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

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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/**

Ball & Brown
1968

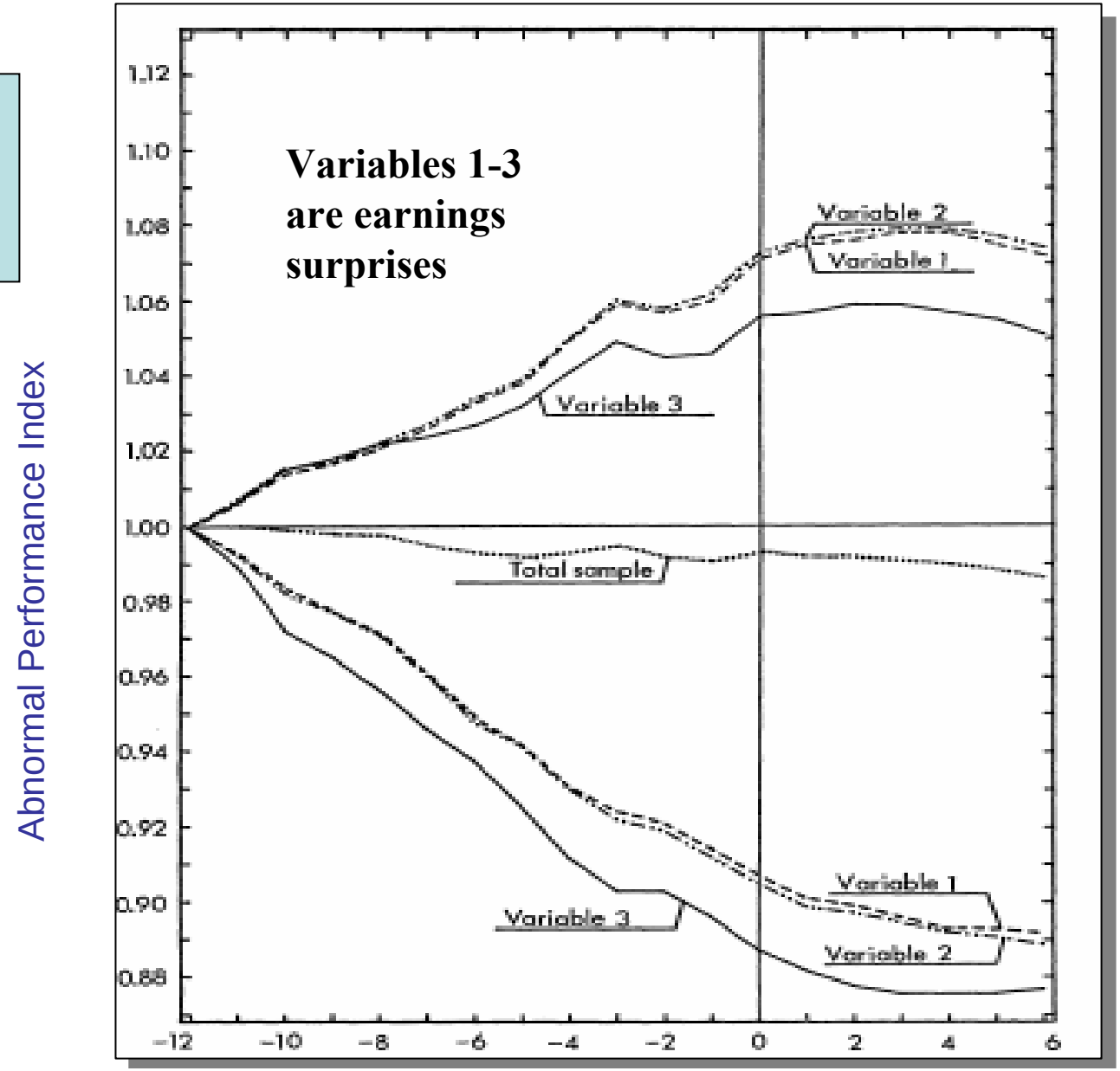
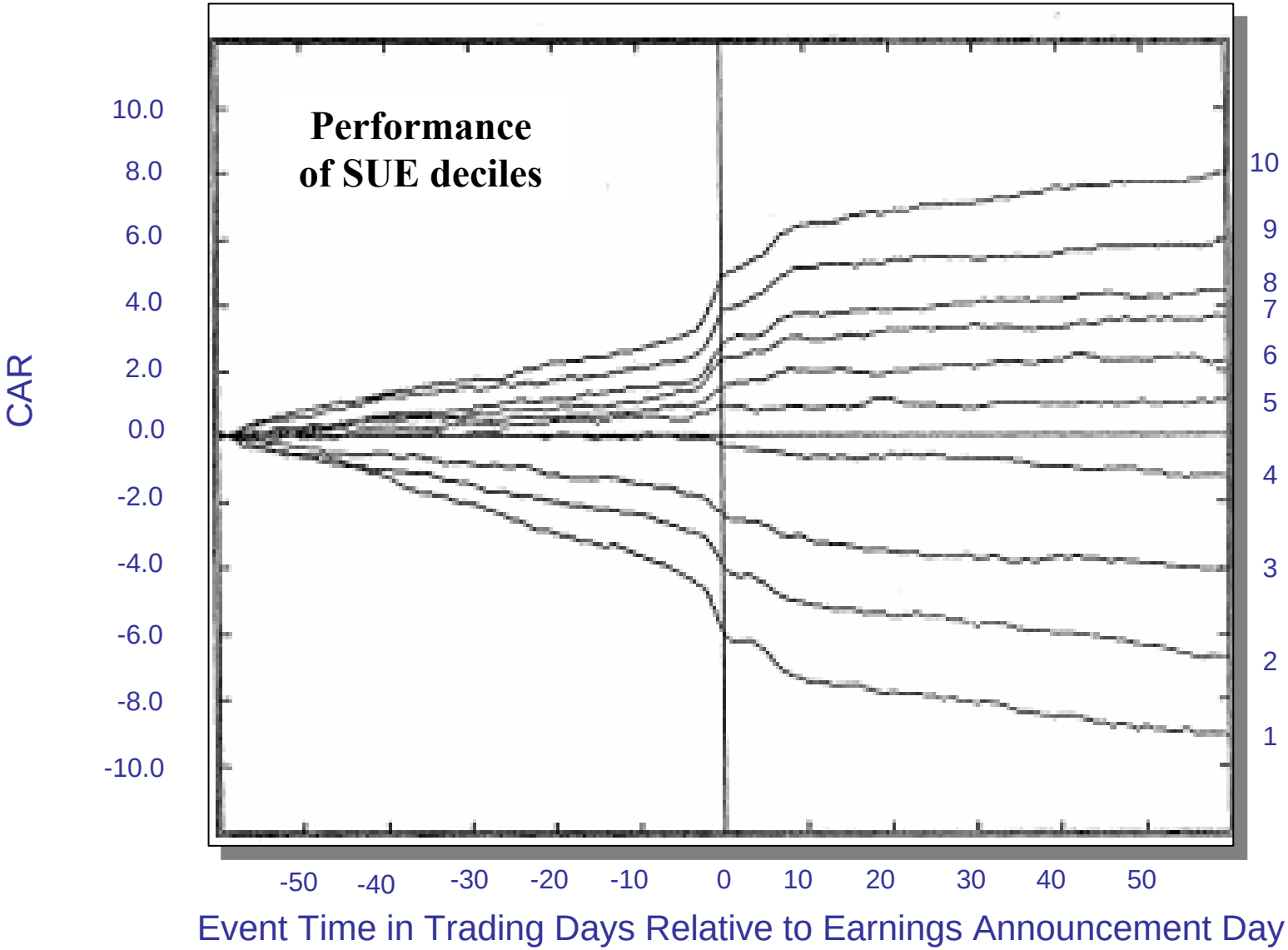


