Are Swedish Mutual Fund Managers Riding Their Losers Too Long?
Investigating the Disposition Effect for Professional Investors

Bachelor’s thesis in economics
Author: Erik Vilhelsson, 860604-8216
Supervisors: Hubert Fromlet
Erik Åsberg
Jönköping June 2011
Abstract

The fundamental assumptions in financial theory that markets are efficient and investors are fully rational are increasingly being questioned. Psychological aspects are becoming more and more important in explaining and understanding markets and investor behaviour. There is a need for investigating the behaviour of investors, not only the behaviour of prices, to accomplish healthier financial markets in the future. Not only do irrational investor biases lead to inferior returns, but on a larger scale it might have detrimental effects on markets. This study aims at exploring the disposition effect, which is the general tendency to sell winning investments too soon and holding on to losing investments too long. The focus is on Swedish mutual fund managers. It is extra important to study professional investors since they are believed to majorly set prices in the market. To do this trading data has been collected for six mutual funds. Then the proportion realized winners have been compared to the proportion realized losers, to see if there is a bias at either direction. Contrary to what was expected, the sample displayed a strong tendency to sell losers relatively more often than winners. During the time studied the market experienced a strong bull market which seems to have had an impact on the disposition effect.
# Table of Contents

1 **Introduction** ................................................................................. 1  
   1.1 Background ............................................................................. 1  
      1.1.1 Disposition Effect ............................................................... 2  
   1.2 Problem Discussion ................................................................. 3  
   1.3 Research Question .................................................................... 3  
   1.4 Purpose ..................................................................................... 3  
   1.5 Results ...................................................................................... 3  
   1.6 Disposition .............................................................................. 4  

2 **Research and Background** ................................................................. 5  
   2.1 Behavioural Finance ................................................................. 5  
   2.2 Evidence of the Disposition Effect ............................................. 5  

3 **Explanations of the Disposition Effect** ............................................... 8  
   3.1 Explanatory Model .................................................................... 8  
      3.1.1 Prospect Theory ................................................................. 8  
      3.1.2 Mental Accounting ............................................................. 9  
   3.2 Outdated Explanations ............................................................... 10  
      3.2.1 Portfolio Rebalancing and Higher Transaction Costs .......... 10  
      3.2.2 Unjustified Belief in Mean Reversion ............................... 11  

4 **Research Methodology** ................................................................... 12  
   4.1 Data Collection ......................................................................... 12  
   4.2 Methodology ............................................................................ 12  
      4.2.1 Hypothesis .......................................................................... 14  

5 **Results and Discussion** .................................................................. 16  

6 **Conclusion** .................................................................................. 18  

7 **List of references** ........................................................................ 18  

Appendix .................................................................................................. 21  
   A-1 Handelsbanken Sverigefond ....................................................... 21  
   A-2 Didner & Gerge Sverigefond ..................................................... 21  
   A-3 Carlson Sverigefond ................................................................. 22  
   A-4 Swedbank Sverigefond ............................................................. 22  
   A-5 SEB Sverigefond ....................................................................... 23  
   A-6 Nordea Sverigefond ................................................................. 23
Figures
Figure 1 Prospect theory value function .................................................. 8
Figure 2 Development of the OMXSPI Jan 2009 - Dec 2010 ....................... 12

Tables
Table 1 Consolidated results for all six mutual funds ............................. 16
\section*{Introduction}

\subsection*{1.1 Background}

The main pillar of financial analysis during the latest decades has been the \textit{efficient market hypothesis}, EMH (Shleifer, 2000). As described by Shleifer, EMH is built upon three main assumptions. First, investors are rational and evaluate prices rationally. Second, if a few investors are not rational, their actions on the market will be random and cancel each other out so that prices are unaffected by them. Third, if irrational investors will have an impact on prices, other investors who are rational will be there to take advantage of arbitrage opportunities in a way that assets are instantly adjusted to their intrinsic values.

Practically an extension of the EMH is the \textit{capital asset pricing model}, CAPM, which shares the most central assumption of rationality. Recent research has questioned the reliability of CAPM but it remains the most important financial model among practitioners (Berk & DeMarzo, 2007). A rational decision maker as seen by CAPM collects all relevant information, analyses it correctly and then makes the decision that provides him or her with the highest expected return, given a chosen risk level. In the real world people rarely work that way. The field that studies how people really makes decisions and how it affects markets is called \textit{behavioural finance} which considers psychological factors as important inputs. Ideas of behavioural finance have been around for decades. A major contribution was \textit{prospect theory} by Kahneman and Tversky (1979) where they in an important paper used cognitive psychology to explain various divergences of economic decision making from conventional theory. Although advances have been made in the field, a general acceptance or breakthrough of the thinking of behavioural finance has not been embraced until the last 5-10 years, marked by Kahneman receiving the Nobel Prize in economics 2002 for his work on prospect theory, together with fellow behavioural economist Vernon Smith.

One aspect for the increased disbelief in efficient markets and emergence of behavioural finance is the occurrences of bubbles in markets. The mostly unanticipated recent global financial crisis has put many economists in doubt of current models and allocation of research efforts. The roots of this failure can be traced to the focus on models which inherently disregard key elements driving outcomes in real economies (Colander, et al., 2009). Regarding the recent bubble, Krugman (2009) said “The belief in efficient financial markets blinded many if not most economists to the emergence of the biggest financial bubble in history, and efficient-market theory also played a significant role in inflating that bubble in the first place.” In the same article he expressed despair over the misconceptions coming from the neoclassical school of economics where EMH is fundamental, which influence all too many major economists. Before that there was the so called “dot-com” bubble, the boom and bust of stock markets in most industrialized countries, driven by the enormous popularity of technology stocks. About a year before the bust of the bubble Thaler (1999) had made a survey where he asked professional investors about their estimation of the intrinsic value of a row of technology stocks. On average they estimated them to be 50% above their fair value (in retrospect we know they were far more overvalued than that). How can such a situation exist? Many suggestions to this question have been presented (see e.g. Camerer, 1997), and obviously, this has to do with psychology. If behavioural finance is relevant in explaining crises it must be important in preventing them.

