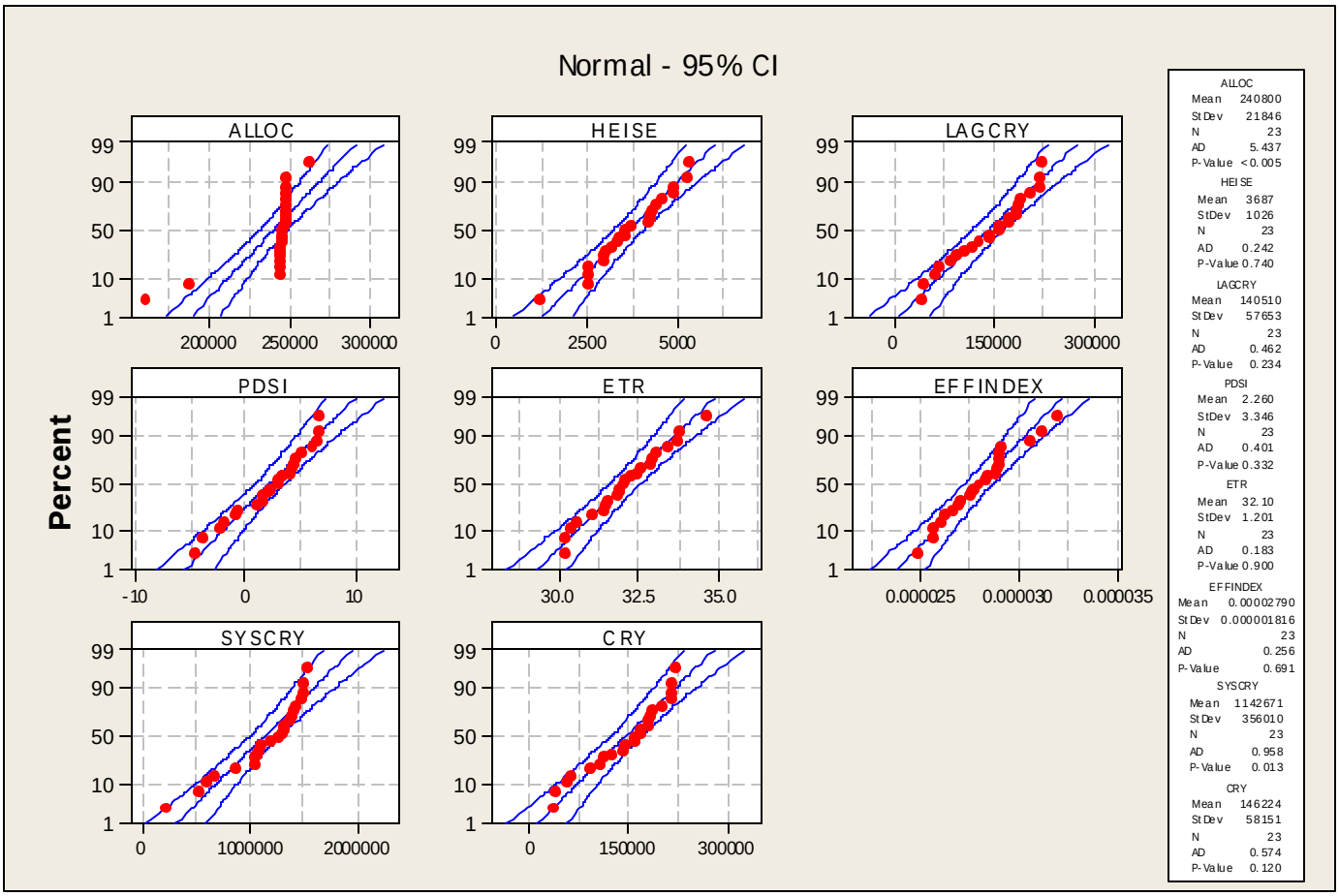
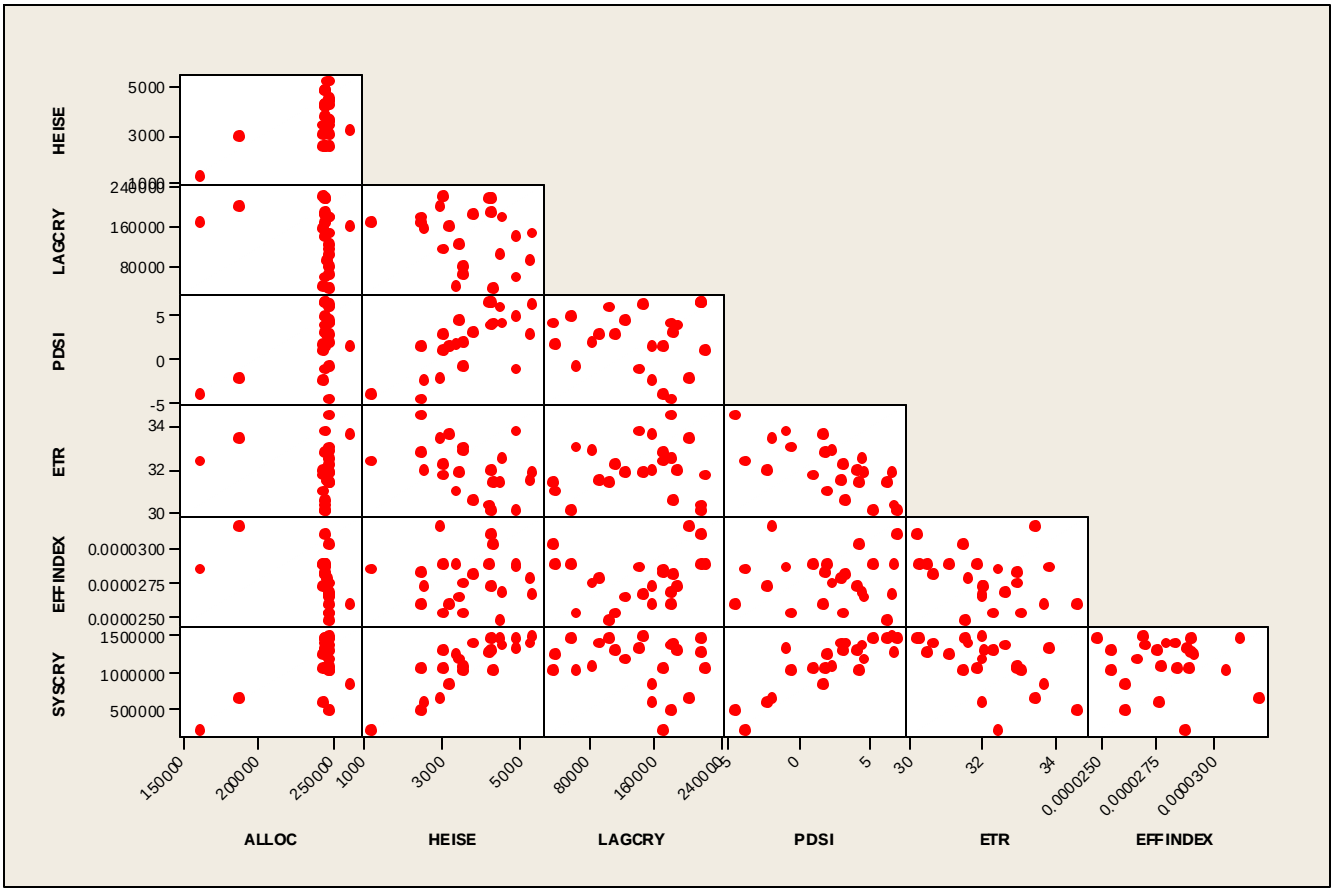
TWIN FALLS CANAL COMPANY



Normal probability plots of raw data; Twin Falls Canal Company.

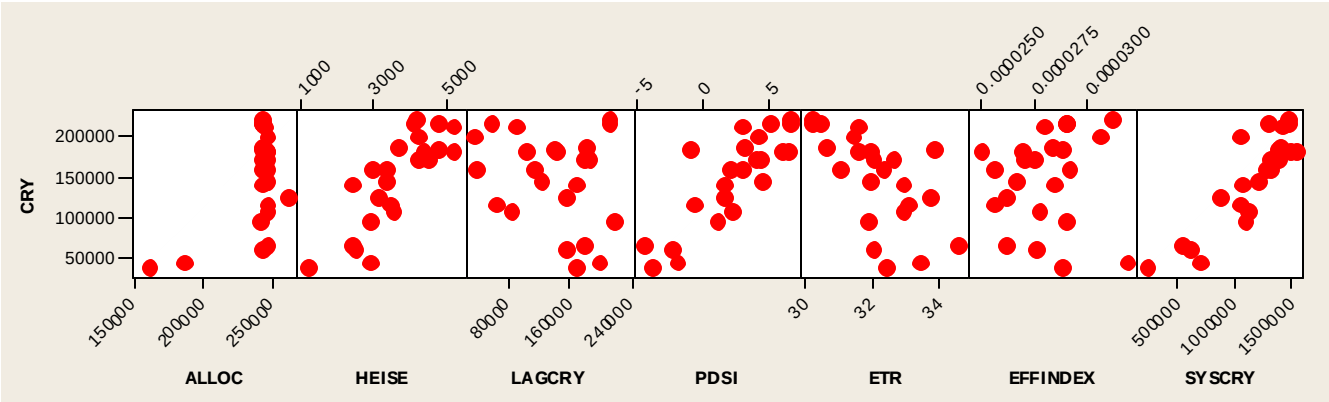
Pearson correlations among independent variables; Twin Falls Canal Company.

	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
ALLOC	1.00						
HEISE	0.52	1.00					
LAGCRY	-0.24	-0.26	1.00				
PDSI	0.48	0.70	-0.11	1.00			
ETR	-0.10	-0.37	0.11	-0.69	1.00		
EFFINDEX	-0.42	0.01	0.19	0.00	-0.32	1.00	
SYSCRY	0.60	0.85	-0.20	0.84	-0.53	-0.08	1.00



Scatter plots among raw independent variables; Twin Falls Canal Company.

	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
CRY	0.55	0.82	-0.24	0.84	-0.63	0.06	0.88



Scatter plot of carryover versus each independent variable; Twin Falls Canal Company.

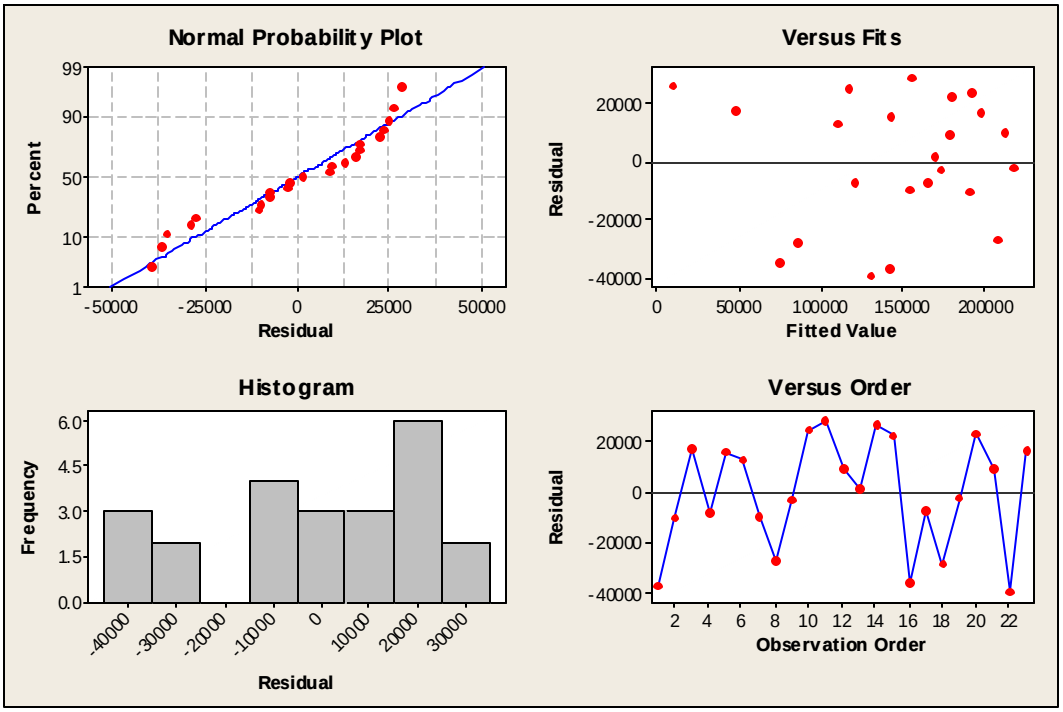
Regression summary of full model with standardized variables; Twin Falls Canal Company.

Predictor	Coef	SE Coef	T	P	VIF
Constant	0.00000	0.09394	0.00	1.000	
sALLOC	0.1338	0.1396	0.96	0.353	2.114
sHEISE	0.2832	0.1969	1.44	0.171	4.201
sLAGCRY	-0.0492	0.1057	-0.47	0.648	1.210
sPDSI	0.2031	0.2172	0.93	0.365	5.114
sETR	-0.1765	0.1618	-1.09	0.293	2.839
sEFFINDEX	0.0894	0.1243	0.72	0.483	1.674
sSYSCRY	0.2925	0.2532	1.16	0.266	6.948

S = 0.450537 R-Sq = 86.2% R-Sq(adj) = 79.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	7	18.9552	2.7079	13.34	0.000
Residual Error	15	3.0448	0.2030		
Total	22	22.0000			



Residual analysis for full model (raw variables); Twin Falls Canal Company.

