



Investment Course IV

September, 2009

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September, 2009



Topic Eight:

Market Efficiency & Behavioral
Finance: A Brief Overview

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An Efficient Capital Market



- ▶ A capital market is considered to be efficient if, through their trading activities, investors set the price of any particular security in a manner that *impounds new information* about that security in an *instantaneous manner*.
- ▶ Said differently, an efficient market is one in which all security prices are set as if *all available information has already been assimilated* by investors and traders and that information has been acted upon in the proper way. Thus, the only thing that will change the security's market price is the arrival of new information which, by definition, is not fully predictable.

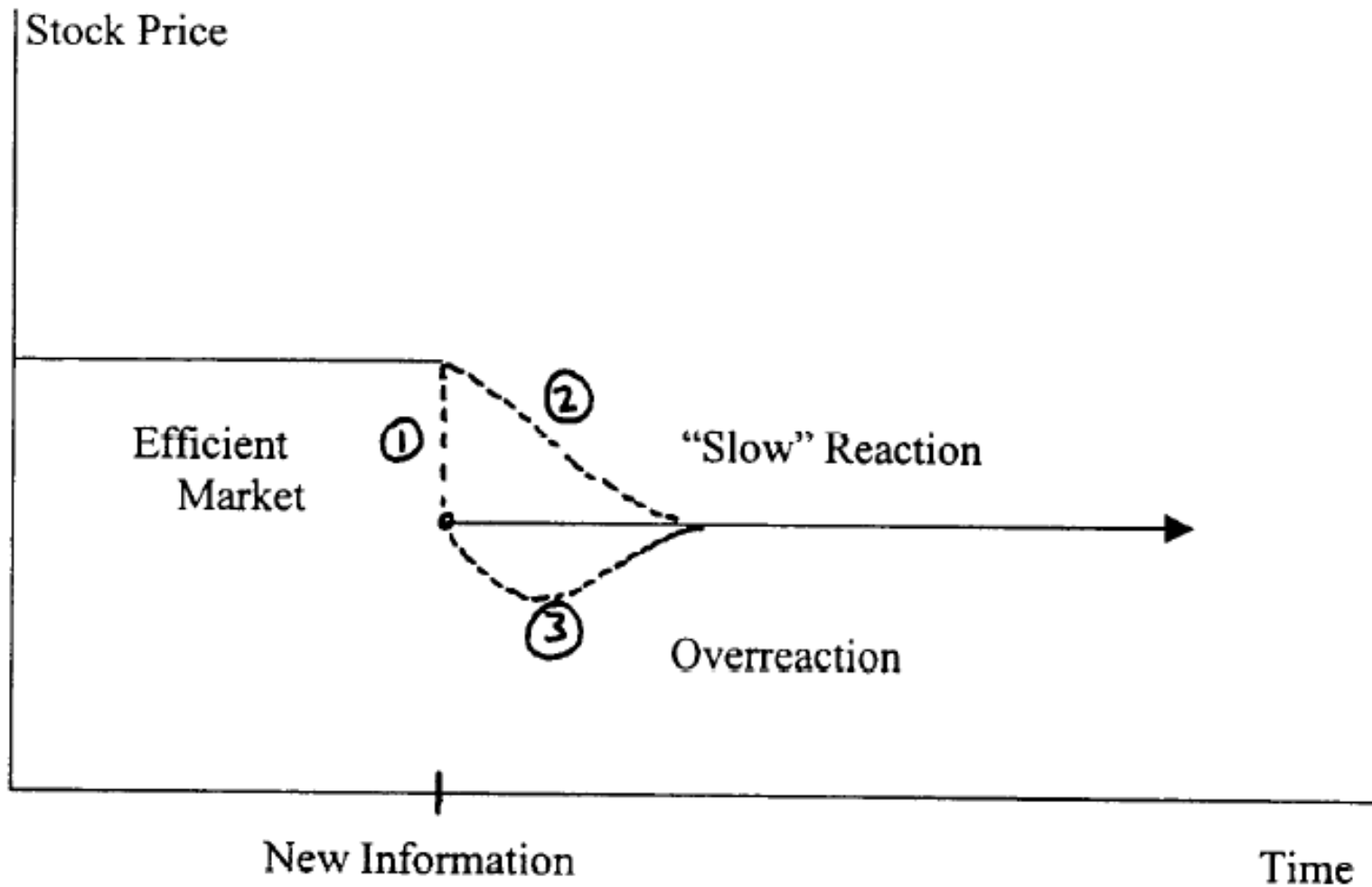
An Efficient Capital Market (cont.)



- ▶ Notice from the preceding discussion that the *critical concept* defining an efficient market is *not if* new information about a particular security is reflected in the security's market price, *but how rapidly* the price adjusts to this new information.

