

# The Efficient Markets Hypothesis – Explained, Demythologized, Buried, and Resurrected

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By David J. Merkel, CFA, FSA

Principal, Aleph Investments, LLC

Writer of [The Aleph Blog](#)

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- You can find a [list of my stockholdings here](#). Since I am talking to a bunch of actuaries today, here is a list of my insurance holdings as of 10/20/2010: Allstate, Assurant, Chubb, National Western Life, Reinsurance Group of America, PartnerRe, Stancorp Financial and Safety Insurance.

# With Thanks To:

- [Efficient Markets Hypothesis website](#), by [\*Martin Sewell\*](#)
- Wikipedia

# The Efficient Markets Hypothesis – A Brief History

- 1828 – Brownian motion discovered by Scottish botanist Robert Brown
- 1863 – French stockbroker, Jules Regnault, discovers price deviation is directly proportional to the square root of time.
- 1889 – George Gibson ‘shares become publicly known in an open market, the value which they acquire may be regarded as the judgment of the best intelligence concerning them.’
- 1900 – Louis Bachelier, published his PhD thesis, *Theorie de la Speculation*.
  - developed the mathematics and statistics of Brownian motion five years before Einstein
  - ‘The mathematical expectation of the speculator is zero’
  - Figures out how to price options.
- 1914 – Bachelier published the book, *The Game, the Chance and the Hazard*), which sold over six thousand copies.

Source: [History of the Efficient Market Hypothesis](#), by Martin Sewell (2008)

# The Efficient Markets Hypothesis – A Brief History (2)

- 1923 – Keynes writes “Some aspects of commodity markets,” saying that agents are paid to bear risk, not speculate.
- 1925 -- Frederick MacCauley, an economist, observed similarity between the fluctuations of the stock market and those of a chance curve which may be obtained by throwing a dice.
- 1933 & 1944 – Cowles reported that investment professionals as a whole do not beat the market.
- 1955 – Leonard Savage finds Bachelier’s 1914 book. Asks other economists if they have heard of him. Paul Samuelson finds the 1900 thesis; Samuelson does his own Ph. D. thesis on option pricing in 1956.
- 1962 – Jack Treynor wrote his unpublished manuscript ‘Toward a theory of market value of risky assets’, the first paper on the Capital Asset Pricing Model (CAPM)
- 1963 – Granger and Morgenstern found that short-run movements of the series obey the simple random walk hypothesis, but that long-run movements do not.

# The Efficient Markets Hypothesis – A Brief History (3)

- 1964 – Numerous papers and books on the “random walk.”
- 1965 – Fama defines an “efficient” market for the first time. Samuelson provided the first formal economic argument for ‘efficient markets’. His contribution is neatly summarized by the title of his article: ‘Proof that properly anticipated prices fluctuate randomly.’ He uses a Martingale, not a random walk.
- 1967 – Harry Roberts coined the term “efficient markets hypothesis” distinguishing between weak and strong form tests.
- 1969 – Fama, Fisher, Jensen and Roll undertook the first ever event study, on stock splits.
- 1970 – The definitive paper by Eugene F. Fama: ‘Efficient capital markets: A review of theory and empirical work’.
- 1973 – Burton G. Malkiel first publishes the classic, “A Random Walk Down Wall Street.”

# The Efficient Markets Hypothesis – Explained

- 1. Weak-form efficiency** – Prices of the securities instantly and fully reflect all information of the past prices. This means future price movements cannot be predicted by using past prices. (and price-related data, like volume)
- 2. Semi-strong efficiency** – Asset prices fully reflect all of the publicly available information. Therefore, only investors with additional inside information could have advantage on the market.
- 3. Strong-form efficiency** – Asset prices fully reflect all of the public and inside information available. Therefore, no one can have advantage on the market in predicting prices since there is no data that would provide any additional value to the investors.

