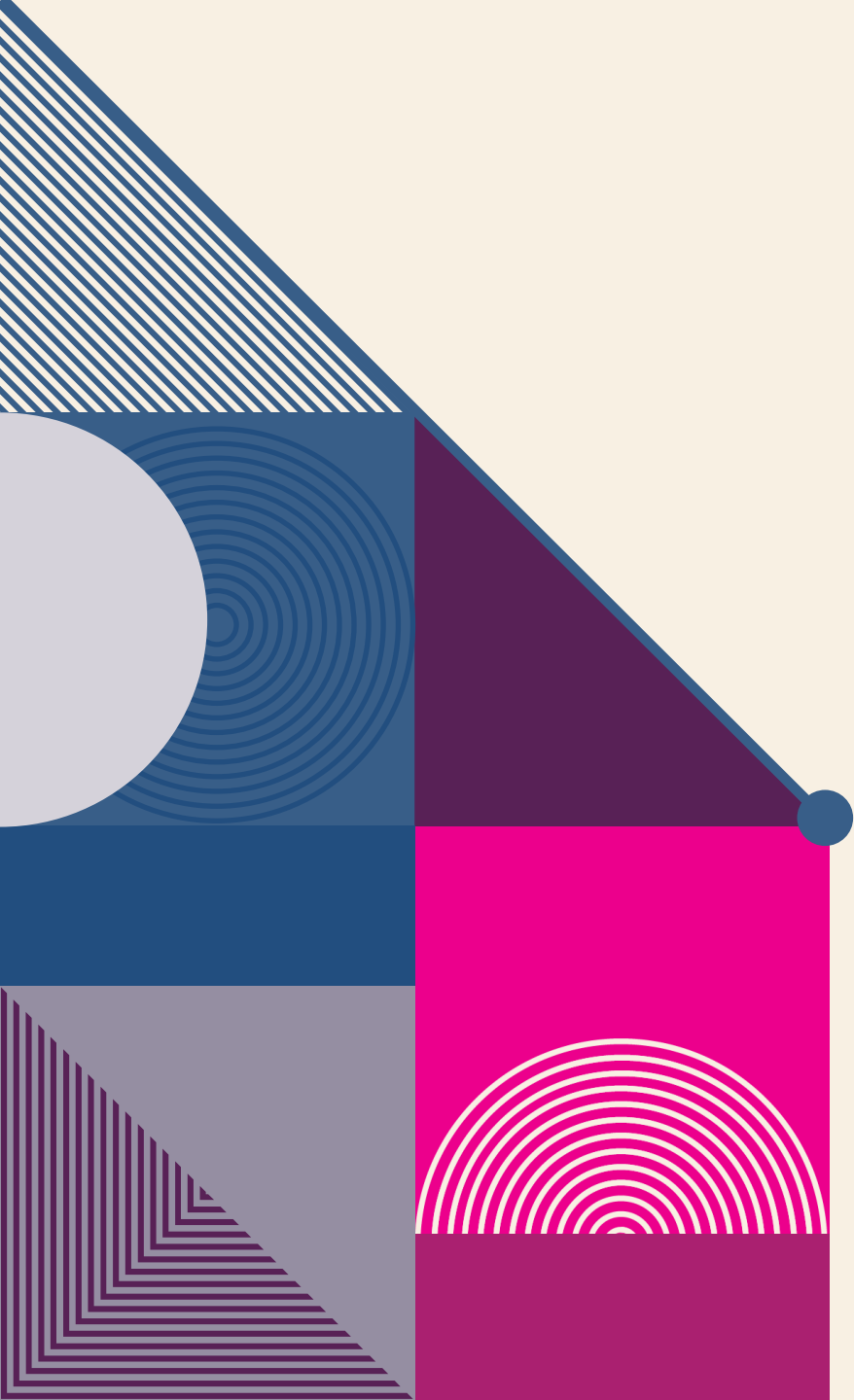


CRYPTOCURRENCY STRATEGY BACKTESTING

Kate Gallagher

Practicum II

Regis University | May 1, 2024



AGENDA

Introduction

Strategies & Portfolios

