

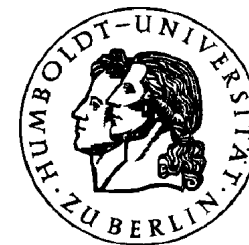
e-learning/e-teaching of statistics: students' and teachers' views

W. Härdle

B. Rönz

www.md-stat.com

www.e-stat.de



Internet services follow already certain standards:

shopping cart programs allow to book, shop and trade...

e-learning/e-teaching is just emerging and is far from such standards.

Statistics is the field that can profit a lot from e-learning/e-teaching standards.

Students' and teachers' views are essential for such a standardisation.

Statistics [stə'tistiks]

information extraction from complex structured data
skills: data handling, graphical insight, mathematics

Therefore students do not like statistics.

Statistics [stə'tistiks]

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skills: data handling, graphical insight, mathematics

Therefore students do not like statistics.

Effective education is a necessity.

student: e-learning is attractive!

teacher: e-learning is modern!

Both "e-s" have to be realized on one platform.
Therefore standardization is necessary.

Proposals:

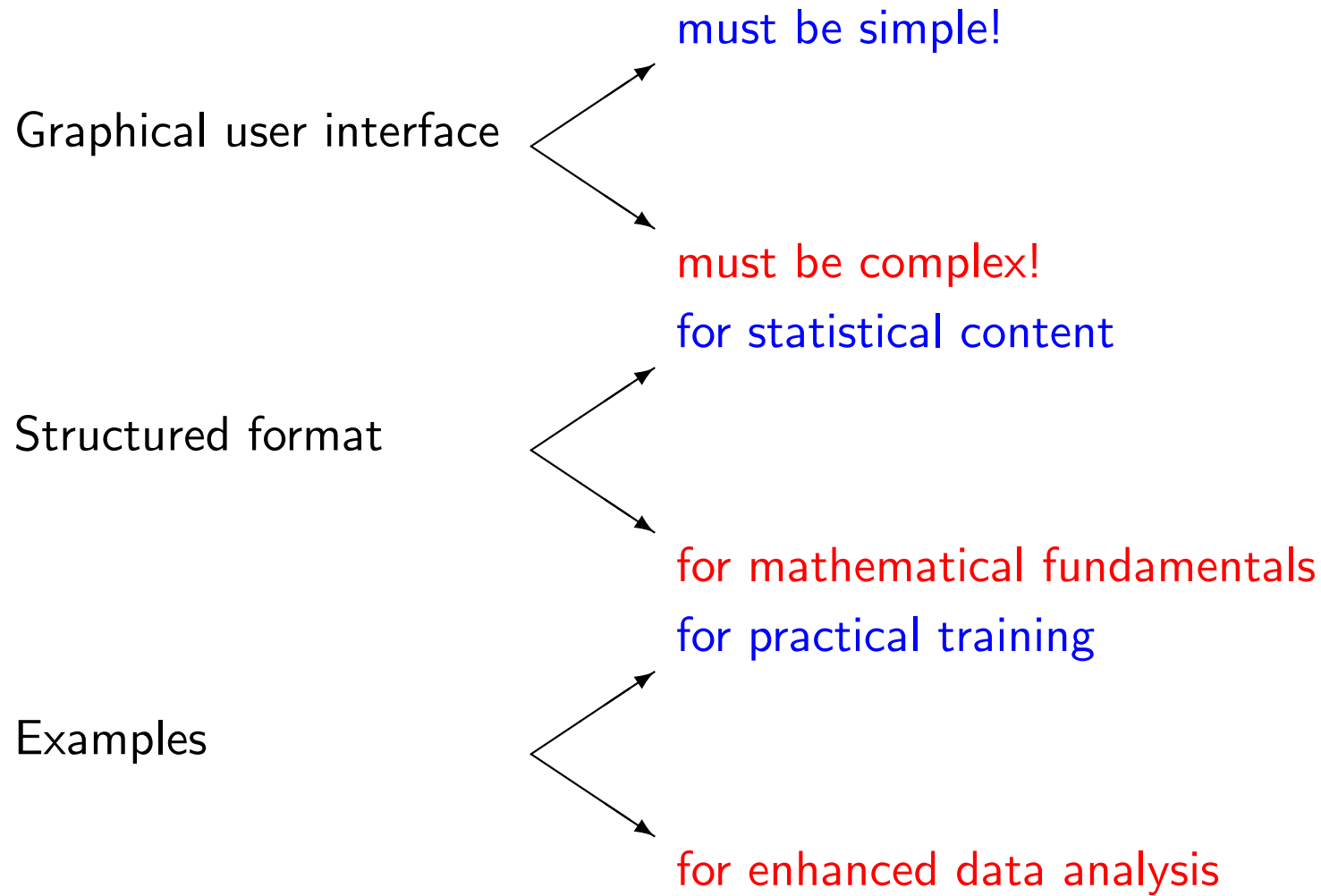


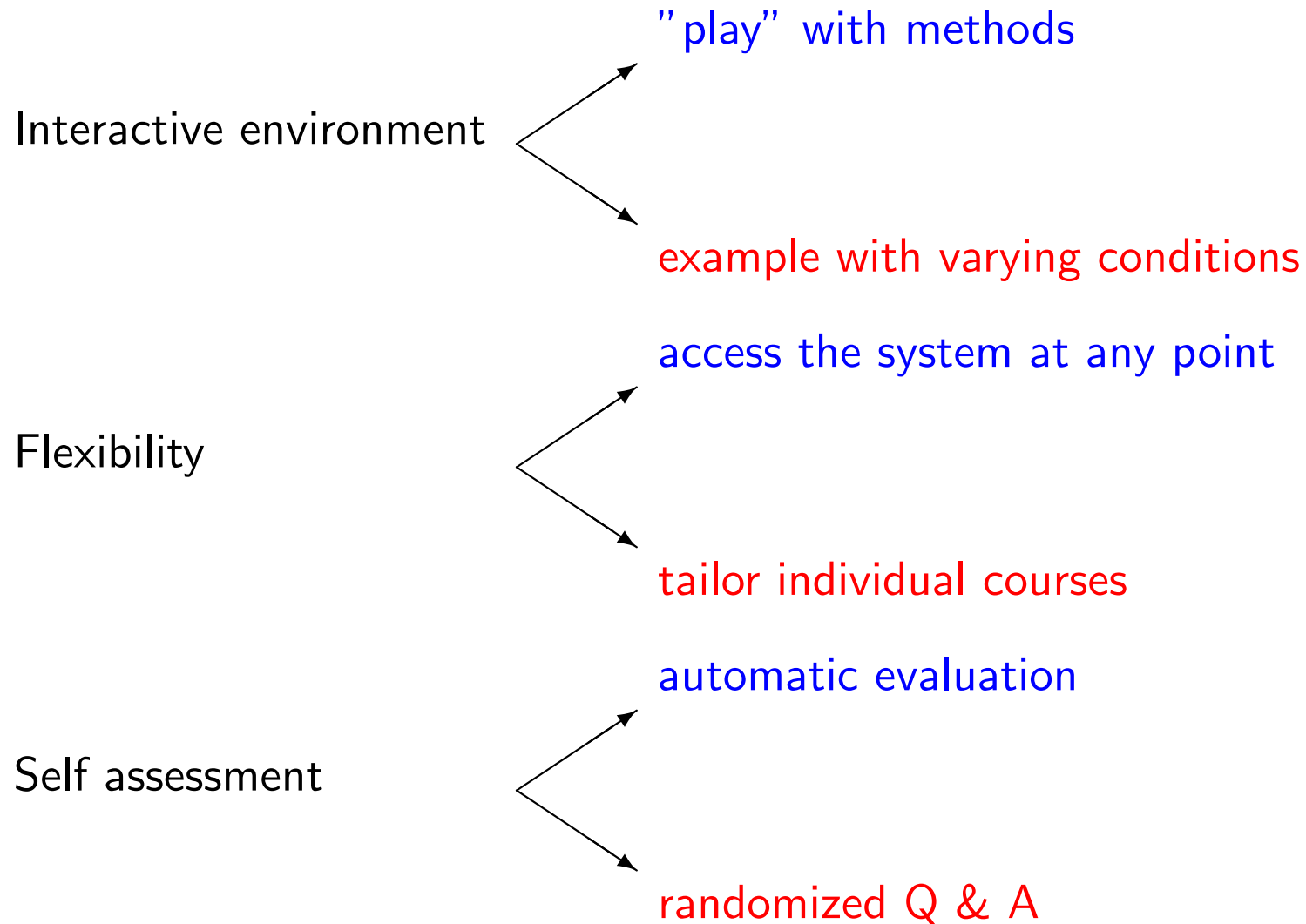
e.stat

e-learning/e-teaching of statistics: students' and teachers' views

1. Introduction ✓
2. Teachers' and students' views
3. e-learning/e-teaching: MM*Stat
4. e-learning/e-teaching: e-stat
5. e-learning/e-teaching documents: MD*book
6. References

