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STATS 202A
Fall 2014
Homework 4

Output:

Figure 1: A plot of paretoint(xmax,3.5,2.5) vs. xmax, for xmax ranging from 10 to 1000.

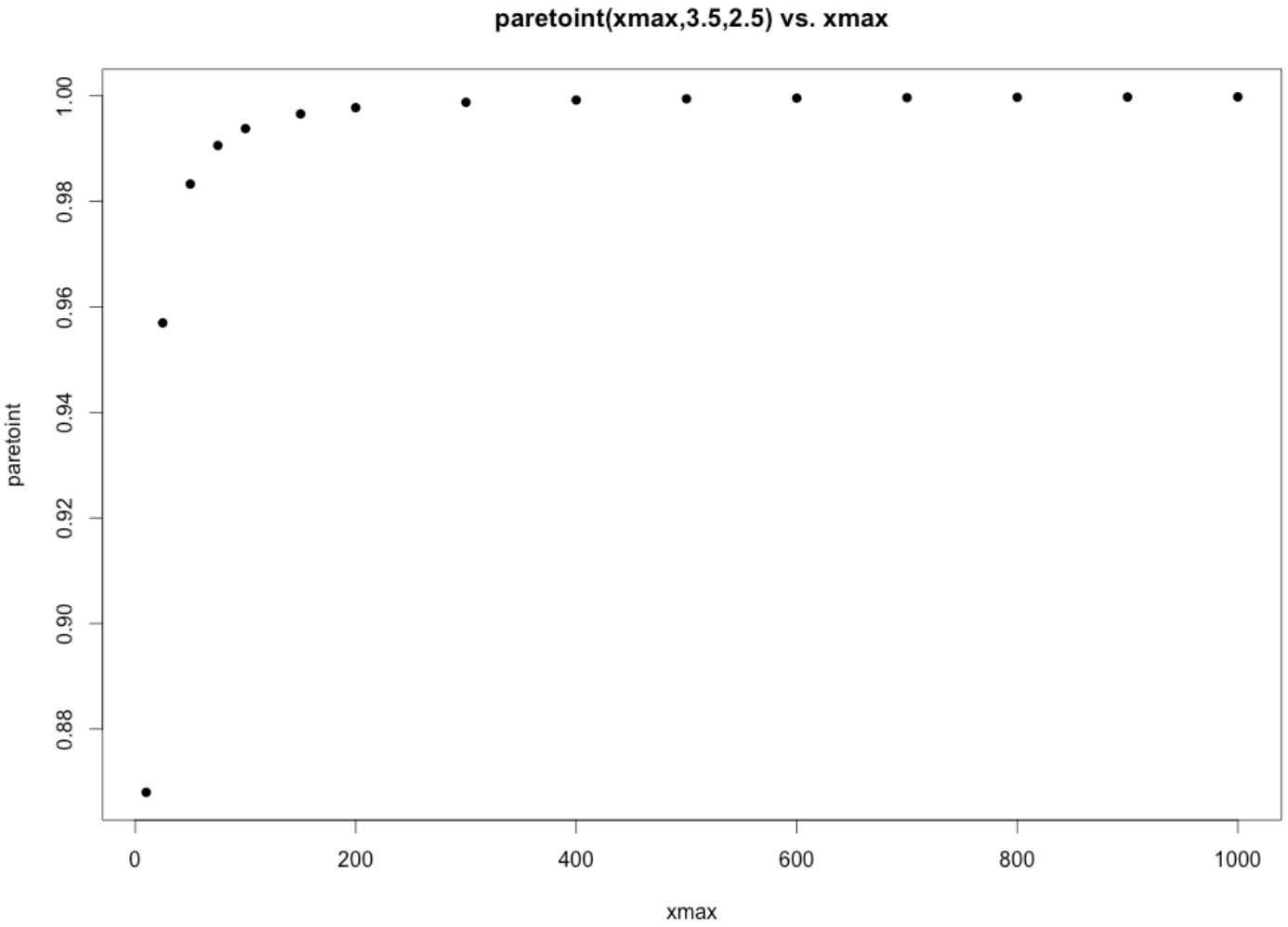


Figure 2: A plot of paretoint(xmax,11.3,3.2) vs. xmax, for xmax between 10 and 1000.

