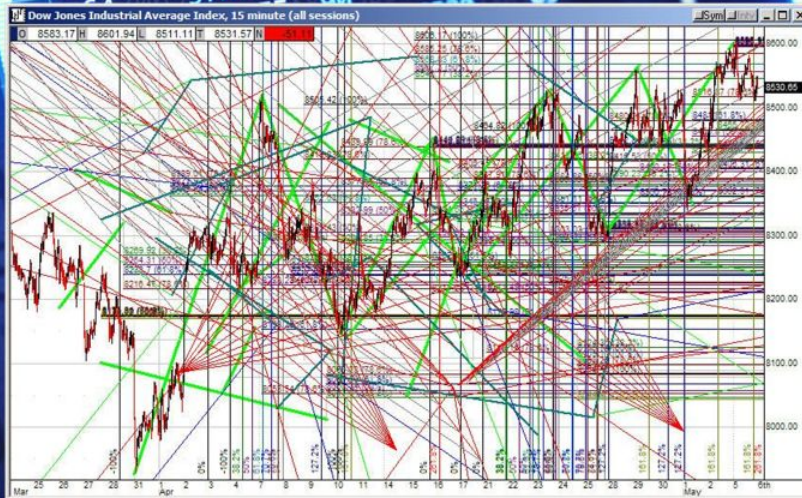


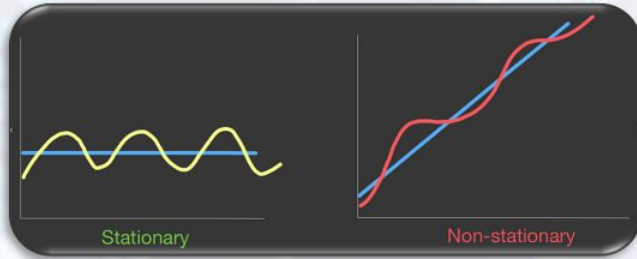
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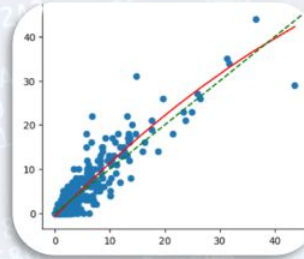


