Introduction

This report details the steps taken to find the best fitted regression model generated from a data set. The data is meant to synthesize gene-environment interactions (or GxE), which is when two genotypes behave differently when exposed to variations in the environment. SAS and Microsoft Excel is used to process the data.

Methodology

We first import the data set (which was in the form of a .csv file) into the SAS environment. We used the getnames function to generate SAS variable names. We had some example code that used the dependent variable (DV) instead of Y, so we set Y equal to DV. We then ran a correlation test on variables E_1 - E_5 with DV and another correlation test on variables G_1 - G_{10} with DV. Next, we ran a Box-Cox transformation with the purpose of finding any potential non-linear transformations of the dependent variables. Initially the Box Cox transformation did not work because our dependent variable had a minimum negative value and since the function takes the log of the dependent value we received an error. In order to obtain available logarithmic values, we added 324.0 to shift the value to positive. Next we set up the two and three-way gene-interaction arrays, which are classified as upper right triangular arrays, and looped our code so that it would try every combination we specified. We then ran a multiple regression model test on n = 2426 observations, specifying that the code should run in a stepwise manner with significance of at least p = .01. After obtaining the multiple regression model, we used the equation that the model test outputted to obtain the values for $Y_{regression}$. We then ran an ANOVA test in excel comparing the original Y values and $Y_{regression}$ values. [Please refer to the technical appendix for all code]

Results

Summary of Stepwise Selection								
Step	Variable Entered	Variable Removed	Number Vars In	Partial R-Square	Model R-Square	C(p)	F Value	Pr > F
1	g3g4		1	0.2772	0.2772	1710.2	929.85	<.0001
2	e1g2		2	0.1423	0.4196	898.38	594.21	<.0001
3	g1g4g5		3	0.0774	0.497	457.7	372.84	<.0001
4	e1e4g4		4	0.0421	0.5391	218.95	221.2	<.0001
5	G3		5	0.0108	0.55	158.94	58.33	<.0001
6	G4		6	0.0155	0.5655	72.389	86.22	<.0001
7		g3g4	5	0.0001	0.5654	70.708	0.31	0.577
8	g1g5		6	0.0095	0.5749	18.562	53.89	<.0001
9		g1g4g5	5	0	0.5748	16.819	0.26	0.613
10	e3g1g7		6	0.0023	0.5772	5.4123	13.42	3E-04
11	E1		7	0.0018	0.5789	-2.5973	10.05	0.002
12	E4		8	0.0017	0.5807	-10.548	10.03	0.002
13		e1e4g4	7	0.0001	0.5806	-12.169	0.38	0.537

Table 1. This table shows the output for the stepwise selection choosing significant variables and interactions.