Analysis of autocorrelation in full-model residuals; Twin Falls Canal Company.

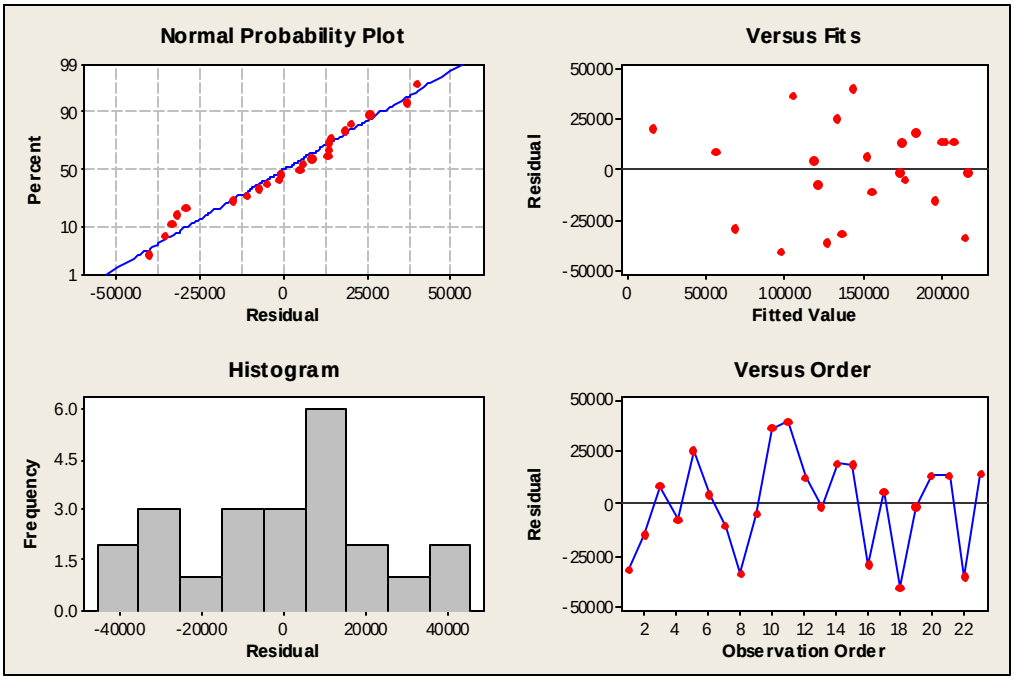
Lag	ACF	t statistic	df	*P*
1	0.08	0.37	20	0.71
2	-0.25	-1.19	19	0.25
3	-0.08	-0.38	18	0.71
4	-0.06	-0.25	17	0.80
5	-0.09	-0.39	16	0.70
6	0.09	0.40	15	0.70

Regression summary of best model with standardized variables; Twin Falls Canal Company

```
Predictor      Coef   SE Coef       T      P    VIF
Constant    0.00000   0.09056    0.00  1.000
sALLOC       0.1527    0.1167    1.31  0.207  1.587
sHEISE       0.4612    0.1368    3.37  0.003  2.184
sPDSI        0.2659    0.1825    1.46  0.162  3.887
sETR        -0.2547    0.1385   -1.84  0.083  2.238

S = 0.434306   R-Sq = 84.6%   R-Sq(adj) = 81.1%

Analysis of Variance

Source          DF       SS       MS       F      P
Regression       4  18.6048   4.6512   24.66  0.000
Residual Error  18   3.3952   0.1886
Total           22  22.0000
```

Regression equation of best model (raw variables); Twin Falls Canal Company

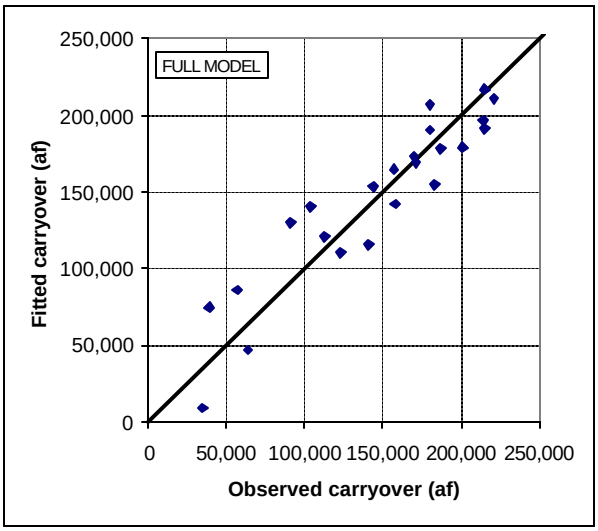
```
CRY = 337465 + 0.406 ALLOC + 26.1 HEISE - 12336 ETR + 4622 PDSI
```

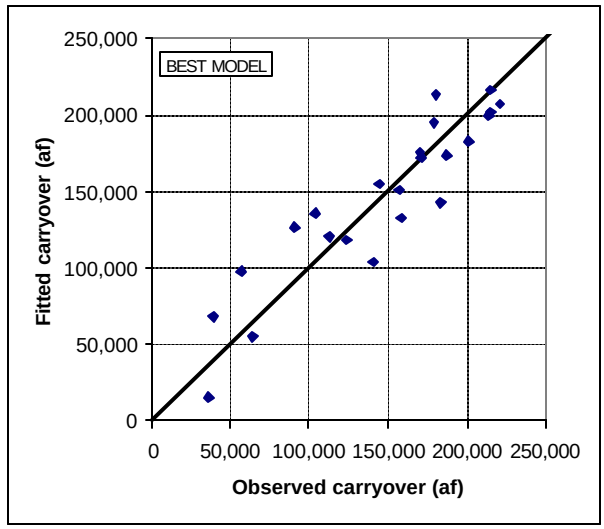


Residual analysis for best model (raw variables); Twin Falls Canal Company.

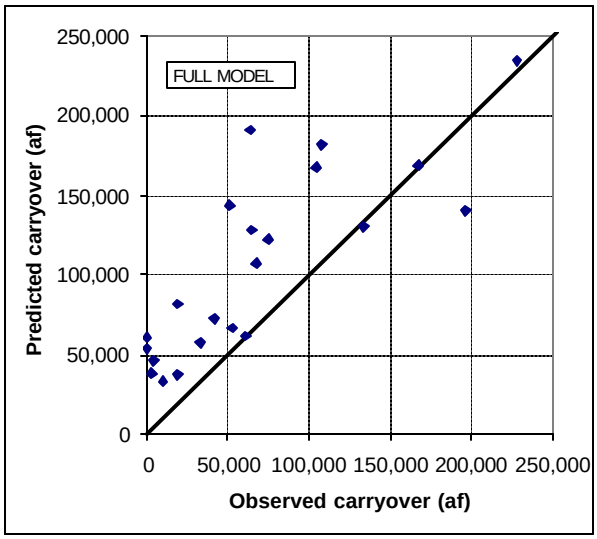
Analysis of autocorrelation in best-model residuals; Twin Falls Canal Company.

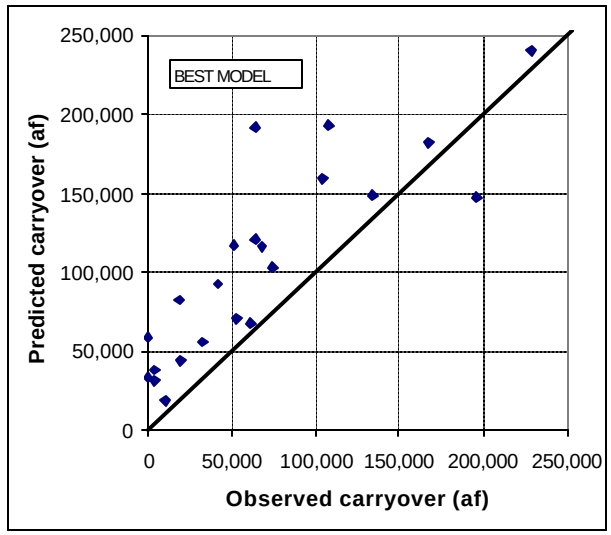
Lag	ACF	t statistic	df	*P*
1	0.10	0.46	20	0.65
2	-0.11	-0.54	19	0.60
3	-0.22	-1.03	18	0.32
4	-0.02	-0.09	17	0.93
5	-0.05	-0.24	16	0.81
6	0.10	0.46	15	0.66





Fitted versus predicted carryover; Twin Falls Canal Company. Line $y = x$ is shown for reference.





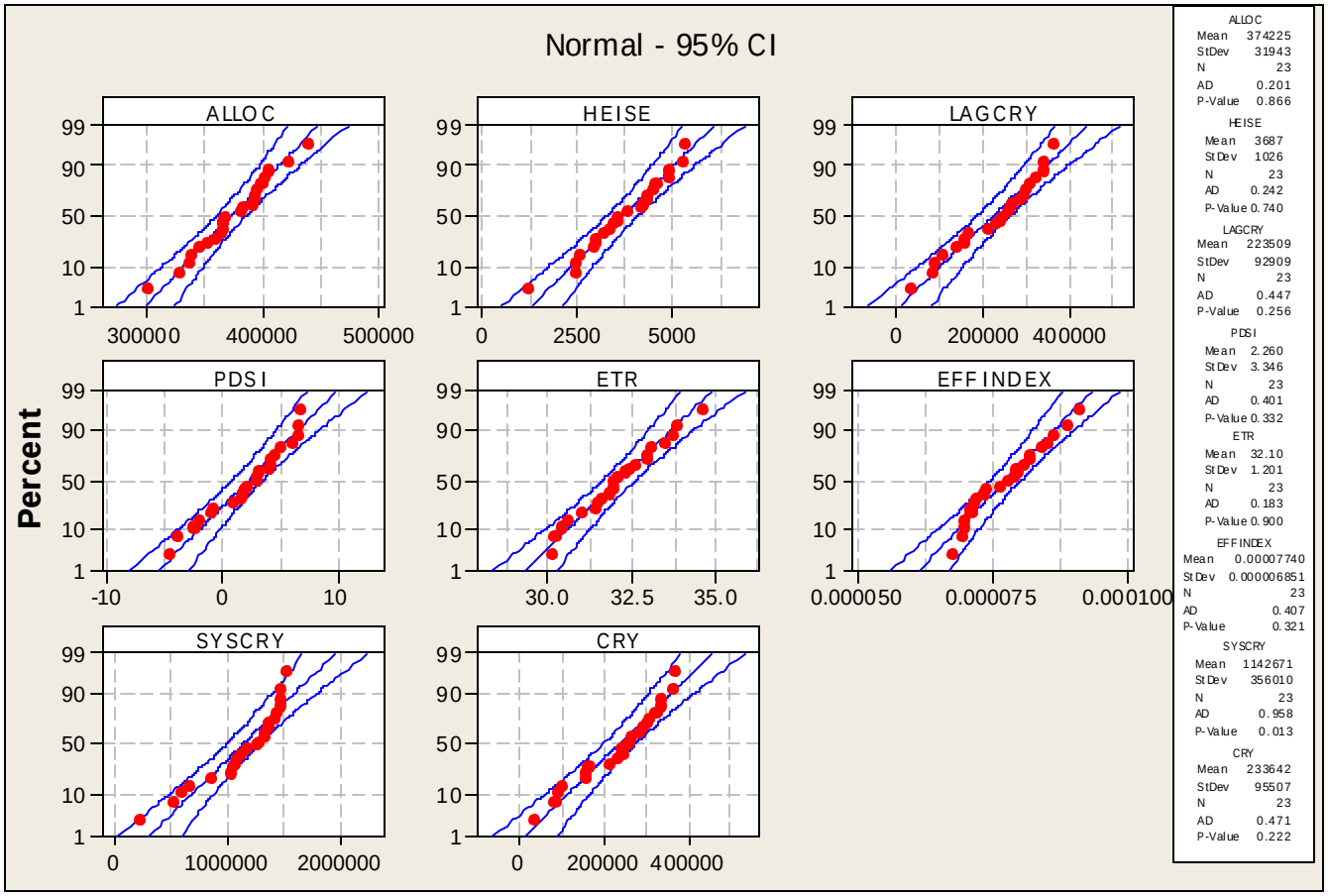
Predicted versus observed carryover, 1987-2008, and line $y = x$; Twin Falls Canal Company.

Comparison of carryover differences "predicted – observed" (best model) between calibration and prediction periods, after correction for 1st-order serial autocorrelation in differences.

	Calibration period	Prediction period
Number of paired observations	22	21
# positive differences	8	18
Sign test* exact *P*-value (up to rounding)	$P = 0.524$	$P = 0.001$
Mean difference	-1517	21897
Approximate *P* for comparison of means**	$P \sim 0.009$	

*Binomial test of H_0: Pr{difference > 0} = 0.5, versus two-sided alternative.
**Permutation test for H_0: calibration-period difference = prediction-period difference, versus two-sided alternative.

