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COMPARATIVE ANALYSIS OF CUMULATIVE ABNORMAL RETURNS OF FTSE BANKS FOR SCOTTISH INDEPENDENCE VOTE 2014 AND BREXIT VOTE 2016

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Comparative analysis of cumulative abnormal returns of FTSE banks for Scottish Independence Vote 2014 and Brexit Vote 2016

FTSE bankalarının kümülatif anormal getirilerinin İskoç Bağımsızlık Oyu ve Brexit Oyu için karşılaştırmalı analizi

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3) Event Study Methodology
4) Cumulative Abnormal Returns
5) The United Kingdom Banks

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LIST OF ABBREVIATIONS

BARC: Barclays Bank

BELEX: Belgrade Stock Exchange

BETI: Bucharest Stock Exchange

BGEO: BGEO Group

BIRS: The Stock Exchange Index of Republika Srpska

BUX: Budapest Stock Exchange

CAPM: Capital Asset Pricing Model

CAR: Cumulative Abnormal Return

CDS: Credit Default Swap

CEE: Central and Eastern European

CROBEX: Zagreb Stock Exchange

CYBGC: CYBG PLC

EU: European Union

FTNMX8350: FTSE 350 Banks Index

FTSE 100: Financial Times Stock Exchange

FTNMX2350: FTSE 350 Construction Materials and Building Materials Index

FTNMX3720: FTSE 350 Household Goods Index

FTNMX5370: FTSE 350 General Retailers Index

FTNMX8350: FTSE 350 Banks Index

FTNMX8570: FTSE 350 Life Insurance Index

FTNMX8670: FTSE 350 Real Estate Investment Trusts REITs Index

HSBC: HSBC Bank

LLOY: Lloyds Bank

MTRO: Metro Bank

OCT: Overseas Countries and Territories

PFTS: Ukraine Stock Exchange

PX: Prague Stock Exchange

REIT: Real Estate Investment Trusts

RBS: Royal Bank of Scotland

SAX: Bratislava Stock Exchange

SBITOP: Slovenia Stock Market

SEE: South and Eastern European

SOFIX: Bulgaria Stock Exchange

STAN: Standard Chartered PLC

UK: The United Kingdom

WIG: Warsaw Stock Exchange

WSE: Warsaw Stock Exchange

XBANK: Borsa Istanbul Banks Index

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ABSTRACT

Remain or Leave? The main hypothesis in this paper is whether political events such as Brexit and the Scottish Referendum have any statistically significant impact on financial markets. cumulative abnormal returns for FTSE 350 Banks Index have been calculated before and after these milestone events. The empirical results show that Brexit had a statistically significant negative impact on the market performance of the FTSE 350 Banks Index relative to the benchmark index performance. Similarly, the Scottish Referendum had a statistically significant positive impact on the same index, though at different times and with different magnitudes. A comparison between the two referendum shows that markets tend to react more to negative events such as Brexit as evidenced by a higher impact on cumulative abnormal returns. This paper also gives a brief insight on how a selected group of five sectors have been affected from both of the events. Components of this selected group include Life insurance, Construction Materials, General Retailers, Household Goods and Real Estate Investment Trusts.

Keywords: Scottish Independence Referendum, Brexit, Event Study Methodology, Cumulative Abnormal Return, UK Banks

ÖZET

Kalmak mı, Gitmek mi? Bu makaledeki ana hipotez, Brexit ve İskoç Referandumu gibi siyasi olayların finansal piyasalar üzerinde istatistiksel olarak anlamlı bir etkisinin olup olmadığıdır. FTSE 350 Banklar İndeksinin kümülatif anormal getirileri, bu dönüm noktası olaylarından önce ve sonra hesaplanmıştır. Ampirik sonuçlar, Brexit'in FTSE 350 Banklar İndeksinin piyasa performansı üzerinde kıyaslama endeks performansına göre istatistiksel olarak anlamlı bir olumsuz etkisi olduğunu göstermektedir. Benzer şekilde, İskoç Referandumu, farklı zamanlarda ve farklı büyüklüklerde olsa da aynı endeks üzerinde istatistiksel olarak anlamlı bir olumlu etkiye sahipti. İki referandum arasındaki bir karşılaştırma, piyasaların Brexit gibi olumsuz olaylara daha fazla tepki gösterme eğiliminde olduğunu gösteriyor. Bu makale ayrıca, seçilen beş sektörden oluşan bir grubun her iki olaydan nasıl etkilendiği hakkında kısa bir fikir vermektedir. Bu seçilen grubun bileşenleri arasında Hayat sigortası, Yapı Malzemeleri, Genel Perakendeciler, Ev Eşyaları ve Gayrimenkul Yatırım Fonları bulunmaktadır.

Anahtar Kelimeler: İskoç Bağımsızlık Referandumu, Brexit, Olay Çalışması Metodolojisi, Kümülatif Anormal Getiriler, İngiliz Bankaları

INTRODUCTION

Cumulative Abnormal Return analysis with Event Study Methodology has been applied to various combinations of Financial world scenarios. Typically, these scenarios would include effect of both expected and unexpected news and event and their knock-on effects on individual or a group of equites listed on the stock exchanges. These events could be in micro level that is stemming from company related news or like the ones this paper is going to analyze occurs on national and international level. This paper is going to present the effects of 2014 Scottish Independence Vote and 2016 European Union Membership Referendum (Brexit). Brexit is an acronym formed from two words. Br part is for Britain and exit part is for Exit, forming the word Brexit. Historical background both of the countries will be provided for a firmer understanding of the subject. Political reasoning behind these vote and referendums will be also given to shed light to the nature of the environment around these specific events. Economists strongly argue that expectations form the world we live in. Investors always try to stay ahead of the competition to get better return to the funds they manage. They try to make sense of the political and economic environment. They then make their move like a chess player calculating all of the possible scenarios for the future unforeseeable outcomes. Even the betting companies tried to chip in to this political event and turned into financial instrument for their own good. Public was provided with census ratings done by credible well-established companies and were also fed odds information from the biggest betting company's statistical expert teams. Due to the fact that these events were both going to affect the core of all the economic partnerships. European Union was deeply worried about first the Scottish Vote and then Brexit. Scottish vote meant that leaving was a better option that being together. This was the cornerstone of the European Union fundamentals. Following Scottish Independence Vote rejections European Union took a breather, but only in a short time to be confronted with Brexit referendum. This time it was going to hurt it more because UK was one of the biggest

members of the EU. According to the European Parliament News website (2019) there were 751 members of the parliament of which 75 were from UK. UK accounted for just above 10 percent of the seats in European Union decision making process. Even if the politicians deny the fact that International trade, free movement of citizens, education and many more issues can be negotiated between countries, economists know very well that all the countries need each other to survive. Flow of money both inwards and outwards of a country is generated through trade and ease of doing business among countries.

Scottish Independence Vote and European Union Referendum both put the citizens of each country and millions of stakeholders in those countries in a difficult situation. Investors and citizens had difficult time comprehending how will their future will be, this still stands as of 2019 during the time of this thesis.

The hypothesis of this study to find out if the Scottish Vote and Brexit Referendum is bad news for the banks listed in FTSE. If negative abnormal return is seen following the calculations, it would be concluded that these events hurt the banking sector around the event dates.

In chapter two, literature review will be provided. Author of this paper has observed that there are numerous works that focus on different aspects of referendum effects on various sectors of both financial firms and corporation working on international arena. However, author did not come across a comparative analysis of two referendums with regards to Cumulative Abnormal Returns. Author believes that these comparison works need to be extended to future event dates and their effects should be measured for public education because when people vote sometimes, they are not aware of the full consequences of their actions. At the time of the writing, UK is still in European Union and negotiations are continuing between parties. European elections are approaching and it is causing UK a dilemma on if she should be included in an election that in the

future, she might not be a part of. European Union on the other has extended United Kingdom's leave date until 31st of October 2019. This date could be the next event date for further analysis. It has been more than 3 years with no agreement on how UK will leave EU. It is a tough ride for UK.

CHAPTER ONE
LITERATURE REVIEW

Dolley, J. C. (1933). plays an essential role in the subject of Event Study Methodology as he is believed to be the first one to use event study methodology in his research of common-stock split-ups in companies listed in the New York Stock Exchange between the years 1920 and 1930. Keeping in mind the information management opportunities of his time, he had great difficulty gathering the information needed to create his data set. He consulted Poor's Manual and Moody's Manual for the history of the listed stock. Finally, he gathered the price quotations from the New York Times. There were 174 split-ups of which 79 were impossible to get necessary price quotations. He then sent a detailed questionnaire to each of the corporations for more information resulting with 63 replies. He then charted number of split-ups against the years. He found out that when viewed with the level of business activity and stock prices of the mentioned years, the frequency of split-ups was in correlation with each other. Also, the effect of the recession years of 1924 and 1927 were clearly visible on his research.

Some academics claim Dolley J.C. was the first one to use Event Study Methodology in the field but it was Eugene F. Fama. (1970). who made it popular. According to Fama's Efficient Hypothesis, there are three types of hypothesis where he explains how available information to both general public and sneaky insiders play part in security prices. These are, Weak, Semi-Strong and Strong forms. Brexit and Scottish Vote results were announced publicly with no chance of anyone having a prior knowledge of the result. This information release style suggests that these events can be considered as semi-strong form.

CAZAN, S. A. (2017). has analyzed the Brexit implications over the eleven English banks. She has reached a conclusion of following the post event windows after 23rd of

June 2016, cumulative abnormal returns for these banks have dropped significantly with the negative market impact. She kept her estimation window with 221 days before the 23rd of June 2016. She has cited Khotari and Warner (2006) for their view on the best estimation window to be below 12 months period due to the fact that it takes into account specification, power against types of hypothesis and finally sensitivity. She has also pointed another valuable fact about Greenland's leave of EU on 1985. According to the article of Maïa De La Baume (2016) on Politico.eu website Greenland became a member of European Economic Community in 1973 through its ties with Denmark. They voted two times against EU one in 1972 before joining and one in ten years later in 1982 which was finally actioned in 1985 with Greenland becoming a Overseas Countries and Territories (OCT) of the EU. Greenland's main issue with European Union was with losing control over fishing rights.

Tihana Škrinjarić. (2019). examined the effects of Brexit from a different point of view. Brexit has not only affected UK but also due to the fact that UK is one of the top financial centers in the world it had effect on Central and Eastern European (CEE) and South and Eastern European (SEE) stock markets and came up with mixed results with the cumulative abnormal returns but highlights her findings on significant volatility series. The countries and stock markets that she has analyzed were BELEX, BETI, BIRS, BUX, CROBEX, PFTS, PX, SAX, SBITOP, SOFIX, and WIG (corresponding countries: Serbia, Hungary, Bosnia and Herzegovina, Bulgaria, Croatia, Ukraine, Czech Republic, Slovakia, Slovenia, Romania, and Poland respectively). The event of Brexit was not only contained in UK but had knock on effects on the rest of the world in form of increased volatility.

