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**ESCAPE TO VICTORY ON THE STOCK MARKET: IMPACT OF  
SOCCER GAME OUTCOMES ON THE CLUB'S STOCK PRICE**

Master's thesis in  
Accounting and Finance

**VAASA 2013**



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**Topic of the Thesis:**Escape to victory on the stock market:  
impact of soccer game outcomes on the  
club's stock price**Name of the Supervisor:**

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**Degree:**

Master's Thesis

**Department:**Department of Accounting and  
Finance**Major Subject:**

Finance

**Year of Entering the University:**

2012

**Year of Completing the Thesis:**

2014

**Pages: 85**

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**ABSTRACT**

The study focuses on game outcomes of the national Championship of stock listed soccer clubs and their influence on the stock price. This paper examines 13 clubs of 6 different countries which count to the top-teams in Europe. The data set includes 13 seasons, from 2000/2001 to 2012/2013.

This study contributes to previous studies and show new aspects of the impact of soccer outcomes. This study investigates the impact of victories, draws and defeats on the stock price and on the trading volume. Particularities of stock price movements concerning the importance of last quarter of the season, of home/away games and of the goal difference are scrutinised. Moreover, it is tested whether there is a surprise effect while using betting odds.

On the next trading the abnormal returns amounts to +0.48 % after victories, -1.05 % after draws and -1.28 % after defeats. During the season the trading volume is higher than in the off-season. Surprisingly the impact of soccer outcomes is stronger in the rest of the season than in the last quarter. There is also evidence for a home/away-games-, goal-difference- and a surprise effect.

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**KEYWORDS:** Behavioral Finance, Investor Sentiment, Soccer, Sport, Stock returns



## 1. INTRODUCTION

“Some people believe football is a matter of life and death. I’m very disappointed with that attitude. I can assure you it is much, much more important than that.”

This sentence is one of the most famous quotes which was used by Bill Shankly, a Liverpool FC soccer coaching legend. He wanted to express that soccer is not just a sport for many people. It has impact on people’s social life, lifestyle and mood. After soccer games there are plenty of pictures and video sequences broadcasted of people experiencing joy and happiness, but also moments in which people are hitting rock bottom and feeling devastated. Sport plays with emotions, not only in stadiums and on the pitch, many spectators also watch soccer games on television.

Over several decades live broadcast soccer events on TV have become more and more popular and thus more and more people who are interested in soccer got access to follow their favourite sport. Media coverage has been increased and newspapers have proclaimed TV viewing records in the recent years. At the FIFA World Cup 2010 in South Africa 3.2 billion viewers around the world watched at least one minute of a game. The final Spain against the Netherlands reached 619.7 million spectators watching at least 20 minutes of the game. (Fédération Internationale de Football Association 2011)

But not only national teams get concentrated attention, also soccer clubs listed on stock exchanges can count on millions of fans. For example Juventus FC is the most popular club in Italy. In 2005 Sport + Markt AG Sports reported that Juventus FC has 180 million supporters all over the world. Based on a survey by Demos & Pi conducted in 2010 Juventus FC received the preferences of 29% of the population in Italy. Sport Lisboa e Benfica is known as the club with the most paid club memberships. In 2012 Benfica counted 224,000 members. (Süddeutsche Zeitung 2013) Another team set a new record in the German Bundesliga. Borussia Dortmund sold 55,000 season tickets for the season 2013/2014. (SPOX.com 2013) All these named clubs issued shares and enthusiastic supporters can be a part of their clubs when buying shares of them.

Since the beginning of stock market investors have been trying to earn excess return and try to find patterns in order to predict future prices. Psychological aspects concern this topic which finds explanation in the behavioural finance part of this study. As people are driven by emotions the decisions of portfolio managers and individual persons who act on stock markets are not always rational. Previous studies (Palomino et al. 2009, Edmans et al. 2007) give evidence that on small stocks a loss effect take place after more important sport games. Many people are interested in soccer, watch the games and support their favourite team. It is a matter of identification and an issue of group dynamics.

### 1.1 Previous studies

Hirt et al. (1992) conducted a study in which they examine how game outcomes affect sports fans' estimates and their own future performance. They give evidence that fans' mood and self-esteem are strongly connected to game outcomes. Fan's estimates of the team's and their own performance were significantly better when their teams won than when they lost.

Trovato (1998) documented the relationship between the Stanley Cup playoffs and suicide rates from 1951 – 1992 in Quebec, Canada in his study. People were assumed to get out of depression and follow social activities during the playoffs. Against all odds during the heat of the ice hockey postseason race young single men were most likely to commit suicide in the month of May. Trovato assumed that this fact can be traced back to a higher consumption of alcohol. But also females were more likely to commit suicide if the Canadians lost in the finals rather than the first few rounds of the playoffs.

Renneboog & Vanbrabant (2000) conducted a working paper which aims at the effect of weekly sporty performances on stock prices of soccer teams listed on the London Stock Exchange and the Alternative Investment Market. Positive excess returns of almost 1% can be realised after a soccer victory on the trading day after a game, whereas a draw and a defeat is penalised through a stock price decrease of 0.6% and 1.4%. Renneboog

& Vanbrabant (2000) focused on English and Scottish teams. They also document that promoted games and relegation games have stronger impact than national Cup and European competitions.

Brown & Hartzell (2001) conducted a study which shows the impact of information on equity prices. Not only in soccer, also in basketball using the example of Boston Celtics the outcome of basketball games significantly affect stock returns, trading volume and volatility. The effect on the stock market is also stronger if the magnitude of the importance of the game is rising. It can be observed that the stock price tend to react more heavily in play-off games than in games in the regular season.

Barajas et al (2005) examined the relationship between sports performance and the revenues of football clubs as well as the effect of sports performance on the financial results in Spanish professional football in their working paper. They used data from 1998 to 2002. As the stock price should reflect all the future cash flows of a company, revenues like ticket sales and prize money awarded from Championships play an essential role for the stock prices. The sport performance of soccer clubs in the Spanish League is explained by sporting revenues, though sport performance has almost no explanation power for economic results.

Duque & Ferreira (2005) examined in their unpublished working paper how sporting performance influence the share price returns for football clubs. They followed the same research topic as Renneboog and Vanbrabant (2000), but used another methodology (ARCH and GARCH methodology). The data set consists of results and stock prices from Sporting SAD and F.C. Porto from the year 1998 to 2003. They document that positive performance lead to rising stock prices, while negative sporting performance entails negative stock price returns.

Berument et al. (2006) conducted a study in which they examined the three biggest soccer clubs in Turkey whether the results influence their stock prices. They suggest that Besiktas' victory against a foreign rival in the Winner's Cup leads to an increase of the share price. They give evidence that there is only an effect after a win. However, it

can be indicated that game outcomes of Galatasaray and Fenerbahce seem to have no impact on their stock prices.

Edmans et al. (2007) used international soccer, cricket, rugby, ice hockey and basketball results as their primary mood variable. Using international results of the mentioned sport disciplines they give strong evidence that a loss effect takes place after international soccer, cricket, rugby and basketball games. For example, in the World Cup elimination stage a defeat leads to an abnormal stock return of -49 basis points on the next trading day. This effect is stronger in small stock markets. The results remain robust after changing the methodology.

Palomino et al. (2009) studied whether different types of information can be used to predict short-run stock returns subsequent to soccer games. Significant abnormal stock returns and rising trading volumes can be observed after games. The data set contains league games and national cup games of 3 seasons. 16 British soccer clubs listed on the London Stock exchange are in the sample. Palomino et al. (2009) used betting odds as the surprise component. Betting odds show the experts' opinion of the outcome and should include public information which should also be incorporated in the stock price of the soccer club in question. The authors conclude that abnormal returns for the winning teams do not reflect rational expectations but are due to overreactions induced by investor sentiment, especially when the teams are expected to win. They state that investors' loyalty to their clubs may lead to fewer share sales in the wake of bad news. Investors ignore non-salient public information such as betting odds. Moreover it can be observed that stock price reacts on good news (wins) faster than on bad news (loss). The average cumulative abnormal returns amount to 88 basis points for victories, -101 basis points for defeats and - 33 basis points for draws.

Samagaio et al. (2009) examined in their working paper the linkage between financial performance, sporting performance and stock market performance. The data set contains results from English football clubs over the period from 1995 to 2007. National and international games played in the UEFA competition are taken into account. They also give evidence of moderate correlation of game outcomes and stock returns.

Scholtens & Peenstra (2009) analysed the effect of national European competition games on the stock market. The data set includes eight teams and their games during the period 2000-2004. They complement the majority of the previous studies by indicating a positive market response for wins and a negative one for defeats. Empirical evidence was given that the response for defeats is stronger and the impact of European competition games is significantly higher than in the national League. The authors also include a surprise effect by using betting odds. Rational expectations on future firm value should drive the markets, so expected outcome of games before a game is played should be priced. They find that unexpected results in European competitions have a stronger impact on the clubs' stock price.

Kaplanski & Levy (2010) examined the effect of World Cup games on the US stock market. Americans are not really interested in soccer, rather in American football, baseball and basketball. About one third of all transactions on the US stock market are carried out by non-US investors. The purpose of this study is whether these non-US investors can be driven by their sentiment and can also affect the US market. They find that game results do not have an impact on the US stock market, though a World Cup effect is found. During the World Cup days from 1950 to 2007 the returns on the US stock market amount to -2.58%. However, the mean return amounts to +1.21% on non-World Cup days.

Bernile & Lyandres (2011) analysed in their study the returns of European soccer clubs and their returns around important matches. Their results show that the market reactions to soccer games are asymmetric. Investors are overly optimistic about their teams' chances to win and are frustrated when losing the game. As a consequence a defeat leads to negative abnormal returns. They state that a victory is followed by near zero returns and that the mean return after games is significantly negative. They provide evidence that pre-event stock prices are inefficient, while post-event stock prices seem to be efficient.

Bell et al. (2011) examined whether the importance of game results of English soccer clubs affect stock returns. The game was judged as being important when the playing

clubs are rivals and fight for a similar league position in the ranking or when the game outcome determines the final position of a team which is likely to be promoted or relegated. The data comprises results from 19 clubs of the Premier League over a period of 7 seasons. In this study it is shown that the result of important games affect stock prices stronger than the ones of less important games.

## 1.2 Purpose of this study

The main objective of this study is to examine the stock market reaction on national league games of stock listed soccer clubs. The key to that question is whether overreaction or underreaction take place and influence stock prices. It is a question if behavioral finance and investor's mood affect prices and thus give evidence that stock markets are not efficient. Do emotions lead professionals and individual investors to evaluate game results incorrectly and is this piece of information wrongly incorporated by market participants? Many studies were conducted and showed that there is a strong relationship between sport results and stock prices.

This topic has been extensively studied. Most studies show that after wins the stock price of the soccer club in question increases and draws and losses lead to negative stock returns. This event study examines sport outcomes of national leagues which are directly allocable to a specific team and its share price. The sample consists of 13 soccer clubs during the period 2000-2013. Besides the win/draw/loss effect, the goal difference effect is examined. It shows if the effect on the stock market is stronger when the team wins with a higher goal difference or if the effect remains as intensive as before after a narrow result. With the help of betting odds a surprise effect is tested. For one test games which take place in the last quarter of the season and games played in the rest of the season are compared. It is analysed if the stock prices are affected stronger after games of the season's end or rather after games of the rest of the season. Furthermore, it is shown in which extent investor sentiment influences trading volume. Last but not least it is examined whether home or away games have greater influence on the stock price.

### 1.3 Research Hypotheses

The main purpose of this paper is to analyse the relationship between football national league games of clubs listed on a stock exchange and the subsequent market reaction. It is assumed that stock prices react positively to wins and negatively to losses. According to studies of Palomino et al. (2009), Edmans et al (2007) and Renneboog & Vanbrabant (2000) wins and losses are relevant for stock movements. The hypothesis  $H_1$  militates against the efficient market theory and speaks in favour for irrational traders.

$H_1$ : Wins (Losses) in the national league lead to positive (negative) reaction of the share.

Palomino et al (2009) already examined the trading volume after soccer outcomes but it was limited to the English Premier League. In this study many famous European soccer clubs are included in the sample. Italy and Turkey are said to be obsessed by soccer. Additionally soccer is the most popular sport in the chosen countries which underpins the strong influence of this kind of sport. The crucial question is if a rising trading volume can be observed as well.

$H_2$ : Football match wins are associated with higher trading volume of the share.

In the last quarter of the season top ranked teams fight for the last places for the European competitions. Qualifying for the Champions League and earn millions only for being in this competition is sometimes determined by only a few points more in the final table of the League. Hence the games in the last quarter are especially emotional, in particular for fans and economically important for the clubs. Of course in the last quarter it is mostly decided which teams are relegated to a lower League. In lower Leagues the earnings from TV rights drop and another source of money is seriously threatened to dwindle. These are arguments for the following hypothesis.

$H_3$ : Wins (Losses) in the last quarter of the season have more influence on the stock price than during the rest of the season.

It is very reasonable to assume that outcomes at home give rise to emotions. H<sub>4</sub> includes the assumption that supporters and potential investors suffer more when their team loses at home and are happier when winning at home. Consequently the effect on stock markets should be stronger. Palomino et al. (2009) include a home variable in their study, but it was not analysed in detail. This is the reason why the fourth hypothesis contributes to previous studies because this aspect of playing at home or away has never been focussed before.

H<sub>4</sub>: Wins (losses) at home have a greater impact on the share price than games played away from home.