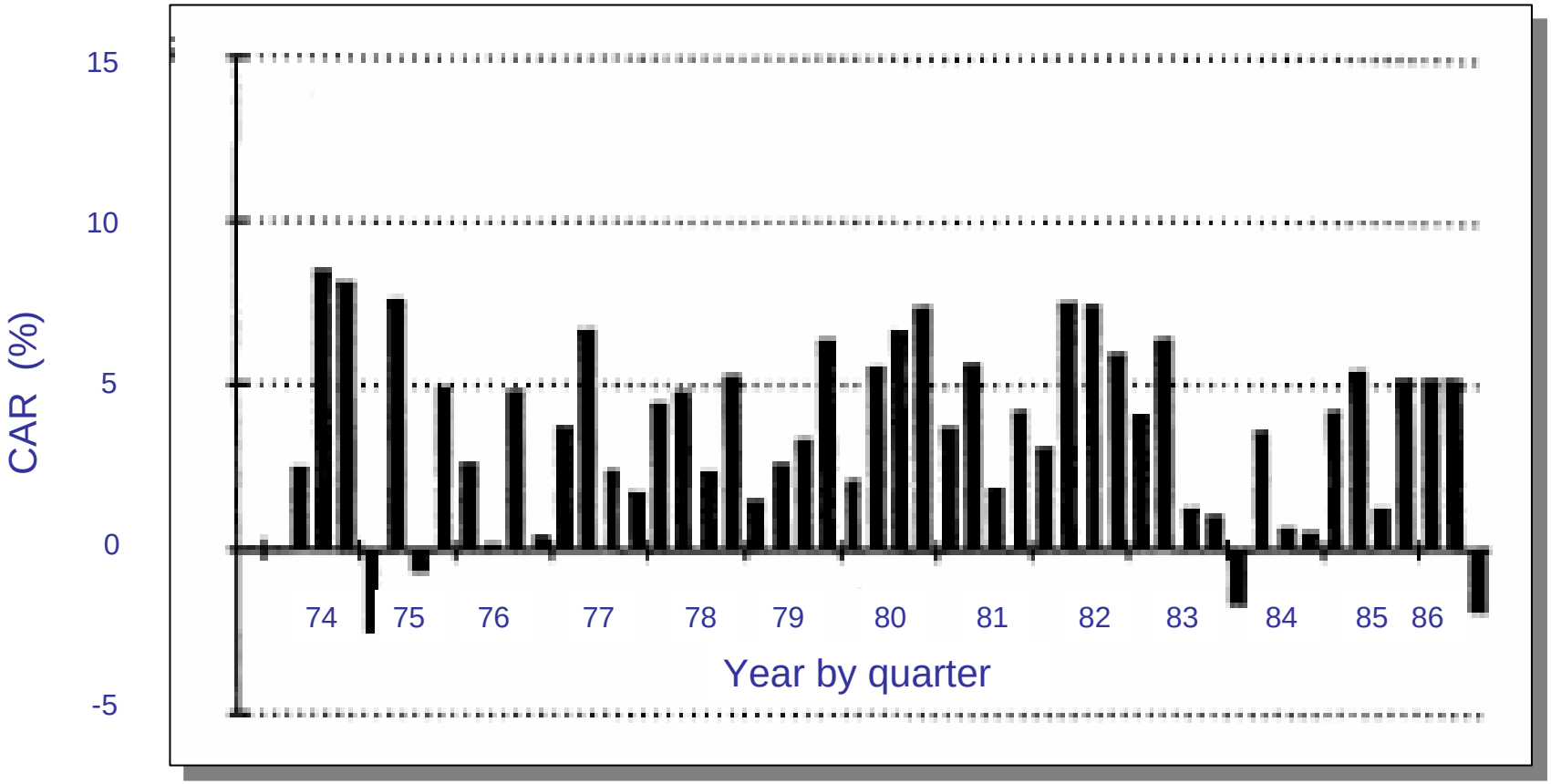
Fig . 1 Abnormal Performance Indexes for Various Portfolios