With greater understanding of economic anomalies, this new knowledge can be used to create better financial models, or improve existing ones. Maybe the most significant area of the field is to adapt models and theories so that unrealistic assumptions can be relaxed and markets can be better understood.
There is however a discussion of how important behavioural finance is in the context of EMH. Ross (1999) claims that as markets are being increasingly driven by professional investors the behaviour of individual investors is getting less relevant, assuming that the professional investors are less likely to be irrational, at least as seen as a group. These rational professional investors, by exploiting arbitrage opportunities, set prices on the market in line with the EMH.

Following that proposition, it certainly sounds like institutional investors are the key market participants. In fact, Swedish together with foreign institutions today own 85% of the total worth of all Swedish stocks (Dagens Industri, 2011).

In Sweden the popularity of mutual funds has grown rapidly the last 30 years. They bring saving opportunities that people normally cannot attain by themselves, such as reduction of risk through high diversification and possibility to invest worldwide on markets otherwise difficult to reach. Lately the Swedish pension system has contributed to an even greater allocation of Swedes’ savings into mutual funds. Including the portion of the common pension savings that are placed in mutual funds, the premium pension system, nearly 100% of the Swedish population (18-74 years old) are saving in mutual funds. Excluding savings for pension, 82% of the adults own shares in some mutual fund. Moreover, 66% of all children in Sweden have savings in mutual funds. Not only have the number of persons increased but also the total share of peoples’ savings that are allocated to these funds has increased. These numbers stand the highest in the world, according to a 2010 report from The Swedish Investment Fund Association (Fondbolagens förening, 2010). In the same rate as the savings have grown, the selection of different funds has become very large in number ranging from various geographical areas or industries.

It is easy to form the belief that the managers of the funds are professional and rational investors since they are educated, experienced, have access to the best analytical tools available, and furthermore charge well for their services. But are these professional investors really unsusceptible to psychological investor biases?

Academics of behavioural finance have documented and discussed many topics concerned with the bounds of rationality, such as herd behaviour (see e.g. Shiller, 2000) and the equity premium puzzle, which is the observation that the difference of return between stocks and bonds is too high to be explained by risk alone (Benartzi & Thaler, 1995). Another among these many investor biases studied within behavioural finance which challenge the assumptions of EMH is the disposition effect.

1.1.1 Disposition Effect

The disposition effect can be defined as the general tendency to sell investments that have gone up in value relative to their purchase price, while keeping investments that have gone down in value, relative to their purchase price. It implies that when an investor sells an asset in her portfolio there is a higher propensity that it will be one that has increased in value relative to the purchase price rather than one that has decreased. Or put differently, investors are less willing to recognize investments that are on the loss side, but are more willing to recognize gains. Hence the expression: “Selling the winners and riding the losers” (Shefrin & Meir, 1985). Barberis and Xiong (2009) consider the topic one of the most striking puzzles within behavioural finance.

The disposition effect has been tested and documented by Odean (1998), among others, who found that individual investors are prone to the disposition effect. To see if the same was true for professional investors Shapira and Venezia (2001) set out to compare the
disposition effect between independent investors and professional investors and found that both groups displayed the disposition effect although to a weaker extent among the professional investors.

There is a significant body of research on the disposition effect, although the Swedish stock market has not been significantly explored on this particular topic. This research aims at further exploring that same line as Shapira and Venezia (2001), by testing the disposition effect on Swedish mutual fund managers. To do this, trading data from six mutual funds have been collected over a time span of two years. Then the proportion realized winners is compared to the proportion realized losers to see if there is a behavioural bias at either direction.

1.2 Problem Discussion
The existence of the disposition effect among professional investors would constitute a problem for two main reasons. First of all, it is detrimental to portfolio performance. As a contrast to the disposition effect there is price momentum. Jegadeesh and Titman (1993) documented that stocks that performed very good (bad) the last 3-12 months continued to perform well (bad) the next 3-12 months. Consequently there is a strong implication that disposition prone investors would experience inferior returns. Second, professional investors mainly manage other people’s money, often pension savings, which then preferably should be managed rationally.

Furthermore, it is widely accepted that professional investors are majorly responsible for setting prices on markets (Shapira & Venezia, 2001), which makes it extra important to study this group.

Finally, it is important to increase knowledge about psychological biases so that financial markets can be better understood and models, policies and theory can be improved in order to get healthier financial markets in the future.

1.3 Research Question
Do Swedish mutual fund managers display the disposition effect in the sense that they sell winners proportionally more often than losers?

1.4 Purpose
This report seeks to answer the question if professional investors display the disposition effect and to which degree this bias seems to be present, if at all. The research focus in this case is on Swedish mutual fund managers. Sweden which is the country that saves the most in the world in mutual funds (Fondbolagens förening, 2010), must then have a developed market for mutual funds. For that reason Sweden provides a good background to make an inference on professional investors. By establishing the presence of the disposition effect among Swedish managers a direct conclusion can be drawn on the Swedish scope. Successively, on those findings a weaker general conclusion can be founded regarding professional investors as a group.

