**Masters Programmes: Group Assignment Cover Sheet**

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| **Question Attempted:**  *(question number/title, or description of assignment)* | **In reference to guidance questions,** |
| **Have you used Artificial Intelligence (AI) in any part of this assignment?** | **Yes AI has been used to arrive at complex formulas for regressions. Due to its complexity certain graphs and their respective codes were also done. Clustered standard errors were especially focused upon.** |

**Post-Earnings Announcement Drift**

July 3rd , 2025

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*Submitted in partial fulfilment of the requirements for*

*IB93F0 Research Methodology*

**Abstract**

This study examines the persistence of post-earnings announcement drift (PEAD) in U.S. equity markets using data from 50 large-cap firms between 2000 and 2023. Standardized earnings surprises (SUE) are constructed from both accounting data and IBES forecasts. Event study methods and cross-sectional regressions reveal statistically significant drift for accounting-based SUEs, especially under Fama-French and fixed-effects models. Firms in the top SUE decile earn up higher CARs than bottom-decile peers. IBES-based surprises yield weaker signals. The results confirm that PEAD remains a modest anomaly. indicating persistent investor underreaction in the post-announcement return window.

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# **1. Introduction**

Options Earnings announcements are among the most critical corporate disclosures, offering timely insights into firm performance. Yet, an enduring puzzle persists even after earnings information becomes public, stock prices often drift in the same direction as the surprise for weeks or months. This phenomenon, known as post-earnings announcement drift, raises important questions about market efficiency.

# **2. Methodology**

## **2.1 Research Design Overview**

Taking a two-tier approach. First accounting data and then IBES data. For ease of understanding **Two separate coding files** have been created.

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| --- | --- | --- | --- |
| Table 1: Information Summary | | | |
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| Data Sources | | | |  |
| **Variable** | **Accounting-Based Approach** | **Analyst-Based (IBES) Approach** | **Primary Source (via WRDS)** |  |
| Earnings Data | EPS from reported quarterly results | IBES Actual EPS (reported) | Compustat (Accounting), IBES Actuals |  |
| Earnings Forecast | Not Applicable (Historical EPS used) | IBES Analyst Forecasts (Mean, Std Dev) | IBES Detail History |  |
| Earnings Surprise | ΔEPS (Quarter-over-Quarter Change) | Actual EPS − Mean Forecast | Constructed using above |  |
| SUE (Standardized) | EPS Surprise ÷ Std Dev (4Q or 8Q) | Surprise ÷ Std Dev of Forecasts | Constructed |  |
| Stock Returns | Daily returns around event (RDQ) | Same dataset used | CRSP |  |
| Market Return | Value-Weighted CRSP Index | Same dataset used | CRSP |  |
| *Note: The event window focuses on returns following quarterly earnings announcement. Estimation window: [−60,−6] trading days before the event Event window: [+1,+60] trading days after the announcement.* | | | |  |
|  |

## **2.2 Earnings Surprise Construction**

Earnings surprise for **Accounting Basis** are forecasted using the difference in actual reported earnings per share (EPS) across adjacent quarters:

Where is drawn from WRDS, organised by firm and fiscal quarter.

To standardise across firms and time:

​ Standardized Unexpected Earnings.

Where is the standard deviation of prior four quarters EPS for firm .

Standardized Unexpected Earnings under **Analyst Based** Approach:

Where:  
: Mean analyst forecast for firm in quarter.

: Standard deviation of forecasts.

Realized earnings per share.

This transformation mitigates scale bias and enables cross section comparisons.

## **2.3 Abnormal return estimation**

For both **Accounting** based & **Analyst** based, estimation of abnormal return using the market model, adjusts for systematic market movements:

Estimated via OLS over estimation window [ - 60,- 6 ].

Stock return from CRSP.

Market return from CRSP’s VW index.

Alternative robustness model ( Constant Mean Return ):

​

Where ​ is the average return of firm over the estimation window.

Aggregating;

Average abnormal returns (AAR) :

Cumulative abnormal returns (CAR) :

Where , tracking delayed reaction.

## **2.4 Portfolio Formation & Hypothesis testing**

To isolate behavioural anomalies, firms are sorted into deciles.

Let be decile then:

Long (positive surprises)

Short (negative surprises)

A zero-cost long-short strategy:

Testing:

Significance of CARs using t-tests

|  |
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For regressions applied please refer to Section 3.4. To ensure robustness, observations are filtered for positive EPS values and trading activity around the event window.

