

Economics and Game Theory

Faculty Collaborators

J. Zhu (Mathematics, Univ Texas Arlington)
L. Sage (Economics, Baldwin Wallace Univ)
K. Shepard (Economics, Univ of Akron)
C. B. Clemons (Theoretical and Applied Mathematics, Univ of Akron)
M. Ferrara (Theoretical and Applied Mathematics, Univ of Akron)
T. S. Norfolk (Theoretical and Applied Mathematics, Univ of Akron)

Graduate Students – Masters Theses Directed

Jinglu Li
Joe Tucker

Undergraduate Students – Honors Projects Directed

Jackie Foust
Joe Tucker

Graduate Students – Masters Theses In Progress

Sandra Addo
Erin McGough
Diana Macavei
Sara Rollo
Mary Zitnik

Undergraduate Students – Honors Projects In Progress

Denielle Ricciardi
Sara Rollo
Mary Zitnik

Overview of Current Investigations

We examine exact, asymptotic and numerical solutions to two-factor option pricing partial differential equations with variable interest rates or arbitrage returns. Two interest rate models, the Vasicek model and the Cox-Ingersoll-Ross model (CIR) are considered. Exact solutions for the Vasicek model with stock option or convertible bond portfolios are derived. Asymptotic and numerical option pricing results for both models are compared in the context of both equilibrium and non-equilibrium financial settings. For the numerical simulations emphasis is placed on systematic implementation of the boundary conditions.

In the area of macroeconomic growth theory we are investigating a four-sector economy, consisting of production, production education, health education and leisure. We use a Hamiltonian maximization technique to determine daily time allotments between the four sectors that maximize utility defined as a combination of consumption and leisure. Logistic equations are defined to describe the technological, life-span, and productivity growth curves.

Game theoretic models are being developed to examine the optimal offensive and defensive strategies for football teams in the Mid-American Conference, to determine optimal, environmental quality control practices between an environmental regulator and a potentially polluting firm, and to examine one-to-one promotions of products between competitive firms when the consumer values both the price and quality of the product. A two-player game theory (zero-sum in football and non-zero sum for the others) framework is used in each case. Payoff functions are defined in all cases. The best-response functions to each game are analyzed and the optimal “production” levels are determined.

Publications

1. “Solutions of Two-Factor Models with Variable Interest Rates”, J. Li, C. B. Clemons, G. W. Young, and J. Zhu, *Journal of Computational and Applied Mathematics*, Vol. 222 (2008), pp. 30-41.