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# Disposition effect on the Hungarian Stock Market

Doctoral Thesis

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# 1. AIMS AND THE STRUCTURE OF DISSERTATION

Thoughts in connection with individual investors' capital market behaviour are as old as the development of capital market trade. In the first half of the 20<sup>th</sup> century *Selden* (1912) made people interested in the field happy with his own book, the title of which is "Psychology of the Stock Market", in which he concentrates on demonstrating that prices on the capital market are highly influenced by the actors' mental attitude, which is in close connection with their investments and trading activity. In the field of modern financial economics, we basically had to wait until the middle of the 1980s to see this field becoming a separate and truly accepted discipline, which is greatly attributable to the literally epoch-making works of *Daniel Kahneman*, *Paul Slovic* and *Amos Tversky*. Nowadays the field has its own journals and even the most prestigious journals of financial economics welcome writings from the field of financial behaviourism.

My dissertation mainly focuses on the disposition effect, which derives from a quite difficultly researchable field of financial behaviourism, since here we examine individual investment decisions, the base data of which are considered securities secrets, thus it is quite difficult to acquire them. According to my best knowledge – due to the hardships of acquiring trade data - such analysis has not been performed yet in Hungary; however, there was a survey conducted among university students by *Molnár* (2006), with the help of which he managed to highlight the existence of the disposition effect, although this analysis lacks real trade environment, real risk undertaking and unfortunately the robustness of the questionnaire research is also questionable.

The *main aim* of my dissertation is to analyse with the help of real trade data the propensity to disposition of my subjects of experiment. The processing of raw data was performed with the help of Microsoft Access, Excel 2007 and SPSS 15.0 programs. Due to the hardships of acquiring trade data (e.g. securities secrets) I wasn't able to analyse the disposition reducing

effect of learning and experience by foreign literature. However, later I would like to analyse this question as well with the help of a deeper data base.

In the *first chapter* of my dissertation I briefly introduce the theory of effective markets and financial behaviourism. I don't show them in details, since *Hámori* (2003), *Komáromi* (2002, 2003), *Molnár* (2006), *Ormos* (2009), *Ormos - Szabó* (1999a, 1999b) and other Hungarian authors have already done this in Hungarian language. I expansively demonstrate the Adaptive Markets Hypothesis (shortly AMH – *Lo* 2004, 2005), which haven't been specified in Hungarian literature so far and I also illustrate the surveys based on AMH. I was incited to introduce this theory in details by the fact that one of the main hypotheses of AMH, that is learning and experience also appear in most of the analyses dealing with disposition effect (learning and experience reduce the propensity to disposition, in other words the investor in the process of time will adapt to the given market situation). Secondly, to my mind the system of hypotheses created by *Lo* describes the behaviour of capital markets, thus the demonstration of it brings the reader closer to the understanding of the definition system of disposition effect which is included in the field of behavioural finance. Last but not least, I wanted to amplify the Hungarian literature dealing with the evolution of market efficiency analysing the developments in foreign exchange rates with a theory that hasn't been detailed in the Hungarian literature so far (*Oszkó* demonstrated briefly in 2010, but before this *Joó* detailed it in 2009).

I embedded the theories in connection with disposition effect (prospect theory, mental accounting, and the fear of regret and the lack of self-control) into the *second chapter* which demonstrates the disposition effect and in which besides the definition of disposition I show in details the wide international literature of the effect and the results of surveys conducted in this field. I demonstrate the findings of *Molnár* (2006) about a questionnaire survey conducted among Hungarian higher education students who became the slave of disposition.

In the *third and closing chapter* I show in details the data on which I based my research, my method of analysis and after these I look for answers for my defined hypotheses.

