ARGHYA GHOSH

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RESEARCH PROFILE

Quantitative researcher with a strong mathematical foundation and over a decade of experience developing, validating, and stress-testing statistical and stochastic models for complex financial systems, including derivative pricing and securitized product valuation. Research interests lie at the intersection of stochastic modeling, risk dynamics, macro–financial systems, and climate-linked uncertainty, with an emphasis on interpretable, theoretically grounded models deployable at scale.

PROFESSIONAL & RESEARCH EXPERIENCE

Vice President, Quantitative Research — JPMorgan Chase & Co. *August 2021 – Present*

- Led the end-to-end development of stochastic pricing and risk models for CRE, CMBS, and structured products used in regulatory stress testing (CCAR, CECL) and internal risk frameworks.
- Built option-adjusted spread (OAS) and cashflow-waterfall/tranche pricing models for CMBS securitized products, translating collateral-level cashflow and prepayment dynamics into structural tranche valuations.
- Designed and implemented the ongoing monitoring framework for all models of CRE, CMBS and SPG domain.
- Established performance monitoring thresholds and escalation triggers across all CRE models, strengthening early-warning capability and supporting proactive model governance.
- Designed and implemented the integrated back-testing framework for all risk models of CRE, CMBS and SPG domain.
- Developed obligor/collateral grading models to support risk rating assignment and portfolio segmentation across CRE and structured product portfolios.
- Built prepayment models to capture borrower refinancing and payoff behavior, improving the accuracy of cashflow projections and loss estimation across CRE and CMBS portfolios.
- Designed macro-linked interest rate and structural models, improving coherence between scenario generation and asset-level valuation across portfolios.
- Developed a scalable Python-based computational pipeline for the CRE Loss Engine, reducing runtime by ~35% and enabling cross-portfolio experimentation.
- Conducted systematic model performance monitoring and benchmarking, strengthening stability, robustness, and regulatory defensibility.
- Performed metrocode-level clustering on rent and land-share metrics to uncover predictive geographic variables for default and loss models, improving segmentation and model discriminatory power.
- Built climate risk models integrating physical, transition, and market risk channels, applied across 10,000+ collateral records.
- Developed many machine learning–based forecasting and PD/LGD frameworks, improving predictive accuracy while maintaining interpretability.
- Proposed a novel NOI volatility framework using a two-barrier Merton-type model, enhancing scenario realism and loss estimation.
- Designed analytical tools adopted across Quantitative Research, Model Risk, and Risk Strategy teams.
- Part of Quantum Inspired Algorithm (QIA) working group of the JP Morgan Quantitative Research team.

Senior Associate, Model Risk Management — Morgan Stanley *October 2019 – August 2021*

- Validated AIRB/IRB, CCAR, and CECL credit risk models for large-scale portfolios, including Residential Mortgage, CRE, and structured products.
- Evaluated scenario construction, macroeconomic factor expansion, and attribution models, reducing uncertainty and improving model interpretability.
- Created a benchmark model using fractional Brownian motion to capture the loss impact where independent increment assumptions were failing.
- Led performance monitoring, backtesting, and challenger model development, strengthening governance and empirical robustness.
- Automated validation workflows and analytical tools, reducing manual intervention and improving reproducibility.

Associate, Model Risk Management — Credit Suisse *July 2016 – October 2019*

- Validated stress-testing and scenario-generation models, including Brownian Bridge–based frameworks and PPNR systems.
- Validated multiple market risk models, including IRC, VAR and expected shortfall frameworks.
- Reviewed pricing and hedging models incorporating Heston stochastic volatility and dynamic hedging assumptions.
- Independently re-implemented and benchmarked derivative pricing models — including credit derivatives (CDS, synthetic CDO/index tranches) and equity derivatives (vanilla and exotic options, structured notes) — against desk valuations to identify calibration and model-risk discrepancies.
- Applied explainable ML techniques to improve transparency in complex forecasting and credit risk models.
- Streamlined data pipelines and validation processes, reducing review timelines significantly.

Statistical Programmer — inVentiv Health *April 2011 – March 2012*

- Constructed clinical trial datasets integrating longitudinal patient indicators and treatment histories.
- Performed exploratory and inferential statistical analyses supporting regulatory submissions.

Assistant System Engineer — Tata Consultancy Services *May 2010 – April 2011*

- Developed automation and configuration management tools for enterprise systems.
- Built Unix-based scripting workflows to improve operational reliability.

PROJECTS

ALGO LAB — Quantitative Portfolio Management Platform *2025*

An end-to-end, institutional-grade quantitative portfolio pipeline for NSE-listed equities and ETFs, built entirely from scratch and deployed as a live web application. The platform covers the full investment process — from universe screening to final trade weights — with strict out-of-sample discipline to prevent look-ahead bias.