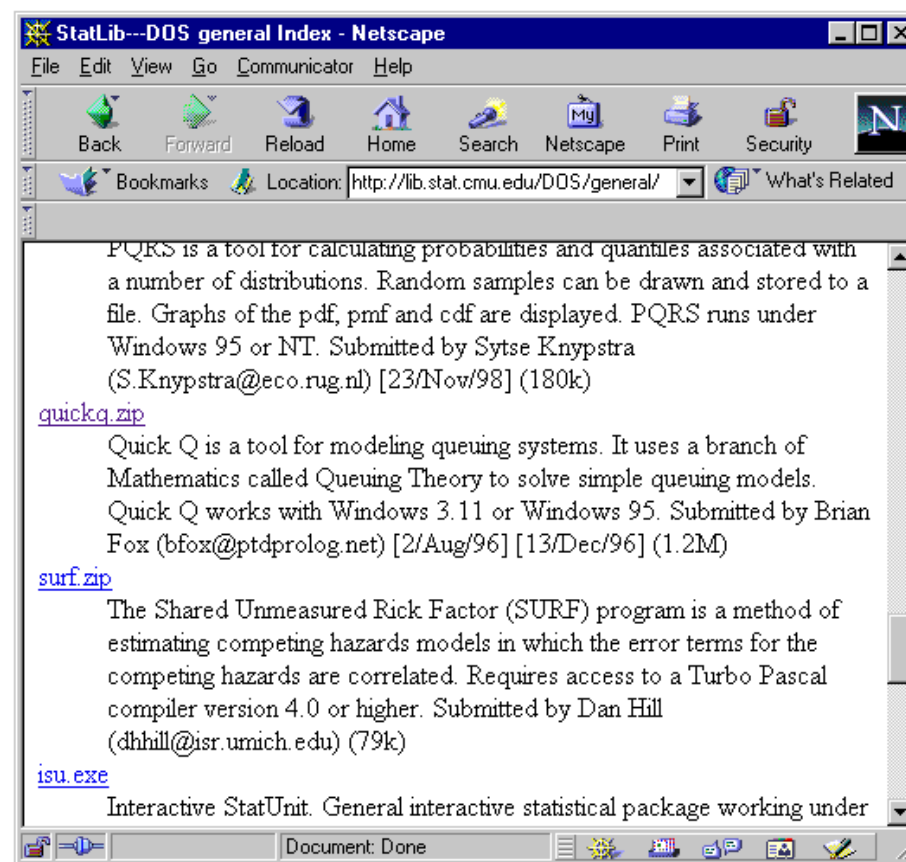
Teachers' and students' views





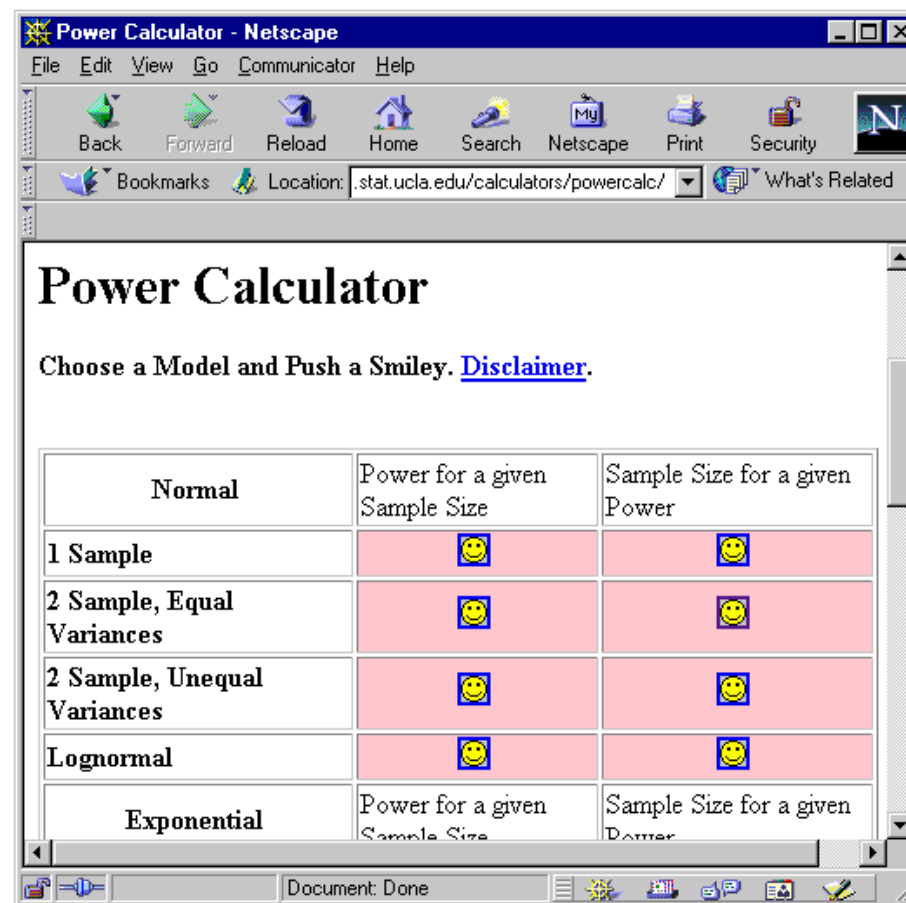
Standardization issues

- Obtain code
- Copy and paste into the editor
- Run
- + Rich methodology
- + Easy drop of methods
- No homogenous platform
- No guarantee
- Need proper software



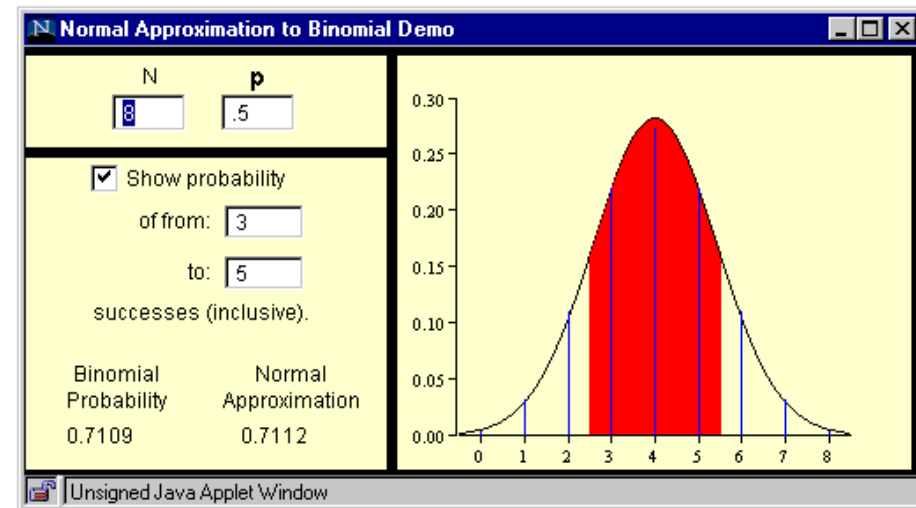
Standardization issues

- "Common Gateway Interface"
- Doesn't need Java
- Start through web server
- + Easy browsing
- + Fast access
- Only small data sets possible
- Limited methods selection
- Difficult to handle for authors



Standardization issues

- Applets
- Start through web browser
- + Easy availability via browser
- + Attractive for beginners
- + Multiple platforms
- Code is prefixed
- Own data?
- Closed package



e-learning/e-teaching: MM*Stat



MM*Stat is an HTML based multimedia environment (www.md-stat.com).

MM*Stat is an MD*booklet, created by MD*book.

MM*Stat is course-oriented:

It contains an introductory statistics course, usually taught at universities.

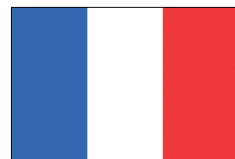
MM*Stat is available in many languages.