Nida Abdioğlu, & Sinan Aytekin. (2016). focused on the role of macroeconomic policy announcements on the Turkish Banks' stock returns from the point of view Cumulative. They have investigated the 24 monetary policy decisions of the Monetary Policy Committee on 12 deposit banks listed on Borsa Istanbul Banks Index (XBANK). They

concluded that Turkish deposit banks gave inconsistent results since in some months Cumulative Abnormal Returns were positive and in some were negative. Clearly monetary policy decisions had an impact on the banks return during these years.

Ramiah, V. (1), Pham, H. N. A. (1), & Moosa, I. (2). (n.d.). (2017) investigated the sectoral effects of Brexit on the British Economy. They used event study methodology to assess the effect of Brexit relative to anticipation and reality. A brief summary of the most significantly affected sectors they have discovered were household goods and home construction were hit by 10-day Cumulative Abnormal Return (CAR10) of -16.81% with t statistics of -5.22 because it gauges housing markets tension against Brexit. Construction and materials sector resulted with CAR10 of -11.06% with t statistics -5.21. Real-estate investment trusts had CAR10 of -12.19% with t statistics -5.26. Banking sector was measured with CAR10 of -15.37% with t statistics of -4.59, due to the concerns about passporting rights, free movement of capital and London being the most active financial center in Euro Zone Area. Uncertainty about the future put down General Retailers sector with CAR10 of -10.62% with t statistics -5.02 with expectation of lower future customer spending.

Oehler, A., Horn, M., & Wendt, S. (2017) focused on Brexit effects of a possible trouble on the tariff free trade on firms which serve domestic and international customers. They brought a close-up view to event studies. They have worked with daily returns cumulative abnormal returns while also tackling a faster pace environment in calculating 5-minute returns which was a highly volatile market at the time of the event. According to the research that is compiled for this paper, they are the only ones who analyzed 5-minute returns for an event. This could be due to the advent of the sophisticated price reporting systems we have today which was not available for decades of studies that was done before. They have observed negative abnormal returns from the crash in the first three five minutes candles on the event day. They have arrived to a conclusion on firms with domestic sales that were not subject of international tariff

uncertainty of Brexit Referendum have experienced a higher negative abnormal return that firms with international clientele.

Tielmann, A., & Schiereck, D. (2017). viewed the effects of Brexit Referendum on the logistic companies. Leaving European Union would mean movement of goods and capital would need to be renegotiated and border controls would be reinstated between United Kingdom and European Union. They have used 107 logistic companies from continental EU countries and United Kingdom. 21 of those were British companies and the rest of the 86 companies from the member countries of European Union. Their findings showed a highly significant negative market reaction for both UK and European companies. However, they point out that UK companies are significantly more affected from the Brexit Referendum result. This is due to the fact that EU companies would still continue to enjoy tariff free trade among EU companies. They would only need to negotiate with single country that is UK, vice versa, UK would need to negotiate with 27 countries. Which at the time of writing following 3 years of Brexit event is in debate in current UK Parliament?

Schiereck, D., Kiesel, F., & Kolaric, S. (2016) compared the stock and CDS (Credit Default Swap) spread reactions to the Brexit Referendum to the bankruptcy filing of Lehman Brothers. This comparison entailed 87 banks for Lehman collapse of which were 40 EU and 47 Non-EU banks with 94 banks for Brexit of which 35 were EU and 59 were Non-EU Banks. Their research shows that Lehman Brothers collapse announcement gave way to a weakly significant negative average Cumulated Abnormal Returns. They explain this result with the devastating knock-on effects of the collapse on the general market indices. Therefore, when put against their market indices, bank did not look in severe condition. They came up with conclusion that Brexit had a worse effect on mainly EU Financial Institutions which had a significant share price decline. On the CDS side, they have found that Lehman case, Non-EU banks were affected more whereas in Brexit case it was the other way around. Brexit

was confined to EU Banks. They concluded as; Brexit was not another Lehman moment for banks. They explained further that; financial market is more robust in dealing with uncertainty against financial system more than before.

Jackowicz, K., Kozłowski, Ł., & Podgórski, B. (2017). took a country specific case, Warsaw Stock Exchange (WSE), Poland, to test against Brexit Referendum Vote. They tested the hypothesis of price decline caused by the referendum was not severe for firms dependent on European Markets. They gathered sample data of 116 companies listed in WSE which excludes financial entities. They have found out that investor reactions were uniform with regard to the firms' degree of international client portfolio.

Lee, S., & Connolly, D. J. (2010) have worked with IT related news events effect on hotels, restaurants and casinos between years 1996 and 2006. Their purpose to uncover how the financial markets perceived the IT news regarding hospitality companies. This sample period is the widest period the author of this paper came across at the time of the writing. They have elected to represent companies with more than 70 percent of the market capitalization. Hotel sector was represented with Hilton, Marriot, Starwood, Choice and Four Seasons. Restaurants were represented with McDonald, Yum Brand, Darden, Wendy's and Brinker. Casinos were represented with Harrah's, MGM, Mirage, Sands, Station and Boyd. They had to classify what would count as an event marker through an intensive classification of the IT news category. Starting with initial 22 categories, they consolidated the scope to 8 categories with more than 5 news item and created a catch all category for the remaining news, totaling the category number to 9. Guest Services, IT infrastructure, Distribution/E-commerce, Sales, Awards, Personnel, Environmental, Supply Chain Management and Accounting formed the top 8 categories. News that were eligible for study were initially stood at 294 then consolidated to 230 dues to the rule that two news that occur within 10 days would be discarded. They released their finding as; no hotel company shows significant Cumulated Abnormal Returns either positive or negative, in restaurants analysis only

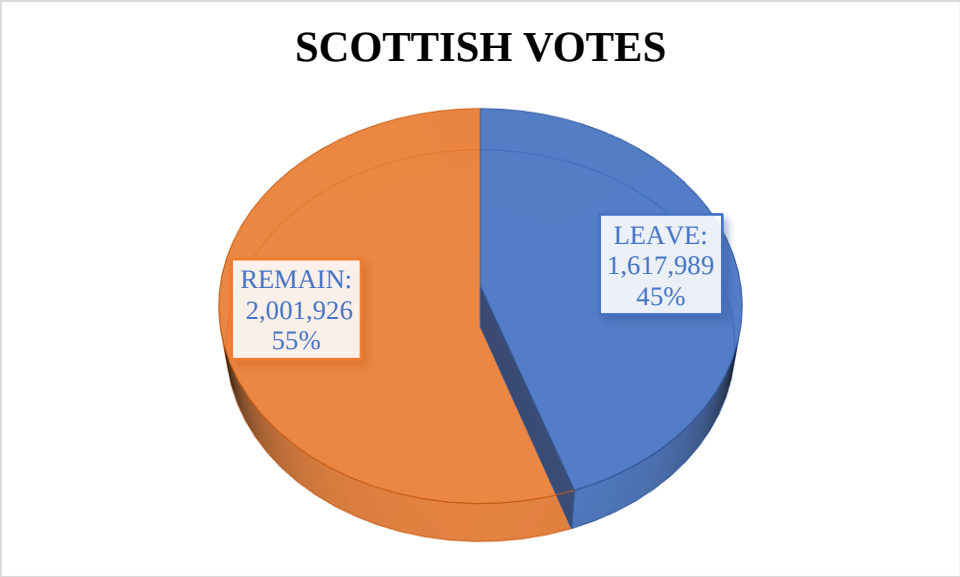
Brinker showed a positive Cumulated abnormal return and finally no casino showed positive Cumulated Abnormal Returns at 5 percent significance level.

Abadie, A., & Gardeazabal, J. (2001). have focused on the economic cost of terrorism by ETA on Basque Country. They had a difficult task on constructing control group share portfolios due to the fact that just because the company is residing in that that particular address would not mean it was going to be badly affected by the attacks. The address selection for that company could have been purely for tax purposes. They also analyzed the event of truce and its effects. They came to a conclusion that markets did welcome truce positively whereas attacks did not bring in positive returns for the investors. Cumulative abnormal returns have been calculated for Basque portfolio and Non-Basque Portfolio. They showed during truce period Basque portfolio over-performed Non-Basque Portfolio with positive cumulative abnormal returns.

CHAPTER TWO
COUNTRY INFORMATION

2.1. Scottish Independence Votes

Figure 2.1. 1 Scottish Votes



Sides of the Scottish Referendum:

According to an article on The Guardian (2014) Scottish independence: everything you need to know about the vote, Scottish citizens were asked "Should Scotland be an independent country"

Yes Campaigners: "Yes Scotland should be an independent country"

Yes Campaigners were after the ability to decide where Scottish money was going to be spent on their own. Oil reserves were part of the debate. Welfare spending, pensions, childcare plans were on top of the agenda for Yes Campaigners. No to spending on nuclear weapons even took its place on the car stickers of the yes supporters.

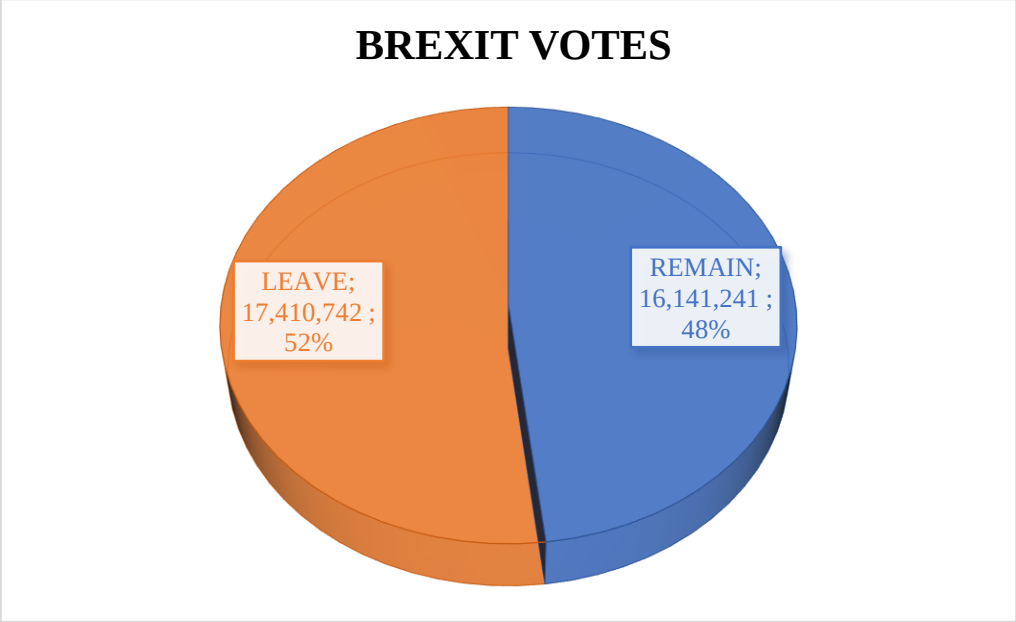
No Campaigners: “No Scotland should be an independent country”

No campaigners pointed their fingers on the possible currency problem if they are separated from the UK. Aging population was another important issue for them leading to the question if needed how country will pay for its public services. They questioned the strength of the oil reserves and heavy dependence of the country on them. They coined the term Better Together which also was on every news channel outlet and was not only embraced in Scotland but in UK.

