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LOW BETA IN CRYPTOCURRENCIES

For the Quantitative Asset & Risk Management II Class taught by Prof. Fabio Alessandrini

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OVERVIEW

WHAT THIS REPORT COVERS

- Introduction
- Literature Review
- Data
- Methodology
- Results
- Sensitivity Analysis
- Conclusion

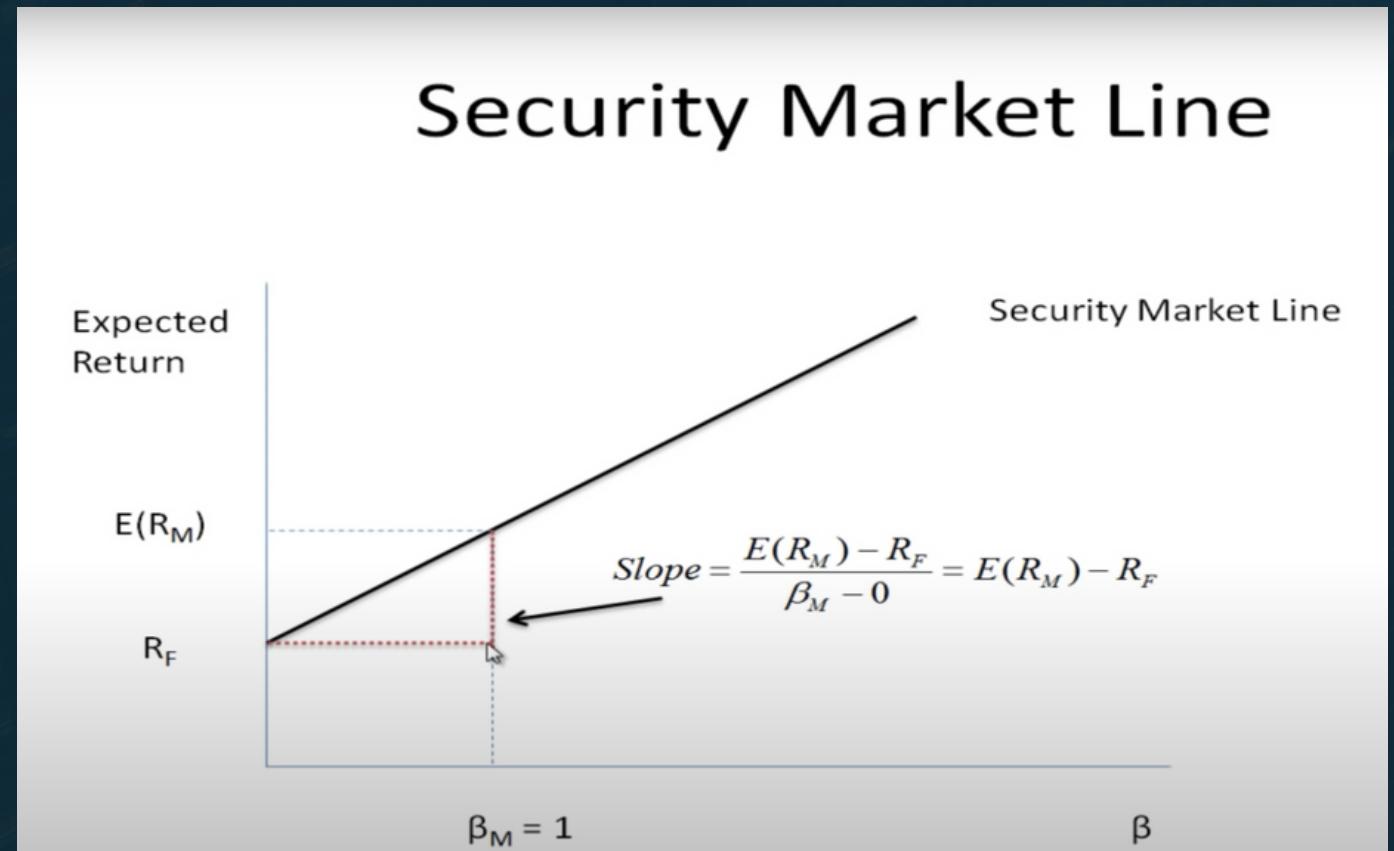
INTRODUCTION

Why are we writing this paper?

“

INTRODUCTION

- Highest risk-adjusted return
- CAPM : $E[R_i] = R_f + \beta_i * (R_m - R_f)$
- $\beta = \text{Cov}(R_i, R_m) / \text{Var}(R_m)$
- Market anomaly ? Low beta
- Inaccuracy of SML → Flatter slope



WHY LOW BETA ANOMALY ?

(IN OTHER ASSET
CLASSES)

- Non-normal distribution of returns
- "Constrained" investors
- Looking for more exposure
- Buy high beta stocks
- Low beta stocks Higher risk adjusted return

THE CRYPTO WORLD

- Does the low beta anomaly exist with cryptos ?
- 24h/24h tradable and with lower fees
- Highly volatile market
- Frequent speculative bubbles
- Low risk aversion investors

“

LITERATURE REVIEW

What has already been done?