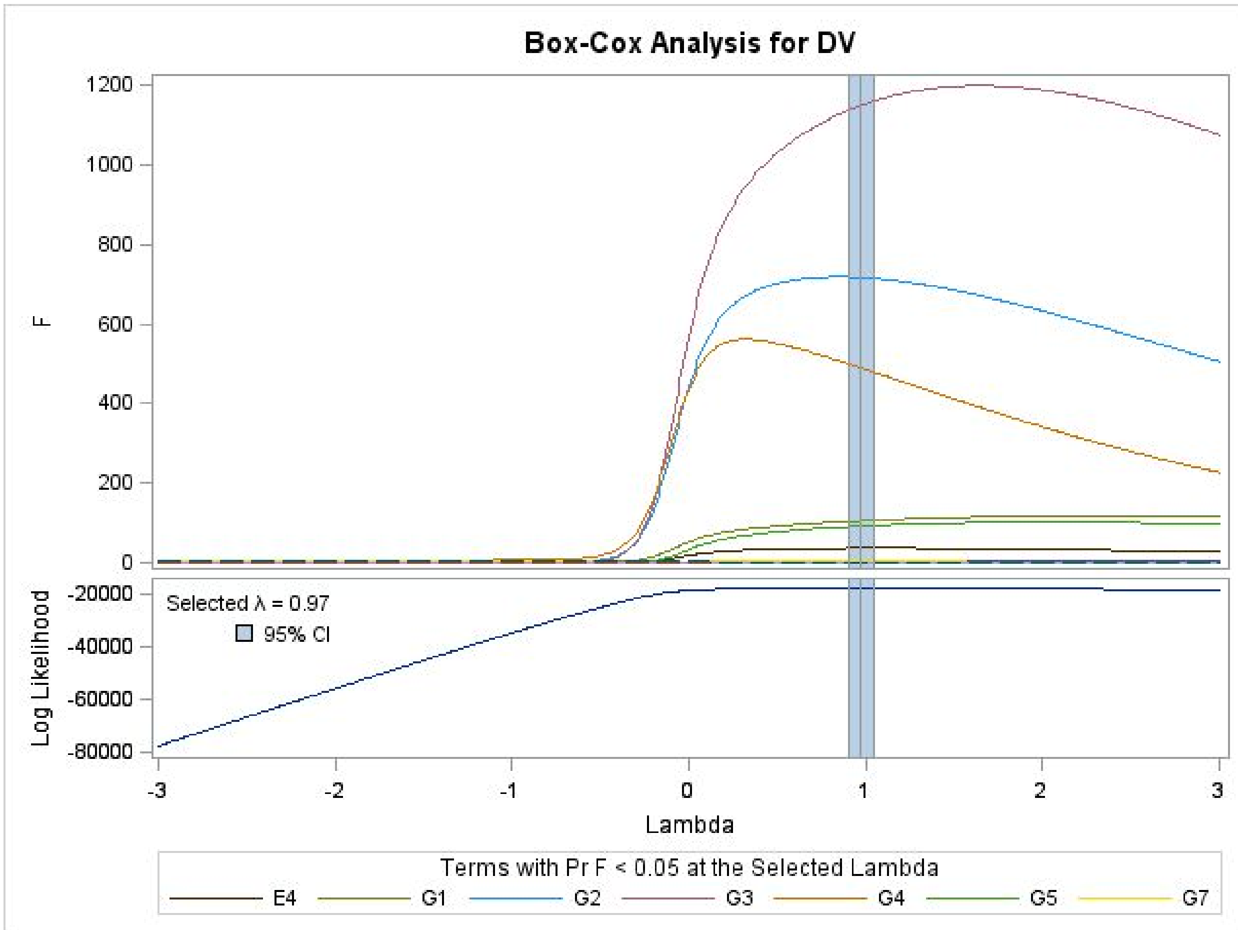

Figure 1. This figure shows the Box-Cox transformation test results.

Dependent Variable BoxCox(DV)				
Number of Observations Read	2426			
Number of Observations Used	2426			
Model Statement Specification Details				
Type	**DF**	**Variable**	**Description**	**Value**
Dep	**1**	**BoxCox(DV)**	Lambda Used	0.97
			Lambda	0.97
			Log Likelihood	-17906.4
			Conv. Lambda	1
			Conv. Lambda LL	-17906.7
			CI Limit	-17908.4
			Alpha	0.05
			Parameter	327
Ind	**1**	**Identity(E1)**	DF	1
Ind	**1**	**Identity(E2)**	DF	1
Ind	**1**	**Identity(E3)**	DF	1
Ind	**1**	**Identity(E4)**	DF	1
Ind	**1**	**Identity(E5)**	DF	1
Ind	**1**	**Identity(G1)**	DF	1
Ind	**1**	**Identity(G2)**	DF	1
Ind	**1**	**Identity(G3)**	DF	1
Ind	**1**	**Identity(G4)**	DF	1
Ind	**1**	**Identity(G5)**	DF	1
Ind	**1**	**Identity(G6)**	DF	1
Ind	**1**	**Identity(G7)**	DF	1
Ind	**1**	**Identity(G8)**	DF	1
Ind	**1**	**Identity(G9)**	DF	1
Ind	**1**	**Identity(G10)**	DF	1

Table 2. This is the Box-Cox table output from the DV Box-Cox transformation. The number of observations is also listed as n = 2426.

