Econ 219B
Psychology and Economics: Applications
(Lecture 10)

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Outline

1. Market Reaction to Biases: Introduction

2. Market Reaction to Biases: Pricing

3. Market Reaction to Biases: Corporate decisions

1 Market Reaction to Biases: Introduction

- So far, we focused on consumer deviations from standard model:

  1. Self-control and naivete'

  2. Reference dependence

  3. Narrow Framing

- Who exhibits these deviations?

    1. **Self-control and naivete'.** Consumers (health clubs, food, credit cards, smoking), workers (retirement saving, benefit take-up)

    2. **Reference dependence.** Workers (labor supply, increasing wages), (inexperienced) traders (sport cards), financial investors, house owners

    3. **Narrow Framing.** Consumers (environmental goods, coherent arbitrariness, housing choice, insurance choice)

- What is missing from picture?

- Experienced agents!

- Firms!

- In a market, interaction between different groups

- Everyone ‘born’ with biases

- Effect of biases lower if:

  - learning

  - advice

  - consulting

  - specialization

- For which agents are these conditions likely to be satisfied?

- Firms

- In particular, firms are likely to be aware of biases.

- Implications?

- Study biases in the market

- Four major instances:

  – Interaction between experienced and inexperienced agents (noise traders – see Lecture 9)

  – Interaction between firms and consumers (contract design, price choice)

  – Interaction between managers and investors (corporate finance)

  – Interaction between employers and employees (labor economics)

  – Interaction between politicians and voters (political economy)

2 Market Reaction to Biases: Pricing

2.1 Self-Control

MARKET (I). INVESTMENT GOODS

Firm

- Monopoly
- Two-part tariff: L (lump-sum fee), p (per-unit price)
- Cost: set-up cost K, per-unit cost a

Consumption of investment good

Payoffs relative to best alternative activity:

- Cost c at $t = 1$, stochastic
  - non-monetary cost

  - experience good, distribution $F(c)$

- Benefit $b > 0$ at $t = 2$, deterministic

CONSUMER BEHAVIOR.

- Long-run plans at $t = 0$:

Consume $\Longleftrightarrow \beta\delta(-p - c + \delta b) > 0$

$\Longleftrightarrow c < \delta b - p$

- Actual consumption decision at $t = 1$:

Consume $\Longleftrightarrow c < \beta\delta b - p$ (Time Inconsistency)

- Forecast at $t = 0$ of consumption at $t = 1$:

Consume $\Longleftrightarrow c < \hat{\beta}\delta b - p$ (Naiveté)

FIRM BEHAVIOR. Profit-maximization

$$\max_{L,p} \delta \left\{L - K + F\left(\beta\delta b - p\right)\left(p - a\right)\right\}$$

$$\text{s.t. } \beta\delta \left\{-L + \int_{-\infty}^{\hat{\beta}\delta b - p} \left(\delta b - p - c\right) dF\left(c\right)\right\} \geq \beta\delta\overline{u}$$

Solution for the per-unit price p^*:

$$
\begin{aligned}
p^* \;=\;& a && \text{[exponentials]} \\
& -\left(1-\hat{\beta}\right)\delta b \frac{f\left(\hat{\beta}\delta b - p^*\right)}{f\left(\beta\delta b - p^*\right)} && \text{[sophisticates]} \\
& -\frac{F\left(\hat{\beta}\delta b - p^*\right) - F\left(\beta\delta b - p^*\right)}{f\left(\beta\delta b - p^*\right)} && \text{[naives]}
\end{aligned}
$$

Features of the equilibrium

1. *Exponential agents* ($\beta = \hat{\beta} = 1$).
   Align incentives of consumers with cost of firm
   $\Longrightarrow$ marginal cost pricing: $p^* = a$.

2. *Hyperbolic agents.* Time inconsistency
   $\Longrightarrow$ below-marginal cost pricing: $p^* < a$.

   (a) *Sophisticates* ($\beta = \hat{\beta} < 1$): commitment.

   (b) *Naives* ($\beta < \hat{\beta} = 1$): overestimation of consumption.

MARKET (II). LEISURE GOODS

Payoffs of consumption at $t = 1$:

- Benefit at $t = 1$, stochastic
- Cost at $t = 2$, deterministic

$\Longrightarrow$ Use the previous setting:

$-c$ is "current benefit",

$b < 0$ is "future cost."

Results:

1. *Exponential agents.*

   Marginal cost pricing: $p^* = a$, $L^* = K$ (PC).

2. *Hyperbolic agents* tend to overconsume. $\Longrightarrow$

   Above-marginal cost pricing: $p^* > a$.

   Initial bonus $L^* < K$ (PC).

EMPIRICAL PREDICTIONS

Two predictions for time-inconsistent consumers:

1. Investment goods (Proposition 1):
   (a) Below-marginal cost pricing
   (b) Initial fee (Perfect Competition)
2. Leisure goods (Corollary 1)
   (a) Above-marginal cost pricing
   (b) Initial bonus or low initial fee (Perfect Competition)

FIELD EVIDENCE ON CONTRACTS

- US Health club industry ($11.6bn revenue in 2000)
  - monthly and annual contracts
  - Estimated marginal cost: $3-$6 + congestion cost
  - Below-marginal cost pricing despite...
  - ...Small transaction costs
  - ...Price discrimination

- Vacation time-sharing industry ($7.5bn sales in 2000)
  - high initial fee: $11,000 (RCI)
  - minimal fee per week of holiday: $140 (RCI)

- Credit card industry ($500bn outstanding debt in 1998)
  - Resale value of credit card debt: 20% premium (Ausubel, 1991)
  - No initial fee, bonus (car / luggage insurance)
  - Above-marginal-cost pricing of borrowing

- Gambling industry: Las Vegas hotels and restaurants:
  - Price rooms and meals below cost, at bonus
  - High price on gambling

WELFARE EFFECTS

Result 1. Self-control problems + Sophistication $\Rightarrow$ First best

- Consumption if $c \leq \beta\delta b - p^*$

- Exponential agent:
  - $p^* = a$
  - consume if $c \leq \delta b - p^* = \delta b - a$

- Sophisticated time-inconsistent agent:
  - $p^* = a - (1 - \beta)\delta b$
  - consume if $c \leq \beta\delta b - p^* = \delta b - a$

- Perfect commitment device

- Market interaction maximizes joint surplus of consumer and firm

Result 2. Self-control + Partial naiveté $\Rightarrow$ Real effect of time inconsistency

- $p^* = a - [F(\delta b - p^*) - F(\beta\delta b - p^*)]/f(\beta\delta b - p^*)$

- Firm sets p^* so as to accentuate overconfidence

- Two welfare effects:
  - Inefficiency: $\text{Surplus}_{\text{naive}} \leq \text{Surplus}_{\text{soph.}}$
  - Transfer (under monopoly) from consumer to firm

- Profits are increasing in naivete' $\hat{\beta}$(monopoly)

- $\text{Welfare}_{\text{naive}} \leq \text{Welfare}_{\text{soph.}}$

- Large welfare effects of non-rational expectations

2.2 Self-Control 2

- Kfir and Spiegler (2004), Contracting with Diversely Naive Agents.

