**Literature Review**

* 2020 A (4 ppl) - Incorporating a forward-looking factor model & diversification measure to Markowitz framework
  + Input
    - Expected return
      * Fama-French factor models
      * Option implied skewness
      * Sample estimation methods
    - Covariance
      * Option-implied volatility
      * Copulas estimation
      * Sample estimation
    - Linearly weighted the outcome from each methods and combine them altogether as the input to minimum-variance portfolio optimization
  + Optimization framework
    - Constraint on diversification by **maximizing** entropy
    - Constraint on risk → used ES (expected shortfall)
* 2020 B (2 ppl) - Dynamic asset allocation in a regime switching model of the economy
  + Input
    - Expected return
      * (HMM) Markov Regime Switching model - **2 regimes**
    - Covariance
      * Conditional variance matrix
  + Optimization framework adjustment
    - Traditional

*vs*.

* + - ES
* 2020 C (4 ppl) - Advanced markowitz optimization with time series momentum
  + Input
    - Expected return
      * Time-series momentum

*vs*.

* Black-litterman model
  + Investigated effects with different uncertainty matrices
  + Optimization framework
    - L1 regularizer (to achieve concentrated position to reduce transaction fees)

*vs*.

* + - Used CVaR (ES)
* 2021 (3 ppl) - A comparison of tail-risk hedging strategies
  + Compared optimization for 3 strategies
    - S&P 500 *vs*. passive (blend of equities, commodities, fixed incomes) *vs*. active tail-risk hedging
  + Optimization framework
    - Objective function
      * Compound annual growth rate (CAGR)
    - Constraints
      * CVaR
* 2022 A (3 ppl) - Portfolio Optimization with market regime classification using gaussian mixtures
  + Compared optimization for crisis-free vs. crisis (dot-com bubble, subprime mortgage crisis and 2020 covid crash)
  + Input adjustment
    - Expected return
      * Gaussian mixture - regime switching
      * ARIMA
    - Covariance
      * Conditional covariance
  + Optimization framework
    - Traditional
* 2022 B (3 ppl) - advanced minimum variance portfolio with robust covariance measure and CVaR
  + Input adjustment
    - Expected return
      * Fama-french 5 factor model (results were bad)
  + Optimization framework
    - Compared exponentially weighted sample covariance *vs*. Ledoit shrinkage covariance *vs*. robust gerber covariance
    - Stability improvement on covariance matrix
      * Reduced instability by noise
      * Reduced instability by signal
        + Nested cluster optimization (NCO) - K means algo on covariance matrix

Created sub-asset group

* + - * Added CVar constraints - CVar constraints on top of CVar constraint
* 2022 C (1 ppl) - Optimizing sparse mean-reverting portfolio
  + Kinda different hmmm…