# Time Series Forecasting Models

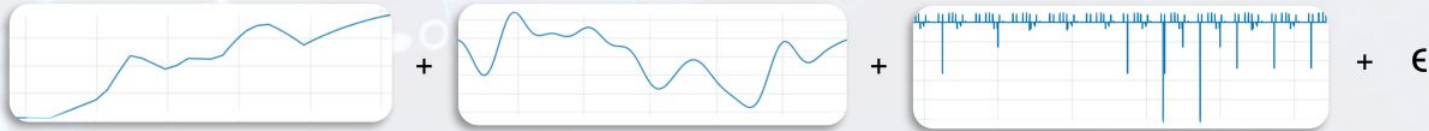
ARIMA



XGBoost



FB Prophet







## Time Series Data

- yFinance
- Federal Reserve Banks



## EDA & Manipulation

- Patterns/Distribution over Time
- Box Cox Data Transformation



## Model Fit Preparation

- Logistic/linear, Features, Hyperparameter, CV,
- choose best model



## Accuracy & Cross-Validation

- Mean Absolute Percentage Error



## Prediction

- Trend forecast
- Changepoints

## Time Series Data

- yFinance
- Federal Reserve Banks



## EDA & Normalization

- Box Cox Data Transformation
- Trend and Patterns over Time



## Model Fit Preparation

- Logistic/linear, Features, Hyperparameter, CV,
- choose best model



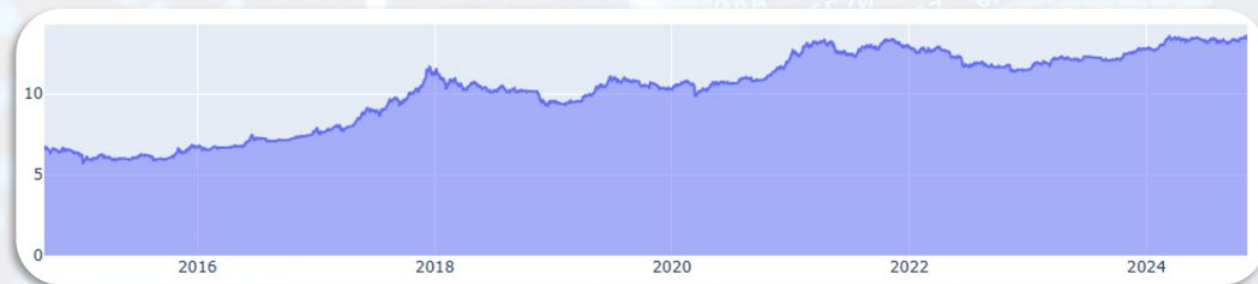
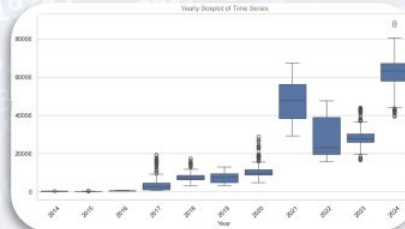
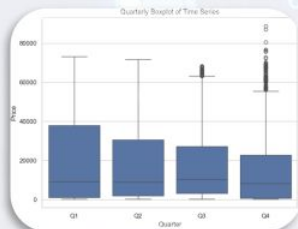
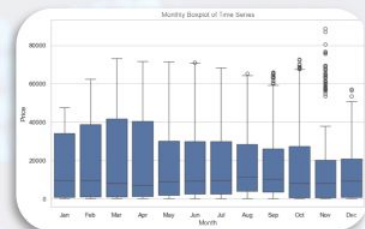
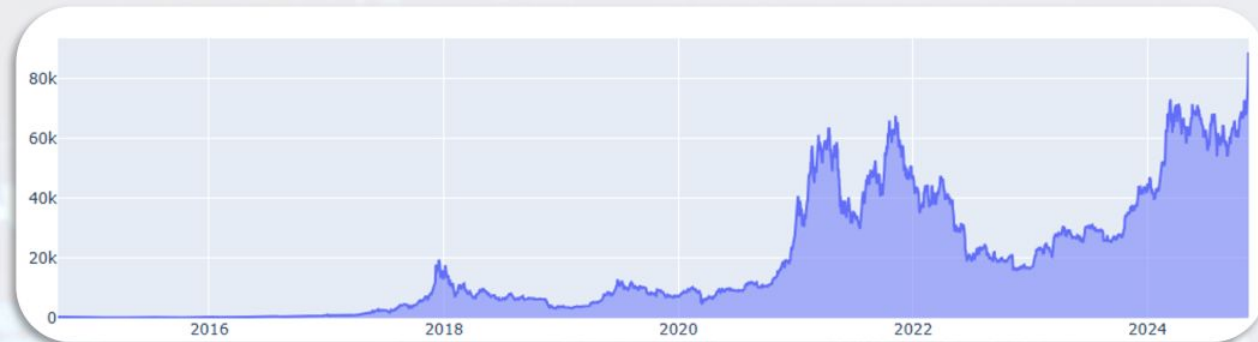
## Accuracy & Cross-Validation

