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ABSTRACT

Corporate sponsorship is a form of advertising in which companies commit and pay to be associated with certain events. Corporate sponsorships of an event, such as the Olympic Games, may feel the need to evaluate the returns on their investment. In order to evaluate these investments, and how they pay off, an event study has been completed. The risk-adjusted event study methodology was used to test the hypothesis that risk-adjusted return of the sponsor companies stock prices are significantly positively affected by the type of information. The event study tested the effect of the 2008 Beijing, 2012 London and 2016 Rio Summer Olympic games on the sponsor company's' stock prices. The opening ceremonies took place on August 8th, 2008, July 27th, 2012 and August 5th, 2016. The information gathered and evidence provided demonstrates throughout all three summer Olympic games, firms showed positive gains to their stock price leading to the opening ceremony, and minimal gains following the opening ceremony. These results confirm the semi-strong form of market efficiency. No investor was able to make above normal return acting on past information.

PROBLEM AND PURPOSE

When researching a topic, it is best to use an event study. An event study is the most common and efficient way to test market efficiency. In order to perform a proper test, the event chosen needs to be theoretically justified. The event this project will analyze is the 2008, 2012 and 2016 Summer Olympics. The opening ceremonies are August 8th, 2008, July 27th, 2012 and August 5th, 2016. This event can be theoretically justified because of the exposure of the sponsors of the Olympic Games would then generate popularity of the sponsor generating expected favorable returns to the respective sponsors. The two most popular and longest standing sponsors of the Olympics are McDonald's and Coca-Cola. The 2008, 2012, and 2016 Olympic games all lasted 16 days. Over those 16 days these firms have plentiful time to show off their brand through advertising and through other avenues. This amount of time on a global level allows for the sponsors to benefit positively, which should increase their underlying stock price. To find out if this event provides new and relevant market information, there will be multiple statistical tests performed, using regression analysis.

Stock prices can change for more than one event. The stock prices of the respective companies change daily at a rapid pace. While one event plays a small factor in the stock price, there are a multitude of reasons why stock prices change. Evaluating stock prices for the company cannot be used as the only measure of how much impact an event had for three reasons. First, while the event researched took place,

other stock price changing events could have occurred within the firm. Second, the value of money cannot be used to provide a consistent measure of value. Finally, events can occur that affect the entire market, therefore no single event may not be responsible for the entire effect. (Bacon, 2008 Olympics). I chose to analyze multiple events over time, in order to test the semi-strong form of market efficiency.

LITERATURE REVIEW

There are three forms of market efficiency: weak form, semi-strong form and strong form. Every form of market efficiency represents the amount of information obtained. If the market is weak form efficient, then stock price reacts so fast to all past information that no investor can earn an above normal return (Ross 11e) In semi-strong efficiency, the stock prices react to quickly to all public information that no investor can earn an above normal return by acting on this information (Ross 11e). Finally, in strong form efficiency, stock price reacts so fast to all information, both public and private, that no investor can earn an above normal return by acting on this type of information. In strong form efficiency, it is from the result of insider information that is acted upon. (Ross 11e). In an efficient market, all past info (historical info) would be considered useless.

The Olympics would be considered public knowledge. Therefore, this study is a test of the semi-strong form of market efficiency. "An efficient capital market is one in which stock prices fully reflect all information available to investors" (Ross 11e). In an efficient market, information is reflected in prices immediately so investors should only expect to gain the normal rate of return (Ross 11e).

There are two types of event studies for an event at a point in time: expected and unexpected. In an unexpected event, such as 9/11 or hurricanes, there is no prior information and any new information is available that day (day 0) making it unpredictable. With an expected event, the investors can make decisions based on what is expected in that event. In a large event like the Olympics, investors have plenty of time to make educated decisions based on the expected information. This event should demonstrate the effects of an expected event, because the date of the opening ceremony was announced earlier in the year.

METHODOLOGY:

The experimental tests in this study demonstrate how quickly the 45 firms reacted to the opening ceremony of the games. This study sample includes 45 companies who decided to make an investment in sponsorship of the 2008, 2012 and 2016 Summer Olympics. This study will use the standard risk adjusted event study methodology in the finance literature to test the stock market's response. The S&P 500 is used as a market indicator. By using the S&P 500, all prices are risk-adjusted, meaning any fluctuations in the economy or market are adjusted through the S&P.