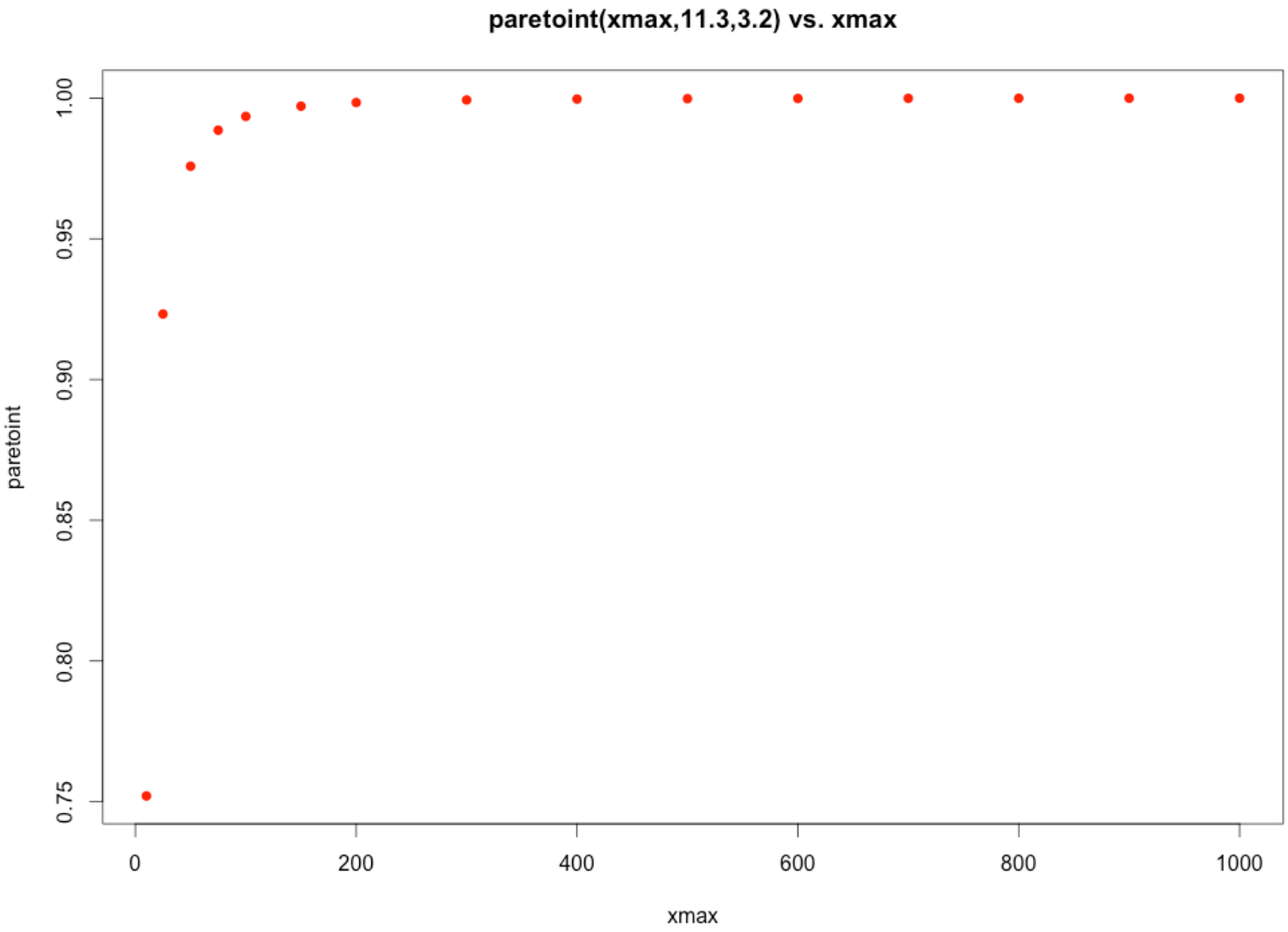