Bernard & Thomas (1989), Replication of FOS (1984)

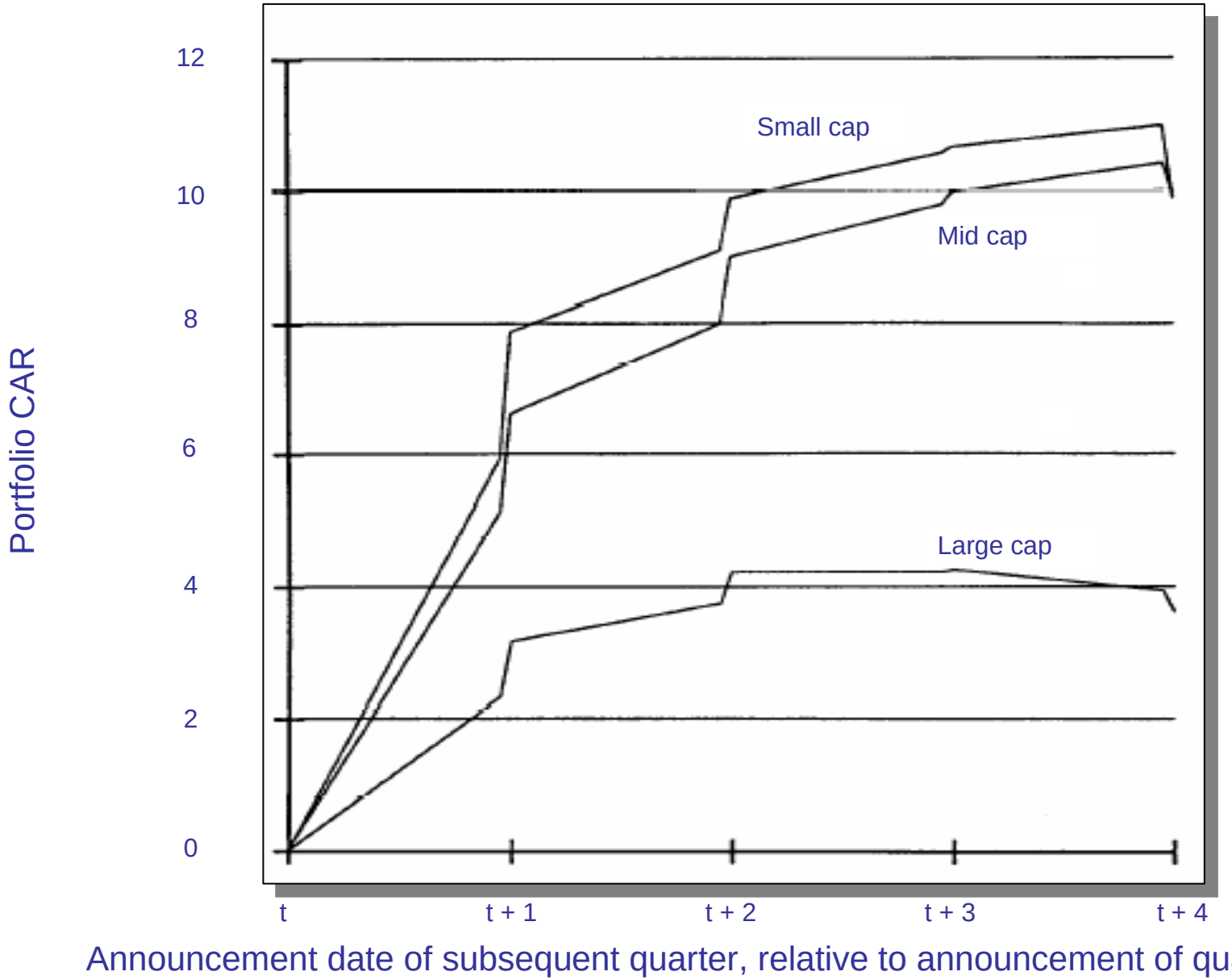


Bernard & Thomas (1989)

Performance of PEAD hedge portfolios by quarter



Bernard and Thomas (1990)



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.
  - Unlikely given the extensive testing of B&T (1989,1990).
- 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).

- $\mathbf{Q_{jt} = \delta_{jt} + Q_{jt-4} + \varepsilon_{jt}}$

  Q_{jt} is income before extraordinary items for firm j in quarter t.

  δ_{jt} is a constant

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

$$SUE_{jt} = \frac{\left(Q_{jt} - \delta_{jt} - Q_{jt-4}\right)}{\sigma_{jt}}$$

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.