In order to test a semi-strong market efficiency in recognition of the Olympic Games and to show effects of the event on stock returns on the opening ceremony date for the 2008, 2012 and 2016 summer Olympic, the null and alternate hypothesis are the following:

$H1_0$: The risk adjusted return of the stock price of the sample of the 2008 summer Olympics is not significantly affected by this type of information on the event date.
$H1_1$: The risk adjusted return of the stock price of the sample of the 2008 summer Olympics is significantly positively affected by this type of information on the event date.
$H2_0$: The risk adjusted return of the stock price of the sample of the 2008 summer Olympics is not significantly affected by this type of information around the event date as defined by the event period.
$H2_1$: The risk adjusted return of the stock price of the sample of the 2008 summer Olympics is significantly positively affected by this type of information around the event date as defined by the event period.

$H3_0$: The risk adjusted return of the stock price of the sample of the 2012 summer Olympics is not significantly affected by this type of information on the event date.
$H3_1$: The risk adjusted return of the stock price of the sample of the 2012 summer Olympics is significantly positively affected by this type of information on the event date.
$H4_0$: The risk adjusted return of the stock price of the sample of the 2012 summer Olympics is not significantly affected by this type of information around the event date as defined by the event period.
$H4_1$: The risk adjusted return of the stock price of the sample of the 2012 summer Olympics is significantly positively affected by this type of information around the event date as defined by the event period.
$H5_0$: The risk adjusted return of the stock price of the sample of the 2016 summer Olympics is not significantly affected by this type of information on the event date.
$H5_1$: The risk adjusted return of the stock price of the sample of the 2016 summer Olympics is significantly positively affected by this type of information on the event date.
$H6_0$: The risk adjusted return of the stock price of the sample of the 2016 summer Olympics is not significantly affected by this type of information around the event date as defined by the event period.
$H6_1$: The risk adjusted return of the stock price of the sample of the 2016 summer Olympics is significantly positively affected by this type of information around the event date as defined by the event period

For this event study methodology, the following steps were taken:

- The events studied are: The 2008 Beijing, 2012 London and 2016 Rio Summer Olympics. These are predicted events.
- Date zero is identified as the opening ceremony date. The event period will be 30 trading days before the event along with 30 trading days after the event.
- Fifteen companies who were sponsors of the Olympics per Olympic year were selected for this study. After the companies were chosen, the adjusted close stock prices were obtained and downloaded from Yahoo! Finance into Microsoft Excel. The fifteen companies selected for research in 2008, 2012, and 2016 are shown in Figure 1, Figure 2, and Figure 3, respectively.

Figure 1: Sample of Sponsor Companies for the 2008 Summer Olympics with related Market Cap (Yahoo! Finance)

Stock Symbol	**Firm Name**	**Market Cap**
KO	Coca-Cola Co.	208.016 B
MCD	McDonald's Corp.	141.763 B
NKE	Nike	399.599B
INTC	Intel Corporation	216.562 B
BAC	Bank of America Corp.	270.479B
JNJ	Johnson and Johnson	358.728B
BBD	Banco Bradesco	70.781B
BP	BP P.I.C.	146.106B
DFS	Discover Financial Services	25.312B
MSFT	Microsoft	1.016 T
MFC	Manulife	34.854B

SNP	China Petroleum and Chemical Corp	82.913 B
BHP	BHP Group	209.642B
TM	Toyota Motor Corporation	175.918 B
GE	General Electric	91.112B

Figure 2: Sample of Sponsor Companies for the 2012 Summer Olympics with related Market Cap (Yahoo! Finance)

