. This must be higher than or equal to the reservation utility $\underline{U}$ for the agent to participate in the contract with the principal. The reservation value $\underline{U}$ represents the utility an agent would get somewhere else, e.g., as employee in a different company.

To begin with, the paper briefly considers the case with the same level of information on both sides to develop some understanding of the model. Since there are no doubts about the real nature of the contract partner, the optimal solution only depends on the risk attitude of the parties. The risk is shifted between the parties towards the one which is more willing to take risks. After deriving with respect to $w(x_i)$, the first-order condition yields $\lambda * = \frac{B\prime(x_i - w(x_i))}{u\prime}$ where λ* is a constant. To characterize the risk shifting process we have to find out what happens to the wage when the output level varies. This means we take the second derivative with respect to x_i and rearrange the equation to $\frac{dw^*}{dx_i} = \frac{r_P}{r_P + r_A} \in [0,1]$ where r_j is the Arrow-Pratt measure of risk aversion for the principal and the agent respectively defined by $r_P = \frac{B\prime\prime}{B\prime}$ and $r_P = \frac{-u\prime\prime}{u\prime}$. Risk neutrality is generally associated with $r_j = 0$.[3] Three different cases can be derived from this. (i) If the principal is risk neutral, $r_P = 0$, and $\frac{dw^*}{dx_i} = 0$. This means the wage does not change with the output resulting in a fixed salary for the agent. (ii) If the agent is risk neutral, $r_A = 0$, and $\frac{dw^*}{dx_i} = 1$, the agent gets the total output as a wage. However, for this condition to hold the agent must buy the license in exchange for a fixed franchise fee. (iii) Both parties are risk averse. This means $\frac{dw^*}{dx_i}$ lies somewhere between 0 and 1 leaving the agent with a partly participation of the increased output as increased wage. The fourth case one can think of with risk neutrality on both sides is not implicitly solvable with the Lagrange method since both B'(.) and u'(.) need to be constant leading to all second derivatives to be zero. Hence, the sufficient condition is not fulfilled and the functions must be observed more closely. [4]

For the sake of completeness, besides the optimal wage, the optimal effort level must also be mentioned shortly. In case (i), which is generally the standard assumption for the players' risk attitude, the optimal effort for the agent is the point where the expected marginal utility equals the marginal disutility of his effort. [4] In return, the agent receives a fixed salary. This solution under symmetric information is also called the first-best solution. In the following paragraph the assumption of symmetric information is released in order to approach the core of the agency problem including unobservable actions in the sense of moral hazard.

From the agent's perspective, a high wage and a low effort is desirable. Therefore, the natural action for him is to exert as little effort as possible since it is not observable. However, the principal anticipates this behavior and pays only the minimum wage. If the principal wants the agent to work harder, he has to incentivize him to do so. This can be done by paying the agent according to the output level. Formally, the most obvious way to show this is to select two different effort levels, high effort and low effort, $e \in \{e^H, e^L\}$. As one would expect, the disutility for higher effort is bigger than for lower effort $(v(e^H)) > (v(e^L))$ and the probability for low output is bigger when low effort is exerted referring to a first order stochastic dominance from p_i^H over p_i^L. Suppose, the outputs are order from low to high, $x_1 < x_2 < \ldots < x_n$, then

$$\sum_{i=1}^{k} p_i^H < \sum_{i=1}^{k} p_i^L \text{ for all k 1 … 1.} \qquad (2)$$

If the principal wants the agent to work only with low effort, he only pays the minimum wage. This is actually a case of symmetric information since all the parameters are known to the parties and therefore the solution is not different to the first-best solution of case (i). The situation becomes different if the principal wants the agent to work with high effort. The following problem occurs:

$$max_{\{w(x_i)\}} \qquad \sum_{i=1}^{n} p_i^H\,[x_i - w(x_i)] \qquad (3)$$

$$\text{s.t. } \sum_{i=1}^{n} p_i^H\, u(w(x_i)) - v(e^H) \geq \underline{U} \qquad (4)$$

$$\sum_{i=1}^{n} p_i^H\, u(w(x_i)) - v(e^H) \geq \sum_{i=1}^{n} p_i^L\, u(w(x_i)) - v(e^L) \qquad (5)$$

