The Groovy Weasels
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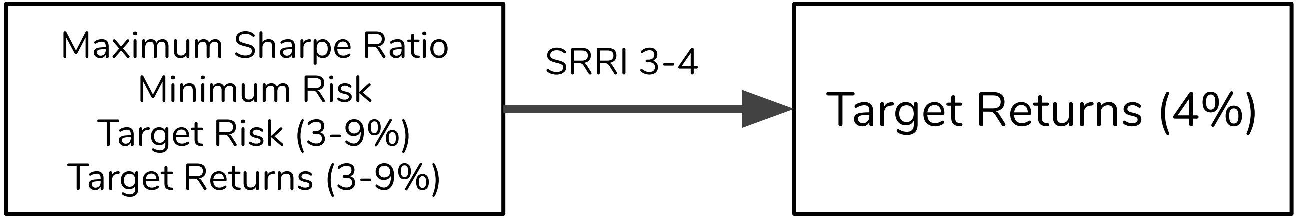
Augmenting economic theory on portfolio creation with deep learning

Outline

1. Theoretical Background
2. Data and Features
3. Model Architecture and Training
4. Results

Don’t put all eggs in the same basket

- Modern Portfolio Theory
- Ledoit-Wolf Shrinkage
- Benchmark Model



Markowitz, H. (1952). Portfolio Selection.
Fama, E. (1965). Random Walks in Stock Market Prices.
Malkiel, B. G. (2003). The efficient market hypothesis and its critics.
Ledoit, O., & Wolf, M. (2003). Honey, I shrunk the sample covariance matrix.

Representing the Markets with Technical Analysis

DATA

CRY
S&P 500
Euro Stoxx 50
WIBOR 3M
LIBOR 3M
Dollar Index
WIG 20

→

FEATURES

MACD
Bollinger Bands
Exponential MA
Stochastic Momentum
Money Flow Index

Bao, W., Yue, J., Rao, Y. (2017). A deep learning framework for financial time series using stacked autoencoders and long-short term memory.

Capturing the Past with the LSTM RNN

Forecasting setup

- Simple RNN regression:
  2 LSTM layers + 1 FC layer
- Standard optimization:
  Adam, lr=0.02%, MSE loss
- Trained to predict future
  covariance and fund returns
- 6-fold cross-validation:
  10-year training window
  validated on 1 following year

