

Experimental testing of theory of information with emphasis on Behavioral economics

Bachelor Thesis

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Abstract

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This bachelor thesis focuses on the role of information in economics and in the financial sector. Different approaches to the role of information are discussed and reviewed. Mainly Economics of Information theory is discussed and experimentally verified using method from behavioral economics. Implications and contributions of this experiment towards economics and financial theory as well as to future research are offered.

Keywords

Economics of Information Theory, Information seeking behavior, Decision-making, Behavioral Economics, Financial markets, Experimental testing.

Abstrakt

Jurečka, Petr. Experimentální testování teorie ekonomie informací s důrazem na Behaviorální ekonomii. Bakalářská práce. Brno: Mendelova univerzita v Brně, 2016.

Tato bakalářská práce je zaměřena na roli informací v ekonomii a ve finančním sektoru. Práce diskutuje a testuje rozdílné přístupy k roli informací, především teorie ekonomie informací bude diskutována a experimentálně ověřena za použití metod behaviorální ekonomie. Implikace a přínosy tohoto experimentu ekonomické a finanční teorii jsou, stejně tak jako pro budoucí výzkum, poskytnuty.

Klíčová slova

Teorie ekonomie informací, získávání informací, rozhodování, behaviorální ekonomie, finanční trhy, experimentální testování.

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1 Introduction and Objective

1.1 Introduction

Idea of Theory of Information (also known as Economics of Information Theory) was used for the first time by Stigler in the paper called "The Economics of Information" (1961). This theory generally says that agents will search as long as the utility which derives from search is greater than costs of the search. In another words consumer will search for lower prices as long as the marginal costs (MC) of additional search are less than the expected marginal revenue (MR) from search (Goldman and Johansson, 1978).

This concept is one of the first complex thoughts on information in economics. Stigler then deepened his work on information in his paper "Information in the Labour market" from 1962 in which he describes behavior of economic agents in search of jobs or employees. These papers had a distinctive impact on economics. Many other authors began to work on how agents use and obtain information and which unique situations may occur. Spence (1973) came up with hypothesis of "Signaling", concept of "Asymmetric Information" was developed by Akerlof (1970), and others continued their work.

Even though this theory became a reference of how agents behave when regarding information, only a few authors tried to actually assess whether this theory truly represents agent's behavior or not. For example, Johansson & Goldman (1978) and Urbany (1986) did so with mixed results. Methods used in these and other assessments were ranging from usage of panel data on specific goods by which they evaluated Economics of Information Theory to designing experiments. Yet there are still blank spots in research regarding information in economics.

In this bachelor thesis methods of Behavioral economics will also be used. Behavioral economics is a scientific field in which psychology and economics are combined. Important authors of Behavioral economics whose work will be beneficial to use in this paper are Amos Tversky, Daniel Kahneman, Dan Ariely, Richard Thaler and others. Many studies regarding role of information will be reviewed.

The role of information in different parts of economics will be described such as information asymmetry, signaling, heuristics, fallacies and biases that occur during decision making, furthermore the role of information in finance sector will be described and discussed (e.g. efficient market hypothesis).

1.2 Objective

The research question is whether the Theory of Information is corresponding with agent's decision making. The aim of the thesis is to experimentally test the Theory of Information. I will review academic literature and will compare approaches to the role of information in agent's decision-making in economics and financial markets. As the basis of my review, I will identify common ground and differences of

these approaches. Then an experiment will be designed in order to test this theory on agent's decision-making. There are many difficulties connected with designing experiment and ensuring unbiased results. I will use standardized psychologic method in order to obtain required data. I will establish hypothesis that I will later on try to verify. Statistical methods will be used to interpret results and reach a conclusion. At the end I will discuss the results and point out benefits of this research as well as possible imperfections, recommendations for further research and, last but not least, possible contributions of this research towards financial sector.

2 Literature Review

In this section I will concentrate on the role of information in economics throughout the history, mostly describing scientific approaches to information from the late twentieth century as well as the most current findings. I will begin with brief introduction of understanding information by eighteenth and nineteenth century economics. Then Stigler's "Economics of Information" will be discussed and papers assessing this theory will be reviewed. Afterwards asymmetry of information and other imperfections regarding information in economy will be discussed. Then the findings and method of Behavioral economics will be mentioned as a modern approach to the role of information and in the end the role of information in financial markets will be reviewed.

2.1 Information in Classical Economics

In eighteenth and nineteenth century economics the role of information was not at the center of scientific research. For the most time the information was discussed at the end of the analysis (Stiglitz, 2000). Formal analysis discussed only situations in which information was considered perfect. There are signs that economists of that time were aware of imperfections among distribution of information. Smith, Marshall, Weber, Sismondi and Mill described examples that from today's perspective could be seen as description of known information economics principles such as adverse selection or uncertainty. Smith for example wrote that if firms raises interest rates, the best borrowers would leave the market. If lenders knew all the necessary information about each one borrower, they would have charged them appropriately for the risk, thus avoiding the leave of best borrowers (Stiglitz, 2000).

The imperfect nature of availability of information to economic agents was considered a natural occurrence in that period. Many economists had an insight into the limitations of human rationality and they were also aware that in an advanced society the information useful in decision-making were not available as a whole, but as a number of separate pieces of incomplete information among individual economic units. This understanding of unequal distribution of information among economic actors led to their critique of state interventions and to the examinations of the role of economic institutions regarding information creation or its absence (Prendergast, 2007).

2.2 Economics of Information

"Economics of Information" is a name of a paper written by George Stigler in 1961 that concerns agents' information seeking behavior. In this paper Stigler is focusing on the role of information in economics. In its beginning Stigler is stating that information is mostly ignored by economists. "One should hardly have to tell acad-

emicians that information is valuable resource: knowledge is power.” (Stigler, 1961, p. 213) This paper is one of the first complex thoughts on the role, nature and creation of information in economics.

2.2.1 Nature of Search

According to Stigler (1961) in any market that is not centralized none of the sellers knows all the asking prices. If someone wants to ascertain the most favorable price than he must canvass number of sellers that is called “search”. Price dispersion, considers Stigler, as a manifestation and measure of “ignorance”. Price dispersion is not unbiased measure of ignorance, because there is never complete homogeneity in the commodity if sales and services provided with them are included. For instance, car dealership might provide more services or offer more varieties of cars and equipment that covers part of the price dispersion (Stigler, 1961).

Buyer accepts any sellers’ asking price, if he is satisfied with it, but when the price dispersion is large it is usually (on average) beneficial to find more sellers. Stigler then demonstrates this on simple example. Imagine that all asking prices are equally divided between 2 dollars and 3 dollar prices. There are two minimum prices (the price offered by first seller who is canvassed) 2 and 3 dollars and the probability of each of them is 50%. With each canvassed seller the probability of 2-dollar price is increasing and the probability of 3-dollar price is decreasing. When two sellers are canvassed the probability of 2-dollar price is 75%, when three sellers are canvassed the probability is 87.5% and so on (Stigler, 1961).

Increased search will yield diminishing returns (reduction of minimum asking price). The greater the price dispersion is, the greater expected reduction in minimum price will be. Savings from additional search are equal to the expected reduction in minimum price multiplied by quantity of purchased goods. Savings are increasing with increasing expenditure (Stigler, 1961).

