The Adaptive Markets Hypothesis and the New Investment Paradigm

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Traditional Ways of Thinking About Investments Are Broken

DIVERSIFY

LONG-ONLY

LONG-RUN

RISK/REWARD

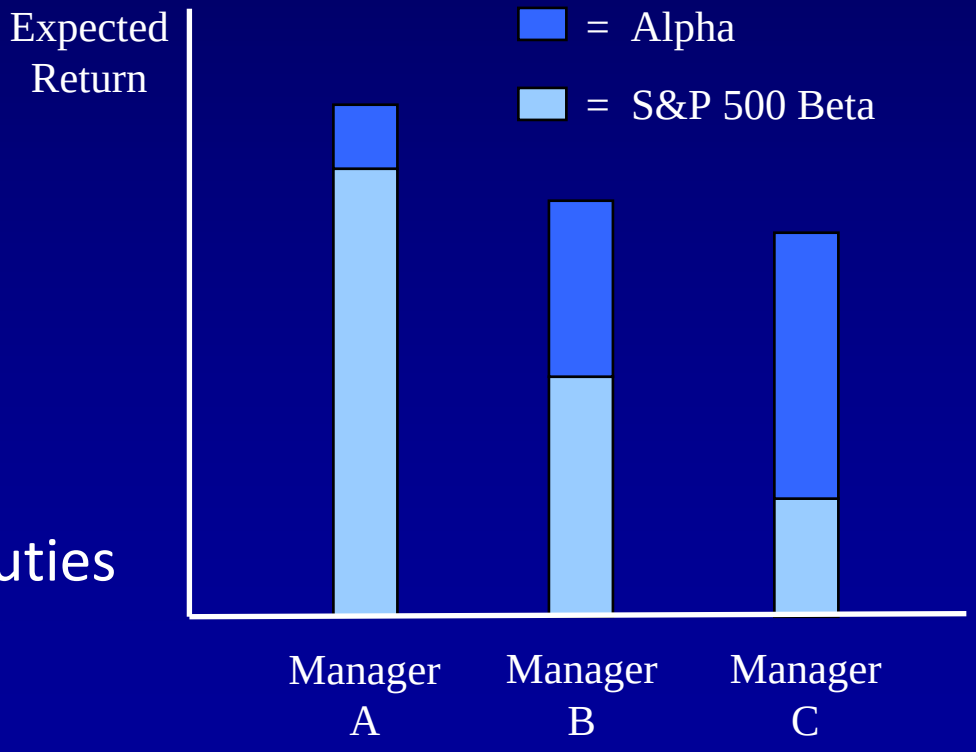
The Traditional Investment Framework

Common Wisdom:

- Beta is easy to come by
- True alpha is hard to find
- Correlation is important

Implications:

- Benchmarks
- Performance attribution
- Indexation and hedging
- Portable alpha overlays
- Risk budgeting
- Framework for fiduciary duties

