

Cryptocurrency Trading

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Perm Summer School 2018
Aug 2, Perm, Russia



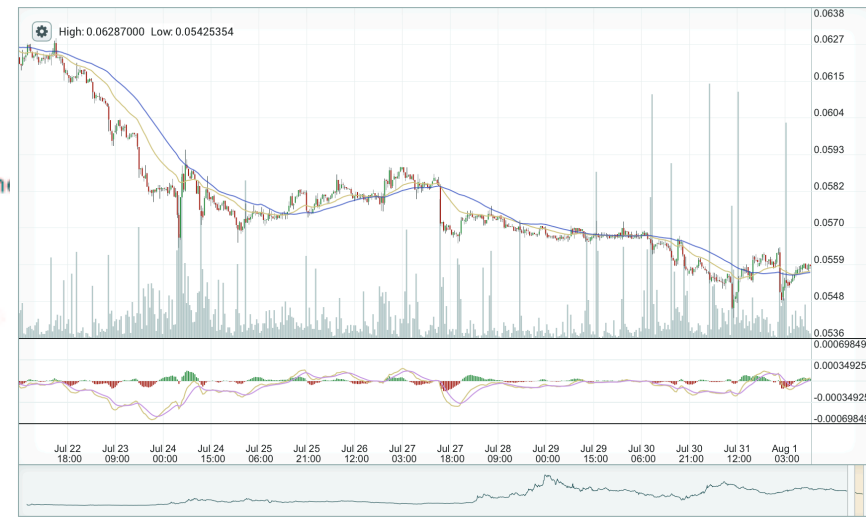
Financial data

- Daily data
- Tick by tick data
- Order book data
- Agent resolved data

Daily data

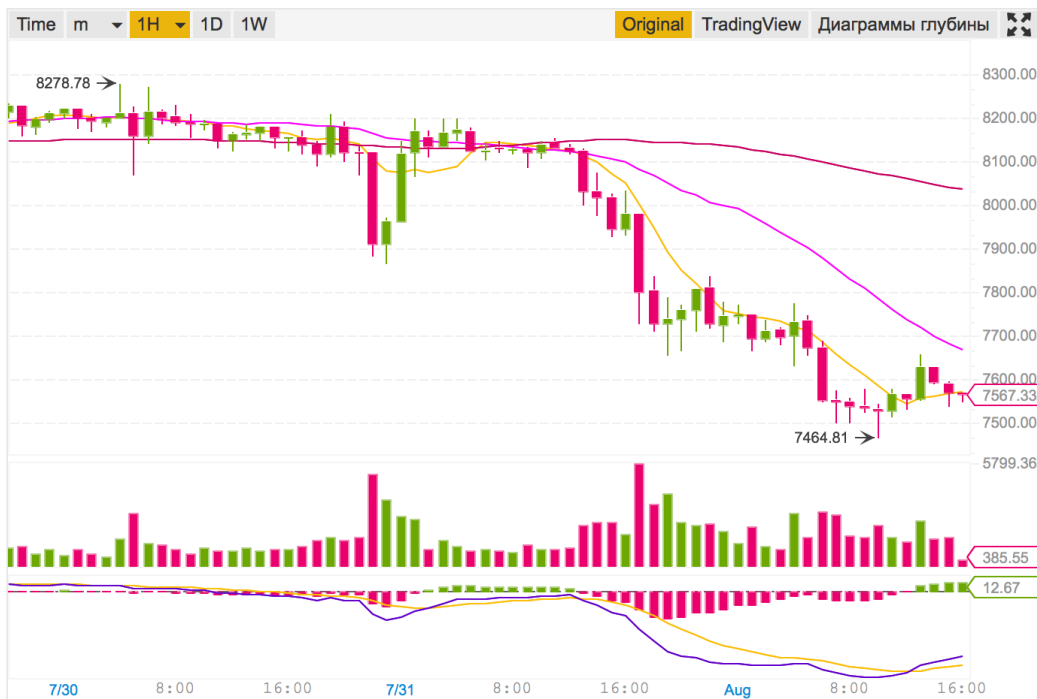
- Usually these data contains opening, closing, high, low price in the day together with the daily volume
- Standard time series methods to investigate these data

	890821	16.82	16.75	16.12	16.19	19800	0	
Date ←	890822	16.19	16.31	16.12	16.31	17884	0	
	890823	16.31	16.56	16.31	16.56	23044	0	Info
	890824	16.56	17.00	16.62	17.00	29916	0	
	890825	17.00	17.00	16.75	16.75	14964	0	
	890828	16.75	16.88	16.62	16.88	13160	0	
	890829	16.88	17.00	16.75	16.81	13516	0	
	890830	16.81	16.88	16.56	16.62	17532	0	
	890831	16.62	16.62	16.44	16.62	14544	0	
Y _{open} ←	890901	16.62	16.88	16.50	16.81	14328	0	Volume
	890905	16.81	16.62	16.38	16.38	20272	0	
	890906	16.38	16.44	16.06	16.19	29308	0	
	890907	16.19	16.25	16.12	16.19	17512	0	
	890908	16.19	16.12	15.81	15.94	21868	0	
	890911	15.94	15.88	15.62	15.75	28104	0	Y _{close}
	890912	15.75	15.94	15.69	15.88	15752	0	
	890913	15.88	15.94	15.56	15.56	26232	0	
Y _{max} ←	890914	15.56	16.00	15.50	15.88	18672	0	Y _{min}
	890915	15.88	16.06	15.69	15.75	55072	0	
	890918	15.75	15.75	15.62	15.69	17392	0	
	890919	15.69	15.81	15.62	15.62	17440	0	
	890920	15.62	15.69	15.56	15.62	16448	0	
	890921	15.62	15.62	15.31	15.31	19504	0	



Order book and Tradelog data

Цена(USDT)	колич(BTC)	Сумма(USDT)
7575.00	0.355845	2,695.52587500
7574.86	0.574404	4,351.02988344
7574.33	1.700000	12,876.36100000
7574.32	0.030000	227.22960000
7573.86	1.047015	7,929.94502790
7573.67	0.001322	10.01239174
7572.65	0.500000	3,786.32500000
7572.47	0.544378	4,122.28607366
7572.01	0.014707	111.36155107
7571.52	0.039622	299.99876544
7571.06	0.001322	10.00894132
7571.00	0.717729	5,433.92625900
7570.64	0.029751	225.23411064
7570.00	1.809268	13,696.15876000
7569.90	0.440463	3,334.26086370
7569.00	0.008588	65.00257200
7568.92	0.005651	42.77196692
7565.31 ↓	\$7,565.31	
7566.11	0.360207	2,725.36578477
7565.31	0.462417	3,498.32795427
7565.30	2.000000	15,130.60000000
7564.01	0.093857	709.93528657
7561.15	0.112000	846.84880000
7560.03	0.388000	2,933.29164000
7560.00	4.142976	31,320.89856000
7558.94	1.400000	10,582.51600000
7558.61	1.000000	7,558.61000000
7558.46	0.388000	2,932.68248000
7558.00	1.643399	12,420.80964200
7557.08	0.001900	14.35845200
7557.05	0.001810	13.67826050



Limit Market Stop-Limit ?

Купить BTC

☰ - USDT

Цена: 7566.41 USDT

колич: BTC

25% 50% 75% 100%

Сумма: USDT

Продать BTC

☰ - BTC

Цена: 7566.41 USDT

колич: BTC

25% 50% 75% 100%

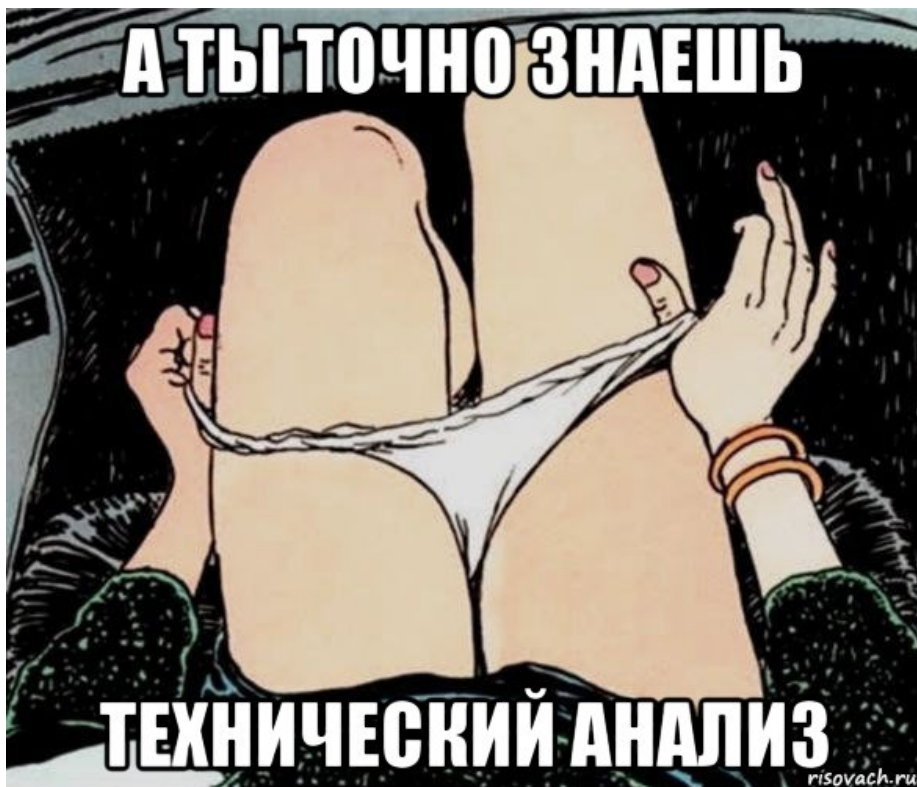
Сумма: USDT

Рынок	Цена	Изменение
У вас нет избранных		

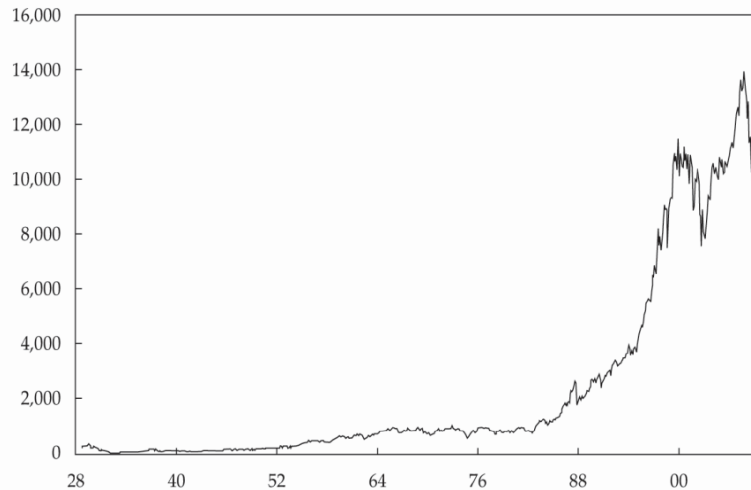
Последние сделки

7,565.31	0.192793	16:21:55
7,566.11	0.243207	16:21:55
7,566.11	0.077000	16:21:54
7,566.11	0.022000	16:21:54
7,566.11	0.018000	16:21:54
7,566.11	0.400000	16:21:54
7,566.11	0.092000	16:21:54
7,566.11	0.043916	16:21:53
7,567.32	0.000027	16:21:53
7,567.33	0.135057	16:21:53
7,567.33	0.006884	16:21:53
7,567.32	0.028849	16:21:51
7,566.12	0.006292	16:21:51
7,566.11	0.101892	16:21:49
7,568.92	0.007712	16:21:49
7,568.92	0.007755	16:21:49

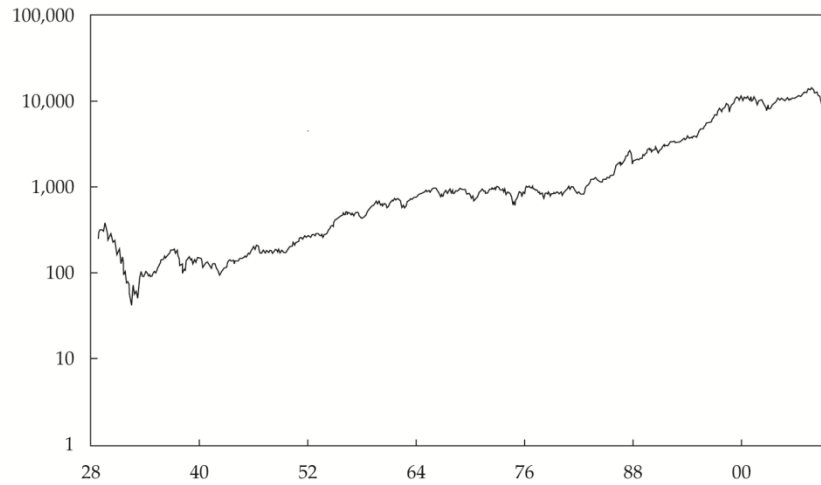
Fundamental vs Technical analysis



Line Charts and Scale

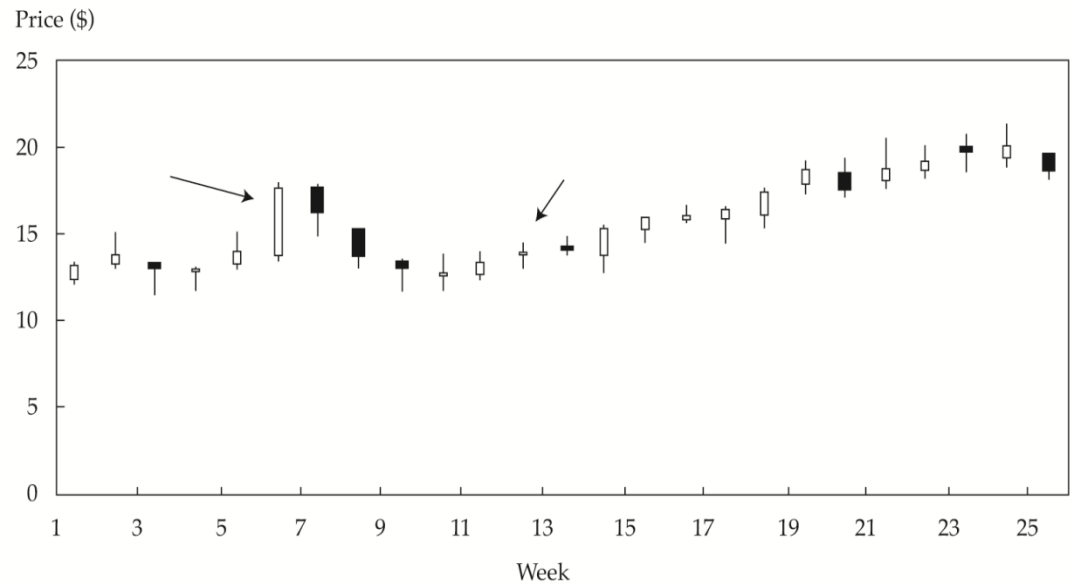
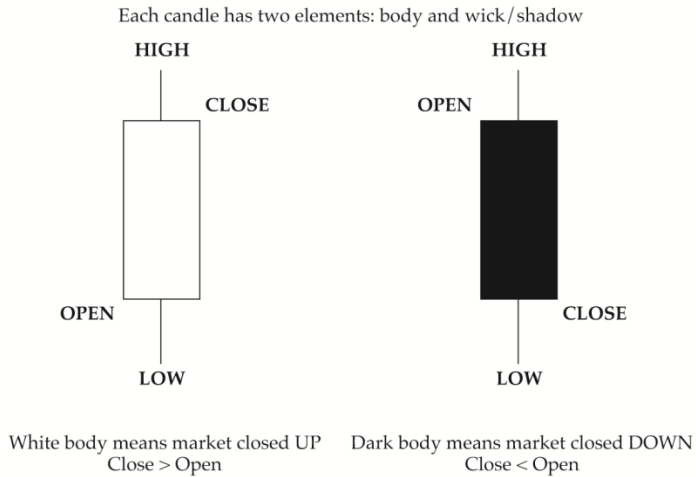


Dow Jones Industrial Average
on a Linear Scale, 1928–2010
(in U.S. dollars)



Dow Jones Industrial Average
on a Logarithmic Scale, 1928–
2010 (in U.S. dollars)

Candlestick Charts



Construction of a
Candlestick Chart

Candlestick Chart: Companhia Vale do Rio
Doce, 1 January– 15 June 2009 (prices in
U.S. dollars)

The Logic of Technical Analysis



Supply and demand determine prices

Changes in supply and demand cause changes in prices

Prices can be projected with charts and other technical tools

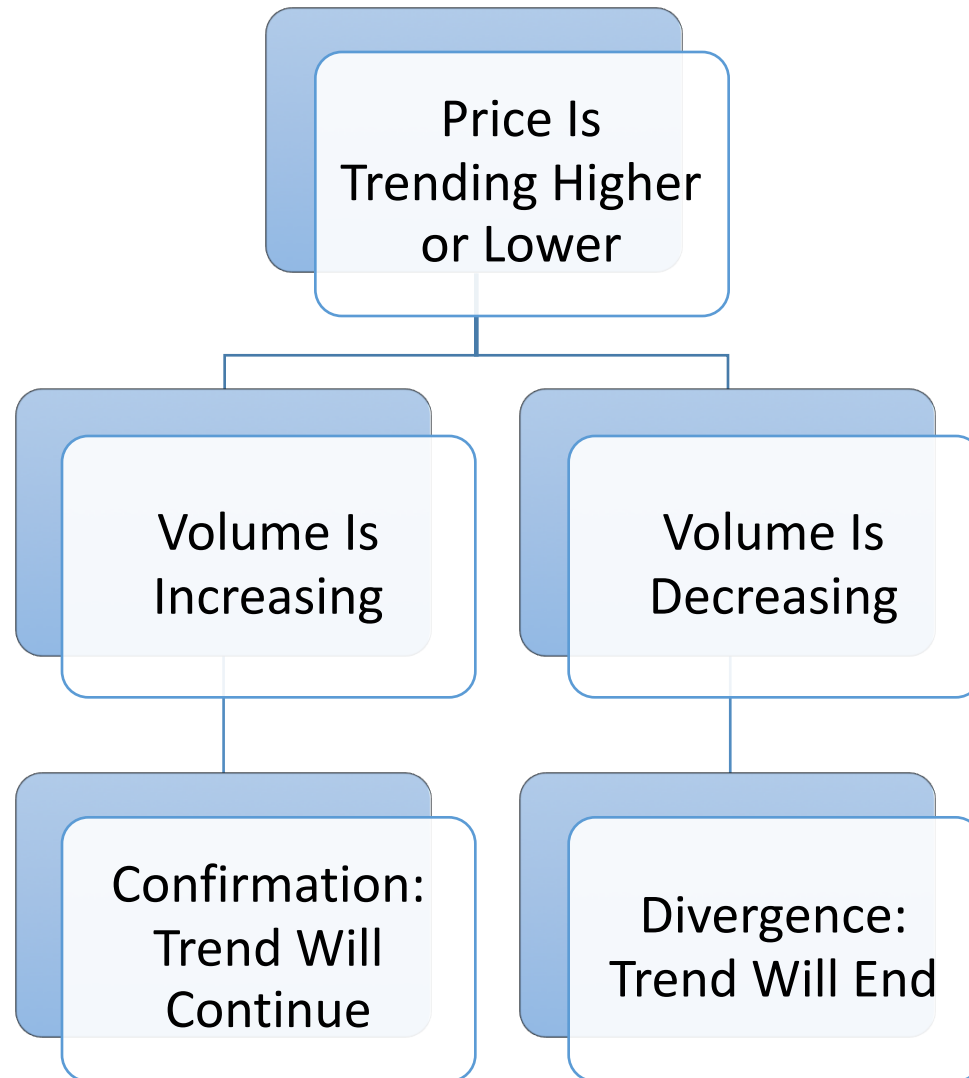
Assumptions of Technical Analysis

- 
- Human behavior is often erratic and driven by emotion.