Now, there is an additional constraint to incentivize the agent, compared to the symmetric case. That is because the utility from high effort must be bigger or

[1] B' > 0, B'' ≤ 0, u' > 0, u'' ≤ 0, v' > 0, v'' ≥ 0
[2] Precisely, Prob [x = | e] = for i 1 2 … n .
[3] Except for the rare case when u (.) or B (.) is constant which means that the person is equally satisfied with any level of the independent variable.

equal to the utility of low effort. Otherwise he would just stay with the low effort level. The first-order condition with respect to yields $\frac{p_i^H}{u\prime(w(x_i)} = \lambda p_i^H + \mu[p_i^H - p_i^L]$ and summing up over all states i results in a Lagrange parameter for the participation constraint of

$$\lambda = \sum_{i=1}^{n} \frac{p_i^H}{u\prime(w(x_i))} \qquad (6)$$

which is obviously bigger than zero and therefore it binds. The second parameter constraint can be checked with a rearranged first-order condition (dividing by p_i^H):

$$\frac{1}{u\prime(w(x_i))} = \lambda + \mu\left[1 - \frac{p_i^L}{p_i^H}\right] \qquad (7)$$

representing the second-best solution of the problem, this time under information asymmetry. Here, it can be seen that the incentive compatibility constraint binds as well due to the fact that μ cannot be 0 since then u' and $w(x_i)$ respectively would be constant as in the symmetric case yielding a fixed salary for the agent. This contradicts the second constraint. With a fixed salary the agent would choose definitely low effort. A very interesting thing to focus on is the so-called likelihood ratio $\frac{p_i^L}{p_i^H}$. The smaller this ratio, the bigger the right-hand side. The left-hand side increases if $u'\big(w(x_i)\big)$decreases and this happens per definition for bigger values of $w(x_i)$. For a smaller likelihood ratio, the possibility of a high output in a certain state to be associated with a high effort increases. In other words this means that the premium in wage paid for higher effort is bigger if less uncertainty about the effort level is involved and the result approaches the wage for high effort of the symmetric case. On the contrary, this means with uncertainty about the true nature of the agent, the principal loses utility because he could be compensating low effort with high wages and the agent loses utility because the premium for high effort decreases. Comparable to the adverse selection problem on the used car market, if the principal is totally unsure about the effort which was exerted $p_i^H = p_i^L = \frac{1}{2}$, only the agent in disguise delivering low effort could benefit from that. [4] The main message one should take from these considerations is that information asymmetry is costly. Although it might seem advantageous to have more information than someone else, the consequences can be severe, even resulting in complete failure of the market.

There are some restrictions to the model that are worth mentioning. First of all, the optimal contract can be rather complicated. Due to simplicity, a linear format is applied from analysts as well as practitioners.

$$w^*(x_i) = a + bx_i \qquad (8)$$

Hence $\frac{dw^*}{dx_i} = b$ and therefore is constant. Following this logic, there are not many constellations where this format can be applied since it demands the principal and the agent to have constant risk aversion. This restricts the possible utility functions dramatically.

Furthermore, both models about adverse selection as well as about moral hazard consider only one period. How the principal interprets the agent's action depends on the expectations on the stay in the market.[8] If a manager wants to be employed for the long-term it might not be in his best interest just to perform low effort since he might get fired. A multi period game changes all the findings severely. A player builds up reputation with all the previous moves that are general knowledge. This knowledge can also be interpreted as reduction of the uncertainty about the other party's true nature and thereby a reduction of the information asymmetry. [9]

The model of moral hazard can vary in many different ways including applications for audit, competing principles or situations where the agent has the informational disadvantage. [10]

3.2. Areas of application

Similar to adverse selection, the notion of moral hazard originates from the area of insurance. An insured person is more likely to waste resources than an uninsured person since he uses the terms of the insurance to his own personal advantage. One example of this is a car driver who is more reckless protected by the coverage from the insurance. The same dilemma occurs in the case of contractor repair shops. They have the tendency to charge a higher price because they know the insurer will cover it.

