

Adaptive Markets and the New Investment Paradigm

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Origins of Modern Economics

- Physics (Samuelson, 1947)
- Samuelson (1998):

Perhaps most relevant of all for the genesis of *Foundations*, Edwin Bidwell Wilson (1879–1964) was at Harvard. Wilson was the great Willard Gibbs's last (and, essentially only) protege at Yale. He was a mathematician, a mathematical physicist, a mathematical statistician, a mathematical economist, a polymath who had done first-class work in many fields of the natural and social sciences. I was perhaps his only disciple... I was vaccinated early to understand that economics and physics could share the same formal mathematical theorems (Euler's theorem on homogeneous functions, Weierstrass's theorems on constrained maxima, Jacobi determinant identities underlying Le Chatelier reactions, etc.), while still not resting on the same empirical foundations and certainties.

Physics Approach In Economics Led To:

- Utility theory, revealed preference (Samuelson)
- General equilibrium theory (Arrow, Debreu)
- Game theory (Harsanyi, Nash, Selten)
- Rational expectations (Lucas, Muth, Sargent)
- Option-pricing theory (Black, Merton, Scholes)
- Efficient markets (Fama, Samuelson)

“Prices fully reflect all available information”



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Journal of
CORPORATE
FINANCE

www.elsevier.com/locate/econbase

The complexity of price discovery in an efficient market: the stock market reaction to the Challenger crash[☆]

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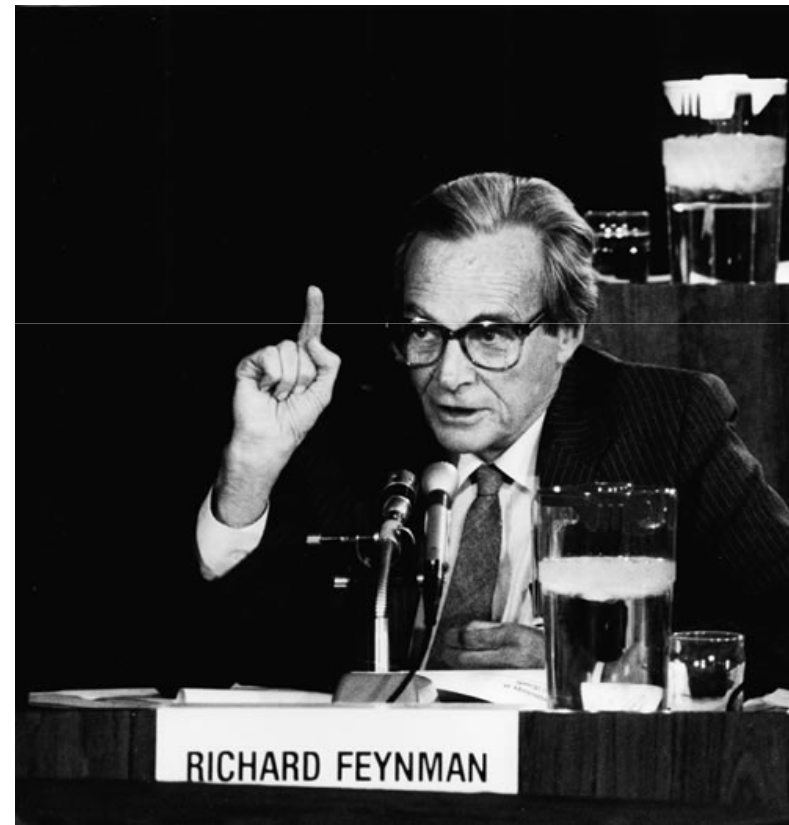
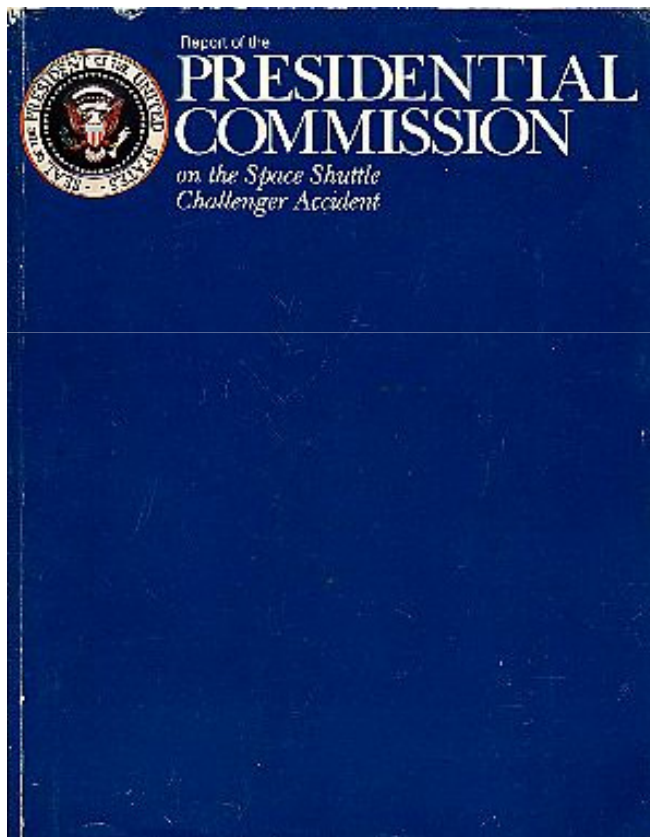
Received 15 November 2001; received in revised form 8 February 2002; accepted 12 July 2002