2.2. Brexit Referendum Votes

The press release from BBC website (2016) with article named EU Referendum Results were as follows:

Figure 2.2. 1 Brexit Votes



Electorate were asked "Should the United Kingdom remain a member of the European Union or leave the European Union"

Yes Campaigners: "Yes the United Kingdom should leave the European Union"

Timothy B. Lee (2016) provides a list of arguments for yes campaigners. The top argument was the sovereignty issue. UK should take matters into its own hands and decide on its own without any intervention from European Union. EU Regulations were believed to be a burden for UK on its way of living. Corporates interest were not catered for under EU and radical reforms were not being able to put in place. EU future looks dark with finally failing members states. Free movement of people, excessive immigration from member states to UK is causing work problems in UK, taking away jobs from UK citizens. UK should keep the money it sends to European Union which is around £13 billion a year but getting back as rebates a far less around one of third of the money that is sent.

No Campaigners: "No the United Kingdom should remain a member of the European Union"

Keith Pilbeam (2016) gives a description of the benefits UK is enjoying in EU membership. All tariff free trade agreement meant 45 percent of the UK trade was tied up in EU, UK's biggest export customer. Passporting rights meant financial institutions would serve customers from all member states freely with no restriction. Domestic investment in UK automatically included access to 27 EU member states which could be used for exporting goods and services. Foreign direct investment chooses UK for its competitive economy and tariff-free access to EU. Immigrations brings in EU citizens with high skills who also pay taxes, compensating the skill shortage in specific fields in UK. Freedom of movement of capital and labour, meaning ability to take up work in EU member states. Money can move from UK to EU with no restriction. Jobs will be lost if UK leaves EU due to lower foreign direct investment, lower exports. Cost of living would rise with the tariffs on imports to UK. Being an EU member provides power in international politics.

CHAPTER THREE
DATA AND METHODOLOGY

Samples for the computations were gathered from Investing.com (2019) Historical prices of daily closing prices for FTSE 100 (FTSE) and FTSE 350 Banks (FTNMX8350). FTSE 100 in formed from the top performing companies in UK. The constituents of this 100 companies are exhibited in the appendix section. FTSE 350 Banks is an index with a ticker FTNMX8350 is formed from the 8 banks listed on FTSE, these are Barclays (BARC), BGEO Group (BGEO), CYBG (CYBGC), HSBC (HSBA), Lloyds Banking (LLOY), Metro Bank (MTRO), RBS PLC(RBS), Standard Chartered (STAN). Along with these data the following sectors have also been examined for comparison purposes. FTSE 350 Life Insurance (FTNMX8570), FTSE 350 Construction Materials (FTNMX2350), FTSE 350 General Retailers (FTNMX5370), FTSE 350 Household Goods (FTNMX3720) and FTSE 350 Reit (FTNMX8670).

Event Date is the actual date when the events in this case referendums took place. For Scottish Vote, event date was 18 September 2014 and Brexit Vote, the event date was 23 June 2016.

Event Window is the time frame where the event study methodology is examined. The time frame selected for this study is 10 working days before and after the selected events to compute the Cumulative abnormal return. Event window for Scottish Vote was between 04 September 2014 (10 days before event date 18 September 2014) and 02 October 2014 (10 days after event date 18 September 2014). For Brexit, event window as between 09 June 2016 (10 days before event date 23 June 2016) and 07 July 2016 (10 days after event date 23 June 2016).

Estimation period is the time were forecasted and real returns have been compared. An estimation period of 30 days before and after the event has also been analyzed for this purpose. Daily returns have been calculated this period. For Scottish Vote, estimation period was between 06 August 2014 and 30 October 2014. For Brexit, estimation period was between 11 May 2016 and 04 August 2016.

3 years prior to the event data has been collected and beta and intercept for the particular stocks have been calculated. For Scottish Vote, 3-year period was between 08 November 2011 and 30 October 2014. For Brexit Vote, 3-year period was between 14 August 2013 and 04 August 2016.

Beta and intercept have been calculated by using linear regression of 3 years historical daily FTSE 100 returns against each of the FTSE 350 sector returns listed on Table 3.1 below.

Table 3. 1 3 years Beta and Intercept Table

		Scottish 3yr		Brexit 3yr	
		BETA	**INTERCEPT**	**BETA**	**INTERCEPT**
FTNMX8350	**Banks**	1.32	$4x10^{-5}$	1.18	$-57x10^{-5}$
FTNMX8570	**Life Insurance**	1.34	$64x10^{-5}$	1.32	$10x10^{-5}$
FTNMX2350	**Construction Materials**	1.32	$5x10^{-5}$	1.15	$45x10^{-5}$
FTNMX5370	**General Retailers**	0.91	$50x10^{-5}$	0.82	$-3x10^{-5}$
FTNMX3720	**Household Goods**	0.88	$68x10^{-5}$	0.88	$58x10^{-5}$
FTNMX8670	**Reit**	0.89	$41x10^{-5}$	0.90	$29x10^{-5}$

Having a beta of 1 shows the returns of respective sectors are correlated with the FTSE 100 index. A beta over 1 means, the sector is still correlated with the benchmark of FTSE 100 but outperforms it and has more volatility. In this study, author has not come up with a negative Beta. A Beta of less than one and above zero means, the sector is still correlated with the benchmark but the following of the returns of FTSE 100 will be less than the actual line of the FTSE 100.

From Scottish Vote, it can be seen that Banks, Life Insurance and Construction Materials have a beta of over 1 leading to a conclusion of outperformance versus FTSE 100, whereas the strength of General Retailers, Household Goods and REIT are still correlated with FTSE 100 but less powerful than the previously mentioned group.

From Brexit Vote, it can be seen that the betas are different due to the fact that it covers a later date interval. Banks beta has fallen from 1.31 to 1.18, Life Insurance from 1.33 to 1.32 and Construction Materials from 1.32 to 1.15. This group still considered as outperformers since it is above 1, the but their strength are weaker. The scenario is the same for previous group of General Retailers, Household Goods and REIT.

Intercepts are calculated as a part of the linear regression equation but as it can be seen from the table above all of them are around zero. In order for them to be visible, author has provided digits to the further number above 0 so that it will not be regarded as zero.

Averages of cumulative abnormal returns were calculated following the 30 days period after the event date. Also, for this 30-day period standard deviation has been calculated. T stats has been calculated with the average cumulative returns and the standard deviation for this period.

Table 3. 2 Scottish Votes CAR Descriptive Statistics

Scottish Votes CAR Descriptive Statistics	Banks	Life Insurance	Construction Materials	General Retailers	Household Goods	REIT
Mean	1.84%	1.55%	0.72%	0.10%	1.65%	1.71%
Standard Error	$28x10^{-4}$	$12x10^{-4}$	$21x10^{-4}$	$14x10^{-4}$	$12x10^{-4}$	$24x10^{-4}$
Median	1.24%	1.53%	0.94%	0.27%	1.76%	1.23%
Standard Deviation	$220x10^{-4}$	$95x10^{-4}$	$166x10^{-4}$	$111x10^{-4}$	$94x10^{-4}$	$185x10^{-4}$
Sample Variance	$5x10^{-4}$	$1x10^{-4}$	$3x10^{-4}$	$1x10^{-4}$	$1x10^{-4}$	$3x10^{-4}$
Kurtosis	-1.07	-0.71	0.54	1.43	-0.05	-0.48
Skewness	0.56	0.04	-0.50	-0.90	-0.19	0.77
Range	7.26%	3.98%	8.36%	5.70%	4.80%	6.56%
Minimum	-1.33%	-0.21%	-3.96%	-3.62%	-0.74%	-1.01%
Maximum	5.93%	3.78%	4.41%	2.08%	4.06%	5.54%
Count	61	61	61	61	61	61

Descriptive Statistics allows the reader recognize the central tendency, dispersion and skewness of a set of data. Date used in this study is a sample of larger set of data.

Sample Mean is calculated by the arithmetic average of the sample data.

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

Means calculated for Scottish Vote are above zero on all of the sectors. On the other hand, means for Brexit Vote all lie below zero.

There appears to be no Mode in all of the sectors listed above for both the Votes. No one of the entries repeatedly to be considered as mode.

Range is a measure of dispersion., that calculates the difference between Maximum value and Minimum value. For Scottish Vote, range of Construction Materials is on the lead with 8.36% only followed by the Banks with 7.2%. Whereas on Brexit Vote, range

of banks are 17%. It is clearly visible that range of all of the sectors are higher on Brexit Vote.

Skewness is a part of the measurement of symmetry of a distribution. Zero skewness meaning a symmetric distribution. Positive skewness is for cases where mean is greater than the median and negative skewness is vice versa.

For Scottish Vote; Banks, Life Insurance and Reit are the sectors with Positive Skewness and Construction Materials, General Retailers, Household Goods have negative skewness.

For Brexit Vote; All of the sectors have negative skewness.

Kurtosis examines how peaked the distribution is when compared with normal distribution. Both of the Votes results show a value less than 3 meaning they are platykurtic, where the distribution. is less peaked than normal distribution.

