

Stock Market Responses to the Brexit Referendum: Industry Level Evidence from the UK[±]

On 23 June 2016, the United Kingdom voted to exit the European Union in the Brexit referendum. We use the event study methodology for analysis. The results show that the Brexit referendum had varying effects on these supersectors. Banks, Insurance, Financial Services, Retail, Travel and Leisure experienced negative returns, while Industrial Goods and Services experienced long-term negative abnormal returns. Sectors such as Food and Beverage, Healthcare, and Oil and Gas showed positive effects, indicating resilience despite economic uncertainty. Chemicals, Construction Materials, and Telecommunications had no significant impact, while Media, Basic Resources, and Technology experienced brief reactions before returning to status quo. The effect of Brexit on many industries turned out to be transitory, with only four supersectors experiencing a lasting change.

Keywords: *Brexit, referendum, market integration, political uncertainty, United Kingdom, U.K., event study methodology*

Introduction

On June 23, 2016, the Great Britain held the referendum known as Brexit on whether or not to leave the European Union. The cost of membership rights against the potential cost of UK withdrawal was one of the main drivers in the decision-making process.

Integration as a single market with the EU, has served the UK economy well. EU membership has helped the UK economy through the free movement of goods and services, capital and labor. It also responded with assistance for the financial climate, trade, investment, and economic stability. In addition, passporting rights enabled U.K. financial firms to operate easily in the E.U. market.

As such, the opponents interpreted the referendum as a method of economic pressure. And they said it would be economically costly—no matter what they chose to define “costly” as, whether in high financial costs or economic uncertainty. It was thought to add complexity to the supply chains while creating new regulatory uncertainty and to weaken the United Kingdom’s negotiating position in trade treaties. But proponents of Brexit argued that Brexit would restore sovereignty, give greater control over the borders and trade, and lift pressure on public infrastructure caused by the free flow of people.

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The Bank of England also expressed concern, as reported in Giles et al (2016) and Giles (2016) Financial Times articles, that the job loss, high prices, weaker pound, and even recession may be the resulting economic consequences of Brexit. Expected risks included banks increasing interest rates or permitting inflation to rise, which could alleviate the economic landscape. On the referendum day, several markets were impacted. Sathyanarayana & Gargasha (2016) found that the FTSE 100 and FTSE 250 experienced a 12% and 8.7% decline, respectively. Germany's DAX was down by 7%, Spain's IBEX decreased by 11%, France's CAC 40 declined by 8.6%, and Japan's Nikkei 225 decreased by 8%. The pound sterling declined to \$1.37 versus the US dollar, representing an 8% decrease, encouraging investors to pursue alternatives such as gold, government bonds, and the Japanese yen. The Nasdaq declined by 4.12%, and the Sensex decreased by 604.51 points. The Hang Seng Index declined by 4.67%, the Kospi decreased by 3.1%, and Australia's primary market, the ASX, plummeted by 3.2%.

Our paper complements existing studies on Brexit by analysing the closing prices of 17 UK supersectors indices after adjusting for dividends, stock splits, and new stock offers. The supersectors analyzed are Banks, Insurance, Financial Services, Retail, Travel and Leisure, Industrial Goods and Services, Media, Food and Beverage, Health Care, Oil and Gas, Basic Resources, Technology, Chemicals, Construction and Materials, Personal and Household Goods, Automobiles and Parts, and Telecommunications. The FTSE All Shares index is used to measure the overall performance of the stock market, and all the data is downloaded from Bloomberg.

The event study methodology is employed, establishing June 24, 2016, as the event date for the analysis. The time covered spans from June 15, 2015, to Aug. 5, 2016. We analyze sectoral cumulative abnormal returns (CARs) to understand stock market reaction to the Brexit referendum. We ran an event study analysis with different event windows to see how much returns differed over that period. In order to validate our findings, We did the analysis for two different time periods, 250 days and 150 days. In addition to studying abnormal returns across industries, we evaluated trading volume patterns that occurred because of the trading action in a period of -10 to +30 days to corroborate our findings.

This paper seeks to analyse sectoral reactions and determine the immediate economic impact of the Brexit referendum on the UK stock market by addressing the research question: what sectoral effects did the Brexit referendum have on the UK stock market, and how these effects demonstrate how resilient or vulnerable particular industries are to political unpredictability. Considering the negative reactions across different markets, we initially expected the referendum would have primarily a negative impact on UK markets. However, we observed a mixed response among the supersectors. After the Brexit referendum, returns were negative for supersectors such as Banks, Insurance, Financial Services, Retail, Travel and Leisure. The Industrial Goods and Services supersector experienced a prolonged period of negative cumulative abnormal returns. The Food and Beverage and Healthcare supersectors exhibited positive returns, demonstrating their

resilience against financial and economic uncertainty. The Oil and Gas supersector experienced positive cumulative abnormal returns, likely because Oil and Gas often act as a safe haven in uncertain times. Certain sectors, such as Chemicals, Construction and Materials, and Telecommunications experienced minimal impact, whereas Personal and Household goods, as well as Automobiles and Parts, saw a brief surge in abnormal returns.

We find that for many industries the effects of Brexit turned out to be transitory. Shorter event windows such as 1-day, 3-day, and even 10-day windows produced significant abnormal returns for many industry supersectors in our sample. However, when we use a 30-day event window, only Insurance and Retail supersectors exhibited negative cumulative abnormal returns, and only Healthcare and Technology exhibited positive cumulative abnormal return.

The remainder of the paper is structured as follows. The next section discusses the relevant literature. The third section describes the research methodology. The following section presents empirical results and the last section concludes.

Literature Review

This study lies in the intersection of market integration literature and political uncertainty literature. Financial market integration denotes the alignment of financial markets, resulting in firms exhibiting similar patterns of cash flows and anticipated risk-adjusted returns. Research on financial market integration began in the early 1970s and included studies such as Errunza and Losq (1985), Jorion and Schwartz (1986), Bekaert and Harvey (1995), Errunza and Miller (2000), Diermeier and Solnik (2001), De Jong and De Roon (2005), Carrieri et al (2007), Mittoo and Rakhmayil (2009), Bekaert et al (2009).

Market integration provides investors with an important perspective on investments and reduces investment barriers, making it easier for them to make investments (Subrahmanyam, 1975). It provides insights into some of the factors impacting investment portfolios and investors' asset allocation. For example, Jorion and Schwartz (1986) recognized that country-specific characteristics play a role in the integration of financial markets while they were studying the integration of the Canadian equity market relative to the overall North American market. Their analysis showed that country factors, which the global index does not account for, significantly affect the expected return. Diermeier and Solnik (2001) asserted this point, stating that country factor is an important source to analyze stock price behavior. Bekaert (2009) also found evidence of a link between the idea of integration and portfolio diversification on an international level. This means that country factors play a big role in the international setting. Kountouris et al (2025) study correlations of U.S. and U.K. stock and bond markets and find similar patterns during the last 20 years, which supports the theory of market integration.

1 Cavaglia et al. (2000) reviewed and complemented the empirical research on
 2 the impact of industry variables on security returns and found that industry factors
 3 are significant in asset management. They argued that diversification by the
 4 industrial sector reduces risk more compared to the diversification by geography
 5 alone. Furthermore, Diermeier and Solonik (2001) examined a wide range of asset
 6 prices and found that regional and currency variables, along with domestic factors,
 7 exerted a greater influence on returns.

8 Market integration results from governments removing investment barriers. It
 9 can effectively decrease systematic risk, lower the risk premium aspect of the cost
 10 of capital, and enhance capital allocational efficiency (Cohn and Pringle, 1973;
 11 Giraldo et al, 2024). De Jong and De Roon (2005) also showed that market
 12 integration leads to lower expected returns and lower capital costs. Conversely, if
 13 the markets are segmented, firms face a high cost of capital, which in turn increases
 14 risk premiums for a subset of securities (Errunza and Miller, 2000; Errunza and
 15 Losq, 1985).

16 Market integration is characterized by inconsistency and variability, frequently
 17 shifting within a specific region (Bekaert and Harvey, 1995), a phenomenon referred
 18 to as time-varying market integration. This takes place as a response to specific
 19 conditions. For instance, inflation, monetary performance convergence, and
 20 decreased interest rate differentials influenced the European Union's integration
 21 trend (Mittoo and Rakhmayil, 2009; Lee and Kim, 2020).

22 The rationale behind time variable integration lies in the market's autonomous
 23 reaction to external shocks, frequently referred to as triggers (Bekaert et al., 2009;
 24 Yu et al., 2010). Political and economic events often establish these triggers, thereby
 25 reinforcing the notion of market segmentation. Triggers consist of regional and
 26 global financial and economic developments that result in varying degrees of cross-
 27 national and subnational integration and contagion (Huyghebaert & Wang, 2010;
 28 Yu et al., 2010; Cho et al., 2015).

29 Political uncertainty literature explores the relationship between political risk
 30 triggers and market integration. A financial crisis can be seen as an example of this
 31 global divergence in integration. Varied degrees of integration render domestic
 32 markets more susceptible to shifts in global markets (Wu, 2020). The existence of
 33 abnormal returns in the stock market reflects the degree of market integration (Cho
 34 et al. 2015), and that has been seen to be impacted by events such as terrorism and
 35 political uncertainty.

36 Chesney et al. (2011) studied the effect of terrorism on the stock, bond, and
 37 commodities markets and showed negative returns that reflect the direct "terror"
 38 impact on diversified portfolio returns. In addition, Narayan et al. (2018)
 39 investigated the fear of terrorism through dynamic conditional correlations. They
 40 show how the threat of both domestic and foreign terrorism affects portfolio
 41 decisions at every stage of an economic cycle, from recession to recovery to
 42 expansion to trough. Papanikos (2025) links political risk events to negative
 43 economic outcomes.

1 Political uncertainty negatively affects stock markets in both developing and
 2 developed economies, as determined by abnormal returns (Erb et al., 1996).
 3 Subsequent studies have identified political events like elections in politically
 4 restricted countries that had potential impacts on the market returns (Pantzalis,
 5 2000). He discovered that there were positive abnormal returns in stock indices in
 6 more than 33 countries two weeks prior to elections. He discovered that it
 7 exacerbated reactions in countries with lower levels of political and economic
 8 freedom, especially when opposition parties were in power. Goodell & Vahamaa
 9 (2013) examined the relationship between the US presidential election cycles and
 10 implied volatility using the VIX index and found that the Implied volatility rose with
 11 positive changes in the probability of the eventual election winner, explaining the
 12 importance of political uncertainty in determination of the investors' expectations.
 13 Kallianiotis (2025) found that repeated dramatic changes in U.S. monetary policies
 14 caused unintended consequences and significantly affected interest rates, financial
 15 market pricing, distribution of wealth, and indebtedness.