Outcomes

Summary & Conclusion



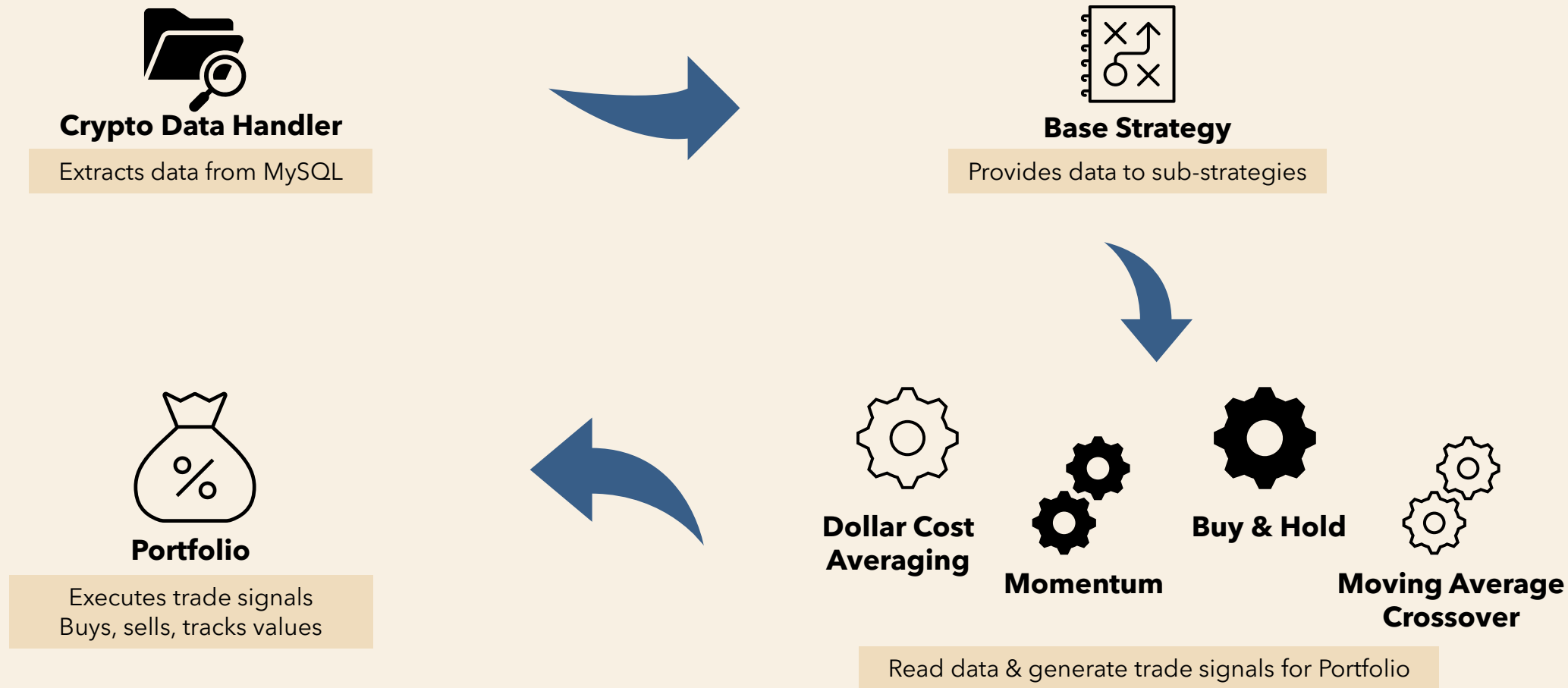
DRIVING QUESTION

Are cryptocurrencies equivalent to equities in trading?

What is crypto?

