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Jessica H. Woodard
Longwood University

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GOVERNMENT SHUTDOWN: A TEST OF MARKET EFFICIENCY

SENIOR HONORS RESEARCH PROJECT

Woodard, Jessica H.
Longwood University
jessica.woodard@live.longwood.edu

Faculty Sponsor
Dr. Frank Bacon
Professor of Finance
baconfw@longwood.edu

ABSTRACT

How does the market react to a government shutdown? Can investors earn above normal returns by acting on this type of information? How efficient is the market in reacting to the announcement of this type of event? This event study tests market efficiency theory by analyzing the impact of two recent US Government shutdowns on the risk adjusted stock price returns of a sample of 50 firms. This study used the standard risk adjusted event study methodology found in the finance literature. Evidence confirms the significant and consistent negative reaction of the risk adjusted returns for the two 50 firm samples of government contracting firms up to 30 days before and after the announcements of the 1995 and 2013 government shutdown. Evidence here documents the tremendous loss of market capital in reaction to a failure of the Federal Government policy makers to compromise and produce a timely operating budget.

INTRODUCTION

A government in gridlock that fails to compromise on a budget agreement results in a government shutdown which may cause significant damage to the nation's economy. If Washington policy makers cause a shutdown, the consequences of the failure of the decision making process offer important implications for future decision makers. The enormous costs associated with gridlock ought to be measured and weighed in the decision making process. One way to quantify the economy's reaction to a massive government shutdown is to examine how the stock market reacts to a government shutdown.

Tests for market efficiency can show the effect of a government shutdown on the stock market. There are three types of market efficiency: weak-form efficiency, semi-strong-form efficiency and strong-form efficiency. These various levels of efficiency have different implications for the market's reaction to an event such as a Federal Government shutdown. According to weak-form efficiency, future prices cannot be predicted by analyzing prices from the past. Excess returns cannot be earned by using investment strategies based on historical share prices or other historical data. Semi-strong-form efficiency is characterized by share prices adjusting quickly to publicly available information. The market will respond quickly and will be unbiased so that no excess returns can be earned by trading on information in the form of public announcements such as a government shutdown. With strong-form efficiency, stock prices reflect all information, public and private, and no one can earn excess returns by acting on inside information.

The purpose of this event study was to test market efficiency theory by analyzing the impact of the government shutdowns of 1995/1996 and 2013 on two samples of 50 firms each. This research tests whether the information embedded in a government shutdown announcement exhibits weak or semi-strong market efficiency. This study tests the effects of the government shutdowns on the risk adjusted returns of 100 government contracting firms using the standard risk adjusted event study methodology in the finance literature. It is reasonable to expect government contracting firm to be highly sensitive to a potential federal government shutdown since the revenues of these firms depends on a government that is open for business. If a strong and swift correlation exists between the event date or the date of the government shutdown and an immediate equity market price change, there may not be opportunity to earn an above normal return and evidence would support efficient market theory.

LITERATURE REVIEW

According to the semi-strong efficient market hypothesis, stock price returns fully reflect all available information. Stock prices react so fast to public information that no investor can earn an above normal return by acting on any public announcements, such as the US government shutdown; one in 1995 and one in 2013.

The US government entered a shutdown October 1, 2013 through October 16, 2013, the second longest since 1980 and the most significant measured in terms of employee furlough days (*Impacts and Costs*, 2013). This shutdown most operations of the government after Congress failed to reach an agreement on the U.S. Federal budget for the fiscal year of 2014 and President Obama's healthcare bill; this was the first government shutdown in 17 years. During the shutdown, approximately 800,000 federal employees were furloughed (Hankel, 2013), for a combined total of 6.6 million days (*Impacts and Costs*, 2013). What happened to the companies that relied on government contracts? Did this affect their normal course of business? Was there an impact to their stock prices? There was a previous federal government shutdown in 1995-1996.

