Econometrics 3rd Assignment

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Summary

In this event study, we analyze the effect of Earnings Calls on stock returns. We come to the conclusion, that earnings calls with a positive earnings surprise tend to influence the stock returns positively, whereas negative earnings surprises tend to negatively influence stock returns. Interestingly, we find in our case that the stock returns of the positive surprises do not fall back to the original level after time, but increase even further, suggesting the existence of the post-earnings announcement drift. On the other hand, the stock returns of the negative surprise increase again after the event, suggesting an overreaction of investors regarding the negative earnings surprise. Regarding the statistical significance, we find that not all of the event day abnormal returns are statistically significant. Furthermore, we find that some of the "Day 1" (Day after the event day) abnormal returns are highly statistically significant, especially for firms where the event day abnormal returns were not statistically significant. This could hint at a sort of time lag, where the stock prices sometimes adjust the day after the earnings announcement. The cumulative abnormal returns seem to be only slightly statistically significant, with some of the cumulative abnormal returns not being statistically significant at all. The statistical significance could be increased with a larger dataset analyzing the effect of earnings calls on stock prices for more than ten companies.

2 Data

To analyse the impact of earnings calls on stock returns, we created a data set with daily 2024 stock returns of ten randomly selected companies from the S&P 500 index. These companies were randomly picked to mitigate sample selection bias in the data set. To limit the possible companies that could have been selected, we opted to choose firms from the S&P 500 index, as therefore, no small and excessively risky or volatile companies are included, which could influence the true effect of the event itself. We decided to examine Earnings of the third quarter of 2024, and thereby Earnings Calls that were announced between October 1st, 2024, and December 31st, 2024. The estimation window is set from 250 days before the event to 50 days before the event, whereas the event window is set from 20 days before the event to 20 days after the event. Importantly, the number of days also includes days on which the stock exchange was closed (weekends, holidays). Thereby, some days are skipped in the estimation and event windows.

3 Literature

Earnings calls are pivotal events for publicly traded firms, offering insights into financial performance, strategy, and outlook. Financial economics research highlights their role in price discovery, volatility, and investor sentiment.

Theoretical Perspectives

The Efficient Market Hypothesis (EMH) (Fama, 1970) suggests stock prices instantly reflect all available information, including earnings call disclosures. In semi-strong efficient markets, unexpected earnings surprises should trigger immediate price adjustments (Campbell, Lo, & MacKinlay, 1997). Rational asset pricing models predict earnings calls as moments of price correction (Bali, Engle, & Murray, 2016).

However, behavioral finance theories (Shiller, 2003) indicate that biases like confirmation bias or loss aversion can cause investor overreaction or underreaction, leading to post-earnings announcement drift (PEAD) (Bernard & Thomas, 1989). If stock prices do not adjust fully, gradual corrections may occur as investors reassess implications.

Empirical Evidence

Empirical studies using event methodology (Campbell, Lo, & MacKinlay, 1997) confirm that positive earnings surprises drive abnormal returns, while negative surprises cause sharp declines (Eckbo, 2008). Firms with higher idiosyncratic risk exhibit stronger price reactions (Bali, Engle, & Murray, 2016).

PEAD remains a robust finding, contradicting EMH's immediate efficiency claim (Bernard & Thomas, 1989). Angrist and Pischke (2014) highlight that macroeconomic shocks can amplify earnings call effects, influencing stock price reactions beyond firm-specific news.

Contradictions and Gaps

While earnings calls significantly impact stock prices, discrepancies exist regarding reaction speed and duration. Some studies suggest near-instant information assimilation via high-frequency trading, while others emphasize persistent anomalies like PEAD. Variations in information asymmetry, investor sophistication, and firm size suggest earnings call effects are not uniform across firms.

Conclusion

Earnings calls play a crucial role in stock price movements. While asset pricing models predict immediate reactions, behavioral biases suggest inefficiencies in investor responses. Future research could examine alternative information sources, such as social media sentiment, in moderating stock price reactions.