January 28, 1986, 11:39am

- 11:47am: “Space Shuttle Explodes”
- 12:17pm: “Lockheed Has No Immediate Comment”
- 12:52pm: “Rockwell Intl Has No Comment”

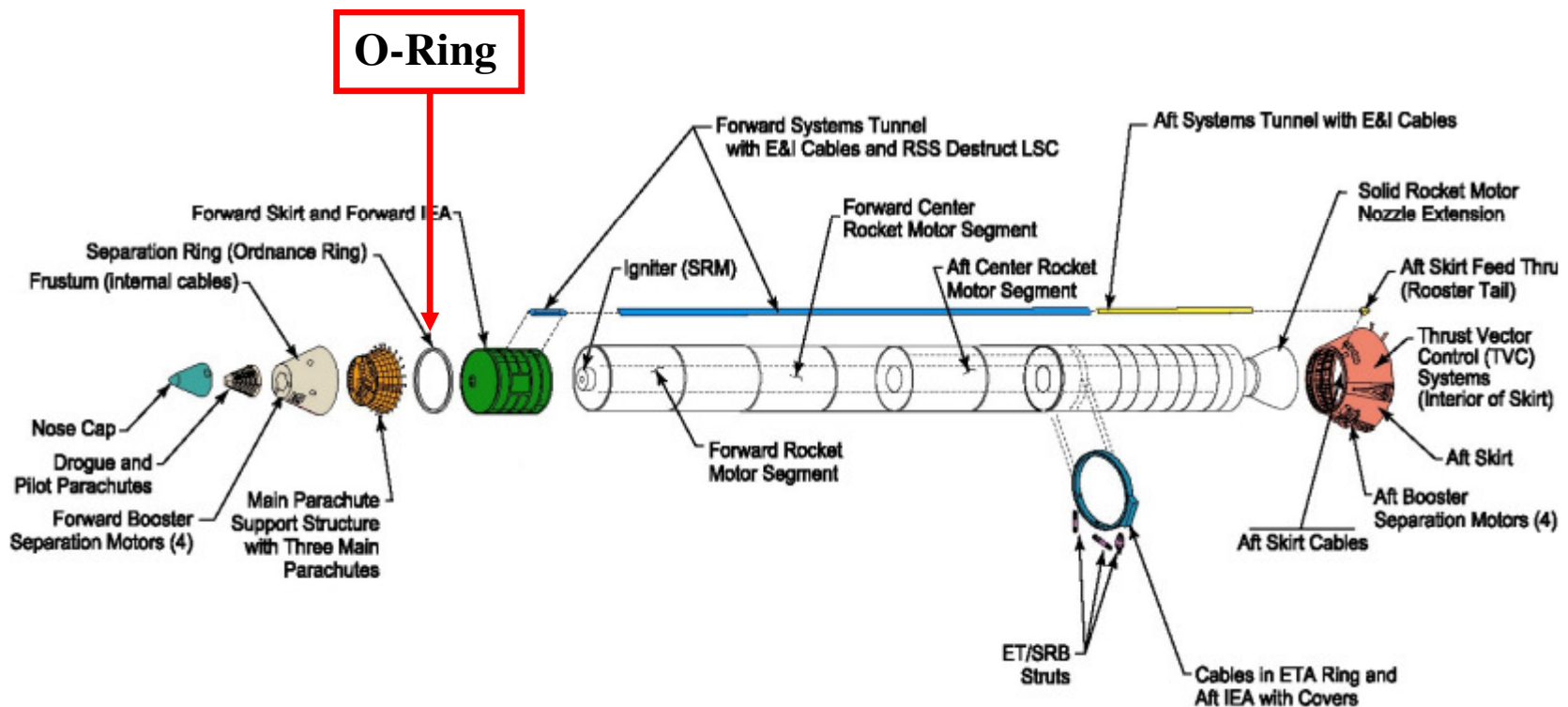


Reagan Establishes Presidential Commission To Investigate



Rogers Commission Report Published June 9, 1986

- Concluded that **Morton Thiokol** was at fault



The Stock Market Reflected This Information Within **Minutes**

Table 2
Intraday stock market behavior around the Challenger crash

Time	Morton Thiokol	Lockheed	Martin Marietta	Rockwell International
<i>Panel A. Stock price movements</i>				
11:30 a.m.	US\$57.25	US\$47.25	US\$35.38	US\$34.75
Noon	Halt	US\$44.50	US\$34.25	US\$32.75
12:36 p.m.	US\$33.00	US\$45.00	US\$32.50	US\$34.13
1:00 p.m.	US\$34.38	US\$45.00	US\$33.00	US\$33.25
<i>Panel B. Stock returns</i>				
11:30–Noon	Halt	– 5.82%	– 3.18%	– 5.76%
Noon–12:36	– 6.04%	1.12%	– 5.11%	4.20%
12:36–1:00	– 1.79%	0.00%	1.54%	– 2.56%