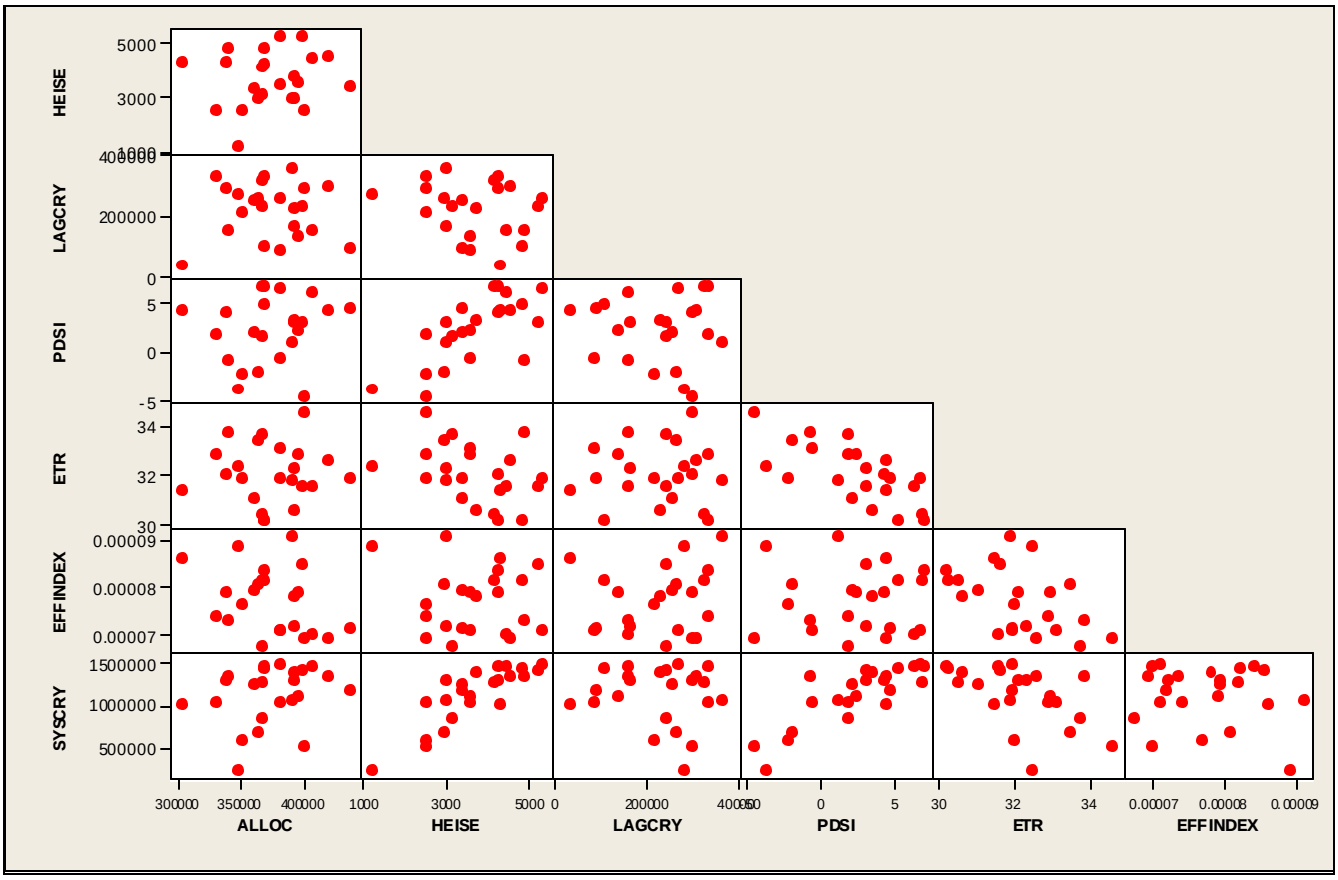
MINIDOKA IRRIGATION DISTRICT



Normal probability plots of raw data; Minidoka Irrigation District.

Pearson correlations among independent variables; Minidoka Irrigation District.

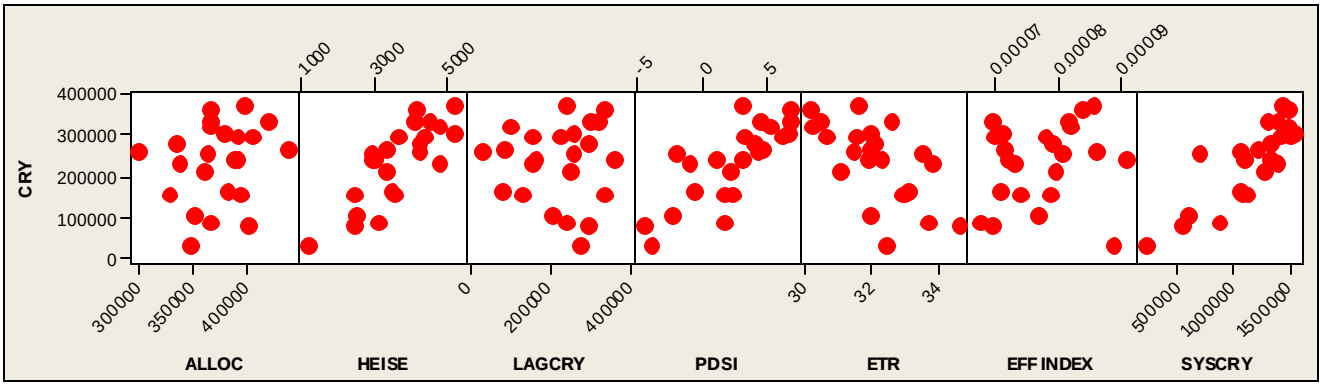
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
ALLOC	1.00						
HEISE	0.11	1.00					
LAGCRY	-0.01	-0.22	1.00				
PDSI	0.16	0.70	-0.07	1.00			
ETR	0.03	-0.37	0.00	-0.69	1.00		
EFFINDEX	-0.36	-0.09	0.19	-0.02	-0.48	1.00	
SYSCRY	0.23	0.85	-0.11	0.84	-0.53	-0.13	1.00



Scatter plots among raw independent variables; Minidoka Irrigation District.

Pearson correlation between carryover and each independent variable; Minidoka Irrigation District.

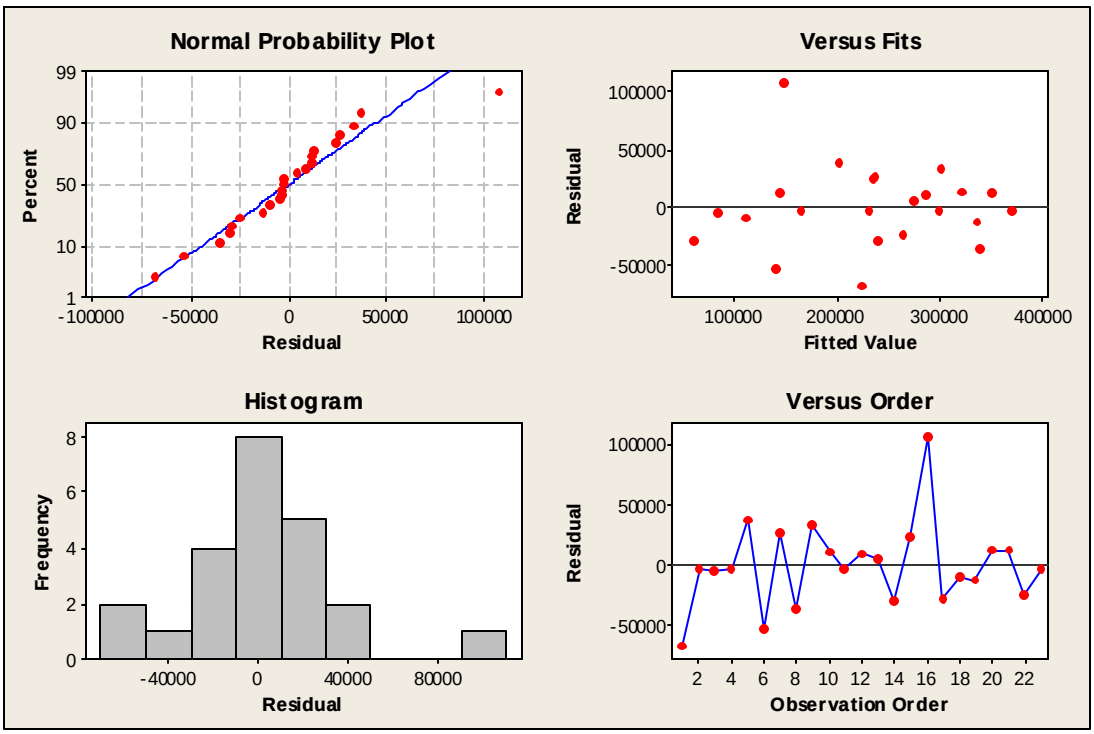
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
CRY	0.23	0.81	0.02	0.79	-0.64	0.16	0.84



Scatter plot of carryover versus each independent variable; Minidoka Irrigation District.

Regression summary of full model with standardized variables; Minidoka Irrigation District

```
Predictor       Coef   SE Coef       T       P     VIF
Constant   -0.00000   0.09298   -0.00   1.000
sALLOC       0.1762    0.1057    1.67   0.116   1.237
sHEISE       0.4736    0.1962    2.41   0.029   4.258
sLAGCRY      0.1196    0.1021    1.17   0.260   1.153
sPDSI        0.1517    0.2177    0.70   0.497   5.244
sETR        -0.1215    0.1912   -0.64   0.535   4.045
sEFFINDEX    0.2233    0.1461    1.53   0.147   2.362
sSYSCRY      0.2460    0.2508    0.98   0.342   6.962

S = 0.445918   R-Sq = 86.4%   R-Sq(adj) = 80.1%

Analysis of Variance

Source          DF        SS       MS       F       P
Regression       7   19.0174   2.7168   13.66   0.000
Residual Error  15    2.9826   0.1988
Total           22   22.0000
```



Residual analysis for full model (raw variables); Minidoka Irrigation District.

Analysis of autocorrelation in full-model residuals; Minidoka Irrigation District.

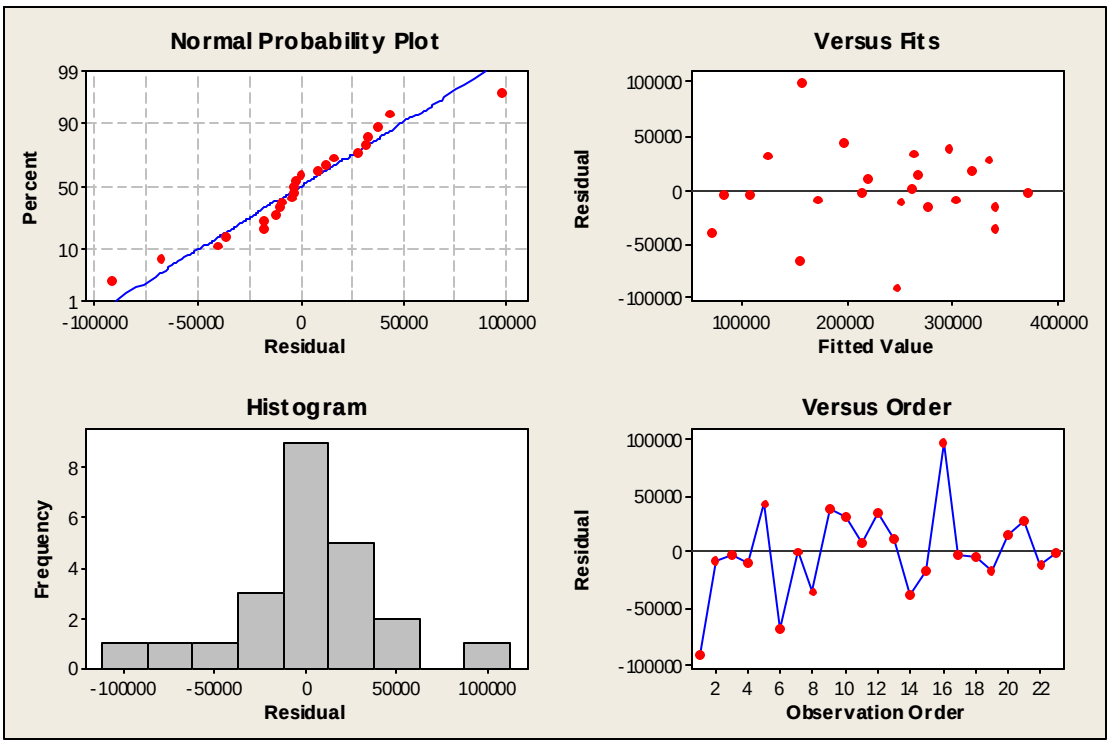
Lag	ACF	t statistic	df	*P*
1	-0.23	-1.09	20	0.29
2	-0.06	-0.27	19	0.79
3	-0.08	-0.38	18	0.71
4	-0.01	-0.04	17	0.97
5	0.21	0.95	16	0.36
6	-0.07	-0.32	15	0.75

Regression summary of best model with standardized variables; Minidoka Irrigation District

```
Predictor      Coef  SE Coef      T      P    VIF
Constant    0.00000  0.09362   0.00  1.000
sALLOC       0.2101   0.1044   2.01  0.059  1.189
sHEISE       0.5420   0.1352   4.01  0.001  1.996
sPDSI        0.3813   0.1362   2.80  0.012  2.025
sEFFINDEX    0.2946   0.1036   2.84  0.011  1.172

S = 0.448981   R-Sq = 83.5%   R-Sq(adj) = 79.8%

Analysis of Variance

Source          DF       SS       MS      F      P
Regression       4  18.3715   4.5929  22.78  0.000
Residual Error  18   3.6285   0.2016
Total           22  22.0000
```

