Is winning Formula One, the formula for added value?

A STUDY REGARDING HOW THE OUTCOME OF A FORMULA ONE RACE AFFECTS STOCK VALUE

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Abstract

Corporate sponsorship has become an increasingly important marketing tool. To research its effect on the stock market we have conducted a study regarding how wins or losses in Formula One affect securities. By facilitating event methodology we show that there exists a correlation between Formula One race results and a certain sponsoring company's stock return's. We use results and stock returns from all events in 2009 and focused specifically on seven companies. The results show no significance in the overall results, but show correlation in six out of seven company's individual results, ranging from plus 6.4 percent to minus 5,75 percent. Winning, losing or other events do not clearly add or subtract value to stock returns, showing that the subject still needs further research in order to reach a conclusive result.

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1. INTRODUCTION

This chapter introduces the basic foundation of the research and presents a discussion as well as the problem formulation and purpose regarding what this study aims to find out.

1.1 FOUNDATION

This report applies event study methodology to examine whether the participation in a Formula One race affects stock value or not. The Formula One race industry had a turnover of 4 billion US dollars last year and attracted some 600 million viewers every race (Deloitte, 2007). It can therefore be considered to attract massive investments and, if sponsored, will have a substantial post in any companies marketing budget, regardless of its size. Should not winning or losing a race therefore have some affect on company value? We intend to search for negative or positive abnormal returns caused by events in Formula One and thereby identify the average effect of such event's to stock value.

The history of sponsoring such huge events can be traced back to the beginning of organized sports. It has for a long time been an accepted way of becoming noticed by customers and to increase sales. The better the team or athlete, the higher the price of the sponsorship. This multi-billion dollar industry is sometimes not only a large part of a company's budget, but also a central part of their marketing strategy. Since these investments are profound and regarded to add worth to a company, their value should also be appreciated in monetary terms (Kahle & Riley, 2004).

Earlier researchers have concentrated on studying the value of sponsorship by focusing on brand awareness or media exposure. Many different approaches have been used, but most have regarded focusing on for example brand value or increased brand recognition by consumers. The literature in this field is extensive and research in this area has generally obtained wide variety of results, some more conclusive than the other (Bennet 1999, Quester & Fallerry 1998). An area that is relatively unexploited is however research regarding how the stock market values such activities.

The stock markets primary role is to allocate resources available on the capital market. The market is however generally regarded to be controlled by people and their expectations (Madura, 2008). The value of a company is often estimated through calculating its present value. The present value is dependent on future expectations of profit. Marketing, which is often a key factor when gaining profit, must therefore have a profound meaning when evaluating company value. When a company is sponsoring a team or athlete that will be seen by millions all over the globe, the exposure is likely to increase sales (Kahle & Riley, 2004). Therefore, the probability of increased sales should also be incorporated into a company's market value.

The methodology used in this study has, as far as we know, only been used to investigate the effect of sports sponsorship to stock returns a few times before. The first well-known research was performed by Cornwell et al (2001). Their research focused on how stock returns on companies sponsoring the Indy 500 were affected by the results of these events. The outcome was however somewhat expected. They found that winning or losing only affects a company's stock if they have a direct affiliation with motorsports. This conclusion is consistent with marketing theory regarding that sponsorship should have a stronger affect when a company has close ties to the sport it's investing in (Mason, 2005). This is however not a consistent outcome of all research in the area. Sullivan & Dussold (2003) examine the effect to sponsors stock return during the Winston Nascar cup. They found that just participating seems to add value, while winning appears to have no impact. If the sponsored car is involved in a crash, there does however seem to be a negative return. Similar research has also been conducted within other sports events. Kirschler & Hinker (2010) research the implications to the sponsor when a soccer team wins or loses a match. Their general results were however surprising. Sponsoring a winning team seemed to have little effect on the stock return, but losing affected the security negatively. The known research that has been conducted has therefore shown relatively different results. These questionable differences in results make it interesting to further examine how events such as wins, losses or other incidents affect a sponsoring company's securities.

1.2 PROBLEM DISCUSSION

The research is as shown relatively inconclusive. Cornwell et al (2001) show proof of correlation, but Kirschler & Hinker (2010) together with Sullivan & Dussold (2003) only show increased or reduced returns under certain circumstances. Therefore there is little consistency regarding research of how stock prices are affected by wins or losses. General marketing theory does state that the increased exposure, which winning a race or match provides, ought to increase sales and consequently increase company value (Kahle & Riley, 2004). The possibility that winning or losing does not actually add any substantial value must however also be contemplated.

There are a number of possibilities supporting such a claim. First of all, the market might not expect it to add value. A company such as Ferrari, mainly owned by Fiat, might increase sales, but the actual value of the increase is too small to affect the Fiat stock price. To be a bit more precise, increased sales within smaller brands might have little effect on the automotive giants that actually own the Formula One teams. The second alternative is that the extra exposure provided by winning does not affect sales substantially. Since the extra exposure only lasts for a number of seconds per viewer, the brand names and sponsors are likely not to be remembered for more than a short period. Thus making winning the race excessive for sponsors.

There are however a few arguments that counter this kind of reasoning. It has been proven by several researchers that it is possible to alter consumer behavior by positive emotional attachments. If a team or person wins a race, then many will automatically have a more optimistic experience of the brand sponsoring them. It has also been proven that the stock market itself actually reacts to certain cognitive attachments by adding value to its returns (Mason, 2005). There should therefore be an effect on stock value due to the increased sales or potential sales of the sponsoring company.

When considering an immense sports industry such as Formula One racing, where the sheer cost of actually participating have several times caused automakers to nearly go bankrupt and where the number of viewers dwarf that of Nascar, some effects are likely to be seen on the stock market when a team wins or loses (Maurice 2010, Martin 2009). This makes it interesting to research the effects of Formula One team's performance, to a sponsoring company's stock value.

1.3 PROBLEM FORMULATION

Based on the introduction and discussion presented in the text above, the research problem will be:

- Does the outcome of a Formula One race affect the sponsor's stock returns?

1.4 PURPOSE

The purpose of this study is to investigate how the outcome of a Formula One race influences a sponsoring company's stock return. In order to address the issue, the query itself has been divided into three specific questions.

- Does winning affect stock returns?
- Does losing affect stock returns?
- Do other events during a race such as a mechanical car failure or an accident affect stock returns?

The study will be conducted through focusing on formula one event's in 2009 and specifically concentrate on seven companies, all which are listed on known stock exchanges.

2. SPORTS & SPONSORS

This chapter reviews the history of sports sponsorship and its implications to the industry that exists today. First it considers the basic history and then the development that has been apparent in later years.

2.1 THE HISTORY BEHIND SPORTS SPONSORSSHIP

Sport has been an important part of human civilization since its birth. Historians have found proof that organized sports existed within China as early as 2000 years before Christ. Egypt, which is regarded as one of the earlier civilizations, has well-documented records from different regulated sports events in among other swimming and fishing. The most well-known example is of course the Olympics that originated from Greece and that still lives on today. Even under the ancient Greek era some 3000 years ago organizations realized that champions and athletes in these games had a certain influence over the public and therefore were worth investing in. Sponsorship became a part of these ancient games when local organizations paid competitors to use their colors on their chariots (Masterlexis et al, 2005).

The Roman Empire embraced the power of sports events as a mean of controlling and handling the public. The events preferred by the Romans did however usually have dire outcomes for whoever lost. Gladiators battled each other and/or wild animals to the death and the magistrate, the equivalent to today's head referee, would decide if an eventual loser still alive was to be exterminated. These games were often organized when times were bad in order to shed blood for the gods. It can however be discussed if these games really were organized for the gods thirst of blood or the public's need for entertainment. The gladiatorial games themselves were also seen as a way for wealthy players within the empire to promote themselves to their clients and to the public. They can therefore be considered as an early form of sports sponsorship (Johnson-Morgan & Summers, 2005)

2.2 SPORTS SPONSORSHIP IN THE 21ST CENTURY

Sports sponsorship has since then evolved. It should however be said that development has been relatively slow. Along history, events similar to those in the Roman Empire have been organized by powerful rulers and wealthy figures to impress clients and opposition. The sponsorship that we see today is however a product of a much more recent development.

The pioneering Greek sense for sports sponsorship rekindled with modern civilization in the early 20th century (Mullin et al, 2007). Sport had become an increasingly significant factor in society due to rising social and economical welfare. The masses wanted entertainment just as the Romans had required it. It therefore became a growing industry with rising influence in society. Cold wars were fought in Olympic stadiums and champions became known all over the world. The investment became so increasingly important that teams started to pay their players ever larger amounts. With the introduction of television, sponsorship developed into an accepted marketing strategy. Babe Ruth became, as a result of the first television broadcast of a Major Baseball league game in 1939, the first athlete to be paid a six figure salary. The sports sponsorship industry did however not really take-off until the early 1970's. The sports marketing and sponsorship area then grew from being a small phenomena into a large industry (Mullin et al, 2007). Today the sports industry itself is calculated to have a global revenue of approximately 141 billion US dollars (Klayman, 2008). The sponsorship part is believed to engross roughly 10 percent of the industry and had in 1996 a yield of approximately 16,6 billion US dollars (Thomson & Speed, 2000).