LITERATURE REVIEW

TRADITIONAL

1972

Black and al.
found the low
beta anomaly

2012

Asness et al.
reported further
evidence of a
low-beta effect
across asset
classes

2014

Andrea Frazzini :
"Betting against
Beta"

2014

Blitz et al.
showed that
lower volatility
stocks generate
higher risk-
adjusted returns

2019

Han et al., 2019
showed that the
SML is even
downward
sloping in
Chinese equities

LITERATURE REVIEW

CRYPTOCURRENCIES



2020

Burggraf and Rudolf :
no significant
findings on low vol
anomaly



2020

Tzouvanas et al. showed
the existence of a
momentum effect but
disappeared over the
longer-term

We bridge the gap between the world of
cryptocurrencies and the low-beta anomaly

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METHODOLOGY

How did we proceed?

DATA SCRAPING

Data from Santiment

Sanpy Python module

Remove all stablecoins

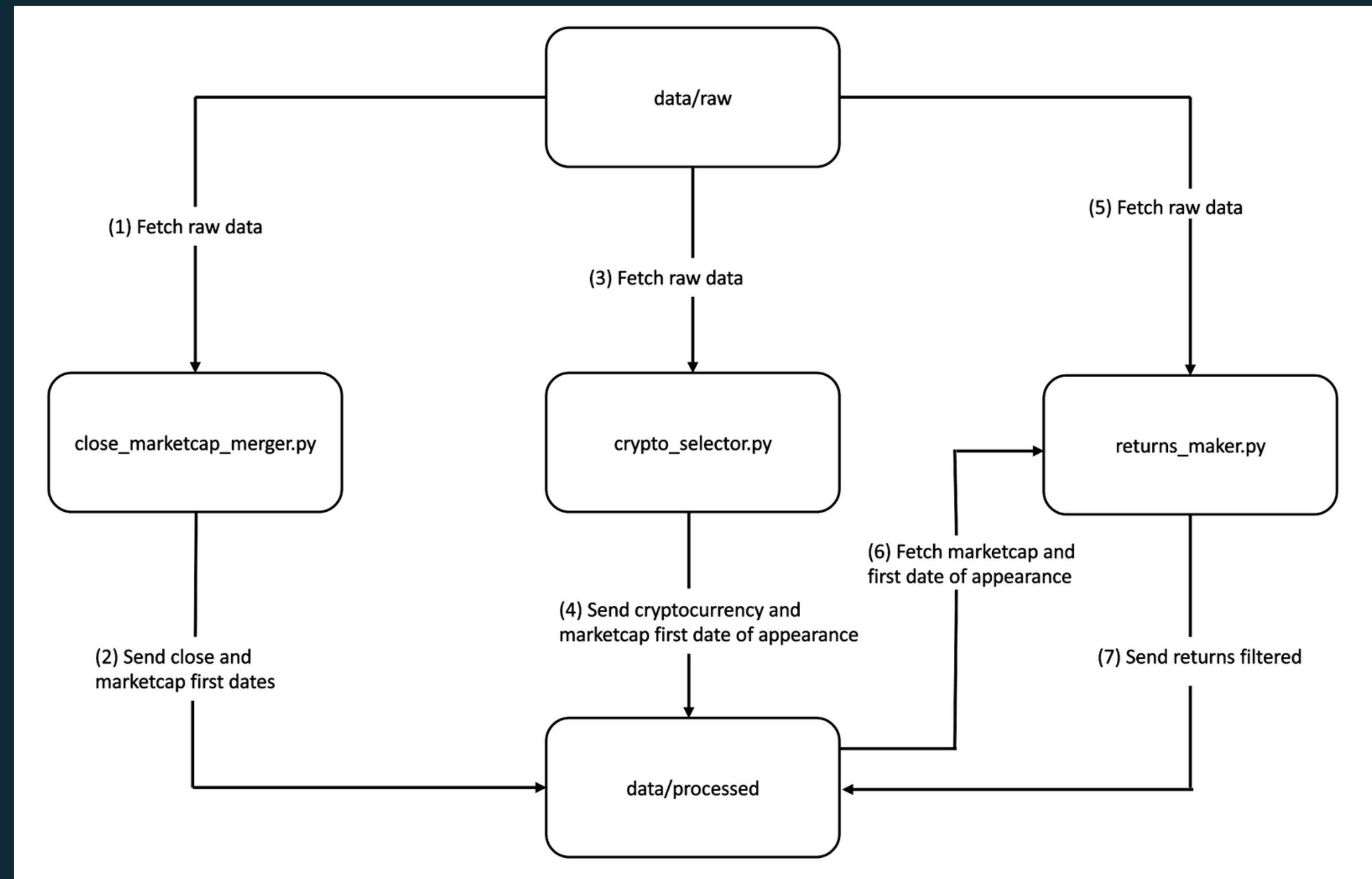
Check all stablecoins from the Santiment platform

Configuration file

number_cryptos = number of cryptocurrencies in portfolio

market_cap = market capitalization threshold in dollars

DATA PREPROCESSING



STRATEGY IMPLEMENTATION

Capitalization-Weighted Model

Weights = 1/Sum of market capitalization

Equal-Weighted Model

Low Volatility

Rolling volatilities over 120 days period
Median for 20 cryptocurrencies portfolio
Quintile for 100 cryptocurrencies portfolio

Low Beta

3 different benchmarks: CW, EW, BTC
Same differentiation as Low Volatility for 20
and 100 cryptocurrencies portfolio

Minimum Variance

Optimization with Sklearn Python module

Metrics

monthly returns, volatility, Sharpe, excess
returns, Beta, max drawdown, TE, IR,
monthly turnover, HHI