Regression equation of best model (raw variables); Minidoka Irrigation District

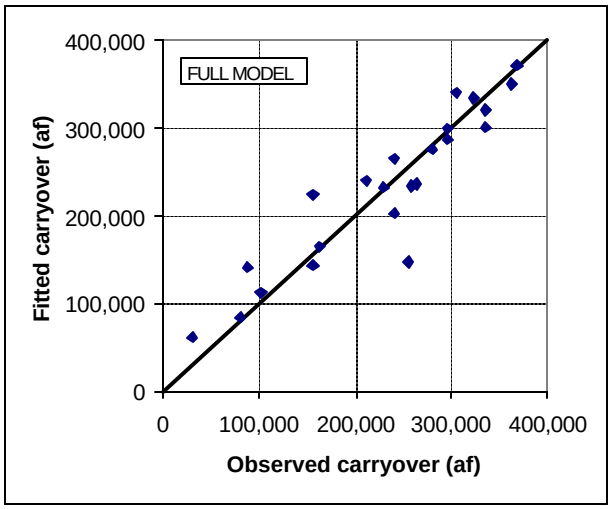
```
CRY = - 529956 + 0.628 ALLOC + 50.5 HEISE + 10884 PDSI + 4.11E+09 EFFINDEX
```

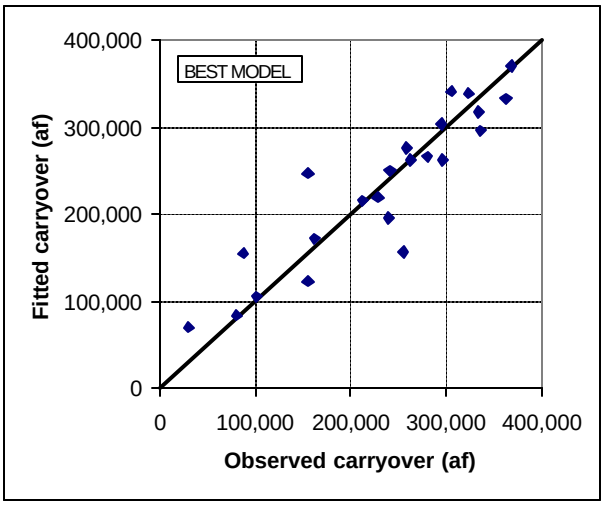


Residual analysis for best model (raw variables); Minidoka Irrigation District.

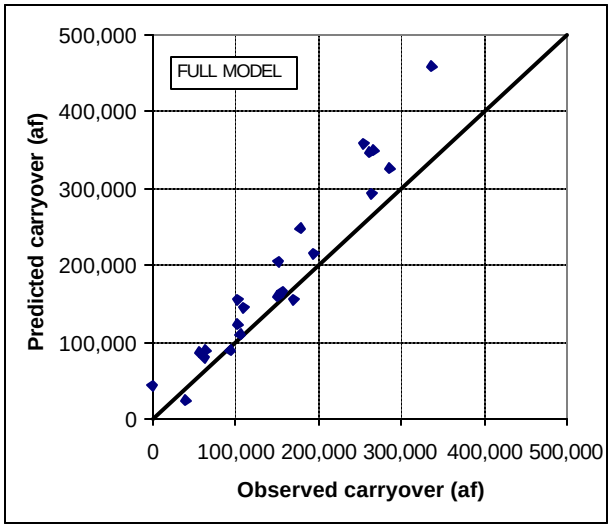
Analysis of autocorrelation in best-model residuals; Minidoka Irrigation District.

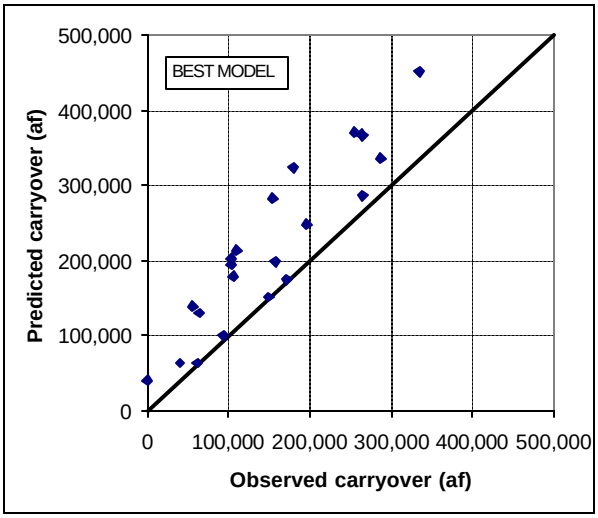
Lag	ACF	t statistic	df	*P*
1	-0.11	-0.51	20	0.61
2	-0.08	-0.39	19	0.70
3	-0.09	-0.45	18	0.66
4	-0.01	-0.04	17	0.97
5	0.24	1.14	16	0.27
6	-0.03	-0.12	15	0.91





Fitted versus predicted carryover; Minidoka Irrigation District. Line $y = x$ is shown for reference.





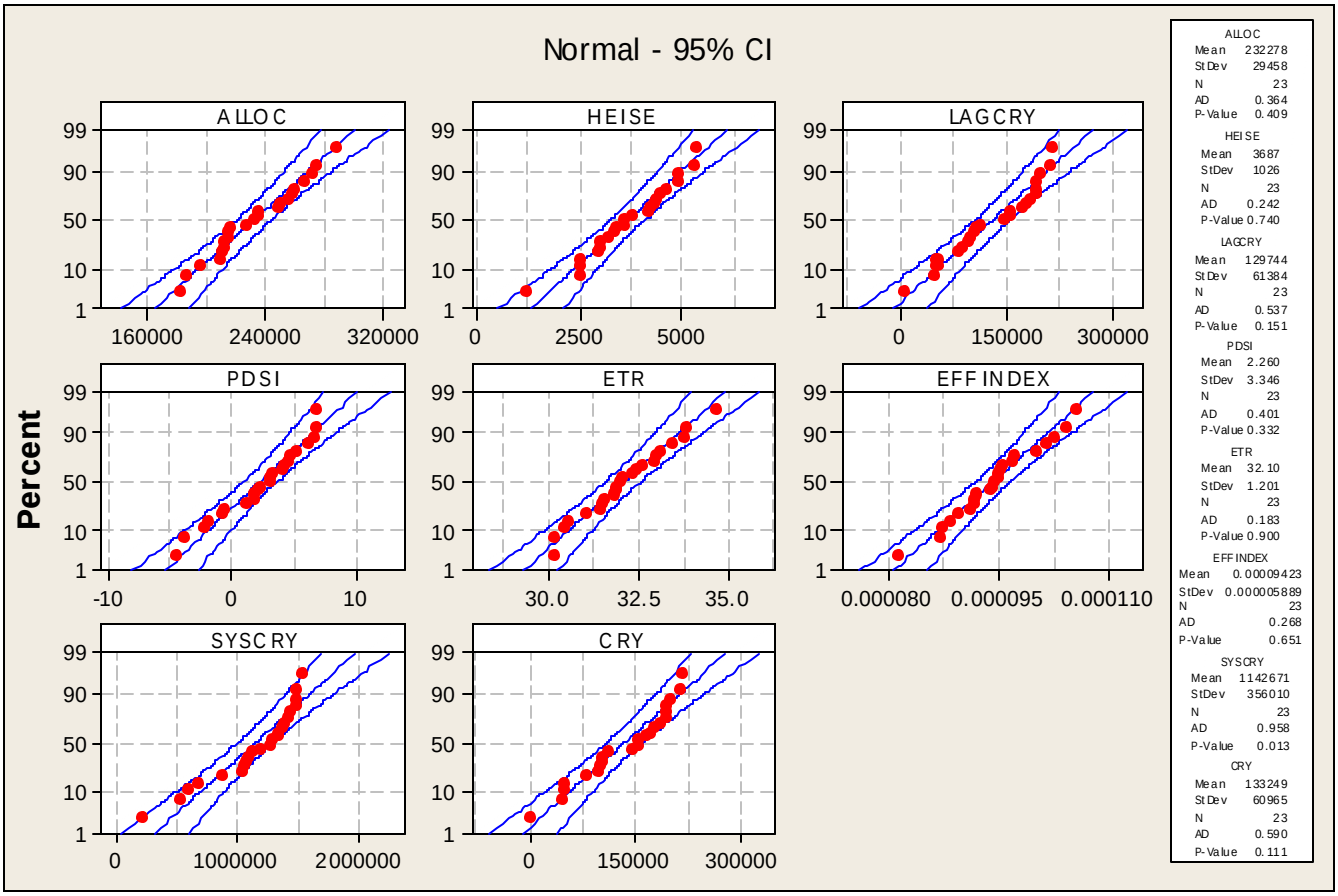
Predicted versus observed carryover, 1987-2008, and line $y = x$; Minidoka Irrigation District.

Comparison of carryover differences "predicted – observed" (best model) between calibration and prediction periods, after correction for 1st-order serial autocorrelation in differences.

	Calibration period	Prediction period
Number of paired observations	22	21
# positive differences	12	15
Sign test* exact *P*-value (up to rounding)	$P = 0.832$	$P = 0.078$
Mean difference	-4177	26119
Approximate *P* for comparison of means**	$P \sim 0.005$	

*Binomial test of H_0: Pr{difference > 0} = 0.5, versus two-sided alternative.
**Permutation test for H_0: mean calibration-period difference = mean prediction-period difference, versus two-sided alternative.

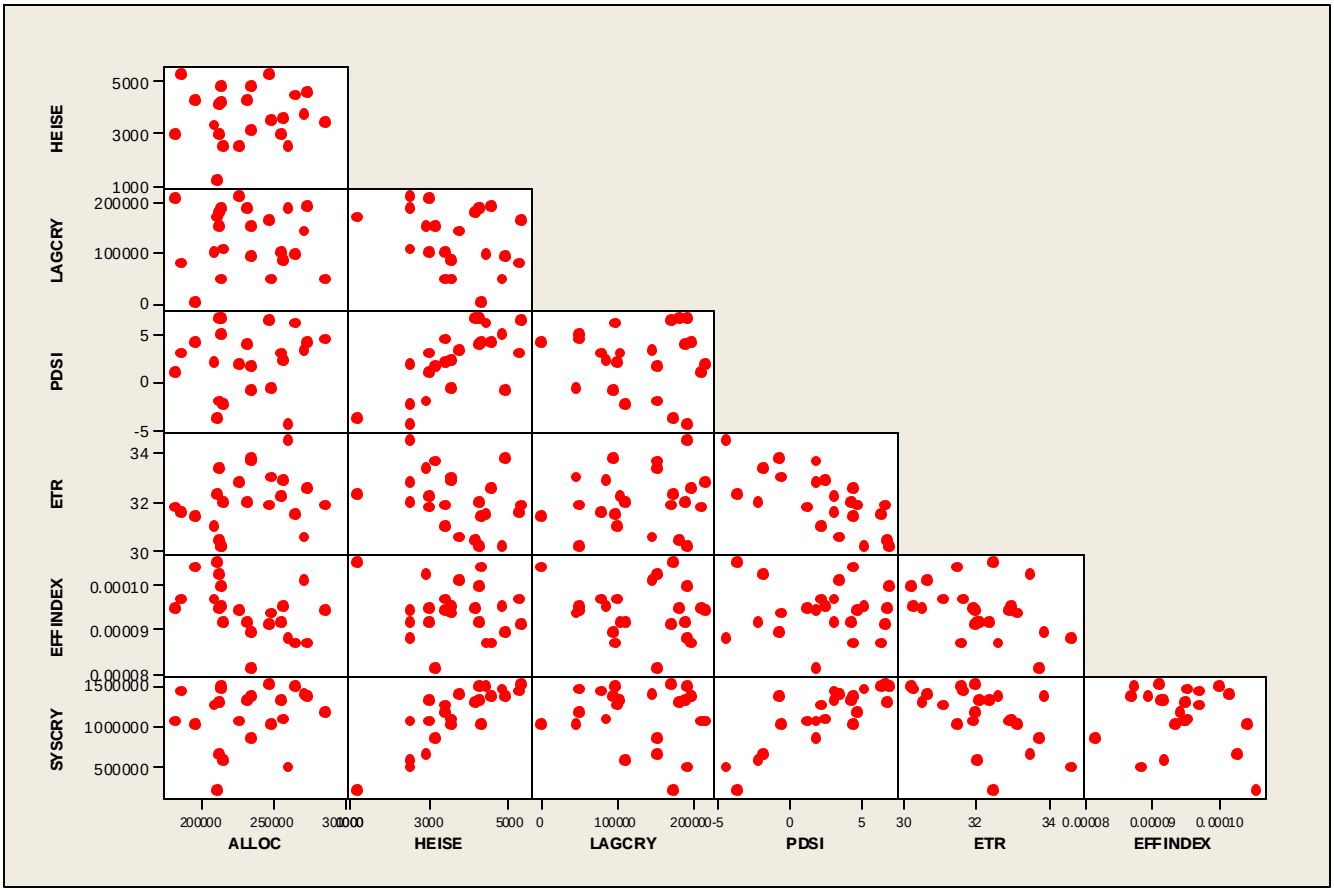
BURLEY IRRIGATION DISTRICT



Normal probability plots of raw data; Burley Irrigation District.

Pearson correlations among independent variables; Burley Irrigation District.