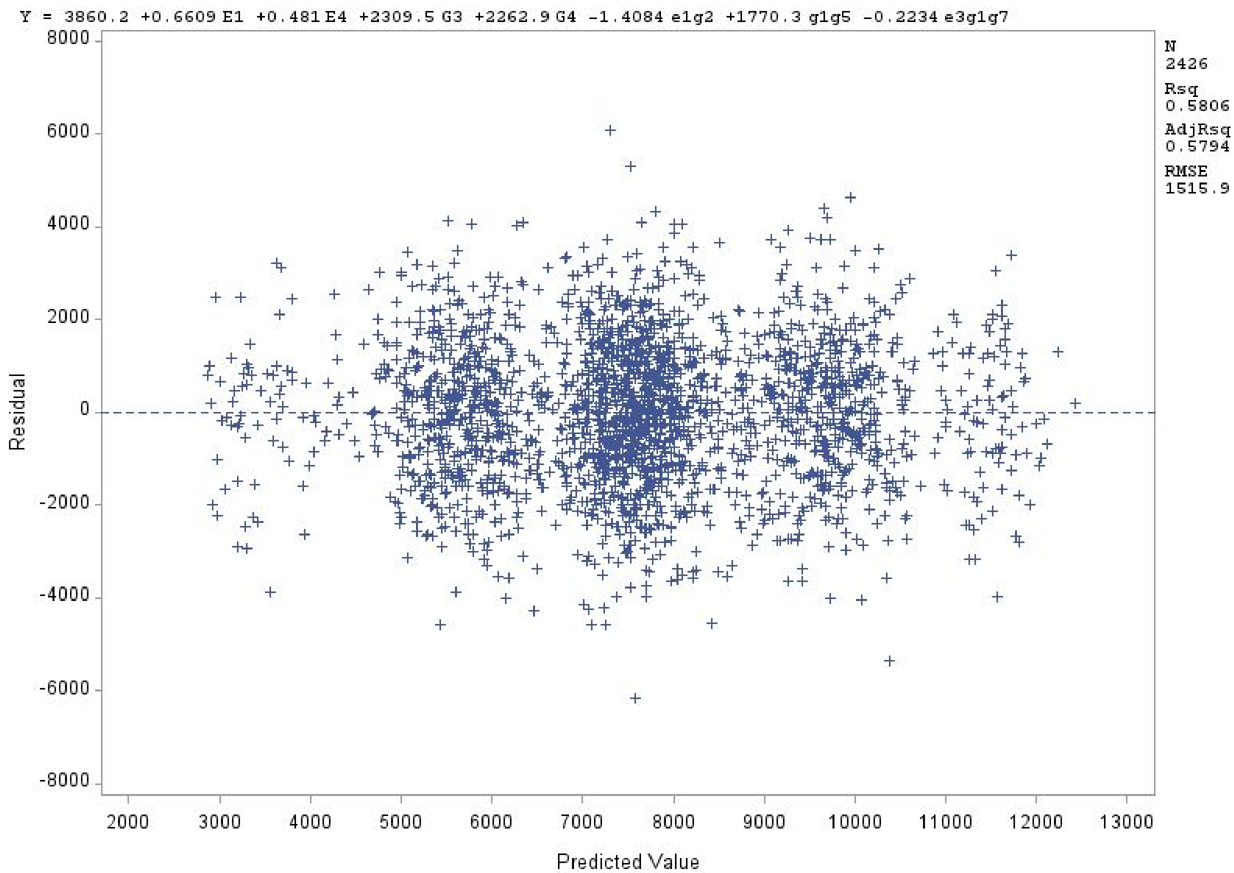

Figure 2. This figure shows the plot of the residuals, which are (as they must be per the regression assumption) randomly distributed. The reported R^2 value is .5806 and the equation is:

$$Y = 3860.2 + 0.669E_1 + .481E_4 + 2309.5G_3 + 2262.9G_4 - 1.408E_1G_2 + 1770.3G_1G_5 - 0.2234E_3G_1G_7$$

Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Y	2426	18516590.44	7632.559953	5463239.855		
Y_Regression	2426	18516533.34	7632.536413	3171891.955		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.672237396	1	0.672237396	1.55698E-07	0.999685182	6.64012191
Within Groups	20940194639	4850	4317565.905			
Total	20940194639	4851				

Table 3. This table shows the ANOVA comparing Y and the $Y_{regression}$ (Y obtained from the multiple regression formula). This shows that the Y values and $Y_{regression}$ values are not statistically different.

Discussion / Conclusion

We found the significant and insignificant independent variables after conducting stepwise regression / correlation tests as represented by Table 1. Of the 10 candidate independent variable(s), only 7 were included in our best fitted model. According to Figure 2, our reported R^2 value is 0.5806. The R^2 values found in real life situations rarely exceed 0.4. Therefore, we conclude that our model is a relatively good fit and representative of the correlation between the dependent variable and the independent variables.