The cost of search means the time spent on approaching sellers. This cost is not equal for all customers, because people value their time differently. Usually those with larger income value their own time more than those with relatively smaller income (Stigler, 1961). The sellers will engage in search as well, especially in case of unique items, which the seller does not sell frequently such as old car. In case of unique goods, the efficiency of personal search is very low, because the buyers/sellers are unknown. If you want to sell an old car and you will personally go house to house looking for buyers, you might have to visit tens or even hundreds of houses to find a buyer. This uncertainty increases the cost of search greatly. This Stigler argues leads to localization of the transactions creating meeting places for buyers and sellers. As an example Stigler states medieval markets as a historical example and advertising as a modern tool. Solution to this problem is creation of specialized traders whose service is to provide meeting place for sellers and buyer e.g. used car dealer (Stigler, 1961).

In my opinion the behavior of sellers/buyers described by Stigler, but even though the uncertainty leads to localization of transactions it additionally leads towards the situation in which sellers/buyers will not search for any additional

sellers/buyers, because of uncertainty of the outcome. I think that when people are not sure of the outcome of search (whether they will find more convenient price or not) they will tend to stay with first few prices they encounter. So even if a person benefited from more intense search (savings would be greater than cost of the search) he/she would choose not to.

2.2.2 Determinants of Search

In this part Stigler (1961) discusses the determinants of search. He states that equation defining optimum search is possible when unique goods are sold e.g. house, antiques. If the purchases are frequent, then the volume of goods purchased using the information obtained by searching must be taken into account.

If a prices are perfectly positively correlated (in successive time periods), then the first search is the only search needed. The savings from that search are equal to the reduction of the minimum asking price multiplied by numbers of purchases based on this search. In a situation, where prices are not correlated, savings from search are equal only to the reduction of asking prices for that one time. Usually prices are positively correlated in successive time periods, but not perfectly. That means that agent's will search for minimum asking prices more at the beginning periods of time than in latter ones. There are differences in what amount of time each individual spend on search due to different costs of time and different expenditures (Stigler, 1961). If a seller whose customers are more price sensitive or have relatively low costs of search (meaning value of time spend searching for better outcome) wants to keep them, then that seller must maintain relatively low asking prices. Otherwise they will search for a better price. Stigler states, that successive correlation of prices may explain why uninformed customers such as tourists pay higher prices in market than locals. He states, that even if they possess optimum amount of information about minimum asking prices they will still pay on average more, because they lack knowledge of the previous asking prices. Furthermore, he states, that every buyer entering new market has no idea of price dispersion and therefore no idea of what amount of time he should spend searching for minimum prices (Stigler, 1961).

I would like to expand on the example regarding tourists. The reason why tourists pay more at markets (or in any place without fixed prices for that matter) could be also explained by differences in search costs. For local finding the right price is easy, because he knows who to approach, but tourists may not even speak the same language and they do not know whom to approach that obviously means that for them the best outcome might very well be to accept higher prices, because trying to lower them might be too time consuming.

First source of dispersion is the cost for dealers to ascertain rivals' prices. Another arises from the nature of information itself. Information becomes over time obsolete, because prices are derived from conditions of supply and demand which no individual can predict. Furthermore, are new sellers and buyers reaching and leaving market. The new sellers/buyers do not know the historical prices which

makes information of experienced buyers/sellers to some extent outdated (Stigler, 1961).

2.2.3 Advertising

Stigler views advertising as a mean for potential buyers to identify sellers. He considers it a powerful tool to diminish ignorance. Just one 5-dollar advertisement in newspapers may be read by as many as twenty-five thousand people which even if a mere fraction of those become new buyers will be much more effective than if any seller was trying to search for buyers in another way (Stigler, 1961).

We need to keep in mind that examples and means of advertising Stigler is describing are 55 years old. From today's perspective advertising in newspapers may seem somewhat outdated and ineffective considering the possibilities of on-line internet marketing, but at that time they were quite effective, because the readership of newspapers used to be higher.

The identification of sellers is necessary, because sellers (e.g. companies) changes, new ones are created and some are ending their business but more importantly, there is a fluctuation of buyers. Some people reach higher disposable income and infrequent buyers need to be reminded of the identity of sellers (Stigler, 1961).

The advertisement is usually paid by the sellers, which increases the prices of their goods. If they had not advertised, only those with a very low cost of search would have found them. However, this is somewhat balanced, if a person does not want to pay for the cost of product and advertising than he can find those companies who advertise very little and buy their goods with relatively lower prices because they spare money on advertising (Stigler, 1961).

This might explain some of the price dispersion people often encounter. Many of us have surely been in a situation in which we have found some shop (or product, restaurant, bar, anything) offering their products or services much cheaper than most of competition. In that case one often thinks "This is great how come I never heard about them before? With these prices they should be famous/offering their service everywhere!", but both their low prices and non-fame are based on the difference between companies spending on advertising (famous, but with higher prices) and those who do not (lower prices, but not famous). This, of course may not be the only reason of that price dispersion, but it probably is one of them.

One more situation in which results of search are biased can be found. After each search result person reevaluates whether to continue or not. Even though this behavior is consistent with Stigler's view the results of these evaluations might be biased and not fully rational. Imagine a situation in which a person is searching for a house to live in. He sets himself some criterions (maximum price, number of rooms etc...) upon which he intends to purchase that house. Afterwards he searches for such houses and after some searching he buys the one with minimum price (if all of them are of the same quality, of course). Then after finding some houses with different prices he keeps finding only the ones which are more expensive than some he had already found. At that point he would think that he has al-

ready found the minimum asking price and that any more search is unnecessary and ineffective. That assumption might very possibly be wrong because he deduces this conclusion on a handful of searched asking prices when in reality many other houses are possibly cheaper. That would be an example of heuristics which is something that will be thoroughly discussed later.

2.2.4 Empirical Assessment

In the previous sub-chapter, I have summarized “Economics of Information” written by Stigler. This short review with commentary is focusing mainly on his description of agent’s behavior regarding obtaining, maintaining and usage of information. Empirical evidence regarding Economics of Information is scarce and mixed. I will discuss important empirical studies based upon this topic. The first one to mention is a study conducted by Goldman and Johansson (1978) in which they were trying to assess the theory of Economics of Information using panel data on gasoline purchases. They used multiple regression techniques with 424 observations. Results of their study were mostly negative. According to Goldman and Johansson (1978) the Economics of Information theory did not represent well, gasoline purchasing behavior. The relations they examined were mostly far below statistical significance. When direction of these relations were analyzed slightly better outcome was observed. In a large number of cases the relations were in expected direction meaning some support for the hypotheses of Economics of Information.

Bucklin (1966) conduct a survey of 506 female participants in order to test three generalizations based on Stigler’s (1961) hypothesis that consumer’s shopping behavior is led by cost of search and reduction of minimum price gained from the search (1) The consumer will shop more extensively where the cost of shopping is low (2) The consumer will search more extensively when she knows little about minimum asking price and identity of sellers (3) The consumer will shop more extensively when the cost of product purchased is high (Bucklin 1966).

