Resist the temptation to trade:
Lo “Buy-n-Hold” the power of passive investing

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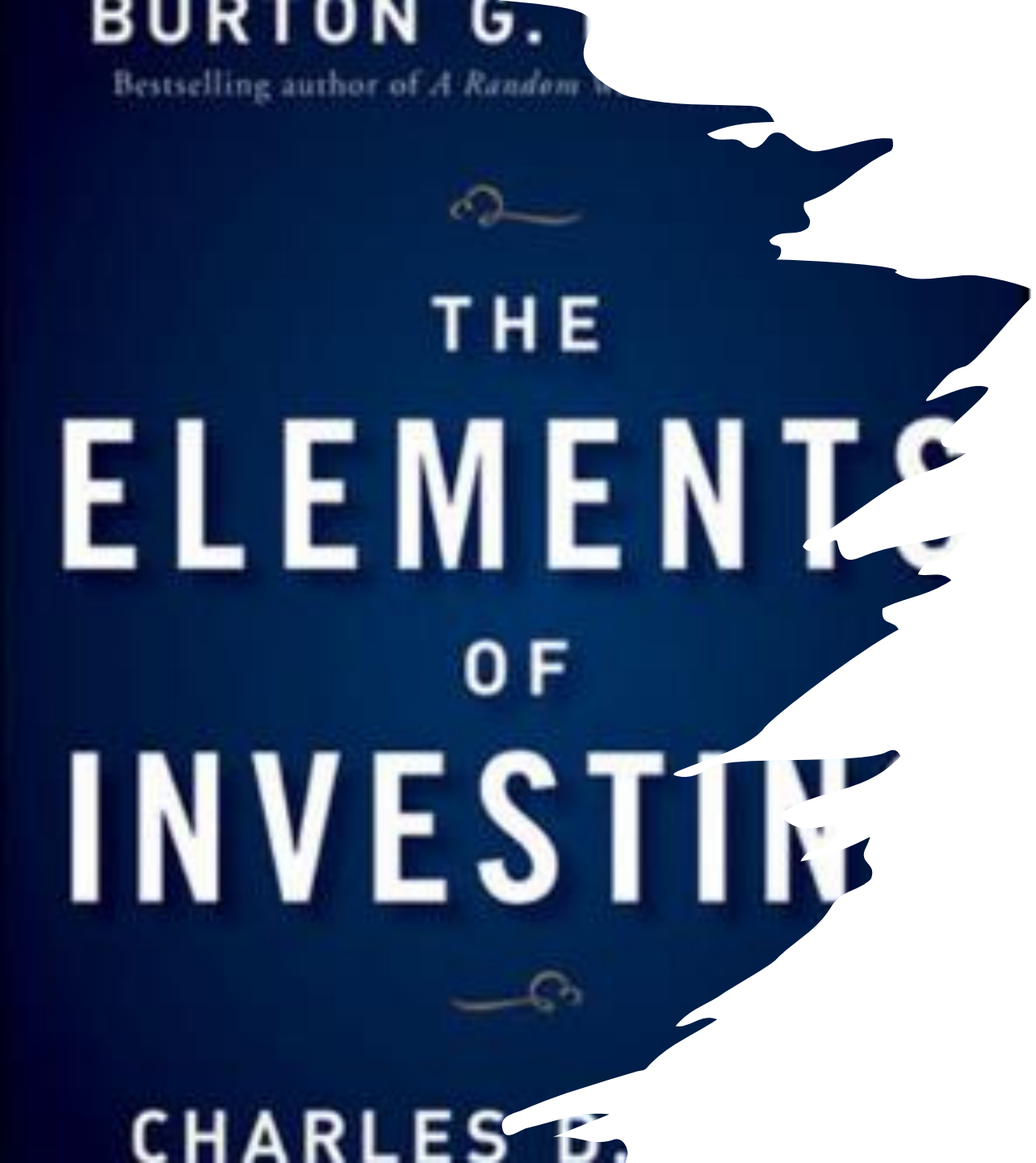


Contents

“We generated stock prices data by simulating coin toss and sent it to an analyst, he said we’ve got to buy this immediately. This pattern’s a classic!”