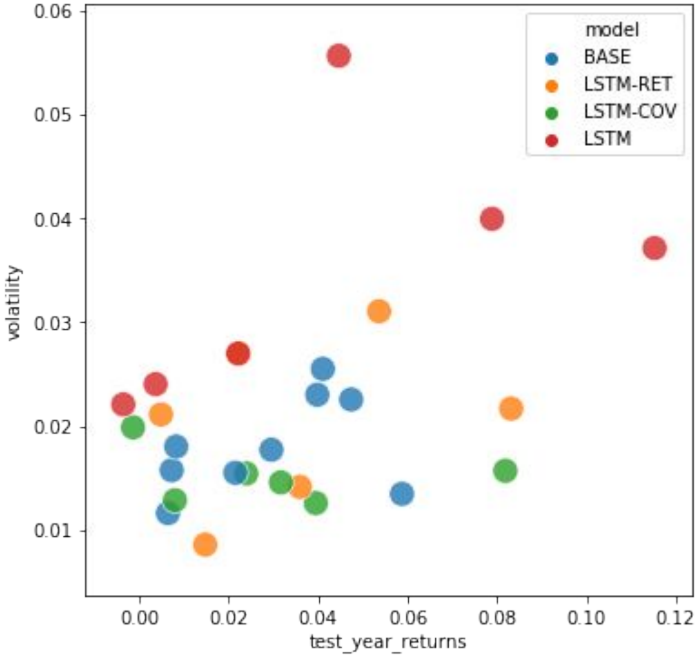
→

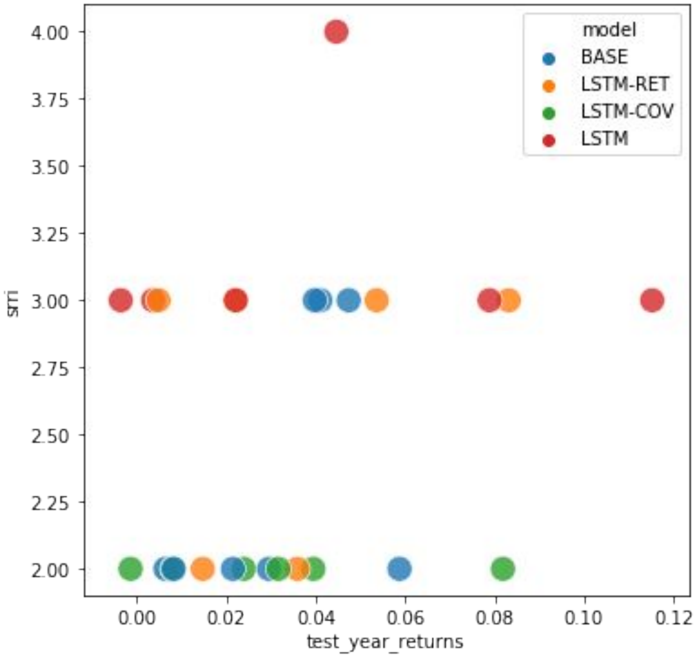
Portfolio creation strategy

BASE
LSTM
LSTM-COV
LSTM-RET

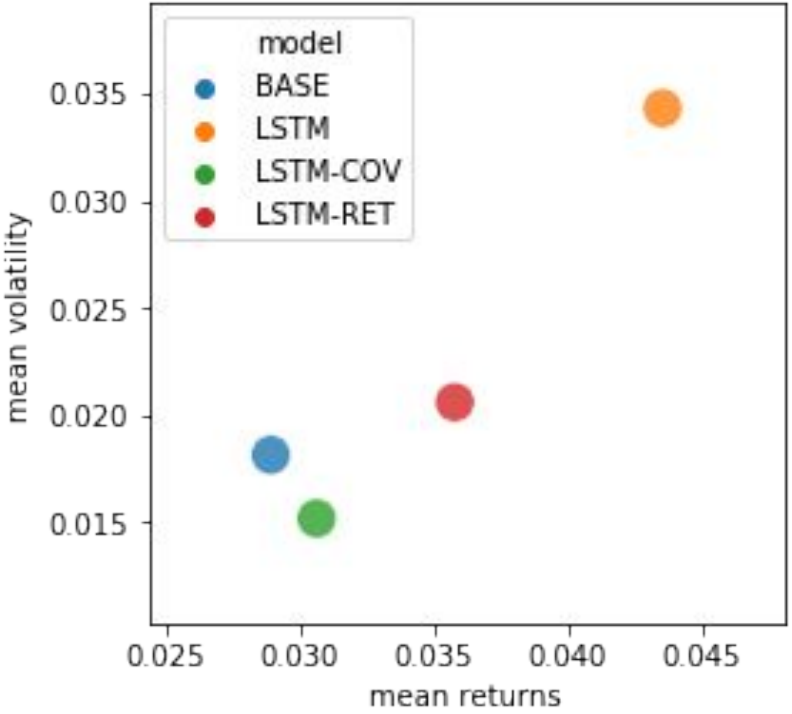
Hochreiter, S. & Schmidhuber, J. (1997). Long Short-term Memory.

Choosing the optimal approach

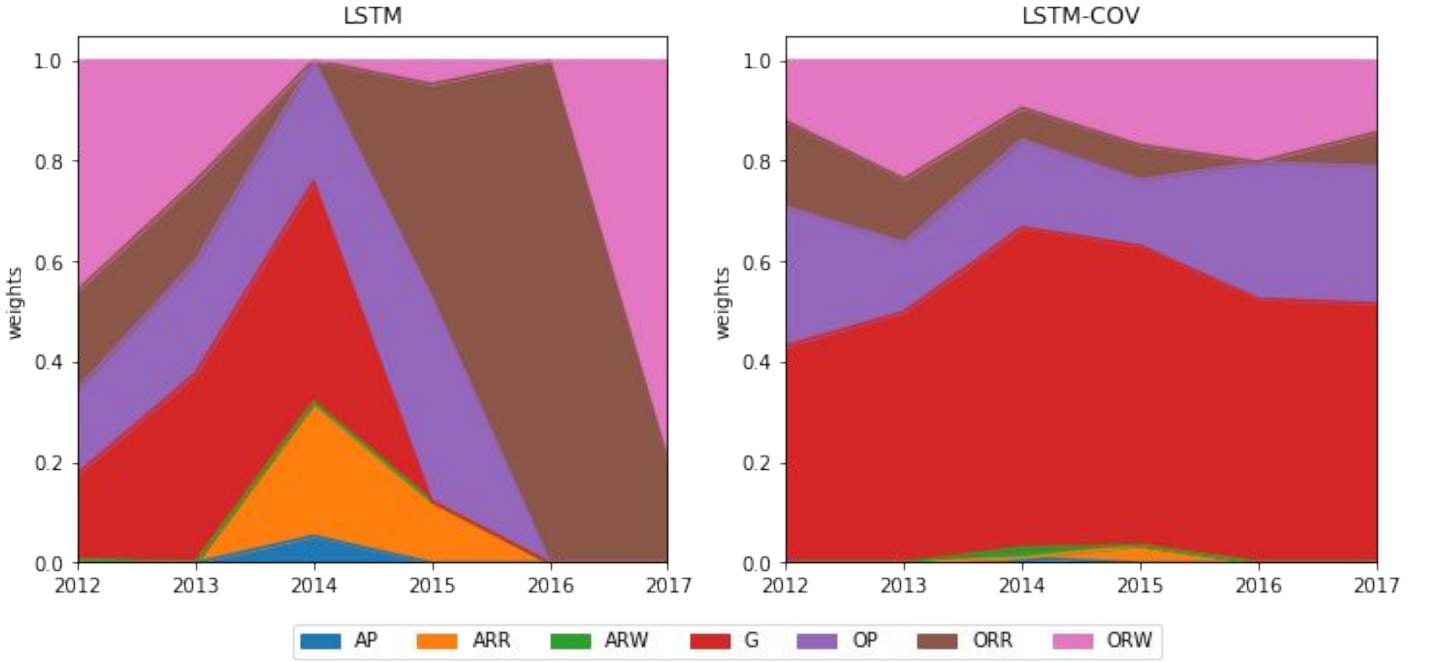




Risk-Return Tradeoff



Risk Seeking vs Safe Approach



Thank you!

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Source code repository: **https://github.com/kowaalczyk/quant-invest**
See **Summary.ipynb** or **Report.pdf** for more detailed results.