The budget wars in 1995 resulted in the government shutting down for six days, November 14-19, and again from December 15, 1995-January 6, 1996 (Kosar, 2004). A dispute between President Bill Clinton and Speaker of the House Newt Gingrich caused the shutdown. They could not agree on domestic spending cuts in the fiscal year 1996 (Drew, 1996). Did both of these shutdowns in 1995/96 and 2013 have a similar impact on the stock market? How fast did the market react to both shutdowns? Is the market efficient with respect to a government shutdown? Answers to these questions offer significant implications for policy makers in

Washington as they weigh the economic costs associated with gridlock and failure to compromise on a budget deal to keep the government open.

Government shutdowns can cost the Federal government billions of dollars. The payroll cost of furloughed employee salaries for the 2013 shutdown was \$2.0 billion. The Federal government also incurs other costs as a result of a shutdown: fees go uncollected, IRS enforcement and other program integrity measures are halted and the Federal government has to pay additional interest on payments that are late because of a shutdown (Burwell, 2013). A government shutdown has negative effects on the economy. Import and export applications are put on hold which can negatively impact trade (Burwell, 2013). Travel and tourism is disrupted at national parks and monuments which hurts local economies (Burwell, 2013).

Not only do government shutdowns impact the financial well-being of the country, they also have a negative impact on American citizens. There are Americans who rely on critical government programs and services (Kosar, 2004). Patients are unable to enroll in clinical trials at the National Institutes of Health, which can make a difference in a patient's life. Tax refunds are delayed and some Americans rely on this money to make yearly payments (Burwell, 2013). Finally, government shutdowns can have a long-term impact on the government's ability to retain a skilled workforce. The 2013 shutdown followed a three-year pay freeze for Federal employees and cuts in training (Burwell, 2013).

Fama (1970, 1976) defined market efficiency in three forms: weak-form, semi-strong-form and strong-form. Weak-form efficiency deals with the notion that no investor can earn an above normal economic return by developing trading rules based on past price or return information. 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 (i.e. higher than the risk adjusted stock price return) by acting on this type of information. Investors cannot use technical analysis of pricing patterns to predict the value of stock prices. The weak form market efficiency test is designed to show that successive price returns are random and independent (Kharusi, Sami, & Weagley, 2014). For example, if an investor reviews a public quarterly report and buys the firm's stock after discovering the firm had higher than expected earnings for the quarter but the stock price does not rise, the market is said to be efficient with respect to past information and is weak form efficient.

According to the semi-strong form efficient market hypothesis concept, the prices of the stocks fully reflect all available information and it's not possible to earn an above normal risk adjusted return by acting on this type of information (Ross, 2013). Fama was one of the major supporters of the efficient market hypothesis. Semi-strong-form market efficiency states that no investor can earn an above normal, economic return based on any publicly available information such as accounting statements, stock split announcements, dividend announcements, sale of stock announcements, repurchase of stock announcements, block trades, and earnings announcements (*Semi-Strong Form*, 2014). A federal government shutdown announcement would also represent this type of publicly available information relative to market efficiency. If the market is semi-strong form efficient, then stock price reacts so fast to all public information that no investor can earn an above normal return by acting on this type of information. The investors cannot use technical analysis or fundamental analysis to find the value of stocks (Kharusi, Sami, & Weagley, 2014). Public announcements of a government shutdown, stock splits, repurchases, and dividend increases are examples of public information. If an investor trades the stock on the announcement date and still does not make an above normal return, the

market is semi-strong form efficient. This study examines semi-strong efficiency with respect to the announcement of a federal government shutdown.

Strong-form efficiency theory suggests that no investor can earn an above normal, economic return using any information, public or private. If the market is strong form efficient, then stock prices react so fast to all information (public and private) that no investor can earn an above normal return by acting on this type of information. In this case, the market reacts to an event within the confines of the firm when it occurs even before it is publicly announced. For this to occur, investors must act on insider information, which is illegal. If an investor trades the stock on the event based on inside information, and still does not make an above normal return, the market is strong form efficient.

Since information effects prices immediately, investors should only expect to obtain a normal rate of return. However, does market efficiency hold for public announcements of a government shutdown? Weak form efficiency states that a company's stock price is based on past prices and information, while strong form efficiency argues that the price is a reflection of all information, public and private. While both of these theories have merit, this study asserts that government shutdown announcements are reflected in the price of a company's stock according to the semi-strong form of efficiency, indicating that all public information available determines the price of the stock.