1.5 Results
This research uses trading data from six Swedish mutual funds coupled with stock price data from the exchanges where they were traded. Interestingly the result of the paper shows that, contrary to most other studies about the disposition effect, the managers exhibited a quite strong disposition to sell losers rather than winners. This deviation from
previous research can probably be ascribed to the special market conditions prevailing during the time span of the study, as the stock market experienced an exceptionally strong re-bounce from the global financial crisis. According to the findings, different market conditions seem to have an impact on the disposition effect.

1.6 Disposition

The next chapter will give an overview of the main research contributions to the disposition effect. Chapter three will cover some explanations to the disposition effect together with a descriptive theoretical model of decision making under risk. Chapter four will describe the data and research method, chapter five will present the result of the empirical study, and chapter six will conclude.
2 Research and Background

2.1 Behavioural Finance

Behavioural finance is a relatively new branch of financial economics that considers how various psychological traits affect investors, analysts and other market participants’ actions on markets and their effect on markets. As defined by Olsen (1998) behavioural finance “seeks to understand and predict systematic financial market implications of psychological decisions processes... behavioural finance is focused on the implication of psychological and economic principles for the improvement of financial decision making.”

The traditional financial theory, that most financial analysis rest upon, makes use of the assumption that economic agents are fully rational. However, more and more research has proven that this assumption is profoundly flawed in trying to understand financial markets and especially individual trading behaviour. Herd behaviour, overconfidence, overoptimism and preference for confirming information are examples of logical fallacies that humans commit but that generally are not taken into account in theory and analysis. Behavioural finance is a growing field of study that seeks to better understand markets and investor behaviour by incorporating psychological factors in economical thinking. There is no unified theory of behavioural finance and much emphasis has been on trying to explain financial anomalies, which are phenomena that cannot be explained by conventional financial theories, by also treating various psychological traits in market participants as explanatory variables. Some findings have also been applied in trying to pinpoint instances when it is possible to achieve above normal returns by exploiting the biases of other market participants (Barberis & Thaler, 2003).

As described by Shefrin (2000) behavioural finance is made up out of three themes. The first is heuristics. The use of heuristics means decisions are more based on intuition and rules of thumbs instead of correct analysis of information. A major sample of this is when decisions need to be made rapidly and there is not enough time or too much information to make thought through decisions. The second theme is framing. The effect of framing is that the same option presented in different formats will lead to inconsistent choices. Circumstances and the way a problem is seen or presented change the way investors perceive it, which in turn leads to irrational choices. In reality framing is important but traditional theory assumes investors to always rationally make choices with respect to risk and return. The last of the three themes is inefficient markets, which is the idea that EMH does not hold as a result of the existence of the two first themes.

These themes are interconnected and within lies many economic anomalies with respect to first market and returns, and second, investor behaviour where the disposition effect can be found.

2.2 Evidence of the Disposition Effect

The term disposition effect was coined to describe the tendency to sell winning stocks too early and hold on to losers too long, by Shefrin and Statman (1985) in an article where they theoretically examined the disposition effect. The disposition effect is a result of an investor behaviour bias and the paper gave support to Kahneman and Tverky’s Prospect Theory (1979) as an explanatory model to the observed behaviour.

Weber and Camerer (1998) expressed disbelief in empirical studies because important variables such as investors’ expectations and individual decisions cannot be controlled or
easily observed in markets, and if the effect is found on the aggregate level, several explanations might be plausible. Therefore they conducted an experimental research, and appear with findings that support Shefrin and Statman (1985). One experiment looked into the trading behaviour of investors in laboratory environment and it turned out that stocks that had gone up in value relative to the purchase price were sold more often than stocks that were below the purchase price. In another experiment all stocks were automatically sold after an investment period. When the next investment period started the participants had the opportunity to buy back the same stocks at no cost but the participants were then suddenly less eager to buy back the losing stocks, making the disposition effect much weaker. So while owning the stocks and having to make the decision themselves whether to sell or hold on, the disposition effect was strong, but when forced to sell all the stocks the disposition effect was greatly reduced as the losing stocks were not bought back extensively. Those findings tell a tale about mental accounting and ownership bias being related to the disposition effect.

To further shed light on the subject, Odean (1998) set out to thoroughly test the disposition effect by analyzing trading records for 10000 accounts at a large discount brokerage house. Due to the impressive data set, this study stands as the most wide-ranging study that has been conducted on the subject and gives compelling knowledge regarding the disposition effect. He provided convincing evidence that the investors in his study demonstrated a strong preference to realize winners rather than losers. The disposition effect was prevailing every month of the year except in December where losers were sold more often than winners, probably due to tax reasons. In the same study he proved that the motivations for this irrational selling could not have been portfolio rebalancing, nor higher trading costs for stocks whose price has decreased.

In an interesting study about mutual fund performance, Wermer (2003) analyzed capital flows to the funds and fund manager behaviour, and found that both factors were important in explaining the performance of mutual funds. He showed that consumers invest heavily in last years’ best performing funds and that managers of these funds invest the new inflows in past winning stocks according to momentum strategy. Together these two occurrences, Wermer suggests, explain largely why mutual fund returns strongly persists over multi-year periods. By contrast, he showed that poor performing funds were reluctant to sell losing stocks to finance new purchases of momentum stocks, which would increase fund return. In light of that, according to Wermer, poorly performing fund managers are consistent with being prone to the disposition effect.