Sources: Fama: [Efficient Capital Markets: A Review of Theory and Empirical Work](#) (1970), via [Wikipedia](#), see also [this blog post](#)

# Strong-form Efficiency

- Argues that even insider information can't be used to make excess profits.
- I've never seen anyone advocate this view.
- If it were true, the SEC would not have to prosecute insider trading cases.
- There are many services that sell legitimate insider trading data as collected by the SEC, because it carries some useful signals of value.



# Semi-strong Efficiency

- Argues that fundamental analysis can't be used to make excess profits.
- Given that most active money in the market is run based on some type of fundamental analysis, it is no surprise that results are market-like minus fees in aggregate.
- Value Line was an anomaly, noted by Fischer Black's 1973 paper "Yes, Virginia, There is Hope."
- The system was [created by Sam Eisenstadt](#), improving on a prior system of Arnold Bernhardt.
- VL has several factors: Earnings surprise, earnings momentum, price momentum, and analyst opinion.
- Worked well until about 2000, then it seemed to run out of juice.

# Semi-strong Efficiency (2)

- Warren Buffett – "[The Superinvestors of Graham-and-Doddsville](#)"
- Argument with Michael Jensen using the analogy of coin-flippers. Jensen famously wrote, 'I believe there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Market Hypothesis.'
- The performance of Buffett and his value investing friends remained strong after the article.
- Buffett has a lot more money to manage now. His percentage outperformance has declined, but the absolute dollar value of outperformance is remarkable.

# Weak-form Efficiency

- Argues that Technical analysis is useless in order to earn excess returns.
- Most fundamental investors and almost all academics agree on this.
- Many academic tests of specific technical analyses find there is no advantage.
- Unfortunately, 10-month price momentum is a good predictor of returns over the next month.
- Prices tend to mean-revert over a 4-year period.
- Tends to be true of indexes, industries, and individual stocks
- Some have found that asset classes do better when they are above their 10-month moving average.

# Generalized Efficiency

- Jensen defines efficiency thus: 'A market is efficient with respect to information set  $\theta_t$  if it is impossible to make economic profits by trading on the basis of information set  $\theta_t$ .'
- In other words, the strategies are so well known, that no one can make money off them. You would need new information outside  $\theta_t$  in order to earn excess returns.
- Roll's critique of the CAPM as a special case; the CAPM assumes that the market is mean-variance efficient
- Joint Hypothesis test – Can't test only EMH. Must test EMH and the thesis that investors are rational in their expectations of the market.
- Applies to Arbitrage Pricing Theory as well. It also assumes investors are rational in their expectations of the market.
- But information is costly, so no market can be perfectly efficient.
- Paradox: gathering information to make excess returns makes the market more efficient; an efficient market discourages investors from gathering more information because they can't make money.

# Myth – EMH Means The Price is Right?

- Particularly during this current economic crisis, many have criticized the EMH as being wrong, because the prices of assets changed dramatically for the worse.
- This comes partly because many EMH proponents have made incautious statements with respect to what it means that current prices are the product of all current and past information.
- Neglects the idea that price movements seem random in the short-run, in the intermediate-run, there are momentum effects and later still, mean-reversion effects.
- Expectations hypothesis – estimated future short-term rates are rarely good predictors of future short-term rates, but they do reflect the collective judgment of the actors in the market.
- This applies to covered interest parity with currencies as well.
- Market prices reflect the judgment of the market at a single point in time, not an inviolable law of God, that can't be changed.

# Are Investors Rational?

- Investors are boundedly rational, in my opinion. It is costly to gather data and think, so people seek shortcuts. Examples:
- Many are slow to react to new information.
- Institutional investors often turn down promising ideas because they don't fit into the risk management schemes of consultants, or, the biases of their boss or peers.
- They imitate the behavior of seemingly successful players, because thinking independently is hard.
- Males particularly try to hit "home runs," but end up with many strikeouts. Women seem to do better with risk-return tradeoffs.
- Many investors have a compulsive desire to get back to even on losing investments, rather than selling out and buying something better.
- And more... I would say we aren't the profit-seeking *homo oeconomicus* as posited by economists.

