# Centered IVs without Interactions

## Notes

1. The author accepts no responsibility for the topicality, correctness, completeness, or quality of the information provided.
2. This pdf is part of a YouTube tutorial: https://youtu.be/ldAG2Q6e5gs
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## Part 1 - Simulate Data

```
# Two X, X_1 and X_2
X_1<-rnorm(100, mean=2.5, sd=1)
head(X_1)
```

```
## [1] 1.0627009 2.6227165 1.8924650 0.4821868 3.0567800 4.2368051
```

```
X_2<-rnorm(100, mean=1.5, sd=1)
head(X_2)
```

```
## [1] 2.6847445 0.5382529 3.0806452 2.7246779 3.9033105 4.5938552
```

```
# One Y

Y<-rnorm(100, mean=3, sd=1)
head(Y)
```

```
## [1] 3.336465 2.336900 4.112299 2.405560 4.179426 3.397588
```

```
mean(Y)
```

```
## [1] 3.043861
```

## Part 2 - Multiple Linear Regression without Centering

```
result_1<-lm(Y~X_1+X_2)
summary(result_1)
```

```
##
## Call:
## lm(formula = Y ~ X_1 + X_2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.17799 -0.55060  0.05898  0.52557  2.38206
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.95093    0.26897  10.971   <2e-16 ***
## X_1         -0.08062    0.09096  -0.886    0.378
## X_2          0.18149    0.08853   2.050    0.043 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9426 on 97 degrees of freedom
## Multiple R-squared:  0.04986,    Adjusted R-squared:  0.03027
## F-statistic: 2.545 on 2 and 97 DF,  p-value: 0.08368
```

## Part 3 - Centering X_1 and X_2

```
X_1_cen<-scale(X_1,scale = FALSE)
X_2_cen<-scale(X_2,scale = FALSE)
head(X_1_cen)
```

```
##             [,1]
## [1,] -1.2317172
## [2,]  0.3282984
## [3,] -0.4019531
## [4,] -1.8122312
## [5,]  0.7623619
## [6,]  1.9423871
```

```
head(X_2_cen)
```

```
##             [,1]
## [1,]  1.1535483
## [2,] -0.9929432
## [3,]  1.5494491
## [4,]  1.1934818
## [5,]  2.3721143
## [6,]  3.0626591
```

## Part 4 - Multiple Linear Regression with Centering

```
result_2<-lm(Y~X_1_cen+X_2_cen)
summary(result_2)
```

```
##
## Call:
## lm(formula = Y ~ X_1_cen + X_2_cen)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.17799 -0.55060  0.05898  0.52557  2.38206
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.04386    0.09426  32.293   <2e-16 ***
## X_1_cen     -0.08062    0.09096  -0.886    0.378
## X_2_cen      0.18149    0.08853   2.050    0.043 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9426 on 97 degrees of freedom
## Multiple R-squared:  0.04986,    Adjusted R-squared:  0.03027
## F-statistic: 2.545 on 2 and 97 DF,  p-value: 0.08368
```

## conclusion

For multiple linear regression without interactions, centering IVs only changes the intercept.