16 Political uncertainty is likely to affect the dynamics of financial markets, as
 17 demonstrated by the mixed stock market reaction around the Quebec referendum;
 18 Beaulieu et al. (2006) analyzed the impact of the Quebec referendum (30 October
 19 1995) on the short-term returns of common stock for Quebec firms. They showed
 20 that uncertainty surrounding the outcome of a referendum had significant effects on
 21 Quebec firms, but those effects varied depending on the level of foreign ownership.
 22 This indicates that the firms with operations in foreign markets are more resilient to
 23 uncertainty.

24 How much political uncertainty matters for price changes depends on how
 25 important the news about that political uncertainty is. Niederhoffer (1971) analyzed
 26 market parameters when studying the Dow Jones Index. He noticed the way certain
 27 global news influenced the fluctuations of the Dow Jones index, and that the price
 28 moves were in direct proportion to how large the headlines in the New York Times
 29 were concerning that news. Zach (2003) and Suleman et al. (2012) explained that
 30 the news intensity related to the uncertainty shapes investors' perception of the
 31 markets in different ways, with negative news often triggering negative reactions.
 32 And that the negative news, especially terrorist attacks, maximizes volatility and
 33 minimizes returns. Papanikos (2024) argued that after a series of recent political and
 34 economic shocks the world is moving towards deglobalization.

35 Ramiah et al. (2017) examined the impacts across a range of sectors following
 36 the Brexit. They investigated its effects across sectors and found that banks,
 37 financial services, retail, travel, and leisure sectors experienced negative returns.
 38 Other sectors such as chemicals and oil and gas, on the other hand, seemed
 39 unaffected. Hill et al. (2019) reported that firms in the UK with foreign ownership
 40 have been relatively more resilient to the effects of the Brexit referendum,
 41 suggesting that net foreign ownership has a buffering effect for industries sensitive
 42 to political changes.

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Methodology

This section describes research hypotheses, data and method. We first develop testable hypotheses based on prior studies. Next, we test the research hypotheses using the data from 17 U.K. industry supersectors using the data and methods described below.

Hypotheses Development

Hypothesis 1

European Union (EU) laws and regulations have influenced the UK legal framework. But there will be uncertainty about the status of the UK, especially in the City of London, one of the world's top financial centers, after the referendum.

After the referendum, firms based in London, which engage in international business and comply with regulations like licensing or standardisation, may be uncertain to some extent (Hill et al., 2019). This would disrupt financial services firms due to their inability to perform cross-border transactions with EU clients unless they relocate to other jurisdictions. Moreover, without a subsequent deal, there could be issues for finance-related sectors from loss of access to the single European market. Taken together, the Brexit referendum result is expected to have a negative impact on the Banking, Insurance, and Financial Services industry supersectors due to the anticipated economic contraction, fewer demands for loans, and the potential increase in bad debts. This provides the basis to formulate the following hypothesis:

H1: Banks, Insurance, and Financial Services supersectors are expected to experience negative abnormal returns following the announcement of the Brexit referendum result.

Hypothesis 2

The referendum can affect the economy through fluctuations in the exchange rate. After the referendum, the British Pound declined against other currencies, which is 7.8% against the U.S. dollar and 5.8% against the Euro (Sathyanarayana & Gargsha, 2016). Such development will likely put pressure on a company's earnings outlook and, ultimately, on its return on investment. Dhingra et al. (2017) argued the referendum created a 9.4% decline to average income per capita in the U.K. Whether through asset sales or the decrease of foreign direct investment, this lowers the long-run value of the British Pound. Ramiah et al. (2017) mentioned that the depreciation of the pound is likely to make overseas travel more expensive for the U.K. residents, therefore impacting the travel and leisure sectors negatively. Giles et al (2016) and Giles (2016) also stated that removal of the "passporting rights" might have a negative effect on these sectors.

Considering the above-mentioned facts, it is apparent that possible negative effects could result in consumer-connected sectors, and the resultant hypothesis is as follows:

H2: The Retail, and Travel and Leisure supersectors are expected to experience negative abnormal returns following the announcement of the Brexit referendum result.

Hypothesis 3

Increases in political uncertainty led firms to cut back on their level of investment and employment (Hill et al., 2019); this means companies scale back. Political uncertainty weighs heavily on investment, as both emerging and established businesses depend on sustained investment into physical and human capital. Therefore, the supply chain disruptions and regulatory changes complicate the operational context of entities in the industrial space.

Sectors such as Automobiles and Parts and Industrial Goods and Services are likely to face challenges due to the uncertainty regarding future trade deals and economic relations, restricting their ability to engage with clients in the European Union and hence are expected to yield negative abnormal returns influencing spending and demand negatively. As a result, the next hypothesis is established:

H3: Industrial Goods and Services and Automobiles and Parts supersectors are expected to experience negative abnormal returns following the announcement of the Brexit referendum result.

Hypothesis 4

Some supersectors such as Personal and Household Goods, Healthcare, and Food and Beverages show more resilience against financial and macroeconomic shocks. There will always be a demand for personal items, food and basic medicines when political instability is in play, and constructing a healthy stock of basic commodities could augment this desire. Thus, the next hypothesis is as follows:

H4: Healthcare, Food and Beverages, and Personal and Household Goods supersectors are expected to experience positive abnormal returns following the announcement of the Brexit referendum result.

Hypothesis 5

Supersectors characterized by the presence of multinational companies with significant foreign revenues or foreign operations would be less sensitive to the uncertainty induced by the referendum. Their relative advantage is often galvanised by the depreciation of the British Pound against the other currencies, which leads to a rise in the British Pound value of foreign sales or assets.

Supersectors such as Construction and Materials, Technology, Media, Telecommunication, and Basic Resources are expected to be affected by uncertainty concerning the referendum results in terms of further agreements of the United Kingdom on foreign trade, but in reality, they are less sensitive to uncertainty regarding the referendum since their international operations hedge against the domestic risks (Fatemi, 1984; Kwok & Reeb, 2000). From this the following hypothesis can be derived:

H5: Construction and Materials, Chemicals, Technology, Media, Telecommunications, and Basic Resources supersectors are expected to yield no abnormal returns following the announcement of the Brexit referendum result.

Hypothesis 6

Considering that the U.K. engages predominantly in international transactions using US dollars (Bouoiyour & Selmi, 2018), the Oil and Gas supersector is likely to exhibit reduced susceptibility to referendum-related uncertainties, thereby allowing the industry to capitalize on diverse economic conditions and currency fluctuations. Through integration and internationalisation, the Oil and Gas supersector serves as a stabilising force amidst regional political and economic uncertainty. Consequently, the Oil and Gas supersector is less exposed than other sectors, making it a “safe haven” and a source of potential positive abnormal returns. It can be posited that:

H6: Oil and Gas supersector is expected to experience positive abnormal returns following the announcement of the Brexit referendum result.

Data

The study uses total returns in British Pounds for 17 supersectors of the U.K. economy downloaded from Bloomberg. The data is obtained for the period from June 15, 2015 to July 08, 2016. The supersectors are based on the Industry Classification Benchmark, established by FTSE Russell¹. The supersectors are: Banks, Insurance, Financial Services, Retail, Travel and Leisure, Industrial Goods and Services, Media, Food and Beverage, Health Care, Oil and Gas, Basic Resources, Technology, Chemicals, Construction and Materials, Personal and Household Goods, Automobiles and Parts, and Telecommunications.

¹FTSE Russell. (n.d.). Industry Classification Benchmark (ICB). London Stock Exchange Group. Retrieved from <https://www.lseg.com/en/ftse-russell/industry-classification-benchmark-icb>. The Industry Classification Benchmark (ICB) is a comprehensive, rules-based classification methodology that supports investment solutions. It is based on market trends and research. It was introduced in 2005 and improved in 2019 with enhanced structural improvements and the integration of the Russell Global Sectors (RGS) classification scheme.

The referendum occurred on June 23, 2016, but we will designate Day 0 as the day after the event, which is June 24, 2016 (the voters were given the time to vote until 10pm on 23rd June 2016, however the market were not opened during the entire time of voting, therefore the impact could be determined the next day only, when the markets open, hence the study examines market reaction on the day after the event, that is June 24, 2016)².

The daily closing prices of the supersectors, adjusted for dividends, stock splits, and new stock offerings, are considered. The study used the FTSE All Shares index as a benchmark for evaluating overall market performance.

Method

Event Study Analysis

We use the industry-level event study methodology by adopting the method used by Buigut and Kapar (2020). They used an event study to test the importance of Qatar foreign policy on Gulf Bureau (GCC) stock markets and looked at the daily stock prices of stock market indices of GCC member countries. Also, El Ghouli et al. (2023) provide an excellent review of the event study method. We used the market model to determine abnormal returns. The model's linear specification is based on the premise that asset returns follow normal distribution. We use FTSE All Share index return for the market index. For the analysis, we tested multiple event windows; the estimation window was 250 days from June 15, 2015, to June 9, 2016. We excluded the data from June 10, 2016, to June 23, 2016, the 10 days before the event, from the estimation period in order to minimise the impact of potential information leakage in the market.

The event took place on June 23, 2016; however, the date utilized for the analysis is June 24, 2016, which is the day following the Brexit referendum, and is designated as $t = 0$. The days before the event are shown as $t = -3, -2, -1$ and days after the event are $t = 1, 2, 3$. The event windows that are used are $(0), (-2+2), (0 + 3), (0 + 5), (0 + 10)$ and $(0+30)$. To prevent the event from influencing the estimation of standard performance model parameters, we omitted the event period from the estimation period. This study uses estimation window consisting of 250 trading days leading up to the Brexit referendum, specifically from June 15, 2015, to June 9, 2016, denoted as the period from -260 to -11.

