Behavioral Decision and Finance

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Public Lecture

National University of Singapore

March 19, 2008

Overview

Introduction to the Subject

- Rational decision [preferences, probabilities]
- Behavioral decision

Founders of the Field (Nobel Prize winners)

- Amos Tversky and Daniel Kahneman
  - "Judgment Under Uncertainty," *Science*, 185 (1974): 1124-1131
  - "Prospect Theory," *Econometrica*, 47 (1979): 263-291
- Thomas Schelling
  - *The Strategy of Conflict* – interactive decisions, drawing inferences from actions of others

The Future –

- The Inseparability of Time and Uncertainty, Deep Uncertainty
- Neuroeconomics

Mainstream Decision Theory

Standard (or "classical") assumptions:

- People *know* what's in their best interest.
- And they *act* on that knowledge.
- Define *preferences* on cardinal basis.
- Assess *probabilities* separately.

Behavioral Decision Theory

- People make systematic errors in decisions
  - Preferences – *strongly inconsistent*
  - Probabilities – *bias calibration and updating*

Behavioral Finance

- Errors persist even in relatively easy financial decisions

Behavioral Economics
also known as **Psychology and Economics**

Better assumptions:

- People sometimes get confused.
  - *"My employer's stock is less risky than a mutual fund."*

- And even when we do understand what's best, we often don't follow through.
  - *"I'll begin my savings next month."*

Psychology + Economics

- Nobel Prize (2002) to Daniel Kahneman

Behavioral Finance

Use psychology *and* economics to understand finance:

Asset pricing:

- IPO underperformance
- Value Anomaly
- Equity premium
- Momentum
- Bubbles

Corporate finance:

- Winner's curse mergers
- Earnings manipulation

Personal finance:

- Passivity
- Procrastination
- Loss aversion
- Narrow Framing
- Return chasing
- Home bias
- Overconfidence
- Wishful thinking

Plan of Presentation

- Rational Decision
- Development of Behavioral Finance
- Behavioral Propensities
    - **Anchoring**
    - **Overconfidence**
    - **Probability Bias**
    - **Group Processes**
    - **Decision Biases**
        - Loss Aversion
        - Status Quo Bias
        - Barn Door Closing
- Where to Find Behavioral Decision
- Case Studies
    - **LTCM Post Mortem**
    - **Inflation-Protected Bonds**
    - **Subprime Mortgage Crises**
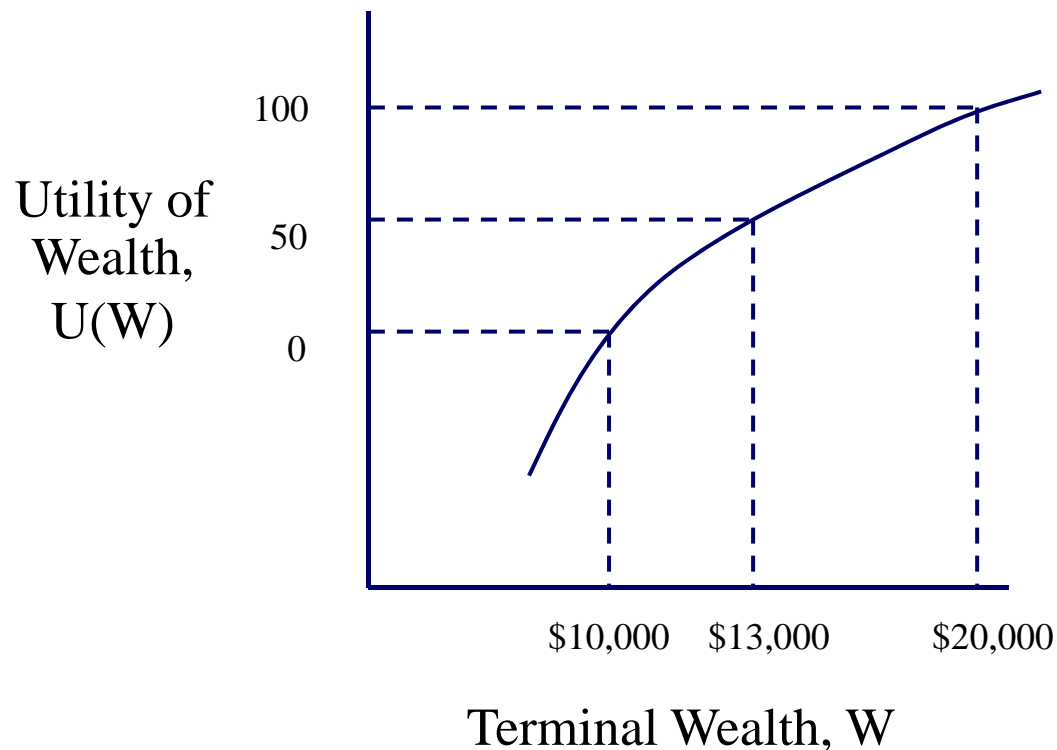- Concluding Thoughts

