

# Pheneas Newman

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## Projects & Research | [Portfolio](#) |

### quantitativelib (Open-Source Library) - [PyPI page](#)

- Implements price and returns analysis, Black–Scholes pricing, Greeks, stochastic models (GBM, CIR, Heston, OU, Merton jumps), SDE solvers, and GARCH-based VaR backtesting.
- Built around a single high-level function that fetches data, runs analysis, and produces plots in one call.
- Designed to expose both one-line analysis workflows and underlying reusable components for pricing and simulation.

### Bayesian Regression for Financial Forecasting - [PDF](#)

- Developed a rolling-window Bayesian regression model for SPY returns (2014–2024, 2,700 observations) using Laplace shrinkage priors and a Student-t likelihood.
- Performed one-step-ahead forecasting with **252-day** windows via 10,000-step ADVI; achieved **RMSE 0.0112**, **MAE 0.0073**, and **53.5% directional accuracy**.
- Used posterior uncertainty to construct probabilistic signals and assessed their out-of-sample stability relative to OLS and Ridge under identical rolling-window evaluation.

### Volatility Forecasting Models - [PDF](#)

- Built and validated GARCH-family and EWMA models in R; evaluated forecasts with Value-at-Risk exceedances.
- Automated rolling forecasts and visualised results in ggplot2.
- Found standard GARCH and EWMA performed poorly in likelihood and backtesting; EWMA failed VaR coverage tests, and GARCH underperformed in low-volatility regimes (violation ratio  $\approx 0.4$ ).
- Identified GARCH models with Student-t and skewed Student-t innovations as the strongest performers, consistently passing VaR backtests and producing reliable volatility forecasts for risk management.

### Reinforcement Learning for Vessel Collision Avoidance - [Repository](#)

- Designed a custom Gym-style environment in Python for multi-agent navigation.
- Implemented DDPG and TD3 agents in PyTorch; tuned reward function coefficients with Optuna.
- TD3 model achieved success rate of **90.35%** with a collision rate of **3.65%**.

### Online Option Pricing Calculator - [Link](#)

- Implemented European option pricing using closed-form Black–Scholes formulas with analytical Greeks.
  - Priced American options via a recombining binomial tree with early-exercise logic.
  - Implemented cash-or-nothing binary options using closed-form risk-neutral pricing.
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## Education

### London School of Economics

Sept 2024 – July 2025

#### MSc Quantitative Methods for Risk Management — Distinction

### Queen Mary University of London

Sept 2019 – July 2024

#### BSc Mathematics with Actuarial Science — First Class Honours

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## Technical Skills

- **Programming:** Python (Pandas, PyTorch, TensorFlow, PyMC, scikit-learn), C++, R (rugarch, copula, ggplot2).
- **Quant Finance:** Derivatives pricing, Greeks, stochastic processes, martingales, volatility modelling, GARCH/ARMA, VaR & Expected Shortfall.
- **Tools:** Git/GitHub (PyPI publishing), LaTeX, Typst, Excel (Certified Specialist), Vim, VS-Code, VS.