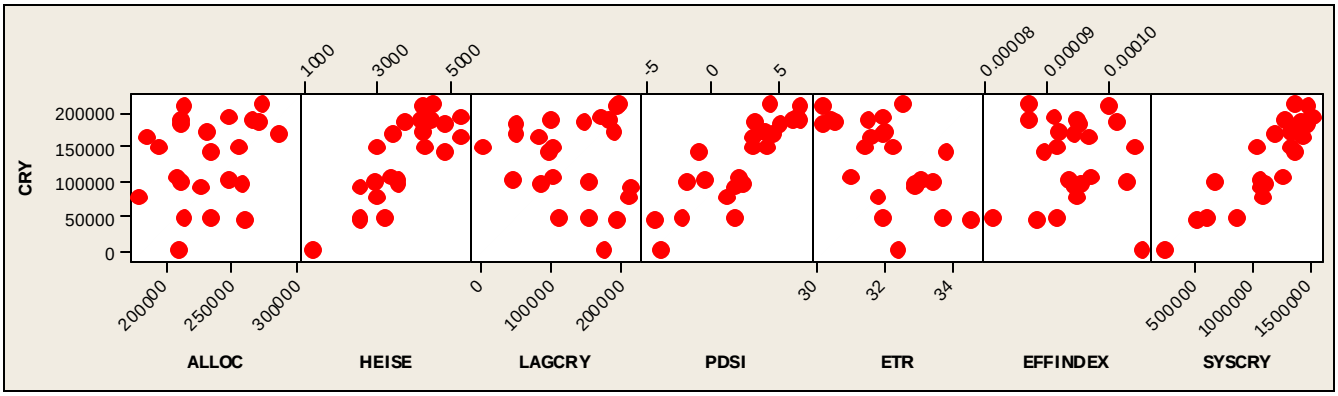
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
ALLOC	1.00						
HEISE	0.04	1.00					
LAGCRY	-0.04	-0.28	1.00				
PDSI	0.12	0.70	-0.09	1.00			
ETR	0.27	-0.37	0.14	-0.69	1.00		
EFFINDEX	-0.44	-0.20	-0.16	-0.08	-0.41	1.00	
SYSCRY	0.17	0.85	-0.15	0.84	-0.53	-0.20	1.00



Scatter plots among raw independent variables; Burley Irrigation District.

Pearson correlation between carryover and each independent variable; Burley Irrigation District.

	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
CRY	0.25	0.83	-0.12	0.86	-0.58	-0.04	0.89



Scatter plot of carryover versus each independent variable; Burley Irrigation District.

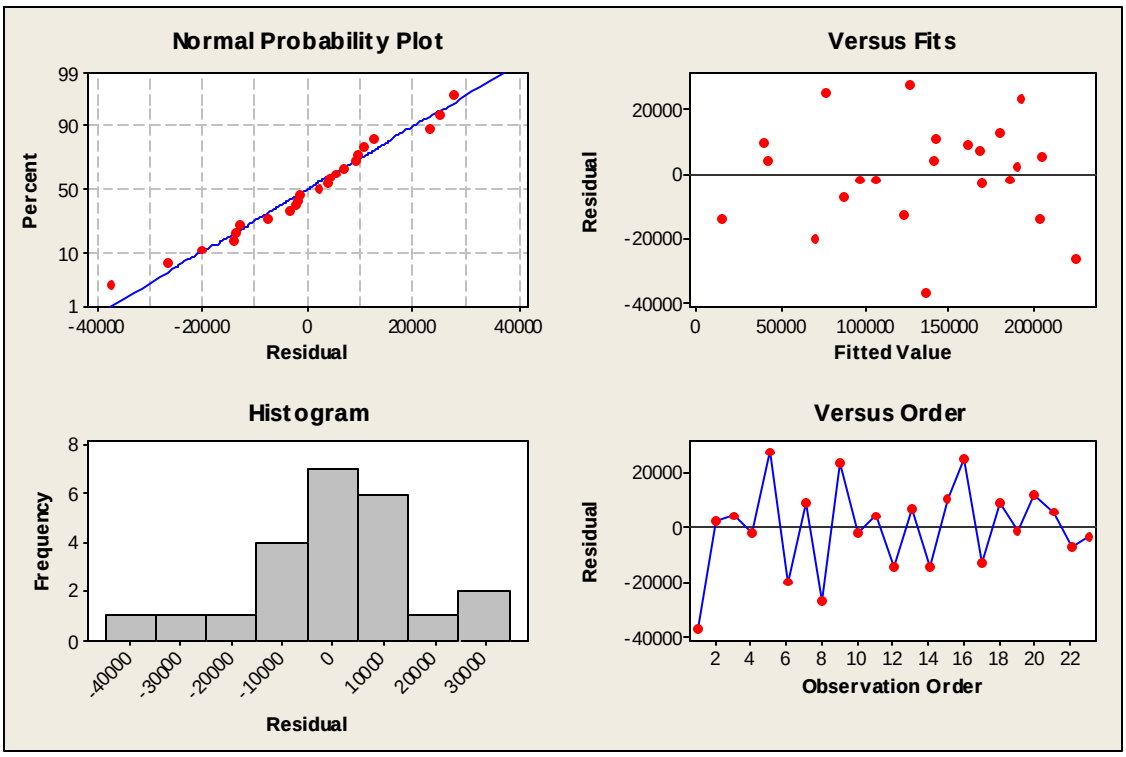
Regression summary of full model with standardized variables; Burley Irrigation District.

Predictor	Coef	SE Coef	T	P	VIF
Constant	0.00000	0.06643	0.00	1.000	
sALLOC	0.30132	0.08769	3.44	0.004	1.667
sHEISE	0.5058	0.1488	3.40	0.004	4.799
sLAGCRY	0.14185	0.07626	1.86	0.083	1.261
sPDSI	0.2193	0.1592	1.38	0.189	5.497
sETR	-0.1261	0.1366	-0.92	0.371	4.046
sEFFINDEX	0.22545	0.09403	2.40	0.030	1.916
sSYSCRY	0.2271	0.1794	1.27	0.225	6.974

S = 0.318590 R-Sq = 93.1% R-Sq(adj) = 89.9%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	7	20.4775	2.9254	28.82	0.000
Residual Error	15	1.5225	0.1015		
Total	22	22.0000			



Residual analysis for full model (raw variables); Burley Irrigation District.

Analysis of autocorrelation in full-model residuals; Burley Irrigation District.

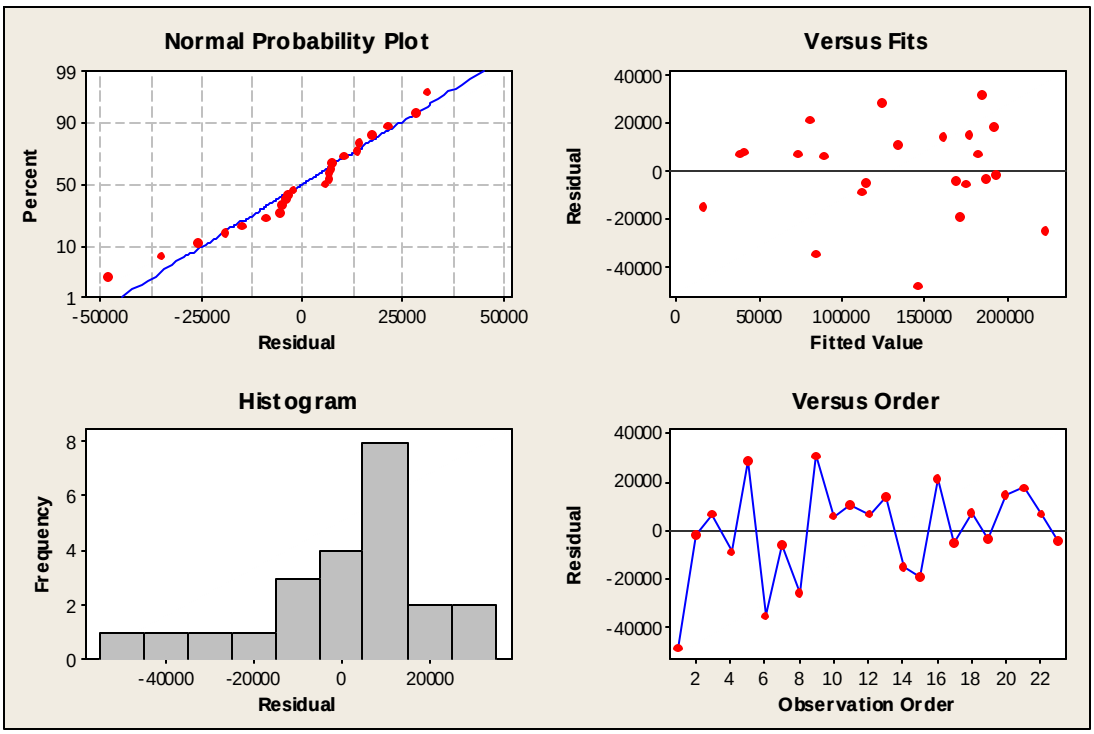
Lag	ACF	t statistic	Df	*P*
1	-0.42	-2.02	20	0.06
2	0.22	0.91	19	0.37
3	-0.28	-1.11	18	0.28
4	-0.01	-0.04	17	0.97
5	0.09	0.35	16	0.73
6	0.05	0.19	15	0.85

Regression summary of best model with standardized variables; Burley Irrigation District

```
Predictor      Coef  SE Coef      T      P    VIF
Constant    0.00000  0.07329   0.00  1.000
sALLOC      0.26788  0.08509   3.15  0.006  1.289
sHEISE       0.5278   0.1091   4.84  0.000  2.120
sPDSI        0.4726   0.1075   4.40  0.000  2.059
sEFFINDEX   0.21932  0.08641   2.54  0.021  1.330

S = 0.351478   R-Sq = 89.9%   R-Sq(adj) = 87.6%

Analysis of Variance

Source          DF       SS       MS      F      P
Regression       4  19.7763   4.9441  40.02  0.000
Residual Error  18   2.2237   0.1235
Total           22  22.0000
```

Regression equation of best model (raw variables); Burley Irrigation District

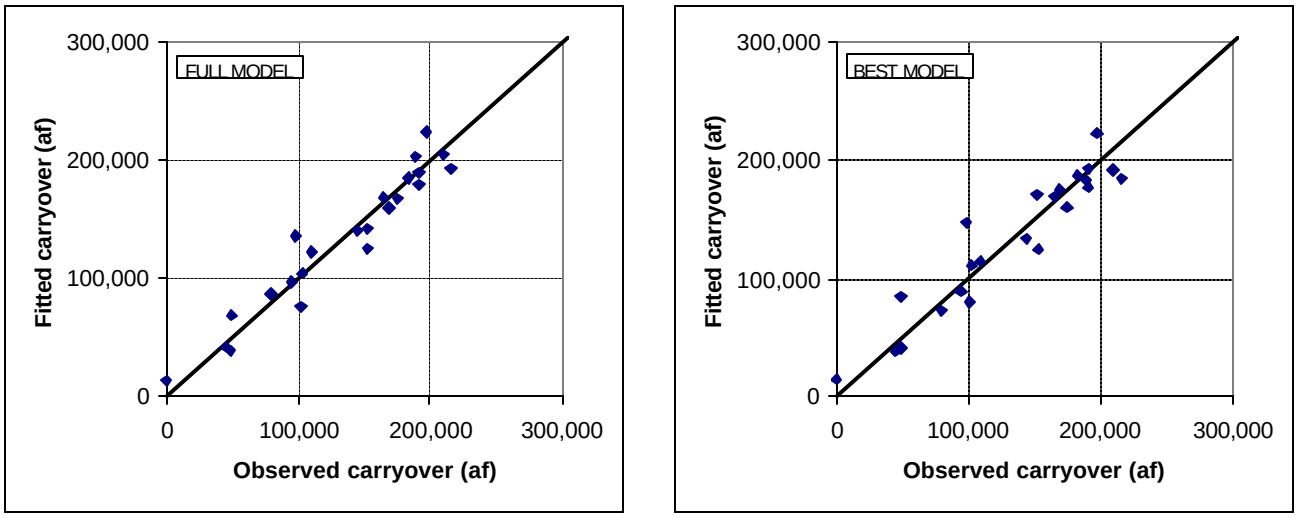
```
CRY = - 344575 + 0.554 ALLOC + 31.4 HEISE + 8611 PDSI + 2.27E+09 EFFINDEX
```



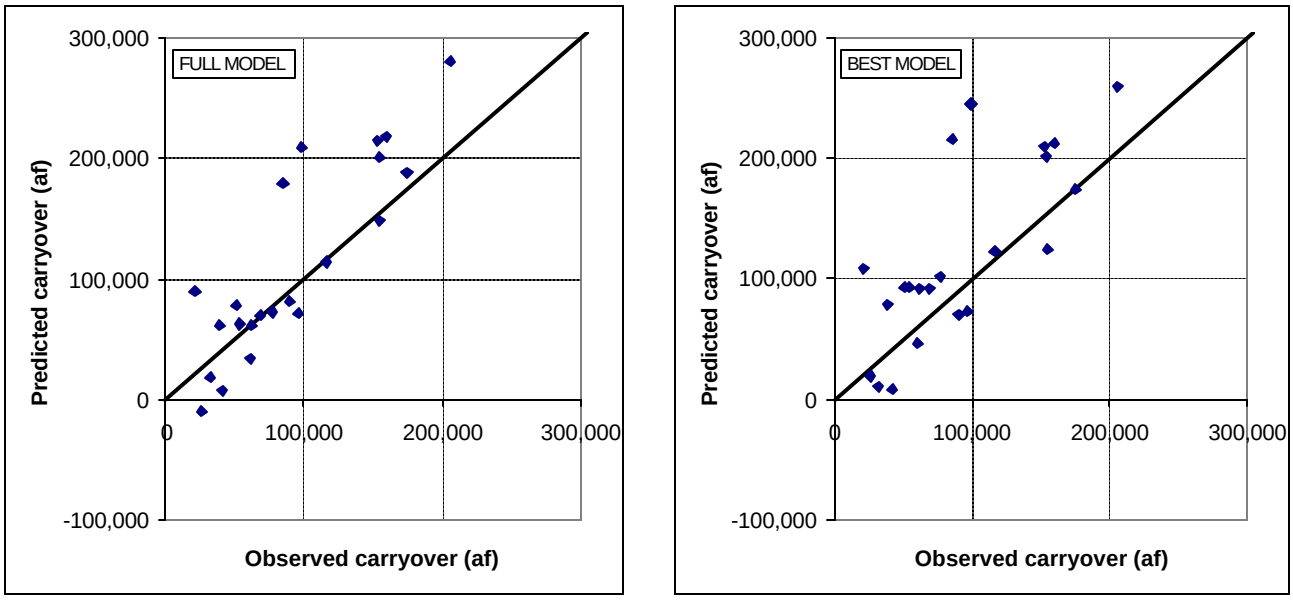
Residual analysis for best model (raw variables); Burley Irrigation District.

