

# Untitled

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Import the “beach.csv” dataset into R and examine the first few rows of data

```
setwd("F:/Quant Eco")
getwd()
```

```
## [1] "F:/Quant Eco"
```

```
beach <- read.csv(file='beach.csv')
head(beach)
```

```
##   BeachID Year OpenBeach
## 1      A 1992    437.8
## 2      A 1993    423.6
## 3      A 1994    333.1
## 4      A 1995    287.4
## 5      A 1996    295.6
## 6      A 1998    201.8
```

Fit a model that includes interactions between Year and BeachID. Report estimates of all coefficients

```
fit_i <- lm(OpenBeach ~ BeachID * Year, data = beach)
fit_i
```

```
##
## Call:
## lm(formula = OpenBeach ~ BeachID * Year, data = beach)
##
## Coefficients:
##   (Intercept)      BeachIDB      BeachIDC          Year BeachIDB:Year
##    36945.73    -34211.98    -28776.11     -18.36      17.04
## BeachIDC:Year
##      14.37
```

Predict the beach area at all three beaches in 1992

```
betas <- coef(fit_i)
betas
```

```
##   (Intercept)      BeachIDB      BeachIDC          Year BeachIDB:Year
##  36945.72537  -34211.97897  -28776.11491     -18.36491      17.04277
## BeachIDC:Year
##      14.37132
```

```
pred1 <- data.frame(BeachID=c('A'), Year=c(1992))
predict(fit_i, newdata = pred1)
```

```
##      1
```

```
## 362.815
```

The predicted beach area for beach A in 1992 is 362.815 hectares.

```
pred2 <- data.frame(BeachID=c('B'), Year=c(1992))
predict(fit_i, newdata = pred2)
```

```
##          1
```

```
## 100.034
```

The predicted beach area for beach B in 1992 is 100.034 hectares.

```
pred3 <- data.frame(BeachID=c('C'), Year=c(1992))
predict(fit_i, newdata = pred3)
```

```
##          1
```

```
## 214.3744
```

The predicted beach area for beach C in 1992 is 214.3744 hectares.

Plot the predicted area of each beach across all years

```
x <- 1992:2014
b_0 <- 36945.72537
b_b1 <- -34211.97897
b_b2 <- -28776.11491
b_b3 <- -18.36491
b_b4 <- 17.04277
b_b5 <- 14.37132
y_ba <- b_0 + b_b3*x
y_ba
```

```
## [1] 362.82465 344.45974 326.09483 307.72992 289.36501 271.00010 252.63519
## [8] 234.27028 215.90537 197.54046 179.17555 160.81064 142.44573 124.08082
## [15] 105.71591 87.35100 68.98609 50.62118 32.25627 13.89136 -4.47355
## [22] -22.83846 -41.20337
```

```
y_bb <- b_0 + b_b1*1 + b_b3*x + b_b4*x
y_bb
```

```
## [1] 100.04352 98.72138 97.39924 96.07710 94.75496 93.43282 92.11068
## [8] 90.78854 89.46640 88.14426 86.82212 85.49998 84.17784 82.85570
## [15] 81.53356 80.21142 78.88928 77.56714 76.24500 74.92286 73.60072
## [22] 72.27858 70.95644
```

```
y_bc <- b_0 + b_b2*1 + b_b3*x + b_b5*x
y_bc
```

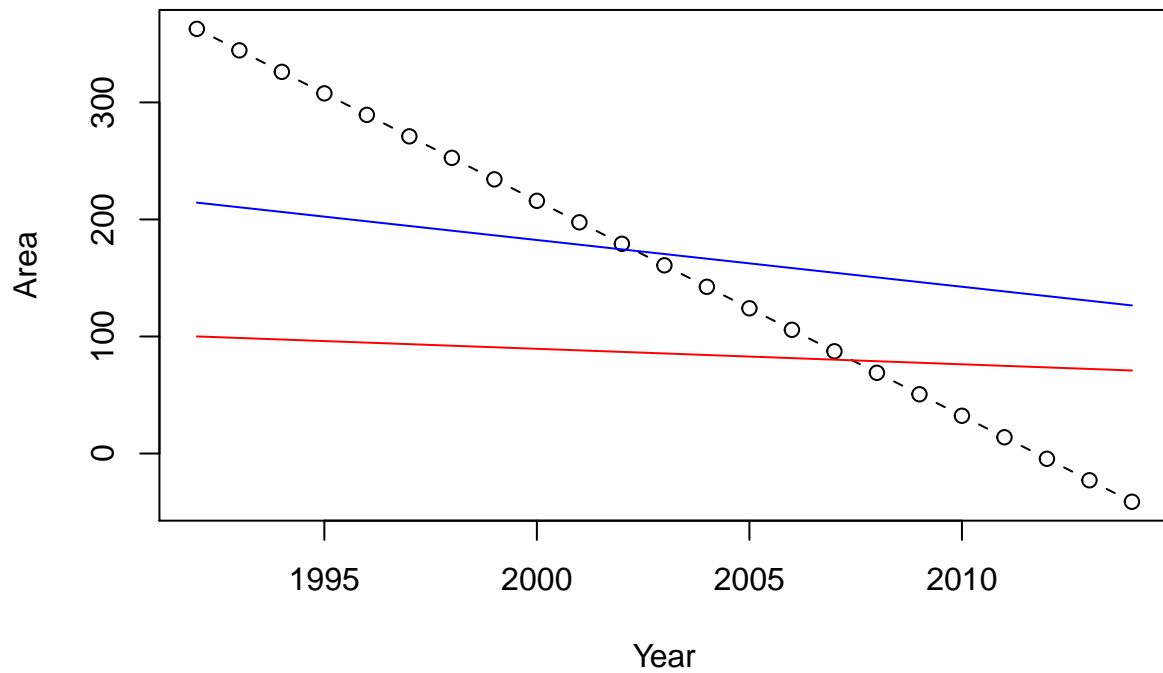
```
## [1] 214.3792 210.3856 206.3920 202.3984 198.4048 194.4112 190.4176 186.4241
## [9] 182.4305 178.4369 174.4433 170.4497 166.4561 162.4625 158.4689 154.4753
## [17] 150.4817 146.4882 142.4946 138.5010 134.5074 130.5138 126.5202
```

betas

```
## (Intercept)      BeachIDB      BeachIDC      Year BeachIDB:Year
## 36945.72537 -34211.97897 -28776.11491 -18.36491 17.04277
## BeachIDC:Year
## 14.37132
```

```
plot(x=x, y=y_ba, type='b', xlab='Year', ylab='Area', col='black')
lines(x=x, y=y_bb, col='red')
```

```
lines(x=x, y=y_bc, col='blue')
```



Interpret the rate of beach area change at each of the 3 beaches

```
ba<-b_b3
ba
```

```
## [1] -18.36491
```

```
bb<-b_b3+b_b4
bb
```

```
## [1] -1.32214
```

```
bc<-b_b3+b_b5
bc
```

```
## [1] -3.99359
```

The rate of beach area change at beach A is a decrease by 18.36491 hectares per year. The rate of beach area change at beach B is a decrease of 1.32214 hectares per year. The rate of beach area change at beach C is a decrease of 3.99359 hectares per year.