People are disappointed when their team lost. Consequently also investors value the team performance and try to find a trend whether the team will continue the upwards/downwards trend or will not. Thus the goal difference could be relevant and influences the extent of positive and negative feelings. Even though Palomino et al. (2009) uses the variable goal difference, H<sub>5</sub> is also a contribution to previous studies because earlier studies have not explicitly investigated this aspect before.

H<sub>5</sub>: The higher the goal difference the greater is the impact on the clubs' stock price.

Only new information should have the power to change stock prices. Publicly issued betting odds reflect bookmakers' opinion and are used as a proxy of the expected outcome. This study focuses on the magnitude of change of the stock price. Is it more harmful for investors if their teams lose when they are expected to win? Are people more emphasized when their teams are expected to lose and surprisingly win? The following hypothesis catches a behavioural finance topic if investors are overreacting to information.

H<sub>6</sub>: An expected win (loss) entails less reaction on the stock price than an unexpected win (loss).

#### 1.4 Contribution

There have been many studies which deal with the topic game outcomes and its impact on the stock price. Basketball, ice hockey, rugby, cricket and soccer are the most popular sport disciplines. This study focuses on soccer and consists of a large range of tests. This study was largely motivated by Palomino et al. (2009) who published their paper about information salience, investor sentiment and stock returns investigating a sample of English stock listed soccer clubs.

This study does not only contribute because of the large number of teams and the large period compared to previous studies. The data set concludes all major stock listed teams of 6 different countries. Scholtens & Peenstra (2009) uses international results, whereas this study concentrates on national league games. Previous studies investigate the impact of soccer outcomes on the share price of stock listed soccer clubs. So does this study. The consequences of a victory, draw and loss are examined. The hypothesis  $H_1$ ,  $H_2$ ,  $H_3$  and  $H_6$  refer to tests conducted by Palomino et al. (2009). Additionally 2 new aspects are included in this study. It is researched whether there is a home/away effect and whether the goal difference is differently incorporated in the share price. Investors might be happier when their team wins on the opponent's pitch and might be more frustrated when the team loses at home. Fans might be more disappointed when they lose with a higher goal difference and might be more satisfied winning a game with a high goal difference.

### 1.5 Structure of this thesis

This study is divided in seven parts. In the first chapter theoretical framework is provided. The second and third chapter dedicates to the base theory. Further data and the methodological background are described in chapter four and five. In the sixth chapter the empirical analysis is presented, followed by the concluding section.

The first three chapters are aimed to introduce the research topic. Theoretical background is provided which is connected to this study. The second chapter stands for a short overview of the market efficiency theory. Within this section there are also the most famous anomalies which are linked to the topic of the study. In the third chapter behavioral finance aspects are depicted. Description and evidences related to investor's behavior are included. The following chapter shows the data used in this study. In the fifth chapter the methodology is described in more details. Chapter six presents the empirical results obtained by the conducted tests. In the last chapter the paper is concluded and further research ideas are suggested.

## 2. EFFICIENT MARKET

Investors always try to be smarter and want to be more successful in investing in stock markets than others. There are many ways to optimize the personal fortune. Either institutional investors invest the clients' money or the individual person does it on their own. All parties have the same target to beat the market. Is that possible?

Market efficiency means that people cannot obtain abnormal returns since all information are public and available for everybody at the same time. The Efficient Market Hypothesis (EMH) was developed by Eugene Fama and plays an essential role in economics. It says that nobody can beat the market because all available information about stock markets and individual stocks are totally incorporated in the stock price and that is why the markets are efficient. (Fama et al. 1969; Fama 1970) The only chance to obtain higher profits is if investors are ready to take higher risk. (Shleifer 2000:5) Fama believes that information spreads extremely quickly thus the prices adjust immediately.

He argued that capital market efficiency theory needs three conditions.

- i) No transaction costs when trading securities.
- ii) All available information are costless and is received by all market participants
- iii) All participants agree on the implications of the given information for the current price and distributions of future prices of each security. (Fama 1970)

Three assumptions are stated by Shleifer (2000:2):

- 1) Investors are rational and value securities rationally.
- 2) In case of irrational actions of some investors, their trades neutralise each other. Thus they do not affect prices.
- 3) Arbitrageurs react on the market when people tend to be irrational and have a sufficient impact, thus the prices do not move.

Copeland et al (2005) add that prices also reflect all information if traders have to pay brokerage fees or a firm earn profits as a monopolist. In an efficient capital market a security price fully reflects the present value of a firm and determines a security price. The general efficient market hypothesis says that stock prices at any time 'fully reflect' all available information. Therefore Fama defines three specific types of efficiency and categorised them as follow:

1) Weak-form efficiency

Historical prices are the only information set and reflect the current price of a stock. Investors are not able to earn excess returns by obeying trading rules which take historical prices and return information into account. Chartist theories and other forms of technical analysis are based on recent prices, so it is bound to be useless (Korhonen 1977: 11).

2) Semi-strong-form efficiency

Prices adjust to information immediately. Information about annual earnings, stock splits, takeovers, dividend announcements or macroeconomic news which directly influence stock prices is publicly available. In this form people cannot earn abnormal returns by developing trading rules which are based on publicly available information. (Copeland et al 2005)

3) Strong-form efficiency

People with a monopolistic information access do not have higher profits than others. They cannot take advantage of insider information. (Copeland et al 2005, Fama 1970) Fama defines strong-form efficiency in that way that stock prices do not move when a piece of information is issued in public. Rubinstein adds that not only the asset price should remain the same after getting the information. It should be able to observe that there is no change in trading volume. (Rubinstein 1975)

The three forms of efficiency are dependent which means before entering the semistrong-form, it must fulfill the condition of the weak form. The same applies for the strong-form efficiency. All the conditions of the weak and the semi-strong form must be fulfilled, before we can actually talk about strong-form efficiency. All forms include the assumption that markets should not react too much or too little on information. It should incorporate the news correctly. The EMH is a direct consequence of equilibrium in competitive markets. (Samuelson 1965)

Technical analysis focuses on the past information and historical prices. By using fundamental analysis investors to find the fair current stock price based on given information. Insider information is a private message which limited and not targeted at the public. All these 3 kind of information should not be profitable for investors according to EMH. In the efficient market theory future prices cannot be predicted. Prices respond to new information at any time. As all information is entirely incorporated in the stock prices it is assumed that the prices move randomly.

Markets can also be called efficient even if investors are irrational in decision making. As their trades are seen as randomly and their strategies are uncorrelated their trades cancel each other out in the efficient market theory (EMT). As a consequence the trading volume would increase, but the stock price would remain at a stable level, close to its fundamental value. (Shleifer 2000:3)

The EMT holds as well if irrational traders' trading strategies are correlated. If they use the same strategy based on irrationality arbitrage will come into play. Arbitrage corrects any prices which differ from the efficient price. So all past, public available and private information is incorporated. At the same time a security is traded on two different markets at different prices. These two trades, purchase at a smaller and sale at a higher price, take place simultaneously. The consequence is that overpriced securities are brought down and underpriced securities are pushed up to its fundamental value by arbitrageurs who are not subject to psychological biases. This process lasts not long because many arbitrageurs want to take advantage and earn the so called free lunch.

Thus the price cannot get too far from its fundamental price, the price of the risk adjusted net present value of its cash flows or dividends. (Shleifer 2000: 3, 4)

The difference between behavioural finance and the efficient market theory is that in behavioural finance arbitrage is risky and therefore limited. As some securities do not have a close substitute arbitrage is not possible. Hence riskless hedges cannot be concluded by arbitrageurs. (Siegel 1998) Not finding an appropriate substitute is not the only risk. Mispricing can become extremer which means expensive goods can get more expensive. Thus the arbitrageur suffers from short-term losses. If he can hold the position as long as the mispricing disappears, the arbitrageur will get a safe profit from his trade. (Shleifer 2000)

The proponents of efficient market theory and the ones of behavioural finance differ in their definition of market efficiency. On the one hand there is an absence of arbitrage for committed supporters of the efficient market theory. On the other hand proponents of behavioural finance draw their attention to objectively correct prices rather than to the absence of arbitrage profits. (Shefrin 2005:111)

In the year 1953 Maurice Kendall described that prices of stocks seemed to follow a random walk. It is like “once a week the Demon of Chance drew a random number”, which means that today’s price explains the price of tomorrow the best. The chance of rising prices is the same like for decreasing prices. Investors could make easy money if people could predict future prices from past ones. As a consequence, the today’s stock price contains all information of past prices, but the same information is not advantageous to predict future prices. (Bearley et al 2008)

If the efficient market hypothesis holds it is wasting time to try to beat the market. An average investor like individuals, pension funds and mutual funds cannot obtain abnormal returns when trying to take advantage of analysing, picking and trading securities. An investor earns more money by passively holding a market portfolio than by concentrating on active money management. New studies weakened conducted studies in the 70s which support the EMH strongly. Behavioural finance is the key word

which emerged and changes the view of financial markets. More and more studies appeared over the last decades which confirmed that the markets seem to be inefficient. In published papers anomalies on financial markets are documented. It is reported of seasonal effects. Rozeff and Kinney (1976) documented that between the years 1904 and 1974 the annual average return in January amounts to 3.5% at NYSE, whereas the average return of the other months are 0.5%. It is not only evident in the United States, there are also studies about the Italian, Belgian and Dutch stock exchange and the returns there are much higher. (Gultekin 1983)

Moreover the weekend effect, the day of the week effect and many more phenomenon is mentioned in famous journals. Therefore investors should be informed about such anomalies and mispricing in the market. But why does not the market eliminate these opportunities of earning abnormal returns when the market is efficient? Malkiel (2003) states in his study that a market can also be efficient even if investors are irrational or if the volatility of a stock price increase which is explained by dividend or earning announcements. Although many bubbles he believes in efficient markets because investors are not able to earn above-average return without taking more risk. He admits that investors were sometimes irrational and the market was not perfectly efficient. In the past there were some patterns and pricing irregularities over a short period but they will not give the investor a chance to construct a method with which abnormal return can be earned.

In inefficient markets some relevant information might not be incorporated or the asset pricing model might not work properly. But when people act irrationally, tax laws are amended from time to time and taking advantage from insider information cannot be excluded, it is barely possible that the market work properly. Additionally the assumptions of no transaction costs, all information is available for anybody and costless, that people share similar expectations about future prices and that people use information the same way are utopian. All these arguments can be used in discussion but are not indicated as necessary for market efficiency. (Korhonen 1977: 9-10)

In efficient markets expected returns cannot be higher or less than the risk-adjusted opportunity cost of capital. All trades take place at the security's fundamental value, based on future cash flows discounted by the opportunity cost of capital. Consequently investors can make profit which is higher than the cost of capital if the price of a security differs from its fundamental value. The challenge is to find the right asset pricing model which indicates an appropriate expected return. Any test of an asset pricing model is a combination of testing if the market is efficient and the model itself. (Bearley et al 2008)

Markets definitely respond to all kind of information which is not a surprise. What is more surprising is the fact that it does not matter if the information is good or bad. As all information is already incorporated the price should not change. It is all about the investors' expectations. They anticipate in their valuation of the share and decide if they will buy, hold or sell it. Investors estimate the intensity of information. Good news does not automatically lead to rising prices and consequently bad news does not lead to bad performance. As a consequence it has revealed that it serves to know the market expectations. Specialists like economists, professional forecasters and big investors focus on it and act according to this. (Siegel 1998) In soccer bookmakers publish the odds for wins, draws and losses and thus provide their expectations of game outcomes to the public.

According to most evidence the weak and the semi-strong forms of market efficiency seem to hold in the real world. On the one hand many famous authors show that almost every market like the Treasury bill market (Roll 1970), the prices at the New York stock exchange (Schwert 1977) and the future market researching on corn and cotton (Larson 1960, Mandelbrot 1963) have "fair" prices and gave evidence to be efficient. But on the other hand hundreds of anomalies take place on the market. To number only a few of them like the small-firm effect, calendar effect, announcement puzzle, the new-issue puzzle and so on cannot be traced back to efficiency on the market. But experts argue that rather pricing models might have deficiencies and are inadequate. (Bearley et al 2008, Jensen 1978)

## 2.1 Pricing models

New information influence prices and are incorporated rapidly. So within a short time period the prices reflect their true value. In order to value stock returns and their risk there are three models which are highly recognized in the financial literature.

### 2.1.1 CAPM

The most widely known model calculates the asset-specific risk called beta. It is based on an older concept, the risk-premium model. This model assigns increasingly high returns require taking higher risk. (Harrington 1987:2) The CAPM was introduced by Jack Treynor (1961), William Sharpe (1964), John Lintner (1965) and Jan Mossin (1966), who extended the work of Harry Markowitz.

The CAPM consist of the following simplifying assumptions:

- 1) Investors are risk-averse and maximize the expected utility of their wealth.
- 2) They are price takers and have the same expectations of asset returns.
- 3) Investors have the possibility to borrow or lend unlimited amount of money at a risk-free rate.
- 4) All assets are marketable and divisible.
- 5) Information is available for free and for everybody at the same time.
- 6) There are no taxes and regulations. Short selling is permitted as well. (Copeland et al. 2005: 147, 148)

In theory only systemic risk determines expected return because unsystematic risk can be eliminated easily through diversification. It cannot be earned extra money for that risk. The extra return results from the risk-free rate which compensate for inflation and compensation for the holding period and a risk premium. The risk premium depends on the amount of systematic risk included in the investment and is measured by the beta. Additionally the market or the equity risk premium is needed to complete the CAPM formula. It represents the historical average excess return on the market portfolio. In

order to regress beta the historical returns has to be regressed by the market's historical returns. (Berk et al. 2012: 366-371)

$$(1) \quad E [R_i] = r_f + \beta_i (E[R_{Mkt}] - r_f)$$

where  $E [R_i]$  is the expected return,  $r_f$  is the risk-free rate,  $\beta_i$  is the beta of the specific stock and  $E[R_{Mkt}]$  is the expected return of the market.