- Designed a 4-step pipeline: Universe Screener → Parameter Tuning → Walk-Forward OOS Backtest → Final Portfolio Weights, operating on ~115 NSE stocks and ETFs across 11 asset classes.
- Implemented three portfolio construction algorithms: QUBO (quantum-inspired combinatorial optimisation via simulated annealing + Max-Sharpe MVO), HRP (Hierarchical Risk Parity with Ward clustering and recursive bisection), and Robust CVaR (uncertainty-aware optimisation with ellipsoidal robustness penalty).
- Applied Ledoit-Wolf covariance shrinkage and James-Stein mean shrinkage to stabilise parameter estimates on limited historical data.
- Built a walk-forward backtesting engine with configurable train/validation/test splits, ensuring parameters are never chosen on held-out test data.
- Developed three hedge overlays: Beta-Neutral (Nifty 50 beta hedge), Drawdown-Triggered (hysteresis-based activation), and Put Protection (Black-Scholes priced insurance).
- Implemented multi-factor universe screener with liquidity, momentum, RSI, volatility band, sentiment (LM dictionary on Google News RSS), and fundamental (P/E, D/E, ROE) filters.
- Deployed as a live application on Railway cloud infrastructure.

Robust Kelly-Criterion Portfolio Optimization Under Mean-Reversion Uncertainty *Ongoing — Personal Research*

Independent research project, pursued out of personal interest, developing a robust Kelly-criterion allocation framework for long-horizon investors when a predictive state variable (bond yields, valuation ratios, risk premia) exhibits mean-reverting dynamics with an uncertain, time-varying mean-reversion speed.

- Deriving a state-dependent Kelly fraction that decomposes myopic exposure from posterior-driven intertemporal hedging demand, extending the Wachter/Kim–Omberg framework to a stochastic mean-reversion speed.
- Designing a Wasserstein-ambiguity, downside-constrained allocation rule that calibrates robustness endogenously to posterior parameter uncertainty and a hard wealth floor.
- Currently building out the empirical estimation pipeline (U.S. Treasury yields, S&P 500 CAPE, macro covariates) for out-of-sample backtesting.

EDUCATION

Quantum Computing Certification — Indian Institute of Technology (IIT) Delhi *June 2025 – February 2026*

Key Coursework: Quantum Mechanics for Computing, Qubit Systems and Quantum Gates, Multi-Qubit Systems & Entanglement, Quantum Circuits and Measurement, Quantum Algorithms (Grover, Quantum Phase Estimation, Quantum Amplitude Estimation), Quantum Error & Noise Models, Quantum Machine Learning (QCML), Variational Quantum Algorithms (VQE, QAOA), Quantum Complexity & Speedups, Introduction to Qiskit and Quantum Programming.

M.Sc. in Applied Mathematics — Chennai Mathematical Institute (CMI) *July 2014 – April 2016*
Key Coursework: Measure Theory, Real Analysis, Topology, Probability Theory, Stochastic Processes, Stochastic Calculus, Time Series Analysis, Statistics.

Bachelor of Engineering — National Institute of Technology (NIT) *July 2006 – April 2010*
Key Coursework: Thermodynamics, Heat Transfer, Refrigeration & Air Conditioning, Internal Combustion Engines, Fluid Mechanics & Fluid Dynamics, Turbomachinery, Strength of Materials, Theory of Machines, Engineering Mathematics, Numerical Methods, Control Systems, Manufacturing Processes, Mechanical Measurements & Instrumentation, Engineering Drawing and Design.

PUBLICATIONS

Quantum Amplitude Estimation for Expected Loss Computation Under a Discretized Latent-Factor Model
Co-Author | With Dr. Ramesh Bhavisetti | Published January 2026 | DOI: 10.36948/ijfmr.2026.v08i01.67306

- Designed a quantum algorithm for credit portfolio expected loss estimation using discretized latent-factor modeling.
- Embedded loss functions via controlled rotations and applied Grover-based amplitude amplification.
- Demonstrated quadratic speedup over classical Monte Carlo methods.

Published in Volume 8, Issue 1, January–February 2026; also in SSRN, Computational & Applied Mathematics eJournal – CMBO.

A Unified Risk-Neutral Stochastic Simulation Framework for Securities-Backed (Lombard) Lending
Co-Author | With Dr. Ramesh Bhavisetti | Published February 2026

- Developed a risk-neutral stochastic framework for modeling the market–credit interaction in securities-backed lending.
- Modeled structural wrong-way risk via LTV-dependent Cox default intensity.
- Endogenized recovery and LGD through collateral dynamics and liquidation haircuts.
- Implemented a reproducible Monte Carlo simulation study with market-consistent calibration.

Published in Volume 8, Issue 1, January–February 2026.

CONFERENCES

- Delivered internal presentations at Morgan Stanley on machine learning explainability methodologies for financial risk models. (2019)
- Presented initiatives at J.P. Morgan on Quantum-Inspired Algorithms and their relevance to large-scale financial computation. (2025)

RESEARCH & TECHNICAL SKILLS

Mathematical & Statistical Foundations: Stochastic Calculus · Probability & Measure Theory · Time Series Analysis · Econometrics · Optimization · Numerical Methods · Monte Carlo Simulation

Modeling & Machine Learning: Statistical Learning · Forecasting Models · PD/LGD Modeling · Cashflow Modeling · Scenario Design · Explainable ML (SHAP, LIME)

Quantitative Finance & Risk: Derivative Pricing Models (IR, FX, Credit, Equity) · OAS & Tranche Valuation · Market, Credit & Liquidity Risk · CCAR & CECL Stress Testing · Structured Products · CRE/CMBS Modeling

Programming & Scientific Computing: Python · R · MATLAB · SAS · SQL · VBA

Emerging Domains: Climate & ESG Risk Modeling · Quantum Computing (Foundational Concepts)

LANGUAGES

English (Proficient) | Hindi (Proficient)