MASTER IN
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MASTER´S FINAL WORK
DISSERTATION

DO THE RESULTS OF CANADIAN HOCKEY HAVE ANY INFLUENCE IN SPORTS-RELATED COMPANY STOCKS?

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SUPERVISION:

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ABSTRACT

Ice hockey is considered the main sport in Canada, hence moving a lot of money in the country's economy, more specifically in sport related companies. This empirical study's objective is to evaluate the impact that Canadian ice hockey outcomes has on the abnormal returns of sport-related company.

This was accomplished by using the event study methodology on 4 sport-related companies, quoted on the Canadian Stock Exchange, and four Canadian hockey team, playing in the National Hockey League (NHL), between 2005 and 2015 (the equivalent to 10 hockey seasons). The NHL is a professional ice hockey league composed by American and Canadian teams. Subsequently 3 different hypotheses were tested on the impact of the hockey results: Win and Loss; Many Goals and Less Goals; and "easy" opponent and "hard" opponent.

The methodology used by this dissertation is the event study methodology, where abnormal returns (AR) and average abnormal returns (AAR) are calculated in order to conclude if there is evidence that sports results lead to abnormal returns.

Findings indicate that there are abnormal returns as a result of sporting results. The market values of the companies are positively affected by a victory and negatively by a defeat. Additionally, a win by a large amount of goals difference negatively impacts the stock prices, while a win by a less amount of goals affects negatively the company value. Finally, a win against a "hard" or "easy" opponent affects the stock price of the sport-related companies negatively and positively, respectively.. A loss depends on the company that is being analyzed.

RESUMO

O hóquei no gelo é considerado o desporto rei do Canadá, neste contexto, o hóquei faz mexer muito dinheiro na economia do país. Este estudo empírico tem como objetivo avaliar o impacto dos resultados desportivos do hóquei canadiano no valor de mercado das empresas relacionados com o desporto estudado.

Isto foi conseguido usando a metodologia de estudo de eventos (event studies) em 4 empresas relacionadas com desporto, cotadas na Bolsa Canadiana, e quatro equipas canadianas de hóquei no gelo, que jogam na Liga Nacional de Hóquei no Gelo (NHL), entre 2005 e 2015 (o equivalente a 10 temporadas de hóquei). Posteriormente foram testados seis diferentes testes de hipóteses do impacto que os resultados do hóquei têm nas empresas: vitória e derrota; muitos golos e poucos golos; e adversário "fácil" e adversário "difícil".

A metodologia usada nesta dissertação é a de estudos de eventos, onde são calculados os retornos anormais (AR) e os retornos anormais a fim de se concluir se existe evidência de que os resultados desportivos levam a retornos anormais.

Os resultados obtidos mostram que existem AR como resultado dos resultados desportivos do hóquei no gelo. O valor de mercado das empresas é positivamente afetado por uma vitória e negativamente por uma derrota. Adicionalmente, uma vitória por uma diferença de golos grande tem um efeito negativo, enquanto uma vitória por uma diferença de golos pequena tem um efeito positivo. Por fim, uma vitória contra um oponente "difícil" ou "fácil" tem um impacto negativo ou positivo, respetivamente, nas ações das empresas. Uma derrota depende da empresa que está a ser analisada.

Palavras-chave: Estudo de eventos, Finanças no hóquei no gelo, Liga Nacional de Hóquei no Gelo, Resultados desportivos, Rendibilidades anormais, Empresas Canadianas relacionadas com desporto.

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LIST OF ACRONYMS AND INITIALS

AAR   -   Average Abnormal Return

AIM   -   Alternative Investment Market

AR   -   Abnormal Return

ARCH   -   AutoRegressive Conditional Heteroskedasticity

BCE   -   Bell Canada Enterprises

BPF   -   Boston Pizza

BNS   -   Bank of Nova Scotia

CAPM   -   Capital Asset Pricing Model

CAAR   -   Cumulative Average Abnormal Returns

E   -   Edmonton Oilers

"easy"   -   Appendix 1

GARCH   -   Generalized AutoRegressive Conditional Heteroskedasticity

"hard"   -   Appendix 1

H0   -   Null Hypothesis

H1   -   Alternative Hypothesis

LSE   -   London Stock Exchange

NBA	-	National Basketball Association
MC	-	Montreal Canadians
NHL	-	National Hockey League
OLS	-	Ordinary Least-Square market model
Roger	-	Rogers Communication Inc.
TML	-	Toronto Maple Leafs
TSX	-	Canadian Stock Exchange
US	-	United States
V	-	Vancouver Canucks

1.   INTRODUCTION

Ice hockey is the official national sport and the most popular game in Canada. It is the country with most players (721 thousand), spending around US$120 million annually on players and hockey operations (The Canadian Encyclopedia). The Canadian economy has over US$11 billion related to hockey (Sportsnet). Hence, the second and third most valuable teams in the National Hockey League (NHL) - the premier ice hockey league are from Canada, namely the Montreal Canadians (MC) and the Toronto Maple Leafs (TML) - are worth US$1.18 billion and US$1.15 billion, respectively. NHL is composed by 30 ice hockey teams, in which 23 are from the United States and 7 from Canada. The current value of the top twelve NHL teams ranges from US$455 million to US$1.2 billion in which four out of twelve are Canadian hockey teams (Abeza et al.). Moreover, the operating income of the five largest Canadian teams is between US$17.2 million and US$91.3 million (Statista).

Canadians account for 50% of all players in the NHL. The teams that won the most NHL Cups between 1915 to 2016 were Canadian teams (1st Montreal Canadians, 2nd Toronto Maple Leafs and 6th Edmonton Oilers).

Canadian hockey teams are highly exposed to the US dollar/Canadian dollar since the revenue collection are denominated in Canadian dollars while its players are paid in US dollars. Comparing the 2013/2014 season with the 2014/2015 season, the value of the Canadian dollar fell significantly against the US dollar (10%). The average annual salaries of Canadian hockey players exceed US$2.4 million.

Majority of the NHL's revenue (80%) was generated from local (non-shared) sources such as tickets, luxury seating, advertising and television in 2014/2015, where the average ticket price was US$62.18.

On average Canadian people spend 7 hours per week watching Television or talking about hockey during the season. In 2015, the average viewing of NHL games on TV reached to 5.6 million people. Canadians believe that hockey is "part of their cultural fabric" and it is considered almost as a religion in Canada.

Generally, investors buy stocks to make money by investing in companies that they believe will have a positive return, applying the opportunity cost, depending on the risk they want to take. However, in the case of ice hockey there is a certain irrationality behind it. To invest in NHL teams, specifically Canadian hockey teams, one has to buy stocks from companies largely attached to NHL teams, since there are no Canadian teams quoted in the Canadian Stock market. Four of those companies are Rogers Communication Inc. (Roger), Bank of Nova Scotia (BNS), Bell Canada Enterprises (BCE) and Boston Pizza (BPF). These companies are chosen for the impact they have in the Canadian economy. Rogers is considered the most highly levered company to the NHL's success and BCE is the largest telecommunication company in Canada. BPF, the leading restaurant and sports bar chain, is also largely influenced by hockey, as people enjoy going out to eat or drink while watching the game. Lastly, an alternative to invest in the success of the NHL is through BNS as the company has a credit card partnership with NHL. Henceforth, the major motivation of this study is to identify if these kind of companies are really affected by the sporting outcomes of Canadian ice hockey.