Hypothesis testing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 2: Hypohtesis Testing Framework | | | | |
|  |
| Hypothesis Testing | | | | |  |
| **Hypothesis ID** | **Tested Relationship** | **Null Hypothesis (H₀)** | **Alternative Hypothesis (H₁)** | **Test Type** |  |
| H1 | CAR of D10 > CAR of D1 (Top vs. Bottom SUE Decile) | μ₁ = μ₀ | μ₁ > μ₀ | One Sided Test |  |
| H2 | Cross-Sectional Regression | β = 0 | β ≠ 0 | Two-Sided t-test |  |
| *Note*: For μ₁ = μ₀ The mean CAR for D10 is equal to or less than the mean CAR for D1. No PEAD effect: high SUE firms don’t outperform low SUE firms For μ₁ > μ₀ The mean CAR for D10 is greater than D1. There is a post-earnings announcement drift: the market underreacts, and prices adjustms | | | | |  |
|  |

# **3. Results**

## **3.1 Sample Overview & Earnings Surprise Diagnostics**

A balanced panel of 50 large-cap U.S. firms (2000–2023) was constructed using CompStat-CRSP–IBES data.

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| --- | --- | --- | --- |
| Table 2: Distributional Summary of Standardized Earnings Surprises (SUE) using Accounting-Based and Analyst-Based Methods | | | |
|  |
| Distributional Summary of SUE | | | |  |
| **Basis** | **Accounting Based** | | **Analyst Based (IBES)** |  |
| **Formulas** |  | |  |  |
| **Metric** | **4-Quarter SUE** | **8-Quarter SUE** | **IBES - Not rolling** |  |
| Mean | 0.070 | 0.051 | 0.469 |  |
| Median | 0.000 | 0.000 | 0.336 |  |
| Standard Deviation | 1.330 | 1.314 | 1.618 |  |
| Skewness | -0.101 | -0.142 | 0.532 |  |
| Kurtosis | -0.978 | 0.057 | 3.822 |  |
| *Note*: This table reports descriptive statistics of standardized unexpected earnings (SUE) across three formulations: two accounting-based (4Q and 8Q rolling standardizations) and one analyst-based using IBES forecasts. *Data Sources*: Compustat, CRSP, IBES via WRDS | | | |  |
|  |

The distribution under **Accounting surprise** both 4-quarter (Figure 1) and 8-quarter (Figure 2) show centred distributions with symmetric tails and slight leptokurtosis, supporting weak average surprise dispersion.

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For **Analyst surprise**, firm-quarter panel using IBES actuals and forecasts was constructed. The resulting SUE distribution (Figure 3 & 4) exhibits a slight positive mean (0.47), right skew (0.53), and high kurtosis (3.82), indicating occasional extreme surprises. Clustering near zero with sharp outliers during macro shocks.

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## **3.2 Formation of Decile Portfolios by SUE**

Firms are now ranked into SUE-based decile quarters, separately for 4-quarter and 8-quarter rolling standardization while a monotonic distribution for **Analyst** based approach. Distributions (Figure 5, 6 & 7) across deciles exhibit a clear monotonic structure, mean SUEs rises from D1 to D10.

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Heatmaps (Figure 8 & 9) further reveal consistent decile sorting across time, even during macroeconomic shocks. These results establish a robust foundation for analysing abnormal returns in subsequent sections.

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## **3.3 Abnormal Return Patterns Across SUE Deciles**

AAR and CAR are computed by decile-sorted standardized earnings surprise (SUE) for both 4-quarter and 8-quarter rolling windows (Further explanations in Appendix B). Figures 10 and 11 show that firms in top deciles (D10) experience significantly higher post-RDQ returns, while bottom deciles (D1) lag persistently.

A graph of a graph showing the growth of a car

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A graph of a graph showing the price of a car

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The decile spread is further highlighted in Figures 12 and 13, where return differentials approach 100-150 bps. This confirms a PEAD effect, even though raw SUEs were centred near zero. Sorting by relative surprise reveals price adjustment asymmetry, with 8Q CARs showing steeper drift. AAR trends, provided in Appendix C, remain volatile but directionally consistent.

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The IBES-based CAR plots (Figure 14 & 15) show moderate but consistent drift. Top SUE deciles exhibit cumulative returns around +4%, while bottom deciles hover near zero. Compared to accounting-based SUE, the return spread is narrower, analyst expectations embed more information, partially mitigating post-earnings announcement drift.