Among all sports, Formula One is considered to be one of the most exclusive and capital intensive on the planet. Formula One can be considered to be the modern equivalent of the Greek chariots used in the Olympics. Companies still pay contenders to carry their colors and trademarks in order to be noticed and therefore add sales and value to their company. Its global turnover is considered to be nearly 4 billion US dollars and the event generates more than half a billion viewers per race (Deloitte, 2007). This makes it the sport with the third highest annual global turnover and also one of the most popular to watch. Only the National Football League and the Major Baseball League obtain higher annual revenue (Rosner & Shropshire, 2004).

3. THEORY & RELATED RESEARCH

This chapter examines the Efficient Market Hypothesis, a central component in this thesis, and research related to the study. This is done in order to acquire an overview of earlier results and conclusions.

3.1 EFFICIENT MARKET HYPOTHESIS

BACKGROUND

The Efficient Market Hypothesis is the main assumption for this thesis. The key aspect being that the market accounts for all information within the stock price (Fama, 1970).

The history of this hypothesis dates as far back as to year 1900, when Louis Bachelier introduced his Theory of speculation. The theory is seen as the foundation of modern financial mathematics and included calculations regarding among other the random walk, which is today widely regarded as a part of the Efficient Market Hypothesis (Sornette, 2003).

The Hypothesis did however not get its name or current shape until 1970, when Eugene Fama at Chicago University published his PhD thesis. The hypothesis was widely accepted until the early 1990's, but became criticised by behavioural finance followers who found support for non-rational investor activities (Shleifer, 2000).

THE HYPOTHESIS

The Efficient Market Hypothesis is based on a number of assumptions. The basic idea is that the market consists of a large number of players, which have unlimited and free of charge access to all available information and have no transaction costs. The hypothesis states that the market, under these circumstances, will be able to determine the most accurate price to any given security, due to that all existing information will be incorporated into the stock price (Fama, 1970). This does however also imply a few more assumptions, specifically that all players are utility maximizers and that all have rational expectations. The first assumption is basically an expression for that people will act in a way that they believe will maximize their profits. The second does however have a more profound meaning. It states that, since all information is available, every player on the market will be prone to have the same expectation to a single security. Thus, all future expectations will be incorporated into the stock price. The basic idea of the hypothesis is therefore that all current information and future expectation is actually integrated in the stock price. Available information is bound to rapidly change, which will also change the current stock value. Prices will therefore consequently seem to be following a random walk over time. The initial meaning of a random walk is that stock value changes are unpredictable and accidental, therefore regarding the market as totally irregular. The Efficient Market Hypothesis does however not regard these changes as random; it considers the available information to be random and the random walk to be created by the manner in which new information enters the market (Ruppert, 2004).

If the assumption is that the Efficient Market Hypothesis is correct, the result would be that all new information would instantly always be accounted for. Investors would therefore not have any information to capitalize on, and it would be impossible for them to beat the market. It is however important to note that this does not apply to every single investor, but to investors as a whole, meaning that some investors might beat the market, and some might make less than the market (Mayo, 2008).

Fama (1970) did however state that market's could be efficient to different levels. Therefore he divided efficiency into three different forms; weak, semi-strong and strong.

Weak form suggests that all trade-related information, such as historical volatility and data regarding volumes, is incorporated into the stock price (Fama, 1970). Traders will therefore have a hard time using for example technical analysis to predict future developments. It does however also state that investor's can earn considerable profits by studying financial statements, thereby identifying overvalued or undervalued companies (Mayo, 2008).

Semi-strong form implies that security prices reflect all public information. Public information can typically be defined as economic/political news or events and public announcements by companies. This form does however also assume that the weak form is a subset to this form. Thus, concluding that investors will also have access to trade-related information. Therefore neither technical nor fundamental analysis can be used to create a greater profit. This form does consequently imply that only information that is not available to the public can be used to achieve abnormal returns (Fama, 1970).

Strong form proposes that all information is reflected in the security price, including private and insider information. Like the semi-strong form this form also includes the criteria of the earlier form. The conclusion of this form is however that no abnormal returns can be created, because all information is incorporated into the stock price (Fama, 1970).

EVIDENCE & CRITIQUE

The hypothesis gained an enormous following when it was released. The theory, stated by Fama (1970), was quickly backed up by a vast array of empirical data and articles conducted by other prominent researchers. All data collected appeared to support the idea. Michael Jensen, a graduate and co-creator of the hypothesis, stated in 1978 that "there is no other preposition in economics that has more solid evidence supporting it than the Efficient Market Hypothesis" (Ruppert, 2004).

Researcher's primarily focused on proving different levels of the hypothesis. The weak form was mainly tested through searching for a non-random pattern in security prices. If the future price would be related to the historical changes, then it would be possible to make an abnormal return. Studies have however revealed that prices act independently of historical events. This shows that historical data has already been integrated into current prices, and that the hypothesis therefore holds (Mayo, 2008). It should however be noted that some anomalies have been found. First of all, these results are spread out over a wide range. Thus pointing out that certain securities actually sometimes act in a predictable manner. The traces of dependency, which could result in abnormal profits, are however often offset by transaction costs that are larger than the potential earnings. Other well-documented anomalies are connected to specific time-periods. Small stocks do often seem to perform better in January (January effect), stock markets historically perform better on Fridays than on Mondays (Weekend effect) and also have a higher general value before holidays (Holiday effect). These inefficiencies are well-known and it should therefore be possible to make an abnormal return. It could also be argued that the market is inefficient due to excessive movements. When measuring 300 specific days on the Dow Jones index, the market declined more than 5 % after following a market rise. This shows us that market correction is needed to compensate for the excess increase, thereby revealing that securities might not be reflecting all relevant information correctly (Madura, 2008).

The semi-strong form has been tested through investigating how the market reacts to specific events and announcements. These studies generally showed that the market instantly adjusted to the new information (Fama, 1991). Therefore it should not possible to make an abnormal return on a constant level, especially when adding transaction costs to the equation. There is however evidence of excess profits when investing in initial public offerings. The first day following the initial public offering seems to have a generally higher return. This can nonetheless be explained by several factors. The first is that investment banking firms, who underwrite the issue, seem to underprice initial public offerings intentionally in order to ensure that the entire issue can be placed. Secondly, it can also be argued that investors might only partake in an initial public offering if the price is low, due to the lack of information. The latter argument can however be regarded as information asymmetry, rather than proving that the market is inefficient (Madura, 2008).

The strong form is harder to prove. Inside information is in general not available to the public, therefore actually finding adequate information to conduct the research can be hard. Jaffe (1974) did however successfully manage to research the subject through using information gathered from “The official summary of insider trading”. By using this data he was able to show that private information could indeed lead to abnormal returns. His method was nonetheless questioned, and other researchers using alternative methods showed results pointing to the contrary. Fama (1991) does however refer to research conducted by Jaffe (1974) and several others later studies that stated the validity of this proclamation. He therefore rules out the existence of the strong form, due to the proven possibility to make abnormal returns with inside information.

3.2 RELATED RESEARCH

Many have focused on the implications of sponsorship with other measures, such as for example brand awareness. Quester & Farrelly (1998) conducted a case study of the effect of sponsorship to brand awareness within the Australian Formula One Grand Prix. Their findings conclude that people in general seldom remember or only briefly remember the sponsor and companies brand name when viewed in Formula One sporting events. From their point of view sponsoring Formula One does not add value to a company or organization and markets should therefore not adjust to issues regarding sponsorship. Some critique must however be directed towards such a statement. The research was conducted as a case study and does therefore not regard one of the main principles of marketing, which is long-term exposure and repetitiveness (Blythe, 2006). The results can therefore not be considered to be conclusive.

Bennet's (1999) research does support Quester & Fallerry (1998) regarding short-term exposures inefficiency, but he did however find strong evidence that long-term and repetitive exposure is prone to give high brand awareness, thereby aligning with general marketing principles (Blythe, 2006).

Research has also been conducted regarding how sports sponsorship affects consumer behavior, thereby considering if sponsorship adds or does not add value to a sponsoring company (Harvey, 2001). Mason (2005) investigates specific impacts to behavior from corporate sponsorship. He concludes that corporate sponsorship can create and alter consumer behavior by soliciting positive emotional attachments. He also found that hardcore fans seem more responsive to sponsorship. Mason (2005) does nonetheless add that the sponsorship itself must be fitted to suit the company. His consensus is therefore that sponsorship can add value and therefore should affect stock value.

Other factors that have been investigated are implications of acquiring extensive sponsorship contracts with famous teams or players. Agrawal & Kamakura (1995) researched the impact of companies gaining endorsement deals with celebrities. They investigated 110 sponsorship deals and found that there was a positive abnormal stock return of in average 0,44%. Another famous example is the so called "Michael Jordan effect" that was documented by Mathur et al (1997). They concluded that companies which secured endorsement deals with the basketball superstar in average experienced a positive abnormal return of 2 percent, resulting in a whopping 1 billion US dollar increase of stock returns. Therefore both articles conclude that endorsing known sports representatives are regarded by the stock market as a way to add company value.