We made the initial assumptions of normally distributed dependent variables with random variance and tested whether our model met that assumption, which it did. According to Figure 2, the plot of the residuals versus the predicted values resembles the shape of a football, which is what we hoped for and reinforces the proposed conclusion that our fitted model is adequate. This football shape indicates that our residuals are randomly distributed.

References

Caspi, Avshalom, et al. “Influence Of Life Stress On Depression: Moderation By A Polymorphism In The 5-HTT Gene (Reports).” *Science* 5631 (2003): 386-389. *Academic OneFile.* Web. 7 May 2015.

“Business Analytics and Business Intelligence Software.” *Business Analytics and Business Intelligence Software*. N.p., n.d. Web. 7 May 2015.

Technical Appendix

SAS script

```
/*import data from group 12 file*/
proc import datafile="C:\Users\pczechowicz\Desktop\group12.csv"
 out=y
 dbms=csv
replace;
 getnames=yes;
      datarow=2;
run;

/*changing the term Y to DV in order to run the code provided by the professor
more easily, also testing to make sure data was imported and renamed
correctly*/
DATA Y;
SET Y;
DV=Y;
DROP Y;
RUN;
PROC PRINT DATA=Y (OBS=10);
RUN;

/*correlational tests between DV, E1-E5*/
proc corr data=y;
var DV E1-E5;
run;

/*correlation tests between DV, G1-G10*/
proc corr data=y;
var DV G1-G10;
run;

/*Proc Transreg procedure fits linear models,
optionally with spline and other nonlinear transformations, and it can be used
to code
experimental designs prior to their use in other analyses, especially Box-Cox
transformations.*/

/*running a box cox transformation*/
proc transreg data=y ss2 detail;
model BoxCox(DV/lambda=-3 to 3 by 0.01 par=327)=identity (E1-E5 G1-G10);
output;
run;
/*after selecting the necessary transformations, transform the dependent
variable in the data step.
```

```
*/

/*re-establishing variable Y*/
data new;
set y;
Y=(DV);
run;


/*Then we need to compute the interaction of the independent variables.*/
/*setting up the two and three way interaction arrays of the upper right
triangular format*/
data new1;
set new;
array one[*]
E1-E5 G1-G10;
array two[*]
e1e2 e1e3 e1e4 e1e5 e1g1 e1g2 e1g3 e1g4 e1g5 e1g6 e1g7 e1g8 e1g9 e1g10
e2e3 e2e4 e2e5 e2g1 e2g2 e2g3 e2g4 e2g5 e2g6 e2g7 e2g8 e2g9 e2g10
e3e4 e3e5 e3g1 e3g2 e3g3 e3g4 e3g5 e3g6 e3g7 e3g8 e3g9 e3g10
e4e5 e4g1 e4g2 e4g3 e4g4 e4g5 e4g6 e4g7 e4g8 e4g9 e4g10
e5g1 e5g2 e5g3 e5g4 e5g5 e5g6 e5g7 e5g8 e5g9 e5g10
g1g2 g1g3 g1g4 g1g5 g1g6 g1g7 g1g8 g1g9 g1g10
g2g3 g2g4 g2g5 g2g6 g2g7 g2g8 g2g9 g2g10
g3g4 g3g5 g3g6 g3g7 g3g8 g3g9 g3g10
g4g5 g4g6 g4g7 g4g8 g4g9 g4g10
g5g6 g5g7 g5g8 g5g9 g5g10
g6g7 g6g8 g6g9 g6g10
g7g8 g7g9 g7g10
g8g9 g8g10
g9g10
;
array three[*]
e1e2e3 e1e2e4 e1e2e5 e1e2g1 e1e2g2 e1e2g3 e1e2g4 e1e2g5 e1e2g6
e1e2g7 e1e2g8 e1e2g9 e1e2g10
e1e3e4 e1e3e5 e1e3g1 e1e3g2 e1e3g3 e1e3g4 e1e3g5 e1e3g6
e1e3g7 e1e3g8 e1e3g9 e1e3g10
e1e4e5 e1e4g1 e1e4g2 e1e4g3 e1e4g4 e1e4g5 e1e4g6
e1e4g7 e1e4g8 e1e4g9 e1e4g10
e1e5g1 e1e5g2 e1e5g3 e1e5g4 e1e5g5 e1e5g6
e1e5g7 e1e5g8 e1e5g9 e1e5g10
e1g1g2 e1g1g3 e1g1g4 e1g1g5 e1g1g6
e1g1g7 e1g1g8 e1g1g9 e1g1g10
e1g2g3 e1g2g4 e1g2g5 e1g2g6
e1g2g7 e1g2g8 e1g2g9 e1g2g10
e1g3g4 e1g3g5 e1g3g6
e1g3g7 e1g3g8 e1g3g9 e1g3g10
e1g4g5 e1g4g6
```