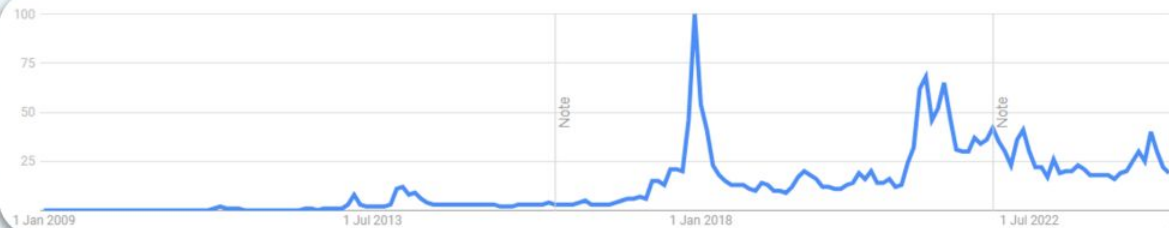
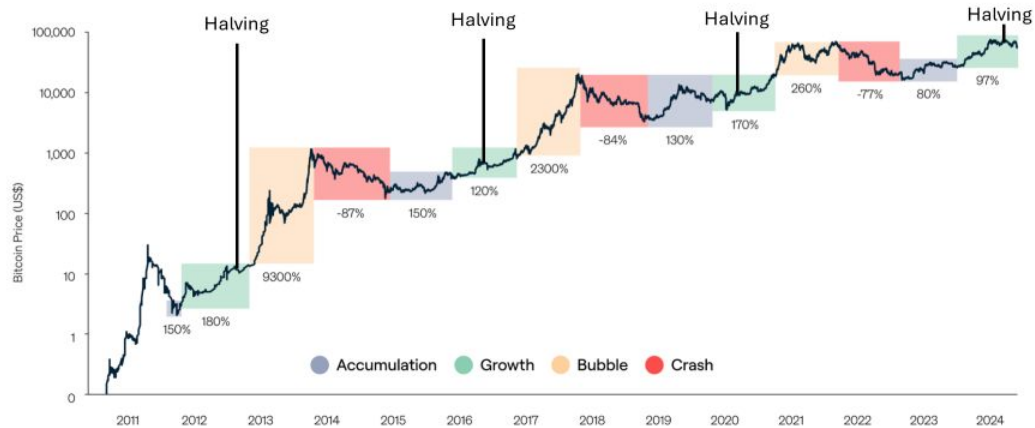
- Mean Absolute Percentage Error



## Prediction

- Trend forecast
- Changepoints





**Regulation and Investment Products**

## Time Series Data

- yFinance
- Federal Reserve Banks

## EDA & Normalization

- Box Cox Data Transformation
- Trend and Patterns over Time

## Model Fit Preparation

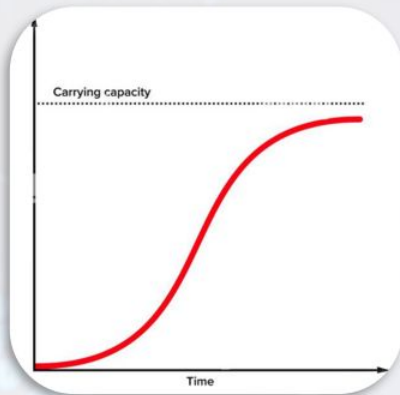
- Logistic/linear, Features, Hyperparameter, CV,
- choose best model

## Accuracy & Cross-Validation

- Mean Absolute Percentage Error

## Prediction

- Trend forecast
- Changepoints



### Trend

- Logistic

### Upper Limit

- Max target value + STD%

### Seasonalities

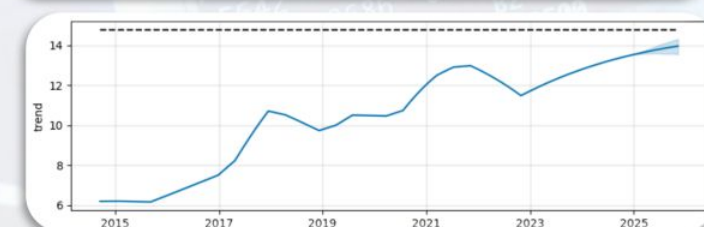
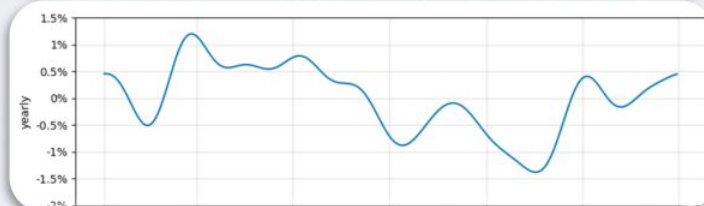
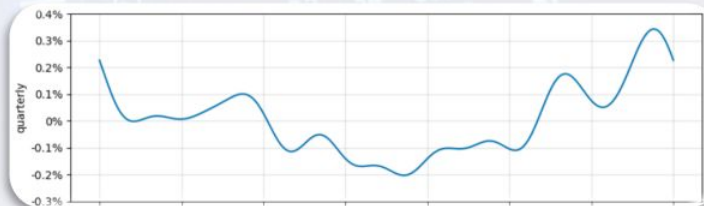
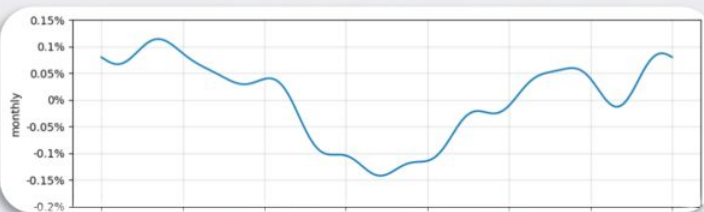
- Monthly
- Quarterly
- Yearly