German



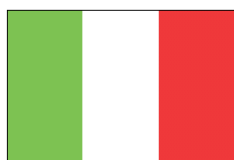
English



French



Spanish



Italian



Czech

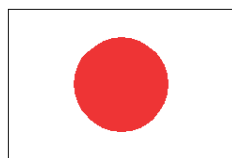


Polish

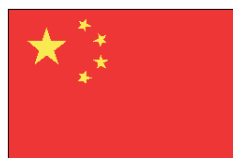


Indonesian

and soon in



Japanese



Chinese



Portuguese



Dutch

Graphical user interface of MM*Stat

The screenshot displays the MM*Stat web application in a Microsoft Internet Explorer browser window. The page title is "6.3 Binomial Distribution". The content includes a definition of a Binomial distribution, its probability density function (PDF), and its distribution function (CDF). The PDF is given by:

$$f(x; n, p) = \begin{cases} \binom{n}{x} \cdot p^x \cdot (1-p)^{n-x} & \text{for } x = 0, 1, \dots, n \\ 0 & \text{otherwise} \end{cases}$$

The distribution is denoted as $X \sim B(n; p)$. The CDF is given by:

$$f(x; n, p) = \begin{cases} \sum_{k=0}^x \binom{n}{k} \cdot p^k \cdot (1-p)^{n-k} & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases}$$

The page also mentions the expected value and variance of a Binomial distribution $B(n; p)$. The interface includes navigation tabs for "lecture" and "contents", and a footer with icons for "information", "explained", "enhanced", and "interactive".

Standardization is via an HTML filing card system.

MM*Stat - Microsoft Internet Explorer von Lycos Bertelsmann

lecture contents lecture 6.3 **information 6.3** explained 6.3 enhanced 6.3 enhanced 6.3 interactive 6.3

6.3 Binomial Distribution

A Binomial distribution is derived from a **random experiment** in which we either obtain **event A** with constant **probability p**, or the **complementary event \bar{A}** with probability $1-p$.

Suppose this experiment is repeated n times.

A **discrete random variable** that contains the number of successes A after n repetitions of this experiment, has a Binomial distribution with parameters n and p . Its probability density function is:

$$f(x; n, p) = \begin{cases} \binom{n}{x} \cdot p^x \cdot (1-p)^{n-x} & \text{for } x = 0, 1, \dots, n \\ 0 & \text{otherwise} \end{cases}$$

Denoted: $X \sim B(n; p)$

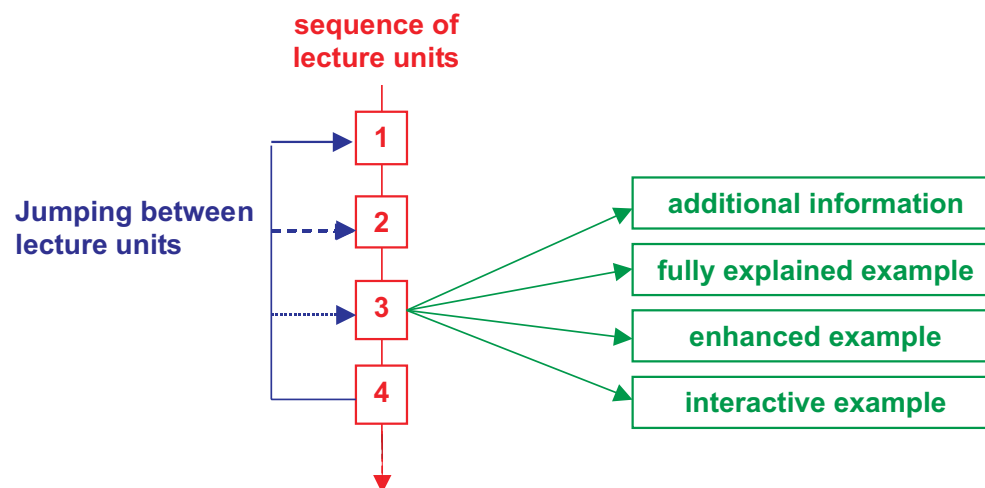
The **distribution function** is given as:

$$f(x; n, p) = \begin{cases} \sum_{k=0}^x \binom{n}{k} \cdot p^k \cdot (1-p)^{n-k} & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases}$$

The **expected value** and the **variance** of a Binomial distribution $B(n; p)$ are:

navigation icons: contents, search, information, explained, enhanced, enhanced, interactive

Structured format:



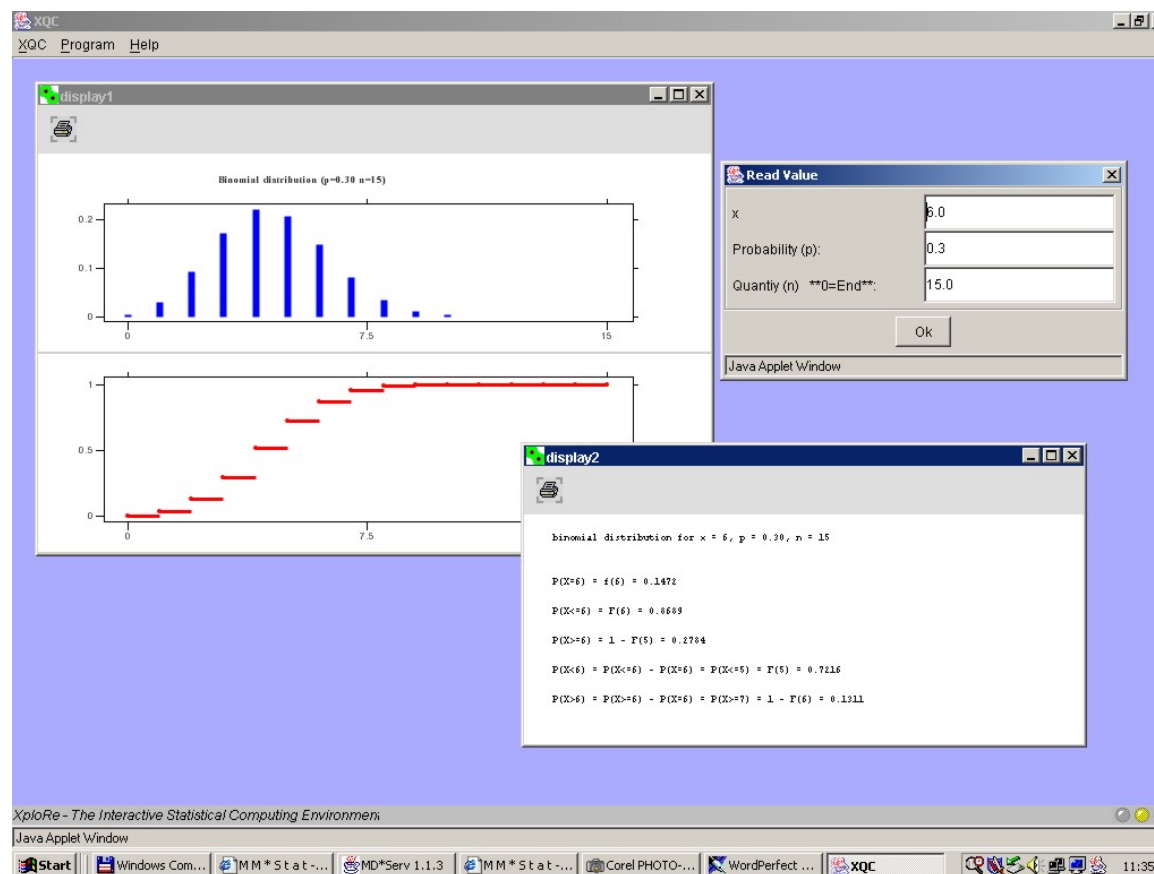
Sequence of lecture units:
straight ahead in statistical
theory

Ramification by

- additional information
- examples
- self assessment
- hypertext functionality

Interactive environment

The implementation of interactive examples into MM*Stat is based on the XploRe Quantlet technology.



The graphical user interface of MM*Stat supports a structure which allows for

- standardization
- structured format
- flexibility
- interactive environment
- examples
- self assessment

Limitations of MM*Stat

- There is a specific course orientation.
- The examples have an economics flavor.
- A specific statistical engine is addressed

Advantages of MM*Stat

- + usage in various courses of studies
- + automatic production from LaTeX via MD*book
- + MD*booklet format is very flexible with configuration of 300 parameters

e-learning/e-teaching: e-stat e.stat

e-stat(www.e-stat.de) is currently under development by teams of 7 German universities.

e-stat is an **open source system** which is XML based. The statistical content is broken down into small modules.