4 Descriptive statistics

The descriptive analysis table provides an overview of the ten randomly selected companies from the S&P 500 index, showing their market capitalization, industry, and earnings call dates. The earnings call dates are spread across October and November 2024, with some firms sharing the same date. The distribution of dates across industries may indicate variations in fiscal reporting schedules or market response patterns. Furthermore, the observation of all Earnings Calls being in October and November hints to the fact that most companies tend to announce their earnings in the first two months of the quarter.

5 Abnormal returns

In the following, the cumulative abnormal returns of stocks around an earnings call are analysed with three different variations. Firstly, normal returns are calculated with the Constant Mean model, where an average daily normal return is calculated. Secondly, with the Market Model, normal returns are now calculated with the inclusion of market risk. Lastly, normal returns are calculated with the Fama and French model, which includes market risk, but also size and value risk factors.

The analysis of firm-specific Cumulative Abnormal Returns (CAR) around earnings calls using the **Constant Mean model** reveals a notable pattern: The Firm-Individual CAR graph shows varied stock reactions on the event day, which can be split up into two groups. Firms with a positive earnings surprise and firms with a negative surprise. The firms with a positive earnings surprise are TTWO (+ ~7.49%), GILD (+ ~6.65%), DGX (+ ~6.69%), ALGN (+ ~4.42%) and HUM (+ ~3.34%). ADM's stock price shows close to no reaction on the event day but will be counted to the positive surprise in this case. Interestingly, in some cases such as TTWO or GILD, the stock price only spikes the day after the earnings call, suggesting a small time lag. After the event, cumulative stock returns vary. Whereas TTWO's returns continue a long-term upwards trend, following the assumption of the post-earnings announcement drift, GILD's cumulative returns decrease back to the pre-event range after some time, suggesting an overreaction of the investors regarding the earnings surprise. Firms with a negative earnings surprise are ROK (- 5.7%), FRT (- ~1.11%), EG (- ~6.45%) and UNP (- ~4.42%). The time lag can be observed for some observations here as well. Interestingly, ROK's cumulative return spikes up +5% on the day before the event, to then drop around 10% on the event day and Day 1. Possibly, there could have been incorrect leaks or the assumption of higher earnings than announced. The constant-mean model, where an average daily normal return is calculated, does

not reflect firm-specific and market-driven factors. To ensure robustness, alternative models like the Market Model should be considered.

Analysing the **Market Model,** generally, the main observations stay similar compared to the Constant-Mean model. The firms are still split into the same groups regarding positive and negative earnings surprise. The pre-event window shows lower CAR dispersion, widening post-announcement, suggesting heterogeneous market reactions, but the CAR dispersion seems to have decreased slightly compared to the Constant Mean Model. Compared to the Constant Mean model, the Market Model aligns fluctuations more with broader market trends, as the Market is now included in the calculation of normal returns, underscoring its impact on CAR estimates. The model's reliance on market-index parameters introduces sensitivity, as its assumption of a linear stock-market relationship may obscure firm-specific shocks or misestimate systemic risk. While refining abnormal return measurement, its dependency on market representativeness necessitates robustness tests, such as adjusting the index or possibly employing multifactor models.

Fama & French Three-Factor Model reveals nuanced market reactions to earnings calls, adjusting for size (SMB) and value (HML) risk factors beyond traditional market beta. While this model can enhance precision by mitigating biases in simpler models, its sensitivity to parameter choices—such as the estimation window or proxies for size and value—may impact CAR magnitudes. Variations in defining firm characteristics or shifts in value-growth dynamics could alter the baseline for "normal" returns, affecting statistical significance. Overall, the CAR results are similar to the Market Model, with the pre-event window showing low dispersion, which widens post-announcement. Compared to the Market Model, the Fama-French approach provides a more complex risk adjustment with three factors but relies on stable factor definitions, which may introduce estimation noise.

