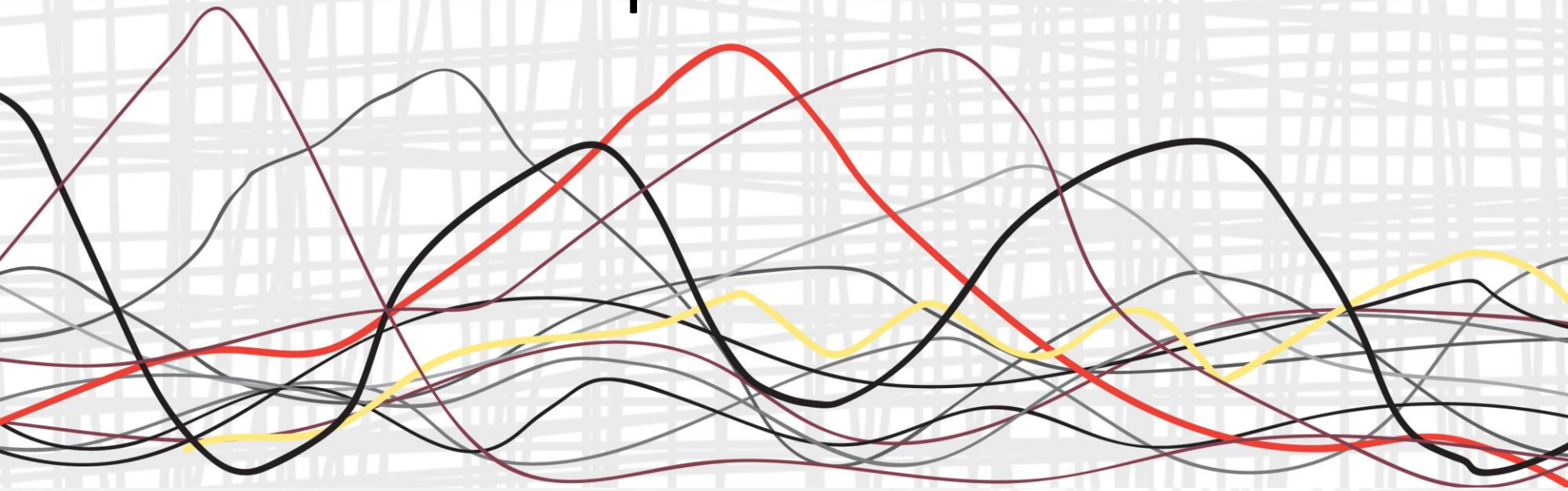
statgraphics 19®

Enhancements to the Design of Experiments



Statgraphics 19 DOE Enhancements

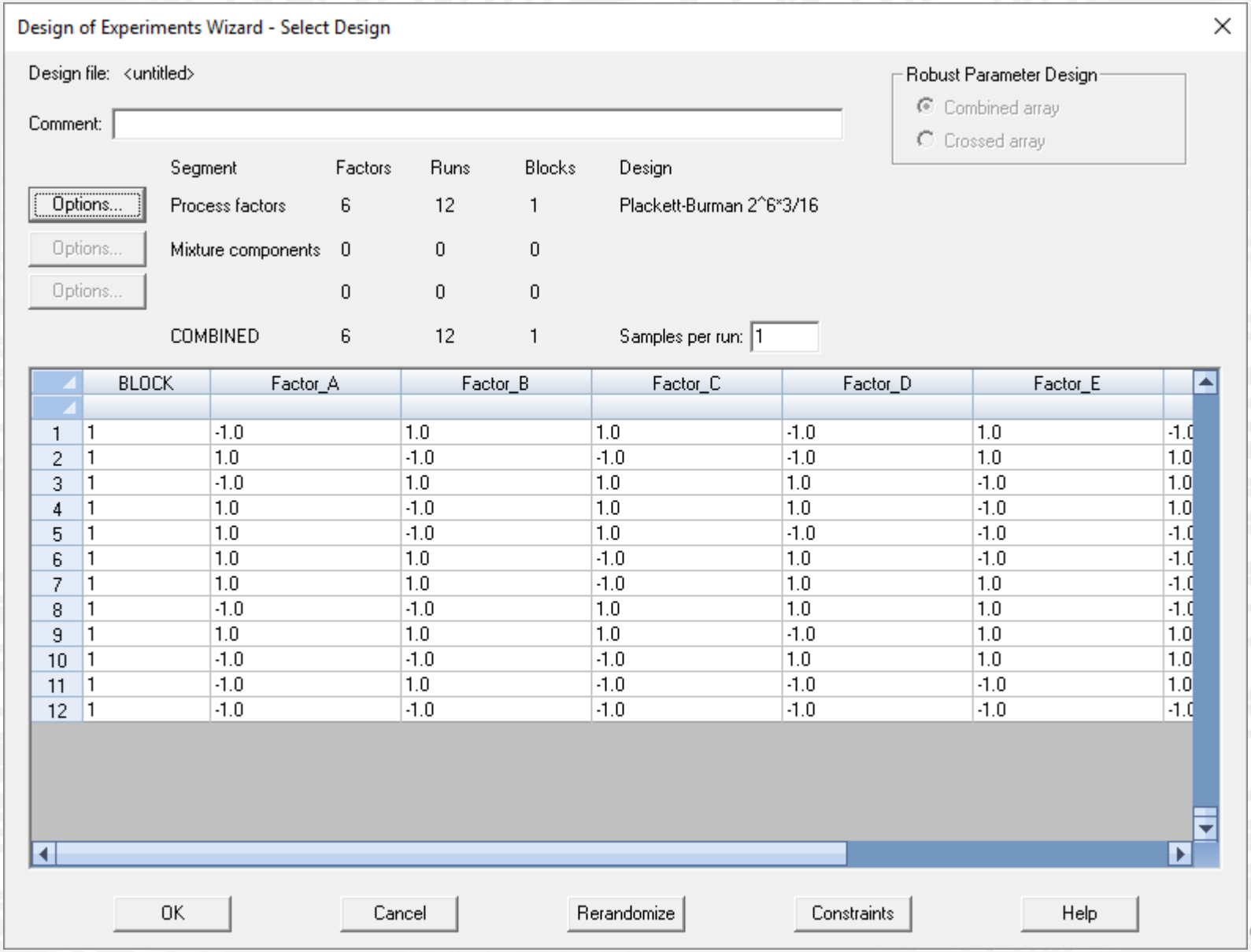
Construction of Alias Optimal Designs

- Computer generated designs
- Maximize design efficiency while minimizing aliasing due to terms not in the current model