METHODOLOGY

This research study analyzed the risk adjusted rate of return for a sample of 50 firms before and after the 2 government shutdowns in 1995/96 and 2013 to test the semi-strong form efficient market hypothesis. Samples were randomly selected from government contracting firms. 36 firms from the first shutdown remained in the second shutdown. This study used the standard risk adjusted event study methodology found in the finance literature. The event day (day 0) is the date of the government shutdown announcement, which is November 14 for 1995 and October 1 for 2013. The historical financial data was obtained through Yahoo Finance and analyzed as follows.

1. The historical stock prices of the sample companies and S&P 500, for the event study duration of -180 to +30 days (where day -30 to +30 is the event period and day 0 is the event day) were obtained.

2. The holding period returns (R) for the sample firms and the corresponding S&P 500 index (R_m) for each day in this study were calculated using the following formula:

$$\text{Current daily return} = \frac{\text{current day close price} - \text{previous day close price}}{\text{Previous day close price}}$$

3. A regression analysis was performed using the actual daily return of each company (dependent variable) and the corresponding S&P 500 daily return (independent variable) over the pre-event period (day -180 to -31) to obtain the intercept alpha and beta. The firms' alphas and betas are shown in Tables 1 and 2 for the 1995 and 2013 shutdowns, respectively.

Risk-Adjusted Method (Market Model)

$R_{i,t} = a + bR_{m,t} + e$ parameter estimation during pre-event period

$E(R) = a + bR_m$ for each day during event period

Excess Return = Actual Return - (a + bR_m)

Table 1: ALPHAS AND BETAS FOR 1995 GOVERNMENT SHUTDOWN

Firm Name	Ticker	Alpha	Beta
Lockheed Martin	LMT	0.00089706	1.16907402
Northrop Grumman	NOC	0.00138441	0.71002098
Verizon	VZ	-0.00014	1.100214
Raytheon	RTN	0.000723	0.542108
Hewlett-Packard	HPQ	0.000587	1.685688
Computer Sciences Corporation	CSC	0.000406	1.265531
Jacobs Engineering Group	JEC	0.000448	0.667897
Boeing	BA	0.000777	1.378171
General Dynamics Corporation	GD	9.58E-05	0.868757
Harris Corporation	HRS	0.000411	0.892525
CACI International	CACI	0.000998	1.279062
IBM	IBM	0.0004	1.122684
United Technologies	UTX	0.000956	0.732155
B/E Aerospace Inc.	BEAV	0.00319	0.139499
Celadon Group	CGI	-0.00122	0.147218
Honeywell International	HON	-0.00023	0.962829
AT&T	T	0.000672	1.176627
Alliant Techsystems	ATK	0.001084	0.311155
Unisys Corp	UIS	-0.00195	0.860372
General Electric	GE	-0.00026	1.243325
Century Link	CTL	-0.00037	0.332293
RTI International	RTI	0.005413	0.254906
Xerox Corporation	XRX	-0.00031	1.347202
Ball Corporation	BLL	-0.00138	0.806172
Cubic Corporation	CUB	0.000479	0.832415
Oshkosh Corporation	OSK	0.00116	0.646395
McKesson Corporation	MCK	0.000797	0.647378
URS Corporation	URS	-4.4E-05	0.683847
Humana Inc.	HUM	-0.00214	1.205183
Healthnet Inc.	HNT	0.000492	1.144353
Textron	TXT	0.000587	0.807666
Navistar International	NAV	-0.00236	1.09509
Merck & Co. Inc	MRK	0.001617	0.583926
Pfizer Inc.	PFE	0.001745	0.317451
Cardinal Health	CAH	0.000765	0.133139
Tetratech	TTEK	0.002904	-0.02411
Exxon Mobil Corporation	XOM	0.000322	0.568414
Valero Energy Corporation	VLO	0.001639	0.364462
Ciber	CBR	0.000955	1.925333
GlaxoSmithKline plc	GSK	0.000969	0.480373
AstraZeneca plc	AZN	0.001904	0.318683
Methode Electronics	MEI	0.001438	1.320291
Dominion Resources	D	-0.00029	0.531802
Praxair	PX	-0.00011	0.988635
Pepco Holdings	POM	0.001253	0.602678
GenCorp	GY	-0.00152	0.190938
Johnson & Johnson	JNJ	0.000929	0.820479
Koninklijke Philips	PHG	0.001664	0.779294
Medtronic Inc.	MDT	0.002613	1.04057
Boston Scientific Corp	BSX	0.002397	1.758926