## 2. THE THEORETICAL FRAMEWORK OF THE DISPOSITION EFFECT

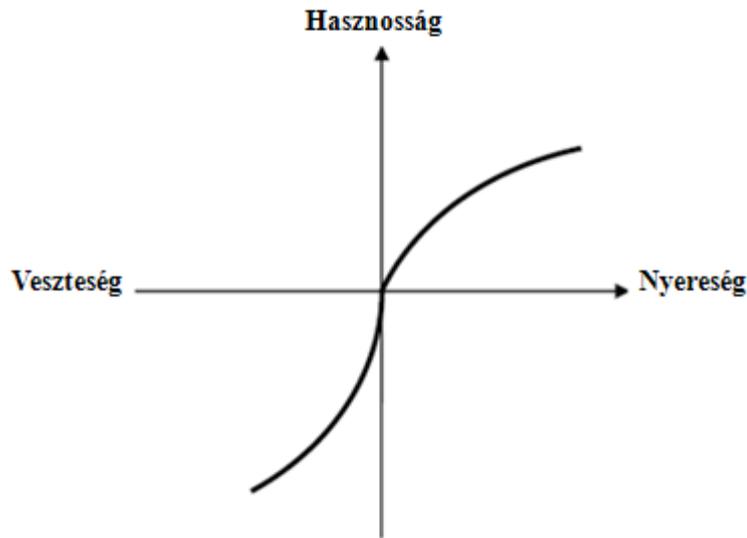
Disposition effect was first described by the authors *Shefrin - Statman* (1985), who showed that investors close their winning positions too fast, while they hold their losing positions too long. The bases of the hypothesis are the prospect theory, the mental accounting, and the fear of regret and the lack of self-control.

In prospect theory *Kahneman and Tversky* (1979) explain that in winning situations (range) people avoid risk (their utility function is concave), while in losing situations they prefer to take risk (their utility function is convex). According to this theory, in risky situations we are engaged in the changes in our property instead of measuring the utility of the available property and our actions are dominated by the aims of avoiding losses.

This means that we are afraid to close our losing positions (at least until we see a little shed of hope that prices would turn around), while in winning situations we are prone to grab the first opportunity to sell our assets. *Kahneman and Tversky* (1979) also refer to that a given amount of loss causes a greater sense of loss than a same amount of profit. Thus the value function (1. Figure) will be steeper in losing (convex) range.

In case of investment in shares it means that when our position turns to loss in case of a few percent of minus we have a small willingness to sell (we insist on our existing things – endowment effect), we don't admit our bad ideas, so we rather “await” until we see a profit on it.

1. FIGURE: A TYPICAL WEIGHT FUNCTION OF KAHNEMAN AND TVERSKY



Source: Kahneman and Tversky (1979): *Prospect Theory: An analysis of Decision Under Risk*, *Econometrica* Vol. 47, p. 279.

In order to define the break-point (on the verge of negative and positive utility) of the “S”-shaped utility curve described by the prospect theory, *Thaler* (1984) created the definition of mental accounting. According to this theory, the investor opens a new mental “account” in each and every purchase, which he/she handles as separate accounts irrespective of each other. Thus, both for its losing and winning positions, the investor uses separate accounts and accordingly, he/she is prone to apply separate strategies, which along with the utility theory of prospect theory explains the break-point at the value zero (reference point). *Thaler and Shefrin* (1981) also highlighted that we are prone to put both the gain on the exchange and the dividend into separated mental accounts. For example we are unwilling to get a stable, high-dividend-paying share with a decreasing trend off our hands, since we are afraid of losing high dividend.

Closing a losing position would be the proof of our previous poor decision, so we would rather hold it (in fear of a new bad strategy) and hence does the preference for risk appear in negative ranges. This hesitation of the investors shows the feeling of regret. On the contrary, in case of a winning position, the feeling of proudness appears, we are proud of ourselves to

have chosen well. Consequently, the individual is inclined to realise his gains fast for ensuring this sense of achievement. However, the feeling of regret does occur in these cases as well, if the given security's price further increases. This may lead to a hasty decision to buy more of the given security generally too late considering the process, which later qualifies as a greedy decision. Additionally, the phenomenon may also be observed in a way that we attribute poor decisions to events beyond our control and on the contrary, in case of a gain we deem it our personal great achievement.