While it is generally accepted that more experienced investors are less susceptible to the disposition effect, greater sophistication does not lead to immunity to it. A few studies have been done to test whether education, wealth and trading experience have an impact on the disposition effect, and most results show that those are factors that have a diminishing effect on the disposition effect. Garvey and Murphy (2004) analyzed a group of professional traders in U.S. and found that they realized their winning stocks at a much higher rate than their losers. In doing so it was also proved that this behaviour was suboptimal in terms of return and that holding the winners longer and selling losers sooner would have increased their profits. Shapira and Venezia (2001) compared trading accounts for amateurs with professional investors in Israel and found that both groups displayed a disposition effect, however, the professional investors to a significantly lesser extent. In a similar manner Dhar and Zhu (2002) compared the disposition effect among different investor characteristics and used demographics and socio-economic data as proxies for investor sophistication. Their results too showed that greater sophistication was involved
with less disposition effect. Furthermore they found that one fifth of their sample did not exhibit any disposition effect at all, this group corresponding to the top layer of sophistication, and that the low-income and non-professional investors have the highest disposition effect. As also mentioned in the study, if some investor groups are more at risk for biases it will have welfare and policy implications. Since low-income and non-professional investors seem to be the most susceptible to adverse irrational trading, efforts should be made to make this group aware of such biases. Grinblatt and Keloharju (2001) analyzed the Finnish stock market with respect to individual investors and institutional investors and found that both groups were more reluctant to realize losses and that price history influence trading volume. Their results suggested that less sophisticated investors were more likely to base their trading decisions on past price patterns.

There seems to be strong proof of the existence of the disposition effect, but it is a different question though if this phenomenon has an aggregate significant effect on markets. If so, it should lead to some return predictability. Frezzini (2006) set out to test this, or more specifically, if the presence of the disposition effect leads to stock “under reaction” to news. After a stock goes up in value after the announcement of some positive news concerning the stock, disposition investors want to sell it to lock in a paper gain, which negatively affect its price. Subsequent returns should then be higher from this lower base. Hence, good news tends to lead to high upcoming returns. In the same manner, after the announcement of bad news, people widely hold on to the stock to avoid selling at a loss. The stock then trading at an inflated price should provide lower subsequent returns. Frezzini presents findings that support this proposition. In another study, Kaustia (2004) suggests that the disposition effect has a market-wide impact after analyzing trading volumes of initial public offerings, IPOs. When an IPO is issued all investors have the same reference price so the disposition effect should be at its strongest. He could detect price movements of IPOs as would be predicted by a disposition effect and argues that the disposition effect and investors’ different reference prices play a role in aggregate stock market activity.

There is also evidence of the disposition effect in other markets. Genovese and Mayer (2001) researched the real-estate market in downtown Boston over seven years. They found that owners who experienced nominal losses set higher asking prices and sell less often than other owners. An effect of that is that volumes decline while prices fall and it helps to explain the positive price-volume correlation in the housing market.
3 Explanations of the Disposition Effect

3.1 Explanatory Model

The explanation mostly proposed in the literature of the disposition effect can be found within prospect theory. It was first pointed out by Shefrin and Statman (1985) that the disposition effect really is an extension of prospect theory, together with mental accounting. Prospect theory and mental accounting together spawn a disposition effect through a combination of several features.

3.1.1 Prospect Theory

The second most cited paper in economics for the last 50 years is Kahneman and Tverky’s (1979) article Prospect Theory: An Analysis of Decision Under Risk (Han Kim, Morse, & Zingales, 2006). In this pioneering work the two psychologists Kahneman and Tversky expressed a critical assessment of expected utility theory as a descriptive model of decision making under risk, and presented an alternative model which they call Prospect Theory. It is a descriptive model, i.e. it tries to model real life choices rather than optimal choices. The theory was not developed primarily with the disposition effect in mind, but prospect theory provides the hypothesis that investors have a disposition to sell winning stocks more often than losers, while normative theory does not.

The model is different in the way it calculates value instead of expected utility, and value is defined in terms of gains and losses. When facing a prospect a decision maker is not concerned with the level of total wealth, but evaluates the decision in terms of gains and losses. The definition in the original text is “Decision making under risk can be viewed as a choice between prospects or gambles” (Kahneman & Tversky, 1979), and they continue to state that people have an irrational tendency to be less willing to gamble with gains than with losses. A few years later the two authors presented an elaborated version of the theory (Tversky & Kahneman, 1991).

Figure 1 Prospect theory value function
Figure 1 Prospect theory value function is a sketch of the value function of prospect theory. As seen in the figure value from possible outcomes from decisions under risk is defined in terms of gains and losses, and the point from where gains and losses are measured is called the reference point. The value function has an S-shape and is concave in the domains for gains and convex in the domains for losses. It is also steeper on the loss side than on the gain side. Loss aversion is central in the theory as can be seen in the disproportional valuation of a $1000 gain compared to a $1000 loss. A $1000 gain is assigned a positive value, but a $1000 loss will give a disproportionately high negative value. The S-shape of the value function leads to more risk averse behaviour in the domain for gains, and more risk seeking behaviour in the domain for losses.

As an example, imagine an investor who bought a stock which was evaluated to have fair risk and return probabilities. After some time the stock increases in value and is seen as a gain relative to the purchase price. The stock will then be in the concave more risk averse part of the investor’s value function. Maybe the expected return of the stock still justifies it risk, but since the investor is now more risk averse about the stock, it might just be that the risk involved in holding the stock is more than the investor prefer to take. He is thus more likely to sell a stock that has gone up in value. What if instead that the stock decreased in value? The stock will now be in the convex loss domain of the value function. On this side of the reference point the investor will be more risk seeking about the stock. Here the investor will continue to hold the stock even if the expected return falls or the risk of the stock increase, to avoid realizing a loss. Now imagine that the investor is holding two stocks. One is a gain and the other one a loss. If the investor stands in front of a liquidity need and there is no new information about either stock, he is more likely to sell the one that has increased in value.

