CHAPTER 7B

Multiple Regression: Statistical Methods Using IBM SPSS

This chapter will demonstrate how to perform multiple linear regression with IBM SPSS first using the standard method and then using the stepwise method. We will use the data file **Personality** in these demonstrations.

7B.1 Standard Multiple Regression

7B.1.1 Main Regression Dialog Window

For purposes of illustrating standard linear regression, assume that we are interested in predicting self-esteem based on the combination of negative affect (experiencing negative emotions), positive affect (experiencing positive emotions), openness to experience (e.g., trying new foods, exploring new places), extraversion, neuroticism, and trait anxiety. Selecting the path **Analyze ➔ Regression ➔ Linear** opens the **Linear Regression** main dialog window displayed in Figure 7b.1. From the variables list panel, we move over **esteem** to the **Dependent** panel and **negafect**, **posafect**, **neoopen**, **neoextra**, **neoneuro**, and **tanx** to the **Independent(s)** panel. The **Method** drop-down menu will be left at its default setting of **Enter**, which requests a standard regression analysis.

7B.1.2 Statistics Window

Selecting the **Statistics** pushbutton opens the **Linear Regression: Statistics** dialog window shown in Figure 7b.2. By default, **Estimates** in the **Regression Coefficients** panel is checked. This instructs IBM SPSS to print the value of the regression coefficient and

Figure 7b.1 Main Dialog Window for Linear Regression

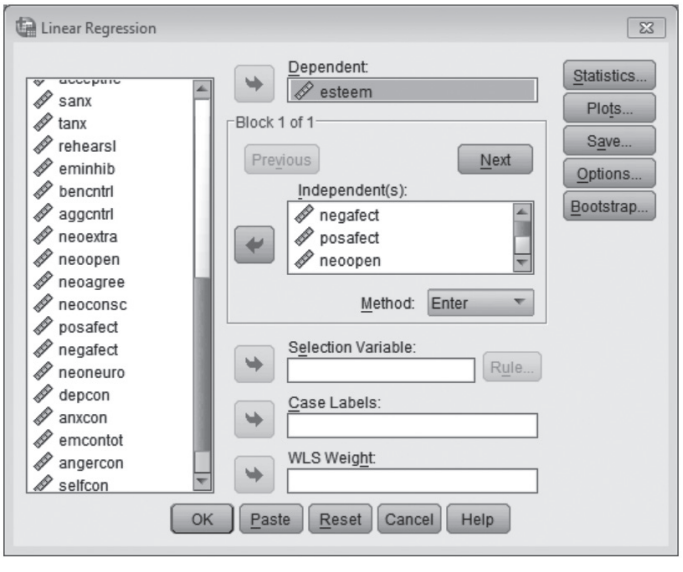
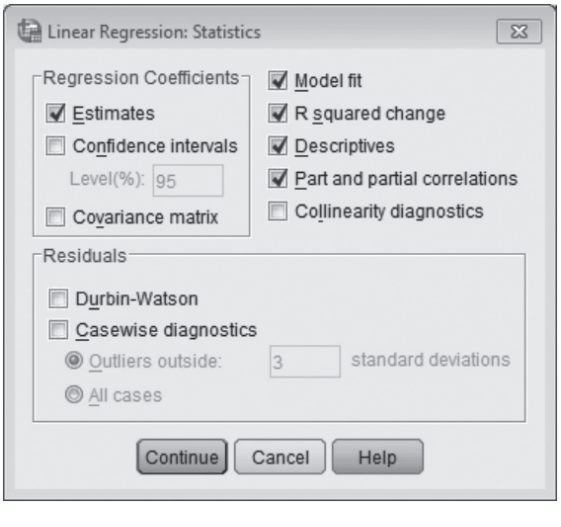


