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LAS TRADERS

Evaluating Portfolio Optimization with In-Sample and Out-of-Sample Techniques

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INTRODUCTION

- Built a portfolio optimization tool using real-world stock data from WRDS CRSP
- Used both mean-variance optimization and Ledoit-Wolf shrinkage
- Compared in-sample (IS) and out-of-sample (OOS) results with visualizations

USER INPUTS

- User provides: stock tickers, in-sample and out-of-sample date ranges, and starting weights
 - Tickers, dates, weights checked for validity
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- In Plain English:
 - “What tickers are in your portfolio?”
 - “What percentage of your portfolio is invested into XYZ?”
 - ...

DATA CLEANING

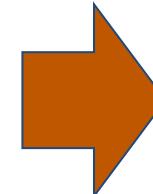
- Pulled monthly returns, prices, and shares from CRSP (Center for Research in Security Prices)
- Matched tickers to correct dates and handled delisting returns
- Cleaned data: fixed negative prices, filled missing delisting returns, dropped missing regular returns



PORTFOLIO OPTIMIZATION

Weights

TICKERS	ORIGINAL	GMV	EFPRT	ORP
WMT	-	-	-	-
NVDA	-	-	-	-
AMD	-	-	-	-
MSFT	-	-	-	-

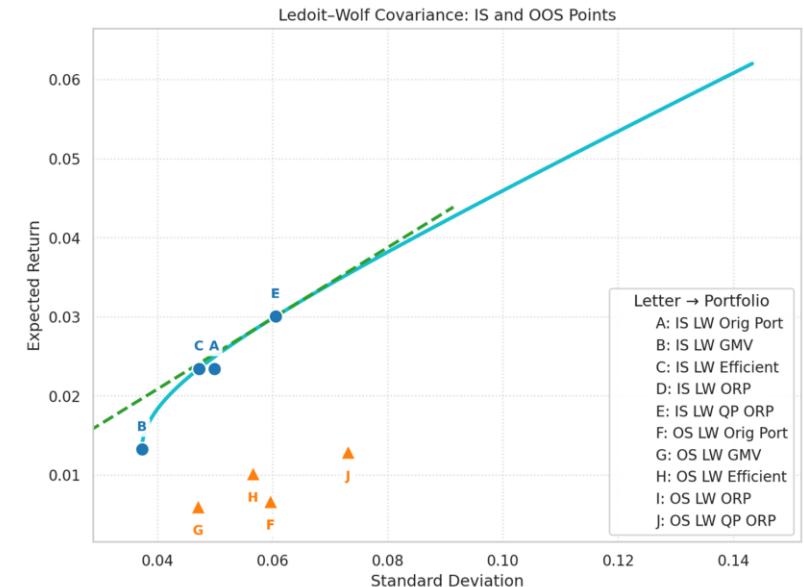
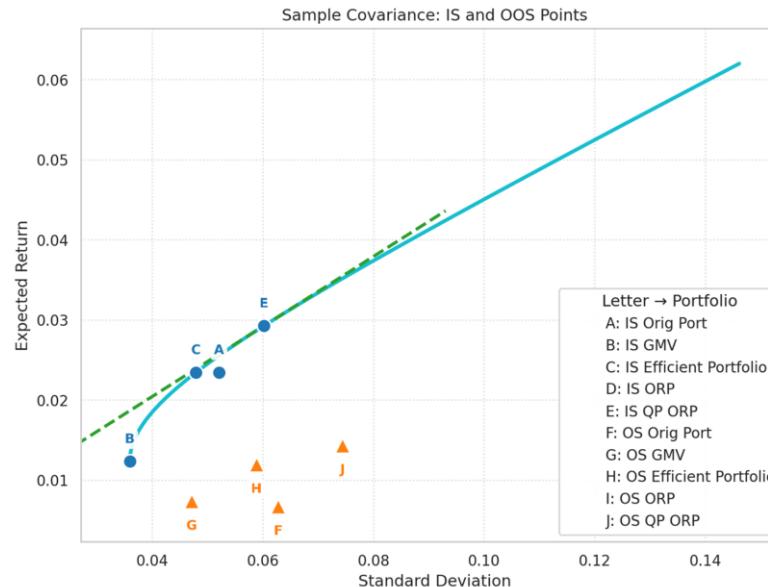


Returns

WEIGHTS	IS RETURNS	OS RETURNS
Original	$w^* \mu$	$w^* \mu$
GMV	$w^* \mu$	$w^* \mu$
EFPRT	$w^* \mu$	$w^* \mu$
ORP	$w^* \mu$	$w^* \mu$

Calculated with in-sample returns
x2 for LW

KEY FINDINGS



- IS portfolios look strong, but OOS performance drops: returns are lower and risk is higher
- This is due to estimation risk: weights fit to past data may not work on new data
- Ledoit-Wolf shrinkage helps a bit, but can't remove all risk from changing markets
- The more you update weights, the more you may pay in trading costs

LIMITATIONS

- User inputs
- Noise vs diversification
- Decrease in risk does not Increase alpha
- Constraints on weights

CONCLUSION

- In-sample looks great, does not translate to out-of-sample
- Shrinkage made weights smaller but did not always raise Sharpe
- Constraints matter and can push to corner solutions
- Other methods are needed to help mitigate overfitting and allow for generalization