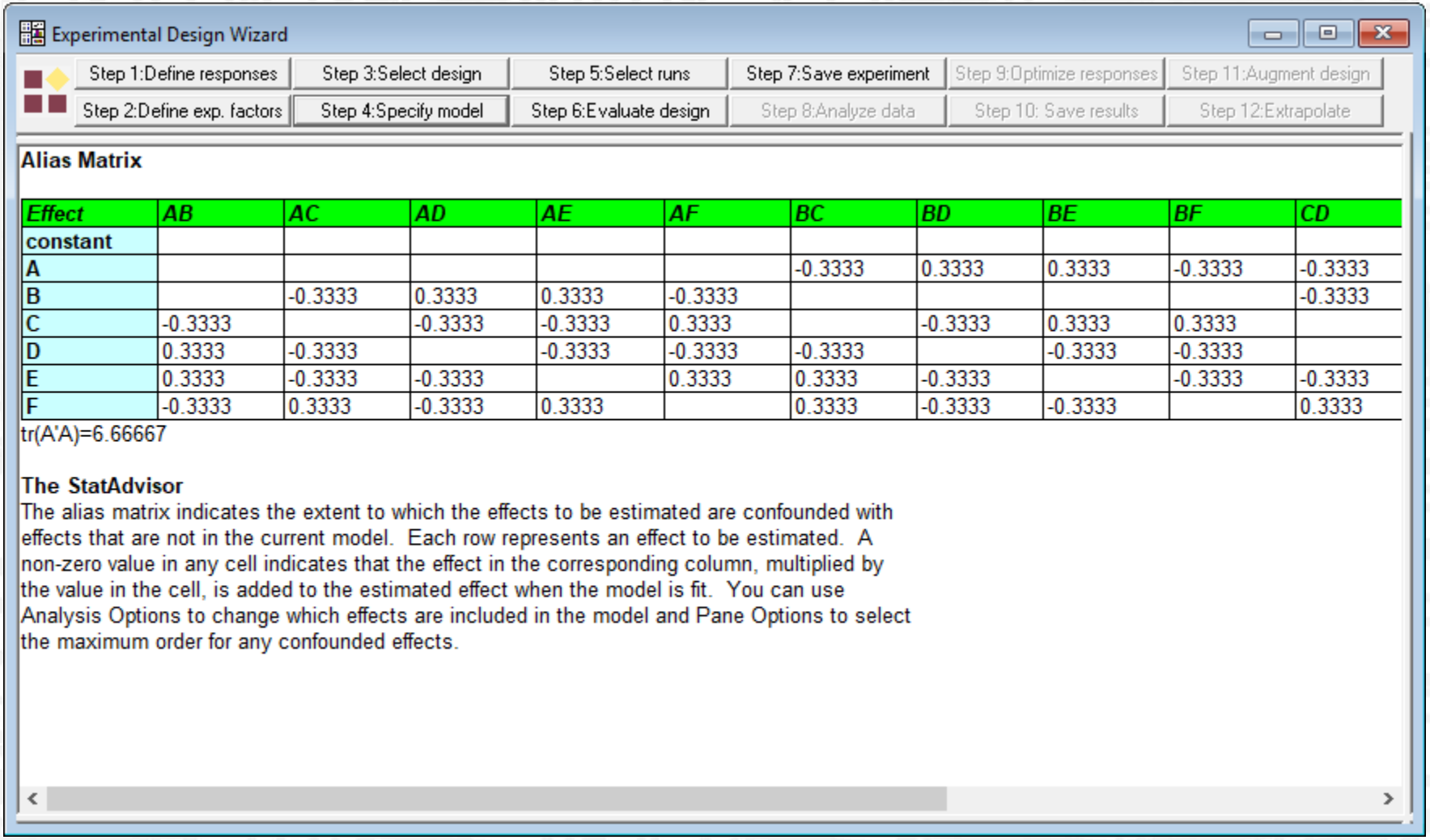
Augmentation of Existing Designs in an Optimal Manner

- Adds additional runs so as to maximize design efficiency

Typical Screening Design for 6 Factors



Alias Matrix for Typical Design



Alias Matrix

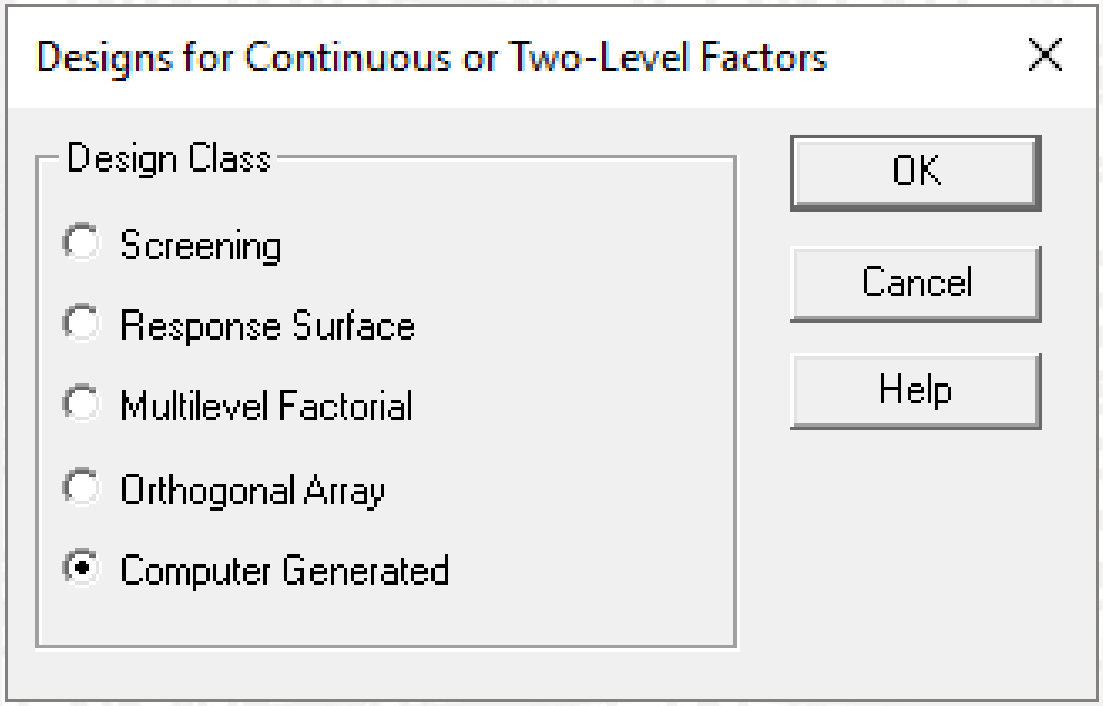
Effect	*AB*	*AC*	*AD*	*AE*	*AF*	*BC*	*BD*	*BE*	*BF*	*CD*
constant										
A						-0.3333	0.3333	0.3333	-0.3333	-0.3333
B		-0.3333	0.3333	0.3333	-0.3333					-0.3333
C	-0.3333		-0.3333	-0.3333	0.3333		-0.3333	0.3333	0.3333	
D	0.3333	-0.3333		-0.3333	-0.3333	-0.3333		-0.3333	-0.3333	
E	0.3333	-0.3333	-0.3333		0.3333	0.3333	-0.3333		-0.3333	-0.3333
F	-0.3333	0.3333	-0.3333	0.3333		0.3333	-0.3333	-0.3333		0.3333

