

Web-based Interactive Teaching of Nonparametric Models

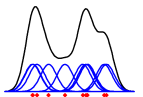
Marlene MÜLLER



June 16, 2000

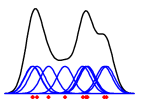
Institut für Statistik und Ökonometrie
Wirtschaftswissenschaftliche Fakultät
Humboldt-Universität zu Berlin, Germany

<http://ise.wiwi.hu-berlin.de/~marlene>



Outline

- Introduction
 - Introductory statistics
 - Advanced statistics courses
- WWW Interfaces to Stat/Math Software
- XploRe – XQC – XQS
- Teaching material on the Web
- Interactive Possibilities in XQC/XQS



Introduction

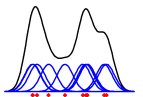
Profiles for computer–assisted teaching

- **Introductory courses**

Students learn the basic elements and methods

- **Advanced courses**

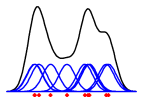
Students deal with particular statistical problems.



Introductory Statistics Courses

- only a few computer-based examples
 - computer-assisted teaching is meant to complement the course (300 students per year!)
- ⇒ computer programs are presented by the teacher/ are used by the students outside the classroom
- ⇒ main object is to study properties of statistical objects (e.g. variables, distributions) and methods (e.g. linear regression)
- ⇒ material should be easily accessible (WWW), mostly hardware independent, and easy to use

Statistics I, II → MM*stat (www.mm-stat.de)



Advanced Statistics Courses

- software is directly used by students
 - course scripts in electronic form are available
- ⇒ students apply “serious” statistical methods to real world examples
- ⇒ students get an introduction into programming the methods themselves

Applied Multivariate Statistical Analysis

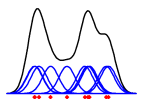
→ ise.wiwi.hu-berlin.de/statistik/multi.html

Non- and Semiparametric Modelling

→ ise.wiwi.hu-berlin.de/statistik/npm.html, ise.wiwi.hu-berlin.de/statistik/spm.html

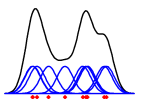
Statistics of Financial Markets

→ ise.wiwi.hu-berlin.de/statistik/fin_ma.html



General Software Requirements

- for introductory courses, routines should be mostly self-explaining,
- for advanced courses, several levels of complexity should be possible: from simple and easy-to-modify macros to full-featured applications,
- easy to access software,
- network capabilities, in particular WWW integration.

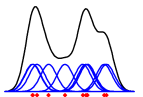


Specific Software Requirements

- state-of-the-art statistical methods,
- graphics: 2D and 3D,
- user interaction
- (high level) programming language.

...

- easy to learn/program,
- computational speed.



WWW Interfaces to Stat/Math Software

- **Rweb**

<http://www.math.montana.edu/Rweb>

- **StatServer (S-Plus)**

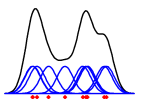
<http://www.mathsoft.com/statserver>

- **XploRe (Java version)**

<http://www.xplore-stat.de/java/java.html>

- **MathXplorer/JS (MathViews)**

<http://www.mathwizards.com/products/MathXplorerJ>



Statistics over the WWW

- **WebStat**

<http://www.stat.sc.edu/webstat/>

- **Xlisp-Stat**

<http://www.stat.ucla.edu/~jose/Xlisp-Stat.cgi>

- **XploRe**

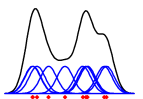
<http://www.xploRe-stat.de/java/java.html>

- **Statlets**

<http://www.sgcorp.com/statlets.htm>

- **GASP** Globally Accessible Statistical Procedures

<http://www.stat.sc.edu/rsrch/gasp/>



Web Enhanced Courses

- **Overview**

<http://www.execpc.com/~helberg/statistics.html>

- **GAUSS Programming for Econometricians**

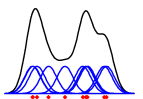
<http://eclab.econ.pdx.edu/gpe>

and ...

