

STATISTICAL ASPECTS OF MEASURING MARKET RISK
DRAFT

Spring 2012
Credits: 1.5

INSTRUCTOR DETAILS:

Professor: Rohit Deo
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COURSE MEETINGS:

tba

PREREQUISITE: STAT-GB.1305 (B01.1305) Statistics and Data Analysis

TEXT: There is no required text for the course

COURSE DESCRIPTION AND LEARNING GOALS

Course Description

The course will introduce and discuss statistical concepts, models, methodology and terminology that are commonly used or referred to in market risk management. Where possible, the methodology will be illustrated with data

Course Goals

The recent financial crisis has raised a lot of awareness as well as criticism of risk management models. One potential problem is that easy access to software and statistical formulae can result in a misplaced belief in the generated numbers without a clear understanding of the methodology and without questioning whether the numbers should be trusted. My aim with this course is to provide our MBA students with an introduction to as well as a basic working knowledge of the various statistical models and methodologies that are in use in evaluating market risk, as well as to highlight the pros and cons of the various procedures from a statistical perspective, a perspective which though very important sometimes tends to get overlooked.

COURSE OUTLINE:

I envision covering the following topics. The actual topics covered will depend on time availability and may change over the course of the semester

Basic concepts of probability: Probability, histograms, probability distribution, mean, variance, skewness, kurtosis. Introduction to VaR and Expected Shortfall (ES). Comparison between VaR and ES. Coherent risk measures.

Non-parametric and Parametric Risk measurement and their pros and cons.

Different parametric distributions used for computing Risk Measures: Normal, t-distribution, Cornish Fisher expansions, Johnson distributions, Mixture distributions. Pros and cons of the different parametric approaches

Checking adequacy of the distributions. Semi-parametric risk measurement and Extreme Value Theory. Multivariate distributions and dependence measures: normal, t-distribution. Generating arbitrary multivariate dependence from copulas.

Distributions of linear combinations of variables. Measuring linear and non-linear time series dependence in returns. Square root of time rule and its validity. Frequency of data observation and scaling for risk.

Volatility clustering and adjustments for it. Long memory in volatility. Risk measurement for non-linear portfolios. Delta normal and Delta Gamma approximations and their pros and cons.

Cornish Fisher expansions for Delta Gamma approximations. Historical simulation, Delta normal calculation, Monte Carlo Simulation.

Decomposition of risk. Marginal, incremental risk.

HOMEWORK AND EXAMS: There will be 2 homework assignments assigned during the course and there will be a final exam at the end of the course, given during the last class

GRADING: The homework will count for 40% of the grade, while the final will count for 60% of the grade.