- “Fake internet money”
- No inherent value or claim on assets
- Meant to circumvent traditional financial systems
- Global market cap of **~\$2.36 trillion**
- Inherently at odds: Crypto as functional currency vs. crypto as trading vehicle for profit

BACKTESTING DESIGN





STRATEGIES & PORTFOLIOS

PORTFOLIO SETUP

- All start with **\$100k cash** on 1/1/2023
- **11** crypto configurations + **1** S&P500
- Increments balanced as a “reasonably informed investor”

Trader Style	Currencies	Increments
<i>Simple</i>	Single currency: Bitcoin (BTC) /Ethereum (ETH) /Dogecoin (DOGE) /Shiba Inu (SHIB) /Solana (SOL) /Cardano (ADA) /Ripple (XRP)	BTC: 0.1 ETH: 1 DOGE: 1000 SHIB: 1000 SOL:100 ADA: 100 XRP: 100
<i>Standard</i>	BTC & ETH	BTC: 0.05 ETH: 0.5
<i>Meme</i>	DOGE & SHIB	DOGE: 1000 SHIB: 1000
<i>Cutting Edge</i>	SOL & ADA & XRP	SOL: 50 ADA: 100 XRP: 100
<i>Diversified</i>	BTC & ETH & DOGE & SHIB & SOL & ADA & XRP	BTC: 0.03 SOL: 30 ETH: 0.3 ADA: 100 DOGE: 1000 XRP: 100 SHIB: 1000
<i>Traditional</i>	S&P 500	SP500: 10

STRATEGY DESIGN

Strategy	Buy Signal	Sell Signal
Moving Average Crossover	50 day moving average surpasses 200 day moving average	50 day moving average falls below 200 day moving average
Dollar Cost Averaging	\$1000/week investment	never
Momentum	Close price increases 10% within 24 hours	Close price decreases 10% within 24 hours
Buy & Hold	\$99,000 on 1/1/2023	never

Tests run from **1/1/2023** to **2/28/2024**

Trades execute at midpoint between high & low price

Transaction fees: 0.1%
Slippage: 0.05%

2 data sources, 40k data points:

- Binance = every 4 hours
- Coinbase = every 6 hours

4 strategies x 11 crypto portfolios
x 2 data sources
+ 4 strategies x 1 S&P 500 portfolio
92 total tests

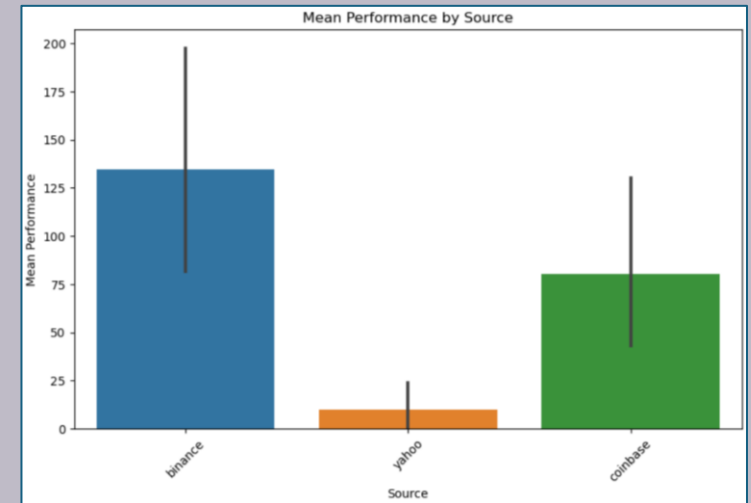


OUTCOMES & CONCLUSIONS

SOURCE COMPARISON

36% difference between
Binance & Coinbase

- Platforms are siloed
- Price disparity varies by currency
- Shorter time frames capture more volatility
- Opportunities for arbitrage
 - Complex and risky
 - Difficult to liquidate