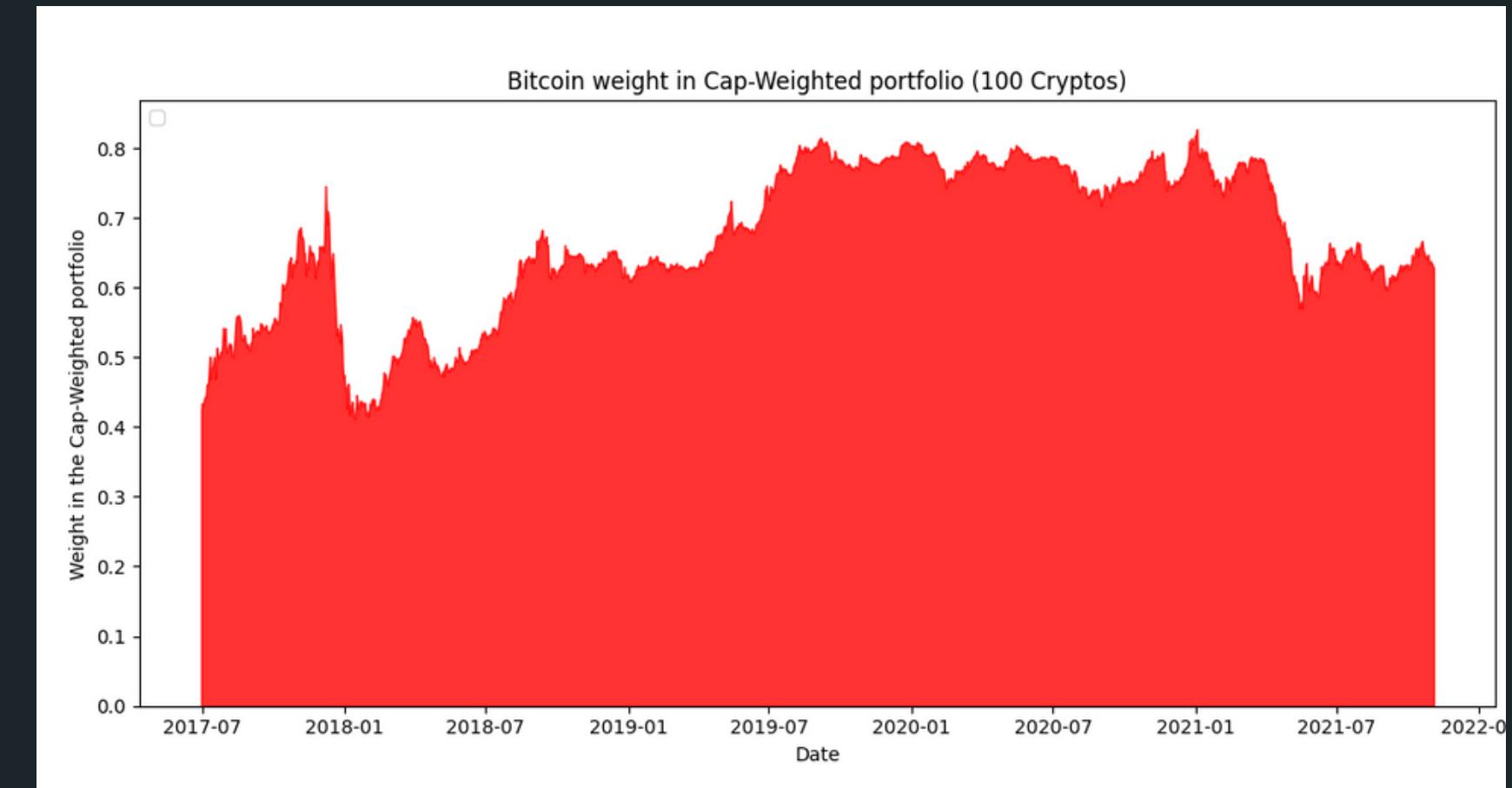
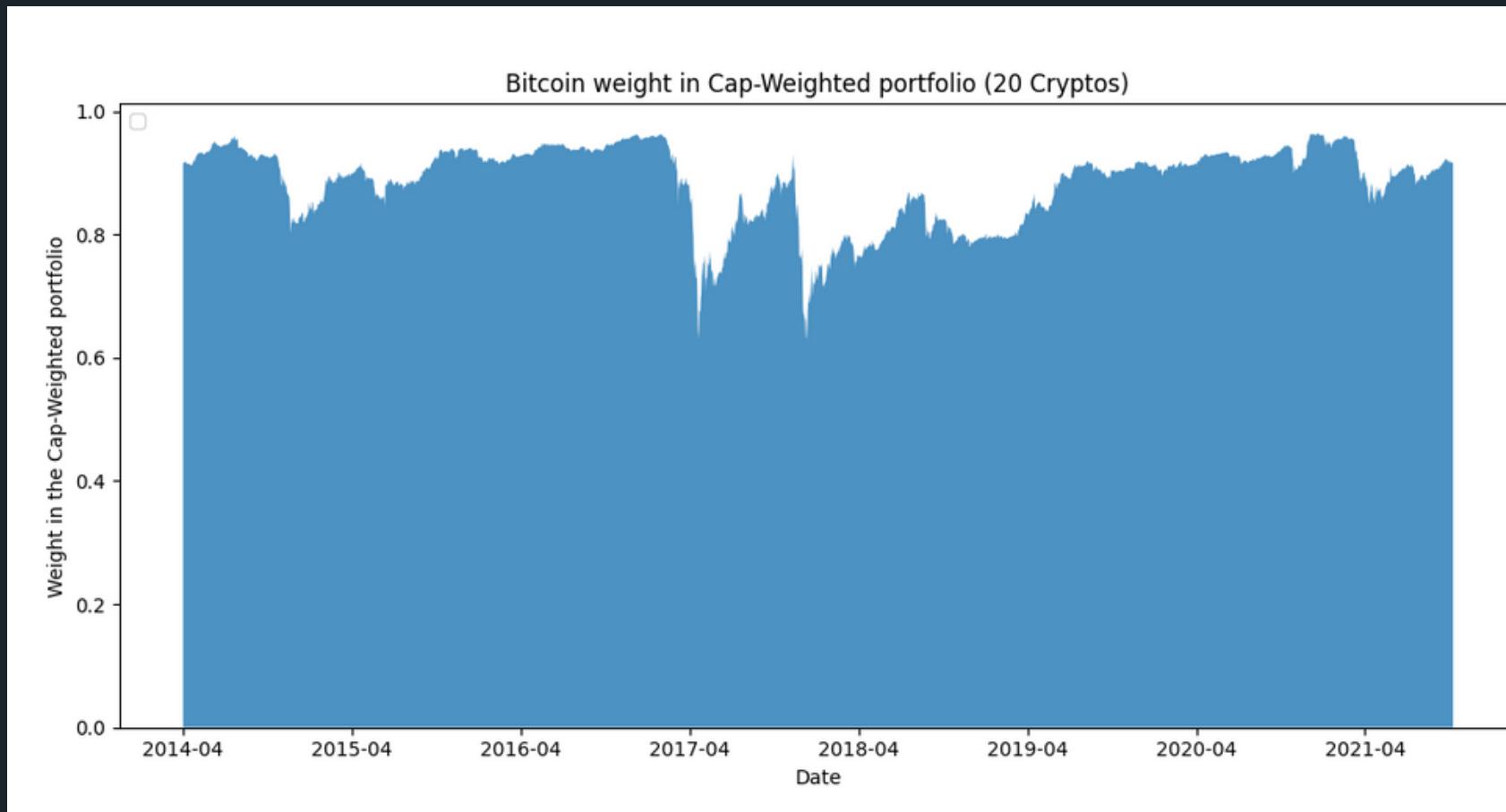
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RESULTS