Regarding **Statistical Significance**, all three models are only partly statistically significant. Analysing the significance of both Day 0 abnormal returns and the CARs on the last day (Day 20), the Constant Mean Model reaches the lowest statistical significance, whereas the statistical significance of both the Market Model and the Fama and Frech Model are on a similar level. The p-values of Day 0 abnormal returns are the lowest for the Market Model, even lower than these of the Fama and Frech model, indicating that in this case, the Market Model provides the highest statistical significance. Interestingly, even for the Market Model, only around half of the Day 0 abnormal returns are statistically significant. This can be reasoned when analysing the Day 1 abnormal returns. For firms with a statistically insignificant Day 0 return, in this case, typically the Day 1 abnormal return is highly significant. This observation again suggests a time

lag of some stock returns regarding their earnings call. In terms of the statistical significance of the CARs on Day 20, all three models don't constantly provide high statistical significance for all companies. Similar to the significance of abnormal returns, the Constant Mean Model is the least significant, with the Market Model and Fama and Frech Model being on the same level. Overall, the Market Model provides the highest statistical significance while being less complex than the Fama and French Model. Thereby, in the following, when calculating average abnormal returns, the Market Model will be utilized.

To generally improve the statistical significance, one could increase the number of analysed events and thereby the number of analysed companies and stock returns.

6 Average abnormal returns

The analysis of Average Cumulative Abnormal Returns (ACAR) highlights asymmetries in market reactions to earnings announcements. Pre-event ACAR values for both the positive and negative earnings surprise companies remain relatively stable, fluctuating between -0.024 (-2.4%) and 0.006 (+0.6%), indicating limited abnormal returns in anticipation of the earnings release. However, the announcement date (Day 0) marks a distinct shift, with ACAR(negative) dropping sharply to -0.016, suggesting a strong negative market reaction. Post-announcement trends show sustained asymmetry. ACAR(negative) declines further, reaching -0.048 (-4.8%) on Day 2 and Day 3 before gradually recovering to an ACAR of –0.009 (-0.9%) on Day 20. In contrast, ACAR(positive) spkies up on the event day from –0.019 to –0.003 and continues to increase on Day 1 and 2, to an average cumulative abnormal return of 0.025 on Day 2. This is a 4.4% increase of ACAR in two days. ACAR(positive) continues to increase in the time after the event date, peaking at 0.049 on Day 20. This suggests that some firms experience a positive revaluation over time, while others face prolonged negative abnormal returns. The results of the companies included in the Positive-Surprise Average align with prior findings on post-earnings drift (PEAD), where stocks with negative surprises tend to underperform in subsequent days, while positive reactions exhibit a delayed appreciation. The dispersion in ACAR responses suggests heterogeneous investor interpretations of earnings news, reinforcing the need for robust models to account for firm-specific and market-wide influences. The results of the Negative-Surprise group of companies suggest an overreaction of investors regarding the negative earnings surprise, possibly because of loss aversion, which also aligns with the assumptions of the existing literature.

The findings are consistent with existing literature on earnings announcement effects. The observed post-event drift, particularly observed for the positive ACARs, aligns with empirical

studies documenting asymmetric market adjustments. While variations exist due to different market conditions and firm characteristics, the evidence generally supports prior studies on earnings announcement anomalies.

