Post-Earnings-Announcement Drift (PEAD): The Role of Revenue Surprises

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The presentation is based on three research papers with Narasimhan Jegadeesh
Overview

• **Purpose:**
  – Assess whether revenue surprises are associated with differential drift levels.

• **Methodology:**
  – Compare the abnormal returns that one can get from PEAD based on earnings alone with those based on earnings and revenue surprises.

• **Results:**
  – The revenue surprise can enhance the returns obtained from a PEAD strategy based on earnings alone.
Acknowledgements

• Thomson Financial for providing earnings and revenue forecasts through I/B/E/S.
  – http://www.thomson.com/index.jsp

• Charter Oak Investment Systems Inc. for providing the original and unrestated Compustat quarterly data.
  – http://www.charteroaksystems.com/
Variables 1-3 are earnings surprises

Ball & Brown 1968

Performance of SUE deciles

Event Time in Trading Days Relative to Earnings Announcement Day
Bernard & Thomas (1989)

Performance of PEAD hedge portfolios by quarter
Bernard and Thomas (1990)

Portfolio CAR

Announcement date of subsequent quarter, relative to announcement of quarter t
PEAD (SUE)

- The tendency of stock returns to continue moving in the direction of the earnings surprise for a year after the initial disclosure of earnings.

- The strongest effect of the PEAD is in the immediately following quarter.

- Most of the PEAD occurs around subsequent earnings announcements.

- The future abnormal returns follow a pattern of \{+,+,+,-\}, similar to that of earnings surprises.
Potential Explanations for PEAD

• Risk factors for firms with extreme earnings surprises.

• Methodological problems.
  – Unlikely given the various methodologies, time periods, and numerous studies.

• Investors’ under-reaction.
  – Inconsistent with market efficiency.
  – Why is it not arbitraged away?
Research Question

• Assume that revenue and expense surprises have differential persistence levels, and that both are disclosed at the same time.

• Do investors adequately adjust security prices to reflect the differential persistence of revenue and expense surprises?
  – (1) Do investors understand that a $1 surprise caused by revenues is not the same as that caused by cost savings?
  – (2) Do investors under-react to revenue and expense surprises?
Revenue Surprise

• Ertimur, Livnat and Martikainen (2003) show that revenue surprises are more persistent than “expense” surprises.

• “Expense” is the difference between revenue and earnings.
  – It includes restructuring, gains/losses on sale of long-term assets, and special items

• Earnings announcements often include revenues too, so investors can calculate both surprises, in addition to earnings surprises.
Intuition

• Instead of focusing on extreme earnings alone, focus on extreme earnings accompanied by extreme revenues, which are more persistent.

• When earnings surprises are more likely to continue in the future, investors are more likely to realize their past under-reactions, leading to a greater drift.

• Hence, focus on extreme earnings surprises driven by extreme revenue surprises than expense surprises.
Digression (Livnat and Mendenhall, 2004)

• Is a stronger immediate market reaction associated with a weaker or a stronger drift?

• **Scenario I:** If the percentage of investors who choose to wait (ignorance, overweighting) is fixed, then a stronger immediate market reaction is associated with a stronger drift.

• **Scenario II:** If investors recognize one signal more and react to it more strongly immediately, then the drift is smaller (assuming total reaction, immediate plus future, is fixed).

• Evidence consistent with Scenario I.
Summary of Persistence Results

• Reaction to revenue and expense surprises is different for the contemporaneous and the prior quarter.

• Under-reaction to the revenue and expense surprises in quarters t-1, t-2 and t-4 surprises. Mishkin test is strongest for quarter t-1.

• Implications: Investors do not fully understand the differential persistence of revenue and expense surprises in pricing securities.
Research Design

• Examine the drift in the quarter following the initial earnings announcement.

• Compare the drift obtained when earnings surprises are used alone to those when sales surprises are used in conjunction with the earnings surprise.

• Use both historical Compustat data and analyst forecast data from IBES.

• Control for institutional holdings, arbitrage risk and trading volume.
Data for Trading Tests

• Estimation of SUE from Compustat data begins with the second quarter of 1987 and ends in the last quarter of 2002.

• The IBES earnings SUE begins in the second quarter of 1989 and ends in the last quarter of 2002.

• The IBES sales surprise begins in the third quarter of 1998 and ends in the last quarter of 2002.

• Data for the last quarter of 2002 is spotty.
Estimation of Historical SUE

• Similar to Bartov (1992).

• \( Q_{jt} = \delta_{jt} + Q_{jt-4} + \varepsilon_{jt} \)

  \( Q_{jt} \) is income before extraordinary items for firm j in quarter t.
  