3.1.2 Mental Accounting

Central to prospect theory is the formulation of the reference point and how each decision is isolated from other decisions. The framework for how people frame decisions under risk is called mental accounting. When people make decisions under risk they do so after segregating each gamble from each other into separate mental accounts. Each choice is then treated on its own, and possible interaction between them is ignored. As a straightforward example of mental accounting, imagine finding $100 on the street. Many would spend that $100 more freely than their hard earned salary from their day job. The explanation is that a new mental account is created for that “extra” money which has nothing to do with the mental account for salary (Thaler R., 1980). Mental accounting comes in relevant to the disposition effect as it can explain why an investor opens up a new mental account for each purchased stock, and the natural reference point is the purchase price. For someone who did not own the stock, the reference point would be the current market price, but mental accounting theory predicts that after the stock is purchased the reference price becomes the purchase price. Consequently when it comes to decision making about the stock the reference point would not adjust but stick to the purchase price of the stock. Selling a stock would mean closing the mental account, and people show considerable difficulties in closing a mental account at a loss (Shefrin & Meir, 1985).

So investors’ risk preference change after prior return changes for assets being held, and mental accounting suggests that each investment is treated separately from each other. It
follows that, former gains in a stock lower its current demand so that investors might want to sell it, and that prior losses increase current demand so that investors want to keep it or even increase holdings. This rationale implies the disposition effect.

Although the theory fits reality, one could go a step further and ask why are people loss averse, and why does their risk aversion change over time? Then one would more foundationally explain why there is a disposition effect. There seems to be a common belief among academics that the disposition effect widely exists, at least to some varying extents. Most of the efforts in the literature have indeed been on trying to prove an existence or non-existence. The question though why such behaviour exists has received less attention. Knowing the driving factors of it might mean that it could be avoided. Also, understanding the psychological reasoning behind the disposition effect would help in shedding light on other investor behaviour, e.g. how buying decisions are made.

In the same paper as where they coined the term, Shefrin and Statman (1985) suggested regret aversion as an explanatory factor behind the disposition effect. Regret aversion can be baked into prospect theory to help explain the psychological reasoning. Regret in this context would be the uncomfortable feeling of knowing that a different choice would have turned out better than the one that were chosen. It assumes that investors are concerned with how the outcome of the choice is going to make them feel about the choice itself, and that decisions are not only functions of expected probabilities and values or utility. This aspect has been favoured to at least partially explain the disposition effect (see e.g. Barber & Odean, 1999; Shiller, 1999). Another suggestion is decreasing sensibility to monetary stimuli, which can explain the S-shape of the value function, the changing of risk preference. Just like it is easier to sense the difference from a 3 degrees room temperature to a 6 degrees one, than from 13 to 16 degrees, the same principle applies to monetary changes. Therefore the difference in value from a gain of $100 to $200 is valued more than the gain from $1100 to $1200, and the loss associated with going from $200 to $100 appears greater than going from $1200 to $1100, even though it is the same change of $100 (Kahneman & Tversky, 1979). A few attempts have been made, but this is still an area for future research within psychology.

### 3.2 Outdated Explanations

Since the disposition effect was first documented some explanations to it have been presented of which some are outdated. The main ones that by now have been proved wrong are still frequently encountered when searching for information about the disposition effect. That might be because it is a relatively fresh and untouched subject, and they are presented here to give the reader an up to date coverage.

#### 3.2.1 Portfolio Rebalancing and Higher Transaction Costs

One of the first explanations was portfolio rebalancing, put forward by Lakonishok and Smidt (1986). If a portfolio is made up by assets to achieve a desired weight between them in terms of risk and return, the portfolio need to be rebalanced when some assets decrease in value and some increase. When an asset increase in value it will have a higher weight in the portfolio so it should be partially sold if one wants to keep the original mix, similarly a decreasing stock needs to be bought. Therefore an investor will act in line with the disposition effect if he wishes to keep the weights of the portfolio. Another explanation was suggested by Harris (1988) and concerned shifting costs associated with trading. When stocks increase in value there will be relatively lower transaction costs involved with trading.
them. Similarly, poor performing stocks will have comparably higher transaction costs. According to Harris, that would induce the disposition effect.

Note that both these explanations do not constitute an irrational behaviour. Both of these explanations though have been debunked by many researchers by adjusting their data for portfolio rebalancing and shifting trading costs, while still detecting the disposition effect (see e.g. Odean, 1998).

### 3.2.2 Unjustified Belief in Mean Reversion

Another explanation is that investors systematically misperceive probabilities regarding losing stocks and winning stocks, thinking that losers will re-bounce while winners will fall. This explanation is called mean reversion and might come from that investors believe that if a stock goes up abnormally in value it deviates from its expected long term rate and should therefore be subject to a reverse in price movement, giving sell incentives. And if a stock experience a below normal return investors might think that in subsequent periods it should perform extra well. If there is no such mean reversion but investors still have an unjustified belief in it, this would motivate the disposition effect. However, in their experimental study of the disposition effect, Weber and Camerer (1998) controlled such that participants in their experiment knew the probabilities of price changes and that they were proficient in statistics, but still they found a disposition effect, thereby discrediting this explanation.
4  Research Methodology

4.1  Data Collection

The research makes use of data from two different sources. The first source is The Swedish Financial Supervisory Authority, Finansinspektionen, to which all Swedish mutual funds must report their holdings every quarter. Here changes in the different funds’ ownership can be observed on a quarterly basis. Ownership of six mutual funds have been followed quarterly for two years from the beginning of 2009 till end of 2010. For an up to date study it requires as fresh data as possible, which explains why the time period is as recent as possible. As to the duration of the period, the longer the better to attain as consistent results as possible, but due to the delimitations of the study it is limited to two years. To narrow down the study further to the Swedish market, only mutual funds with main coverage on the Swedish stock market have been used. These stock funds invest their capital foremost in the Swedish stock market although a small percentage of the fund might be placed on other markets and in other instruments than stocks. To get a representative sample, one mutual fund from each major bank has been chosen, namely Handelsbanken, Swedbank, SEB and Nordea, together with two smaller “outsiders”, represented by Didner & Gerge and Carlson.