Rational Decision

- Define preferences

  Attach to end states, no "joy along the way," no regret

  In finance attach to dollar amounts

  Value total portfolio, not components

Focus on Decisions

Cardinal values — not just ranking
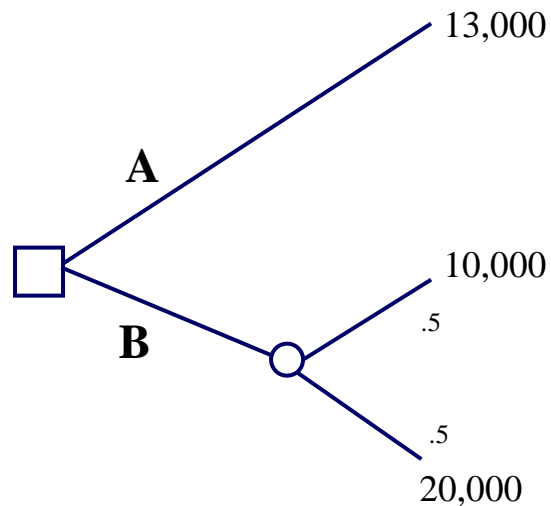
Maximize expected value of utility

Implication

$U(13,000) = .5U(10,000) + .5U(20,000)$ implies indifference A & B

Decision Tree

Options   Payoffs

13,000

A

10,000

.5

B

.5

20,000

Most investors psychologically weight losses twice as heavily as gains

(Kahneman and Tversky, 1979)

The typical subject won't take even odds gambles unless the upside is twice as good as the downside.

In other words, the median person won't take my gamble unless the gamble is improved:

Heads you win	$200
Tails you lose	$100

But regular stock market on a typical day offers:

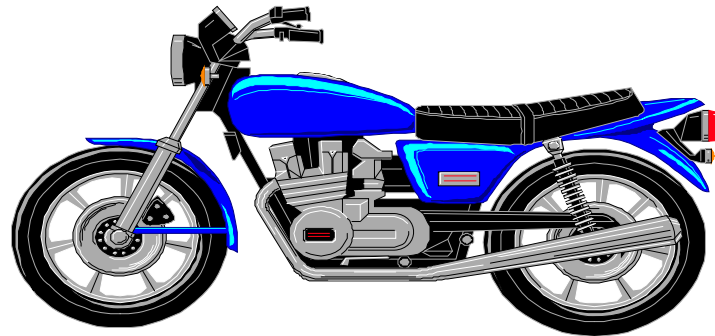|	
Heads you win	$100.04
Tails you lose	$100

Subjective Probabilities

- Estimate probabilities

    Frequently subjective

    A subjective probability of 0.2 for Dow Jones to be up 80 or more today —

    Implies — just as soon win groovy prize

    If: A... Dow Jones up 80

    B... random member from 1 to 100 lies in interval 17-36

    No "discount for ambiguity"