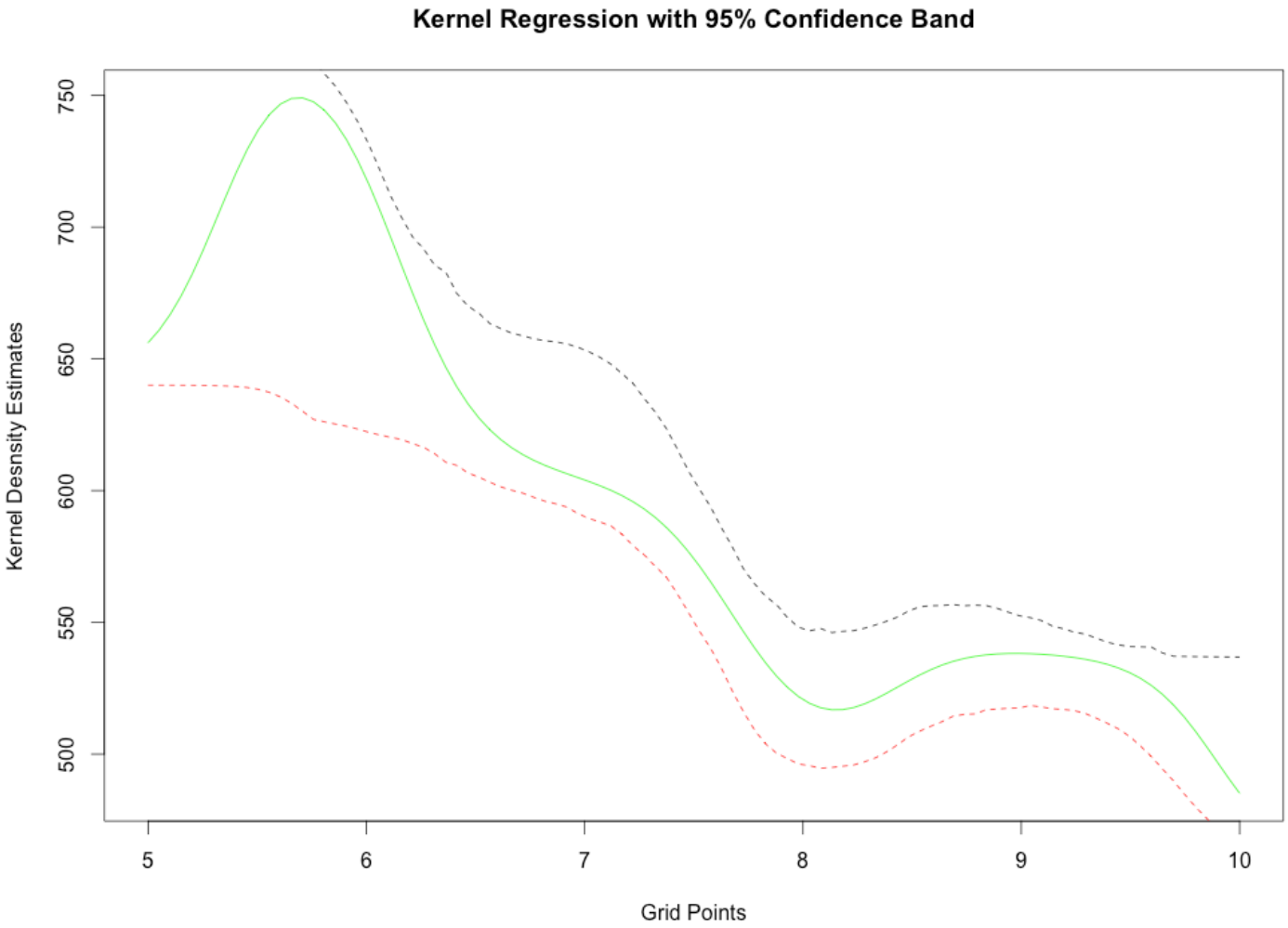