Table 3. 3 Brexit Votes CAR Descriptive Statistics

Brexit Votes CAR Descriptive Statistics	Banks	Life Insurance	Construction Materials	General Retailers	Household Goods	REIT
Mean	-0.24%	-5.73%	-2.65%	-7.77%	-5.16%	-9.64%
Standard Error	$65x10^{-4}$	$92x10^{-4}$	$44x10^{-4}$	$101x10^{-4}$	$79x10^{-4}$	$103x10^{-4}$
Median	-0.14%	-2.36%	-1.52%	-3.29%	-1.76%	-4.44%
Standard Deviation	$504x10^{-4}$	$715x10^{-4}$	$345x10^{-4}$	$787x10^{-4}$	$617x10^{-4}$	$807x10^{-4}$
Sample Variance	$25x10^{-4}$	$51x10^{-4}$	$12x10^{-4}$	$62x10^{-4}$	$38x10^{-4}$	$65x10^{-4}$
Kurtosis	-1.35	-1.43	-1.38	-1.73	-1.90	-1.53
Skewness	-0.15	-0.18	-0.34	-0.10	0.00	-0.28
Range	17.09%	23.64%	11.34%	24.53%	16.46%	25.84%
Minimum	-9.91%	-19.38%	-9.61%	-21.13%	-13.18%	-25.72%
Maximum	7.18%	4.26%	1.73%	3.40%	3.29%	0.12%
Count	61	61	61	61	61	61

CHAPTER FOUR

RESULTS

4.1. Results of Scottish Independence Votes

4.1.1. Banks

Figure 4.1.1. 1 Scottish Votes, Banks CAR

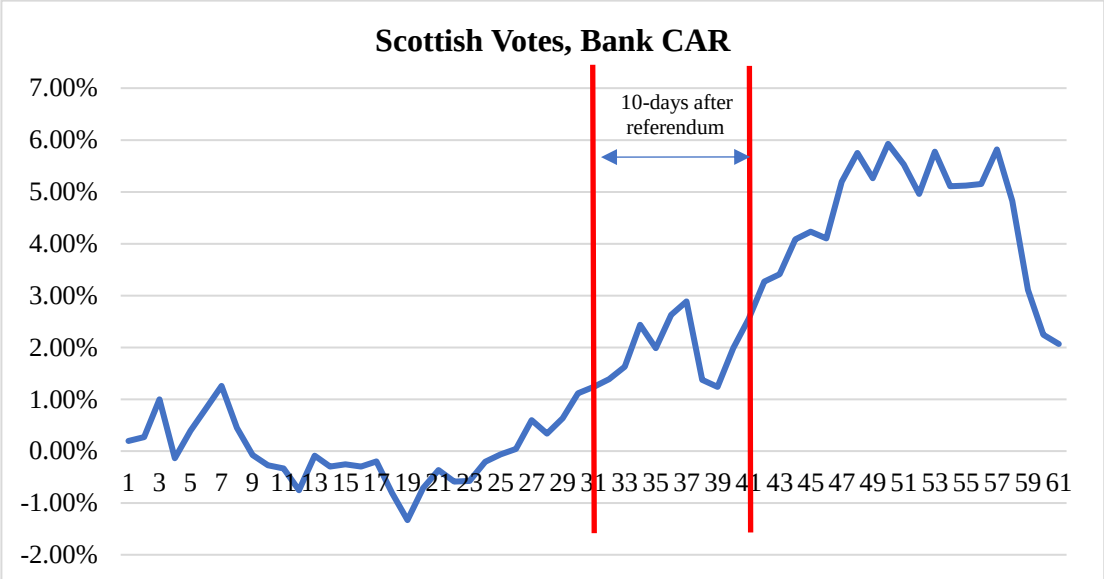


Table 4.1.1. 1 Scottish Votes, Banks CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	3.70%	2.01%
ST DEV S	1.58%	0.59%
TSTAT	2.34	3.39
PROB	1.32%	0.40%

30 days estimation period prior to the event starts on 06/08/2014 and 30 days after the event ends in 30/10/2014. 3-year Beta has been calculated for dates between 08/11/2011 and 30/10/2014. 3-year beta has been found as 1.31980. Intercept was found to be 0.0000413.

Based on Capital Asset Pricing Model (CAPM), FTSE 350 Banks daily returns has been estimated using the calculated 3-year Beta. The difference between the estimated FTSE 350 Banks daily returns and the actual returns is the calculated abnormal return.

Basing our forecast period 30 days before the event, cumulative abnormal return has been calculated until 30 days after the event.

Cumulative abnormal return starts with zero at 30 days before the event, which increases to 1,24% on the day of the event and peaks at 2,55% at 10 days after the event. Finally, it declines to 2,06% 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Banks index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find 3.70%.

Standard deviation of the sample for the same period has been calculated as 1.58%.

T Statistics has been found by taking into account the average and standard deviation of the sample as 2.34.

Based on student t distribution calculated t statistic equates to 1.32% probability. As a result, we reject the null hypothesis with a 95% confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that cumulative abnormal return has peak 10 days after the event. Following this finding, the same study has been employed on the 10-day period.

10 days observation period following to the event date ends on 02/10/2014

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find 2.01%.

Standard deviation of the sample for the same period has been calculated as 0.59%.

T Statistics' has been found by taking into account the average and standard deviation of the sample as 3.39.

Based on student t distribution calculated t statistic equates to 0.40% probability. As a result, we reject the null hypothesis with a 99% confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

4.1.2. Life Insurance Companies

Figure 4.1.2. 1 Scottish Votes, Life Insurance CAR

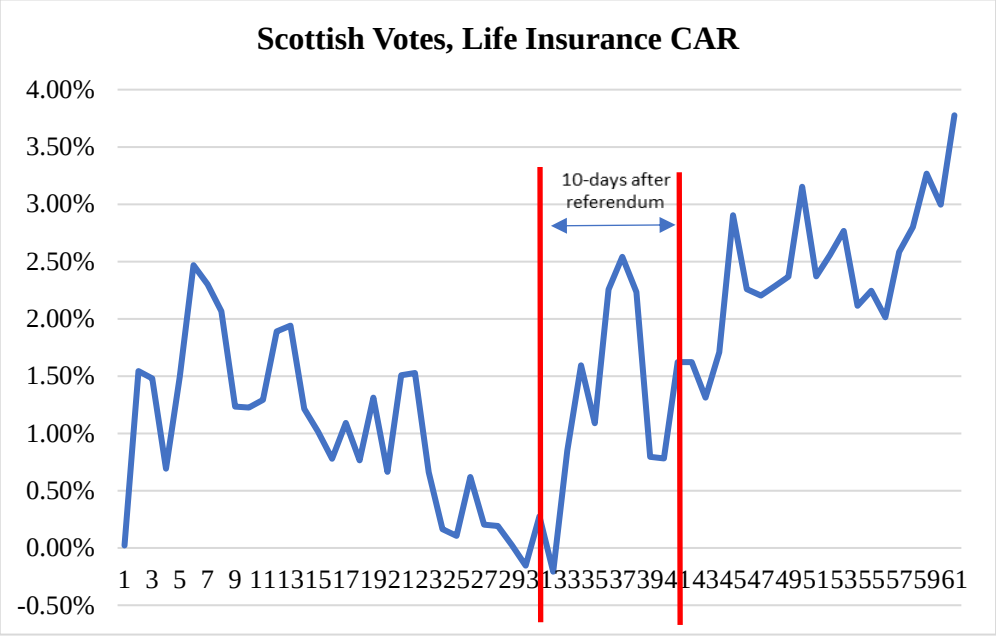


Table 4.1.2. 1 Scottish Votes, Life Insurance CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	2.09%	1.35%
ST DEV S	0.86%	0.85%
TSTAT	2.44	1.59
PROB	1.06%	7.30%

Cumulative abnormal return starts with zero at 30 days before the event, which increases to 0,28% on the day of the event. In order to compare with banking sector, 10 days after the event time CAR is found to be at 1,62%. It continues to rise up to 3,78% 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Life Insurance index returns. However, the results have to be

verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find 2,09 %.

Standard deviation of the sample for the same period has been calculated as 0,86 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as 2,44.

Based on student t distribution calculated t statistic equates to 1,06 % probability. As a result, we reject the null hypothesis with a 95 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 02/10/2014

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find 1,35 %.

Standard deviation of the sample for the same period has been calculated as 0,85 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as 1,59.

Based on student t distribution calculated t statistic equates to 7,30 % probability We cannot reject the null hypothesis, as a result we cannot prove that cumulative abnormal return is actually different than zero.

4.1.3. Construction Materials

Figure 4.1.3. 1 Scottish Votes, Construction Materials CAR

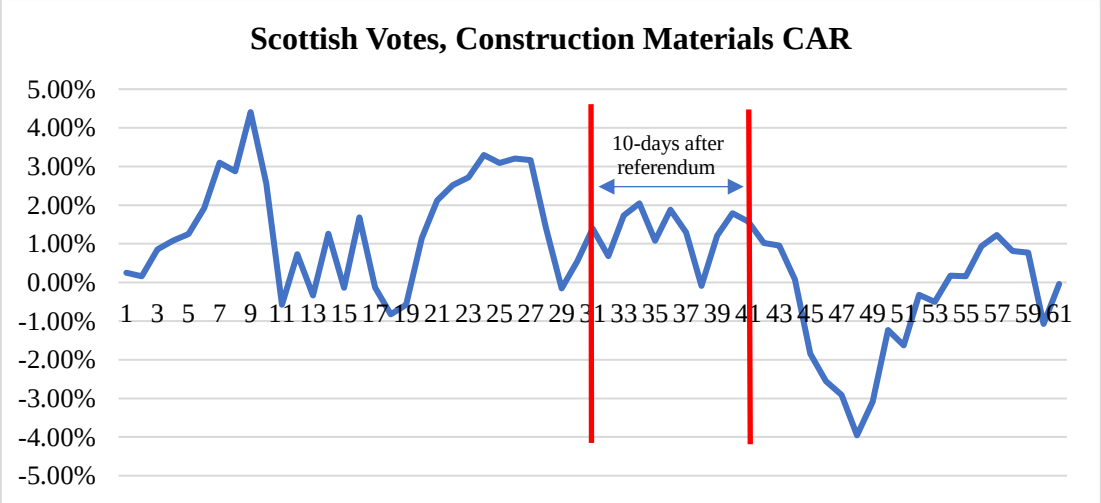


Table 4.1.3. 1 Scottish Votes, Construction Materials CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	0.01%	1.32%
ST DEV S	1.62%	0.65%
TSTAT	0.0034	2.04
PROB	49.86%	3.60%

Cumulative abnormal return starts with zero at 30 days before the event, which increases to 1,39% on the day of the event. In order to compare with banking sector, 10 days after the event time CAR is found to be at 1,58%. It drops down to 0,04% 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Life Insurance index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find 0,01 %.

Standard deviation of the sample for the same period has been calculated as 1,62 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as 0,0034.

Based on student t distribution calculated t statistic equates to 48,98 % probability. We cannot reject the null hypothesis, as a result we cannot prove that cumulative abnormal return is actually different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 02/10/2014

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find 1.32 %.