If the assumption is that sports sponsorship actually adds value, then winning an event should add even more value, considering the positive cognitive attachments implied by Mason (2005) and the prolonged exposure effects investigated by Bennet (1999). The research in this area is however not as extensive as in other areas.

One of the earliest studies conducted in the area was by Cornwell et al (2001). Their article investigated the implications of how winning a Nascar Indianapolis 500 race affects sponsors stock price. Thus seeing if the old Detroit automaker saying “Win on Sunday, sell on Monday” actually had any content. They used an estimation of time-series data in order to measure the effect of the Indiana 500 events to stock prices. This was done by conducting a regression analyses between the winning sponsoring companies stock return and center for research securities prices (CRSP) value-weighted index. The research was performed over a 170 day period, 150 days before and 20 days after the event. The data was then used to estimate a 40-day model of the winning companies’ stock value if they in fact had not won, 20 days before the race and 20 after. By doing this, they created an approximation of the stock value as if these sponsors would not have been backing the right car. This methodology is identical to the method used by Mathur et al (1997) which was earlier mentioned. The research concludes that there is a substantial effect on companies that have a direct association with motorsports, while those that have not appear to be unaffected. To be more precise, auto companies sponsoring the event were positively or negatively affected by the outcome of the race, whilst sponsors who had no affiliation remained unaffected. This further enhances the findings by Mason (2005) regarding that sponsoring companies are more prone to be more affected by sponsorship if they have a more direct connection to the sport itself.

Sullivan & Dussold (2003) investigated a similar area. They studied if winning the Nascar Winston cup adds value to the current stock price. They used an event methodology just like Cornwell et al (2001), but utilize a different approach. Instead of estimating what would have happened, they measure the effect on all companies involved in the race. By comparing the company’s stock to the general index, they search for any abnormal returns that might have occurred in connection to different Nascar events, such as winning, coming in last or crashing. They found that just by participating in the cup adds between 0.2-0.4 percent in stock value, but that actually winning does not have any apparent affect. Negative events do however seem to have an effect on stock value. Their research shows an abnormally negative return if the company’s car is involved in a crash or accident.

When regarding Cornwell et al (2001) and Sullivan & Dussold (2003) it becomes relatively unclear if winning a motorsport actually affects company value. It is however impossible to regard these results to be conclusive for motorsports as a whole. Both researchers focus on American Nascar racing, which might be an important sport within the US, but is relatively small internationally.

Research has however been done in other larger sports such as soccer. Kirschler & Hinker (2010) investigated the implications to sponsors when winning or losing soccer games. They also used a similar model to that of Sullivan & Dussold (2003). By comparing the chosen sponsor's stock return on the day after a match to the current index return and at the same time account for anomalies, such as the Friday effect and autoregression, they research if any abnormal returns are gained with different soccer events. Kirschler & Hinker (2010) find that there is a positive abnormality when a firm sponsors both winning and losing side and a negative abnormality when a company sponsors the losing team. They do not however find any positive abnormality when regarding companies that sponsor a soccer match winner. Thus would winning actually not add value, but sponsoring both sides would.

4. METHOD

This chapter explains how the study has been conducted. The chapter starts with a brief introduction to event study methodology, followed by a presentation of where and how data was obtained and which data that has been used. The chapter then presents the specific methodology for this study, including which variables were used and how calculations were made. Finally, the accuracy and reliability of the method is discussed.

4.1 EVENT STUDY METHODOLOGY

This study follows the event study methodology guidelines presented in a simplified form by MacKinlay (1997), but actually derive from amongst other Fama et al (1969). The methodology assumes an efficient market, where economic events are reflected immediately in stock prices. A traditional event study follows six steps. First the event and the event window needs to be defined. An event window is the time-period for which the stock prices will be studied. When this is done, the criteria for which companies to study is decided, which can range from availability of data to listing in a specific market. The third step is obtaining the abnormal returns, for which we chose the market model. The market model is one of the two most common models for modeling the normal return and the one chosen for this report. It is also used to calculate the abnormal return where the independent variable is the market return. The basic formula is:

$$R_{it} = \alpha_i + \beta_i R_{it}^{m} + \varepsilon_{it} \qquad (4.1)$$

R_{it} is the return on security i and R_{mt} the market portfolio both over the period t. α_i and β_i are the parameters of the market model to be estimated, which is the fourth step of an event study. ε_{it} is the error term with the expected value of zero. To estimate the parameters of the market model the OLS[1] method is used. An expected daily return of the stocks can be calculated by using the estimated market model:

$$\varepsilon_{it} = R_{it} - E[R_{it} \mid R_{it}^{m}] \, R_{it} \qquad (4.2)$$

[1] Ordinary Least Square, the estimation process of the abnormal return, thus unknown parameters (Baddeley & Barrowclough, 2009).

This is the difference between the actual and the expected return. The parameters can be estimated using the time series data, either a time period before the events, or the same time period if the events are not endogenous, i.e. affected by the stock prices. The latter estimation process requires no structural changes of the market model for a proper estimation and is also the method followed in this study. When these steps are done, the framework to test the abnormal returns is designed. This is done by defining the null hypothesis and deciding how to aggregate the firms' abnormal returns. Thereafter the regression is performed, with the following equation:

$$\varepsilon_{it} = \delta_0 + \delta_1 x_{1i} + \ldots + \delta_M x_{Mi} + \eta \qquad (4.3)$$

δ is the regression coefficient and M the characteristics to be tested and η the zero mean disturbance term which are not correlated to the x's.

4.2 DATA

FORMULA ONE RACES – ODDS & INFORMATION

In the season of 2009, 17 races took place with at most 20 drivers. Out of the twelve different car sponsors present in the 2009 season, five are examined in this study, together with two non-car related sponsors. These companies were chosen first of all due to them being listed, secondly because of their stock data being available throughout 2009 and finally due to their history of sponsoring Formula One. The automobile sponsors examined are BMW, FIAT (owner of Ferrari), Daimler AG (owner of Mercedes), Renault and Toyota. The two non-automobile related sponsors are Vodafone and Philip Morris. Vodafone sponsored the McLaren – Mercedes car in 2009, which means that they are bound to the same Formula One results. Marlboro, owned by Philip Morris, is a main sponsor of Ferrari and is therefore implicitly connected to their team's race outcome. The sponsors appear with logos on the cars, clothing and much more. The companies not to be examined in this study, on account of different reasons, such as not being listed on any stock exchange, are Williams, McLaren, RBR and STR Red Bull Racing (Scuderia Toro Rosso in Italian), Brawn, Force India and Sauber (formula1, 2010). The race-results were all gathered from the Formula One official website and the pre-race odds for each driver and each race, were obtained from Daniel Gustavsson at Svenska Spel AB by request.

STOCK MARKET DATA

The stock market indices and stock prices that have been used were obtained through the Thomson Datastream, from December 31, 2008 to December 31, 2009. This data is adjusted for splits and dividends. The indices used are for the market of the respective stock. For the BMW stock and the Daimler AG we used DAX 30 Performance, for Toyota Topix Core 30, for Renault CAC 40, for Fiat FTSE MIB, for Vodafone FTSE 100 London and for Philip Morris NYSE Composite.

TIME SPAN

The time-period is one year, 2008-12-31 – 2009-12-31. The race-season is from March until November and stretching the time period on both sides of the season provides better a more accurate period for the estimation of the beta- and alfa-values. Expanding the time-period further is not an option in this case, due to that structural changes in the market model then need to be considered and sponsors change each year. In Formula One, sponsorship is not consistent from year to year and the same teams do not participate every year. To expand the time period from one year to several, this needs to be accounted for and the number of companies to study would probably be fewer. In this study, the event window is the day after a race and due to all races taking place on Sundays, Mondays will always be the event window. The compounded stock returns from Mondays are therefore used. According to Brown & Warner (1985), who conducted a study where they tested the possible shortcomings of event studies, a short event window provides a greater statistical significance to the test. The one season/one year choice of time-period is also strengthened by the same time-period used in amongst other the study by Sullivan & Dussold (2003).

4.3 METHODOLOGY

The hypothesis tested in this study is if abnormal returns, positive or negative, are correlated to a Formula One Race. Further, the correlation is controlled against different outcomes of races, for instance a win or an accident.

The calculations are carried out by using a two step multiple regression analyses. One to find the abnormal return of the stock’s and one to see if the abnormal return in any way correlates to any of our explanatory variables. The dependent variable in step 2 is the abnormal returns obtained in step 1. The independent variables included in the regression in step 2 are the positions in a race, thus; win, low win, middle, high loose, loose, accident, failure and win*odds. Where; WIN = 1st place, LOW WIN = 2-3rd place, MIDDLE = 4-7th place, HIGH LOOSE = 8-14th place, LOOSE ≥ 15th place. An accident is a crash or accident and failure is when a car cannot compete due to pre-race mechanical malfunction. Since only one car was disqualified in 2009, this variable is left out. The win*odds variable is included to check if winning a race, when the odds are really high (i.e. low probability of winning), has an effect. Further, each step is carried out both separately for each company and for all companies as a whole, eight times to be exact.