- ▶ In establishing whether capital markets are efficient, it is often useful to consider the nature of the information that the market is expected to react to:
 - *Weak Form Efficiency*: Information contained in past price movements only.
 - *Semi-Strong Form Efficiency*: Public information announcements (e.g., earnings announcements, corporate restructurings)
 - *Strong Form Efficiency*: Non-public information (e.g., insider trading)

Efficient vs. Inefficient Information Processing



Market Efficiency: Implications and Evidence



- ▶ One direct implication of capital markets that are *economically* (if not perfectly) *efficient* is that it will be *impossible* over time for a money manager *to consistently add “alpha”* to a client’s portfolio through such activities as market timing or superior stock selection.

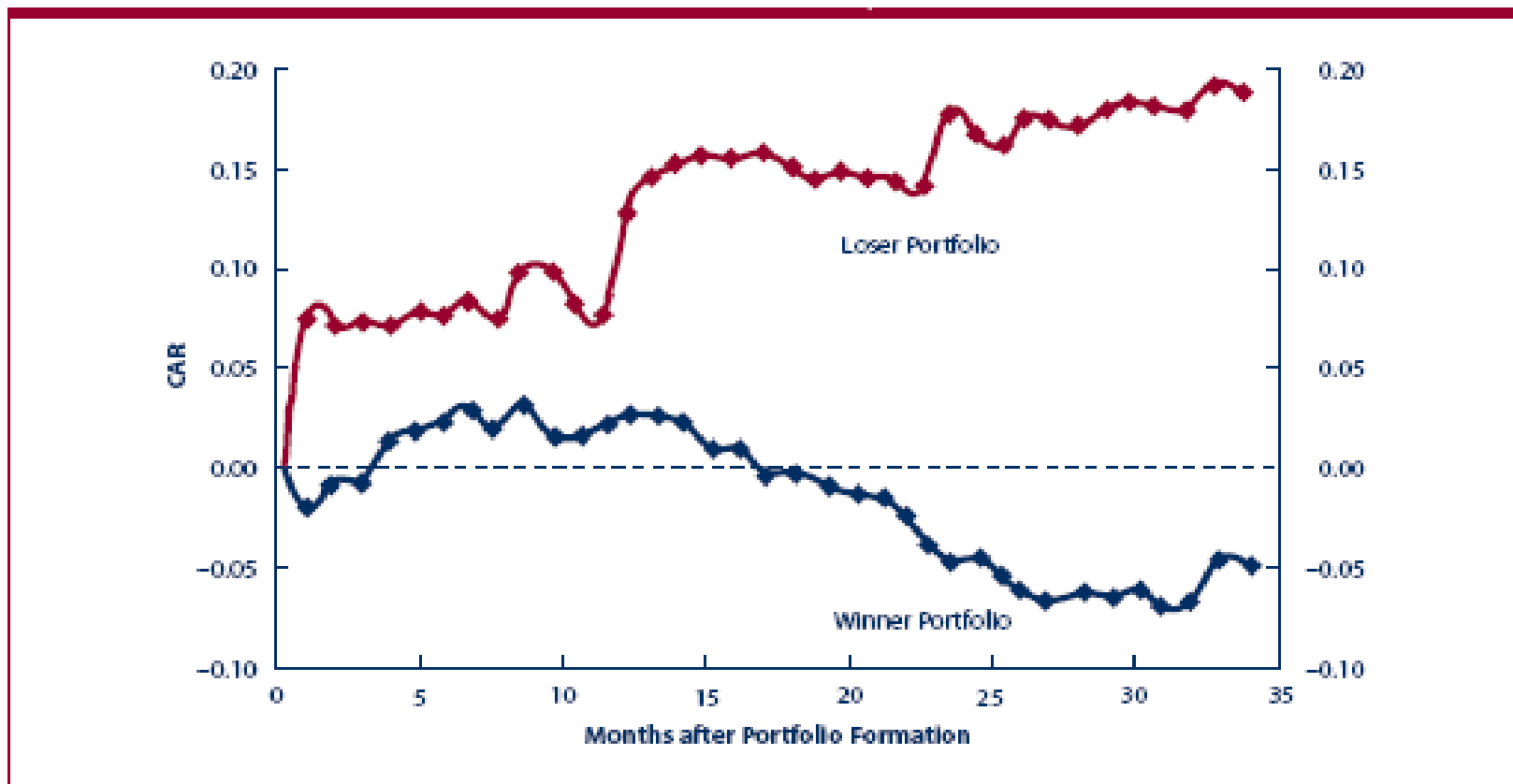
- ▶ This in turn suggests that a passive indexing of asset class investments with the appropriate risk level is the appropriate strategy to follow.

- ▶ Empirical research on capital market efficiency has established the following stylized “facts”:
 - Markets are generally efficient in both the weak and semi-strong forms over time, but there are some important and consistent deviations from this rule.
 - Markets are generally *not* strong form efficient, but the number of people who genuinely possess inside information is smaller than those who think they do.
 - It is very difficult to establish market efficiency without specifying a model for expected returns (e.g., CAPM, Fama-French three-factor model). This means that any conclusions about market efficiency are subject to the possibility that the expected return model was mis-specified. (This is sometimes referred to as the *joint hypothesis* problem.)