# Behavioral Finance

- Prospect theory – Hurts more to lose than the pleasure from winning. Leads to loss aversion, and accounting for gains and losses separately.
- Framing – People give different answers to the same question different ways.
- Pride: Remember our winners and forget our losers.
- Confirmation Bias: Ignore data that is contradictory, and receive that which is confirming. Slow adjustment of ideas to reflect data.
- Status quo bias: Avoid making changes.
- Self-serving bias: If it wins it was my pick, if it loses, blame the analyst, data source, market surprise, etc.
- And more... this is just a taste.

# Factors

- Fama – Beta, Value, Size
- Carhart – Beta, Value, Size, Momentum
- Momentum, the Most Durable Factor
- Some studies add other factors, like net operating accruals, a measure of accounting quality.
- EMH is in a sense left behind by current finance research, because all testing assumes that other factors are valid.



# Anomalies

- Cheap valuation, book, earnings, sales, dividends, EBITDA
- Price momentum with mean-reversion over longer periods
- Low accrual accounting entries as a fraction of earnings or assets; [Piotroski's accounting criteria](#)
- Low net stock issuance; low asset growth
- Positive earnings surprises
- Low historical return volatility
- Illiquidity, which is a proxy for size and neglect
- Return negatively correlated with risk – Bond studies, Morningstar study
- Minimum variance portfolios tend to outperform, so do minimum beta
- Insider Purchases
- Alphaclone

## Sources:

- [\*What has worked in investing?\*](#)
- [Finding Alpha](#)
- [CXO Advisory](#)

# What Many Quantitative Equity Hedge and Mutual Funds Do

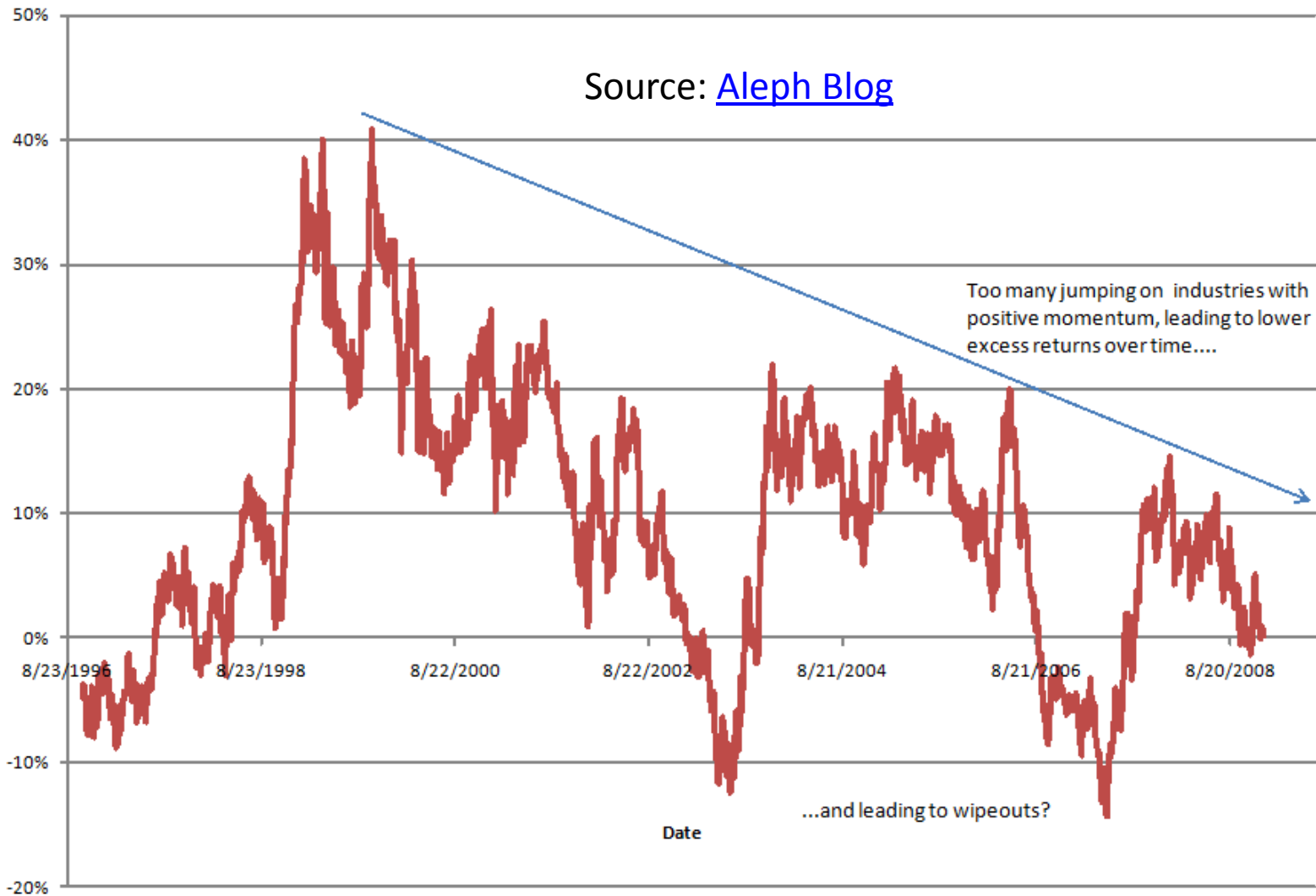
- Choose your trading time horizon – shorter-run will be more momentum-driven, longer will include more fundamental factors.
- Decide what factors or anomalies are relevant to stock pricing
- Define the universe of stocks
- Estimate expected return on the various stocks over the time horizon
- Go long stocks with expected high returns, and short those with low returns, subject to diversification constraints which might include limits on: factor exposure, industry, portfolio weight, liquidity, etc.
- Same applies to long only mutual funds