- Extend DellaVigna and Malmendier (2004):
  - incorporate heterogeneity in naiveté
  - allow more flexible functional form in time inconsistency
  - different formulation of naiveté

- Setup:

  1. Actions:

     – Action $a \in [0, 1]$ taken at time 2

     – At time 1 utility function is $u(a)$

     – At time 2 utility function is $v(a)$

  2. Beliefs: At time 1 believe:

     – Utility is u with probability θ

     – Utility is v with probability $1 - \theta$

     – Heterogeneity: Distribution of types θ

  3. Transfers:

     – Consumer pays firm $t(a)$

     – Restrictive assumption: no cost to firm of providing a

- Therefore:
  - Time inconsistency ($\beta < 1$) –> Difference between u and v
  - Naiveté ($\hat{\beta} > \beta$) –> $\theta > 0$
  - Partial naiveté here modelled as stochastic rather than deterministic
  - Flexibility in capturing time inconsistency (self-control, reference dependence, emotions)

- Main result:

- **Proposition 1.** There are two types of contracts:

  1. Perfect commitment device for sufficiently sophisticated agents ($\theta < \underline{\theta}$)

  2. Exploitative contracts for sufficiently naive agets ($> \underline{\theta}$)

- Commitment device contract:

  - Implement $a_\theta = \mathsf{max}_a\, u(a)$

  - Transfer:

    * $t(a_\theta) = \mathsf{max}_a\, u(a)$

    * $t(a) = \infty$ for other actions

  - Result here is like in DM: Implement first best

- Exploitative contract:
  - Agent has negative utility:

$$u(a_\theta) - t(a_\theta) < 0$$

  - Maximize overestimation of agents:

$$a_\theta^u = \arg\max\left(u(a) - v(a)\right)$$

2.3 Self-Control 3

- Oster&Scott-Morton, Pricing of Magazine Subscriptions, 2004

- Two types of magazines:

  - *People*

  - *Astronomy*

- Individuals with self-control problems want to commit to read *Astronomy* more

- Higher demand of subscriptions for *Astronomy* than for *People*

- Magazines offers deeper discount on subscription on *People*

- Data on 300 US magazines (ABC, MRI)
- Three measures of *Astronomy* (vs. *People*):
  1. Expert (0/1). RA rating of whether sources mentioned
  2. Genre: Non-business trade, Religion, Intellectual
  3. Pride-Future Gain. RA rating of "would you be proud" and "pleasure of the moment". (English PhD not representative)
- Various control variables

- Table 3. OLS regression of relative subscription price ($S/12p$):
  - All '*Astronomy* magazine' predictors associated with higher relative subscription prices
  - Magnitudes consistent: 1 SD increase –> .02-.03 higher $S/12p$

- BUT:
  1. Model makes predictions on quantities, not prices
  2. Hard to control for important counfounding factors

Table 1: A Sample of Magazine Ratings

Pride=0	Pride=6	FutureGain=3	FutureGain>12
Penthouse	Art and Antiques	Penthouse	Forbes
Playboy	Art and Auction	Playboy	Fortune
Easy riders	Barron's	The Rolling Stone	HBR
Movieline	Business Week	Spin	Kiplingers
National Enquirer	Forbes	Vibe	Astronomy
National Examiner	Fortune	The Source	Worth
People	Harvard Business Review	Entertainment Weekly	Money
Premiere	Kiplingers	Interview	New York Review of Books
Soap Opera Digest	The New Yorker	Movieline	The Nation
Soap Opera Weekly	E-The Environmental Magazine	National Enquirer	Venture Reporter
Star	Architectural Digest	National Examiner	E-The Environmental Magazine
Starlog	American Heritage	People	Red Herring
TV Guide	Foreign Policy	Premiere	American History
True Story	NY Review of Books	Soap Opera Digest	Inc
US Weekly	Smithsonian	Soap Opera Weekly	
Cat Fancy	Economist	Star	
Traier Life	The Nation	Starlog	
Details	Faith & Family	Ttrue Story	
Maxim	Reform Judaism	US Weekly	
ESPN Magazine		Advocate	
Cosmopolitan		Details	
In Style		Maxim	
Marie Claire		Jet	
Amazing Spiderman		ESPN	
Cosmo Girl!		Amazing Spiderman	
Realms of Fantasy		Mad	
Teen		Realms of Fantasy	
Teen People		Teen People	

Table 3: Regression Results

Dependent Variable: One year subscription rate/ (newsstand price*number of annual issues)

Variable	*(1) Expert*	*(2) Genre*	*(3) Pride*	*(4) FutureGain*
Circulation	4.22E-08** (9.25E-09)	3.76E-08** (9.14^{E}-09)	4.09^{E}-08** (9.17^{E}-09)	4.19^{E}-08** (9.26^{E}-09)
Ln(Circ)	-0.53** (.011)	-.043** (.011)	-.047** (.011)	-.052** (.011)
Available	-.012** (.004)	-.012** (.004)	-.014** (.004)	-.013** (.004)
Number of issues	-.0055** (.0010)	-.0060** (.0010)	-.0056** (.0010)	-.0056** (.0010)
No. issues interaction	.0021 (.0011)	.0023** (.0011)	.0022 (.0011)	.0020 (.0011)
Intro offer	-.140** (.037)	-.160** (.037)	-.145** (.036)	-.144** (.037)
Ad rate	-.276** (.109)	-.247** (.107)	-.278** (.108)	-.275** (.109)
Expert	.054** (.022)	……..	……..	…..
Trade	…………	.136** (.047)	………	…..
Religious	……….	.130** (.051)	………..	….
Intellectual	………	.072** (.035)	…….	…
Pride	……….	……….	.020** (.006)	….
FutureGain	………..	……….	….	.0096** (.0043)
Constant	1.44** (.139)	1.33** (.140)	1.34** (.144)	1.38** (.147)
No observations	298	298	298	298
Adj R^2	.273	.295	.282	.270

** significant at the .05 level or better
Standard errors in parentheses

3 Market Reaction to Biases: Corporate Decisions

3.1 Accounting 1

- Degeorge, Patel, and Zeckhauser (1999)
- Constanca

Earnings Management to Exceed Thresholds
by Degeorge et al.

Presentation by Constança Esteves

April 18, 2005

PRESENTATION STRUCTURE

Paper's major findings

Why thresholds are important

Identification strategy

Critique of the paper

Suggestions for future research

PAPER'S MAJOR FINDINGS

Managers of companies manipulate earnings in response to three types of thresholds

- **Positive profits**
- **Maintenance of recent performance**
- **Meet analyst expectations**

Positive profits threshold proves predominant

Future performance of firms that seem to have boosted earnings to meet threshold is poorer than that of its control group

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WHY MANAGERS, FIRM STAKEHOLDERS AND THE MARKET CARE ABOUT THRESHOLDS?