Figure 7b.2 The Linear Regression Statistics Window

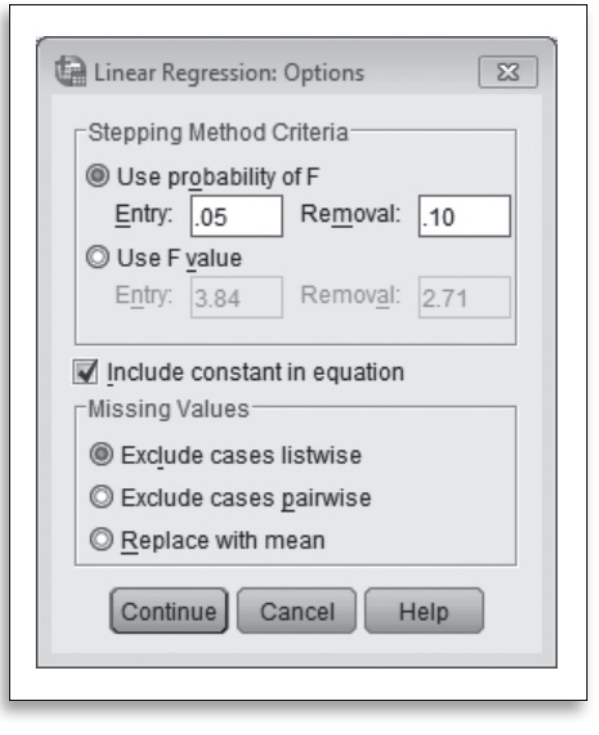


related measures. We also retained the following defaults: **Model fit**, which provides *R*-square, adjusted *R*-square, the standard error, and an ANOVA table; **R squared change**, which is useful when there are multiple predictors that are being entered in stages so that we can see where this information is placed in the output; **Descriptives**, which provides the means and standard deviations of the variables as well as the correlations table; and **Part and partial correlations**, which produces the partial and semipartial correlations and conveys important information when multiple predictors are used. Clicking **Continue** returns us to the main dialog screen.

7B.1.3 Options Window

Select the **Options** pushbutton; this displays the **Linear Regression: Options** dialog window shown in Figure 7b.3. The top panel is applicable if we were using one of the step methods, and we will discuss this in Section 7B.2. We have retained the defaults of including the *Y* intercept (the constant) in the equation and of excluding cases listwise. The choice **Exclude cases listwise** (sometimes called listwise deletion) means that all cases must have valid values on all of the variables in the analysis in order to be included; a missing value on even one of the variables is sufficient to exclude that case. Selecting this choice ensures that the set of variables, and thus the regression model, is based on the same set of cases. So long as there is relatively little missing data, this choice is best. Clicking **Continue** returns us to the main dialog box, and selecting **OK** produces the analysis.

Figure 7b.3 The Linear Regression Options Window



7B.1.4 Multiple Regression Output

We will examine the output of the analysis in the order we suggest that you proceed. Figure 7b.4 contains descriptive information. The upper table contains the means and standard deviations of the variables, and the lower table shows the square correlation matrix. The correlation results are divided into

Figure 7b.4 Descriptive Statistics and Correlations Output for Standard Regression

Descriptive Statistics

	Mean	Std. Deviation	N
esteem self-esteem: coopersmith	71.2952	20.95292	420
negafect negative affect: mpq	5.7786	3.73029	420
posafect positive affect: mpq	7.7048	2.90970	420
neoopen openness: neo	55.4607	10.90952	420
neoextra extraversion: neo	55.8324	11.28265	420
neoneuro neuroticism: neo	50.5394	11.14793	420
tanx trait anxiety: spielberger	38.3262	10.59431	420

Correlations

		esteem self-esteem: coopersmith	negafect negative affect: mpq	posafect positive affect: mpq	neoopen openness: neo	neoextra extraversion: neo	neoneuro neuroticism: neo	tanx trait anxiety: spielberger
Pearson Correlation	esteem self-esteem: coopersmith	1.000	-.572	.555	.221	.425	-.693	-.724
	negafect negative affect: mpq	-.572	1.000	-.324	-.168	-.218	.712	.713
	posafect positive affect: mpq	.555	-.324	1.000	.221	.528	-.441	-.528
	neoopen openness: neo	.221	-.168	.221	1.000	.051	-.227	-.183
	neoextra extraversion: neo	.425	-.218	.528	.051	1.000	-.347	-.375
	neoneuro neuroticism: neo	-.693	.712	-.441	-.227	-.347	1.000	.809
	tanx trait anxiety: spielberger	-.724	.713	-.528	-.183	-.375	.809	1.000
Sig. (1-tailed)	esteem self-esteem: coopersmith	.	.000	.000	.000	.000	.000	.000
	negafect negative affect: mpq	.000	.	.000	.000	.000	.000	.000
	posafect positive affect: mpq	.000	.000	.	.000	.000	.000	.000
	neoopen openness: neo	.000	.000	.000	.	.148	.000	.000
	neoextra extraversion: neo	.000	.000	.000	.148	.	.000	.000
	neoneuro neuroticism: neo	.000	.000	.000	.000	.000	.	.000
	tanx trait anxiety: spielberger	.000	.000	.000	.000	.000	.000	.
N	esteem self-esteem: coopersmith	420	420	420	420	420	420	420
	negafect negative affect: mpq	420	420	420	420	420	420	420
	posafect positive affect: mpq	420	420	420	420	420	420	420
	neoopen openness: neo	420	420	420	420	420	420	420
	neoextra extraversion: neo	420	420	420	420	420	420	420
	neoneuro neuroticism: neo	420	420	420	420	420	420	420
	tanx trait anxiety: spielberger	420	420	420	420	420	420	420

