The theory of automated trading

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Disclaimer

Not a financial advisor, don't have a SE, MBA or any finance related degree.

Do not trade real money that you can not afford to lose!

Do not start trading; find better ways to use your time and skills!

The intention of the presentation is to share some facts and ideas which the author considers interesting.

Why do I like trading

It is not about money - when I try to trade, I am always losing money 😭

It is about abundance of problems to solve. Trading is simple, but very difficult to succeed.

Complex

Easy   Difficult

Simple
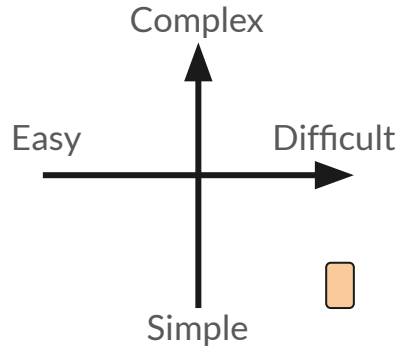
What is trading

Buying and selling assets with intention to make profit (*investment is not trading)

Asset classes:

- Equities (stocks) - invest directly in companies
- Fixed income (bonds) - loans
- Real estate investment trusts
- Commodities (metals, agriculture products)
- Exchange traded funds (ETFs) - exchange listed security that tracks a collection of other securities (indexes)
- Foreign exchange (Forex)
- Financial derivatives - options and futures
- Crypto

Investment - supporting business, values, without sole intention to make money.

Zero sum game? Gambling? Random walk?

Trading is not a zero sum game:

- Fees
- Insider knowledge
- Manipulations

Trading become gambling when odds are unknown and wishing for luck.

There is a theory that claims that market moves are a random walk and the future price can not be predicted.

Although we can not predict price precisely, there are patterns in the market that occurs with probability high enough to use them in trading.

What moves the price?

What truly moves the price is AGGRESSION.

If the price goes up, then the buyers are more aggressive (they use market orders).

Traders become aggressive because of fear of either missing out or losing.

How it is being done

Order matching engines and trading terminals

The stock "tape" as it comes from the "ticker."

Automation

Renaissance technologies and Medallion fund.
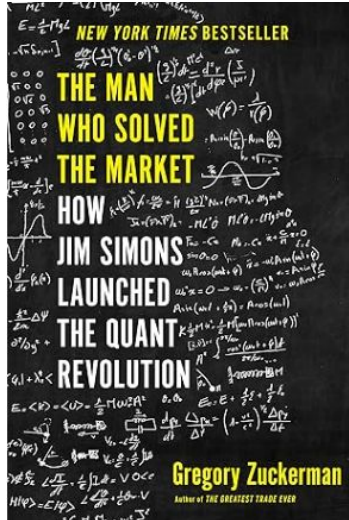
Annual Returns for the S&P 500 vs. The Medallion Fund (Net of Fees) 1988-2021

Source: DFA, Gregory Zuckerman (OfDollarsAndData.com)

Psychology factor

> If smart people would be able to be consistently profitable in trading, we would have many rich people.
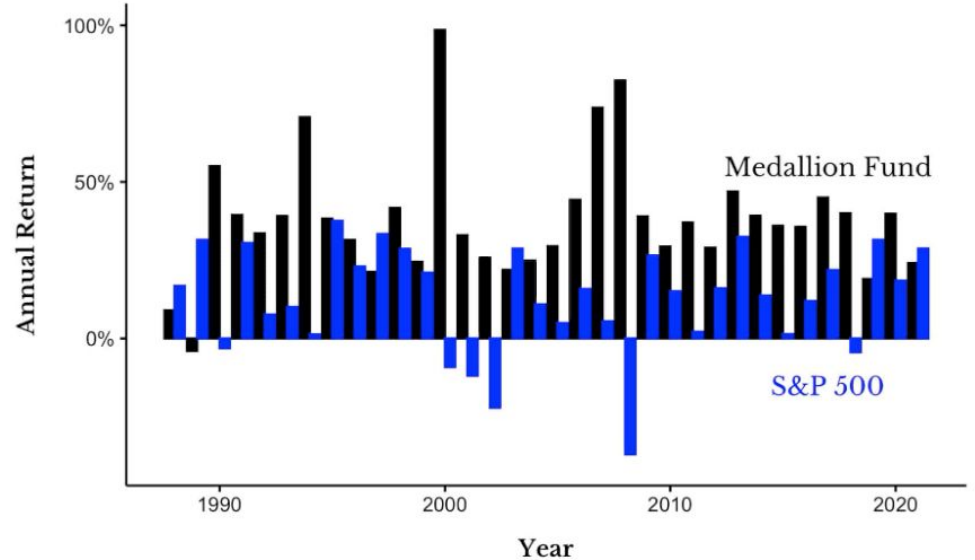
- **Loss aversion** is the observation that human beings experience losses asymmetrically more severely than equivalent gains. Each next win gives less satisfaction. Each loss adds to pain of previous loses. According to one study, the pain of losing $100 still outweighs the happiness of gaining $240.
- **Endowment effect** causes traders to hold on to a losing position for too long. Demand much more to give up the asset than they would pay to acquire it.
- **Status quo bias** causes traders to hold on to a losing position for too long. A preference for the current state of affairs.
- **Representativeness bias** - put too much weight on recent experience and underweight long-term average.
- **Fear of missing out**