Two Important Market Efficiency “Anomalies”

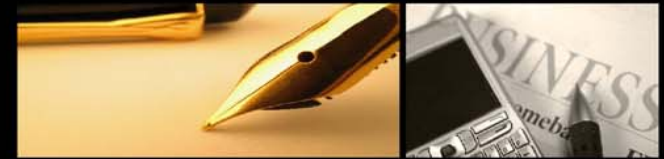


- ▶ **Market Overreaction** (W. DeBondt and R. Thaler, *Journal of Finance*, 1986)



Source: Werner F. M. DeBondt and Richard Thaler, "Does the Stock Market Overreact?" *Journal of Finance* 40, no. 3 (July 1985): 793-805. Reprinted with permission of Blackwell Publishing.

Two Important Market Efficiency “Anomalies” (cont.)



- ▶ **Market Underreaction** (L. Chan, N. Jegadeesh, and J. Lakonishok, *Financial Analysts Journal*, 1999)

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)	10-1 (PPS)
A. Classification Based on Prior Six-Month Return											
1994	-12.00	-6.10	0.40	2.10	0.50	-0.90	-1.80	3.10	-4.50	-6.40	5.40
1995	35.70	27.40	32.30	35.00	32.30	32.20	30.30	36.70	35.30	42.10	6.40
1996	11.90	15.60	17.90	20.20	27.90	22.50	22.00	21.90	20.40	15.30	3.40
1997	7.20	05.70	14.80	20.80	26.60	32.80	35.60	37.30	37.50	23.80	16.60
1998	-2.30	-4.40	-7.00	-3.30	-0.40	0.00	04.50	0.10	-0.80	04.40	6.70
1994-1998 average	8.10	7.64	11.68	14.96	17.38	17.32	18.12	19.82	17.58	15.84	7.74
B. Classification Based on Standardized Unexpected Earnings											
1994	-2.30	-2.40	-6.80	-1.00	-4.60	-1.20	-0.10	-3.30	0.90	-2.00	0.30
1995	36.70	25.40	27.80	31.00	33.40	27.50	36.10	36.90	38.60	40.60	3.90
1996	16.30	17.90	19.20	16.30	21.90	19.60	23.10	22.70	24.70	18.40	2.10
1997	25.50	21.70	23.50	22.80	24.10	24.50	25.20	28.40	29.60	28.10	2.60
1998	-3.20	-5.20	-1.30	04.40	-0.60	5.00	-0.10	-0.60	0.00	-6.20	-3.00
1994-1998 average	14.60	11.48	12.48	14.70	14.84	15.08	16.84	16.82	18.76	15.78	1.18

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A Four Risk Factor Model of Expected Returns:



$$(R_{it} - RFR_t) = \alpha_i + b_{i1}(R_{mt} - RFR_t) + b_{i2}SMB_t + b_{i3}HML_t + b_{i4}MOM_t + e_{it}$$

where, in addition to the excess return on a stock market portfolio and the two Fama-French risk factors (i.e., SMB and HML) we have:

MOM (i.e., “momentum”) is the return to a portfolio of stocks with the highest past returns less the return to a portfolio of stocks with the lowest past returns



Exhibit 9.8 Estimates for Risk Factor Premia, Factor Sensitivities and Expected Returns

A. Risk Factor Premium Estimates Using Historical and Hypothetical Data

Risk Factor	Historical: 1997-2006	Historical: 1987-2006	Historical: 1927-2006	Hypothetical Forecast
Market	6.83%	8.28%	8.30%	7.00%
SMB	3.49	1.09	3.70	2.00
HML	7.53	5.36	5.25	3.00
MOM	9.74	10.11	10.73	4.00

B. Estimates of Factor Sensitivities and Expected Risk Premia: Three-Factor Model

	GE	CAG	CSX
<i>Factor:</i>			
Market	0.826	0.565	0.906
SMB	-0.660	-0.120	0.089
HML	-0.245	0.117	0.370
<i>E(Risk Prem):</i>			
87-06	4.80%	5.18%	9.59%
Hypothetical	3.72	4.07	7.64

C. Estimates of Factor Sensitivities and Expected Risk Premia: Four-Factor Model

	GE	CAG	CSX
<i>Factor:</i>			
Market	0.777	0.593	0.804
SMB	-0.655	-0.123	0.100
HML	-0.186	0.084	0.496
MOM	-0.074	0.042	-0.158
<i>E(Risk Prem):</i>			
87-06	3.97%	5.65%	7.83%
Hypothetical	3.27	4.32	6.68

Overview of Psychology and Financial Markets



- ▶ *Behavioral Finance* is the study of how investor/trader psychology affects financial economic judgments and choices.
- ▶ It is based on the premise that some financial phenomenon can be understood using models in which economic agents are *not fully rational*.
- ▶ Two “building blocks” of behavioral finance:
 - *Limits to Arbitrage*: For various reasons, the actions of rational traders are insufficient to offset the actions of irrational agents
 - *Investor Psychology*: People make mistakes (i.e., cognitive errors) repeatedly and do not necessarily learn from those mistakes

Behavioral Finance Overview (cont.)



