MV Portfolio Optimization

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Overview

INTRODUCTION

- Purpose of the presentation is to analyze stock market data and optimize portfolios.
- We will cover the importance of ETL (Extract, Transform, Load) processes in data analysis.
- Objective of portfolio optimization and its role in investment strategies.
- Demonstrates the effectiveness of the ETL process in maintaining data integrity and optimizing portfolio performance.
- The process involved extracting data from Yahoo Finance, followed by a comprehensive ETL procedure and analysis in R Studio.

ETL Process

Extract:

- Creation of database structures (e.g., custom calendar table)
- Importing data (e.g., EOD quotes and indices)
- Data retrieval in R (e.g., connecting to database, fetching data)

Transform:

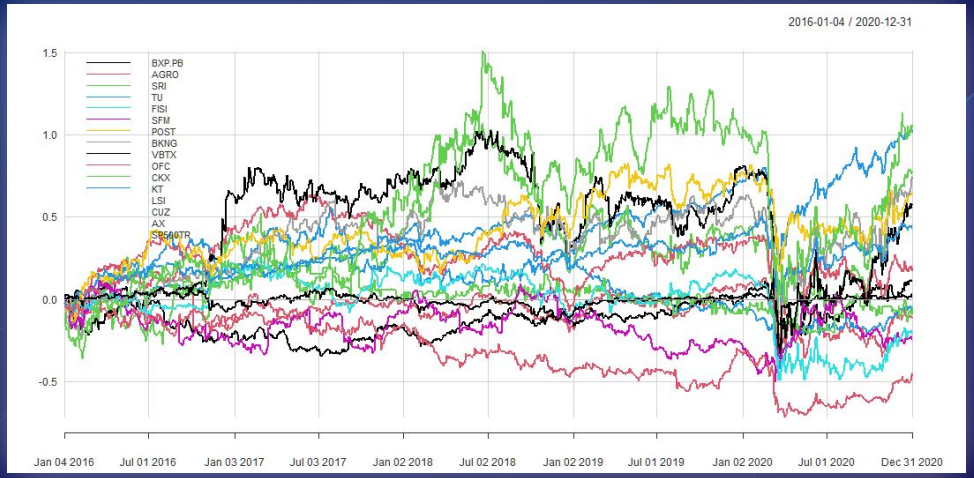
- Filtering and completeness checks
- Data transformation and merging
- Missing data imputation techniques

Load:

- Daily Returns
- Completeness Check for Daily Returns

Portfolio Optimization

- Import packages
- Define Training Range
- Define MAR
- Optimize portfolio
- Define testing range
- Back testing and compare with SP500TR



Portfolio Optimization

Data Preparation for Optimization:

- Setting up data for analysis (e.g., converting to xts objects)
- Splitting data into training and testing sets

Markowitz Portfolio Optimization:

- Methodology overview (risk-return optimization)
- Constraints and methodology (e.g., ROI optimization)
- Results and insights from optimized portfolio weights

Performance Evaluation: Testing and Evaluation

Applying Optimized Weights

- The weights indicate how much of the portfolio's total value is invested in each asset or security
- Determines the portfolio's overall performance and influence of the results
- TU, BXP.PB, and POST hold the highest weights in our portfolio which can positively or negatively affect it based on their returns
- Sum of weights is 1, meaning it's properly normalized

Table 2: Optimal Weights of the selected stocks

Stock	Weights
BXP.PB	0.2760
AGRO	-0.1226
SRI	0.1134
TU	0.3128
FISI	-0.2564
SFM	0.0225
POST	0.2194
BKNG	0.1397
VBTX	0.1227
OFC	0.0174
CKX	0.1247
KT	0.0216
LSI	0.0790
CUZ	-0.2111
AX	0.1410

Performance Evaluation: Annualized Returns

Calculating and Applying Annualized Returns

- SP500TR index had an annualized return of 29.87% vs 22.12% for the portfolio
- Portfolio has a 7% lower annualized return
- SP500TR has a higher STD deviation (16.23% vs 14.92%) meaning it is more volatile than the portfolio
- Both SP500TR and the portfolio are great investments as they have a Sharpe ratio > 1