Table 1, The Frequency of Positions for Each Team

	BMW 2 cars	*MERCEDES 6 cars*	*FERRARI 4 cars*	*RENAULT 4 cars*	*TOYOTA 4 cars*	*MERCEDES – MCLAREN 2 cars*
WIN		10	1	6		2
LOW WIN	2	11	5	11	5	3
MIDDLE	9	26	14	13	22	10
HIGH LOOSE	15	24	18	17	26	9
LOOSE	4	16	13	9	7	4
ACCIDENT	1	7	6	5	5	3
FAILURE	4	9	10	5	5	4

STEP 1 – OLS ESTIMATION

The first thing to be done is to find the abnormal returns of the stocks. This is done through conducting an OLS-regression, using logarithmic returns from the stocks and from the stock indices. Logarithmic returns are used since we assume continuously stock prices and indices. Any possibility of an increase/decrease from the previous day to affect the price the current day is captured by the auto-regression included. As a result of all events being on Mondays, weekday dummies[2] are included to account for any possible weekday effect. Tests were run both with and without the weekday dummies, but since the residuals differed, the tests including dummies were used.

To calculate the logarithmic returns from the stock prices this formula is used:

$$R_{i;t} = \ln(P_{i;t\,1}) - \ln(P_{i;t\,0}) \tag{4.4}$$

The returns of the respective indices are calculated in the same way:

$$R_{it}^{m} = \ln(I_{i;t1}) - \ln(I_{i;t\,0}) \tag{4.5}$$

The stock prices are assumed to be continuous and therefore the logarithmic returns are used for both the stock prices and the market indices.

The residuals are calculated as follows:

$$R_{it} = \alpha + \beta_{1:i}\, R_{mt} + \beta_{AR:i}\, AR + \beta_2 MON_t + \beta_2 TUE_t + \beta_2 WED_t + \beta_2 THU_t + \varepsilon_{it} \tag{4.6}$$

To adjust for autocorrelation, an AR term is added in the first regression.

STEP 2 – PANEL REGRESSION

The residuals from step 1 are used as the dependent variable in the step 2 panel regression.

$$\varepsilon_{it} = \alpha + \beta_1 WIN_{i;t} + \beta_2 LOW\ WIN_{i;t} + \beta_3 MIDDLE_{i;t} + \beta_4 HIGH\ LOOSE_{i;t} + \beta_5 LOOSE_{i;t} + \beta_6 ACCIDENT_{i;t} + \beta_7 FAILURE_{i;t} + \beta_8 WIN*ODDS_{i;t} \tag{4.7}$$

Where ε_{it} is the abnormal return of stock *i* over the time-period *t*, WIN = 1st place, LOW WIN = 2-3rd place, MIDDLE = 4-7th place, HIGH LOOSE = 8-14th place, LOOSE ≥ 15th place. An accident is a crash or accident and failure is when a car cannot compete due to pre-race

[2] A dummy variable is a binary variable used to capture non-measurable influences, such as seasonal or day-of-the-week effects. To obtain imperfect multicollinearity and thus separate the influence of the intercept and the dummies, one dummy parameter needs to be left out. Otherwise a perfect linear correlation between the explanatory variables and groups of explanatory variables will occur and the influences will be impossible to separate. With a perfect linear correlation the OLS does not work. The additive dummy variables are capturing the differences in group means across the weekdays. The Gauss-Markov assumptions will not be violated as the estimators will remain BLUE, but they will be less precisely estimated and thus the result will become less accurate (Baddeley & Barrowclough, 2009). Hence, Fridays are excluded from the dummies.

mechanical malfunction. The position reached in a race is denoted with a 1 in the dummy corresponding to that position.

Each associated company has several cars in each race, from two up to seven. To account for the odds in the most possible accurate way, compiled odds were created. The highest odds in the 2009 season was 1000 to 1, therefore betting on that particular driver gives a return of 1000 times the bet. The compiled odds are obtained by dividing each individual odds by 1000, summarize all individual odds for each associated company and divide that sum by the number of drivers.

$$COMPILED\ ODDS = \sum^{x} \frac{(\frac{y_1}{1000} + \ldots + \frac{y_n}{1000})}{n}$$

(4.8)

In the test including all companies, fixed effects were used, as the averages of the dependent variables might be different for each company.

4.4 ACCURACY AND RELIABILITY OF THE METHODOLOGY

To increase the probability that the OLS estimations are providing reliable and accurate results, tests are needed to account for violations of the Gauss-Markov assumptions. If these assumptions are fulfilled, the results will more likely be accurate and reliable as the OLS will have the best linear estimation. OLS is a model assuming a linear correlation and to be sure that the estimation of the parameters fit the data in the most linear way possible, they should meet the following criteria. If one of the assumptions is violated, but the consistency remains, a large sample can maintain the accuracy and reliability of the estimators.

- The mean or expected value of the error term is zero, $E(\varepsilon_{it})=0$
- Homoscedasticity, $var(\varepsilon_{it})=\sigma^2$ where σ^2 is a constant. The opposite is heteroscedasticity. The problem of heteroscedasticity was tested for and when there was a problem, it was also adjusted for.
- No autocorrelation, $cov(\varepsilon_i, \varepsilon_j)=0$. The possibility of autocorrelation is removed in the first regression analysis by the added AR term.
- Exogenity: $cov(\varepsilon_i, X_i)=0$, where X is the explanatory variable.

- Large sample. The sample in this study sample is not large enough to compensate for violations of the assumptions.

By applying the White period coefficient covariance in the panel regressions, the treats to accuracy of the results that can arise when violating the Gauss-Markov assumptions are partly accounted for.

Micronumerosity, when there are few observations and relatively many independent variables, is also considered (Baddeley & Barrowclough, 2009). With 17 races and 7 or 8 explanatory/independent variables, it might affect the accuracy of the results which are considered.

The ability to replicate is, according to Bryman (2004), an important aspect to maximize credibility of a study. All steps of the tests have been carefully documented along the way and by following the exact same method as this study it should be possible to achieve the same results.

All calculations of step 1 have been made in Microsoft Excel, eliminating imperfections within the calculations. The panel regressions of step 2 are all made in Stata, where the possibility to correct and adjust for faults such as heteroscedasticity is possible, unlike if the tests would be made in Microsoft Excel.

The choice to use compiled odds and test for all cars within one company as a whole instead of testing for a car’s Individual results, might affect the outcome. When there is a wide spread between the odds among the cars of one team, the win*odds can become misleading.

5. RESULTS

In this chapter we present our final results. The section has been subdivided into two parts, one primary and one secondary. In the primary part we present findings directly related to our purpose and in the secondary we focus on results that were acquired unintentionally.

5.1 PRIMARY RESULTS

Table 2 **Ordinary Least Squares Results** [1]

	BMW	*DAIMLER*	*FIAT*	*PHILIP MORRIS*	*RENAULT*	*VODAFONE*	*TOYOTA*	*ALL CORPS.*
WIN[2]	–	0.0089 (0.013)	-0.0001 (0.006)	0.0644* (0.004)	0.0384* (0.004)	-0.0575* (0.004)	–	0.0020 (0.006)
WIN[3]	–	-0.0015 (0.007)	0.0242* (0.006)	0.0204* (0.008)	0.0280* (0.004)	-0.0111 (0.007)	–	0.0039 (0.005)
LOW WIN	-0.0093 (0.018)	-0.0011 (0.006)	-0.0024 (0.005)	0.0092*** (0.005)	0.0148* (0.003)	0.0009 (0.010)	0.0006*** (0.003)	0.0015 (0.004)
MIDDLE	-0.0179** (0.008)	-0.00267 (0.009)	-0.0169* (0.005)	-0.0124* (0.004)	0.0100* (0.004)	-0.0030 (0.004)	0.0058 (0.003)	-0.0042 (0.003)
HIGH LOOSE	0.0109)*** (0.005)	0.0044 (0.006)	0.0038 (0.006)	-0.0027 (0.004)	-0.0272* (0.005)	-0.0018 (0.006)	-0.0030 (0.003)	-0.0002 (0.003)
LOOSE	-0.0028 (0.011)	0.0100 (0.009)	0.0107*** (0.006)	-0.0043 (0.005)	-0.0046 (0.003)	-0.0099 (0.010)	0.0036 (0.003)	-0.0005 (0.004)
ACCIDENT	-0.0202* (0.006)	0.0017 (0.009)	0.0149* (0.003)	0.0228* (0.009)	-0.0152* (0.004)	0.0069** (0.003)	-0.0010 (0.006)	0.0026 (0.004)
FAILURE	0.0022 (0.006)	-0.0082 (0.008)	-0.0010 (0.008)	0.0018 (0.007)	0.0023 (0.004)	0.0065 (0.008)	-0.0134** (0.005)	-0.0052 (0.004)
WIN* ODDS	–	-0.0814 (0.080)	0.1358* (5.34e-15)	-0.2472* (3.03e-14)	-0.1630* (0.050)	2.4248* (7.92e-13)	–	0.0194 (0.033)
R SQUARE	0.0177	0.0088	0.0238	0.0586	0.0267	0.0243	0.0185	0.0027

[1] Missing values due to no placement for the car in the respective category.
[2] The WIN variable from tests including WIN*ODDS as a variable
[3] The WIN variable from tests excluding the WIN*ODDS variable.
*: significant at 10% level (two-tailed test)
**: significant at 5% level (two-tailed test)
***: significant at 1% level (two-tailed test)

In table 2 the results from the OLS-regressions are presented. If the result and outcome of a race affects the stock price, the variables should be significant. If none of the variables affected any of the respective company's stock prices, no results would be significant.