- Burton G. Malkiel

“If you found $10 on street, then according to efficient market hypothesis you should not pick it up as someone would have picked up already. ”

- Andrew W. Lo

Introduction

Stock prices in efficient markets are unpredictable

Machine Learning methods for trading

Is It all statistical fluke?

Literature review

- Efficient Market hypothesis was popularized by (Fama, 1965)
- Only empirical evidence exists
- Some papers pointed by (Hsu *et al.*, 2016) claims 70% accuracy!

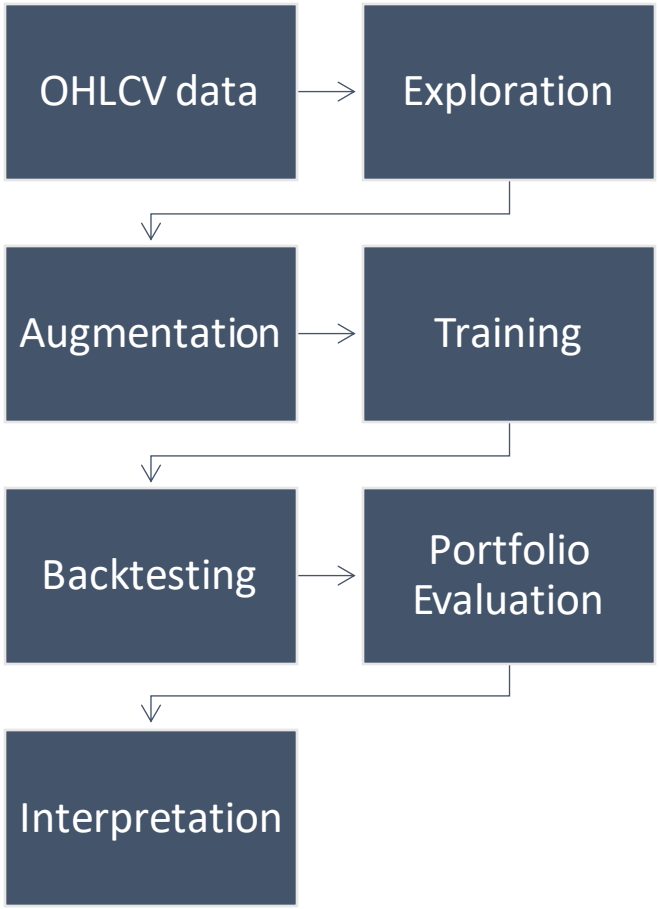
Hypothesis

Null Model: Is mean of excess returns from machine learning models greater than mean of excess returns from random walk model?

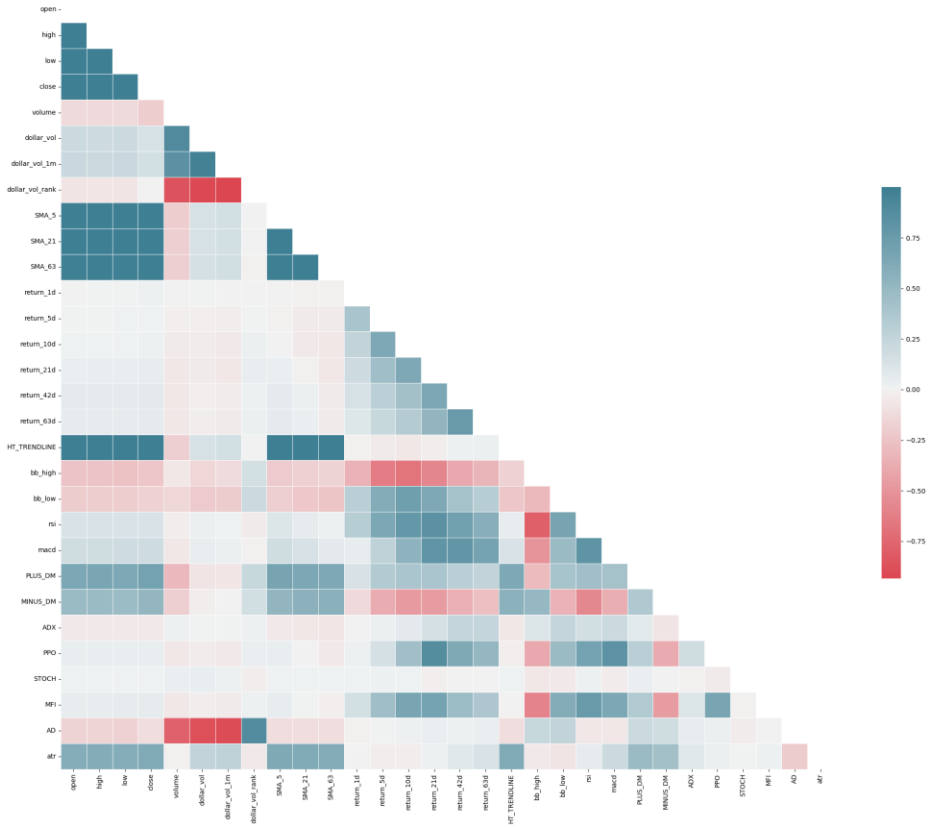
Alternative Hypothesis says otherwise.

