**Fin654- Financial Analytics**

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Textbook:

<https://2su.onlinebusiness.syr.edu/local/files/lib/download.php?id=200846&userid=1179>

https://bookdown.org/wfoote01/faur/#analytics

RMD Templates:

<http://rmarkdown.rstudio.com/gallery.html>

**Asynch 1 – R Warm-ups for finance**

Reading – FUAR ch. 1 +2

Lumpy = Nonlinear

Imagine This

Cash Flow elements for

**Lease Payments:**

Term Structure of Interest Rates

Credit Risk of Customers

Impact of economy on customers’ market value

**Residual Cashflow:**

Operational Risks

Aggregating Risks

**Borrowing Costs:**

Term Structure of Interest Rates

Our own Credit Risk

**Collateral**

Portfolio Optimization

Market Risk

**Regulatory Issues**

Operational Risk

**Shareholder tolerance for risk**

Market Risk

Hedging

Vector – homogenous data types

List – can be a variety of different data types

Matrix – Rows and Columns.

Vector – Single Row

**Matrix Multiplication**

**Description**

Multiplies two matrices, if they are conformable. If one argument is a vector, it will be promoted to either a row or column matrix to make the two arguments conformable. If both are vectors of the same length, it will return the inner product (as a matrix).

**Usage**

x %\*% y

**Arguments**

|  |  |
| --- | --- |
| x, y | numeric or complex matrices or vectors. |

Salvage value = terminal value

The term structure of interest rates represents how, at a given time, yield to maturity (YTM) depends on maturity

Bonds may be viewed as packages of zero-coupon instruments

Use of continuously compounded rates simplifies the relationships among the forward rates, the yields to maturity, and the prices of zero-coupon bonds

The yield curve is obtained by plotting yield on bonds of same credit quality against maturity

U.S. STRIPS, a type of zero-coupon bond, may be used to estimate forward rates.

nls() is used for nonlinear models under normality assumptions

nlrq() combines non-linear regression and quantile regression

For highly non-linear patterns, no one smoothing effect may work because the regression curves differ from period to period

Introducing "knots" allows for multiple regression curves to join at the knots so that the resulting curve is continuous and with a continuous first derivative

Project 4- Define User Defined functions

Do project in flex dashboard. Rearrange code from RMD into flexdash RMD

Extra week to work on this.

First step: Take data munging and insert into Rchunk before generating graphs. {r, echo = False} to hide output.

Market risk is the risk due to changes in prices

Value-at-Risk (VaR) Uses two parameters, the time horizon (T) and the tolerance level (α) OR confidence level (1-α)

Expected Shortfall (ES), also known as: expected loss given a tail event, tail loss, and shortfall

Gaussian: rnorm()

Student’s t thresholds: rt() = ratio of a Gaussian random variate to the square root of a chi-squared random variate.

Chi-square: “half-way” between the above two

Generalized Pareto Distribution

Behavior in excess of the threshold

Mean excess over the threshold is linear in the threshold

Market risk is the risk due to changes in prices

Value-at-Risk (VaR) Uses two parameters, the time horizon (T) and the tolerance level (α) OR confidence level (1-α)

Expected Shortfall (ES), also known as: expected loss given a tail event, tail loss, and shortfall It translates to losses exceeding VaR.

There are non-parametric and parametric methods to assess Risk.

Generalized Pareto Distribution is a parametric method:

Behavior in excess of the threshold

Mean excess over the threshold is linear in the threshold

Flexdashboard helps to organize the storyboard.

Shiny assist with interactive charts and graphs.

Rmarkdown is brings shiny and flexdashboard together for easily generated documents.

Central Limit Theorem: It is possible to use probabilities associated with the normal curve to answer questions about the means of sufficiently large samples.

Financial markets data are not normally distributed. Variances are not constant.

Much of Finance is concerned with Financial risk. The return on an investment is its revenue expressed as a fraction of the initial investment. Well-balanced portfolios address risk, risk appetite and diversification.

Simple models have large biases but small variances of the estimators. Complex models have small biases but large variances. With complex models, uncertainty analysis could be challenging in the past, but no longer is because of modern statistical techniques such as resampling. Hence, a tradeoff.

There are two basic resampling methods, model-free and model-based, which are also known, respectively, as nonparametric and parametric.

In a parametric statistical model, the distribution of the data is completely specified except for a finite number of unknown parameters. Nonparametric statistical models rely on no or few assumptions about the shape or parameters of the population distribution from which the sample was drawn.

R comes with a plethora of packages that makes it a mature tool for Analytics Modeling.