Divulging further into this, we are using 4 companies quoted on the Canadian stock exchange and 4 top Canadian hockey teams playing in the NHL between 2005 and 2015 (10 hockey seasons). The conclusion reached was that there is a relationship between the outcomes of the sporting event and the market value of sport-related companies, more specific, "good" outcomes have a positive impact on stock prices and "bad" outcomes have a negative impact on the stock prices. Moreover, the number of goals a team wins or loses and the opponent the team plays against with also impacts the stock performance of the companies. These results are in line with the conclusions reached by Scholtens & Peenstra (2009) and Brown & Hartzell (2001)

So, the objective of this dissertation is to try to answer to the following questions:

1. What is the impact of the hockey outcomes on the stock prices of the companies?
2. Is the impact on the stock prices due to games against "stronger" opponents similar to the games against "weaker" opponents?
3. Is the impact on the stock prices due to games with result difference equal or higher than three similar to games with result difference less than three?
4. Is there asymmetry between the abnormal returns of the different sporting outcomes?

This study has been conducted based on previous studies however there have been limited studies showing the effect of market value of a company of sporting outcomes. Most of the studies conclude that outcomes do affect the stock price, such as the findings of Brown & Hartzell (2001) and Edmans et al (2007).

This study is organized in five section, the first one being the present section with the introduction. In section 2 the literature review presents other studies on the relationship between the sports outcome and the company performance are referred. The methodology used to find answer to the question under study in this dissertation is described in section 3. Finally, in section 4 the findings will be presented and conclusion regarding the study and future researches will be discussed in section 5.

2.   LITERATURE REVIEW

What do we know about the influence of ice hockey on Canadian sport-related companies? Until now and to my best knowledge there are no studies about the topic, however there are related literatures that concerns with other sports, mainly soccer, or other variables which influence stock performances (Samagaio et al, 2009).

The purpose of the study leads us to the question, "Are the markets efficient to new information in the case of ice hockey outcome?" The first literature about market efficiencty and event studt originates from Fama et al. (1969), which tries to study how price adjust to new information, as a consequence of a stock split. The conclusion reached by the author was that the stock prices adjust very fast to new information, thereby making the market considerably efficient.

Renneboog & Vanbrabant (2000) had as their aim was to investigate if share prices of English soccer clubs listed on the London Stock Exchange (LSE) and on the Alternative Investment Market (AIM) are affected by the team's performance between 1995 and 1998. Using event study methodology, they found out that there is a positive abnormal return (AR) of around 1% in the first trading day after a victory, while after a loss or tie there is a negative abnormal return of 2.5% and 0.6%, respectively. These authors did not find any different reactions in stock returns between games in the Premier League and games in the European Championships.

Following the same logic, Brown & Hartzell (2001) had an objective to study if sports results have an impact on the team stock price. This specific study analyzed the performance of the Boston Celtic basketball team from the National Basketball

Association (NBA) and the impact it caused on their stock returns. The authors found that stock prices are directly affected by the team performance, however there is an asymmetry on the reaction between wins and losses. Furthermore, in the regular-season game performances have smaller impact in stock prices than playoff games. Besides, they also got to the conclusion that game performances have a higher impact in trading volume and volatility during the basketball season.

Scholtens & Peenstra (2009) also studied if there is an effect on the abnormal return of stock returns caused by soccer matches performances. 1274 matches of eight teams in the national and European competition during 2000-2004 were analyzed. The countries studied were England, Portugal, Scotland, Turkey, Italy, Germany, Holland and Denmark. The fact that the study was made with international teams and not only with teams from the same country is an innovation. The conclusion reached is in line with the one of Brown & Hartzell (2001), there is a significant and positive reaction in the stock market for victories and negative for defeats, being the effect of a defeat stronger than that of a victory. Additionally, Renneboog & Vanbrabant (2000) found evidence for a stronger impact on the stock prices when playing in the European competition comparing to when playing in the national competition.

Using a different methodology, ARCH and GARCH methodology, Duque & Ferreira (2005) investigated if the stock performance of Portuguese soccer teams quoted in Euronext Lisbon Stock Exchange are affected by sporting results. The selected period was from 1998 to 2003 of the soccer clubs Sporting and Porto, since they were the only teams quoted on the Stock Exchange at that time. The authors argued that there is a positive relationship between stock price returns and sporting performance, besides the

fact that trading volume is higher at the end of the season. The novelty was the introduction of a variable that explains the sporting success, as it was considered more important for a victory near to the end of the Championship than a victory to the beginning of the Championship.

Betting markets co-exist with stock markets for professional soccer clubs listed on the Stock Exchange Market. Palomino, Renneboog & Zhang (2005) study the stock market reactions of this two markets. The study was around 16 teams during the period between 1999 to 2002. The authors argued that there was no impact on the stock prices after the odd release by bookmakers, but the opposite happened after sporting results. Moreover, the odds can be used to predict short-run stock prices.

Stadtmann (2003) argued that only the expectation error should influence stock prices. He applied the news model to the football industry to analyze, whether new information regarding the sporting succeed could explain subsequent changes in the stock price of the soccer team Borussia Dortmund. In this study 97 games were examined during 2000 to 2002. Additionally, it was proved that there is a direct link between the team success in a game and changes in stock returns.

A different approach emerged from Edmans, Garcia & Norli (2007). Investor mood is influenced by sports performance which strongly impact stock returns. To prove this the authors used international soccer performance to reach the conclusion that there is a drop in the market after a loss, being this loss stronger in small stocks and in more important games. In addition, the study also proved that soccer outcomes have a small direct economic impact.

Comprehensibly with time sports are going to increase importance and new ways of financing are going to appear, leading to new studies trying to understand the relationship between investors mood and sporting results. The scarcity about this topic is the main reason for this dissertation that pretends to investigate if investors' reactions influenced by sporting performances have an impact on the stock prices of the sports-related companies. This study will give special attention to 8 Canadian ice hockey teams and 4 sports-related companies during 10 seasons (2005-2015).

3. METHODOLOGY

3.1.DATA

The study developed in this dissertation follow an event study methodology. This assesses the impact of a specific event on a company's market value, in a particular time period. Brown & Werner (1980, 1985) gave detailed explanation about this methodology.

The first step of the event study methodology is to define the parameters. The companies selected to assess this study are somehow linked to sport. These companies quoted on the Canadian Stock Exchange (TSX), are Rogers Communication Inc., BCE Inc., Boston Pizza and Bank of Nova Scotia. Rogers is levered to the NHL results; BCE transmits all hockey games; BNS has a credit card partnership with the NHL; and BPF belongs to one of the most visited restaurants in Canada. Due to the strong relation to the sport hockey, these companies have been selected to analyze if the sporting results of the Canadian hockey teams affect the market value of the selected companies. Ice hockey in Canada is worth over US$11 billion annually.

The time period chosen was from 5th September 2005 to 25th March 2015 (10 hockey seasons). The event that will be studied is the final game result of four different Canadian hockey teams: Montreal Canadians (MC), Toronto Maple Leafs (TML), Edmonton (E) and Vancouver (V). These four teams were chosen, because they have more fans out of the seven Canadian teams. There are only two possible outcomes: win or loss. In ice hockey there are no ties, if the game ends with both team having the same score an overtime period will be given until there is a winner. The day when the game

occurs is defined as "day 0". In the time period chosen there are 10.468 hockey games (Brown & Hartzell, 2001) and the estimation period used as a robustness check was the whole sample. The sporting results were taken from www.hockey-reference.com.