Stock Symbol	**Firm Name**	**Market Cap**
KO	Coca-Cola Co.	208.016 B
GE	General Electric Co.	65.932 B
MCD	McDonald's Corp.	141.763 B
ACER	ACER Therapeutics	34.562 B
TM	Toyota Motor Corporation	175.918 B
V	Visa Inc.	299.987 B
PG	The Proctor and Gamble Company	229.06 B
NKE	NIKE, Inc.	115.471 B
K	Kellogg's Company	21.342 B
BAC	Bank of America Corp.	270.479B
BUD	Anheuser-Busch	172.675B
UPS	United Parcel Service Inc.	97.522B
NSANY	Nissan	26.93B
DFS	Discover Financial Services	25.312B

Figure 3: Sample of Sponsor Companies for the 2016 Summer Olympics and related Market Cap (Yahoo! Finance)

Stock Symbol	**Firm Name**	**Market Cap**
KO	Coca-Cola Co.	208.016 B
GE	General Electric Co.	65.932 B
MCD	McDonald's Corp.	141.763 B
BABA	Alibaba Group Holding Limited	401.247 B
INTC	Intel Corporation	216.562 B
TM	Toyota Motor Corporation	175.918 B

V	Visa Inc.	299.987 B
PG	The Proctor and Gamble Company	229.06 B
NKE	NIKE, Inc.	115.471 B
K	Kellogg's Company	21.342 B
BAC	Bank of America Corp.	270.479B
BUD	Anheuser-Busch	172.675B
UPS	United Parcel Service Inc.	97.522B
JNJ	Johnson and Johnson	358.728B
MFC	Manulife	34.854B

- For this study, -180 trading days before date zero to -31 trading days before date zero is known as the pre event period. This period was used to calculate the alphas along with the betas for the 45 chosen firms.
- HPR (holding period return) is to be calculated. HPR is calculated as: (Ending Price-Beginning Price)/Beginning Price. Next expected returns are calculated. Then expected returns are calculated as the respective firm's alpha + (firm's beta*market return). For this study, the market return is the HPR of the S&P 500 index.
    - **Current daily return** $= \frac{\text{current day close price} - \text{previous day close price}}{\text{previous day close price}}$
- To obtain the alphas and betas of a firm, a regression analysis must be conducted with the firm's HPR as the dependent variable and the S&P 500 HPR as the independent variable. The alphas and betas are shown in *Figure 4, Figure 5 and Figure 6.*
- To find expected return the following formula is used E(R)= alpha+Beta (R_m)
    - Where R_m is the return on the market (S&P 500)
    - Then, the Excess return (ER) will be calculated as:
        - ER= the Actual Return (R) – Expected Return E(R)
- To test semi-strong Average Excess Returns (AER) for days -/+ 30 need to be calculated. Excess returns are calculated by subtracting each firm's expected return from the firm's HPR. Next, the sum all of the firm's excess returns is divided by 15 (number of sponsor companies) to calculate your Average Excess Return (AER).
- After AER is calculated, Cumulative Excess returns (CAER) are to be calculated. CAER is calculated by adding up the AER's for each day from -30 to +30.
- Lastly, the p-value is found by a regression analysis where the market return (HPR) was the dependent variable and the AERs were the independent variable.

Figure 4: 2008 Sponsor Companies' Alpha and Beta

Stock Symbol	Alpha	Beta
KO	-0.0004798	0.44913722
MCD	0.00036647	0.58422242
NKE	0.00063654	0.99237053
INTC	0.00030015	1.47778663
BAC	-0.0018756	1.57537729
JNJ	4.9435E-05	0.33195712
BBD	0.00175056	1.47510725
BP	0.00029712	0.56219515
DFS	0.00098035	2.36490706
MSFT	-0.0005992	0.93387684
MFC	3.6209E-05	0.8545697
SNP	-0.0008463	1.46552528
BHP	0.00195754	1.17718915
TM	-0.0001382	0.90425252
GE	-0.0012804	1.09300593

Figure 5: 2012 Sponsor Companies' Alpha and Beta

Stock Symbol	Alpha	Beta
KO	0.0007486	0.53618398
GE	0.00097142	1.105756
MCD	-0.0004614	0.50010528
BP	-0.00095279	1.194401466
ACER	-0.00415	0.662405
TM	0.00092724	0.70760968
V	0.00140268	0.86061014
PG	-9.999E-05	0.45928076
NKE	0.00068176	0.78942447
K	-0.0001714	0.32452596
BAC	0.00078595	1.99093119
BUD	0.00152847	0.88747265
UPS	0.00046052	0.80279804
NSANY	-4.439E-05	0.99182916
DFS	0.00156042	1.19810766