tr(A'A)=6.66667

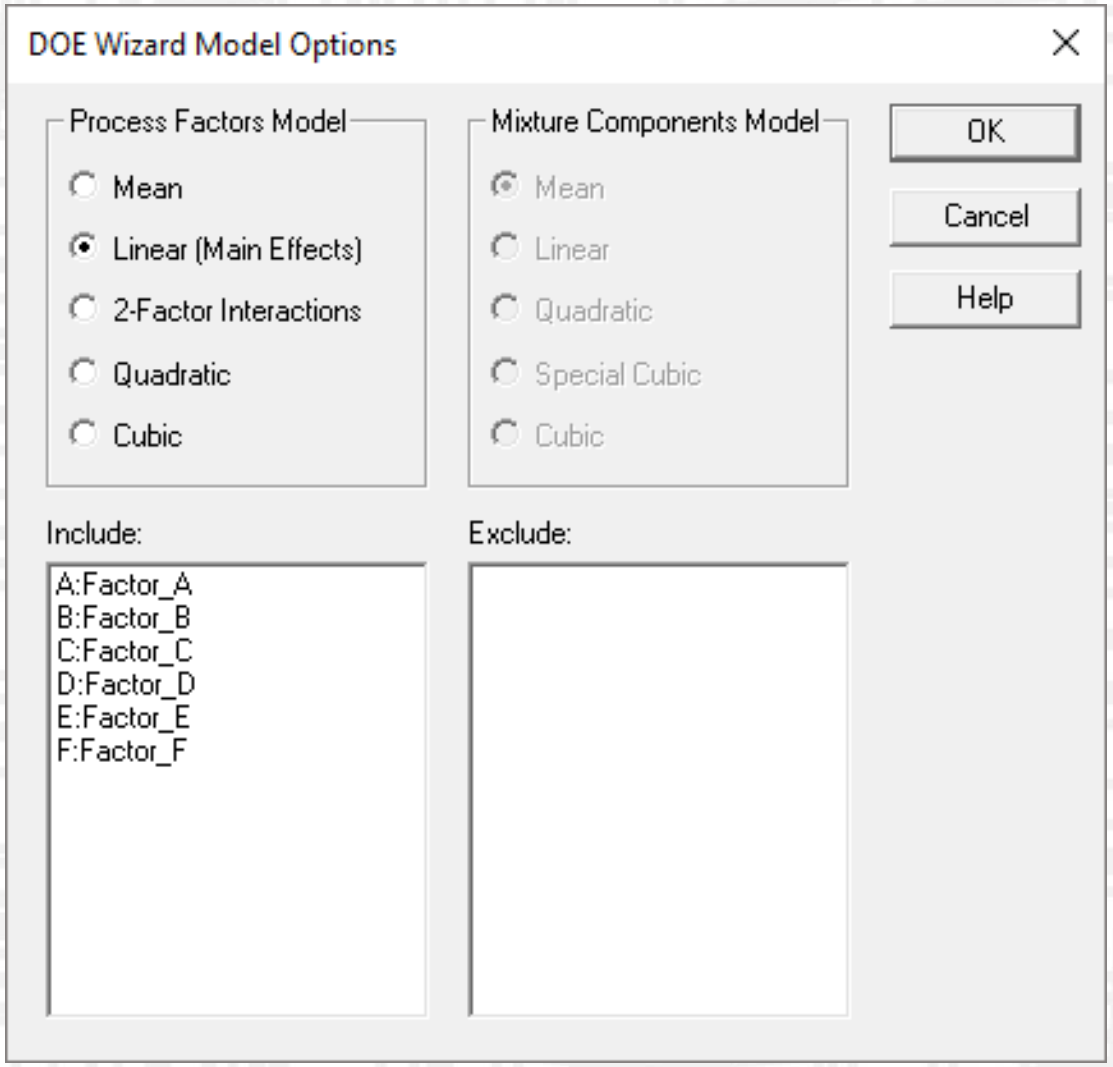
The StatAdvisor

The alias matrix indicates the extent to which the effects to be estimated are confounded with effects that are not in the current model. Each row represents an effect to be estimated. A non-zero value in any cell indicates that the effect in the corresponding column, multiplied by the value in the cell, is added to the estimated effect when the model is fit. You can use Analysis Options to change which effects are included in the model and Pane Options to select the maximum order for any confounded effects.