  \( \delta_{jt} \) is a constant

• Use firms with 21 consecutive quarters up to quarter t to estimate:

\[
SUE_{jt} = \frac{(Q_{jt} - \delta_{jt} - Q_{jt-4})}{\sigma_{jt}}
\]
Definition of Earnings Surprises

\[ SUE_{i,t} = \frac{Q_{i,t} - E(Q_{i,t})}{\sigma_{i,t}}, \]

\[ E(Q_{i,t}) = Q_{i,t-4} + \delta_{i,t}. \]

\[ \delta_{i,t} = \frac{\sum_{j=1}^{16} (Q_{i,t-j} - Q_{i,t-j-4})}{16}, \]

\[ \sigma_{i,t} = \frac{1}{15} \sqrt{\sum_{j=1}^{16} (Q_{i,t-j} - Q_{i,t-j-4} - \delta_{i,t})^2}. \]

\( Q_{it} \) is income before extraordinary items for firm \( i \) in quarter \( t \).
Estimation of Analyst Forecasts SUE

• Similar to Mendenhall (2003)

• IBES actual minus the mean analyst forecast in the “relevant” group, scaled by the standard deviation of the forecasts in the group.

• The “relevant” group includes all the most recent forecasts made during the 90-day period prior to the disclosure of actual earnings, with a minimum of two forecasts.
Why Use Both?

• Compustat “rewrites” history, with a hindsight bias that may be stronger for extreme surprises.

• Compustat is available for more firms.

• “IBES actual” is presumably what was originally reported.

• However, the “IBES actual” does not include some items, mostly special items.
Livnat and Mendenhall (2006)

• For firms with IBES forecasts, the drift is significantly stronger (about 1-1.5% per quarter) using the IBES forecast as expected earnings than a time-series forecast.

• The exclusion of special items strengthens the drift (about 0.25% per quarter).

• Using the originally reported numbers from Charter Oak reduces the drift, but not significantly. Still, a more accurate back-test should use the originally-reported numbers.
Estimation of Sales Surprise SUS

• Historical SUS is analogous to SUE.

• Fewer sales forecasts are available than earnings forecasts.

• The analyst forecasts’ SUS is IBES actual sales minus the mean IBES forecast of sales in the “relevant” group, scaled by actual IBES sales. Estimated even if the “relevant” group includes only one forecast.
Assignment to Deciles

• Consistent with the literature, transform the SUE and SUS to decile ranks.

• The ranks are scaled to fall between zero and one.

• Assignment to a decile rank is based on SUE and SUS cutoffs from the previous quarter.
Other Variables

- Cumulative abnormal returns from one day after the announcement through the day of the next earnings announcement. Raw returns minus the Fama-French (6-group, Small/Big and 3 B/M) portfolio returns.

- Institutional holdings as a percentage of outstanding shares.

- Arbitrage risk is 1 minus the squared correlation between the firm’s monthly return and the S&P 500 return. 60 months prior to quarter-end.

- The average monthly trading volume over the 60 months, divided by shares outstanding.
Abnormal Returns - Historical

CAR (%)

Bottom 30% DSUE
Middle 40% DSUE
Top 30% DSUE

Bottom 30% DSUS
Middle 40%
Top 30% DSUS
Abnormal Returns – Analyst Forecasts
Regression of CAR on DSUE, DSUS and Controls

<table>
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<tr>
<th>Expected sign</th>
<th>Intercept</th>
<th>DSUE</th>
<th>DSUE</th>
<th>Institnl.</th>
<th>Arbitrg.</th>
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<td>0.005</td>
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Regression of CAR on DSUE, DSUS and Controls

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<td>5.019</td>
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<td>9131</td>
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<td>0.358</td>
<td>0.370</td>
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</table>
Hedge Portfolio

- Earnings only -- long positions in the top 30% SUE and short positions in the bottom 30% SUE.

- Earnings and sales -- long positions in the top 30% of both SUE and SUS, and short positions in the bottom 30% of both SUE and SUS.

- Average returns over all available quarters.
# Hedge Portfolio Returns

<table>
<thead>
<tr>
<th></th>
<th>Earnings-Based Hedge Portfolio (1)</th>
<th>Earnings-and Sales-Based Hedge Portfolio (2)</th>
<th>Difference (2-1)</th>
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<tbody>
<tr>
<td>Panel A: Historical SUE and SUS (63 quarters)</td>
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<tr>
<td>CAR(%)</td>
<td>1.944</td>
<td>2.210</td>
<td>0.266</td>
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<tr>
<td>Standard Deviation of CAR</td>
<td>1.159</td>
<td>1.833</td>
<td>0.917</td>
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<tr>
<td>t-statistic</td>
<td>13.31</td>
<td>9.57</td>
<td>2.3</td>
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<tr>
<td>Significance level</td>
<td>0.001</td>
<td>0.001</td>
<td>0.025</td>
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<tr>
<td>Average number of firms</td>
<td>1586</td>
<td>786</td>
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<tr>
<td>Panel A: Analyst Forecast SUE and SUS (17 quarters)</td>
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<tr>
<td>CAR(%)</td>
<td>2.199</td>
<td>3.620</td>
<td>1.421</td>
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<tr>
<td>Standard Deviation of CAR</td>
<td>3.331</td>
<td>4.611</td>
<td>2.620</td>
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<tr>
<td>t-statistic</td>
<td>2.72</td>
<td>3.24</td>
<td>2.24</td>
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<td>Significance level</td>
<td>0.015</td>
<td>0.005</td>
<td>0.040</td>
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<tr>
<td>Average number of firms</td>
<td>302</td>
<td>122</td>
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</table>
CAR - Improvement by Using Revenues

