NATIONAL UNIVERSITY OF SINGAPORE
NUS BUSINESS SCHOOL
Department of Decision Sciences

DSC2008 Business Analytics—Data and Decisions

<u>Lecturer</u> : **Assoc Prof Quek Ser Aik**

<u>Session</u> : **Semester I, 2014/2015**

Module Objectives

"Most companies today have plenty of data. However, creating intelligence and gleaning real insights from this data is what continues to elude organizations."—*Competing on Analytics: The New Science of Winning.*

Business decisions are often made under uncertainty. In the modern business environment, technological advances facilitate the collection of huge amounts of data, which can potentially improve the decision-making process. Successful businesses make use of Business Analytics and Business Intelligence, which are fundamentally based on quantitative statistical methods and optimization procedures, to identify patterns and trends in their data, which eventually lead to realistic predictions and insightful strategies.

The sister module, DSC1007 Business Analytics—Models and Decisions (Business Analytics I), focuses on models and processes. This module is more concerned with data and tools, and introduces students to the fundamental concepts of statistical inference such as parameter estimation and hypothesis testing, as well as to statistical tools useful in business analytics, such as regression analysis and time series forecasting. This continues the theme of delivering hands-on experience in modules focusing on analytics and operations.

This module was co-designed, and is co-taught, by the Department of Decision Sciences in the NUS Business School and the Department of Statistics and Applied Probability in the Faculty of Science, to draw upon the relevant expertise from the two Departments.

The module provides all BBA students with a common statistical grounding for Business Analytics, upon which specialization may be built depending on each student's chosen field. For the truly visionary student, a natural follow-on could in time be the NUS MSc(Business Analytics), or MSBA, http://facebook.com/nusmsba. Biz undergrads may take some MSBA classes (see http://msba.nus.edu); e.g. BMA5002 is an extension of DSC2008, while BDC5101 is of DSC1007.

In keeping with the principles of Rigor and Relevance, also emphasized in Business Analytics I, students are expected to acquire the following knowledge and abilities.

Rigor

Parallel to the coverage in Business Analytics—Models and Decisions, this module teaches fundamental concepts underpinning the following business analytic tools:

1. Data summarization: pivot table;
2. Statistical inference: sampling distributions, confidence intervals and hypothesis testing;
3. Regression analysis: linear and multiple regression, regression diagnostics and model building;
4. Time series analysis: smoothing, regression-based models, ARIMA models and forecasting;
5. Clustering and market segmentation: K-means method.

Emphasis will be made on how, what and why certain tools are useful, and what their contributions would be when used in practice.

Relevance

Module content makes use of examples that are based on current events and timely business topics. Adopting the Plan/Do/Report problem-solving approach, worked examples show students how to clearly define the business decision to be made and *plan* which method to use, *do* the business analysis with data-based numerical evidence & illuminating graphical displays, and finally *report* their findings and recommendations to the decision maker. This approach is reinforced using case-study projects involving real data, in which students investigate a business-related question or make a business decision. This module also makes active use of the Excel spreadsheet and the SAS software.

Students will be equipped with the ability to "tell a story" and provide insights based on (big) data given to them (e.g. during their internships).

Module Prerequisites

None.

Module Outline

Conducted by QUEK Ser Aik (Business)

Describing data (Week 1-2)
      Data types
      Data statistics
            Description
            Sampling
      Data models
            Standard distributions
            Sampling distributions

Confidence Interval
Central Limit Theorem

Inferring from Data (Week 2-3)
       Testing hypothesis
       Comparing distributions
              Goodness-of-fit
              Homogeneity
       Comparing averages
              1 sample
                     variance known & unknown
              2 samples
                     samples independent
                           variances known
                           variances unknown
                                variances equal & unequal
                     samples dependent
              Multiple samples
                     Analysis of Variance
       Relating variables
              Correlation

Predicting beyond Data (Week 4-6)
       Simple regression
       Multiple regression
              Variables selection
              Interactions
              Missing values
              Outliers
              Transformations
              Trimming over-fit
       Logistic regression

Conducted by CHEN Ying (Science)

Time Series Analysis (Week 7-11)
       Multiple-regression-based time series models
       Smoothing methods
              Simple moving average
              Weighted moving average
              Single exponential smoothing
              Holt-Winters exponential smoothing
       Autoregressive Integrated Moving Average models

Cluster Analysis (Week 11-12)
       Distance measure
       Hierarchical cluster analysis
       K-means method

Revision (Week 13)

Module Synopsis

Using analytical tools to develop insights and understanding of business performance to drive decision making. Building students' confidence to analyze related Asian issues and present findings to a lay audience.

Module Web

An up-to-date version of this document is at http://ow.ly/rUfLH.