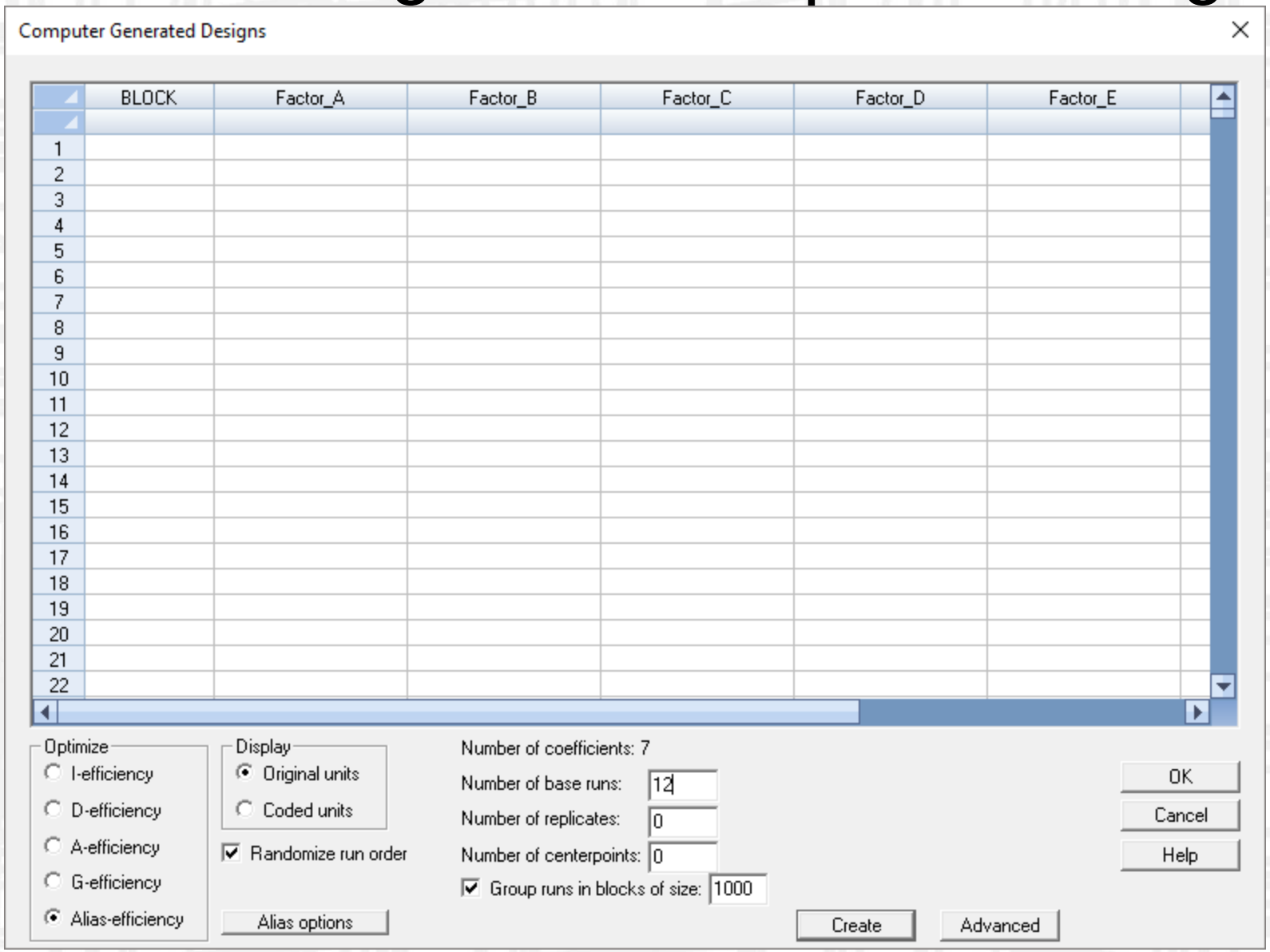
Constructing an Alias Optimal Design



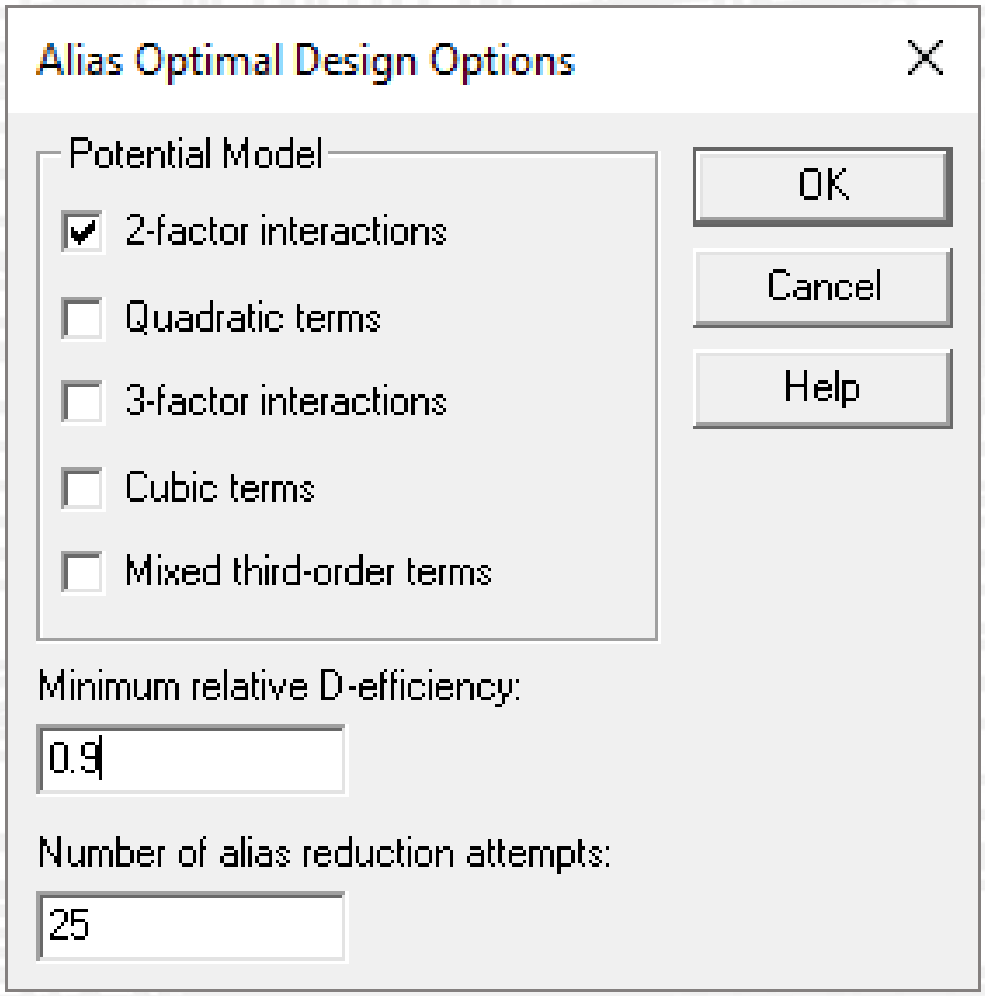
Constructing an Alias Optimal Design



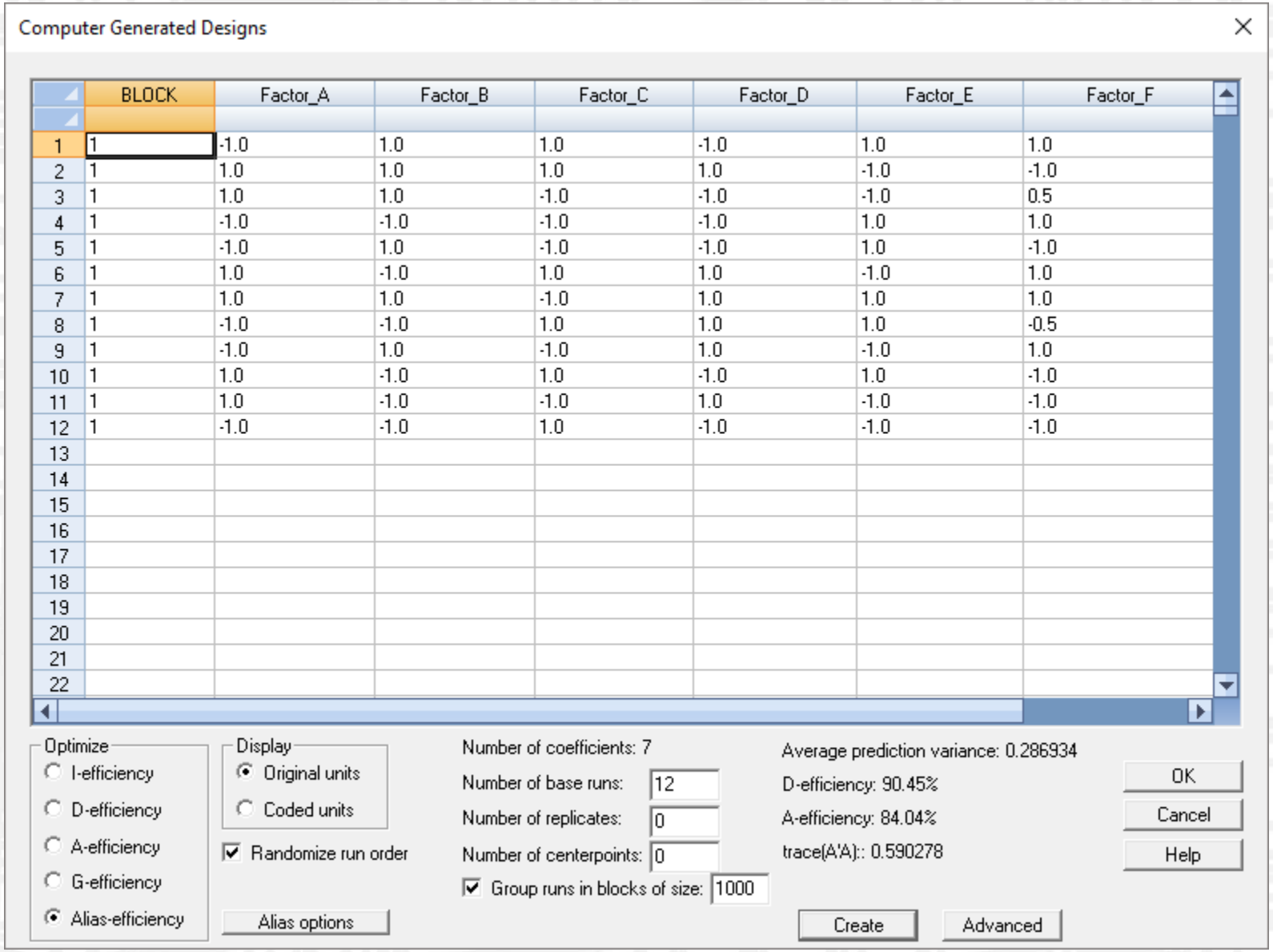
Constructing an Alias Optimal Design



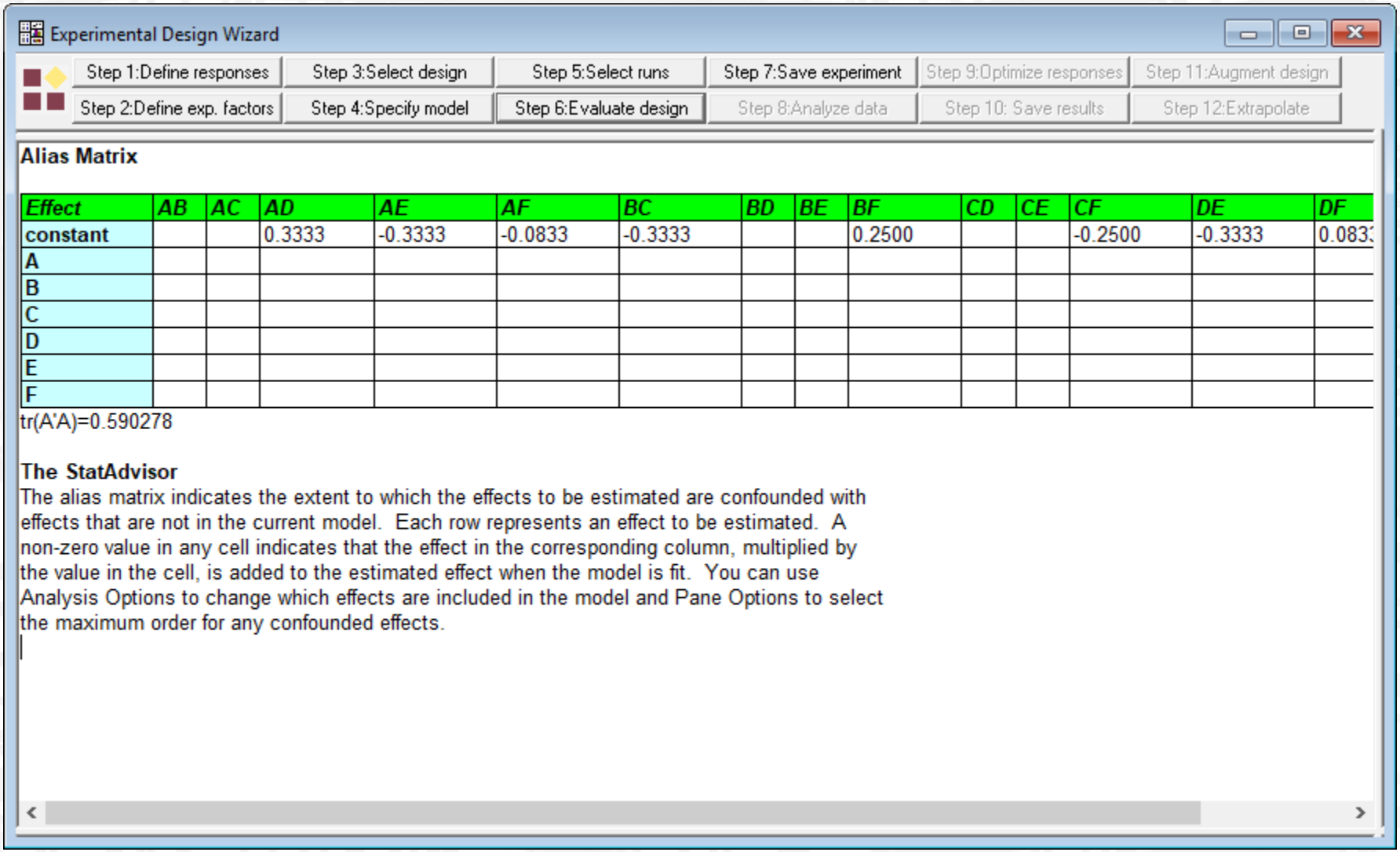
Constructing an Alias Optimal Design