-4 -3 -2 -1 0 1 2 3 4 5 6

## Hedge Portfolio Returns
### – Various Sub-Samples

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<tbody>
<tr>
<td><strong>Growth (Below-median B/M)</strong></td>
<td>3.52</td>
<td>4.73</td>
<td>1.21</td>
<td>0.009</td>
<td>0.08</td>
<td>0.752</td>
<td>1.13</td>
<td>0.002</td>
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<tr>
<td><strong>Value (Above-median B/M)</strong></td>
<td>3.75</td>
<td>4.25</td>
<td>0.50</td>
<td>0.071</td>
<td>-0.15</td>
<td>0.371</td>
<td>0.65</td>
<td>0.005</td>
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<tr>
<td><strong>Large (Above-median size)</strong></td>
<td>2.57</td>
<td>2.50</td>
<td>-0.07</td>
<td>0.872</td>
<td>-0.10</td>
<td>0.739</td>
<td>0.03</td>
<td>0.923</td>
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<tr>
<td><strong>Small (Below-median size)</strong></td>
<td>4.47</td>
<td>5.38</td>
<td>0.90</td>
<td>0.003</td>
<td>0.00</td>
<td>0.986</td>
<td>0.90</td>
<td>0.001</td>
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<tr>
<td><strong>Low Earnings Persistence</strong></td>
<td>3.98</td>
<td>5.13</td>
<td>1.15</td>
<td>0.003</td>
<td>0.28</td>
<td>0.218</td>
<td>0.87</td>
<td>0.002</td>
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<td><strong>High Earnings Persistence</strong></td>
<td>3.63</td>
<td>4.29</td>
<td>0.66</td>
<td>0.035</td>
<td>0.01</td>
<td>0.948</td>
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<td><strong>Low Correlation of Earnings and OCF</strong></td>
<td>3.39</td>
<td>4.48</td>
<td>1.09</td>
<td>0.002</td>
<td>0.09</td>
<td>0.603</td>
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<td><strong>High Correlation of Earnings and OCF</strong></td>
<td>4.17</td>
<td>4.58</td>
<td>0.42</td>
<td>0.237</td>
<td>-0.15</td>
<td>0.480</td>
<td>0.57</td>
<td>0.051</td>
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<tr>
<td><strong>Low Proportion of Accruals</strong></td>
<td>3.94</td>
<td>5.06</td>
<td>1.12</td>
<td>0.002</td>
<td>0.22</td>
<td>0.385</td>
<td>0.90</td>
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<td><strong>High Proportion of Accruals</strong></td>
<td>3.69</td>
<td>3.89</td>
<td>0.20</td>
<td>0.582</td>
<td>-0.35</td>
<td>0.052</td>
<td>0.55</td>
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<td><strong>Low Institutional Holdings</strong></td>
<td>4.37</td>
<td>5.20</td>
<td>0.83</td>
<td>0.010</td>
<td>-0.02</td>
<td>0.895</td>
<td>0.85</td>
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<tr>
<td><strong>High Institutional Holdings</strong></td>
<td>2.80</td>
<td>3.35</td>
<td>0.56</td>
<td>0.132</td>
<td>0.05</td>
<td>0.864</td>
<td>0.51</td>
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<tr>
<td><strong>Low Volume</strong></td>
<td>4.16</td>
<td>4.96</td>
<td>0.80</td>
<td>0.026</td>
<td>0.02</td>
<td>0.914</td>
<td>0.78</td>
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<tr>
<td><strong>High Volume</strong></td>
<td>3.11</td>
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<td>0.81</td>
<td>0.043</td>
<td>0.05</td>
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<td><strong>Low Arbitrage Risk</strong></td>
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<td>3.65</td>
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<td>-0.19</td>
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<tr>
<td><strong>High Arbitrage Risk</strong></td>
<td>4.62</td>
<td>5.78</td>
<td>1.15</td>
<td>0.000</td>
<td>0.21</td>
<td>0.342</td>
<td>0.94</td>
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</table>
Sensitivity Analysis

• Results hold for:
  – Pre 1993
  – 1993-1997
  – 1998-2002

• Firms with market cap above $100 million.

• Only NYSE and AMEX firms.

• Firms with more than one analyst forecast of sales.
Correlation between revenue and earnings surprises

<table>
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<tr>
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<tr>
<td>All</td>
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<td>Book-to-Market</td>
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<td>0.29</td>
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<tr>
<td>Large</td>
<td>0.18</td>
<td>0.19</td>
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Summary and Conclusions

• A sales surprise in the same direction of the earnings surprise is associated with a stronger drift.
• The stronger drift is incremental to control variables that were shown to be associated with differential drift levels.
• Investors do not fully incorporate the differential persistence of revenue and expense surprises in setting security prices.
• There continues to be an under-reaction to both revenue and expense surprises.
• Analyst forecasts do not properly incorporate the earnings and revenues surprises.
• This study does not explain the anomaly, but adds to it another dimension.