Because thresholds are salient

- **There is a mental dividing line between meeting or failing to meet the norm**
- **Thresholds create a reference points, inducing a loss if not met (prospect theory)**
- **Thresholds as a heuristic or rule of thumb for the health of a company**

And managers have some discretion over how and when earnings are reported

- **Have some flexibility in the choice of inventory methods, estimation of pension liabilities etc.**
- **Can transfer income from one year to the next, by deferring expenses, artificially increasing sales by "stuffing the pipeline" etc.**

THIS THRESHOLD EFFECT IS IDENTIFIED BY DISCONTINUITY CLOSE TO THE THRESHOLD
Theoretical model setup

2 period model: t=1,2

L_t = true earnings, L_t is a random variable

R_t= reported earnings, $R_t \in \Re$

M_t = amount added to earnings, $M_t \in \Re$

k() = cost of manipulation (convex function)

$f(R_t,\ R_{t-1})$ **= Payoff for manager in period t**

$v(R_t,\ R_{t-1})$ **= Bonus if manager meets or surpasses benchmark**

$$R_1 = L_1 + M_1.$$

$$R_2 = L_2 - k(M_1)$$

$$f(R_t,\ R_{t-1}) = \beta R_t + v(R_t,\ R_{t-1}),$$

$$\begin{aligned} v(R_t,\ R_{t-1}) &= \gamma \text{ if } R_t \geq R_{t-1} \\ &= 0 \text{ otherwise.} \end{aligned}$$

Where managers pick M_1 to maximize

$$f(R_1,\ R_0) + \delta E[f(R_2,\ R_1)]$$

A SPECIFIC CASE OF MODEL YIELDS A DISCONTINUITY AT Z

Z = Point at which choosing M_1=-L_1 equals payoff from saving for next year

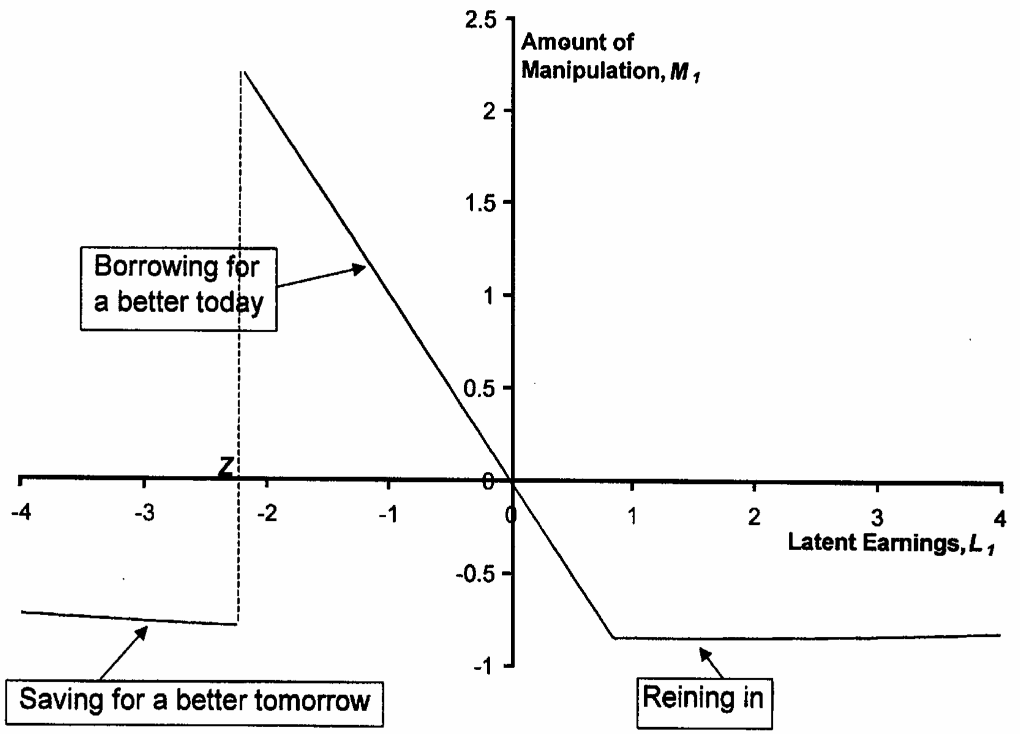


FIG. 2.—Optimal amount of period 1 manipulation, M_1, as a function of latent period 1 earnings L_1. Latent earnings L_1 are normally distributed with mean zero and standard deviation 10. If reported earnings $R_1 = L_1 + M_1$ reach at least $R_0 = 0$, the executive reaps a bonus of 10. The period 2 cost of manipulation is $k(M_1) = e^M - 1$. The executive knows L_1 exactly when choosing the manipulation level M_1.

Assumptions

- R_o=0, β=1, γ=10, δ=1
  max $f(R_o,R_1)= R_1+v(R_1,0)$
- L_1~ N(0,10), $k(M_1)=e^M-1$
- Initial threshold achieved when $L_1+M_1=0$

Findings

- Just below zero, optimal strategy is to set M_1=-L_1
- Left of Z, depress earnings now for a better future
- Right of Z, "borrowing" M_1 maximizes $f(R_o,R_1)= R_1+v(R_1,0)$
- L1 small and positive, reign in earnings

EMPIRICALLY, THE EFFECT IS IDENTIFIED USING THE AUTHORS' τ STATISTIC AND FIRM QUARTERLY DATA

Identify discontinuities close to thresholds using the authors' statistic

- **τ statistic indicates if should reject the null hypothesis that distribution at the threshold is continuous and smooth**
  - **τ statistic extrapolates from neighborhood densities to compute expected density at the threshold assuming no unusual behavior at that point**

Theoretical constructs of thresholds are as follows

- **Positive profits: $EPS \geq 0$**
- **Maintenance of recent performance: $EPS_t - EPS_{t-4} \geq 0$**
- **Meet analyst expectations: FERR= EPS-E[analyst forecasts]$\geq$0**

Data

- **Quarterly data on 5,837 firms over 1974-1996**
- **Mostly mid-cap or larger firms; not have random sample of firms**