Results of this research mostly supports hypotheses mentioned above. The generalization that consumers respond to low cost of shopping (which is a term similar to cost of search) by ascertaining more prices at more shops is supported by this research. Another generalization concerning value of product and extent of search is as well supported by this survey. By cross tabulation of prices and extent of search a strong association was found. The consumer according to this survey does search more when she is searching for high priced items. The last generalization which stated that consumers will search for more minimum prices when they are less informed was partially supported. When consumers did not know any brands or did not prefer any stores they shopped more extensively but when they did not know any specifics about attributes of the product they did not shop more extensively (relative to those informed). Bucklin offers an explanation to this behavior stating that when products for which consumer does not have any strong conviction are purchased the consumer will purchase them at the most convenient occasion (Bucklin, 1966).

Urbany (1986) conducted an experimental examination of the economics of information. Three hypotheses were tested (1) that there is an interaction between price dispersion and uncertainty. Prior knowledge of price range will positively affect number of shops approached. When customers have knowledge about price range and also know where products with lowest prices are sold, the price range will have negative or no effect on the number of shops approached. Hypothesis (2) states that there is an interaction between cost of search and uncertainty. Lower prices of search will lead to more shops being approached than will higher costs of search. When concrete information about identity of sellers is known to consumers than the level of search costs will affect number of shops approached diminishingly. Third hypothesis (3) states that is an interaction between price dispersion and cost of search. When prices are more dispersed, than consumers with low cost of search will shop more extensively, than those with higher cost of search. The results are consistent with economics of information theory. For instance, prior knowledge about product's prices and identity of sellers reduces amount of search (Urbany, 1986). Despite their results, both Urbany (1986) and Buclin (1966) states searching is complex process and that not all of consumer's behavior can be explained by Economics of Information theory.

Ford et al. (1990) evaluated the role of advertising on consumer's behavior. Advertising claims, according to the economics of information theory, will be predominantly truthful when consumers can easily verify them, because otherwise the market would penalize the companies that would misled consumers. Ford et al. tried to verify whether this notion correspond with consumer's behavior or not. The results are supporting Economics of Information theory that consumers will be more skeptical towards advertising claims that cannot be easily verified before purchase. Moreover, the consumers are more skeptical of claims regarding low priced items. That would suggest that consumers do not fully trust ability of the market to discipline misleading advertisers (Ford, Smith, & Swasy, 1990). Challenges of how to advertise products to customers and whether to control information flow are discussed in economics as well (see Ariely, 2000).

2.3 Information in the Labour Market

Stigler (1962) continued his work on the role of information by extending the Economics of Information theory to the labour market. All workers can never acquire all the information about opportunities of employment from all possible employers and conditions of those opportunities such as wage, stability of employment etc. Furthermore, they can never maintain all of these information up to date. There is some price dispersion, even when strictly homogenous commodities are considered. The price dispersion would be eliminated only if all sellers would have information of all opportunities of all buyers and vice versa. The null price dispersion is rarely (if ever) reached, because it costs more to obtain all of the necessary information, than it yields. Employers will search for wage demands and workers will search for wage offers as long as the marginal return from search is greater

than marginal cost of search. When identities of possible employers are easily found, the wage dispersion will be lesser than when it is more time consuming to identify them (Stigler, 1962).

The cost of search will be relatively low when the probability of acceptance to the job is high. When there is a high probability of rejection by prospective employer than the cost of search will be high. This, argues Stigler, would mean that in the period of expanding employment dispersion of wages will be smaller (Stigler, 1962).

The costs of search are usually borne by workers, because for them the costs are lower than for the companies. When worker approaches company seeking for a job, he can easily find out whether the company's business uses skills he possesses. On the other hand, it is much more complicated for company to find out someone who possesses skills required. The chance that company needs additional workers is usually greater than that worker will accept offer by a company. Additionally, the cost of search for employers includes a training of new workers as well as their low productivity for some initial period (it usually takes workers some time to get use to the new operation). Stigler (1962) then proposes a way to reduce hiring costs for employers that being higher wages. If workers are paid relatively high wages, they will leave their employment much rarely. Also more apparently high skilled workers will accept offers.

McCall (1965) used basics of Stigler's (1962) work and described optimal strategy for workers in search of employment. Period of unemployment and the amount of search is determined by the wage worker believes his services/skills are worth. If a worker thinks that his services ought to be highly valued, he will reject any offers that will fall short of his own estimate and remain unemployed. High price of information will decrease any searching activity. McCall examined influences of length of unemployment, possible length of employment and unknown wage distribution. He states that searcher will revise his own estimates of worth of his services as the offers come. Searcher will obtain information about wage dispersion of work related to his skills from these offers (McCall, 1965).

2.4 Information Asymmetry

Information Asymmetry relates to a situation in which one side of a transaction possesses information necessary to estimate particular value. The absence of knowledge about conditions leads to disadvantage of not knowing and possibly even market failure (Akerlof, 1970).

2.4.1 Adverse Selection and Moral Hazard

Akerlof (1970) describes information asymmetry on example of the used bad cars in America called "Lemons", hence the name of the paper "Market for Lemons". In his description of information asymmetry, he states that there are four kinds of cars. Good, bad, old and new. New car can be good or bad, the same is true about used cars. Individual in such market buys a new car without knowledge whether it

is a good or bad one. Individual knows that with probability q it is a good car and with probability $(1-q)$ it is a bad car. Q can be assumed as a proportion of good cars produced. After some time, however, the owner of a car can judge more precisely the condition of that particular car, thus information asymmetry is created. Both good and bad cars must, however, be sold at the same price, because the buyer does not know what the actual value of the purchased car is. Because they are sold at the same price, the good cars are driven out of the market by bad cars. Even worse scenario is possible, according to Akerlof (1970), that bad cars drive out not-so-bad, driving out medium cars driving out good cars until there is no market at all.

Another two examples are provided by Akerlof (1970), one from insurance market, other one from labor market. People older than 65 years often face difficulties when buying medical insurance. He asks himself why the prices of medical insurance do not rise to match the level of risk. Answer to this question was that when prices of medical insurance rise only people who were relatively more certain that they would need the insurance would insure themselves. Some people who would have otherwise insured themselves would not do it because of the increased price. This would lead to a situation in which none insurances would be sold at any price (Akerlof, 1970).

Second example concerns labour market and explains possible reason why employer may not want to hire a minority worker. Akerlof (1970) thinks that it may not necessarily be a result of racism and discrimination, but it may be a reasonable behavior of employer who maximizes his profits. Race may be estimate of person's background, quality of schools he attended and so on. This is the result of difficulty to distinguish between good and bad workers.

Akerlof (1970) mentions few tools for countering information asymmetry. One of them is a guarantee issued by seller, thus transferring some responsibility of the quality of purchased goods on seller. Another is brand recognition, because customer using brand name goods can penalize the company, if the quality falls short of expectations by not purchasing their goods anymore.

2.4.2 Tools to Diminish Information Asymmetry

There are tools to diminish information asymmetry and adverse effects it causes as well as moral hazard. Some of them are administered by government. Mann and Wüstemann (2010) defined such situations. They identified three basic situations in which government intervenes (1) Asymmetries between market partners (2) Asymmetries between the government and citizens (3) Information asymmetries within governments.