This table reports the price movements and stock returns of the four major space-shuttle firms in the period immediately surrounding the 11:39 a.m. crash of the space shuttle Challenger on January 28, 1986. There is no reported price for Morton Thiokol at noon because of an NYSE trading halt in that stock from 11:52 a.m. to 12:44 p.m. The first post-crash trade in Morton Thiokol occurred at 12:36 p.m. on NASDAQ. Data are taken from the price sheets of Francis Emory Fitch.

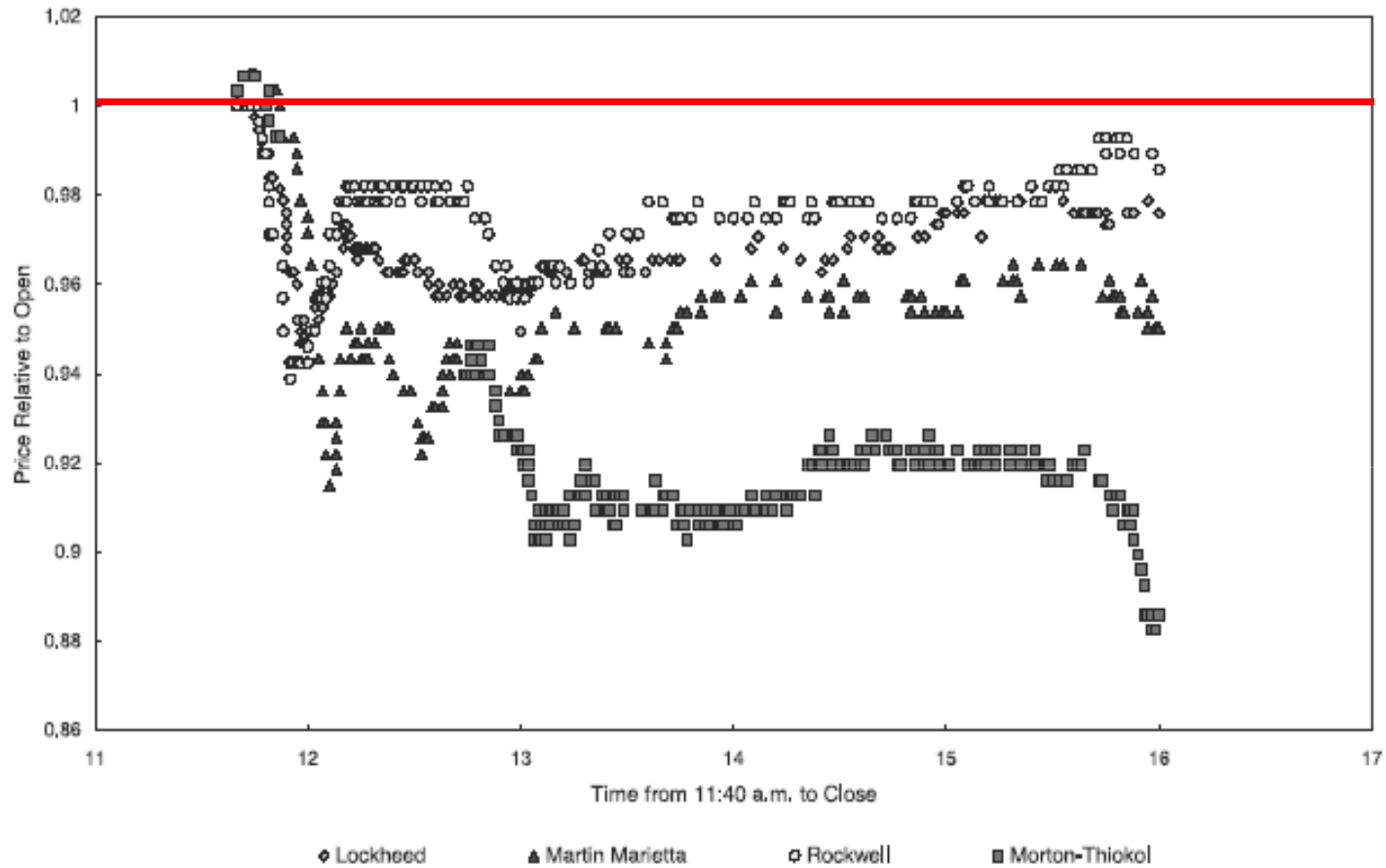


Fig. 1. Intraday stock price movements following the challenger disaster.