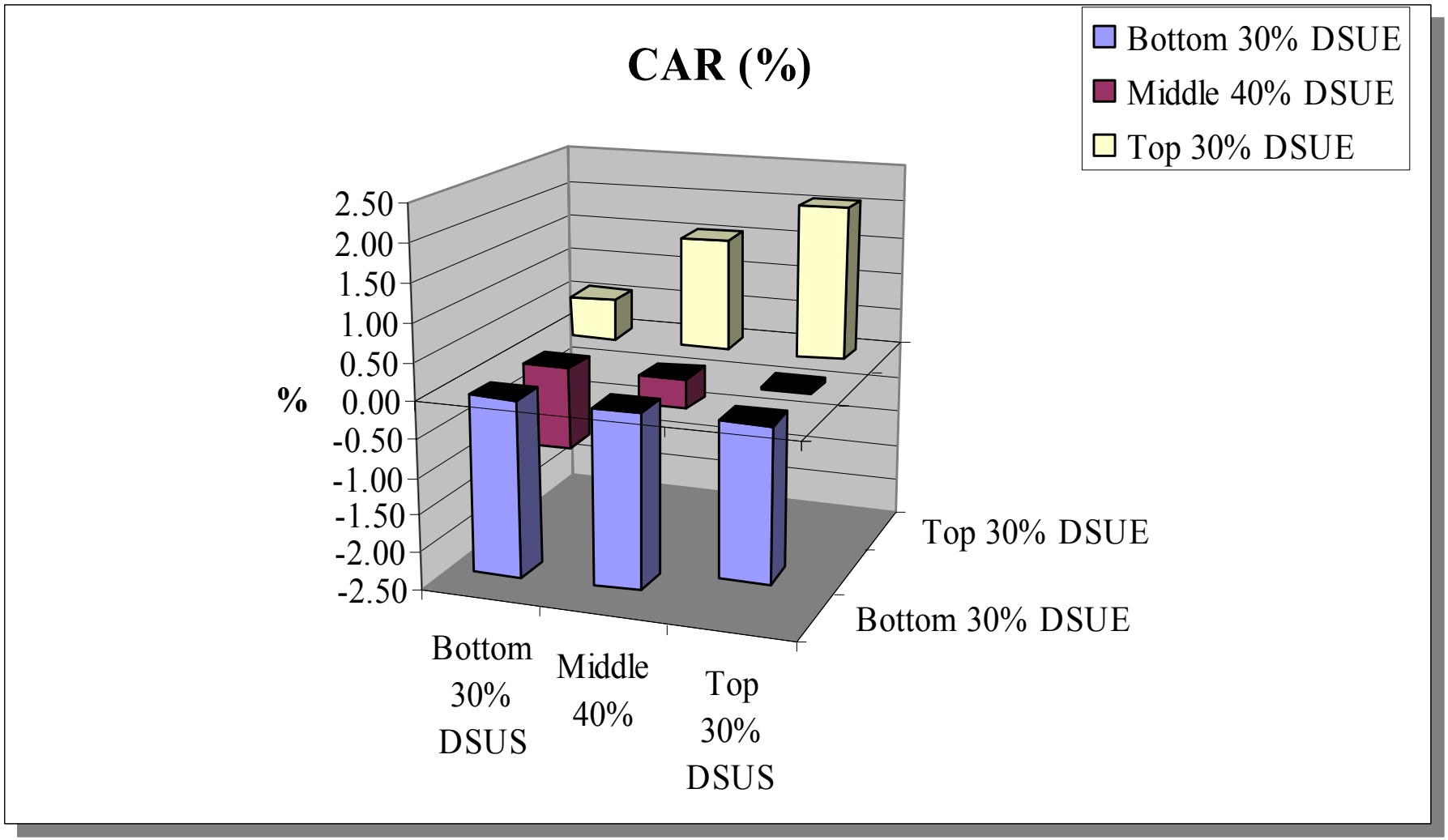
Assignment to Deciles

- 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.