In the first situation governments may intervene by setting minimum required quality. Schooling may be an example of such intervention. Government sets required minimum of quality of education. This can be explained by high cost of changing schools (which may include transportation and moving costs) and that the quality of education provided can be distinguished only after a long time. In some cases, minimum price is enforced by government. For instance, farmland in

France has set minimum prices or in some countries minimum fee is set for some professions such as legal practice. Fees are intended to guarantee some standard of quality by omitting price negotiations with each customer. Instead the lawyer can focus on the case. When government knows what best increases utility of its citizens than the government provides services and goods beneficial for general population and bans those that decreases their utility. For example, government guarantee food and water safety and inspect water and food producers. Another example is ban of drugs or providing free sex education (and sometimes condoms) so that „hidden bads“ of overdose and AIDS are avoided (Mann & Wüstemann, 2010). Information asymmetries among government is when part of governing bod possess information other part of government needs, but does not possess (Mann & Wüstemann, 2010).

Hayes (1984) states that information asymmetry between a firm and a union concerning the state in which the firm is situated can be straighten by the threat of strike made by union. Union can threat the firm with possibility of strike, if the wages do not increase. Basically, the union offers that workers would work for higher wages immediately or for the current wages after some time (length of strike). The company in a good situation has incentive to increase wages (it still pays off), on the contrary, the company which is not in good situation may decline the offer and risk the possibility of strike. Offers made by union are determined by a state in which union is. Union with big strike fund would more likely made offer asking for higher wages than union with no strike fund would (Hayes, 1984).

Saxton and Anker (2013) examined role of financial blogs in the stock markets. They state that blogs produce information beneficial to diminish asymmetric information in stock markets, especially on insider trading. Insider trading can be defined as an exploitation of internal information about conditions of particular company by company insiders (e.g. corporate officers, directors and large stock holders and others) (Givoly & Palmon, 1985). The results indicate that blogging by stock market analysts is beneficial for all stock market actors and that it decreases asymmetric information in stock markets (Saxton & Anker, 2013).

2.4.3 Empirical Assessment of Information Asymmetry

There have been many attempts to prove existence of information asymmetry. Focus is usually upon car insurance markets, financial markets or health insurance.

Wang at al. (2008) examined the role of increasing deductibles on moral hazard in automobile insurance market in Taiwan. They found information asymmetry present in insurance market. They also found evidence that deductible provision could affect the extent of moral hazard.

Helland and Tabarrok (2012) examined the influence of liability laws on moral hazard. According to Helland and Tabarrok, Liability laws decreases costs of accidents which lowers their incentives to invest in safety. In the situation they described, aircraft manufactures could not be sued for libel, if the aircraft was older than 18 years. Their research finds out that when aircraft manufactures could not be sued for liability, the probability that these aircrafts were in accident was re-

duced. Behavior of aircraft's owners is consistent with moral hazard. (Helland & Tabarrok, 2012).

Kim et al. (2009) states that measuring information asymmetry is very sensitive on chosen method. They found evidence of information asymmetry where, by choosing different method, would otherwise be none.

Spindler et al. (2013) observed information asymmetry in automobile insurance market in Germany.

On the other hand, some studies failed to find information asymmetry. For instance, Chiappori and Salanie (2000) did not find any evidence of information asymmetry in French automobile insurance market. Similarly, Snell and Tonks (1998) found little evidence of information asymmetry on London Stock Exchange. Kamin (2004) examined the role of moral hazard in international financial markets and concluded that at that time there was little support of any major influence of moral hazard on international markets.

2.4.4 Signaling

Spence (1973) described agents' behavior called "Signaling" that means a tendency to use some changeable attributes to "signal" agent's competencies and abilities to a potential employer.

Employer cannot usually be sure whether potential employee will or will not be productive. This information may not be known to the employer even after hiring, because it usually takes some time for a new employee to become used to the job and learn needed skills, in some cases even a special training may be needed. This makes employing decisions investments with uncertainty. Employer can, however, pay attention to certain attributes such as previous work experiences, references, education, completed trainings, age, race, gender and others (Spence, 1973). Spence (1973) furthermore says that only those attributes that can be altered constitute "signaling". These attributes effect the way employer views potential employee. If a potential employee is perceived highly through these attributes, he may be offered higher wage because employer might expect higher productivity from him. Potential employees can alter their signals for instance, they can improve their education or complete some kind of work related training (Spence, 1973). Signaling is a concept that has become permanent part of economic theory and there are still new papers being published on it (see Spence, 2002).

One can view signaling as a way to improve information asymmetry (or at least diminish uncertainty about prospects of hiring particular employee). Employees, knowing that employers use these attributes to assess potential employees and their initial wage rate, will try to improve their signals in order to demonstrate their capabilities. On the other hand, potential employees may try to cheat (they may lie about their education, reasons for being fired from job, previous work experiences) which leads to situation in which employer is somewhat able to assess capabilities of possible employee, but he still is uncertain about whether to trust him, leaving him verifying attributes stated by employee.

2.4.5 Bundling

Bundling refers to an activity of seller or producer who offers together more products or services in order to make customers purchase more products and services. There two kinds of bundling (1) products can be bought bundled together as well as separately (2) product can be bought only together. The second kind of bundling is often called block booking or tying (Kenney & Klein, 1983). Block booking is sometimes considered as an extension of power of monopolies and as such is illegal (Kenney & Klein, 1983). Regardless of the type, consumer has difficulty not only properly estimate value of each of the purchased goods, but in some cases even purchased goods at all. The problem of assigning proper value for each of the bundled goods in order to advertise them is common problem for companies (Bakos & Brynjolfsson, 1999).

One can easily imagine a situation in which a consumer and a seller estimates value of each of the bundled goods differently, thus creating asymmetry. For example, if a customer wants to buy a soccer ball and finds soccer ball bundled together with a shoes for playing soccer, he must estimate value of soccer ball and shoes separately so that he can compare the prices with other prices of balls and shoes, or he can try to find another bundled shoes and balls somewhere else. Anyway, it will probably result in increased costs of search, thus decreased search.

Soman and Gourville (2001) evaluated the role of bundling on customers' actual consumption. They found out that consumption of bundled goods was lower than of separate goods. If a person purchases four-day ski pass instead of four one-day ski passes than there is higher probability of him not skiing the last day. This is described by authors by customers' perception of sunk costs. Bundling goods separates the costs of consumption from the actual consumption, thus reducing attention to the sunk costs (money spent on the goods) (Soman & Gourville, 2001).

2.5 Information and Behavioral Economics

Behavioral economics is a mixture of economics and psychology that considers human limitations and investigate behavior of such agents (Mullainathan & Thaler, 2000).

For our purposes, only the most important findings of behavioral economics and those related to the role of information in decision-making process will be discussed.

2.5.1 Endowment Effect

Endowment effect is a bias that occurs when person overestimates values of goods in his possession. The person also wants to sell the particular item for higher price, than for which he is willing to buy the item. This is especially true for items with personal emotional value (Thaler, 1980).