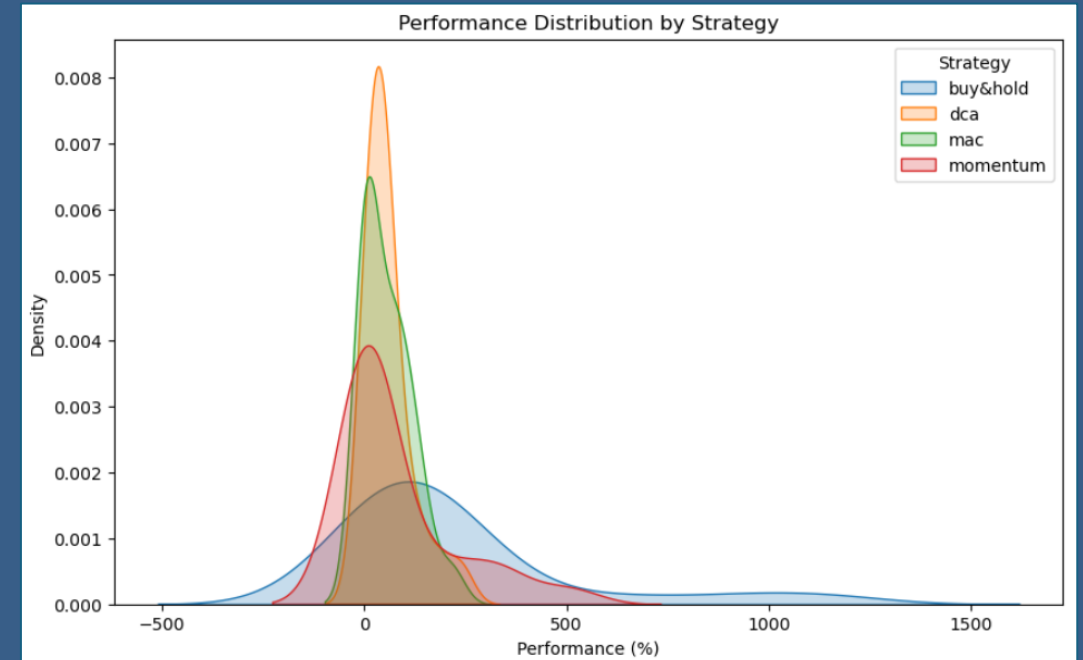
# ▾	Exchange	Score ⓘ	Trading volume(24h)	Avg. Liquidity	Weekly Visits
1	 Binance	9.9	\$19,673,958,201	872	16,885,328
2	 Coinbase Exchange	8.2	\$2,409,509,724	748	83,591

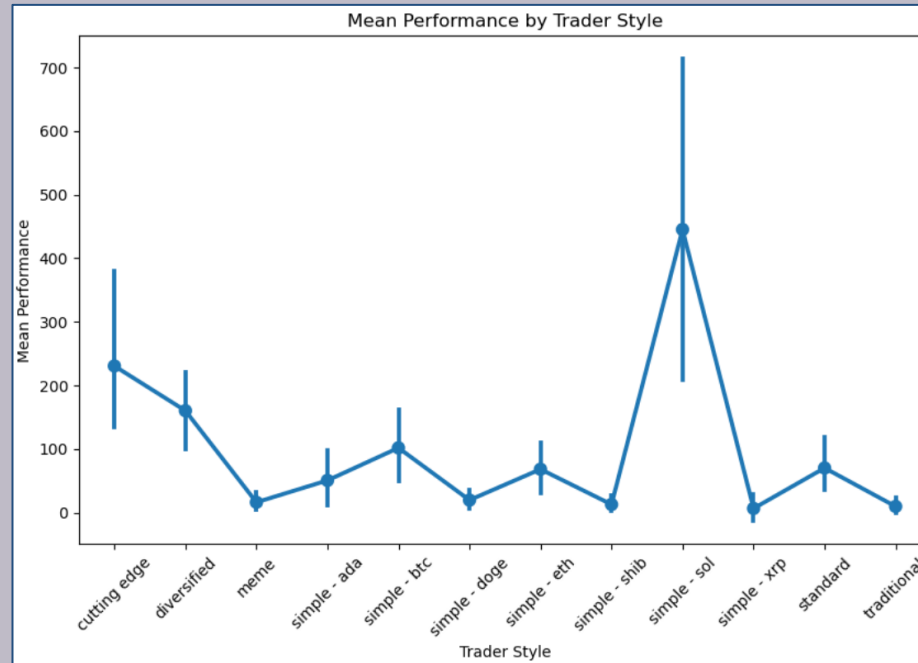
Image source: coinmarketcap.com

RESULTS BY STRATEGY

Strategy	Mean Perf (%)	Best Portfolio	Worst Portfolio	S&P 500 Perf (%)
Buy & Hold	219.8	Simple - SOL (1039.9)	Simple - XRP (18.1)	31.9
Momentum	80.1	Simple - SOL (415.9)	Meme (-0.1)	0.0
Dollar Cost Averaging	57.8	Simple - SOL (209.8)	Simple - XRP (5.2)	7.0
Moving Average Crossover	55.2	Diversified (179.5)	Simple - ADA (-0.2)	0.0