### Seasonality Mode

- Multiplicative

### Sensitivity

- To breackpoints in trend (Changepoints)
- To seasonality



## Time Series Data

- yFinance
- Federal Reserve Banks

## EDA & Normalization

- Box Cox Data Transformation
- Trend and Patterns over Time

## Model Fit Preperation

- Logistic/linear, Features, Hyperparameter, CV,
- choose best model

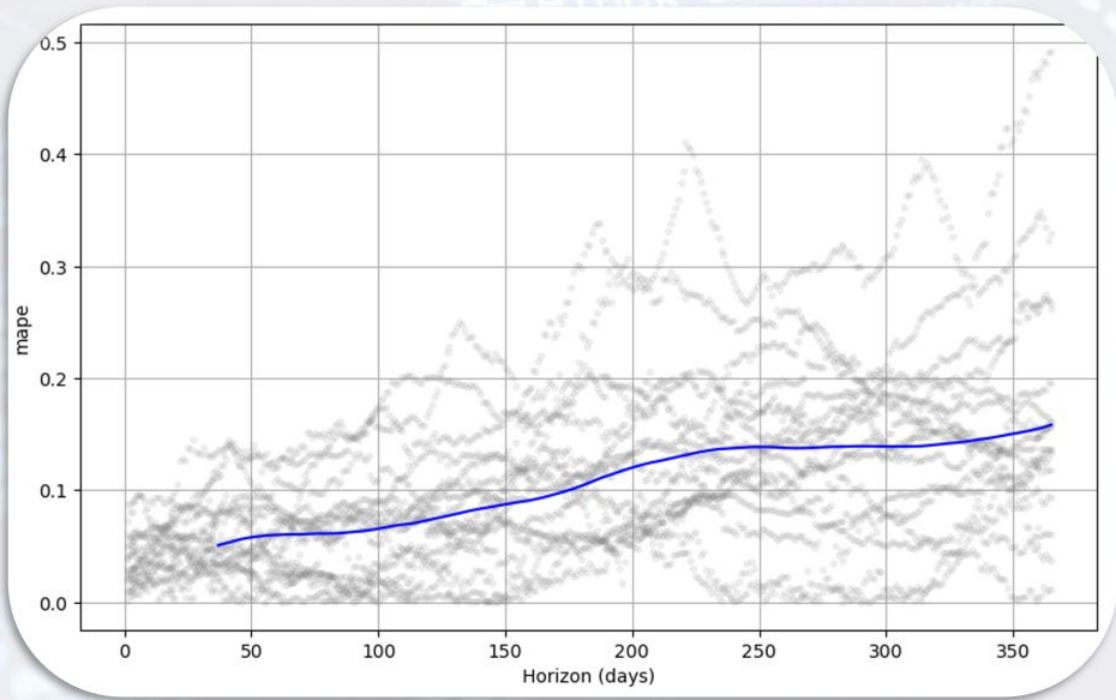
## Accuracy & Cross-Validation

- Mean Absolute Percentage Error

## Prediction

- Trend forecast
- Changepoints





## Time Series Data

- yFinance
- Federal Reserve Banks



## EDA & Normalization

- Box Cox Data Transformation
- Trend and Patterns over Time



## Model Fit Preparation

- Logistic/linear, Features, Hyperparameter, CV,
- choose best model



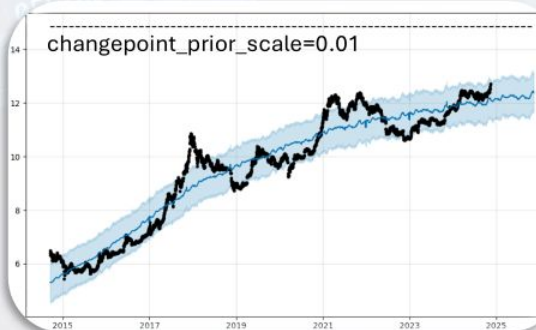
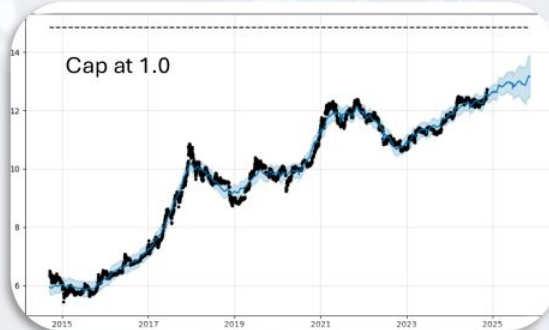
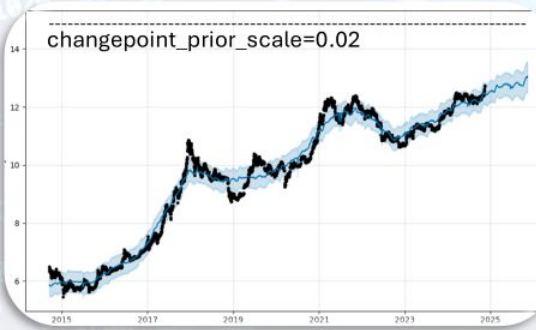
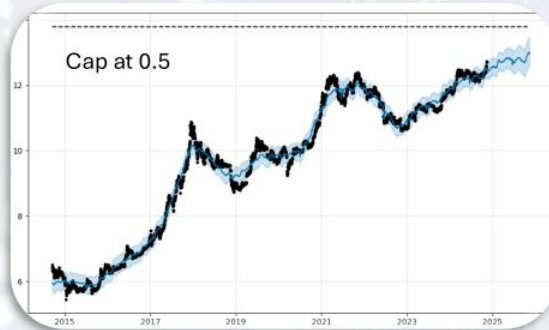
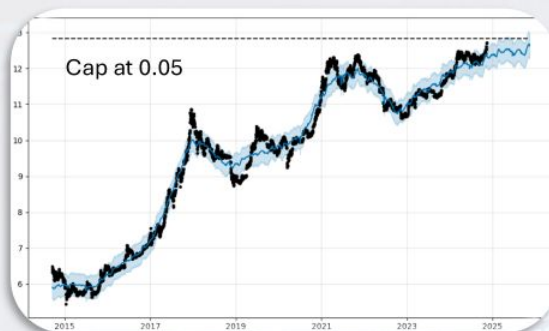