The above-described trading strategy full of heuristic distortions applied on psychological basis is called overcompensation in secondary literature based on the works of *De Bondt and Thaler* (1985, 1987). This phenomenon may be the cause of the return to the average, which as a process means a negative autocorrelation for the prices of the shares. It is profitable in short term (1-2 months) (see the details in *Bremer and Sweeney*, 1988; *Lehmann*, 1988; *Jegadeesh*, 1987), but on the long run it is not a viable strategy, as in these cases the momentum effect prevails (*Jegadeesh and Titman* (1993) justified it for 3-12 months). This means that in short term, the profitable (loss-making) shares' prices increase (decrease) further, which completely contradicts the individual's basic capital market expectations (the joint effect of greediness, 'herding' and the technical analysis comes into operation). Thus, appropriate self-control becomes vital during successful trading.

*Thaler and Shefrin* (1981) demonstrate their self-control hypothesis in connection with the above, where according to their reasoning the rational (planning) part of the human brain fights against the emotive, short-sighted (acting) part. This theory appears in an extended way in *Lo's* (2004) hypothesis of adaptive markets. *Lo* (2004, 2005) explains that in some cases of strong emotional impacts, rational planning loses against the short-sighted brain function (suffering from myopia). Based on these results, learning has a vital role in the Adaptive Markets Hypothesis<sup>1</sup> (AMH).

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<sup>1</sup> The adaptive market hypothesis is called complex adaptive systems' hypothesis as well, I use the first definition consistently.

According to *Thaler and Shefrin* (1981) this planning-acting model and the prevalence of emotion lead to mental accounts and to cases where we hold our losing positions for too long thus delaying regret and giving a chance to avoid it fully in the end.

For example traders examined in the doctoral dissertation of *Glick* (1957) were aware that holding loss is not rational, yet they were reluctant to realise their losing position due to the low self-control. Professionals usually use manual or mechanical darning with which they can eliminate the annoying effects of anchoring. Darning means that we realise our open position on a given, pre-determined price level, which protects us from the endowment effect. To apply a strategy like this, discipline and self-control are essential.

The connection between prospect theory and disposition was later examined by *Hens and Vlcek* (2005), and *Barberis and Xiong* (2009) as well. However, they came to the conclusion that although the prospect theory supports the disposition effect in some cases, it causes contradictory reactions in others. Thus they demonstrated higher risk-taking in winning positions (doubled position) and smaller risk-taking in losing conditions (half of the original position). On the other hand, *Kaustia* (2008) came to the conclusion that prospect theory does not explain the disposition effect, because he believes it indicates that any differences in the original purchase price means that selling dispositions should decrease (at least based on the decreasing steepness of the “S” utility curve). On the contrary, according to the findings of *Kaustia* (2008) in a winning range, selling dispositions are either constant or increasing; while in a losing range investors are indifferent to the amount of their losses. The increasing selling disposition emerging in a winning range can be explained by the long term negative autocorrelation of yields of shares (return to the average) (e.g. *French and Roll*, 1986). In a losing range the endowment effect can be one of the main reasons of being reluctant to sell it.

*Odean* (1998) was the first to undertake the explicit measurement of the disposition effect; he empirically proved the truthfulness of the hypothesis by using real trade data accessed from 10.000 investors' securities accounts. His findings demonstrated that individual investors hold their losing positions for too long, while they do the opposite in winning positions. Later, the authors *Shapira and Venezia* (2001) and also *Feng and Seasholes* (2005) further elaborated the methodology of *Odean* (1998) and they justified the relevance of the phenomenon as well. The empirical justification of the disposition effect hypothesis first concentrated on the investors of the USA. However, later the examination of the behaviour of other countries supported its truthfulness for the markets of Estonia (*Talpsepp* 2009), Finland (*Grinblatt and Keloharju* 2001), Portugal (*Cerqueira Leal et al.* 2010), Germany (*Weber and Welfens* 2007), Israel (*Shapira and Venezia* 2001), Australia (*Brown et al.* 2006), Taiwan (*Cheng et al.* 2009), Korea (*Choe - Eom* 2009) and China (*Feng and Seasholes* 2005).