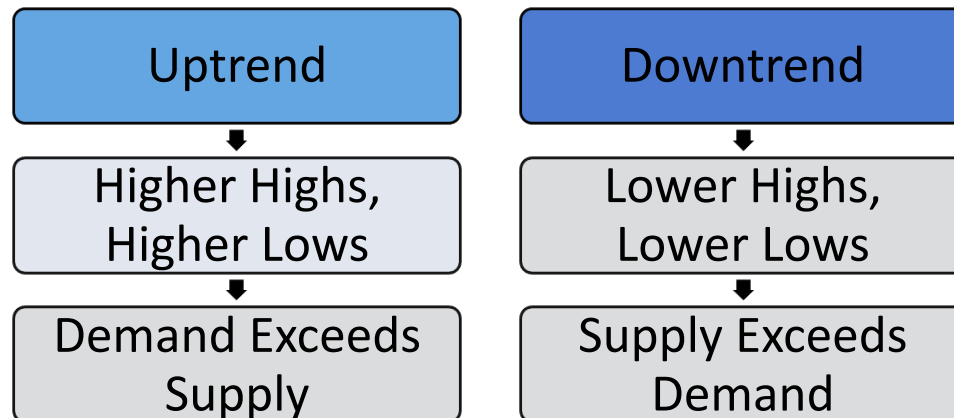
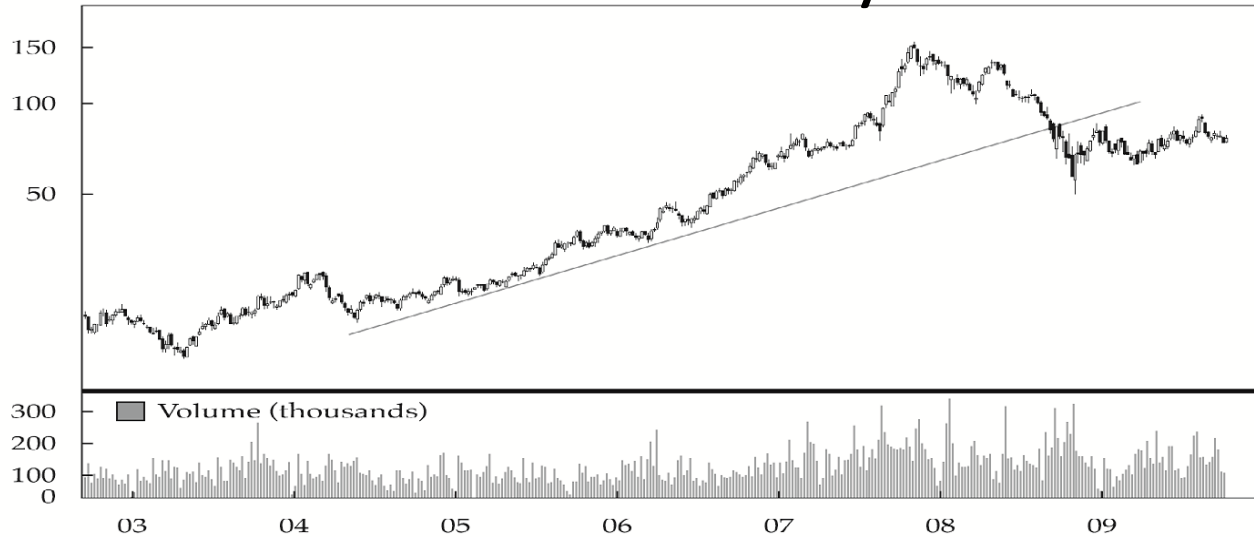
- 
- Market trends and patterns reflect irrational human behavior.

- 
- Trends and patterns repeat themselves and are thus predictable.

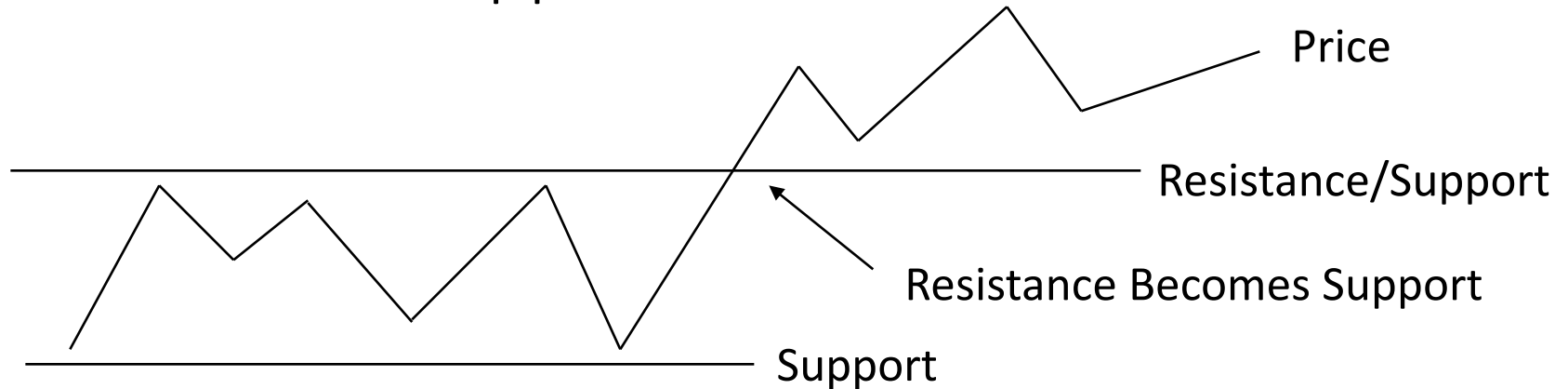
Price and Volume



Trend Analysis



Support and Resistance



Support

- A low price range in which buying activity is sufficient to stop a decline in price

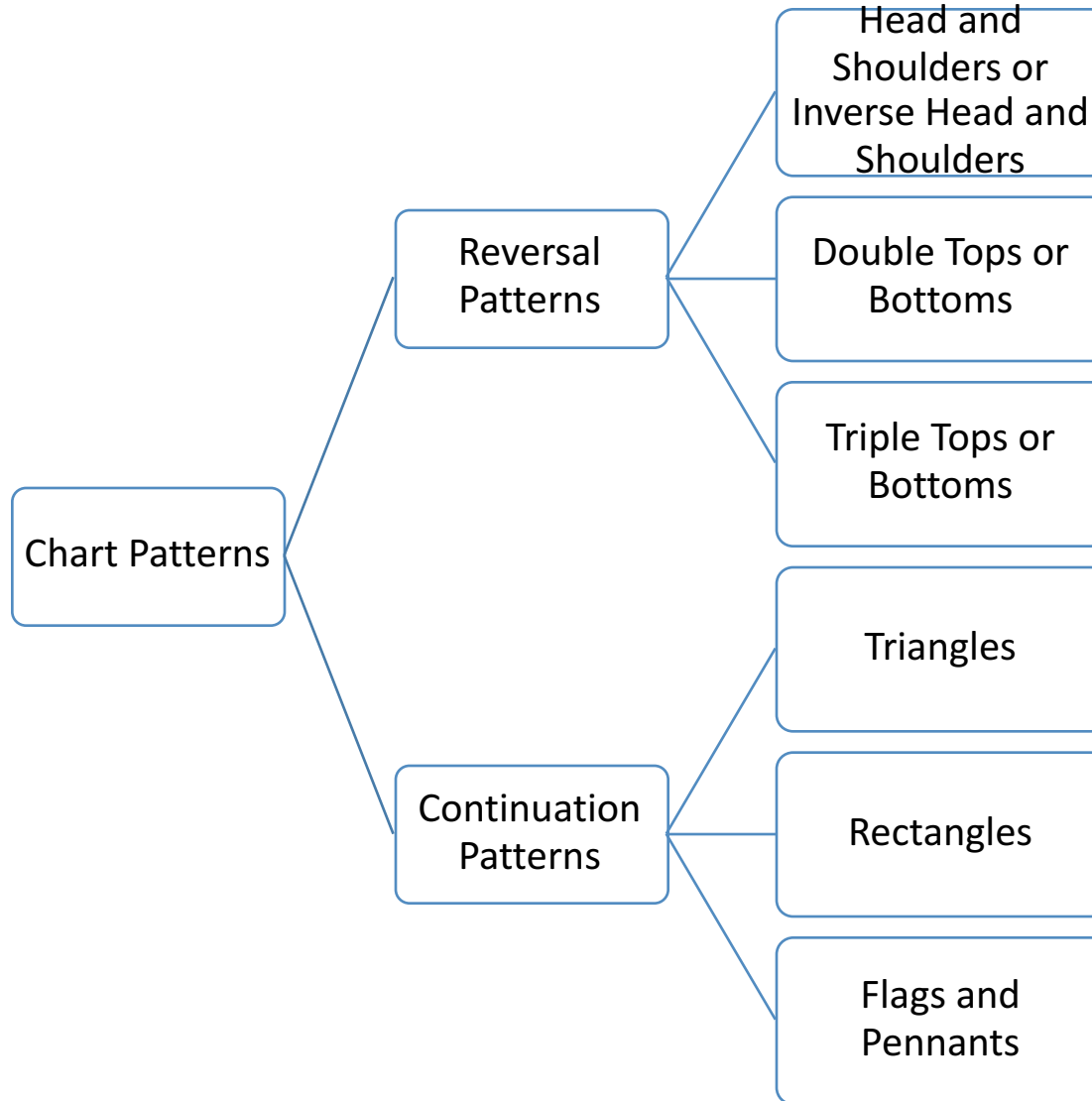
Resistance

- A high price range in which selling activity is sufficient to stop a rise in price

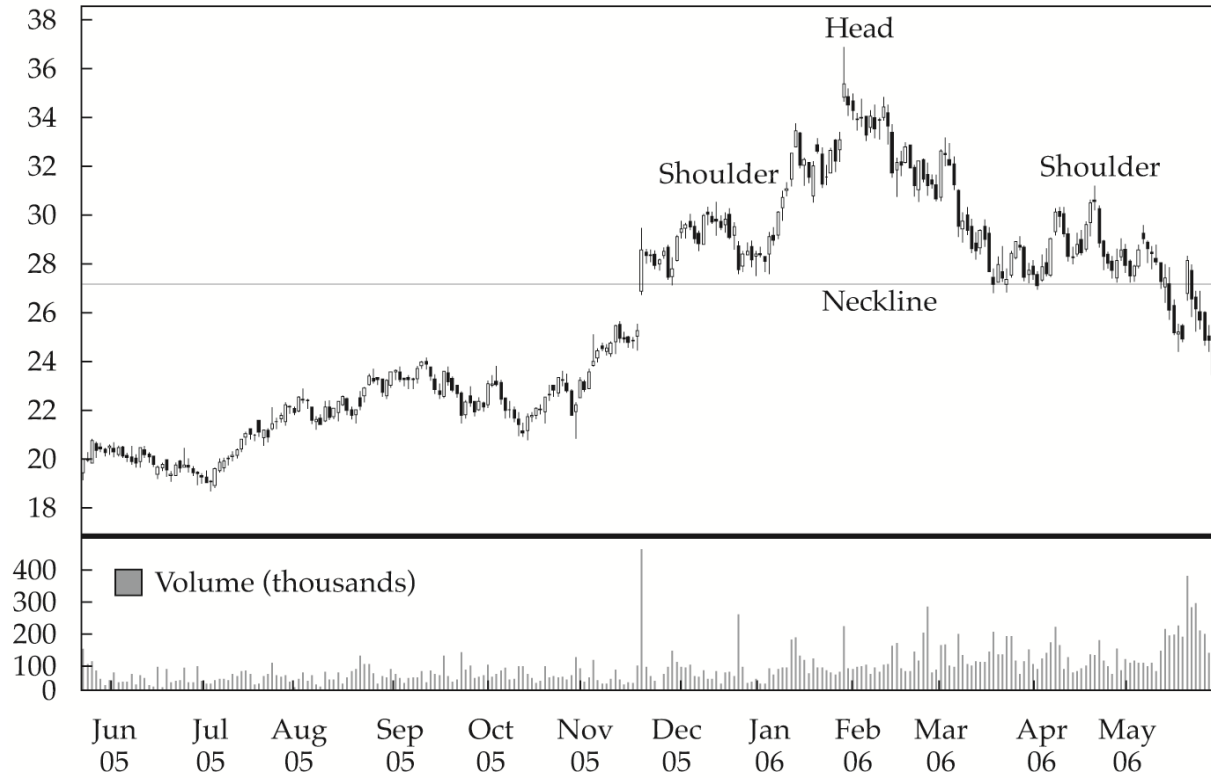
Change in Polarity

- Once a resistance (support) level is breached, it becomes a support (resistance) level