RESULTS BY PORTFOLIO



Testing Conclusions

- SOL is clear winner
- **But...** a longer timeframe would show different results (BTC has most consistent growth)
- Momentum trading is extremely effective in crypto, but requires constant attention

Trader style	Performance (%)
Simple - SOL	445.1
Cutting Edge	230.6
Diversified	160.3
Simple - BTC	101.8
Standard	70.2
Simple - ETH	68.3
Simple - ADA	50.7
Simple - DOGE	19.7
Meme	16.3
Simple - SHIB	12.7
Traditional	9.7
Simple - XRP	6.6

SOME RISKS OF CRYPTO

Fraud & Theft

Terra founder Do Kwon charged with fraud over its \$40 billion crypto crash

Image source: theverge.com

FTX: inside the crypto exchange that 'accidentally' lost \$8bn

Image source: ft.com

Former Celsius CEO arrested, company agrees to pay \$4.7 billion settlement

Image source: cnbc.com

Extreme Volatility

After \$2 trillion crypto crash, what happens next?

Image source: pbs.org

Cryptocurrency losses top \$275bn in a single day as instability spreads

Image source: nikkei.com

Scams

'We lost our life savings in a cryptocurrency scam'

Image source: bbc.org

New Study Estimates as Much as \$75 Billion in Global Victims' Losses to Pig-Butchering Scam

Image source: time.com

CONCLUSIONS

Crypto volatility leads to opportunities and risks that don't exist in equities

Opportunities

Extreme volatility leads to extreme performance
Speculation & diversification
Global access; markets never close
Innovation and disruption

Risks

Challenging to use as currency or liquidate
No investor protections
Industry is rife with fraud and scams
Legal & regulatory uncertainty
Cybersecurity issues

Cryptocurrencies are not like equities,
but they are a trading tool

SOL-USD 3-year performance



Image source: yahooofinance.com



APPENDIX

ALL PERFORMANCE TEST RESULTS

Binance & SP500

Test No.	Strategy	Source	Trader Style	Starting Value	Final Value	Performance
1	MAC	Binance	simple - btc	\$ 100,000	\$ 195,754.71	95.75%
2	MAC	Binance	simple - eth	\$ 100,000	\$ 160,472.29	60.47%
3	MAC	Binance	simple - doge	\$ 100,000	\$ 119,671.66	19.67%
4	MAC	Binance	simple - shib	\$ 100,000	\$ 100,001.10	0.00%
5	MAC	Binance	simple - sol	\$ 100,000	\$ 241,254.93	141.25%
6	MAC	Binance	simple - ada	\$ 100,000	\$ 101,168.16	1.17%
7	MAC	Binance	simple - xrp	\$ 100,000	\$ 107,802.92	7.80%
8	MAC	Binance	standard	\$ 100,000	\$ 188,215.26	88.22%
9	MAC	Binance	meme	\$ 100,000	\$ 119,672.76	19.67%
10	MAC	Binance	cutting edge	\$ 100,000	\$ 198,220.09	98.22%
11	MAC	Binance	diversified	\$ 100,000	\$ 314,787.88	214.79%
12	MAC	Yahoo	traditional	\$ 100,000	\$ 100,000.00	0.00%
13	Momentum	Binance	simple - btc	\$ 100,000	\$ 144,891.47	44.89%
14	Momentum	Binance	simple - eth	\$ 100,000	\$ 114,435.77	14.44%
15	Momentum	Binance	simple - doge	\$ 100,000	\$ 100,008.44	0.01%
16	Momentum	Binance	simple - shib	\$ 100,000	\$ 99,999.98	0.00%
17	Momentum	Binance	simple - sol	\$ 100,000	\$ 605,153.06	505.15%
18	Momentum	Binance	simple - ada	\$ 100,000	\$ 100,455.91	0.46%
19	Momentum	Binance	simple - xrp	\$ 100,000	\$ 99,925.19	-0.07%
20	Momentum	Binance	standard	\$ 100,000	\$ 129,663.62	29.66%
21	Momentum	Binance	meme	\$ 100,000	\$ 100,008.42	0.01%
22	Momentum	Binance	cutting edge	\$ 100,000	\$ 444,880.00	344.88%
23	Momentum	Binance	diversified	\$ 100,000	\$ 342,154.24	242.15%
24	Momentum	Yahoo	traditional	\$ 100,000	\$ 100,000.00	0.00%