What was found was the presence of statistically-significant results when testing the companies individually, not when testing them together. Highly statistical significant results were found for the variables accident, win and win*odds. Less significant results were found for low win, middle and high loose, while loose and failure showed almost no significant results. As a result of several variables and several companies studied, the outcome is presented in three ways to facilitate the understanding and comparability of them. First the results are presented for each company, secondly for each variable and finally as the two groups, car companies and sponsors. Throughout the results, stock return is mentioned as return.

BMW: Due to not winning any races in 2009, the variables for win and win*odds are omitted from the tests. Statistically significant at a 1 % level is the accident variable, with a lower return of 2 %. At a 5 % level the middle variable is significant, with 1.8 % lower return and at a 10 % level the high loose variable is significant with a return of 1 % higher on days following a race compared to days which does not.

Daimler AG: All results for Daimler AG are insignificant and therefore not accounted for.

Fiat: For Fiat several significant observations are found. Significant at a 1 % level are results for the win (win*odds excluded), middle, accident and win*odds. For win (win*odds excluded) there is a higher return of 2.4 %, for middle there is a lower return of 1.7 %, for accident there is 1.5 % higher return and for win*odds there is a lower return of 8.1 %. At a 10 % significance level the loose variable is significant, with a 1 % higher return.

Philip Morris: In this analysis the results obtained are highly statistically significant for almost all variables. The win (with excluded and included win*odds)-, win*odds-, accident-, and middle variables are all significant at a 1 % level. Both win-variables and the accident have higher return, the one with win*odds included of 6.4 %, with win*odds excluded of 2 % and the accident of 2.2 %. The win*odds and the middle however, have a lower return of 24.8 % respectively 1.2 %. The low win variable is significant at a 90 % level, with a higher return of 0.9 %.

Renault: Nearly all variables reach a 1 % statistically significance level. With higher returns on days following a race compared to days which does not are the win (win*odds included) with 3.8 %, win (win*odds excluded) with 2.8 %, low win with 1.5 % and middle with 1 %. With lower returns are the following variables, high loose with 2.7 %, accident with 1.5 % and win*odds with 16.3 %.

Toyota: Only two results are statistically significant. The accident variable at a level of 5 % significance and a lower return of 1.3 % and the low win variable with a significance of 10 % and a higher return of 0,06 %.

Vodafone: significant at a 1 % level is the win (win*odds included) with a lower return of 5.8 % and the win*odds with a higher return of 242 %. This result is however not credible. The few observations can collide with another happening or news regarding Vodafone which is not a consequence of the Formula One races. At a 5 % level the accident becomes significant and with a higher return of 0.7 %.

For BMW, Fiat, Philip Morris and Renault significant results at a 1 % significance level for the variable ACCIDENT exists, and for Vodafone and Toyota with 5 % significance. Surprisingly, the coefficients are not conclusive. For BMW, Renault and Toyota there is return of about 2 % less on days following racedays, while for Fiat, Philip Morris and Vodafone the return on a day following a race is 0.6 % - 2.3 % higher than a day not following a race.

Two different WIN variables exists, one where the WIN*ODDS are included in the same test and one where it is excluded. For the test with the WIN*ODDS included, results significant at a 1 % significance level exists for Philip Morris, Renault and Vodafone. Philip Morris and Renault have a higher return by 6.4 % and 3.8 % respectively while Vodafone generates a lower return of 5.8 %. For the WIN variable with WIN*ODDS excluded, Fiat, Philip Morris and Renault obtain significant results at a 1 % significance level with an average of a 2 % higher return on days following races relatively to days not following races.

The fourth significant results from the tests is for the WIN*ODDS variable, which for all but one of the companies who won in the 2009 season had results significant at a 1 % significance level. Fiat and Vodafone had a higher return, Fiat by 13.6 % and Vodafone by a stunning 242.5 % while Philip Morris and Renault has 24.7 % and 16.3 % lower return on these days compared to days not following a race.

Similar results among the sponsors and among the car companies are not found. Both sponsors examined have a positive coefficient for the ACCIDENT variable while regarding both the WIN and the WIN*ODDS, where one has a positive coefficient the other has a negative. Among the car companies, results are equally dispersed. For the WIN variable where WIN* odds were excluded, both Fiat and Renault have positive coefficients. For ACCIDENT however, both BMW and Renault has positive coefficients while Fiat has a negative.

Notice the absence of statistically significant result for the failure variable. This inclines that if a race is discontinued due to failure of the car, there is no effect on the stock price. Furthermore, inclined in the results is that winning a race when the probability of doing so is low, will more likely give a lower return the day after a race than a higher. Crashing in a race though, will more likely be accompanied by a higher return.

Another finding is the gigantic higher stock return for Vodafone and the win*odds variable. When reviewing the data this regards, only two observations are used, due to McLaren-Mercedes only winning two races in 2009. Also, for Vodafone the same Monday as after a won race, the 28th of September 2009, there is a 2.5 % lower stock return than the previous Friday. An abnormal return which is not explained by the market since this return is when the market return is already accounted for.

5.2 SECONDARY RESULTS

In step one of the methodology, the weekday dummies were decided to be included when calculating the residuals. There are theories stating that the day of the week might affect how the movements in stock price behave. In this study, all abnormal returns used are from Mondays, so if there exists such an effect that price movements correlate to weekdays, our outcome could be affected by this. The weekend-effect states that stocks should perform better on Fridays than Mondays. The residuals in our tests differed when calculating them with or without the weekday-dummies which insinuates that the residuals might actually be affected by whether it is Monday or Tuesday. A sample of the residuals can be seen in Appendix 10.9.

6. ANALYSIS

In this chapter we analyze our results and compare them with the Efficient Market Hypothesis as well as to earlier research. The Chapter will be divided into two parts for the sake of simplicity, one regarding the Efficient Market Hypothesis and one considering earlier research.

6.1 IS THERE A CLEAR CONNECTION TO THE EFFICIENT MARKET HYPOTHESIS?

The Efficient Market Hypothesis states that all available information should be incorporated into the current stock price (Fama, 1970). This implies that increased exposure, producing higher expected sales, would boost stock price because of increased potential company value and vice verse. The results from the data of this thesis do however show evidence of many contradictions regarding the matter. When reviewing results from the test including all companies, which presents the average effect of formula one result's to the included companies stock, we find no apparent correlation. This contradicts the Efficient Market Hypothesis that implies that there should have been at least a certain reaction from all companies that are valued by the market, due to increased expectations of future sales (Fama, 1970). When regarding this result the hypothesis might seem to be proven a theory with a low level of connection to reality. There are however a number of factors that could be stated in order to counter the results. First of all, that the sales increase is not significant enough to effect stock, and secondly that the company that actually owns the automotive maker is too large to be affected by fluctuations in subdivisions sales.

These statements are however eradicated by the more detailed results. While the overall results show little correlation, much of the individual data shows the opposite. Out of the seven companies that were examined in the study, six show some kind of correlation between stock market performance and Formula One race results. The results were however not very consistent. Philip Morris and Renault stock show strong correlation with Formula One team performance, whilst Vodafone, BMW, Toyota and Fiat merely are affected to certain levels. What is especially interesting is that Daimler shows no correlation at all. Both sponsors and automakers used in this research have an annual turnover of several billion US dollars (2009 annual reports), which implies that if one brand is heavily affected, then at least some effect should been seen on the others. There are of course a large number of other issues that could be brought up regarding why Daimler should be unaffected, but these arguments would probably not explain why the others are affected. The Efficient Market Hypothesis does therefore seem to only support certain companies.

This result can also be linked to the different forms suggested by Fama (1970). The weak form is insufficient when regarding this kind of hypothesis, due to that it is based on earlier stock behavior. The strong form is with all probability unsuccessful because of the unpredictability of a Formula One race. If a person were to tamper with the circumstances surrounding a race and therefore gained an advantage, it could be regarded as inside information. There would however still be too many variables to actually be sure that a specific team or driver would win. The person would have to be able to corrupt all other participant's in order to surely eliminate competition. Thus acquiring such an advantage is a complicated to say the least and also probably difficult compared to the stock market, where certain information can easily be acquired by insiders. The remaining form that could explain the correlation, that seemingly affects six out of seven companies, is the semi-strong form. Formula One event's are set on Sundays, which means that companies will be affected by the news of their Formula One team's progress on Mondays. Therefore the information could be regarded as a public statement. The result of this study therefore partially supports, and partially challenges the semi-strong form of the Efficient Market Hypothesis. The support can be seen in the affect on six out of seven companies, but challenges the results when regarded as a whole.

When considering the critique towards the Efficient Market Hypothesis, the varying results can generally be considered the studies weak spot. It could be stated that the correlation which exists, is a result of behavioral tendencies on the stock market. This approach would regard that some companies are more affected due to the market being irrational. Thus explaining why some companies are affected and some not. This statement is however an answer that disregards many other factors, such as size of the company and the value that the stock market believes should be added to the company's security. To be sure that these results should be regarded as purely behavioral tendencies, a lot more research would have to be done to eliminate external factors.