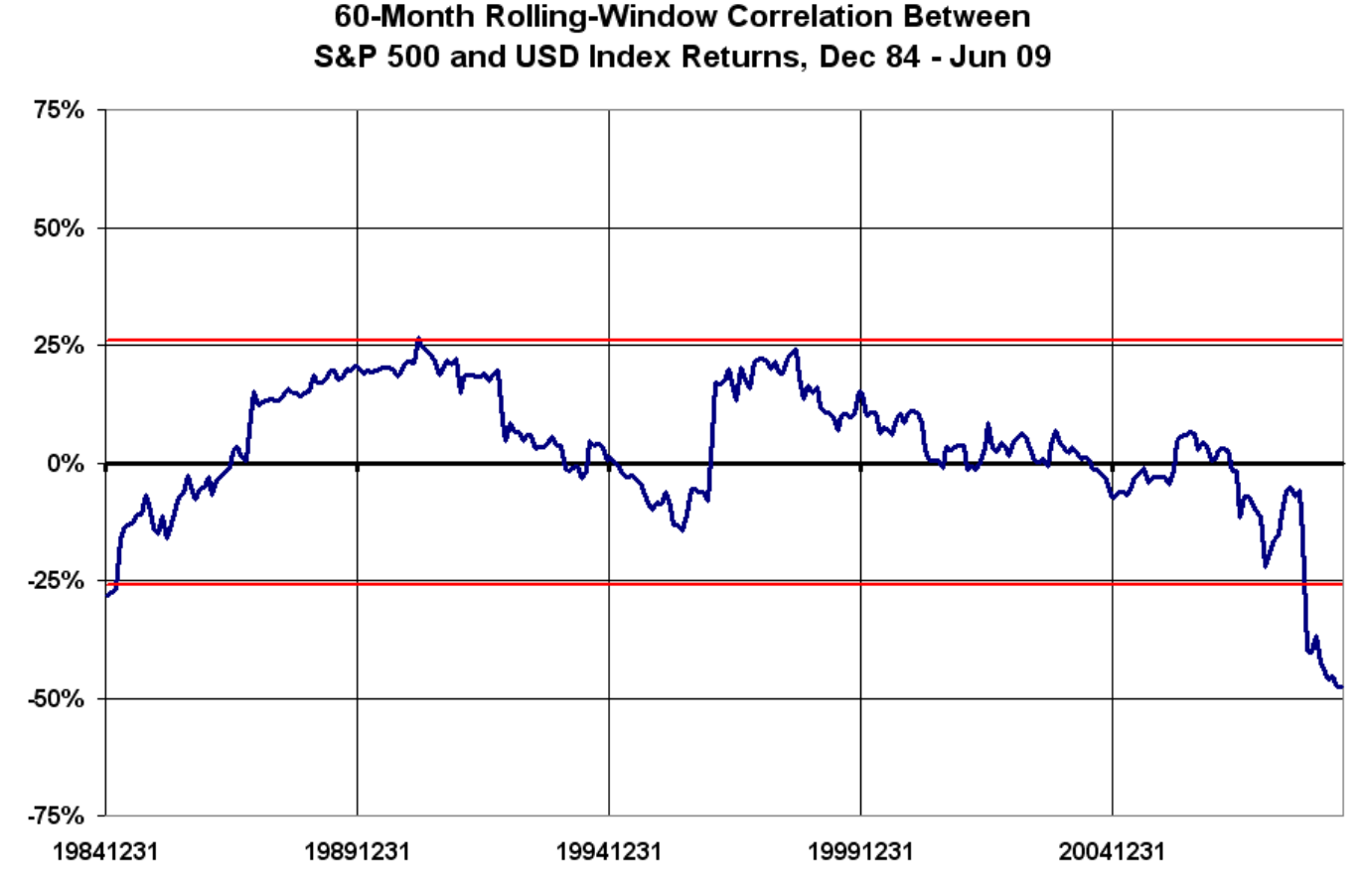


The Traditional Investment Framework

Jack Bogle (1997) on the Origins of the Vanguard Index Trust:

The basic ideas go back a few years earlier. In 1969–1971, Wells Fargo Bank had worked from academic models to develop the principles and techniques leading to index investing. John A. McQuown and William L. Fouse pioneered the effort, which led to the construction of a $6 million index account for the pension fund of Samsonite Corporation. **With a strategy based on an equal-weighted index of New York Stock Exchange equities, its execution was described as "a nightmare".** The strategy was abandoned in 1976, replaced with a market-weighted strategy using the Standard & Poor's 500 Composite Stock Price Index. The first such models were accounts run by Wells Fargo for its own pension fund and for Illinois Bell.