- Rationality is not supported by the data
- Cognitive and behavioral biases
 - Loss aversion, anchoring, framing
 - Overconfidence
 - Overreaction
 - Herding
 - Mental accounting



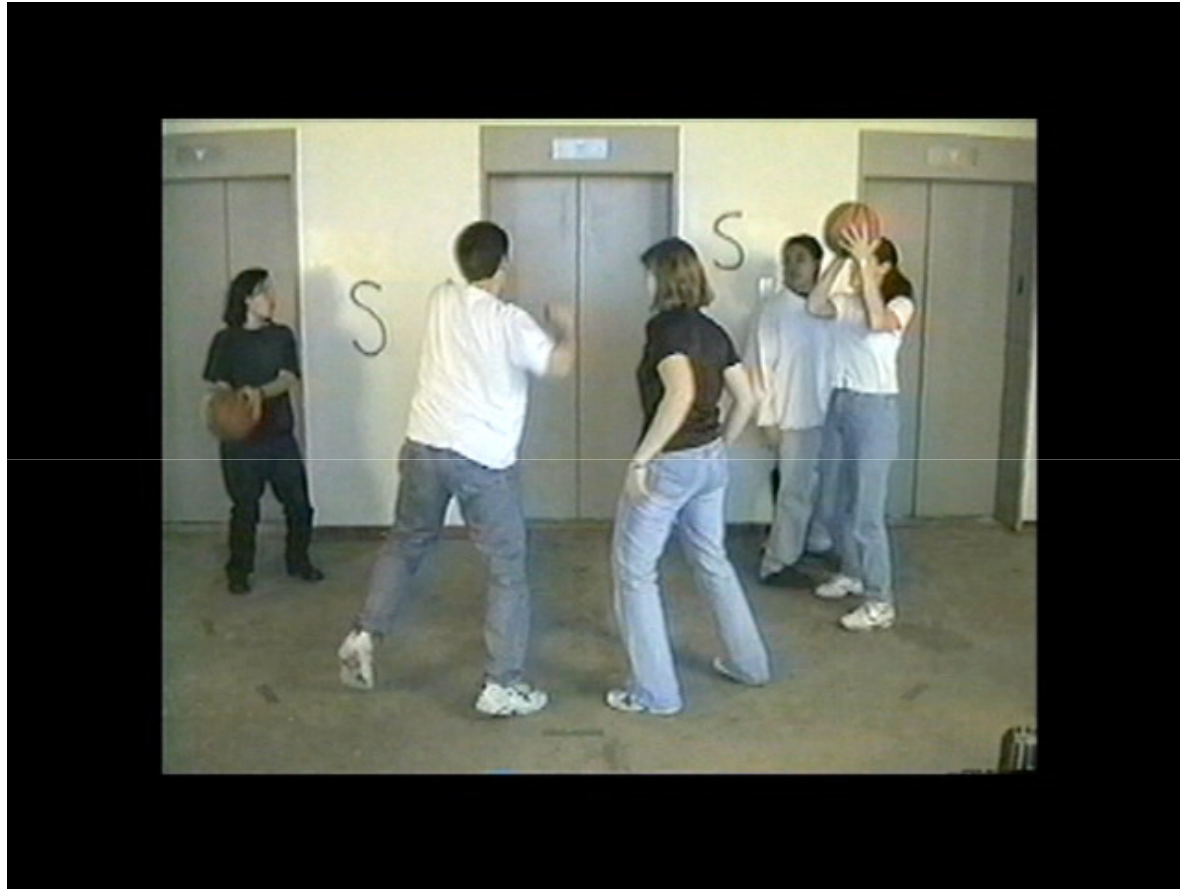
Even Samuelson (1947) Had Reservations:

...[O]nly the smallest fraction of economic writings, theoretical and applied, has been concerned with the derivation of *operationally meaningful* theorems. In part at least this has been the result of the bad methodological preconceptions that economic laws deduced from *a priori* assumptions possessed rigor and validity independently of any empirical human behavior. But only a very few economists have gone so far as this. The majority would have been glad to enunciate meaningful theorems if any had occurred to them. In fact, the literature abounds with false generalization.

We do not have to dig deep to find examples. Literally hundreds of learned papers have been written on the subject of utility. Take a little bad psychology, add a dash of bad philosophy and ethics, and liberal quantities of bad logic, and any economist can prove that the demand curve for a commodity is negatively inclined.