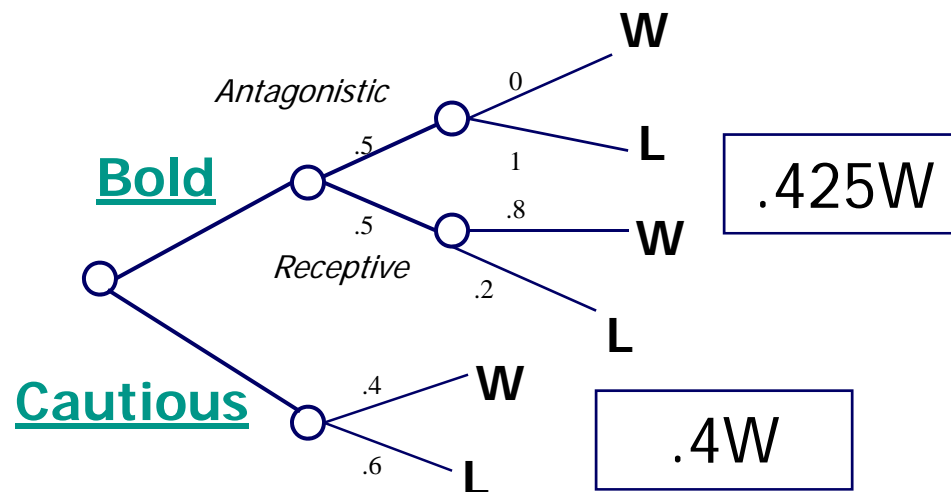   **Treat compound probabilities as single value**

- Gather information and update appropriately
- Be sensitive to value of perfect and imperfect information
    Operation for mother
- Win the account
    (No risk aversion on probabilities – no discount for ambiguity)
    (Relevant to investing in the unknown and unknowable.)

Bold superior to **Cautious**

Real World and Worlds of Study

Real world of finance

- Markets and security prices move, often dramatically, beyond fundamentals (ex., Oct. 1987, Summer 1998, NASDAQ swoon Springs 2000-2001, NASDAQ rise post 9/11, 2006 upswing).
- Currencies swing widely, unrelated to interest rate differentials, or other traditional causative factors.
- Successful speculators/investors exist beyond expectations of "monkeys and typewriters." — Harvard endowment performance, Temasek Holdings performance.
- Big industry capitalizing on investor errors – mutual fund success despite poor performance, excess trading on markets.
- Whole world fooled by subprime crisis.

Psychologists' world

- Demonstration of systematic biases in individual decision making.
- Biases persist despite having significant consequences.
- Moderate industry identifying regularities in biases.
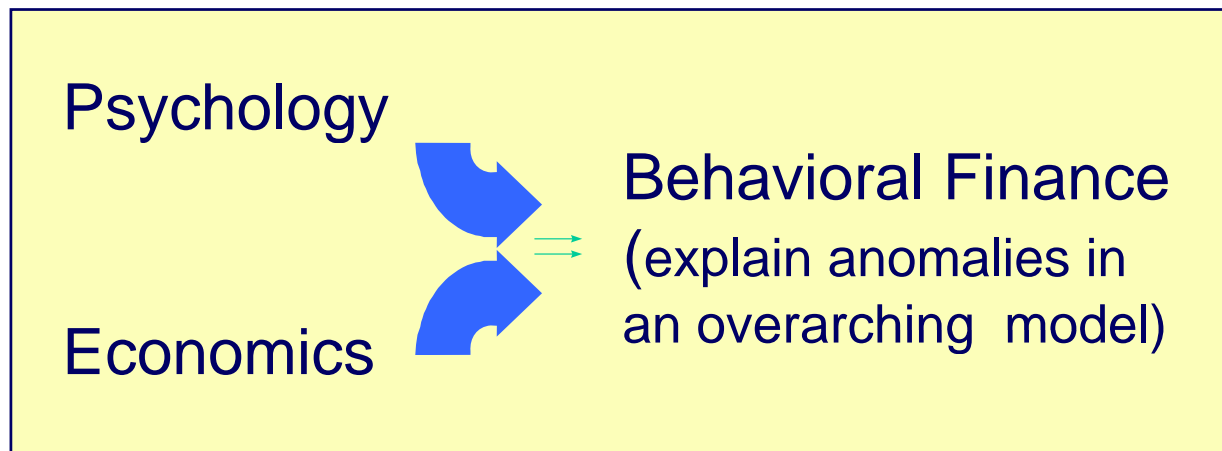- Brain imaging to understand biases.

