



Cbus Super Fund Risk Modelling Case

Prepared for Deloitte QFS Simulation

Executive Summary



This project simulates a Deloitte QFS client engagement to forecast drawdown risk and analyze portfolio VaR for Cbus Super Fund.



Predicts >5% drawdowns over 20 trading days using logistic regression.



Implements Parametric, Historical, and Monte Carlo VaR



Assesses diversified risk vs. single ETF risk profile

Business Problem

Super funds like Cbus exist to preserve and grow capital over decades, not chase short-term alpha. Their portfolios must support members' retirement needs 20 to 30 years into the future, making drawdown risk management far more critical than tactical gains. The client requires a data-driven solution to answer:

“Can we predict whether the portfolio will experience a drawdown of more than 5% over the next 20 trading days?”

“How good is diversified risk compared to single ETF risk profile?”

Deloitte Objective:

- 1) Predict >5% drawdowns in the next 20 days.
- 2) Implement VaR and ES to assess the risk of portfolio compared to single ETF.

Methodology

Drawdown Prediction Model (Classification-Based)

- **Target Variable:** Binary flag if future 20-day return $< -5\%$
- **Features:** Rolling return volatility, momentum indicators, moving averages
- **Model:** Logistic Regression
- **Validation:** ROC-AUC and Confusion Matrix

VaR & Expected Shortfall Estimation (Risk Quantification)

- **Portfolio Composition:** 7 ETFs diversified portfolio
- **VaR Models Implemented:**
 - - Parametric (Variance-Covariance)
 - - Historical Simulation
 - - Monte Carlo Simulation
- **Confidence Level:** 95%
- **Lookback period:** 252 Days
- **Comparative Analysis:** ETFs Portfolio vs. single ETF (IVV)

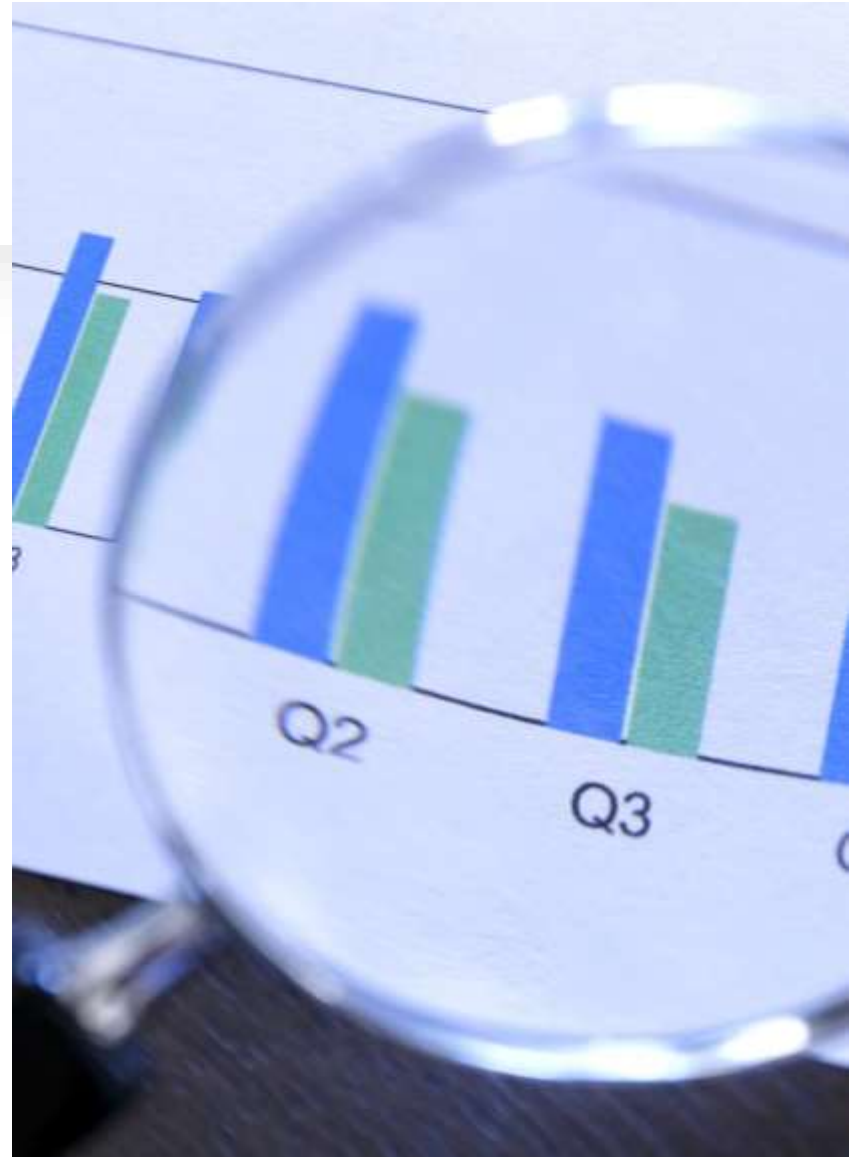
Model Evaluation: Drawdown Risk Forecasting