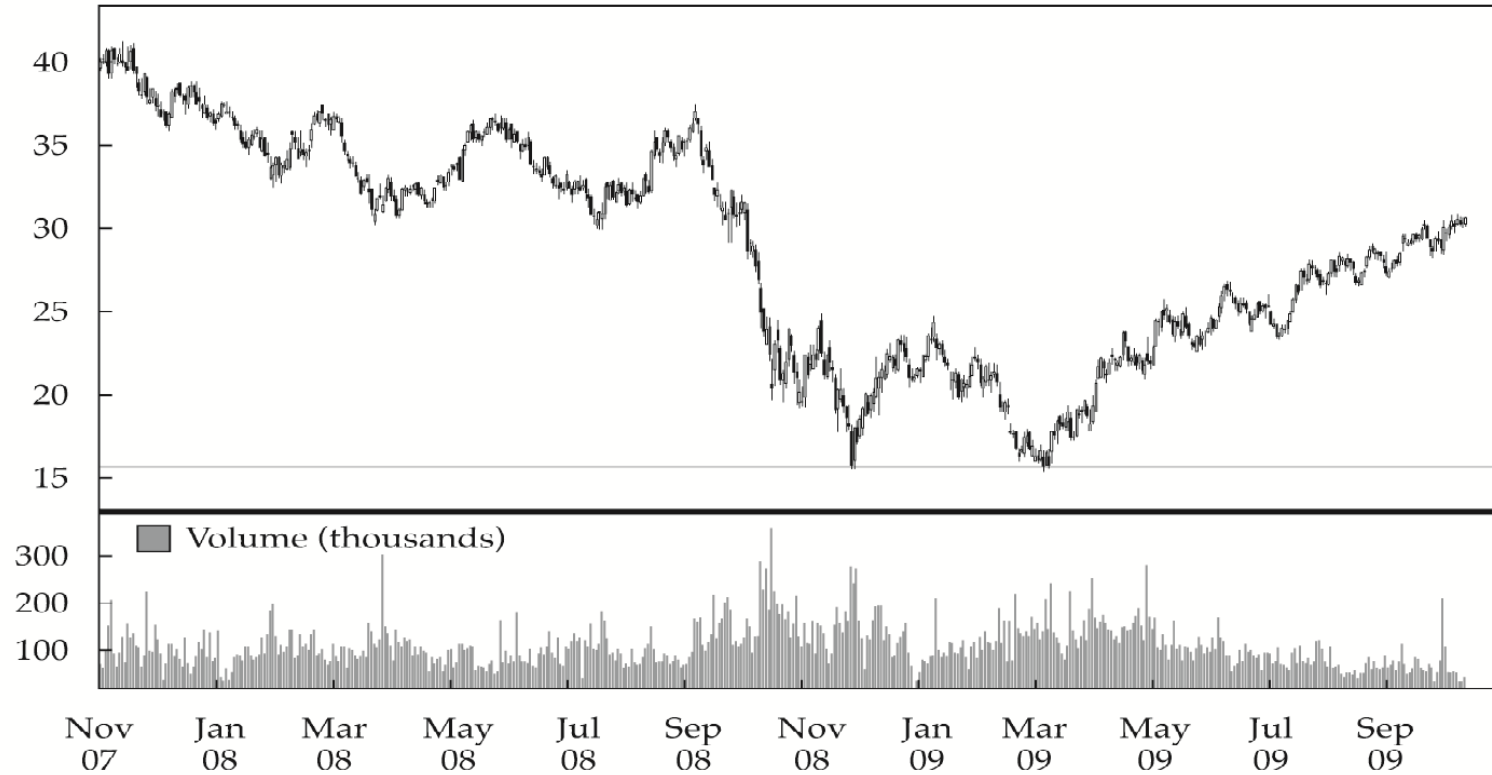
Chart Patterns



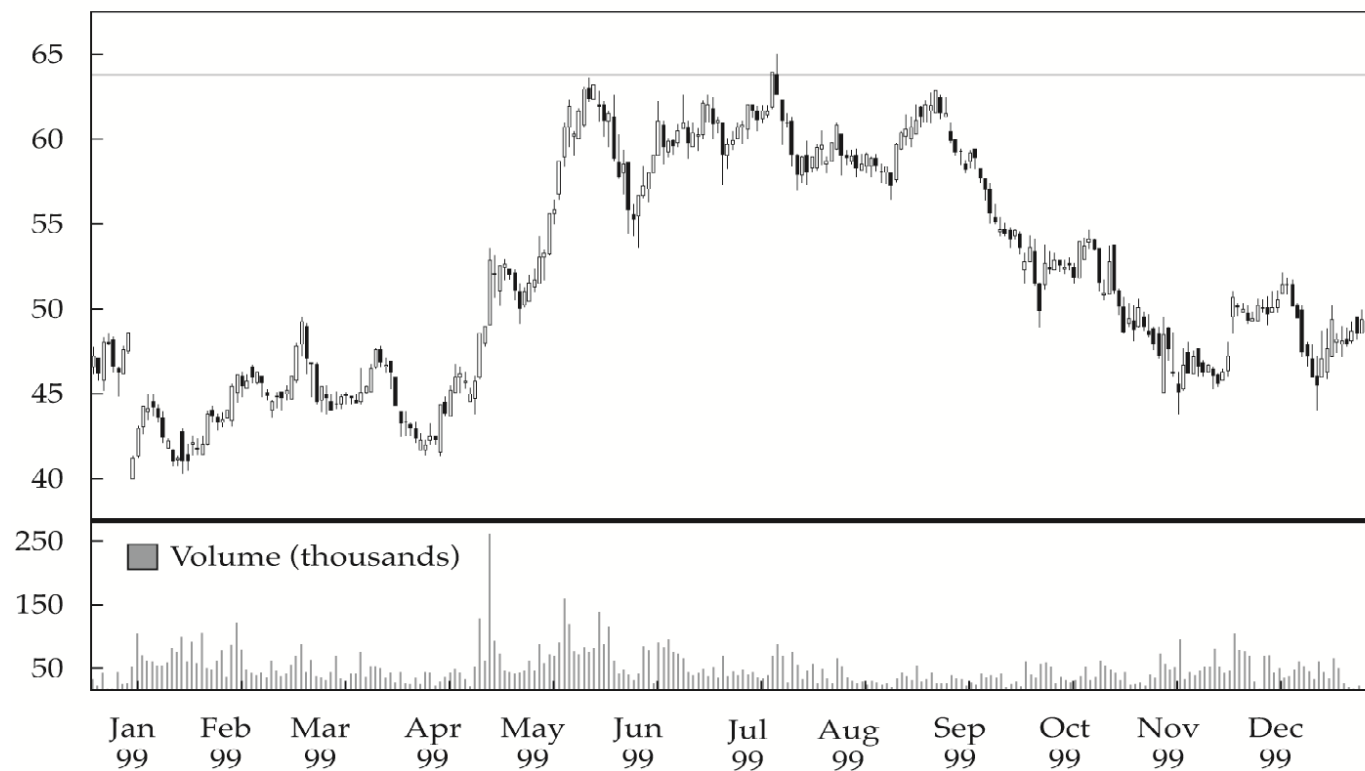
Head and Shoulders



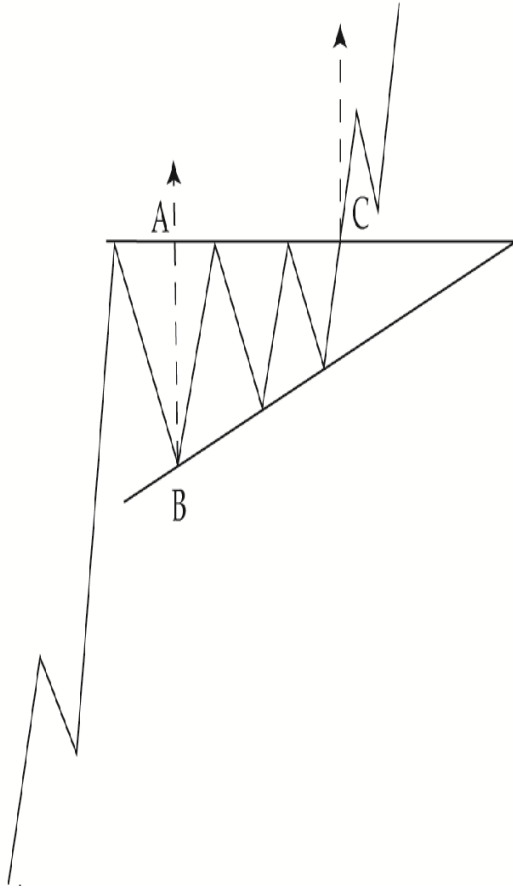
Double Tops and Bottoms



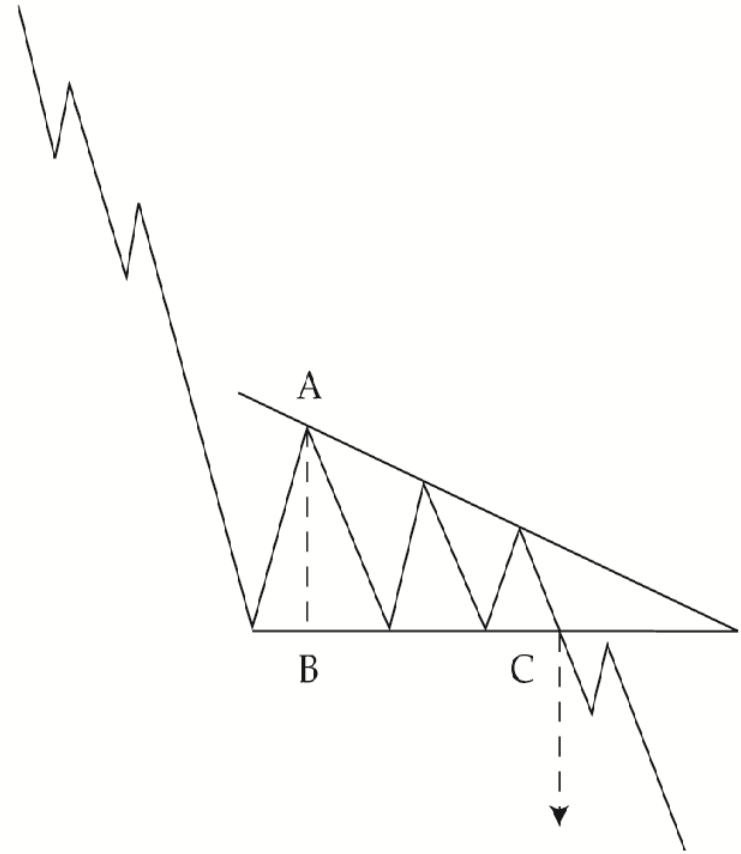
Triple Tops and Bottoms



Triangles



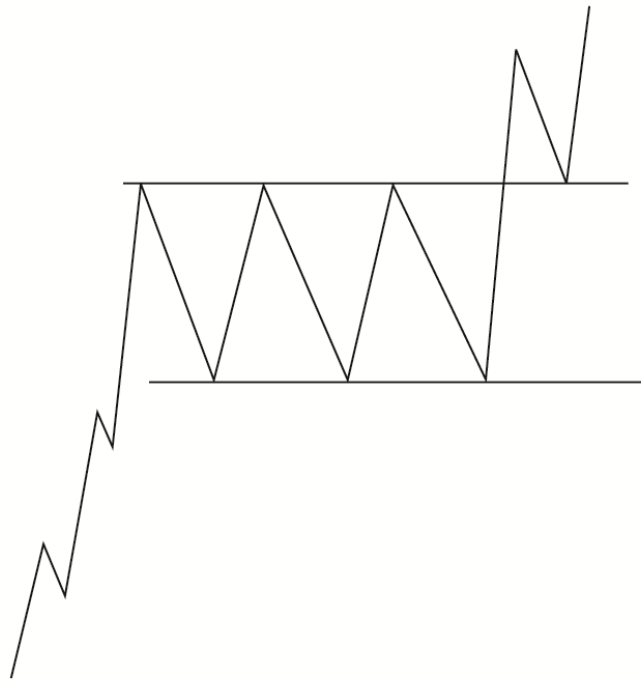
Ascending Triangle Pattern



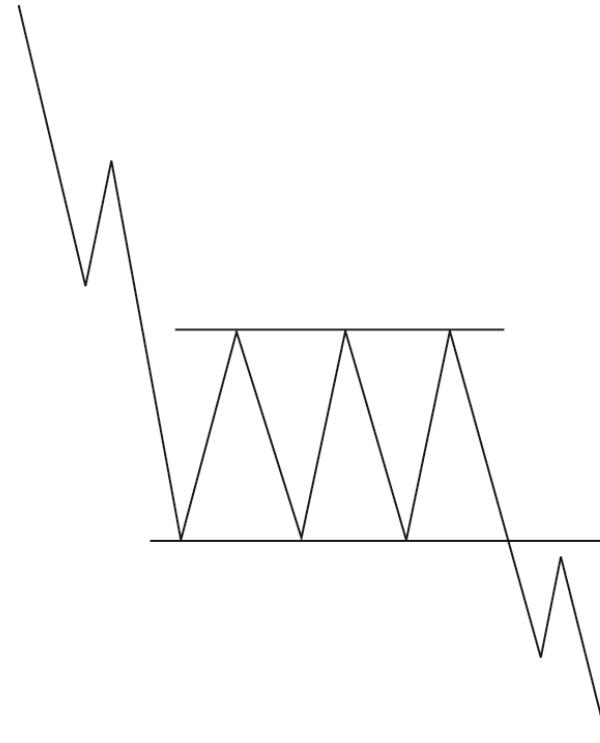
Descending Triangle Pattern

Rectangles

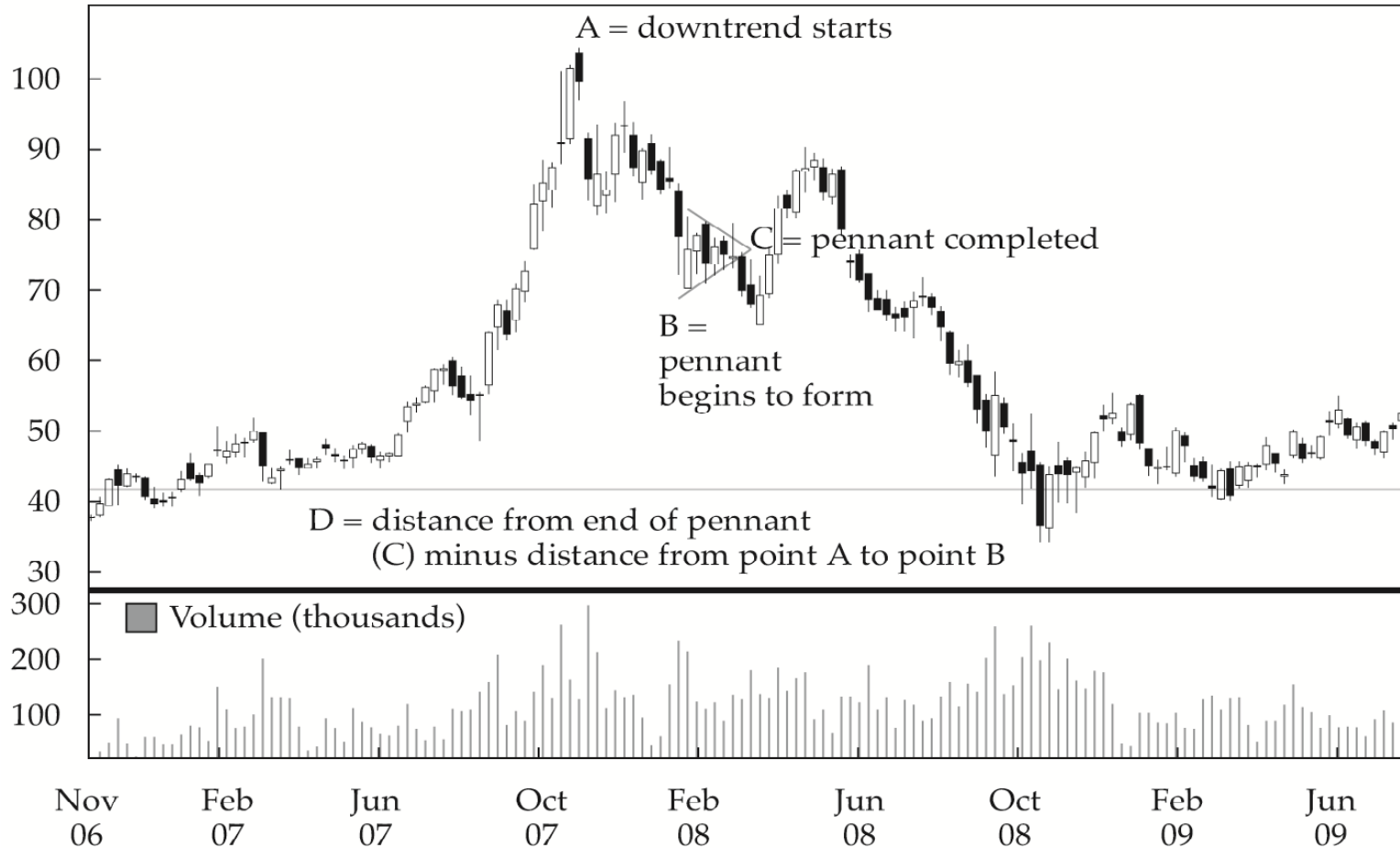
Bullish Rectangle



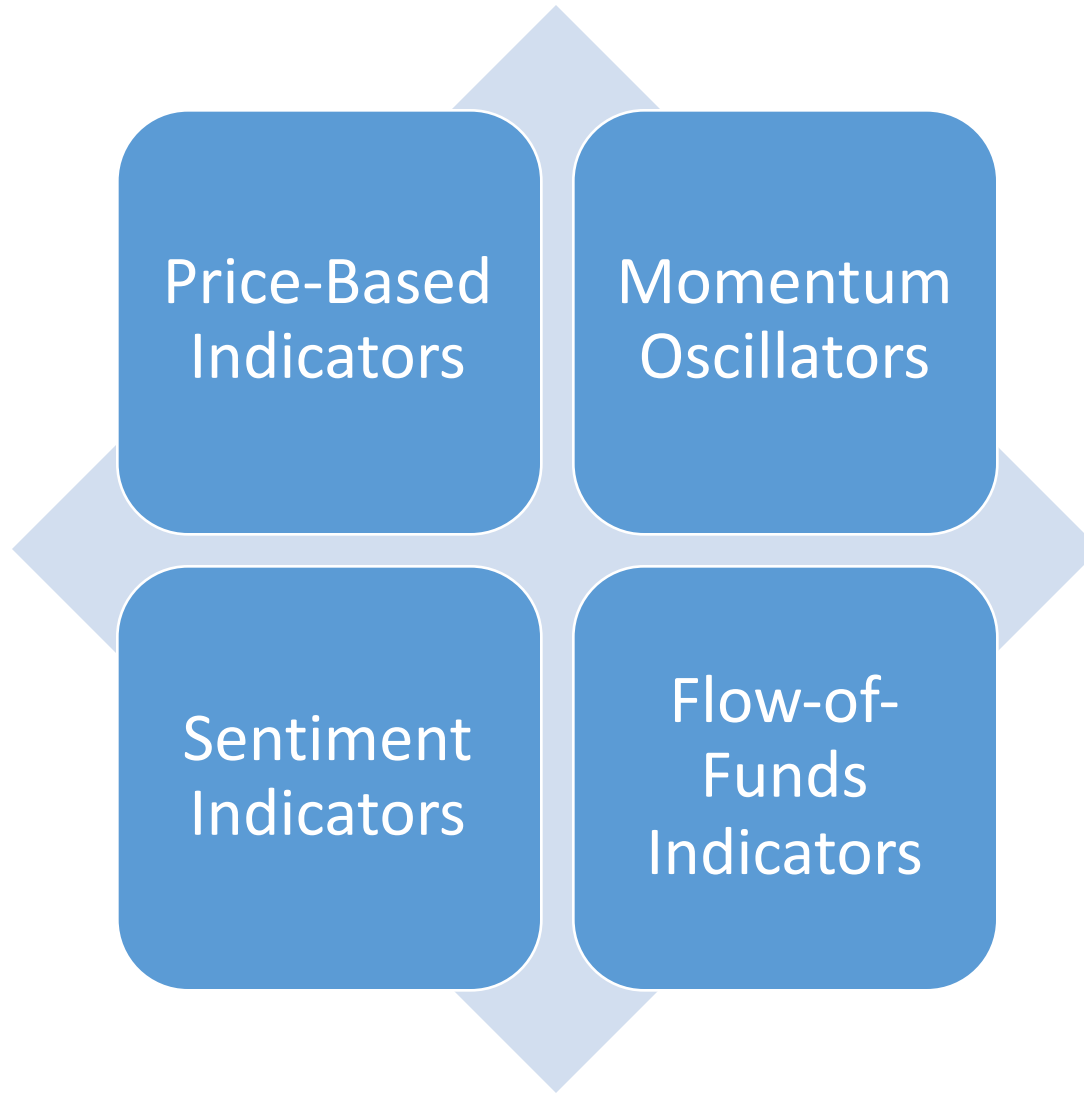
Bearish Rectangle



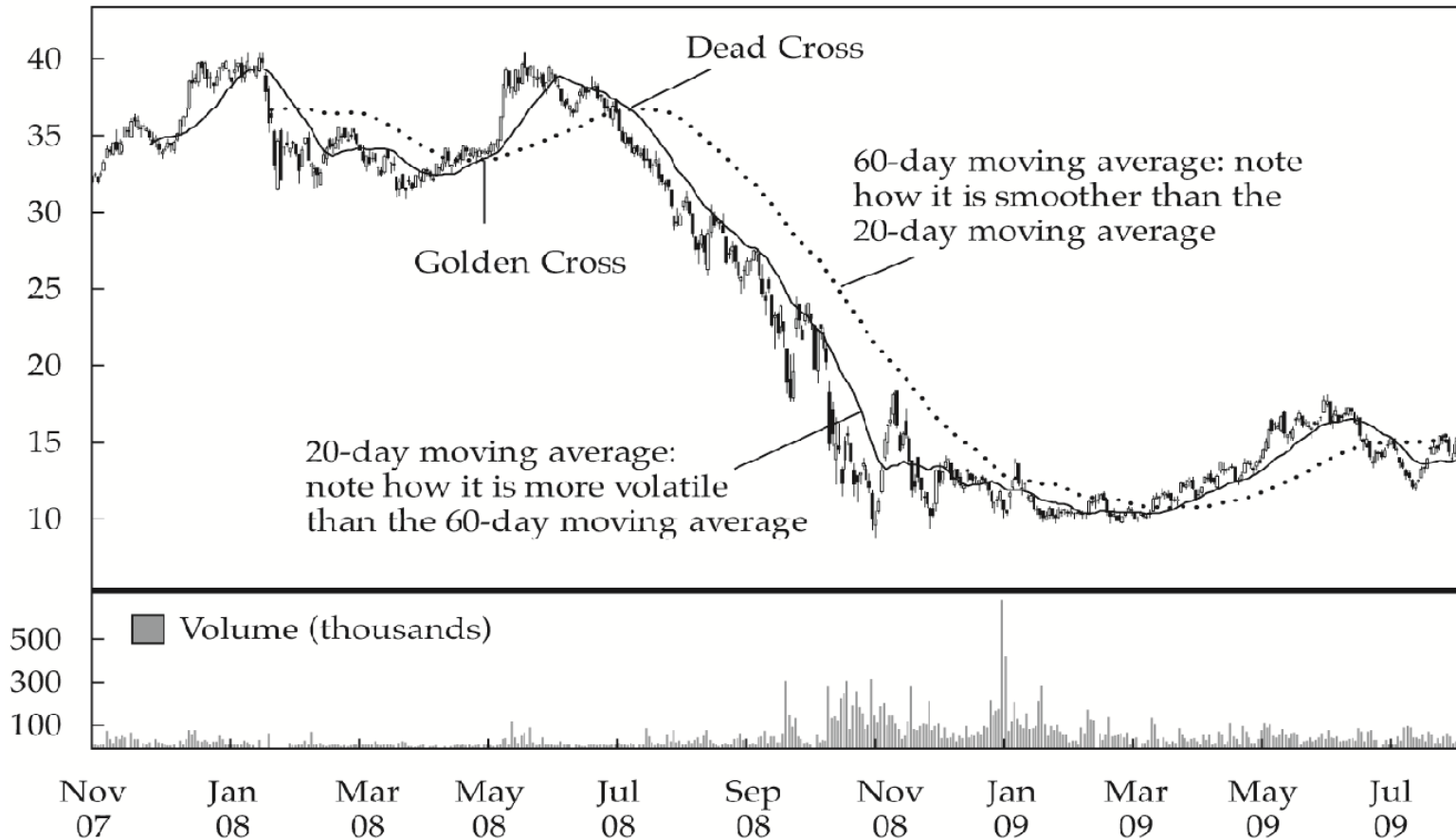
Flags and Pennants



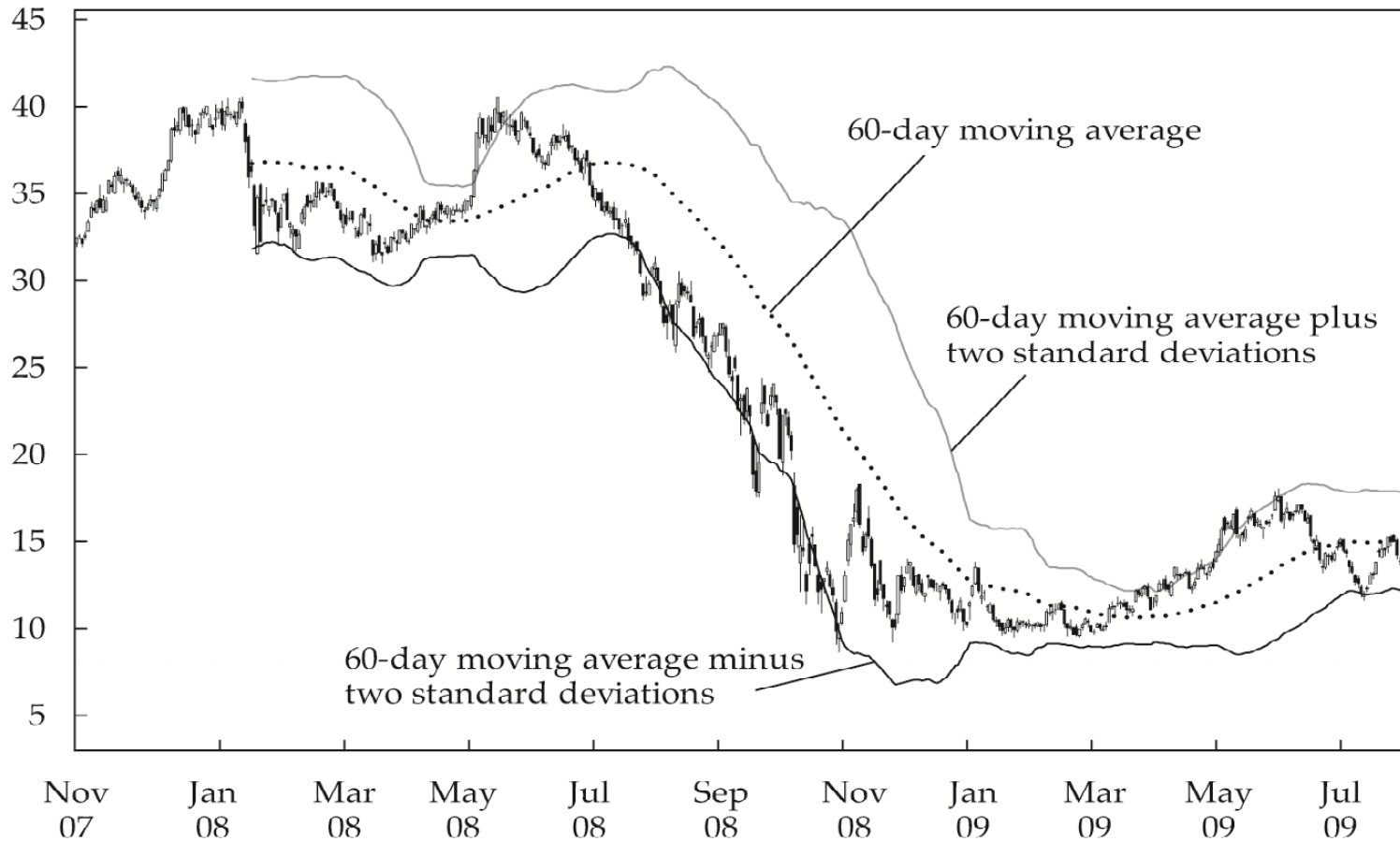
Technical Indicators



Price-Based Indicator: Moving Average



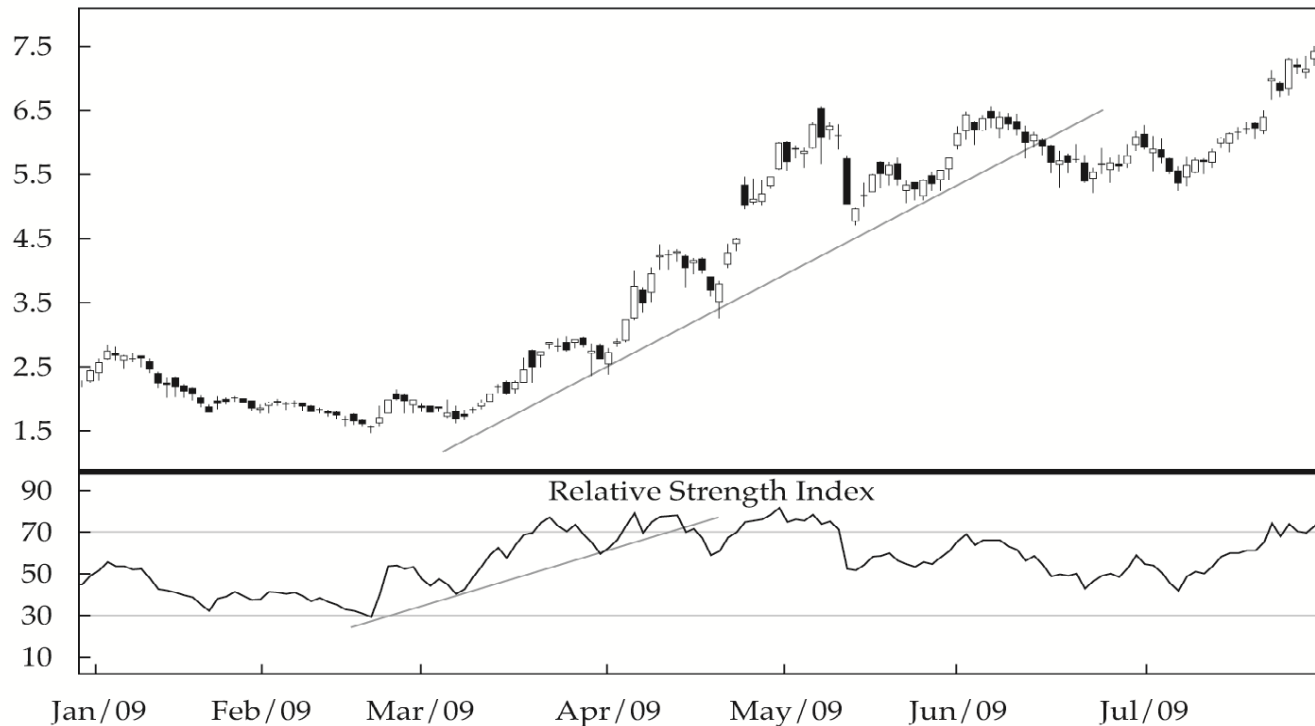
Price-Based Indicator: Bollinger Band



Momentum Oscillator: Relative Strength Index

$$RSI = 100 \frac{100}{1 + RS}$$

$$RS = \frac{\text{(Up changes for the period under consideration)}}{\text{(|Down changes for the period under construction|)}}$$



Sentiment Indicator: Calculated Statistical Indices

Put/Call Ratio

- Normally below 1.0
- Considered a contrary indicator

CBOE Volatility Index

- Based on options on stocks in the S&P 500
- Used with trend, pattern, or oscillator tools

Margin Debt

- Rising margin debt believed to be a signal of aggressive buying
- Considered a contrary indicator

Short Interest Ratio

- Short interest ÷ Average daily trading volume
- Considered a contrary indicator

Flow-of-Funds Indicators

Margin Loans

- Ability to buy stock on margin may increase demand