Financial Markets Have Become More Complex



Hedge Funds Have Permanently Changed The Investment Landscape

Thought Leadership Series
APRIL 2009

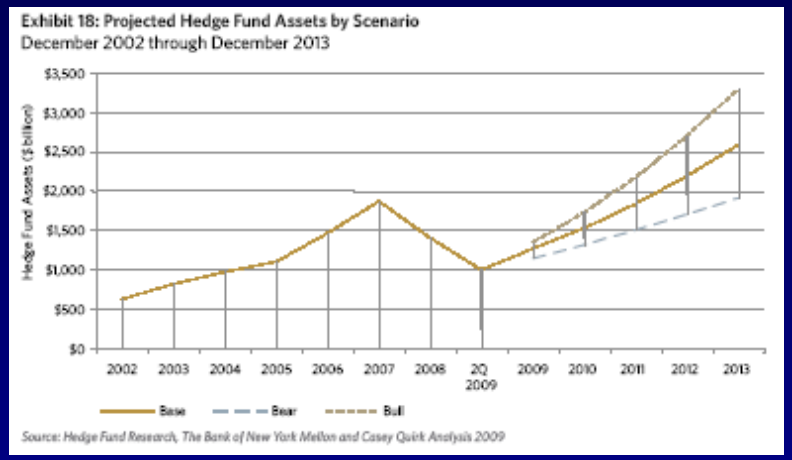
CONTENTS

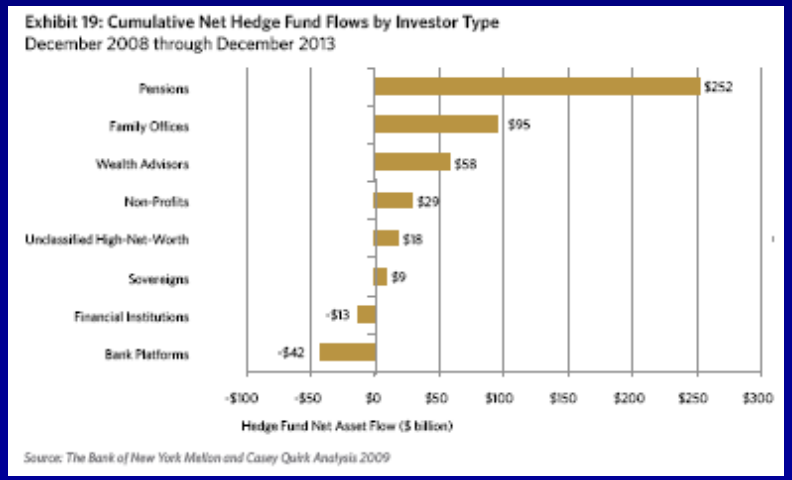
The Hedge Fund of Tomorrow:
Building an Enduring Firm

- The hedge fund industry is facing a transformational crisis. The industry must address key shortcomings in its business and operating models in order to position itself as the future of active asset management.
- We forecast that hedge fund assets will reach almost $2.6 trillion by the end of 2013, after reaching their low point in 2009.
- Institutions are committed to hedge fund investing and accounted for less than 17% of net redemptions during 2008 and 2009. North American institutions will be the greatest source of institutional net flows into hedge funds between now and 2013.
- Global high-net-worth investors' commitment to hedge funds will depend on capital market conditions and hedge fund returns during the next several years. High-net-worth and retail investors accounted for more than 80% of redemptions for 2008 and 2009.
- Funds of hedge funds will maintain their role as the primary hedge fund distribution channel, capturing almost 60% of net flows between 2010 and 2013. Funds of hedge funds will likely oversee close to 50% of total hedge fund assets in 2013, compared with 36% in 2005 and 17% in 2000.
- Investors will carve their previously amorphous hedge fund allocation into three distinct categories: Market Directional Liquid, "Classic" Hedge Liquid and Illiquid. There is growing recognition that hedge funds may not be an asset class, but instead represent an investment framework applicable across all traditional asset classes and investment programs.
- We predict that, regardless of capital market returns, "Classic" Hedge strategies will experience the most stable demand.
- Successful hedge funds will rebuild their operating models. Managers will have to invest in robust systems, processes and controls and rely on independent third parties for key administrative and operational activities.
- The Enduring Firm will be built upon a foundation of strong alignments. Hedge funds have to restructure fee models, liquidity terms and compensation, and align client requirements with business needs across four functional areas: management, operations, distribution and investments.
- Fee models will evolve to ensure better, more stable revenues for managers. Performance fees will vary by strategy, firm and liquidity terms, and will incorporate rolling periods and deferrals.
- There are four viable business models the hedge fund of tomorrow can pursue. The Multi-Capability Platform (a better designed and more durable model) will see the greatest growth in share.