What however can be stated is that there seem to be some behavioral tendencies on the stock market. The effects stated by Madura (2008) are apparent even in this study. The most obvious being the Weekend effect shown in the secondary results. This is a behaviour or effect that the Efficient Market Hypothesis has a hard time explaining.

6.2 HOW DOES THIS RESEARCH COMPARE TO EARLIER RESEARCH?

Earlier research has come to several different conclusions. When considering the results compiled by Quester & Farrelly (1998), they meant that the short term effects of sports sponsorship should be low due to brand awareness being trivial. Bennet (1999) however found that there is a long term positive effect to sports sponsorship. Increased brand awareness should imply higher sales and therefore an increased company value. What can be observed, when regarding the results in this thesis in comparison to the studies conducted by Bennet (1999), is that the stock market seems to agree to a certain extent that the brands value increases, shown by the movement in stock prices.

Mason (2005) presents that a sponsorship should be fitted to suit the company. What is especially interesting is that the consensus of such a statement usually is that motorsport teams should be affiliated with automotive producers. The best fit can of course be interpreted in many ways, but if both studies are regarded as correct, Philip Morris must be an outstanding fit and Daimler must be unsuitable. This strongly contradicts the research conducted by Cornwell et al (2001). Their research implied that with higher association to the sponsored sport, came higher affect to the stock. Since their research also focused on motorsport's, the results should have been similar. There are however a few differences when comparing the research. Cornwell et al (2001) focused on Nascar, which is restricted to the US, and used a different kind of method. The difference between the global stock market and the US stock market is generally substantial, due to factors such as ownership structure and concentration (Shleifer & Vishny, 1997). What difference it makes in this study is hard to say and therefore it is hard to contemplate if the correlation should be bigger or smaller. What can be viewed as a considerable factor is that the cost of participating in Formula One is up to 40 times higher than in Nascar (Collantine 2008, Wood 2008). Therefore it is plausible to believe that there should be a stronger effect to the sponsoring company. It is however not the effect itself that is questionable when considering the outcome of the research conducted by Cornwell et al (2001) or this thesis, it is the difference in correlation. The model used by Cornwell et al (2001) was also substantially different from the one used in this thesis. Their model was based on predictions of the stock return, regarding if a team had not won. This calculation might be considered to be less reliable because it deals with alternative events that have never occurred, but the method chosen in this thesis might also be considered less dependable due to all the factors that must be accounted for. It is therefore hard to rule out which model is better. What is apparent is that the results produced in this thesis to a considerable extent contradict those of Cornwell et al (2001).

The conclusions documented by Sullivan & Dussold (2003) show more similarities to the results presented in this thesis. They used a comparable method and have different results to those of Cornwell et al (2001). The results presented by them show that stock returns seem to be affected by participating in a race (plus 0.2-0.4 percent) or by negative events, such as accidents or crashes. The study we present find that there is no overall correlation, but it does however show very strong correlation for certain companies when regarded individually. In this aspect our results strongly differ from those of Sullivan & Dussold (2003). Here we find that several of the companies in out thesis individually show both positive and negative returns often correlated to the teams results. The individual results are not shown in the research conducted by Sullivan & Dussold (2003). They merely show average values and therefore it is not feasible to rule out the possibility that the same correlation can be found in certain companies, even in their study. Sullivan & Dussold (2003) do however not account for expectations with the use of odds, which have been proved to have a considerable affect in this study.

We also compare our research to Kirschler & Hinker (2010), which also use a similar method and approach, but to a different sport. They focus on how the results of soccer affect stock returns. Kirschler & Hinker (2010) find substantial support for negative stock returns when losing a game and positive if an organization sponsors both teams, but no correlation to actually winning. This supports our overall results to some extent, but not our individual. There is however a number of factors that differ when regarding soccer compared to Formula One. Even though soccer can be costly due to expensive sponsorship contracts, the cost seldom reaches the levels of those incorporated in Formula One, therefore implying that the sports events might have a less significant economical affect to a company’s stock returns. Soccer is however a more prominent sport when regarding the number of viewers, but is spread over hundreds of nations and teams. A win or lose situation in a local team might therefore not be prone to effect stock value, while Formula One results would.

7. CONCLUSIONS

In this chapter we present our final conclusions and connect them to the theoretical framework mentioned in earlier chapters.

7.1 FORMULA ONE SEEMS TO ADD SOME VALUE

The overall results show no level of significant correlation between stock returns and Formula One race results. This means that general effects to stock returns cannot be seen.

The individual results do however show higher significance between several companies and teams. Philip Morris shows the highest correlation in general and is affected by most outcomes. These results show a positive correlation when regarding positions 1-3 as well as with an accident. The results do correspond to our predictions regarding that the increased exposure given by better positions or an accident are considered as valuable by the market. This conclusion can nonetheless not be taken for all participants. Daimler AG shows no correlation at all with the Formula One race results, thereby completely contradicting our forecast. The other five companies that have been considered do however show correlating results in some form, which further enhances our belief that there is a connection between Formula One results and stock return.

The Efficient Market Hypothesis seems to be sufficient in some form for most trials, due to showing changes in security returns in six out of seven tests. This further strengthens the research conducted by Fama (1970). The results do however differ from several other studies in our specific research area. As stated before we found that there is no effect to these companies when regarded as a whole. Research conducted by Cornwell et al (2001) as well as Sullivan & Dussold (2003) do show overall results to some extent. There are nonetheless strong similarities when regarding the individual results. Five out of seven companies show correlation associated with accidents and four out of seven show stock return in connection with winning a race. This resembles parts of the results achieved be earlier research. The differing results can however be connected to the different types of research models used or motorsport size and location.

Another interesting conclusion is the certain level of behavioral tendencies that seem to exist. The secondary results show support for the suggested weekend effect. This effect strongly contradicts the Efficient Market Hypothesis, therefore also proving that the market can act irrationally.

Consequently our research finds that Formula One events can affect sponsoring companies, but do so to an individual extent. We can also deduct that the highest effect does not generally have to be to the directly associated automotive companies, which was concluded by Cornwell et al (2001), but can be to companies that are “well suited” to the sport they are sponsoring, suggested by Mason (2005).

The results must however be viewed critically. This research has only been conducted over one year and therefore suffers from being strongly affected by random events. In order to increase the validity of these results, further research must be conducted over a considerably longer period of time. This tells us that our research might show an interesting outcome, but that the results might have been eradicated over time.

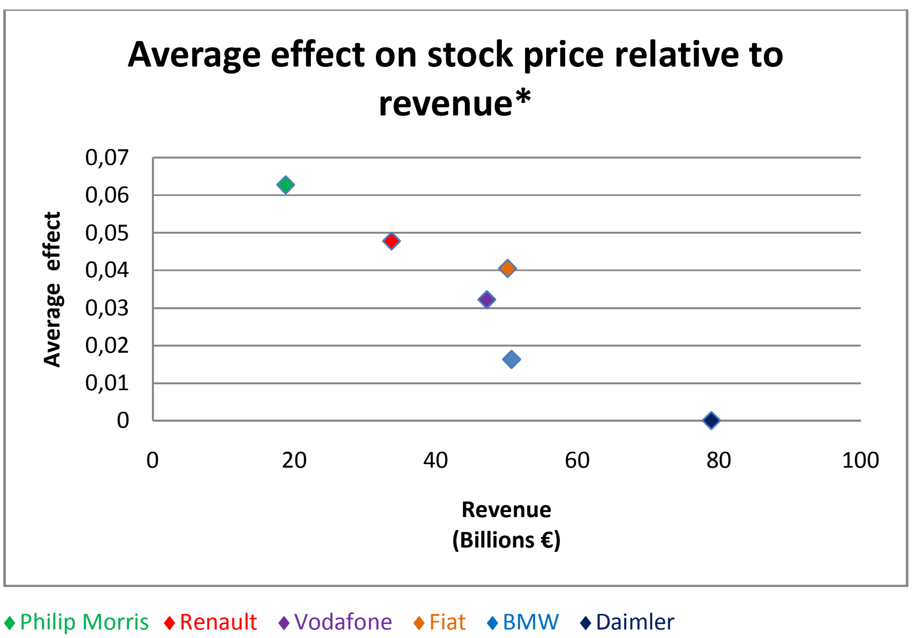
The final conclusion is therefore that the effect of Formula One events to stock return can be considerable and seems to in general be dependent on the type of company that sponsors the team, but that the results cannot be considered to be completely conclusive.

8. SUGGESTED FUTURE RESEARCH

The most obvious need is further research on our chosen topic, in order to ensure the validity of our results. If the results shown by our research were to be regarded as valid, a more interesting question does however occur. The enquiry is simply why some companies seem to be influenced by Formula One results and why some do not. It is however apparent that further research within this area is needed to be able to answer such a question.

When conducting this research we found an interesting correlation, the smaller the turnover of the sponsoring company, the larger the effect to the company's stock. We could nonetheless not prove this due to our research only being conducted over one year. To be able to be sure of such a statement, research would have to be conducted over a significantly longer period of time.