Table 2: ALPHAS AND BETAS FOR 2013 GOVERNMENT SHUTDOWN

Firm Name	Ticker	Alpha	Beta
Lockheed Martin	LMT	0.00132418	0.79831544
Northrop Grumman	NOC	0.00175598	0.79325727
Verizon	VZ	0.00043	0.641845
Raytheon	RTN	0.001474	0.71652
Hewlett-Packard	HPQ	0.002632	0.878972
Computer Science Group	CSC	0.000498	1.361739
Jacobs Engineering Group	JEC	0.001012	1.460351
Boeing	BA	0.001463	0.916067
General Dynamics Corporation	GD	0.000627	0.880267
Harris Corporation	HRS	0.000402	0.996649
CACI International	CACI	0.000583	0.973898
IBM	IBM	-0.00073	0.762279
United Technologies	UTX	0.000557	1.023362
B/E Aerospace Inc.	BEAV	0.00125	1.26577
Celadon Group	CGI	-0.00145	1.382945
Honeywell International	HON	0.000577	1.172603
AT&T	T	-0.00039	0.71175
Alliant Techsystems	ATK	0.002233	0.856703
Unisys Corp	UIS	0.001625	1.31539
General Electric	GE	0.000244	0.943636
Century Link	CTL	-0.00152	0.778948
RTI International	RTI	-0.00041	1.490997
Xerox Corporation	XRX	0.001263	1.352813
Ball Corporation	BLL	-0.00062	0.908086
Cubic Corporation	CUB	-8.2E-05	0.947262
Oshkosh Corporation	OSK	0.001109	1.921241
McKesson Corporation	MCK	0.00069	0.785438
URS Corporation	URS	0.000659	1.083178
Humana Inc.	HUM	0.001691	0.345725
Healthnet Inc.	HNT	-1.2E-07	1.026708
Textron	TXT	-0.00103	1.848564
Navistar International	NAV	0.000877	2.508768
Merck & Co. Inc	MRK	0.000268	0.701658
Pfizer Inc.	PFE	1.88E-05	0.80349
Cardinal Health	CAH	0.000623	0.848268
Tetratech	TTEK	-0.00222	1.163991
Booz Allen Hamilton	BAH	0.002182	0.775281
KBR Inc.	KBR	-0.00052	1.453227
Fluor Corp.	FLR	-0.00078	1.694448
L3 Communications Holding	LLL	0.000631	0.807102
ITT Corporation	IT	0.001006	1.471509
Rockwell Collins	COL	0.000664	0.98289
AmerisourceBergen Corp	ABC	0.001326	0.613073
Babcock & Wilcox Company	BWC	0.000421	0.932074
CGI Group	GIB	-0.00145	1.382945
Accenture plc	ACN	-0.00051	1.096228
VSE Corp	VSEC	0.003737	0.736176
United Parcel Service	UPS	0.000142	0.770687
AECOM Technology Corp	ACM	-6.7E-06	1.748248
Southcross Energy Partners	SXE	-0.00114	0.221362

4. In order to get the normal expected returns, the risk-adjusted method was used. The expected return for each stock, for each day of the event period from day -30 to +30 was calculated as follows:

$$E(R) = \alpha + \beta * (R_m)$$

5. Excess return (ER) was calculated as follows:

$$ER = \text{the Actual Return (R)} - \text{Expected Return } E(R)$$

6. Average Excess Returns (AER) were calculated (for each day from -30 to +30) by averaging the excess returns for all the firms for each day.

$$AER = \frac{\text{Sum of Excess Return for sample firms on each day}}{N}$$

7. Cumulative AER (CAER) was calculated by adding the AERs for each day from -30 to +30.

8. Graphs of AER and Cumulative AER were plotted for the event period.

To test for semi-strong market efficiency on the government shutdown announcements, the following null and alternative hypotheses were used for the two shutdown samples:

H1₀: The risk adjusted return of the stock price of the sample of 50 government contracting firms is not significantly affected by this type of information on the announcement date of the November 14, 1995 government shutdown.