Endowment effect has been experimentally tested and results support its existence. In an experiment participants were randomly given mugs and then the

mugs market was created. Kahneman, Knetsch, and Thaler (1990) states, that according to Coase theorem about a half of mugs should be traded, but observed trades fell short of that line. Link between loss aversion and endowment effect was observed as a part of a study that aims to unify many of behavioral economics phenomena together (Dean & Ortoleva, n.d.).

Endowment effect could describe a part of price dispersion occurring in the markets. Stigler (1961) views sources of price dispersion as an absence of all the information and heterogeneity of the products. Behavioral economics, however, suggest that part of that dispersion may be caused by overestimating the value of already possessed goods.

Interestingly, endowment effect could also explain part of difference between prices of new and old cars from Akerlof's (1970) example. It may not be a moral hazard as a misuse of information that only a car owner possesses but also that the car owner because of emotional and sentimental value he has for his car he overestimates the value of the car.

2.5.2 Sunk Cost Fallacy

Sunk cost fallacy (also known as sunk cost effect) relates to a situation in which person continues his efforts or endeavor, because of resources already spent on it (e.g. money, time) (Arkes & Blumer, 1985).

Arkes and Blumer (1985) demonstrate this fallacy on a simple example. Imagine a man wins a ticket to a concert. He does not want to go alone, so his girlfriend buys one ticket for herself. On the day of the concert terrible snowstorm is happening. The man decides that he will not go as the concert is not worth getting cold in terrible snowstorm. In that situation his girlfriend says that she wants to go so that the money she spent on the ticket are not in vain. From economics point of view this behavior does not make any sense, only additional costs and utility should influence her decision, not the previous one (Arkes & Blumer, 1985).

Sunk cost effect could similarly affect information seeking behavior. If a person tries to find lower price for some time, he feels somewhat obligated to continue in his search so that his previous effort is not without result.

2.5.3 Anchoring

Anchoring is a heuristic in which the outcome of person's estimation is influenced by random value called "anchor". People in their evaluations use initial values which then by some estimate or partial computation alter, but the resulted value will still be biased towards initial value (Tversky & Kahneman, 1974).

Tversky and Kahneman (1974) demonstrated this heuristic by simple experiment. They spun wheel of fortune (resulting in random numbers from 0 to 100) in presence of a student and then asked him whether this number is greater or lesser than percentage of African countries in UN. After that, students were asked to estimate that percentage by increasing or decreasing given number. Results confirmed that initial "anchor" biased results toward initial value (Laibson & Zeck-

hauser, 1998). The median percentage were 25 for group with given initial value of 10 and percentage 45 for group with initial value 65 (Tversky & Kahneman, 1974).

Even sequence in which numbers are viewed can alter the resulting value. When high pupils were asked to quickly estimate number value of computation.

- $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$
- Or
- $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$

In the descending version the estimates were higher than in the rising version. In the first version the median was 2 250, in the second it was 512 (Tversky & Kahneman, 1974).

Ariely, Loewenstein and Prelec (2003) replicated these results with an experiment in which students were asked, if they would pay for certain products dollar value equal to the last two digits of their social security number. Secondly, they were asked how much would they be willing to pay for those products. Students' offers were correlated with the last two digits of their social security number.

2.5.4 Information Bias

Information bias occurs when one considers useful to ascertain more information, even when it will not change the outcome (chosen action) (Baron, Beattie, & Hershey, 1988).

This bias can be demonstrated on simple example. Imagine that a patient is presenting symptoms that suggest diagnosis of globoma with probability about 80%. If it is not globoma it might be popitis or flapemia. Only one treatment can be chosen at one time (they are contradictory to one another). A ET scan would gain positive result, if the patient has popitis and negative if she has flampemia. If the patient has the first illness, the result can be both positive and negative with the same probability. Would you do the ET scan? (Baron, Beattie, & Hershey, 1988).

Many people, according to Baron et al. (1988), have said that they would do the test even though it is somewhat costly. The outcome, however, does not change with or without the test. The most probable illness, regardless of the result of the test, is still the first illness (Baron, Beattie, & Hershey, 1988).

2.5.5 Diversification Bias

Diversification bias refers to a situation in which one overestimate their need for variety of goods, thus choosing more diversified basket of goods than they otherwise would have. When people purchase goods for future use, they choose products with more variety than they would if they bought the products immediately before consumption in separate purchases (Read & Loewenstein, 1995).

Diversification bias can be described by "time contraction" and "choice bracketing" which means that longer periods are perceived as short (time contraction)

and that the choices which are framed together are regarded differently from separated choices (Read & Loewenstein, 1995). Amir et al. (2008) discussed and examined difference between monetary assessment and predicted utility topic connected with expected utility (from more diversified basket of products) and actual utility.

2.5.6 Placebo Effect

Placebo effect describes a situation in which person experience specific feelings/conditions because of the expectations levied on that experience. For example, one who would be told that particular energy drink increases his ability to solve puzzles would solve puzzles more effectively after consumption of the drink even though the energy drink would be normal (had no actual effect on puzzles solving) (Shiv, Cameron & Ariely, 2005).

Shiv et al. studied pricing of products and its influence on experience of consumption. They have through three experiments tested whether the price of products had any impact on the experience from consumption. They found out that discounted price decreases the placebo effect. People who consumed the energy drink with discounted price experienced worse outcomes (solve less puzzles) than those who consumed the product with regular price.

These findings are interesting for pricing and advertising. It may suggest that in some situations people can experience greater benefits from consuming products for higher price. This theoretically could also describe a small part of price dispersion. If person (although unconsciously) derives greater pleasure from consuming more expensive product, he may be in general less willing to search for lower prices. However, this is merely my untested thought that would need substantial empirical and theoretical evidence.

2.5.7 Overconfidence Bias and Hard-Easy Effect

Overconfidence bias and Hard-Easy effect both relates to situations in which people over/underestimates the correctness of their beliefs (Harvey, 1997).

Harvey (1997) demonstrates this bias on simple example. People were asked to answer questions ("France is more populous than Germany: true/false?") and then to estimate probability of correctness of their answers. Harvey (1997) suggested that people in general overestimate the probability of their correctness and also overestimate their ability to distinguish true and untrue statements. However, not only overestimation, even underestimation of correctness of answers occurs. That is in cases of very easy questions, that situation is called the hard-easy effect (Harvey, 1997).

Overconfidence is one of the themes of behavioral finance, in which the role of overconfidence of traders and other market makers is discussed as a possible source of inefficiency of markets.

2.5.8 Confirmation Bias

Confirmation bias relates to a situation when one pays attention disproportionately to the information that is in compliance with his beliefs. This process of looking mainly for information supportive of our beliefs (or unsupportive of statements we do not like) is unconscious. Confirmation bias is one of the most known and influential biases (Nickerson, 1998).

Confirmation bias, combined with overconfidence bias, might lead to a situation in which person unknowingly selects only information that favors his view (e.g. says that a particular investment is promising) and even is overly confident about his findings.

2.5.9 Gambler's Fallacy

Gambler's fallacy refers to a situation when people expect outcomes of random sequences to have some system. For example, when coins are being flipped, people believe that if there is a sequence of heads then it is more likely that next flip will be tailed (even though both have the same 50% probability). It is called gambler's fallacy mainly because it is observable in people playing roulette. They often bet similarly as described before. When they observe that black color was drawn few times in sequence they expect that it is more likely the next draw will be red (Rabin & Vayanos, 2010).