Further research should therefore also be conducted regarding if there is any correlation between the size of the company and the effect of Formula One results to stock returns. This research might not only answer why, but also how much influence Formula One results have on a company's securities.



*The average effect is calculated by taking all affection for each company for each variable, and divided with the number of variables.

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10. APPENDIX

10.1 BMW

Table 1.1

Linear regression

Number of obs	= 262
F(6, 255)	= 4.21
Prob > F	= 0.0005
R-squared	= 0.0177
Root MSE	= .01957

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	(omitted)					
lowwin	-.009306	.0181278	-0.51	0.608	-.0450052	.0263931
middle	-.017926	.0082874	-2.16	0.031	-.0342465	-.0016055
highloose	.0108639	.0057325	1.90	0.059	-.0004252	.0221531
loose	-.0028162	.0107506	-0.26	0.794	-.0239875	.0183551
accident	-.0202132	.0059423	-3.40	0.001	-.0319154	-.008511
failure	.0021731	.0060772	0.36	0.721	-.0097949	.014141
winodds	(omitted)					
_cons	.0001266	.0012623	0.10	0.920	-.0023592	.0026124

Table 1.2

Linear regression

Number of obs	= 262
F(6, 255)	= 4.21
Prob > F	= 0.0005
R-squared	= 0.0177
Root MSE	= .01957

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	(omitted)					
lowwin	-.009306	.0181278	-0.51	0.608	-.0450052	.0263931
middle	-.017926	.0082874	-2.16	0.031	-.0342465	-.0016055
highloose	.0108639	.0057325	1.90	0.059	-.0004252	.0221531
loose	-.0028162	.0107506	-0.26	0.794	-.0239875	.0183551
accident	-.0202132	.0059423	-3.40	0.001	-.0319154	-.008511
failure	.0021731	.0060772	0.36	0.721	-.0097949	.014141
_cons	.0001266	.0012623	0.10	0.920	-.0023592	.0026124

10.2 DAIMLER

Table 2.1

Linear regression

Number of obs =	262
F(8, 253) =	1.82
Prob > F =	0.0733
R-squared =	0.0088
Root MSE =	.01754

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.0089511	.0131648	0.68	0.497	-.0169755	.0348777
lowwin	-.0011364	.0055079	-0.21	0.837	-.0119835	.0097107
middle	-.0026715	.008836	-0.30	0.763	-.020073	.0147299
highloose	.0043757	.0063945	0.68	0.494	-.0082175	.0169689
loose	.0100313	.0085259	1.18	0.240	-.0067596	.0268222
accident	.001742	.0085173	0.20	0.838	-.0150318	.0185159
failure	-.0082152	.0079493	-1.03	0.302	-.0238705	.00744
winodds	-.0813845	.0795354	-1.02	0.307	-.2380204	.0752514
_cons	-7.89e-06	.0011403	-0.01	0.994	-.0022536	.0022378

Table 2.2

Linear regression

Number of obs =	262
F(7, 254) =	1.95
Prob > F =	0.0620
R-squared =	0.0061
Root MSE =	.01753

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	-.001457	.0067829	-0.21	0.830	-.0148149	.0119009
lowwin	-.0002701	.0057486	-0.05	0.963	-.0115912	.011051
middle	.0020686	.0062404	0.33	0.741	-.0102209	.0143582
highloose	.0029883	.0056629	0.53	0.598	-.0081638	.0141405
loose	.0055012	.0051461	1.07	0.286	-.0046331	.0156356
accident	-.0037633	.0059743	-0.63	0.529	-.0155289	.0080022
failure	-.0088684	.0083257	-1.07	0.288	-.0252646	.0075277
_cons	-6.37e-06	.0011381	-0.01	0.996	-.0022477	.002235

10.3 FIAT

Table 3.1

Linear regression

Number of obs =	262
F(6, 252) =	.
Prob > F =	.
R-squared =	0.0238
Root MSE =	.0283

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	-.0000318	.0050017	-0.01	0.995	-.0098822	.0098185
lowwin	-.0023936	.0051769	-0.46	0.644	-.0125891	.0078018
middle	-.0168509	.0050549	-3.33	0.001	-.0268062	-.0068957
highloose	.0038339	.0061547	0.62	0.534	-.0082874	.0159552
loose	.0106615	.0059331	1.80	0.074	-.0010233	.0223462
accident	.0148926	.0034681	4.29	0.000	.0080625	.0217226
failure	-.0089565	.0079935	-1.12	0.264	-.0246991	.0067862
dsq	.0332117	.0034995	9.49	0.000	.0263197	.0401038
winodds	.1358026	5.34e-15	2.5e+13	0.000	.1358026	.1358026
_cons	.0000138	.001858	0.01	0.994	-.0036454	.003673

Table 3.2

Linear regression

Number of obs	=	262
F(7, 253)	=	.
Prob > F	=	.
R-squared	=	0.0235
Root MSE	=	.02825

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.0241863	.006241	3.88	0.000	.0118954	.0364772
lowwin	-.0023936	.0051666	-0.46	0.644	-.0125687	.0077814
middle	-.0168509	.0050449	-3.34	0.001	-.0267863	-.0069155
highloose	.0038339	.0061426	0.62	0.533	-.0082632	.015931
loose	.0106615	.0059214	1.80	0.073	-.001	.0223229
accident	.0148926	.0034612	4.30	0.000	.0080762	.021709
failure	-.0089565	.0079777	-1.12	0.263	-.0246677	.0067548
dsq	.0332117	.0034926	9.51	0.000	.0263334	.04009
_cons	.0000138	.0018543	0.01	0.994	-.0036381	.0036657

10.4 PHILIP MORRIS

Table 4.1

Linear regression

Number of obs	=	262
F(6, 252)	=	.
Prob > F	=	.
R-squared	=	0.0586
Root MSE	=	.01446

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.0644837	.0038253	16.86	0.000	.0569501	.0720174
lowwin	.009266	.0047803	1.94	0.054	-.0001484	.0186803
middle	-.0124327	.0038453	-3.23	0.001	-.0200057	-.0048597
highloose	-.0027418	.0039081	-0.70	0.484	-.0104386	.0049549
loose	-.0043282	.004569	-0.95	0.344	-.0133264	.0046701
accident	.0228206	.0086794	2.63	0.009	.0057271	.0399141
failure	.0018026	.0073042	0.25	0.805	-.0125824	.0161875
dsq	-.0596971	.0086847	-6.87	0.000	-.076801	-.0425932
winodds	-.247195	3.03e-14	-8.2e+12	0.000	-.247195	-.247195
_cons	.0002384	.0009447	0.25	0.801	-.0016222	.0020989

Table 4.2

Linear regression

Number of obs	=	262
F(7, 253)	=	.
Prob > F	=	.
R-squared	=	0.0554
Root MSE	=	.01446

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.0204006	.0078146	2.61	0.010	.0050107	.0357905
lowwin	.009266	.0047708	1.94	0.053	-.0001296	.0186615
middle	-.0124327	.0038377	-3.24	0.001	-.0199906	-.0048748
highloose	-.0027418	.0039004	-0.70	0.483	-.0104232	.0049395
loose	-.0043282	.0045599	-0.95	0.343	-.0133084	.0046521
accident	.0228206	.0086623	2.63	0.009	.0057613	.03988
failure	.0018026	.0072897	0.25	0.805	-.0125537	.0161588
dsq	-.0596971	.0086675	-6.89	0.000	-.0767668	-.0426274
_cons	.0002384	.0009429	0.25	0.801	-.0016185	.0020952

10.5 RENAULT

Table 5.1

Linear regression

Number of obs =	262
F(8, 253) =	20.21
Prob > F =	0.0000
R-squared =	0.0164
Root MSE =	.0267

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.0384462	.0043549	8.83	0.000	.0298696	.0470228
lowwin	.0147775	.0029875	4.95	0.000	.0088941	.020661
middle	.0099504	.0036939	2.69	0.008	.0026757	.0172252
highloose	-.0271797	.0048248	-5.63	0.000	-.0366815	-.0176779
loose	-.0045265	.0028757	-1.57	0.117	-.0101899	.0011369
accident	-.0152459	.0037806	-4.03	0.000	-.0226913	-.0078005
failure	.002318	.0040516	0.57	0.568	-.0056612	.0102972
winodds	-.1629705	.0490055	-3.33	0.001	-.2594811	-.0664599
_cons	.0001588	.001758	0.09	0.928	-.0033034	.003621

Table 5.2

Linear regression

Number of obs =	262
F(7, 254) =	21.82
Prob > F =	0.0000
R-squared =	0.0157
Root MSE =	.02666

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.0279649	.0038015	7.36	0.000	.0204784	.0354515
lowwin	.0130285	.0036903	3.53	0.000	.005761	.020296
middle	.0099856	.0037757	2.64	0.009	.0025499	.0174213
highloose	-.0258314	.0054719	-4.72	0.000	-.0366075	-.0150553
loose	-.004832	.0032306	-1.50	0.136	-.0111941	.0015301
accident	-.0129223	.0045203	-2.86	0.005	-.0218244	-.0040202
failure	.0017999	.004209	0.43	0.669	-.0064891	.010089
_cons	.0001428	.0017538	0.08	0.935	-.003311	.0035966