The event window chosen was the next trading day of the Canadian Stock Exchange, a day after a game (Scholtens & Peenstra, 2009). For the purpose of this study, the only important analysis is the impact that a **single** game has on the market value of the companies. Therefore, the event window cannot be longer than one day, due to an overlap of information which may lead to contaminated results (Dyckman et al., 1984; Glascock et al., 1991).

3.2.ABNORMAL RETURN

To measure the impact of the sporting results, the abnormal returns were calculated. The abnormal return is the difference between the observed return and the expected return of the stock price k on day t (Brown & Warner, 1983). Define:

(1) $AR_{kt} = R_{kt} - \overline{R}_{kt}$

With the observed return as:

(2) $R_{kt} = \ln\left(\frac{P_{kt}}{P_{kt-1}}\right)$

Where, P_{kt} is the stock price k at day t adjusted, already includes the dividend, and P_{kt-1} is the stock price k at day t-1. To calculate the returns daily prices were taken from Bloomberg.

For this study, the market model was chosen to calculate the expected return, following Brown & Warner (1980 and 1985); Beaver (1981); Dyckman et al. (1984), under a wide variety of conditions and a well-specified model. The index used as a proxy was the TSX, the Canadian stock exchange market, one of the largest stock exchange markets in the world (8th largest by market capitalization) with around 1500 companies listed on the stock market. The model is defined as:

(3) $R_{kt} = \alpha_k + \beta_k * R_{mt} + \varepsilon_{kt}$

Where R_{mt} is the market return of the index at day t; $\alpha_k + \beta_k$ are estimated using the ordinary least-square (OLS) market method during the estimation period; and ε_{kt} is the error term.

Brown & Werner (1980 and 1985) and Mackinlay (1997) explained that other models can be used when calculating the abnormal return, like the mean adjusted return, the market adjusted return and the capital asset pricing model (CAPM). Thus, in this study we will only focus on the OLS market model, since it takes into accounts the market and firm conditions and relates it to the company's shares. Moreover, "there is no evidence that a more complicated methodology" has better outcomes than the market model, and some papers actually reach to the conclusion that complicated methodologies can lead to worse results (Brown & Werner, 1980). Therefore, since majority of researchers use the market model and is not considered a complicated model, it is the one used in this dissertation.

The abnormal return is defined as:

(4) $AR_{kt} = R_{kt} - E(R_{kt}) = R_{kt} - \hat{\alpha}_k - \hat{\beta}_k R_{mt}$

The next step is the aggregation of the abnormal returns, so that a more general conclusion on the impact on the stock prices due to sporting results can be taken (Fama e al., 1969); MacKinlay, 1997; Serra, 2002). This aggregation is important when dealing with multiple events (MacKinlay, 1997), and was made in two components, by result and by company. The aggregation process starts by joining the abnormal returns by the final game outcome (win or loss), calculating an arithmetic mean, where N is the number of observations of an outcome. The average abnormal return (AAR) is defined as:

(5) $\quad AAR_{kt} = \frac{1}{N} \sum_r AR_{r(kt)}$, with r=1,2 where 1 - Win and 2 - Loss.

3.3. HYPOTHESIS TESTS

Parametric and non-parametric tests are used to test the outcomes of the average abnormal return and analyze if there is an impact on the company's stock prices owed to sporting results. The t-test is used as a parametric test (Mackinlay, 1997). The null hypothesis (H0) is defined as the outcomes having no impact on the stock price of the company, which means that the average abnormal return of the stocks on the day after a game is equal to zero. The hypothesis test assumes that the abnormal return is normal distributed:

$$AR_{kt} \sim N(0, \sigma^2(AR_{kt})) \text{ with } \sigma^2(AR_{kt}) = \sigma_{kt}^2$$

The t-test is defined as:

(6) $\quad t = \dfrac{AAR_r}{\sqrt{\dfrac{VAR(AAR_r)}{N}}}$

Looking at the abnormal returns of the four sport-related company it can be concluded that the majority of the sample is normal distributed. This can be seen in the Histogram of the abnormal returns of each company (see Figure 1 to 4).

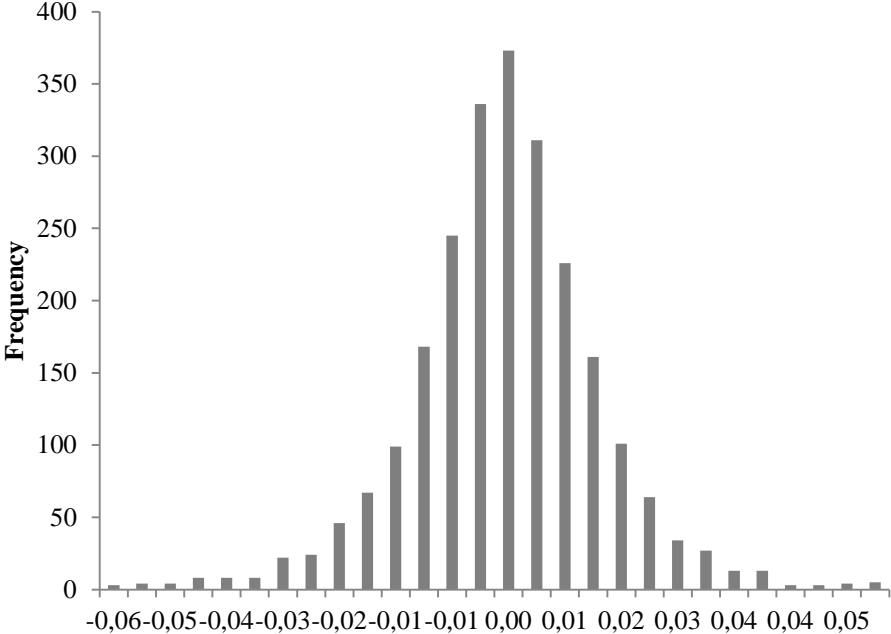**Figure 1 - Histogram Abnormal Return Roger**

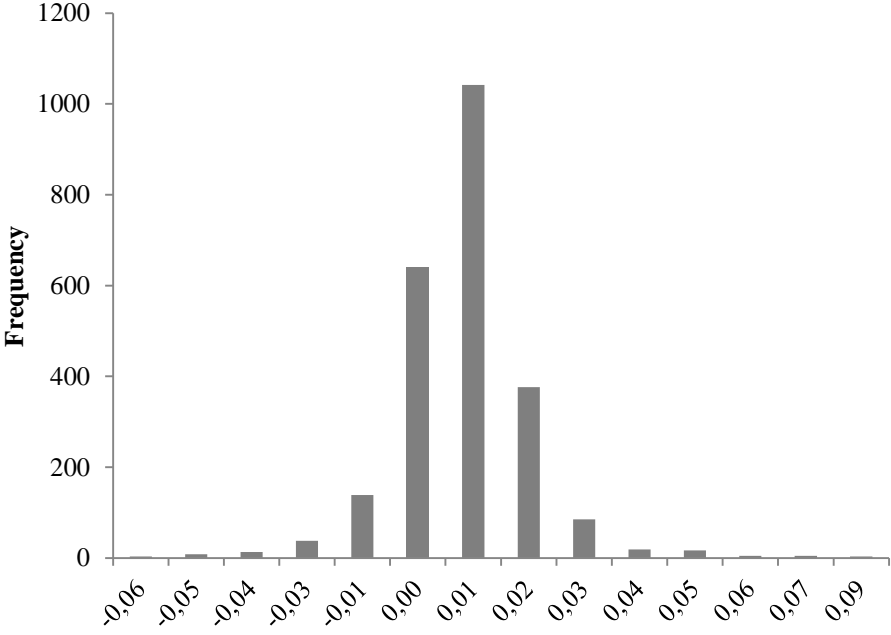**Figure 2- Histogram Abnormal Return BCE**