Model Results

- The model identified **13 true drawdown events** out of 13, with **46 false positives**.
- Sensitivity (Recall) = 100%, ensuring no major drawdown is missed.
- **Limitation:** Higher false alarm rate. Can be tuned using decision thresholds or regularization techniques.

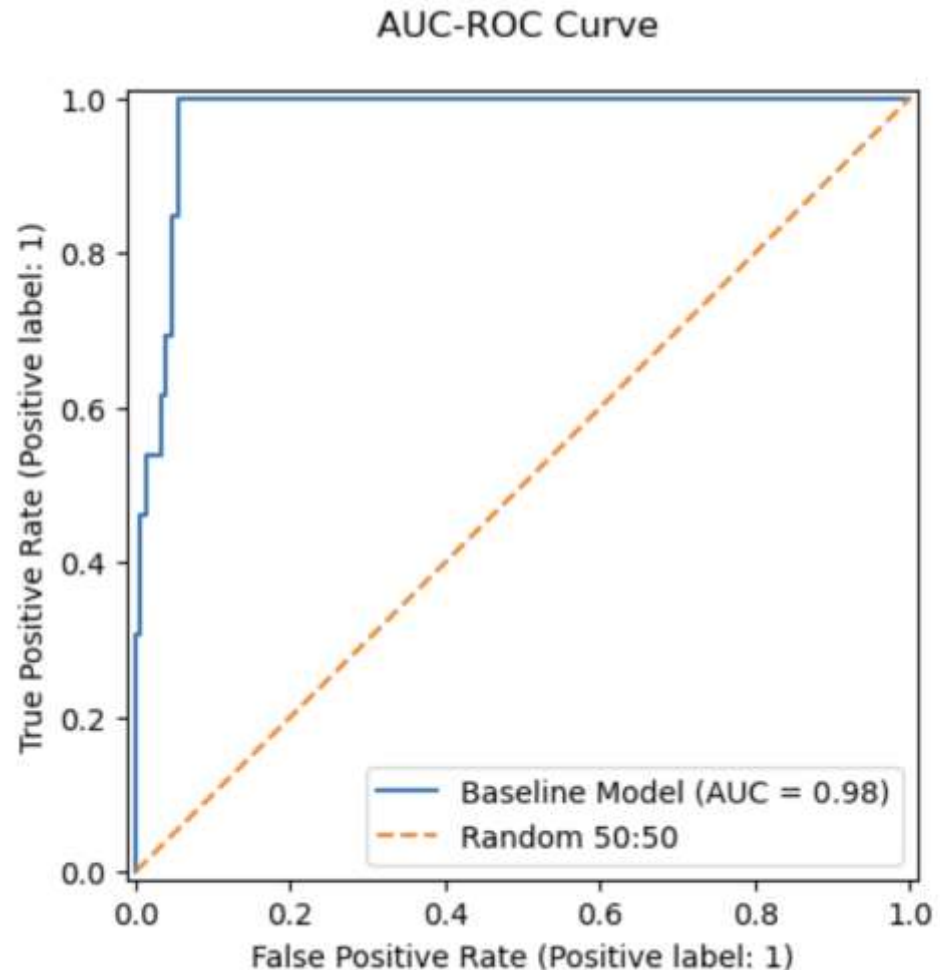
Business Insights

- Model Captured all drawdowns, enabling early warning with confidence.
- For Cbus, the model prioritizes member protection with high sensitivity suitable. It also supports fiduciary standards proactive and explainable risk mitigation decisions



Visual Outputs

- AUC of 0.98 indicates excellent predictive power.
- Enables early detection of high-risk drawdown periods.
- Supports Cbus's need for timely de-risking and capital preservation.