H1₁: The risk adjusted return of the stock price of the sample of 50 government contracting firms is significantly negatively affected by this type of information on the announcement date of the November 14, 1995 government shutdown.

H2₀: The risk adjusted return of the stock price of the sample of 50 government contracting firms is not significantly affected by this type of information around the announcement date of the November 14, 1995 government shutdown as defined by the event period.

H2₁: The risk adjusted return of the stock price of the sample of 50 government contracting firms is significantly negatively affected around the announcement date of the November 14, 1995 government shutdown as defined by the event period.

H3₀: The risk adjusted return of the stock price of the sample of 50 government contracting firms is not significantly affected by this type of information on the announcement date of the October 1, 2013 government shutdown.

H3₁: The risk adjusted return of the stock price of the sample of 50 government contracting firms is significantly negatively affected by this type of information on the announcement date of the October 1, 2013 government shutdown.

H4₀: The risk adjusted return of the stock price of the sample of 50 government contracting firms is not significantly affected by this type of information around the announcement date of the October 1, 2013 government shutdown as defined by the event period.

H4₁: The risk adjusted return of the stock price of the sample of 50 government contracting firms is significantly negatively affected around the announcement date of the October 1, 2013 government shutdown as defined by the event period.

H5₀: The reaction of risk adjusted return of the stock price of the sample of 50 government contracting firms for the 1995/96 government shutdown is not significantly different from the reaction of risk adjusted return of the stock price of the sample of 50 government contracting firms for the 2013 government shutdown around the announcement date as defined by the event period.

H5₁: The reaction of risk adjusted return of the stock price of the sample of 50 government contracting firms for the 1995/96 government shutdown is significantly different from the reaction of risk adjusted return of the stock price of the sample of 50 government contracting firms for the 2013 government shutdown around the announcement date as defined by the event period.

QUANTITATIVE TESTS AND RESULTS

Did the market react to the government shutdown announcements in 1995 and 2013? Was the information surrounding the event significant? A priori, one would expect there to be a significant difference in the Actual Average Daily Returns (Day -30 to Day +30) and the Expected Average Daily Returns (Day -30 to Day +30) if the information surrounding the event impounds new, significant information on the market price of the sample firms' stock. If a significant risk adjusted difference is observed, then we support our hypothesis that this type of information did in fact significantly either increase or decrease stock price. To statistically test for a difference in the Actual Daily Average Returns and the Expected Daily Average Returns over the event period day -30 to day +30, we conducted a paired sample t-test for the two samples and found a significant difference at the 5% level between actual average daily returns and the risk adjusted expected average daily returns. Average Excess Return (AER) graphs are shown on pages 9 and 10. Results here support the alternate hypothesis H2₁ and H4₁: The risk adjusted return of the stock price of the two samples (50 firms each) of government contracting firms is significantly negatively affected around the 1995 and 2013 government shutdown dates as defined by the event periods. This finding supports the significance of the information around the event since the market's negative reaction was observed.