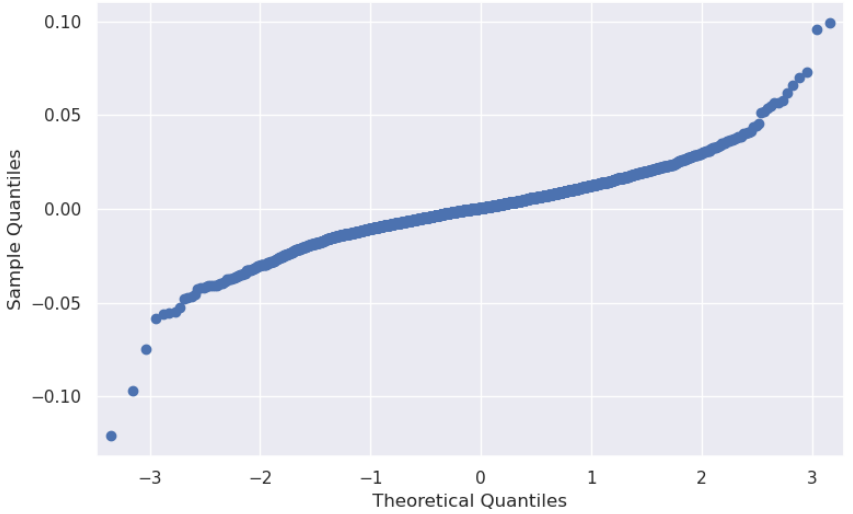
Methodology

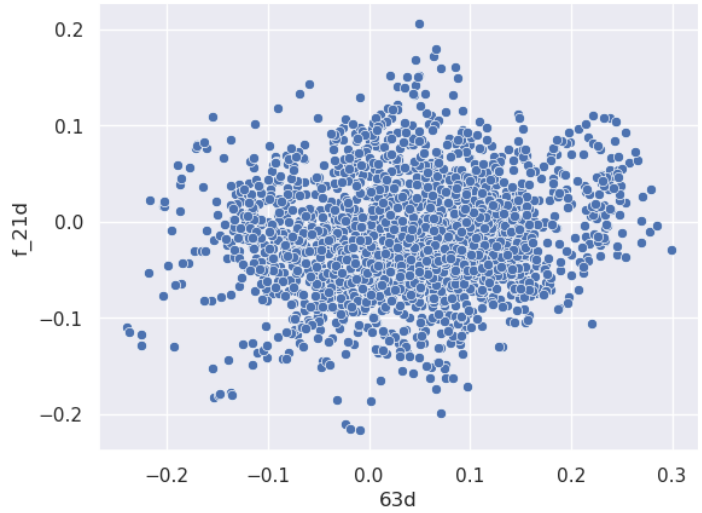
Symbol (ticker)	Name	Market Cap	Industry
AAPL	Apple Inc. Common stock	2.9 trillion (Mega)	Technology
MSFT	Microsoft Corporation Common stock	2.2 trillion (Mega)	Technology
DIS	Walt Disney Company Common Stock	184 billion (Large)	Movies/Entertainment
NKE	Nike Inc. Common Stock	194 billion (Large)	Shoe Manufacturing
AAL	American Airlines Group Inc. Common stock	8 billion (Medium)	Air Freight/Delivery services
ZG	Zillow Group, Inc. Class A Common stock	9 billion (Medium)	Real estate/business services
VTI	Vanguard Total Stock Market Index Fund	1.25 trillion (net assets)	finance