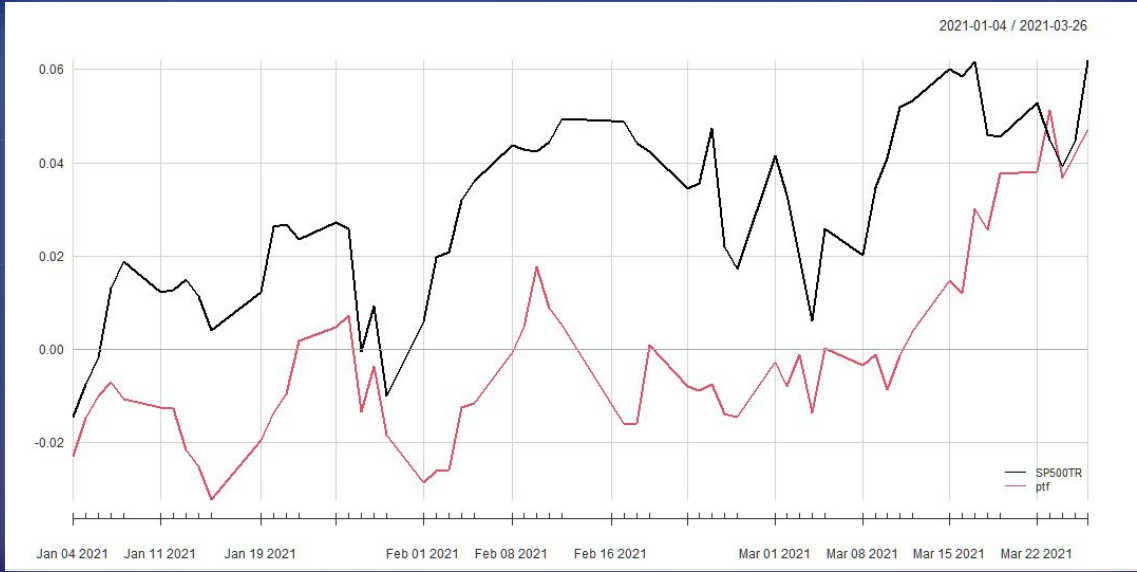
Table 3 : Annualized Returns

	SP500TR	ptf
Annualized Return	0.2987	0.2212
Annualized Std Dev	0.1623	0.1492
Annualized Sharpe(Rf = 0%)	1.8399	1.4820

Performance Evaluation: Cumulative Returns

Cumulative Returns Analysis

- The portfolio falls short of the SP500TR index with a 7% difference
- SP500TR is more volatile, but has superior performance
- Composition of the portfolio needs to be effectively balanced between risk and returns to enhance performance



Conclusion

Key Findings:

- The allocation of weights in a portfolio plays a crucial role in determining overall performance. For instance, TU, BXP.PB, and POST holds the highest weight in the portfolio, significantly influencing its returns
- The portfolio's predicted cumulative returns were lower than those of the SP500TR index, suggesting that the optimization model may need refinement for better results
- The optimized portfolio underperformed the SP500TR index, achieving an annualized return of 22.12% compared to 29.87% for the SP500TR. This highlights the challenge of consistently outperforming major market indices

Conclusion

Implications:

- Consistently comparing portfolio performance against benchmarks like the SP500TR index helps in evaluating the effectiveness of the investment strategy and making necessary adjustments
- High volatility stocks can offer high returns but come with increased risk. Investors need to balance their portfolios by including more stable investments
- The importance of diversification is highlighted by the varied performance of different stocks. Allocating weights effectively can mitigate risk and improve overall returns.