three major rows: the first contains the Pearson *r* values, the second contains the probabilities of obtaining those values if the null hypothesis was true, and the third provides sample size.

The dependent variable **esteem** is placed by IBM SPSS on the first row and column, and the other variables appear in the order we entered them into the analysis. The study represented by our data set was designed for a somewhat different purpose, so our choice of variables was a bit limited. Thus, the correlations of self-esteem with the predictor variables in the analysis are higher than we would ordinarily prefer, and many of the other variables are themselves likewise intercorrelated more than we would prefer. Nonetheless, the example is still useful for our purposes.

Figure 7b.5 displays the results of the analysis. The middle table shows the test of significance of the model using an ANOVA. There are 419 ($N - 1$) total degrees of freedom. With six predictors, the **Regression** effect has 6 degrees of freedom. The **Regression** effect is statistically significant indicating that prediction of the dependent variable is accomplished better than can be done by chance.

Figure 7b.5 The Results of the Standard Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.779[a]	.607	.601	13.22887	.607	106.356	6	413	.000

a. Predictors: (Constant), tanx trait anxiety: spielberger, neoopen openness: neo, neoextra extraversion: neo, posafect positive affect: mpq, negafect negative affect: mpq, neoneuro neuroticism: neo

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	111675.183	6	18612.531	106.356	.000[a]
	Residual	72276.207	413	175.003		
	Total	183951.390	419			

a. Predictors: (Constant), tanx trait anxiety: spielberger, neoopen openness: neo, neoextra extraversion: neo, posafect positive affect: mpq, negafect negative affect: mpq, neoneuro neuroticism: neo

b. Dependent Variable: esteem self-esteem: coopersmith

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	96.885	7.294		13.283	.000			
	negafect negative affect: mpq	-.386	.264	-.069	-1.462	.144	-.572	-.072	-.045
	posafect positive affect: mpq	1.338	.293	.186	4.564	.000	.555	.219	.141
	neoopen openness: neo	.088	.062	.046	1.420	.156	.221	.070	.044
	neoextra extraversion: neo	.185	.069	.099	2.684	.008	.425	.131	.083
	neoneuro neuroticism: neo	-.477	.106	-.254	-4.505	.000	-.693	-.216	-.139
	tanx trait anxiety: spielberger	-.646	.117	-.326	-5.511	.000	-.724	-.262	-.170

a. Dependent Variable: esteem self-esteem: coopersmith

The upper table in Figure 7b.5 labeled **Model Summary** provides an overview of the results. Of primary interest are the **R Square** and **Adjusted R Square** values, which are .607 and .601, respectively. We learn from these that the weighted combination of the predictor variables explained approximately 60% of the variance of self-esteem. The loss of so little strength in computing the **Adjusted R Square** value is primarily due to our relatively large sample size combined with a relatively small set of predictors. Using the standard regression procedure where all of the predictors were entered simultaneously into the model, **R Square Change** went from zero before the model was fitted to the data to .607 when the variable was entered.

The bottom table in Figure 7b.5 labeled **Coefficients** provides the details of the results. The Z**ero-order** column under **Correlations** lists the Pearson *r* values of the dependent variable (self-esteem in this case) with each of the predictors. These values are the same as those shown in the correlation matrix of Figure 7b.4. The **Partial** column under **Correlations** lists the partial correlations for each predictor as it was evaluated for its weighting in the model (the correlation between the predictor and the dependent variable when the other predictors are treated as covariates). The **Part** column under **Correlations** lists the semipartial correlations for each predictor once the model is finalized; squaring these values informs us of the percentage of variance each predictor uniquely explains. For example, trait anxiety accounts uniquely for about 3% of the variance of self-esteem (−.170 * −.170 = .0289 or approximately .03) given the other variables in the model.