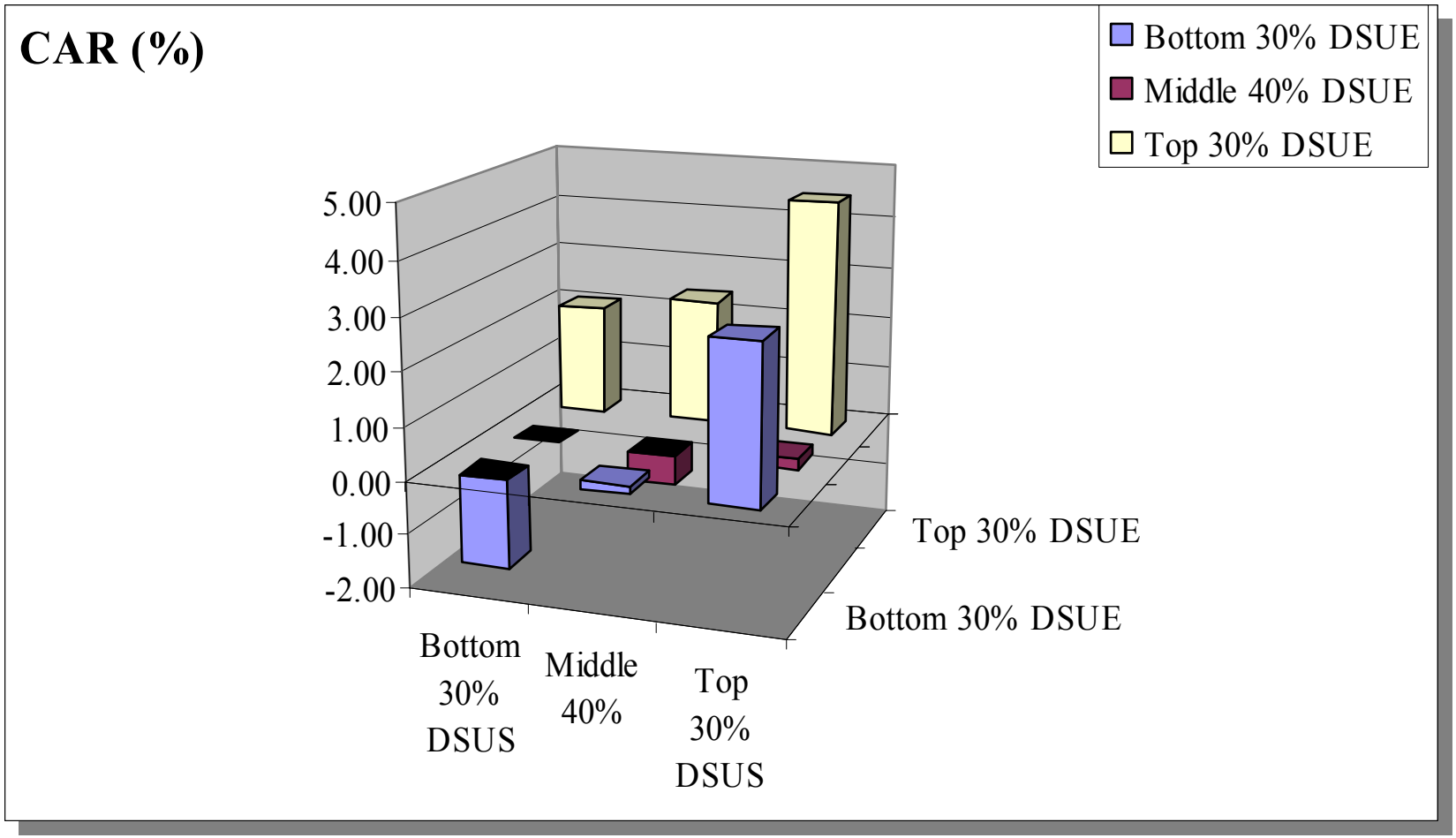
Other Variables

- 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



Abnormal Returns – Analyst Forecasts



Regression of CAR on DSUE, DSUS and Controls

Panel A: Historical SUE									
	Intercept	DSUE Earnings	DSUE Sales	Institnl. Holding	Arbitrg. Risk	Trading Volume	N	R-Sqr.	Signf.
Expected sign		+	+	-	+	-			
Earnings only	-2.933	5.640					164400	0.005	0.001
Significance (t-stat)	0.001	0.001							
Earnings and sales	-3.224	5.255	1.030				164400	0.005	0.001
Significance (t-stat)	0.001	0.001	0.001						
Earnings, Sales and Controls	-3.357	8.958	1.229	-0.718	0.057	-0.913	142420	0.007	0.001