The first data set provides information about which stocks have been traded and when, but it does not tell anything about the prices of the traded stocks. Therefore a second source is needed to obtain the prices of the stocks during each quarter. The second data set have been retrieved from the exchanges where the stocks are traded using Yahoo! Finance. Prices were adjusted for splits and dividends as needed for this study. Daily price data was collected that later was calculated into quarterly averages for each stock that was traded.

4.2  Methodology

![OMXS-ALL SHARE INDEX Jan 2009 - Dec 2010](image)

Figure 2 Development of the OMXSPI Jan 2009 - Dec 2010
To test whether Swedish fund managers sell their winners too soon and hold on to their losers too long, basically the same methodology as Odean (1998) developed is employed. He used a method where he measured and compared the proportion of sold winners to the proportion of sold losers. That is the number of sold winners compared to the number of sold loser relative to the opportunity to sell both. As Odean points out it is not enough to only count and compare the number of sold losers and winners, since in a rising stock market there would be much more stocks trading at a gain and in a declining market there would be much more stocks trading at a loss. For that reason it is necessary to look at the rate at which managers sell their winnings stocks and losing stocks relative to their opportunity to do so. That aspect gets even clearer given that during the time period of the study, the Swedish stock market experienced a strong re-bounce after the global financial crash and overall stocks grew a great deal in value, as can be seen in Figure 2 Development of the OMXSPI Jan 2009 - Dec 2010.

Odean used data from individual traders from a large discount brokerage house and that way tested the disposition effect using accounts from individual holders. In that study different characteristics of the traders of each account such as wealth or trading experience were not recorded, but all accounts were aggregated across. In contrast, this study uses data only for mutual fund managers to test the disposition effect among professional investors. Another difference is the time base of the trading data. In lack of better options, quarterly data is used here. This lower accuracy for the exact dates of the trades might in a few cases cause bad estimates, but when only dealing with whether stocks are trading at a gain or loss and not estimating exact price levels, quarterly data may be sufficient. In the long run such possible errors might compensate each other out, and a large data set can increase the statistical significance. Though, more exact data of the funds trading dates would of course have been preferred.

Each fund is gone through in chronological order. At the end of the first quarter a new portfolio is constructed out of stocks whose purchase dates are known, i.e. stocks that have been purchased during the first quarter. Consequently all stocks that have been purchased before January 2009 will not be included. By no means will this portfolio represent the whole ownership of the fund, only a fragment, but there is no reason to think that these new stocks will be biased towards stocks that the managers have abnormal preferences to sell at a loss or gain. At the end of the next quarter a new portfolio is constructed out of new stocks purchased in that quarter plus the unsold stocks from the previous quarter portfolio. This procedure is repeated throughout the period of study.

As mentioned, the exact trading date is not provided by the data so the exact trading price is also not known. Prices of purchases and sells are therefore estimated to be the average stock price of the quarter in the quarter the stock was bought or sold.

For each quarter, for the stocks that are 100% sold off, the selling price is compared to its average purchase price to see if it is a realized gain, RG, or a realized loss, RL. Every stock that is in the portfolio but is not sold is either an unrealized gain, URG, or an unrealized loss, URL. Whether it is an URG or an URL is determined by comparing the stock’s price at the end of the quarter with its average purchase price. Stocks that were bought the same quarter are treated as neutrals and are not taken into account until the next quarter.

Due to the nature of a mutual fund the same stock is often traded many times without selling 100% of its total shares. Liquidity needs change, there are new people investing in the fund and present investors sell their positions in the fund continuously, which lead to the stocks included in the fund often are traded without it being an action for which the
managers’ primary intent is to increase the return of the fund. Although, of course sometimes partial sales are done for strategic reasons, in this study only stocks that are fully sold are counted when counting RGs and RLs.

There are several possible choices of the reference point from which gains and losses are determined. It could be specified as the latest purchase price, the lowest purchase price, the highest purchase price or the average purchase price of a stock. Odean (1998) tried with different reference points and came up with essentially the same finding regardless of the specification. In this study the average price will be used. For a stock which has had one or several partial sells the first in, first out principle has been used to calculate the average purchase price, assuming that the shares that were sold were those that were purchased first.

After every RG, RL, URG and URL have been calculated and counted they are added across for all funds and are treated jointly as one set of data. The proportion realized gains, PRG, can be calculated as shown in equation 1:

$$PRG = \frac{RG}{RG + URG}$$  \hspace{1cm} (1)

And the proportion realized losses, PRL, in the same manner shown in equation 2:

$$PRL = \frac{RL}{RL + URL}$$  \hspace{1cm} (2)

To illustrate with an example, imagine an investor with 5 stocks in his portfolio, A, B, C, D and E. A and B have values more than paid for, and C, D, and E are worth less. Another investor has 3 stocks in his portfolio, F, G and H, of which F and G are gains and H is a loser. On one day the first investor sells stock A and C, making 1 RG and 1 RL while having 1 URG and 2 URLs in his portfolio. The other investor sells his stock F making 1 RG while having 1 URG and 1 URL in his portfolio. So for these two investors in this period 2 RGs, 1 RL, 2 URGs and 3 URLs are counted. They are first summed for each account and then across accounts. Then the two ratios can be calculated, and in the example they become $PRG = 2/(2+2) = 1/2; and PRL = 1/(1+3) = 1/4$.