Analysis of autocorrelation in best-model residuals; Burley Irrigation District.

Lag	ACF	t statistic	df	*P*
1	-0.18	-0.86	20	0.40
2	0.10	0.45	19	0.66
3	-0.22	-1.01	18	0.32
4	-0.03	-0.12	17	0.91
5	0.06	0.25	16	0.81
6	-0.01	-0.03	15	0.97



Fitted versus predicted carryover; Burley Irrigation District. Line $y = x$ is shown for reference.



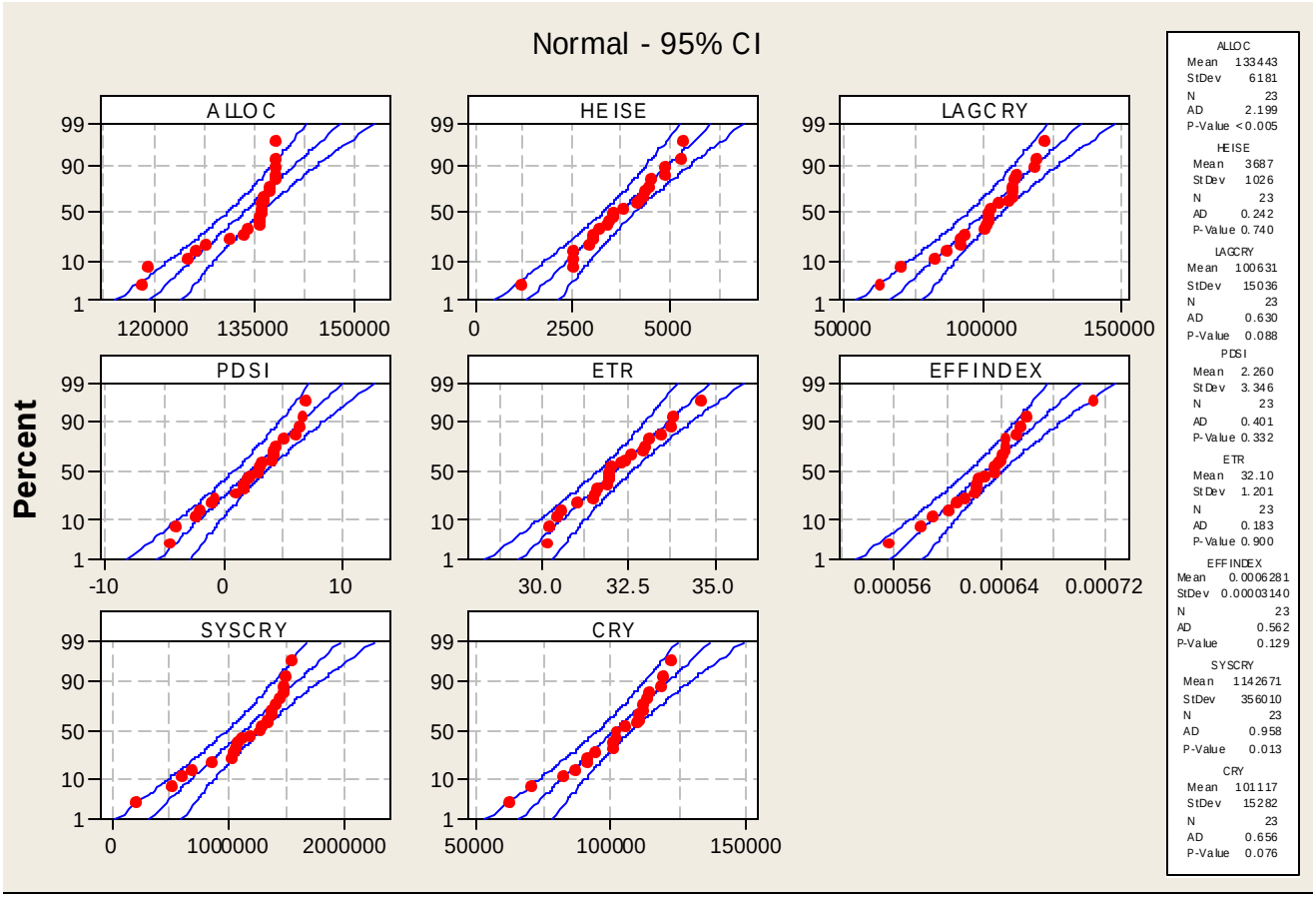
Predicted versus observed carryover, 1987-2008, with line $y = x$; Burley Irrigation District.

Comparison of carryover differences "predicted – observed" (best model) between calibration and prediction periods, after correction for 1st-order serial autocorrelation in differences.

	Calibration period	Prediction period
Number of paired observations	22	21
# positive differences	10	12
Sign test* exact *P*-value (up to rounding)	$P = 0.832$	$P = 0.664$
Mean difference	-2232	12663
Approximate *P* for comparison of means**	$P \sim 0.10$	

*Binomial test of H_0: Pr{difference > 0} = 0.5, versus two-sided alternative.
**Permutation test for H_0: mean calibration-period difference = mean prediction-period difference, versus two-sided alternative.

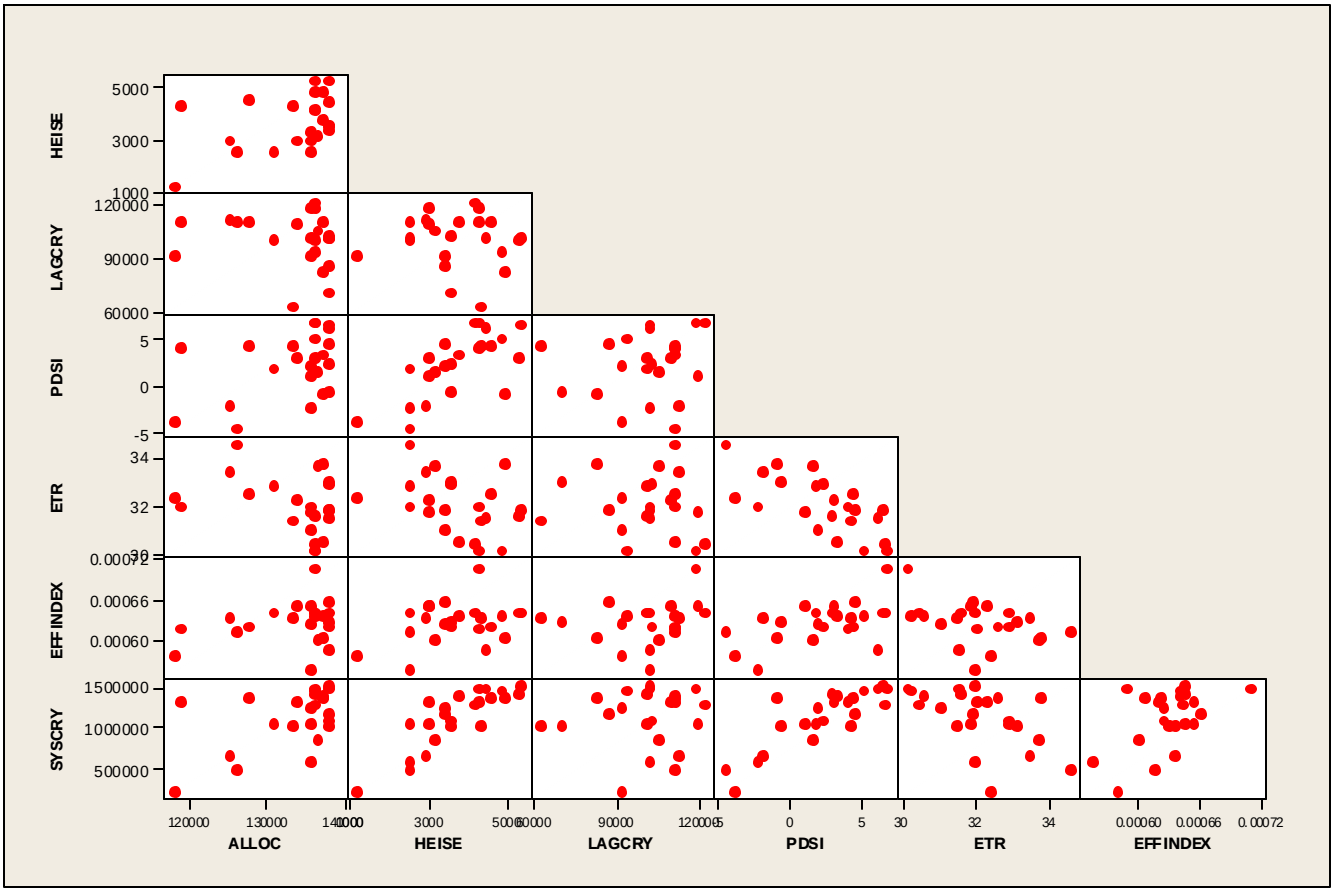
A&B IRRIGATION DISTRICT



Normal probability plots of raw data; A&B Irrigation District.

Pearson correlations among independent variables; A&B Irrigation District.

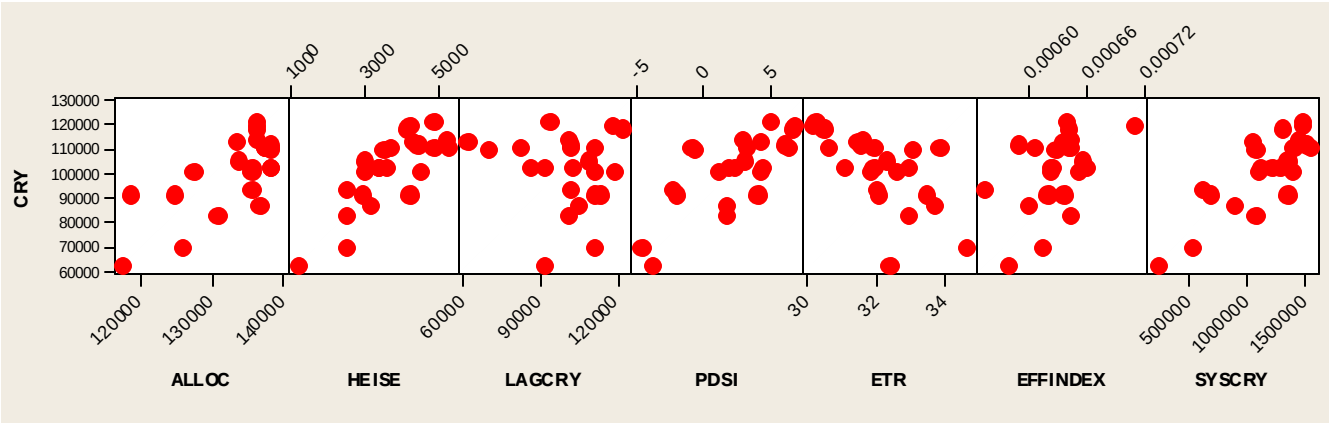
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
ALLOC	1.00						
HEISE	0.44	1.00					
LAGCRY	-0.17	-0.07	1.00				
PDSI	0.43	0.70	0.15	1.00			
ETR	-0.31	-0.37	-0.12	-0.69	1.00		
EFFINDEX	0.25	0.33	0.21	0.54	-0.40	1.00	
SYSCRY	0.54	0.85	0.09	0.84	-0.53	0.53	1.00



Scatter plots among raw independent variables; A&B Irrigation District.

Pearson correlation between carryover and each independent variable; A&B Irrigation District.

	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
CRY	0.71	0.80	-0.09	0.73	-0.64	0.48	0.83



Scatter plot of carryover versus each independent variable; A&B Irrigation District.