Constructing an Alias Optimal Design



Alias Matrix for Alias Optimal Design



Alias Matrix

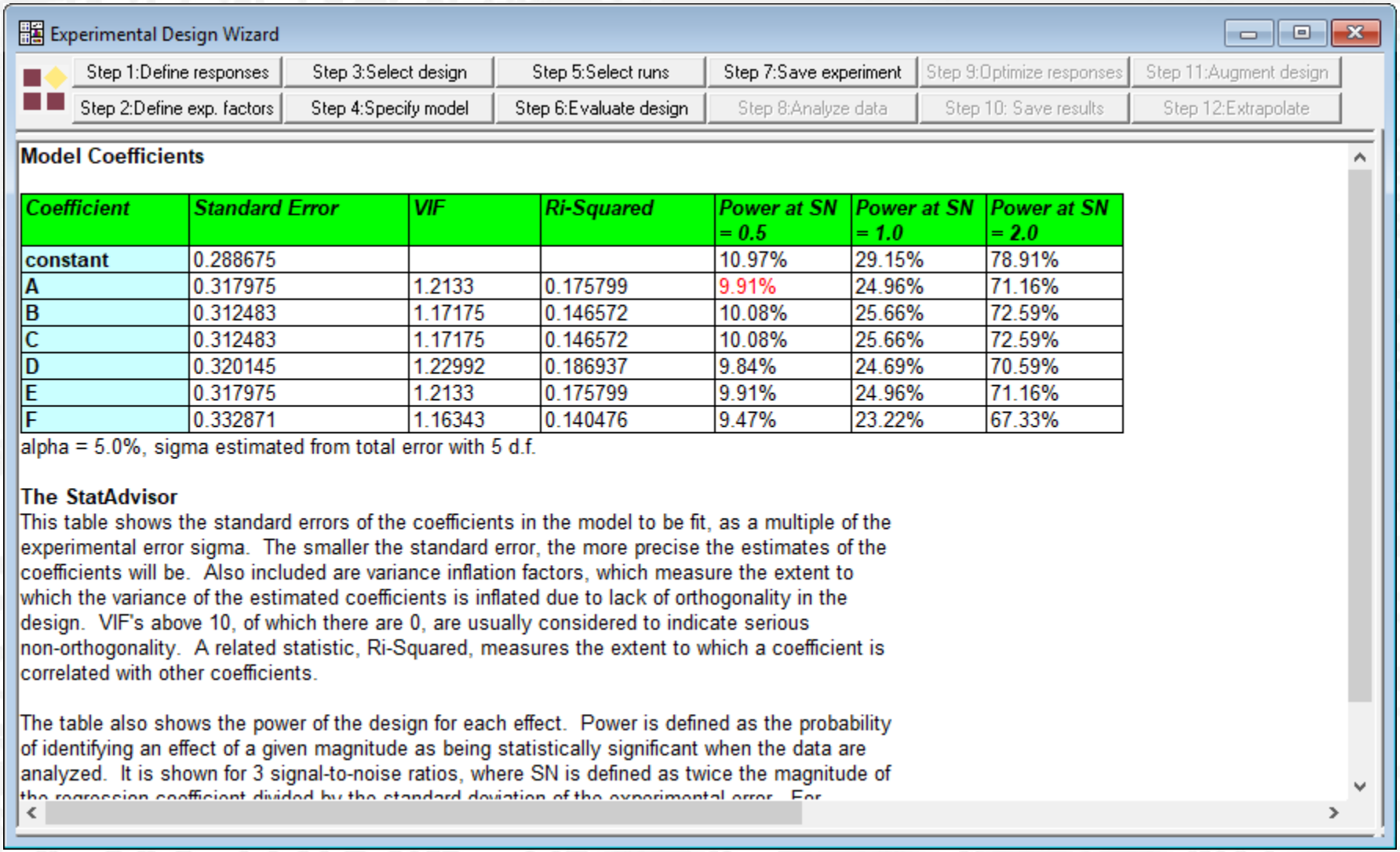
Effect	AB	AC	AD	AE	AF	BC	BD	BE	BF	CD	CE	CF	DE	DF
constant			0.3333	-0.3333	-0.0833	-0.3333			0.2500			-0.2500	-0.3333	0.083
A														
B														
C														
D														
E														
F														