FIRST, THE AUTHORS CHECK IF THERE ARE SYSTEMATIC VARIATIONS IN THE DATA THAT MAY BIAS THE RESULTS

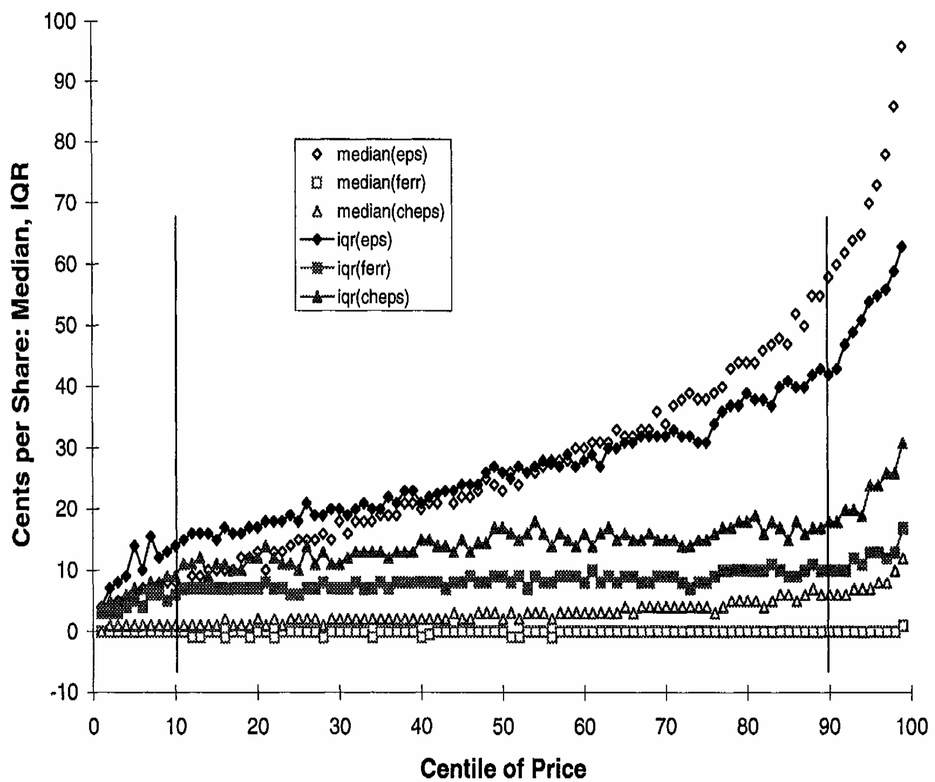


FIG. 4.—Medians and interquartile ranges for EPS, FERR, and ΔEPS as a function of centiles of price per share.

Findings

- **Problem: median EPS and EPS IQR (interquartile range) increase systematically with share price**
- **No problem: median FERR and FERR IQR do not vary systematically share price between 10th and 90th centile**
- **No problem: median ΔEPS and IQR ΔEPS also not vary systematically with share price between 10th and 90th centile**

THEN, THE AUTHOR'S LOOK FOR DISCONTINUITIES CLOSE TO THE "POSITIVE EARNINGS" THRESHOLD

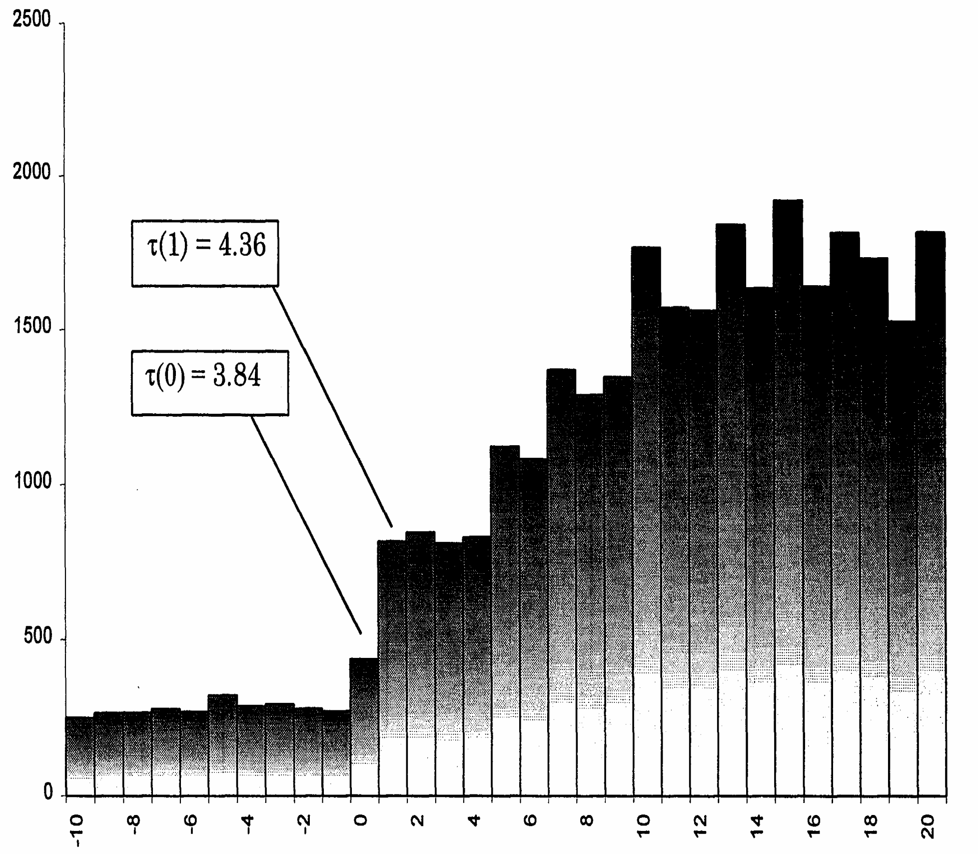


FIG. 7.—Histogram of EPS: exploring the threshold of "positive/zero profits"

Findings

- **Shaved distribution in the negative region**
- **EPS distribution with a considerable jump between 0 and 1 cents**
  - **managers seem to prefer to report strictly positive EPS**
  - **Confirmed by high τ statistic of 4.36**
- **EPS distribution with another jump between -1 and 0 cents**
  - **Confirmed by high τ statistic of 3.84**