7 Tables

7.1 Descriptive Statistics

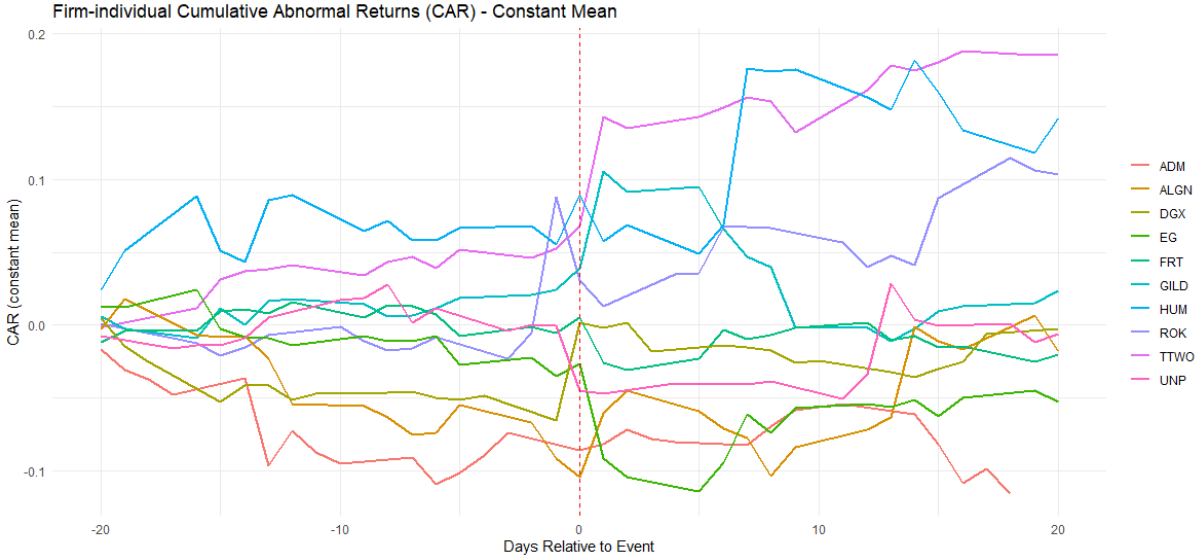
Table 1: Descriptive Table: Information about the "Event Stocks"

Ticker	Firm Name	Market Cap	Industry	Earnings Call Date
TTWO	Take-Two Interactive Software, Inc.	$32.30B	Video Games	06.11.2024
ADM	Archer-Daniels-Midland Company	$21.80B	Food Processing	18.11.2024
ROK	Rockwell Automation, Inc.	$30.37B	Industrial Machinery	07.11.2024
GILD	Gilead Sciences, Inc.	$122.18B	Biotechnology	06.11.2024
ALGN	Align Technology, Inc.	$16.30B	Medical Devices	23.10.2024
EG	Enel Group	$14.45B	Electric Utilities	30.10.2024
FRT	Federal Realty Investment Trust	$9.41B	Real Estate Investment Trusts	30.10.2024
HUM	Humana Inc.	$33.66B	Health Insurance	30.10.2024
DGX	Quest Diagnostics Incorporated	$17.99B	Diagnostics	22.10.2024
UNP	Union Pacific Corporation	$147.63B	Railroads	24.10.2024

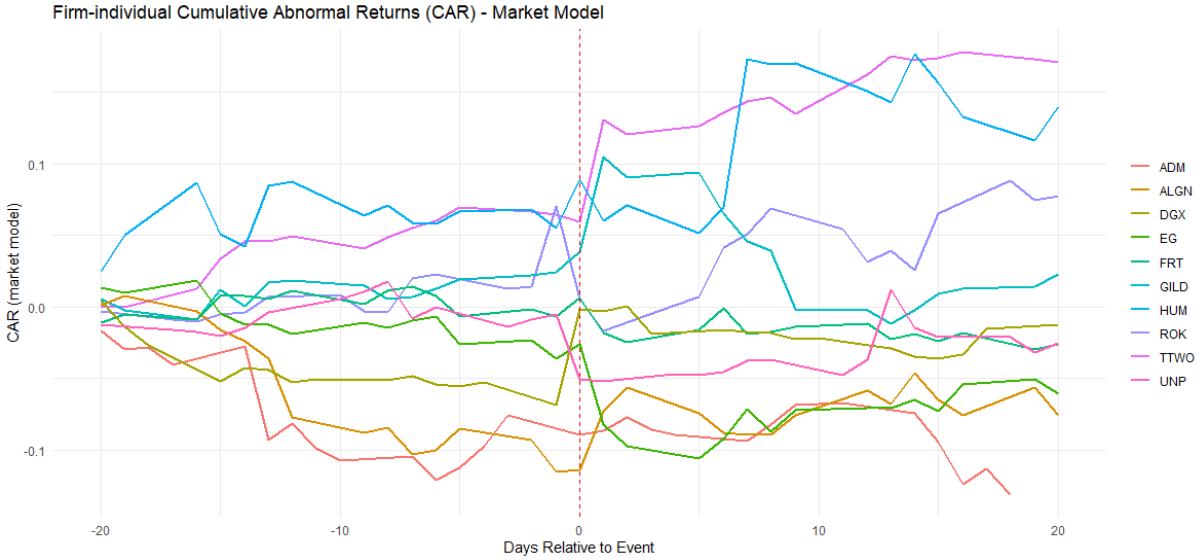
Notes: This table presents the firms which stock returns are analyzed in this event study. These 10 firms have been randomly selected from the S&P 500 index. The table presents the Firm Name, Market Capitalization, Industry and the analyzed Earnings Call Date.

