

Trading, Investment and Risk Management

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Introduction

This series of lectures focuses on the application of econometric techniques in modern financial markets. The purpose of the course is to help the participants understand how econometrics is used by financial professionals rather than on the development of state of the art econometric tools. For this reason, the emphasis will primarily be on financial applications including trading models, investment models, and risk management applications.

The course is designed in a sequence of lectures that relate to specific markets, on the one hand, and specific techniques, on the other. This sequence is described in the following table.

Lecture	Market	Technique(s)
Monday	Foreign Exchange	Univariate Directional Model
Tuesday	Equities	Multivariate Portfolio Optimization Models
Wednesday	Fixed Income - 1	Valuation Principles
Thursday	Fixed Income - 2	Risk Analysis
Friday	Options	Valuation and Risk Analysis
Saturday	Volatility Forecasting	Evaluation Procedures

The course will presume that participants have a basic knowledge of finance and investment theory. Introductory texts relating to these materials include:

Alexander, Carol (ed.) The Handbook of Risk Management and Analysis (Wiley, 1996)
Dowd, Kevin, Beyond Value at Risk (Wiley, 1998)
Fabozzi, Frank J., Valuation of Fixed Income Securities (Frank Fabozzi and Associates, 1994)
Grabbe, J. Orlin International Financial Markets (Third edition, Prentice Hall, 1996)
Jorion, Phillipe, Value at Risk (Richard D. Irwin, 1997)
[RiskMetrics](#) Technical Document , 4th edition, JP Morgan
Sharpe, William F., Gordon J. Alexander, and Jeffrey V. Bailey, Investments Sixth edition, Prentice Hall, 1999)
Taleb, Nassim Dynamic Hedging: Managing Vanilla and Exotic Options (Wiley, 1996)
The course will also assume familiarity with Microsoft Excel.

Lecture 1: The Foreign Exchange Market

A. *Directional Rules for Major Currencies.*

This class will be concerned with econometric tests of the efficiency of the foreign exchange forward market. Topics will include:

- Do exchange rates follow a random walk?
- Interest rates and currency returns
- Technical analysis and non-linear dynamics
- The ARCH-GARCH currency trading model.
- Position Implementation and Performance Analysis.

Lecture Notes:

John Bilson, "The Non-Linear Dynamics of the Exchange Rate."

Example:

The Dollar/Yen Exchange Rate

Class Exercise:

The Lira/Mark Exchange Rate.

B. *Devaluation Analysis*

Many smaller countries adopt foreign exchange policies which involve fixing their exchange rate to that of a major currency. In this class, we will be concerned with forecasting the breakdown of such a system.

- What are the underlying causes of financial crises
- The probability of a currency crisis
- Alternative measures of fundamental currency valuation
 - Purchasing Power Parity
 - Monetary Parity
 - Equity Parity
- Estimation and Performance Analysis

Lecture Notes:

John Bilson, "VaR – Emerging Currencies."

JP Morgan, "The Event Risk Indicator Technical Document."

Example:

The Mexican Peso/Dollar Rate.

Class Exercise:

The Thai Baht/Dollar Rate.

Lecture 2: Equity Markets

In the past few years, the efficient markets approach to equity selection has been badly battered by new research which demonstrates that expected returns have been somewhat predictable and that risk management is important. In this class, we will review some of this literature, develop

some models for equity selection, and then develop some risk management procedures for equities.

A. Risk and Return

One of the most basic tenets of financial theory is that investors demand higher returns for assets with greater risk. In this class, we will examine if past volatility is associated with higher future returns. This work, which is based upon original research by Professor Bob Haugen, demonstrates that futures returns are negatively related to past risk. This finding provides a powerful incentive for corporate risk managers to control their financial risks.

B. Directional Models in Equities

In this section, we will develop the basic mean variance optimization model with an emphasis on forecasting expected returns and the covariance matrix of returns. The approach is applied to a three asset portfolio consisting of Germany, Japan and the U.S..

C. Risk Management and Analysis

In this session, we will develop a volatility forecasting model for an equity index. Issues to be addressed include the choice of a volatility metric, conditional heteroscedasticity, and the distribution of asset returns.

Lecture Notes:

John F. O. Bilson "Haugen's Heroes", "An Adaptive Mean Variance Framework," and "Value at Risk for Single Assets,"

Robert A. Haugen and Nardin L. Baker, "Commonality in the Determinants of Expected Stock Returns," Journal of Financial Economics 41 (1996) 401-439.

Lecture 3: Fixed Income Markets

A. Basic Valuation Principles

This lecture will cover some basic aspects of the valuation of portfolios of fixed income instruments. From a foundation built upon the term structure of Eurodollar futures, we will derive the spot and forward curves, develop cash flow maps, and explore the duration and convexity calculations for standard bonds and bonds with embedded options. This will lead in to the estimation of Value at Risk statistics for fixed income portfolios.

B. Parsimonious VaR Models for Fixed Income Portfolios.

The conventional VaR models based upon duration and convexity do not provide a transparent view of risk when portfolios contain extensive spread positions. In this lecture, we develop a new VaR framework which is based upon the estimation of exposure to the Level, Slope and Curvature of the yield curve.

Readings:

John F. O. Bilson, "Basic Valuation Principles," and "Parsimonious Value at Risk for Fixed Income Portfolios."

Nelson, Charles R. and Andrew F. Siegel, "Parsimonious Modeling of the Yield Curve,"

Journal of Business (1987, 60, No. 4)

Ram Wilmer, "A New Tool for Portfolio Managers: Level, Slope and Curvature Durations," Journal of Fixed Income (June, 1996)

Lecture 4: Options and Options Markets.

A. Introduction to Options

This lecture will review the basics of option pricing including Black Scholes, Binomial Models, and simulation methodologies. The purpose is to develop estimates of the greek parameters – delta, gamma, vega, rho, etc. – as a foundation of risk analysis for options portfolios.

B. Value at Risk Analysis for Options

Basic VaR models are based upon the assumption of normal distributions and linear payoff functions. In this lecture, we demonstrate how to break from these assumptions. In addition, we explore the role of variation in implied volatility as a determinant of the risk of an option position. The lecture will make use of innovative developments of VaR methodology by Garman and Wilson.

Readings:

John F. O. Bilson, "Introduction to Options," and "VaR for Options"

Garman, Mark, "The End of the Search for Component VaR," (Berkeley: Financial Engineering Associates, 1997)

Wilson, Tom C., "Calculating Risk Capital," in Carol Alexander (ed.) The Handbook of Risk Management and Analysis (Chichester: John Wiley and Sons, 1996)

Lecture 5. Volatility Estimation and Value at Risk.

While a great deal of emphasis has been placed on the efficient estimation of models of conditional heteroscedasticity, relatively little attention has been paid to the usefulness of these models for Value at Risk analysis. In this lecture, we will focus on volatility estimation from a management perspective. In addition, we will explore market based tests of alternative volatility models.

Readings:

John F. O. Bilson, "The Assessment of Alternative Models of Financial Market Volatility."