Significance (t-stat)	0.001	0.001	0.001	0.001	0.005	0.005			

Regression of CAR on DSUE, DSUS and Controls

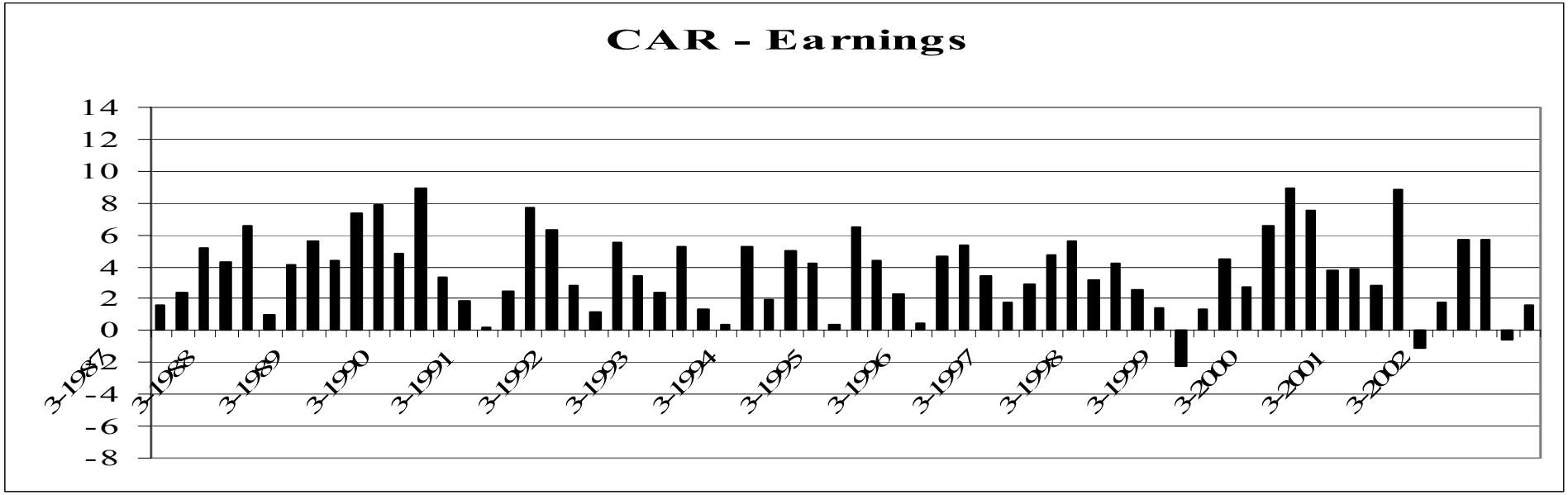
Panel C: Analyst Forecast Earnings and Sales SUE	Intercept	DSUE Earnings	DSUE Sales	Institnl. Holding	Arbitrg. Risk	Trading Volume	N	R-Sqr.	Signf.
Earnings only	**-1.569**	**5.019**					9131	**0.003**	**0.001**
Significance (t-stat)	**0.004**	**0.001**							
Earnings and sales	**-2.427**	**4.261**	**2.792**				9131	**0.004**	**0.001**
Significance (t-stat)	**0.001**	**0.001**	**0.010**						
Earnings, Sales and Controls	-1.281	-1.621	**2.420**	0.425	0.117	0.575	7788	**0.003**	**0.001**
Significance (t-stat)	0.077	0.590	**0.032**	0.230	0.358	0.370			