- ▶ Three main themes of behavioral finance:
 - Frame Dependence
 - Heuristic-driven biases
 - Inefficient markets

- ▶ Three fundamental heuristic-driven biases:
 - Investor Overconfidence
 - Representativeness (i.e., stereotyping)
 - Loss aversion (i.e, frame dependence)

- ▶ Concluding messages of behavioral finance:
 - The message is not that beating the market is easy or that plenty of risk-free arbitrage opportunities exist
 - “Smart money” does not try to exploit every apparent mispricing opportunity; some risks not worth taking
 - Investors need to distinguish luck from skill
 - Mistakes of investors/traders are another source of risk that portfolio managers need to take into account

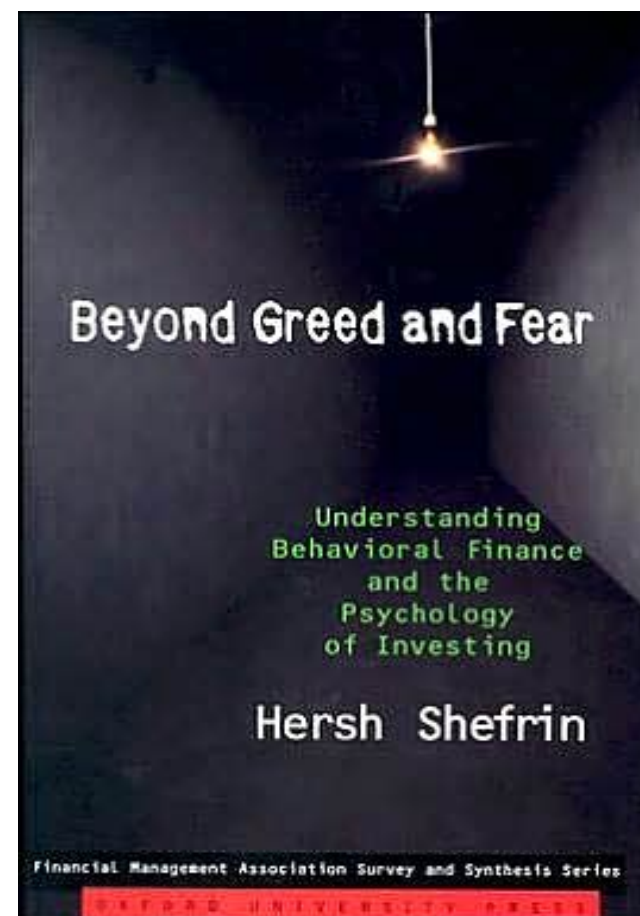
A Good Reference Book on Behavioral Finance:



*Beyond Greed and Fear:
Understanding Behavioral Finance and
the Psychology of Investing*

by

Hersh Shefrin
U. of Santa Clara



Examples of Behavioral Biases



- ▶ Let's take a "Trivial Pursuit" style test with the following rules:
- ▶ I will ask you to provide answers to 10 questions. In addition to your *best guess*, also provide
 - A *low-end guess*
 - A *high-end guess*
- ▶ Provide guesses so that you feel *90% confident* that the right answer will lie between your low guess and your high guess.

Trivia Test Questions



1. How old was Martin Luther King when he died?
2. How long, in miles, is the Nile River?
3. How many countries were members of OPEC in 1989?
4. How many books are there in the Hebrew Bible?

Trivia Test (cont.)



5. What is the diameter, in miles, of the Earth's moon?
6. What is the weight, in pounds, of an empty Boeing 747?
7. In what year was Wolfgang Amadeus Mozart born?

Trivia test (cont.)