What performances have we
reached? Any anomalies?

RESULTS

Influence of Bitcoin



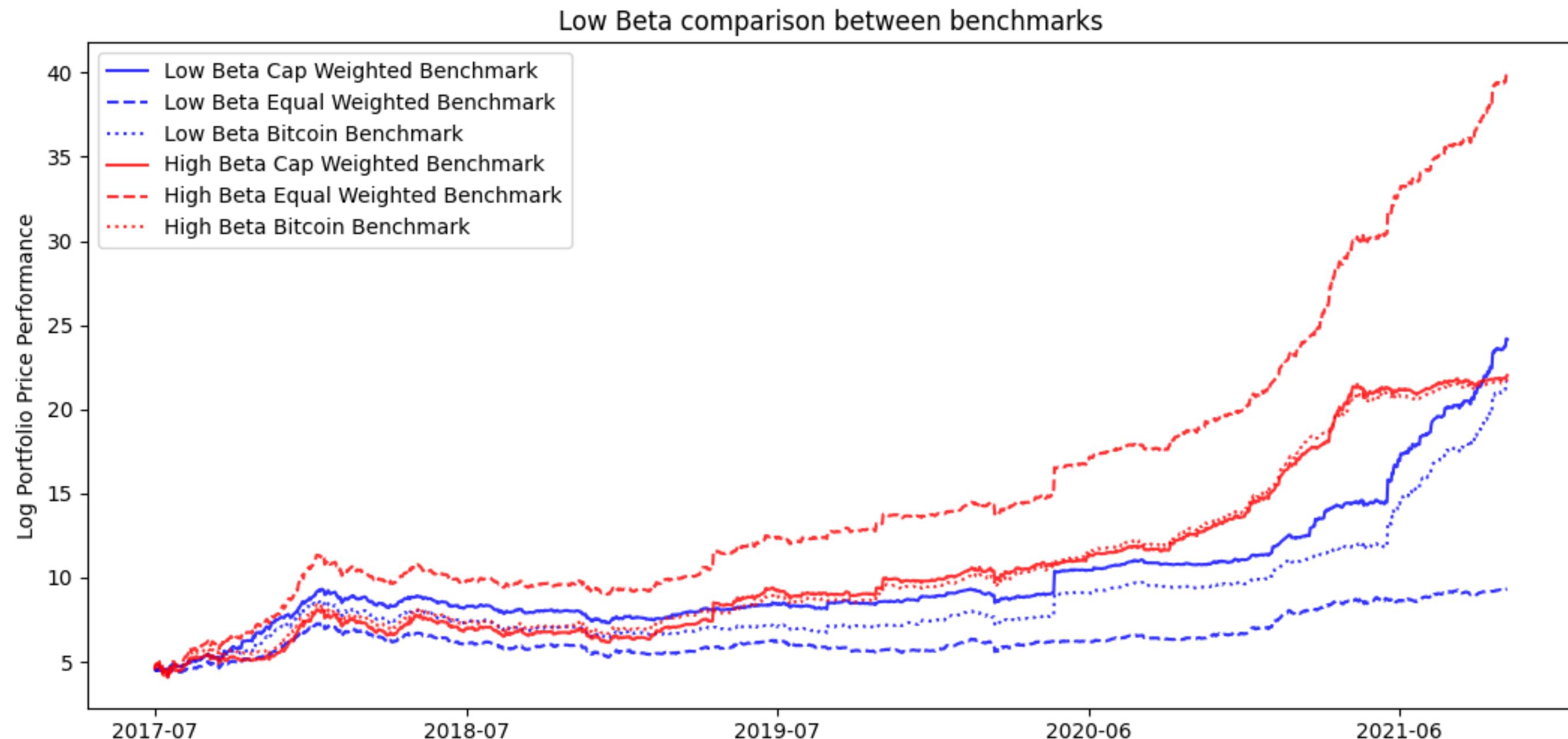