tr(A'A)=0.590278

The StatAdvisor

The alias matrix indicates the extent to which the effects to be estimated are confounded with effects that are not in the current model. Each row represents an effect to be estimated. A non-zero value in any cell indicates that the effect in the corresponding column, multiplied by the value in the cell, is added to the estimated effect when the model is fit. You can use Analysis Options to change which effects are included in the model and Pane Options to select the maximum order for any confounded effects.

Variance Inflation Factors



Model Coefficients

Coefficient	Standard Error	VIF	Ri-Squared	Power at SN = 0.5	Power at SN = 1.0	Power at SN = 2.0
constant	0.288675			10.97%	29.15%	78.91%
A	0.317975	1.2133	0.175799	9.91%	24.96%	71.16%
B	0.312483	1.17175	0.146572	10.08%	25.66%	72.59%
C	0.312483	1.17175	0.146572	10.08%	25.66%	72.59%
D	0.320145	1.22992	0.186937	9.84%	24.69%	70.59%
E	0.317975	1.2133	0.175799	9.91%	24.96%	71.16%
F	0.332871	1.16343	0.140476	9.47%	23.22%	67.33%

alpha = 5.0%, sigma estimated from total error with 5 d.f.

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This table shows the standard errors of the coefficients in the model to be fit, as a multiple of the experimental error sigma. The smaller the standard error, the more precise the estimates of the coefficients will be. Also included are variance inflation factors, which measure the extent to which the variance of the estimated coefficients is inflated due to lack of orthogonality in the design. VIF's above 10, of which there are 0, are usually considered to indicate serious non-orthogonality. A related statistic, Ri-Squared, measures the extent to which a coefficient is correlated with other coefficients.

The table also shows the power of the design for each effect. Power is defined as the probability of identifying an effect of a given magnitude as being statistically significant when the data are analyzed. It is shown for 3 signal-to-noise ratios, where SN is defined as twice the magnitude of the regression coefficient divided by the standard deviation of the experimental error. For