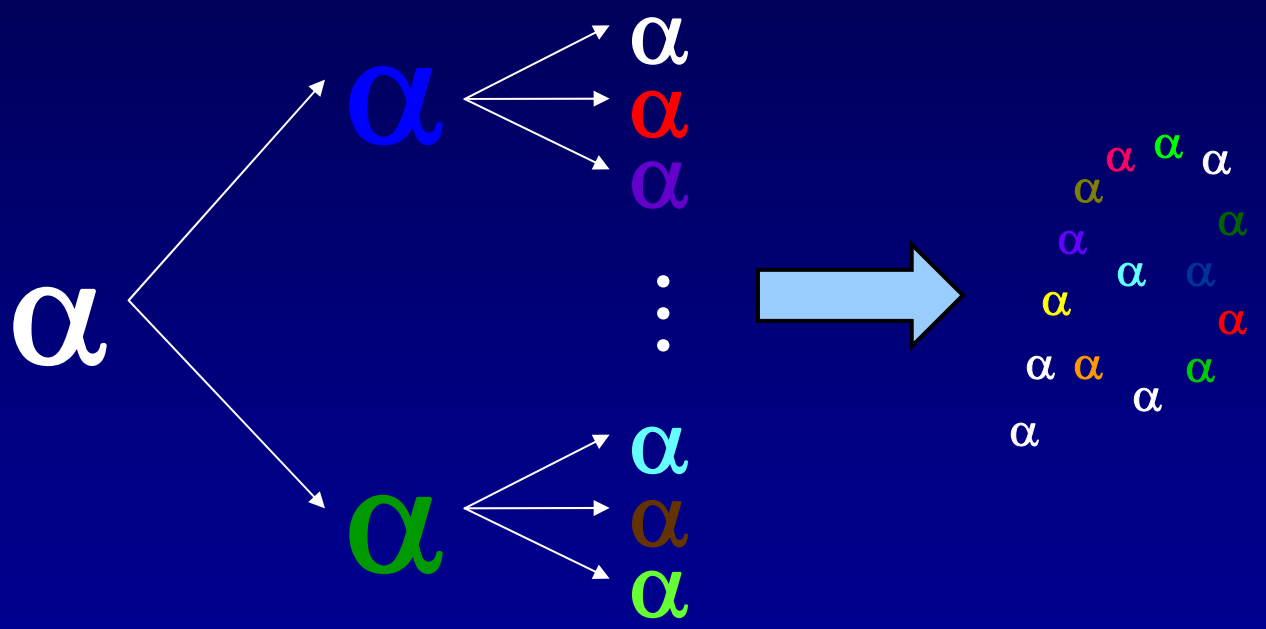
Casey Quirk

THE BANK OF NEW YORK MELLON





A Beta Is Born



Unique → Novel → Popular → Common

A Beta Is Born

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

Pellegrini to Leave Paulson & Co. to Start Own Fund

By Gregory Zuckerman

The man who helped John Paulson pull off one of the greatest trades of this decade is leaving his side.

Paolo Pellegrini, who played a crucial role in helping to implement bets against subprime mortgages that netted Paulson & Co. about $15 billion in 2007, resigned from the $36 billion hedge-fund firm Dec. 31.

While Mr. Paulson is the visionary within the firm who drives its general direction, Mr. Pellegrini and a few others helped find the riskiest subprime-mortgage securities to bet against, and figured out the best way to capitalize on their expected falls in value.

Mr. Pellegrini put together data showing that even stabilizing home prices would lead to huge losses in the subprime market, a possibility that other investors scoffed at when the trades were made in 2005 and 2006.

Mr. Pellegrini, who had a background in derivatives before joining Paulson in 2004, helped his boss use credit-default swaps, or insurance-like contracts that provided protection against various slices of mortgage-backed securities.

The move paid off when the housing market began to crumble in early 2007.

A former banker and native of Italy, Mr. Pellegrini, 52 years old, was the co-portfolio manager of the two Paulson Credit Opportunities funds, along with Mr. Paulson.

Mr. Pellegrini is expected to start his own hedge fund.

The departure was amicable, according to people close to the matter.

The departure is a loss for Paulson, but the firm boasts a team of senior analysts and hasn't lost other professionals on its investment team in the past year.