- Declining margin balances may result in forced selling

Mutual Fund Cash Positions

- Considered a contrary indicator: High cash balances represent buying power
- Some analysts take into account the level of interest rates

New Equity Issuance and Secondary Offerings

- Considered a contrary indicator: High issuance and offerings are considered signs of a market top

Cycles

Kondratieff Wave (K-wave)

- Western economies have a 54-year cycle
- Originally tied to economic cycles and commodity prices

18-Year Cycle

- $3 \times 18 \text{ years} = 54 \text{ years}$
- Most often mentioned in connection with real estate prices

Decennial Pattern

- Pattern of market returns broken down based on the last digit of a year
- Years ending in 5 have the best returns

Presidential Cycle

- Returns broken down by year of U.S. President's term in office
- Third year (year prior to next election) has best historical performance

Elliott Wave Theory

 Grand Supercycle

 Supercycle

 Cycle

 Primary

 Intermediate

 Minor

 Minute

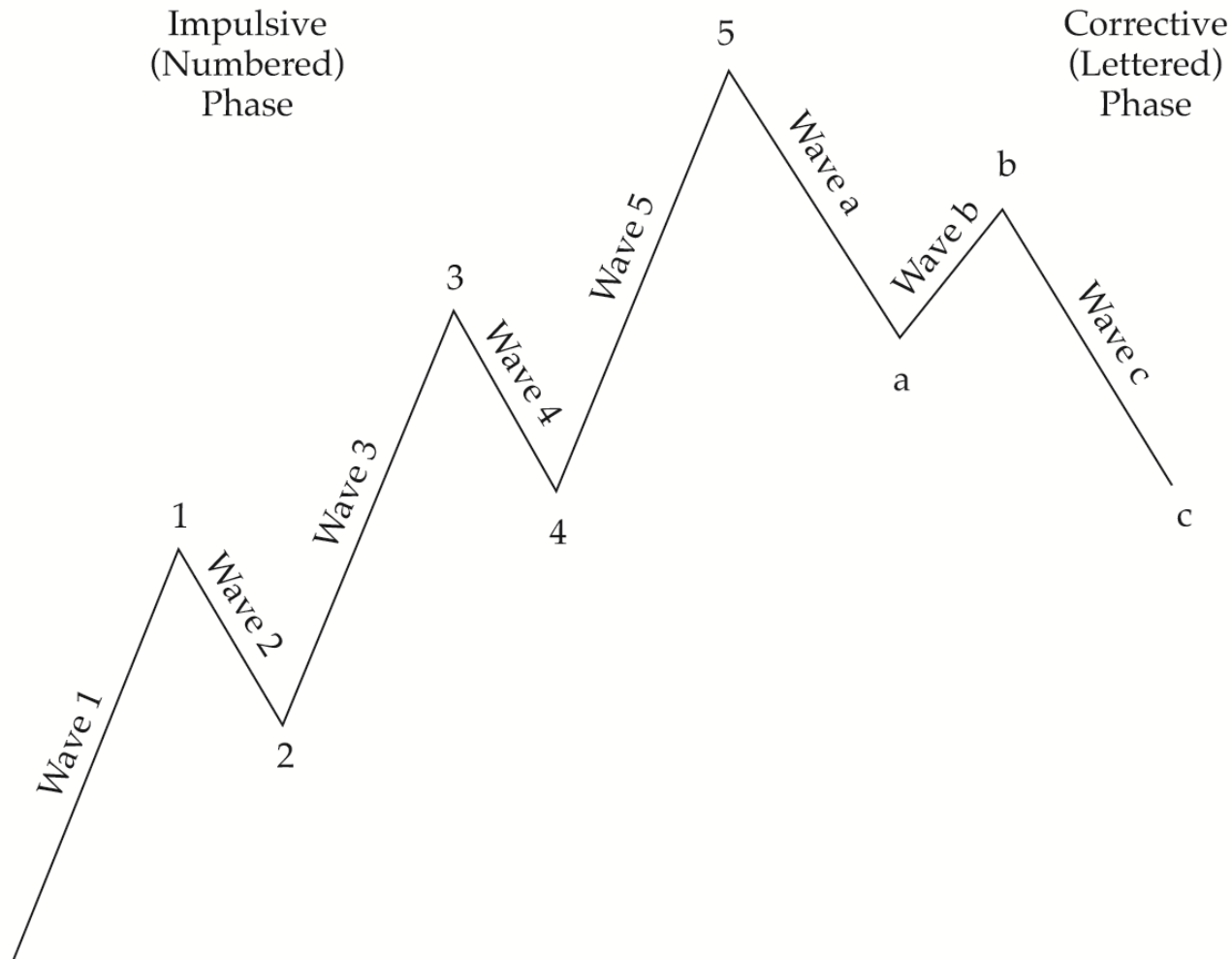
 Minuette

 Subminuette

Follow patterns that are ratios of

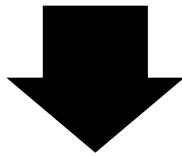
Fibonacci Sequence:
0, 1, 1, 2, 3,
5, 8, 13, 21...

Impulse Waves and Corrective Waves

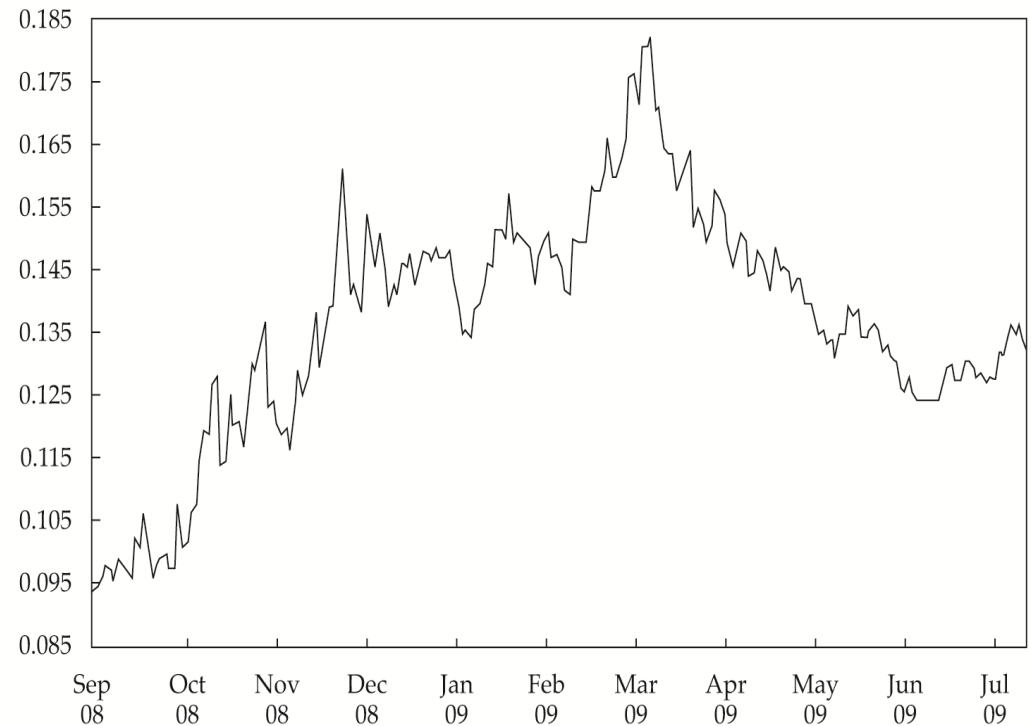


Intermarket Analysis

Inflection points in
one market



May be a warning
sign of a change in
trend in another
market



Relative Strength of 10-Year T-Bonds vs. S&P 500,
September 2008–July 2009

A Typical Path to First Failure



(and 2nd, 3rd, 4th, 5th,
6th, ...)