Test No.	Strategy	Source	Trader Style	Starting Value	Final Value	Performance
25	DCA	Binance	simple - btc	\$ 100,000	\$ 168,048.64	68.05%
26	DCA	Binance	simple - eth	\$ 100,000	\$ 150,829.19	50.83%
27	DCA	Binance	simple - doge	\$ 100,000	\$ 137,846.13	37.85%
28	DCA	Binance	simple - shib	\$ 100,000	\$ 125,226.48	25.23%
29	DCA	Binance	simple - sol	\$ 100,000	\$ 337,978.60	237.98%
30	DCA	Binance	simple - ada	\$ 100,000	\$ 154,867.41	54.87%
31	DCA	Binance	simple - xrp	\$ 100,000	\$ 112,003.29	12.00%
32	DCA	Binance	standard	\$ 100,000	\$ 160,542.65	60.54%
33	DCA	Binance	meme	\$ 100,000	\$ 130,190.03	30.19%
34	DCA	Binance	cutting edge	\$ 100,000	\$ 233,465.97	133.47%
35	DCA	Binance	diversified	\$ 100,000	\$ 186,562.61	86.56%
36	DCA	Yahoo	traditional	\$ 100,000	\$ 106,974.95	6.97%
37	Buy & Hold	Binance	simple - btc	\$ 100,000	\$ 366,881.36	266.88%
38	Buy & Hold	Binance	simple - eth	\$ 100,000	\$ 277,741.46	177.74%
39	Buy & Hold	Binance	simple - doge	\$ 100,000	\$ 167,024.76	67.02%
40	Buy & Hold	Binance	simple - shib	\$ 100,000	\$ 155,028.81	55.03%
41	Buy & Hold	Binance	simple - sol	\$ 100,000	\$ 1,245,083.50	1145.08%
42	Buy & Hold	Binance	simple - ada	\$ 100,000	\$ 265,241.87	165.24%
43	Buy & Hold	Binance	simple - xrp	\$ 100,000	\$ 172,721.01	72.72%
44	Buy & Hold	Binance	standard	\$ 100,000	\$ 331,225.40	231.23%
45	Buy & Hold	Binance	meme	\$ 100,000	\$ 163,425.97	63.43%
46	Buy & Hold	Binance	cutting edge	\$ 100,000	\$ 732,032.47	632.03%
47	Buy & Hold	Binance	diversified	\$ 100,000	\$ 420,625.43	320.63%
48	Buy & Hold	Yahoo	traditional	\$ 100,000	\$ 131,896.36	31.90%

ALL PERFORMANCE TEST RESULTS

Coinbase

Test No.	Strategy	Source	Trader Style	Starting Value	Final Value	Performance
49	MAC	Coinbase	simple - btc	\$ 100,000	\$ 166,351.85	66.35%
50	MAC	Coinbase	simple - eth	\$ 100,000	\$ 145,693.68	45.69%
51	MAC	Coinbase	simple - doge	\$ 100,000	\$ 101,017.54	1.02%
52	MAC	Coinbase	simple - shib	\$ 100,000	\$ 99,999.70	0.00%
53	MAC	Coinbase	simple - sol	\$ 100,000	\$ 188,254.32	88.25%
54	MAC	Coinbase	simple - ada	\$ 100,000	\$ 98,414.85	-1.59%
55	MAC	Coinbase	simple - xrp	\$ 100,000	\$ 98,595.91	-1.40%
56	MAC	Coinbase	standard	\$ 100,000	\$ 159,392.95	59.39%
57	MAC	Coinbase	meme	\$ 100,000	\$ 101,001.28	1.00%
58	MAC	Coinbase	cutting edge	\$ 100,000	\$ 219,035.76	119.04%
59	MAC	Coinbase	diversified	\$ 100,000	\$ 244,144.33	144.14%
60	Momentum	Coinbase	simple - btc	\$ 100,000	\$ 114,943.46	14.94%
61	Momentum	Coinbase	simple - eth	\$ 100,000	\$ 104,956.30	4.96%
62	Momentum	Coinbase	simple - doge	\$ 100,000	\$ 99,870.64	-0.13%
63	Momentum	Coinbase	simple - shib	\$ 100,000	\$ 99,999.96	0.00%
64	Momentum	Coinbase	simple - sol	\$ 100,000	\$ 426,736.43	326.74%
65	Momentum	Coinbase	simple - ada	\$ 100,000	\$ 100,158.18	0.16%
66	Momentum	Coinbase	simple - xrp	\$ 100,000	\$ 100,000.00	0.00%
67	Momentum	Coinbase	standard	\$ 100,000	\$ 109,949.88	9.95%
68	Momentum	Coinbase	meme	\$ 100,000	\$ 99,870.61	-0.13%
69	Momentum	Coinbase	cutting edge	\$ 100,000	\$ 286,005.73	186.01%
70	Momentum	Coinbase	diversified	\$ 100,000	\$ 218,223.88	118.22%