Counting Problem

Video

Economists' World & Behavioral Finance

Economists' world

- Behavior in the context of firms and markets — reliance on rational utility-maximizing framework

- Hostile to assertions of nonrational behavior

- But tradition of empirical investigations ...
  Discovery of anomalies!

Psychology

Economics

Behavioral Finance
(explain anomalies in
an overarching model)

Anomalies as Inspiration

Internet stock pricing and volume

- new paradigm (real options on brave new digital world)

- absence of reliable anchor for "arbitrageurs" to employ

- huge potential for behavioral propensities to persist/dominate; e.g., herding, bubbles, leaking balloons (recent world markets)

Price – earnings multiples, then and now

- S&P 500 historical average 16, 7 in 1980 (100), 45 in 2002 (1500)

Money illusion

- focus on nominal versus real magnitudes

- professors' salaries in 1980s

- inflation-protected bonds

Anomalies as Inspiration, continued

Currency trading – more than $1 trillion/day

Stock market level, Dow Jones

    September 1, 2001   9,840

    Today   12,000
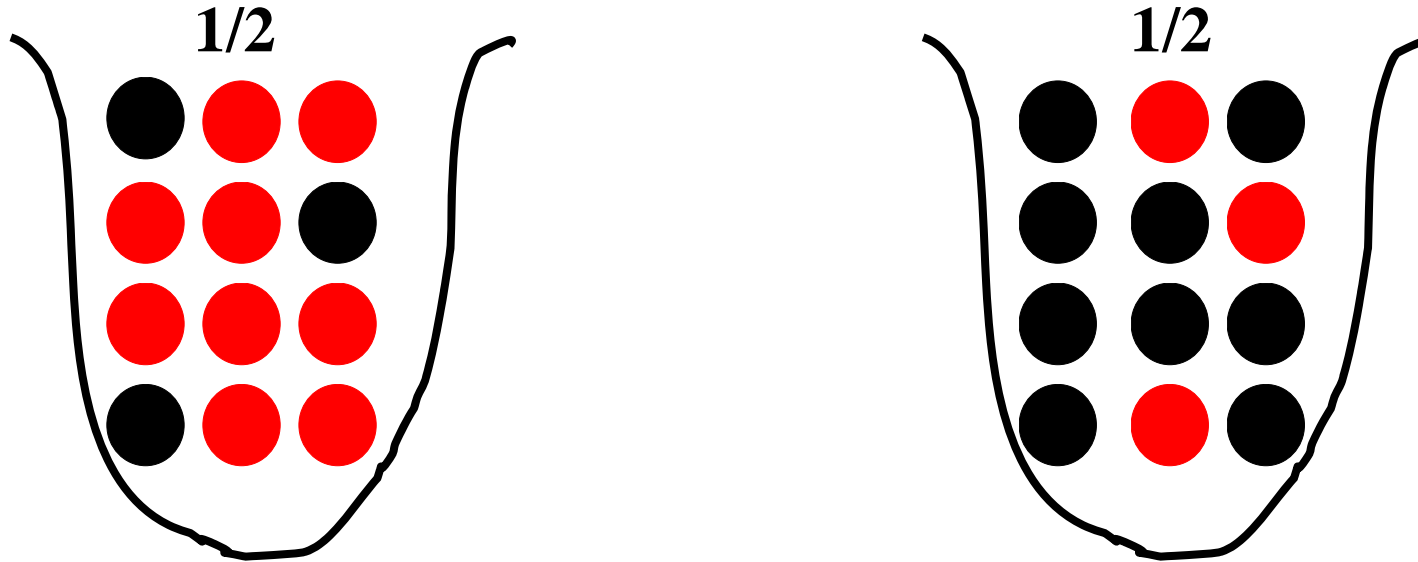
Changes, 2001-Today

- Global warming

- Terrorism

- Avian Flu

- Iraq War

- Subprime Crisis

- Unpopular President

- Recession Looming

Anchoring

Reddish or Blackish Bag Problem

1/2

1/2

RBRRBRBRRBR   7R   4B

Counting

Count regular passes
Count bounce passes

Overconfidence

ESTIMATION QUESTIONNAIRE:

Population of Peru

World Record hammer throw (7.3 kilos, 1.3 meter chain)

1. SURPRISE – HAVE ESTIMATE LIE
   BELOW 1ST PERCENTILE   OR
   ABOVE 99TH PERCENTILE.

2. APPROPRIATELY CONFIDENT PEOPLE SURPRISED 2% OF TIME.

3. MOST GROUPS SURPRISED 40% OF THE TIME.

4. RECOMMENDATION – THINK BROADLY.

5. ASIDE:
   OPTIMISTIC PEOPLE DO BETTER IN LIFE, GENERALLY OVERCONFIDENT.
   ONLY DEPRESSIVES ASSESS THEIR CHANCES ACCURATELY.

Winner's Curse

Cousin of Overconfidence: Value own opinion too highly.

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┌──────────┐
│  JAR     │
│   OF     │
│ COINS    │
└──────────┘
```

Everyone bids for the jar.

High bid wins.

Your best estimate is 61 Singapore dollars. How much should you bid?

Passivity and Procrastination

Would you like to have

A) ½ cup of favorite coffee right now

or

B) Full cup tomorrow

Would you like to have

C) ½ cup of favorite coffee in a week

or

D) Full cup in eight days

Choosing fruit vs. chocolate
Read and van Leeuwen (1998)

Choosing Today   Eating Next Week

→ *Time*

If you were
deciding today, for **next week**,
would you choose
fruit or chocolate?

Lindt
SWISS PREMIUM CHOCOLATE
Milk Chocolate

Patient choices for the future:

Choosing Today   Eating Next Week

Time

Today, subjects typically choose fruit for next week.

74% choose fruit

Time Inconsistent Preferences:

Choosing and Eating

For Now

→ *Time*

70% choose chocolate

Emotional Decision-making
Shiv and Fedorikhin (1999)

- Cognitive burden/load is manipulated by having subjects keep a 2-digit or 7-digit number in mind as they walk from one room to another

- On the way, subjects are given a choice between a piece of cake or a fruit-salad

Processing burden	% choosing cake
Low (remember only 2 digits)	41%
High (remember 7 digits)	63%

Quantitative Model

- Quasi-hyperbolic discounting (Laibson, 1997)
- Place full weight on present rewards and costs