Passive investing

Diversification basically means "don't put all your eggs in one basket."





jehzlau

THE FUTURE OF MONEY

➔ CREATE YOUR OWN PORTFOLIO

This is my new hobby. My previous hobby was collecting overpriced earphones and headphones. Its value decreases over time. Now I collect cryptos. Its value increases exponentially as the years go by. If you do your research, then buy whenever you have extra cash, then you`ll increase your money`s worth, instead of just depositing it in a fiat bank.

Acquisition Cost	Realized P/L	Profit / Loss	Holdings	24H Profit / Loss
\$ 436.59 k	\$ 1.24 M	\$ -112.88 k ▼ -25.85%	\$ 323.72 k	\$ -4,611.95 ▼ -1.40%

☰ OVERVIEW

📊 RISK ANALYSIS ⚡

📈 ADVANCED CHART ⚡

📅 ACCOUNTING ⚡

Portfolio Change

\$ -45.66 k ▼ -12.36%

Portfolio MIN
\$ 314.88 k

Portfolio MAX
\$ 391.32 k

Least Profitable
IOT \$ -25.38 k

Most Profitable
BTC \$ 7,417.24

Worst Crypto
INS (-40.57%)

Best Crypto
ETP (272.08%)

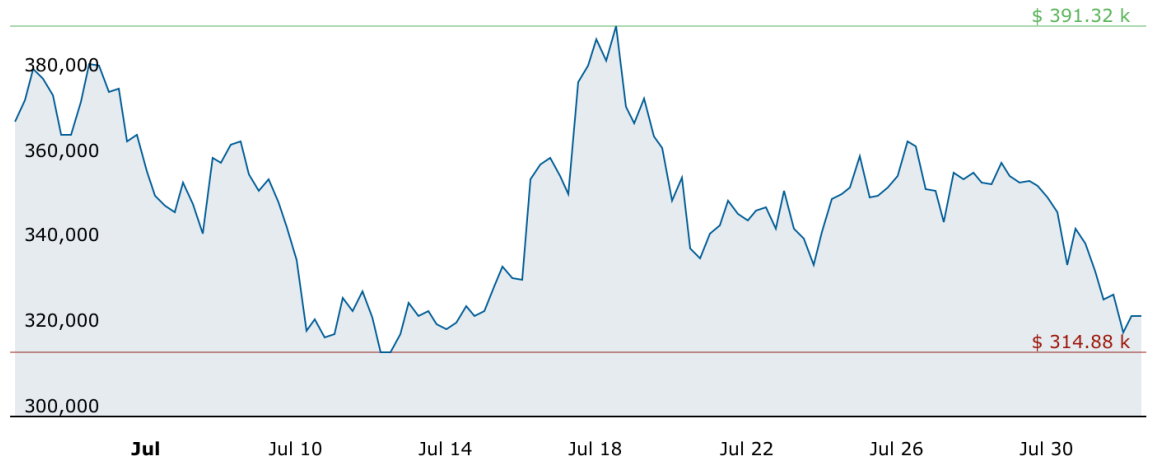
Your best six hour period was on Tuesday, 17 July 2018 at 17:00 when you made a profit of \$ 26.12 k. Your worst six hour period was on Wednesday, 18 July 2018 at 23:00 when you made a loss of \$ -18.25 k.

Portfolio 1 Month Chart

📄 Open Positions

⚡ Period P/L

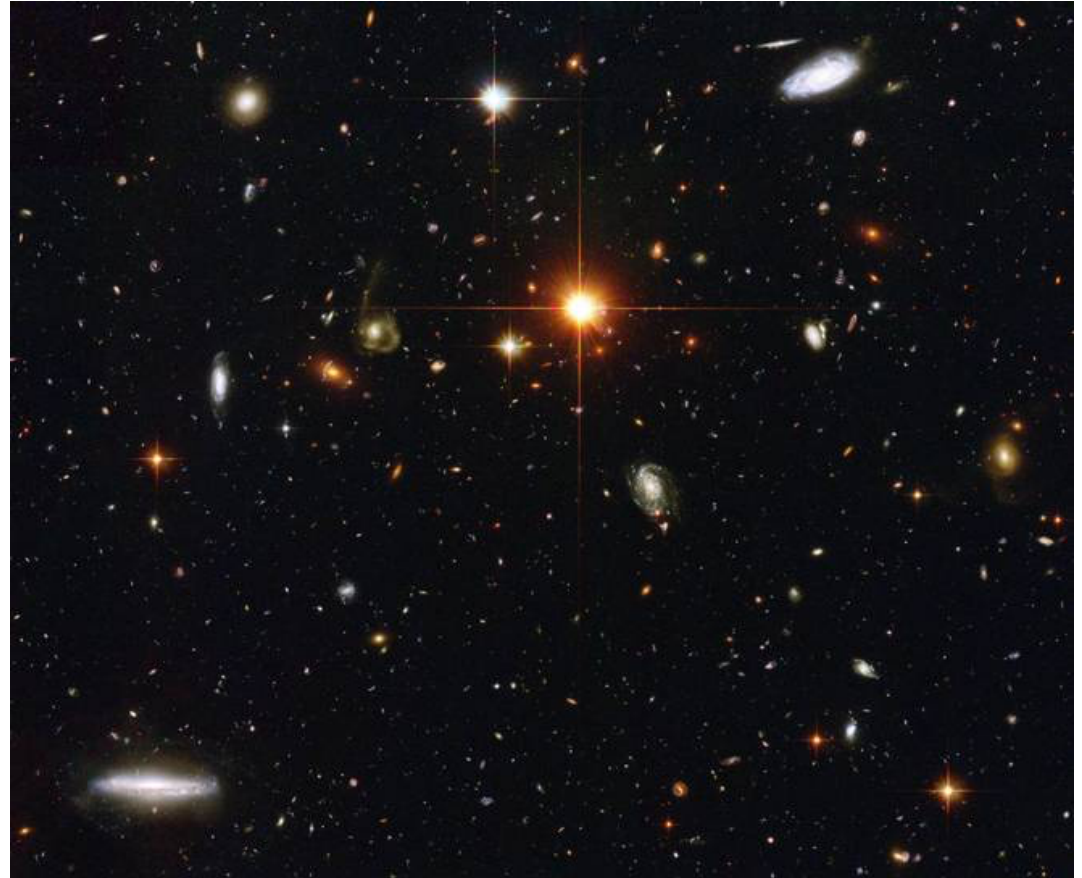
📈 Advanced Chart



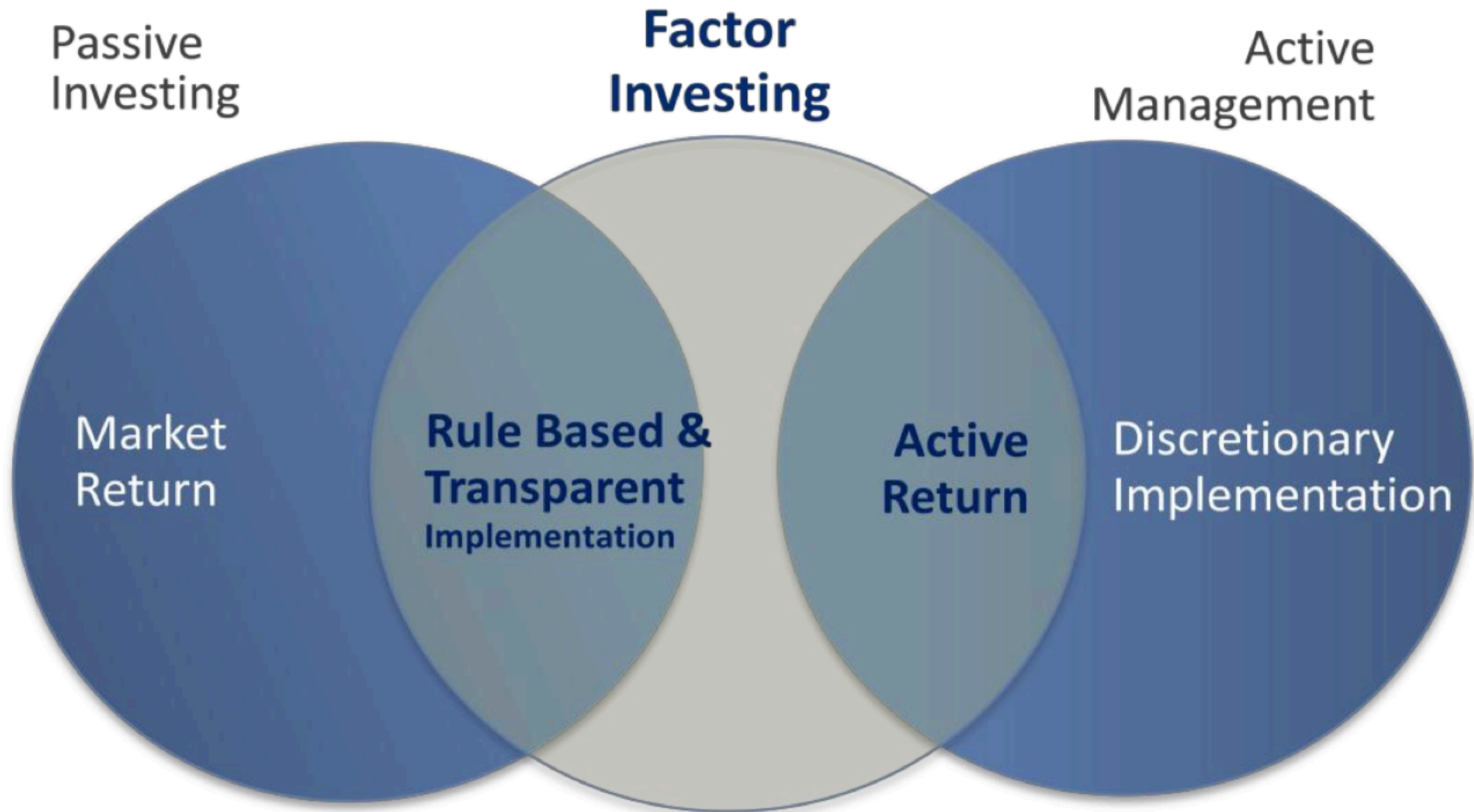
1 Day | 1 Week | **1 Month** | ⚡ 1 Year | ⚡ Year To Date | ⚡ All

Trading universe

- Stocks
- Bonds
- Cash and cash equivalents
- Commodities
- Commercial real estate
- Collectibles such as art, coins
- Insurance products
- Derivatives
- Foreign currency
- Venture capital
- Private equity
- Distressed securities
- Crypto
- Yourself

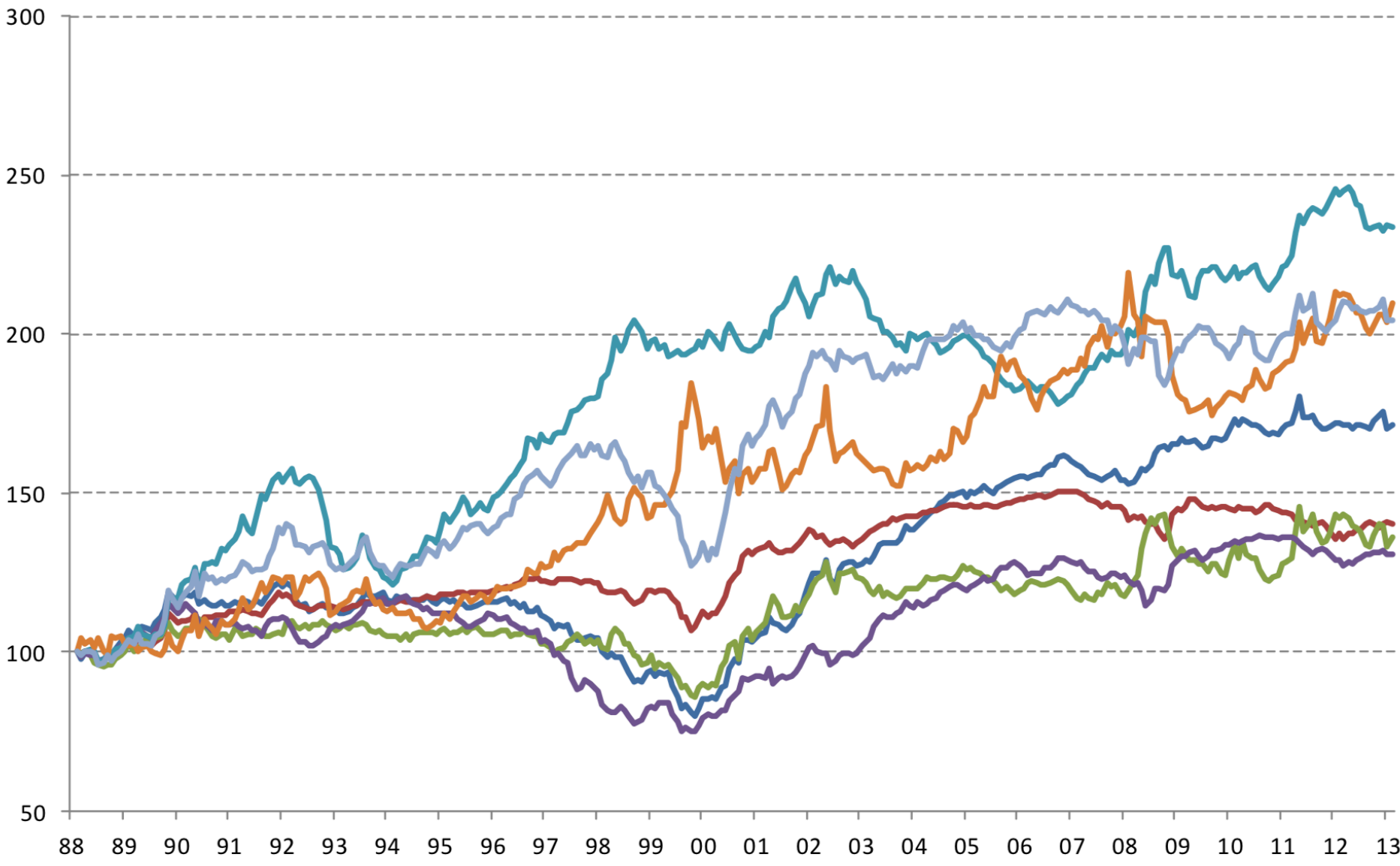


Factor investing



Passive investing

Systematic Factors	MSCI Indexes
Value	<ul style="list-style-type: none">➤ MSCI Value Weighted Indexes: Capture Value factor by weighting according to four fundamental variables (Sales, Earnings, Cash Flow, Book Value)
Low Size (Small Cap)	<ul style="list-style-type: none">➤ MSCI Equal Weighted Indexes: Capture low size effect by equally weighting all stocks in a given parent index
Momentum	<ul style="list-style-type: none">➤ MSCI Momentum Indexes: Reflect the performance of high momentum stocks by weighting based on 6- and 12-month momentum scaled by volatility
Low Volatility	<ul style="list-style-type: none">➤ MSCI Minimum Volatility Indexes: Reflect empirical portfolio with lowest forecast volatility using minimum variance optimization➤ MSCI Risk Weighted Indexes: Capture low volatility stocks by weighting based on the inverse of historical variance
Dividend Yield	<ul style="list-style-type: none">➤ MSCI High Dividend Yield Indexes: Select high dividend stocks with screens for quality and potential yield traps
Quality	<ul style="list-style-type: none">➤ MSCI Quality Indexes: Capture high quality stocks by weighting based on debt-to-equity, return-on-equity, and earnings variability



— Risk Weighted/World — Value Weighted/World — Min Volatility/World — Equal Weighted/World
— Quality/World — Momentum/World — High Div Yield/World

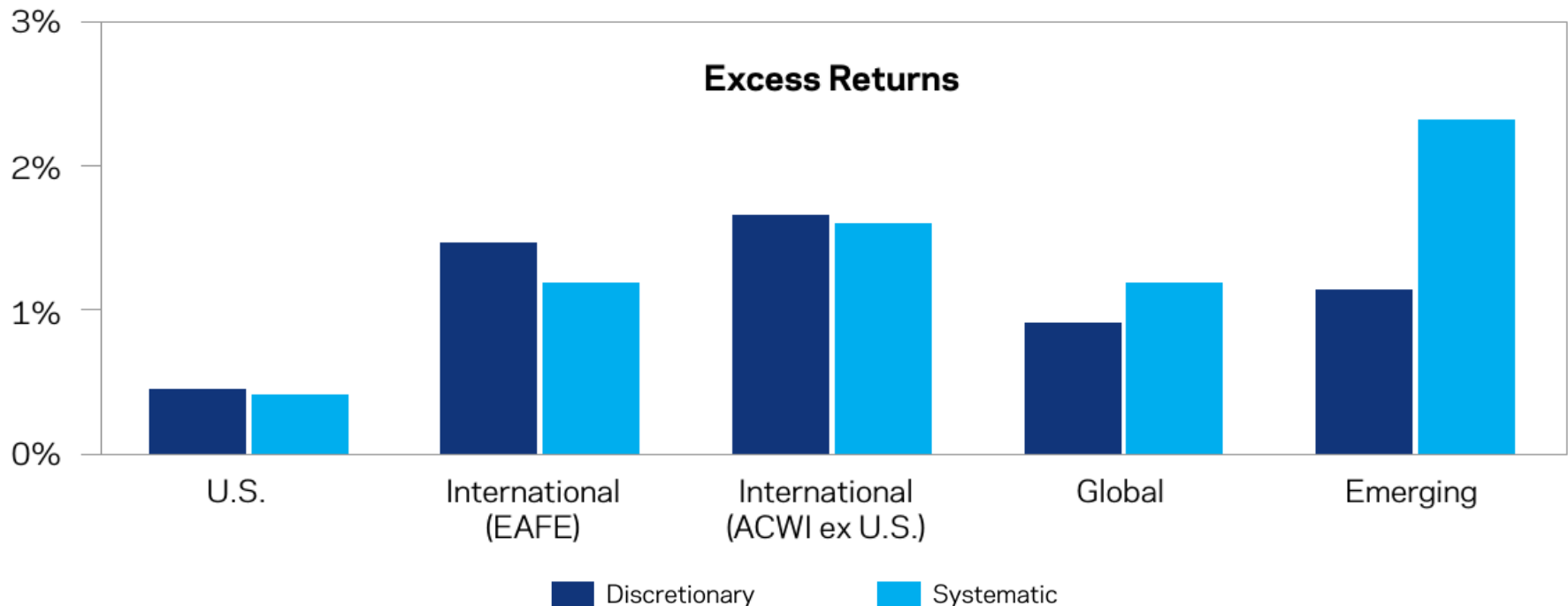
Factors for crypto?

