

MULTIPLE REGRESSION

This procedure is often used to do the equivalent of a factorial ANOVA when one or more of the factors is continuous, rather than categorical. For example, you might want to determine whether the consistency of judgment (a continuous variable), sex (a categorical variable), and/or an interaction between consistency and sex predicts the accuracy of judgment.

To do this, you must first compute a variable to represent the interaction term:

```
compute inter = consis * sex .
```

This will create a new variable called "inter" in your spreadsheet. Next, to run the multiple regression analysis, specify the dependent variable (here, ach100), the predictors (here, consis and sex), and then the interaction term (here, inter). Notice that there are two different "enter" subcommands; each requests a different model, or a different regression equation. The first one includes only the "main effects" and the second one adds in the interaction. The "desc" subcommand requests descriptive statistics, and the "stats" subcommand requests the default statistics for the analysis.

```
regression  
  /desc  
  /stats  
  /dep ach100  
  /enter consis sex  
  /enter inter .
```

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
Achievement, 100 cases	.37929	.087445	106
Sex 1=m 2=f	1.74	.443	106
Consistency (R)	.88592	.065811	106
SEX_CON	1.5373	.40761	106

The first part of the output (above) shows you the sample size, mean, and standard deviation of the dependent and predictor variables.

The second part of the output (below) shows you the correlations among all the variables.

Correlations

		Achievement, 100 cases	Sex 1=m 2=f	Consistency (R)	SEX_CON
Pearson Correlation	Achievement, 100 cases	1.000	.177	.518	.314
	Sex 1=m 2=f	.177	1.000	-.020	.959
	Consistency (R)	.518	-.020	1.000	.255
	SEX_CON	.314	.959	.255	1.000

Variables Entered/Removed^b

Model	Variables Entered	Variables Removed	Method
1	Consistency (R), Sex 1=m 2=f ^a	.	Enter
2	SEX_CON ^a	.	Enter

- a. All requested variables entered.
 b. Dependent Variable: Achievement, 100 cases

The third part of the output (above) shows you what variables were entered into each model in the analysis. Note that consistency and sex were entered into the first model, and then their interaction was entered into the second model. When you come to the results, below, you'll need to remember to look up the stats for each effect in the correct model.

The fourth part of the output (below) shows you the coefficient of determination (R Squared), or the percentage of variance in the dependent variable accounted for by the predictor(s), for each model in the analysis.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.551 ^a	.304	.290	.073673
2	.551 ^b	.304	.283	.074029

- a. Predictors: (Constant), Consistency (R), Sex 1=m 2=f
 b. Predictors: (Constant), Consistency (R), Sex 1=m 2=f, SEX_CON

ANOVA^c

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.244	2	.122	22.462	.000 ^a
	Residual	.559	103	.005		
	Total	.803	105			
2	Regression	.244	3	.081	14.835	.000 ^b
	Residual	.559	102	.005		
	Total	.803	105			

- a. Predictors: (Constant), Consistency (R), Sex 1=m 2=f
 b. Predictors: (Constant), Consistency (R), Sex 1=m 2=f, SEX_CON
 c. Dependent Variable: Achievement, 100 cases

The fifth part of the output (above) gives you a p value for each model, which you can ignore.

The sixth part of the output (below) shows you each model, or regression equation, that was calculated. Here is where you'll find the equivalent of tests for main effects and an interaction.

The first model contains the main effect results. You typically report the beta coefficient and its p-value. Here, you can see that there was a main effect for sex: $\beta = .19$, $p = .025$. To interpret this, you'd need to check how sex was coded; since the beta is positive, that means that accuracy levels increased

from sex = 1 (males) to sex = 2 (females), thus women were more accurate in their judgments than men. You can also see that greater consistency predicted greater accuracy: $\beta = .52$, $p < .001$; again, you can tell the direction of the relationship from the sign of the beta, as you do with correlations. Beta is also a measure of effect size, so you can see that the effect for consistency was much larger than that for sex. On the first model, ignore the constant.

(Note that when you type up results from multiple regression, you use the Greek symbol for beta, not the word itself. You can easily get this symbol on word processors. For example, on Word if you use the "Insert" menu, then the "Symbol" option, you can find the Greek alphabet in one of the many character sets included in your version of Word.)

The second model contains the interaction results. For this model, ignore the constant, consistency, and sex results, and pay attention only to the interaction variable. Here, you can see that there was no statistically reliable interaction between consistency and sex, $\beta = .12$, $p = .917$. Had there been an interaction, you would have had to plot a graph of some type to understand its nature.

You can ignore the final section of the output, "Excluded Variables."

FINAL NOTE: Multiple regression, like ANOVA, can easily handle more than two predictor variables. For example, suppose you added a continuous variable representing age to the sample analysis shown above. What you would need to do is first compute new variables to represent all two-way and three-way interactions:

```
compute sex_con = sex * consis .
compute sex_age = sex * age .
compute age_con = age * consis .
compute s_a_c = sex * age * consis .
```

Then, in your syntax for running the analysis, you enter all main effect terms on the first model, all two-way interactions on the second model, and the three-way interaction term on the third model:

```
regression
  /desc
  /stats
  /dep = ach100
  /enter sex age consis
  /enter sex_con sex_age age_con
  /enter s_a_c .
```

When finding stats for each main effect or interaction, be sure to look on the correct model in the output. That is, use model 1 for the main effects, model 2 for the two-way interactions, and model 3 for the three-way interaction.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.299	.102		-2.947	.004
	Sex 1=m 2=f	3.699E-02	.016	.187	2.278	.025
	Consistency (R)	.694	.109	.522	6.348	.000
2	(Constant)	-.262	.376		-.695	.489
	Sex 1=m 2=f	1.472E-02	.213	.075	.069	.945
	Consistency (R)	.651	.422	.490	1.541	.126
	SEX_CON	2.510E-02	.240	.117	.105	.917

a. Dependent Variable: Achievement, 100 cases

Excluded Variables^b

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	SEX_CON	.117 ^a	.105	.917	.010	5.462E-03

a. Predictors in the Model: (Constant), Consistency (R), Sex 1=m 2=f

b. Dependent Variable: Achievement, 100 cases