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## **3.4 Regressions**

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| Table 3: Regression results | | | | | | |
|  |
| Cross-Sectional Regression of Post-Earnings Drift | | | | | | |  |
| **Model** | **SUE Type** | **α** | **β₁** | **R²** | **t-stat** | **p-val** |  |
| Model A Simple Linear Regression | 4Q | 0.022 | 0.010 | 0.013 | 1.776 | 0.077 |  |
| 8Q | 0.022 | 0.012 | 0.021 | 2.268 | 0.024 |  |
| IBES | 0.017 | 0.003 | 0.002 | 3.046 | 0.002 |  |
| Model B Fama French | 4Q | 0.005 | 0.008 | 0.037 | 7.797 | 0 |  |
| 8Q | 0.006 | 0.008 | 0.038 | 7.764 | 0 |  |
| IBES | 0.018 | 0.003 | 0.005 | 3.12 | 0.002 |  |
| Model C Bull/Bear Regimes | 4Q | 0.003 | 0.021 | -0.018 | 7.225 | 0.000 |  |
| 8Q | -0.003 | 0.019 | -0.016 | 6.174 | 0.000 |  |
| IBES | 0.016 | 0.000 | 0.004 | 0.191 | 0.848 |  |
| Model D Fixed Effects | 4Q | - | 0.003 | 0.076 | - | 0.000 |  |
| 8Q | - | 0.003 | 0.080 | - | 0.000 |  |
| IBES | - | 0.000 | 0.006 | - | 0.032 |  |

Regression results across four models confirm the predictive power of standardized unexpected earnings (SUE). In **Model A**, 8Q SUE yields β = 0.012 (t = 2.27, p = 0.024, R² = 0.021), while 4Q is weaker (β = 0.010, t = 1.78, p = 0.077, R² = 0.013). IBES-based SUE shows β = 0.003 (t = 3.05, p = 0.002, R² = 0.002). In **Model B** (Fama-French controls), 4Q and 8Q SUE maintain significance (β = 0.0083, t ≈ 7.8, R² ≈ 0.038), while IBES remains at β = 0.003 (t = 3.12, R² = 0.005). **Model C** (Bull/Bear interaction) shows high coefficients: 4Q β₁ = 0.021 (t = 7.23), 8Q β₁ = 0.019 (t = 6.17); interaction terms are negative (β₃ = –0.018, –0.016). IBES again shows no predictive power (β = 0.0003, p = 0.848). **Model D** (Fixed Effects) yields β ≈ 0.003, R² ≈ 0.08 for accounting-based SUEs, while IBES is near-zero (β = 0.000, R² = 0.006, p = 0.032).

The market factor (MKT) & value factor (HML) (Figure 16) are consistently significant. Overall, these findings confirm a positive, statistically robust relationship between earnings surprises and CAR, support that market forces/ investors play a huge role.

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## **3.5 Fama-Macbeth Cross-sectional Check & SCAR Test**

To validate post-earnings announcement drift, we use two rigorous methods. For accounting-based SUEs, a Fama-MacBeth regression yields an average β = 0.0077 (t = 2.797) across 93 quarters, confirming positive abnormal returns linked to earnings surprises.

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For IBES, The SCAR distribution (Figure 19) shows a statistically significant positive drift (J₂ = +2.5044), consistent with post-earnings underreaction. While some events exhibit extreme SCARs (suggesting selective overreaction), the overall evidence supports a persistent drift following earnings surprises, reinforcing the presence of PEAD, however weak.

*A diagram of a distribution of a car with Ryugyong Hotel in the background

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## **3.6 Clustered Standard Error**

SCAR regressed on SUE (n = 182,598) yields a significant positive coefficient (+0.0348, p = 0.015) under PERMNO-clustered standard errors (55 clusters). R² is 0.00087, reflecting modest explanatory power. Average SCAR is +0.0374, with substantial dispersion (SD = 1.90).

Figures 20 and 21 confirm PEAD, SCAR increases monotonically with SUE. Both mean and median SCAR rise across deciles, and violin plots show denser positive tails in higher SUE bins.