7.2 Cumulative Abnormal Returns

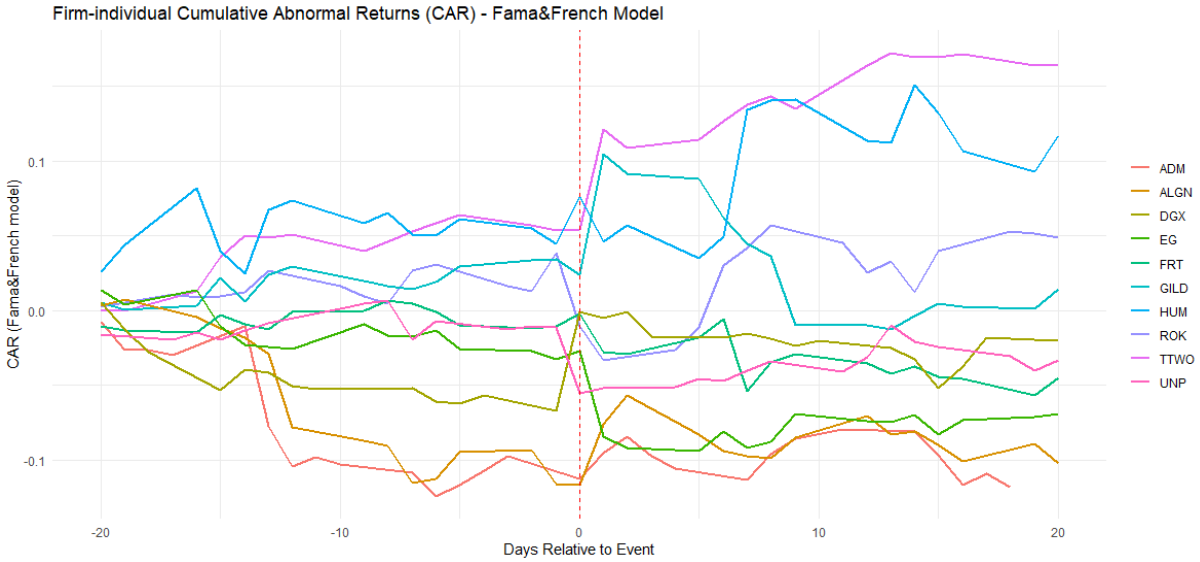
7.2.1 Cumulative Abnormal Returns: Constant Mean