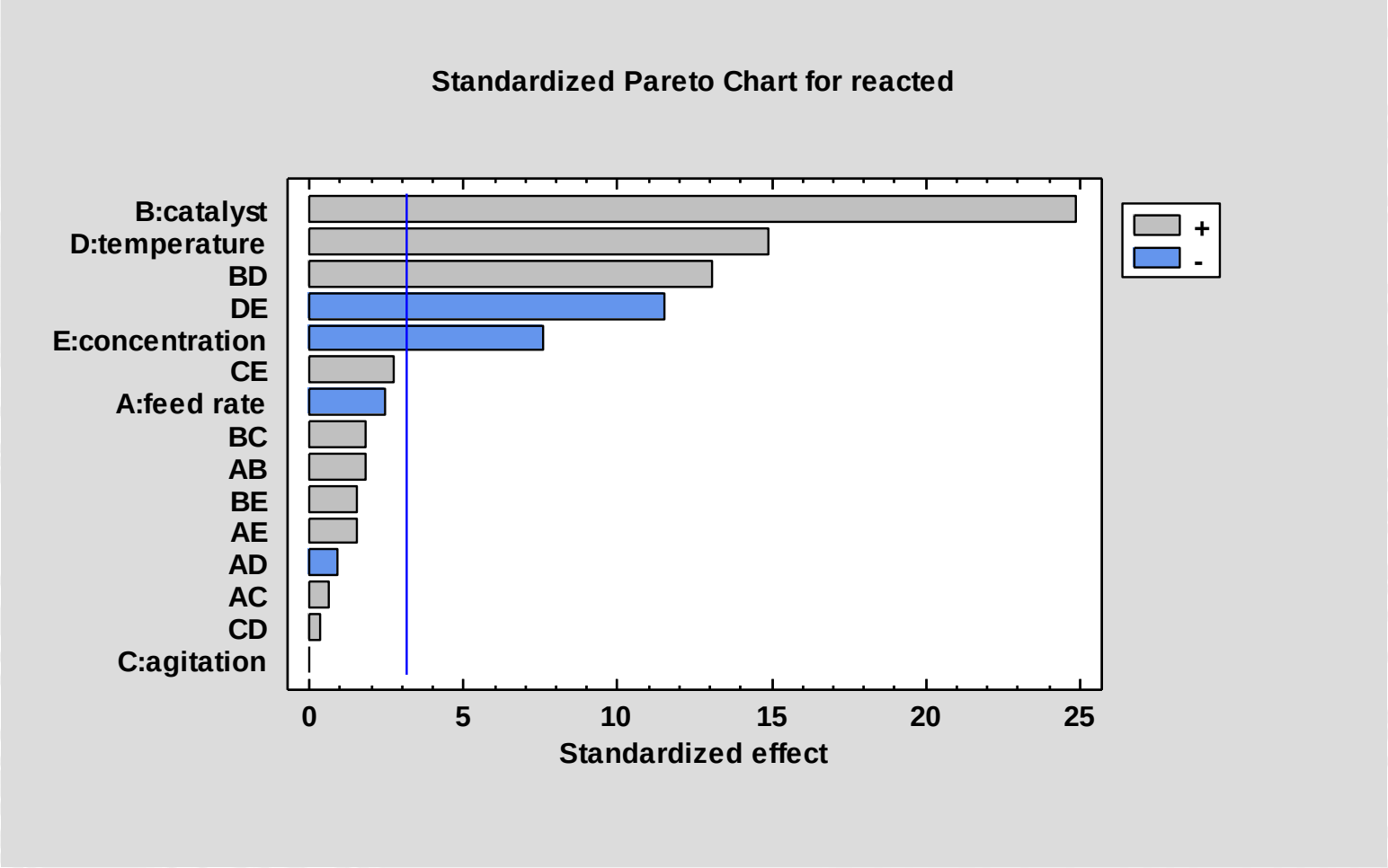
Augmenting Existing Designs

C:\DocData19\chemical reaction2.sgx

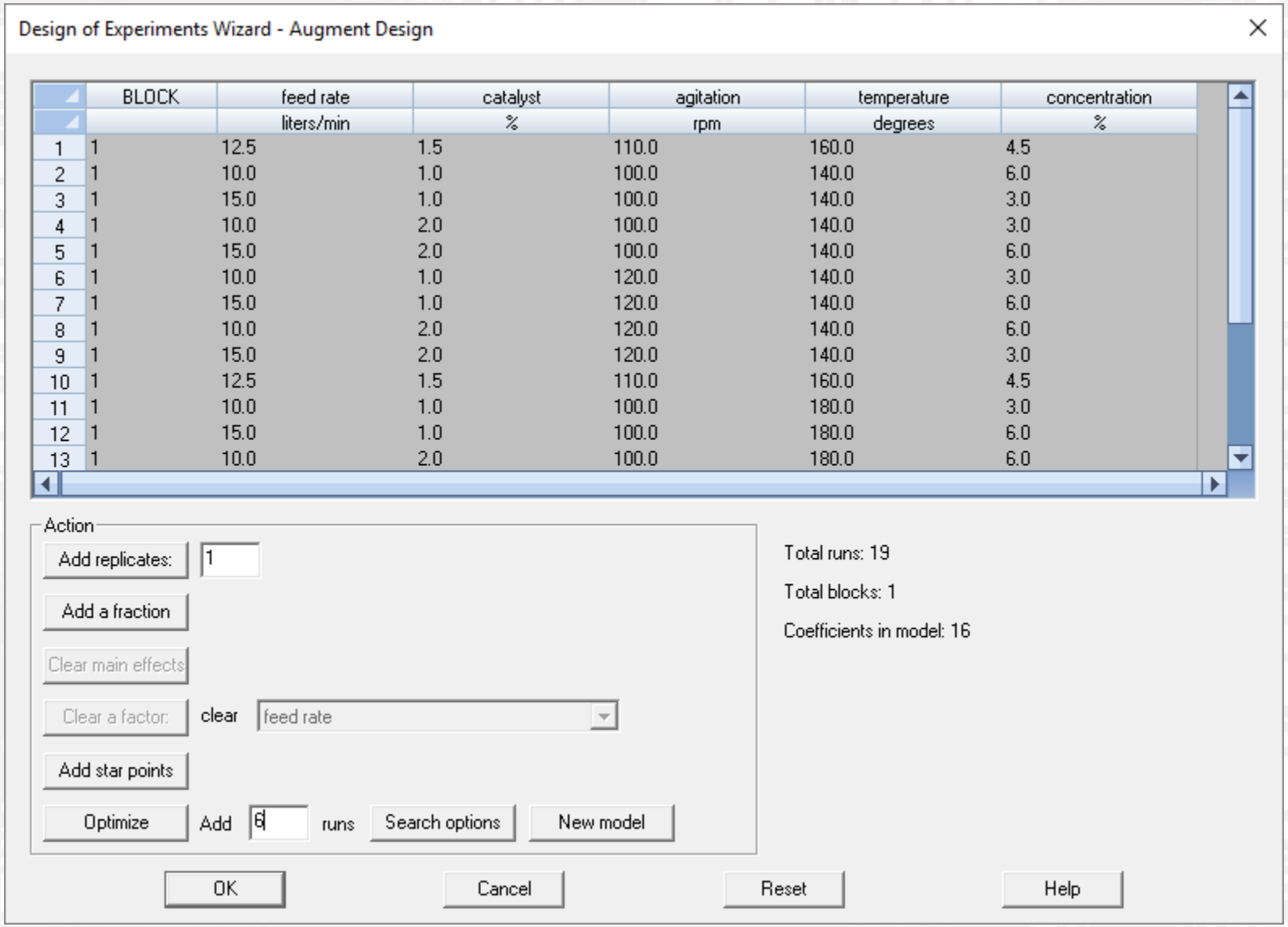
	BLOCK	feed rate	catalyst	agitation	temperature	concentration	reacted
		liters/min	%	rpm	degrees	%	%
	Integer	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric
1	1	12.5	1.5	110.0	160.0	4.5	65
2	1	10.0	1.0	100.0	140.0	6.0	56
3	1	15.0	1.0	100.0	140.0	3.0	53
4	1	10.0	2.0	100.0	140.0	3.0	63
5	1	15.0	2.0	100.0	140.0	6.0	65
6	1	10.0	1.0	120.0	140.0	3.0	53
7	1	15.0	1.0	120.0	140.0	6.0	55
8	1	10.0	2.0	120.0	140.0	6.0	67
9	1	15.0	2.0	120.0	140.0	3.0	61
10	1	12.5	1.5	110.0	160.0	4.5	67
11	1	10.0	1.0	100.0	180.0	3.0	69
12	1	15.0	1.0	100.0	180.0	6.0	45
13	1	10.0	2.0	100.0	180.0	6.0	78
14	1	15.0	2.0	100.0	180.0	3.0	93
15	1	10.0	1.0	120.0	180.0	6.0	49
16	1	15.0	1.0	120.0	180.0	3.0	60
17	1	10.0	2.0	120.0	180.0	3.0	95
18	1	15.0	2.0	120.0	180.0	6.0	82
19	1	12.5	1.5	110.0	160.0	4.5	63