### 3. THE SYSTEM OF HYPOTHESES

In my dissertation I analysed the following hypotheses:

**H1: It is also true for the subjects of the experimental analysis that they realise their winning position fast, whereas they hold their losses long, thus they also become the slaves of disposition.**

Similar to international literature I also have the assumption during my analysis that higher education students participating in my experiments in 2009 and 2010 (altogether 133 people) are the slaves of disposition, which has already been shown among Hungarian university students by *Molnár* (2006) with the help of questionnaire surveys. I tested this hypothesis of mine at an aggregate investors' level with three empirical methods: with the PGR-PLR of *Odean* (1998), with the holding time of *Shapira and Venezia* (2001), and with the logit regression of *Feng and Seasholes* (2005) based on TGI-TLI.

**H2: Investors with the best yields are less or not at all prone to disposition, while those with the worst performance are strongly affected by this. Proneness to disposition deteriorates the investment performance.**

Stock market investors (including me as well) could experience in connection with their own accounts the harmful effects of the fast realisation of gains and the convulsive holding of losses, that's why a lot of investors protect themselves from endowment effect by defining a stop-loss level. Based on my investment experiences like these I analysed whether proneness to disposition is really harmful to individual accounts. I analysed the hypothesis with the methods of *Odean* (1998) and *Shapira and Venezia* (2001) in a way that I analysed the trade data of investors with the best/worst 20% of yields participating in the stock market game in 2009 and 2010. For the testing of the method of *Feng and Seasholes* (2005) at an individual level the length of the games' time intervals wasn't sufficient.

**H3: Subjects of experiment with the best and worst yields are prone to fall into the trap of disposition when they meet those leveraged investment instruments that mean higher risks.**

In contrast to share positions, when trading with leveraged investment instruments there is usually a much higher risk-taking, thus the subjects of experiment may as well face with their poor decisions in the short run. In case of significant percentage of losses this can easily lead to palsy and definite insistence. I analysed the hypothesis with the method of *Shapira and Venezia* (2001), since this way I could analyse the proneness to disposition in connection with leveraged transactions.

**H4: Shares sold by the subjects of experiment perform significantly better in their average trade horizon than the shares purchased by them right after the sale.**

*Odean* (1999) and *Chen et al.* (2007) also demonstrated that investors mistimed their positions. Thus the shares sold by them performed significantly better in the next period than those bought after the selling. For the testing of this hypothesis I compared the yields of the sold and of the firstly bought shares after the selling (the method of *Odean* from 1999) counting by the passing of 1,5,6,7,14,21,63 trading days from the purchase of the first share after the selling. I applied a two-sample t-test to determine the significant difference.

**H5: There is no significant difference between the yields of shares sold and purchased by subjects of experiment with the best yields, whereas it still persists in case of the worst ones.**

Similar to the disposition effect I also examined in the timing of buying and selling positions whether there is a difference between the investors with the best/worst 20% of yields who took part in the experiments of 2009 and 2010. I hypothesised that the more successful subjects of experiment do timing better. I compared the examination with the analysis between yields introduced in the H4 hypothesis.

**H6: The increase in trading frequency reduces the yields on the investments of the subjects of experiment.**

Most of the students participated in the stock market game in 2009 and 2010 did not have a long run trading experience, thus I had the expectation that they cannot realise higher yields than the transaction costs by increasing the trading frequency. This effect may be helped by the phenomenon of overconfidence about which we can talk if an investor overestimates the accuracy of its decisions in an uncertain environment. The overestimation of these skills may lead to excess trading which reduces the investment performance (*Barber and Odean, 2000 and 2001*). I analysed the hypothesis with a regression test between yield (dependent variable) and trading frequency (independent variable).