e1g4g7 e1g4g8 e1g4g9 e1g4g10
e1g5g6
e1g5g7 e1g5g8 e1g5g9 e1g5g10
e1g6g7 e1g6g8 e1g6g9 e1g6g10
e1g7g8 e1g7g9 e1g7g10
e1g8g9 e1g8g10
e1g9g10
e2e3e4 e2e3e5 e2e3g1 e2e3g2 e2e3g3 e2e3g4 e2e3g5 e2e3g6
e2e3g7 e2e3g8 e2e3g9 e2e3g10
e2e4e5 e2e4g1 e2e4g2 e2e4g3 e2e4g4 e2e4g5 e2e4g6
e2e4g7 e2e4g8 e2e4g9 e2e4g10
e2e5g1 e2e5g2 e2e5g3 e2e5g4 e2e5g5 e2e5g6
e2e5g7 e2e5g8 e2e5g9 e2e5g10
e2g1g2 e2g1g3 e2g1g4 e2g1g5 e2g1g6
e2g1g7 e2g1g8 e2g1g9 e2g1g10
e2g2g3 e2g2g4 e2g2g5 e2g2g6
e2g2g7 e2g2g8 e2g2g9 e2g2g10
e2g3g4 e2g3g5 e2g3g6
e2g3g7 e2g3g8 e2g3g9 e2g3g10
e2g4g5 e2g4g6
e2g4g7 e2g4g8 e2g4g9 e2g4g10
e2g5g6
e2g5g7 e2g5g8 e2g5g9 e2g5g10
e2g6g7 e2g6g8 e2g6g9 e2g6g10
e2g7g8 e2g7g9 e2g7g10
e2g8g9 e2g8g10
e2g9g10
e3e4e5 e3e4g1 e3e4g2 e3e4g3 e3e4g4 e3e4g5 e3e4g6
e3e4g7 e3e4g8 e3e4g9 e3e4g10
e3e5g1 e3e5g2 e3e5g3 e3e5g4 e3e5g5 e3e5g6
e3e5g7 e3e5g8 e3e5g9 e3e5g10
e3g1g2 e3g1g3 e3g1g4 e3g1g5 e3g1g6
e3g1g7 e3g1g8 e3g1g9 e3g1g10
e3g2g3 e3g2g4 e3g2g5 e3g2g6
e3g2g7 e3g2g8 e3g2g9 e3g2g10
e3g3g4 e3g3g5 e3g3g6
e3g3g7 e3g3g8 e3g3g9 e3g3g10
e3g4g5 e3g4g6
e3g4g7 e3g4g8 e3g4g9 e3g4g10
e3g5g6
e3g5g7 e3g5g8 e3g5g9 e3g5g10
e3g6g7 e3g6g8 e3g6g9 e3g6g10
e3g7g8 e3g7g9 e3g7g10
e3g8g9 e3g8g10
e3g9g10
e4e5g1 e4e5g2 e4e5g3 e4e5g4 e4e5g5 e4e5g6
e4e5g7 e4e5g8 e4e5g9 e4e5g10
e4g1g2 e4g1g3 e4g1g4 e4g1g5 e4g1g6

