A BRIEF INTRODUCTION TO THE HISTORICAL DEVELOPMENT OF FINANCIAL THEORY AND PRACTICE

By Wenlong (Will) Zhao
prepared for RiskLab at UofT

PURPOSES

- Disclaimer/Not Investment Advice
- Introduction/Refreshment
- Historical Development
- Theoretical Foundation
- A Bigger Picture and Beyond
- Intuition/No Math

ROAD MAP

- Belief
  - EMH Believer
  - Non-Believer
- Philosophy
  - Ancient
  - Old
  - Modern
  - New
- Analysis
  - Technician
  - Fundamentalist
  - Portfolio Theorist
  - Behavioralist
- Strategy
- Conclusion

Belief	Believer	Philosophy	Ancient	Analysis	Technician	Strategy
			Old		Fundamentalist	
			Modern		Portfolio Theorist	
	Non-Believer		New		Behavioralist	

BELIEF

- Efficient Market Hypothesis (EMH) Believer
- Non-Believer

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WHAT DO YOU BELIEVE?

- Investment is a(n)
  - Myth (e.g. astrology, numerology, Alchemy)
  - Art (e.g. painting, sculpture)
  - Science* (e.g. astronomy, physics)
  - Mixture

	Believer		Ancient		Technician	
Belief		Philosophy	Old	Analysis	Fundamentalist	Strategy
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EMH

- Eugene Fama*
  - Efficient Capital Markets: A Review of Theory and Empirical Work (1970)
    - Categorized empirical tests of efficiency into "weak-form", "semi-strong-form", and "strong-form" tests.

		Market Prices Reflect:		
		Past Market Data	**Public Information**	**Private Information**
Forms	**Weak Form**	Yes	Not required	Not required
	Semi-Strong Form	Yes	Yes	Not required
	Strong Form	Yes	Yes	Yes

Source: https://www.cfainstitute.org

Belief	Believer Non-Believer	Philosophy	Ancient Old Modern New	Analysis	Technician Fundamentalist Portfolio Theorist Behavioralist	Strategy

MARKET ANOMALIES

- Rational Choice Theory vs. Rational Expectation Hypothesis (REH)*
- The Assaults/Anomalies

Anomaly	Type	Observation
January effect	Calendar based	Returns on January is significantly higher than the rest of the months of the year
Holiday effect	Calendar based	Return on stocks in the day prior to market holiday tend to be higher than other days
Momentum	Technical	Observer tendency for rising stock prices to rise further, and falling prices to keep falling
Dividend Yield	Fundamental	High yielding stocks tend to outperform.
Size effect	Other	Small-cap companies outperform large-cap companies on a risk-adjusted base.
Post-Announcement Drift (PAD)	Other	Price changes tend to persist after initial announcements.

Source: http://www.investorhome.com/anomaly.htm

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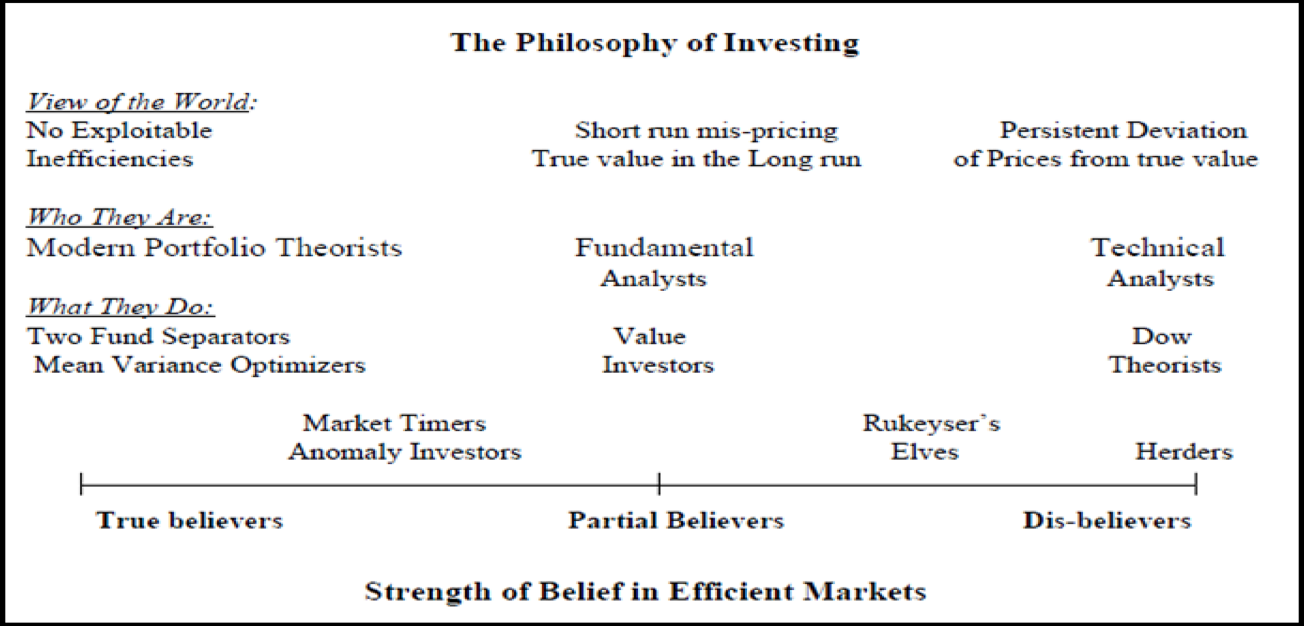
INVESTMENT PHILOSOPHY SPECTRUM



Source: Poitras, Geoffery (2010). *Valuation of Equity Securities.* Singapore: World Scientific Publishing, p. 28

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PHILOSOPHY

- Ancient
- Old
- Modern
- New

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ANCIENT FINANCE

- Joseph de la Vega* (1650 – 1692)
  - Confusion de Confusiones (1688)
    - The oldest book ever written on the stock exchange business
    - Trading rule of thumb
- Homma Munehisa (1724 - 1803)
  - Future and Forwards on Japanese rice market
  - Father of Candlestick Charts
  - The Fountain of Gold - The Three Monkey Record of Money (1755)
    - The first book on market psychology

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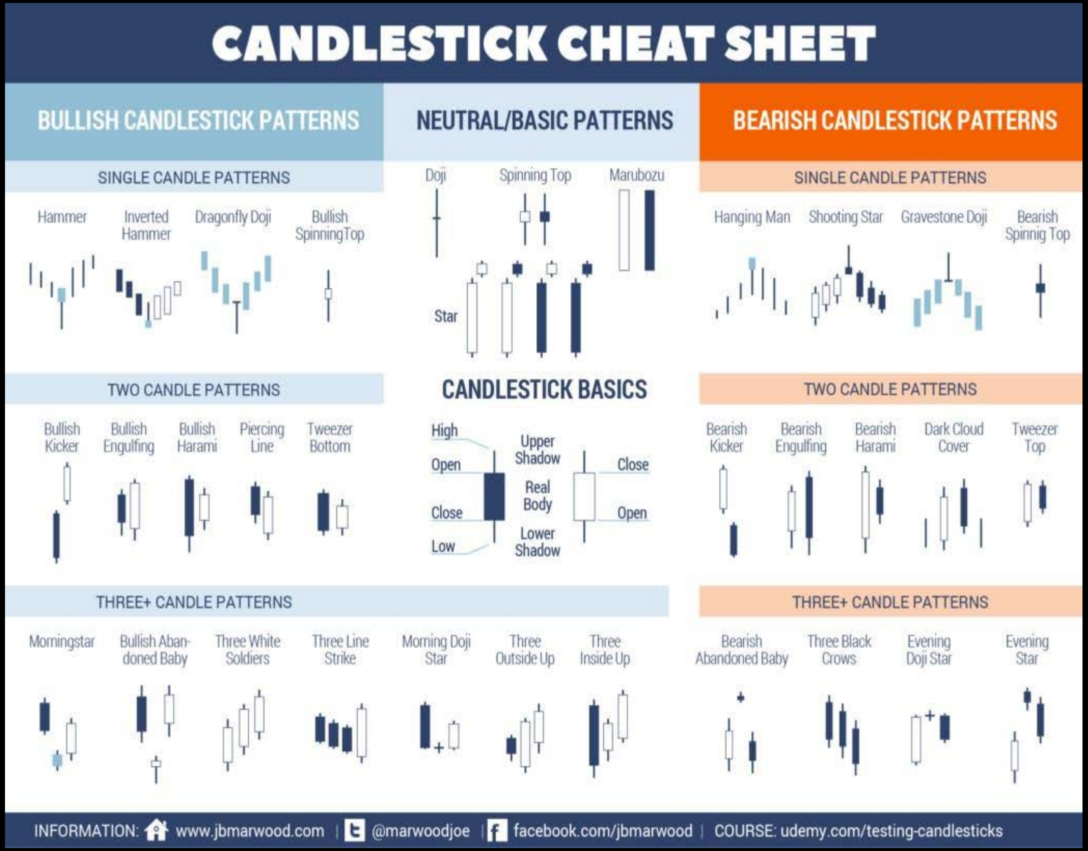
CANDLESTICKS CHARTS



