

Mixed Model Analysis

Use a Mixed Model for an ANOVA or regression model with at least one factor specified as a random variable. JMP Pro® has a Mixed Model and a Generalized Linear Mixed Model platforms offering the more flexibility in fitting mixed models.

This example uses standard JMP to fit an unbalanced design involving six people chosen at random to take measurements on three different machines

Analysis of Linear Mixed Models

1. From an open JMP data table, select **Analyze > Fit Model**.



In JMP Pro, select the **Mixed Model** or **Generalized Linear Mixed Model** platform from the Personality list to fit mixed models.

The remainder of these instructions are for fitting mixed models in standard JMP.

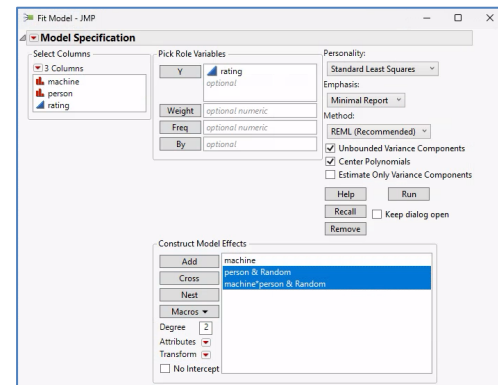
2. Add the response: From **Select Columns**, select a continuous variable (continuous variables have blue triangles), and click **Y**.
3. Add model effects: Select variables and click **Add** (under **Construct Model Effects**). To specify an interaction term, select multiple columns, then click **Cross**.
4. Specify random effect(s): Select a model effect, then select **Random** from the red triangle next to **Attribute**. Here, “person” is specified as a random effect, so the “person*machine” interaction is also a random effect.
5. Accept the defaults (the **REML Method** with **Unbounded Variance Components** selected), and click **Run**.

By default, JMP will display the **Summary of Fit** table, **REML Variance Components Estimates**, and more. Additional options are available under the **top red triangle**.

Interpretation:

1. Variance Components Estimates: The total estimated variance is 37.56, which can be decomposed into three sources: person (22.46, or 59.8%), person*machine (14.23, or 37.9%) and residual (0.87, or 2.3%).
2. Fixed Effect Tests: The p-value for the fixed effect (machine) is 0.0003. Kenward-Roger F tests are used.

Machine.jmp (Help > Sample Data Folder)



Response rating

Effect Summary

Summary of Fit

RSquare	0.992571
RSquare Adj	0.992309
Root Mean Square Error	0.933203
Mean of Response	59.85
Observations (or Sum Wgts)	44

Parameter Estimates

REML Variance Component Estimates

Random Effect	Var Ratio	Component	Std Error	95% Lower	95% Upper	Wald p-	Value	Pct of Total
person	25.765476	22.435765	17.414105	-11.67525	56.586783	0.1972	59.785	
machine*person	16.344588	14.233991	6.5151618	1.4645861	27.003473	0.0289*	37.896	
Residual	0.8706867	0.2410664	0.5405379	1.6332462			2.319	
Total	37.560625	17.824737	17.698786	126.50166			100.000	

-2 Residual Log Likelihood = 184.06872401
Note: Total is the sum of the positive variance components.
Total including negative estimates = 37.560625

Covariance Matrix of Variance Component Estimates

Iterations

Random Effect Predictions

Fixed Effect Tests

Source	Nparm	DF	DFDen	F Ratio	Prob > F
machine	2	2	10.1	19.9639	0.0003*

Effect Details

Tips:

- **REML** (restricted maximum likelihood) is the preferred estimation method over **EMS** (Method of Moments). REML estimates are properly shrunk and the standard errors are properly scaled.
- **Unbounded Variance Components** is the default method for estimating the variance components. Unchecking this box will restrict the variance estimates to be non-negative.
- JMP assumes a simple correlation matrix with **compound symmetry** (i.e., correlation is constant).

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