The next step is to calculate the abnormal returns. When evaluating a performance metric like the cumulative abnormal returns, we compute test statistics that we compare against its predicted distribution. We base this comparison on the assumption of no unusual performance or, alternatively, an average of zero unusual performance. If that test statistic exceeds a critical value (usually associated with the

²The voters had until 10pm on 23rd June to vote or leave or remain - <https://www.politico.eu/article/polls-open-in-uk-brexit-eu-referendum-remain-leave/>

5% or 1% tails, that is, a 0.05 or 0.01 test level), we will reject the null hypothesis. For each supersector we conduct a t-test at the 95% confidence level that corresponds to the p-level. This p-value indicates the probability of discovering a mean difference by random chance in the absence of any actual differences within the population.

Trading Volume Analysis

We analyzed the trading volume of the supersectors' index i over a 40-day period surrounding the event date, spanning from -10 to +30 days post-event. We applied the method outlined by Biktimirov (2004) to measure the change in trading volume. We have taken the log of daily trading volumes of both supersectors index and FTSE all-share index, and divided them with each other, to calculate the ratio. Next, we calculated the average market-adjusted trading volume ($\overline{VOL}_{i,estim}$) for each supersector i during the estimation period which runs from day -259 to day -10 before the corresponding event date.

Next, to assess whether trading activity varies, we computed the market-adjusted daily trading volume ratio ($VOLR_{i,t}$). We analyze the variation in trading volume in relation to the event date and is calculated by dividing it by each individual's adjusted trading volume in the event period. Finally, if there is no change in trading volume, the trading volume ratio should equal to 1.00. We use the t-test to check if the sample mean trading volume ratio is statistically different from 1.00.

Results

Event Study Analysis

For the event study analysis, there are 261 daily observations for the cumulative abnormal returns for each of the 17 sectoral indices. This adds up to 4,437 observations of daily returns across six event windows. The results are presented in Table 1.

On the event day ($T=0$), Banks exhibited a negative abnormal returns value of 5.135%; insurance displayed a CAR of -6.918%, and Financial Services reported a CAR of -3.208%, all accompanied by statistically significant t-values ranging from 5% to 10%. The Retail supersector demonstrated a negative abnormal return of 5.241%, which was significant with a t-value of -8.601. A negative response in the Travel and Leisure supersector with a total abnormal return reaching -2.244% ($t = -3.268$) was seen. The negative abnormal returns were statistically significant for the Industrial Goods and Services (CAR = -1.318%, $t = -2.999$) and Media supersector with CAR = -1.688 at a t value of -2.648. In contrast, the Healthcare and Oil and Gas supersectors exhibited positive abnormal returns of 6.115% and 6.093%, respectively, both significant at the 5% level or higher. The Food and Beverage

supersector reported the positive abnormal return (3.045%) with a t-value of 4.367. For the Basic Resources supersector, the abnormal return was 5.875% (t-value = 2.589). The Technology supersector returned 3.933% (t value 4.192). The other supersectors showed no significant cumulative abnormal returns based on t-values.

In the event window spanning period from $T = -2$, $T = +2$, Banks had a CAR of -7.735%, the Insurance supersector had a CAR of -8.477%, and the Financial Services had a CAR of -5.305% with significant t-values between -4 to -10. The Retail and Travel and Leisure supersectors saw significant negative cumulative abnormal returns (CARs) of -8.827% and -7.648% (t-values of -6.478 and -4.981 respectively). The returns were statistically significant for the Industrial Goods and Services supersector with a CAR of -2.487% and t-value of -2.531. Automobiles and Parts also had significantly negative CARs of -5.537%. There were statistically significant positive abnormal returns of 3.104% in the Food and Beverage supersector, 9.489% in the Healthcare supersector, and 9.130% in the Oil and Gas. The remaining supersectors showed non-significant cumulative abnormal returns as shown by t-values.

In the 3-day event window ($T = 0$, $T = +3$), banks had a CAR of -10.676%, the Insurance supersector had a CAR of -8.705%, and the Financial Services had a CAR of -6.529% with significant t-values between -5 to -10. The Retail and Travel and Leisure supersectors saw significant negative cumulative abnormal returns (CARs) of -8.264% and -7.851% (t-values of more than 5 in both cases), respectively. The returns were statistically significant for the Industrial Goods and Services supersector with a CAR of -2.379% and t-value of -2.706. Automobiles and Parts also had significantly negative CARs of -6.936%. There were statistically significant positive abnormal returns of 4.111% in the Food and Beverage supersector, 10.273% in the Healthcare supersector, 9.247% in the Oil and Gas, and 3.355% in the Personal and Household Goods.

Five days around $T = 0$ (from $T = 0$ to $T = +5$), the Banks recorded a CAR of -12.827% with a t value of -6.468, and the Insurance supersector showed the CAR of -9.673% with a t value of -5.631; the Financial Services sector was negatively affected, with a CAR value of -6.481% ($t = -6.330$). The Retail supersector showed a CAR of -8.840% and $t = -5.922$. The CAR values for Travel and Leisure and Industrial Goods and Services were -7.624% ($t = -4.533$) and -2.195% ($t = -2.039$), respectively. Automobiles and Parts showed a negative CAR value of -6.425% and $t = -1.995$. The Personal and Household Goods experienced a CAR of 4.468% at a significant t-value of 3.056. Healthcare, Oil and Gas and Food and Beverage all had positive cumulative abnormal returns (CAR). For Healthcare, it was 10.341% with a t value of 5.254; for Oil and Gas, it was 8.807% with a t-value of 2.979; and for Food and Beverage, it was 5.082% with a t-value of 2.917. No significant cumulative abnormal returns were detected in the remaining supersectors.

During the 10-day window ($T = 0$ to $T = +10$), the negative returns were seen in Banks (CAR = -12.795, $t = -4.765$), Insurance (CAR = -15.152, $t = -6.515$), Financial Services (CAR = -6.574, $t = -4.742$), Retail (CAR = -12.102, $t = -5.988$),

Travel and Leisure (CAR = -7.880, $t = -3.460$), Industrial Goods and Services (CAR = -2.699, $t = -1.852$) and Automobiles and Parts (CAR = -7.252, $t = -1.663$). On the other hand, Food and Beverage, Healthcare, and Oil and Gas supersectors showed cumulative abnormal returns of 6.233%, 12.897%, and 10.483% respectively at the significant t -values. The other supersectors did not display significant cumulative abnormal returns.

During the 30-days event window ($T = 0$ to $T = +30$), the only supersectors that showed the significant cumulative abnormal returns were the Insurance (CAR = -7.378, $t = -1.890$), Retail (CAR = -9.619, $t = -2.835$), Healthcare (CAR = 14.706, $t = 3.287$), and Technology (CAR = 27.047, $t = 5.177$). There were no significant cumulative abnormal returns were seen in Banks, Financial Services, Travel and Leisure, Industrial Goods and Services, Media, Food and Beverage, Oil and Gas, Basic Resources, Chemicals, Construction and Materials, Personal and Household goods, Automobiles and Parts, and Telecommunications.

Table 1 and Figures 1 through 6 provide a comprehensive summary of the effects observed across various windows. All supersectors, except for Chemicals and Telecommunications, showed notable cumulative abnormal returns, whether positive or negative, at least once throughout the different event periods that were examined. Apart from Insurance, Retail, Healthcare, and Technology, most supersectors did not exhibit any effects during the 30-day event window. During the 30-day observation period, Healthcare showed positive abnormal returns, while Insurance and Retail continued to show negative cumulative abnormal returns. However, Technology experienced a temporary effect, with the cumulative anomalous return occurring only on the day of the event and during the $T+30$ -day interval.

The other sectors such as Banks, Financial Services, Travel and Leisure and Industrial Goods and Services supersectors showed a significant reaction to the Brexit referendum, leading to negative cumulative abnormal returns. In contrast, the Food and Beverage, Health Care, and Oil and Gas supersectors all saw positive trends. The Media only exhibited a negative impact on the day of the event.

Technology demonstrated a significant positive impact only on the day of event and 30-days event window and Construction and Materials showed a negative effect on the $T+10$ day. The Personal and Household Goods supersectors did not exhibit a significant impact on the event day; however, they demonstrated a positive impact in subsequent windows.

Similarly, Automobiles and Parts exhibited no significant impacts on the event day; however, they showed a negative impact over the 3-day and 5-day windows before returning to normal. The Basic Resources and Technology supersectors showed a positive impact on the event day but did not show any significant impacts in the subsequent windows. The Media supersector experienced significantly negative cumulative abnormal returns only on the event day ($t=0$) and no further impacts in other windows.

The Industrial Goods and Services experienced a significant negative impact over a short duration; however, they promptly returned to their previous trends. There were no significant effects in the Chemicals, Construction and Materials, and Telecommunications supersectors throughout the observation period.

Trading Volume Analysis

To confirm that the referendum was a significant event for the examined industry sectors, this study examines changes in trading volume around the announcement of the referendum results. Cready and Hurtt (2002) propose that supplementing abnormal return analysis with trading volume analysis increases the power of the tests to detect market reaction.

We conduct t-tests whether the sample means in the trading volume variables for the supersectors equals to 1.00. The test results are presented in Table 2. For example, for Banks supersector the sample mean is 1.0155 and it is significantly different from 1.00 because the corresponding t-value is 10.9500. In other words, there is evidence of a positive change in trading volume for Banks. In a similar manner we detect positive spikes in trading volume for Insurance, Travel and leisure, Industrial goods and services, Media, Technology, Food and beverage, Healthcare, Construction and materials, and Personal and household goods. Positive spikes in trading implies new information arrived at the market and different market participants had different market views, which resulted in more trading.

Other sectors had negative change. For example, Basic Resources sector's sample mean trading volume variable is 0.9785, it is significantly less than 1.00 because its t-value is -14.0590. Similarly, Oil and gas, Chemicals and Telecommunications had negative spikes in the trading volume, indicating uniform market views among market participants.

Investor beliefs are not immediately evident in the market, but the movement in trading volume may decode this state of belief to some extent, as seen by the positive and negative spikes (as illustrated in figure 5-7). Trading volume is often influenced by the information asymmetry surrounding any announcements. For example, if investors have access to asymmetrical information, their expectations about equities differ, which will increase or decrease trading volume depending on the circumstances.