Figure 6: 2016 Sponsor Companies' Alpha and Beta

Stock Symbol	Alpha	Beta
KO	0.00059067	0.53670306
GE	0.00018202	0.90760805
MCD	0.00065256	0.54008613
BABA	4.52E-06	1.25549845
INTC	6.0876E-06	1.20160009
TM	-0.0006329	1.06880364
V	-0.0002172	1.29234805
PG	0.00078113	0.56497957
NKE	-0.0008476	0.87093905
K	0.00117719	0.45188824
BAC	-0.001579	1.75999481
BUD	0.0005212	0.01589903
UPS	0.000231	0.70951026
JNJ	0.00099693	0.6452693
MFC	-0.0003263	-0.0236421

QUANITATIVE TESTS AND RESULTS

Were the risk-adjusted stock price returns of the 45 companies that sponsored the 2008, 2012, and 2016 positively affected by the global event? How did the market react to the opening ceremonies on August 8, 2008, July 27, 2012 and August 5, 2016? After calculating the Average Excess Returns (AER) from day -30 to +30, the Cumulative Excess Returns (CAERS) were obtained by adding the AERs from each day from -30 to +30. In figure 7, there is an increase from day -24 to day 0. After day 0, the returns leveled off. In figure 8, the returns exponentially increase at day -12. Then, they level off from day -10 to day -5, before gradually decreasing back down until day +12. In figure 9, returns were positive from day -30 to -14, and leveled off until day 0. After day 0, returns were positive. In all three Olympic games, it was observed that the excess returns peaked leading up to the event date, with returns decreasing for the whole duration of the Olympic Games, before picking back up after they concluded. Therefore, the results confer that the market had already imbedded the information into the stock prices of the sponsors' companies by the event dates of August 8th, 2008, July 27th, 2012 and August 5th, 2016, thus supporting semi-strong form efficiency, presented by Fama (1970).