Exploration & Augmentation

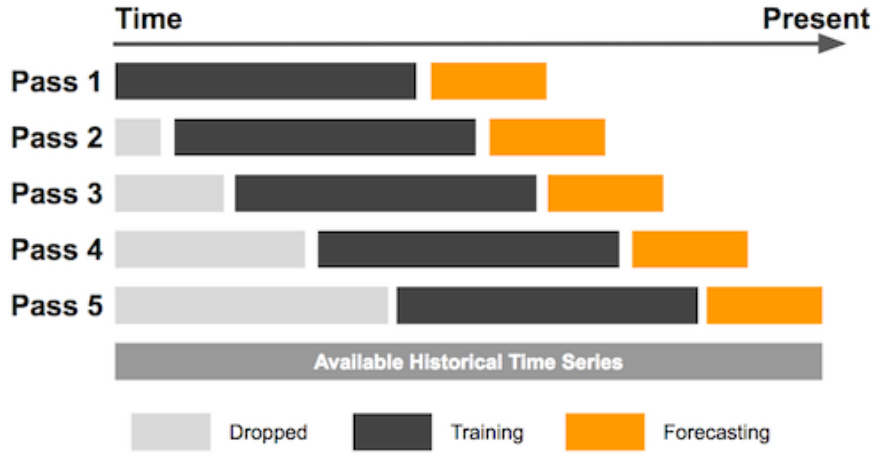




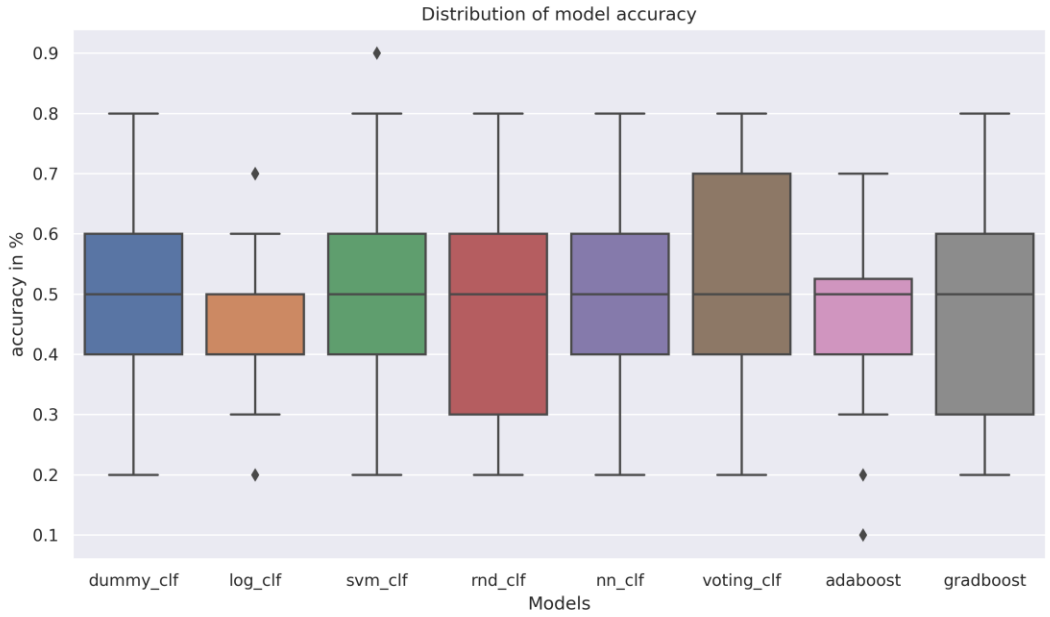


Experimentation

- Train Classification models on past 252 days
- Validate on next two weeks using TimeSeriesSplit