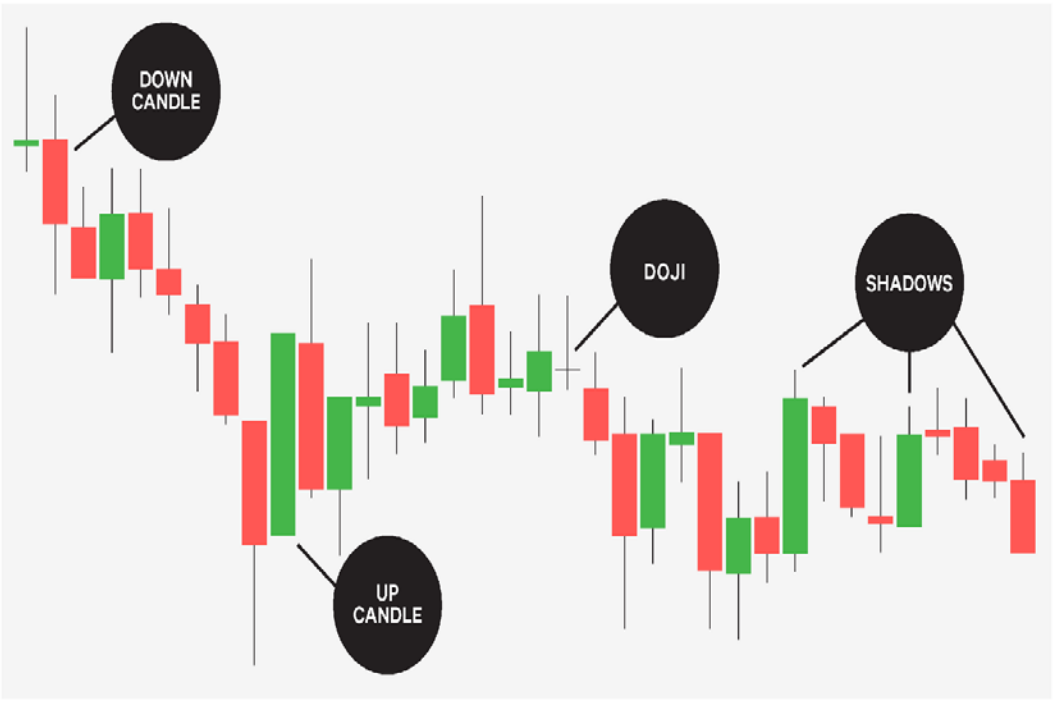


FIGURE 1: CLOSEUP VIEW OF A CANDLESTICK CHART.

This image shows up (green) and down (red) candles, as well as an unchanged "doji" candle. The "shadows" are the vertical lines above and below the candles' real bodies. Image source: The thinkorswim® platform from TD Ameritrade. *For illustrative purposes only.*

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THE GUESSING GAME

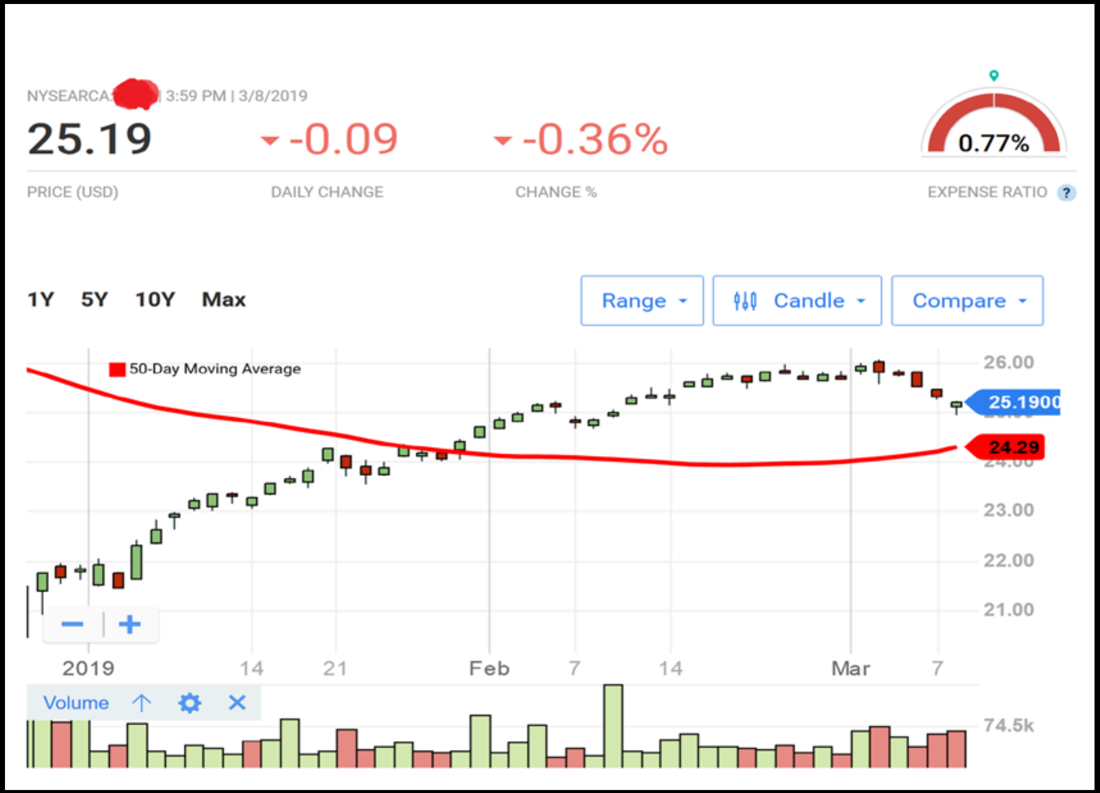

Chart Credit: https://money.usnews.com

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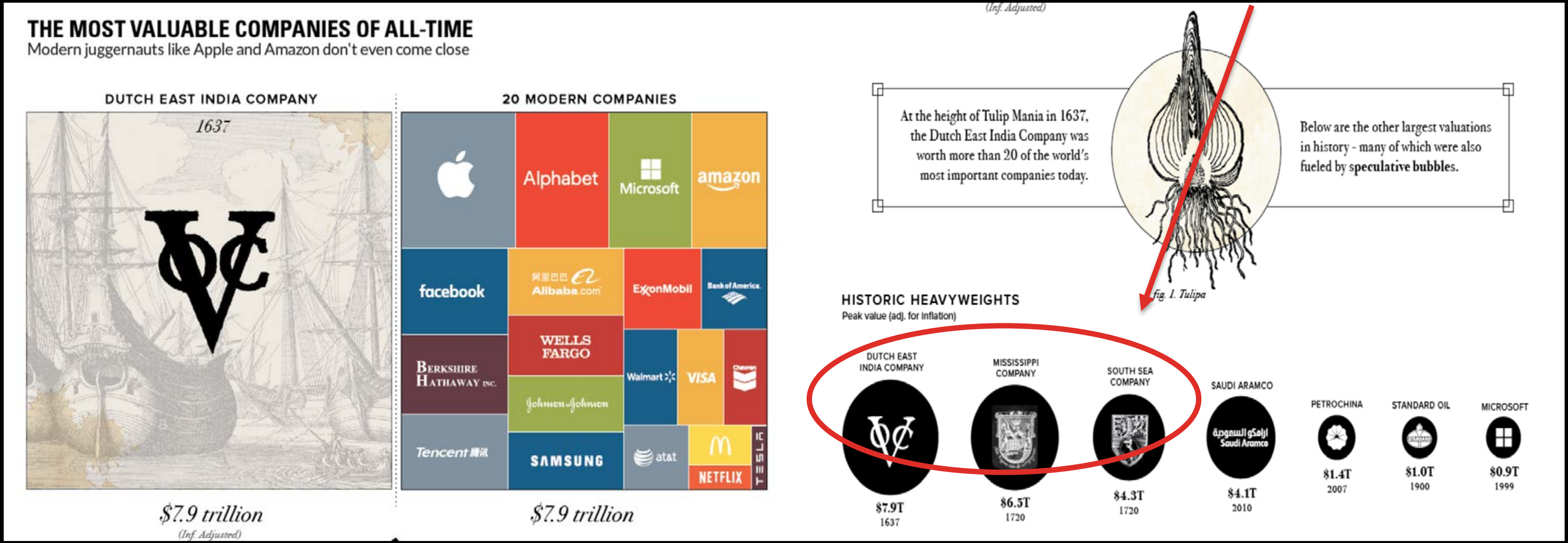
MARKET BUBBLES