Another field of application is parallel to adverse selection the lending market. Banks cannot fully observe what the borrowers do with their money. However, banks can also be agents in this constellation as seen in the financial crisis. Some banks were simply "too-big-to-fail". A collapse of these banks would have caused severe damage to the entire economy what motivated governments to rescue them from default and thereby cover their immense risk which was taken earlier. A bank with this knowledge does not care about its risk anymore.

Speaking about the inefficiencies of asymmetric information, it is inevitable to mention the difference in interests and motives between the parties. It is in the power of the principal to design contracts that ensure a closer alignment of those interests. The agent participates as a consequence from the alignment in the risk as well as the returns of the principal. It is not exactly a direct monitoring device in the sense of transforming the unobserved action into an observed but it makes the principal less doubtful about the agent's intentions and the true nature. In the case of the previous example such a mechanism would be for the manager to be compensated according to the company performance, for the insured person a system of shared costs in case of an event covered by the insurance, for the borrower debt covenants or credit card limits in case of a private borrower respectively. The incentive must be both under the influence of the agent and directed towards the right action. These conditions are not always given.

In all of these examples of adverse selection and moral hazard it can be stated that informational advantage is rather a curse than an advantage. [11] The agents want to make a deal with the principal but they cannot credibly convince the principal of their quality which leads to market inefficiencies. After all, everything the agents could say is nothing but "cheap talk". [12] [13]

4. SIGNALING AND INFORMATION ASYMMETRY

The key to master information asymmetry are costs. Cheap talk becomes meaningful when the words are backed up by costly actions. For example, a manager can signal the owner of a company his potential to perform high effort with his level of education. This signal decreases the principal's uncertainty about the agent, gives a higher premium to the agent and reduces consequently the information asymmetry. One has to be aware of the fact that such a message could also be used strategically to mislead the principal. Therefore the signal must be of the type that it discriminates between the different agents and only an agent of high format could use the correspondent signal.[4] Furthermore, an agent would only send a signal if it improves his utility despite the costs involved. Inversely, a principal only considers the signal if it is relevant.

The mechanism of signaling formally can be shown by a simple extension of the adverse selection example about the used car market. There we had the utility functions $U_s = P - p_s k$ for the seller and $U_b = p_b k - P$ for the buyer. Additionally, we introduce two different sellers, one offering good quality (G) and one offering bad quality (B) but trying to disguise it as good quality. Initially, they look the same for the buyer since he does not know about the quality. Now we assume the seller can signal the value with a guarantee that enables the buyer to get his money back if the car breaks down right after the sale. The utilities of the sellers are now $U_{si} = P_i - p_s k_i - r_i P_i$ with r_i being the probability of a failing car for seller i= {G, B}. It seems very natural that $r_G < r_B$. The utility of the buyer changes to

$$U_b = \theta\,(p_b\, k_G - P) + (1 - \theta)\,(p_b\, k_B - P), \quad (9)$$

where θ is the belief of the buyer that the seller offers good quality. If he does not know anything about the quality, his beliefs are logically $\theta = 0.5$. Using some numbers as example we get without signal $U_{sG} = 100 - 85 = 15$, $U_{sB} = 100 - 70 = 30$ and $U_b = 0.5\,(110 - 100) + 0.5\,(75 - 100) = -7.5$. In this example the one who benefits most from the trade is the seller of bad quality. His utility is bigger than the good quality seller and the buyer's utility is negative. On the contrary, including a guarantee we get the utilities $U_{sG} = 100 - 85 - 0.1 * 100 = 5$,

$U_{sB} = 100 - 70 - 0.4 * 100 = -10$ and $U_b = 1 * (110 - 100)$. Recognizing the good seller's signal, the buyer is certain about the type of the seller since he knows that a bad seller would not offer any cars at these conditions.