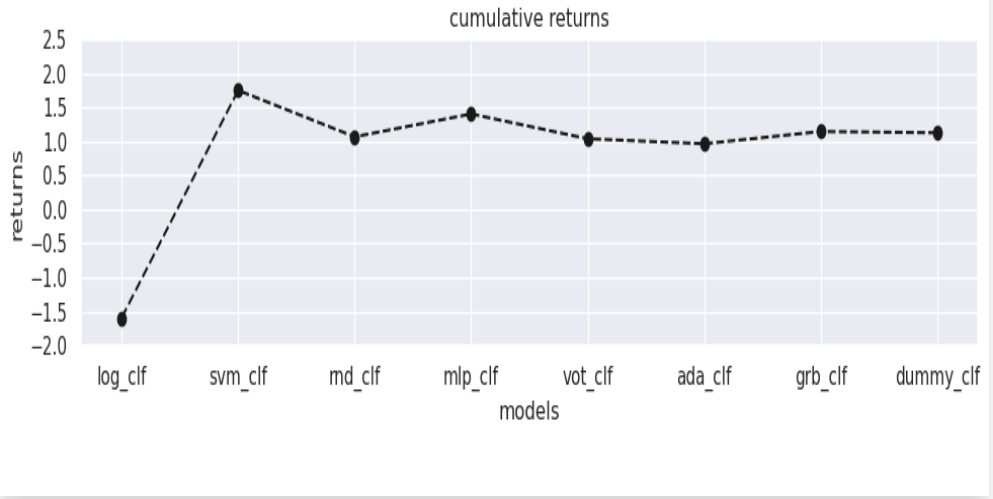
Time series CV (Yang, 2018)

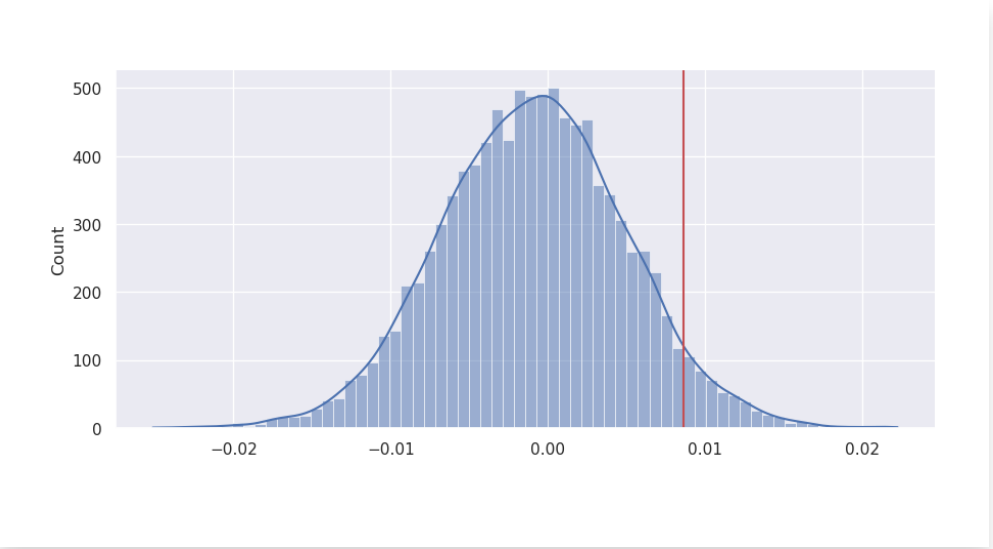


Results

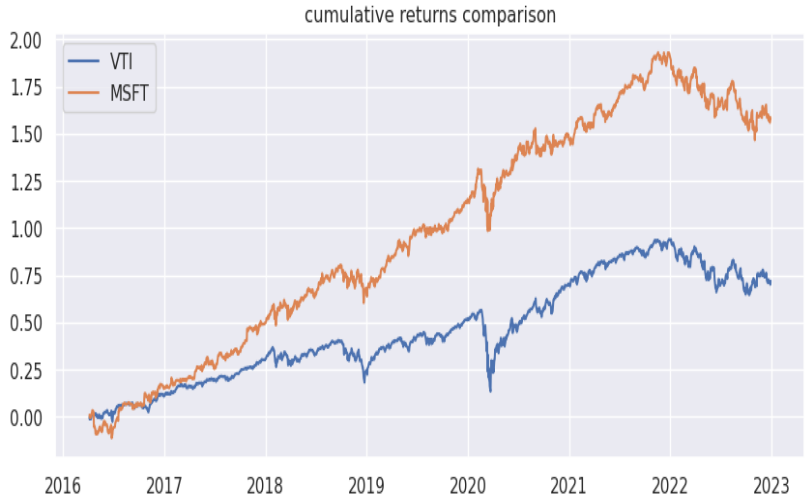
T - Test	P - value
Buy-n-Hold	0.76
Index	0.74