Trading volume is the sum of all individual investors' trades and can indicate how sectors react to market events. For example, a significant increase in trading volume in Banks, Insurance, Media, Construction and Materials, and Personal and Household Goods (Figure 5) demonstrates that the referendum had a significant impact on these supersectors, which was also accompanied by significant abnormal returns, indicating that the significant abnormal returns were not due to chance. Other sectors, such as Retail, Travel and Leisure, Food and Beverage, Healthcare, Industrial Goods and Services, and Telecommunications, showed no deviations

from baseline levels in trading volume during the event (Figure 6). This suggests that these supersectors might not have significant exposure to the vote.

Supersectors such as Oil and Gas and Technology, on the other hand, saw a decrease in trading volume on the announcement day, followed by an increase later (Figure 7). Because of these differing expectations for equities, investors feel compelled to adjust their portfolio, and these patterns might be used to detect trends and make more informed investing decisions.

Robustness test—Using a 150-day estimation window

To verify the robustness of the results, we calculated abnormal returns across all supersectors using a 150-day estimation window. The results are presented in Table 3. Despite a narrower estimation window, the results were similar to those of the 250-day period. The only exception was Personal and Household Goods, which exhibited little change in the T+10 window but none in the 250-day period.

We found similar results across alternative estimation windows, suggesting that the effect of Brexit on these supersectors is robust and stable across estimation windows of different lengths. The results are robust, reflected in consistently positive values for abnormal returns across supersectors such as Healthcare, Oil and Gas, as well as Food and Beverage and negative abnormal returns for Retail, Banks, Financial Services, Industrial Goods and Services as well as Travel and Leisure.

Furthermore, the variability of results in Personal and Household Goods, Automobiles and Parts, along with the observed stability in the Construction and Materials, Chemicals, Media, Basic Resources, Technology, and Telecommunications supersectors, support consistency across estimation periods.

Discussion

The Brexit referendum had a substantial effect on multiple economic supersectors. Before the referendum, the Bank of England (BoE) cautioned that Brexit could result in job losses, higher prices, a weakened pound, and a possible recession, with growth forecasts lowered by 0.2 percentage points. The primary issue was the possibility for banks to increase interest rates or allow inflation to rise. As anticipated, the analysis confirmed the presence of the negative abnormal return in Banks, Insurance, and Financial Services supersectors. It was also reflected in the investor behaviour where they redirected the capital away from equities and put in other alternatives, such as gold, government bonds and Japanese yen, which are acknowledged as traditional safe haven (Sathyanarayana and Gargasha, 2016). A few sell-off the financial assets consequently supporting the theory that the Brexit referendum had a negative impact on the financial related sectors.

The Retail, Travel and Leisure supersectors have negative total abnormal return post referendum indicating consumer supersectors were negatively affected. When uncertainty deepens, households tend to spend less and save more. The substantial

1 exposure of these sectors suggests political uncertainty has a material effect on
 2 households' income disposable, spending and saving behaviours. Moreover, the
 3 Industrial Goods and Services and Automobiles and Parts supersectors showed
 4 significant sensitivity to the referendum, leading to the longer periods of negative
 5 returns, suggesting the expenses cut in industrial domain as well.

6 In contrast, the Food and Beverage and Health Care supersectors exhibited
 7 positive returns. Personal and Household Goods also showed the prolonged period
 8 of positive abnormal returns, reinforcing the view that some supersectors are need-
 9 based and do not react while macroeconomic and financial variables change. During
 10 economic decline and political unrest demand for essential medicines and food tends
 11 to remain the same or even higher, as people hoard necessary goods against an
 12 unknown future.

13 Media, Basic Resources, and Technology exhibited the response the day of the
 14 event but then stopped displaying significant cumulative abnormal returns.
 15 Similarly, Construction and Materials showed the negative reaction for 10 days
 16 event window; most of this attribute of these supersectors could be deemed as an
 17 overreaction.

18 Supersectors that are traditionally significant in the context of international
 19 trade, such as Oil and Gas, have responded positively, suggesting a strong remnant
 20 of integration that is independent of the EU. The Chemicals and
 21 Telecommunications supersectors showed resilience and were immune to the Brexit
 22 referendum.

23 This research expands on the work of Ramiah et al. (2017)'s analysis, which
 24 showed how the Brexit referendum impacted different U.K. industries. While the
 25 study shares some commonalities with the research of Ramiah et al (2017), it also
 26 presents notable differences. For example, both studies observed positive returns in
 27 sectors such as Oil and Gas. Negative abnormal returns were observed in the Travel
 28 and Leisure, Retail, Banks, and Financial Services supersectors. Neither study
 29 observed an effect in the Chemicals industry. However, we observed different
 30 outcomes in a few supersectors. Our study, for instance, discovered a positive
 31 impact on the Food and Beverage supersector. In contrast, Ramiah et al. (2017)
 32 found a negative effect on Food Producers but a positive effect on Beverage and
 33 Tobacco.

34 Likewise, the Insurance supersector in our analysis showed a negative effect,
 35 whereas Ramiah et al. (2017) showed a negative effect on Life Insurance and no
 36 effect on Non-Life Insurance. Another supersector such as Media showed no impact
 37 in our study but Ramiah et al. (2017) study showed a negative impact on this sector.
 38 Our research uncovered a negative influence on the Industrial Goods and Services
 39 supersector. However, Ramiah et al. (2017) found positive effects with Aerospace
 40 and Defense but a negative one with Electronic and Electrical Equipment that are
 41 the subdomains of Industrial Goods and Services.

42 These differences likely stem from differences in methodology, focus, and data
 43 availability. That is, Ramiah et al. (2017) focused on industry sectors, whereas we

analyze industry supersectors, which might account for the discrepancies, and we obtained supersectors index returns from Bloomberg, while Ramiah et al. (2017) study does not always detail how their index returns were constructed. Some industries do not have enough data points, such as REITs and Real Estate Investment and Services, so we excluded them from the analysis. We could not include Support Services because there are no clear definitions of the supersector. Our study uses Oil and Gas, but Ramiah et al. (2017) studied Alternative Energy. That also complicates comparisons of results and demands deeper probing into those differences.

Conclusion

The paper investigates how each U.K. industry supersector reacted to the Brexit vote based on five event windows- three, five, ten and thirty days (pre and post event), so it aims to provide a complete picture of the market behaviour at a time of political uncertainty. We validated the results through two separate time periods, 250 days and 150 days, and trading volume.

Predictions in the study were based on existing research into the impact of referendums on various supersectors. The different supersectors reacted differently; some showed positive or negative returns over the observation period, while others showed no significant changes or eventually returned to their original levels.

The varied levels of the reactions were the characteristics of the sector-specific factors, for example Banks, Insurance, Financial Services, Retail, and Travel and Leisure seem to experience permanent negative cumulative abnormal returns. This demonstrated their high level of segmentation and their reliance on EU markets. Industrial Goods and Services and Automobiles and Parts showed negative cumulative abnormal returns for 10 days after the referendum date, but these effects reversed over the subsequent period. On the other hand, the Food and Beverage, Healthcare and Personal and Household goods supersectors tend to display permanent positive abnormal returns, reinforcing the significance of regional focus.

Media, Basic Resources, Technology, and Construction and Materials supersectors showed a temporary reaction and reverted to their previous levels. So, we speculate that this is an indication of an overreaction that could have reinforced the null hypothesis, suggesting that the referendum did not have a significant effect on these supersectors. The findings suggest that, over time, investors tend to create self-control systems to prevent further losses during periods of uncertainty. The uncertainty created by events like the Brexit vote also leaves the same cautious investors to only impact stock markets in the short term.

Chemical and Telecommunications supersectors showed no significant changes, proving they are resilient to the market conditions such as political and economic shocks. Within this context, the importance of market integration becomes apparent. These are the main supersectors driven by multinational

corporations, whose activities are known to be characterized by high investments abroad and/or exports abroad. The changes benefit these companies even as the British Pound falls against other currencies. That means the value of their foreign profits or holdings abroad is greater in British Pounds after the changes.

Finally, the Oil and Gas supersector showed positive abnormal returns, thereby rejecting the null hypothesis. Oil and Gas may function as a reliable asset during periods of uncertainty, suggesting that foreign trade agreements following Brexit are less susceptible to disruption. The international operations of the companies enhance the diversification of domestic risks, making them some of the least susceptible to uncertainties associated with Brexit.

This study contributes to literature in several ways. It provides evidence of permanent shifts in stock returns for several supersectors as the result of Brexit. It investigates sectors that have not yet been examined by prior research, such as Telecommunications and Automobiles and Parts.

We uncover a nuanced response of the U.K. economy to Brexit and discover that political uncertainty and market segmentation offers different combinations of benefits and costs to different supersectors.

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Table 1. *Abnormal return (AR) on event day and cumulative abnormal returns (CAR) for different event windows*
The table presents the effects of the referendum on supersectors performance in each event window

Descriptives	Banks	Insurance	Financial Services	Retail	Travel and Leisure	Industrial Goods and Services	Media	Food and Beverage
(T = 0)								
AR	-5.135	-6.918	-3.208	-5.241	-2.244	-1.318	-1.688	3.045
s2	0.656	0.492	0.175	0.371	0.471	0.193	0.407	0.486
t statistics	-6.343	-9.865	-7.674	-8.601	-3.268	-2.999	-2.648	4.367
p-value	0.001***	0.001***	0.001***	0.001***	0.002***	0.003***	0.009***	0.001***
(T-2, T+2)								
CAR	-7.735	-8.477	-5.305	-8.828	-7.648	-2.487	-1.896	3.1041
s2	3.278	2.459	0.874	1.857	2.357	0.966	2.033	2.431
t statistics	-4.272	-5.406	-5.675	-6.478	-4.981	-2.531	-1.330	1.991
p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.012***	0.184	0.005**
(T= 0, T+3)								
CAR	-10.676	-8.705	-6.529	-8.264	-7.851	-2.379	-1.637	4.111
s2	2.622	1.967	0.699	1.486	1.886	0.773	1.626	1.945
t statistics	-6.593	-6.207	-7.810	-6.781	-5.717	-2.706	-1.284	2.948
p-value	0.001***	0.001***	0.001***	0.001***	0.001***	0.007***	0.200	0.004***
(T= 0, T+5)								
CAR	-12.827	-9.673	-6.481	-8.840	-7.624	-2.195	-1.310	5.082
s2	3.933	2.950	1.048	2.228	2.829	1.159	2.439	2.917
t statistics	-6.468	-5.631	-6.330	-5.922	-4.533	-2.039	-0.839	2.976
p-value	0.001***	0.001***	0.001***	0.001***	0.001***	0.042**	0.402	0.003***
(T= 0, T+10)								
CAR	-12.795	-15.152	-6.574	-12.102	-7.880	-2.699	-1.826	6.233
s2	7.211	5.409	1.922	4.085	5.186	2.125	4.472	5.348
t statistics	-4.765	-6.515	-4.742	-5.988	-3.460	-1.852	-0.863	2.695
p-value	0.001***	0.001***	0.001***	0.001***	0.001***	0.064**	0.388	0.008***
(T= 0, T+30)								
CAR	-6.788	-7.378	-1.445	-9.619	-6.015	-1.296	-1.071	3.652
s2	20.321	15.244	5.417	11.513	14.615	5.989	12.602	15.072
t statistics	-1.506	-1.890	-0.621	-2.834	-1.573	-0.530	-0.302	0.941