VaR & ES Model Evaluation

Model Results

Portfolio VaR and ES under 95% confidence level

- Parametric VaR : -0.0118 → Annualized: **18.76%**
- Historical VaR : -0.0076
- Monte Carlo VaR : -0.0077
- Expected Shortfall : -0.0108
- Annualized Parametric VaR: 18.76%

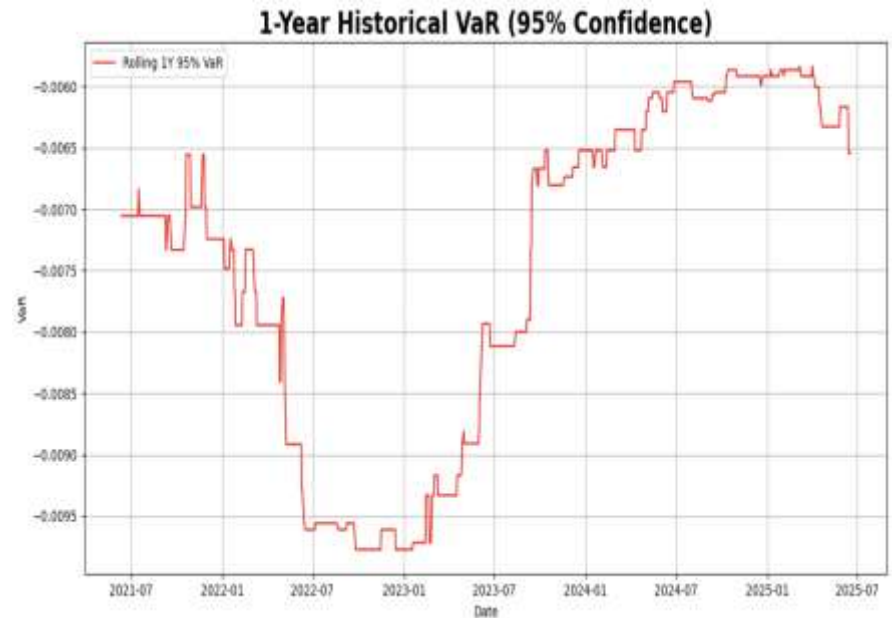
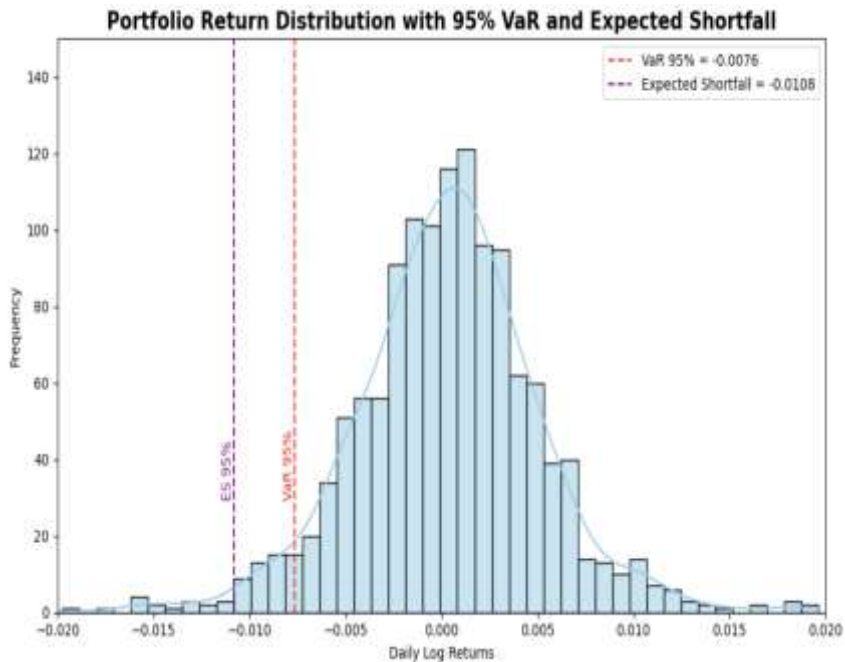
Single ETF (IVV) VaR and ES under 95% confidence level

- Parametric VaR : -0.0175
- Historical VaR : -0.0172
- Monte Carlo VaR : -0.0176
- Expected Shortfall : -0.0256

Business Insights

- Portfolio VaR < Single ETF VaR across all methods, which demonstrates effective diversification.
- Confirms the portfolio is not overly exposed to any single risk factor.
- Annualized risk metrics provide long-term insights aligned with superannuation governance and capital oversight.

Visual Outputs



Summary & Alignment with Deloitte QFS



Developed a forward-looking risk solution that detects >5% drawdowns with high recall (100%) and AUC of 0.98.



Delivered diversified VaR analysis to demonstrate portfolio stability and quantify downside exposure.



Designed the model to support Cbus's fiduciary responsibility: early intervention, transparent communication, and member-first protection.



This case shows how I bridge finance, mathematics, and client needs, which is, as a QFS analyst, delivers every day.