… AND LOOK FOR DISCONTINUITIES CLOSE TO "SUSTAIN RECENT PERFORMANCE" THRESHOLD

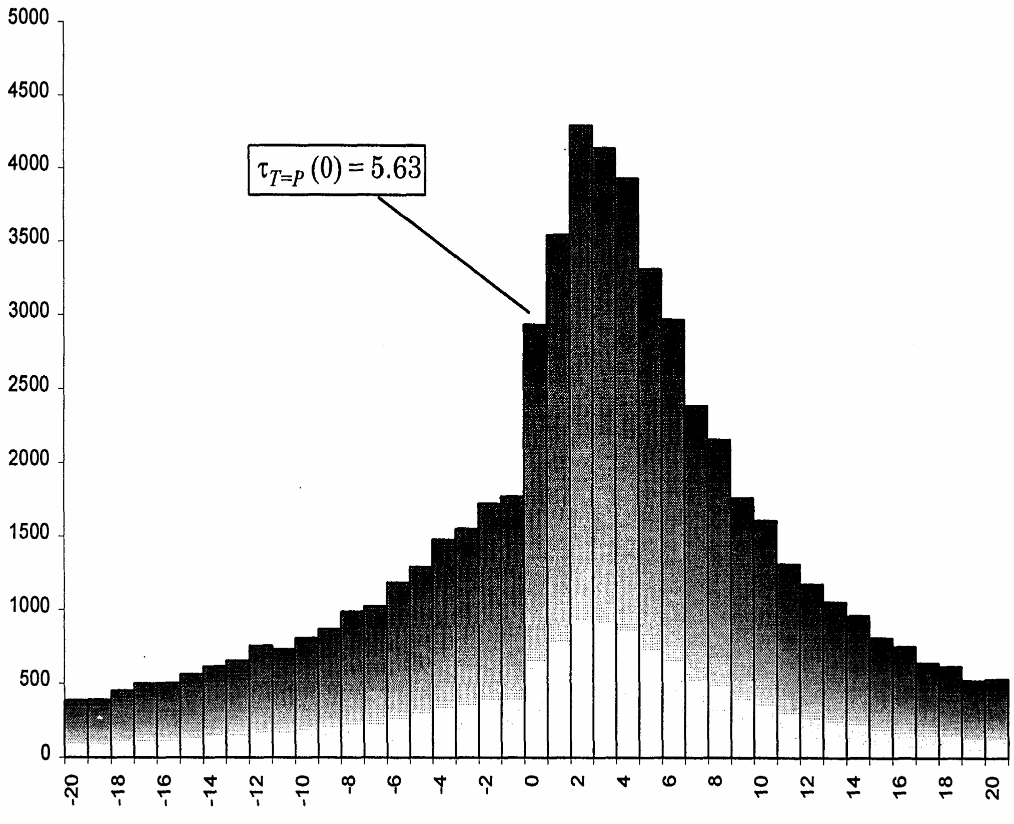


FIG. 5.—Histogram of change in EPS ($\Delta EPS = EPS_t - EPS_{t-4}$): exploring the threshold of "sustain recent performance."

Findings

- **Observe a large jump of the distribution at zero**
- **τ statistic high - reject the null that the distribution at zero is continuous and smooth**
- **Consistent with hypothesis that executives manage earnings to report comparable or higher EPS than 4 quarters ago**

… AND FINALLY, LOOK FOR DISCONTINUITIES CLOSE TO THE "MEET THE ANALYST EXPECTATIONS" THRESHOLD

Meet analyst expectations threshold

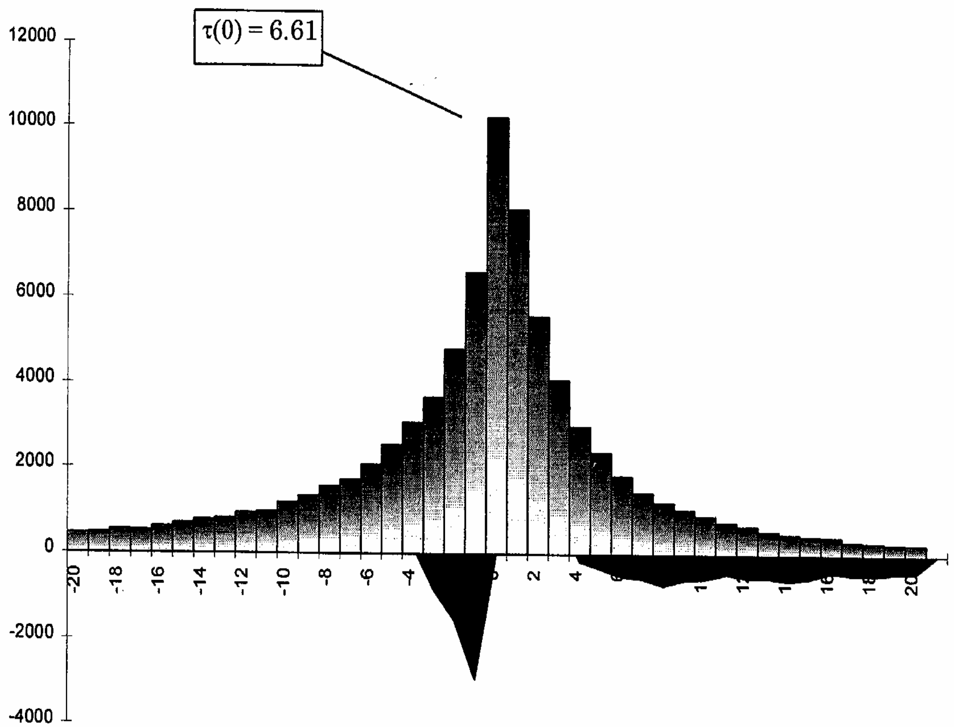


FIG. 6.—Histogram of forecast error for earnings per share: exploring the threshold of meeting analysts' expectations.

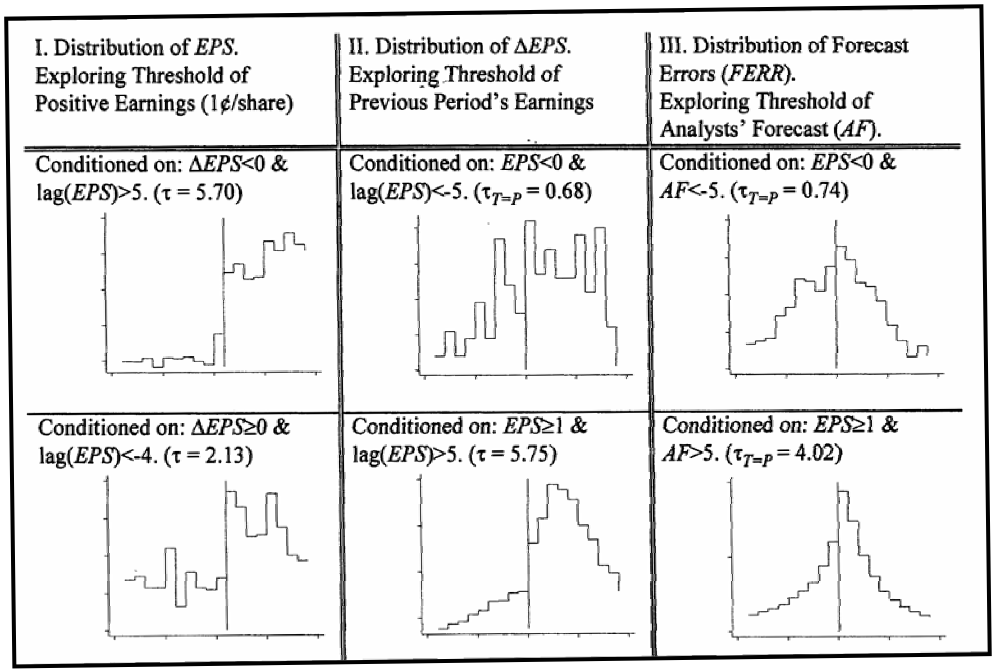
Findings

- **Distribution of FERR drops sharply below zero, though hard to see**
- **Extra pile-up of observations at zero confirmed by the high τ statistic**
- **High levels of shortfall in density close to zero (versus equidistant bin on the other side of the threshold of zero)**