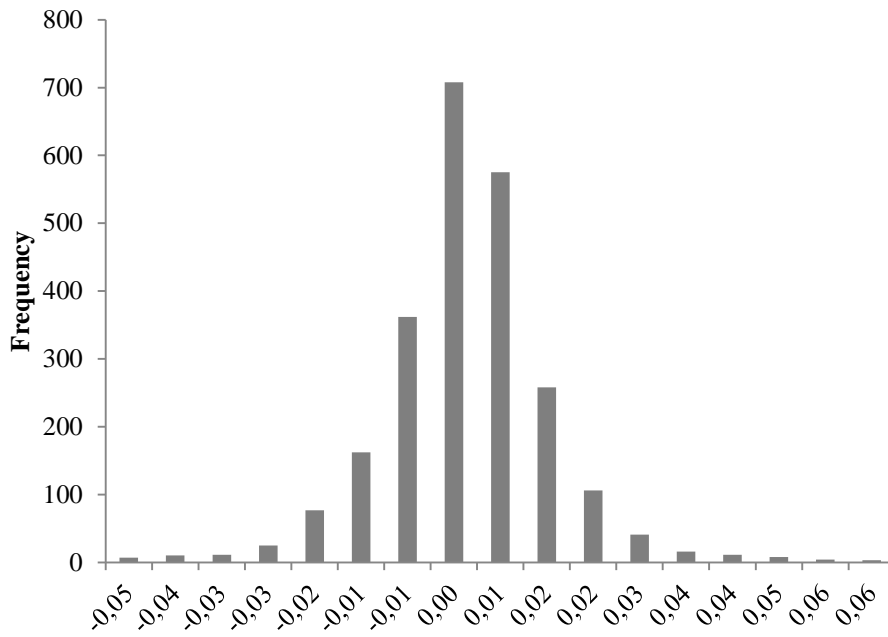**Figure 3 - Histogram Abnormal Return BPF**

Figure 4 - Histogram Abnormal Return BNS
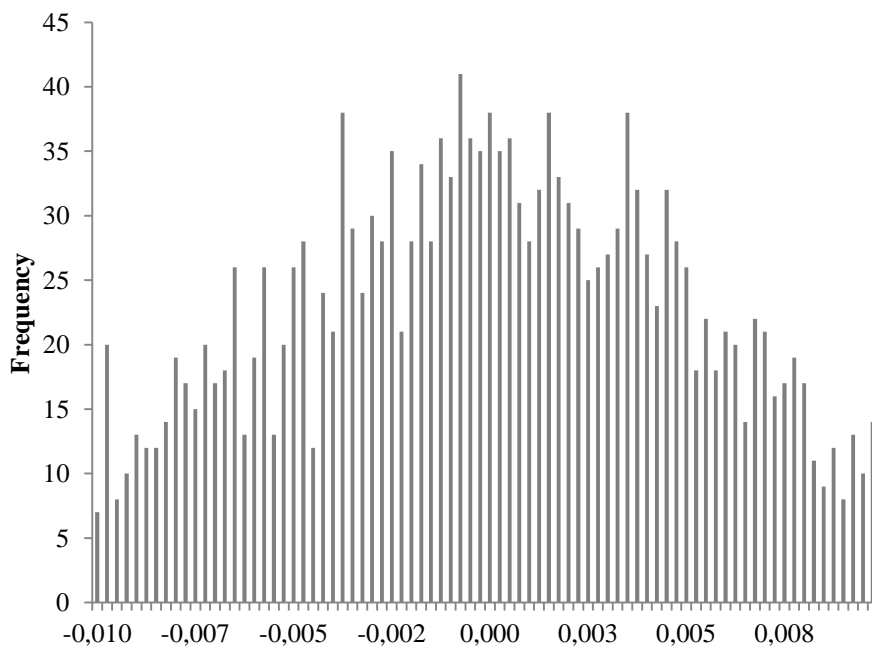
Roger, BCE and BPF are clearly following a normal distribution, while BNS has a sample that is more uniformly distributed.

Company shares do not follow a normal distribution; therefore, non-parametric tests have an important role in the event study methodology. When analyzing abnormal returns on a single day, it is proofed that non-parametric tests have better results than parametric tests (Kolari & Pynnonen, 2011). Thus, two non-parametric tests will be used, the sign test and the Wilcoxon test. The need to make non-parametric test relates to the fact that if the assumption of normality of abnormal returns is violated, the parametric tests are not well specified. Non-parametric tests are considered a more powerful and well-specified tests than the parametric tests, as they better detect a false null hypothesis of no abnormal returns (Serra, 2002).

The sign test is a simple binomial test, which examines if the frequency of abnormal, positive or negative, return is equal to 50%. This test takes into consideration the evidence of skewness in abnormal returns (Serra, 2002). Hence, the null hypothesis is defined as the probability of the frequency being positive or negative is equal to 50% (p=0.5) and the alternative hypothesis is defined as p>0.5, in case of a victory, or p<0.5 in case of a loss. We are dealing with a large sample, so the test statistic gets very near to the normal standard distribution, following the limit theorem.

The second non-parametric statistical hypothesis test used is the Wilcoxon Signed-rank Test, which takes into account both sign and magnitude of abnormal returns. This test is used as an alternative to the t-test in samples that do not follow a normal distribution. The Wilcoxon test is considered better than the sign test, since it takes into account the variation of the signal and magnitude of the variation, therefore the Wilcoxon test is seen as a stronger test than the sign test (Serra, 2002). In our case the null hypothesis is

defined as the median being equal to zero ($M_d = 0$) and the alternative hypothesis is defined as the median being different from zero ($M_d \neq 0$).

The critical value for the rejection region for the three tests, are presented below:

Tabela 1 - Critical Value of the Rejection Area

T-Value	Unilateral	Bilateral
2.326	1.0%	2.0%
1.960	2.5%	5.0%
1.645	5.0%	10.0%

In the conclusions presented on section 4, we will use the unilateral region, as the purpose of this study as to test if the abnormal returns of the day after a victory game is higher or equal to zero and the day after a losing game is lower or equal to zero.

Finally, when analyzing the hockey outcomes we have to take into account two things. Firstly, investors do not see a win or a loss against a "strong" opponent the same way as a win or loss against a "weak" opponent. In the point of view of an investor a win against a "strong" opponent has a positive impact on the investor's mood, while a loss against a "weak" opponent has a negative impact. Consequently, the impact on investors mood can influence the company market value. Secondly, an investor sees a win which the difference of goals is higher than 3 better than a win with the difference of goals smaller than 3. The same conclusion is taken, as this can affect the investors mood and can influence the company stock price. Taking these two assumptions into consideration, the following section will assess if the market value of the company has a higher or lower impact on a company value when analyzing a win or loss generally, and also if they are influenced by the two assumptions made.

4.   RESULTS

4.1 T-STUDENT

The stock prices used in this dissertation to analyze the investor reaction relatively to the sporting outcomes, was taken from Bloomberg with a time period between 5th of September 2005 and 25th of April 2015 (10 hockey seasons). Analyzing this time range it can be seen that there was an abrupt descending tendency from 2007 to 2008, followed by a growing tendency until the end of the time period. This tendency can be seen in the Canadian Stock Prices, as well as, in the stock prices of the four Canadian related-sport companies (Figures 5 to 9).