- Place 1/2 weight on all future rewards and costs
  - **Exercise**
  - **Savings**
  - **High-brow or low-brow movie**
  - **Food consumption**

Conclusions of fMRI Study

- Time discounting results from the combined influence of two neural systems:
  - Emotional structures are impatient.
  - Fronto-parietal systems (analytic systems) are patient.
- The emotional brain, does not respond to delayed rewards.
- The emotional brain creates a drive for instant gratification.

Solutions to Savings Problems

UNSUCCESSFUL

- Paying employees to save:
  - matches don't work

- Educating employees:
  - financial education (alone) doesn't work

SUCCESSFUL

- Automatic enrollment – You are saving 2% of your pay. Call this telephone number to opt out.

- Singapore Plan – Much higher savings rate. You can't opt out.

Probability Bias

- Rational model tells us that probability assessments should be independent of values.

- Retrospective study. In fact, individuals assess probabilities in a manner influenced by their values:

  - Who will win the 2008 Presidential election?
  - Whom do you want to win the election?

- Bush predictor in 2004 and willingness to pay to avoid global warming.
  - Strong negative correlation

Group Decision Processes

Group processes exacerbate behavioral propensities.

- Agreement on why your candidate will win.

- Reinforcing beliefs on why the business deal makes sense.

- Herding suppresses information – RED and GREEN urns. Each ¾ likely to give own color as

RED, GREEN, GREEN, GREEN ....

Implication: Encourage alternative models and contrary evidence.

Decision Biases

Loss Aversion

- People reset their reference points (RJZ and AOL)
- Small losses count much more than small gains
- Equity premium relative to bonds?
- Short-term volatility of market is excessive relative to long-term volatility

Status Quo Bias

- Inheritance from Uncle Joe
  - Moderate-risk company A
  - High-risk company B