https://www.visualcapitalist.com/most-valuable-companies-all-time/

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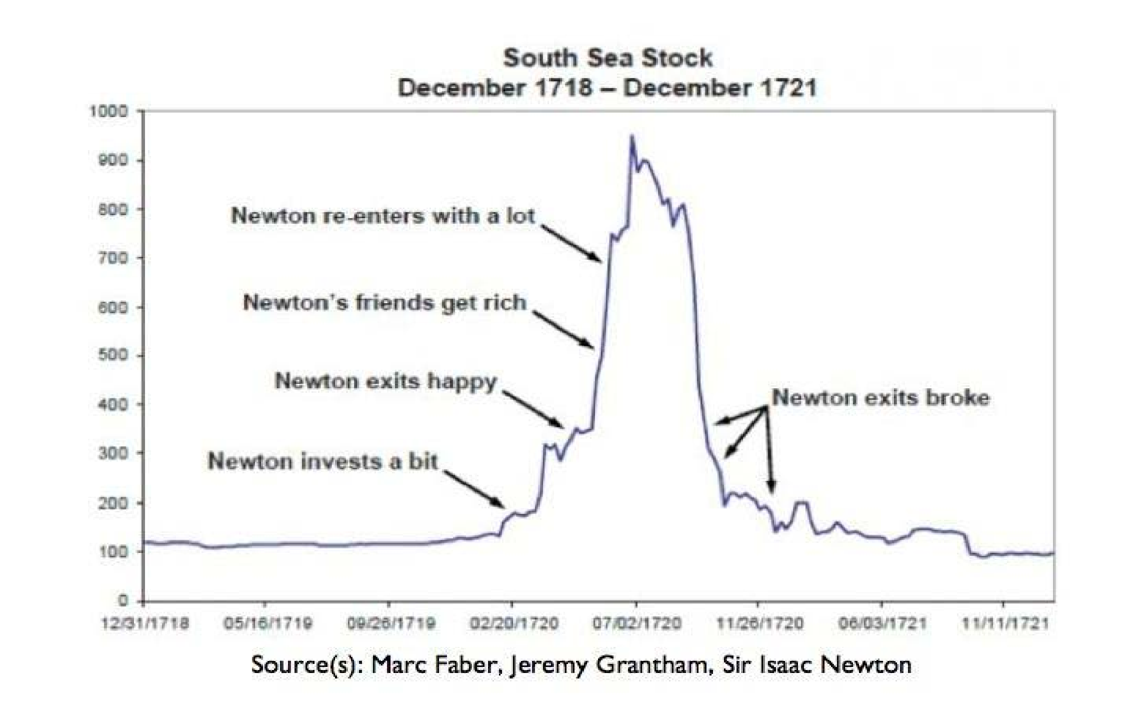
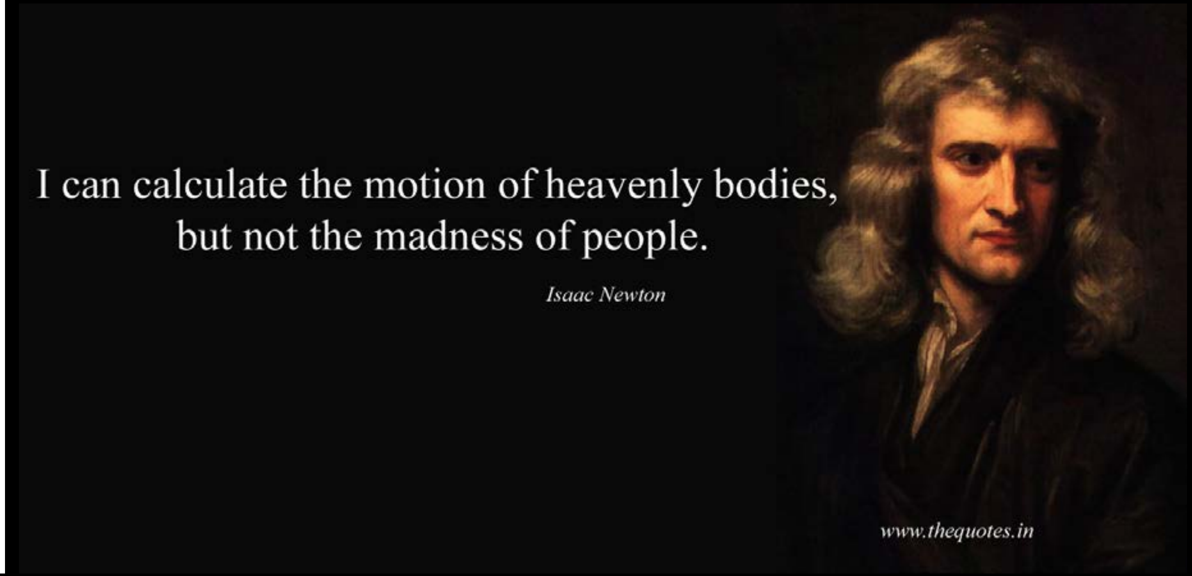
SOUTH SEA AND SIR. ISAAC NEWTOWN





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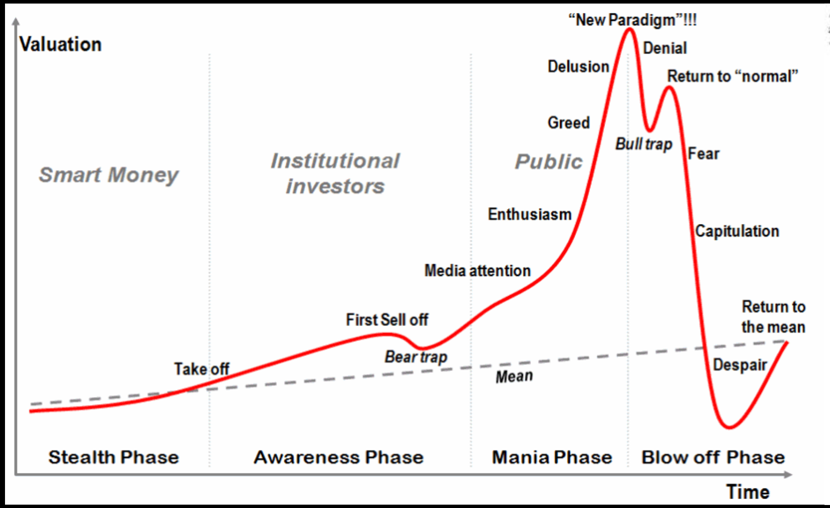
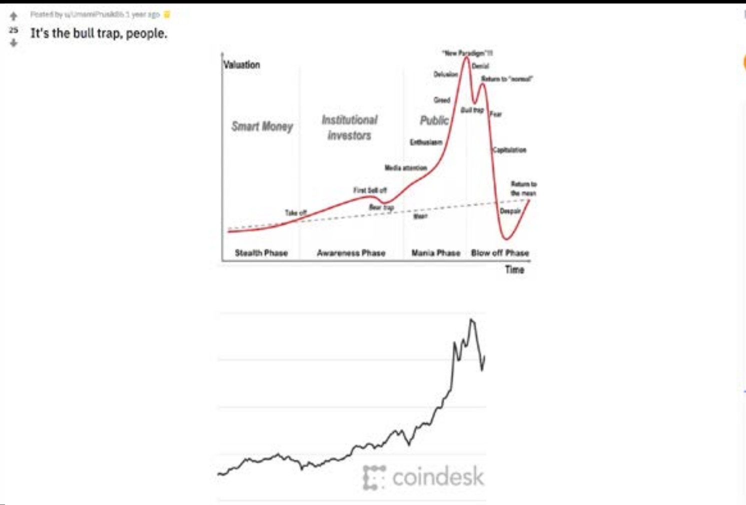
CRYPTOCURRENCY BUBBLE?