Standard deviation of the sample for the same period has been calculated as 0,65 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as 2,04.

Based on student t distribution calculated t statistic equates to 3,60 % probability. As a result, we reject the null hypothesis with a 99% confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

4.1.4. General Retailers

Figure 4.1.4. 1 Scottish Votes, General Retailers CAR

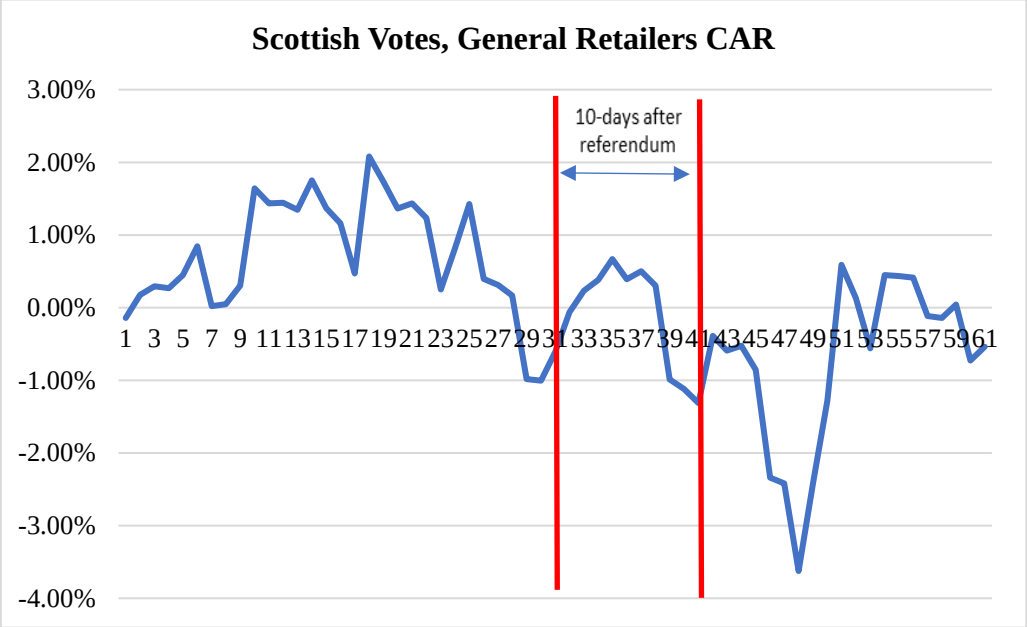


Table 4.1.4. 1 Scottish Votes, General Retailers CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	-0.52%	-0.10%
ST DEV S	1.06%	0.75%
TSTAT	-0.49	-0.13
PROB	68.46%	55.20%

Cumulative abnormal return starts with zero at 30 days before the event, which drops to -0,60% on the day of the event and drops more to -1,32 % at 10 days after the event. Finally, it increases to -0,54 % 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 General Retailers index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find -0,52 %.

Standard deviation of the sample for the same period has been calculated as 1,06 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as -0,49.

Based on student t distribution calculated t statistic equates to 68,46 % probability. We cannot reject the null hypothesis, as a result we cannot prove that cumulative abnormal return is actually different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 02/10/2014

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find -0,10 %.

Standard deviation of the sample for the same period has been calculated as 0,75 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as -0,13.

Based on student t distribution calculated t statistic equates to 55,20 % probability. We cannot reject the null hypothesis, as a result we cannot prove that cumulative abnormal return is actually different than zero.

4.1.5. Household Goods

Figure 4.1.5. 1 Scottish Votes, Household Goods CAR

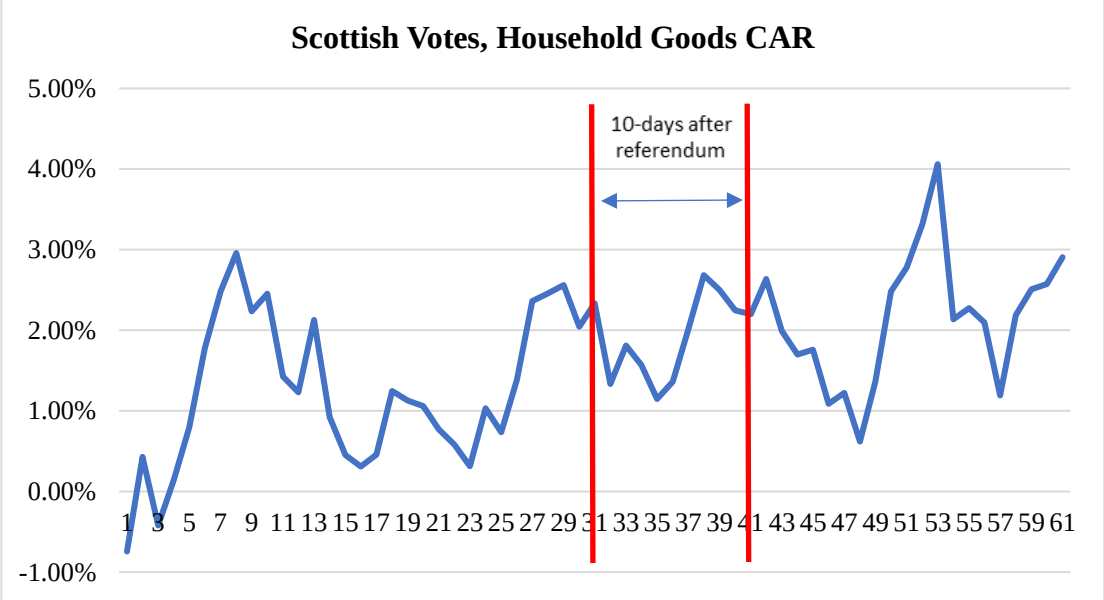


Table 4.1.5. 1 Scottish Votes, Household CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	2.06%	1.89%
ST DEV S	0.74%	0.53%
TSTAT	2.79	3.58
PROB	0.47%	0.30%

Cumulative abnormal return starts with zero at 30 days before the event, which increases to 2,33% on the day of the event and drops to 2,20 % at 10 days after the event. Finally, it climbs to 2,91 % 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Household Goods index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find 2,06 %.

Standard deviation of the sample for the same period has been calculated as 0,74 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as 2,79.

Based on student t distribution calculated t statistic equates to 0,47 % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 02/10/2014

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find 1,89 %.

Standard deviation of the sample for the same period has been calculated as 0,53 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as 3,58.

Based on student t distribution calculated t statistic equates to 0,30 % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

4.1.6. Real-estate Investments

Figure 4.1.6. 1 Scottish Votes, REIT CAR

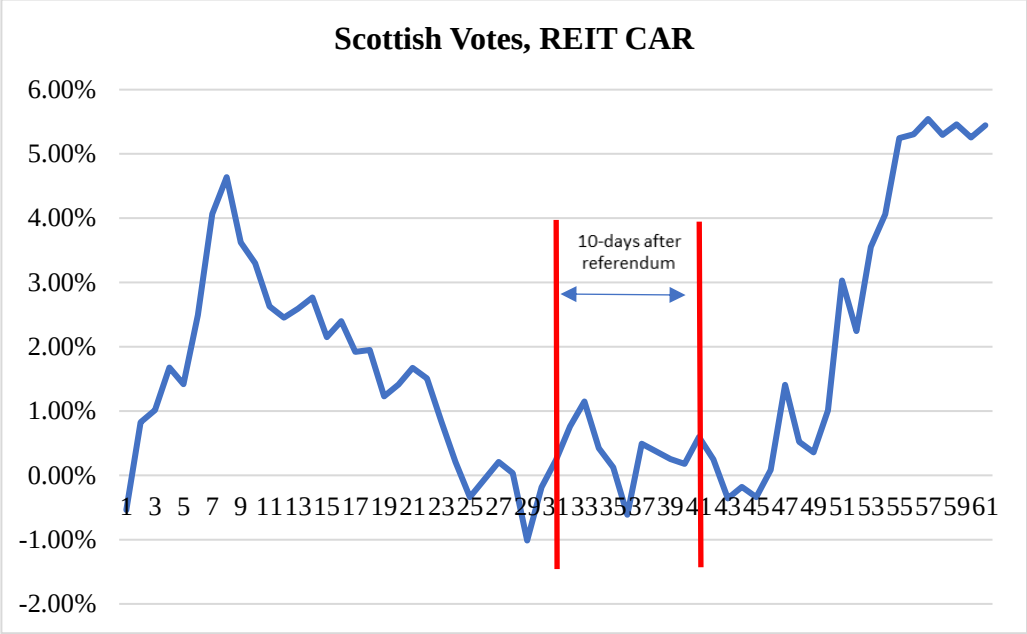


Table 4.1.6. 1 Scottish Votes, REIT CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	1.90%	0.37%
ST DEV S	2.23%	0.46%
TSTAT	0.85	0.81
PROB	20.07%	21.96%

Cumulative abnormal return starts with zero at 30 days before the event, which increases to 0,24% on the day of the event rises slightly to 0,59 % at 10 days after the event. Finally, it reaches to 5,45 % 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Reit index returns. However,

the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find 1,90 %.

Standard deviation of the sample for the same period has been calculated as 2,23 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as 0,85.

Based on student t distribution calculated t statistic equates to 20,07 % probability. We cannot reject the null hypothesis, as a result we cannot prove that cumulative abnormal return is actually different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 02/10/2014

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find 0,37%.

Standard deviation of the sample for the same period has been calculated as 0,46 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as 0,81.

Based on student t distribution calculated t statistic equates to 21,96 % probability. We cannot reject the null hypothesis, as a result we cannot prove that cumulative abnormal return is actually different than zero.