Figure 7: AER & CAER of 2008 Sponsors

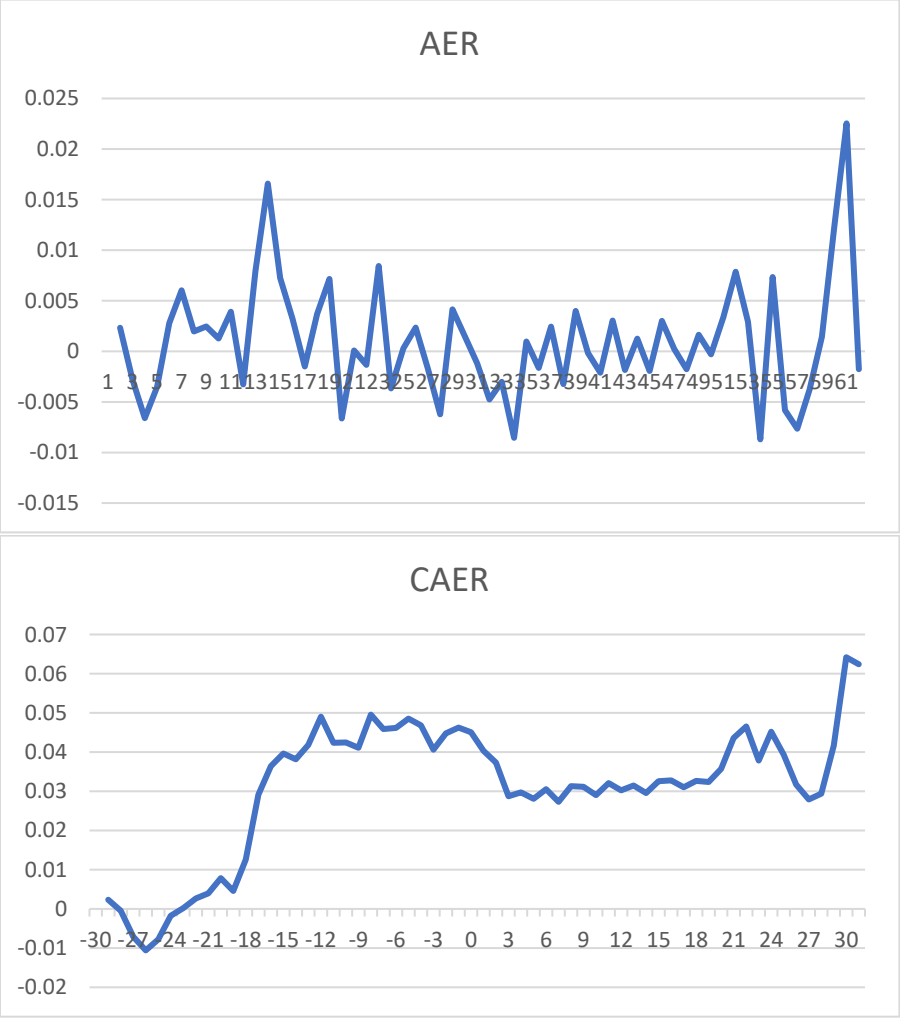


Figure 8: AER & CAER of 2012 Sponsors

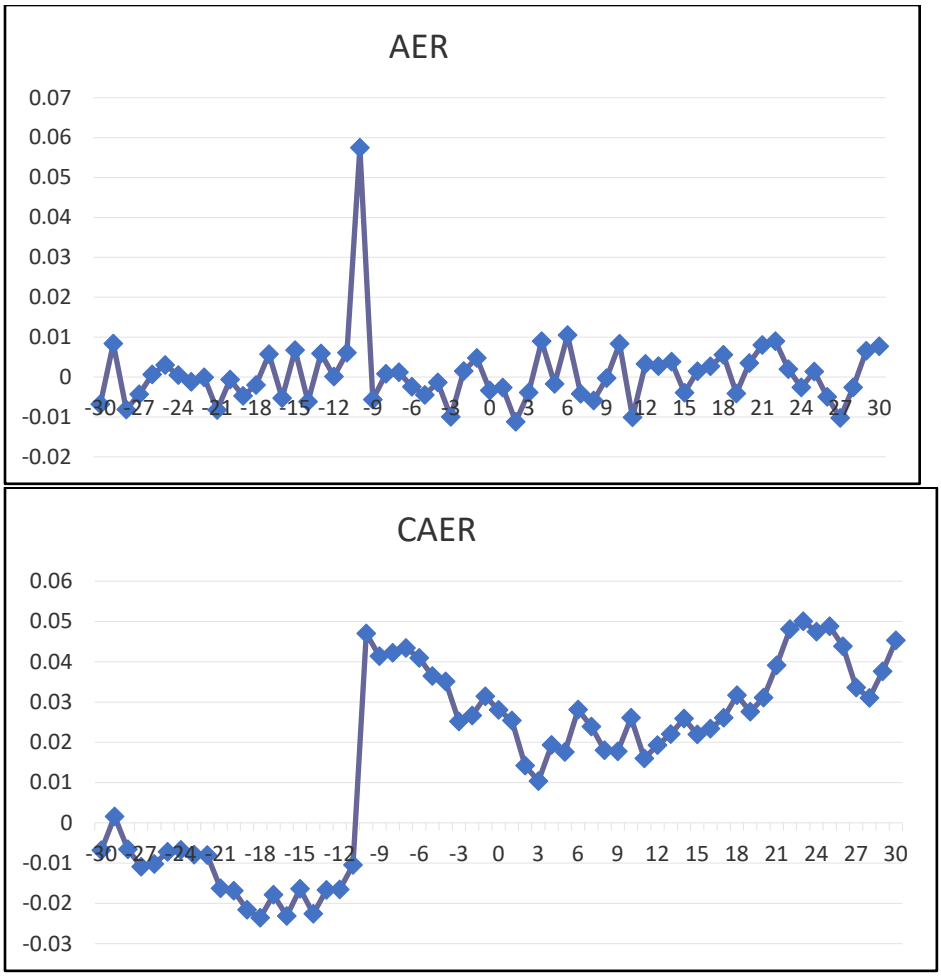
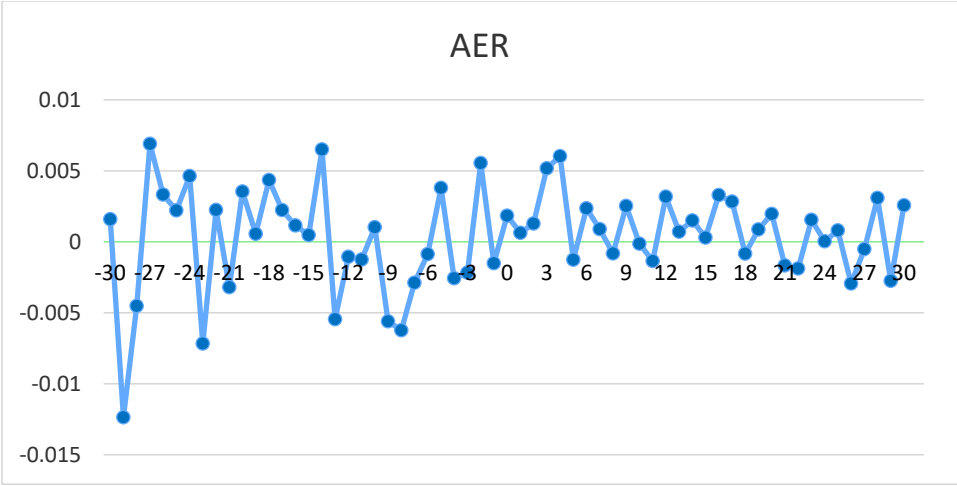