chemical reaction2 | B | C

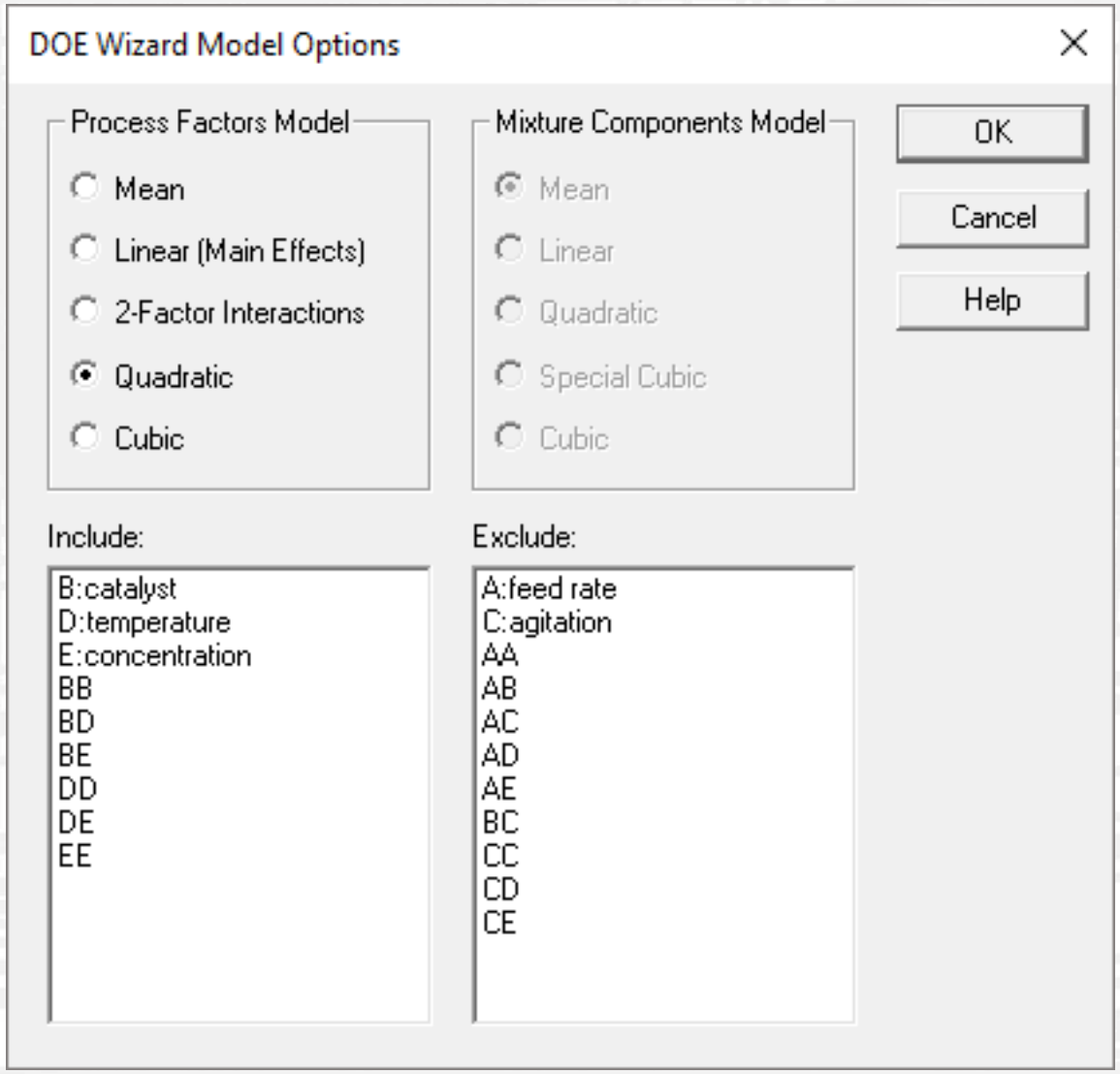
Pareto Chart for Original Design



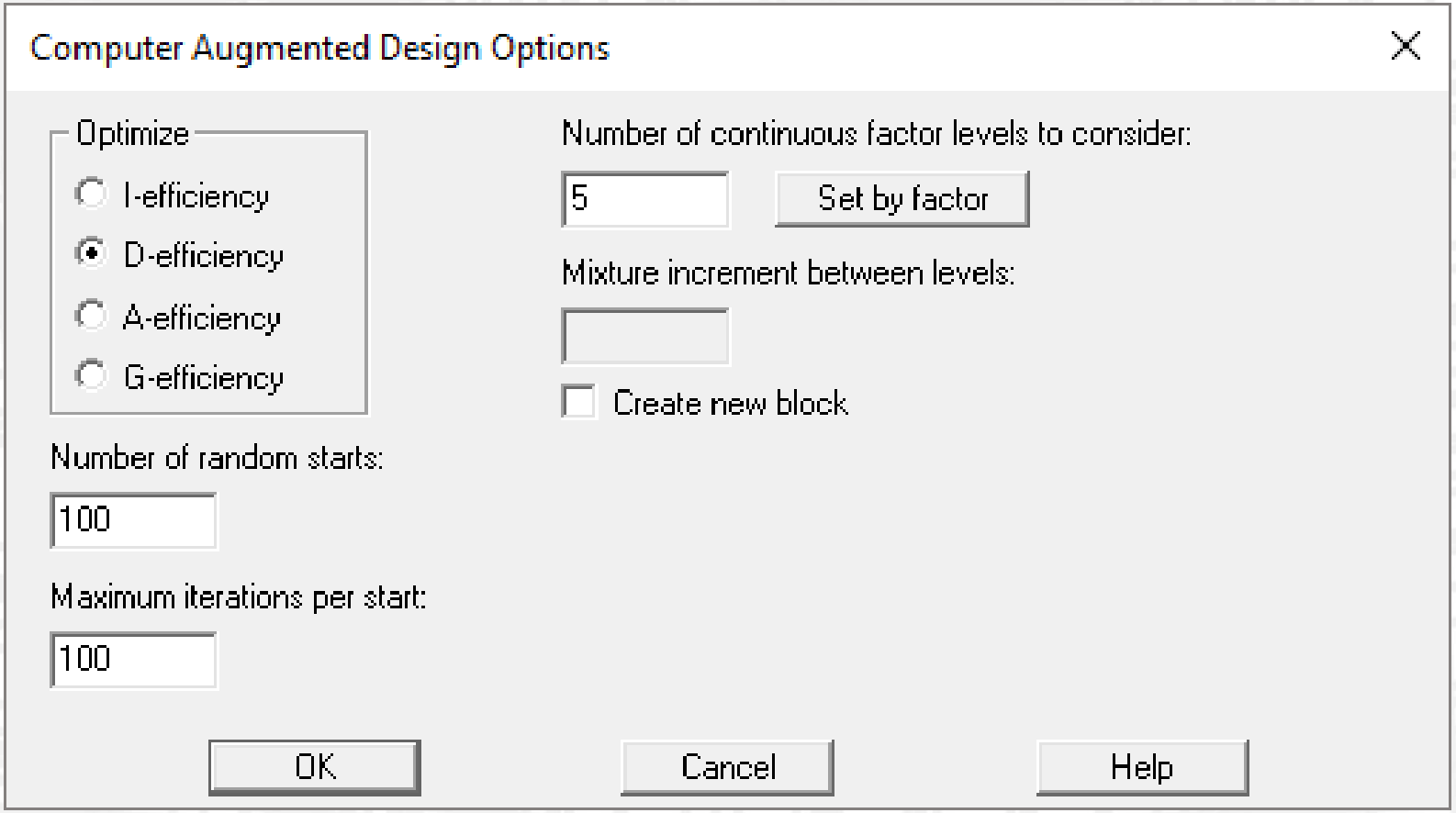
Augment Design Step



Specify New Model



Specify Search Options



Augmented Design

Design of Experiments Wizard - Augment Design

	BLOCK	feed rate	catalyst	agitation	temperature	concentration
		liters/min	%	rpm	degrees	%
13	1	10.0	2.0	100.0	180.0	6.0
14	1	15.0	2.0	100.0	180.0	3.0
15	1	10.0	1.0	120.0	180.0	6.0
16	1	15.0	1.0	120.0	180.0	3.0
17	1	10.0	2.0	120.0	180.0	3.0
18	1	15.0	2.0	120.0	180.0	6.0
19	1	12.5	1.5	110.0	160.0	4.5
20	1	12.5	1.0	110.0	180.0	4.5
21	1	12.5	1.0	110.0	160.0	3.0
22	1	12.5	1.5	110.0	180.0	3.0
23	1	12.5	2.0	110.0	160.0	3.0
24	1	12.5	2.0	110.0	180.0	4.5
25	1	12.5	1.5	110.0	140.0	3.0

Action

Add replicates: 1

Add a fraction

Clear main effects

Clear a factor: clear feed rate

Add star points

Optimize Add 6 runs Search options New model

Total runs: 25

Total blocks: 1

Coefficients in model: 10

D-efficiency: 44.61%

G-efficiency: 38.17%

A-efficiency: 21.96%

Average prediction variance: 0.250949

OK Cancel Reset Help

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