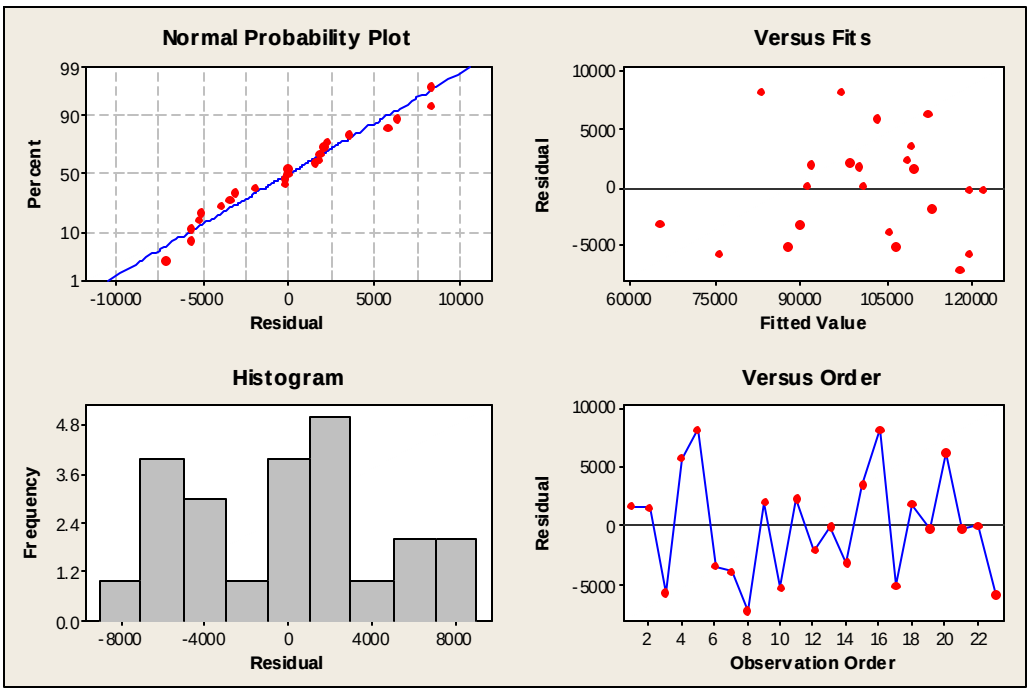
Regression summary with standardized variables; A&B Irrigation District.

Predictor	Coef	SE Coef	T	P	VIF
Constant	-0.00000	0.07449	-0.00	1.000	
sALLOC	0.35964	0.09409	3.82	0.002	1.526
sHEISE	0.5041	0.1560	3.23	0.006	4.195
sLAGCRY	-0.04448	0.08411	-0.53	0.605	1.219
sPDSI	-0.1743	0.1695	-1.03	0.320	4.954
sETR	-0.3643	0.1082	-3.37	0.004	2.020
sEFFINDEX	0.13653	0.09587	1.42	0.175	1.585
sSYSCRY	0.0921	0.2081	0.44	0.664	7.468

S = 0.357237 R-Sq = 91.3% R-Sq(adj) = 87.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	7	20.0857	2.8694	22.48	0.000
Residual Error	15	1.9143	0.1276		
Total	22	22.0000			



Residual analysis for full model (raw variables); A&B Irrigation District.

Analysis of autocorrelation in full-model residuals; A&B Irrigation District.

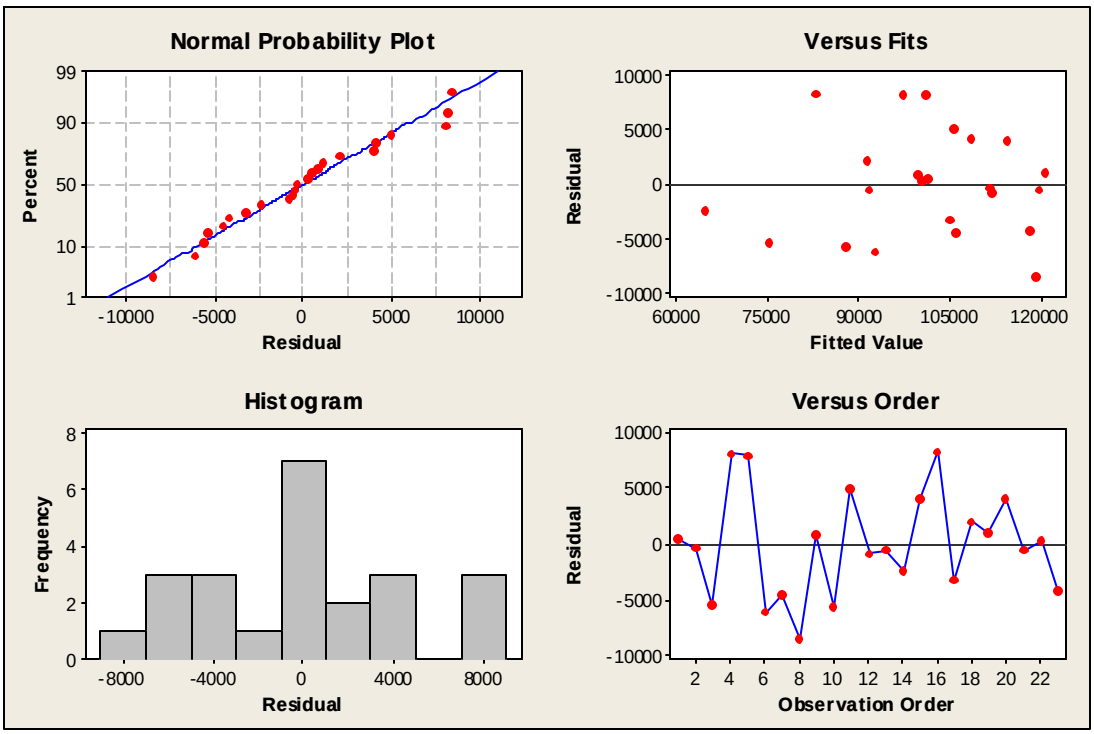
Lag	ACF	t statistic	df	*P*
1	-0.13	-0.60	20	0.55
2	-0.09	-0.42	19	0.68
3	-0.24	-1.13	18	0.27
4	0.19	0.84	17	0.41
5	0.03	0.12	16	0.91
6	-0.12	-0.51	15	0.62

Regression summary of best model with standardized variables; A&B Irrigation District

```
Predictor       Coef  SE Coef      T      P    VIF
Constant   -0.00000  0.07129  -0.00  1.000
sALLOC      0.37479  0.08280   4.53  0.000  1.290
sHEISE      0.48968  0.08596   5.70  0.000  1.391
sETR       -0.30014  0.08367  -3.59  0.002  1.317
sEFFINDEX   0.10761  0.08161   1.32  0.204  1.253

S = 0.341891   R-Sq = 90.4%   R-Sq(adj) = 88.3%

Analysis of Variance

Source          DF       SS      MS      F      P
Regression       4  19.8960  4.9740  42.55  0.000
Residual Error  18   2.1040  0.1169
Total           22  22.0000
```

Regression equation of best model (raw variables); A&B Irrigation District

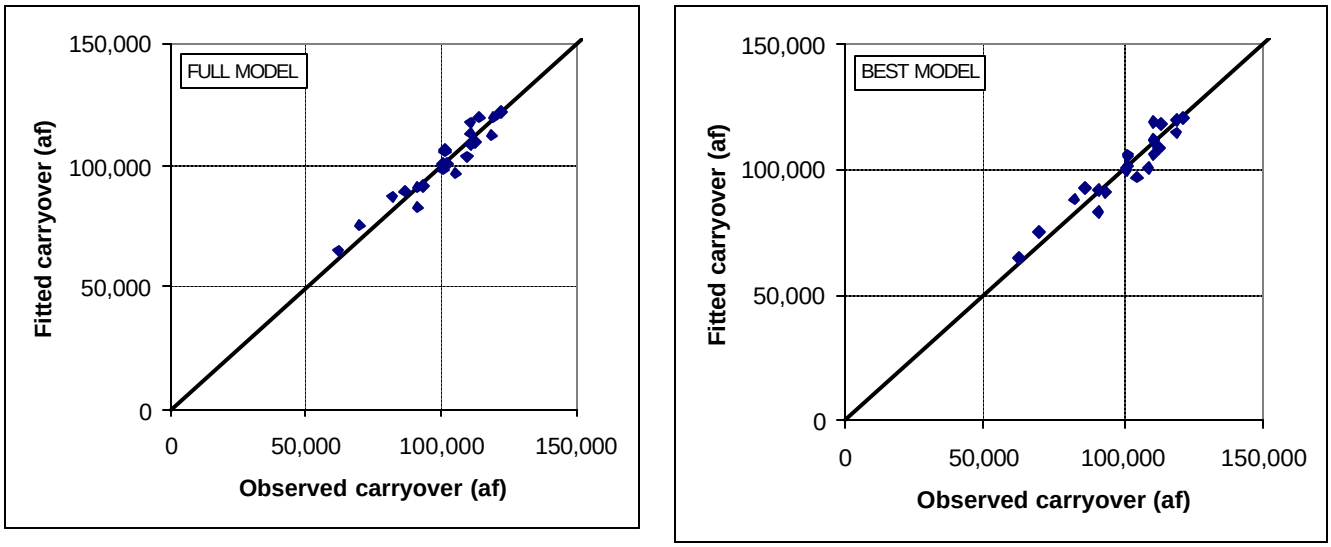
```
CRY = 40287 + 0.927 ALLOC + 7.29 HEISE - 3820 ETR + 52378690 EFFINDEX
```



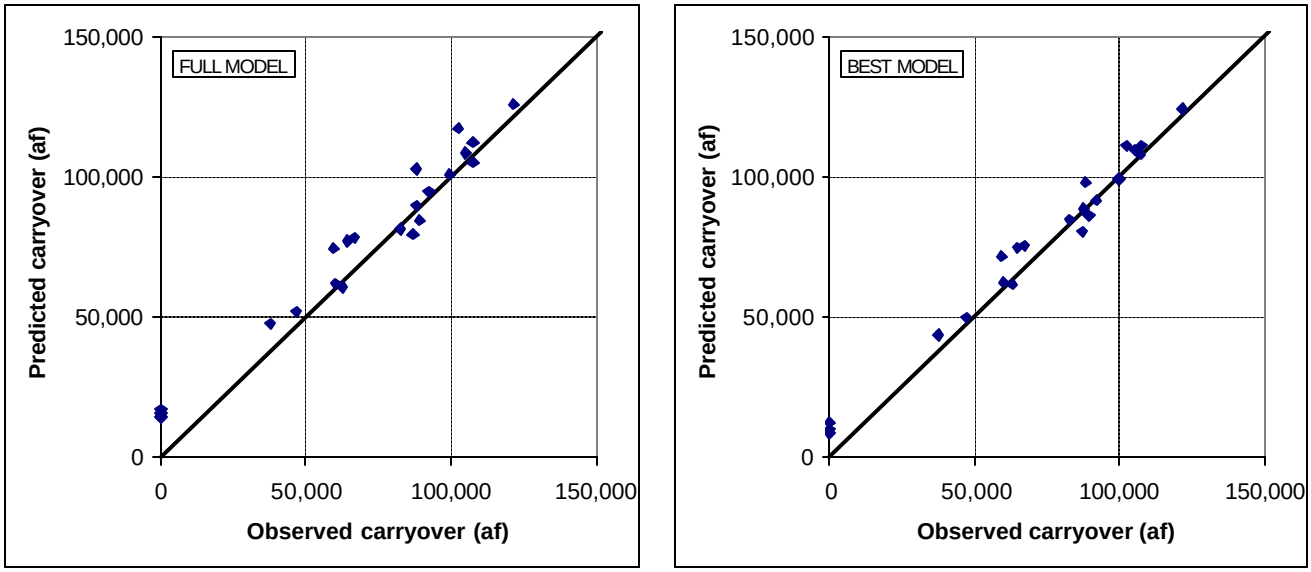
Residual analysis for best model (raw variables); A&B Irrigation District.

Analysis of autocorrelation in best-model residuals; A&B Irrigation District.

Lag	ACF	t statistic	df	*P*
1	-0.02	-0.09	20	0.93
2	-0.09	-0.41	19	0.68
3	-0.23	-1.12	18	0.28
4	0.09	0.42	17	0.68
5	0.00	0.01	16	0.99
6	-0.08	-0.36	15	0.72



Fitted versus predicted carryover; A&B Irrigation District. Line $y = x$ is shown for reference.