Figure 9: AER & CAER of 2016 Sponsors



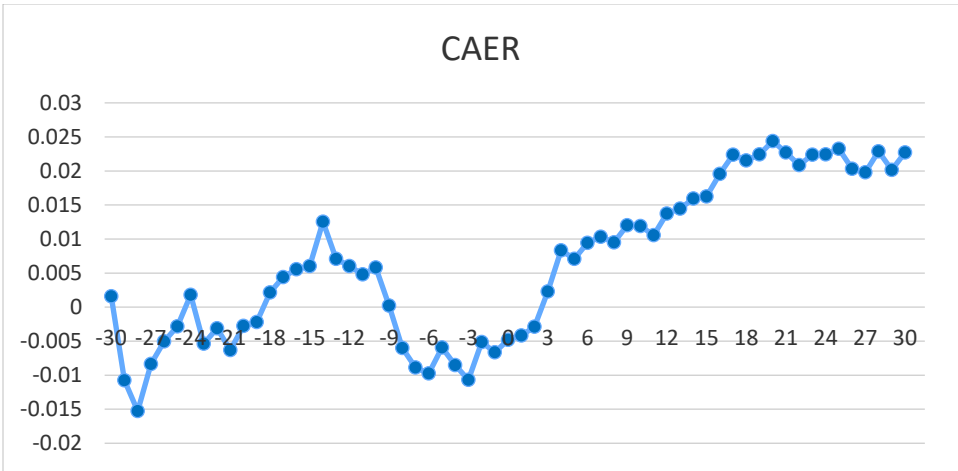
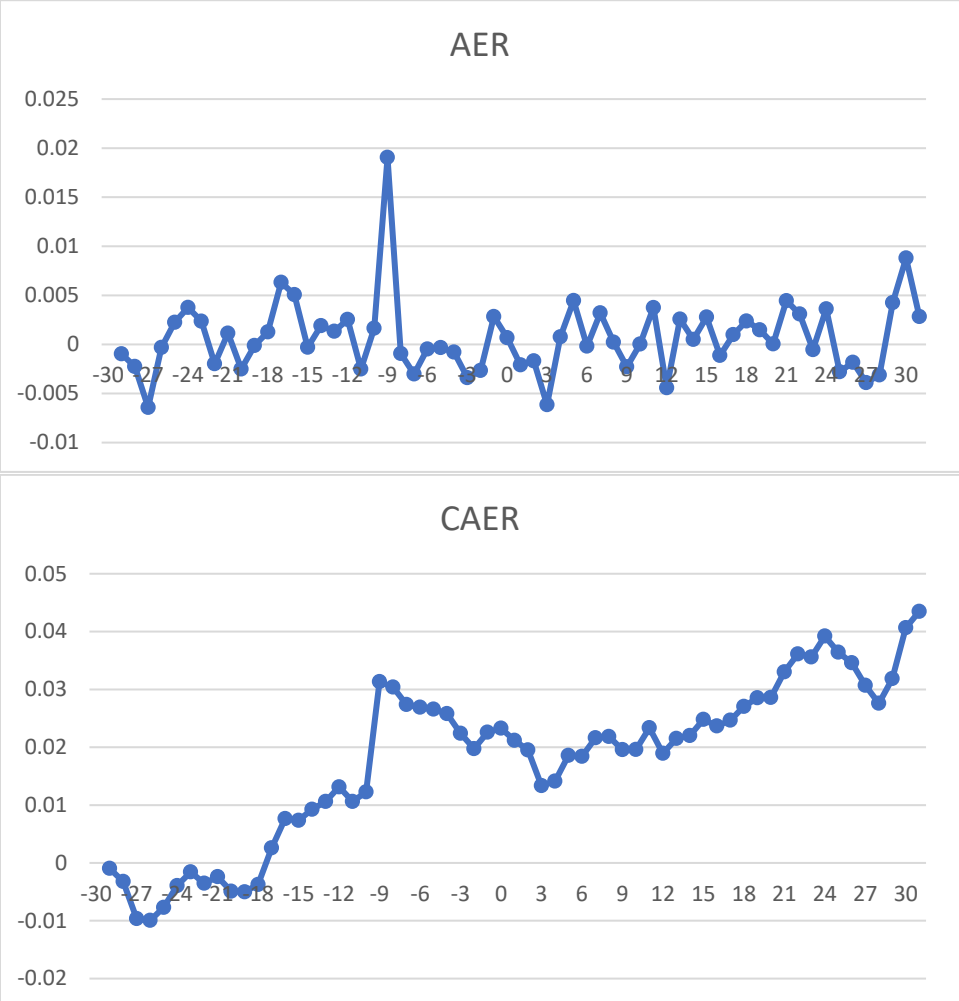