e4g1g7 e4g1g8 e4g1g9 e4g1g10
e4g2g3 e4g2g4 e4g2g5 e4g2g6
e4g2g7 e4g2g8 e4g2g9 e4g2g10
e4g3g4 e4g3g5 e4g3g6
e4g3g7 e4g3g8 e4g3g9 e4g3g10
e4g4g5 e4g4g6
e4g4g7 e4g4g8 e4g4g9 e4g4g10
e4g5g6
e4g5g7 e4g5g8 e4g5g9 e4g5g10
e4g6g7 e4g6g8 e4g6g9 e4g6g10
e4g7g8 e4g7g9 e4g7g10
e4g8g9 e4g8g10
e4g9g10
e5g1g2 e5g1g3 e5g1g4 e5g1g5 e5g1g6
e5g1g7 e5g1g8 e5g1g9 e5g1g10
e5g2g3 e5g2g4 e5g2g5 e5g2g6
e5g2g7 e5g2g8 e5g2g9 e5g2g10
e5g3g4 e5g3g5 e5g3g6
e5g3g7 e5g3g8 e5g3g9 e5g3g10
e5g4g5 e5g4g6
e5g4g7 e5g4g8 e5g4g9 e5g4g10
e5g5g6
e5g5g7 e5g5g8 e5g5g9 e5g5g10
e5g6g7 e5g6g8 e5g6g9 e5g6g10
e5g7g8 e5g7g9 e5g7g10
e5g8g9 e5g8g10
e5g9g10
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g1g2g7 g1g2g8 g1g2g9 g1g2g10
g1g3g4 g1g3g5 g1g3g6
g1g3g7 g1g3g8 g1g3g9 g1g3g10
g1g4g5 g1g4g6
g1g4g7 g1g4g8 g1g4g9 g1g4g10
g1g5g6
g1g5g7 g1g5g8 g1g5g9 g1g5g10
g1g6g7 g1g6g8 g1g6g9 g1g6g10
g1g7g8 g1g7g9 g1g7g10
g1g8g9 g1g8g10
g1g9g10
g2g3g4 g2g3g5 g2g3g6
g2g3g7 g2g3g8 g2g3g9 g2g3g10
g2g4g5 g2g4g6
g2g4g7 g2g4g8 g2g4g9 g2g4g10
g2g5g6
g2g5g7 g2g5g8 g2g5g9 g2g5g10
g2g6g7 g2g6g8 g2g6g9 g2g6g10
g2g7g8 g2g7g9 g2g7g10
g2g8g9 g2g8g10

```
g2g9g10
g3g4g5 g3g4g6
g3g4g7 g3g4g8 g3g4g9 g3g4g10
g3g5g6
g3g5g7 g3g5g8 g3g5g9 g3g5g10
g3g6g7 g3g6g8 g3g6g9 g3g6g10
g3g7g8 g3g7g9 g3g7g10
g3g8g9 g3g8g10
g3g9g10
g4g5g6
g4g5g7 g4g5g8 g4g5g9 g4g5g10
g4g6g7 g4g6g8 g4g6g9 g4g6g10
g4g7g8 g4g7g9 g4g7g10
g4g8g9 g4g8g10
g4g9g10
g5g6g7 g5g6g8 g5g6g9 g5g6g10
g5g7g8 g5g7g9 g5g7g10
g5g8g9 g5g8g10
g5g9g10
g6g7g8 g6g7g9 g6g7g10
g6g8g9 g6g8g10
g6g9g10
g7g8g9 g7g8g10
g7g9g10
g8g9g10;

/*looping through the interaction arrays*/
n=0;
do i=1 to dim(one);
do j=i+1 to dim(one);
n=n+1;
two(n)=one(i)*one(j);
end;
end;

m=0;
do i=1 to dim(one);
 do j=i+1 to dim(one);
 do k=j+1 to dim(one);
m=m+1;
three(m)=one(i)*one(j)*one(k);
 end;
 end;
end;
run;
```

```
/*Then we use the stepwise option in SAS procedure Proc Reg to select the
reasonable independent
variables at significance level of 0.01*/ ;
/*running a test to find the multiple regression model of the type Y= some
combination of the interactions of E1-E5, G1-G10*/
proc reg data=new1; model Y= E1-E5 G1-G10
e1e2 e1e3 e1e4 e1e5 e1g1 e1g2 e1g3 e1g4 e1g5 e1g6 e1g7 e1g8 e1g9 e1g10
e2e3 e2e4 e2e5 e2g1 e2g2 e2g3 e2g4 e2g5 e2g6 e2g7 e2g8 e2g9 e2g10
e3e4 e3e5 e3g1 e3g2 e3g3 e3g4 e3g5 e3g6 e3g7 e3g8 e3g9 e3g10
e4e5 e4g1 e4g2 e4g3 e4g4 e4g5 e4g6 e4g7 e4g8 e4g9 e4g10
e5g1 e5g2 e5g3 e5g4 e5g5 e5g6 e5g7 e5g8 e5g9 e5g10
g1g2 g1g3 g1g4 g1g5 g1g6 g1g7 g1g8 g1g9 g1g10
g2g3 g2g4 g2g5 g2g6 g2g7 g2g8 g2g9 g2g10
g3g4 g3g5 g3g6 g3g7 g3g8 g3g9 g3g10
g4g5 g4g6 g4g7 g4g8 g4g9 g4g10
g5g6 g5g7 g5g8 g5g9 g5g10
g6g7 g6g8 g6g9 g6g10
g7g8 g7g9 g7g10
g8g9 g8g10
g9g10
e1e2e3 e1e2e4 e1e2e5 e1e2g1 e1e2g2 e1e2g3 e1e2g4 e1e2g5 e1e2g6
e1e2g7 e1e2g8 e1e2g9 e1e2g10
e1e3e4 e1e3e5 e1e3g1 e1e3g2 e1e3g3 e1e3g4 e1e3g5 e1e3g6
e1e3g7 e1e3g8 e1e3g9 e1e3g10
e1e4e5 e1e4g1 e1e4g2 e1e4g3 e1e4g4 e1e4g5 e1e4g6
e1e4g7 e1e4g8 e1e4g9 e1e4g10
e1e5g1 e1e5g2 e1e5g3 e1e5g4 e1e5g5 e1e5g6
e1e5g7 e1e5g8 e1e5g9 e1e5g10
e1g1g2 e1g1g3 e1g1g4 e1g1g5 e1g1g6
e1g1g7 e1g1g8 e1g1g9 e1g1g10
e1g2g3 e1g2g4 e1g2g5 e1g2g6
e1g2g7 e1g2g8 e1g2g9 e1g2g10
e1g3g4 e1g3g5 e1g3g6
e1g3g7 e1g3g8 e1g3g9 e1g3g10
e1g4g5 e1g4g6
e1g4g7 e1g4g8 e1g4g9 e1g4g10
e1g5g6
e1g5g7 e1g5g8 e1g5g9 e1g5g10
e1g6g7 e1g6g8 e1g6g9 e1g6g10
e1g7g8 e1g7g9 e1g7g10
e1g8g9 e1g8g10
e1g9g10
e2e3e4 e2e3e5 e2e3g1 e2e3g2 e2e3g3 e2e3g4 e2e3g5 e2e3g6
e2e3g7 e2e3g8 e2e3g9 e2e3g10
e2e4e5 e2e4g1 e2e4g2 e2e4g3 e2e4g4 e2e4g5 e2e4g6
e2e4g7 e2e4g8 e2e4g9 e2e4g10
e2e5g1 e2e5g2 e2e5g3 e2e5g4 e2e5g5 e2e5g6
e2e5g7 e2e5g8 e2e5g9 e2e5g10
```