If $PRG - PRL$ is significantly different from zero we can say that there is a disposition to sell either winners or losers more often.

4.2.1 Hypothesis

Derived from the theory, in terms of equation 1 and 2, the null hypothesis to be tested becomes as in equation 3 below:

$$PRG > PRL$$  \hspace{1cm} (3)

Then, the alternative hypothesis becomes:

$$PRG \leq PRL$$  \hspace{1cm} (4)

To test the statistical significance of the findings the t-statistic is used. The formula for the t-statistic is as shown in equation 5:

$$t \text{ statistic} = \frac{\bar{x} - \mu}{\text{st.err.}}$$  \hspace{1cm} (5)
Where the standard error is:

\[
st. err. = \sqrt{\frac{PGR(1 - PGR)}{RG + URG} + \frac{PLR(1 - PLR)}{RL + URL}}
\]
5 Results and Discussion

To test whether Swedish mutual fund managers sell their winners relatively more often than their losers, each fund has been analyzed on its own and then data from all of them has been pooled into one data set. Every URG, URL, RG and RL have been counted, to calculate the proportion realized gains, PRG, and the proportion realized losses, PRL.

Table 1 Consolidated results for all six mutual funds

<table>
<thead>
<tr>
<th>Quarter</th>
<th>URG</th>
<th>URL</th>
<th>RG</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarter 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Quarter 2</td>
<td>21</td>
<td>-</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Quarter 3</td>
<td>38</td>
<td>6</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Quarter 4</td>
<td>58</td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Quarter 5</td>
<td>67</td>
<td>9</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Quarter 6</td>
<td>65</td>
<td>16</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Quarter 7</td>
<td>67</td>
<td>25</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Quarter 8</td>
<td>80</td>
<td>17</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sum</td>
<td>396</td>
<td>77</td>
<td>33</td>
<td>27</td>
</tr>
</tbody>
</table>

PRG 0.077
PRL 0.260
PRG-PRL -0.183
t-statistic -4.071

As shown in table 1, 27 losing stocks were sold and 33 winners were sold, while there were 77 unrealized losers and 396 unrealized winners. Surprisingly, the data exhibit a substantial tendency to sell losers proportionally more often than winners. Given the theory and overview of previous research, this is the opposite of what was expected, since the disposition effect documented by researchers is the tendency to sell winners more often than losers. According to the data about 8% of the winners were sold while 26% of the losers were sold. The null hypothesis that Swedish mutual fund managers sell winners proportionally more often than losers consequently has to be rejected, and it is done convincingly so with a fairly large t-statistic of more than 4.

Naturally, the contrary results of my study to other ones lead to the question why. If there would have been any irregularities in the research that could have caused incorrect results, they would be either in the method or in the data. The method used in this research is basically the same as in Odean (1998) and is reasonably uncomplicated. Regarding the method, what can be remarked on are the estimated trading prices. As already described, a purchased stock is detected by comparing the content of a fund with the content of the same fund last quarter. If one stock exist in the fund at the end of this quarter but was not there at the end of the previous quarter, it can be concluded that it was bought during this quarter, and the estimated purchase price is the average price of the stock during the quarter it was bought. A sold stock and its selling price are found in the same way. Maybe a
stock was bought at the beginning of the quarter, maybe at the end; in most cases the estimated price will not be exact. But it also does not have to be. The method is only concerned with if stocks are traded at a gain or a loss and most of the time exact prices are not needed to determine that. In some cases though when it is a close call, an inexact estimate could cause a stock to be treated as a gain when it is really a loss and vice versa, but there is no reason to believe that such errors would be biased towards being either a gain or a loss. More reasonably, it is believed that such errors would cancel each other out in the long run throughout the analysis. Furthermore, the difference between the proportion realized gains to the proportion realized losses, which can be seen in table 1, is too large to be explained by bad estimations. A second place to look for irregularities would be in the data. All the data has carefully been collected from reliable sources, those being The Swedish Financial Supervisory Authority for mutual fund contents, and Yahoo! Finance for stock prices. I therefore cannot but argue that the findings are intact from mistakes and that the explanation for the unexpected results lies elsewhere, namely in the specific time period from which they have been extracted.

The study examined the disposition effect from beginning of 2009 till end of 2010. During this time period many stock markets experienced extraordinary positive returns coming from a regain in investor confidence after the global financial crisis. The Swedish stock market index increased nearly 100% during these two years, as can be seen in Figure 2 from the previous chapter. This is unusual.

I propose that the special market conditions prevailing during the period characterized by a strong bull market influenced mutual fund managers into a behaviour of reversed disposition effect.

In a bull market like this one a majority of all stocks increase in value. Maybe even some stocks whose fundamental value cannot justify an appreciation still increase in value. Fund managers are having happy days seeing most of their assets appreciate. But some stocks do not; some even depreciate, even in a market like this. Maybe investors think, if a stock does not even go up now it really must be a rotten egg, and those losing stocks that do not follow in the race are then more likely to be sold. Whether this rationale being smart or not, such a way of thinking would induce a reversed disposition effect.