Discretionary and Systematic



С самого начала у меня была какая-то тактика и я ее придерживался..

Performance Characteristics for Discretionary and Systematic Groups of Active Institutional Equity Managers in the eVestment Database, April 2007 to March 2017

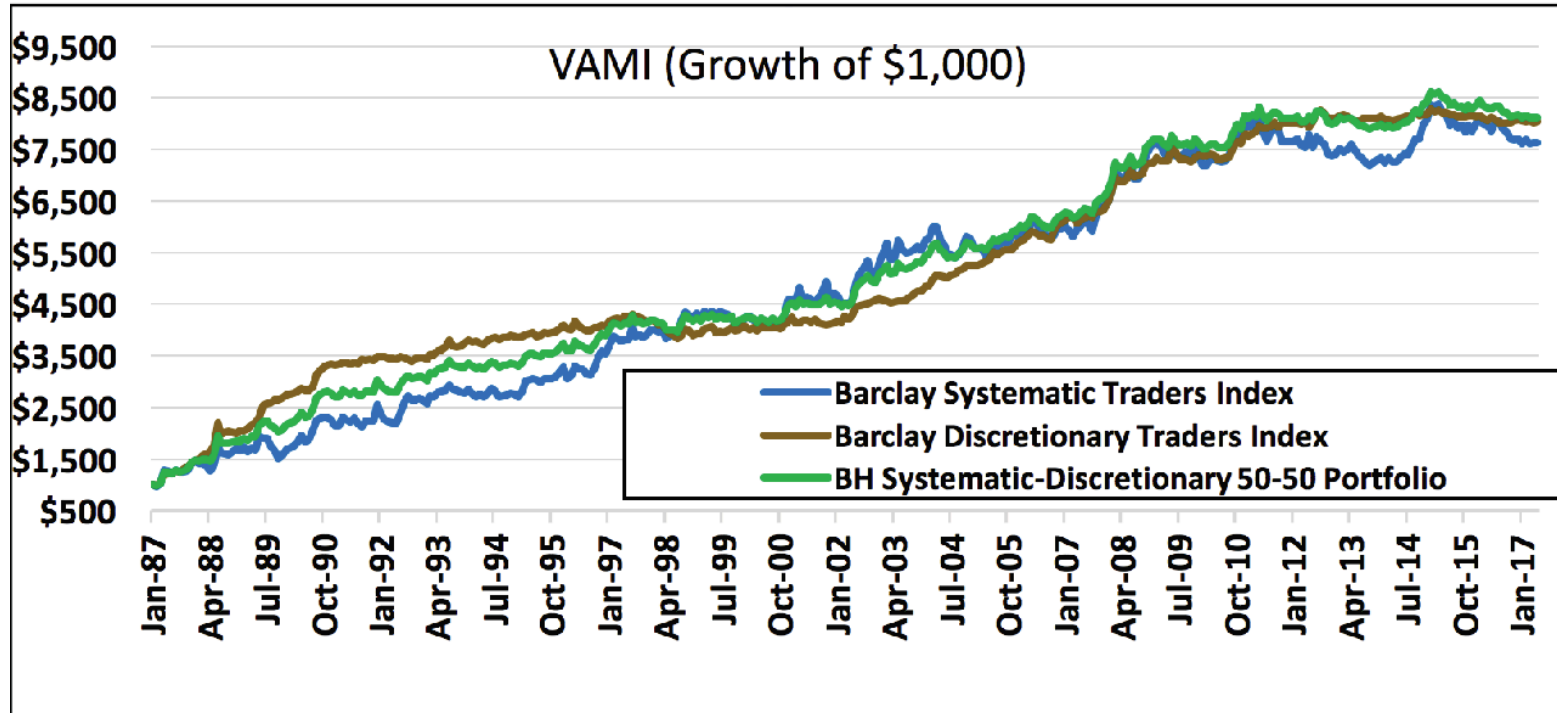


Source: AQR analysis based on eVestment data. Note that eVestment categorization relates to quantitative versus fundamental, which we refer to as systematic and discretionary, respectively. The average annualized excess returns (gross of fees), tracking error, and information ratio, computed separately for discretionary and systematic managers, and separately for the large cap universes of U.S., EAFE, Global, Emerging, and ACWI. The performance statistics are computed using managers' preferred benchmarks and are as of 3/31/2017. Only funds with "Active" product status are included in the analysis, eVestment database, accessed on 7/5/2017. The number of strategies in each universe for systematic and discretionary managers (in this order) are as follows: U.S. - 140, 511; International (EAFE) - 24, 83; International (ACWI ex-U.S.) - 11, 55; Global - 33, 118; and; Emerging - 5, 24.

HEAD TO HEAD

Shown is the performance of the BarclayHedge Systematic and Discretionary Traders' Indexes as well as its risk metrics from February 1987 through May 2017. Incentive and management fees have been deducted.

Source: BarclayHedge



RISK TABLE

	Compound ROR	Standard Deviation	Downside Deviation	Sharpe Ratio	Sortino Ratio	Calmar Ratio	Kurtosis	Skewness
Barclay Systematic Traders Index	6.93%	12.66%	6.16%	0.51	1.04	0.14	11.51	2.12
Barclay Discretionary Traders Index	7.11%	7.48%	2.70%	0.88	2.45	-0.07	45.18	4.65
BH Systematic-Discretionary 50-50 Portfolio	7.15%	9.14%	3.63%	0.73	1.83	0.1	26.59	3.55

Asset allocation

- Strategic asset allocation
- Dynamic asset allocation
- Tactical asset allocation
- Core-satellite asset allocation

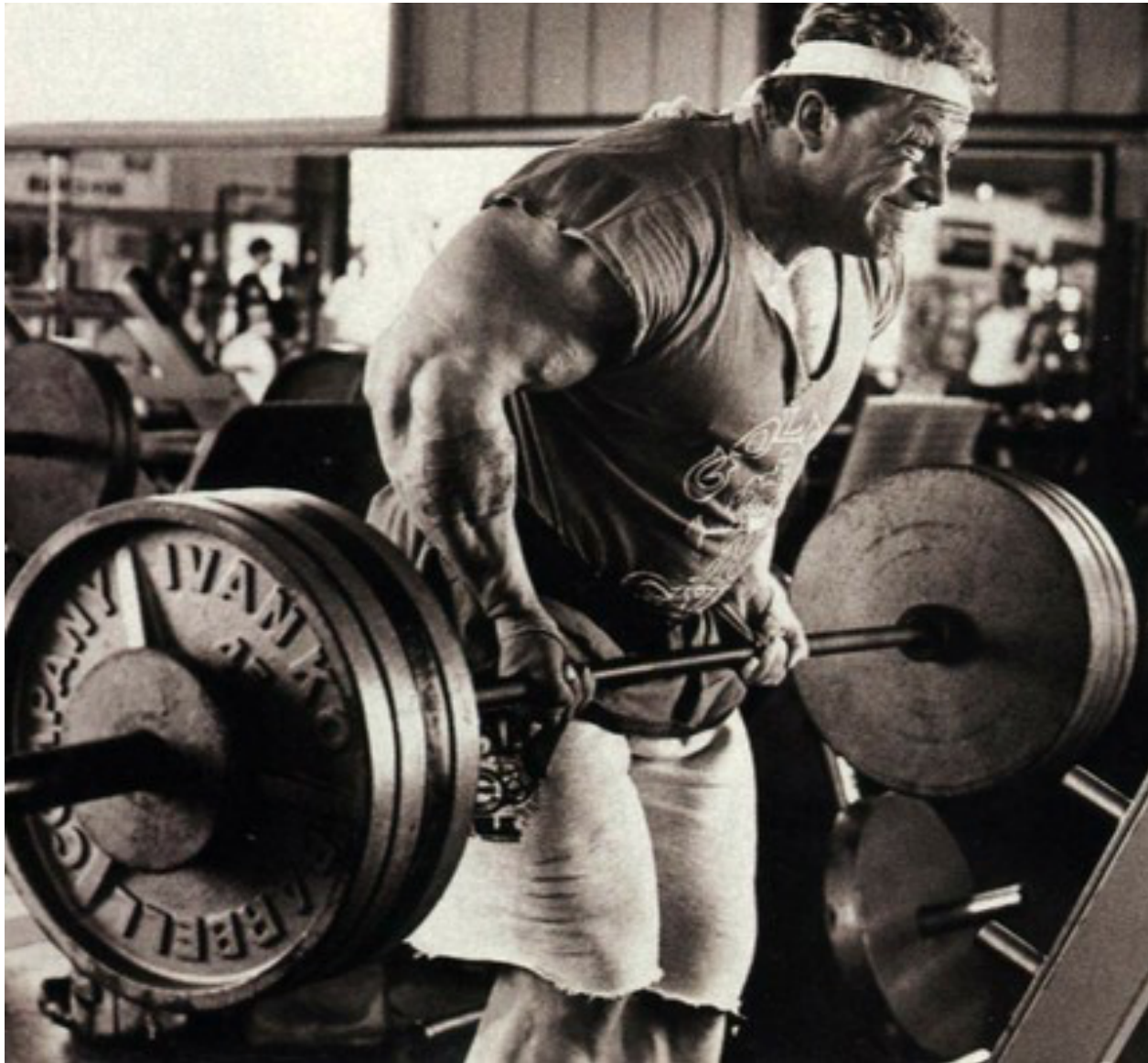


Systematic (quantitative) trading

What people think I do when they learn that I do quantitative trading...



And the reality...

