

Stress Testing Financial Models for Compliance

Compliance Scenario Engine

July 2, 2025

Introduction

Financial institutions are required to perform rigorous stress testing of their models and portfolios to ensure resilience under extreme but plausible scenarios. Regulatory frameworks such as the Comprehensive Capital Analysis and Review (CCAR) in the US and Basel III guidelines internationally mandate that banks demonstrate their ability to withstand economic shocks and market crashes.

Importance of Stress Testing

Stress testing helps in:

- Identifying vulnerabilities in portfolio allocations or model assumptions.
- Ensuring adequate capital buffers are maintained during crises.
- Satisfying regulatory requirements and avoiding penalties.

Scenario Generation using Correlated Factor Shocks

A realistic approach to stress scenario generation involves shocking key macroeconomic or market factors in a correlated way, rather than independently. This better captures systemic risk and contagion effects.

Algorithm Steps

1. **Identify Key Factors:** Select economic or financial factors such as equity returns, interest rates, credit spreads, or GDP growth.
2. **Estimate Factor Correlations:** Use historical data to compute the covariance matrix among these factors.
3. **Generate Shock Vectors:** Draw extreme shocks from a multivariate normal distribution using the estimated covariance, or specify deterministic extreme values.

4. **Apply Shocks:** Adjust model inputs or portfolio returns using these shocks to evaluate impacts.
5. **Evaluate Metrics:** Compute portfolio value changes, Value-at-Risk (VaR), Expected Shortfall (ES), or model prediction drift.

Conclusion

Systematic scenario generation and impact analysis help institutions prepare for adverse conditions, enhance risk governance, and maintain compliance with regulatory stress testing requirements.