Test No.	Strategy	Source	Trader Style	Starting Value	Final Value	Performance
71	DCA	Coinbase	simple - btc	\$ 100,000	\$ 147,432.38	47.43%
72	DCA	Coinbase	simple - eth	\$ 100,000	\$ 139,377.04	39.38%
73	DCA	Coinbase	simple - doge	\$ 100,000	\$ 108,964.01	8.96%
74	DCA	Coinbase	simple - shib	\$ 100,000	\$ 103,538.10	3.54%
75	DCA	Coinbase	simple - sol	\$ 100,000	\$ 281,540.00	181.54%
76	DCA	Coinbase	simple - ada	\$ 100,000	\$ 143,479.98	43.48%
77	DCA	Coinbase	simple - xrp	\$ 100,000	\$ 98,311.70	-1.69%
78	DCA	Coinbase	standard	\$ 100,000	\$ 122,072.35	22.07%
79	DCA	Coinbase	meme	\$ 100,000	\$ 112,107.55	12.11%
80	DCA	Coinbase	cutting edge	\$ 100,000	\$ 211,801.37	111.80%
81	DCA	Coinbase	diversified	\$ 100,000	\$ 156,931.18	56.93%
82	Buy & Hold	Coinbase	simple - btc	\$ 100,000	\$ 310,397.56	210.40%
83	Buy & Hold	Coinbase	simple - eth	\$ 100,000	\$ 252,550.80	152.55%
84	Buy & Hold	Coinbase	simple - doge	\$ 100,000	\$ 123,238.84	23.24%
85	Buy & Hold	Coinbase	simple - shib	\$ 100,000	\$ 119,233.10	19.23%
86	Buy & Hold	Coinbase	simple - sol	\$ 100,000	\$ 1,034,673.63	934.67%
87	Buy & Hold	Coinbase	simple - ada	\$ 100,000	\$ 241,329.15	141.33%
88	Buy & Hold	Coinbase	simple - xrp	\$ 100,000	\$ 63,435.07	-36.56%
89	Buy & Hold	Coinbase	standard	\$ 100,000	\$ 160,778.21	60.78%
90	Buy & Hold	Coinbase	meme	\$ 100,000	\$ 103,829.71	3.83%
91	Buy & Hold	Coinbase	cutting edge	\$ 100,000	\$ 319,393.74	219.39%
92	Buy & Hold	Coinbase	diversified	\$ 100,000	\$ 198,789.35	98.79%

OPERATIONAL CLASS DESIGN

Extract data from MySQL

CryptoDataHandler
Attributes
connection: connect_to_db(host, port, user, passwd, database)
Methods
__init__(self, host, port, user, passwd, database)
get_crypto_data(self, currency, source)
close_connection(self)