THEY ALSO ANALYSE INTERACTIONS AMONG THE THRESHOLDS

Positive EPS threshold proves predominant

Example



Method

- **Condition distribution of EPS on having attained/not attained any of the the other two thresholds**
- **Conclude that positive EPS threshold is dominant**
  - **- prevails regardless of whether or not the two other thresholds are met**

LAST, THEY ANALYSE THE PERFORMANCE OF FIRMS THAT HAVE BARELY MET THE THRESHOLD

Performance in the subsequent year is poorer relative to that of control group

TABLE 1 Next Year's Relative Performance by Groups Formed around the No-Change Threshold of the Formation Quarter's ΔEPS; Subsample of Firms with ΔEPS ≥ 0 for Formation Quarter

	Groups by Performance in Formation Year			
Annual ΔEPS (Cents/Share) in Formation Quarter	A. Miss Threshold −5 to −1	B. Meet Threshold 0 to +4	C. Surpass Threshold +5 to +9	D. Strongly Surpass Threshold +10 to +14
No. of observations	1,143	2,220	3,688	4,049
Performance in following year:				
1. Mean ΔEPS	9.48	7.10	6.53	9.44
2. Median ΔEPS	13	8	9	12
3. Wilcoxon test*	4.02	−.77	−7.54	N.A.
p-values values (reporting column relative to next column)	.0001	.4389	.0000	

NOTE.—N.A. = not applicable.

* The Wilcoxon test compares a group's performance in the postformation year with that of the next group. Under the null hypothesis that the distributions of performance of the two groups being compared are the same, the Wilcoxon test is distributed standard normal ($N(0,1)$).

Confirmed for no mean reversion

- **Coefficient of ß not statistically different from zero conditional on observations where $\Delta EPS_t > 5$ in** $\Delta EPS_{t+1} = \alpha + \beta \Delta EPS_t$.

Expect that "meet threshold"group will underperform the groups immediately above "surpass threhold" and below "miss threshold"

Main finding is that mean and median ΔEPS in period two is lower for group B than for group A (significant under the Wilcoxson test)

PAPER CRITIQUE
Virtues

Tries to identify the phenomenon of earnings manipulation close to a threshold

- Widely believed to be the case

Used psychological insights, such as loss aversion, to explain why the market and managers care about thresholds

Creates a new test statistic to try to distinguish whether the pattern of the sample distribution we see close to the threshold is due to a regular continuing trend in the data or due to a discontinuity

.

PAPER CRITIQUE
Potential flaws

Theoretical model

- Strange to have the optimal amount of borrowing at time 1 (M_1) be equal to the total latent earnings (L_1) instead of the short-fall between latent and threshold earnings

Identification of the discontinuity

- Could test robustness of the results using
  - another test statistic (but perhaps not many available at the time)
  - sensitivity of results to the size of the bins

Comparison of performance of "Meet threshold firm" with just "Miss the threshold" and "Surpass threshold"

- Robustness check on whether these groups differ in the amount of mean reversion
- Treatment and control groups may vary greatly; therefore results may be explained by other factors other than earnings manipulation
  - Need to show that they are similar in other aspects, e.g. mean reversion, etc.

SUGGESTIONS FOR FUTURE RESEARCH

Investigate how other thresholds can lead to misbehavior

- Any policy that establishes a threshold for receiving rewards or punishment
  - e.g. teachers and pay-for-performance above threshold
  - e.g. electoral fraud - close elections more corrupt

Identify other methods, both parametric and non-parametric, to check for discontinuities at thresholds

.

- Issues:
  - Effect of competition: what if other firms do it? (Shleifer, AEA 2004)
  - Uncertainty about ability to meet threshold
  - Managers want to insure themselves against risks

3.2 Accounting 2

- DellaVigna and Pollet (2004)

- On Friday investors appear to be less responsive to earning surprises

- Immediate stock response to F earning surprises 20 percent lower then on non-F

- Do firms respond by timing more negative earnings on Friday?

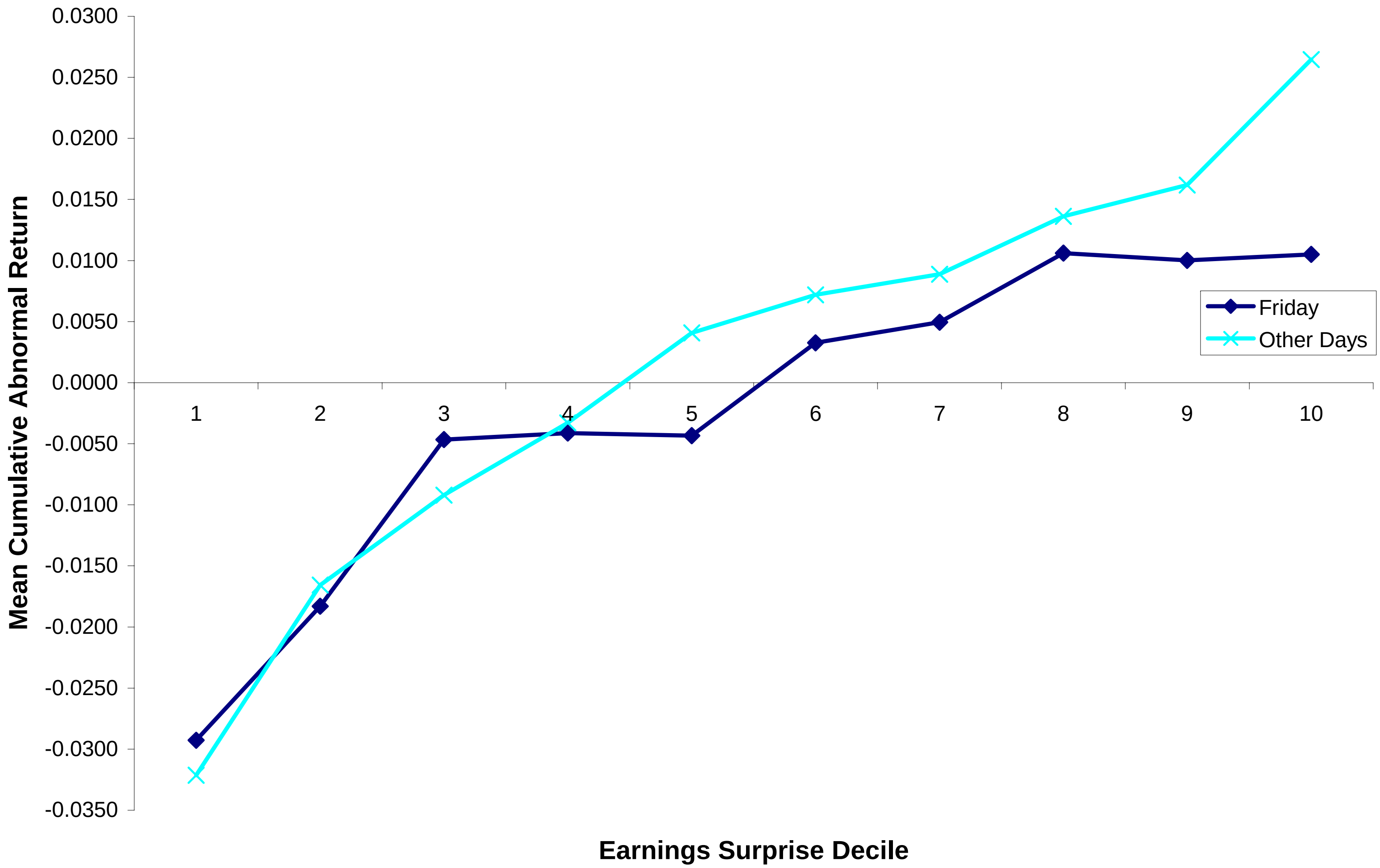
- Three measures of earning quality:

  1. Non-negative operating profits

  2. Non-negative surprise relative to analyst forecast (e^1)

  3. Returns around announcement date (0,1)

Figure 1a: Response To Earnings Surprise From 0 To +1



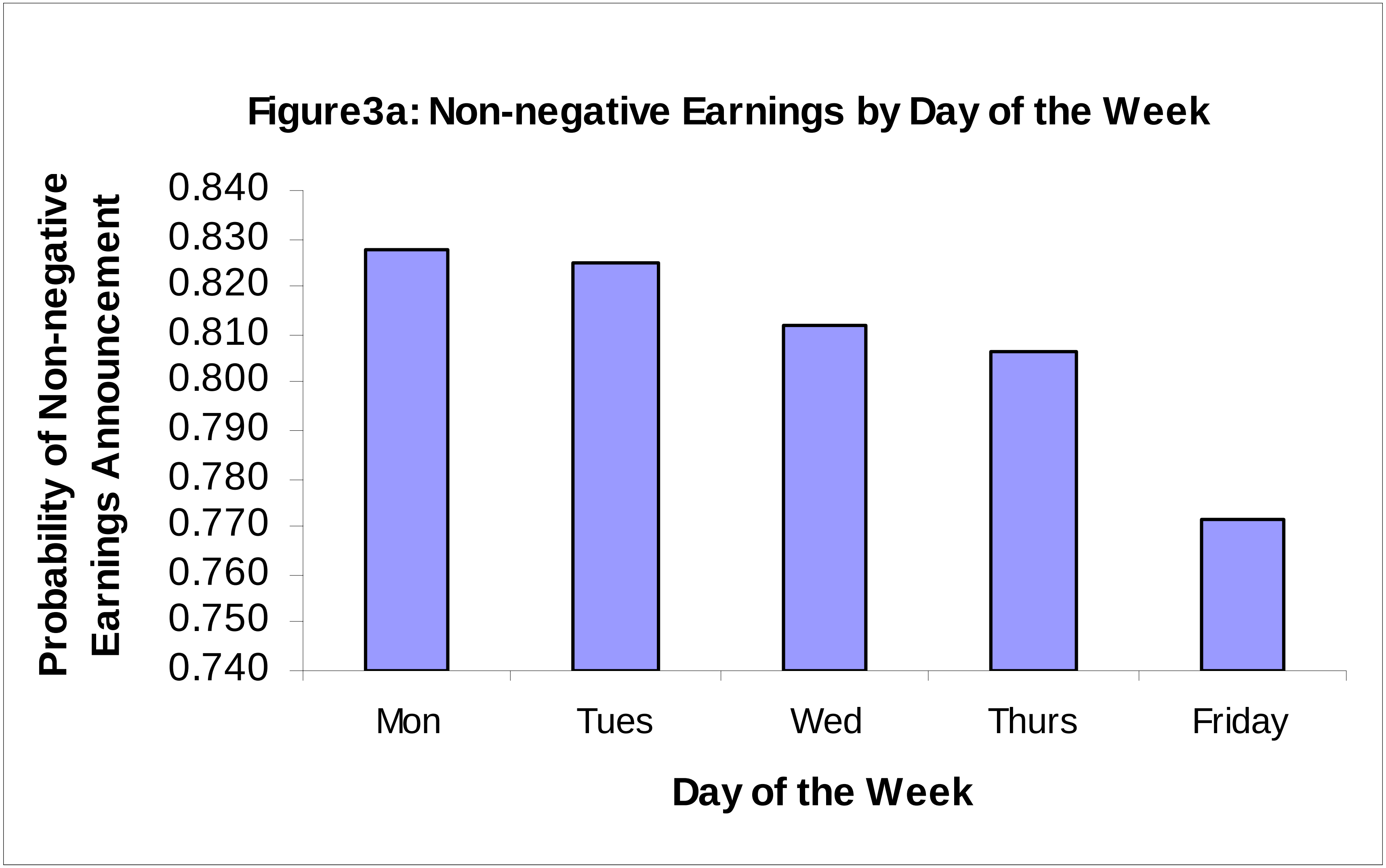


Figure3a: Non-negative Earnings by Day of the Week
Probability of Non-negative Earnings Announcement
0.840
0.830
0.820
0.810
0.800
0.790
0.780
0.770
0.760
0.750
0.740
Mon
Tues
Wed
Thurs
Friday
Day of the Week