The *Y* intercept of the raw score model is labeled as the **Constant** and has a value here of 98.885. Of primary interest here are the raw (**B**) and standardized (**Beta**) coefficients, and their significance levels determined by *t* tests. With the exception of negative affect and openness, all of the predictors are statistically significant. As can be seen by examining the beta weights, trait anxiety followed by neuroticism followed by positive affect were making relatively larger contributions to the prediction model.

The raw regression coefficients are *partial regression coefficients* because their values take into account the other predictor variables in the model; they inform us of the predicted change in the dependent variable for every unit increase in that predictor. For example, positive affect is associated with a partial regression coefficient of 1.338 and signifies that for every additional point on the positive affect measure, we would predict a gain of 1.338 points on the self-esteem measure. As another example, neuroticism is associated with a partial regression coefficient of −.477 and signifies that for every additional point on the neuroticism measure, we would predict a decrement of .477 points on the self-esteem measure.

This example serves to illustrate two important related points about multiple regression analysis. First, it is the model as a whole that is the focus of the analysis. Variables are treated akin to team players weighted in such a way that the sum of the squared residuals of the model is minimized. Thus, it is the set of variables in this particular (weighted) configuration that maximizes prediction—swap out one of these predictors for a new variable and the whole configuration that represents the best prediction can be quite different.

The second important point about regression analysis that this example illustrates, which is related to the first, is that a highly predictive variable can be "left out in the cold," being "sacrificed" for the "good of the model." Note that negative affect correlates rather substantially with self-esteem ($r = -.572$), and if it was the only predictor it would have a beta weight of −.572 (recall that in simple linear regression the Pearson *r* is the beta weight of the predictor), yet in combination with the other predictors is not a significant predictor in the multiple regression model. The reason is that its predictive work is being accomplished by one or more of the other variables in the analysis. But the point is that just because a variable

receives a modest weight in the model or just because a variable is not contributing a statistically significant degree of prediction in the model is not a reason to presume that it is itself a poor predictor.

It is also important to note that the IBM SPSS output does not contain the structure coefficients. These are the correlations of the predictors in the model with the overall predictor variate, and these structure coefficients help researchers interpret the dimension underlying the predictor model (see Section 7A.11). They are easy enough to calculate by hand (the Pearson correlation between the predictor and the criterion variable divided by the multiple correlation), and we incorporate these structure coefficients into our report of the results in Section 7B.1.5.

7B.1.5 Reporting Standard Multiple Regression Results

Negative affect, positive affect, openness to experience, extraversion, neuroticism, and trait anxiety were used in a standard regression analysis to predict self-esteem. The correlations of the variables are shown in Table 7b.1.As can be seen, all correlations, except for the one between openness and extraversion, were statistically significant.

The prediction model was statistically significant, $F(6, 413) = 106.356$, $p < .001$, and accounted for approximately 60% of the variance of self-esteem ($R^2 = .607$, Adjusted $R^2 = .601$). Self-esteem was primarily predicted by lower levels of trait anxiety and neuroticism, and to a lesser extent by higher levels of positive affect and extraversion. The raw and standardized regression coefficients of the predictors together with their correlations with self-esteem, their squared semipartial correlations and their structure coefficients, are shown in Table 7b.2. Trait anxiety received the strongest weight in the model followed by neuroticism and positive affect. With the sizeable correlations between the predictors, the unique variance explained by each of the variables indexed by the squared semipartial correlations was quite low. Inspection of the structure coefficients suggests that, with the possible exception of extraversion whose correlation is still relatively substantial, the other significant predictors were strong indicators of the underlying (latent) variable described by the model, which can be interpreted as well-being.

7B.2 Stepwise Multiple Regression

We discussed the forward, backward, and stepwise methods of performing a regression analysis in Chapter 5A. To illustrate how to work with these methods, we will perform a

Table 7b.1 Correlations of the Variables in the Analysis ($N = 420$)

Variable	2	3	4	5	6	7
1. Self-Esteem	–.572	.555	.221	.425	–.693	–.724
2. Negative Affect	--	–.324	–.168	–.218	.712	.713
3. Positive Affect		--	.221	.528	–.441	–.528
4. Openness			--	.051	–.227	–.183
5. Extraversion				--	–.347	–.375
6. Neuroticism					--	.809
7. Trait Anxiety						--

Note. All correlations except that between Openness and Extraversion were statistically significant ($p < .001$).