4.2 Results for Brexit Referendum

4.2.1. Banks

Figure 4.2.1. 1 Brexit Votes, Banks CAR

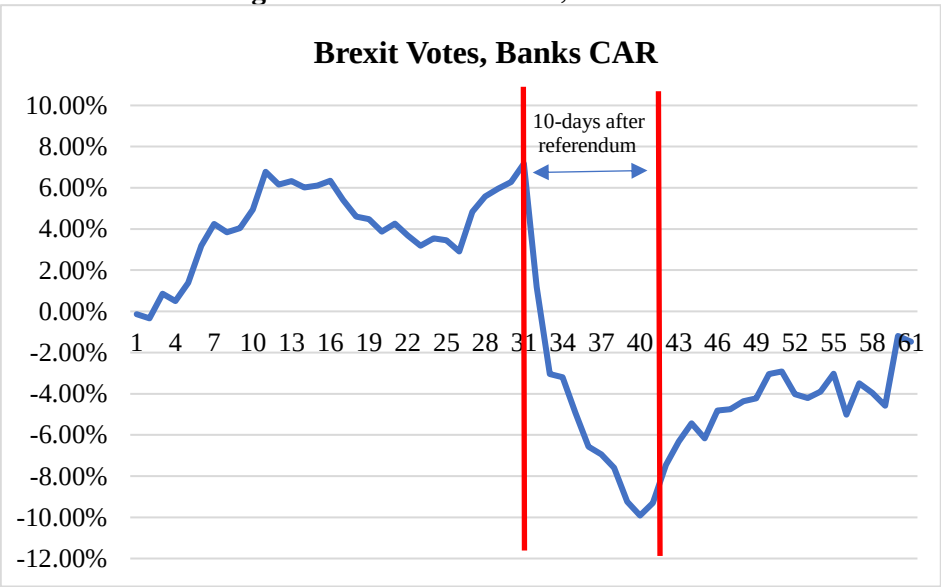


Table 4.2.1. 1 Brexit Votes, Banks CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	-4.80%	-5.96%
ST DEV S	2.45%	3.49%
TSTAT	-1.96	-1.70
PROB	2.97%	6.12%

30 days estimation period prior to the event starts on 11/05/2016 and 30 days after the event ends in 04/08/2016. 3-year Beta has been calculated for dates between 14/08/2013 and 04/08/2016. 3-year beta has been found as 1.18355. Intercept has been found -0.000572803

Based on Capital Asset Pricing Model (CAPM), FTSE 350 Banks daily returns has been estimated using the calculated 3-year Beta. The difference between the estimated FTSE 350 Banks daily returns and the actual returns is the calculated abnormal return.

Basing our forecast period 30 days before the event, cumulative abnormal return has been calculated until 30 days after the event.

Cumulative abnormal return starts with zero at 30 days before the event, which increases to 7,18% on the day of the event and peaks at -9,31% at 10 days after the event. Finally, it rose to -1,48% 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Banks index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find -4.80%.

Standard deviation of the sample for the same period has been calculated as 2.45%.

T Statistics has been found by taking into account the average and standard deviation of the sample as -1.96.

Based on student t distribution calculated t statistic equates to 2.97% probability. As a result, we reject the null hypothesis with a 95% confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that cumulative abnormal return has peak 10 days after the event. Following this finding, the same study has been employed on the 10-day period.

10 days observation period following to the event date ends on 07/07/2016

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find -5.96%.

Standard deviation of the sample for the same period has been calculated as 3.49%.

T Statistics' has been found by taking into account the average and standard deviation of the sample as -1.70.

Based on student t distribution calculated t statistic equates to 6.12% probability. We cannot reject the null hypothesis, as a result we cannot prove that cumulative abnormal return is actually different than zero.

4.2.2. Life Insurance Companies

Figure 4.2.2. 1 Brexit Votes, Life Insurance CAR

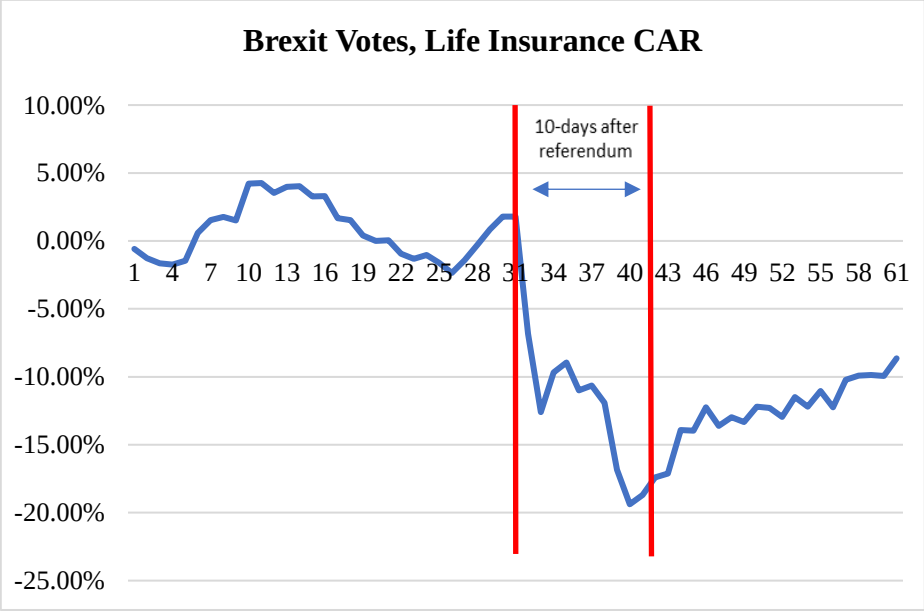


Table 4.2.2. 1 Brexit Votes, Life Insurance CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	-12.47%	-12.65%
ST DEV S	2.99%	4.26%
TSTAT	-4.17	-2.97
PROB	0.01%	0.78%

Cumulative abnormal return starts with zero at 30 days before the event, which increases to 1,79% on the day of the event and drops down dramatically to -18,70 % at 10 days after the event. Finally, rises to -8,63 % 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Life Insurance index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR $\neq$ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find -12.47 %.

Standard deviation of the sample for the same period has been calculated as 2,99 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as -4,17.

Based on student t distribution calculated t statistic equates to 0,01 % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 07/07/2016

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find -12,65 %.

Standard deviation of the sample for the same period has been calculated as 4,26 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as -2,97.

Based on student t distribution calculated t statistic equates to 0,78 % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

4.2.3. Construction Materials

Figure 4.2.3. 1 Brexit Votes, Construction Materials CAR

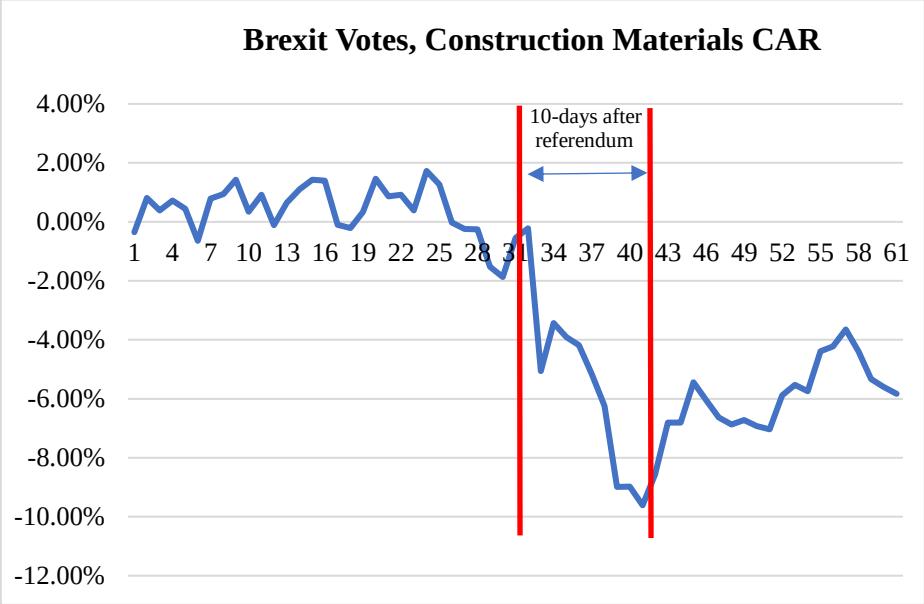


Table 4.2.3. 1 Brexit Votes, Construction Materials CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	-5.81%	-5.58%
ST DEV S	1.91%	2.95%
TSTAT	-3.04	-1.89
PROB	0.25%	4.58%

Cumulative abnormal return starts with zero at 30 days before the event, which increases to -0.55% on the day of the event day of the event and drops down to -8,98 % at 10 days after the event. Finally, it rises to -5,83 % 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Construction Materials index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find -5,81 %.

Standard deviation of the sample for the same period has been calculated as 1,91 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as -3,04.

Based on student t distribution calculated t statistic equates to 0,25 % probability. As a result, we reject the null hypothesis with a 99% confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 07/07/2016

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find -5,58 %.

Standard deviation of the sample for the same period has been calculated as 2,95 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as -1,89.

Based on student t distribution calculated t statistic equates to 4,58 % probability. As a result, we reject the null hypothesis with a 95% confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero

4.2.4. General Retailers

Figure 4.2.4. 1 Brexit Votes, General Retailers CAR

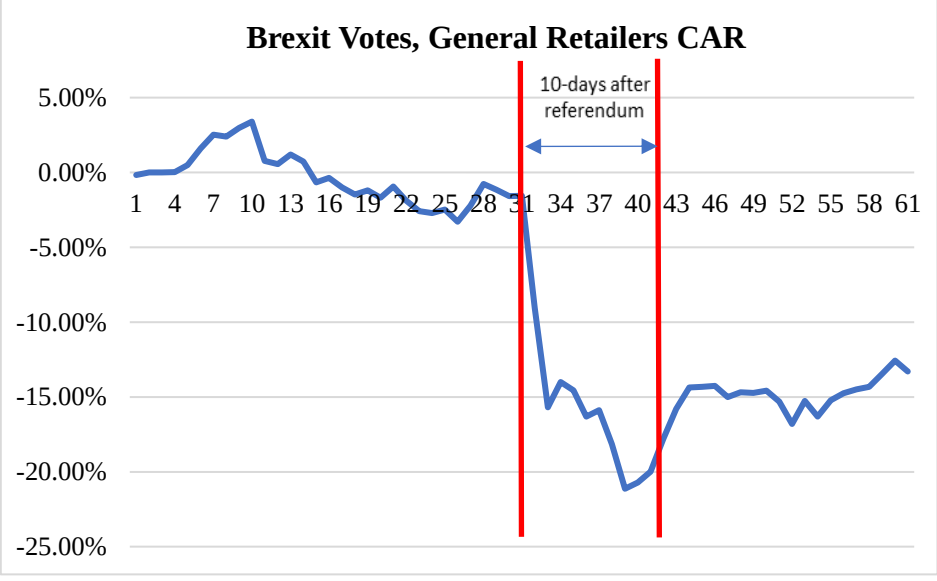


Table 4.2.4. 1 Brexit Votes, General Retailers CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	-15.43%	-16.55%
ST DEV S	2.39%	3.66%
TSTAT	-6.45	-4.52
PROB	$24x10^{-8}$%	0.07%

Cumulative abnormal return starts with zero at 30 days before the event, which reduces to -1,57% on the day of the event and crashes -19,99% at 10 days after the event. Finally, it eases to -13,29 % 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 General Retailers index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find -15,43 %.

Standard deviation of the sample for the same period has been calculated as 2,39 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as -6,45.