Mr. Paulson's two credit funds rose about 15% in 2008 through the middle of December. Other Paulson funds rose between 7% and 38% in that period, thanks to wagers against financial firms and general cautiousness about the economy.

By contrast, the average hedge fund lost more than 20% for 2008, while the Standard & Poor's 500-stock index lost 38%, including dividends.

In recent weeks, Mr. Paulson has been one of the few buyers of top-rated mortgage-backed securities, a move that is paying off as credit markets have rallied.

He also is part of a team of investors that have reached an agreement to purchase **IndyMac Bank**, which last year became one of the biggest bank failures in U.S. history. Some investors who were outbid for IndyMac say the deal will bring profits to Mr. Paulson and the other victors in the competition.

But Mr. Paulson's original focus, the merger-arbitrage world, has proven trickier lately.

Paulson was, according to public filings, the largest holder of **Rohm & Haas** Co. as of Sept. 30; the company tumbled last week on worries about an acquisition. It also held 5.5 million shares of telecom-provider **BCE** Inc., which has fallen, too. It isn't clear whether Paulson still holds shares or how much of any positions were hedged. A spokesman declined to comment.

Paolo Pellegrini helped craft Paulson's successful strategy betting against subprime mortgages.

A Beta Is Born

Other Examples

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

Wall Street Journal
September 7, 2007

AUGUST AMBUSH

How Market Turmoil Waylaid the 'Quants'

Morgan Stanley Star Is Among Those Battered; No Time for Music Now

By Scott Patterson And Anita Raghavan

Peter Muller, a 43-year-old trader at Morgan Stanley, is used to markets behaving more or less as he expects. But in late July, some unusual patterns perplexed him. Certain investing strategies that historically had posted steady gains started faltering for no evident reason.