The CAPM equation says that the risk free rate plus the calculated beta multiplied by difference between the market risk premium and the risk free rate has to be summed up to get the expected return. (Berk et al. 2012: 366-370) Given the directly proportional relationship between the security's beta and the expected return, it can be expressed in a linear function by using the Security Market Line (SML). It indicates the linear relationship between the security's expected return and its systematic risk. As the SML can be used for all securities all kind of portfolios lay on SML, as well as the market portfolio. The CAPM is a widely used tool to measure expected return considering the systemic risk of the security in question. (Berk et al. 2012: 370)

To conclude, if the CAPM is true then the expected return of every security should lay directly on the SML. Thus abnormal returns are observed when the expected return shows any deviation. If this is a persistent state we can declare that the market is inefficient. (Copeland et al 2005: 371)

### 2.1.2 Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Model (APM) was introduced by Stephen Ross (1976). His model provides an alternative way how to calculate the expected return and risk. The APM can be seen as an extension of the CAPM. CAPM refer to only a single factor, the return on the market portfolio, to figure out the expected return of a security. (Copeland et al 2005: 176).

The assumptions behind the APT are:

- Investors are risk-averse and try to maximize their wealth
- They have the possibility to lend or borrow money at the risk-free rate
- No transaction costs, no taxes and short-selling is allowed. (Harrington 1978: 193)

Practitioners argued that there are different kinds of stocks on the market. Some are more sensitive to interest rate; some are more sensitive to changes in the oil prices. Macroeconomic news enhances or detracts from the expected return. (Harrington 1978: 188, 189)

$$(2) \quad E [R_i] = r_f + \beta_{i1}(E[RF_1] - r_f) + \dots + \beta_{ik}(E[RF_k] - r_f)$$

where  $R_i$  is the return on an asset,  $r_f$  is the risk-free rate of return,  $\beta_i$  is the sensitivity of the asset to a particular asset's return (covariance between asset's return with changes in the factor) and  $RF_k$  is the expected return on a portfolio with an average (1.0) sensitivity to a factor,  $k$ , that systematically affects returns, a factor common to all asset returns. (Harrington 1978: 189, 190)

The APM has some attractive features. It is not relevant to measure the market portfolio. Data from only a few assets are sufficient to test the APT. Nevertheless APT does not reveal what the particular factors are.

### 2.1.3 3-Factor model

In the CAPM it is only one factor the beta used, in the APM many factors can be used but it is not clear which should be used. Anomalies like the small firm effect are evidence against the CAPM, but obviously happen on the market. So Fama and French include 3 factors in their regression of the model. (Fama & French 1993)

$$(3) \quad E [R_i] = r_f + b_i[E(R_m) - r_f] + s_iE(SMB) + h_iE(HML) + \varepsilon_i$$

where  $E[R_i]$  is the expected return of an asset  $i$ ,  $r_f$  is the risk free rate,  $E(R_m)$  is the expected return of the market,  $b_i$  expresses the sensitivity of asset returns to market returns,  $s_i$  is the sensitivity of the asset returns to the return of SMB,  $E(SMB)$  is the expected return of small size minus return on big size,  $h_i$  is the sensitivity of the asset returns to the return of HML,  $E(HML)$  is the expected return of high BE/ME ratio minus return of low B/M ratio and  $\varepsilon_i$  represent the error term of the asset  $i$ . (Fama & French 1993)

This formula concludes the market factor, the size factor and the book-to-market factor and their sensitivities. Fama & French stated that smaller companies and firms with a higher B/M ratio do better on the market. (Copeland et al. 2005: 873) Mark Carhart (1997) added a fourth factor to this model. The factor is called momentum effect. He gave evidence that in the short-run stocks which did well recently should be bought and stocks with a poor recent performance should be sold. As this condition is only valid in the short-run the portfolio is called the prior 1 year portfolio. (Berk et al 2012: 378)

## 2.2 Anomalies

Anomaly is the definition for something which is inconsistent with its expectations. The theory says that asset-pricing behaviour can be the reason for occurring anomalies. In the long run all anomalies seem to disappear, reverse or mitigate. Sometimes the anomalies also do not hold in other sample periods, became weaker or completely disappeared after publishing the phenomenon in journals. When testing an anomaly researches usually take other samples (e.g. countries or firms) or simply take prior periods. (Schwert 1977)

In case of discovering a technique with which you can earn abnormal returns, nobody is interested to publish it and watch the anomaly disappearing. So publishing would not make sense, except one is hunting for fame. If there is a reliable strategy or technique working all the time, the general public might not know it. The number of anomalies is large and many of them realized on several markets. Below just a few, but important ones are pointed out.

### 2.2.1 Asset pricing anomalies

Many anomalies have been discovered, but not all can be mentioned in this thesis. This section dedicates to a few asset pricing anomalies which are related to this study and are well documented in finance literature.

#### 2.2.1.1 The size effect

One of the oldest and most famous anomalies is the small-firm effect. When picking small stocks in a portfolio also higher risk is taken into account. Nevertheless investors can earn abnormal returns over different time periods. There can be many reasons for this phenomenon. Either rebalancing of portfolios by institutional investors, tax issues, low liquidity or when evaluating small firms risk is not measured appropriate, which is might due to overpriced information. (Mishkin 2001: 704, 705)

Banz (1981) states that at the NYSE small firms had higher risk-adjusted returns than mid-size and big ones over forty years. One reason may be misspecifications in the CAPM. But also a lack of information about small firms, which leads to limited diversification, could result in higher returns. He summarizes that the size effect exist but he cannot explain why. The size effect is totally accepted in the financial sector that the size factor (SMB) takes an important place in the Fama-French's 3 factor model.

Brennan et al (1998) indicate that the size effect can be explained by liquidity. Small-cap stocks are traded on less liquid markets than large-cap stocks. Higher returns are obtained which compensates the higher transaction costs. Ho & Hung (2009) includes an investor sentiment variable in different asset pricing models. They find investor sentiment plays an essential role in conditional asset pricing models for capturing anomalies. Furthermore, they state that the size effect becomes less important in the conditional CAPM and not significant in other models.

### 2.2.1.2 Book-to-market equity factor

Fama & French (1993) point out 3 factors that should explain stock-market returns. The market factor, the size factor and the book-to-market equity factor were included in the 3 factor model. Later on the momentum effect was added. The factor HML (high minus low) is the return of a portfolio strategy that is long on high book-to-market stocks and short on low book-to-market stocks. HML and SMB strategies generate higher return in most countries. (Davis 1994; Chan, Hamao & Lakonishok 1993; Capaul et al. 1993) Fama & French (1993) state that both factors explain the large difference between the average returns across stocks.

HML and SMB are related to economic fundamentals and can predict future GDP growth rates. High book-to-market value is associated with a relatively cheap share price compared to its book value and the earnings on assets are low. On the other hand a low B/M value means that high earnings are persistent. Stocks with a high B/M value are also called value stocks and stocks with a low B/M value are called glamour stocks. Fama & French's study (1993) shows that HML produces statistically significant average abnormal returns of 0.40% per month. They assume that acquiring firms are the reason for the book-to-market effect. They have high stock prices relative to their book values and thus low loadings on HML. Acquiring firms are expected to be successful, but generates negative abnormal returns when controlling only the market and size factor. Lakonishok et al (1994) give evidence that value stocks have outperformed glamour strategies over the period of April 1968 to April 1990. The explanation for this phenomenon is that actual future growth rates of earnings, cash flows etc. of glamour stocks revealed to be overrated and lower than in the past. However, bearing fundamental risk seems not to be the reason for higher returns of value stocks. It turned out that value stocks are underpriced relative to their risk and return characteristics, whereas glamour stocks are overvalued. They also discovered that the book to market equity factor is caused by expectational errors of investors. Investors' expectations about future growth refer to past information. Investors believe that the growth rates of glamour companies are persisting higher than of value firms. Individual and institutional investors prefer glamour strategies and avoid value strategies. La Porta et al (1997) confirm those results.

### 2.2.1.3 Price earnings ratio effect

The P/E ratio effect says that low price-earnings portfolios perform better than high price-earnings portfolios. Between the years 1957-1971 investors earned higher absolute and risk-adjusted return with securities of low price-earnings securities. It is assumed that information cannot be processed quickly enough and there are lags and frictions. Investors could not exploit the market reaction because of transaction costs and tax costs. (Basu 1977) La Porta (1996) provide similar results. He builds portfolios based on the stock's price to earnings ratio. He documents that an investment strategy which buy shares with a low price-to-earnings ratio and sell short shares with a high ratio generates abnormal returns.

### 2.2.1.4 Momentum effect

At this strategy there are two portfolios. One portfolio consist of stocks which performed well, the other consist of stock which performed poorly in the past. Many studies gave evidence (Jegadeesh & Titman 1993) that holding the so-called winner portfolio for 3-12 month generates higher returns than holding the loser portfolio. Between 1965 until 1989 investing in such an investment strategy based on the stocks' past 6 month returns and holds those 6 months would lead to a compounded excess return of 12.01 % per year in average. If the holding period lasts longer than 12 months the momentum effect changes. In this case investors can earn more money with loser portfolio. A possible reason for this is that people might move prices away from their long-run values when buying winners and selling losers. Thus an overreaction of the market takes place. (De Long et al 1990a) Another possibility is that the market underreacts on information in the short-run and overreacts in the long-run. Jegadeesh & Titman (2001) prolonged their work and conduct a study using more recent data. The results are similar to their earlier study. The authors could also rebut the argument that momentum effect is due to data snooping biases.

### 2.2.2 Seasonal anomalies

The most famous calendar anomaly is called the January Effect. Many studies give evidence that average return in January is substantially higher than in other months. Not only Rozeff & Kinney (1976) describe the January effect in their most significant study, also Keim (1983) add in his study that the January effect occurs strongly at small stock markets. Additionally to the January effect he states that the highest returns can be earned in the first five days of the month. This finding and many other calendar effects might be interesting in this study. Games in soccer are not played during summer and in January. Hence also seasonality concerns this study. The aim of this study is not to list all seasonal anomalies, but only mention a few.

#### 2.2.2.1 Turn-of-the-week effect

Many studies give evidence that on Fridays investors can obtain higher returns than on Mondays. According to a study conducted by Cross (1973) on Fridays between 1953 until 1970 the S&P 500 increased with a probability of 62 %, whereas on Monday only of 39.5% The average return amounted to 0.12 % on Fridays, the average return on Mondays only to -0.18 %. Similar results are provided by French (1980). On Mondays between 1953 until 1977 the mean return was also slightly in the negative area with -0.168 %. The highest returns could be observed on Wednesdays and Fridays.

Pettengill (2003) documents that the turn-of-week effect also appears in futures, Treasury bills, debts and exchange rates. He indicated many reasons which cause this anomaly. The returns are assumed to be normal distributed, but they are not. Bad news are often postponed over the weekend and are announced on Mondays which explain the Monday effect. Another explanation could be that investors are afraid of buying stocks on Monday because of negative firm-specific news and short-sellers usually opens their positions on Monday in order to react on new information from the weekend. Ke et al (2007) find the turn-of-the-week effect in the Taiwan foreign exchange market. Examining the period from 1992 to 2006, covering three trading regimes, they document higher returns on the first three days of the week. In the

contrary the turn-of-the week effect disappeared for almost all currencies in the 1990s in the New York foreign exchange market.

#### 2.2.2.2 Turn of the month

During the last few days and the first few days of each month it can be noticed that stock prices increase temporarily. There is evidence given by Ariel (1987) that on ten consecutive trading days of a month investors can obtain higher returns than on other days. The first nine trading days of a month and the last trading day are the most profitable days. However, Lakonishok & Smidt (1988) examined the Dow Jones Industrial Average index and find that on only 4 consecutive days, beginning with the last trading day of the month, abnormal returns can be earned. A possible explanation could be that the end of the month is a typical pay-off day. Dividends, interest and principal payments are paid out. Furthermore little investors try to avoid high transaction costs, gather their money and put the bulk of money on relatively illiquid stocks. (Ogden 1987) Another explanation is indicated by Nikkinen, Sahlström & Äijö (2007). They give evidence that higher returns in the first half of the month are due to important macroeconomic announcements. Kunkel et al. (2003) examines 19 stock markets from 1988 to 2000. They give evidence that the turn-of-the-month effect (TOM) still exist in 16 of 19 countries during the full period. 87% of the monthly return, on average, across countries, can be traced back to the 4-day TOM period. During 1994-2000 the TOM effect disappeared in the United States, but in other countries it is still persistent.

#### 2.2.2.3 Halloween effect

The sell-in-may effect, also known as Halloween effect, describes the period from October until April in which higher return are obtained on the money market. Bouman & Jacobsen (2002) examined in their study in which countries the Halloween effect exist. The results show that in 36 out of 37 countries the phenomenon is prevailing. The

effect tends to be highly significant in especially European countries. For instance the Halloween effect has been persisting since 1694.