## Accuracy & Cross-Validation

- Mean Absolute Percentage Error
- Within reasonable range for high volatility



## Prediction

- Trend forecast



	horizon	mse	rmse	moe	mape	mdape	mape	coverage
0	37 days	0.357155	0.597625	0.511254	0.030609	0.046895	0.050539	0.103806
1	38 days	0.366645	0.605512	0.518195	0.031550	0.047536	0.051274	0.099051
2	39 days	0.375201	0.612337	0.523576	0.032153	0.047990	0.051873	0.099051
3	40 days	0.384485	0.620069	0.529261	0.032773	0.048007	0.052489	0.097438
4	41 days	0.394091	0.627767	0.534879	0.033377	0.048635	0.053089	0.095823
...	...	...	...	...	...	...	...	...
324	361 days	3.206718	1.790791	1.597784	0.155586	0.138642	0.152642	0.551795
325	362 days	3.239475	1.799804	1.603995	0.156247	0.138642	0.153176	0.557021
326	363 days	3.273433	1.808967	1.610201	0.156912	0.138642	0.153712	0.560247
327	364 days	3.308542	1.818840	1.617088	0.157625	0.138396	0.154300	0.563472
328	365 days	3.343818	1.828811	1.623686	0.158339	0.137941	0.154862	0.566701