Table 7b.2 Standard Regression Results

Model	*b*	*SE-b*	Beta	Pearson *r*	sr^2	Structure Coefficient
Constant	96.885	7.294				
Negative Affect	–.386	.264	–.069	–.572	.002	–.734
Positive Affect*	1.338	.293	.186	.555	.020	.712
Openness	.088	.062	.046	.221	.002	.284
Extraversion*	.185	.069	.099	.425	.007	.546
Neuroticism*	–.477	.106	–.254	–.693	.019	–.890
Trait Anxiety*	–.646	.117	–.326	–.724	.029	–.929

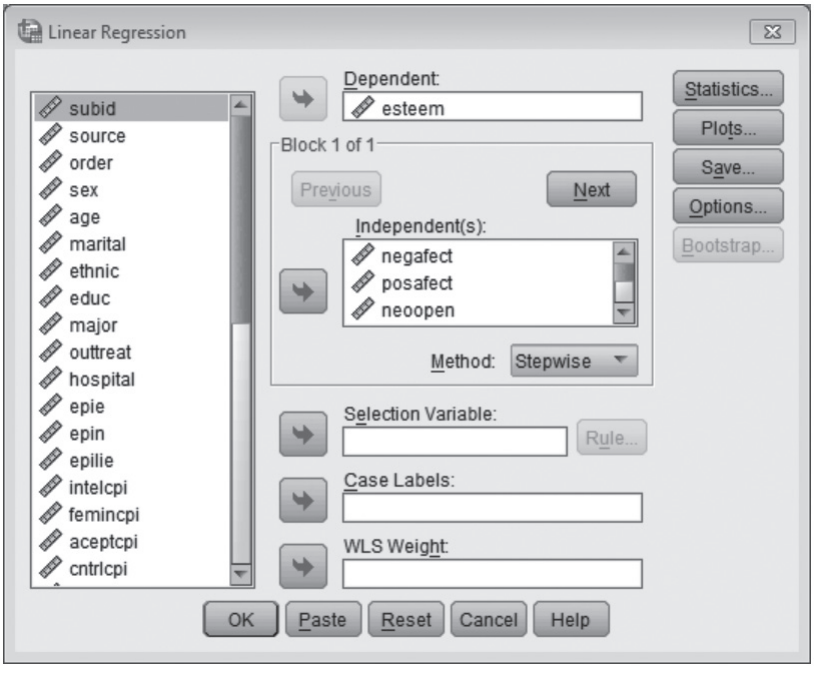
Note. The dependent variable was Self-Esteem. $R^2 = .607$, Adjusted $R^2 = .601$.
sr^2 is the squared semi-partial correlation.
* $p < .05$.

stepwise analysis on the same set of variables that we used in our standard regression analysis in Section 7B.1. We will use the data file **Personality** in these demonstrations. In the process of our description, we will point out areas of similarity and difference between the standard and step methods.

7B.2.1 Main Regression Dialog Window

Select the path **Analyze ➔ Regression ➔ Linear**. This brings us to the **Linear Regression** main dialog window displayed in Figure 7b.6. From the variables list panel, we click over **esteem** to the **Dependent** panel and **negafect**, **posafect**, **neoopen**, **neoextra**, **neoneuro**, and **tanx** to the **Independent(s)** panel. The **Method** drop-down menu contains the set of step methods that IBM SPSS can run. The only one you may not recognize is **Remove**, which allows a set of variables to be removed from the model together. Choose **Stepwise** as the **Method** from the drop-down menu as shown in Figure 7b.6.

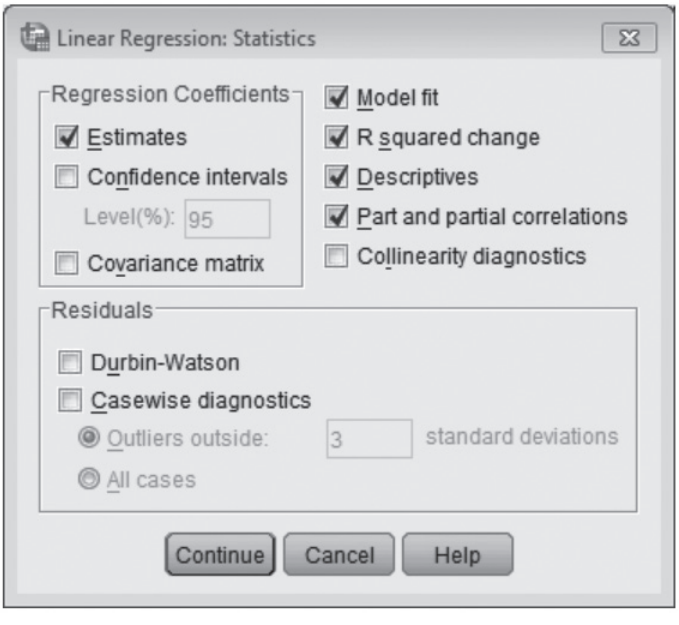
Figure 7b.6 Main Dialog Window for Linear Regression



7B.2.2 Statistics Window

Selecting the **Statistics** pushbutton brings us to the **Linear Regression: Statistics** dialog window shown in Figure 7b.7. This was already discussed in Section 7B.1.2. Clicking **Continue** returns us to the main dialog box.