In the area of corporate finance there are two major issues where signaling plays an important role: the payout policy and the capital structure. Both develop initially from information asymmetry between investors and firm managers about the true firm value. In case of information asymmetry the parties evolved use every available source of new information which helps to reduce the uncertainty. Since there are private information before the investors finances a firm and unobservable actions by the firm's managers, this constellation combines the adverse selection as well as moral hazard.

The payout policy determines the decision making concerning the last year earnings. Either the company reinvests the funds in the company to buy new capital equipment or it shares the money to its shareholders. There are two common distribution methods: dividends and share repurchase. Both methods reveal the company's expectations for the future in some way. If a company decides to pay dividends, this has long-term implications. Increasing dividends is good news and decreasing dividends is bad news. However, the negative effect of decreasing dividends is much stronger than the positive effect. [14] This is the reason why dividends are quite stable even when the earnings increase because the fear of cutting the dividend and sending a bad signal is too high.

Distributing money via share repurchase also has a signaling effect about the true firm value, but it is weaker. Firstly, this is due to the fact that the interpretation depends on the management's motives. If the firm acts in the interest of long-term shareholders, share repurchases are believed to signal underpricing of the stock. In this case the firm tries to maximize long-term share price on the expense of those shareholder who sell. However, if the firm acts in the interest of all the shareholders the total net profit stays the same. Generally, the management is supposed to act on the behalf of long-term shareholders. Another reason for the repurchase to be a weaker signal is the difference in nature compared to dividends. A repurchase can take several years and does not have to be completed with the full amount which was previously announced. This makes this payout method rather inconclusive. [15]

Capital structure in combination with signaling draws attention to the pecking order hypothesis. [16] It claims that a manager tries to finance a new project initially with internal funds, followed by debt and equity. There are two major reasons for this. Firstly, the adverse selection issue drives entrepreneurs away from equity sources since it is difficult to signal a good project in advance to the investors. [17] Furthermore, issuing new equity signals the management's belief that the stock is overpriced since it benefits most this way. Therefore, the potential shareholders adjust the price downwards and the stock price declines. [15] Due to these reasons debt funds are preferred over equity funds. Furthermore, debt covenants and the danger of bankruptcy that comes along with debt financing can be interpreted as a statement of confidence about the company's performance. However, internal funds are preferred over external funds. This is simply because the company avoids any information asymmetries that involve strictly higher costs than symmetric information.

There are some opposite views to the pecking order hypothesis. Some empirical studies including Robertson and Leary show that capital structure decisions are not

[4] Signaling goes back to Spence (1973).

always based solely on the pecking order motive of minimizing costs of information asymmetry. It might be motivated by incentive conflicts that can be avoided with internal financing rather than be motivated by information asymmetry. Furthermore, agency costs such as large firms, firms with low market-to-book ratios, high cash flow, and low shareholder protection, or transaction costs can be reasons to follow the pecking order. [18]

The payout policy as well as the pecking order hypothesis as a signaling tool contradicts Modigliani and Miller's theorems strictly since they assume that the capital structure cannot display any new information. [15] Another theory which does not include the possibility of information asymmetry is the efficient market hypothesis, developed by Kendall. It states that there are no predictable patterns in stock price movements since all the information is already entailed in the prices. Counterexamples opposing this random walk are market anomalies and successful charter analysts. Latter ones have superior information compared to the average of the market since information is costly and not available for everyone. [19] To limit the extent of searching costs regulation can require a minimum level of information from companies. [20]

5. CONCLUSION

In the course of this paper, the importance of information asymmetry has been shown. The different models can be categorized according to the point of time when the asymmetry occurs resulting in the models of adverse selection and moral hazard. Although one would expect more information to be advantageous, it can cause inefficiencies in the relationship, even leading to the complete failure of the market. Thus, more information can have a negative effect on the utility. The inefficiencies can be abated with the help of signaling or in terms of contractual designs with contract menus in adverse selection and interest alignment in moral hazard. However, the second-best solution will always cost strictly more than the first-best solution under symmetric information.