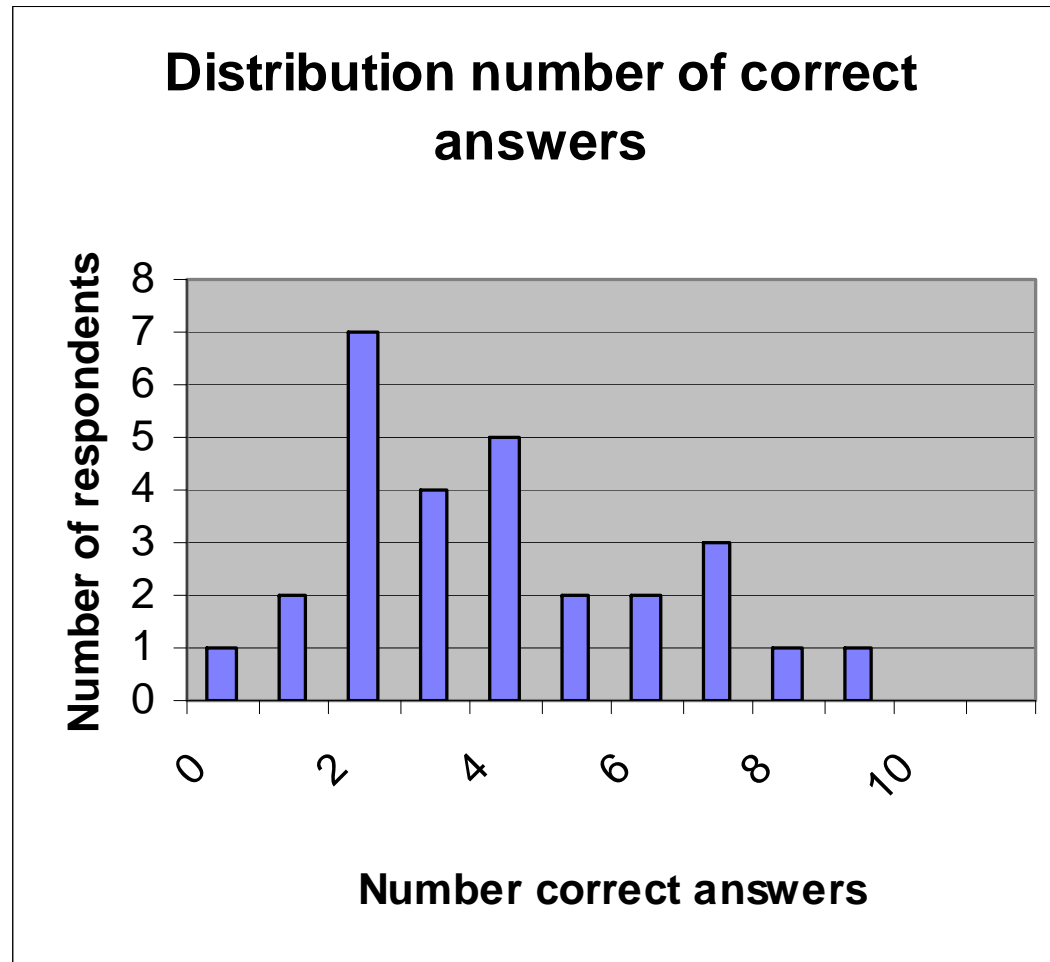


8. How long, in days, is the gestation period of an Asian elephant?

9. What is the air distance, in miles, from London to Tokyo?

10. How deep, in feet, is the deepest known point in the ocean?

How Do People Generally Do?



Here's another chance



- ▶ The Dow Jones Industrial Average closed the year 1999 at **11,497**. Other facts:
 - The DJIA commenced in May 1896 at a level of 40
 - It does *not* account for reinvested dividends

- ▶ Now suppose dividends *had been reinvested* when computing the DJIA

- ▶ What would the DJIA closing value have been in 1999 with reinvested dividends? Once again, make your best guess and give your 90% confidence interval.

Examples of Behavioral Biases: Overconfidence



- ▶ What does the trivia test tell us:
 - ✓ Most people are overconfident about difficult tasks
 - ✓ They set their confidence intervals too narrowly
 - ✓ They end up being surprised more often than they anticipated
 - ✓ Despite being frequently surprised, they don't adjust their behavior so the surprises keep coming in the future

- ▶ One reason why investors tend to be overconfident is the *confirmation bias*; that is, people tend to seek information that confirms what they think they already know and overlook information that challenges prior beliefs.

Examples of Behavioral Biases: Representativeness



- ▶ Consider the following question:

Mary is quiet, studious, and very concerned with social issues. While an undergraduate student at University of California-Berkeley, she majored in English Literature and Environmental Studies. Given this information, please indicate which of the following three cases is the *most probable*:

- a. Mary is a librarian
 - b. Mary is a librarian and a member of the Sierra Club
 - c. Mary works in the banking industry
- ▶ *Representativeness* is judgment based on stereotypes. These are “shortcuts” that people commonly use to help process large amounts of information quickly.
 - ▶ The *overreaction hypothesis* is based on a misapplication of representativeness; that is, investors take actions based on the notion that losers will stay losers.

Examples of Behavioral Biases: Frame Dependence



- ▶ *Frame dependence* refers to the possibility that the choice that an investor makes in a certain situation depends on how the investment is presented or “packaged” (i.e., framed).
- ▶ Consider the following “investment” choices:

Choice #1: A: 100% chance of winning \$240

 B: 75% chance of winning \$0
 25% chance of winning \$1000

Choice #2: C: 100% chance of losing \$750

 D: 75% chance of losing \$1000
 25% chance of losing \$0

Examples of Behavioral Biases: Frame Dependence (cont.)



- ▶ Many people choose **A** (i.e., the sure gain) and **D** (i.e., the chance of losing nothing)
- ▶ Now consider still another “investment” choice:

Choice #3: **E:** 75% chance of losing \$760
 25% chance of winning \$240

F: 75% chance of losing \$750
 25% chance of winning \$250

- ▶ Clearly here in Choice #3, **F** dominates **E** (i.e., F is like E plus an additional \$10). However, it is easy to show that:

$$E = A + D$$

$$F = B + C$$

- ▶ Consequently, investors who selected A & D when they were offered separately would not make the same choice when the alternatives are packaged together. This is *frame dependence*.