Behavioral Critique of Efficient Markets

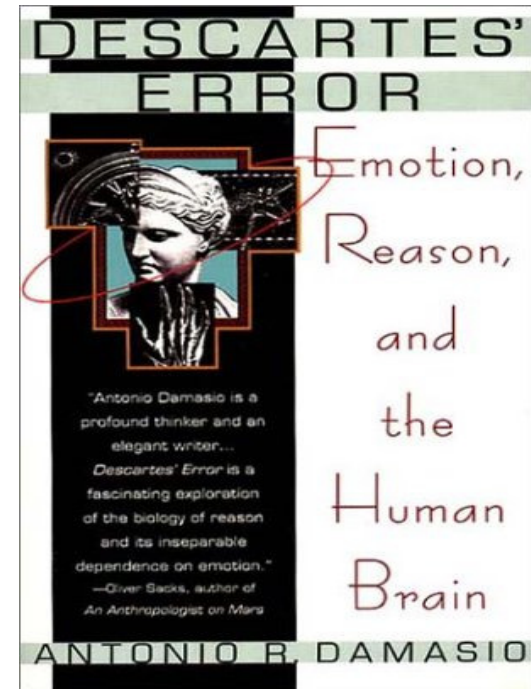
New Paradigm



Source: www.viscog.com

Patient Elliot Had Frontal Lobe Damage:

- No Impact on IQ or Logical Functions
 - Perceptual Ability
 - Past Memory
 - Short-Term Memory
 - Learning
 - Language
 - Arithmetic
- But Behavior Was Quite Irrational!



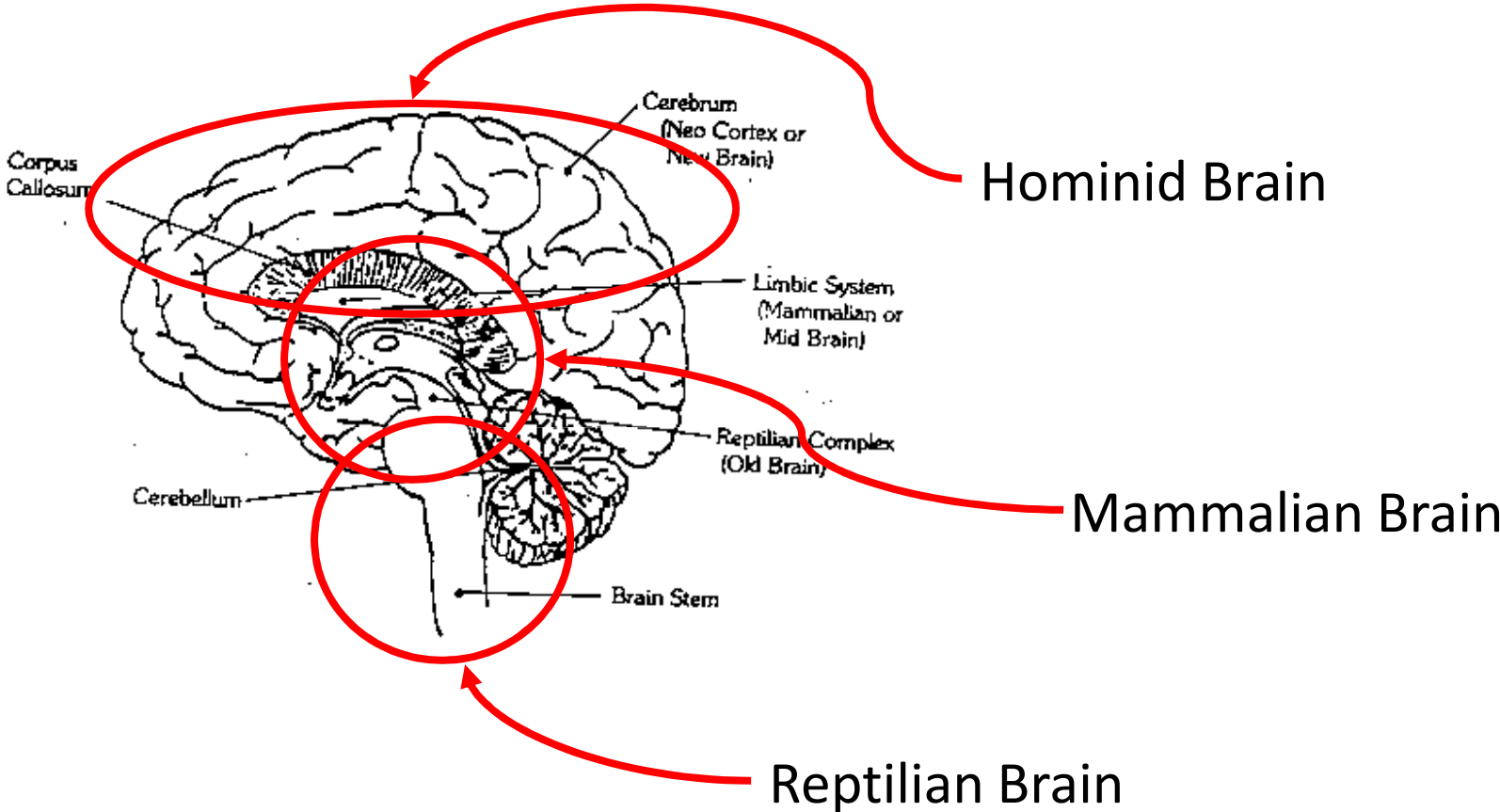
Damasio (1994, p. 36):