- Jean-Paul Rodrigue
  - phases of a bubble (2008)





Source: https://www.reddit.com/r/Bitcoin/comments/7lp6fc/its_the_bull_trap_people/ https://www.coinbase.com/price/bitcoin

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OLD FINANCE - EARLY DEVELOPMENT OF ECONOMIC THEORIES

- Adam Smith
  - The Wealth of Nations (1776)
    - Self-interested, Rational Individual Assumption
    - Absolute Advantage
- David Ricardo
  - On the Principles of Political Economy and Taxation (1817)
    - Value theory
- John Stuart Mill
  - Essays on some unsettled questions of political economy (1844)
    - Comparative Advantage
- Alfred Marshall
    - Principles of Economics (1890)
      - Neoclassical Economics
      - Marginalist Revolution

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OLD FINANCE - APPROACHES

- Graham, Dodd and Cottle
  - Security Analysis (1934) (1962)
    - Anticipation Approach
    - Relative Value Approach
    - Intrinsic Value Approach
      - Margin of safety
      - "Ignore Mr. Market's emotional issue and focus on the long-run"
- John Keynes
  - The General Theory of Employment, Interest and Money (1936)(1964)
    - Anticipation Approach
    - "In the long run we are all dead."
    - "Markets can remain irrational longer than you can remain solvent"
    - (Misattributed) "It is better to be vaguely right than exactly wrong." - Carveth Read (1898)

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OLD FINANCE - PRACTICES

- Philip Fisher
  - Common stocks and uncommon profits (1958)
    - the best time to sell a stock is "almost never“
- Warren Buffett
  - Quotes and Misquotes
    - “I’d be a bum on the street with a tin cup, if the market were always efficient.”
    - “Our favorite holding period is forever”
    - Not buying a stock but Investing in a business
- Vahan Janjigian*
  - Even Buffett isn’t perfect – What You Can and Can’t Learn from the World’s Greatest Investor (2008)
    - Average investors should “never marry a stock.”

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MODERN FINANCE – MATHEMATICAL ANALYSIS

- Irving Fisher*
  - Mathematical Investigations in the Theory of Value and Prices (1892)
  - The Theory of Interest, as Determined by Impatience to Spend Income and Opportunity to Invest It (1930)
- Louis Bachelier*
  - The Theory of Speculation (1900)
- Paul Samuelson*
  - Foundations of Economic Analysis (1947)

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MODERN FINANCE - HYPOTHESES

- Jules Regnault
  - Calcul des Chances et Philosophie de la Bourse (1863) (RWH)
- Eugen Fama
  - The Behavior of Stock Market Prices (1965) (RWH)
  - Efficient Capital Markets: A Review of Theory and Empirical Work (1970) (EMH)
- John Muth
  - Rational Expectations and the Theory of Price Movements (1961) (REH)
- Burton MalKiel
  - A Random Walk Down Wall Street (1973) (RWH)

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MODERN FINANCE – ASSETS PRICING

- Harry Markowitz (1950s)
  - Diversification, mean-variance portfolio optimization model
- Jack Treynor (1961, 1962), William F. Sharpe (1964), John Lintner (1965), Jan Mossin (1966), Michael Jensen (1968), Fischer Black (1972), etc.
  - Capital Assets Pricing Model (CAPM)
    - Treynor Ratio, Sharpe Ratio, Jensen's alpha etc.
- Stephen Ross (1976)
  - Arbitrage Pricing Theory (APT)
- Fischer Black, Myron Scholes(1973), and Later, Robert Merton
  - Contingent claims pricing models (BSM Model)

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MODERN FINANCE - CORPORATE FINANCE

- Franco Modigliani and Merton Miller
  - MMI and MMII* (1958)
    - Capital-Structure Irrelevance, tax shield and WACC
- Alan Kraus and Robert Litzenberger
  - trade-off theory of capital structure (1973)
    - cost of financial distress

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MATHEMATICAL MODEL EXAMPLES

- Utility functions under REH in the CAPM framework
- The return of a (well-diversified) portfolio under CAPM (a one factor model)
- The return of a (Well-diversified) portfolio under multifactor model with APT
- Black-Scholes equation and formulas
- The Greeks
- Etc.

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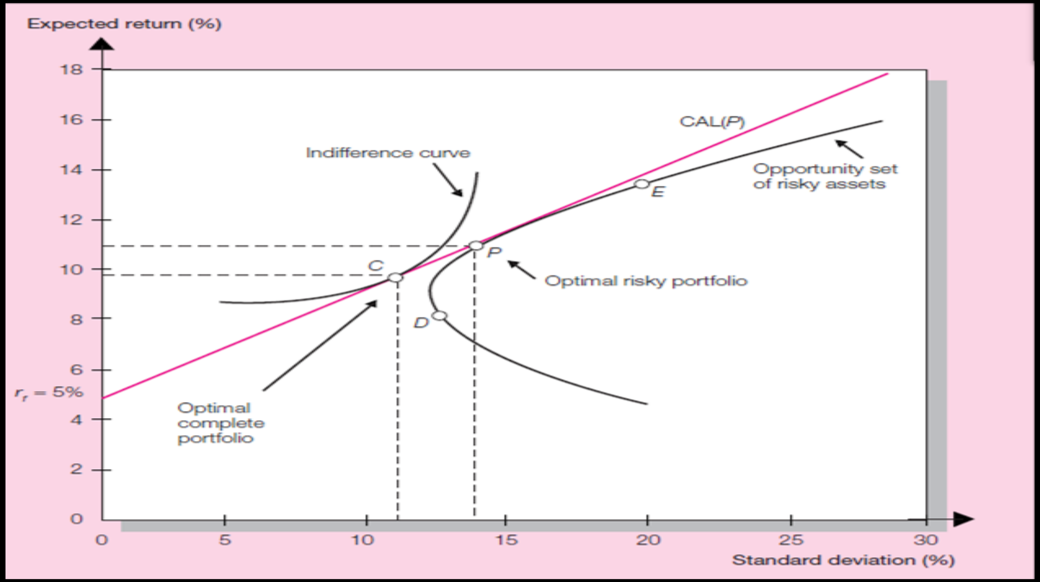
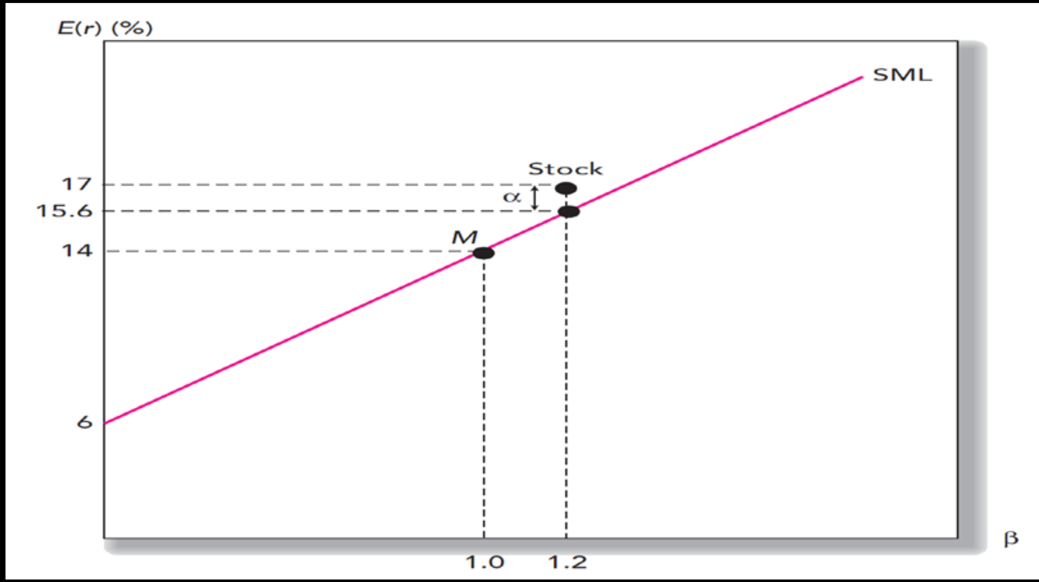
CAPM





Source: Bodis, Z., Kane, A., & Marcus, A. (2009). Investments (8th ed.). New York: McGraw-Hill Irwin.