Hong & Yu (2009) investigated the trading activity of 51 stock markets during the summer. They find that stock turnover decrease significantly during the summer and especially in countries with a lower stock turnover the mean stock return decline simultaneously. The effect of lower trading volume is larger for the ten biggest stock markets. Besides also the bid-ask spread widens during summer. Small but also large investors are on vacation and trade less. Bouman & Jacobsen (2002) observed that during November until April the trading volume tends to slightly higher. Many anomalies are statistically significant, but when introducing transaction costs it becomes not economically significant. The turn of the week is a good example for it. However, investing during the period November until April is profitable also when trading costs are considered. Another special feature of this anomaly is that it does not disappear after discovery and there is no reasonable explanation for it.

### 3. BEHAVIORAL FINANCE

Due to the extreme volatility of and the turmoil on the financial markets investors suffered from substantial losses. Not only shares of the financial sector dropped dramatically, also other sectors were buffeted by the financial crisis. Securities on financial markets seemed to be mispriced. As arbitrage is not powerful enough to converge prices to its fundamental prices, there must be another reason for mispricing. Experts have the opinion that mispricing is caused by investors' psychology. (Bearley et al 2009) Stocks of low capitalization, younger, unprofitable, high volatility, non-dividend paying growth companies are heavily affected by investor sentiment. (Baker & Wurgler 2007)

Pricing models are based on the assumption that investors are rational. This assumption should simplify creating models, but does not take into account the decision process of investors when investing their money. Irrational decisions can entail serious disadvantages and affect the portfolio poorly. The capital market theory does not cover topics for example how investors build up their portfolio or which factor is decisive for people thinking about investing their savings. Knowing the motivation of investors it raises the question if it is even possible to earn persistently more earnings than the average investor.

Psychologists are convinced that risk-taking behaviour is not determined by greed and fear, rather hope and fear drive people to run risks. (Lopes 1987) Kahneman and Tversky (1972, 1973) and Tversky & Kahneman (1971, 1973, 1974) claimed that people use heuristics in making decisions under uncertainty. This behaviour is consistent and predictable. Individuals do not follow the economic theory and judge incorrectly about likelihood of uncertain events. Availability but also representativeness and anchoring are among the main features of heuristics. De Bondt (1998) states in his study that people are prone to heuristic-driven bias like availability bias, representativeness, overconfidence, anchoring and adjustment and aversion to ambiguity.

The reason why the assumption that investors can be rational is simply wrong is documented by many practitioners. (Tversky & Kahneman 1974) It can be observed that people no matter if they are professional investors or individuals repeat their mistakes again and again. Many reasons are driven by heuristic errors. Heuristic is defined as the process by which people find things out for themselves. They usually figure it out by trial and error which again makes people developing rules of thumb. Nowadays these rules of thumb are called heuristics. (Shefrin 2002:13)

### 3.1. Heuristics

#### 3.1.1 Availability bias

Availability is one of the most important key words when talking about heuristics. People rely on their experience and more on feelings than on probabilities. Thus the media plays an essential role. Medias influence people and cause them to over- or underestimate the probability of an event. The more often people perceive targeted information, the more they take it as usual. Frequent occurrences can be better recalled and are easier to imagine. People tend to generalize their findings to a principle. As they use their imperfect heuristics, consequently, they commit errors in certain situations. (Shefrin 2002: 14)

If an event occurs several time and a person always experienced the same outcome the person's estimation about the probability of the outcome shifts. People living in retirement homes who experienced death with loved ones and the near surroundings estimate the probability of the mortality rate higher than teenagers. It is easier to attribute a higher probability to something people can imagine than to abstract things. So the outcome or the event does not have to be experienced once, the ease of constructing instances affects people's estimations. (Tversky & Kahneman 1974)

### 3.1.2 Representativeness

Representativeness means when people rely on stereotypes and directly conclude from past into the future. If an event happened in the past, it is assumed to happen in the same magnitude like last time and similar. It could also be the result of coincidence or bad luck. People fail to differ and thus are misled by representativeness. (Shefrin 2002: 16)

Similarities with particular factors like for example abilities and appearances should not affect probabilities of an event or an outcome. However, people tend to make mistakes in their judgment of probabilities. Rather the prior probability should affect estimations but are neglected. So people also neglect such important information even though they are told before. When people estimate probabilities they are influenced about the information or description they get. If the information for example for a company was favourable the profits were predicted as positive. If the description of the company was bad the performance or outcome was negatively evaluated, although the received information had no value. The information set given was expected to have no value for the persons involved in the test. (Tversky & Kahneman 1974)

The winner-loser effect is considered to be caused by representativeness. De Bondt and Thaler (1985, 1987) dedicated to this topic and showed that portfolios of past loser stocks perform better than past winners in the preceding three years. Rinne and Vähämaa (2011) claimed that the “Dogs of the Dow” strategy, which supports the winner-loser effect, works in the Finnish markets, especially in downturns. Evidences that strategies which concerns buying and selling stocks on their past performance, are successful lead to following question: Are also analysts and forecasters who are supposed to be rational biased? The given studies illustrate that analysts are too pessimistic about recent losers and too optimistic about recent winners.

### 3.1.3 Overconfidence

According to Kent et al (1998) overconfidence in behavioural finance means that people tend to overestimate the precision of private information signal about security prices.

Investors attach greater weight to private than to public information. They believe to benefit more from it than if they receive information which is available for everybody. Thus informed traders cause the stock prices to overreact. The theory says that investors underreact to public information signals. Kent et al (1998) assumes that investors underestimate their forecast error variance and overestimate their ability to evaluate stock prices. People are strongly convinced of their abilities that they credit success on their own and blame other external factors for failure (Langer & Roth 1975).

Psychologists find that over- and underreaction can be caused by overconfidence. Odean (1998) indicates that when investors think the signal is more accurate than it is in reality the markets overreact. After the news is announced the price corrects. Poterba & Summers (1988) document that big news lead only to moderate stock price movements and when little news is issued big movements can be observed. Overconfidence implies that people are not aware of being disadvantaged when it comes to receive information. Badly informed investors make investment decisions and trade more often than as usual which cause huge trading volume. (Shefrin & Statman 1994, Odean 1998)

De Bondt (1998) examined a group of experienced investors who had a portfolio of 310,000 dollars in average. 72% of the portfolio was invested in stocks. His study targeted to the ability of forecasting of the investors' own portfolio's shares and their opinion of the development of the Dow Jones. De Bondt (1998) states that people were overoptimistic about the future performance of their own shares, but not about the Dow Jones. The investors were also frequently surprised about the price changes of their own portfolio. Moreover their forecasts were anchored to past performance. During downtrends of one of their own stocks they believed that the chance is smaller for a downtrend than for an uptrend. The reverse applied during uptrends. Furthermore these investors underestimate the correlation between the market and their shares, the beta.

#### 3.1.4 Anchoring-and adjustment, Conservatism

Anchoring is an issue of estimate probabilities for an event. Let us imagine people have to estimate the probability of an outcome and suddenly new information is issued. In

this case people tend to underreact. They seem to anchor to their first estimation and hold their opinion. The new information either conservatively incorporated or is not adjusted sufficiently. The same process occurs when analysts react on newly published earnings announcements. Once they build their opinion they do not revise it appropriately. The process is the same, no matter if the news is considered as good or bad. The magnitude becomes stronger in both directions. These unexpected surprises is seen as an issue of overconfidence because when the deviation of the estimated upper and the lower limit is too narrow, people get surprised more frequently. (Shefrin 2002: 20)

Basu (1997) claims that bad news is incorporated more quickly in stock prices than good news. In order to test the speed of earnings announcement he used firms' stock returns. He finds that positive earnings changes are more persistent and states that conservatism increased over time due to the fact that the sensitivity of earnings also rose. The reason can be that investors would rather like to liquidate a firm than suffer predictable losses (Hayn 1995).

### 3.1.5 Ambiguity aversion

Knight (1921) claims that in uncertain situations probabilities cannot be used. Uncertainty is defined as situations in which the chances of a specific happening are unknown. Individuals do not like situations in which the outcome's probability is not known. Even when the odds are good to gamble people prefer the safe way. They like familiar situations and fear the unknown (Shefrin 2002). In general the term "ambiguity aversion" means that investors prefer to make risk assumptions in investment decisions based on known probabilities instead of unknown probabilities. (Tabak & Fazio 2010)

### 3.2 Belief forming and other risk behaviour

People are expected to be rational. Further, it is argued that the best decisions are achieved if investors have objective beliefs in order to maximize the average present

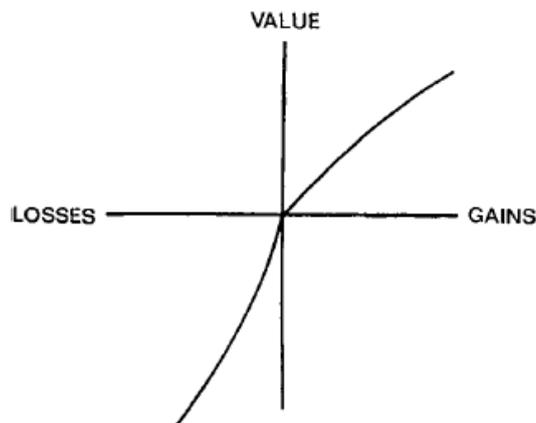
discounted value of utility. Biased beliefs affect the outcome unfavourably. (Brunnermeier 2007)

Olsen (1998) documented the potential psychological attributes of a decision maker. His preference is multi-faceted, open to change and often formed during the decision process itself. He tends to adapt his decision according to the environment in which the decision is made. Thus it influences their selection of decision process and decision technique. Furthermore decision makers look for a satisfactory solution, not for an optimal one. When it comes to investment-related decisions, Olsen (1998) also claims that investors are convinced that prices are not right because they are not predictable. In times of excessive volatility and of bubbles herding takes place.

De Bondt (1998) notes that people choose their stock well-considered. Investors think that a solid understanding of a bunch of firms is a better measurement of risk than a diversified portfolio. Investors ignore the fact that beta measures risk and also neglect that risk and return are strongly related to each other.

Thaler & Johnson (1990) point out in their study that investors' decision making process is influenced by prior outcomes. On the one hand if the investor experienced a loss, he tends to avoid any risk. On the other hand if his transactions have been crowned with success the investors start to behave like a gambler. The bets get larger and running risks does not represent a problem. This effect is also well-known under the term "hot hands". However, Thaler & Johnson (1990) admit that it is difficult to generalize a typical behaviour about risk-taking preferences and predictions about human behavior as well.

Kahneman & Tversky (1979) state that investors do not want to take risk in which they could experience loss. They do not value their portfolio at the current price, but take a look in the past at the acquiring day and calculate the price difference. If they made a good profit after the review investors will be happy. But if they revealed slight loss investors would be much less happy. As a compensation of a minor loss a high return is needed. Below Kahneman & Tversky's hypothetical value function is illustrated.



**Figure 1.** Hypothetical value function

### 3.3 Herding

Herding is when people follow advisors and totally trust them. It is like sheep follow their shepherd. As a consequence they overreact to new information and sell their stocks too early. (Olsen 1998) Culter, Poterba & Summers (1990) describe herding as a phenomenon which occurs when people take investment decisions because of historical stock price performance instead of fundamental analysis. A group of investors act as momentum-traders. Due to peer pressure market participants ensure uniform behaviour and thus initiate herding.

Even John Maynard Keynes already said that professional investors follow the herd. Due to the high pressure on the labour market there are circumstances in which managers copy the decisions of other managers. They are concerned about their reputation and ignore even essential information. It takes a lot of courage to swim against the current in the middle of recessions or booms. If fund managers succeed in finding an asset class in which they could be spared from dwindling prices they would get recognition. But if they fail and bet their money unconventionally on the wrong horse at the stock market, their reputation will suffer tremendously. The reason is that the labour market cannot measure if managers processed valuable information about an

investment or foolishly only noisy signals. Hence the performance of the managers' investment and the similarity of the behaviour among all managers are taken into consideration. Consequently if investment decisions are simply mimicked and the same transaction is repeated several times it would result in excessive volatility. Trends and even bubbles could occur because of noisy signals. (Scharfstein & Stein 1990)

A reason for homogenous investment opinions could be that people feel good when acting like other market participants. To adjust one's opinion to the majority's one generates security. It stands to reason that individual investors act similarly like professional investors. They are also subject to psychological bias. It would be reasonable that for example a nation or important opinion leaders act with enthusiasm completely irrational on the stock market. Higher volatility and abnormal returns could be the consequences because supporters and unknowing persons mimic this behaviour caused by enthusiasm.

### 3.4 Over- and underreaction

When an investor hears news about a company, it could be either good or bad news. Underreaction means that people rely too much on their prior built beliefs and thus underreact to news. The market overreact when average returns following a series of good news is lower than the average return following a series of bad news. When people overreact they put heavier weight on information and may become too optimistic about future outcomes. As a consequence of both, over- and underreaction, the prices deviate from its fundamentally fair price. Representativeness and conservatism are the two factors which explain over- and underreaction the best. Conservatism states that people slowly change already formed impressions when they face new evidence. Kahneman and Tversky (1974) claim that people tend to see patterns in random situations which support the representativeness thesis. Bernard (1992) found that earnings announcements follow a random walk, but people typically assume that they are a mean reverting. Confirming these findings Andreassen and Kraus (1990) and De Bondt (1993) observed that people buy when prices fall and sell when prices rise although the series was a random walk.

Over- and underreaction in the financial sector is mainly observed when news has to be incorporated into share prices. Evidences on both sides show noticeable patterns on the stock market. Over a period of one to twelve months stock prices tend to underreact to published information. (Poterba & Summers 1991, Jegadeesh & Titman 1993) Contrary, prices seem to overreact during the time horizon of three until five years. (De Bondt & Thaler 1985, Fama & French 1992, Lakonishok, Shleifer & Vishny 1994) Another example of underreaction is that people can obtain abnormal return by trading on public information about insider trades. Seyhun (1992) documented that prices underreact on these kinds of trades. Barberis et al. (1998) documents in their study that after several good news investors became too bullish. This is due to overreaction and subsequently low returns are realized.