Soon, the unusual trading spread from U.S. to Japanese and European

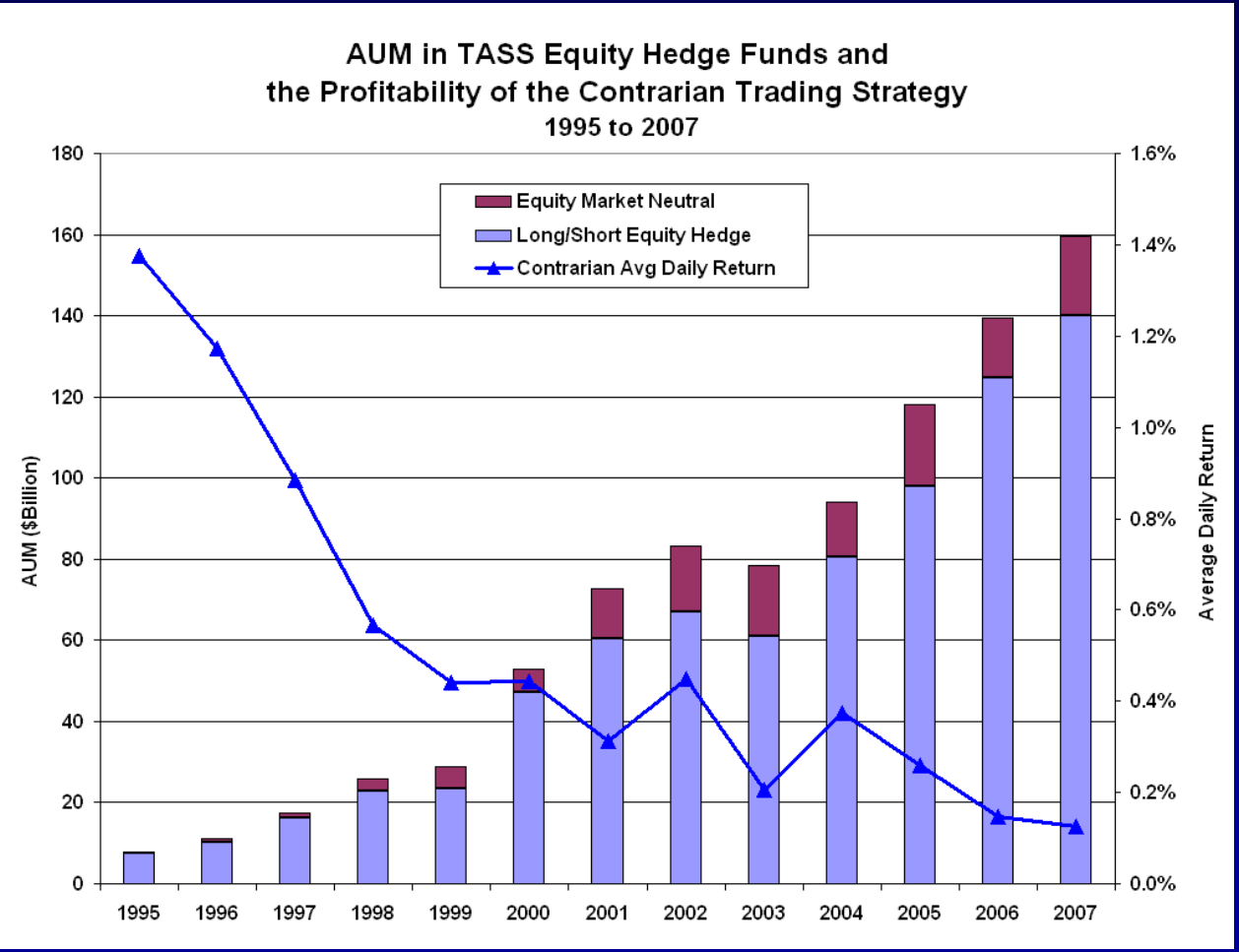
Adding Up

Estimated assets in quant hedge funds using two common strategies, 'market neutral' and 'statistical abitrage'; quarterly data