There are several widely spread theories that assume total information in the market including the efficient market hypothesis or the Modigliani Miller theorems. If this assumption is relaxed, the results must be considered in a different light.

The issue of information asymmetry will continue to puzzle researchers all over the business and economy landscape in the future. There are still many open questions and more are arising with every. That is the reason why this topic will always be fascinating.

6. LITERATURE

[1] Hirshleifer, J.: Where Are We in the Theory of Information?, The American Economic Review, Vol. 63 Issue 2, (1973) pp. 31-39.

[2] Christensen, J. A.; Demski, J. S.: Accounting Theory: An Information Content Perspective, International Edition, Boston: McGraw-Hill, 2003

[3] Jensen, M. C.; Meckling, W. H.: Theory of the firm: managerial behavior, agency costs and ownership structure, Journal of Financial Economics Vol. 3, (1976) pp. 305-360.

[4] Macho-Stadler, I.; Perez-Castrillo, J. D.: An Introduction to the Economics of Information: Incentive and Contracts, 2nd edition, Oxford: Oxford University Press, 2001

[5] Arrow, K. J.: Uncertainty and the Welfare Economics of Medical Care, The American Economic Review, Vol. 53 Issue 5, pp. 941-973.

[6] Gibbard, A.: Manipulation of Voting Schemes: A General Result, Econometrica, Vol. 41 No. 4, (1973) pp. 587-601.

[7] Krugman, P.: The Return of Depression Economics and the Crisis of 2008, New York: W.W. Norton Company Limited, 2009

[8] Spence, A. M.: Job Market Signaling, Quarterly of Economics, Vol. 87, (1973) pp. 355-374

[9] Sobel, J.: (1985), A Theory of Credibility, Review of Economic Studies, Vol. 52, pp. 557-573

[10] Ewert, R.: Wirtschaftsprüfung und asymmetrische Information, Heidelberg [u.a.], Springer, 1990

[11] Leland, H. E.; Pyle, D. H.: Informational Asymmetries, Financial Structure and Financial Intermediation, Journal of Finance Vol. 32 Issue 2, (1977) pp. 371-387.

[12] Crawford, V. P.; Sobel, J.: Strategic Information Transmission, Econometrica, Vol. 50 No. 6, (1982) pp. 1431-1451.

[13] Aumann, R. J.; Hart, S.: (2003), Long Cheap Talk, Econometrica, Vol. 71 No. 6, (1963) pp. 1619-1660.

[14] Grullon, G.; Michaely, M.; Swaminathan, R.: Are Dividend Changes a Sign of Firm Maturity?, Journal of Business, Vol. 75, (2002) pp. 387-424.

[15] Berk, J.; De Marzo, P.: Corporate Finance, 2nd global edition, Munich: Pearson Education, 2011

[16] Myers, S.: The Capital Structure Puzzle, Journal of Finance, Vol. 39, (1984) pp. 575-592

[17] Gibbons, R.: Game Theory for Applied Economists, Princetown, New Jersey: Princetown University Press, 1992

[18] Leary, M. T.; Robertson, M. R.: The pecking order, debt capacity, and information asymmetry, Journal of Financial Economics, Vol. 95, (2010) pp. 332-355.

[19] Hens, T.; Rieger, M. O.: Financial Economics: A concise introduction to Classical and Behavioral Finance, Heidelberg [u.a.], Springer, 2010

[20] Admati, A.R.; Pfleiderer, P.: Forcing Firms to Talk: Financial Disclosure Regulation and Externalities, The Review of Financial Studies, Vol. 13 No. 3, (2000) pp. 479-519.

Kontakt autora:

mr. sc. Tomislava Majić, mag. oec.,
Sveučilište Sjever, Trg dr. Žarka Dolinara 1
48000 Koprivnica
tomislava.majic@unin.hr

Boris Pongrac, bacc. ing. logist.,
Kralja Zvonimira 2, 40324 Goričan
boris.pongrac45@gmail.com

Georg Richter, struč. spec.
Sberbank Europe AG, Schwarzenbergplatz 3,
1010 Vienna, Austria
georg.alexander.richter@gmail.com