### 3.5 Home bias

It is well-documented that investors create poorly diversified portfolio. It can be seen in many samples that people put all their eggs in one basket and act against diversification which is the basis of portfolio theory. Blume et al (1974) found that in a huge sample of more than 17,000 investors 34.1 percent held only one dividend paying stock. 50 percent held no more than 2 stocks and only 10.7 percent created a personal portfolio of more than 10 shares. However, Meir Statman (1987) proposes in his study that at least 30 stocks should be included in well-diversified portfolio.

The phenomenon “home bias” describes the behaviour of investors to concentrate their stock holdings in the local stock market (Shefrin 2002). This section focuses on another behavioural finance issue that people mainly invest their savings on the home stock markets. French & Poterba (1991) conducted a study in which they analyse investors’ behaviour. Concerning portfolio diversification investors in each country expect a several hundred basis points higher return in their domestic equity market than in other markets. Only 7 percent of U.S. investors’ portfolios consist of foreign stocks. It is not a special case in the United States the phenomenon is spread all around the world. This results in investor choices. The concentrated holdings of domestic stocks can be explained by the investors’ “optimism” and “pessimism”. Fear might be also a

predominant emotion when people finding themselves in unfamiliar situations. Therefore foreign companies are not seen as familiar as local companies. There is evidence that people rather invest in the company for which they work.

Moreover people seem to impute extra risk to foreign investments because of lack of information about foreign markets and firms. Since the population is more interested and confident in buying domestic shares, sport fans of a team may think to have deeper insights in the financial situation in this club, hence they buy this stock. How do people become supporters of soccer clubs? There are many ways like people are raised to supporters by one family member because he/she likes a soccer club. It could also be that it is regional euphoria which reigns in the home-town. Both can lead to buying/selling stocks at the stock market. Shares of the investors' favourite club provides him a symbolic and emotional value which sometimes is not only connected to earning profit, more being part of the club.

### 3.6 Noise-trading

Most investors are not only too confident about their abilities; they also think that their decisions are based on fundamental data. The truth is that many people generally have poor timing, overreact and underreact to news and try to follow trends and at the same time believe to be well-informed. (Shleifer 2000, 144) These kinds of investors are called noise traders. Noise trading should not move prices when markets are efficient, only information should cause price movements. De Long et al. (1990b) state that the sentiment of noise traders is unpredictable which add a risk factor to the market. Arbitrageurs bet against them in order to bring the price up/down to the security's fair price. As a result prices diverge significantly from the "true" value. The noise trader risk is that investors' behaviour becomes extremer which means they become even more bullish/bearish although the prices are fundamentally too high/low. As a result arbitrageurs with short-term investment horizons expose the risk to suffer a loss.

Excess volatility on asset markets, mean reversion of stock returns and puzzles of under-and overreaction and many other examples are caused by noise traders. (De Long

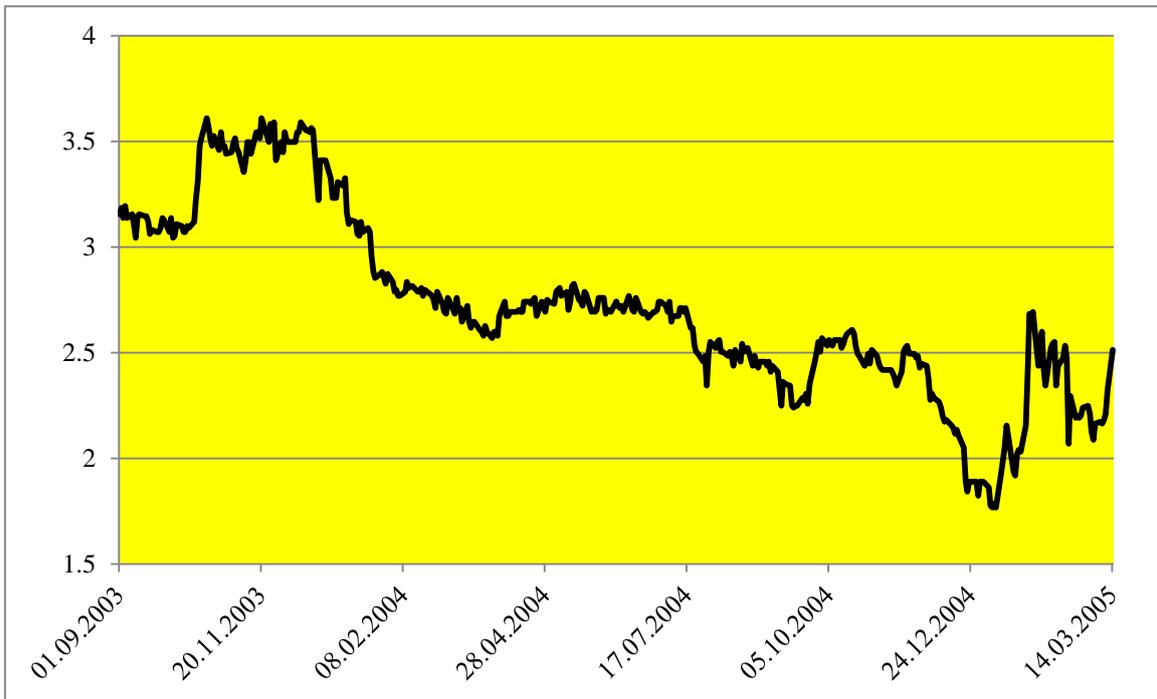
et al. 1990b) Furthermore all investment strategies which are not based on fundamental data are seen as noise. So charting methods should not affect the market. Friedman (1953) claims that noise trading which has impact on prices obtain lower returns than smart money investors. In contrary De Long et al. (1990b) claim that noise trading can be economically successful in portfolios which consist of assets which are subject to noise trader risk. These investors are rewarded for taking risk created by them.

## 4. DATA

There are 22 soccer clubs listed in European indices which show partly a long tradition on the soccer pitch and in investor's portfolios. Big players in the world of soccer tried their way on the stock market like Borussia Dortmund and Juventus. All clubs are well-known in Europe, but also around the world. Professional investors like mutual funds and financial institutions but also supporters of the clubs are holding shares of soccer clubs in their portfolio.

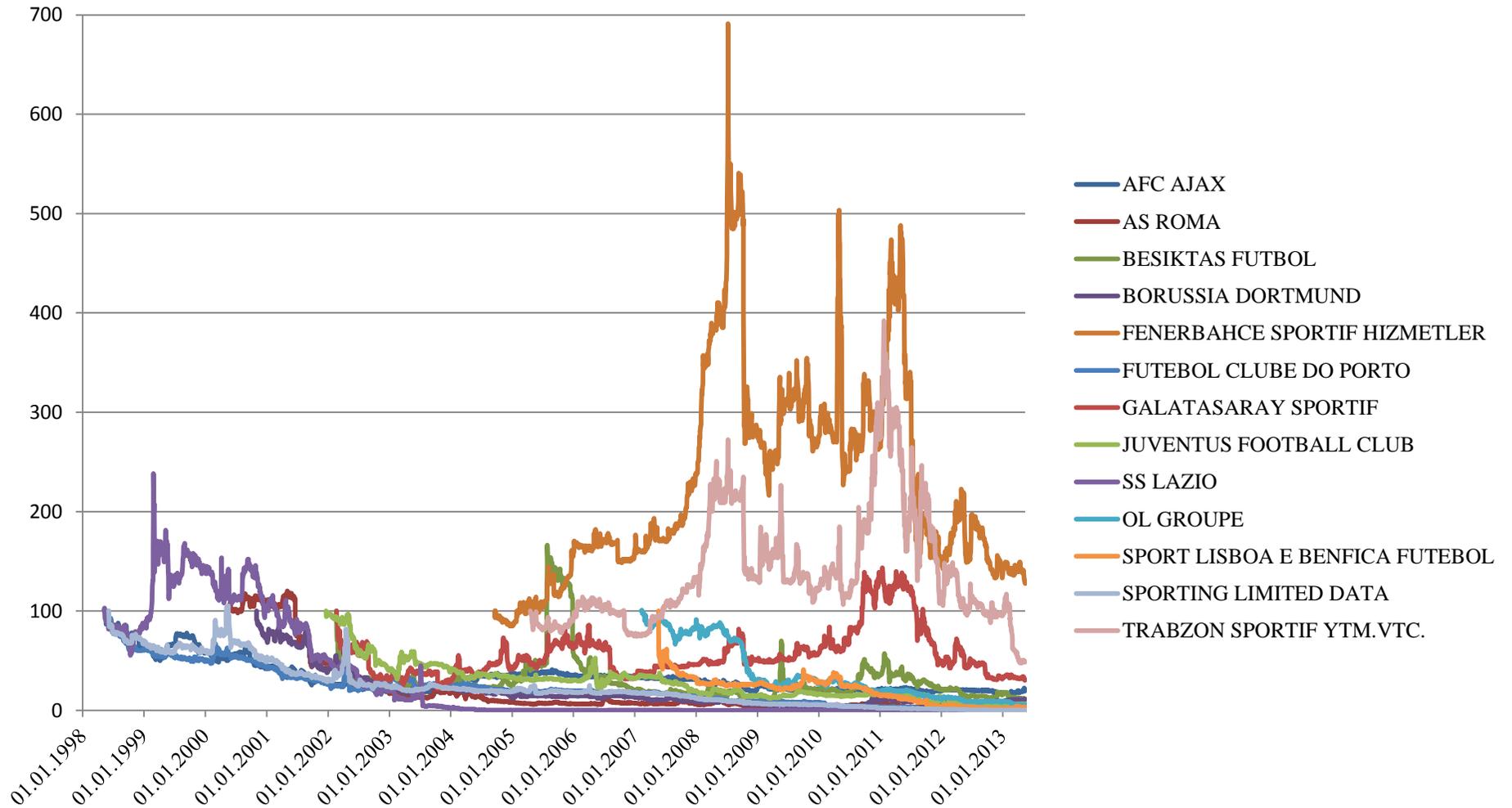
In this study all soccer national league games of 6 different countries and 13 different soccer teams are collected. The data set consist of 13 seasons, beginning with the season 2000/01 until the season 2012/2013. It is downloaded from the website <http://www.football-data.co.uk/data.php>. Results and betting odds from various leagues like from England, Scotland, Germany, Italy, Spain, France, the Netherlands, Belgium, Portugal, Turkey and Greece can be obtained. It can be seen that the choice of the number of leagues is limited to 11 countries. Data from Denmark (Aalborg Boldspilklub, Arhus Elite, Brondby IF, F.C. Kobenhaven, Silkeborg), Sweden (AIK Football) Macedonia (Teteks Tetovo) and Poland (Ruch Chorzow) were not available on the internet. Due to this fact the named clubs were excluded. Glasgow Rangers filed for insolvency in the year 2012 and was relegated in the Scottish Third Division. That is the reason why Glasgow Rangers is excluded as well. According to Scholtens & Peenstra (2009) teams with a stock which show zero-return dates are also excluded. It is assumed that on zero-return dates the share is not traded. This analysis is influenced by trading volumes, therefore Celtic Glasgow is excluded. Borussia Dortmund ran into troubles in the year 2003. By the end of the year 2003 two German newspapers "Süddeutsche Zeitung" and "kicker" revealed that Borussia Dortmund dispose of a massive lack of funding. Furthermore the CEO had been accused of having manipulated Borussia Dortmund's balance sheet. In February 2004 the half-yearly accounts were issued and thus a loss of 29.4 million Euros was admitted. In October 2004 a loss of 67.7 million Euros and total debts of 118.8 million Euros were announced. On 14<sup>th</sup> of March in 2005 the insolvency could be averted because the creditors agreed to the

proposed reorganization plan. Figure 2 shows the share price from 1<sup>st</sup> September 2003 until 14<sup>th</sup> March 2005.



**Figure 2.** Borussia Dortmund share chart from 1<sup>st</sup> September until 14<sup>th</sup> March

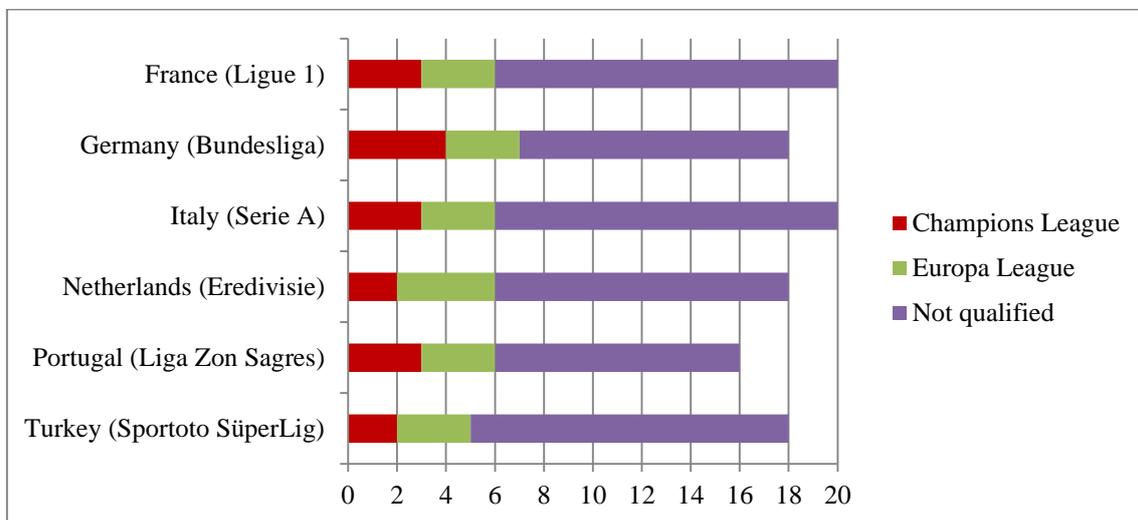
The price was very volatile during the hard times of Borussia Dortmund. Nevertheless the club is not excluded as the sport results during this time were also not good. On 22<sup>nd</sup> of April 2004 Borussia Dortmund could not qualify for the UEFA-Cup which meant that the chance of more revenues was also lost. So the athletic success and the financial problems match to the decreasing stock price and is not seen as an excluding criterion.