Based on student t distribution calculated t statistic equates to $24x10^{-8}$ % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 07/07/2016

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find -16,55 %.

Standard deviation of the sample for the same period has been calculated as 3,66 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as -4,52.

Based on student t distribution calculated t statistic equates to 0,07 % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

4.2.5. Household Goods

Figure 4.2.5. 1 Brexit Votes, Household Goods CAR

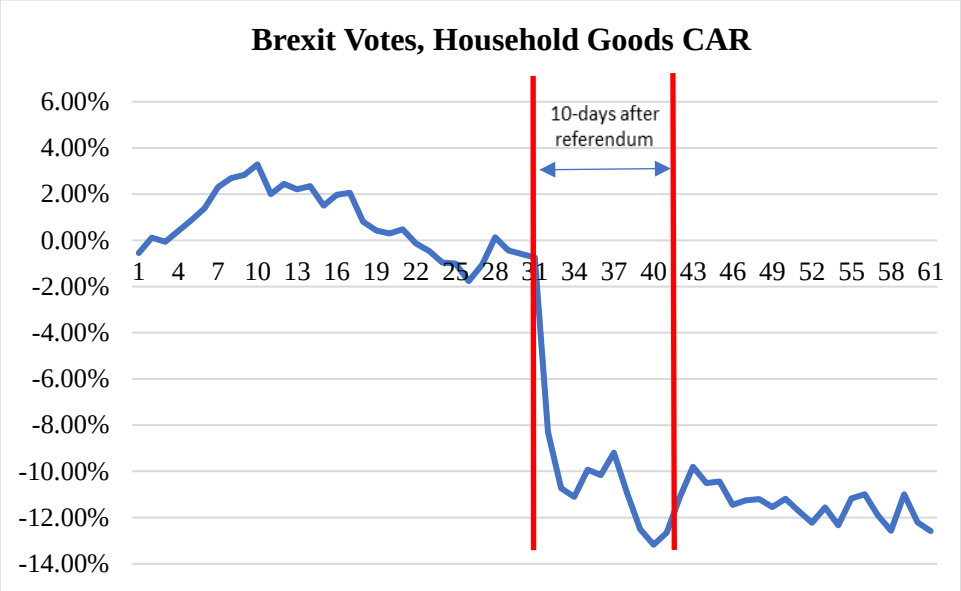


Table 4.2.5. 1 Brexit Votes, Household Goods CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	-11.25%	-10.87%
ST DEV S	1.09%	1.57%
TSTAT	-10.32	-6.94
PROB	$16x10^{-12}$%	$34x10^{-6}$%

Cumulative abnormal return starts with zero at 30 days before the event, which slightly decreases to 0,74% on the day of the event and drops down to -12,66 % at 10 days after the event. Finally, it rises to -12,59% 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Household Goods index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find -11,25 %.

Standard deviation of the sample for the same period has been calculated as 1,09 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as -10,32.

Based on student t distribution calculated t statistic equates to $16x10^{-12}$ % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 07/07/2016

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find -10,87 %.

Standard deviation of the sample for the same period has been calculated as 1,57 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as -6,94.

Based on student t distribution calculated t statistic equates to $34x10^{-6}$ % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

4.2.6. Real-estate Investments

Figure 4.2.6. 1 Brexit Votes, REIT CAR

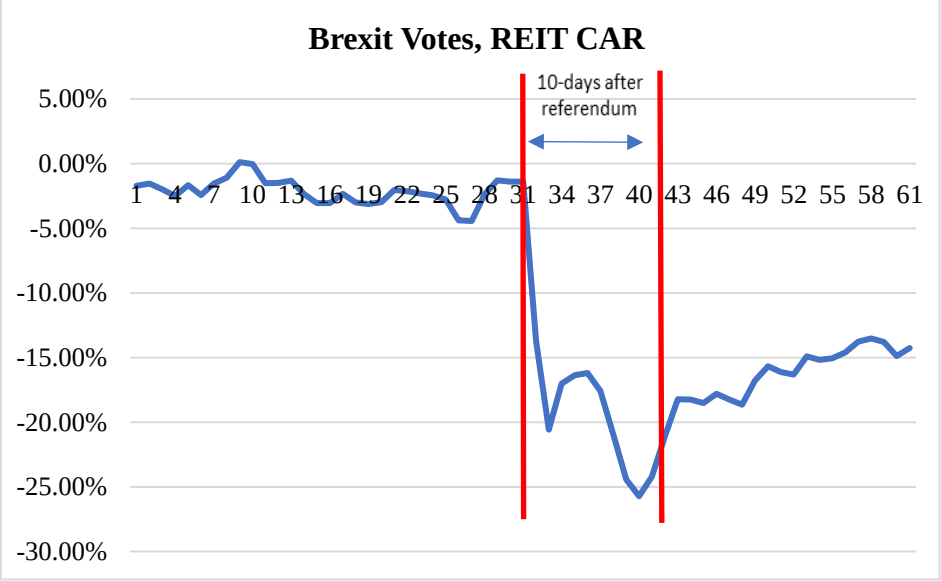


Table 4.2.6. 1 Brexit Votes, REIT CAR Statistics

	30 DAYS	10 DAYS
AVERAGE	-17.41%	-19.68%
ST DEV S	3.28%	4.12%
TSTAT	-5.31	-4.78
PROB	$5x10^{-6}$%	0.05%

Cumulative abnormal return starts with zero at 30 days before the event, which rose up to -1,38% on the day of the event drops to -24,22 % at 10 days after the event. Finally, it rose up to -14,27 % 30 days after the event. This empirical analysis suggests that the event had an impact on the FTSE 350 Reit index returns. However, the results have to be verified through hypothesis testing, where the null hypothesis is Cumulative Abnormal Return is equal to zero.

H_0 =CAR= 0, Null hypothesis Cumulative abnormal return is equal to zero

H_1 = CAR ≠ 0, Alternate hypothesis Cumulative abnormal return is not equal to zero

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 30 day of following the event date to find -17,41 %.

Standard deviation of the sample for the same period has been calculated as 3,28 %.

T Statistics has been found by taking into account the average and standard deviation of the sample as -5,31.

Based on student t distribution calculated t statistic equates to $5x10^{-6}$ % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

While analyzing the evolution of Cumulative abnormal returns following the event date, it has been observed that FTSE Banks had a peak cumulative abnormal return 10 days after the event. Following this finding, the same study has been employed on FTSE Life Insurance index on the 10-day period.

10 days observation period following to the event date ends on 07/07/2016

In order to test our null hypothesis;

An average of the cumulative abnormal return has been taken for the date after the 10 day of following the event date to find -19,68 %.

Standard deviation of the sample for the same period has been calculated as 4,12 %.

T Statistics' has been found by taking into account the average and standard deviation of the sample as -4,78.

Based on student t distribution calculated t statistic equates to 0,05 % probability. As a result, we reject the null hypothesis with a 99 % confidence interval and conclude that Cumulative Abnormal Return is significantly different than zero.

4.3 Comparison of Scottish Vote and Brexit findings

In order to compare the impact of both events, a hypothesis test based on the difference of the cumulative abnormal returns of both events has been conducted. It has been assumed that, Brexit Referendum sample and Scottish Independence Vote sample are from the same population with different variances. As a result, a student t-test comparing two samples with different variances has been conducted.

> $H_0 = CAR_{Brexit} - CAR_{Scottish} = 0$, Null hypothesis 30-day Cumulative abnormal return of Brexit minus Cumulative abnormal return of Scottish Vote is equal to zero
>
> $H_1 = CAR_{Brexit} - CAR_{Scottish} \neq 0$, Alternate hypothesis 30-day Cumulative abnormal return is not equal to zero

t-statistic is calculated using the following formula where, X_1 is the absolute value of CAR_{Brexit} and X_2 is the absolute value of $CAR_{Scottish}$, S_1 is the standard deviation of CAR_{Brexit} and S_2 is the standard deviation of $CAR_{Scottish}$

$$t = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^{1/2}}$$

Degrees of freedom (df) is calculated as

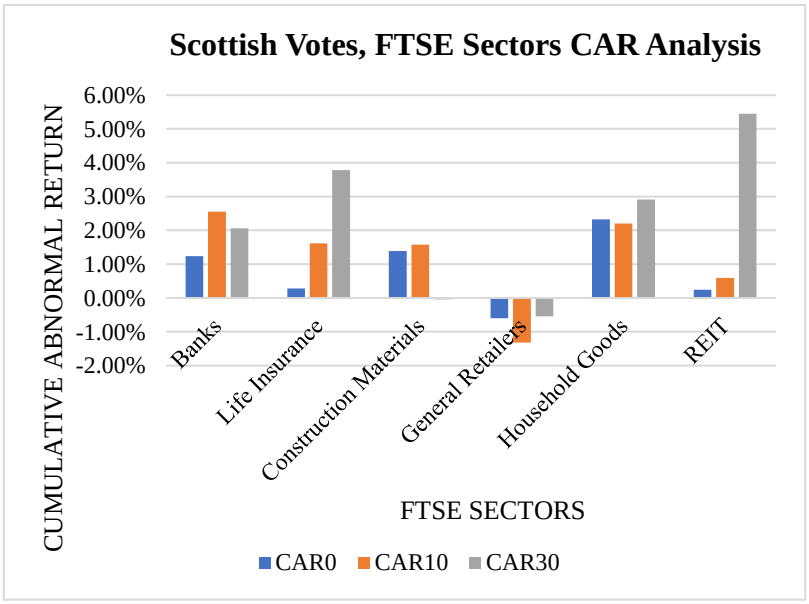
$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{(s_1^2/n_1)^2}{n_1} + \frac{(s_2^2/n_2)^2}{n_2}}$$

Using the above formulas, t-stat and the degrees of freedom are calculated as -2.06% and 51.38, respectively. Based on student t distribution calculated t statistic equates to 97.8% probability. As a result, we reject the null hypothesis with a 99% confidence interval and conclude that the difference between the Cumulative Abnormal Returns of Brexit and Scottish Referendum is significantly different than zero.