- **Non- and Semiparametric Modelling (XploRe)**

<http://ise.wiwi.hu-berlin.de/statistik/npm.html>

<http://ise.wiwi.hu-berlin.de/statistik/spm.html>

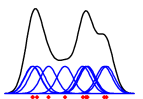


XploRe

<http://www.xplore-stat.de>

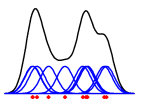
- interactive computational environment for statistics
- can be used either as standalone version as well as within a local network or the Internet

Schmelzer, Kötter, Klinke & Härdle (CompStat'96 Proceedings),
Härdle, Klinke, Müller: XploRe Learning Guide (Springer 1999)



XploRe Flavours

- ★ generic (standalone) versions
for Unix/X11 (Solaris/Sparc, Linux/PC, ...) and for
MS Windows (95/98/NT/2000 for PC)
- ★ Java client/server version – XQC/XQS
The server might run on a remote machine. The
XploRe Java client runs under Java 1.1.
- ★ Java applet version at the XploRe Web site – XQC
<http://www.xplore-stat.de/java/java.html>



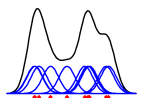
Teaching Material on the Web

- <http://ise.wiwi.hu-berlin.de>
→ Statistics → courses & material

The screenshot shows a Netscape browser window with the title "Netscape: Institut für Statistik und Ökonometrie". The address bar contains "http://ise.wiwi.hu-berlin.de/". The website header features a logo of a building and the text "Institute for Statistics and Econometrics". Below the header is a navigation menu with buttons for "professors", "assistants", "courses & material", and "research". The "courses & material" button is selected. The main content area is divided into "courses:" and "material:". Under "courses:", there are two columns: "Grundstudium" and "Hauptstudium". Under "material:", there are two columns of links. The footer contains contact information for Humboldt-Universität zu Berlin.

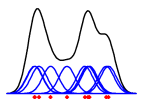
courses:	
Grundstudium	Hauptstudium
Statistische Methodenlehre I	Semiparametrische Methoden Nichtparametrische Methoden
Statistische Methodenlehre II	Multivariate Statistische Methoden
WM*Stat - Statistik multimedial	Computergestützte Statistik I Computergestützte Statistik II
Privatissimum	Applied Quantitative Methods
Einf. in die stat. Programmiersprache XploRe	Verallgemeinerte Lineare Modelle
Interaktive computergestützte stat. Analyse	Wirtschaftsstatistik
	Statistik der Finanzmärkte

Humboldt-Universität zu Berlin, Wirtschaftswissenschaftliche Fakultät, Lehrstuhl für Statistik
Spandauer Str. 1 10178 Berlin/Germany
Phone:+49-30-2093-5630 Fax:+49-30-2093-5649



XploRe Based Teaching Material on the Web

- <http://www.xplore-stat.de/ebooks/ebooks.html>



Electronic Scripts with Hyperlinks

Netscape: Varying the Bandwidth

File Edit View Go Communicator Help

Location: <http://www.quantlet.de/scripts/spm/node30.html> What's Related

[Next](#) [Up](#) [Previous](#) [Contents](#) [Index](#) [XploRe Macros](#)

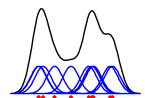
[Next: Varying the Kernel Function](#) [Up: Motivation and Derivation](#) [Previous: Derivation](#) [Contents](#) [Index](#)