**Figure 3.** Stock prices of all soccer clubs used in this study during their IPOs until 31.07.2013

Figure 3 shows all 13 clubs which are used in this study and their prices since the year 1998. In order to get a better overview about the price development of all stock prices, they are modified, so they start at the price level 100. It can be seen that in 2013 Fenerbahce Istanbul is the only club which is above the price of the initial public offer. Over a short period also Trabzonspor, Lazio and Galatasaray reached a peak above the opening price of the IPO and seemed to be a good investment in the long run. Due to this overview, investments in stock listed soccer clubs as a long-term project is not worth to put some money on. It can be observed that the share prices of soccer clubs are relatively volatile and from time to time they turned out to be a good investment.

The UEFA-coefficient ranking determines the number of places allocated to a nation in UEFA club competition. It is based on the results of each nation's club in the five previous UEFA Champions League and UEFA Europa League. For instance the country coefficients of 2013/2014 entitle Spain, England and Germany to participate with the best 7 teams of the previous season at a UEFA competition. The fewer points the teams collect during the previous five years the fewer places are allocated.



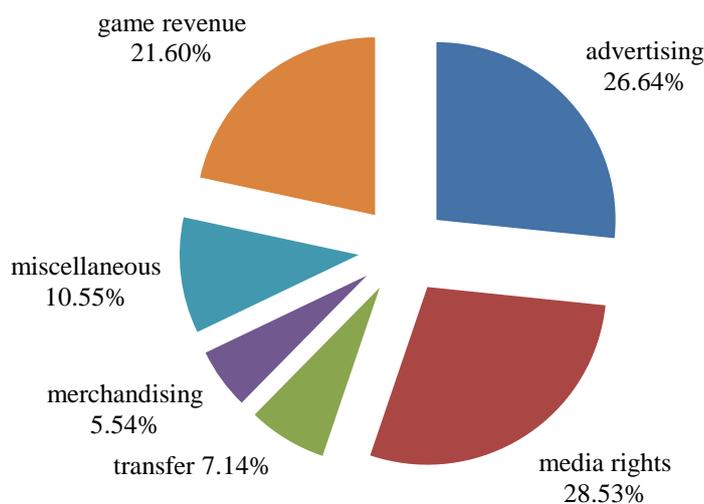
**Figure 4.** UEFA-coefficient ranking (Union of European Football Associations 2013a)

In Figure 4 it can be seen how difficult it is to capture a place for a European competition. Out of the sample it is relatively easy for a German team to participate in the Champions League in 2013. The top 3 teams are in the UEFA Champions League, 1

can qualify for it and 3 teams are in the UEFA Europa League. One thing is certain, once a team reaches the Champions League huge amounts of money are waiting. (Union of European Football Associations 2013a)

In 2013/2014 every team which is featuring the group stage can expect a minimum of 8.6 million Euros. The winning team of the Champions League Final can anticipate a fee of 37.4 million Euros. For a win a team receives 1 million Euros and a draw brings 500.000 Euros extra into the coffers of the clubs. Reaching the next stage is additionally honoured with a fee of several million Euros (Union of European Football Associations 2013b). In the season 2012/2013 only being in the group phase of Europa League meant a fee of 1 million Euros. Winning one game leads to a bonus fee of 140.000 Euros, whereas 70.000 Euros are collected when the game ended in a tie. (Union of European Football Associations 2013c). Generally speaking reaching a place at a European competition, especially in the Champions League, means lots of earnings and offers players a perfect platform to promote themselves.

Due to the DFL report 2012/2013 (German football association) the components of incoming cash flows are advertisement, media rights, game revenue (ticket sale), transfers, merchandising and miscellaneous.



**Figure 5.** Earnings overview of the German Bundesliga in 2012/2013

Figure 5, the pie chart gives an overview of the earnings of all teams of the German Bundesliga. The largest earning factor is taken by the media rights (28.53%). Advertisement and game revenues are also considerable components in the income statement. Media rights, advertisement and game revenues account for more than 75% of all incoming cash flows. After appearances in the Champions League many players who played well and thus increasing their market price can be sold to other clubs for huge transfer amounts. (DFL Report 2014)

**Table 1.** List of clubs used in the study

<b>Club</b>	<b>ISIN</b>	<b>Founding year</b>	<b>List date</b>
AFC Ajax	NL0000018034	1900	11.05.1998
AS Roma	IT0001008876	1927	22.05.2000
Beşiktaş	TRABJKAS91X6	1903	19.02.2002
Borussia Dortmund	DE0005493092	1909	30.10.2000
Fenerbahçe Futbol A.Ş	TREFBAH00019	1907	17.09.2004
Futebol Clube do Porto	PTFCP0AM0008	1893	01.06.1998
Galatasaray Spor Kulübü	TRAGSRAY91X9	1905	19.02.2002
Juventus Football Club S.p.A.	IT0000336518	1897	19.12.2001
Società Sportiva Lazio S.p.A.	IT0003621783	1900	06.07.1998
Olympique Lyonnais	FR0010428771	1950	01.02.2007
Sport Lisboa e Benfica	PTSLB0AM0010	1904	01.05.2007
Sporting Clube de Portugal	PTSCP0AM0001	1906	02.06.1998
Trabzonspor Kulübü	TRETRBZ00016	1967	15.04.2005

**Table 2.** Clubs and matching stock exchange

Ajax Amsterdam	AEX All share
AS Roma	
Juventus FC	DJSI World Italy subset
Lazio	
Borussia Dortmund	DAX 30
Besiktas	
Fenerbahce	BIST National 100
Galatasaray	
Trabzonspor	
FC Porto	
Benfica	Portugal PSI-20
Sporting	
Olympique Lyonnais	CAC 40

Czarnitzki & Stadtmann (2002) state that sporting success entails higher attendance figures. Being success in the national League lead to higher revenues through extra funds of the UEFA, more games take place which mean higher ticket sales and higher sponsoring earnings are possible because firms get more attention in Europe. Additionally TV-rights can be sold expensively.

Table 1 shows all clubs whose game outcomes are used for this study. The data is obtained from the club's homepages. Some of the clubs went public during the observation period. Benfica was the last club which issued shares on the stock market. That's the reason why Benfica has the smallest number of observations in this study.

All the games of the data set cannot be taken into account. Excluding criteria are adopted from the study of Palomino et al. 2009. All the results of non-listed clubs are excluded. If betting odds are missing the result is also excluded. Games are also excluded if two listed soccer clubs play against each other. The reason is that both betting odds and the outcome is the same. In the sample are now 13 teams. All in all 4347 observations are obtained in the final sample. In table 2 a list of all teams and the used matching indices is depicted.

In this study the odds of up to 10 major online bookmakers are considered as the market expectation formed by specialists. All the data are collected on Friday afternoons for the weekend fixtures and on Tuesday afternoons for midweek games. Betting odds show the amount of money that bettors can win on winning bets per unit of a bet.

Betting odds can change over time, since bookmakers want to have their book balanced. First when framing odds bookmakers want to attract as many people as possible for them. Second they want to balance their liabilities given the possible outcomes. The betting company adds a bookmaker's commission to the odds for making profit. (bettingexpert 2013)

In order to test the hypotheses data streams from share prices and indices are necessary. Daily data of the clubs' share prices, the matching indices and indices for calculating the SMB (MSCI Europe Large Cap and MSCI Europe Small Cap) are obtained by the University of Vaasa.

## 5. METHODOLOGY

In this study the event study methodology is used to analyse the effect of soccer game outcomes on the stock market return of listed football teams. The event in this study is a win, draw or loss.

Before calculating the abnormal returns the raw returns have to be calculated. Palomino et al. (2009) mentions that their results do not change if the calculation method for returns is modified. Scholtens & Peenstra (2009) used the following formula to compute the returns for each stock and each index,

$$(4) \quad r_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right)$$

where  $P_{it}$  denotes the closing price of stock  $i$  on day  $t$ .  $P_{it-1}$  is the closing price of the stock  $i$  of period  $t-1$ .

In order to obtain abnormal return the expected returns, the return when the event would not have occurred, has to be calculated. The difference between the observed returns and the expected returns represent the abnormal returns. To arrive at expected returns the market model including the control for the size effect is used.

The expected returns are calculated based on regression model. The equation is as follow

$$(5) \quad r_{it} = \alpha_i + \beta_i r_{mt} + \beta_{is} \text{SMB}_t$$

Where  $\hat{\alpha}_i$  denotes the estimated average return of the stock which would be realized if the market return is zero within a period of time  $t$ .  $\hat{\beta}_i r_{mt}$  is also estimated and measures the sensitivity of a stock relative to the market return.  $\hat{\beta}_{is} SMB_t$  is estimated and the sensitivity of a stock relative to the  $\varepsilon$  represents the error term and can be considered as the firm-specific return of a stock. The following regression model defines the abnormal return ( $AR_{it}$ ),

$$(6) \quad AR_{it} = r_{it} - \hat{\alpha}_i - \hat{\beta}_i r_{mt} - \hat{\beta}_{is} SMB_t$$

The soccer matches are the events and occur weekly. It is impossible to not include event-related returns of the football teams. Brown and Hartzell (2001) used the full sample period as estimation window. The same methodology is used for this study. For capturing the market expectations about games outcomes, dummy variables and continuous variables are used.

First the provided betting odds are converted into probabilities of outcome. The formula for calculating the probabilities of wins and losses are as follow.

$$(7) \quad \text{ProbWin}_i = \frac{x_{iw}^{-1}}{x_{iw}^{-1} + x_{id}^{-1} + x_{il}^{-1}}$$

$$(8) \quad \text{ProbLoss}_i = \frac{x_{il}^{-1}}{x_{iw}^{-1} + x_{id}^{-1} + x_{il}^{-1}}$$

Where  $w$ ,  $d$  and  $l$  denote a win, draw and loss, let  $x_{ij}$  ( $j=w, d, l$ ) denote one plus the average betting odds of up to 10 major online bookmakers for a bet on game outcome  $j$  for team  $i$ . For one unit of money bet,  $x_{ij}$  units of money are awarded to the bettor which includes the invested unit of money if outcome  $j$  is realized for team  $i$ . Therefore  $x_{ij}$  reflects the opinion of the bookmakers and simultaneously his belief about the

probability of outcome  $j$  for team  $i$ . *ProbWin* and *ProbLoss* present the bookmaker's beliefs about the probability to win or lose. (Palomino et al 2009) Probabilities for draws are not taken into account, since previous studies show strong reactions on wins and losses, but not on draws.

Furthermore to assess the experts' opinion on the outcome, Palomino et al (2009) use a measure of so-called *ProbDiff*. It measures the difference between the probability of a win and the probability of a loss. The formula of the difference of these two probabilities is as follow:

$$(9) \quad \text{ProbDiff}_i = \text{ProbWin}_i - \text{ProbLoss}_i$$

A positive value in *ProbDiff<sub>i</sub>* signifies a higher probability to win. A *ProbDiff<sub>i</sub>* equals zero means that the probability to lose the game is the same like to win it. Therefore a negative value denotes that the team is expected to lose the game. If *ProbDiff<sub>i</sub>* is exactly zero which means the probability of winning the game is equal the probability of losing the game, the game is excluded for this calculation.

Moreover four dummy variables are used in the study of Palomino et al. (2009). In this study *ProbDiff<sub>i</sub>* is used to present the bookmakers' expectations. The four groups (SEW = strongly expected to win, WEW = weakly expected to win, WEL = weakly expected to lose, SEL = strongly expected to lose) are created based on the magnitude of the expectation.

- The dummy variable for SEW is one, if  $\text{ProbDiff}_i > 0.3$  and otherwise zero
- The dummy variable for WEW is one, if  $\text{ProbDiff}_i \in [0, 0.3]$  and otherwise zero
- The dummy variable for WEL is one, if  $\text{ProbDiff}_i \in [-0.3, 0]$  and otherwise zero
- The dummy variable for SEL is one, if  $\text{ProbDiff}_i < -0.3$  and otherwise zero

Forming those four groups is necessary to measure the surprise effect on the stock markets. In case of missing data of betting odds the game is excluded.

In order to face the challenge of measuring the experts' opinion Palomino et al. (2009) add a second approach. This approach focuses more on the probability to win (*ProbWin*). Hence, similar parameters are constructed.