Descriptives	Banks	Insurance	Financial Services	Retail	Travel and Leisure	Industrial Goods and Services	Media	Food and Beverage
p-value	0.132	0.059**	0.535	0.005**	0.116	0.596	0.763	0.347

Note: *, **, and *** display significance at 10%, 5%, and 1% level, respectively

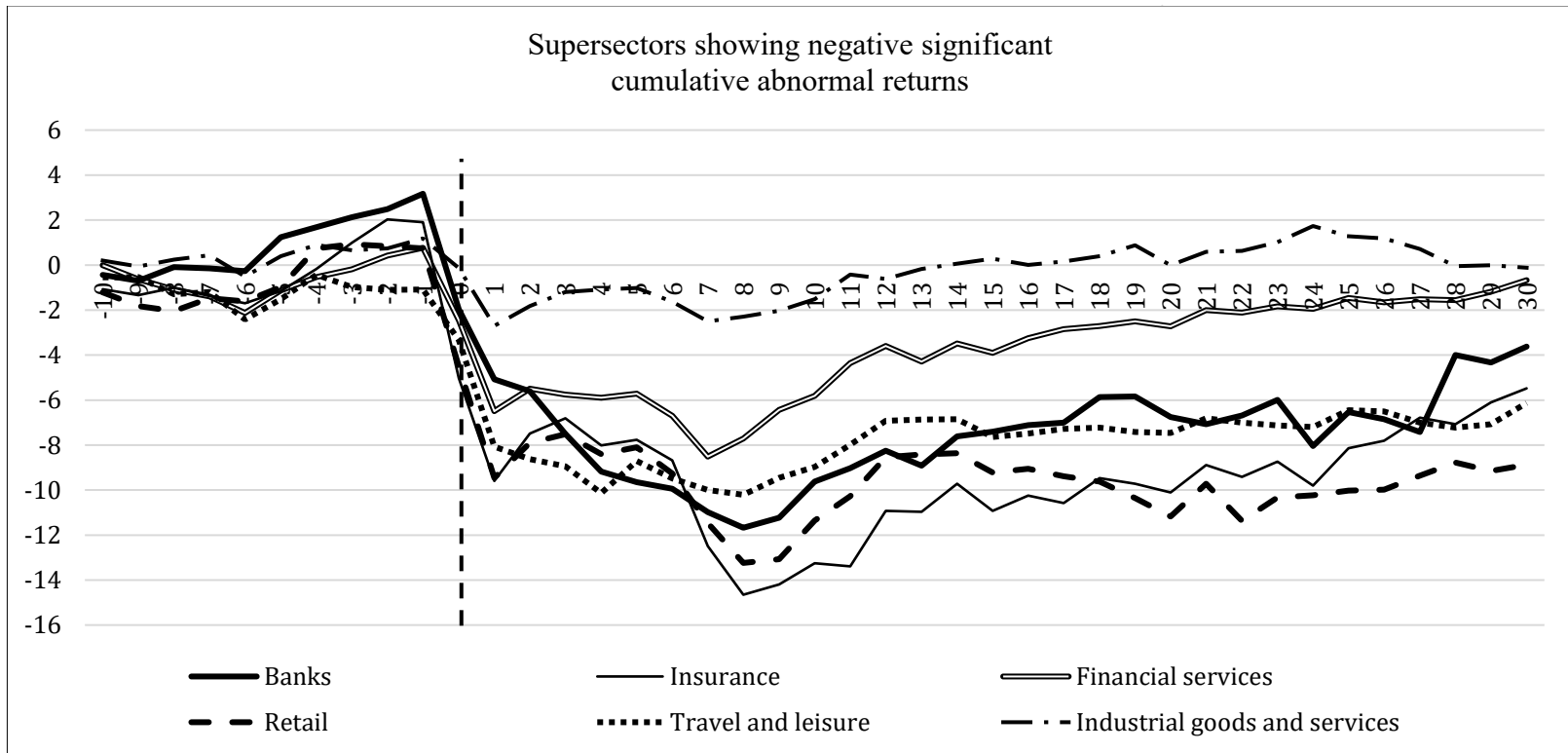
Table 1 (continued). *Abnormal return (AR) on event day and cumulative abnormal returns (CAR) for different event windows*

Descriptives	Health Care	Oil and Gas	Basic Resources	Technology	Chemicals	Construction and Materials	Personal and Household Goods	Automobiles and Parts	Telecommunications
(T = 0)									
AR	6.115	6.093	5.875	3.933	1.036	0.987	1.080	1.666	-0.679
s ²	0.646	1.457	5.148	0.880	0.589	0.930	0.356	1.729	0.576
t statistics	7.611	5.048	2.589	4.192	1.350	1.024	1.809	1.267	-0.895
p-value	0.001***	0.001***	0.01***	0.001***	0.177	0.306	0.071*	0.205	0.371
(T-2, T+2)									
CAR	9.489	9.130	8.882	2.420	-1.951	-0.895	1.994	-5.537	0.558
s ²	3.228	7.285	25.742	4.402	2.947	4.649	1.781	8.643	2.880
t statistics	5.281	3.383	1.751	1.154	-1.136	-0.415	1.493	-1.883	0.329
p-value	0.000***	0.000***	0.080*	0.249	0.256	0.678	0.135	0.060**	0.743
(T= 0, T+3)									
CAR	10.273	9.247	7.186	2.609	-1.334	-2.076	3.355	-6.936	0.012
s ²	2.582	5.828	20.593	3.522	2.357	3.719	1.425	6.914	2.305
t statistics	6.393	3.830	1.583	1.391	-0.869	-1.077	2.811	-2.638	0.008
p-value	0.001***	0.001***	0.114	0.165	0.385	0.282	0.006**	0.009**	0.994
(T= 0, T+5)									
CAR	10.341	8.807	7.337	2.798	0.311	-3.107	4.468	-6.425	-1.340
s ²	3.873	8.742	30.890	5.282	3.536	5.579	2.137	10.371	3.457
t statistics	5.254	2.979	1.320	1.217	0.165	-1.316	3.056	-1.995	-0.721

Descriptives	Health Care	Oil and Gas	Basic Resources	Technology	Chemicals	Construction and Materials	Personal and Household Goods	Automobiles and Parts	Telecommunications
p-value	0.001***	0.003***	0.187	0.224	0.869	0.189	0.002***	0.046**	0.471
(T= 0, T+10)									
CAR	12.897	10.483	10.751	5.197	1.069	-6.282	3.924	-7.252	-2.824
s2	7.101	16.027	56.632	9.685	6.483	10.227	3.918	19.014	6.338
t statistics	4.840	2.618	1.429	1.670	0.420	-1.964	1.982	-1.663	-1.122
p-value	0.001***	0.009**	0.153	0.095	0.675	0.050**	0.048**	0.097*	0.262
(T= 0, T+30)									
CAR	14.706	-3.974	12.446	27.046	3.050	-4.178	-0.569	-1.176	-3.978
s2	20.012	45.167	159.599	27.293	18.270	28.823	11.042	53.584	17.860
t statistics	3.287	-0.591	0.985	5.177	0.714	-0.778	-0.171	-0.161	-0.941
p-value	0.001***	0.554	0.325	0.000***	0.476	0.436	0.864	0.872	0.347

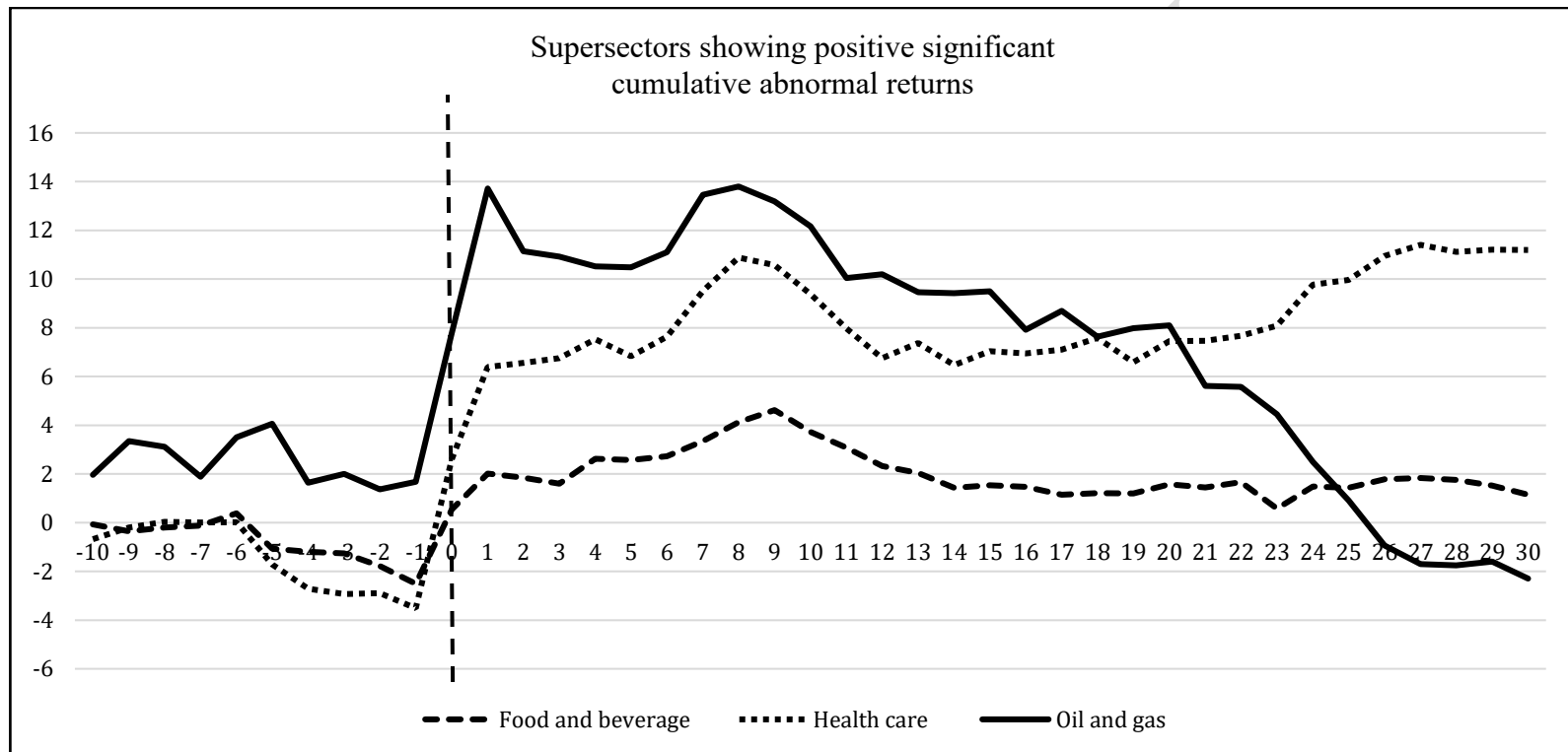
Note: *, **, and *** display significance at 10%, 5%, and 1% level, respectively