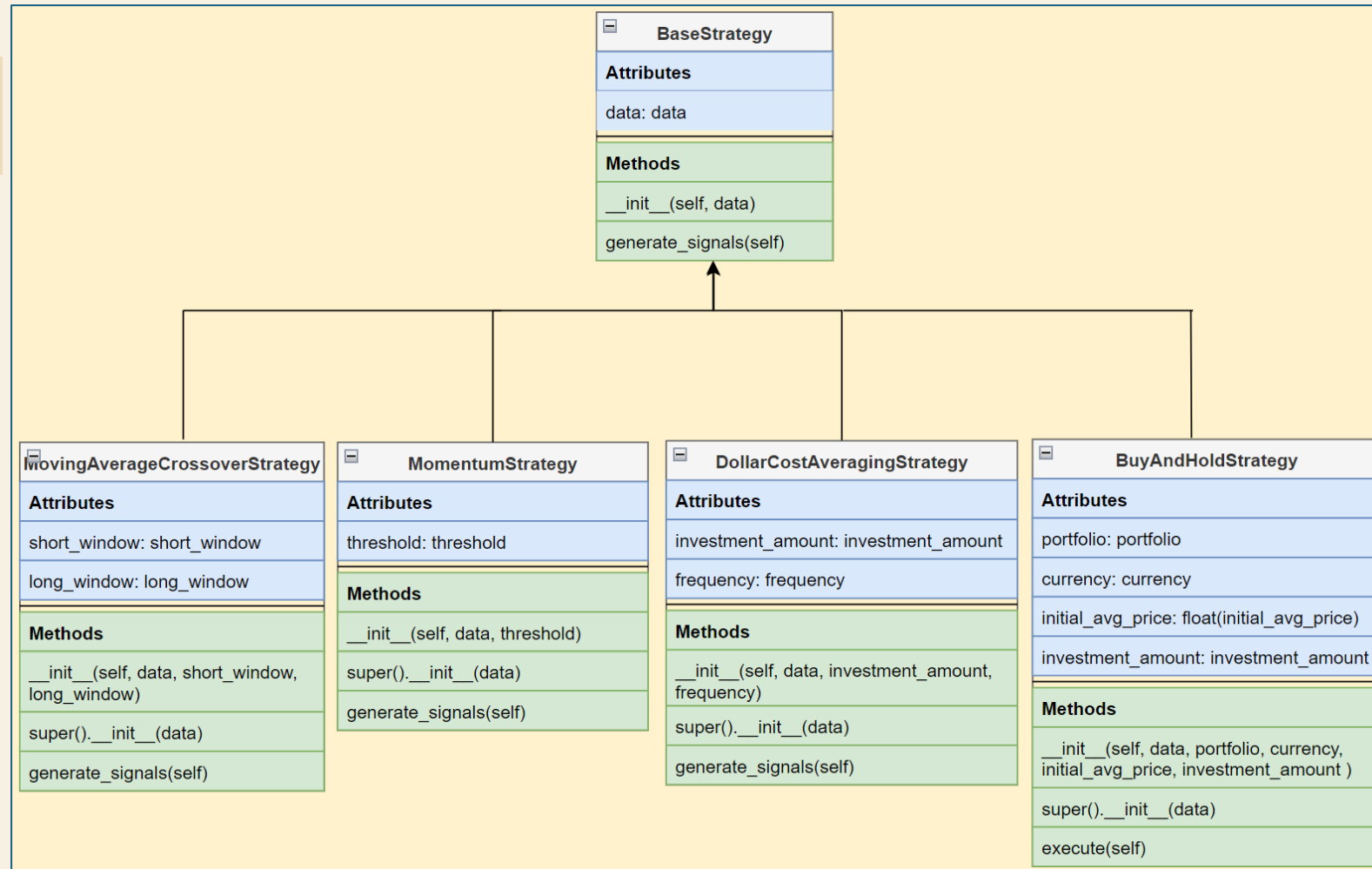
Buy, Sell, Track Values

Portfolio
Attributes
positions: {}
cash: initial_cash
portfolio_value: initial_cash
transaction_cost_rate: 0.001
slippage_rate: 0.0005
Methods
__init__(self, initial cash)
buy(self, currency, price, quantity)
sell(self, currency, price, quantity)
update_portfolio_value(self, current_prices)

STRATEGY CLASS DESIGN

Extract data using
CryptoDataHandler

Generate trade
signals for
Portfolio





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THANK YOU

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[Project Github](#)