Consequences of Behavioral Biases in Capital Markets



- ▶ *Prospect Theory*, which was established by Daniel Kahneman and Amos Tversky, contends that individuals think differently about situations of potential gains and potential losses.
- ▶ Specifically, people are risk-averse when gains are involved but risk-seeking when trying to avoid losses.
- ▶ Another way of thinking about this is that investors are *loss averse*.

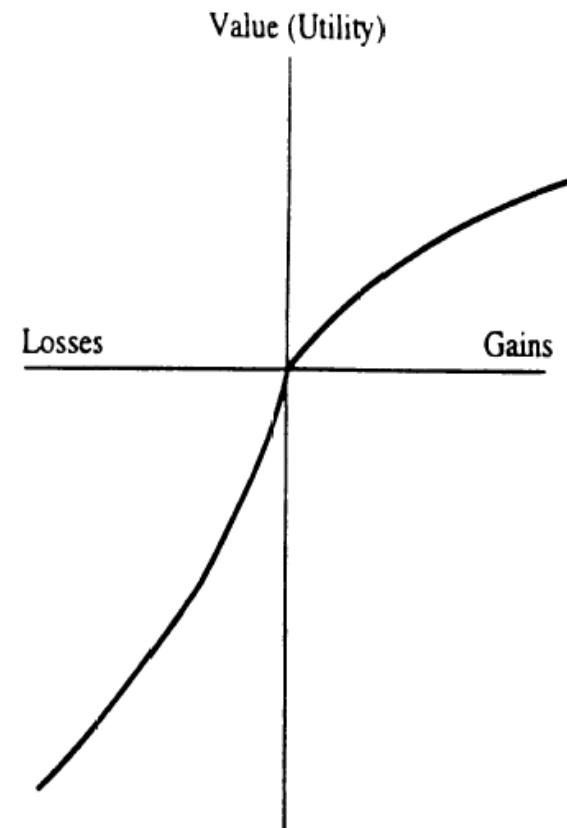


Figure 1. Prospect theory value function.

Consequences of Behavioral Biases in Capital Markets (cont.)



- ▶ A consequence of prospect theory in capital markets is that investors are more reluctant to realize their losses than they are when taking their gains. That is, investors hold on to their “losers” too long and sell their “winners” soon. This has been called by economists Hersh Shefrin and Meir Statman the **disposition effect**.
- ▶ The disposition effect was tested by Terry O’Dean (*Journal of Finance*, 1998) using the following hypothesis on investor behavior:

Proportion of Gains Realized (PGR) > Proportion of Losses Realized (PLR)

PGR and PLR for the Entire Data Set

This table compares the aggregate Proportion of Gains Realized (PGR) to the aggregate Proportion of Losses Realized (PLR), where PGR is the number of realized gains divided by the number of realized gains plus the number of paper (unrealized) gains, and PLR is the number of realized losses divided by the number of realized losses plus the number of paper (unrealized) losses. Realized gains, paper gains, losses, and paper losses are aggregated over time (1987–1993) and across all accounts in the data set. PGR and PLR are reported for the entire year, for December only, and for January through November. For the entire year there are 13,883 realized gains, 79,658 paper gains, 11,930 realized losses, and 110,348 paper losses. For December there are 866 realized gains, 7,131 paper gains, 1,555 realized losses, and 10,604 paper losses. The *t*-statistics test the null hypotheses that the differences in proportions are equal to zero assuming that all realized gains, paper gains, realized losses, and paper losses result from independent decisions.

	Entire Year	December	Jan.–Nov.
PLR	0.098	0.128	0.094
PGR	0.148	0.108	0.152
Difference in proportions	-0.050	0.020	-0.058
<i>t</i> -statistic	-35	4.3	-38

Financial Incentives and Investment Behavior



- ▶ How does a manager's compensation structure affect the way that he or she invests a portfolio on behalf of the client? Brown, Harlow, and Starks (*Journal of Finance*, 1996) examined this issue. They based their study on the following observations:
 - Mutual fund investors focus primarily on published *rankings of relative performance* when making their investment decisions.
 - These allocation decisions are *asymmetric* in that funds with good relative performance experience net cash inflows while those with poor relative performance do not experience significant outflows.
 - Mutual fund managers are typically compensated with an incentive-based scheme based on a (i) a flat fee, and (ii) a bonus that is based on performance relative to a peer group (i.e., other managers).
 - The basis for the compensation structure is that fund companies generate fees as a percentage of AUM; as AUM increases, the dollars the fund company has to distribute to managers increases as well.

- ▶ Their research premise based on these stylized facts was:
 - From these facts we suggest that the mutual fund industry can be viewed as a *tournament* in which all funds with a similar investment objective compete with one another during the year.
 - This tournament structure, where cash flows into the funds and, ultimately, the manager's compensation depends on *relative performance*, can provide *incentives* for managers to alter the investment characteristics of their portfolios.
 - Specifically, at some interim assessment point, managers of those funds most likely to be "losers" at the end of the tournament will have the incentive to *increase the risk* of their portfolios more than those managing funds likely to be "winners".

Empirical Methodology (cont.)