Figure 10: AER & CAER of 2008, 2012, 2016 (Global)



To statistically test for a difference between these two types of risk adjusted average excess returns for the 45 sponsor companies, a paired t-test was utilized, leading to significant evidence, at the 0.05 level. Consequently, supporting the alternative hypotheses $H1_1$: The risk adjusted return of the stock price of the sample of the 2008 summer Olympics is significantly positively affected by this type of information on the event date. $H2_1$: The risk adjusted return of the stock price of the sample of the 2008 summer Olympics is significantly positively affected by this type of information around the event date as defined by the event period. $H3_1$: The risk adjusted return of the stock price of the sample of the 2012 summer Olympics is significantly positively affected by this type of information on the event date. $H4_1$: The risk adjusted return of the stock price of the sample of the 2012 summer Olympics is significantly positively affected by this type of information around the event date as defined by the event period. $H5_1$: The risk adjusted return of the stock price of the sample of the 2016 summer Olympics is significantly positively affected by this type of information on the event date. $H6_1$: The risk adjusted return of the stock price of the sample of the 2016 summer Olympics is significantly positively affected by this type of information around the event date as defined by the event period. After completing an analysis of all three Olympics into a global study, the graph proves all three hypotheses to remain true.

CONCLUSION

The purpose of this event study was to test market efficiency and determine whether the 2008, 2012 and 2016 Summer Olympics Games had a positive risk adjusted rate of return for the 45 selected sponsor companies. Evidence shows, in the CAER graphs, an increase in risk-adjusted returns for the sample in the lead up to the event date (day 0), but then they remained constant for the duration of the games. Therefore, the results supported semi-strong form market efficiency as the market anticipated the gains on those sponsors of the Olympic Games, and if an investor acted upon this information, no above normal returns could have been obtained. These results support the hypotheses, and this study will provide companies who are thinking about becoming sponsors for future Olympic Games more information, allowing them to make a more calculated decision.

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