Figure 1.

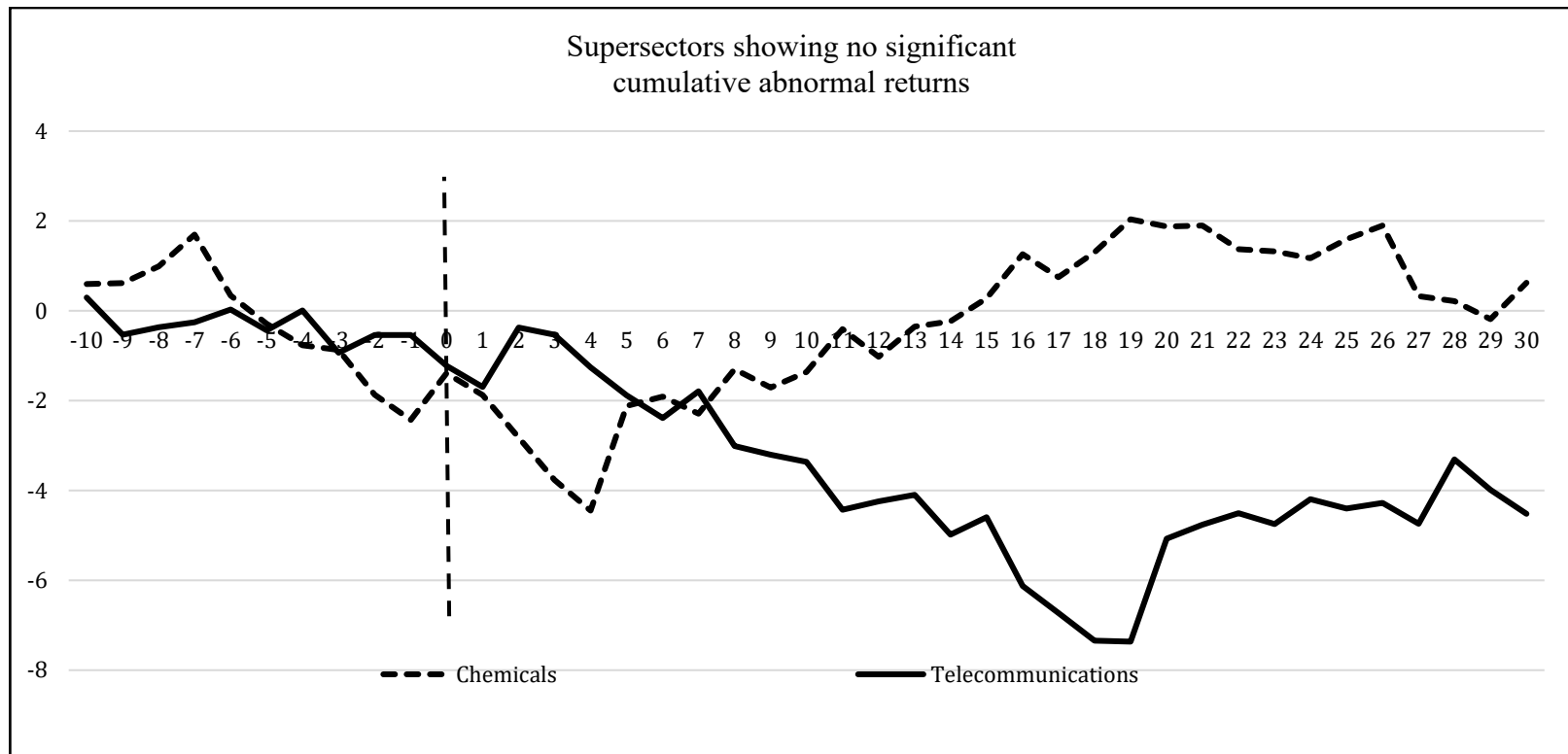


This graph shows cumulative abnormal returns for banks, insurance, financial services, retail, travel and leisure, and industrial goods and services supersectors.

Figure 3.

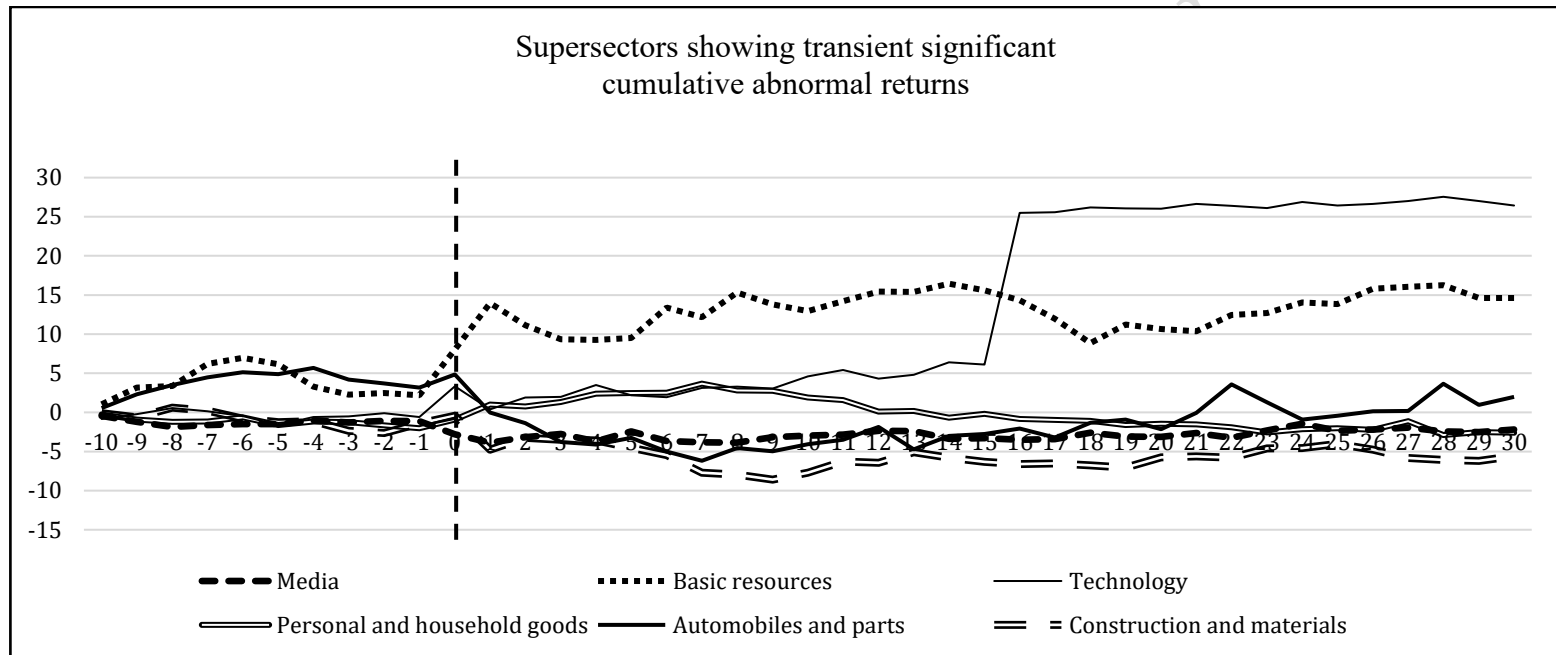


This graph shows cumulative abnormal returns for food and beverage, healthcare and oil and gas supersectors.



This graph shows cumulative abnormal returns for chemicals and telecommunications supersectors.

Figure 4.



This graph shows cumulative abnormal returns for media, basic resources, technology, personal and household goods, automobiles and parts and construction and materials supersectors.

Table 2. Trading Volume Analysis

The table provides output for 17 different supersectors including a t-statistic valuation and p-value. It compares the sample data to the population mean to determine the significance of changes in the volume of trading.