When the job called for interrupting an activity and turning to another, he might persist nonetheless, seemingly losing sight of his main goal. Or he might interrupt the activity he had engaged, to turn to something he found more captivating at that particular moment... The flow of work was stopped. One might say that the particular step of the task at which Elliot balked was actually being carried out too well, and at the expense of the overall purpose. One might say that Elliot had become irrational concerning the larger frame of behavior...

No Reaction to Emotional Stimuli:

- *“to know, but not to feel.”*
- Impaired Emotional Response \Rightarrow Irrationality
- Serious Implications For Decisionmaking
- What Do We Mean By Rational?
- Left Brain/Right Brain Distinction

The Triune Model of the Brain



Examples of Applications

- Forced smile vs. natural smile
- Social rejection vs. physical pain

Emotional Stimulus Can Hinder Hominid Brain

- “The Gift of Fear”, G. de Becker
- Too flustered to speak

Say the colors of the following word:

RED **GREEN** **BLUE** **YELLOW** **ORANGE**

BLUE **BROWN** **RED** **GREEN** **PURPLE**

PINK **BLACK** **BLUE** **YELLOW** **GREEN**

Say the colors of the following word:

RED **GREEN** **BLUE** **YELLOW** **ORANGE**

BLUE **BROWN** **RED** **GREEN** **PURPLE**

PINK **BLACK** **BLUE** **YELLOW** **GREEN**

Preferences Are Produced By The Three Brains

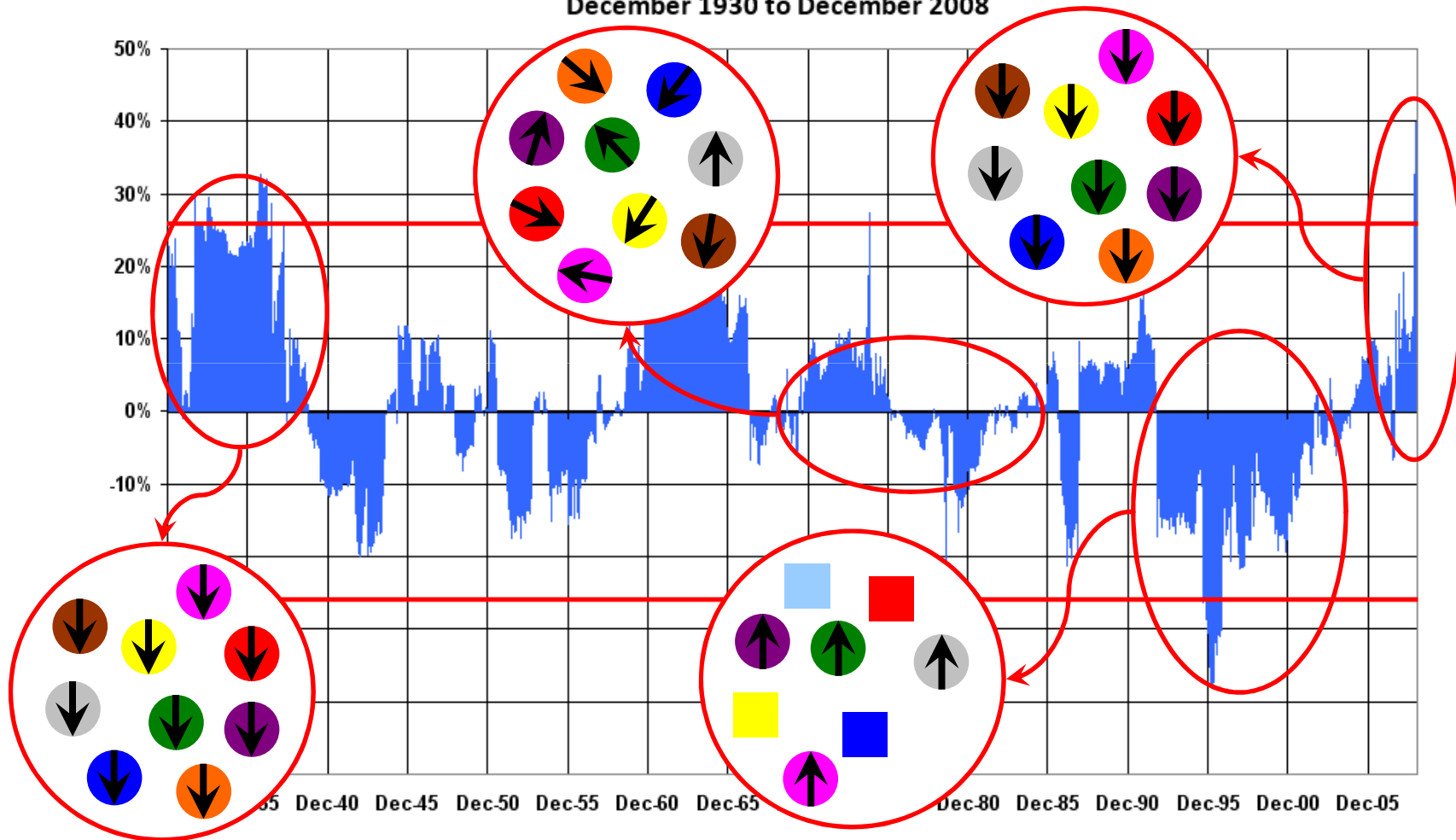
- Logical Reasoning Produced By Hominid Brain
- Emotional Stimulus Can Override Hominid Brain
- Lack of Emotion Can Also Lead To Irrationality
- Preferences May Not Be Stable Over Time
- Preferences May Not Be Stable Over Situations
- Agents Do Not Have Rational Expectations
- Neuroscientific and Evolutionary Roots of Behavior