Example: regression analysis

module1: actual motivation

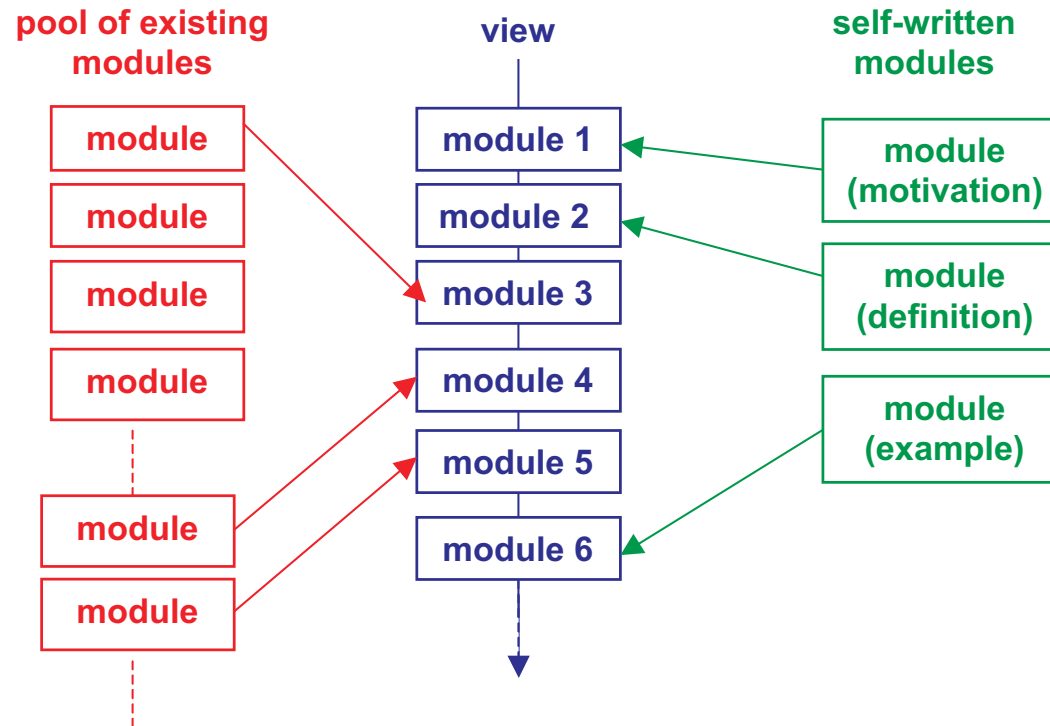
module2: explanation of general purpose

module3: specification of regression model

module4: listing of properties

module5: estimation techniques

aim of the module concept: to compile statistics courses across topics and applications



e-stat view: application oriented arrangement of modules e.g. economics, biology, mathematics ...

e-stat scenarios: empirical applications with real-world data sets e.g. insurance, virtual enterprice ...

e-stat levels: A(low) B(medium) C(experienced)

emilea-Stat - Microsoft Internet Explorer von Lycos Bertelsmann

Adresse <http://emilea-stat-db.uni-oldenburg.de/index.jsp>

View: Allgemein

Testmodule >
Markov-Kette

Level A Level B Level C

Definition Satz 1 Beweis

Eine Folge X_0, X_1, \dots von Zufallsvariablen mit Werten in einer endlichen oder höchstens abzählbaren Menge I heißt **Markov-Kette**, wenn

$$P(X_{n+1} = i_{n+1} | X_0 = i_0, \dots, X_{n-1} = i_{n-1}, X_n = i_n) = P(X_{n+1} = i_{n+1} | X_n = i_n)$$

für alle $n \in \mathbb{N}_0$ und alle $i_0, \dots, i_{n-1}, i_n, i_{n+1} \in I$ gilt. Die (sog.) **Markov-Eigenschaft** besagt, dass die zukünftige Entwicklung des Systems nur von dem zuletzt beobachteten Zustand i_n abhängt und von der sonstigen Vorgeschichte i_0, \dots, i_{n-1} unabhängig ist. Sind die bedingten Wahrscheinlichkeiten $P(X_{n+1} = j | X_n = i)$ unabhängig von n , so ist die Markov-Kette **homogen**; andernfalls **inhomogen**. Wir betrachten im folgenden nur homogene Markov-Ketten. Die Menge I der Zustände heißt **Zustandsraum**.

XploRe SPSS R

self assessment

- online examples
- exercises
 - discrete or multiple choice
 - fill-in-the-blank text
 - free text answers

interactive environment


- applets
- R
- XploRe

e-learning/e-teaching: MD*book

MD*book

(www.md-book.com) web based document generation.