CAP-WEIGHED INDEX



EQUALLY WEIGHTED & BITCOIN INDEX

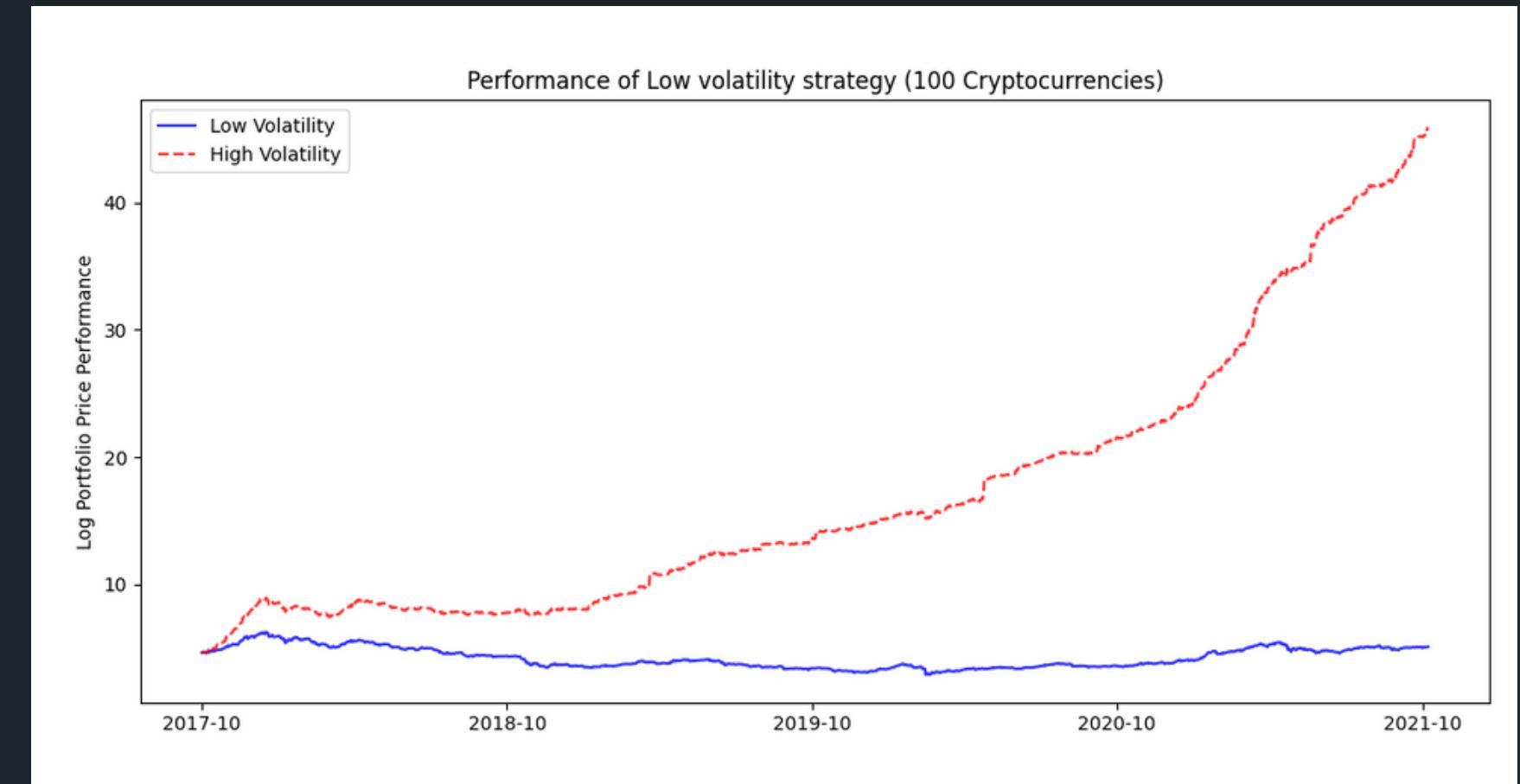
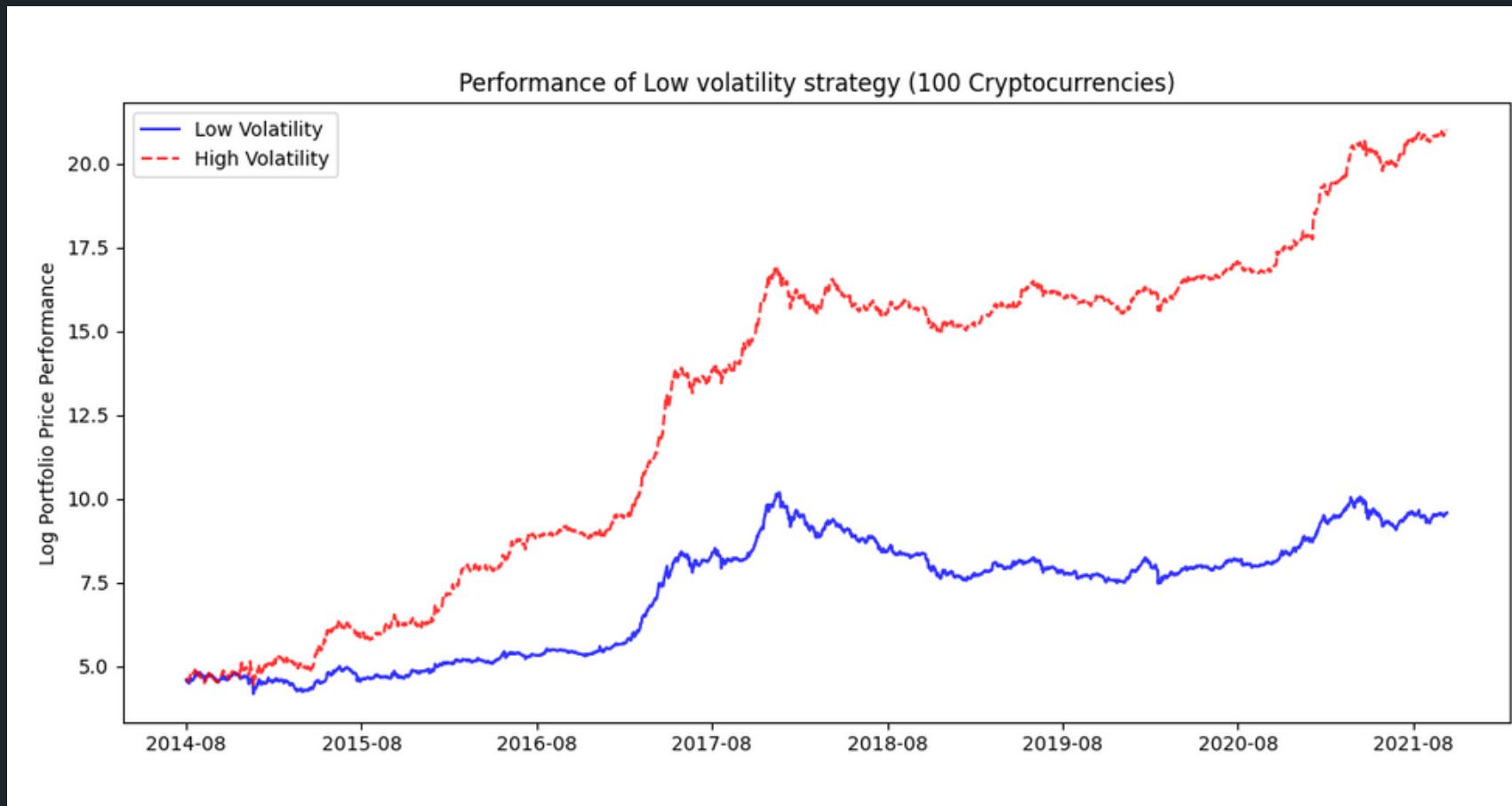
RESULTS