$100 billion
80
60
40
20
0
2005
'06
'07

Source: Hedgefund.net

A Beta Is Born



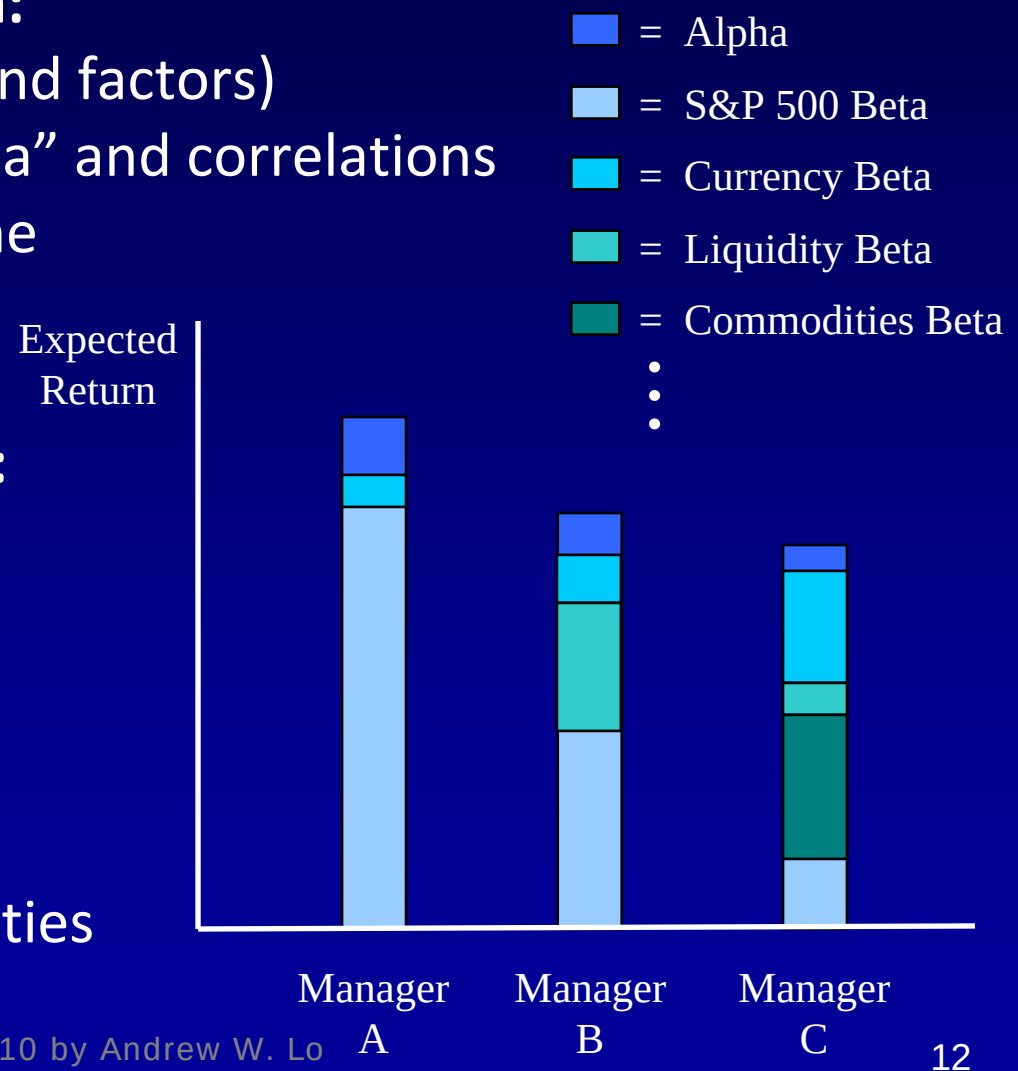
A Multitude of Betas Now Exists

New View of Risk and Return:

- There are multiple betas (and factors)
- Factors differ in "risk premia" and correlations
- Premiums vary through time
- Correlations also vary

Implications for Alternatives:

- Benchmarks
- Performance attribution
- Indexation and hedging
- Portable alpha overlays
- Risk budgeting
- Framework for fiduciary duties



The Full Spectrum of Investments

▪ Sharpe Ratio:	High	Low
▪ Transparency:	Low	High
▪ Liquidity:	Low	High
▪ Risk Exposures:	Complex	Simple
▪ Controls:	Few	Many
▪ Capacity:	Limited	High
▪ Trading:	Hyperactive	Passive
▪ Fees:	High	Low