## 4. THE METHODOLOGY OF THE RESEARCH

During the analysis I used the three relevant methods that measure the disposition effect as described in the literature. The name of the creators, their methods and their advantages and disadvantages (briefly summarised) are included in Table 1. I applied the SPSS program for the regression calculations necessary for the analytical section.

The first internationally known method was *Odean's* (1998) PGR and PLR based analysis. The essence of the method is that I examined the portfolio of an investor on every trade day when it sold a share and I divided its positions into four possible categories depending on the sale-purchase-actual price. In case of sold shares, the sale price was compared to the original average purchase prices and this categorised the securities sold in winning (realised gain – RG) or losing (realised loss – RL) groups.

1. TABLE: THE METHODS OF MEASURING DISPOSITION EFFECT

Author	Method	Advantage/disadvantage
Odean (1998)	PGR, PLR	It is well applicable to an investor group as a whole at cumulative level. Its disadvantage is that it analyses only the day of the sale and the purchase.
Shapira and Venezia (2001)	Holding times	It is well applicable at cumulative level. Similar to Odean its main disadvantage is that it analyses only the day of the sale and the purchase.
Feng and Seasholes (2005)	TGI, TLI	It is also applicable at individual level in case of a large sample. It follows the whole life cycle of purchased capital market instrument.

*Source: Own compilation*

I ranked each and every other share which was in the portfolio of the investor and was not sold based on the average sale price and the given day's closing price as unrealised gain (paper gain – PG) or unrealised loss (paper loss – PL).

Similar to *Odean* (1998) under realised or unrealised winning position I understand the cases, when the given trading day's minimum and maximum price was above the average sale price (in the first case the sale happened and in the second, the share was kept). Accordingly, I categorised instruments into realised or unrealised loss position, if the given trading day's

minimum and maximum sale price was below the average sale price (and the share was sold or kept).

I examined disposition effect at an accumulated level by the share sales' extant portfolios after ranking them accordingly with the aid of the following correlations:

$$PGR = \frac{RG}{RG + PG} \quad (1)$$

$$PLR = \frac{RL}{RL + PL} \quad (2)$$

If there is a significant difference between these two calculated values (PGR is significantly higher than PLR) then investors are characterised with disposition (DE). I analysed the existence of a significant difference with the aid of a two-sample t-test.

With the aid of the *Odean* (1998) method I examined the existence of disposition by comparing the number of realised gains to the actually realisable gains at the aggregate investors' level at the closing position of a given period. The proportion of gains realised (*PGR*) and the proportion of losses realised (*PLR*) are equal in case there is no disposition (as the two quotients show the ratio of the actual realisation). However, the value of *PGR* is significantly higher than the value of *PLR* if we rather realise winning securities too fast and hold losing securities too long. In other words: in this case investors are less intent on realising their losses, thus disposition effect (DE) characterises their behaviour.

When defining *PGR* and *PLR* values I used several conditions. In cases when the average purchase price was between the daily minimum and maximum amounts, I disregarded these positions and did not calculate with them, since the daily data was not at my disposal, thus it was impossible to rank the kept positions as winning or losing. Furthermore, I also disregarded one-element portfolios, when the client remained without a capital market instrument after selling the given instrument. Finally, similar to *Odean* (1998), I only took share positions into consideration (leveraged share positions also excluded) when defining *PGR* and *PLR* values. The reason for this latter decision of mine was on the one hand

that the incidental compulsory liquidation of deadlines and certificates would distort my findings; on the other hand in the examined periods there was a significant amount of certificate expiration, which also resulted in artificial closings on the individual accounts. In case of non-leveraged share portfolios, I did not have to consider these artificial closing conditions.

