Cross-Disciplinary Integration of Quantum Computing in Economics and Finance

Cem Fotocan
American Collegiate Institute

***Abstract*—The convergence of quantum computing and economics represents a frontier in computational social science, promising to transform the modeling of uncertainty, complexity, and interdependence in financial and macroeconomic systems. This study explores how quantum computing methodologies—particularly quantum annealing, variational algorithms, and hybrid quantum–classical frameworks—can be integrated into Dynamic Stochastic General Equilibrium (DSGE) modeling, stochastic simulations, and systemic risk analytics. By focusing on collaborative university–industry partnerships, the paper examines mechanisms that accelerate translational research, facilitate scalable experimentation, and bridge theoretical quantum advances with applied financial modeling. The analysis highlights how quantum-enhanced algorithms can improve the tractability and precision of multidimensional optimization problems inherent in macroeconomic forecasting and risk estimation. It also emphasizes the institutional value of joint academic–industrial infrastructures in fostering data sharing, interdisciplinary education, and early adoption of post-classical computing in finance. The findings suggest that hybridized quantum frameworks can substantially advance decision sciences, enabling resilient and adaptive economic systems capable of responding to global shocks with greater computational foresight.**

The increasing volatility of global markets, the expansion of interconnected financial systems, and the growing complexity of economic interactions have rendered traditional computational models insufficient for capturing systemic dynamics [5]. Economists and financial engineers are increasingly constrained by the computational bottlenecks of classical simulation methods—particularly in solving nonlinear, high-dimensional problems such as those found in Dynamic Stochastic General Equilibrium (DSGE) models and large-scale risk analytics [6]. As economies become more data-rich yet structurally uncertain, there is a critical need for computational paradigms that transcend conventional algorithmic limitations. Quantum computing, with its foundation in superposition, entanglement, and quantum parallelism, offers a transformative framework for reimagining the analytical foundations of economics and finance [2].

Quantum methodologies are particularly well-suited to address the multidimensional optimization challenges pervasive in economic modeling [9]. Quantum annealing and hybrid variational algorithms can efficiently explore massive solution landscapes, allowing for more robust calibration of DSGE parameters and faster convergence in stochastic simulations. Such capabilities enable economists to

Digital Object Identifier 10.62802/zar9yr94
Date of publication 19 11 2025; date of current version 19 11 2025