Is it possible to isolate and observe the samples' daily response to the announcement from day -30 to day +30? If so, at what level of efficiency did the market respond to the information and what are the implications for market efficiency? Another purpose of this analysis was to test the efficiency of the market in reacting to the government shutdown announcements. Specifically, do we observe weak, semi-strong, or strong form market efficiency as defined by Fama, 1970, in the efficient market hypothesis? The key in the analysis is to determine if the AER and CAER are significantly different from zero or that there is a visible graphical or statistical relationship between time and either AER or CAER. T-tests of AER and CAER both tested different from zero at the 5% level of significance. Likewise, observation of the CAER Graphs in Charts 2 and 4 (graphs of CAER from day -30 to day +30 for the 1995 and 2013 government shutdown samples, respectively) on pages 10 and 11 confirms the significant and consistent negative reaction of the risk adjusted returns for the two samples of government contracting firms up to 30 prior to the announcements of the 1995 and 2013 government shutdowns. Graphs in Charts 2 and 4 demonstrate that the announcements of the 1995 and 2013 government shutdown had a significant negative impact on the firms' share price up to 30 days prior to announcement day 0 with a continuous negative trend up to 30 following day 0. The evidence supports the null hypotheses H1₀ and H3₀: The risk adjusted return of the stock price of the 2 samples of 50 government contracting firms is not significantly affected by this type of information on the announcement dates of the November 14, 1995 and the October 1, 2013 government shutdowns. The risk adjusted return of the stock price of the two samples of government contracting firms is not significantly affected by this type of information on the announcement date when made public.

For the samples of firms analyzed, an investor is unable to earn an above normal risk adjusted return by acting on the public announcements of the government shutdowns. As of the announcement date, the firms' stock prices had already adjusted to the new information embedded in the government shutdown. However, after the announcement, stock price exhibited a continuous negative trend up to 30 days post announcement suggesting that an investor could earn an above normal return following the government shutdown announcement. Such post announcement stock returns behavior offers support for the weak form of market efficiency. Overall, the results are consistent with the semi-strong form market efficiency hypothesis which states that the stock price reflects all publicly available information on the announcement but the post announcement negative trend of the risk adjusted stock returns is consistent with weak form market efficiency hypothesis. Interestingly, the results for both samples suggest significant trading activity up to 30 days prior to the announcement of the government shutdowns, possibly suggesting that investors may have anticipated the events.

In addition, the study analyzed whether or not market efficiency varies by timing of the government shutdowns. Specifically, are the observed reactions to the 1995 and 2013 shutdowns similar? Observation and comparison of the CAER graphs in Chart 2 and 4 below show similar reaction to the 1995 and 2013 government shutdown announcements. Specifically CAER graphs in Chart 2 and 4 below show a continuous negative trend in risk adjusted stock returns from day -30 to day +30. The negative reaction to the 1995 shutdown appears to be slightly larger and more volatile than in 2013. While there are minor observable differences in the two samples' reaction to the shutdown news, overall the results support H5₀. The reaction of risk adjusted return of the stock price of the sample of 50 government contracting firms for the 1995/96 government shutdown is not significantly different from the reaction of risk adjusted return of the stock price of the sample of 50 government contracting firms for the 2013 government shutdown around the announcement date as defined by the event period. Evidence here documents the tremendous loss of market capital in reaction to a failure of the Federal Government policy makers to compromise and produce a timely operating budget.