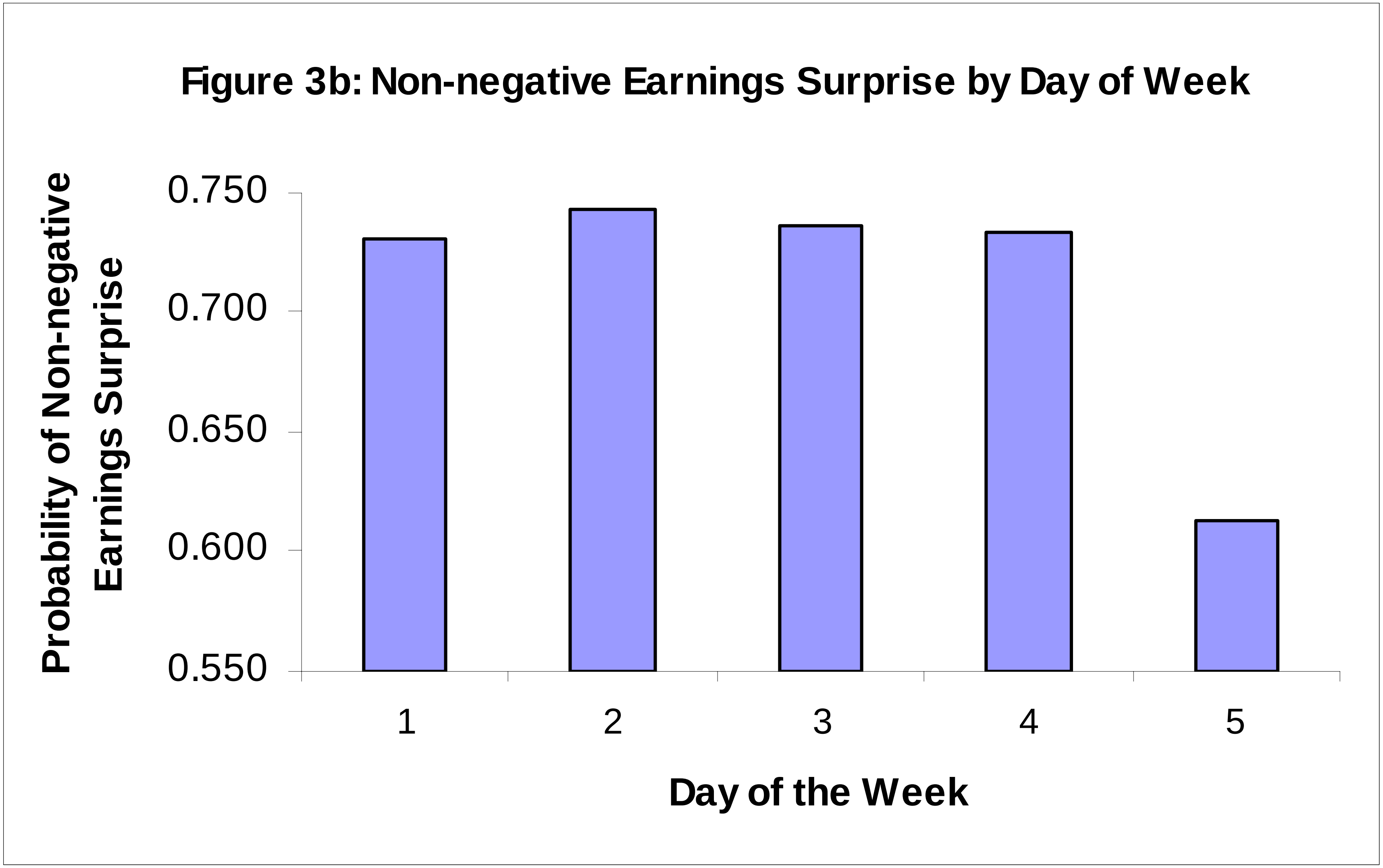


Figure 3b: Non-negative Earnings Surprise by Day of Week
Probability of Non-negative Earnings Surprise
0.750
0.700
0.650
0.600
0.550
1
2
3
4
5
Day of the Week

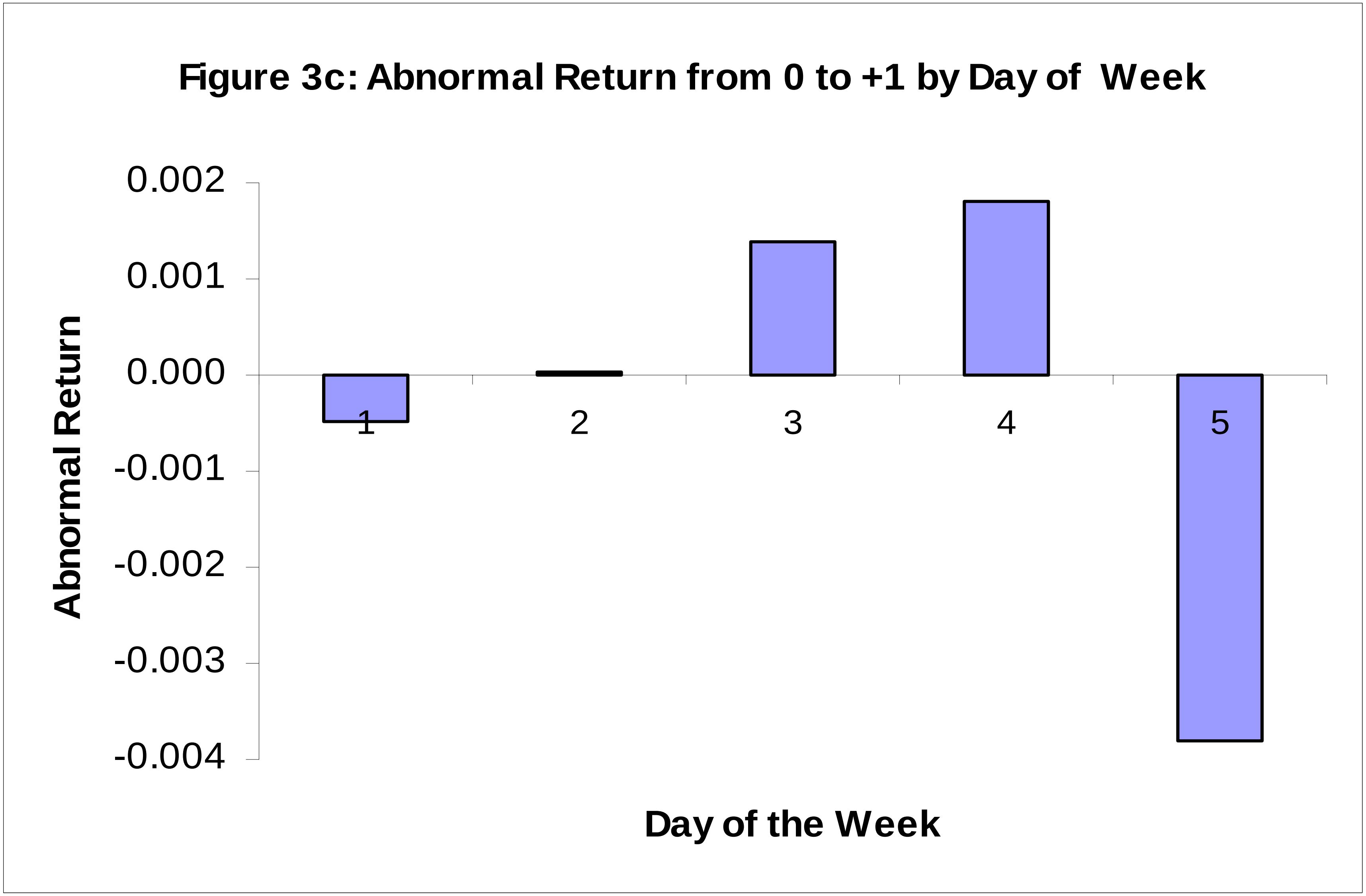


Figure 3c: Abnormal Return from 0 to +1 by Day of Week
0.002
0.001
0.000
-0.001
-0.002
-0.003
-0.004
Abnormal Return
1
2
3
4
5
Day of the Week