INDEPENDENT PROJECT MILESTONE 2

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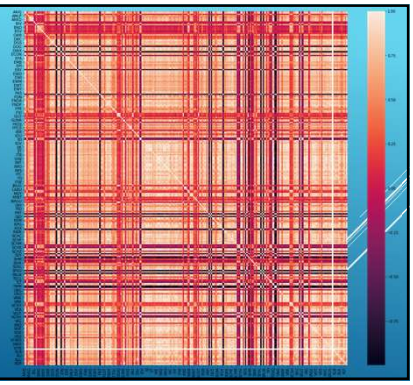
CORRELATION HEATMAP



COVARIANCE ESTIMATION

- Switched from sample covariance to Ledoit and Wolf shrinkage method
- Covariance matrix is unstable where number of assets is greater than the number of historical observations
- Need to ensure estimated covariance matrix is non-singular and positive definite
- Source: 691.pdf (upf.edu)

RETURNS HEATMAP

SUMMARY STATS

- **Assumes all assumptions hold*
- Annual expected return = $(1 + r_p)^t - 1 = 33.6\%$
- Annual expected risk = $x^T Q x \sqrt{t} = 30.2\%$
- Estimated alpha per unit risk = $\frac{\Sigma(r_a - r_b)}{\sigma_p} = 1.12$

REFORMING OPTIMIZATION INTO CONVEX PROBLEM

- Problem is a modified sharpe ratio problem: $\max_x \frac{\mu^T x - r_f}{\sqrt{x^T Q x}}$
- Reforming into a convex problem: $\min y^T Q y$
- Sources:
  https://people.stat.sc.edu/sshen/events/backtesting/reference/maximizing%20the%20sharpe%20ratio.pdf
  https://coral.ise.lehigh.edu/~ted/files/ie447/lectures/Lecture9.pdf