Figure 3: A plot of your kernel regression estimates fˆ (m1), fˆ (m2), ..., fˆ (m100) versus m, along with 95% bootstrap confidence intervals, for the petroleum tax and consumption data.



Code:

```
#include <R.h>
#include <Rmath.h>

//Question 1.
//-----------
void paretoint(double *xmax, double *c, double *p, double *y) {
  double interval= *xmax / pow(10,6);
  double i = 0.0, j = 0.0;
  double x,temp;
```

```
  for(x= 0.0; x< *xmax; x = x+interval) {
    i = x;
    j = x + interval;
    temp = ((j-i)/6) * (*p-1) * (pow(*c,*p-1)) * (pow((i+ *c),-*p) + pow((j+ *c),-*p) + 4
*
            pow(((i+j)/2 + *c),-*p));
    *y = *y + temp;
  }
}

//Question 2.
//-----------
void kernreg2 (double *x, double *y, int *n, double *b,double *g2, int *m, double *est)
{
  int i,j;
  double a1,a2,c;
  for(i = 0; i < *m; i++) {
    a1 = 0.0;
    a2 = 0.0;
    for(j=0; j < *n; j++) {
      c=dnorm(x[j]-g2[i],0,*b,0);
      a1  +=  y[j]  *  c;
      a2 += c;
    }
    if(a2 > 0.0)
      est[i] = a1/a2;
    else est[i] = 0.0;
  }
}
```

R Code:

```
# Question 1
#===========
system("/usr/local/bin/R CMD SHLIB hw4.c")
dyn.load("hw4.so")

paretoint2 <- function(xmax, c, p){
  .C("paretoint",as.double(xmax), as.double(c), as.double(p), y=as.double(0))
}

xmaxvalues = c(10, 25, 50, 75, 100, 150, 200, 300, 400, 500, 600, 700, 800, 900, 1000)
y = c()

for(i in 1:length(xmaxvalues)) {
  y = append(y, paretoint2(xmaxvalues[i], 3.5, 2.5)$y);
}

plot(xmaxvalues, y, xlab="xmax", ylab="paretoint", main="paretoint(xmax,3.5,2.5) vs.
xmax", pch=16,col="black");

y = c()
for(i in 1:length(xmaxvalues)) {
  y = append(y, paretoint2(xmaxvalues[i], 11.3, 3.2)$y);
}

plot(xmaxvalues, y, xlab="xmax", ylab="paretoint", main="paretoint(xmax,11.3,3.2) vs.
xmax", pch=16,col="red");
```

```
# Question 2
#===========
# Part a)
system("/usr/local/bin/R CMD SHLIB hw4.c")
dyn.load("hw4.so")

# Part b)
input = scan("x15.txt",what="char")
z = matrix(input,ncol=6,byrow=T)
x = as.numeric(z[,2])
y = as.numeric(z[,6])

# Part c)
n = 48
bw = bw.nrd(x)
m = 100
g2 = seq(min(x),max(x),length=m)
a3 = .C("kernreg2", as.double(x), as.double(y), as.integer(n), as.double(bw),
as.double(g2), as.integer(m), estim=double(m))

# Part d)
xi = rep(0,100);
yi = rep(0,100);
samplexy = sample(1:48, 100, replace=TRUE)

for(j in 1:100)
{
  k = samplexy[j]
  xi[j] = x[k]
  yi[j] = y[k]
}
n = length(xi)
m = 100
a3 = .C("kernreg2", as.double(xi), as.double(yi), as.integer(n), as.double(bw),
as.double(g2), as.integer(m), estim=double(m))

# Part e)
data <- data.frame()
xi=rep(0,100)
yi=rep(0,100)
for(i in 1:200) {
  samplexy = sample(1:48, 100, replace=TRUE)
  for(j in 1:100) {
    k = samplexy[j]
    xi[j] = x[k]
    yi[j] = y[k]
  }
  n=length(xi)
  m = 100
  a3 = .C("kernreg2", as.double(xi), as.double(yi), as.integer(n), as.double(bw),
as.double(g2), as.integer(m), est=double(m))
  data <- rbind(data,a3$est)
}

x25 = rep(0,100)
x975 = rep(0,100)
```

```
for(i in 1:100)
{
  xtemp <- data[[i]]
  x25[i]=quantile(xtemp,0.025)
  x975[i]=quantile(xtemp,0.975)
}

# Part f)
plot(g2, a3$est, type="n", xlab="Grid Points", ylab="Kernel Desnsity
Estimates",main="Kernel Regression with 95% Confidence Band")
points (g2,a3$est,type="l",col="green")
points(g2,x25,type="l",lty=2,col="red")
points(g2,x975,type="l",lty=2,col="black")
```