	Banks	Insurance	Retail	Financial Services	Travel and Leisure	Industrial Goods and Services
Sample size (n)	41	41	41	41	41	41
Population Mean (μ)	1	1	1	1	1	1
Sample Mean ($\bar{x}$)	1.0155	1.0064	1.0010	1.0000	1.0069	1.0048
Numerator	0.0155	0.0064	0.0010	0.0000	0.0069	0.0048
Sample Standard Deviation (s)	0.0091	0.0081	0.0063	0.0102	0.0085	0.0083
Denominator	0.0014	0.0013	0.0010	0.0016	0.0013	0.0013
t-value	10.9500	5.0556	0.9944	0.0122	5.1866	3.6902
Degree of freedom (df)	40	40	40	40	40	40
Alpha value (α)	0.05	0.05	0.05	0.05	0.05	0.05
t-crit (two-tailed test t value)	2.0211	2.0211	2.0211	2.0211	2.0211	2.0211
Comparison of t-value and t-crit	t > t-crit	t > t-crit	t < t-crit	t < t-crit	t > t-crit	t > t-crit
Null Hypothesis (no effect) rejected	Yes	Yes	No	No	Yes	Yes
Significant change	Yes	Yes	No	No	Yes	Yes

Table 2 (continued). *Trading Volume Analysis*

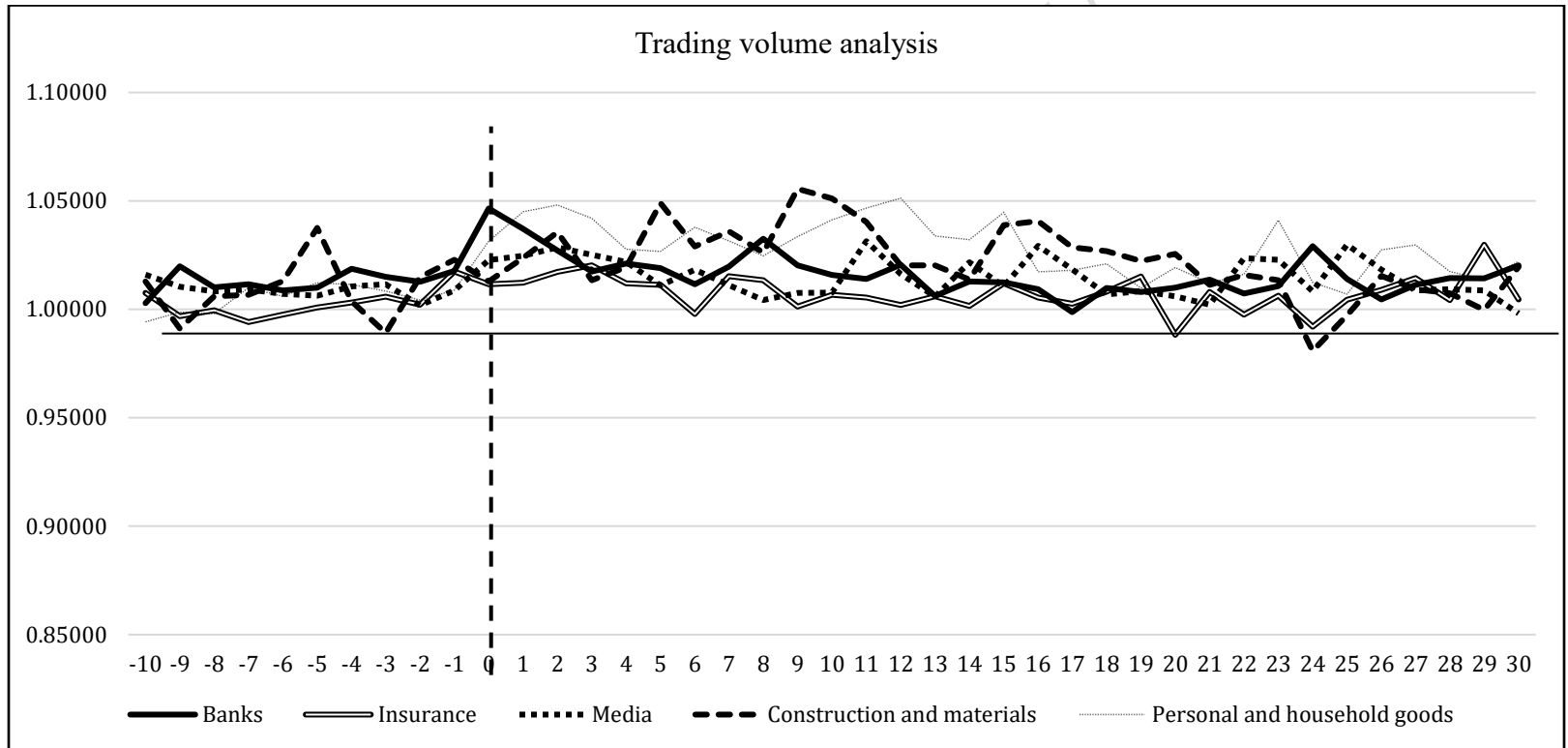
	Media	Basic Resources	Technology	Food and Beverage	Health Care	Oil and gas
Sample size (n)	41	41	41	41	41	41
Population Mean (μ)	1	1	1	1	1	1
Sample Mean ($\bar{x}$)	1.0136	0.9785	1.0115	1.0159	1.0091	0.9807
Numerator	0.0136	-0.0215	0.0115	0.0159	0.0091	-0.0193
Sample Standard Deviation (s)	0.0086	0.0098	0.0297	0.0148	0.0089	0.0108
Denominator	0.0013	0.0015	0.0046	0.0023	0.0014	0.0017
t-value	10.1298	-14.0590	2.4788	6.9084	6.5174	-11.4009
Degree of freedom (df)	40	40	40	40	40	40
Alpha value (α)	0.05	0.05	0.05	0.05	0.05	0.05
t-crit (two-tailed test t value)	2.0211	2.0211	2.0211	2.0211	2.0211	2.0211
Comparison of t-value and t-crit	t > t-crit	t > t-crit	t > t-crit	t > t-crit	t > t-crit	t > t-crit
Null Hypothesis (no effect) rejected	Yes	Yes	Yes	Yes	Yes	Yes
Significant change	Yes	Yes	Yes	Yes	Yes	Yes

Table 2 (continued). *Trading Volume Analysis*

	Chemicals	Construction and Materials	Personal and Household goods	Automobiles and Parts	Telecommunications
Sample size (n)	41	41	41	41	41
Population Mean (μ)	1	1	1	1	1
Sample Mean ($\bar{x}$)	0.9892	1.0194	1.0228	1.0051	0.9960
Numerator	-0.0108	0.0194	0.0228	0.0051	-0.0040
Sample Standard Deviation (s)	0.0205	0.0165	0.0151	0.0192	0.0118
Denominator	0.0032	0.0026	0.0024	0.0030	0.0018

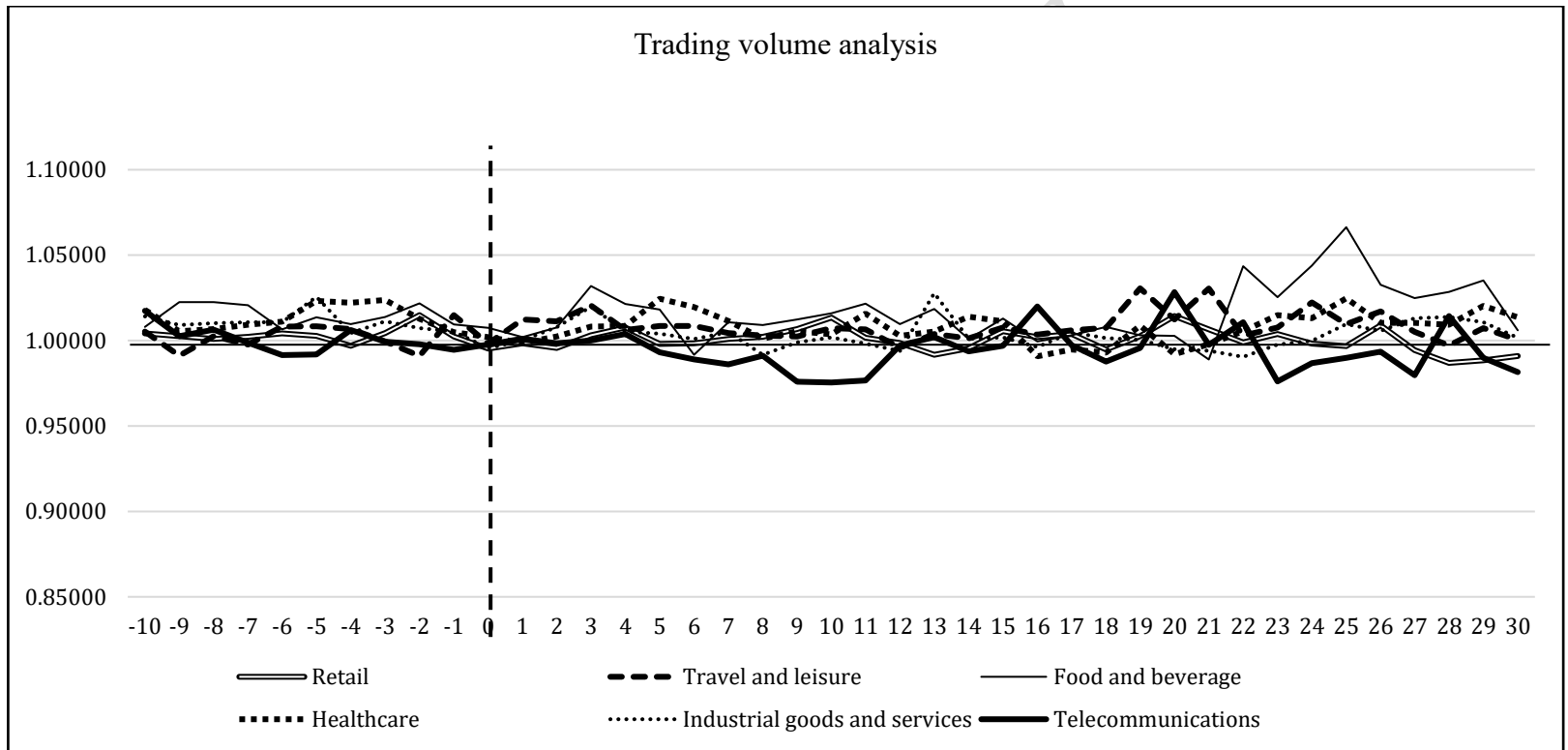
t-value	-3.3783	7.5305	9.6631	1.7177	-2.1835
Degree of freedom (df)	40	40	40	40	40
Alpha value (α)	0.05	0.05	0.05	0.05	0.05
t-crit (two-tailed test t value)	2.0211	2.0211	2.0211	2.0211	2.0211
Comparison of t-value and t-crit	$t > t\text{-crit}$	$t > t\text{-crit}$	$t > t\text{-crit}$	$t < t\text{-crit}$	$t > t\text{-crit}$
Null Hypothesis (no effect) rejected	Yes	Yes	Yes	No	Yes
Significant change	Yes	Yes	Yes	No	Yes

Figure 5.