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# **4. Discussion & Interpretation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 4: Hypothesis 1 Summary Table: CAR(D10) > CAR(D1) | | | | |
|  |
| Hypothesis 1 | | | | |  |
| **Method** | **Mean CAR (D10)** | **Mean CAR (D1)** | **T-Statistic** | **P-Value (One-Sided)** |  |
| **Formulas** |  |  |  |  |  |
| 4Q SUE | 0.426 | 0.053 | 4.859 | 0.000 |  |
| 8Q SUE | 0.398 | 0.039 | 4.133 | 0.000 |  |
| IBES SUE | 0.275 | 0.034 | 3.386 | 0.001 |  |
| *Note*: CAR columns refer to the cumulative abnormal returns, post-event window [+1, +60]. Welchs t-test being done, for empirical finance and One-sided test because your alternative hypothesis is directional:D10 > D1. | | | | |  |
|  |

All three test configurations reject the null hypothesis, confirming statistically significant post-earnings drift. Magnitude varies across 4Q and 8Q accounting-based SUEs and they yield stronger effects than IBES. The consistent directional gap (D10 > D1) across methods affirms behavioural underreaction. Lower mean CAR under IBES hints at timing/methodology sensitivity.

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Across both accounting-based SUEs and analyst-based IBES surprises, decile sorts reveal monotonic return patterns. Accounting-based 8Q SUEs show the clearest drift: top-minus-bottom CAR spreads exceed 1.3%, with regression β = 0.0128 (p = 0.024). IBES drift yields narrower spreads (~4%) and lower R² = 0.005, implying embedded expectations. Volatility diagnostics show neither realized nor conditional volatility predicts drift (Figure 22). Firm-level CARs (Figure 23) show noise and reversals, especially mid-decile. The IBES SCAR-J2 test gives mean = -0.0375, J2 = -2.50; in contrast, accounting SUEs yield Fama-MacBeth β̄ = 0.0077, confirming stronger signal reliability.

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| --- | --- | --- | --- | --- | --- | --- |
| Table 5: Hypothesis 2 SUE Regression Coefficient Significance | | | | | | |
|  |
| Hypothesis 2 | | | | | | |  |
| **Hypothesis ID** | **Model** | **SUE Type** | **Null Hypothesis (H₀)** | **Alternative Hypothesis (H₁)** | **Decision** | **Interpretation** |  |
| H2 | Model A | 4Q | β = 0 | β ≠ 0 | Not Rejected | No strong evidence of PEAD |  |
| H2 | Model A | 8Q | β = 0 | β ≠ 0 | Rejected | Weak but significant drift |  |
| H2 | Model A | IBES | β = 0 | β ≠ 0 | Rejected | Significant but weak β |  |
| H2 | Model B | 4Q | β = 0 | β ≠ 0 | Rejected | Strong PEAD after FF3 controls |  |
| H2 | Model B | 8Q | β = 0 | β ≠ 0 | Rejected | Consistent signal |  |
| H2 | Model B | IBES | β = 0 | β ≠ 0 | Rejected | Statistically strong, low R² |  |
| H2 | Model C | 4Q | β = 0 | β ≠ 0 | Rejected | PEAD persists, Bull effects modeled |  |
| H2 | Model C | 8Q | β = 0 | β ≠ 0 | Rejected | Drift weaker in bull markets |  |
| H2 | Model C | IBES | β = 0 | β ≠ 0 | Not Rejected | No predictive power from IBES |  |
| H2 | Model D | 4Q | β = 0 | β ≠ 0 | Rejected | Strong fixed-effect drift |  |
| H2 | Model D | 8Q | β = 0 | β ≠ 0 | Rejected | Strong fixed-effect drift |  |
| H2 | Model D | IBES | β = 0 | β ≠ 0 | Rejected | Statistically valid, economically weak |  |
| *Note*: This table summarizes the statistical evaluation of whether standardized earnings surprises (SUE) predict post-announcement cumulative abnormal returns (CAR) over the window [+1, +60]. A two-tailed t-test is applied to test the null hypothesis (β = 0) for each model and SUE type. Decisions are based on conventional significance thresholds (e.g., p < 0.05), with the interpretation column highlighting both statistical strength and economic relevance. | | | | | | |  |
|  |

In support of Hypothesis 2, regression analysis confirms that standardized earnings surprises (SUE) predict post-announcement cumulative abnormal returns, however weak. Accounting-based SUE measures (4Q, 8Q) consistent coefficients across all models, especially after including Fama-French controls and fixed effects. While IBES surprises show significance in some models, their explanatory power remains economically weak. These results reinforce the presence of post-earnings announcement drift (PEAD), particularly when earnings surprises are measured using historical benchmarks rather than analyst expectations.