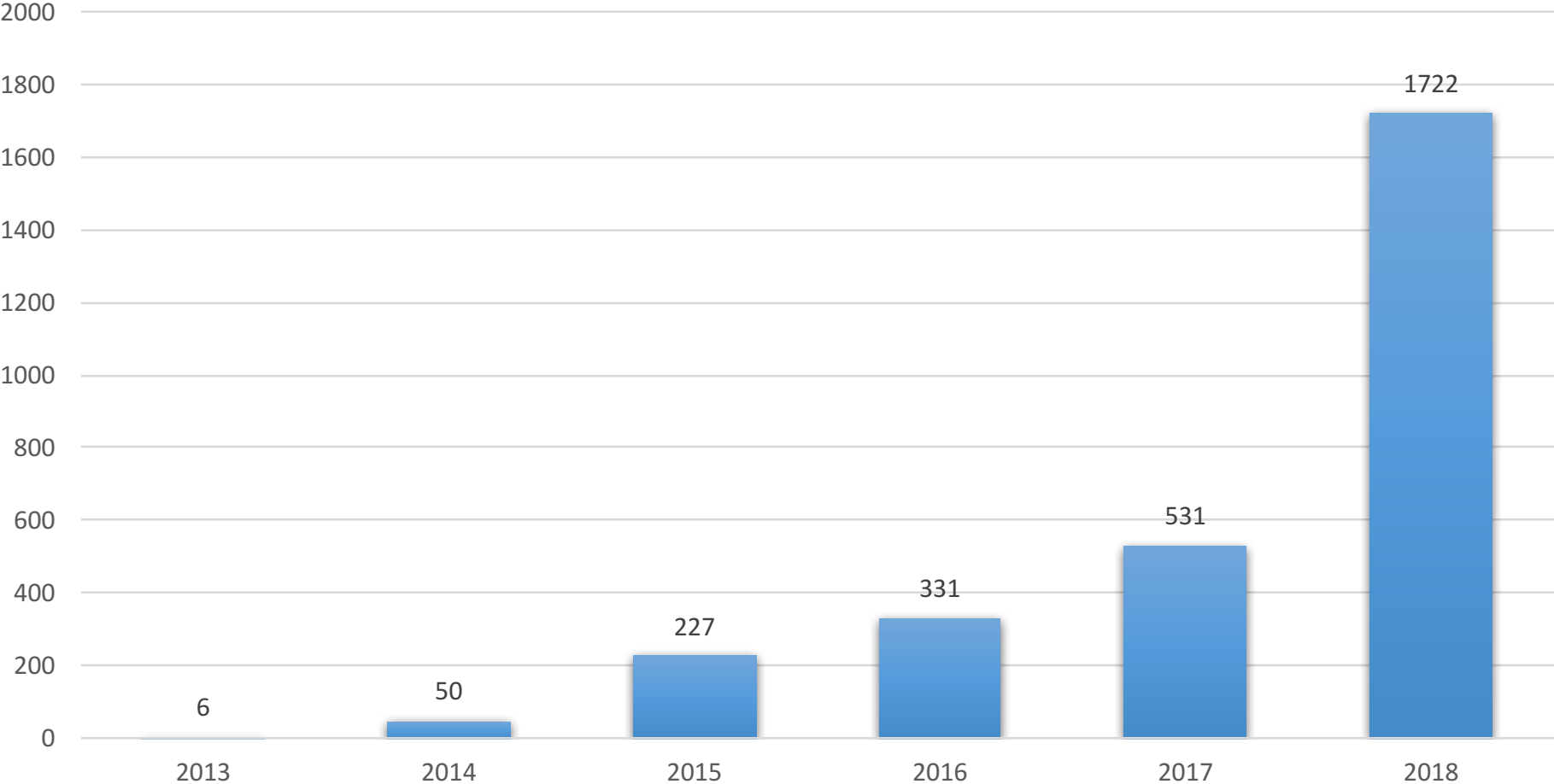


Data

coinmarketcap.com

cryptocompare.com

Number of coins



Connection to exchanges



ccxt



rusquant



ccxt



Alternative data

accern

Sentiment data



THOMSON REUTERS

Sentiment data

Блокчейн



Sentiment data

Bloomberg

Sentiment data

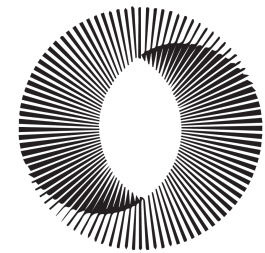


BLOCKCHAIN

sentix 
expertise in behavioral finance

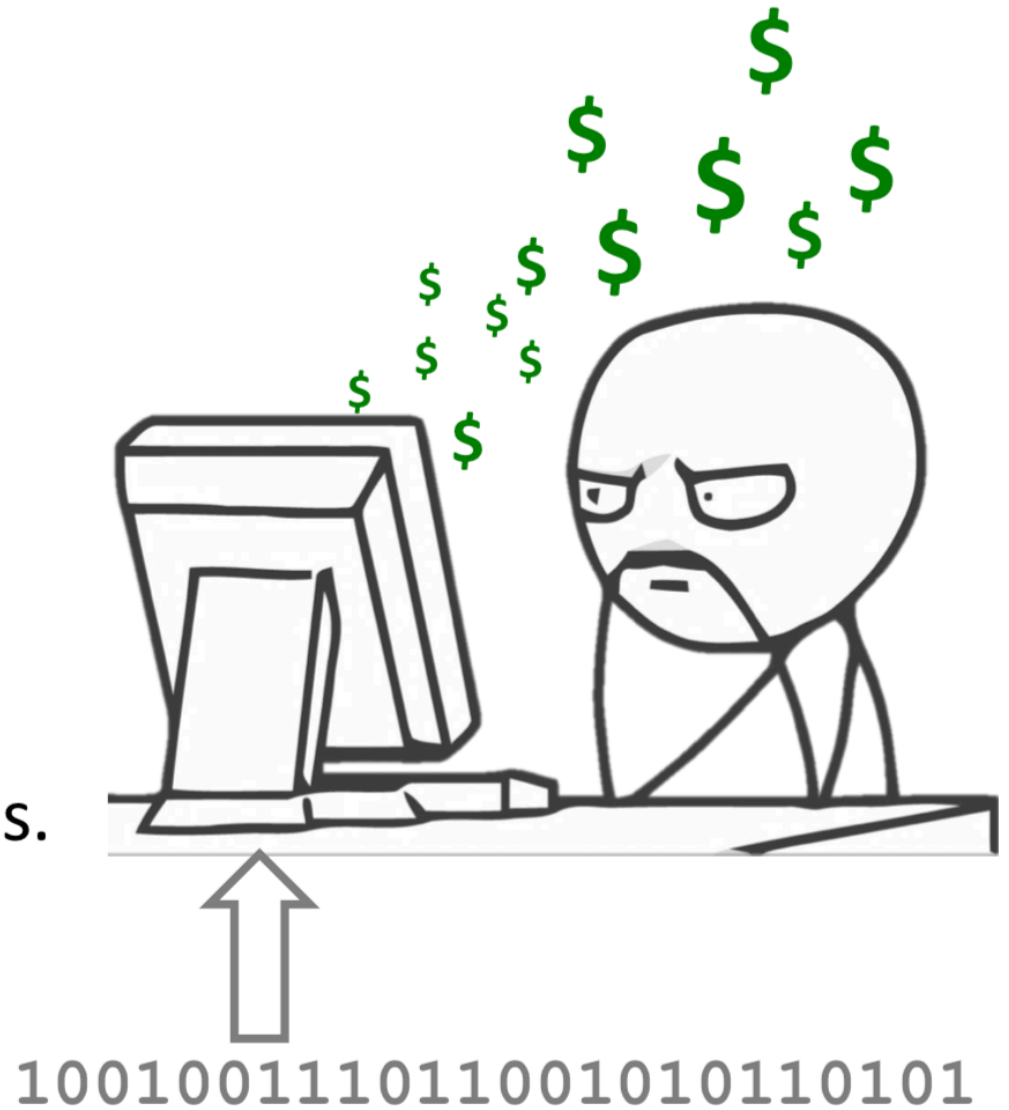


spreadstreet

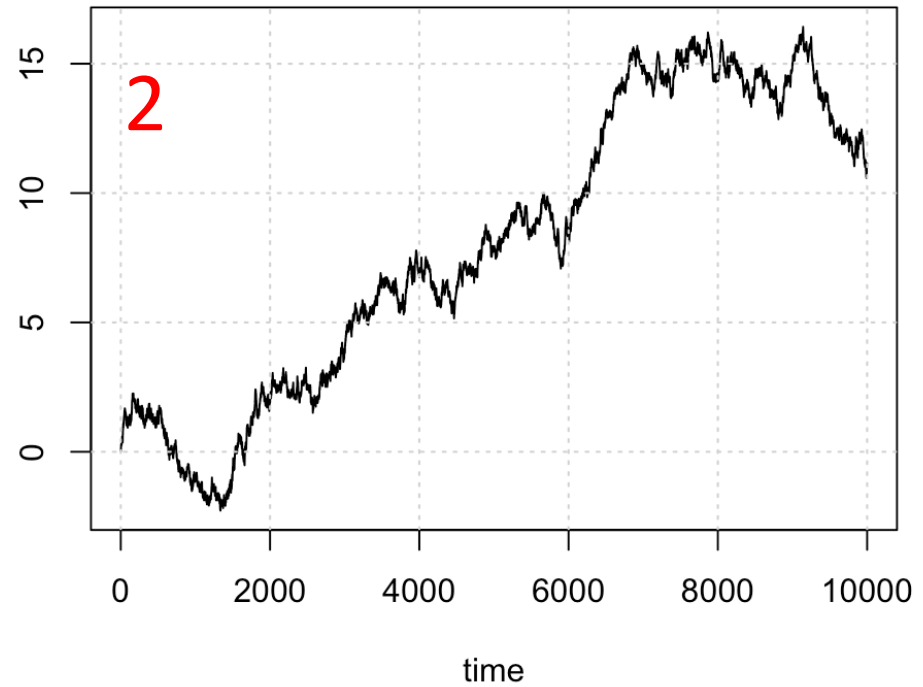
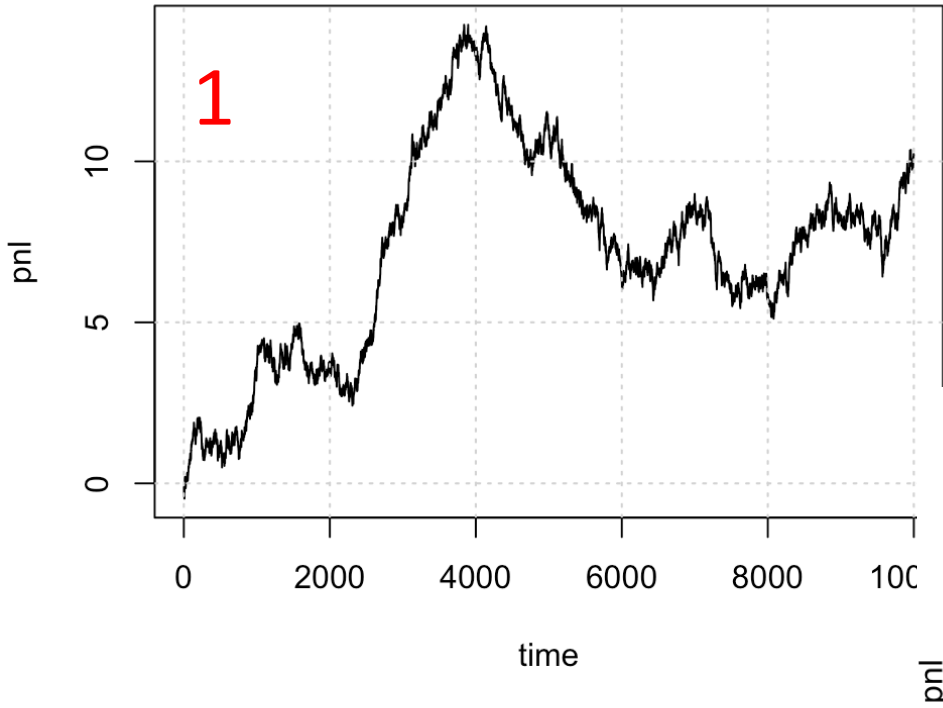


CONSILIUM
CRYPTO

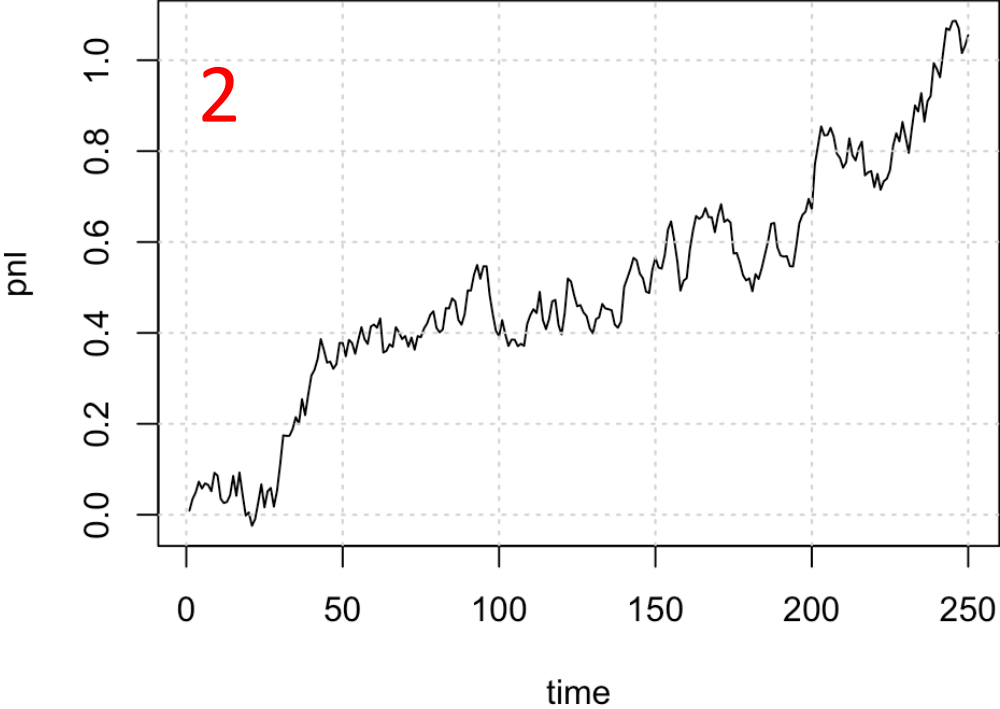
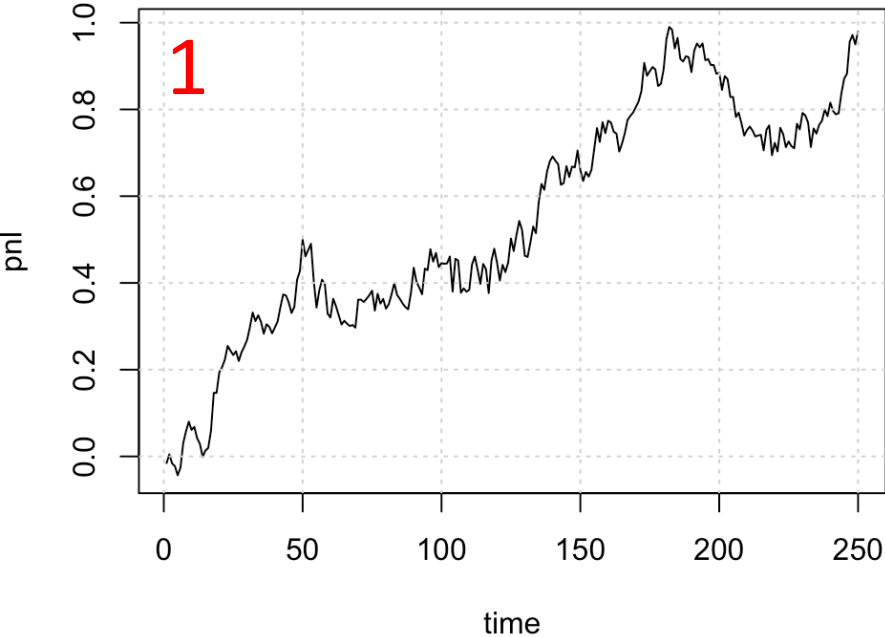
1. Source and explore some **bad** data.
2. Find confirmation of your preconceived notion.
3. Back test all the things.
4. Sort by PNL.



Which is better?



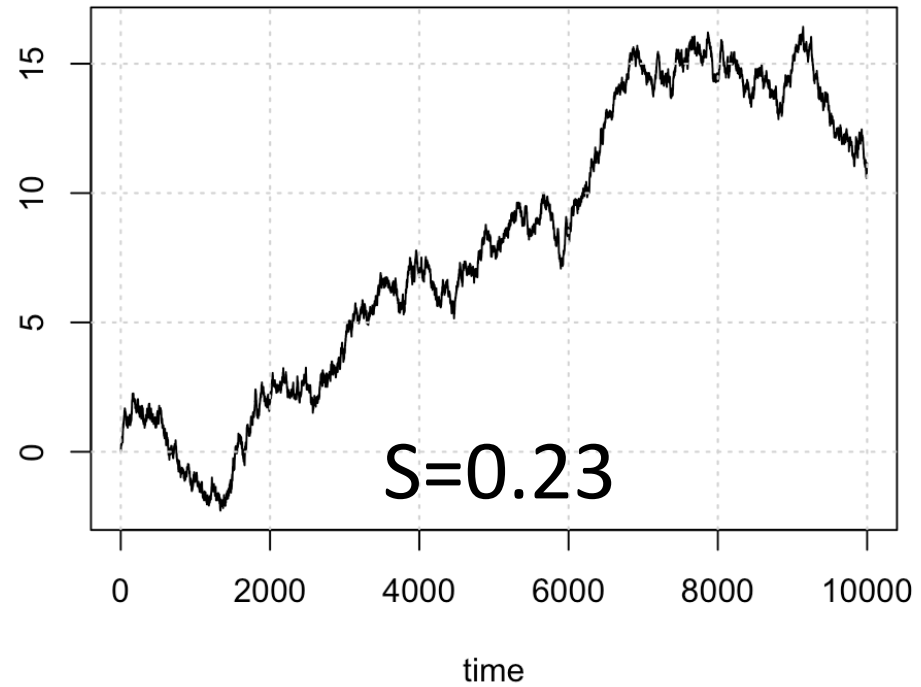
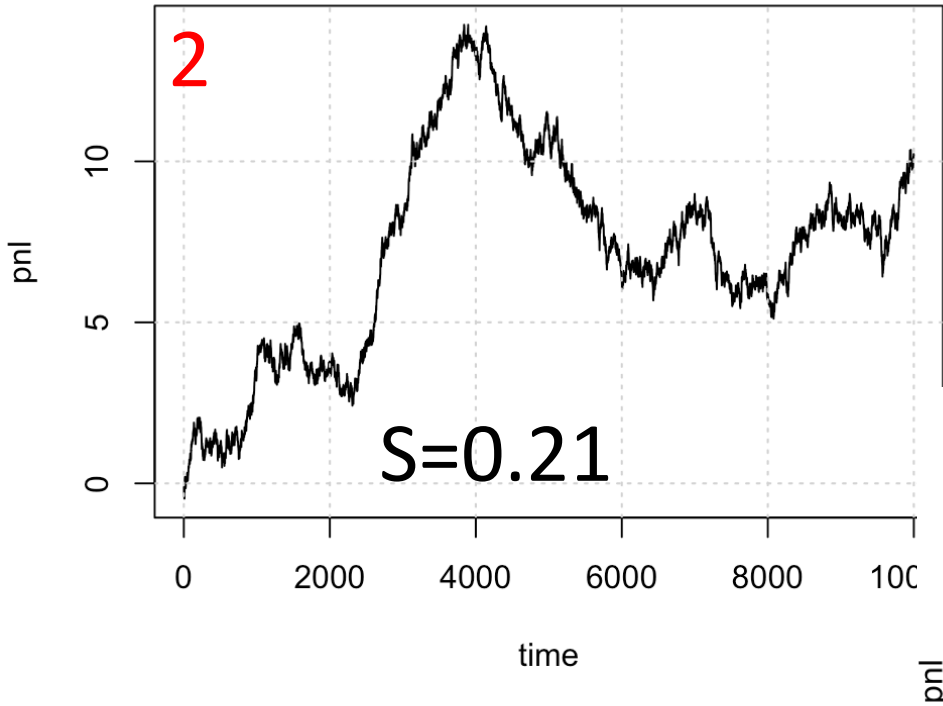
Which is better?



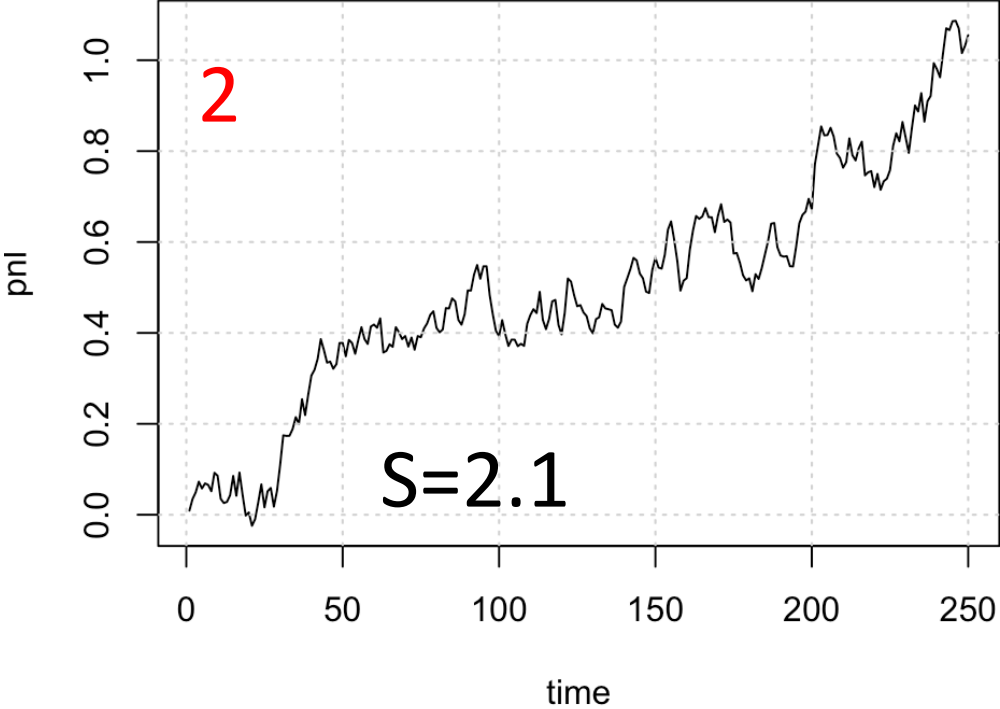
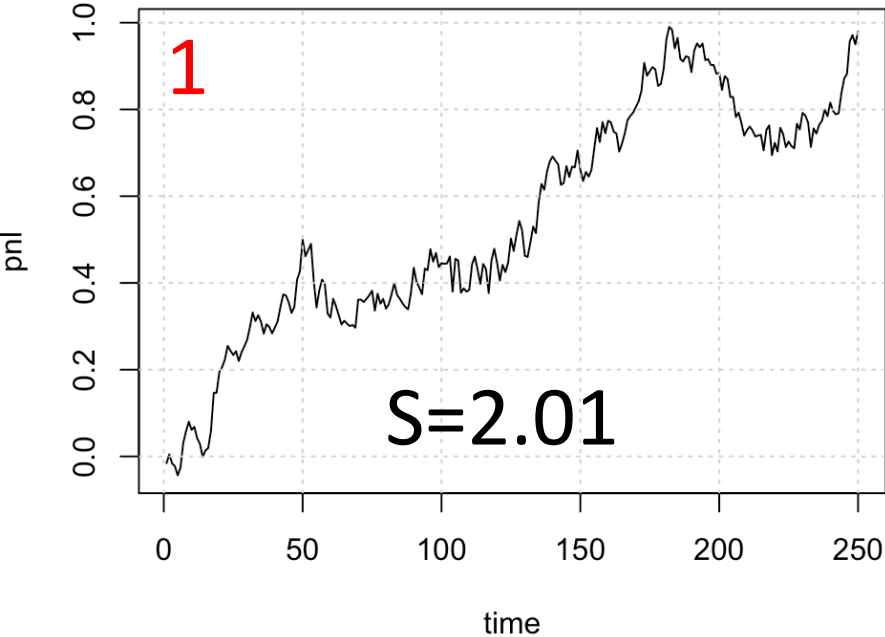
Sharpe ratio

$$S = \left(\frac{R_p - R_f}{\sigma_p} \right)$$

Which is better?



Which is better?