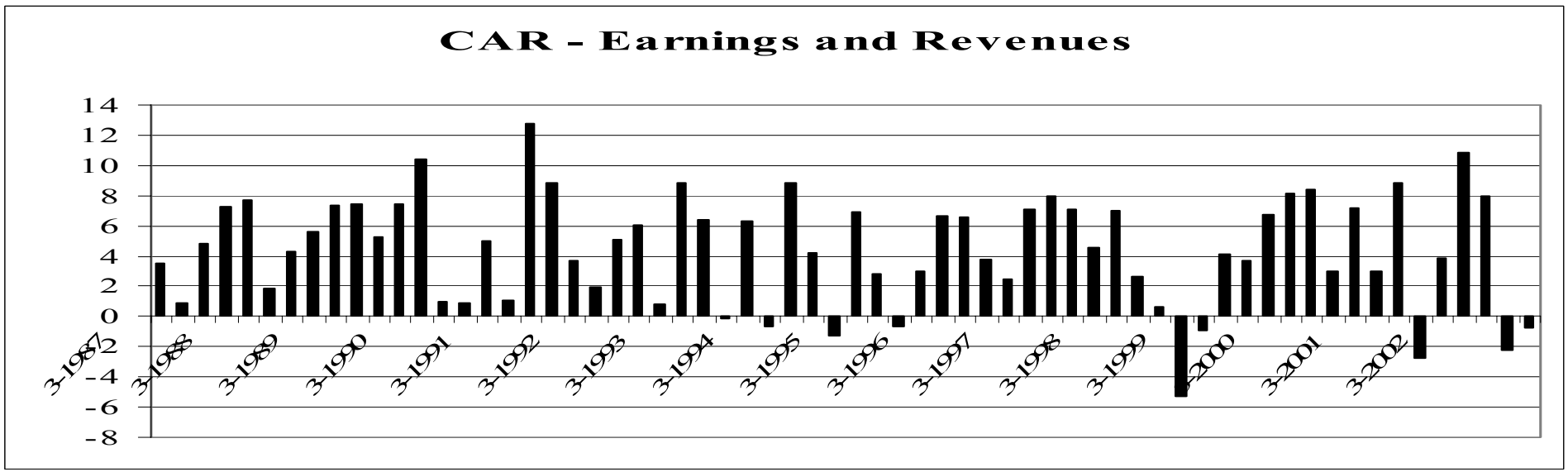
Hedge Portfolio

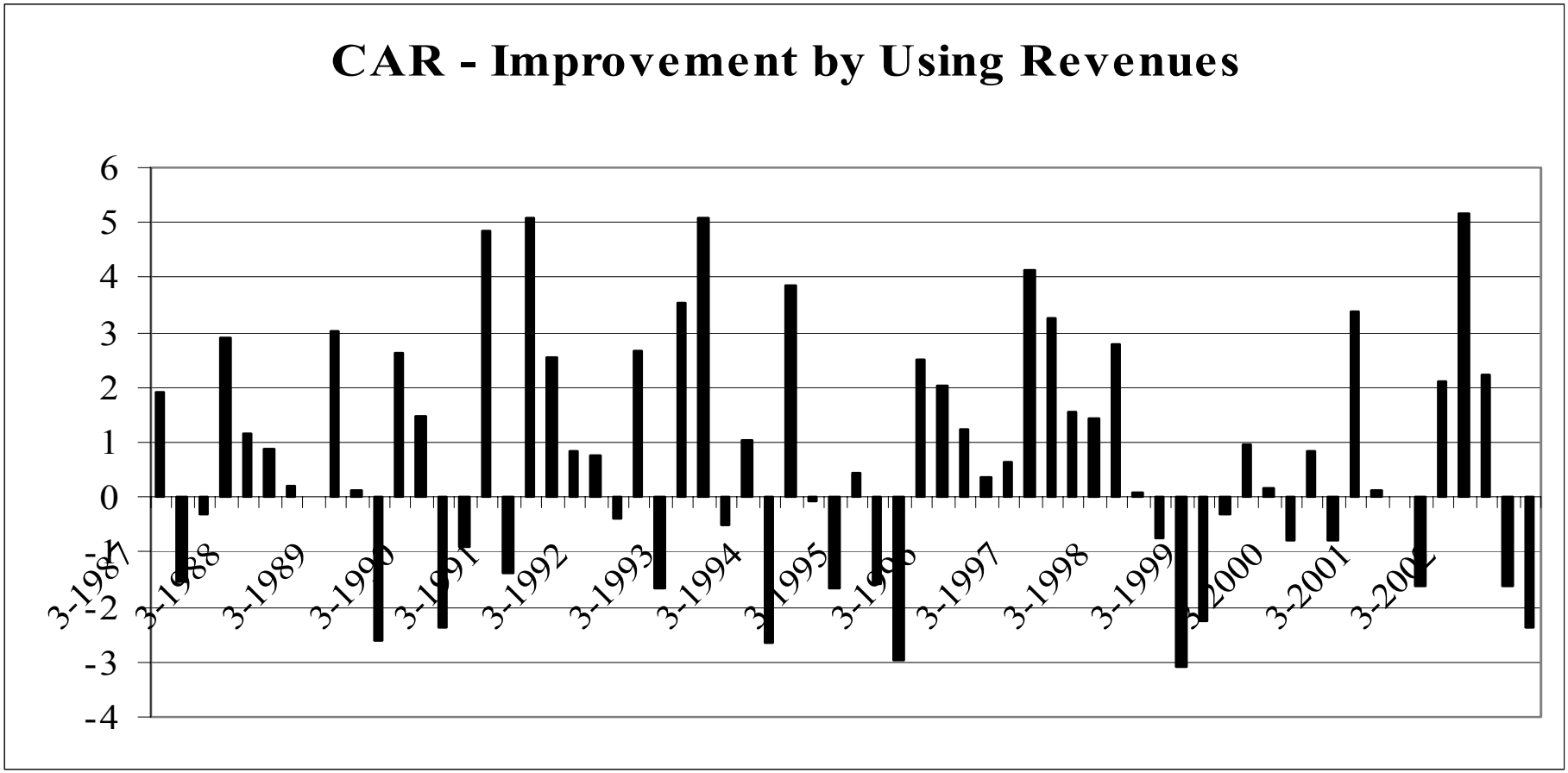
- Earnings only -- long positions in the top 30% SUE and short positions in the bottom 30% SUE.
- Earnings and sales -- long positions in the top 30% of both SUE and SUS, and short positions in the bottom 30% of both SUE and SUS.
- Average returns over all available quarters.

