10: Model Output Can Deceive

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Ideas and issues illustrated by the graphs in this vignette

The issues noted here apply to all regression models, including regression models where the outcome variable is categorical. They will be discussed, however, mostly in the context of models with an outcome variable that is treated as continuous. We examine how errors in explanatory variables can skew results.

```
# To include the figures, change `showFigs <- FALSE`
# to `showFigs <- TRUE` in the source `.Rnw` file,
# and regenerate the PDF.
#
showFigs <- FALSE
```

1 Code for the Figures

```
fig10.1 <- function(){
 ## ---- xWITHerr ----
tau <- (0:5)/2.5; m <- length(tau); n <- 200; SD <- 2
x0 <- rnorm(n, mean=12.5, sd=SD)  # Generate x-values
df <- data.frame(sapply(tau, function(xtau)x0+rnorm(n, sd=SD*xtau)))
  # Columns after the first are x-values with added error
df$y = 15+2.5*x0 + rnorm(n, sd=1.5)
names(df) <- c(paste("X", tau, sep=""), "y")
lab <- c(list("0"),
        lapply(tau[-1], function(x)substitute(A*s[z], list(A=x))))
form <- formula(paste("y ~ ", paste(paste("X", tau, sep=""),
                                    collapse="+")))
library(latticeExtra)
xlabel <- expression(italic(x)*' ('*italic(z)*' with error)')
striplabel <- strip.custom(strip.names=TRUE,
                           var.name="SD(added err)",
                           sep=expression(" = "),
```

```
                            factor.levels=as.expression(lab))
gph <- xyplot(form, data=df, outer=TRUE, xlab=xlabel, strip=striplabel,
              type=c("p", "r"))
gph+layer(panel.abline(15, 2.5, lty=2))
}
```

```
fig10.2 <- function(){
set.seed(31)           # Reproduce graph shown
## Use function errorsINx(), from DAAG
errorsINx(gpdiff=4, timesSDx=1.25, SDyerr=2.5, n=80, plotit=FALSE)[["gph"]]
}
```

```
pkgs <- c("latticeExtra", "DAAG")
z <- sapply(pkgs, require, character.only=TRUE, warn.conflicts=FALSE)
if(any(!z)){
  notAvail <- paste(names(z)[!z], collapse=", ")
  print(paste("The following package requires to be installed:", notAvail))
}
```

```
if(require('latticeExtra')) fig10.1() else
  print("Package 'latticeExtra' is not available, cannot do graph")
```

```
if(require('latticeExtra')&require('DAAG')) fig10.2() else
  print("Packages 'latticeExtra' &/or 'DAAG' is/are not available, cannot do graph")
```