  - T bills
  - Municpal bonds

Barn Door Closing

Taking Action Today That Would Have Been Beneficial Yesterday

Flows to mutual funds

Flows to investment sectors

Flows to overseas nations

Venture capital recent years

Momentum investing

Hedge funds Spring 2007 (friends' sons)

Return chasing in general

Availability heuristic

(Difficult to recall all valid cases, whether vivid or not, from past)

- Frequency of event approximated by *availability* of its instances.

- Incorrect estimation of associations because recall of only selective combinations.

- Example. Attractive Singaporean woman in a fancy hotel cocktail lounge in black evening dress, having a martini. What are the odds that she is a cabaret singer as opposed to a school teacher?

- Economy Today: U.S. massive deficit. What bring to mind? (Japan 1990s?)

Big Considerations

Decisions for **SELF**

Decisions as **AGENT**

- Most people in this room are agents in and must <u>understand</u> their client/principal's psychology

- Can guide their client's thinking

REGIME SHIFTS

Where to Find Behavioral Decision

Rational		Behavioral
Steady State	vs.	Adaptive
Recurring situation	vs.	Unique
Continuous allocation	vs.	Discrete
States of the world identified	vs.	States of the world need to be identified
Alternatives clear	vs.	Alternatives need to be identified
Price taking	vs.	Negotiation or strategic
Goods	vs.	Time, health, faith, love
Subject to arbitrage	vs.	No poaching

If find terrible decisions with finance, how about marriage?

Capitalizing on Behavioral Decisions

- David Ricardo, the Battle of Waterloo and British Bonds

- Warren Buffett

   California Earthquake Authority

   Writing insurance in 1998 – 5 times fair actuarial value

   Writing hurricane insurance for 2006

   Writing municipal bond insurance in 2008

- You

   Fancy stocks versus dogs

   Return chasing

   Investing in the unknown and unknowable