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THE NORMAL ASSUMPTION

- Bean machine*
- Binomial distribution
- Random walk
- Brownian motion
- Heat Equation

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NEW FINANCE

- Robert Haugen
  - The New Finance: Overreaction, Complexity, and Uniqueness (2004)
- Market Psychology and Market Anomalies
- Non-self-interested and Irrational Behaviors
- Normative theories and Positive theories (Behavioral Economics)
  - Risk aversion
    - Risk loving, Risk Neutral, Risk averse
  - Regret aversion
    - Insurance and Lottery coexists

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BEHAVIORAL FINANCE

- Early development with Ancient Finance
  - Market Anomalies, Bubbles and Financial Crises
- Amos Tversky and Daniel Kahneman
  - Judgment Under Uncertainty: Heuristics and Biases (1974)
  - Prospect theory (1979)
- Hersh Shefrin
  - Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing (2002)
    - heuristic-driven bias
    - frame dependence
    - inefficient markets
- Dan Ariely
  - Predictably Irrational (2008)

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BEHAVIORAL BIAS

- Cognitive error*
  - Definition: “Cognitive errors stem from basic statistical, information-processing, or memory errors; cognitive errors typically result from faulty reasoning. “ (CFA Institute)
  - Examples: Confirmation Bias, Gamblers’ Fallacy, Mental Accounting, etc.
- Emotional bias*
  - Definition: “Emotional biases stem from impulse or intuition; emotional biases tend to result from reasoning influenced by feelings.” (CFA Institute)
  - Examples: Loss-Aversion Bias, Overconfidence Bias, Endowment Bias, etc.

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ANALYSIS

- Technician
- Fundamentalist
- Portfolio Theorist
- Behavioralist

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TECHNICAL ANALYSIS

- Charles Dow and Edward Jones
  - DJIA (1896)
- William Gann*
  - Speculation A Profitable Profession (1910)
  - Tunnel Thru The Air (1927)
  - The Magic Word (1950)
- Ralph Elliott
  - The Wave Principle (1938)
  - Nature's Law – The Secret of the Universe (1946)

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THE COMMON MISCONCEPTION

Picture Credit: Wikipedia.org

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TECHNICAL ANALYSIS CON'T

- Louise McWhirter
  - Astrology and Stock Market Forecasting (1977)
- Welles Wilder
  - New Concepts in Technical Trading Systems (1978)
    - RSI, DMI, ATR, MOM, ADX, SAR,...
  - The Adam Theory of Markets or What Matters is Profit (1987)
    - None of them works, follow the old saying "The trend is your friend."
- John Bollinger
  - Bollinger Bands ® (1980s)
- Nison Steve
  - Japanese Candlestick Charting Techniques (1991)
- Martin Schwartz*
  - Pit Bull: Lessons from Wall Street's Champion Day Trader (1999)

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FUNDAMENTAL ANALYSIS

- Macro
  - Market, Industry, Political, Economic, Sociocultural, Technological, Legal, Environmental, etc.
    - E.g.: PESTLE, “Porter's Five Forces”
- Micro
  - Financial Reports, Market metrics, Analyst’s Reports, Credit Rating, Corporate Governance, etc.
    - E.g.: “the Big four”
  - Company strategies and Competitive advantage
    - E.g.: Porter's generic strategies, SWOT
  - Caution: “Cook the books”, OBS & SPV, Asymmetric Information*, Principal-Agent Problem* and Moral Hazard*.
    - Sarbanes-Oxley Act (SOX) (Enron, WorldCom)
    - Howard Schilit - Financial Shenanigans: How to Detect Accounting Gimmicks and Fraud in Financial Reports (1993)

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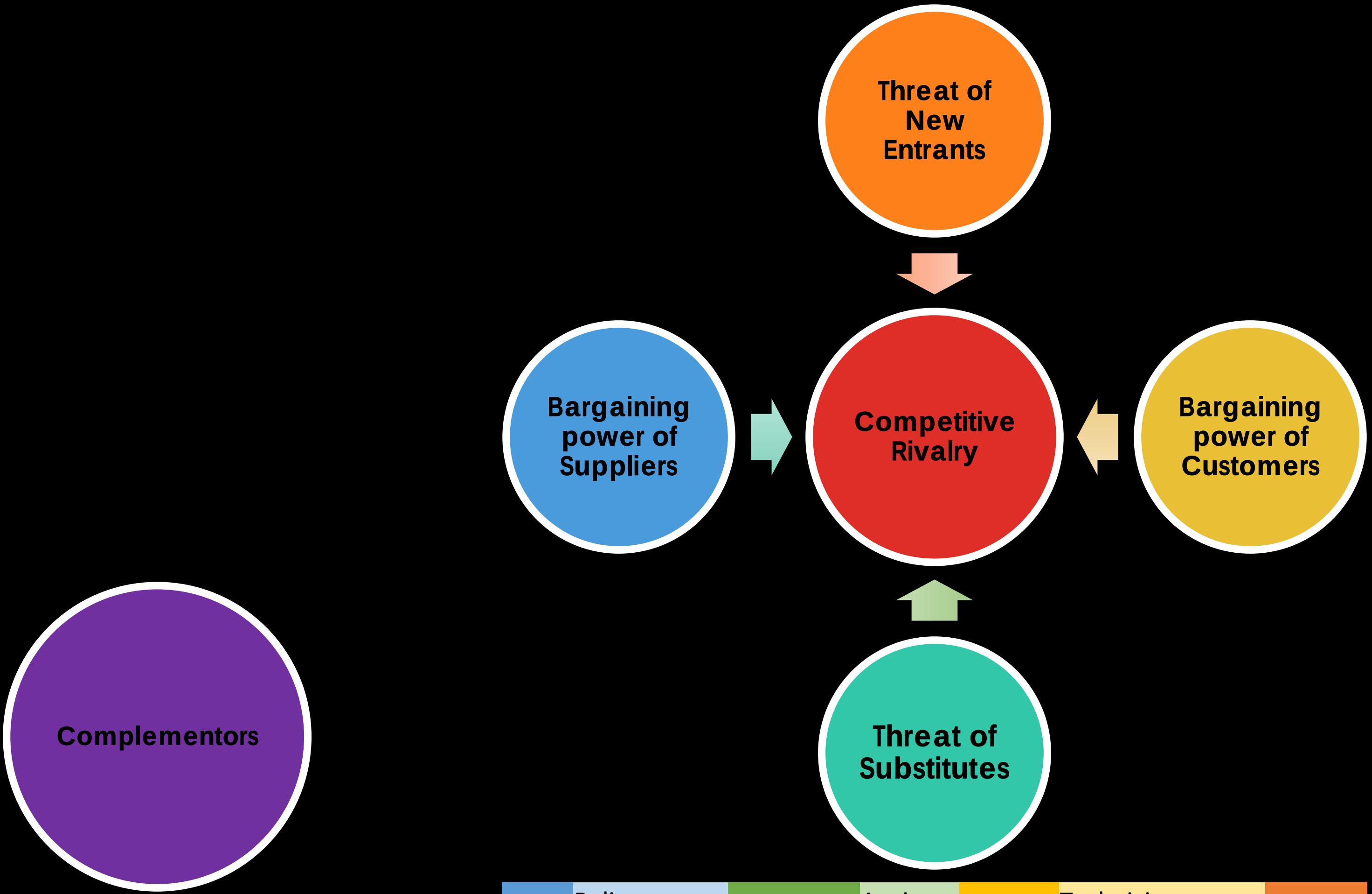
PORTER'S FIVE FORCES