This fallacy was examined by Croson and Sundali (2005) on videotapes from casinos. They have found that there is small, but significant influence of this bias in people's betting behavior.

Gambler's fallacy has impact even in areas where it may not be expected. It is thought in behavioral finance that disposition effect in finance is related to gambler's fallacy (Croson & Sundali, 2005).

2.6 Information in Financial Sector

Information is crucial in financial markets. What is the difference between two investors one opening long position and other short? The difference is in the information they obtained, evaluated and based decision on. In this chapter, few approaches to information in financial sector, such as efficient market hypothesis and behavioral finance, will be discussed and also examples of imperfections of financial markets such as insider trading and disposition effect will be shown.

2.6.1 Efficient market hypothesis

Efficient market hypothesis was one of the most accepted hypothesis in financial economics (Naseer & Tariq, 2015). In *efficient market* hypothesis, market is believed to incorporate any new relevant information that arises about stock into the price without delay. That means that neither technical analysis (which is analyzing past prices and trends to predict future prices) nor fundamental analysis (which is analyzing financial information e.g. company earnings, debt, assets etc. in order to

find undervalued stock) can accurately predict future price (Malkiel, 2003). It should be impossible to outperform market. Portfolio of randomly chosen and held stocks should outperform any predictions (Malkiel, 2003).

The *Efficient market* hypothesis is connected with the *random walk* hypothesis which states that information of preceding events is already incorporated in the price, thus only today's news affects the price and tomorrow only tomorrow's news will change the price. Because news is unpredictable, it is impossible to predict tomorrow's price (Malkiel, 2003). This was mainly meant as an investment strategy, that it is better to buy and hold portfolio, than trying to frequently open long and short positions to beat the market.

Efficient market hypothesis faces both theoretical and empirical difficulties (Naseer & Tariq, 2015). Mainly scientific field of behavioral finance, accounting for irrational behavior of market players (e.g. herd behavior, confirmation bias, over-confidence bias, disposition effect), challenges this hypothesis.

Stock market crashes such as in 1987 are considered a proof of incorrectness of *efficient market hypothesis* (De Bondt & Thaler, 1995).

Another problem arises in empirical verification of Efficient market hypothesis because of axiomatic nature of the hypothesis (Alajbeg, Bubas, & Sonje, 2012).

2.6.2 Information Cascades

Information cascades (also known as herd behavior) relates to situation in which one behaves by imitating others, not considering actual information that he possesses (Banerjee, 1992).

It can be demonstrated on simple example. Imagine that you want to go to the restaurant. There are two restaurants close to each other A and B. Probability that restaurant A is better is 51% and that B is better is 49%. One hundred people want to go to the restaurant, 99 of them have an information that restaurant B is better and one person has information that restaurant A is better. Logically most (99 of 100) should go to restaurant B. However, imagine that that one person who has information that restaurant A is better chooses first. He would go to restaurant A and second person who would choose, would see that someone preferred A rather than B, thus the information would cancel each other and person would choose according to the prior probability and go to restaurant A. All of the next 98 people would as well go to the restaurant A even though the sum of information makes it clear that restaurant B is better (Banerjee, 1992).

Because the second person chose to follow herd instead of using his own information, externality for the population is created. It is called herd externality (Banerjee, 1992).

This behavior is known to occur on financial markets (especially stock markets) where people often decide in accordance with others instead of using their own information. It is considered a source of market fragility (Wray & Bishop, 2016).

2.6.3 Behavioral Finance

Behavioral finance is a field that combines knowledge of economics, finance, psychology and social sciences. „It seeks to understand and predict systematic financial market implications of psychological decision process“ (Olsen, 1998, p. 11).

Behavioral finance, similarly to behavioral economics, does not regard agents as always rational, nor it regards that market irrationality is caused solely by market mechanism, but that markets consists of imperfectly rational individuals in imperfect markets (Hilton, 2001). It rather emphasizes the role of motives, emotions and other psychological concepts to explain certain phenomena that occurs on financial markets (e.g. information cascades, disposition effect, overreactions).

Daniel et al. (1998) analyzed investors' behavior and came up with theory of securities market over and under reactions which are caused by two concepts. First overconfidence in information they possess (overconfidence bias as described above) and second by biased self-attribution.

2.6.4 Disposition Effect

Disposition effect is tendency to sell assets (e.g. shares) that have gained value and keep those that did lost value. Disposition effect can be explained by two hypotheses of prospect theory (prospect theory was introduced by Kahneman & Tversky in 1979) (1) the notion that people value gains and losses relatively from initial point (usually they refer to initial point which in stock market would be price for which the shares were bought) (2) that people look for risk when facing possibility of loss and that they avoid risk when certainty of gains is a possibility (Weber & Camerer, 1998).

Weber and Camerer (1998) did experimentally test disposition effect and concluded that there is a disposition effect. Subjects tended to sell lesser amount of shares when their price fell than when it rose. People also sold less when the price was lower than initial price of purchase.

2.6.5 Insider Trading

Insider trading can be defined as an exploitation of internal information about conditions of particular company by company insiders (e.g. corporate officers, directors and large stock holders and others) (Givoly & Palmon, 1985). Academicians, as well as general public, are interested in the amount of information insiders possess that general public does not. The profit that arise from use of such information is at the center of attention (Jaffe, 1974). Insider trading is one of information asymmetries that occurs on financial markets.

Insider trading is usually prohibited (Leland, 1992) even though some argue that insider trading translates into more accurate prices (prices created in market in which insider trading is allowed would contain private information) (Leland, 1992). Discussion about the effectiveness of prohibition and appropriate regulations are often discussed (see Carlton & Fischel, 1983).

2.6.6 Economics of Information and Financial Markets

Surprisingly, there has not been many attempts to merge Economics of Information theory with financial sector. If the economics of information govern behavior of agent's throughout economy, it must also govern information seeking behavior and decision making of market players. If we accept Stigler's (1961) theory, then we need to incorporate it into finance as well.

Economics of Information theory (EOI) could be already governing financial sector. What else are financial markets than place where sellers and buyers meet, where one seeks money to expand his company and other seeks opportunities to invest his disposable income. In that way stock markets are just few extra steps further into the simple Stigler's (1961) example of localization of trade to car dealers (thus decreasing search costs for everyone). Even when we look at individuals we can clearly see patterns of this behavior. Someone wants to invest his savings but lacks the knowledge and information necessary to make rational decision and because it would take him a long time to find out in what to put his money etc. (high search costs for information), he rather pays someone who will do it for him, thus different funds (e.g. mutual funds) are created.

Behavior of individual traders should similarly be governed by this theory. Trader should „compute“ whether the search costs of analysis (reading through past prices, company information etc.) is lower than expected benefit from that search. The role of price dispersion should in stock market play either bid-ask spread or past prices variation. According to EOI, with greater price dispersion the benefit of search increases, thus more people search and vice versa. Similarly, traders should search for further information in stocks which in history had greater variation which means that the information they search for may be more valuable.

Economics of information theory should govern behavior of financial markets as well as the general economics. These thought, however, are merely my ideas unproven and without any relevant empirical data to support it.