Figure 5 - Stock Prices Rogers

Source: Bloomberg

Figure 6 - Stock Prices TSX

Source: Bloomberg

Figure 7 - Stock Prices BNS

Source: Bloomberg

Figure 8 - Stock Prices BCE
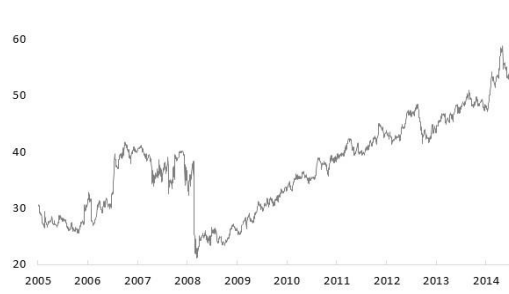
Source: Bloomberg

Figure 9 - Stock Prices BPF

Source: Bloomberg

The financial crisis of 2007 to 2009 was the main reason for the descending trend seen in all stock prices on that period. The bankruptcy of Lehman Brother, one of the biggest investment bank in the world, almost led to the collapse of the world financial system. The bursting of the U.S housing bubble turned a crisis into the worst recession seen in the last 80 years. However, the Canadian economy recovered fast reaching the same market values as the pre-crisis values.

Following the methodology described in the previous section, the outcomes of the NHL games were taken from www.hockey-reference.com where all four teams participated, (10.468 game outcomes during 10 hockey seasons).

Firstly, the linear regressions of the four teams are presented below:

Figure 10 - BNS Linear Regression
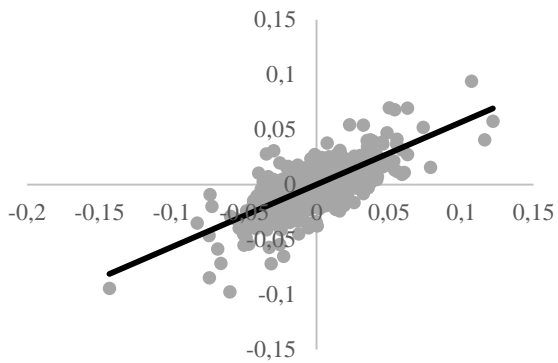
Figure 11 - Roger Linear Regression
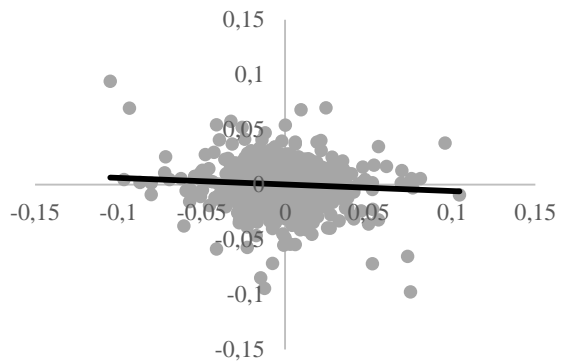
Figure 12 - BCE Linear Regression
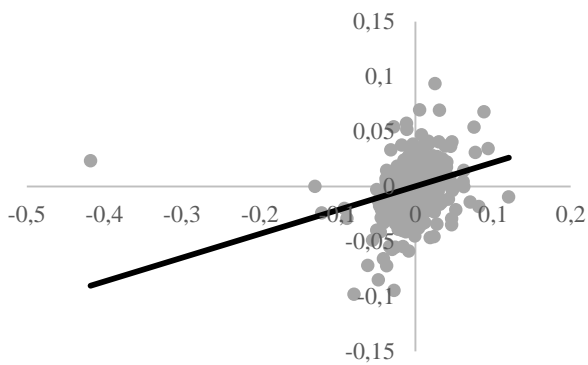
Figure 13 - BPF Linear Regression
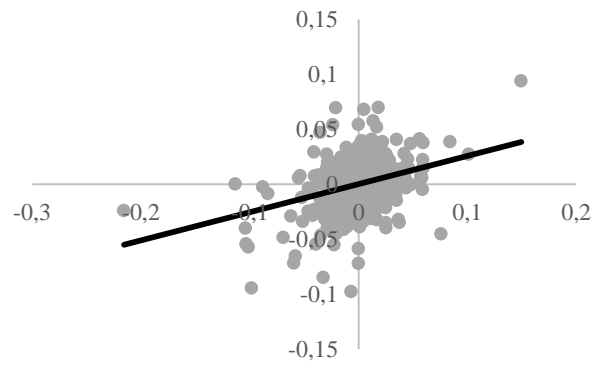
From the four figures above, we can see that there is a linear relationship between the returns of the TSX and the sport-related companies.

In Table 2 are the average abnormal returns of the day after a hockey game of the four sport-related companies.

Table 2 - AAR & T-Student (Win/Loss)

	Roger		BCE		BPF		BNS	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win	0.005%	0.279	0.008%	0.528	0.0241%	1.37*	-0.0104%	-0.908
Loss	-0.0003%	-0.017	-0.0393%	-1.70**	0.0263%	1.35*	-0.0113%	-1.011

*,** represents the level of significance of 5% and 10%

Roger Communication Inc. (Roger); Bell Canada Enterprises (BCE); Boston Pizza (BPF); Bank of Nova Scotia (BNS)

From table 2 it can be said that on average a win has a positive impact in the value of the companies Roger, BCE and BPF, while the stock prices of the company BNS react on average negatively to a win. In case of loss, it has a negative impact in all market value of the companies, except for BPF. The effect of a loss is higher comparing to the effect of a win in the stock prices. With the t-Student test, BCE and BPF are statistically significant in a loss, while the remaining outcomes of the other companies are not, besides the win outcome of the company BPF.

The company that is more affected by the sporting outcomes is BPF (0.024%). This outcome can be a consequence of a more direct linkage between restaurant and the sporting results comparing to other sectors like telecommunication or bank. Generally, the public watch games in restaurants without knowing the outcome of the game, therefore the restaurant is often profitable whenever there is a game regardless of a loss or a win. In table 2 this result can be seen, showing that both win and loss have a positive impact on the company value as people consume drinks/ food independently of the outcome.

Even though Rogers has the total rights to transmit all games of the NHL, BCE is more affected by the game outcomes. Hence, BCE is more exposed to the Canadian hockey compared to Rogers due to the interest expressed by BCE in the Montreal Canadian team and Maple Leaf Sports & Entertainment; and also based on the fact that this

company is the owner of some of Toronto's professional sports franchises. This effect can be observed in table 2 where the company value of Roger is affected by 0.005% if the sporting outcome is a win, while BCE is affected by 0.008%. The same effect can be seen when the outcome is a loss.

Table 3 are the average abnormal returns of the day after a hockey game, divided by teams.

