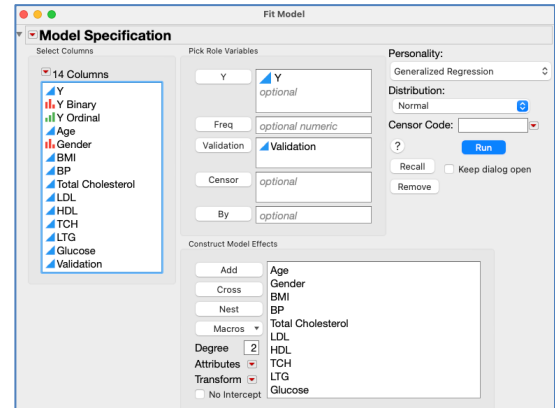# Generalized Regression – Regularized / Penalized Methods

JMP PRO Fit Model's Generalized Regression personality provides advanced parameter estimation methods. When dealing with high dimensional data, regularization methods (Lasso, Ridge, Elastic Net) can help address multicollinearity, perform variable selection, and reduce overfitting.

Regularized / Penalized Regression

1. From an open data table, select **Analyze > Fit Model.**
2. Select a response variable from **Select Columns** and click **Y**.
3. Specify model effects under Construct Model Effects.
4. If desired, select a validation column **(JMP® Pro only)**.
5. Select **Generalized Regression** as the **Personality**.
6. If needed, change the default Normal response distribution.
7. Click Run. A standard least squares or maximum likelihood model will be fit by default.
8. To fit a regularized regression model, go to Model Launch and select the desired Estimation Method. Use the Advanced Controls to specify additional estimation options for your chosen estimation method, and choose a Validation Method for automatic model tuning.
9. Click **Go** to fit the model.

Generalized Regression will tune the regularization parameter automatically and return the model that achieved the best validation statistic (as specified under Validation Method in Step 8).

The Solution Path shows the process of "shrinking" the parameter estimates across different values of the regularization parameter. The left plot shows the parameter estimates, and the right plot shows the validation statistic. The red line in each is placed at the automatically chosen solution. Other solutions can be selected by dragging the red line to other positions. The paramteter estimates table will update automatically.
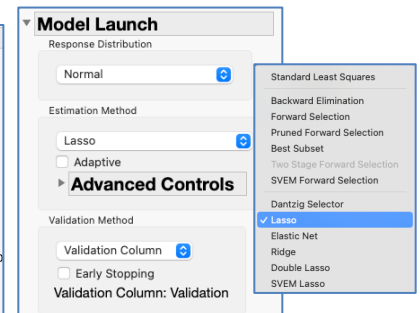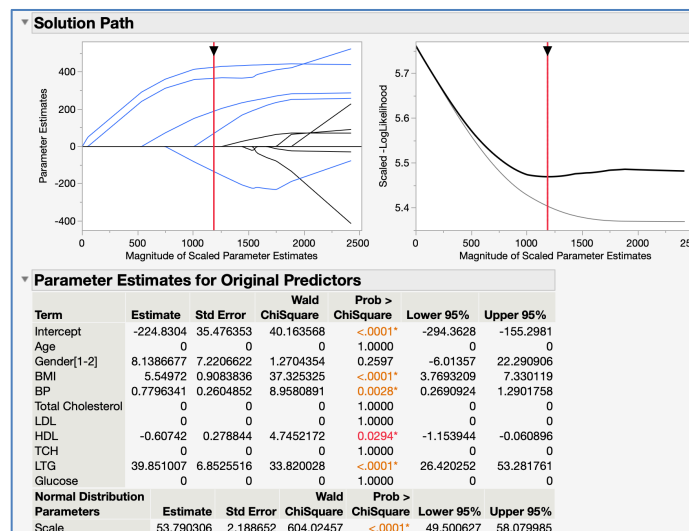
A Model Comparison table at the top of the report summarizes each model fit. Here, we fit 4 models using standard least squares, Lasso, Elastic Net, and Ridge. Each has a similar Validation RSquare, with Lasso producing a model with 7 parameters (5 main effects plus an intercept and scale parameter).

Model Comparison

Show	Response Distribution	Estimation Method	Validation Method	Nonzero Parameters	AICc	BIC	Generalized RSquare	Validation Generalized RSquare
☑	Normal	Standard Least Squares	Validation Column	12	3343.7392	3387.4853	0.544387	0.4413913
☑	Normal	Lasso	Validation Column	7	3354.0637	3379.825	0.5123364	0.4477465
☑	Normal	Elastic Net	Validation Column	11	3350.7579	3390.9358	0.5306424	0.4443829
☑	Normal	Ridge	Validation Column	12	3356.8967	3400.6427	0.5245677	0.4413977

Visit **Fitting Linear Models > Generalized Regression Models** in **JMP Help** to learn more.