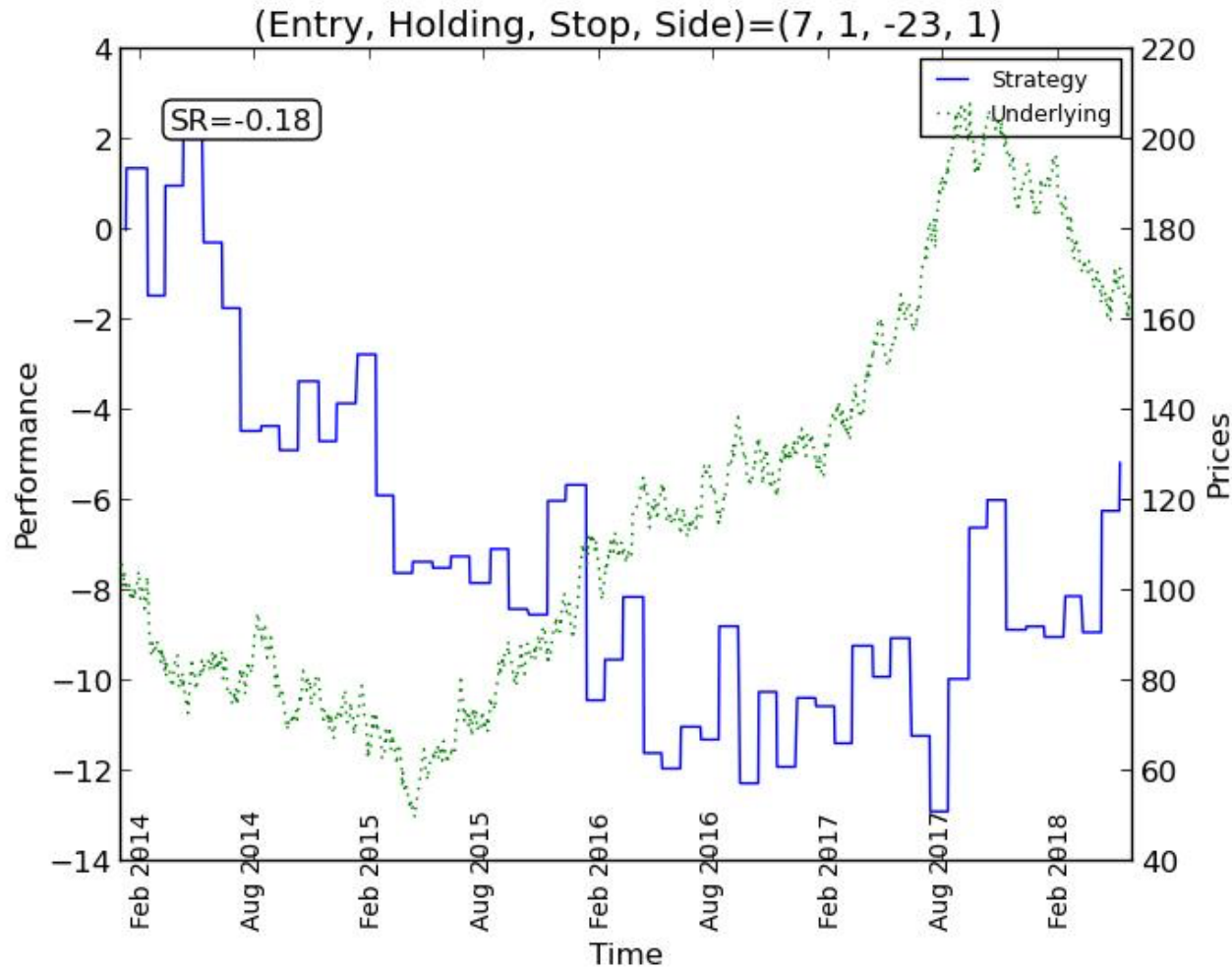


Trade the top performing backtests...



Overfitting

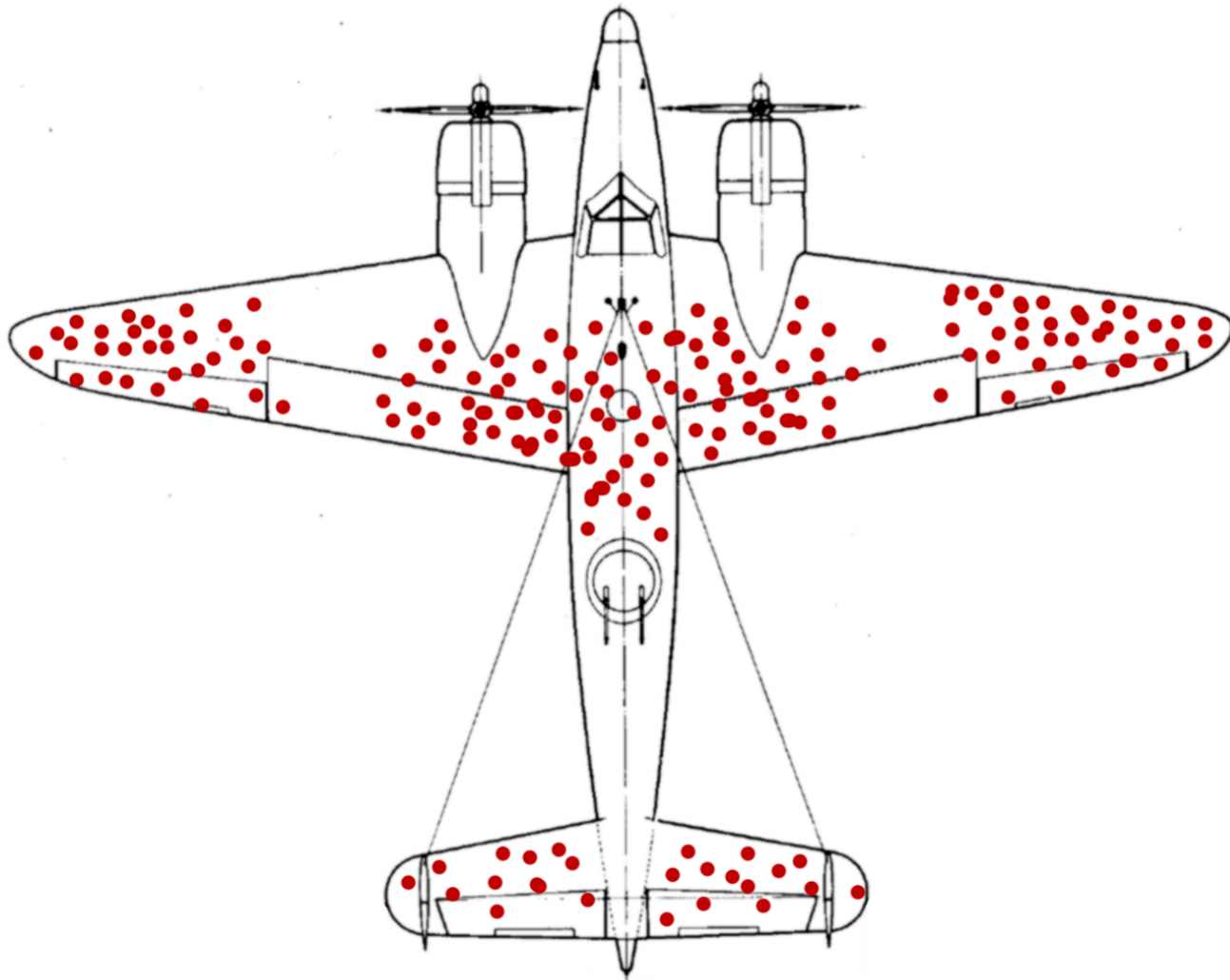
Overfitting occurs when a model describes noise (randomness) in the data set rather than the underlying statistical relationship



It's kind of like...



Survivorship Bias



Look-ahead bias

specific example of look-ahead bias in which the strategy is allowed to peek a little bit into the future.



Trusting stateful strategy luck

A stateful strategy is one whose holdings over time depend on which day in history it was started.



Time Period Specific Bias

We focus our study by examining a very limited time period of history: from roughly 2010 to 2018. This period may be very unique and characterized by specific events



Prior Empirical Study Bias

We build upon findings from an earlier empirical study

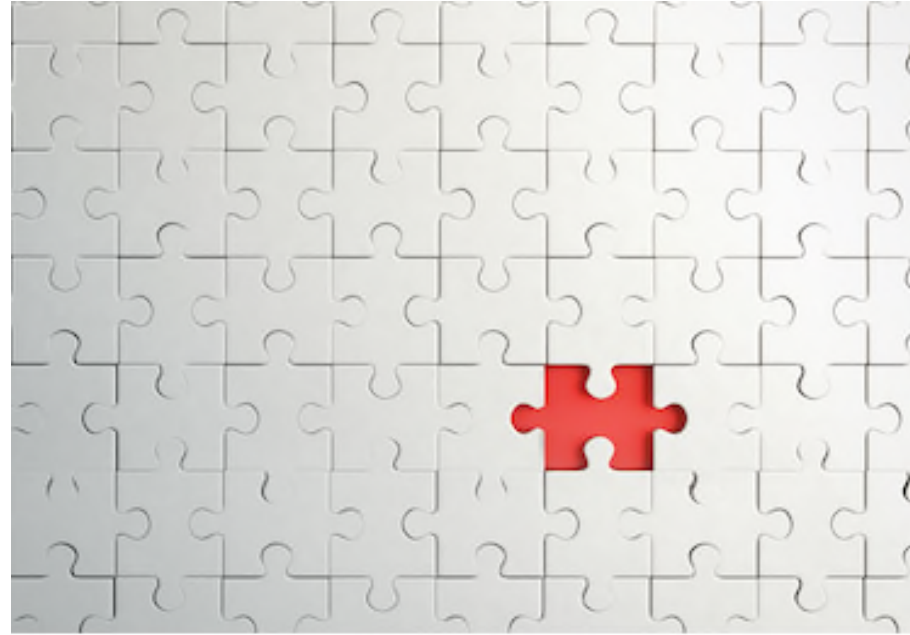


Harry Markowitz

MISSING VARIABLE BIAS

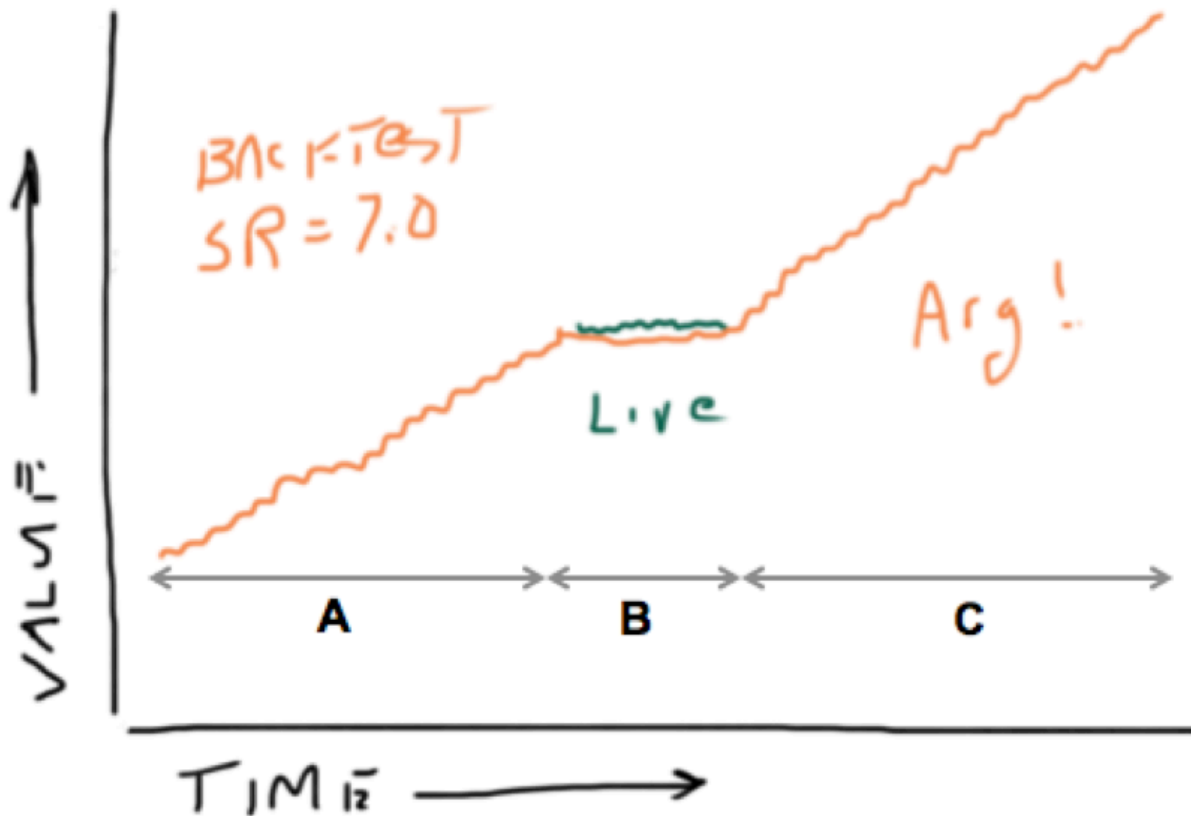
Omitted-variable bias occurs when a model is created which leaves out one or more important causal variables.

The bias is created when the model incorrectly compensates for the missing variable by over or underestimating the effect of one of the other variables.



Ignoring market impact and costs

The very act of trading affects price. Historical pricing data does not include your trades and is therefore not an accurate representation of the price you would get if you were trading.



The technologists problem

We revert to what we know, so we build infrastructure instead of strategies.



В мире существует 10 типов людей

Те, кто понимает бинарный код
и те, кто не понимает...

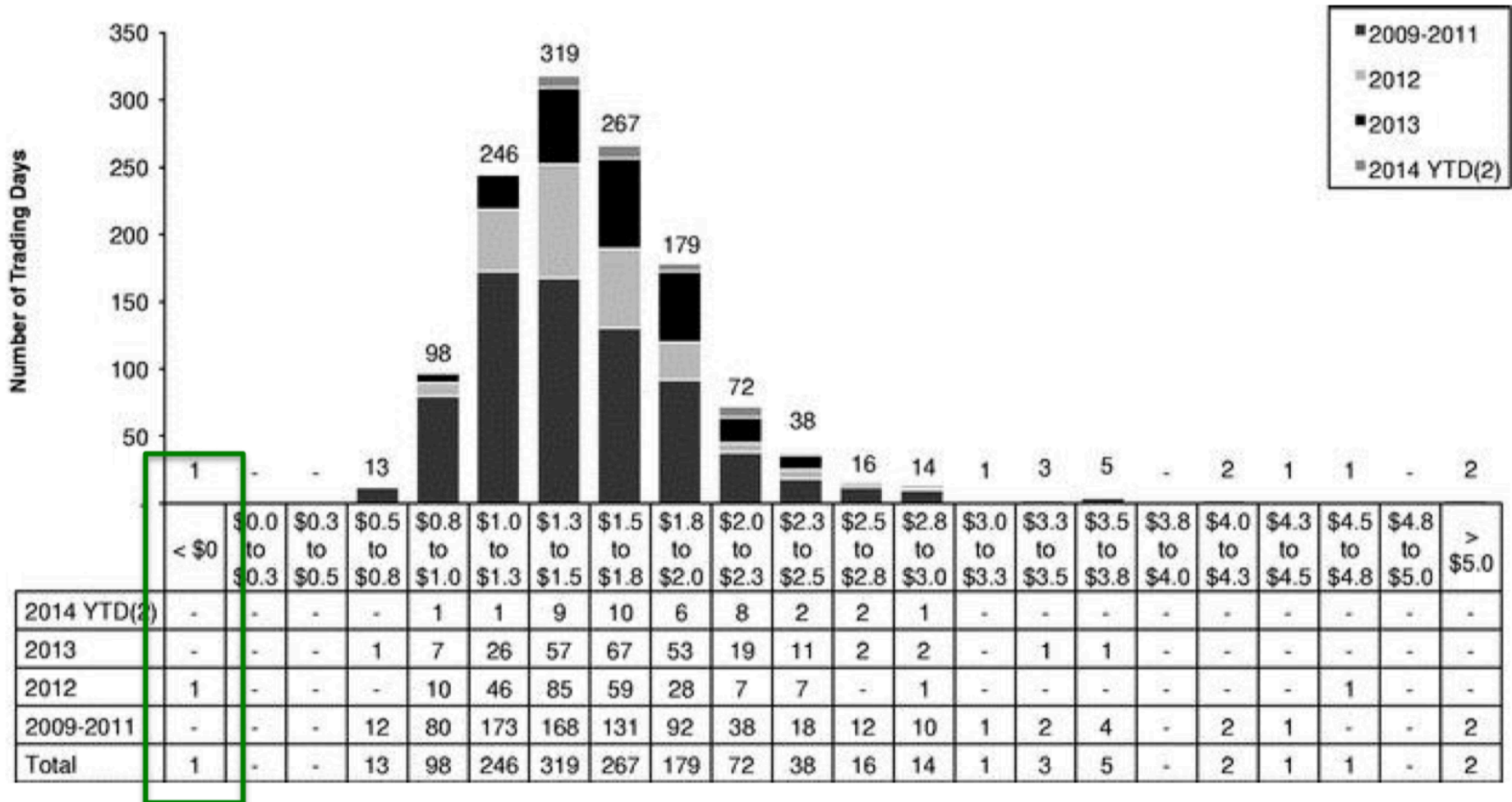
What We All Want

1001001110110010

\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$



Once you're lucky, twice you're good, 1,331 times you must be cheating...



The “Right Way” might be
the wrong way. Plot your
own path.

You are all alone out there...



why does my stock market strategy lose money?



Web

More ▾

Search tools

Your search - **why does my stock market strategy lose money?** - did not match any documents.

Suggestions:

- Make sure all words are spelled correctly.
- Try different keywords.
- Try more general keywords.
- Try fewer keywords.

Work Within Your Constraints

- Personal
- Time
- Capital
- Cost Structure
- Technology
- Infrastructure (co-location, feeds, latency, etc)

Ignore this at your own peril.

Some Suggestions

- Read absolutely everything you can.
- Pick the most focused market niche you can.
- Make sure your data is good. Buy it.
- Focus on research. Forget production.
- Prove to yourself that your model has predictive power.

Everything else is easier if you can do this.



You don't set out to build a wall.

**You don't say, 'I'm going to build
the biggest, baddest, greatest wall
that's ever been built.'**

You don't start there.

**You say, 'I'm gonna lay this brick
as perfectly as a brick can be laid.'**

You do that every single day.

And soon you have a wall.

Will Smith

Thank you for your
attention!