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Michael Porter* (1979)

THE BIG FOUR

- Income Statement
- Balance Sheet
- Cash Flow Statement
- Statement of Shareholder Equities
- Notes

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VALUATION

- Valuation methods*
  - Absolute Valuation:
    - DCF
    - Cost Approach
    - Ability to pay
    - liquidation value
    - EVA and MVA
  - Relative Valuation:
    - Comparable (ratios and market metrics)
    - Precedent Transactions
- Assumptions
- Sensitivity Analysis

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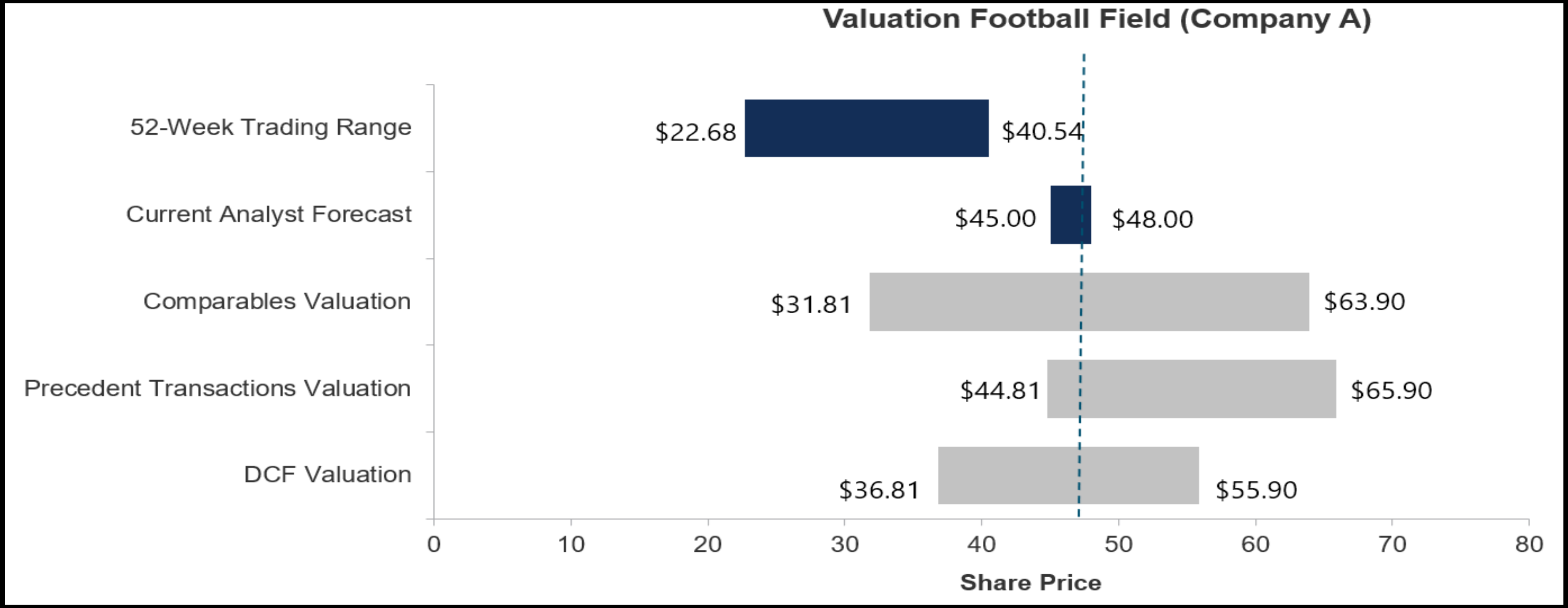
FOOTBALL FIELD CHART



Source: corporatefinanceinstitute.com

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RISKS

- Return and Risk tradeoffs
  - Coefficient “A” of the utility curve
  - Risk Aversion Assumption
- Risk Type
  - Market, Credit, Liquidity, Operational, Model, etc
- Risk Measure
  - Qualitative, Quantitative, Quantified Qualitative
- Risk Management and Control
  - Black Swan and Gray Rhino
- Example
  - LTCM

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THE BASICS OF A FINANCIAL ANALYSIS REPORT

- Executive Summary
- Company Overview
- Investment Thesis
- Valuation
- Key Risks
- Other Considerations
- The Bottom Line

Source: https://www.investopedia.com/articles/investing/032113/basics-financial-analysis-report.asp

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PORTFOLIO MANAGEMENT

- Active vs. Passive (e.g. Index Funds, ETFs)
- Pricing Models (e.g. CAPM, APT, BSM)
- Trading Strategies (e.g. Risk-Factors(Beta), Statistical Arbitrage, Pair Trading)
- Return Generation (e.g. Alpha)
- Risk Measures (e.g. VaR, ES)
- Financial Engineering/ Quant (e.g. the Greeks(Delta-Gamma Hedging))
- Economics and Econometrics (e.g. Cross Sectional, Time Series, Panel)

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SMART BETA AND ETF

- Fama–French three-factor Model*
  - Market Minus Risk-free
    - High beta vs. Low beta/volatility?
  - Small Minus Large
    - Small cap vs. Large cap
  - High Minus Low
    - Value vs. Growth

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ANALYSIS EXAMPLES

- Industry Practice
  - Mutual Funds
    - https://www.td.com/ca/en/personal-banking/products/saving-investing/mutual-funds/td-mutual-funds/

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BEHAVIORAL INVESTING

- Eugen Fama
  - Market Efficiency, Long-Term Returns, and Behavioral Finance (1998)
    - Opponent of Behavioral finance
    - “inadequate quality of statistical research”
- Robert Shiller*
  - Irrational Exuberance (2000) (2005)
    - Timely prediction of market crash
  - From Efficient Markets Theory to Behavioral Finance (2003)
    - “we do not expect such research to provide a method to make a lot of money off of”
- Hersh Shefrin
  - Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing (2002)
    - “not to use behavioral finance to make a killing.”
  - Behavioral Risk Management (2015)
    - “The most important risk management disasters in the preceding fifteen years all have psychological pitfalls at their root.”

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THE FUTURE OF FINANCE?

- Return/Profit generation perspective
  - Is there real life applications to make profit using psychology?
    - Minimum payment on credit cards
  - Market anomaly exploitation?
- Risk control perspective

