Boston College
Department of Economics
Economics 319
Frontiers of Economic Science and Global Financial Markets
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Books for Course:

Thomas Friedman, *The Lexus and the Olive Tree*. 2000. Bantham Books.

Duane Hanselman and Bruce Littlefield, *Mastering Matlab 6*

Philip Hans Franses and Dick van Dijk, *Non-Linear Times Series Models in Empirical Finance*. Cambridge University Press, 2000.

Paul McNelis, Neural Networks and Genetic Algorithms: Forecasting Risk and Returns in Globalized Financial Markets. Manuscript in Preparation.

Scope of the Course:

This course is about the empirical significance of "globalization" for decision making in international financial markets. . While there has been much discussion of the politics and policy implications of globalization, too little attention has been paid to the challenges and opportunities of globalization in financial markets, for "operational" empirical work and decision-making in Economics and Finance.

Too often, we think "linearly", and we think of "shocks" as simply normally distributed random deviations around a steady state, or at most, as a moving average or autoregressive process with normally distributed innovations. Similarly, risk is usually measured as "variance" or "standard deviation". Investors try to maximize the mean of their returns while trying to minimize the variance.

We shall see that there are very compelling reasons for using this "linear" and "normal" (or Gaussian) framework. Solutions are exact and quick to obtain.

However, there are important reasons to question this linear and Gaussian "world view". For one thing, risk is not variance, no one is at risk of winning the lottery! Similarly, shocks emanating and spreading through international financial hardly represent small random deviations around a steady state. Just ask anyone from Indonesia, Korea, or Thailand if the 1997 "crisis" was a random, normal shock to their financial markets.

Fortunately, there has been progress in other disciplines about how people make "learn" and make decisions, in response to external stimuli. Much of this work comes from the "Artificial Intelligence" (AI) discipline, particularly on artificial neural networks and genetic algorithms.

My goal in this course is to show how advances in these fields may be made operational for more effective decision making in globalized financial markets.

By definition, operational empirical work involves computational analysis and measurement. How significant, for example, are "contagion" or "spillover" effects from one emerging market to another? Programs in Matlab will be made available for students to do this type of analysis, by making use of recent advances in non-linear econometrics and "artificial intelligence".

Grading and Debate Format: There will be regular written assignments, involving computation empirical analysis. However, a good part of the grading will depend on the quality of the exposition and "accessibility" of the results to a broader policy analysis.

There will be several debates in class, in which students will be required to present defend their results. Members of the class will be called up to criticize the results and policy implications being presented by individual students.

Assignments	50%
Debates	25%
Exam	25%.

Exams:

There will be a "practice" exam in October, and a "real" exam in November. The major part of the course grade will depend on the written assignments as well as on the quality of the "debates".

Description of the Course

First and foremost, this course is about analysis and communication. There will be exercises for computational implementation and for reporting what you have learned. There is a lot of truth in the statement used among Jesuits, *if you have not taught it, you don't understand it.* The ultimate test of what one writes is simple: can someone learn something useful from the paper? Easily? Remember, the readers see only what one writes, not what one means to say. So it must all be there, and be accurate. Make papers short, to the point, and above all, reader friendly.

Class time and course work will be divided in the following formats:

- lecture,
- group work and work with the ta on Matlab, and
- group directed discussion and debates between groups

Since assignments will include reading assignments, the lecture will serve to elaborate on and clarify the readings.You will be expected to complete the reading assignment by the first class meeting of each week, where you often be called upon to give a short summary of the readings.

During group directed discussion, you will be expected to report on your group's progress/difficulties and ask questions about the material on the assignment.

The purpose of working in groups on Matlab is twofold. First, by sharing ideas you will be able to learn from each other, allowing you to clarify what you get out of the lecture and reading. and . Second is to get you accustomed to working with other people, a likely situation in your future jobs.

The goal for an assignment is to get each group member to understand the entire assignment, do the computational work in teams, and assess the work of each other. Sometimes, people make type errors and come up with strange results, and it is good to have peers catch these results!

. Frequently a major part of an assignment will be to summarize the various components. In order to do this you will need to understand the entire assignment. However, the writing and presentation of the short papers should be individual work.

Course Outline

I. Defining Globalization: Thomas Friedman
   A. Globalizaiton then and now
   B. Policy Implications: the "golden straitjacket"
   C. Learning and the "electronic herd"

[Read Friedman's book and summarize his key points, particularly on the "straitjacket" and the "herd"

II. Classical Econometric Analysis
   A. Assumptions of the models
   B. Use of models
   B. Evaluation of models

[Read my first chapter, as well as Chapters 1 and 2 in Frances and van Dijk]

III. Intermediate Step: The GARCH Model
   A. Rationale of non-linearity
   B. Problems of GARCH
   C. GARCH in Mean and Multivariate GARCH in Mean
   D. Limits of "stochastic volatility"

[Chapter 4 in Frances and van Dijk]

IV. Neural Network
   A. What is a neural network?
   B. How does one design a network?
   C. How does one evaluate a network?

[Chapters 2 in my book, Chapter 5 in Frances and van Dijk]

V. Estimation of a Neural Network
- A. Quasi-Newton methods vs. backpropogation
- B. Global solutions with the genetic algorithm
- C. Hybrid methods

[Chapter 3 in my book]

VI. Applications of Neural Networks
- A. Forecasting inflation
- B. Forecasting spill-over effects in markets
- C. Forecasating "shapes"

[Reading: "The Effect of the Japanese and US Share Markets on the All Ordinaries: A Comparison of Three Models", in *International Journal of Finance and Economics*, 1998.

VII. Optimal Portfolio Analysis and Risk
- A. Traditional mean/variance analysis
- B. Alternative definition of risk
- C. Optimal portfolio analysis for different definitions of risk

VIII. Forecasting Loan Default and Bank Failures
- A. Logit/Probit Models
- B. Comparison of Linear Models vs. Logit Probit Models

[Readings: Chapter in manuscript]

IX. Pricing Risk and Options under High Volatility
- A. Black-Sholes Model and Call/Put Options
- B. Options with stochastic volatility
- C. Options with jump diffusion

[Application: pricing risk under high volatility]
[Notes to be distributed]