

LITERATURE REVIEW FOR MODELS IN PORTFOLIO OPTIMISATION:

1. Multiple Linear Regression :-

- Multiple Linear Regression is one of the most traditional statistical methods employed in finance for portfolio optimization.
- MLR establishes a linear relationship between independent variables (such as asset returns, macroeconomic indicators, etc.) and a dependent variable (portfolio return).

2. Long Short-Term Memory Networks :-

- LSTMs, a type of recurrent neural network (RNN), have gained prominence for their ability to capture temporal dependencies in sequential data.
- This feature makes them particularly suitable for financial time series forecasting, which is integral to portfolio optimization.

3. Autoencoders:

- Autoencoders are a class of artificial neural networks designed to learn efficient representations of data.
- In the context of portfolio optimization, they can be utilized for dimensionality reduction and anomaly detection, enabling better feature selection and enhancing model robustness.

PROS AND CONS OF EACH MODEL:

1. Multiple Linear Regression :-

PROS:

- **Established Framework:** It forms the basis for many financial theories, particularly in risk-return analysis (e.g., Markowitz's Mean-Variance Optimization).
- **Efficiency:** Computationally less intensive compared to more complex models, allowing for quick analysis.

CONS:

- **Assumption of Linearity:** MLR assumes linear relationships, which may not hold true in real financial data.
- **Multicollinearity Issues:** High correlations between independent variables can lead to unreliable coefficient estimates.

2. LSTM:-

PROS:

- **Captures Temporal Dependencies:** LSTMs are adept at modeling sequential data, making them suitable for time series forecasting in finance.
- **Handling Non-Linearity:** They can model complex, non-linear relationships that traditional models may miss.

CONS:

- **Computationally Intensive:** Training LSTMs requires significant computational resources and time.

- **Overfitting Risk:** They can easily overfit the training data, especially with small datasets.

3. Autoencoders:-

PROS:

- **Dimensionality Reduction:** Autoencoders can efficiently reduce the number of features, improving model performance and reducing noise.
- **Anomaly Detection:** Useful for identifying outliers, enhancing risk management strategies.

CONS:

- **Complexity:** Requires careful tuning of architecture and hyperparameters, which can be challenging.
- **Limited Interpretability:** Similar to LSTMs, autoencoders are often viewed as black-box models, making it difficult to understand how decisions are made.

When selecting a model for portfolio optimization, it's essential to weigh these pros and cons in the context of specific goals, available data, and market conditions. Often, a hybrid approach that combines the strengths of these models may yield the best results.

DEFINING THE BASELINE MODEL:

By utilizing historical return data to generate expected returns and assessing the variance and correlation between assets, Multiple Linear Regression provides a simple yet effective framework for portfolio construction. As a baseline, MLR enables comparison with more sophisticated models like LSTMs or Autoencoders, where we can evaluate enhancement in predictive accuracy and portfolio performance.