- ▶ For each year, rank fund sample from highest to lowest by RTN variable. Classify interim “winners” and “losers” by whether they are above or below median value, respectively.
- ▶ For interim winner and loser funds, classify again according to whether RAR is above or below its median value.
- ▶ These classifications lead to a **2 x 2 contingency table**: (i) interim winners and losers; and (ii) high or low volatility ratios.
- ▶ Advantages of the “Tournament Approach”:
 - No requirements to specify an appropriate benchmark portfolio or factor structure
 - Market-timing assessment problems do not arise
 - Mean-variance efficiency of a benchmark is not an issue
 - Survivorship bias is not a problem (works against the central hypothesis)

Risk-Change Hypotheses



► *Null Hypothesis:*

	High Risk Ratio	Low Risk Ratio
Interim Loser	25.0 %	25.0 %
Interim Winner	25.0 %	25.0 %

Risk-Change Hypotheses (cont.)



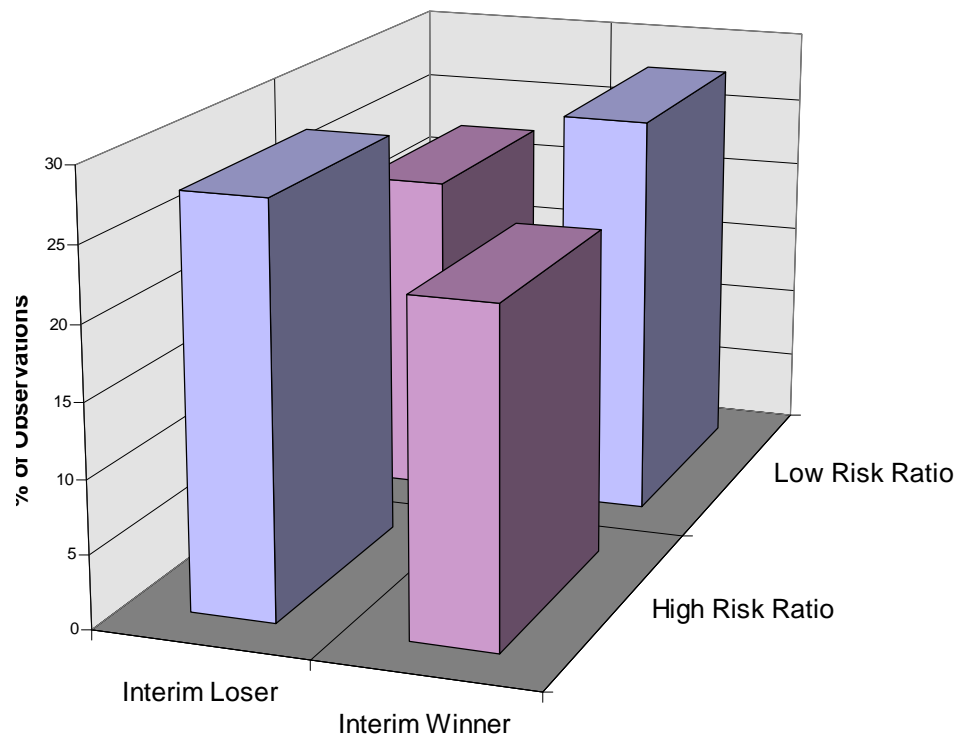
► *Predicted Alternative Hypothesis:*

	High Risk Ratio	Low Risk Ratio
Interim Loser	$> 25.0 \%$	$< 25.0\%$
Interim Winner	$< 25.0 \%$	$> 25.0 \%$

Empirical Results



1980 - 1991 (2,484 observations)



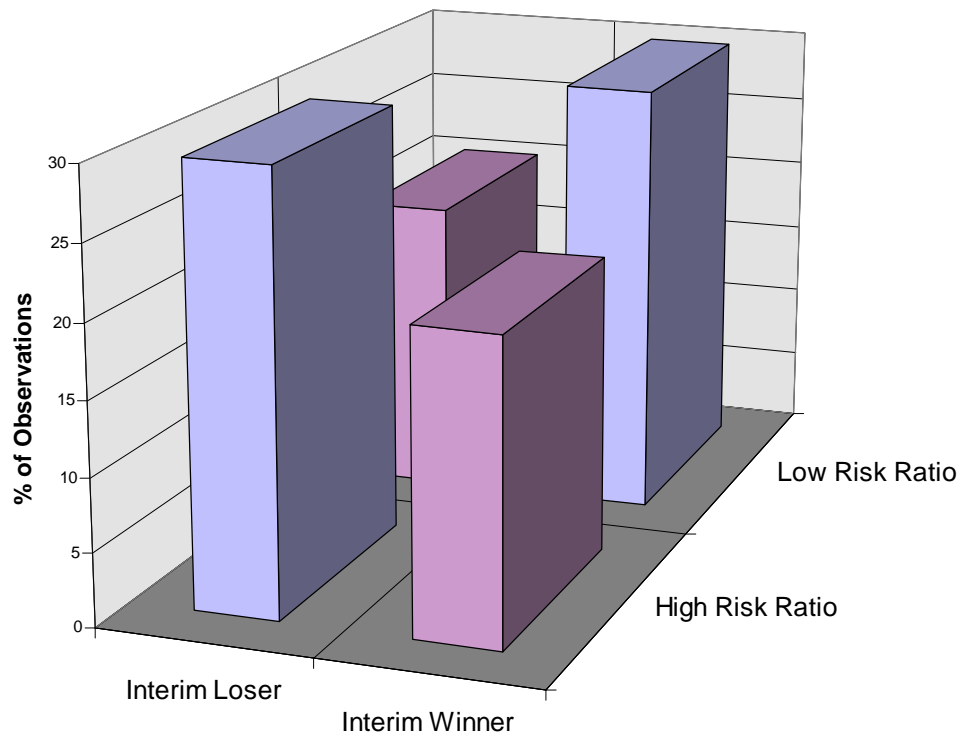
	High Risk Ratio	Low Risk Ratio
Interim Loser	27.7 %	22.2 %
Interim Winner	22.4 %	27.7 %

