

**NATIONAL UNIVERSITY OF SINGAPORE  
NUS Business School  
Department of Decision Sciences**

**DSC2008 Business Analytics—Data and Decisions**

**Instructor : Assoc Professor Quek Ser Aik**

**Session : Semester 2, 2015/2016**

**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/groups/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 DSC1007, 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.

The Business School gathers students who are both verbally and quantitatively predisposed. Bizaders need to embrace numbers, in addition to having facility for language. Spreadsheet will be the tool of the trade, and executive summary the order of the day: both the convincing scientist and the persuasive artist must productively inhabit every NUS Business graduate.

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 future internship or work).

### **Module Prerequisites**

None.

But must like Microsoft Excel. Must also like to read and write—need to present findings in concise executive summaries to a completely lay audience averse to numbers. Module materials can be verbose.

### **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 (slight mention)
  - 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) or colleague

## 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.

### **Assessment Components**

Individual Tutorial Assignments (Weeks 4 & 10): 20%

Group Project (due Week 12; presentation Week 13): 20%

Class Participation: 20%

Final Examination (Open Book; bring anything except computers and hand phones): 40%

### **Module Web**

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