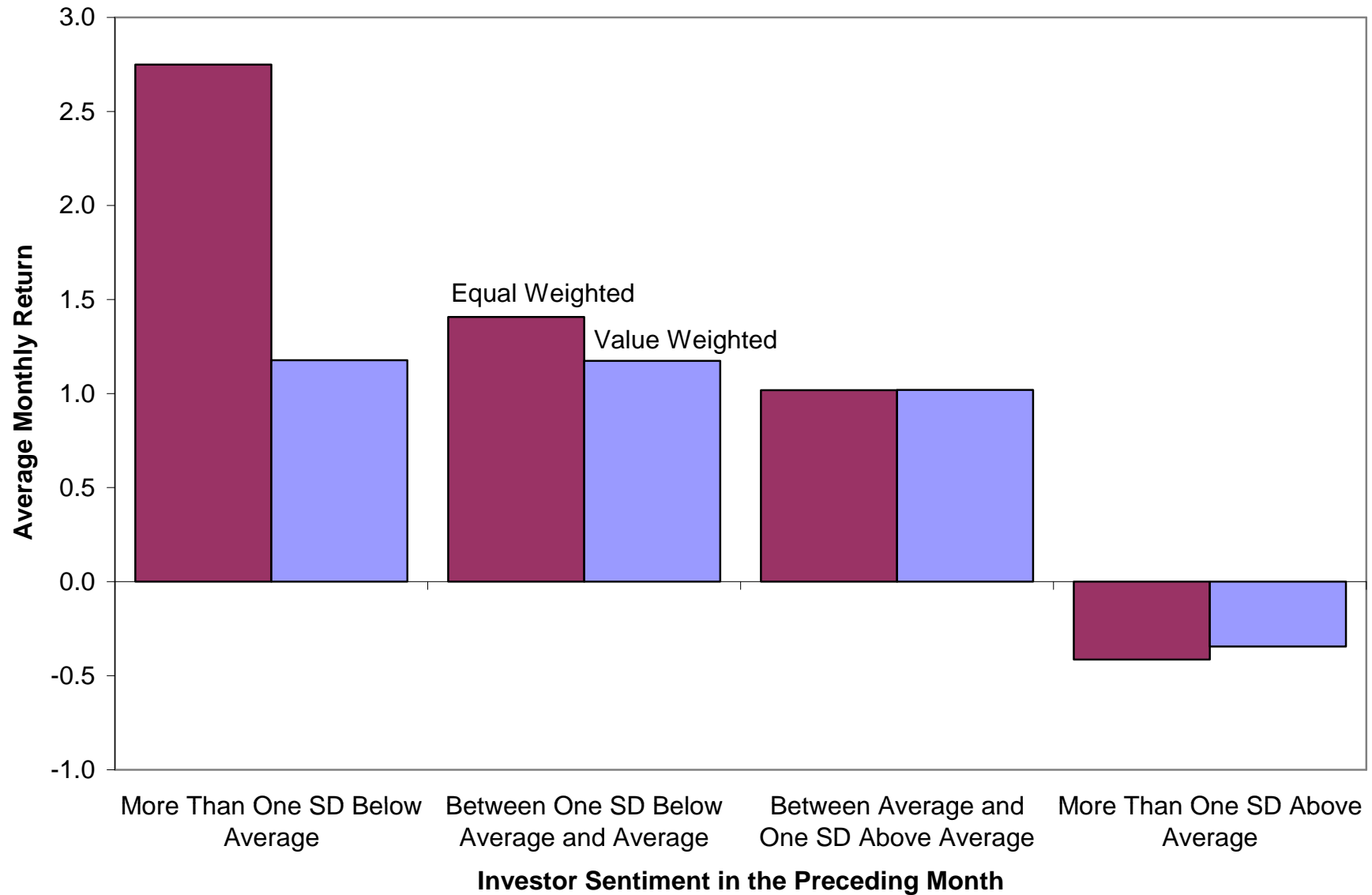# Excess returns generated by picking stocks based on historical B/M, CF/P, S/P and E/P

Chan and Lakonishok (2004)

- Returns from a value strategy
  - Large stocks (1969-2001): 16.4% per annum
  - Small stocks (1979-2001): 22.8% per annum
  - EAFE markets (1989-2001): 12.3% per annum

- For comparison:
  - S&P 500 Return (1969-2001): 11.4% per annum
  - Russell 2000 Return (1979-2001): 13.8% per annum
  - EAFE Free Index (1989-2001): 4.5% per annum

- Value investing has been successful. Return chasing — the opposite of value investing — is a mistake. One *should* sell stocks that have had high historical returns.
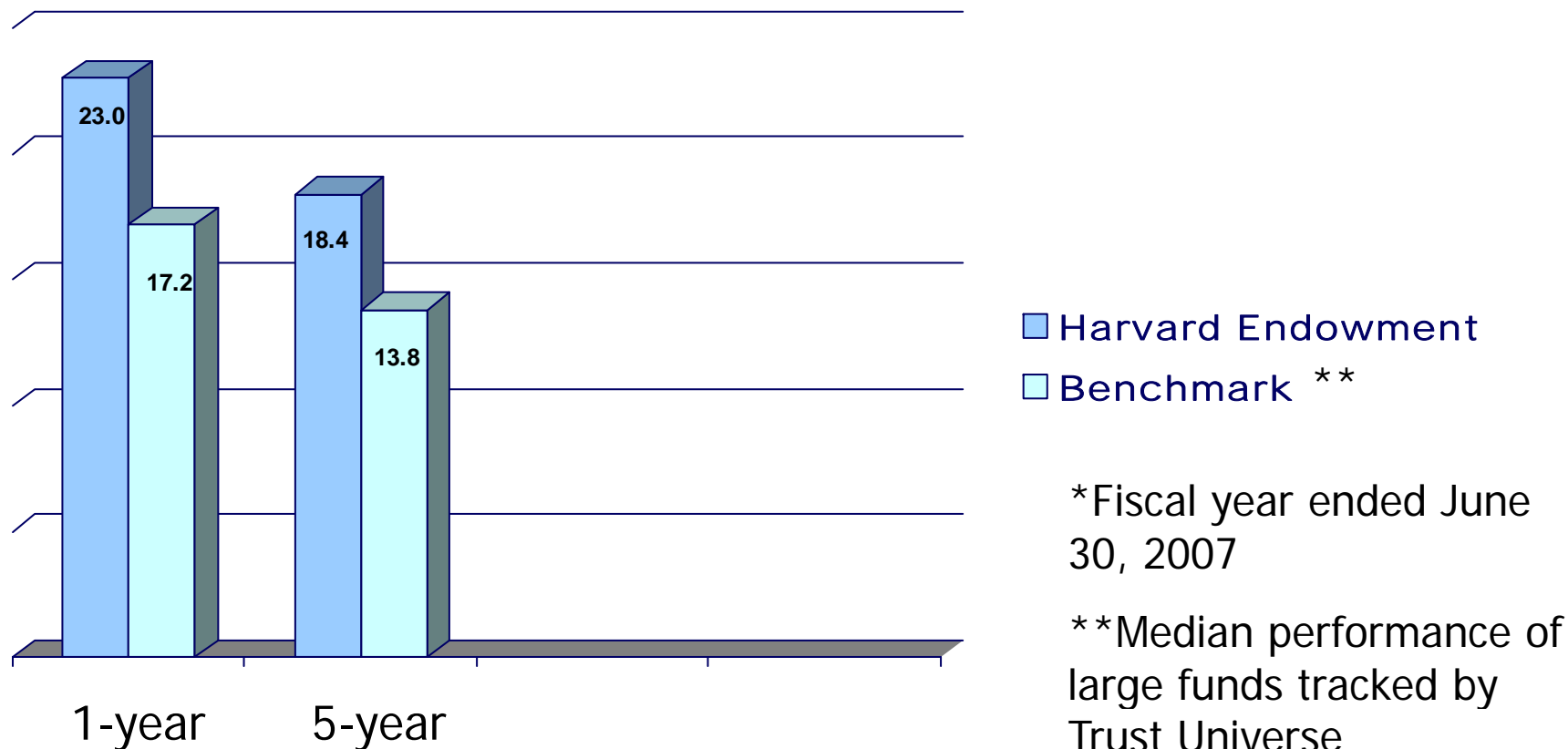
Figure 6. Sentiment and market returns. Average monthly returns in percentage points on the equal- and value-weighted market portfolios. The sample is divided into four groups according to the sentiment level in the preceding month.

Can You Make Money Understanding This Material?
Harvard Endowment Performance

Average annual return*

Harvard Endowment

Benchmark **

1-year   5-year

*Fiscal year ended June 30, 2007

**Median performance of large funds tracked by Trust Universe Comparison Service

Source: Harvard Management Co.

July 1, 2006-June 30, 2007:   Harvard   23.0%

Temasek Holdings:
 17% last 5 years, 26% last 2 years

Lessons From Behavioral Decisions and Finance

✓ Think systematically and independently about your **preferences** and **probabilities**.

✓ Behavioral considerations matter.

✓ Understand and address the behavioral needs of associates.

✓ Improve decisions by:

   ▪ **"knowledge as first step"**

   ▪ **reflect on biases — e.g., overconfidence**

   ▪ **"heal thyself" — debiasing or rebiasing (eyeglasses)**

✓ Invest understanding the behavioral biases of others.

> Of all the ways of defining man, the worst is the one which makes him out to be a rational animal.
> Anatole France