3 Method

In this part of my thesis I design an experiment to determine whether the Economics of Information Theory does correspond with agent's decision making. Economics of Information Theory states that agents search for additional information about prices as long as the expected reduction of minimum prices is greater than search of cost (Stigler, 1961). This theory, amongst other, states that higher dispersion of prices leads to more extensive search because the expected reduction of minimum prices is greater. This particular notion, although intuitive, has mixed evidence. Urbany (1986) and Bucklin (1966) have found some evidence supporting hypothesis that higher price dispersion leads to more extensive search. However, Goldman and Johansson (1978) have found none using panel data on gasoline purchases. All of them had difficulties in their respective research. Bucklin (1966) and Urbany (1986) faced difficulties with people's brand preferences. Goldman and Johansson (1978) faced reliance of collected data as some of the purchases were made by different people (anyone from household who used the automobile at that time).

Considering mixed and imperfect results, I propose an experiment that would assess the role of price dispersion on searching behavior.

3.1 Method

Method to test influence of price dispersion on information related decision making will be inspired by an experiment conducted by Irwin and Smith (1957). They gave students cards with a number on them. Students were asked to state when they think the mean of the pack is greater or lower than zero. The number of cards needed for students to reach conclusion was observed.

In my experiment, respondents (university students) will be given a deck of cards, 10 CZK and a wafer. There will be three kinds of decks of cards, each with different price dispersion. In deck A, all of the cards will have price 10 CZK written on them (no price dispersion), deck B will have numbers ranging from 8 CZK to 12 CZK and deck C will have numbers ranging from 6 CZK to 14 CZK. Money will be given to respondents in cash as it leads to more conservative (risk averse) decisions (Holt & Laury, 2002).

Respondents will be given 10 CZK and instructed to buy a wafer using prices written on the cards. They can either accept the price and buy the wafer or they can turn another card and so on until the end of the deck. It will be clarified that money they would have not spent on the purchase would be theirs to take, thus it will incentive them to search for lower price. Respondents will be instructed to wait 20 seconds between each turn in order to avoid people quickly skimming through the entire deck as well as to increase their search cost. Finally, when a respondent settles on particular price, he will write down number of turned cards and chosen price in a questionnaire, then takes bought wafer and remaining money and that is the end of experiment for him.

In the beginning of the experiment, respondents will not be told the hypothesis of the research so the potential bias in responding according to the administrator's wish would be prevented. As to the ethics of the experimental testing, respondent's personal data will be kept in anonymity and the respondents will be assured of it. In the end, according to ethical standards, the respondents will be told the purpose of the experiment and they would be also informed that they have the right to know the results of the research after its results will have been analyzed.

If Economics of Information Theory corresponds with agent's behavior than respondents who were given deck A should on average draw the least number of cards. Respondents with B deck should on average draw more cards than respondents from group A and finally respondents with deck C should draw the highest number of cards. That is because people in group A should quickly realize that there is no price dispersion and that any further search is only wasting resources (time). People in group B should search more extensively because the price dispersion means possibility of gains from lower price. Similarly, group C should search the most extensively because the gains from search are highest.

3.2 Hypotheses

Hypothesis 1: There is a difference in number of price cards turned between groups with different price dispersion.

Hypothesis 2: Higher price dispersion leads to higher number of turned price cards.

4 Results

Hypothesis 1: There is a difference in number of price cards turned between groups with different price dispersion.

Hypothesis 2: Higher price dispersion leads to higher number turned of cards.

A one-way between subjects ANOVA with contrasts was conducted to compare the effect of price dispersion (frequencies can be found in table 1) on number of price cards turned ($N=89$, $Min=1$, $Max=22$, $M=7.74$, $SD=4.31$) for *no dispersion* ($M=6,85$), *narrow dispersion* ($M=9,66$) and *wide dispersion* ($M=9,66$).

Tab. 1 Descriptive statistics of price dispersion

	Frequency	Percent	Cumulative Percent
no dispersion	27	30.3	30.3
narrow dispersion	32	36.0	66.3
wide dispersion	30	33.7	100.0
Total	89	100.0	100.0

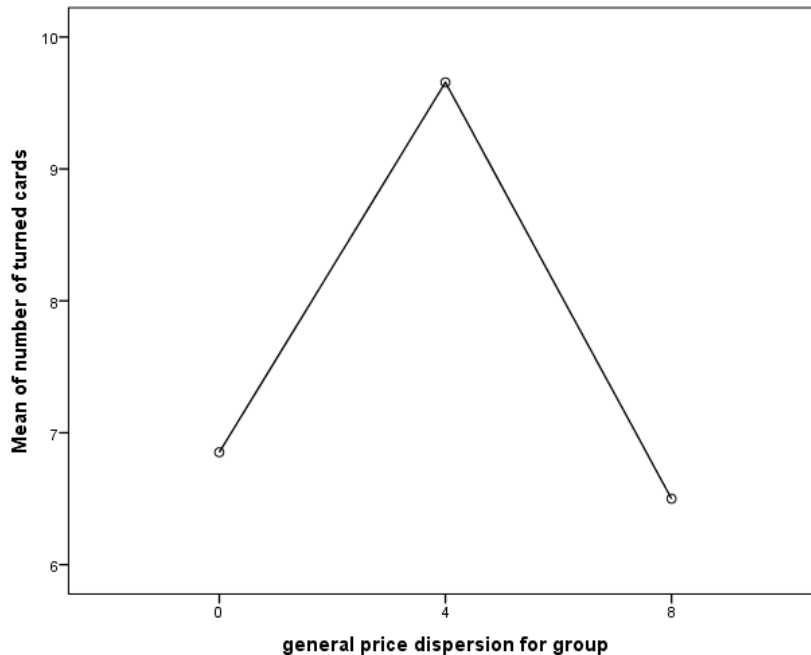
Although original sample size was 102, there were 14 outliers diagnosed. Thirteen of them were the same values, more than four standard deviations distant from the mean. Simultaneously, they equaled the maximum value possible. Some of the respondents declared that they had turned over all of the cards just for the reason of curiosity. I assumed that the reason might be similar for all of the respondents. Therefore, they were not included in the analysis. However, the remaining outlier was included in the data because of the lack of the theoretical reasons for not to do so.

There was a significant effect of price dispersion on number of price cards turned at the $p<0.05$ level for the three conditions, $F(2, 86) = 5.476$, $p = 0.006$. However, the price dispersion explains only 13% of number of price cards turned variance, $\eta^2=0.127$.

Planned contrasts were also added to the ANOVA model. Equal variances were not assumed (Levene statistic $F(2,86)=10.086$, $p<0.001$). Planned contrasts revealed that the *narrow price dispersion* significantly increased *the number of cards*

turned, $t(53,589)=-2.774$, $p=0.008$. However, the difference between *no dispersion* and both *narrow* and *wide dispersion* was not found significant, $t(74,506)=1.582$, $p=0,118$. As you can see in the chart 1, the means of cards turned for *no dispersion* and *wide dispersion* were very similar. A significant difference between *narrow* and *wide dispersion* can be also seen in this chart.