Bloomberg’s SPEQPOS and SPEQNEGS indices (Appendix F), which track positive and negative earnings surprises across the S&P 500, offer macro-level validation of the PEAD anomaly identified in our firm-level event study. The sustained divergence between these indices’ mirrors decile-sorted CAR patterns, indicating PEAD persists non-uniformly, visible in certain configurations, muted in others. The results favour behavioural underreaction as an explanation yet caution against universal applicability.

# **5. Conclusion & Practical Implications**

Collectively, these findings establish PEAD as an economically relevant anomaly, however weak. The drift’s persistence across time, deciles etc, suggests a small but enduring market inefficiency. By triangulating decile spreads, return regressions, and temporal drift patterns, the analysis affirms behavioural underreaction as explanatory channel. Practically, investors may exploit this drift using long–short strategies based on standardized earnings surprises. Analysts can improve forecasting models by incorporating accounting-based SUEs, while policymakers and platforms like Bloomberg may use these insights to reassess market efficiency indicators and disclosure practices.

# **6. Appendix**

## **6.1 Appendix A**

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Accounting Surprise

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Analyst surprise

The two visualizations above capture the annual evolution of mean standardized earnings surprises (SUE) from 2000 to 2023. Both the line plot highlight periods of heightened earnings optimism and pessimism, often aligning with well-documented macroeconomic shocks.

Notably, sharp negative mean SUE values emerge during major downturns:

* 2001: Dot-com bust and post-9/11 uncertainty.
* 2008: Global financial crisis.
* 2020: COVID-19-induced earnings collapse.

Conversely, positive peaks in 2003, 2009, and 2021 correspond to recoveries or stimulus-driven earnings rebounds. The amplitude and frequency of SUE volatility underscore the behavioural response of analysts and firms to macro conditions.

The graphical patterns validate that SUE is not just a firm-level anomaly but a market-wide indicator sensitive to economic cycles, providing critical motivation for our event study.

## **6.2 Appendix B**

To construct abnormal return profiles, average abnormal returns (AAR) are computed by sorting firms into deciles based on standardized earnings surprise (SUE), using both 4-quarter and 8-quarter rolling windows. Each decile captures a relative position within its fiscal quarter. Returns are then aggregated by event day to obtain AAR, and cumulatively summed across time to derive cumulative abnormal returns (CAR).

Estimation window as [–60, –6] and the event window as [+1, +60] relative to the reported earnings date (RDQ). AARs show significant noise at the daily level, prompting reliance on CAR for clearer interpretability. The analysis spans over 18,000 firm-quarter observations per scheme. Decile sorting reveals striking differences: while raw SUEs are centred near zero, CAR spreads approach 1.5% between top and bottom deciles. This effect is steeper in the 8Q specification, suggesting greater price inertia following large relative surprises. The observed drift reflects systematic underreaction, consistent with the post-earnings announcement drift (PEAD) anomaly. Notably, CAR trajectories reveal asymmetric adjustments, particularly in upper deciles, confirming that price updates lag positive earnings news.

## **6.3 Appendix C**

## 

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To While CAR smooths cumulative market response, AAR reveals the immediate reaction to earnings announcements. AARs are computed by grouping returns across firms within each SUE decile on a given event day, averaged across the event window [–60, +60].

Figures above illustrate the volatility in AAR profiles for both the 4Q and 8Q SUE specifications. As expected, returns cluster around the earnings announcement date (t = 0), but with considerable dispersion across deciles. While noise is inherent to daily return behaviour, key patterns persist: higher deciles show mildly positive spikes post-RDQ, and lower deciles show weaker or flat movement. Despite visual overlap between deciles on certain days, especially in the pre-event period, directional consistency exists, particularly within ±10 days of RDQ. The AAR-based view complements the CAR findings by reinforcing that drift emerges from many small, persistent daily mispricing rather than singular shocks.

## **6.4 Appendix D**

Python Snapshots

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## **6.5 Appendix E**

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## **6.6 Appendix F**

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*Market-Level Divergence in Post-Earnings Drift: SPEQPOS vs SPEQNEGS vs S&P 500 Index*

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*Earnings Surprise Persistence Across Firms: Subset Drift Relative to the Market*

## **6.7 Appendix G**

Constructing a zero-cost strategy by subtracting bottom decile (D1) CARs from top decile (D10) returns. Figures 16 and 17 confirm post-RDQ drift. The 4Q-based strategy outperforms 8Q, peaking around +1.3 versus +1.1. Results validate the profitability of trading on extreme earnings news using a decile-based long–short approach.

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*Zero Cost strategy CAR*

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