Varying the Bandwidth

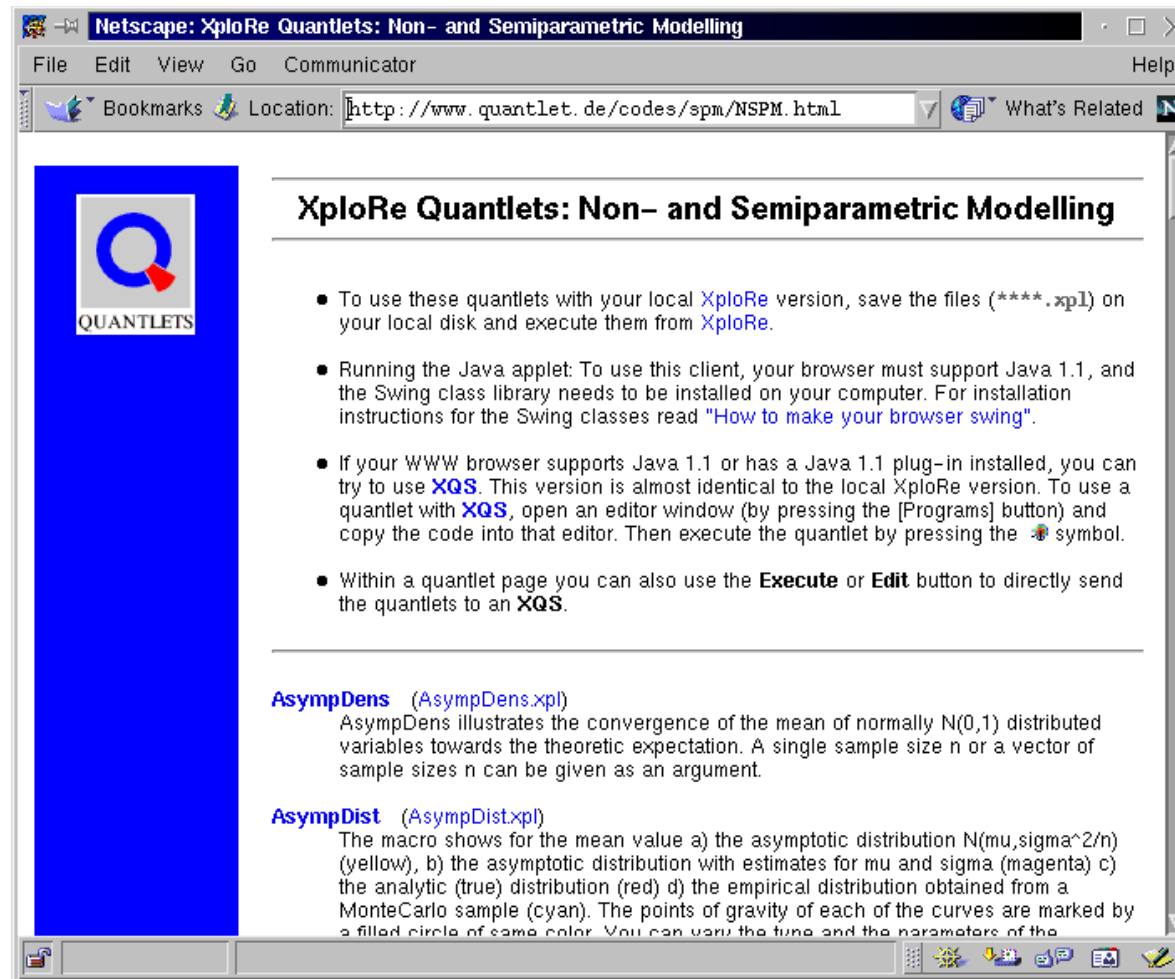
In analogy to the histogram, h controls the smoothness of the estimate and the choice of h is a crucial problem. Figure 3.2 shows density estimates for the Stock Returns data using the Quartic kernel and different bandwidths.

Figure 3.2: Four kernel density estimates for the Stock Returns data with bandwidths $h = 0.004$, $h = 0.008$, $h = 0.015$, and $h = 0.05$. ([density.xpl](#))


Bandwidth (h)	Plot Description
0.004	Highly peaked and noisy density estimate.
0.008	Less peaked and smoother density estimate.
0.015	Further smoothed density estimate.
0.050	Very smooth, bell-shaped density estimate.



XploRe Quantlets

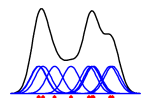


XploRe Quantlets: Non- and Semiparametric Modelling

- To use these quantlets with your local XploRe version, save the files (*.xpl) on your local disk and execute them from XploRe.
- Running the Java applet: To use this client, your browser must support Java 1.1, and the Swing class library needs to be installed on your computer. For installation instructions for the Swing classes read "How to make your browser swing".
- If your WWW browser supports Java 1.1 or has a Java 1.1 plug-in installed, you can try to use XQS. This version is almost identical to the local XploRe version. To use a quantlet with XQS, open an editor window (by pressing the [Programs] button) and copy the code into that editor. Then execute the quantlet by pressing the  symbol.
- Within a quantlet page you can also use the **Execute** or **Edit** button to directly send the quantlets to an XQS.