Conclusion

Future Directions:

- Extending the analysis period could provide more comprehensive insights into long-term performance and stability. Instead of looking into a three months period, we can instead forecast a year ahead
- Including other financial indicators and macroeconomic factors, such as interest rates and inflation, in the analysis could enhance the robustness and predictive power of the portfolio model
- Analyzing how the portfolio would have performed during historical market events can help to understand its resilience/robustness

Portfolio Return

High Volatility

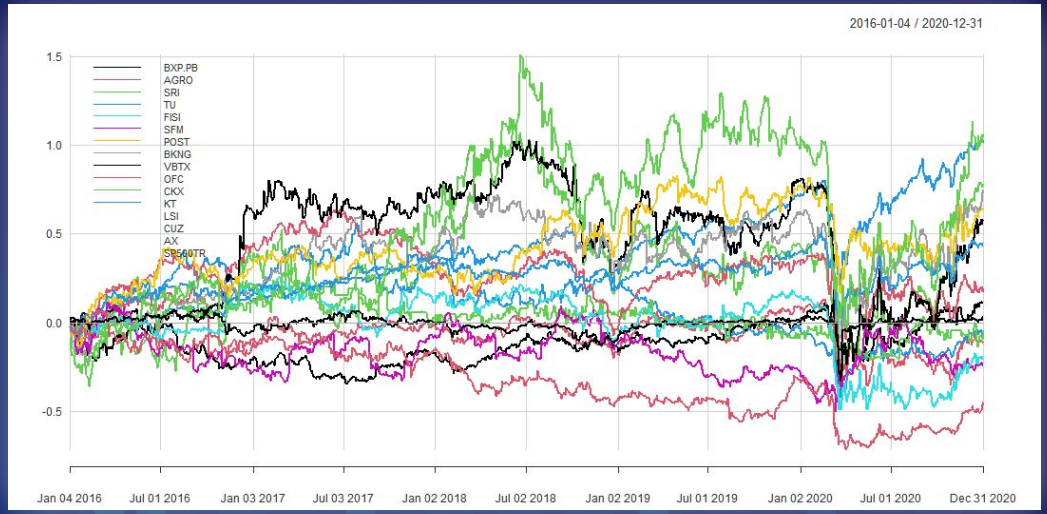
- Stocks like POST and AGRO have high returns but wide price fluctuations, indicating higher risk.

Low Returns

- Stocks like KT, OFC, and AX show minimal growth and underperformance with flat price trends.

Stable Investment

- Stocks like SRI and LSI are less volatile with moderate, consistent returns., consistent upward trends.



Conclusion

Key Findings:

- Summary of findings from data analysis and portfolio optimization

Implications:

- Practical implications for investment decisions
- Insights gained from the analysis process

Future Directions:

- Areas for further research or refinement

Portfolio Optimization: Data Preparation for Optimization

Setting up Data for Analysis:

- Converting to ‘xts’ Objects:
  - Data was converted ‘xts’ objects for time series analysis in R
- Splitting Data:
  - Training Set: Data from 2016-2020 was used for training
  - Testing Set: Data from January 2021 – March 2021 was used for training

Selected Tickers

Name of the Team Member	Ticker	Name of the Company
Keerthanaa Ellur	LSI	Life Storage Inc. Common Stock
	CUZ	Cousins Properties Incorporated Common Stock
	AX	Axos Financial Inc. Common Stock
Eduardo Mejia	POST	Post Holdings Inc. Common Stock
	BKNG	Booking Holdings Inc. Common Stock
	VBTX	Veritex Holdings Inc. Common Stock
Frank Meza Perales	OFC	Corporate Office Properties Trust Common Stock
	CKX	CKX Lands Inc. Common Stock
	KT	KT Corporation Common Stock
Arundhathi Roy	BXP.PB	Boston Properties Inc. Common Stock
	AGRO	Adecoagro S.A. Common Shares
	SRI	Stoneridge Inc. Common Stock
Annie Xu	TU	Telus Corporation Ordinary Shares
	FISI	Financial Institutions Inc. Common Stock
	SFM	Sprouts Farmers Market Inc. Common Stock

Thank You