10.6 VODAFONE

Table 6.1

Linear regression

Number of obs =	262
F(6, 252) =	.
Prob > F =	.
R-squared =	0.0243
Root MSE =	.01496

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	-.0575462	.0042228	-13.63	0.000	-.0658626	-.0492297
lowwin	.0008827	.010185	0.09	0.931	-.019176	.0209413
middle	-.0029746	.0042573	-0.70	0.485	-.011359	.0054098
highloose	-.0017883	.0058127	-0.31	0.759	-.013236	.0096594
loose	-.0099311	.0098577	-1.01	0.315	-.0293451	.009483
accident	.0068845	.0034729	1.98	0.049	.0000449	.0137242
failure	.0064554	.0083141	0.78	0.438	-.0099185	.0228293
dsq	.0140493	.0035006	4.01	0.000	.0071551	.0209435
winodds	2.42481	7.92e-13	3.1e+12	0.000	2.42481	2.42481
_cons	.0000766	.0009663	0.08	0.937	-.0018265	.0019797

Table 6.2

Linear regression

Number of obs	=	262
F(7, 253)	=	.
Prob > F	=	.
R-squared	=	0.0220
Root MSE	=	.01495

residuals	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	-.0111111	.0072061	-1.54	0.124	-.0253026	.0030805
lowwin	.0008827	.0101649	0.09	0.931	-.0191359	.0209012
middle	-.0029746	.0042489	-0.70	0.485	-.0113422	.0053931
highloose	-.0017883	.0058012	-0.31	0.758	-.0132132	.0096365
loose	-.0099311	.0098382	-1.01	0.314	-.0293064	.0094442
accident	.0068845	.0034661	1.99	0.048	.0000585	.0137105
failure	.0064554	.0082976	0.78	0.437	-.0098858	.0227966
dsq	.0140493	.0034937	4.02	0.000	.0071689	.0209297
_cons	.0000766	.0009644	0.08	0.937	-.0018227	.0019759

10.7 TOYOTA

Table 7.1

Linear regression

Number of obs	=	262
F(6, 255)	=	3.33
Prob > F	=	0.0035
R-squared	=	0.0219
Root MSE	=	.01224

residualer	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	(omitted)					
lowwin	.0005659	.003126	0.18	0.856	-.0055901	.0067219
middle	.0058181	.003331	1.75	0.082	-.0007417	.0123779
highloose	-.0030327	.0031222	-0.97	0.332	-.0091813	.0031159
loose	.0035545	.0033253	1.07	0.286	-.002994	.010103
accident	-.0010072	.0056513	-0.18	0.859	-.0121364	.010122
failure	-.0134425	.0052504	-2.56	0.011	-.0237822	-.0031027
winodds	(omitted)					
_cons	.0000309	.0007974	0.04	0.969	-.0015395	.0016012

Table 7.2

Linear regression

Number of obs	=	262
F(6, 255)	=	3.33
Prob > F	=	0.0035
R-squared	=	0.0219
Root MSE	=	.01224

residualer	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	(omitted)					
lowwin	.0005659	.003126	0.18	0.856	-.0055901	.0067219
middle	.0058181	.003331	1.75	0.082	-.0007417	.0123779
highloose	-.0030327	.0031222	-0.97	0.332	-.0091813	.0031159
loose	.0035545	.0033253	1.07	0.286	-.002994	.010103
accident	-.0010072	.0056513	-0.18	0.859	-.0121364	.010122
failure	-.0134425	.0052504	-2.56	0.011	-.0237822	-.0031027
_cons	.0000309	.0007974	0.04	0.969	-.0015395	.0016012

10.8 ALL COMPANIES

Table 8.1

```
Fixed-effects (within) regression               Number of obs      =      1834
Group variable: ftg                             Number of groups   =         7

R-sq:  within  = 0.0027                         Obs per group: min =       262
       between = 0.5296                                        avg =     262.0
       overall = 0.0027                                        max =       262

                                                F(8,1819)          =      0.63
corr(u_i, Xb)  = -0.0314                        Prob > F           =    0.7573
```

residuals	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.002054	.00577	0.36	0.722	-.0092625	.0133705
lowwin	.0015133	.0039638	0.38	0.703	-.0062607	.0092874
middle	-.0042266	.0030333	-1.39	0.164	-.0101757	.0017224
highloose	-.0002418	.0030817	-0.08	0.937	-.0062858	.0058021
loose	.0005156	.0042208	0.12	0.903	-.0077625	.0087936
accident	.0026418	.0042227	0.63	0.532	-.0056401	.0109237
failure	-.0051865	.003999	-1.30	0.195	-.0130297	.0026567
winodds	.0193817	.0334207	0.58	0.562	-.0461653	.0849286
_cons	.0001079	.0004783	0.23	0.822	-.0008302	.0010459
sigma_u	.00003525					
sigma_e	.01988194					
rho	3.143e-06	(fraction of variance due to u_i)				

Table 8.2

```
Fixed-effects (within) regression               Number of obs      =      1834
Group variable: ftg                             Number of groups   =         7

R-sq:  within  = 0.0026                         Obs per group: min =       262
       between = 0.5382                                        avg =     262.0
       overall = 0.0025                                        max =       262

                                                F(7,1820)          =      0.67
corr(u_i, Xb)  = -0.0564                        Prob > F           =    0.7006
```

residuals	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
win	.0039351	.0047711	0.82	0.410	-.0054223	.0132924
lowwin	.0013644	.0039547	0.34	0.730	-.0063919	.0091207
middle	-.0039601	.0029977	-1.32	0.187	-.0098394	.0019192
highloose	4.23e-06	.0030517	0.00	0.999	-.0059811	.0059895
loose	.0009355	.0041574	0.23	0.822	-.0072183	.0090893
accident	.0028726	.0042032	0.68	0.494	-.0053709	.0111161
failure	-.0050245	.0039885	-1.26	0.208	-.0128471	.002798
_cons	.0001043	.0004782	0.22	0.827	-.0008335	.0010421
sigma_u	.00006113					
sigma_e	.01987832					
rho	9.458e-06	(fraction of variance due to u_i)				

10.9 RESIDUAL SAMPLE

	Incl. Dummies		Excl. Dummies	
BMW Observation	*Estimated Y*	*Residuals*	*Estimated Y*	*Residuals*
1	0,001313906	-0,00131391	0,000390903	-0,0003909
2	0,043400072	-0,02647538	0,037416302	-0,0204916
3	-0,00271253	-0,01443977	0,004441079	-0,0215934
4	0,00447395	-0,01063906	0,008159602	-0,0143247
5	-0,01642405	0,02395403	-0,020024925	0,0275549
6	-0,01090115	0,00565898	-0,011930876	0,0066887
7	-0,01605032	0,04332577	-0,022205029	0,0494805
8	-0,01906042	0,00630429	-0,012051907	-0,0007042
9	-0,02402137	-0,02419463	-0,020475123	-0,0277409
10	-0,05350098	-0,00264303	-0,056885857	0,0007418
11	-0,02613779	0,00924593	-0,026692829	0,009801
12	0,012289068	-0,01228907	0,006333541	-0,0063335
13	-0,01968479	-0,00999098	-0,012451637	-0,0172241
14	-0,02594385	-0,00248149	-0,022263791	-0,0061616
15	0,006589416	0,01447522	0,003256762	0,0178079
16	-0,00741678	-0,0269398	-0,008546513	-0,0258101
17	-0,00771643	-0,02616629	-0,013598873	-0,0202838
18	0,028157567	0,00845218	0,035845223	0,0007645
19	-0,00023214	0,01375682	0,002989311	0,0105354
20	0,054314627	-0,03147167	0,050805241	-0,0279623
21	-0,01877178	-0,01977689	-0,019957291	-0,0185914
22	-0,02015726	0,03774191	-0,026049727	0,0436344
23	-0,02239883	-0,02173606	-0,015321751	-0,0288131
24	0,018957293	-0,00587065	0,022919667	-0,009833
25	0,034763971	0,02196404	0,031187675	0,0255403
26	0,011521569	0,00635224	0,01016351	0,0077103
27	0,040820064	0,07195831	0,034678299	0,0781001
28	0,010025083	0,03832811	0,016427298	0,0319259
29	-0,03710275	0,00354778	-0,034112051	0,0005571
30	0,006528806	0,01005607	0,003238605	0,0133463
31	-0,02735515	0,03752773	-0,028519574	0,0386922
32	0,009021606	0,02918311	0,00282915	0,0353756
33	-0,01474618	0,00345866	-0,007813017	-0,0034745
34	-0,04302703	-0,02981315	-0,039561581	-0,0332786
35	-0,00660657	0,00360738	-0,009617382	0,0066182
36	0,003701917	0,01166007	0,002812481	0,0125495
37	-0,04591508	0,01823166	-0,052348962	0,0246655
38	-0,03154043	-0,02475148	-0,024119783	-0,0321721
39	-0,02044579	-0,02279189	-0,016524487	-0,0267132
40	-0,01466956	0,04920829	-0,017955719	0,0524944
41	0,032305547	-0,01670152	0,031207075	-0,015603