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/camtr-5ZGqA
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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] 2.431812 2.919058 2.075795 2.808850 1.647900 3.173214
```

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

```
## [1]  0.8972387 -0.0258751  1.9739896  1.2475595  3.3406035  2.3671040
```

```
# One Y

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

```
## [1] 2.1156326 2.9362302 4.6251768 2.4087498 3.1848438 0.9605331
```

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
## -2.48473 -0.67783  0.01868  0.64825  2.06747
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.9844910  0.3305983   9.028 1.69e-14 ***
## X_1         -0.0441251  0.1079806  -0.409    0.684
## X_2         -0.0002323  0.1149368  -0.002    0.998
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.003 on 97 degrees of freedom
## Multiple R-squared:  0.001744,   Adjusted R-squared:  -0.01884
## F-statistic: 0.08475 on 2 and 97 DF,  p-value: 0.9188
```

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,]  0.09052253
## [2,]  0.57776783
## [3,] -0.26549479
## [4,]  0.46756045
## [5,] -0.69338978
## [6,]  0.83192380
```

```
head(X_2_cen)
```

```
##            [,1]
## [1,] -0.4831643
## [2,] -1.4062781
## [3,]  0.5935866
## [4,] -0.1328435
## [5,]  1.9602005
## [6,]  0.9867010
```

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
## -2.48473 -0.67783  0.01868  0.64825  2.06747
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.8808607  0.1002953  28.724   <2e-16 ***
## X_1_cen     -0.0441251  0.1079806  -0.409    0.684
## X_2_cen     -0.0002323  0.1149368  -0.002    0.998
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.003 on 97 degrees of freedom
## Multiple R-squared:  0.001744,   Adjusted R-squared:  -0.01884
## F-statistic: 0.08475 on 2 and 97 DF,  p-value: 0.9188
```

conclusion

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