Table 3 - AAR & T-Student (Win/Loss) by Hockey Team

	Roger							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win	0.0111%	0.400	0.0865%	2.82**	0.0807%	2.76**	0.0336%	1.219
Less	0.0757%	2.68**	-0.0187%	-0.692	-0.0604%	-2.14**	-0.0345%	-1.29*
	BNS							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win	-0.0202%	-1.071	-0.0027%	-0.151	-0.0232%	-1.29*	-0.0236%	-1.32*
Loss	-0.0289%	-1.75**	-0.0261%	-1.52*	-0.0869%	-4.51**	-0.0292%	-1.76**
	BCE							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win	0.0285%	1.064	-0.0668%	-2.63**	-0.1457%	-5.92**	0.0546%	2.43**
Loss	-0.0583%	-2.59**	-0.0417%	-1.68**	0.0396%	0.956	-0.0685%	-2.62**
	BPF							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win	0.0305%	0.967	0.2185%	6.91**	-0.0455%	-1.63*	0.0022%	0.089
Loss	0.0358%	1.31*	-0.0528%	-1.94**	0.1502%	4.70**	-0.0761%	-2.49**

*,** represents the level of significance of 5% and 10%
Roger Communication Inc. (Roger); Bell Canada Enterprises (BCE); Boston Pizza (BPF); Bank of Nova Scotia (BNS)

The main observation that can be taken from table 3 is that Roger, the telecommunication company, is more affected by the outcomes of the Montreal team (0.0865%), while BNS is more affected by the Vancouver (-0.0236%). Moreover, BCE is highly affected by Toronto (-0.1457%) and BPF by Montreal (0.2185%). Thus, both telecommunication companies are more affected by the same team, the Montreal

Canadians and this is owed to three main reasons: a) the Montreal Canadian ice hockey team is worth more (US$1.18); b) the team has won more NHL Cups from 1915 to 2016; c) and the team has more fans.

Other tests were made, beside seeing if a win or a loss has an impact on the stock prices of the four companies. Table 4 describes the impact the number of goals has on an investor and if the number of goals in a win/loss has a higher/lower effect on the investors reaction.

Table 4 - AAR & T-Student /Many/Less Goals)

	Roger		BCE		BPF		BNS	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Many	-0.0139%	-1.94**	-0.0310%	-4.81**	0.0203%	2.19***	0.0079%	1.49*
Less	0.0085%	0.738	-0.0045%	-0.430	0.0069%	0.640	-0.0105%	-1.53*
Win (many)	-0.0029%	-0.917	-0.0065%	-1.85**	-0.0011%	-0.336	0.0112%	3.44***
Loss (many)	0.0001%	0.045	-0.0049%	-3.18**	0.0032%	1.61*	-0.0018%	-1.40*
Win (less)	0.0411%	3.07**	-0.0158%	-1.116	0.0244%	1.74**	-0.0168%	-1.88**
Loss (less)	0.0076%	0.96*	-0.0012%	-0.216	-0.0013%	-0.207	-0.0054%	-1.279

*,** represents the level of significance of 5% and 10%
Roger Communication Inc. (Roger); Bell Canada Enterprises (BCE); Boston Pizza (BPF); Bank of Nova Scotia (BNS)

It was tested if the amount of goals a team wins (more than 3 goals difference to the other team), impacts the value of the company. Additionally, it was tested if the number of goals (less or many) in a win or loss has an impact on the stock prices. In this case a game won by a large amount of goals (more than 3) has a negative impact in the companies Roger, BCE and BPF; while a game won by a small amount of goals has a positive impact on the same companies. The opposite happens to BNS, which reacts positively to a win by a large amount of goals and negatively to a win with a small amount of goals. Furthermore, a loss by a large amount of goals has a positive reaction in Roger and BPF and a negative reaction in BCE and BNS, while a loss by a small

amount of goals has a positive reaction on Rogers and a negative reaction on the other three teams. All companies are statistically significant when talking about wins by a small amount of goals.

BPF has an interesting result: if there is a win and the goal difference is more than three there is a negative impact on the company value, while a loss affects the company positively. The inverse happens to the company value when there is a win with goals difference of less than 3. The company value increases with a loss by many goals or by a win but with less goals, which can be translated to that people tend to stay longer in the restaurant after a losing a game by many goals or after a winning game (with a goals difference less than 3 goals).

BNS is the official sponsor of the NHL however, it is not much affected by the sporting results. A possible reason for this can be the crisis of 2007 to 2009, which is included in the time period chosen for this study. All the bad publicity that the bank had during the crisis, due to some bankruptcies that occurred all over the world, lead to an uncertainty and distrust relatively to the banking sector. Therefore, investors are highly risk averse when dealing with this specific sector, even when it is strongly linked to ice hockey.

Both Rogers and BCE have a negative reaction if the outcome is a win by many goals, as people do not show interest in watching commentaries after a game if their favorite team won by many goals. The value of Rogers almost does not change when talking about a loss by many goals, while BCE reacts negatively to this outcome. A reason for this can be similar as mentioned earlier which is when dealing with a result difference higher than 3, people tend to ignore the commentaries after a game. Roger and BCE have opposite reactions to a win/ loss with goals difference smaller than three, as a

result of Roger having the total rights of broadcast of NHL games and people are incline to watch the game commentaries since fans tend to feel that the outcome is unfair when they lose by less goals compared to losing for many goals.

Finally, the opponent was also taken in consideration. It was tested if a "hard"/"easy" opponent has an impact on the value of the companies and if the investors react differently if a team wins/ losses against a "hard"/"easy" opponent (Table 5).

Table 5 - AAR & T-Student (Hard Opponent/ Easy Opponent)

	Roger		BCE		BPF		BNS	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Opponent (hard)	0.0051%	0.559	-0.0106%	-1.41*	0.0140%	1.59*	-0.0054%	-0.948
Opponent (easy)	0.0054%	0.550	-0.0066%	-0.673	0.0051%	0.496	-0.0096%	-1.61*
Win(hard)	0.0047%	1.133	-0.0035%	-0.867	0.0017%	0.378	-0.0025%	-0.843
Loss(hard)	0.0000%	0.598	-0.0046%	-1.166	0.0012%	0.287	-0.0037%	-1.195
Win (easy)	0.0118%	1.67**	-0.0059%	-0.684	0.0058%	0.854	0.0007%	0.139
Loss(easy)	0.0109%	1.32*	-0.0057%	-1.027	0.0020%	0.276	-0.0091%	-2.07**

*,** represents the level of significance of 5% and 10%
Roger Communication Inc. (Roger); Bell Canada Enterprises (BCE); Boston Pizza (BPF); Bank of Nova Scotia (BNS)

The results obtained in this study are in majority not statistically significant, therefore it cannot be said that these outcomes reflect the characteristic of the impact of a winning or losing game has on stock prices. However, five results are statistically significant, which we can conclude that a game against a "hard" opponent affects negatively the stock prices of BCE, while a game against a "easy" opponent has also a negatively effect on the stock prices of BNS.

On the other hand, the AAR of winning a game against a "hard" opponent has a positive effect on the stock price of BPF and a negative effect on the ones from the other three companies. While a loss against a "hard" opponent has no effect on the market value of the four Canadian companies. Roger and BPF reacts positively to a win and loss against

a "easy" opponent, while BNS reacts negatively in both cases. BCE has an asymmetric reaction, where in case of a win it reacts positively, and in case of a loss negatively.

The overall results show that the company values are less affected by a win/ loss against a hard opponent than by an easy opponent, hence when a team is playing against a hard opponent it is easier to guess the outcome; therefore a smaller reaction. The only company that is more affected by the outcome against an "easy" opponent is Rogers, being indifferent to a win or a loss as it reacts positively to both outcomes.

Table 6 summarized the effects of all tests described above.