e2g1g2 e2g1g3 e2g1g4 e2g1g5 e2g1g6
e2g1g7 e2g1g8 e2g1g9 e2g1g10
e2g2g3 e2g2g4 e2g2g5 e2g2g6
e2g2g7 e2g2g8 e2g2g9 e2g2g10
e2g3g4 e2g3g5 e2g3g6
e2g3g7 e2g3g8 e2g3g9 e2g3g10
e2g4g5 e2g4g6
e2g4g7 e2g4g8 e2g4g9 e2g4g10
e2g5g6
e2g5g7 e2g5g8 e2g5g9 e2g5g10
e2g6g7 e2g6g8 e2g6g9 e2g6g10
e2g7g8 e2g7g9 e2g7g10
e2g8g9 e2g8g10
e2g9g10
e3e4e5 e3e4g1 e3e4g2 e3e4g3 e3e4g4 e3e4g5 e3e4g6
e3e4g7 e3e4g8 e3e4g9 e3e4g10
e3e5g1 e3e5g2 e3e5g3 e3e5g4 e3e5g5 e3e5g6
e3e5g7 e3e5g8 e3e5g9 e3e5g10
e3g1g2 e3g1g3 e3g1g4 e3g1g5 e3g1g6
e3g1g7 e3g1g8 e3g1g9 e3g1g10
e3g2g3 e3g2g4 e3g2g5 e3g2g6
e3g2g7 e3g2g8 e3g2g9 e3g2g10
e3g3g4 e3g3g5 e3g3g6
e3g3g7 e3g3g8 e3g3g9 e3g3g10
e3g4g5 e3g4g6
e3g4g7 e3g4g8 e3g4g9 e3g4g10
e3g5g6
e3g5g7 e3g5g8 e3g5g9 e3g5g10
e3g6g7 e3g6g8 e3g6g9 e3g6g10
e3g7g8 e3g7g9 e3g7g10
e3g8g9 e3g8g10
e3g9g10
e4e5g1 e4e5g2 e4e5g3 e4e5g4 e4e5g5 e4e5g6
e4e5g7 e4e5g8 e4e5g9 e4e5g10
e4g1g2 e4g1g3 e4g1g4 e4g1g5 e4g1g6
e4g1g7 e4g1g8 e4g1g9 e4g1g10
e4g2g3 e4g2g4 e4g2g5 e4g2g6
e4g2g7 e4g2g8 e4g2g9 e4g2g10
e4g3g4 e4g3g5 e4g3g6
e4g3g7 e4g3g8 e4g3g9 e4g3g10
e4g4g5 e4g4g6
e4g4g7 e4g4g8 e4g4g9 e4g4g10
e4g5g6
e4g5g7 e4g5g8 e4g5g9 e4g5g10
e4g6g7 e4g6g8 e4g6g9 e4g6g10
e4g7g8 e4g7g9 e4g7g10
e4g8g9 e4g8g10
e4g9g10