Figure 7b.7 The Linear Regression Statistics Window

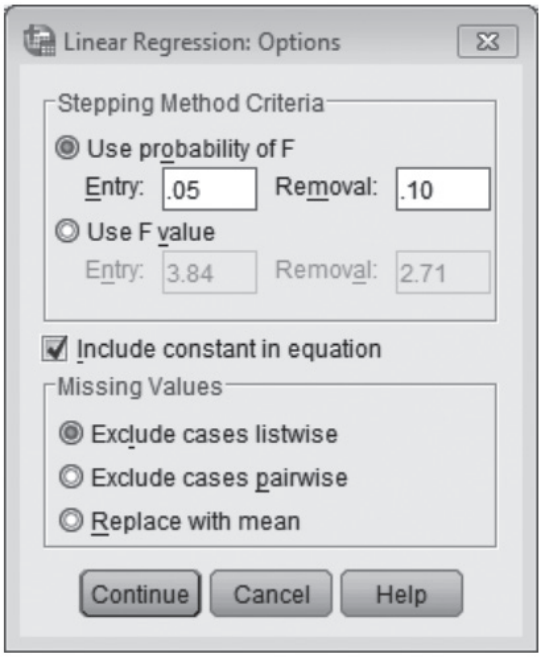


7B.2.3 Options Window

Selecting the **Options** pushbutton brings us to the **Linear Regression: Options** dialog window shown in Figure 7b.8. The top panel is now applicable as we are using the stepwise method. To avoid looping variables continually in and out of the model, it is appropriate to set different "significance" levels for entry and exit. The defaults used by IBM SPSS are common settings, and we recommend them. Remember that in the stepwise procedure, variables already entered into the model can be removed at a later step if they are no longer contributing a statistically significant amount of prediction.

Earning entry to the model is set at an alpha level of .05 (e.g., a variable with a probability of .07 will not be entered) and is the more stringent of the two settings. But to be removed, a variable must have an associated probability of greater than .10 (e.g., a variable with an associated probability of .12 will be removed but one with an associated probability of .07 will remain in the model). In essence, it is more difficult to get in than be removed. This is a good thing and allows the stepwise procedure to function. Click **Continue** to return to the main dialog window, and click **OK** to perform the analysis.

Figure 7b.8 The Linear Regression Options Window



7B.2.4 Stepwise Multiple Regression Output

The descriptive statistics are identical to those presented in Section 7B.1.4, and we will skip those here. Figure 7b.9 displays the test of significance of the model using an ANOVA. The four ANOVAs that are reported correspond to four models, but don't let the terminology confuse you. The stepwise procedure adds only one variable at a time to the model as the model is "slowly" built. At the third step and beyond, it is also possible to remove a variable from the model (although that did not happen in our example). In the terminology used by IBM SPSS, each step results in a model, and each successive step modifies the older model and replaces it with a newer one. Each model is tested for statistical significance.

Examining the last two columns of the output shown in Figure 7b.9 informs us that the final model was built in four steps; each step resulted in a statistically significant model. Examining the **df** column shows us that one variable was added during each step (the degrees of freedom for the **Regression** effect track this for us as they are counts of the

Figure 7b.9 Tests of Significance for Each Step in the Regression Analysis

ANOVA[e]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96502.996	1	96502.996	461.281	.000[a]
	Residual	87448.394	418	209.207		
	Total	183951.390	419			
2	Regression	104086.724	2	52043.362	271.736	.000[b]
	Residual	79864.666	417	191.522		
	Total	183951.390	419			
3	Regression	109881.931	3	36627.310	205.712	.000[c]
	Residual	74069.460	416	178.052		
	Total	183951.390	419			
4	Regression	110934.239	4	27733.560	157.626	.000[d]
	Residual	73017.152	415	175.945		
	Total	183951.390	419			

a. Predictors: (Constant), tanx trait anxiety: spielberger

b. Predictors: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq

c. Predictors: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq, neoneuro neuroticism: neo

d. Predictors: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq, neoneuro neuroticism: neo, neoextra extraversion: neo

e. Dependent Variable: esteem self-esteem: coopersmith

number of predictors in the model). We can also deduce that no variables were removed from the model since the count of predictors in the model steadily increases from 1 to 4.