High Beta Anomaly
Rebalancing each day



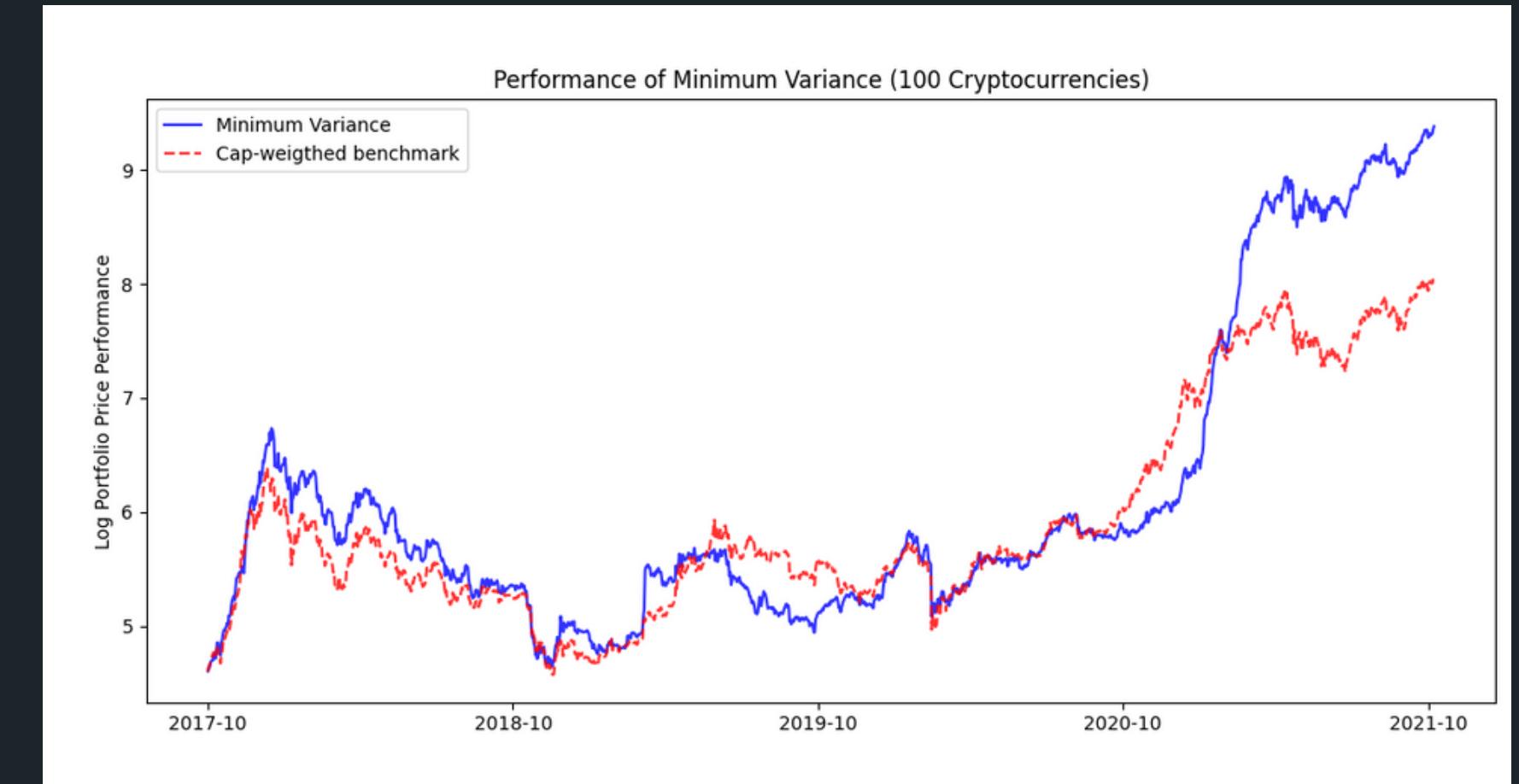
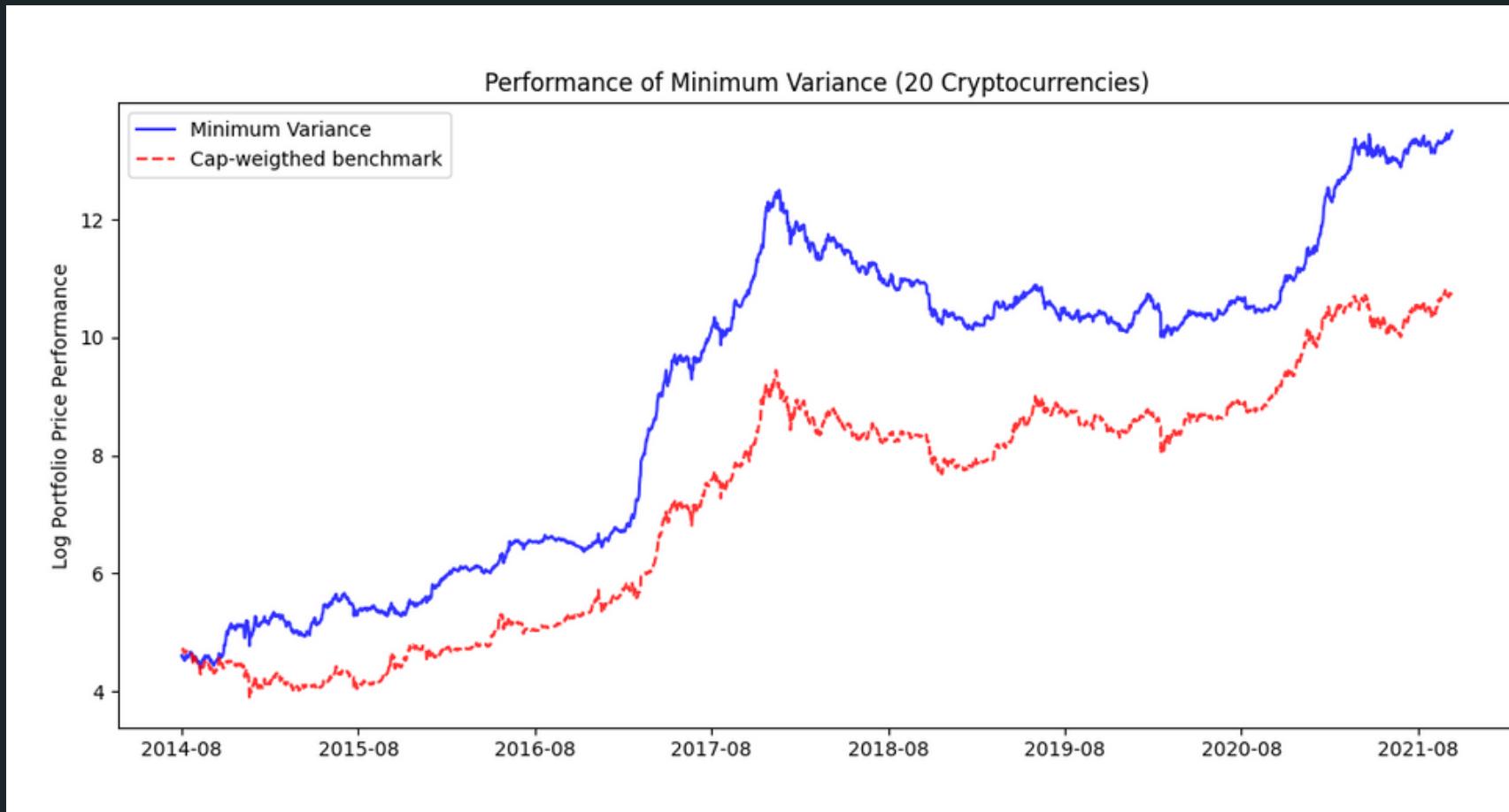
RESULTS