Table 6 - Summary of Impact on Stock Prices

	Roger	BCE	BPF	BNS
Win	+	+	+	-
Loss	-	-	+	-
Many	-	-	+	+
Less	+	-	+	-
Win (many)	-	-	-	+
Loss (many)	+	-	+	-
Win (less)	+	+	+	-
Loss (less)	+	-	-	-
Opponent (hard)	+	-	+	-
Opponent (easy)	+	-	+	-
Win(hard)	-	+	-	-
Loss(hard)	=	=	=	=
Win (easy)	+	+	+	-
Loss(easy)	+	-	+	-

*Not all results were statistically significant
Roger Communication Inc. (Roger); Bell Canada Enterprises (BCE); Boston Pizza (BPF); Bank of Nova Scotia (BNS)

In the above table it can be seen that the Roger is more affected positively than negatively by the outcomes of the games. A possible reason can be the crisis that happened in the last 10 years. With the crisis, people tend to eat more in fast food chains

compared to "normal" restaurants, being a sport chain a good choice for watching hockey games (The Economist and Chron). The exact opposite happens to BNS, it is more negatively affected by the game results than positively, due to the banking sector as the bankruptcy of the Lehman Brothers in 2008 gained aa great deal of uncertainty and distrust by part of the general public. Therefore, people are not keen to invest in the banking sector, even when the bank has a linkage to sports.

4.2 SIGN TEST AND WILCOXON RANK TEST

In Table 7 we have the p-value, of the same tests made for the T-Student, of the Sign test and the Wilcoxon Rank test.

Table 7 - P-Value Sign Test & Wilcoxon Rank Test

	Roger		BCE		BPF		BNS	
	Sign Test	Wilcoxon	Sign Test	Wilcoxon	Sign Test	Wilcoxon	Sign Test	Wilcoxon
Win	0.612	0.529	0.949	0.960	0.057**	0.063**	0.439	0.557
Loss	0.675	0.683	0.525	0.570	0.254	0.288	0.604	0.452
Many	0.759	0.7285	0.024**	0.021**	0.307	0.263	0.838	0.789
Less	0.221	0.189*	0.9377	0.9107	0.072**	0.089**	0.774	0.961
Win (many)	0.685	0.618	0.155*	0.128*	0.685	0.614	0.155*	0.128*
Loss (many)	0.8644	0.8010	0.001**	0.001**	0.016**	0.013**	0.016**	0.013**
Win (less)	0.400	0.351	0.471	0.456	0.471	0.439	0.631	0.623
Loss (less)	0.051**	0.050**	1.000	0.942	0.171*	0.170*	0.770	0.743
Opponent (hard)	0.426	0.413	0.504	0.476	0.239	0.215	0.975	0.895
Opponent (easy)	0.534	0.451	1.000	0.876	0.090**	0.122*	0.778	0.954
Win(hard)	0.646	0.581	0.927	0.855	0.646	0.583	0.783	0.707
Loss(hard)	0.171*	0.173*	0.528	0.479	0.141*	0.130*	0.207	0.180*
Win (easy)	0.889	0.812	0.328	0.308	0.485	0.447	0.209	0.194*
Loss(easy)	0.128*	0.117*	0.589	0.566	0.184*	0.177*	0.085**	0.078**

*,** represents the level of significance of 5% and 10%
Roger Communication Inc. (Roger); Bell Canada Enterprises (BCE); Boston Pizza (BPF); Bank of Nova Scotia (BNS)

From table 7 it can be seen that there are more values which are statistically significance. The Wilcoxon test is the more adequate test, since it doesn't assume the normality of the stock prices. However, there is never the case that the sign test is

statistically significant and the Wilcoxon on the other hand is not, this is not a problem to be considered in this dissertation. A game lost with many goals suffered, has a negative impact of 0,49% on the stock prices, while a win has a positive impact (2,41%) on the sport-related company BPF. The non-parametric tests reach the same conclusions as the parametric test, however the non-parametric test show that there are more results reflecting characteristic of the population.

4.3 COMPARING TO OTHER STUDIES

The conclusions achieved for the companies Roger and BCE are in line with the Studies mentioned on Section 2 – Literature Review. Like Renneboog & Vanbrabant (2000) there are asymmetric reactions between a win outcome and a lose outcome, as it can be seen in the AAR of both companies. There is a positive abnormal return around 0.01% in the first trading day after a victory in BCE, while after a loss there is a negative abnormal return of -0.04%. The effect of a defeat is stronger than that of a victory, like it was concluded in the study of Scholtens & Peenstra (2009).

To conclude, this dissertation is in line with the studies made about this subject. It can be said that there is an asymmetry on the impact in the company value between a win and a loss and the effect of a loss is stronger than the effect of a win.

5. CONCLUSION AND FUTURE RESEARCH

The main objective of the present dissertation is to analyze if the outcomes of the Canadian hockey games have an impact on the stock prices of four sport-related companies. In almost every "king" sport of a country, money is a key factor, therefore winning or losing does affect the cash flow of the team and can affect the market value. In order to figure out if there is an impact caused by the investor mood, influenced by the outcome of the supporting team, the event study methodology was used. The average abnormal return (AAR) of the quoted day after a game were calculated for 10.468 hockey games (10 hockey seasons) from four Canadian hockey teams, between 5th September 2005 to 25th Abril 2015. Furthermore, it was tested if the average abnormal return were equal to 0, using one parametric test, t-test, and two non-parametric, the sign test and the Wilcoxon rank test.

Considering the results obtained and answering to the 1st question, it can be concluded that the market value of the companies is positively affected by a victory and negatively by a defeat.

Additionally, the answer to the 2nd question of this research is on one hand a win against a "hard" opponent negatively affects the stock price, while a loss doesn't have any effect on the market value of the companies. On the other hand, a win against an "easy" opponents have a positive impact on the company market value, while a loss differs depending on the sport-related company.

The answer to the 3rd question made in this dissertation is that a win with a large amount of goals difference negatively affects the company value, while a win by less amount of goals affects negatively the company value.

When comparing the results obtained in this dissertation with previous studies, it seems to agree with the conclusion reached by other author like Brown & Hartzell (2001) and Scholtens & Peenstra (2009), where they conclude that the sporting outcome does affect the stock price of the company, as well as there is an asymmetry between wins and losses. The difference in results from this study to previous studies made, can be due to the fact that some of them where analyzing Basketball teams in the case of Brown & Hartzell (2001) and football teams in the case of Scholtens & Peenstra (2007), and this dissertation only focus on hockey teams.

When the stock prices "fully reflect" the available information in the market it is considered that the market is efficient. In this dissertation it has been concluded that stocks do reflect a small adjustment due to sporting results of ice hockey.

The time period chosen for this study takes into account the financial crisis of 2007 to 2009, which resulted in large economic instability. This could lead to some outliers and create some friction in the abnormal returns. Therefore, the power of the tests conducted can be inferior, since it takes into account the crisis. Hence, this study has 10.468 observations, leading to a more precise outcome, than other studies made before.

For further research, to accomplish the analysis carried out in this investigation, it would be of interest to perform the same study taking into account all teams of the NHL. Furthermore, it could also be taken into consideration games played by National team, Canada, and see how it could affect the Canadian exchange market and the sports-

related companies. This should be taken into account since the national team is normally considered of higher importance than the Canadian hockey teams in general.

Additionally, it can be taken into consideration other factors from the game, like quality of the game, shots on goal, and others and see if it has an impact on the stock prices of the companies.

Likewise, it can be taken into consideration to separate the sample into two: (i) after the financial crisis and (ii) before the financial crisis. This would investigate different results due to the crisis and it would also conclude if the crisis effect does not exist. This can be a way to remove the crisis effect of the results obtained.

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APPENDIX 1

The "hard" opponents are:

- Arizona Coyotes

- Winnipeg Jets

- Buffalo Sabes

- Toronto Maple Leafs

- Boston Bruins

- Tampa Bay Lightning

- Edmonton Oilers

- New York Islanders

- Detroit Red Wings

- Anaheim Ducks

- Dallas Star

- Colombus Blue Jacket

- Chicago Blackhawks

- Vancouver Canucks

- Nashville Predators

The "easy" opponents are the other hockey teams on the NHL that were not mentioned above.