Chart 1: AER vs. Time 1995 Government Shutdown

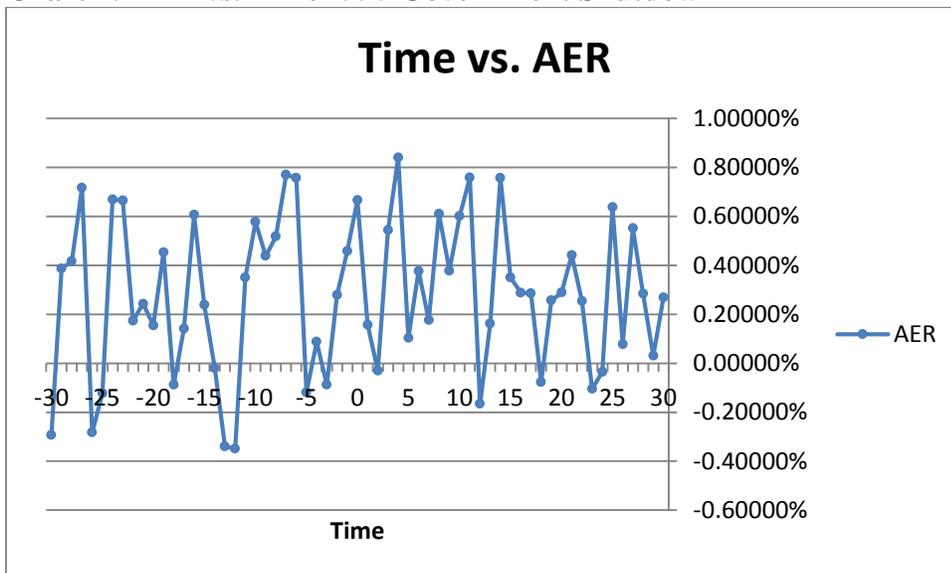


Chart 2: CAER vs. Time 1995 Government Shutdown

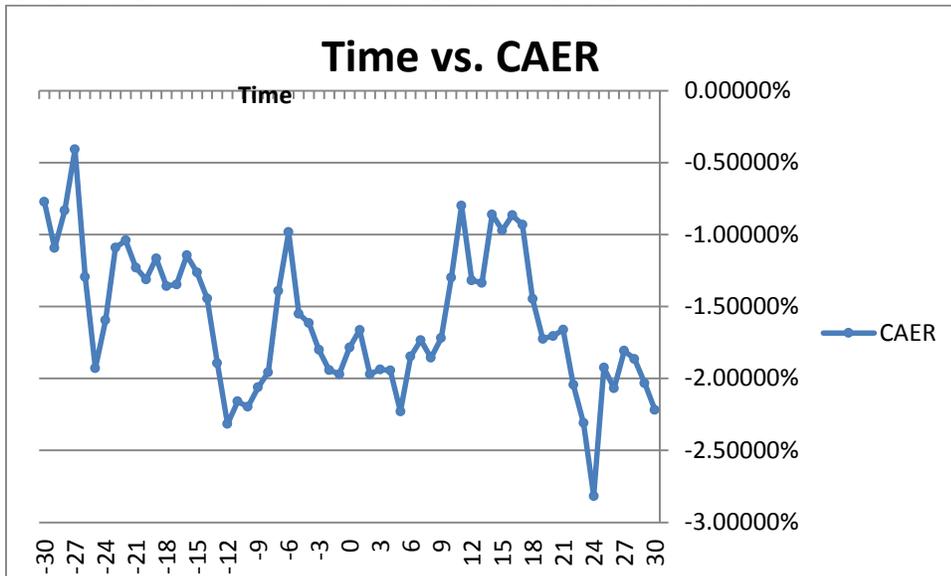


Chart 3: AER vs. Time 2013 Government Shutdown

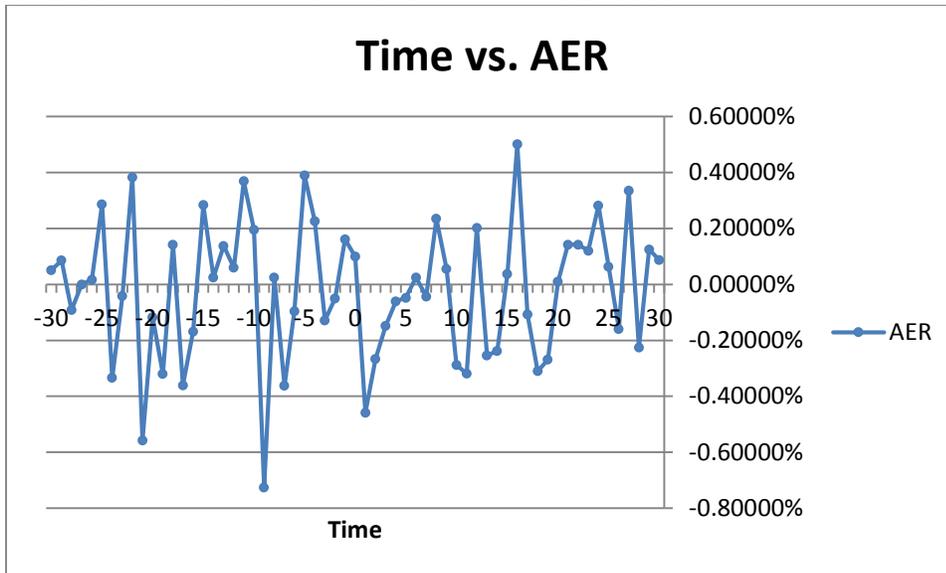
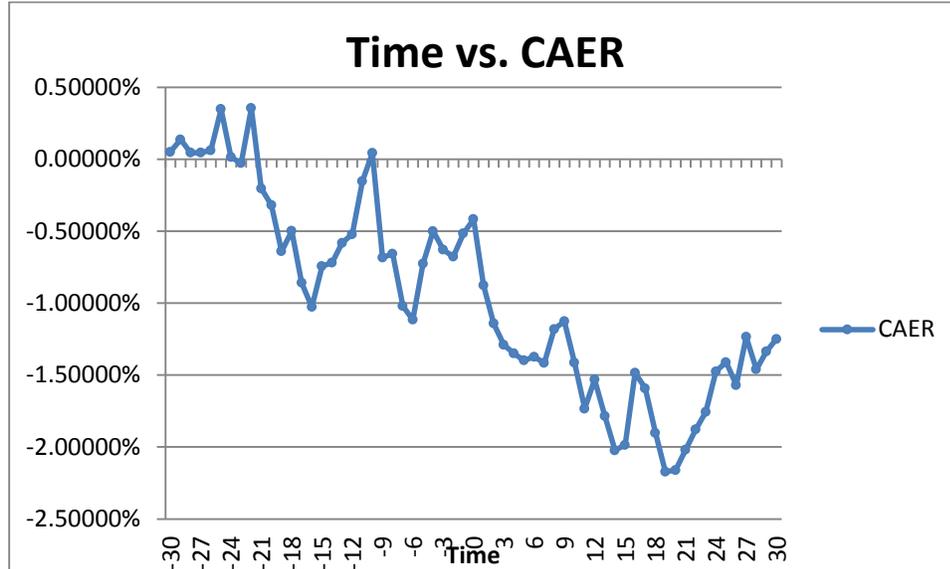


Chart 4: CAER vs. Time 2013 Government Shutdown



CONCLUSION

The purpose of this event study was to test market efficiency theory by analyzing the impact of the government shutdowns of 1995/1996 and 2013 on two samples of 50 firms each. This research tests whether the information embedded in government shutdown announcement exhibits semi-strong market efficiency. The risk adjusted return of the stock price of the two samples (50 firms each) of government contracting firms is significantly negatively affected around the 1995 and 2013 government shutdown dates as defined by the event periods. This finding supports the significance of the information around the event since the market's negative reaction was observed.

Evidence confirms the significant and consistent negative reaction of the risk adjusted returns for the two samples of government contracting firms up to 30 prior to the announcements of the 1995 and 2013 government shutdown. Results demonstrate that the announcements of the 1995 and 2013 government shutdown had a significant negative impact on the firm's share price up to 30 days prior to announcement day 0 with a continuous negative trend up to 30 following day 0. The risk adjusted return of the stock price of the government contracting firms is not significantly affected by this type of information on the announcement dates. However, after the announcement, stock price exhibited a continuous negative trend up to 30 days post announcement suggesting that an investor could earn an above normal return following the government shutdown announcement. Such post announcement stock returns behavior offers support for the weak form of market efficiency. Results are mixed with support of the semi-strong form market efficiency hypothesis stating that stock price reflects all publicly available information on the announcement but the post announcement negative trend of the risk adjusted stock returns is consistent with weak form market efficiency hypothesis. Interestingly, the results for both samples suggest significant trading activity up to 30 days prior to the announcement of the government shutdowns possibly suggesting that investors may have anticipated the events.

In comparing the 1995 and 2013 reactions, there are minor observable differences in the two samples' reaction to the shutdown news. Evidence here documents the tremendous loss of market capital in reaction to a failure of the Federal Government policy makers to compromise and produce a timely operating budget. An important extension of the current study could conduct the same tests on the announcement of the government's reopening to investigate the possible gain in the capital markets relative to the positive news.

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