- The dummy variable for SEW is one, if  $ProbWin_i > 0.45$  and otherwise zero
- The dummy variable for WEW is one, if  $ProbWin_i \in [0.35, 0.45]$  and otherwise zero
- The dummy variable for WEL is one, if  $ProbWin_i \in [0.25, 0.35]$  and otherwise zero
- The dummy variable for EL is one, if  $ProbWin_i < 0.25$  and otherwise zero

The methodology of calculating the change of trading volumes and its impact is inspired by Palomino et al. (2009). To arrive at abnormal trading volumes, the following measure is used:

$$AV(1,2) = \frac{\text{Volume}(t=1) + \text{Volume}(t=2)}{\text{Volume}(t=-2) + \text{Volume}(t=-1)} - 1$$

where ( $t=1$ ) is the trading volume on Monday, ( $t=2$ ) is the trading volume on Tuesday. ( $t=-2$ ) is the trading volume on Thursday the game and ( $t=-1$ ) is the trading volume on Friday.

If  $AV(1,2)$  shows a positive number it means that the trading volume during the next two trading days after games is higher than before. Therefore a significant positive result would support  $H_6$ . Most of the games are at the weekend, that is why  $t$  can be used a certain day. It is tested whether investors' sentiment leads to increasing trading volume. In order to control the day-of-the week effect the results of the above equation is compared to non-season periods. If data points are missing either for Monday and Tuesday or Thursday and Friday, leading to a zero of the numerator or the denominator, the observation is deleted.

## 6. EMPIRICAL RESULTS

**Table 3.** Descriptive statistics of the clubs

	AJX	ASR	BEN	BES	BVB	FEN	GAL	JUV	LAZ	LYO	POR	SPO	TRA
Mean	-0.000	-0.001	-0.001	0.000	-0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.001	-0.001	0.000
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	0.214	0.287	0.434	1.211	0.24	0.201	0.177	0.237	0.64	0.141	0.511	0.644	0.197
Minimum	-0.113	-0.237	-0.474	-0.408	-0.216	-0.215	-0.441	-0.223	-0.558	-0.124	-0.503	-0.486	-0.217
Std. Dev.	0.0230	0.032	0.044	0.043	0.025	0.028	0.031	0.024	0.043	0.021	0.032	0.042	0.031
Skewness	0.983	1.101	0.188	7.604	0.045	0.05	-1.488	0.589	0.314	0.511	0.003	0.819	0.254
Kurtosis	10.413	14.867	22.311	219.434	12.908	16.637	28.921	21.254	49.408	10.043	47.548	37.732	11.514
Sum	-0.085	-2.145	-2.093	0.254	-1.207	0.85	0.015	-1.928	-3.763	-2.537	-2.741	-2.624	0.186
Sum Sq. Dev.	2.010	3.590	3.178	5.508	2.122	1.785	2.887	1.787	7.193	0.766	3.89	6.729	2.047
Observations	3803	3442	1617	2986	3327	2313	2986	3030	3803	1689	3803	3803	2613
Games	442	428	156	315	432	245	315	392	428	243	362	362	227

The examined clubs are Ajax Amsterdam (AJX), AS Roma (ASR), Benfica (BEN), Besiktas (BES), Borussia Dortmund (BVB), Fenerbahce (FEN), Galatasaray (GAL), Juventus (JUV), Lazio (LAZ), Olympique Lyonnais (LYO), FC Porto (POR), Sporting (SPO) and Trabzonspor (TRA).

The empirical analysis is based on the outcomes of soccer games and how they influence their stock prices. Previous literature give evidence that wins lead to positive returns and draw and losses lead to negative returns.

To measure the effect of national League games data of 13 teams and the matching indices are used. The chapter is divided into 6 parts, each for every hypothesis. The descriptive statistics of all 13 clubs are depicted in Table 3.

### 6.1 Win/Draw/Loss-effect

This section deals with the effect of soccer outcomes and their effect on the stock price of stock listed soccer clubs. Palomino et al. (2009) provide evidence that cumulative abnormal returns are significantly positive at the 1 % level following a winning soccer games. Inspired by their study all games are collected to investigate the movement of the stock price after victories, draws and losses. In this study, victories, draws and losses are highly significant at the 1% level. Table 4 shows cumulative abnormal returns one, two and three days after a game outcome. Positive abnormal returns can be obtained after victories. The abnormal returns for draws and losses are significant and negative like in previous studies. It can be seen that the magnitude of the win effect is smaller than for draws and losses. On the next trading day after a game the stock price increases by about 0.48 % after a win, after a draw it decrease by about -1.05 % and after a loss - 1.28 %. The regression includes 4347 observations. The fact that most of the listed clubs are top teams in their national leagues is the reason why the majority of the observations are wins.

**Table 4.** Effect of Wins, Draws and Losses on stock listed soccer clubs' share price

	N	Share price reactions to games in Basis Points		
		AAR(1)	ACAR(1,2)	ACAR(1,3)
All games				
Win	2561	47,52***	37.40***	35.84***
t-statistic		7.335	4.182	3.309
p-value		(0.000)	(0.000)	(0.009)
Draw	982	-104,93***	-112,32***	-136.48***
t-statistic		-10.030	-7.776	-7.804
p-value		(0.000)	(0.000)	(0.000)
Loss	804	-128,39***	-143.87***	-163.71***
t-statistic		-11.105	-9.013	-8.470
p-value		(0.000)	(0.000)	(0.000)
Total	4347			

The dependent variables are the average abnormal return (AAR) and the average cumulative abnormal returns for two and for three days (ACAR). Win, Draw and Loss are dummy variables which are equal to one if the team wins, loses or ties the game and zero otherwise. All regressions have 4347 observations. \*\*\* stands for statistical significance at the 1% level.

It is also tested whether the win/loss effect lasts several days. In table 4 it can be seen that considering daily data the win effect dwindles, whereas the effect after draws and losses intensifies when looking at the cumulative abnormal returns. The market reactions on games in the following days remain the same which means that the sign is not changing over time. A loss triggers a three-day average abnormal return of -1.64 %, a draw -1.36 % and a victory 0.35 %. Under the circumstances that going short is allowed and possible the statistically significant results are also economically significant. All regressions are significant at a level of 1%. The hypothesis  $H_1$  cannot be rejected because significant reactions of the share price can be observed in all directions, if a team loses or play a draw the share price declines and if a team wins the price increases.

## 6.2 Trading volume reaction

People tend to be emotional instead of rational when their soccer team is playing. In this study an analysis is conducted to test if people's trading activity is influenced by game outcomes. As most of the games are on Friday night or on the weekend Monday's and Tuesday's trading volume is expected to be greater than on Thursday and Friday. All results in table 5 are highly significant and positive which means that the summed up trading volume from Monday and Tuesday is higher than the one from Thursday and Friday. It can be seen that the trading volume is on the highest level when teams lost and on the lowest when they won. This implies that people are ready to trade more when their team lost than when they won.

**Table 5.** Trading volume reactions after weekend games

	Trading volume reactions to game results
Win	0.846***
t-statistic	9.085
p-value	(0.000)
Draw	1.081***
t-statistic	7.167
p-value	(0.000)
Loss	1.333***
t-statistic	8.027
p-value	(0.000)

The dependent variable is the weekly trading volume. Monday's and Tuesday's turnover is divided by Thursday's and Friday's turnover minus 1. If the weekly turnover shows a positive value, the trading volume on Monday and Tuesday is bigger than on Thursday and Friday. Win, Draw and Loss are dummy variables which are equal to one if the team wins, loses or ties the game and zero otherwise. \*\*\* stands for statistical significance at the 1% level.

To make sure that the Monday-effect is captured all observations are divided into 2 groups, on-season and off-season. Palomino et al. (2009) define on-season as periods "around game dates". In this study on-season means that a game was played in the previous week, whereas off-season is defined as a trading week in which no games were

played in the previous week. Most of the observations of the off-season take place in January, June, July, August and by the end of May. If a game took place in the previous week the on-season dummy variable is equal to one, if not it is a zero.

**Table 6.** Comparison of trading volume in on- and off-season

Comparison on-season/off-season			
	On-season	Off-season	
Win	0.338***		
t-statistic	17.247		
p-value	(0.000)		
Draw	0.371***		
t-statistic	11.822	No games	
p-value	(0.000)		
Loss	0.425***		
t-statistic	12.049		
p-value	(0.000)		
Mean trading volume	0.362	Mean trading volume	0.292

The dependent variable is the weekly trading volume. Monday's and Tuesday's turnover is divided by Thursday's and Friday's turnover minus 1. If the weekly turnover shows a positive value, the trading volume on Monday and Tuesday is bigger than on Thursday and Friday. Win, Draw and Loss are dummy variables which are equal to one if the team wins, loses or ties the game and zero otherwise. \*\*\* stands for statistical significance at the 1% level.

Since there are few outliers the observations are classified according to the size of the trading volumes. 10% of the highest and 10% of the lowest turnover reactions are excluded in the regression concerning the comparison between on- and off-season. After excluding influencing outliers the results show a slight difference. In table 6 it can be seen that both mean trading volumes are positive. This means that the mean trading volumes on Mondays and Tuesdays are generally larger than on Thursdays and Fridays. So a day-of-the-week effect cannot be ruled out. Moreover, when comparing the two periods, on- and off-season, it can be indicated during the on-season the mean trading volume is significantly higher than at the off-season. The results are consistent with

Palomino et al.'s (2009) study. They give evidence that the mean abnormal trading volume around game dates is significantly larger than for June and July.

This could be explained that during the summer the trading volumes remain at a low level, which confirms Harrison & Yu (2009). It is reasonable that after games a soccer club stands in the spotlight. The media and the people pay more attention to the teams and it is more obvious to think of a purchase or sale of securities of the team. Moreover it can be seen that losses affects the trading volume more than victories. Also draws lead to a higher share turnover at the stock exchange than a victory. Nevertheless there is a higher trading volume when a team won a game at the weekend than in the off-season.

### 6.3 End-of-the-season-effect

This section deals with the question if games at the end of the season have more impact on the stock price than games occurring earlier in the season. At the end of the season game outcomes decide if teams have the right to play in international competitions which is linked to higher earnings. If a team suffers from a bad season and it is almost about to be relegated to lower league the games at the end of the season are getting more and more important. In order to test this hypothesis the season is divided into 2 parts, the period from April until June is defined as end of the season and the games from August to March as the rest of the season. The regression consists of Win, Draw, Loss and the seasonal dummies April-July and August-March. Table 7 and table 8 show the average (cumulative) returns. Table 7 exhibit all observations of the end of the season. In this table it can be observed that all results are highly significant. They all have the same sign like in table 4. It can be seen that the magnitude of the win-effect as well as the draw and loss-effect is stronger in the rest of the season than in the last quarter of the season.

Table 8 shows that the strong effect of victories, draws and defeats of the rest of the season. The win-effect seems to dwindle and almost disappear.

**Table 7.** The average reaction on share price of all games played in April - July

N		End of the season		
		AAR(1)	ACAR(1,2)	ACAR(1,3)
Panel B	All games in April - July			
Win		24.90*	-8.89	-23.60
t-statistic	577	1.810	-0.469	-1.028
p-value		(0.070)	(0.639)	(0.304)
Draw		-90.33***	-89.52***	-142.06***
t-statistic	189	-3.758	-2.703	-3.541
p-value		(0.000)	(0.007)	(0.000)
Loss		-90.94***	-128.08***	-129.98***
t-statistic	159	-3.470	-3.547	-2.972
p-value		(0.000)	(0.000)	(0.003)
Total	925			

**Table 8.** The average reaction on share price of all games played in August - March

N		Rest of the season		
		AAR(1)	ACAR(1,2)	ACAR(1,3)
Panel A:	All games in August - March			
Win		54.09***	50.75***	52.88***
t-statistic	1984	7.312	4.973	4.276
p-value		(0.000)	(0.000)	(0.009)
Draw		-108.40***	-117.82***	-134.23***
t-statistic	793	-9.264	-7.299	-6.863
p-value		(0.000)	(0.000)	(0.000)
Loss		-137.62***	-147.78***	-170.42***
t-statistic	645	-10.607	-8.256	-7.858
p-value		(0.000)	(0.000)	(0.000)
Total	3422			

The dependent variable is the average abnormal return (AAR) and the average cumulative abnormal returns for two and for three days (ACAR). Win, Draw and Loss are dummy variables which are equal to one if the team wins, loses or ties the game and zero otherwise. \*\*\* stands for statistical significance at the 1% level, \*\* stands for statistical significance at the 5% level and \* stands for statistical significance at the 10% level.

In table 7 in the end of the season the positive sign is changing to a negative one at ACAR (1,2) and ACAR (1,3), but both values become insignificant. The results of the draw and loss effect remain relatively stable. Based on table 4, table 7 and table 8 it can be seen that victories which represent good news are incorporated more quickly than bad news (draws and losses).

#### 6.4 Home-/Away-games-effect

There are plenty of studies which examine the win/draw/loss-effect, but the home-/Away-effect have not been explicitly factored in previous studies. Supporters of soccer clubs may go to the stadium and are emotionally stronger involved in the game outcomes. According to betting odds the team that plays at home seems to have slight favouritism which means that a win is more expected than away. As the pressure for winning on the home pitch increase people could be more disappointed when losing. To test the hypothesis that game outcomes at home lead to higher extent of share price movement the games are divided in 2 parts, home and away games.

Table 9 gives evidence that victories at away games have a stronger effect on the stock price than at home games. The effect after wins almost doubles when playing on the opponent's pitch. A victory at home generates abnormal return of 0.35 % on the next trading day, whereas a victory after away games leads to 0.65 %. In contrast, losses are felt even more sharply when played at home. After defeats at home the stock price drops by -1.45 % and become even worse after further 2 days (-1.83 %). If a team plays away and lost the game the stock price falls by about 1.20 % the next trading day and become worse after 3 trading days (1.53 %). People might expect losses more when their teams play away or at least they cope with losses at opponent's pitch better. The share price loses 1.2 % of its value on the next trading day. The same applies for draws. Tying a game at home leads to a fall of the share price by 1.19 % and after the following 3 trading days even by 1.77 %. If a team draws a game away the stock price decreases by 0.94 % and by 1.03 % after 3 trading days.

