

# R Code for Computing the Maximum Score Estimator

In this article, we discuss the R code that computes the maximum score estimator proposed in C. Manski (1975) and C. F. Manski (1985). In the following we consider the simulation scenario used in Table 2 of Patra, Seijo, and Sen (2015). We fix  $\beta_0 = \frac{1}{\sqrt{d}}(1, \dots, 1)^\top$  and assume that

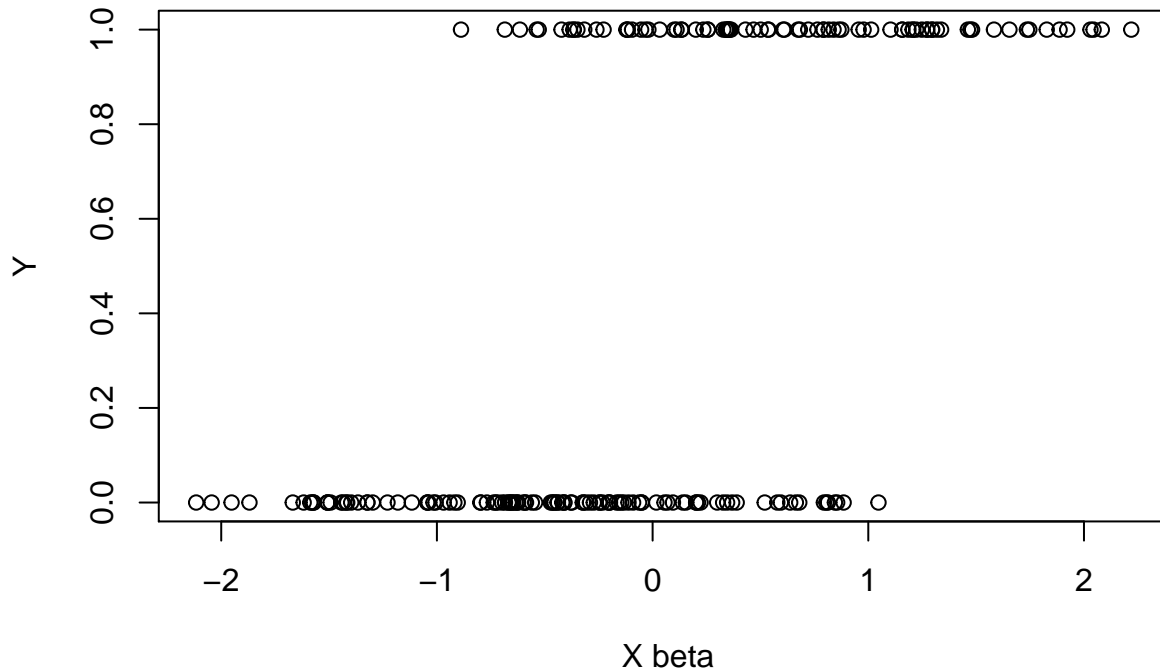
$$U|X \sim N\left(0, \frac{1}{(1+|X|^2)^2}\right), \quad X \sim \text{Uniform}([-1, 1]^d), \quad \text{and} \quad Y = \mathbf{1}_{\beta_0^\top X + U \geq 0}.$$

For demonstration purposes, we fix  $n = 200$  and  $d = 3$ . The following codes generate the sample and computes the maximum score estimator.

```
rm(list= ls())
source('MSE.R')
```

```
## Loading required package: slam
```

```
n<-200
d<-3
X <- matrix(runif(n*d, -1,1), n,d)
beta.0 <- rep(1,d)
err <- rnorm(n,0,1)
ind <- X%*%beta.0
y<- as.vector((ind+err>0)*1)
plot(ind,y, xlab= paste(" X", expression(beta)), ylab="Y")
```



```
ans <- MSE(X,y)
cat(" The MSE for this data set is: ")
print(ans$beta.hat, digits=3)
print(paste("It took ", format(ans$time, digits=2), " secs to compute it"))
```

```
## Rcplex: num variables=203 num constraints=200
## The MSE for this data set is: [1] 0.641 0.601 0.477
```

```
## [1] "It took 0.96 secs secs to compute it"
```

The above code requires a valid **CPLEX** installation and the R package **Rcplex** to run. Our codes are based on the exact MIP algorithm proposed in Florios and Skouras (2008). I would like to thank Florios Kostas for his helpful discussions and comments. See [here](#) for a MATLAB version of the code.

The required R file “MSE.R” can be downloaded [here](#). The codes to implement the smoothed bootstrap procedure in Patra, Seijo, and Sen (2015) is forthcoming.

## References

- Florios, Kostas, and Spyros Skouras. 2008. “Exact Computation of Max Weighted Score Estimators.” *Journal of Econometrics* 146 (1). Elsevier: 86–91.
- Manski, C. 1975. “Maximum Score Estimation of the Stochastic Utility Model of Choice.” *J. Econometrics* 3: 205–28.
- Manski, Charles F. 1985. “Semiparametric Analysis of Discrete Response. Asymptotic Properties of the Maximum Score Estimator.” *J. Econometrics* 27 (3): 313–33. doi:[10.1016/0304-4076\(85\)90009-0](https://doi.org/10.1016/0304-4076(85)90009-0).
- Patra, Rohit K., Emilio Seijo, and Bodhisattva Sen. 2015. “A Consistent Bootstrap Procedure for the Maximum Score Estimator.” *J. Econometrics (Revision Resubmitted)*. <http://arxiv.org/abs/1105.1976>.