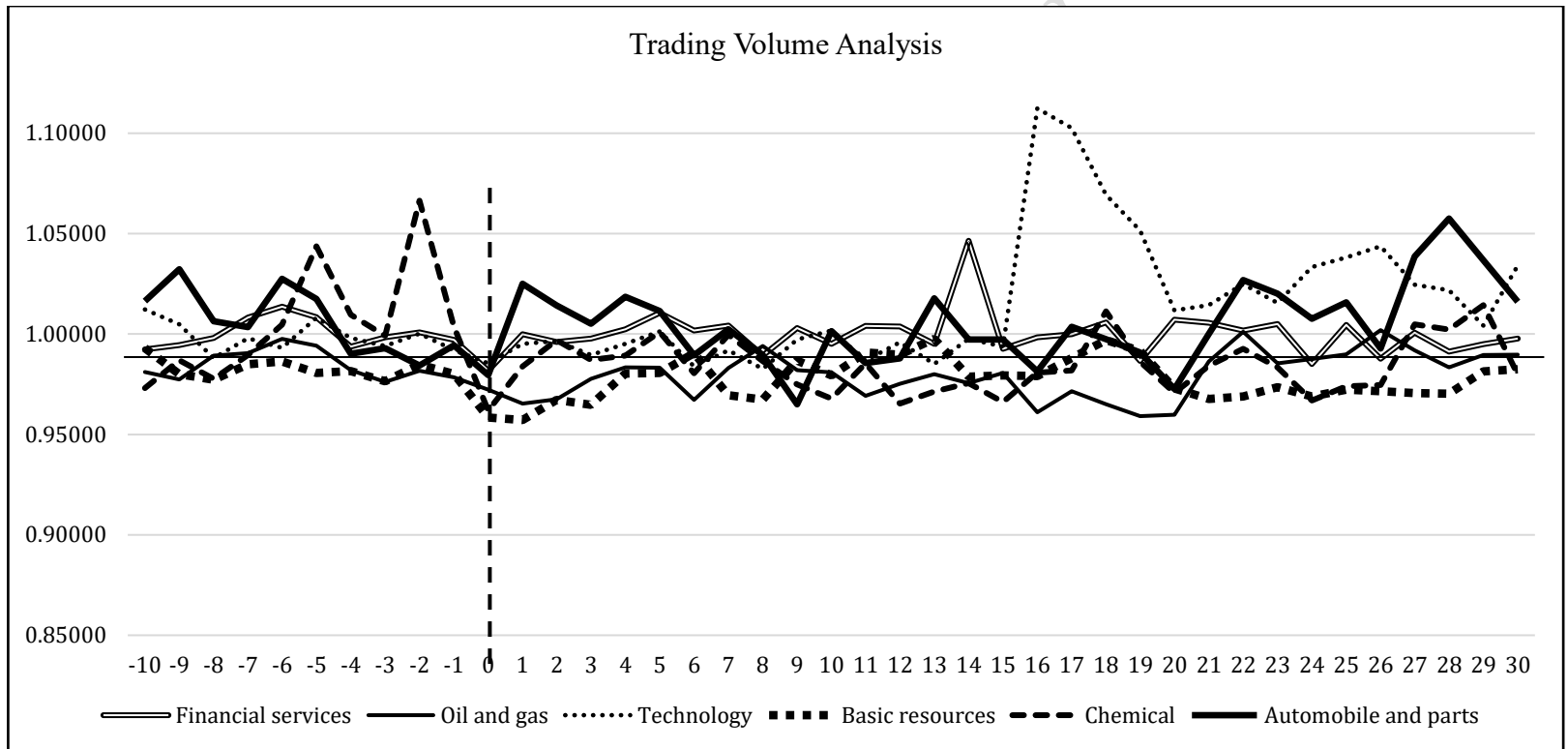
This graph shows trading volume for banks, insurance, media, construction and materials, and personal and household goods supersectors.

Figure 6



This graph shows trading volume for retail, travel and leisure, food and beverage, healthcare, industrial goods and services and telecommunication supersectors.

Figure 7



This graph shows trading volume for financial services, oil and gas, technology, basic resources, chemical and automobile and parts supersectors.

Table 3. Descriptive statistics and t-test results for different supersectors for 150 days estimation window
Results from regression models (intercept coefficients, slope coefficients), Abnormal Returns (AR), Cumulative Abnormal Returns (CAR), variance (s2), t-statistics, and p-values across time points are shown below.

Descriptives	Banks	Insurance	Financial Services	Retail	Travel and Leisure	Industrial Goods and Services	Media	Food and Beverage
(T = 0)								
AR	-5.135	-6.918	-3.208	-5.241	-2.244	-1.318	-1.688	3.045
s2	0.902	0.566	0.179	0.452	0.544	0.178	0.449	0.272
t statistics	-5.406	-9.194	-7.585	-7.798	-3.042	-3.125	-2.521	5.837
p-value	0.001***	0.001***	0.001***	0.001***	0.003***	0.002***	0.012**	0.001***
(T-2, T+2)								
CAR	-7.734	-8.477	-5.305	-8.827	-7.647	-2.487	-1.896	3.104
s2	4.512	2.831	0.894	2.259	2.720	0.890	2.243	1.361
t statistics	-3.641	-5.038	-5.609	-5.873	-4.637	-2.636	-1.266	2.661
p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.009*	0.206	0.008*
(T= 0, T+3)								
CAR	-10.676	-8.705	-6.529	-8.264	-7.851	-2.379	-1.637	4.111
s2	3.609	2.265	0.716	1.807	2.176	0.712	1.794	1.089
t statistics	-5.619	-5.785	-7.719	-6.148	-5.322	-2.820	-1.222	3.940
p-value	0.001***	0.001***	0.001***	0.001***	0.001***	0.005***	0.222	0.001***
(T= 0, T+5)								
CAR	-12.827	-9.673	-6.481	-8.840	-7.624	-2.195	-1.310	5.082
s2	5.414	3.397	1.073	2.710	3.264	1.068	2.691	1.633
t statistics	-5.513	-5.248	-6.256	-5.369	-4.220	-2.124	-0.798	3.977
p-value	0.001***	0.001***	0.001***	0.001***	0.001***	0.034**	0.425	0.001***
(T= 0, T+10)								
CAR	-12.795	-15.152	-6.574	-12.102	-7.880	-2.699	-1.826	6.233
s2	9.926	6.228	1.968	4.969	5.985	1.958	4.934	2.994
t statistics	-4.061	-6.072	-4.687	-5.429	-3.221	-1.929	-0.822	3.603
p-value	0.001***	0.001***	0.001***	0.001***	0.002***	0.054**	0.411	0.001***
(T= 0, T+30)								
CAR	-6.788	-7.378	-1.445	-9.618	-5.050	-1.296	-1.071	3.652
s2	27.973	17.550	5.545	14.004	16.866	5.517	13.905	8.437

Descriptives	Banks	Insurance	Financial Services	Retail	Travel and Leisure	Industrial Goods and Services	Media	Food and Beverage
t statistics	-1.283	-1.761	-0.614	-2.570	-1.229	-0.552	-0.287	1.257
p-value	0.200	0.078	0.539	0.010***	0.219	0.581	0.774	0.209

Table 3 (continued). *Descriptive statistics and t-test results for different supersectors for 150 days estimation window*

Descriptives	Health Care	Oil and Gas	Basic Resources	Technology	Chemicals	Construction and Materials	Personal and Household Goods	Automobiles and Parts	Telecommunications
(T = 0)									
AR	6.115	6.093	5.875	3.933	1.036	0.987	1.080	1.666	-0.6793
s2	0.709	1.698	6.884	0.790	0.599	0.990	0.420	1.575	0.6576
t statistics	7.263	4.676	2.239	4.425	1.338	0.992	1.666	1.327	-0.8377
p-value	0.001***	0.001***	0.026**	0.001***	0.181	0.321	0.096**	0.185	0.4024
(T-2, T+2)									
CAR	9.489	9.130	8.882	2.420	-1.951	-0.895	1.994	-5.537	0.558
s2	3.545	8.490	34.421	3.950	2.996	4.950	2.101	7.877	3.288
t statistics	5.039	3.133	1.514	1.218	-1.127	-0.402	1.375	-1.972	0.308
p-value	0.000***	0.001***	0.130	0.224	0.260	0.687	0.169	0.049**	0.758
(T= 0, T+3)									
CAR	10.273	9.247	7.186	2.609	-1.334	-2.076	3.355	-6.936	0.0118
s2	2.836	6.792	27.537	3.160	2.397	3.960	1.680	6.302	2.6303
t statistics	6.100	3.548	1.369	1.468	-0.862	-1.043	2.588	-2.763	0.0073
p-value	0.001***	0.001***	0.171	0.142	0.389	0.297	0.01**	0.006**	0.9942
(T= 0, T+5)									
CAR	10.341	8.807	7.337	2.798	0.311	-3.107	4.468	-6.425	-1.3403
s2	4.254	10.188	41.305	4.740	3.596	5.940	2.521	9.453	3.9454
t statistics	5.013	2.759	1.142	1.285	0.164	-1.275	2.814	-2.090	-0.6748
p-value	0.001***	0.006**	0.254	0.199	0.870	0.203	0.005**	0.037**	0.5000
(T= 0, T+10)									
CAR	12.897	10.483	10.751	5.197	1.069	-6.282	3.924	-7.252	-2.8242

Descriptives	Health Care	Oil and Gas	Basic Resources	Technology	Chemicals	Construction and Materials	Personal and Household Goods	Automobiles and Parts	Telecommunications
s2	7.800	18.678	75.726	8.691	6.592	10.889	4.621	17.330	7.2333
t statistics	4.618	2.426	1.235	1.763	0.417	-1.904	1.825	-1.742	-1.0501
p-value	0.001***	0.016**	0.217	0.078	0.677	0.057**	0.068*	0.082*	0.2939
(T= 0, T+30)									
CAR	14.706	-3.974	12.446	27.046	3.050	-4.178	-0.568	-1.176	-3.978
s2	21.981	52.639	213.410	24.492	18.577	30.688	13.024	48.838	20.385
t statistics	3.137	-0.548	0.852	5.465	0.708	-0.754	-0.157	-0.168	-0.880
p-value	0.001***	0.584	0.394	0.001***	0.479	0.451	0.875	0.866	0.378

Note: *, **, and *** display significance at 10%, 5%, and 1% level, respectively