Whatever the psychological mechanisms are that make the investors sell losers proportionally more often than winners during this period of time, the result of the study indicates that being in a bull market affects the disposition effect among professional investors in a positive direction. That investor psychology shifts with shifting market conditions is not a radical statement though. It is known that different market conditions do change the general investor behaviour, herd behaviour definitely being one of those concepts, (see e.g. Camerer, 1997). Most behavioural economists would most likely say that a bull market like this one in the first place is a result of changing investor psychology. The result of this study is important as it sheds light upon the selling decision in view of the disposition effect and that this bias is not static but possibly also changes with changing market conditions.
6 Conclusion

This study has tested the disposition effect, the general tendency that investors sell their winners too early and hold on to their losers too long. Contrary to what was expected, the results of this study show that Swedish mutual fund managers proportionally sold more losers rather than winners.

These different findings do not put doubt on previous studies; they are as convincing as before this study was done, rather the disposition effect is illuminated further. The most striking difference in this study compared to similar ones is the market conditions that prevailed for the time period being studied, which is also the likely explanation to the unexpected results. A relatively short time period of two years was used, which precisely encompasses a strong bull market. One can speculate in the psychological mechanisms why, but in such a market when a majority of the stocks increase in value, the studied mutual fund managers demonstrated a reversed disposition effect. This is incidentally good news since selling the losers and investing more in winners is argued to be a superior strategy to selling winners and investing in losers.

Other researchers have found that higher investor sophistication is associated with lower disposition effect, or no disposition effect, (Dhar & Ning, 2002; Shapira & Venezia, 2001; Grinblatt & Keloharju, 2001) and mutual fund managers indisputably must belong to the top layer of sophistication. In light of that, when losing stocks stand out and are easily detectable, and the market is rushing it is not difficult to believe that the psychological aspects normally governing selling decisions are replaced or affected in a way that leads to abnormal trading behaviour.

If there was a market wide reverse disposition effect in bull markets, that would mean that losing stocks would decrease further since demand for them would decrease and the prices of the winning stocks would increase further since demand for them would increase. Perhaps that could help explain stock bubbles in a certain industry. Bubbles occur in times when the market as a whole is going up, if investors then significantly sell the minority of stocks that are on the loss and investors systematically further invest in the stocks that increase the most, that would help fuelling a bubble. Understanding the behaviour behind financial bubbles is crucial since they usually are predecessors of recessions.

To strengthen the result of this study one could add funds to be analyzed but keep the same time period. That way the results of this study could be made more certain. I am unaware of any studies that have studied the disposition in different market conditions. As a second step, it would be interesting to test the disposition effect keeping the same extended sample but using different time periods representing bull markets, bear markets and normal market conditions and compare them to see how the disposition effect changes with changing markets. Also how it changes when specifically focusing on market liquidity should be kept in mind.
7 List of references


Appendix

**Appendix**

**A-1 Handelsbanken Sverigefond**

Table 1 Result for Handelsbanken Sverigefond

<table>
<thead>
<tr>
<th>Quarter</th>
<th>URG</th>
<th>URL</th>
<th>RG</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>quarter 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 2</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>quarter 3</td>
<td>9</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 4</td>
<td>14</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 5</td>
<td>17</td>
<td>4</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 6</td>
<td>11</td>
<td>6</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>quarter 7</td>
<td>14</td>
<td>7</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>quarter 8</td>
<td>21</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Sum**

<table>
<thead>
<tr>
<th>PRG</th>
<th>PRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.098</td>
<td>0.257</td>
</tr>
</tbody>
</table>

**A-2 Didner & Gerge Sverigefond**

Table 2 Result for Didner & Gerge Sverigefond

<table>
<thead>
<tr>
<th>Quarter</th>
<th>URG</th>
<th>URL</th>
<th>RG</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>quarter 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 4</td>
<td>5</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 5</td>
<td>5</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 6</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 7</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>quarter 8</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

**Sum**

<table>
<thead>
<tr>
<th>PRG</th>
<th>PRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.103</td>
<td>0.667</td>
</tr>
</tbody>
</table>

1 Excel sheets containing data and operations for each fund can be sent upon request.
### A-3 Carlson Sverigefond

Table 3 Result for Carlson Sverigefond

<table>
<thead>
<tr>
<th></th>
<th>URG</th>
<th>URL</th>
<th>RG</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>quarter 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 3</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 4</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 5</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 6</td>
<td>6</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 7</td>
<td>5</td>
<td>7</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 8</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Sum 31 15 5 1

PRG 0,139
PRL 0,063

### A-4 Swedbank Sverigefond

Table 4 Result for Swedbank Sverigefond

<table>
<thead>
<tr>
<th></th>
<th>URG</th>
<th>URL</th>
<th>RG</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>quarter 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 2</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>quarter 3</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 4</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>quarter 5</td>
<td>13</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 6</td>
<td>15</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 7</td>
<td>19</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>quarter 8</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Sum 94 5 2 3

PRG 0,021
PRL 0,375
## A-5 SEB Sverigefond

Table 5 Result for SEB Sverigefond

<table>
<thead>
<tr>
<th></th>
<th>URG</th>
<th>URL</th>
<th>RG</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>quarter 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 2</td>
<td>5</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 3</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 4</td>
<td>12</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>quarter 5</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 6</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>quarter 7</td>
<td>9</td>
<td>4</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>quarter 8</td>
<td>11</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Sum 68 15 7 9

PRG 0,093
PRL 0,375

## A-6 Nordea Sverigefond

Table 6 Result for Nordea Sverigefond

<table>
<thead>
<tr>
<th></th>
<th>URG</th>
<th>URL</th>
<th>RG</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>quarter 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 3</td>
<td>9</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>quarter 4</td>
<td>14</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>quarter 5</td>
<td>14</td>
<td>1</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>quarter 6</td>
<td>15</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>quarter 7</td>
<td>16</td>
<td>5</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>quarter 8</td>
<td>16</td>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Sum 85 14 6 1

PRG 0,066
PRL 0,067