How to write a trading bot - data

Google APIs, example for bitkub:

https://api.bitkub.com/api/market/ticker?sym=THB_BTC

{"THB_BTC":{"id":1,"last":1291730.29,"lowestAsk":1291450.01,"highestBid":1291450,"percentChange":-0.09,"baseVolume":40.82874991,"quoteVolume":52775706.2,"isFrozen":0,"high24hr":1302919.9,"low24hr":1285749.83,"change":-1105.78,"prevClose":1291730.29,"prevOpen":1292836.07}}

OHLC api:
https://github.com/bitkub/bitkub-official-api-docs/blob/master/restful-api.md#get-tradingviewhistory

Kinds of data: current tickers - historical OHLC - trades - order book, …

How to write a trading bot - understanding the data

Order book:

Price(USDT)	Amount(BTC)	Total
36478.80	0.00067	24.44080
36478.71	0.00176	64.20253
36478.58	0.00210	76.60502
36478.44	0.00067	24.44055
36478.32	0.00020	7.29566
36478.22	0.00066	24.07563
36478.13	0.00072	26.26425
36478.08	0.00067	24.44031
36478.00	0.12740	4,647.29720
36477.95	0.00176	64.20119
36477.86	0.00066	24.07539
36477.84	0.00100	36.47784
36477.78	0.54826	19,999.30766
36477.72	0.00067	24.44007
36477.68	0.00072	26.26393
36477.50	0.01437	524.18168
36477.46	0.18895	6,892.41607
36477.45	0.53140	19,384.11693
36477.36	0.00067	24.43983
36477.27	0.28987	10,573.66625

36,477.27 ↑ $36,477.27   More

36477.26	8.07079	294,400.30524
36477.03	2.50596	91,409.97810
36476.78	0.00138	50.33796
36476.76	0.16440	5,996.77934
36476.75	0.23138	8,439.99042
36476.72	0.41274	15,055.40141
36476.64	0.00372	135.69310
36476.43	0.00176	64.19852
36476.42	0.00066	24.07444
36476.40	0.40991	14,952.04112
36476.33	0.00609	222.14085
36476.28	0.00067	24.43911
36476.27	0.02242	817.79797
36476.18	0.40991	14,951.95094
36476.06	0.00066	24.07420
36476.00	0.12740	4,647.04240
36475.99	0.07796	2,843.66818
36475.92	0.00067	24.43887
36475.88	0.00522	190.40409
36475.74	0.00647	235.99804

Trades feed:

Market Trades   My Trades

Price(USDT)	Amount(BTC)	Time
36,557.27	0.00053	22:54:39
36,557.27	0.00258	22:54:39
36,557.27	0.00240	22:54:38
36,557.28	0.00957	22:54:38
36,557.28	0.00134	22:54:38
36,557.27	0.02057	22:54:37
36,557.27	0.00054	22:54:37
36,557.27	0.00444	22:54:37
36,557.27	0.00286	22:54:36
36,557.28	0.00019	22:54:36
36,557.27	0.00192	22:54:36
36,557.28	0.00246	22:54:35
36,557.28	0.50000	22:54:34
36,557.28	0.00147	22:54:34
36,557.28	0.00111	22:54:34
36,557.27	0.00133	22:54:34
36,557.27	0.00357	22:54:34

OHLC:

Other: day of week, news, weather, stars, etc.

How to write a trading bot - buying and selling

Order types:

- **LIMIT** BUY/SELL (adding to order book)
- **MARKET** BUY/SELL (matching to best order book price)

Example: BUY 1btc using LIMIT order at price 40001!

Directions:

- **LONG** - buy and sell later at higher price
- **SHORT** - (borrow), sell, buy at lower price, (repay)

Testing strategies

Backtesting - should be fast.

Forward trading / paper trading - should be accurate.
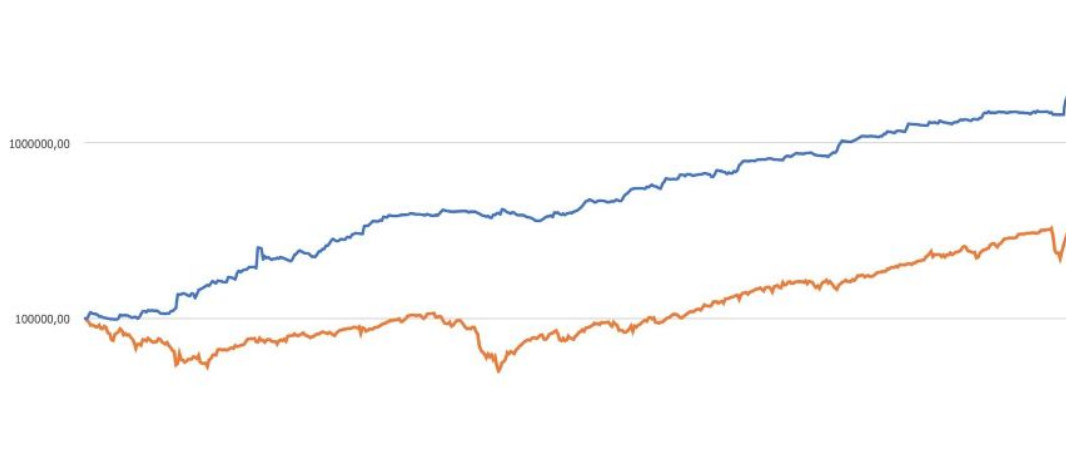
Live trading - should be safe.