Hedge Portfolio Returns

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


CAR - Earnings
14
12
10
8
6
4
2
0
-2
-4
-6
-8
3-1987
3-1988
3-1989
3-1990
3-1991
3-1992
3-1993
3-1994
3-1995
3-1996
3-1997
3-1998
3-1999
3-2000
3-2001
3-2002


CAR - Earnings and Revenues
14
12
10
8
6
4
2
0
-2
-4
-6
-8
3-1987
3-1988
3-1989
3-1990
3-1991
3-1992
3-1993
3-1994
3-1995
3-1996
3-1997
3-1998
3-1999
3-2000
3-2001
3-2002


CAR - Improvement by Using Revenues
6
5
4
3
2
1
0
-1
-2
-3
-4
3-1987
3-1988
3-1989
3-1990
3-1991
3-1992
3-1993
3-1994
3-1995
3-1996
3-1997
3-1998
3-1999
3-2000
3-2001
3-2002

Hedge Portfolio Returns – Various Sub-Samples

Sub-sample	Earning	Earnings & Revenue	Difference		Short Positions Difference		Long Positions Difference	
	Return	Return	Return	Signif.	Return	Signif.	Return	Signif.
Growth (Below-median B/M)	3.52	4.73	**1.21**	**0.009**	0.08	0.752	**1.13**	**0.002**
Value (Above-median B/M)	3.75	4.25	**0.50**	**0.071**	-0.15	0.371	**0.65**	**0.005**
Large (Above-median size)	2.57	2.50	-0.07	0.872	-0.10	0.739	0.03	0.923
Small (Below-median size)	4.47	5.38	**0.90**	**0.003**	0.00	0.986	**0.90**	**0.001**
Low Earnings Persistence	3.98	5.13	**1.15**	**0.003**	0.28	0.218	**0.87**	**0.002**
High Earnings Persistence	3.63	4.29	**0.66**	**0.035**	0.01	0.948	**0.65**	**0.008**
Low Correlation of Earnings and OCF	3.39	4.48	**1.09**	**0.002**	0.09	0.603	**1.00**	**0.000**
High Correlation of Earnings and OCF	4.17	4.58	0.42	0.237	-0.15	0.480	**0.57**	**0.051**
Low Proportion of Accruals	3.94	5.06	**1.12**	**0.002**	0.22	0.385	**0.90**	**0.000**
High Proportion of Accruals	3.69	3.89	0.20	0.582	**-0.35**	**0.052**	0.55	0.100
Low Institutional Holdings	4.37	5.20	**0.83**	**0.010**	-0.02	0.895	**0.85**	**0.002**
High Institutional Holdings	2.80	3.35	0.56	0.132	0.05	0.864	**0.51**	**0.031**
Low Volume	4.16	4.96	**0.80**	**0.026**	0.02	0.914	**0.78**	**0.005**
High Volume	3.11	3.25	**0.81**	**0.043**	0.05	0.825	**0.76**	**0.011**
Low Arbitrage Risk	3.17	3.65	0.49	0.205	-0.19	0.335	**0.68**	**0.025**
High Arbitrage Risk	4.62	5.78	**1.15**	**0.000**	0.21	0.342	**0.94**	**0.000**

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

Sample		1987 to 2003	1987 to 1995	1996 to 2003
All		0.26	0.26	0.25
Book-to-Market	Value	0.29	0.30	0.28
	Growth	0.23	0.24	0.22
Size	Small	0.29	0.30	0.28
	Large	0.18	0.19	0.18

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.