The disadvantage of the method is that during analysis it only considers the day of sale and purchase; consequently, the exchange rate movements during the holding of the shares are not shown in the results. It poses a further problem that analysing at an individual level in case of a difference between PGR and PLR, we would mechanically get the fake result during the regression analysis that the more shares we hold in our portfolio, the less inclined we are to the disposition effect. However, this would only be the natural concomitance of the PGR-PLR calculation method as *Feng and Seasholes (2005)* have already demonstrated it. The situation is the same if we perform more than one sale in the same year, as in this case, the difference between PGR-PLR would indicate a growing and the PGR/PLR quotient would indicate a declining disposition value. Thus, considering the above, the existence of the disposition effect is only worth analysing at the aggregate level using the PGR, PLR calculation method of *Odean (1998)*.

The other applied method was the analysis of holding times elaborated by the co-authors *Shapira and Venezia (2001)*. Here, I compared the holding times of winning and losing positions. The disposition effect is present in this case if the average holding times of the positions closed as losing is significantly longer than the average holding times of winning positions. During my analysis I determined winning/losing closed positions based on four inventory evaluation methods (FIFO, average purchase price, FIFO+costs, average purchase price+costs). I calculated holding times in trade days and in order to measure significant differences I applied a two-sample t-test. The inclination to disposition is thus measured by holding times in this case, based on which if we hold our winnings for less trade days overall and we “await” (hold for a long time) our losses, the disposition effect would also be proven.

Similar to *Odean's* PGR, PLR method, the problem with the method of *Shapira and Venezia* (2001) is also that we may only examine the day of sale and purchase, thus we cannot react to price moving that occur in the interim. Accordingly, it may easily happen that an investor sells a share in winning position after 20 days, while its price rises above the original purchase price only on the 20<sup>th</sup> day after the purchase. The possibility to observe intermediate days is made possible by the method elaborated by *Feng and Seasholes* (2005).

This third method is based on the TLI, TGI method created by *Feng and Seasholes* (2005). The method applied by the co-authors is based on the logit regression also applied by *Grinblatt and Keloharju* (2001), where they assign number 1 to the positions sold on the given day and number 0 to the positions kept on the given day. During the regression analysis this will be my dependent variable. *Feng and Seasholes* (2005) extend their research with a survival analysis, which provides them with the probability of selling positions as winning and as losing. Based on their research I created two independent variables: TLI (Trading Loss Indicator), which took the value 1 in case the share was sold in a losing position, or it was traded at a paper loss, i.e. its actual value was below the reference price, in all other cases, the value of TLI was 0. The other index is TGI (Trading Gain Indicator), which took the value 1, if the given share was sold in a winning position or if it was traded at a paper gain and its value was 0 in all other cases. I took the average purchase price weighted with the number of shares as a reference price, while when ranking into the winning/losing categories I calculated with the daily minimum-maximum prices as shown at the PGR-PLR method. After calculating the above numbers, I ran the logit regression analysis in order to define the presence of the disposition effect.

In case the value of TLI during the estimation is smaller than 1, which indicates basic selling inclinations, it means that the participating investors are (TLI value -1%) less willing to sell their losing positions than it would be indicated by the basic selling probability. However, in case of a value above 1, their selling inclination would be higher. Using the same logic when interpreting the values of TGI, I may conclude that investors realise gains more willingly in

case of a value above 1, while if the value is below 0, they are less willing to realise their gains.

The novelty of the method of *Feng and Seasholes* (2005) arises from that investors' behaviour is applicable not only to the analysis of aggregate, but that of individual level as well, which problem has already been demonstrated in connection with *Odean* (1998) and *Shapira and Venezia* (2001). In case of the method of *Feng and Seasholes* (2005) I could observe the whole life cycle of capital market instrument purchased by the investor, which this way provided a better view of investors' decisions and of the existence of disposition effect.

When determining TGI-TLI values I used the same condition that I used in case of PGR-PLR method, in other words I only examined share positions. The reason for my decision on the one hand was the distortion of artificial closings as described at PGR-PLR method, and on the other that in case of forward indices short selling is ensured, which would result in different investment psychology and yield/risk relations among university students.