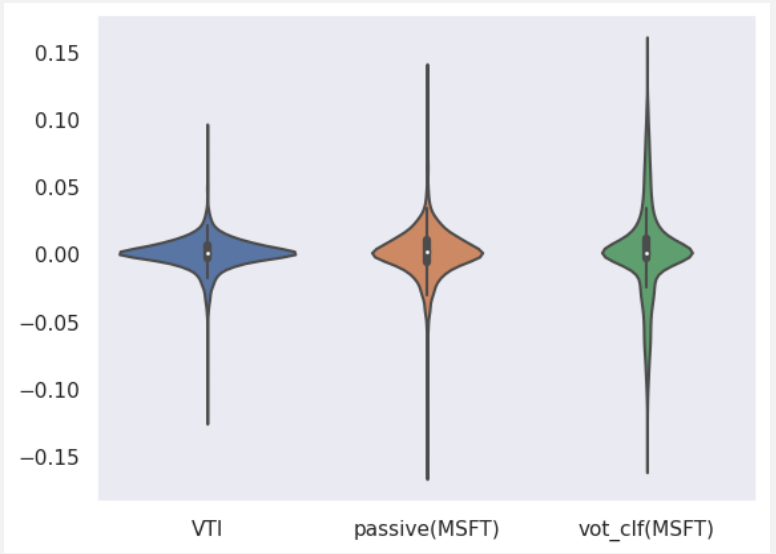
$$\mu_{best} < u_{dummy}$$

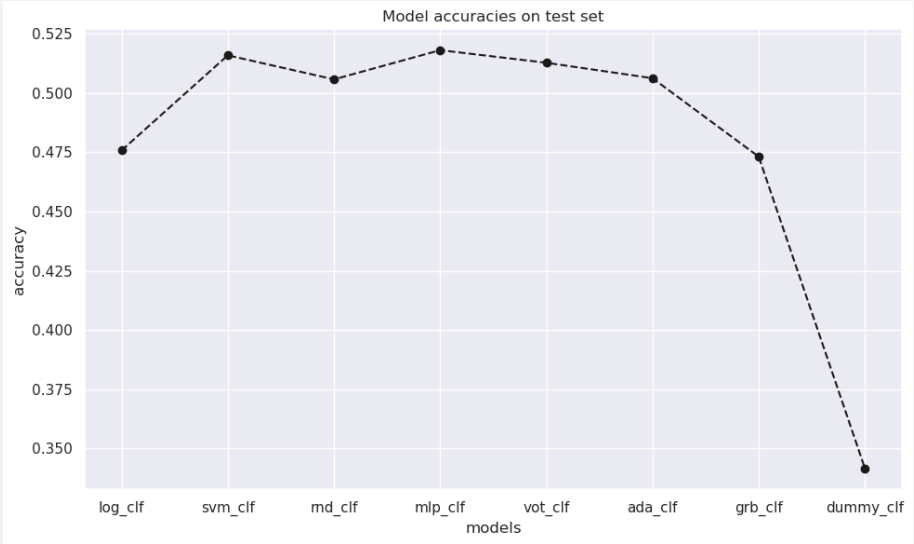




Interpretation





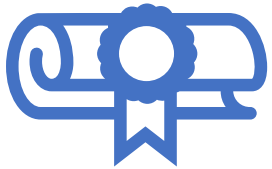


Conclusion

- We cannot reject random walk hypothesis
- Market anomalies > Market movement

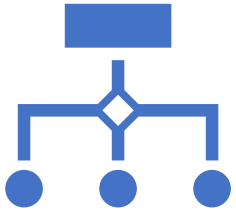
Q&A

References



Fama, E. (1965) 'Random Walks in Stock-Market Prices', *Financial Analysts Journal,* Available at: https://doi.org/10.2469/faj.v21.n5.55.

Hsu, M. *et al.* (2016) 'Bridging the divide in financial market forecasting: machine learners vs. financial economists', *Expert Systems with Applications,* 61, pp. 215-234. Available at: https://doi.org/10.1016/j.eswa.2016.05.033.



Yang, R. (2018) *Omphalos, Uber's Parallel and Language-Extensible Time Series Backtesting Tool.* Available at: https://www.uber.com/en-GB/blog/omphalos/ .