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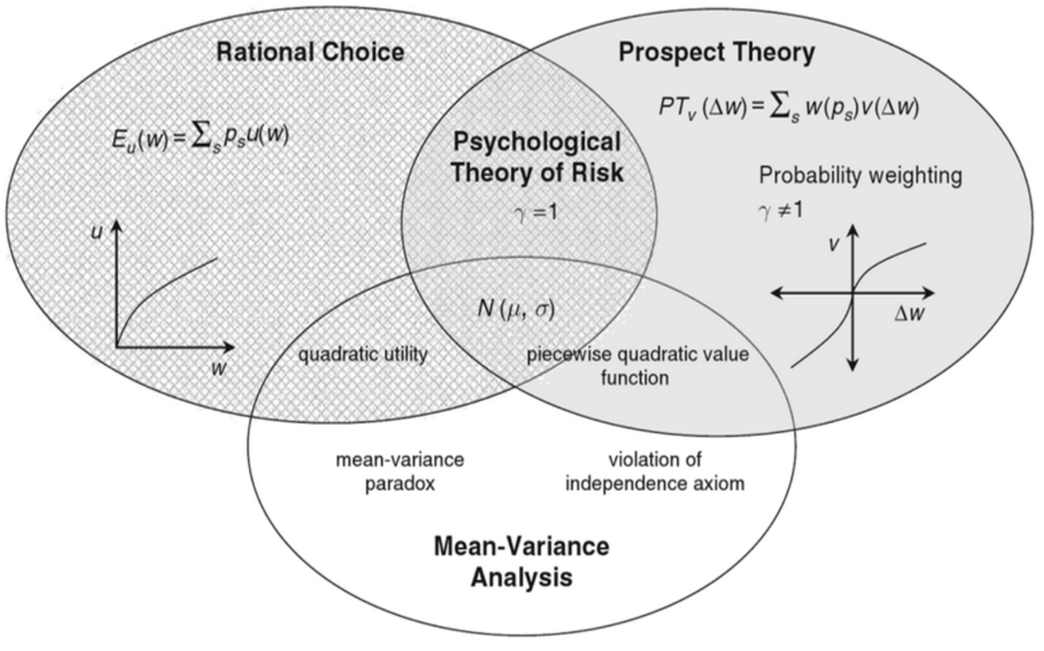
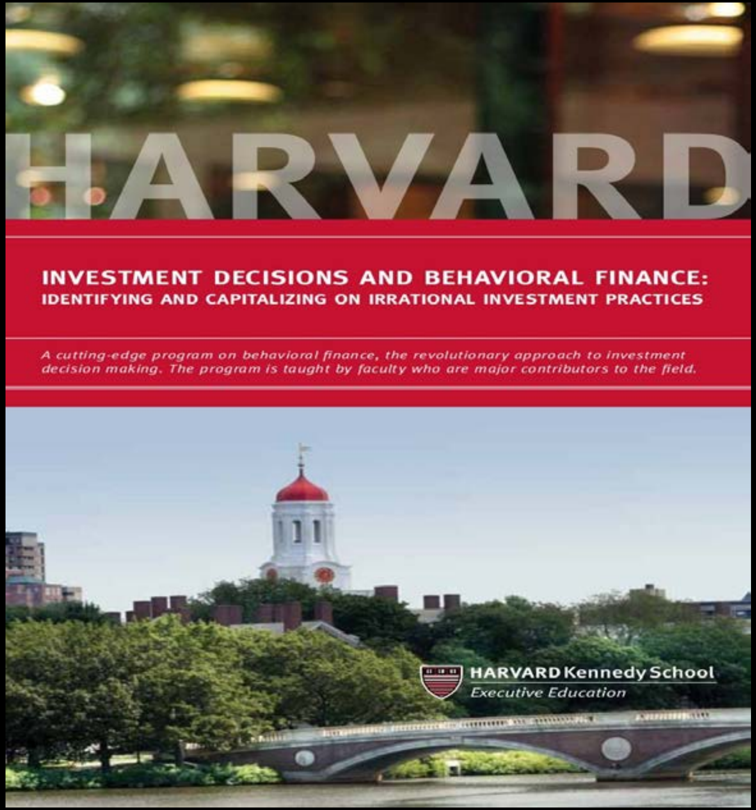
THE EXPERIMENTS ON FUTURE FINANCE



Source: Hens, T. & Bachmann K. (2008) Behavioral Finance for Private Banking, West Sussex: John Wiley & Sons, p. 65



Belief	Believer	Philosophy	Ancient	Analysis	Technician	Strategy
			Old		Fundamentalist	
			Modern		Portfolio Theorist	
	Non-Believer		New		Behavioralist	

POSSIBLE STRATEGIES FOR STOCKS

- Trend Following
  - e.g. “Buy high, sell higher”, “The trend is your friend, until the end when it bends.”
- Value Investing
  - e.g. “Buy low, sell high”, Margin of safety, Value vs. Growth, Buffett Quotes
- Portfolio Management
  - e.g. Diversification, Benchmark or Absolute Return, Hedging risk, Seeking Alpha
- Behavioral Approach
  - e.g. Reduce and eliminate behavioral bias, Anomalies Exploitation
- Question: Momentum Investing?

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The strategy spectrum

- “from the point of view of trading style and the underlying factor that guides the profit or loss of the strategy。”

Quant	Momentum (time-series or cross-sectional)	Pair-trading, most types of statistical arbitrage	Advanced models (e.g. HMM, regime switching)	HF Market-making, Cash-futures arbitrage	News-based automated trading
Technical	MA cross-over, Continuation patterns	Swing, Retracement, Pivot trading	Opening range, dual thrusts, patterns	Range-based short gamma (vol selling)	Nothing much here
Fundamental	Factor-based investing	value investing	value/ RV (relative value) strategies	Cross-asset, cross country RV/ short gamma	Usually discretionary
	Trending	Mean-reverting	Break-out	Carry	Event-based

Source： https://blueshift.quantinsti.com/docs/quants

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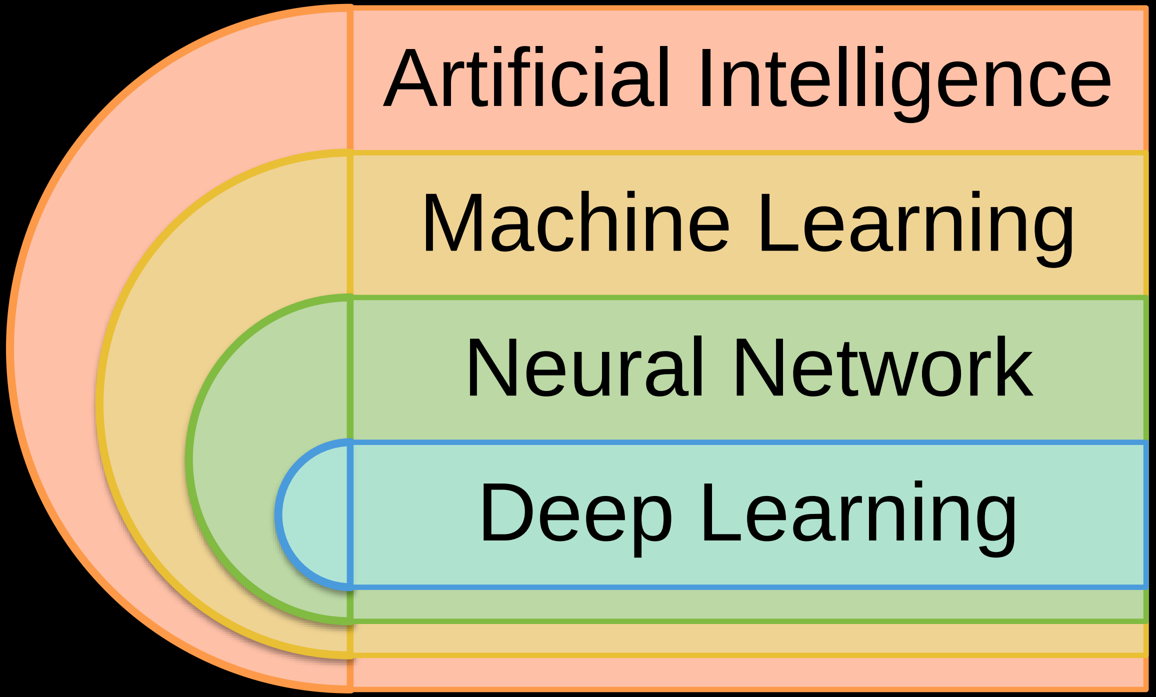
THE NEW TREND – SYNTHESIS WITH DATA SCIENCE

- All the fancy names
  - e.g. AI, ML, NN, DL
- Current industry trend as to incorporate big data, and conduct various types of analyses to assist investment strategy formation.
  - e.g. Algorithm Trading



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THE GAME'S ANSWER

- [AIEQ]
  - [EquBot: The AI Powered Equity ETF (AIEQ)]
  - [World's First AI-Run Global ETF Makes Its Own Managers Nervous]

