



Coding Projects - Part 3

Value-at-Risk (VaR)



The Investment Fund ABC currently has a 1,000,000 USD position in the S&P 500 Index. The Risk Manager of the Fund wants to estimate the **tail risk** (extreme negative outcomes) of this position based on **historical data** (and forecasts). Calculate the **minimum loss** over a **one-day period** that will occur with **1% probability**: Use **Parametric** and **Historical** VaR-methods.

VaR Monte Carlo Simulations

The Investment Fund ABC currently has a 1,000,000 USD position in the S&P 500 Index. The Risk Manager of the Fund wants to estimate the tail risk (extreme negative outcomes) of this position based on historical data (and forecasts).

Simulate the **minimum loss** over a **period of one quarter** that will occur with **1% probability**:

Use the

- **Parametric** simulation
- **Bootstrapping** simulation



Conditional Value-at-Risk (CVaR)

The Investment Fund ABC currently has a 1,000,000 USD position in the S&P 500 Index. The Risk Manager of the Fund wants to estimate the tail risk (extreme negative outcomes) of this position based on historical data (and forecasts).

Simulate the **conditional expected loss** over a **period of one quarter** that will occur with **1% probability**:

Use the

- **Parametric** simulation
- **Bootstrapping** simulation



Dynamic & path-dependent Simulations

John (65) recently retired. He owns liquid assets worth 625,000 USD to cover life expenses during retirement. John's bank offers to pay a fixed monthly annuity of 2,635 USD for the next 30 years.

Alternatively, John evaluates a diversified Investment Portfolio with an expected long-term return of 0.5% per month with a monthly standard deviation of 2.5% (assume normality). John plans to withdraw 2,800 USD per month (minimum: 2200 USD).

Simulate/Calculate the risk of outliving his assets prior to his 95th birthday (longevity risk).

Formulate and simulate an appropriate path-dependent strategy that 1) lowers longevity risk to 10% or less, and, at the same time 2) further increases expected income.

