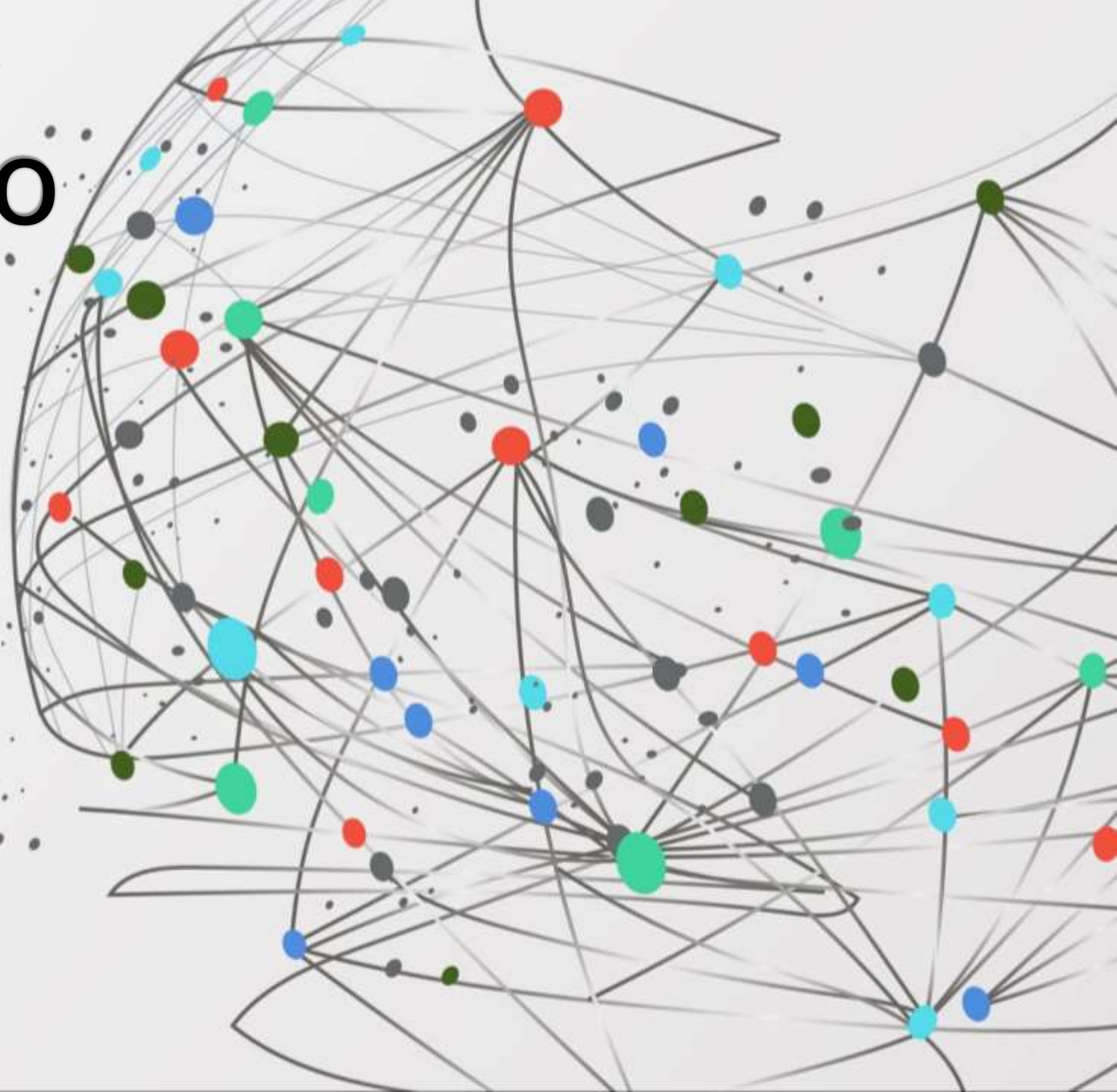


Model Portfolio Theory using Python



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What is Modern Portfolio Theory ?

- The **Modern Portfolio Theory (MPT)**, introduced by **Harry Markowitz in 1952**, is a foundational concept in finance that helps investors construct portfolios to **maximize returns for a given level of risk**.
- The theory emphasizes diversification, suggesting that by combining assets with different risk-return profiles, investors can build an efficient portfolio that lies on the *efficient frontier*, where no portfolio offers a higher expected return for the same or lower risk.
- MPT uses statistical measures like **expected return, standard deviation (volatility), covariance, and the Sharpe Ratio** to evaluate and optimize portfolios.
- The core idea is that **risk is not just about individual assets but how they interact with each other**, and a well-diversified portfolio can significantly reduce overall risk without necessarily sacrificing returns.

Changes that affects the graph

Effect of Changing the Start Date (Lookback Period)

- Alters the historical dataset used for analysis (price, returns, volatility).
- Log returns are recalculated based on the new time range.
- Covariance matrix is updated, impacting risk estimates.
- Leads to different optimal weight allocations by the optimizer.
- Result: Portfolio graph changes due to changes in historical behavior of assets.

Effect of Changing Constraints & Bounds

- Constraints ensure total weights sum to 1 (fully invested portfolio).
- Bounds restrict how much can be invested in each asset (e.g., 0% to 50%).
- Tight bounds force diversification across more assets.
- Loose bounds allow higher concentration in high-performing assets.
- Result: Bar graph reflects weight limits set — tighter bounds flatten distribution.