1. Individuals act in their own self-interest
2. Individuals make mistakes (“satisfice”)
3. Individuals learn and adapt (heuristics)
4. Competition drives adaptation and innovation
5. Evolution determines market dynamics

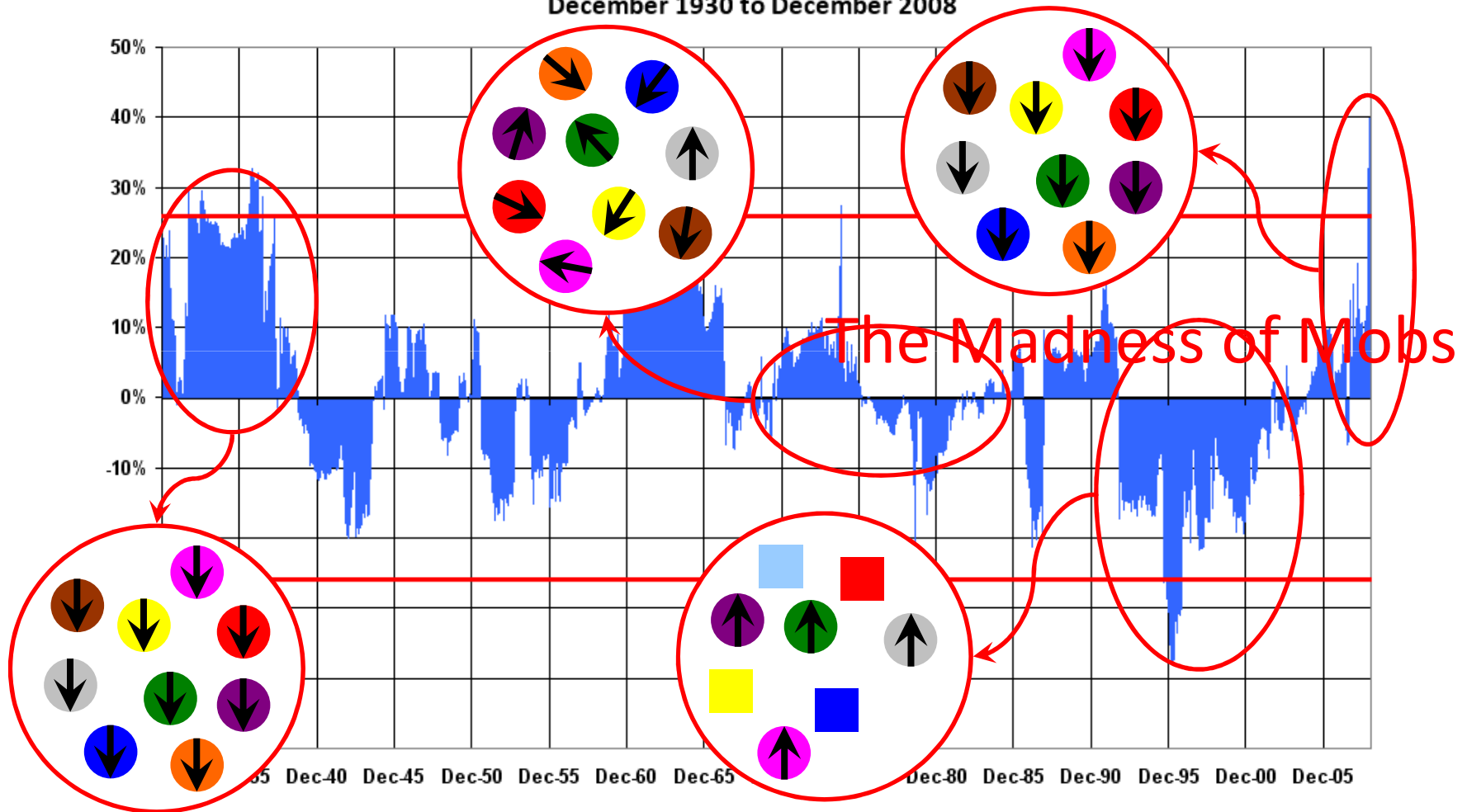
See Lo (2004, 2005)