Past Performance Is Not Indicative Of Future Results!

Consistent profitability

It is not about amount of money, it is about consistency.

Sharpe ratio, Sortino ratio, RoMaD.

How to succeed

- Edge in the market (statistical advantage, find and explore inefficiencies in the market)
- Risk management
- Consistency (for manual trading)
- Psychology (for manual trading)
- Journaling (for manual trading) or logging and monitoring/statistics

Edge in the market

> The market does not run on chance or luck.

> Like the battlefield, it runs on probabilities and odds (David Dreman).

Where to look for strategies:

- YouTube
- Academic papers
- Forums
- Books
- GitHub

> What truly make a strategy proprietary and its secrets worth protecting are the tricks and variations that you have come up with, not the plain-vanilla version (Quantitative Trading by Ernest P. Chan).
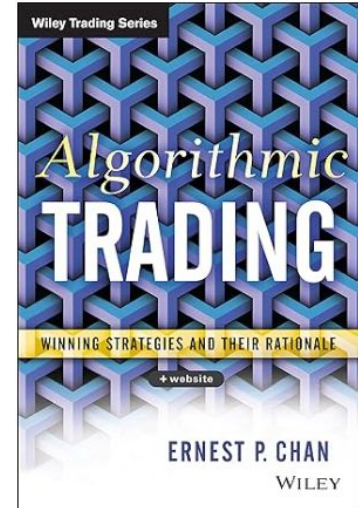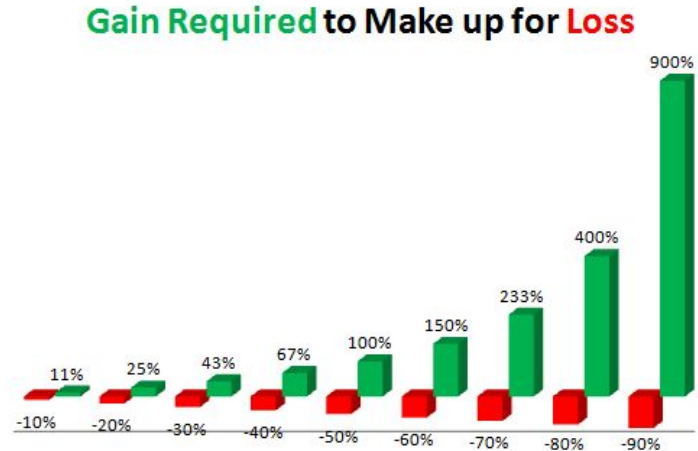
Risk management

> The most important rule of trading is to play great defense, not great offense (Paul Tudor Jones)

Parts of risk management:

- Backtest and papertrade new strategies first
- Cut losses short and maximize gains
- Position sizing
- Fuses

Gain Required to Make up for Loss

Can a trading strategy be profitable if we are entering trades randomly with a flip of a coin?

Cutting loses and maximizing profits with trailing stop.

Can I lose more than I have?

1. You had 100$ worth of the asset, price of the asset went up x3 in a month, this month you were trading, and made 20% profits on top, so you have 120$. If you would keep the asset, it would cost 300$, so the loss is 180$.
2. Borrow 100$ worth of asset, sell, get 100$, price went +20%, so, to buy the same about of asset to repay, you need 120$, 20$ loss. Exchanges would try to liquidate your account before it goes negatives, but it is not always the case.

Risk of longin is limited by the amount of asset bought, risk of shorting is not limited!

I found a strategy on the internet!

97% Win Rate Trading Strategy (Exposed)
11K views • 7 days ago

A few days ago, while I was analyzing charts at my desk, I got this in my inbox. A message that made me feel like a complete idiot ...

4K   Subtitles

97% WIN RATE

16:49

Transaction costs:
- Spread
- Commission
- Liquidity cost
- Opportunity cost
- Market impact
- Slippage

Regimes:

BULL	BEAR	SIDEWAYS	VOLATILE
Trend up	Trend down	Range bound	No boundaries
Slow	Fast	Very slow	Very fast
Buy the deep	Sell the rallies	Buy support	Lock in profits
Long positions	Short positions	Cycle positions	Quick trades
Easiest	Difficult	Simple	Lower time frame
Trend traders like	Short sellers like	Swing traders like	Day traders like
Accumulation	Distribution	Ranges	Emotional uncertainty

Ideas that didn't work

Martingale, opposite side trades, grid, …