High Vol Anomaly



RESULTS

Minimum Variance



RESULTS

Summary (20 Cryptos)

Table 1: Metrics for each strategy with 20 cryptocurrencies

	monthly_returns	volatility	sharpe	excReturns	beta	max_drawdown	TE	IR	monthly_turnover	HHI
CW	0.11	0.21	0.51	0.00	1.00	-0.35	0.00	NaN	0.20	7941.00
BTC	0.09	0.21	0.41	-0.02	0.97	-0.36	0.01	-122.10	0.00	1.00
EW	0.22	0.24	0.90	0.11***	0.92	-0.42	0.03	187.31	0.00	500.00
MV	0.16	0.21	0.76	0.05*	0.80	-0.40	0.03	82.61	3.46	1799.00
Low Vol	0.10	0.22	0.48	-0.00	0.87	-0.45	0.02	-49.77	0.76	1000.00
High Vol	0.35	0.32	1.09	0.24***	0.96	-0.38	0.05	264.88	0.76	1000.00
Low Beta	0.20	0.24	0.80	0.09**	0.82	-0.41	0.03	112.20	0.47	1000.00
High Beta	0.23	0.29	0.80	0.13***	1.02	-0.42	0.04	187.18	0.47	1000.00
Low Beta EW	0.13	0.22	0.57	0.02	0.81	-0.42	0.02	18.13	0.21	1000.00
High Beta EW	0.31	0.31	1.01	0.21***	1.19	-0.42	0.05	230.58	0.21	1000.00
Low Beta BTC	0.20	0.25	0.82	0.10**	0.76	-0.46	0.03	128.86	0.52	1000.00
High Beta BTC	0.23	0.29	0.78	0.12***	0.97	-0.40	0.04	172.47	0.52	1000.00

t statistics in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

RESULTS

Summary (100 Cryptos)

Table 2: Metrics for each strategy with 100 cryptocurrencies

	monthly_returns	volatility	sharpe	excReturns	beta	max_drawdown	TE	IR	monthly_turnover	HHI
CW	0.07	0.22	0.30	0.00	1.00	-0.40	0.00	NaN	0.39	4944.00
BTC	0.06	0.21	0.27	-0.01	0.93	-0.36	0.01	-48.02	0.00	1.00
EW	0.32	0.29	1.10	0.25***	0.99	-0.44	0.04	224.51	0.00	100.00
MV	0.12	0.23	0.53	0.05	0.77	-0.43	0.03	33.73	4.41	939.00
Low Vol	0.02	0.23	0.07	-0.05**	0.94	-0.47	0.02	-163.97	1.66	500.00
High Vol	3.14	0.73	4.31	3.07***	1.00	-0.42	0.16	285.03	0.83	500.00
Low Beta	0.73	0.50	1.47	0.66**	0.69	-0.40	0.13	140.91	0.66	500.00
High Beta	0.79	0.49	1.61	0.72**	1.26	-0.49	0.08	193.53	0.61	500.00
Low Beta EW	0.09	0.23	0.38	0.02	0.54	-0.44	0.02	17.35	0.38	500.00
High Beta EW	2.24	0.72	3.10	2.17**	2.42	-0.51	0.16	234.78	0.51	500.00
Low Beta BTC	0.67	0.48	1.39	0.60**	0.65	-0.44	0.13	127.58	0.64	500.00
High Beta BTC	0.60	0.41	1.46	0.53***	1.19	-0.46	0.06	245.27	0.72	500.00

t statistics in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

“

SENSITIVITY ANALYSIS

Does leverage impact the low volatility anomaly?

SENSITIVITY ANALYSIS

LEVERAGE

- February 2019 - Leverage introduced in cryptos
- Split our dataset to test for leverage
- No impact in the 20 crypto basket
- Large impact in the 100 crypto basket
- Crypto investors are pushed to use margin

“

SENSITIVITY ANALYSIS

Does rebalancing impact our
portfolios? (1d, 7d, 30d)

SENSITIVITY ANALYSIS

REBALANCING

(INITIAL) daily & (NEW) weekly and monthly

Low Beta

- Daily : High Beta, Weekly : Low Beta, Monthly : High Beta
- Could be due to day/swing trades, where high volatility cryptos are dumped in a week

SENSITIVITY ANALYSIS

REBALANCING

(INITIAL) daily & (NEW) weekly and monthly

High volatility

- Daily rebalancing is the best
- Effect is best captured when volatility is at its highest
(daily captures fast volatility spikes)

“

CONCLUSION

Let's wrap up our project

CONCLUSION

WHAT WE HAVE DONE

- Extracted high beta and high volatility inverted & enhanced anomaly
- Only anomaly came with weekly rebalancing, a low beta effect was extracted
- Identified some very profitable portfolios using smart beta strategies

- We would recommend investing in our portfolios to risk-seeking investors
- Very profitable strategies (high Sharpe ratio, excess returns but also high volatility)
- Risk-averse investors should use our portfolios only for diversification purposes
- High Volatility is difficult to implement (low liquidity, sharp pump and dumps)

CONCLUSION RECOMMENDATIONS

CONCLUSION EXTENSIONS

- More dynamic portfolios
- Extra constraints on liquidity (1 mil MC)
- Broader range of cryptos - Binance has approx. 260 cryptos
- How much overperformance do we have with the High Beta compared to a regular SML?

THANK YOU FOR YOUR ATTENTION



ANY QUESTIONS?