This latter deduction is verified by the display shown in Figure 7b.10, which tracks variables that have been entered and removed at each step. As can be seen, trait anxiety, positive affect, neuroticism, and extraversion have been entered on Steps 1 through 4, respectively, without any variables having been removed on any step.

Figure 7b.11, the **Model Summary**, presents the **R Square** and **Adjusted R Square** values for each step along with the amount of **R Square Change**. In the first step, as can be seen from the footnote beneath the **Model Summary** table, trait anxiety was entered into the model. The **R Square** with that predictor in the model was .525. Not coincidentally, that is the square of the correlation between trait anxiety and self-esteem ($.724^2 = .525$), and is the value of **R Square Change**.

On the second step, positive affect was added to the model. The **R Square** with both predictors in the model was .566; thus, we gained .041 in the value of **R Square** (.566 – .525 = .041), and this is reflected in the **R Square Change** for that step. By the time we arrive at the end of the fourth step, our **R Square** value has reached .603. Note that this

Figure 7b.10 Variables That Were Entered and Removed

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	tanx trait anxiety: spielberger	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	posafect positive affect: mpq	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	neoneuro neuroticism: neo	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	neoextra extraversion: neo	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: esteem self-esteem: coopersmith

value is very close to but not identical to the R^2 value we obtained under the standard method.

The **Coefficients** table in Figure 7b.12 provides the details of the results. Note that both the raw and standardized regression coefficients are readjusted at each step to reflect the additional variables in the model. Ordinarily, although it is interesting to observe the dynamic changes taking place, we are usually interested in the final model. Note also that the values of the regression coefficients are different from those associated with the same variables in the standard regression analysis. That the differences are not huge is due to the fact that these four variables did almost the same amount of predictive work in much the same configuration as did the six predictors accomplished using the standard method. If economy of model were relevant, we would probably be very happy with the trimmed model of four variables replacing the full model containing six variables.

Figure 7b.13 addresses the fate of the remaining variables. For each step, IBM SPSS tells us which variables were not entered. In addition to tests of the statistical significance of each variable, we also see displayed the partial correlations. This information together tells us what will happen in the following step. For example, consider Step 1, which contains the five excluded variables. Positive affect has the highest partial correlation (.294), and it is statistically significant; thus, it will be the variable next entered on Step 2. On the second step, with four variables (of the six) excluded, we see that neuroticism with a statistically significant partial correlation of

Figure 7b.11 Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.724[a]	.525	.523	14.46398	.525	461.281	1	418	.000
2	.752[b]	.566	.564	13.83915	.041	39.597	1	417	.000
3	.773[c]	.597	.594	13.34360	.032	32.548	1	416	.000
4	.777[d]	.603	.599	13.26442	.006	5.981	1	415	.015

a. Predictors: (Constant), tanx trait anxiety: spielberger

b. Predictors: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq

c. Predictors: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq, neoneuro neuroticism: neo

d. Predictors: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq, neoneuro neuroticism: neo, neoextra extraversion: neo

Figure 7b.12 The Results of the Stepwise Regression Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	126.197	2.652		47.588	.000			
	tanx trait anxiety: spielberger	−1.432	.067	−.724	−21.477	.000	−.724	−.724	−.724
2	(Constant)	103.366	4.427		23.347	.000			
	tanx trait anxiety: spielberger	−1.183	.075	−.598	−15.742	.000	−.724	−.611	−.508
	posafect positive affect: mpq	1.722	.274	.239	6.293	.000	.555	.294	.203
3	(Constant)	114.095	4.665		24.459	.000			
	tanx trait anxiety: spielberger	−.706	.111	−.357	−6.386	.000	−.724	−.299	−.199
	posafect positive affect: mpq	1.679	.264	.233	6.364	.000	.555	.298	.198
	neoneuro neuroticism: neo	−.567	.099	−.302	−5.705	.000	−.693	−.269	−.177
4	(Constant)	105.775	5.751		18.392	.000			
	tanx trait anxiety: spielberger	−.698	.110	−.353	−6.345	.000	−.724	−.297	−.196
	posafect positive affect: mpq	1.384	.289	.192	4.793	.000	.555	.229	.148
	neoneuro neuroticism: neo	−.549	.099	−.292	−5.537	.000	−.693	−.262	−.171
	neoextra extraversion: neo	.167	.068	.090	2.446	.015	.425	.119	.076

a. Dependent Variable: esteem self-esteem: coopersmith

−.269 wins the struggle for entry next. By the time we reach the fourth step, there is no variable of the excluded set that has a statistically significant partial correlation for entry at Step 5; thus, the stepwise procedure ends after completing the fourth step.