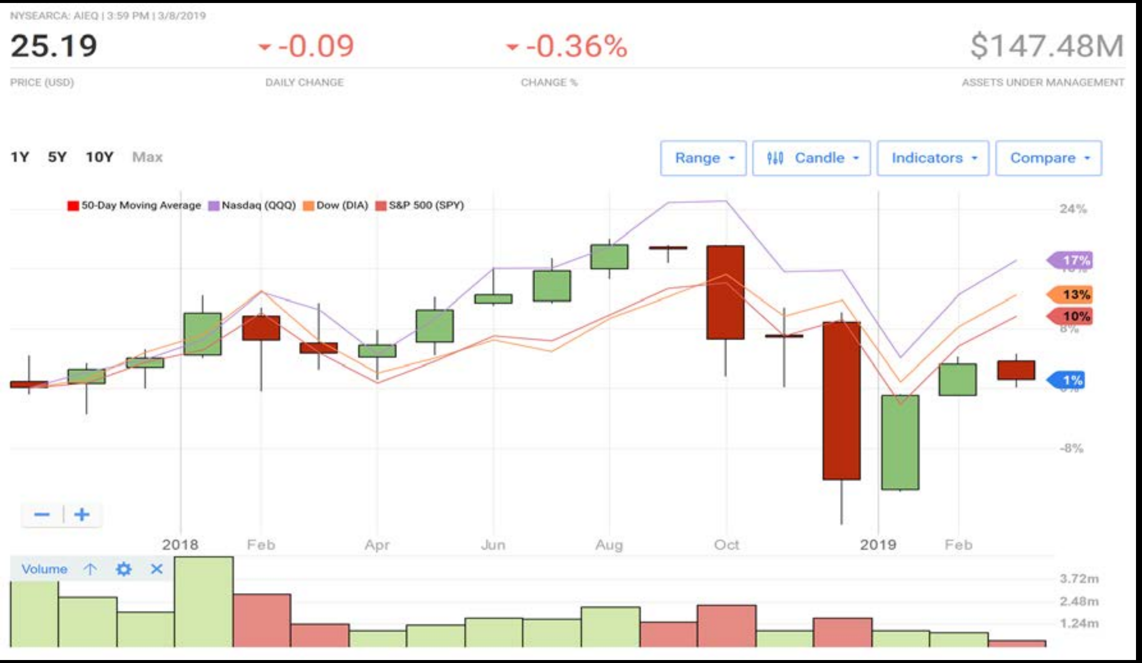

Chart Credit: https://money.usnews.com/funds/etfs/large-blend/ai-powered-equity-etf/aieq/interactive

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MARKETS OTHER THAN THE EQUITY MARKET (OPTIONAL)

- Bond Market
  - Term Structure of Interest
  - Level, Duration, Convexity
  - Option Adjusted Spread
  - Credit Spread
- Commodities
  - Technical, Fundamental, Supply and Demand,
- Derivatives
  - Pricing Models, VIX
- Other Alternatives (Real Estates, Forex, Cryptocurrency, etc.)
- Take a guess on their market sizes compare to the stock market?

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BOND (OPTIONAL)

- What “interest rate” are we talking about?
  - Federal Funds Rate, Overnight Target Rate, etc.
  - US Treasury Bills, Canadian Government Bond, European Sovereign Bond, etc.
  - LIBOR, OIS, SOFR, etc.
  - Prime Rate
  - All the other rates
  - Negative interest rates*
- Type of Bonds
  - Zeroes, Coupons, Strips
  - Federal, Provincial, Municipal, Corporate
  - Embedded options (Callable, Putable, Convertible)
  - Secured with Collaterals, Ratings with Tranches

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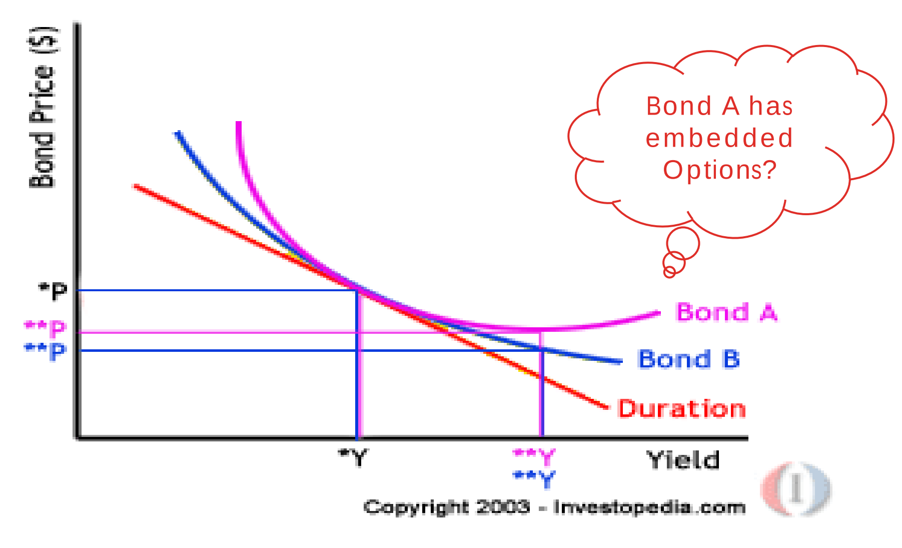
BOND EXAMPLES (OPTIONAL)

- Classical Immunization Strategy
  - Barbell vs. Bullet trade-offs
  - Duration, Convexity and Key Rates
  - The trade-off of Theta
- Arbitrage
  - Long-Term Capital Management (LTCM)
  - European Debt Crisis



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COMMODITIES (OPTIONAL)

- *The New Gatsbys* (Tamarkin, 1985, pp. 112-113). The story takes place at the Chicago Board of Trade:

  Soybeans were sharply higher. There was a drought in the Illinois Soybean Belt. And unless it ended soon, there would be a severe shortage of Beans. ... Suddenly a few drops of water slid down a window. “Look,” someone shouted, “rain!” More than 500 pairs of eyes shifted to the big windows. ... Then came a steady trickle which turned into a steady downpour. It was raining in downtown Chicago.

  Sell. Buy. Buy. Sell. The shouts cascaded from the traders' lips with a roar that matched the thunder outside. And the price of soybeans began to slowly move down. Then the price of soybeans broke like some tropic fever.

  It was pouring in Chicago all right, but no one grows soybeans in Chicago. In the heart of the Soybean Belt, some 300 miles south of Chicago the sky was blue, sunny and very dry. But even if it wasn't raining on the soybean fields it was in the heads of the traders, and that is all that counts. To the market nothing matters unless the market reacts to it. The game is played with the mind and the emotions.

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DERIVATIVES (OPTIONAL)

- John Hull
  - Options, Futures, and Other Derivatives
- Investopedia.com
  - https://www.investopedia.com/trading/options-strategies/

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STORY TIME: CAUTIONS

- Ex ante vs. Ex post
  - “Past performance is no guarantee of future results.”
  - The Morningstar’s tale of “How to become a millionaire?”
- “Nothing is guaranteed”
  - The Airline stock’s tale of “How to become a millionaire?”
- “Lies, damned lies, and statistics.”
  - Paradoxes
    - Simpson’s Paradox, Berkson's paradox, Bertrand paradox, Two Envelops Paradox, Raven Paradox, etc.
  - GIPS
    - Arithmetic vs. Geometric Returns
    - Time-weighted vs. Money-weighted Returns
- Survivorship Bias
  - Termination Unobserved

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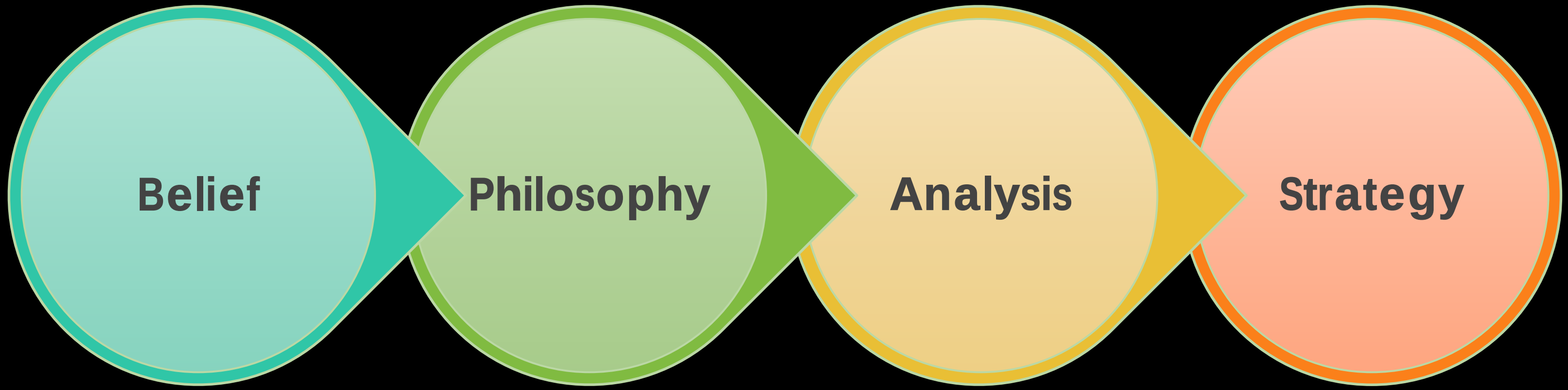
CONCLUSION



Q&A

Missed some big names? e.g. George Soros*, Peter Lynch, etc.

THANK YOU