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Regression Equations and Interpretation of Parameter Estimates: ANCOVA Example

The following PROC GLMSELECT step creates an ANCOVA model of the relationship between blood pressure (the continous response variable **BPChange**) and the two predictor variables **Treatment** and **BaselineBP**. The categorical predictor, **Treatment**, indicates which of the three drug treatments the subject received. The continuous predictor, **BaselineBP**, indicates the subject's baseline blood pressure—that is, the blood pressure level prior to treatment.

```
ods select none;
proc glmselect data=trials2c outdesign=design2c;
   class treatment;
   model bpchange = treatment|baselinebpc / selection=none;
title 'Check Collinearity on Centered ANCOVA Model';
run;
```

The output from this PROC GLMSELECT step includes the following Parameter Estimates table:

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	B	-0.75286	0.32152	-2.34	0.0215	0
Treatment Approved Drug	Treatment Approved Drug	B	-3.76863	0.46584	-8.09	<.0001	1.33260
Treatment New Drug	Treatment New Drug	B	-9.58261	0.46884	-20.44	<.0001	1.39780
Treatment Placebo	Treatment Placebo	0	0	.	.	.	.
baselinebpc	baselinebpc	B	-0.16734	0.09101	-1.84	0.0694	2.73171
baselinebp*Treatment Approved Dr	baselinebp*Treatment Approved Drug	B	-0.75861	0.14588	-5.20	<.0001	1.65282
baselinebp*Treatment New Drug	baselinebp*Treatment New Drug	B	-0.98130	0.13100	-7.49	<.0001	2.07541
baselinebp*Treatment Placebo	baselinebp*Treatment Placebo	0	0	.	.	.	.

To write the regression equation for each treatment, you can use the parameter estimates from the table above. The three regression models are as follows:

- Approved Drug:
  BPChange = (−0.7529 − 3.7663) + (−0.1673 − 0.7586) * **BaselineBP** = −4.5192 − 0.9259 * **BaselineBP**
- New Drug:
  BPChange = (−0.7529 − 9.5826) + (−0.1673 − 0.9813) * **BaselineBP** = 10.3355 − 1.1486 * **BaselineBP**
- Placebo:
  BPChange = −0.7529 − 0.1673 * **BaselineBP**

This ANOVA model is based on the **trialsc** data set, in which the continuous predictor **BaselineBP** (the covariate) was centered by subtracting the mean. With the mean subtracted, the parameter estimates take on new interpretations. *Placebo* was the reference group, so the parameter estimate corresponding to the intercept can be interpreted as follows:

- If a person with the average value of **BaselineBP** took the placebo, that person can expect his or her blood pressure to change by -0.75 units.
- If a person with the average value of **BaselineBP** took the new drug, that person can expect his or her blood pressure to change by -9.58 units more than the placebo.
- If a person with the average value of **BaselineBP** took the approved drug, that person can expect his or her blood pressure to change by -3.77 units more than the placebo.

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