Table 4.3. 1 Scottish Votes, FTSE Sectors CAR

SCOTTISH VOTES, FTSE SECTORS CAR					
TICKER	**SECTORS**	**CAR0**	**CAR10**	**CAR30**	**Sparkline**
FTNMX8350	**Banks**	1.24%	2.55%	2.06%	
FTNMX8570	**Life Insurance**	0.28%	1.62%	3.78%	
FTNMX2350	**Construction Materials**	1.39%	1.58%	-0.04%	
FTNMX5370	**General Retailers**	-0.60%	-1.32%	-0.54%	
FTNMX3720	**Household Goods**	2.33%	2.20%	2.91%	
FTNMX8670	**REIT**	0.24%	0.59%	5.45%	

Figure 4.3. 1 Scottish Votes, FTSE Sectors Car Analysis

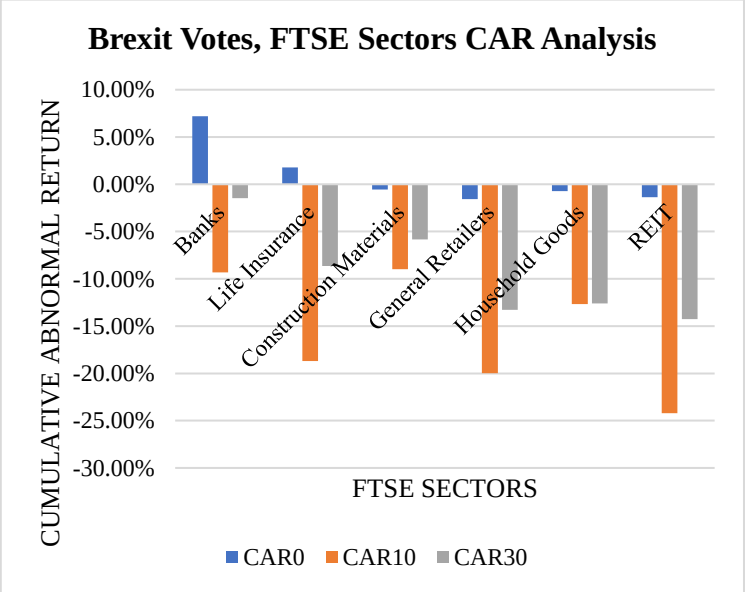


When selected FTSE sectors are viewed side by side it gives a clearer indication that most of the sectors including Banking sector welcomed the Scottish remain vote with positive perspective. General Retailers sector was the only sector that has given a negative CAR during 30 days after the event date.

Table 4.3. 2 Brexit Votes, FTSE Sectors CAR

BREXIT VOTES, FTSE SECTORS CAR					
TICKER	**SECTORS**	**CAR0**	**CAR10**	**CAR30**	**Sparkline**
FTNMX8350	**Banks**	7.18%	-9.31%	-1.48%	
FTNMX8570	**Life Insurance**	1.79%	-18.70%	-8.63%	
FTNMX2350	**Construction Materials**	-0.55%	-8.98%	-5.83%	
FTNMX5370	**General Retailers**	-1.57%	-19.99%	-13.29%	
FTNMX3720	**Household Goods**	-0.74%	-12.66%	-12.59%	
FTNMX8670	**REIT**	-1.38%	-24.22%	-14.27%	

Figure 4.3. 2 Brexit Votes, FTSE Sectors CAR Analysis



Brexit Vote on the other hand provided banks a positive CAR on the day event however speedily retracted the returns to negative levels on CAR10 and CAR30. Apart from CAR0 of banks to be around 7.18% level the rest of the participants of the study showed negative CAR results.

In a scenario where one considers both of the events as minor then a wider perspective can be given with the following results.

Table 4.3. 3 Scottish Votes 3 Years CAR Analysis

SCOTTISH 3YR CAR ANALYSIS					
TICKER	**SECTORS**	**AVERAGE**	**ST DEV S**	**TSTAT**	**PROB**
FTNMX8350	**Banks**	5.34%	0.071	0.75	77.32%
FTNMX8570	**Life Insurance**	25.20%	0.134	1.88	96.99%
FTNMX2350	**Construction Materials**	7.56%	0.071	1.06	85.57%
FTNMX5370	**General Retailers**	21.92%	0.159	1.38	91.59%
FTNMX3720	**Household Goods**	26.86%	0.161	1.67	95.23%
FTNMX8670	**REIT**	10.83%	0.091	1.19	88.28%

Life insurance had that the highest Average CAR with 26,86% on Scottish 3yr CAR Analysis. Banks were the lowest with 5,34%.

Table 4.3. 4 Scottish Votes 3 Years CAR Analysis Descriptive Statistics

SCOTTISH 3YR CAR ANALYSIS **Descriptive Statistics**	**Banks**	**Life Insurance**	**Construction Materials**	**General Retailers**	**Household Goods**	**REIT**
Mean	5.34%	25.20%	7.56%	21.92%	26.86%	10.83%
Standard Deviation	0.07	0.13	0.07	0.16	0.16	0.09

Standard deviation shows that Banks with 0.07 standard deviation is not as dispersed as the other sectors listed above. General Retailers and Construction Materials have standard deviations of 0.16, which is the highest in the sample.

Table 4.3. 5 Brexit Votes 3 Years CAR Analysis

BREXIT 3YR CAR ANALYSIS					
TICKER	**SECTORS**	**AVERAGE**	**ST DEV S**	**TSTAT**	**PROB**
FTNMX8350	**Banks**	3.82%	0.061	0.63	73.50%
FTNMX8570	**Life Insurance**	14.76%	0.084	1.75	95.95%
FTNMX2350	**Construction Materials**	16.07%	0.139	1.16	87.62%
FTNMX5370	**General Retailers**	10.56%	0.078	1.35	91.08%
FTNMX3720	**Household Goods**	26.16%	0.194	1.35	91.14%
FTNMX8670	**REIT**	22.02%	0.121	1.82	96.54%

Household goods have that the highest Average CAR with 26,16% on Brexit 3yr CAR Analysis. Banks were the lowest with 3,82%.

Table 4.3. 6 Brexit Votes 3 Years CAR Analysis Descriptive Statistics

BREXIT 3YR CAR ANALYSIS **Descriptive Statistics**	**Banks**	**Life Insurance**	**Construction Materials**	**General Retailers**	**Household Goods**	**REIT**
Mean	3.82%	14.76%	16.07%	10.56%	26.16%	22.02%
Standard Deviation	0.06	0.08	0.14	0.08	0.19	0.12

Standard deviation shows that Banks with 0.06 standard deviation is not as dispersed as the other sectors listed above. Household Goods had standard deviations of 0.19 which is the highest in the sample.

Due to the fact that both events cover different date interval, a comparison has been made on the 3 years before event date plus 30 days. Findings show, average CAR of Banks were 5.34% on Scottish Vote era whereas on Brexit era it dropped to 3.82%. From Scottish Vote era to Brexit era; Life Insurance dropped from 25.20% to14.76%, Construction Materials rose from 7.56% to 16.07%, General Retailers decreased from 21.92% to 10.56%, Household Goods from slightly decreased from 26.86% to 26.16% and REIT rose from 10.83% to 22.02%.

Table 4.3. 7 Scottish Votes, 3 Years vs 30 Days CAR Analysis

SCOTTISH 3YR vs 30 DAYS CAR ANALYSIS			
TICKER	**SECTORS**	**3YR AV**	**30 DAY AV**
FTNMX8350	**Banks**	5.34%	3.70%
FTNMX8570	**Life Insurance**	25.20%	2.09%
FTNMX2350	**Construction Materials**	7.56%	0.01%
FTNMX5370	**General Retailers**	21.92%	-0.52%
FTNMX3720	**Household Goods**	26.86%	2.06%
FTNMX8670	**REIT**	10.83%	20.07%

Banks had an average CAR of 5.34% including the Scottish Vote but when Scottish vote event date plus 30 days is analyzed it can be seen that this average is dropped to 3.70%. It is visible that Banking sector was affected less than the other sectors. REIT on the other hand showed an increase return from 10.83% to 20.07%.

Table 4.3. 8 Brexit Votes, 3 Years vs 30 Days CAR Analysis

BREXIT 3YR vs 30 DAYS CAR ANALYSIS			
TICKER	**SECTORS**	**3YR AV**	**30 DAY AV**
FTNMX8350	**Banks**	3.82%	-4.80%
FTNMX8570	**Life Insurance**	14.76%	-12.47%
FTNMX2350	**Construction Materials**	16.07%	-5.81%
FTNMX5370	**General Retailers**	10.56%	-15.53%
FTNMX3720	**Household Goods**	26.16%	-11.25%
FTNMX8670	**REIT**	22.02%	-17.42%

Banks had an average CAR of 3.82% including the Brexit Vote but when Brexit vote event date plus 30 days is analyzed it can be seen that this average is dropped to -4.80%. It is visible that all the sectors on the Table 4.3.8 has been severely affected from Brexit.

When Banking sector is analyzed using Scottish and Brexit Vote 3 years and event period plus 30 days, the affects become clearer. In the 3 year prior to Scottish Vote

event date plus 30 days, Banks had a 3 years Car of 5,34% but when this number drops to 3.82% on 3 year prior to Brexit Vote event date plus 30 days period. These can be also seen on the 30 days after event dates. Banks had a CAR of 3,70% on 30 days after Scottish Vote whereas on the other hand Banks had a CAR of -4,80% on 30 days after the Brexit Votes.

CONCLUSION

Through the findings of this paper, it is visible that UK had a clearly rough time with its referendum as compared to Scottish Vote. The power struggle between yes campaigners who believe Britain should leave European Union and no campaigners who believe Britain should stay in the European Union is still going on 3 years after the event date. Scotland on the other hand embraced the remain vote during these 3 years only to ignite it again just recently in 2019.

The main hypothesis in this paper is whether political events such as Brexit and the Scottish Referendum have any statistically significant impact on financial markets. As summarized in the literature review, there have been many event studies based on economic and political paradigm shifts in different countries and empirical research suggests that these events have an impact on financial markets. In order to see whether Brexit or the Scottish Referendum had any impact on the financial markets, cumulative abnormal returns for FTSE 350 Banks Index have been calculated before and after these milestone events. The empirical results show that Brexit had a statistically significant negative impact on the market performance of the FTSE 350 Banks Index relative to the benchmark index performance. Similarly, the Scottish Referendum had a statistically significant positive impact on the same index, though at different times and with different magnitudes. A comparison between the two referendum shows that markets tend to react more to negative events such as Brexit as evidenced by a higher impact on cumulative abnormal returns. A study of 3 years analysis prior to event dates plus 30 days has been studied and found out that these averages were different in during these event periods. Scottish Vote era had a higher average CAR compared to Brexit era. Scottish remain was considered as positive addition and did not affect returns following the event date as severely as the leave outcome of Brexit which pushed the positive 3-year average of 3.82% to -4.80%.

In order to demonstrated the effects of both events on other five sectors such as Life insurance, Construction Materials, General Retailers, Household Goods and REITs. These sectors have naturally not been immune to these events. Some sectors had bigger hits then Banking sector during event window and after. Further study on this subject could look at the performance of these industries in the 3 years following the Brexit Vote which at the time of writing has been not finalized.

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