e5g1g2 e5g1g3 e5g1g4 e5g1g5 e5g1g6
e5g1g7 e5g1g8 e5g1g9 e5g1g10
e5g2g3 e5g2g4 e5g2g5 e5g2g6
e5g2g7 e5g2g8 e5g2g9 e5g2g10
e5g3g4 e5g3g5 e5g3g6
e5g3g7 e5g3g8 e5g3g9 e5g3g10
e5g4g5 e5g4g6
e5g4g7 e5g4g8 e5g4g9 e5g4g10
e5g5g6
e5g5g7 e5g5g8 e5g5g9 e5g5g10
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e5g7g8 e5g7g9 e5g7g10
e5g8g9 e5g8g10
e5g9g10
g1g2g3 g1g2g4 g1g2g5 g1g2g6
g1g2g7 g1g2g8 g1g2g9 g1g2g10
g1g3g4 g1g3g5 g1g3g6
g1g3g7 g1g3g8 g1g3g9 g1g3g10
g1g4g5 g1g4g6
g1g4g7 g1g4g8 g1g4g9 g1g4g10
g1g5g6
g1g5g7 g1g5g8 g1g5g9 g1g5g10
g1g6g7 g1g6g8 g1g6g9 g1g6g10
g1g7g8 g1g7g9 g1g7g10
g1g8g9 g1g8g10
g1g9g10
g2g3g4 g2g3g5 g2g3g6
g2g3g7 g2g3g8 g2g3g9 g2g3g10
g2g4g5 g2g4g6
g2g4g7 g2g4g8 g2g4g9 g2g4g10
g2g5g6
g2g5g7 g2g5g8 g2g5g9 g2g5g10
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g2g7g8 g2g7g9 g2g7g10
g2g8g9 g2g8g10
g2g9g10
g3g4g5 g3g4g6
g3g4g7 g3g4g8 g3g4g9 g3g4g10
g3g5g6
g3g5g7 g3g5g8 g3g5g9 g3g5g10
g3g6g7 g3g6g8 g3g6g9 g3g6g10
g3g7g8 g3g7g9 g3g7g10
g3g8g9 g3g8g10
g3g9g10
g4g5g6
g4g5g7 g4g5g8 g4g5g9 g4g5g10
g4g6g7 g4g6g8 g4g6g9 g4g6g10
g4g7g8 g4g7g9 g4g7g10

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g4g8g9 g4g8g10
g4g9g10
g5g6g7 g5g6g8 g5g6g9 g5g6g10
g5g7g8 g5g7g9 g5g7g10
g5g8g9 g5g8g10
g5g9g10
g6g7g8 g6g7g9 g6g7g10
g6g8g9 g6g8g10
g6g9g10
g7g8g9 g7g8g10
g7g9g10
g8g9g10

/*format of selection is step-wise with entry level significance at least .01*/
/selection=stepwise SLENTRY=0.01;
plot residual.*predicted.;
run;
```