Besides the three methods aimed at defining the disposition effect I also analysed the sale and purchase decisions of investors from other aspects. Here, similar to *Odean* (1999) and *Chen et al* (2007) I examined how the average yields of shares sold by investors and then bought first after the sale changed compared to the past and the future of the transaction. Because previous authors found that the sold shares showed a significantly higher yield on average than the bought ones. In my analysis I calculated trade days from the first share purchase after the sale (1, 5, 6, 7, 14 trade days, 1 and 3 months). During analysis I ran a two-sample t-test to define the significant difference. In my research I calculate trade days from the first share purchase after the sale.

The method could normally not work without weighting with risk, as it is obvious that we expect lower yields from lower risk investments than from higher risk ones. However, in a short term analysis the differences in calculating normal yields are quite small, thus I simplified my analysis accordingly, similar to the earlier researches.

## 5. THE EVALUATION OF HYPOTHESES

The available data made it possible to analyse six main hypotheses in my dissertation. Having seen the results, all in all it can be said that the inclination to disposition, as we see it in international literature, appears in case of the subjects of Hungarian experiments as well and so does the harmful effect of it.

**T1: Subjects of experiment usually realise their winnings fast, whereas it is usually difficult to get their losing positions off their hands.**

It is also a characteristic of the Hungarian higher education students (the subjects of my two experiments) that they realise their winning positions too fast, whereas they are prone to await the losing positions. I analysed my hypothesis with three methods. First I analysed the inclination to disposition of the subjects of experiment with the PGR, PLR-based indicators of *Odean* (1998). Having evaluated the findings I found that university students sold their winning positions in significantly higher proportion in the samples of 2009 and 2010 and also in the consolidated sample of 2009-2010. The logit regression method of *Feng and Seasholes* (2005) that is based on the indicators of TGI, TLI also confirmed my hypothesis, since the participants of my experiments were very prone to sell their winning positions, whereas they insisted on their losses very much.

This view was overshadowed by my results based on the holding time method of *Shapira and Venezia* (2001) according to which results the subjects of experiment kept the gains for more days in case of closed positions. It is important to note that in both time intervals of the analysis a stable bull market dominated in capital markets. In most cases losing positions (mostly in case of shares) were not closed until the end of the game. In case of the game of 2010 for example many people had kept their few-week long share positions that were under the purchase price also before the downward share market correction that began in May, which I could not follow with the aid of a method based on the study of *Shapira and Venezia*

(2001) (the exact closing prices after the period of the game would have been necessary for this).

**T2: Subjects of experiment with the best yields are not the slaves of disposition. However, in case of those with the worst investment performance the inclination to disposition is evincible.**

Based on the first thesis most of the subjects of my two experiments were the slaves of disposition effect. The harmful effect of it was demonstrated by several authors (*Cheng et al.*, 2009; *Wermers*, 2003; *Frazzini*, 2006; *Choe and Eom*, 2009) in international literature, therefore I analysed from two sides whether yield really affects investment performance. Regarding my results it can be said that during experiments the inclination to disposition had a harmful effect, which reduced the stock-market efficiency of higher education students.

In this research I analysed the aptness for disposition effect of investors with the best and worst 20% of performance during the period of two stock market games. I analysed the hypothesis with the PGR, PLR-based indicators of *Odean* (1998) and with the method of *Shapira and Venezia* (2001) that is based on holding times. My hypothesis was fully proved by my results based on the method of *Odean* (1998), however it was just partly proved by the results based on the method of *Shapira and Venezia* (2001), since in case of the latter not every inventory evaluation method (FIFO, FIFO+costs, average purchase price, average purchase price+costs) showed unambiguous result.

**T3: Subjects of experiment with the best and worst yields are prone to fall into the trap of disposition when they meet those leveraged investment instruments that mean higher risks, but due to the small size of sample it did not always provide a significant result.**

The inclination to disposition is further intensified among university students with the best and worst investment performance when meeting a higher risk, which sheds light on that those wishing to invest should only deal with risky assets if they have appropriate experience.