Chart 1 Means plot for planned contrasts



Therefore, the *price dispersion* was recoded and the multiple linear regression was additionally conducted to predict *number of cards turned* based on the categorical *price dispersion* with two levels – *narrow* and *wide dispersion*. A significant correlation between *price dispersion* and *number of cards turned* was found, $r=-0.33$, $p=0.04$. A significant regression equation was also found, $F(1,60)=7.329$, $p=0.009$, with an $R^2=0.109$. Participant's predicted *number of cards turned* is equal to $12.813 - 0.789(\text{price dispersion})$. Participant's *number of cards turned* decreased approximately 0.8 card for each CZK increase in price. The *price dispersion* was a significant predictor of *number of cards turned*, explaining 10.9 % of its variance.

Tab. 2 Regression coefficients for number of cards turned

	Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	9.656	.811		11.907	.000	8.034	11.278
price dispersion	-3.156	1.166	-.330	-2.707	.009	-5.488	-.824

5 Discussion

Results of the experiment are somewhat surprising, instead of anticipated results, I have found significant negative correlation between price dispersion and number of cards turned. *Narrow price dispersion* significantly increased number of cards turned.

Although the first hypothesis is supported by the empirical data, the second one is supported with opposite direction than expected. The *price dispersion* describes only small percentage (10.9%) of *number of cards turned*, explaining 10,9 % of its variance with correlation $r=-0.33$. These findings to some extent suggests that greater dispersion does not always imply greater search, but that it may even mean opposite. It is also very interesting that the results of the control group and of the group with wide dispersion are very similar. It may mean that there is a significant influence of price dispersion on agent's behavior but only to some point where the trend stops and then the curve decreases again. In other words, price dispersion may cause the extended search but if the dispersion is too wide, the respondents somehow give up on searching. On the other hand, this trend may also be caused just by the smaller valid sample sizes so it could be an interesting phenomenon for further research to observe.

I have faced some difficulties in this experiment, including; 1) number of outliers 2) number of respondents 3) cost of time 4) low expenditure 5) previous knowledge.

1) The number of outliers (13 with value of 24 and one with value of 22) might have been partially caused by curiosity. Some of the respondents reported that they realized much sooner that all the prices are 10 CZK (in A group most of outliers were found), but that they wanted to know whether at the end of all 24 cards there is some lower card (they wonder whether there is a catch in it). Another explanation for this behavior might be sunk cost fallacy, respondents turned cards and after while continued to search so that the already spent time would not be in vain. Because I am not sure which of these explanations played role here, I have discarded those results. The other outlier (value 22) was kept because the reason obviously was not curiosity. I suggest that in future the experiment would be done with decks of many cards (let's say hundreds) so that no one would spend hours simply because of curiosity. The other option for the further research methods may be for example that all of the cards are held by the administrator who is giving them one by one to the respondent so the respondent would not know the exact, nor the approximate amount of cards available.

2) Number of participants could bias the results, too. In the beginning of the analysis, there were 102 respondents, which was exactly the sample size needed for ANOVA analysis to gain high effect size, according to statistical software G-POWER. Unfortunately, thirteen respondents were discarded as outliers because they significantly biased the data, which have lowered the effect size to the rather medium level. Despite 89 respondents were sufficient to get the results of multiple

linear regression, it would help to replicate this experiment with greater sample size for getting higher effect size.

3) Cost of time of respondents vary, that is why only university students were respondents, time costs among students should not vary as much as if the whole population would be included (people with high disposable income and those with low). But the differences even among students are great and might distort the results.

4) Low expenditure is a problem because people, according to Stigler (1961), search more when relatively high expenditure is being spent on particular purchase. This experiment had only small expenditure purchase. In future research greater amount of money should be given to participants so that they have greater incentives to search.

5.1.1 Implications for Future Research

To summarize, I propose that future research is conducted with 1) greater amount of money given to the participants 2) with deck of many cards so no one would go through all of them just out of curiosity or with a procedure that will prevent finding out the exact number of cards 3) to sort participants by their disposable income (which means cost of time) 4) to conduct this experiment with more respondents. 5) To observe the difference between influence of no dispersion and large dispersion isolated to find out if their influence is really similar.

5.1.2 Implications for Economics and Financial Sector

Findings of my experiment imply that people may search more when they face lower or no dispersion of prices in small expenditure purchases. This directly contradicts Stigler's Economics of Information theory. Agents facing greater price dispersion should search relatively more than those who face lower or no price dispersion. This difference might be caused by low expected reduction of prices relative to the actual price. People may not be care about reduction of prices as small as 4 CZK or 2 CZK (even though they represent 40% or 20% discount) enough to search more extensively.

Another explanation of this behavior might be, that people do not care that much about search cost vs. expected benefit from lower price, but that they care more about "winning". By "winning" I mean that they in search do not care about actual benefit, but about lowering the price (even though it costs them more than they benefit, especially in group A, where they do not benefit from reduction of prices at all). I think people in this situation just want to lower the price and will search until they do (or realize that it cannot be done). So people in group C quickly lowered the price by at least 2 CZK (20%) and were satisfied with it. People in group A and B tried to lower the price and searched more to do so. Especially, in group A people should have quickly realized that there is no price dispersion and that they only waste their own time, but they did not regard this, rather try to lower the price and turned more cards.

The implications for economics and financial sector are mainly in realization that people do not evaluate information seeking behavior by benefits (lowered price) against costs, but they are governed also by “winning” or some satisfaction that arises from discounting the price.

To continue with an idea of economics of information theory in financial sector I stated that bid-ask spread or variance of prices traded in the past, might be equivalent of price dispersion in financial and stock markets, therefore I conclude that market players might not actually search for more information (because greater variance of past prices might indicate that in future there will be more variance of prices) as I stated, but that this research indicates that this line of thought might be wrong, especially when small dispersion and small expenditure is considered.

6 Conclusion

In this bachelor thesis I have reviewed academic literature regarding information and agent's decision-making behavior and different approaches to the role of information in economics and financial markets. Economic approaches ranging from classical economics to Stigler's (1961) Economics of Information theory as well as information asymmetry, behavioral economics, efficient market hypothesis, behavioral finance, information cascades and others.

Furthermore, I have designed an experiment that have tested hypotheses of Economics of Information theory on agent's decision-making, regarding information seeking behavior. Hypotheses were testing whether price dispersion affected information seeking behavior. According to Economics of Information Theory, agent's should search for lower prices as long as expected benefits from that search (expected reduction in minimum price) is greater than cost of search (cost of time, cost of passed opportunities). That means that when there is wider price dispersion (because the expected reduction of minimum price is greater) people should search relatively more than when there is smaller or no price dispersion.

Results of my experiment indicate, that this may not be universally applicable law but that in some situations people may actually search more when they face lower or no dispersion. Possible reasons for this behavior were discussed. One of them might be that people do not evaluate solely on benefit vs. cost but that effect I call "winning" affects the outcome. People in low expenditure and low or none dispersion of prices purchases try to discount the price for the feeling of "winning" (or perhaps the word "bargaining" could also be used) and after some discounting and searching they stop searching for lower prices. People who face no price dispersion try to discount the price and search longer than others, that may be because even though they realize that they probably are wasting time (that they are unable to lower the price) they still want to and for some time try to "win".

Possible implications for future research are discussed as well as implications for economics and financial sector.

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