# How it Failed in August 2007

- Falling returns led to:
- Use of leverage – Up, then down
- Growth beyond the liquidity capacity of the stocks owned – who is there to take the other side of your trade?
- Crowded trade – valuation and momentum
- "Events that models only predicted would happen once in 10,000 years happened every day for three days."
- Similar to failures like RMBS (1994), LTCM (1998), Tech stocks and momentum (2000), Correlation crisis (2005), housing/debt bubble crisis (2005-?)
- Should cut off complex trades when unlevered returns are less than what can be obtained by investing in Single-B bonds.

# Industry Momentum Example

Excess Returns From High Momentum Industries, 12 Months Trailing



# The Adaptive Markets Hypothesis

- The AMH argues that markets are like an ecology.
- Different players pursue different strategies to earn scarce excess returns.
- When one strategy gets too many players, it overshoots and crashes. Then players leave the strategy, accentuating the decline, until everyone knows that the strategy doesn't work.
- That's the best time to adopt the strategy, but few do so because of behavioral biases.

# The EMH as a Limiting Concept

- An implicit assumption of the EMH is that research costs are free. They are not free. Also, it implicitly assumes that a dominant number of investors understand what information drives the markets. Both assumptions are not true — even in the most clever firms, there is information that is missed, and research costs are expensive, and not always rewarded.
- But the effort to earn above-average returns forces the market closer to the EMH. When the competition is tough, finding excess returns is hard. This makes it a limiting concept. We never get there, but effort to find above-average returns gets us closer to that ideal. Conversely, when many decide to index, those who do not index have a better chance at earning above normal returns, because there is a large chunk of naive capital in the market seeking average returns with certainty.
- The Adaptive Markets Hypothesis says that all of the market inefficiencies exist in a tension with the efficient markets, and that market players make the market more efficient by looking for the inefficiencies, and profiting from them until they disappear, or at least, until they get so small that it's not worth the search costs any more.