**Table 9.** Home/Away-effect

N		Share price's reactions to games in Basis Points		
		AAR (1)	ACAR (1,2)	ACAR (1,3)
Home games				
Win	1486	35.05***	18.11	15.42
t-statistic		4.093	1.535	1.078
p-value		(0.000)	(0.125)	(0.281)
Draw	430	-118.92***	-137.91***	-177.21***
t-statistic		-7.472	-6.286	-6.667
p-value		(0.000)	(0.000)	(0.000)
Loss	258	-145.09***	-170.96***	-183.18***
t-statistic		-7.061	-6.036	-5.338
p-value		(0.000)	(0.000)	(0.000)
Total	2174			
Away games				
N		Share price's reactions to games in Basis Points		
		AAR (1)	ACAR (1,2)	ACAR (1,3)
Away games				
Win	1075	64.75***	63.84***	63.61***
t-statistic		6.435	4.602	3.784
p-value		(0.000)	(0.000)	(0.000)
Draw	552	-94.02***	-92.47***	-103.43***
t-statistic		-6.696	-4.776	-4.409
p-value		(0.000)	(0.000)	(0.000)
Loss	546	-120.50***	-131.07***	-152.62***
t-statistic		-8.534	-6.733	-6.470
p-value		(0.000)	(0.000)	(0.000)
Total	2173			

The dependent variable is the average abnormal return (AAR) and the average cumulative abnormal returns for two and for three days (ACAR). Win, Draw and Loss are dummy variables which are equal to one if the team wins, loses or ties the game and zero otherwise. \*\*\* stands for statistical significance at the 1% level.

Draws and losses at home affect the share price stronger than after away games. This implies that teams are expected to win at home and the expectations for a victory are lowered when a team plays an away game. In general, especially losses at home are punished significantly by a decrease. A loss is slowly incorporated in the stock price because after 2 and 3 days the price still decreases. After victories the share price increases rapidly right the day after the game.

### 6.5 Goal-difference-effect

The goal difference shows how superior a team won or how bitter the defeat was the team swallowed. It is created by the difference of the goals shot by a stock listed soccer club and the goals received. To measure the effect whether it matters if the victory or the defeat was more than clear or narrow several dummies are included in the regression: 3 for a victory (+1 goal, +2 goals, more than +2 goals), 1 dummy for a draw and 3 other dummy variables for a defeat (-1 goal, -2 goals, more than 2 goals received). As the results for draws, 0 goals difference, are already provided, it is not shown in the following table.

As the draws are excluded there are now 3365 observations. The main conclusion which can be drawn from table 10 is that the sensitivity of the share price increase when a team is losing. The higher the goal difference of a team the stronger the share price decreases. The highest average abnormal return is obtained after a clear defeat when a team loses a game with more than 2 goals difference. After three trading days the stock price drops by about 2.48 % in average. As well as in other tests before a defeat is incorporated relatively slowly compared to victories. After 3 days the cumulative returns are the highest value. After a victory of only 1 goal difference the share price increase slightly. The cumulative abnormal returns for 2 and 3 days become insignificant. The results for a goal difference of exactly +2 and more than 2 goals are similar. The stock price return amounts to 0.54 % until 0.65 %.

**Table 10.** Goal difference and the reaction of the share price

		Goal difference and its effect on the share price		
N		AAR(1)	ACAR(1,2)	ACAR(1,3)
All games				
More than +2 goals	692	63,35***	53.63***	64.95***
t-statistic		5.053	3.102	3.100
p-value		(0.000)	(0.002)	(0.002)
+2 goals	804	57.93***	62.95***	58.94***
t-statistic		4.980	3.925	3.033
p-value		(0.000)	(0.000)	(0.002)
+1 goal	1065	29.36***	19.21	13.82
t-statistic		2.905	1.378	0.819
p-value		(0.004)	(0.168)	(0.413)
-1 goal	486	-126.23***	-136.36***	-152.48***
t-statistic		-8.437	-6.609	-6.100
p-value		(0.000)	(0.000)	(0.000)
-2 goals	222	-114.85***	-139.10***	-166.88***
t-statistic		-5.188	-4.557	-4.512
p-value		(0.000)	(0.000)	(0.000)
More than -2 goals	96	-170.63***	-209.76***	-248.08***
t-statistic		-5.069	-4.519	-4.411
p-value		(0.000)	(0.000)	(0.000)
Total	3365			

The dependent variable is the average abnormal return (AAR) and the average cumulative abnormal returns for two and for three days (ACAR). More than +2 goals, +2 goals, +1 goal, -1 goal, -2 goals, more than -2 goals are dummy variables which get a one depending on the goal difference of the game outcome. All regressions have 3365 observations, because draws are not taken into account. \*\*\* stands for statistical significance at the 1% level, \*\* stands for statistical significance at the 5% level and \* stands for statistical significance at the 10% level.

Therefore it can be assumed that the goal difference at victories does not influence investor's behaviour. The main thing that counts for investors is that the stock listed soccer club wins. Investors might think to detect a trend line. Mainly if a team suffers from a high defeat, investors seem to be risk averse. The risk is obviously too high that

the team is in bad shape in general and this condition is assumed to remain unchanged for the next time. Investors avoid risks and overreact to negative game outcomes.

## 6.6 Surprise-effect

Based on the betting odds probabilities the game outcomes are calculated. Bookkeepers publish their betting odds before the game and they are indicators about professionals' opinion. 6 observations are excluded as the data for odds are not available. Table 11 shows the share price reaction of a soccer outcome for the next trading day. It can be seen that a surprise effect can be detected. The less likely a team is supposed to win the more intensive the share price moves. The share price of a team, which is strongly expected to lose but surprisingly wins, increases in average by 1.65 %. There is only a narrow difference between the result for weakly and strongly expected to lose. In the contrary there is only a slight positive change if the victory is expected. The stock price hardly moves when the team is strongly expected victories. The 2 approaches give almost the same results. Using *ProbDiff* the result for victories when a team is strongly expected to win is insignificant.

In case a soccer team surprisingly ties the game even though it is supposed to win it the share price decreases. Depending on the fact whether a team is strongly or weakly expected to win the magnitude of the change is cushioned. This applies for victories, draws and defeats. In both approaches the stock price falls by about 1.30 % when a team is strongly expected to win the game but only draws the game. When the team is weakly expected to win but draws or loses the game the values of the two approaches differs widely. On the one hand using *ProbDiff* the share loses 1.18 % of its value. On the other hand it decreases by 0.96 % using *ProbWin*.

**Table 11.** Surprise effect

N		Share price reactions to games in Basis Points							
All games		AAR (1)							
		SEW	SEWa	WEW	WEWa	WEL	WELa	SEL	SELa
Win	2557	27.85***	34.83***	80.44***	84.38***	173.98***	162.78***	50.29	164.80***
t-statistic		3.599	4.60	5.947	4.403	6.007	5.098	0.505	2.733
p-value		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.614)	(0.006)
Draw	982	-130.37***	-130.08***	-118.25***	-96.84***	-1.58	-33.66	126.33	95.47*
t-statistic		-8.964	-10.186	-6.409	-3.848	-0.055	-1.025	1.578	1.852
p-value		(0.000)	(0.000)	(0.000)	(0.000)	(0.957)	(0.305)	(0.115)	(0.064)
Loss	802	-129.06***	-132.13***	-121.12***	-99.3***	-140.93***	-156.78***	-134.49**	-130.12***
t-statistic		-5.792	-7.976	-6.398	-4.147	-5.792	-5.817	-2.479	-3.178
p-value		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.013)	(0.002)
4341									

The dependent variable is the average abnormal return (AAR) on the next trading day. SEW, WEW, WEL and SEL are dummy variables based on *ProbDiff* which are equal to one if the team strongly expect to win, weakly expected to win, weakly expected to lose or strongly expected to lose and zero otherwise. SEWa, WEWa, WELa and SELa are dummy variables based on *ProbWin* which are equal to one if the team strongly expect to win, weakly expected to win, weakly expected to lose or strongly expected to lose and zero otherwise. All regressions have 4341 observations. \*\*\* stands for statistical significance at the 1% level, \*\* stands for statistical significance at the 5% level and \* stands for statistical significance at the 10% level.

The main result in table 11 is that even though it is expected that a top team loses a defeat the game has negative consequences. Investors do not differentiate between losses. It is striking that when a team loses and it is either strongly expected to win or to lose the average decrease of the stock price is about 1.30 %. The strongest reactions to the share price can be observed when a team is weakly expected to lose and also actually loses. The shares decrease substantially by 1.41 % and 1.57 % which is the strongest movement in this table. Draws when the team is expected to win feel like losses. It makes no difference for investors whether the club ties or lost the game when they are expected to win. The magnitude of the drop of the share price is the same. The two approaches provide similar results. If a team is strongly expected to win and ties the game the stock price falls by 1.3% using both approaches. When it is weakly expected to win but the game ends tied the share price falls by 1.18% (*ProbDiff*) and 0.97% (*ProbWin*).

Table 11 gives evidence that traders on the stock markets are not rational. Victories are incorporated like expected. A slight upwards movement follows a victory when it is expected and a strong upwards movement takes place when the victory is unexpected. Concerning defeats people do not take odds into account which should be a good indicator of the game outcome. As most of the teams are top teams they show hardly any expected to lose observations. Hence these few observations of the subgroups WEL and SEL were summed up and were put together in one group. It was considered that due to the small number of observations the results are influenced. Also after controlling this issue the results remain the same.

## 7. CONCLUSION

This study examines whether soccer outcomes influence the stock price of a stock listed soccer clubs. The data set consists of games and stock prices of 13 clubs of 6 different countries. The time period is spanning from the season 2000/2001 to 2012/2013 and includes stock prices from the year 1999 on. This study clearly shows several effects of soccer outcomes.

Estimating with OLS, the abnormal return on the next trading amounts to +0.48 % after victories, -1.05 % after draws and -1.28 % after defeats. Given the possibility to go short on the stock listed soccer club the results are not only statistically, but also economically significant. It is striking that the win effect seems to dwindle after one day, whereas the draw and loss effect tends to continue. This indicates that good news is incorporated faster than bad news. For instance, after 3 days a defeat generates an average abnormal return of -1.64 %. All results confirm previous literature. (Edmans et al. 2007, Palomino et al. 2009)

In general, trading volumes tend to be higher after defeats than after victories. After controlling the day of the week effect two subgroups are created by dividing the sample in on-season and off-season observations. Due to outliers both 10% tails of the observations are excluded. The mean trading volume is higher during the season than in the off-season. Using a larger sample, different teams and more recent time periods the results are similar to Palomino et al.'s (2009).

During the end of the season top teams fight for the best places in the ranking. Championships are sometimes decided on the very last game of the season. This study covers the importance of games in the last quarter of the season. Surprisingly, the win-effect seems to disappear in the end of the season. The magnitude of the effect after draws and losses is also stronger during the rest of the season. That is why  $H_3$  has to be rejected.

Home games enjoy more attention and are seen as more important than away games. Wins at home seem to be expected by the investors and have almost no influence on the stock price (+0.35 %) the magnitude of the draw and loss effect increases. The highest difference in changes concerns draws. A draw at home leads to negative abnormal returns of -1.77 % after the next 3 consecutive trading days. In contrast, the stock price falls by 1.03 % after 3 consecutive trading days when tying a game on the opponent's pitch. After defeats at home the stock price drops by -1.45 % and become even worse after further 2 days (-1.83 %). If a team plays away and lost the game the stock price falls by about 1.20 % the next trading day and get worse after 3 trading days (1.53 %). People might expect losses more when their teams play away or at least they cope with losses at opponent's pitch better.

The goal difference is also investigated in this study. A narrow victory of +1 goal difference entails a stock price increase of 0.29 %. A high goal difference when winning a game of 2 goals and more generates an abnormal return of double the size. The stock price reactions after losses with a goal difference of -1 or -2 goals are similar. It leads to a decrease of about 1.15 % and 1.26 %. But if the team suffers a bitter defeat of a goal difference of more than -2 goals the stock price loses value of 1.71 % and reaches a negative maximum of -2.48 % after 3 trading days.

People do not act rational after game outcomes. Wins and draws lead to the expected reactions. But investors tend to act depressively when their team lost, even though the defeat was expected. The results for defeats are similar. The stock prices decline amounts to about 1.30 %, no matter which outcome the expert's opinion predicts.

Due to this study it can be concluded that investors overreact. Even if losses are expected it also leads to negative abnormal returns. This study mainly confirms findings from previous studies. There is evidence for the win/draw/loss-, a home/away-, a goal difference- and a surprise effect. Soccer outcomes also affect trading volumes. The only hypothesis that games in the last quarter of the season have greater influence on the stock price than games of the rest of the season was rejected.

As games of the UEFA Champions League and UEFA Europa League are linked with lots of money games from those competitions should be analysed. Some clubs are excluded because of a lack of data, so those missing clubs can be examined. It is suggested that only mere soccer clubs should be analysed. Most of the soccer clubs are managed like a firm and dispose of many different activity fields. Entertainment parks, basketball teams and other assets are indicated in the balance sheets and affect stock movements. It is not clear why investors behave irrationally although information derived from game outcomes should be incorporated rapidly. The true reason that makes people overreact on the stock market is worth for further research

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