I analysed the H3 hypothesis with the method of *Shapira and Venezia* (2001), where students both with the best and the worst investment performance kept their winning positions longer. This phenomenon turns around when meeting the leveraged positions; therefore both groups were prone to ‘stick’ in their losing positions.

**T4: Shares sold by the subjects of experiment performed significantly better in their average trade horizon than their shares purchased right after the sale.**

**T5: There was not in all cases a significant difference between the yields of shares sold and purchased by subjects of experiment with the best yields, whereas it still persisted in case of the worst ones.**

International authors (*Odean, 1999; Chen et al., 2007*) demonstrated that investors ill-time their transactions. Thus their sold shares perform better in the coming times compared to those purchased right after it. This phenomenon is also evincible in two of my experimental markets, where the recent exchange rate developments did not affect significantly the buying and selling decisions of investors.

For the analysis I used the method of *Odean* (1999), based on which I accepted H4 hypothesis. However, I could only partly accept H5 hypothesis that refers to the difference between the timing of the best and worst subjects of experiment. The worst ones usually do spoil the timing of their positions, which was also observed several times in case of the best ones, that is to say here my idea referring to the first part of my H5 hypothesis (there is no significant difference between the yields of shares sold and purchased by higher education students with the best yields) was not proved in all cases.

**T6: The increase in trading frequency reduces the yields on the investments of the subjects of experiment.**

The subjects of my two experiments without adequate knowledge of investment got worse results in case of higher trading frequency. An explanation of this can be the phenomenon of excess self-control (e.g. *Barber and Odean, 2000*), when investors regularly overestimate the accuracy of their decisions in uncertain environment. A practical form of it is manifested when they more often trade due to the overestimation of their skills.

I analysed the relation between the yield (dependent variable) and the trading frequency (independent variable) with the help of a regression analysis. In order to avoid distortion I excluded individuals entering into extremely lot of transactions (over 100) from the analysis. As a result of the analysis I found that the linear regression line explains best (4,7% at a 1% significance level) the relation between the two variables. Its direction was in line with prior expectations, that is to say the yield decreased by 0,235 percentage points in case of a trade number that increased by one.

## **6. LIMITATIONS AND FUTURE RESEARCH**

The greatest limitation of the dissertation was that I was not able to analyse the trade data for several years of a wider group of Hungarian investors (the applied method made it possible). Similar to others I also experienced that referring to securities secrets broker agencies are reluctant to hand over bulk trade data that could be the bases for analysis. Thanks to the results of the current research and to the research method neglecting the personal data of clients I hope that this analysis will be amplified to a wider group of Hungarian investors in the future, which would preferably twin with a multi-year sampling.

In this case I would be able to analyse bear markets besides bull markets. With the segmentation of investors I would be able to analyse this effect in the Hungarian capital market and in the relation of different investor's characteristics based on the inclination to disposition, the investment yields, the experience, the qualifications and the sex. In view of the current results I think that the analysis of the differences between sexes and the proneness of experience to reduce disposition as discussed much in foreign literature can be the main focuses of further research.

My two experiments conducted among university students also shed light on the existence of disposition effect and also on the harmful effect of it. The most important practical usefulness of the dissertation is that the answers of investors on capital market fluctuations (waves of panic and greediness) are not adequate in most cases, thus it is important to make students aware of this during education. In my opinion the existence of disposition makes it possible to make a forecast referring to a given share based on the decisions of individual investors. The increasing rate of unrealised loss (parallel to a sale in decreasing loss) within the position in a given share of a private investor may refer to a strong bear market. The decrease in the number of so-far unrealised losing positions (parallel to the increase in the number of positions realised with a little winning) may easily be the sign of the turn of a negative trend prevailing in the given share. From my point of view the analysis of this hypothesis may also give the basis for a future research.

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