MD*book creates

- e-books 
- MD*booklets
(MM*Stat, FIC, XIC, NIC, MIC)
- XML documents for e-stat
- PS format
- pdf format
- HTML format

Cooperation with Springer Verlag, Heidelberg



Applied Multivariate Statistical Analysis

W. Härdle, L. Simar



Applied Nonparametric Regression

W. Härdle



Applied Quantitative Finance

W. Härdle, T. Kleinow, G. Stahl

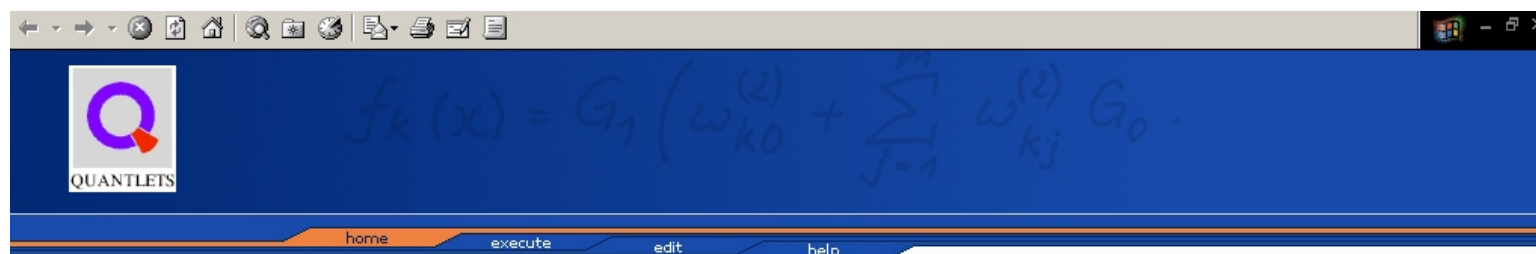
DOWNLOAD



COMPSTAT 2002–Proceedings in Computational Statistics

W. Härdle, B. Rönz





XFGiv03

Description: XFGiv03 shows the term structure of implied volas.

Download: [XFGiv03.xpl](#)

Code:

```
proc()=XFGiv03()

    x = read("XFGIVTermStructure.dat")

    d = createdisplay(1,1)
    x1 = 1:8~x[,1]
    x2 = 1:8~x[,2]
    x3 = 1:8~x[,3]
    x4 = 1:8~x[,4]

    setmaskl(x1,(1:8) ',1,1,4)
    setmaskl(x2,(1:8) ',2,1,4)
    setmaskl(x3,(1:8) ',3,1,4)
    setmaskl(x4,(1:8) ',4,1,4)

    show(d,1,1,x1,x2,x3,x4)
    setgopt(d,1,1,"title","Term structure","xlabel", "Subindex","ylabel", "Percentage [%]", "yvalue",0|1,"xmajor",
endp

XFGiv03()
```

QUANTLETS

home execute

XploRe Quantlet Client started

XFGiv03

Description: XFGiv03 shows the term structure of

Download: [XFGiv03.xpl](#)

Code:

```

proc()=XFGiv03()

  x = read("XFGIVTermStructure.d")

  d = createdisplay(1,1)
  x1 = 1:8~x[,1]
  x2 = 1:8~x[,2]
  x3 = 1:8~x[,3]
  x4 = 1:8~x[,4]

  setmask1(x1,(1:8) ',1,1,4)
  setmask1(x2,(1:8) ',2,1,4)
  setmask1(x3,(1:8) ',3,1,4)
  setmask1(x4,(1:8) ',4,1,4)

  show(d,1,1,x1,x2,x3,x4)
  setgopt(d,1,1,"title","Term structure","xLabel", "Subindex","yLabel", "Percentage [%]", "yvalue",0|1,"xmajor")
endp

XFGiv03()
    
```

XQC
XQC Program Help

d

Term structure

Subindex	Series 1 (%)	Series 2 (%)	Series 3 (%)	Series 4 (%)
1	0.265	0.265	0.265	0.265
2	0.285	0.285	0.285	0.285
3	0.295	0.295	0.295	0.295
4	0.295	0.295	0.295	0.295
5	0.285	0.285	0.285	0.285
6	0.265	0.265	0.265	0.265
7	0.245	0.245	0.245	0.245
8	0.215	0.215	0.215	0.215

Output/Result

Welcome to XploRe Quantlet Client
Version 1.2

XploRe - The Interactive Statistical Computing Environment
Java Applet Window

Start | Yahoo... | SMS... | www... | Win... | Appli... | Appli... | obra... | XploRe | Zube... | xfg0... | XQC | 15:10

e-learning/e-teaching

are the basis for

e-learning/e-teaching

are the basis for

e-science

e-learning/e-teaching

are the basis for

e-science

and

e-business

References

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