APPENDIX 2

Table 8 - AAR & T-Student (Many/Less) by Hockey Team

	Roger							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Many	-0.110%	-4.29***	-0.162%	-5.97***	-0.117%	-4.43***	0.135%	7.17***
Less	0.076%	2.67***	0.063%	2.15***	0.024%	0.814	-0.028%	-0.927
	BNS							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Many	-0.009%	-0.508	0.077%	4.24***	0.025%	1.48*	0.036%	2.47***
Less	-0.028%	-1.61**	-0.027%	-1.529	-0.074%	-3.91***	-0.041%	-2.19***
	BCE							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Many	-0.229%	-9.74***	-0.120%	-6.04***	-0.035%	-1.50*	-0.120%	-5.44***
Less	0.010%	0.411	-0.046%	-1.77**	-0.044%	-1.185	0.008%	0.312
	BPF							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Many	-0.0925%	-3.19***	0.2948%	8.85***	0.1620%	5.09***	-0.0137%	-0.578
Less	0.0544%	1.87**	0.0582%	2.01***	0.0457%	1.53*	-0.0479%	-1.61*

Table 9 - AAR & T-Student (Win(many)/Loss(many)) by Hockey Team

	Roger							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (many)	-0.1025%	-5.83***	-0.0590%	-7.08***	-0.0035%	-0.409	0.0979%	10.19***
Loss (many)	-0.0012%	-0.158	0.0054%	0.979	-0.0107%	-2.32***	0.0067%	1.46**
	BNS							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (many)	0.0637%	5.65***	0.0654%	10.40***	-0.0152%	-1.45*	0.0678%	7.88***
Loss (many)	-0.0119%	-2.13***	0.0004%	0.105	-0.0089%	-2.50***	-0.0088%	-2.38***
	BCE							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (many)	-0.1002%	-5.96***	-0.0042%	-0.628	0.0393%	3.09***	-0.0407%	-3.03***
Loss (many)	-0.0212%	-3.17***	-0.0187%	-4.47***	-0.0195%	-5.15***	-0.0189%	-3.76***
	BPF							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (many)	-0.0537%	-3.94***	0.0164%	2.84***	0.0412%	3.39***	-0.0213%	-1.89**
Loss (many)	-0.0064%	-0.613	0.0277%	5.44***	0.0197%	3.75***	0.0098%	2.02***

Table 10 - AAR & T-Student (Win(less)/Loss(less)) by Hockey Team

	Roger							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (less)	0.1340%	3.09***	0.2646%	8.89***	0.2597%	9.51***	0.0204%	0.765
Loss (less)	0.0541%	2.42***	0.0525%	3.42***	0.0279%	1.65**	-0.0133%	-0.709
	BNS							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (less)	-0.1210%	-4.08***	0.0480%	2.45***	-0.0987%	-5.83***	-0.0828%	-3.94***
Loss (less)	-0.0083%	-0.658	-0.0149%	-1.63*	-0.0429%	-4.84***	-0.0213%	-2.17***
	BCE							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (less)	0.1810%	4.33***	-0.2271%	-6.92***	-0.1479%	-5.05***	-0.0667%	-2.43***
Loss (less)	-0.0196%	-1.115	-0.0208%	-1.85**	0.0203%	1.74**	0.0030%	0.244
	BPF							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (less)	0.1402%	2.73***	0.0564%	2.11***	0.001502	5.12***	0.0431%	1.36*
Loss (less)	0.0314%	1.54*	-0.0145%	-0.985	-0.0003	-2.11***	-0.0083%	-0.575

Table 11 - AAR & T-Student (Opponent(hard)/(easy)) by Hockey Team

	Roger							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Opponent (hard)	-0.0019%	-0.068	0.0292%	1.028959667	0.1178%	3.98***	-0.0494%	-1.78**
Opponent (easy)	0.0829%	2.92***	0.0406%	1.38*	-0.0691%	-2.45***	0.0334%	1.159
	BNS							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Opponent (hard)	0.0101%	0.578	0.0726%	3.99***	-0.1758%	-10.20***	-0.0210%	-1.116
Opponent (easy)	-0.0480%	-2.74***	-0.0848%	-5.00***	0.0128%	0.653	-0.0349%	-2.02***
	BCE							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Opponent (hard)	0.0047%	0.203	-0.0030%	-0.136	-0.1212%	-4.89***	-0.0599%	-2.57***
Opponent (easy)	-0.0417%	-1.66**	-0.0968%	-3.57***	0.0062%	0.154	0.0258%	0.952
	BPF							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Opponent (hard)	-0.0227%	-0.752	0.1109%	4.16***	0.0242%	0.856	0.0925%	3.43***
Opponent (easy)	0.0696%	2.45***	0.0675%	2.12***	0.0880%	2.81***	-0.1465%	-4.82***

Table 12 - AAR & T-Student (Win(hard)/Loss(hard)) by Hockey Team

	Roger							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win(hard)	-0.0118%	-0.831	0.0488%	4.27***	0.0177%	1.73**	0.0140%	1.056
Loss(hard)	0.0063%	0.335	0.0607%	4.55***	0.0258%	1.75**	-0.0414%	-2.92***
	BNS							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win(hard)	-0.0060%	-0.564	0.0178%	2.13***	-0.0234%	-3.41***	-0.0311%	-3.27***
Loss(hard)	0.0102%	0.936	0.0235%	2.53***	-0.0553%	-7.39***	-0.0372%	-4.77***
	BCE							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win(hard)	0.0205%	1.67**	-0.0262%	-2.15***	-0.0073%	-0.670	-0.0359%	-2.66***
Loss(hard)	-0.0100%	-0.647	-0.0192%	-1.90**	-0.0321%	-3.31***	-0.0129%	-1.29*
	BPF							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win(hard)	-0.0012%	-0.062	-0.0109%	-1.45*	0.0018%	0.154	0.0363%	2.59***
Loss(hard)	-0.0136%	-0.756	-0.0101%	-0.787	0.0299%	2.97***	0.0134%	1.29*

Table 131- AAR & T-Student (Win(easy)/Loss(easy)) by Hockey Team

	Roger							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (easy)	0,0232%	0,956	0,0068%	0,598	0,0870%	5,72***	0,0278%	2,66***
Loss(easy)	0,0681%	3,29***	0,0317%	2,02***	-0,0024%	-0,173	0,0315%	1,67**
	BNS							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (easy)	-0,0060%	-0,564	0,0178%	2,13***	-0,0234%	-3,41***	-0,0311%	-3,27***
Loss(easy)	0,0102%	0,936	0,0235%	2,53***	-0,0553%	-7,39***	-0,0372%	-4,77***
	BCE							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (easy)	0,0088%	0,363	-0,0363%	-2,91***	-0,0371%	-2,15***	-0,0021%	-0,170
Loss(easy)	-0,0473%	-2,96***	-0,0438%	-3,90***	0,0332%	3,14***	-0,0108%	-0,837
	BPF							
	Edmonton		Montreal		Toronto		Vancouver	
	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student	AAR(%)	t-Student
Win (easy)	0,0326%	1,30*	0,0306%	2,55***	0,0764%	4,66***	-0,0286%	-2,01***
Loss(easy)	0,0489%	2,41***	0,0310%	2,07***	-0,0441%	-3,02***	-0,0111%	-0,720