Figure 7b.13 The Results of the Stepwise Regression Analysis

Excluded Variables[e]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics: Tolerance
1	negafect negative affect: mpq	−.112[a]	−2.350	.019	−.114	.492
	posafect positive affect: mpq	.239[a]	6.293	.000	.294	.721
	neoopen openness: neo	.091[a]	2.680	.008	.130	.967
	neoextra extraversion: neo	.179[a]	5.058	.000	.240	.859
	neoneuro neuroticism: neo	−.311[a]	−5.625	.000	−.266	.346
2	negafect negative affect: mpq	−.139[b]	−3.034	.003	−.147	.488
	neoopen openness: neo	.062[b]	1.872	.062	.091	.945
	neoextra extraversion: neo	.106[b]	2.777	.006	.135	.709
	neoneuro neuroticism: neo	−.302[b]	−5.705	.000	−.269	.346
3	negafect negative affect: mpq	−.061[c]	−1.296	.196	−.063	.434
	neoopen openness: neo	.038[c]	1.180	.239	.058	.928
	neoextra extraversion: neo	.090[c]	2.446	.015	.119	.704
4	negafect negative affect: mpq	−.070[d]	−1.487	.138	−.073	.432
	neoopen openness: neo	.047[d]	1.446	.149	.071	.918

a. Predictors in the Model: (Constant), tanx trait anxiety: spielberger

b. Predictors in the Model: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq

c. Predictors in the Model: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq, neoneuro neuroticism: neo

d. Predictors in the Model: (Constant), tanx trait anxiety: spielberger, posafect positive affect: mpq, neoneuro neuroticism: neo, neoextra extraversion: neo

e. Dependent Variable: esteem self-esteem: coopersmith

7B.2.5 Reporting Stepwise Multiple Regression Results

Negative affect, positive affect, openness to experience, extraversion, neuroticism, and trait anxiety were used in a stepwise multiple regression analysis to predict self-esteem. The correlations of the variables are shown in Table 7b.1. As can be seen, all correlations except for the one between openness and extraversion were statistically significant.

The prediction model contained four of the six predictors and was reached in four steps with no variables removed. The model was statistically significant, $F(4, 415) = 157.626$, $p < .001$, and accounted for approximately 60% of the variance of self-esteem ($R^2 = .603$, Adjusted $R^2 = .599$). Self-esteem was primarily predicted by lower levels of trait anxiety and neuroticism, and to a lesser extent by higher levels of positive affect and extraversion. The raw and standardized regression coefficients of the predictors together with their correlations with self-esteem, their squared semi-partial correlations, and their structure coefficients are shown in Table 7b.3. Trait anxiety received the strongest weight in the model followed by neuroticism and positive affect; extraversion received the lowest of the four weights. With the sizeable correlations between the predictors, the unique variance explained by each of the variables indexed by the squared semipartial correlations, was relatively low: trait anxiety, positive affect, neuroticism, and extraversion uniquely accounted for approximately 4%, 2%, 3%, and less than 1% of the variance of self-esteem. The latent factor represented by the model appears to be interpretable as well-being. Inspection of the structure coefficients suggests that trait anxiety and neuroticism were very strong indicators of well being, positive affect was a relatively strong indicator of well-being, and extraversion was a moderate indicator of well-being.

Table 7b.3 Stepwise Regression Results

Model	b	*SE-b*	Beta	Pearson *r*	sr^2	Structure Coefficient
Constant	105.775	5.751				
Trait Anxiety	–.698	.110	–.353	–.724	.038	–.932
Positive Affect*	1.384	.289	.192	.555	.022	.714
Neuroticism*	–.549	.099	–.292	–.693	.029	–.892
Extraversion*	.167	.068	.090	.425	.006	.547

Note. The dependent variable was Self-Esteem. $R^2 = .603$, Adjusted $R^2 = .599$.
sr^2 is the squared semi-partial correlation.
* $p < .05$.