7.2.2 Cumulative Abnormal Returns: Market Model

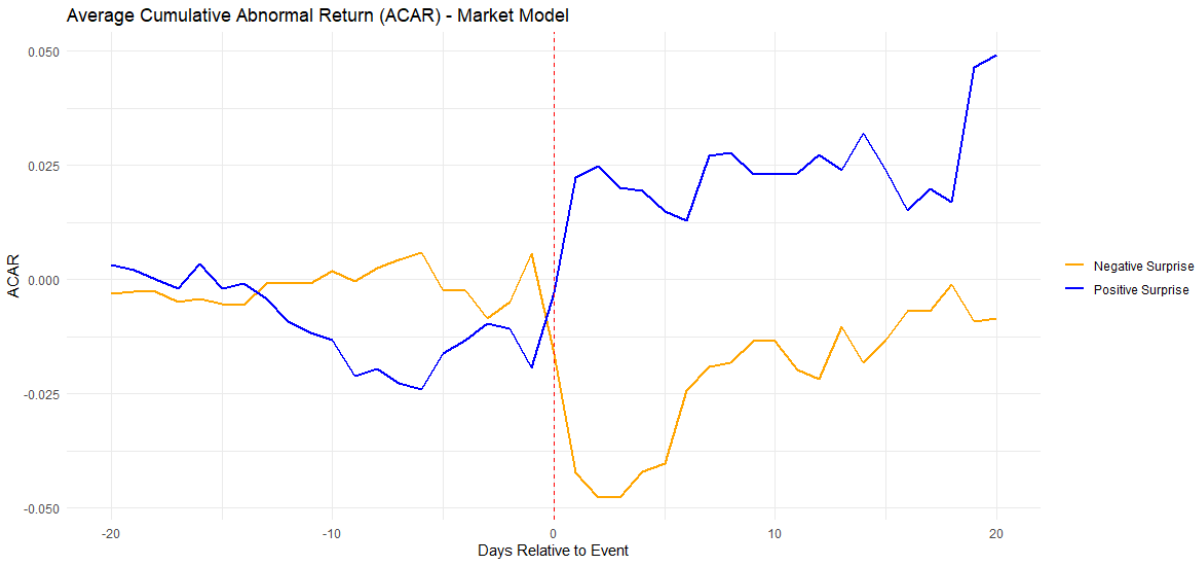


7.2.3 Cumulative Abnormal Returns: Fama&French Model



7.3 Average Cumulative Abnormal Returns

7.3.1 Plot of Average Cumulative Abnormal Returns (Market Model)



7.3.2 Table of Average Cumulative Abnormal Returns (Market Model)

Table 2: Average Cumulative Abnormal Returns: Positive & Negative Surprise

Day	ACAR (negative)	ACAR (positive)
-20	-0.003	0.003
-19	-0.003	0.002
-18	-0.003	0.000
-17	-0.005	-0.002
-16	-0.004	0.003
-15	-0.005	-0.002
-14	-0.006	-0.001
-13	-0.001	-0.004
-12	-0.001	-0.009
-11	-0.001	-0.012
-10	0.002	-0.013
-9	-0.000	-0.021
-8	0.003	-0.020
-7	0.004	-0.023
-6	0.006	-0.024
-5	-0.002	-0.016
-4	-0.002	-0.013
-3	-0.009	-0.010
-2	-0.005	-0.011
-1	0.006	-0.019
0	-0.016	-0.003
1	-0.042	0.022
2	-0.048	0.025
3	-0.048	0.020
4	-0.042	0.020
5	-0.040	0.015
6	-0.024	0.013
7	-0.019	0.027
8	-0.018	0.028
9	-0.013	0.023
10	-0.013	0.023
11	-0.020	0.023
12	-0.022	0.027
13	-0.010	0.024
14	-0.018	0.032
15	-0.013	0.024
16	-0.007	0.015
17	-0.007	0.020
18	-0.001	0.017
19	-0.009	0.047
20	-0.009	0.049

Notes: This table presents the Average Cumulative Abnormal Returns (ACARs) for firms with a positive and a negative Earnings Surprise. Importantly, as weekends are included in this 40-day span, the CARs of the firms for the weekends are filled with the CAR of the last working day. This is done to prevent extreme deviations because of less observations per day.

8 Sources

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9 Data Sources

- Daily 2024 Stock Returns of S&P 500 companies: https://www.investing.com/
- S&P 500 Earnings Call Dates: https://www.sectorspdrs.com/earningscalendar
- Fama & French 3 Factors: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

10 Packages

1. expss
2. tidyverse
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