AsympDens (AsympDens.xpl)
AsympDens illustrates the convergence of the mean of normally $N(0,1)$ distributed variables towards the theoretic expectation. A single sample size n or a vector of sample sizes n can be given as an argument.

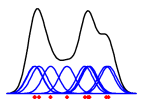
AsympDist (AsympDist.xpl)
The macro shows for the mean value a) the asymptotic distribution $N(\mu, \sigma^2/n)$ (yellow), b) the asymptotic distribution with estimates for μ and σ (magenta) c) the analytic (true) distribution (red) d) the empirical distribution obtained from a MonteCarlo sample (cyan). The points of gravity of each of the curves are marked by a filled circle of same color. You can vary the tune and the parameters of the




```

; -----
; Library      NSPM
; -----
; See_also    denest createdisplay setmask setgopt
; -----
; Macro       density
; -----
; Description  estimates univariate kernel densities
;              with different bandwidths.
; -----
; Author      Stephanie Freese, Marlene Mueller 980604
; -----
library("plot")
library("smoother")
;
x=read("stock")
fh1=denest(x,0.004)
fh1=setmask(fh1,"line","solid")

```



Executable Quantlet



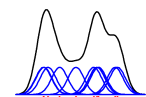
The screenshot shows a Netscape browser window titled "Netscape: density". The address bar contains the URL "http://www.quantlet.de/codes/spm/density.html". The page content includes a green banner at the top that says "XQS started, wait for applet!". Below this, the page provides metadata for the Quantlet:

- Subject:** Non- and Semiparametric Modelling
- See XploRe:** [denest](#) [createdisplay](#) [setmask](#) [setgopt](#)
- Quantlet:** **density**
- Description:** estimates univariate kernel densities with different bandwidths.
- Download:** [density.xpl](#)
- Author:** Stephanie Freese, Marlene Mueller 980604

The "Code:" section contains the following XploRe script:

```
library(" graphic" )
library(" plot" )
library(" smoother" )
setsize(600, 450)
;
x=read(" stock" )
fh1=denest(x,0.004)
fh1=setmask(fh1, " line" , " solid" )
fh2=denest(x,0.008)
fh2=setmask(fh2, " line" , " solid" )
```

On the left side of the browser window, there is a blue sidebar with the "QUANTLETS" logo and a menu with the following items: "Execute", "Edit", "Help", and "Quantlet List". The status bar at the bottom of the browser shows "100%" zoom and various system icons.



Editable Quantlet

Netscape: density
File Edit View Go Communicator Help

Location: <http://www.quantlet.de/codes/spm/density.html>

QUANTLETS

Execute
Edit
Help
Quantlet List

XQS started, wait for applet!

Subject: **Non- and Semiparametric Modelling**
See XploRe: [denest](#) [createdisplay](#) [setmask](#) [setgopt](#)

Quantlet: **density**
Description: estimates univariate kernel densities with different bandwidths.
Download: [density.xpl](#)

Author: Stephanie Freese, Marle

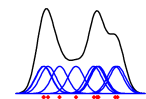
Code:

```
library("graphic")
library("plot")
library("smoother")
setsize(600,450)
;
x=read("stock")
fh1=denest(x,0.004)
fh1=setmask(fh1,"line","solid")
fh2=denest(x,0.008)
fh2=setmask(fh2,"line","solid")
fh3=denest(x,0.015)
fh3=setmask(fh3,"line","solid")
fh4=denest(x,0.05)
```

XploRe Editor density.xpl

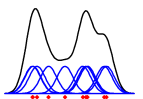
File Edit XploRe

Unsigned Java Applet Window



Examples from Non- and Semiparametric Modelling

- ★ interactive examples
- ★ user-programmable examples



Interactive Examples

XploRe tools

- `readvalue`:
A input box to enter and modify parameters.
- `selectitem`:
A selection box to choose from a number of options.

User-Programmable Examples

XploRe tool

- XQC editor