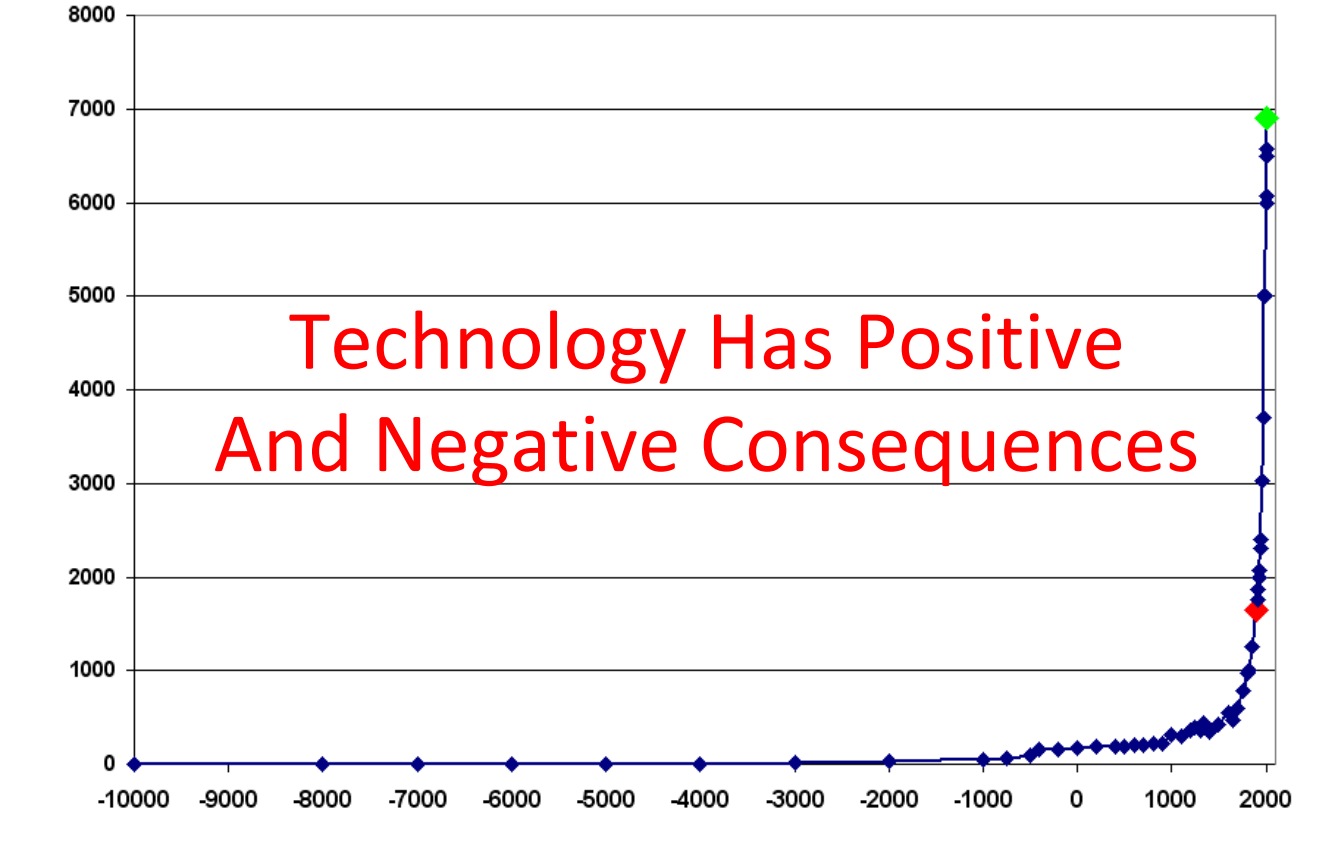
Untapped New Investment Opportunities

Why Haven't We Seen These Other Betas Before?

1. Not enough AUM in alternatives to "move the needle" until recently (alpha decay vs. beta proliferation)
2. Recent technological advances
3. Financial innovation takes time
4. Markets are not stationary
5. Physics envy!

World Population Growth

World Population, 10,000 BC to 2008 AD



The Adaptive Markets Hypothesis

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

A Comparison of Hypotheses

Efficient Markets

- Rational expectations
- Optimizing behavior
- No free lunch
- Risk/reward relation
- Stationary returns
- Static linear models
- Homogeneous agents
- Mathematical rigor
- Empirical rejections

Adaptive Markets

- Adaptive expectations
- Satisficing behavior
- No free lunchplans
- Fear/greed vs. logic
- Nonstationary returns
- Dynamic nonlinear models
- Heterogeneous agents
- Biological rigor
- Empirical confirmations

Practical Implications of Adaptive Markets

1. Risk/reward relation is not stable (nonlinear)
2. Markets are not always rational (balance between fear/greed vs. logic)
3. Strategies wax and wane over time
4. Adaptation and innovation are key to survival
5. Survival is all that matters

A New Investment Paradigm Is Emerging

Traditional Framework

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

New Framework

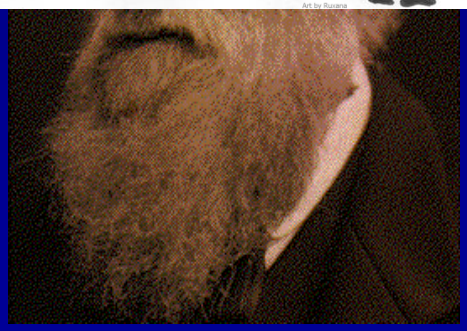
- Long/short strategies
- Diversify across more asset classes and strategies
- Passive transparent indexes
- Manage risk via active volatility scaling algorithms
- Alphas $\Rightarrow$ multiple betas
- Markets are **adaptive**
- "In the long run we're all dead", but make sure the short run doesn't kill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

DIVERSIFY	Consider multiple asset classes and betas, including liquidity
LONG-ONLY	Consider reducing or removing the long-only constraint
VALUE/GROWTH	Behavioral drivers may create cycles that are hard to predict
STOCKS IN THE LONG-RUN	Financial markets are not stationary; which long-run?
RISK/REWARD	Risk is rewarded normally; risk is punished during crises

Conclusion

"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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