60-Month Rolling-Window Autocorrelation of the S&P 500

December 1930 to December 2008



The Wisdom of Crowds 60-Month Rolling Window Autocorrelation of the S&P 500 December 1930 to December 2008



Consider Getting Dressed:

- 5 Jackets, 10 Pants, 20 Ties, 10 Shirts, 10 Pairs of Socks, 4 Pairs of Shoes, 5 Belts
- 2,000,000 Possible Outfits!
- Takes 1 Second To Evaluate Each Outfit
- How Long To Get Dressed?
- 23.1 Days!

How Do We Get Dressed So Quickly?

⇒ **Evolutionary Forces**

How Alpha Turns To Beta

New Paradigm

Example: Paulson & Co. (Wall Street Journal, January 5, 2009)

The collage consists of three main elements:

- Newspaper Article Snippet:** The top portion shows a headline "Pellegrini to Leave Paulson & Co. to Start Own Fund" by Gregory Zuckerman. The text discusses Paolo Pellegrini's role in helping John Paulson with subprime mortgage bets and his decision to leave to start a hedge fund.
- Book Cover:** The central element is the cover of the audiobook "The Greatest Trade Ever" by Gregory Zuckerman. The cover features the title in large, bold letters, the author's name, and a subtitle: "THE BEHIND-THE-SCENES STORY OF HOW JOHN PAULSON DEFIED WALL STREET AND MADE FINANCIAL HISTORY". It also mentions "READ BY MARC GASHMAN" and "AN UNABRIDGED PRODUCTION". The artwork depicts a roulette wheel, stacks of casino chips, and small house models.
- Portrait:** On the right is a black and white portrait of Paolo Pellegrini, a man in a suit and tie.

Other Examples

- Value, growth, momentum, earnings surprise
- ABS, MBS, CDO, structured credit
- Equity market neutral
- The “carry” trade
- Merger arbitrage
- Trend-following

Wall Street Journal
September 7, 2007



Traditional Framework

- Diversify across stocks and bonds
- Long-only constraint
- Market-cap-weighted indexes
- Manage risk via asset allocation
- Alpha vs. market beta
- Markets are efficient
- Equities in the long run

New Framework

- Diversify across more asset classes and strategies
- Long/short strategies
- Passive transparent indexes based on algorithms
- Manage risk via active volatility scaling algorithms
- Alphas \Rightarrow multiple betas
- Markets are **adaptive**
- “In the long run we’re all dead”, but make sure the short run doesn’t kill you first

The Full Spectrum of Investments

Hedge
Funds

Index
Funds



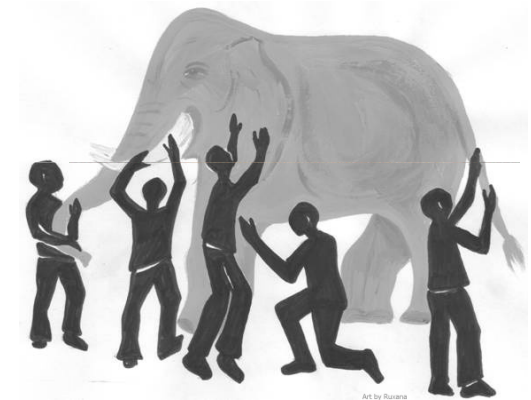
- Sharpe Ratio: High
- Transparency: Low
- Liquidity: Low
- Risk Exposures: Complex
- Controls: Few
- Capacity: Limited
- Trading: Hyperactive
- Fees: High



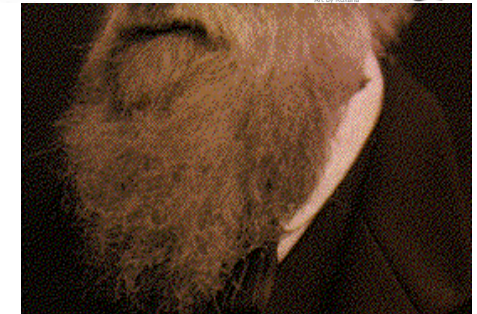
- Low
- High
- High
- Simple
- Many
- High
- Passive
- Low

“It Takes A Theory To Beat A Theory”

- Standard paradigm is not wrong, just incomplete
- Markets evolve and adapt
- Neuroscience explains behavior
- Evolution determines dynamics
- Competition, selection, innovation



How Adaptive Are You?



Thank You!

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