(p-value 0.000)

Empirical Results (cont.)



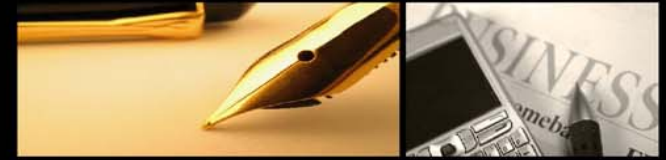
1986 - 1991 (1,633 observations)



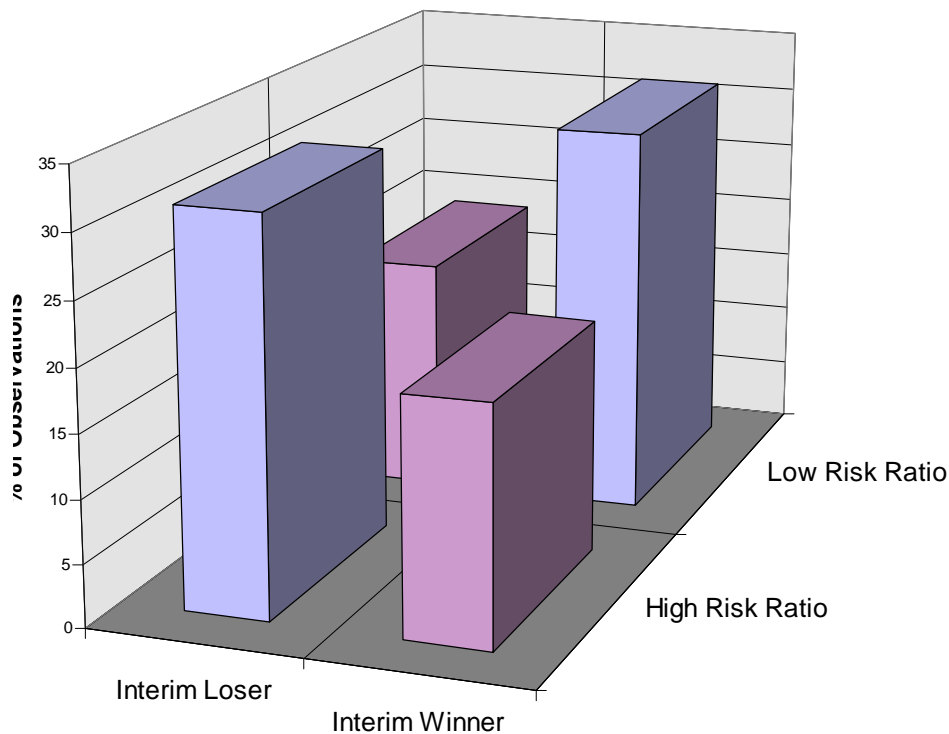
	High Risk Ratio	Low Risk Ratio
Interim Loser	29.7 %	20.2 %
Interim Winner	20.4 %	29.7 %

(p-value 0.000)

Empirical Results (cont.)



1989 - 1991 (932 observations)



	High Risk Ratio	Low Risk Ratio
Interim Loser	31.2 %	18.8 %
Interim Winner	18.8 %	31.2 %

(p-value 0.000)

Conclusions



- ▶ Interim losers alter the volatility of their funds during the latter part of a year to a significantly greater extent than do interim winners.
- ▶ This effect became significantly stronger during the last half of the 1980 - 1991 sample period when the number of new funds in the industry increased dramatically.
- ▶ This tendency existed for all funds but was somewhat more pronounced for newer funds and for smaller funds.
- ▶ Cumulative performance has almost as large an impact on the risk decision as does the interim return in the current tournament.
- ▶ Analysis of a simulated set of unmanaged stock portfolios confirm that the observed risk changes were due to explicit managerial actions.
- ▶ The difference in the interim, post-assessment period, and final annual rankings suggest that the mid-year volatility adjustments on the part of the interim losers did, in part, have the desired effect of increasing their rankings.