# Summary

- The recent crisis does not mean that the EMH is wrong; the EMH should make no long-term claims with respect to the long-term accuracy of prices.
- The EMH is right and useful as a limiting concept.
- Momentum, Value and other factors have tended to earn excess returns over time, partly due to foibles of human nature, because man is not fully rational in the way that economists believe.
- Attempts to earn excess returns push the market closer to the EMH. Excessive efforts to earn excess returns can lead to severe turbulence.
- The Adaptive Markets Hypothesis is a better explanation of market behavior, as it takes into account both market anomalies, and the tendency toward efficiency.

# Epilogue Scene One — Efficient Markets Hypothesis

An economics professor and a grad student are walking along the sidewalk, and the grad student spots a twenty dollar bill on the sidewalk. He says, “Hey professor, look, a twenty dollar bill.” The professor says, “Nonsense. If there were a twenty dollar bill on the street, someone would have picked it up already.” They walk past, and a little kid walking behind them pockets the bill.



# Epilogue Scene Two — Adaptive Markets Hypothesis, Part 1

An economics professor and a grad student are walking along the sidewalk, and the grad student spots a twenty dollar bill on the sidewalk. He says, “Hey professor, look, a twenty dollar bill.” The professor says, “Really?” and stoops to look. A little kid walking behind them runs in front of them, grabs the bill and pockets it.

# Epilogue Scene Three — Adaptive Markets Hypothesis, Part 2

An economics professor and a grad student are walking along the sidewalk, and the grad student spots a twenty dollar bill on the sidewalk. He says quietly, “Tsst. Hey professor, look, a twenty dollar bill.” The professor says, “Really?” and stoops to look. He grabs the bill and pockets it. The little kid doesn’t notice.

# Epilogue Scene Four — Adaptive Markets Hypothesis, Part 3

An economics professor and a grad student are walking along the sidewalk, and the grad student spots a twenty dollar bill on the sidewalk. He grabs the bill and pockets it. No one is the wiser.

# Epilogue Scene Five — Adaptive Markets Hypothesis, Part 4

An economics professor and a grad student are walking along the sidewalk, and the grad student is looking for a twenty dollar bill lying around. There aren't any, but in the process of looking, he misses the point that the professor was trying to teach him. The professor makes a mental note to not take him on as a TA for the next semester. The little kid looks for the twenty dollar bill as well, but as he listens to the professor drone on decides not to take economics when he gets older.

# About Me

- 2010-Present – Runs Aleph Investments, LLC, which manages equity portfolios
- 2008-2010 – Chief Economist and Director of Research of Finacorp Securities
- 2007 – Started my website [Alephblog.com](http://Alephblog.com).
- 2003-2007 – Senior Investment Analyst at Hovde Capital. I also managed the internal profit sharing and charitable endowment monies of the firm.
- 2003-2007 – Leading commentator at the excellent investment website [RealMoney.com](http://RealMoney.com). James Cramer invited me to write for the site.
- 2001-2003 – Corporate bond manager for Dwight Asset Management.
- 1998-2001 – Mortgage Bond and Asset/Liability manager for Mount Washington Investment Group (St. Paul Companies)
- 1992-1998 – Investment Actuary, Provident Mutual
- 1986-1992 – Actuary, Pacific Standard and AIG
- Bachelor's and Master's degrees in Political Economy from The Johns Hopkins University. (1982)

# For Further Reference

- [How Wall Street Looks at Insurance Companies](#)
- Residential Real estate pieces – [Tops](#) and [Bottoms](#)
- Equity Market pieces – [Tops](#) and [Bottoms](#)
- [Subprime piece](#) (before the crash)
- [Buy High Yield piece](#) (November 2008)
- [ALG piece](#)
- [Loss Severity Leverage](#) – on an unnamed mutual insurer.
- [An Amazing Ten Years for Insurance Stocks](#)
- [Past the Peak of the Credit Cycle](#) – SOA Annual Meeting 2007 Presentation
- Website: [The Aleph Blog](#)
- Contact me at [david.merkel@gmail.com](mailto:david.merkel@gmail.com)