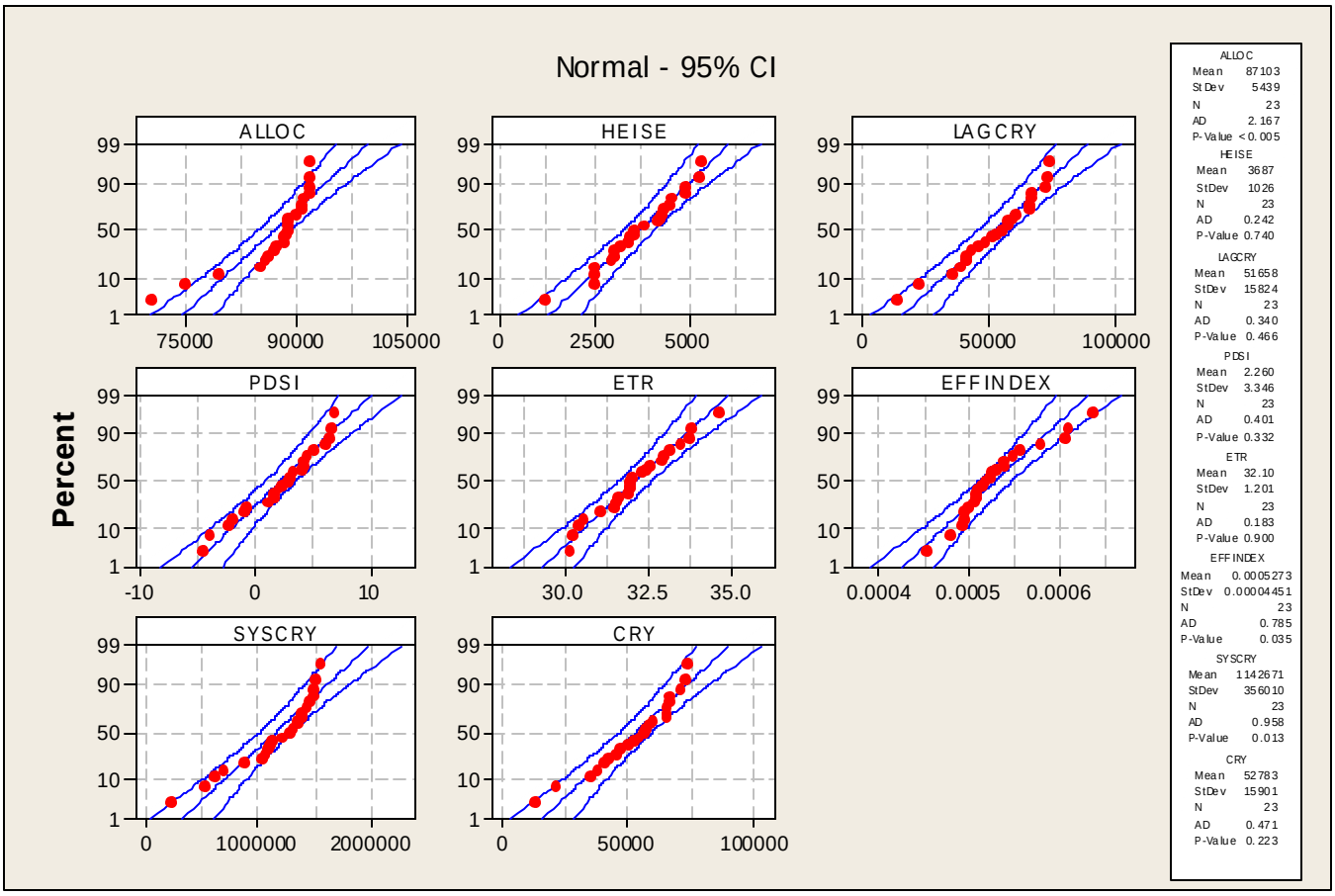
Predicted versus observed carryover, 1987-2008, with line $y = x$; A&B Irrigation District.

Comparison of carryover differences "predicted – observed" (best model) between calibration and prediction periods, after correction for 1st-order serial autocorrelation in differences.

	Calibration period	Prediction period
Number of paired observations	22	21
# positive differences	12	16
Sign test* exact *P*-value (up to rounding)	$P = 0.832$	$P = 0.0266$
Mean difference	20	2038
Approximate *P* for comparison of means**	$P \sim 0.16$	

*Binomial test of H_0: Pr{difference > 0} = 0.5, versus two-sided alternative.
**Permutation test for H_0: mean calibration-period difference = mean prediction-period difference, versus two-sided alternative.

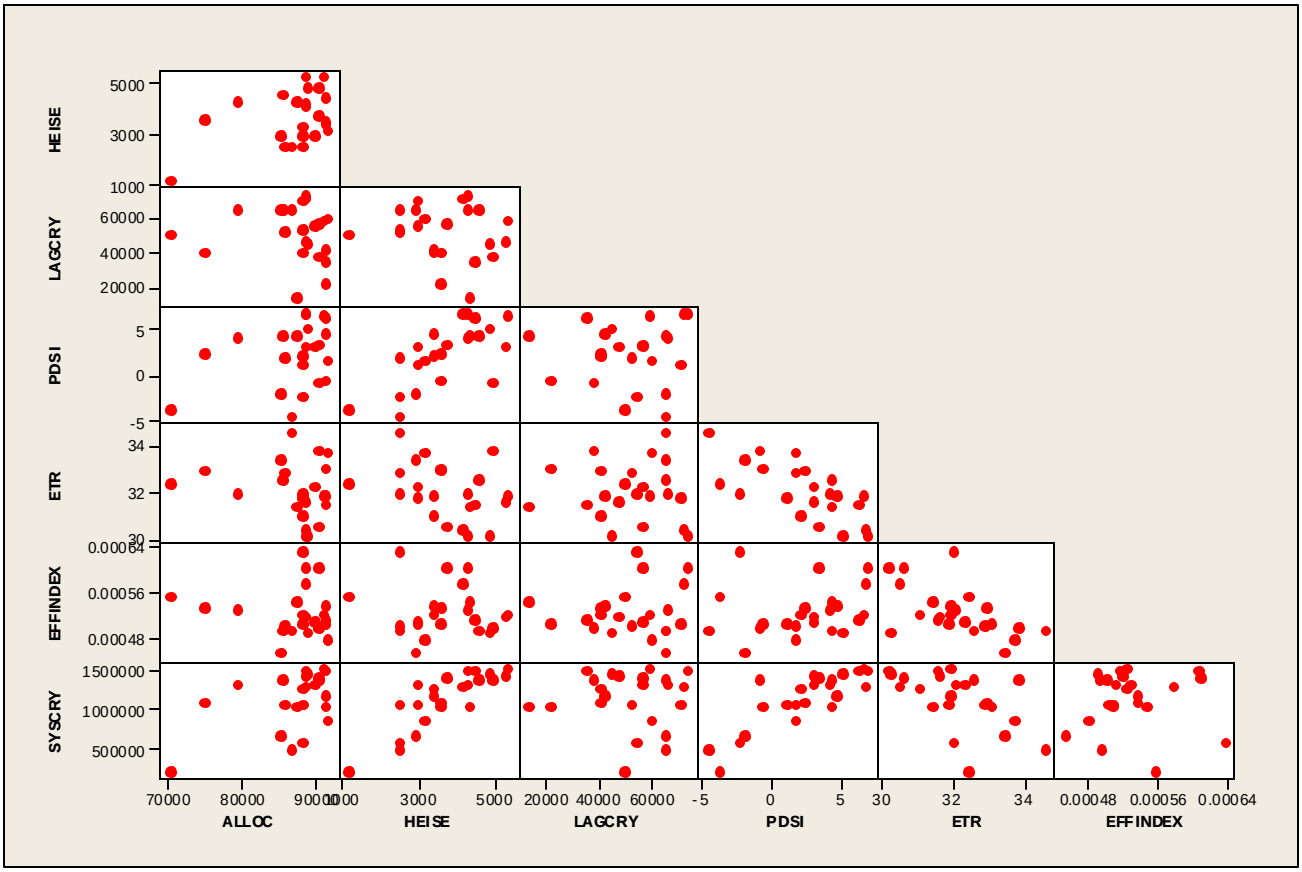
MILNER IRRIGATION DISTRICT



Normal probability plots of raw data; Milner Irrigation District.

Pearson correlations among independent variables; Milner Irrigation District.

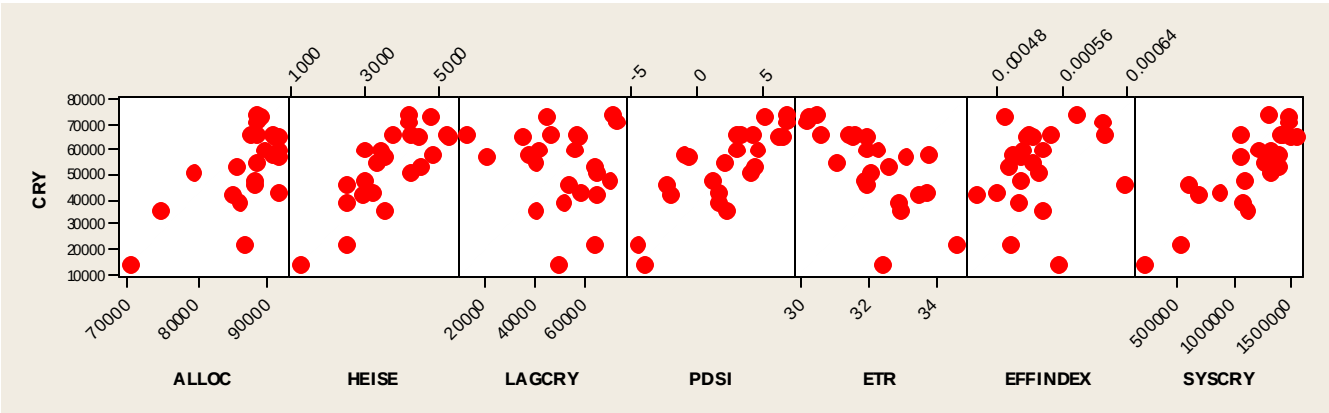
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
ALLOC	1.00						
HEISE	0.43	1.00					
LAGCRY	-0.08	-0.14	1.00				
PDSI	0.33	0.70	0.05	1.00			
ETR	-0.16	-0.37	-0.05	-0.69	1.00		
EFFINDEX	-0.06	-0.08	0.08	0.17	-0.56	1.00	
SYSCRY	0.49	0.85	-0.03	0.84	-0.53	0.01	1.00



Scatter plots among raw independent variables; Milner Irrigation District.

Pearson correlations between carryover and each independent variable; Milner Irrigation District.

	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
CRY	0.65	0.79	-0.13	0.80	-0.70	0.21	0.84



Scatter plot of carryover versus each independent variable; Milner Irrigation District.

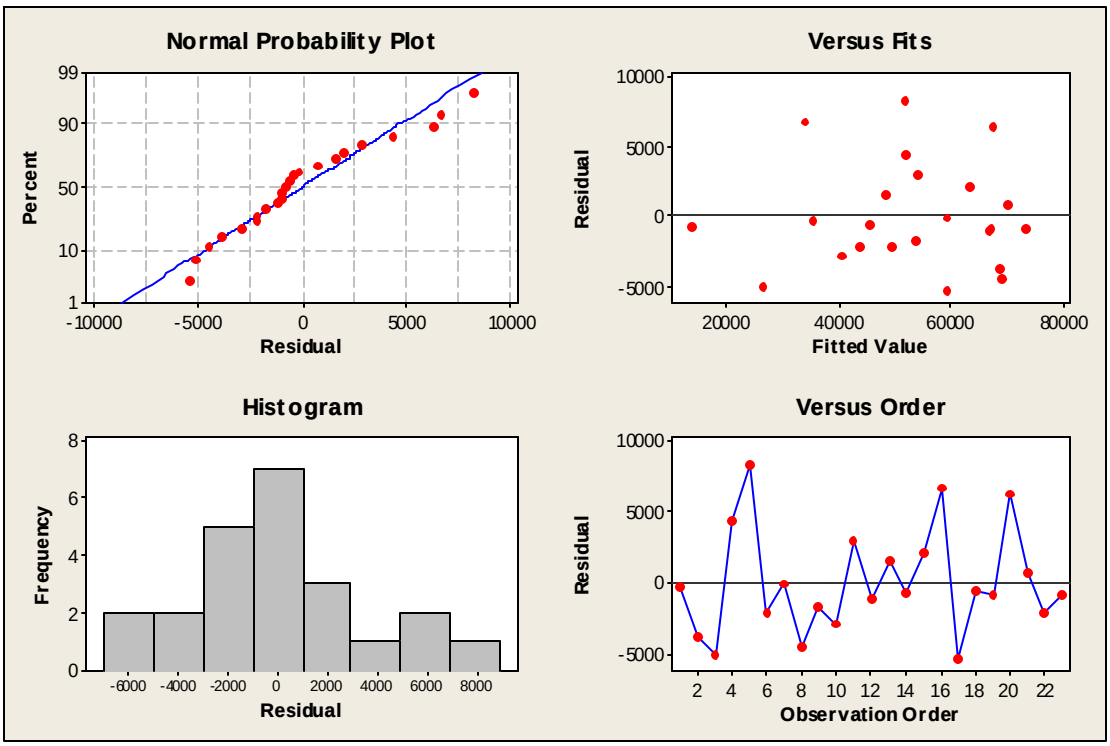
Regression summary for of full model with standardized variables; Milner Irrigation District.

Predictor	Coef	SE Coef	T	P	VIF
Constant	-0.00000	0.05858	-0.00	1.000	
sALLOC	0.36539	0.06958	5.25	0.000	1.349
sHEISE	0.3370	0.1169	2.88	0.011	3.811
sLAGCRY	-0.07447	0.06200	-1.20	0.248	1.072
sPDSI	0.0981	0.1324	0.74	0.470	4.887
sETR	-0.3844	0.1071	-3.59	0.003	3.197
sEFFINDEX	0.03414	0.07983	0.43	0.675	1.776
sSYSCRY	0.0903	0.1554	0.58	0.570	6.727

S = 0.280944 R-Sq = 94.6% R-Sq(adj) = 92.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	7	20.8161	2.9737	37.68	0.000
Residual Error	15	1.1839	0.0789		
Total	22	22.0000			



Residual analysis for full model (raw variables); Milner Irrigation District.

Analysis of autocorrelation in full-model residuals; Milner Irrigation District.

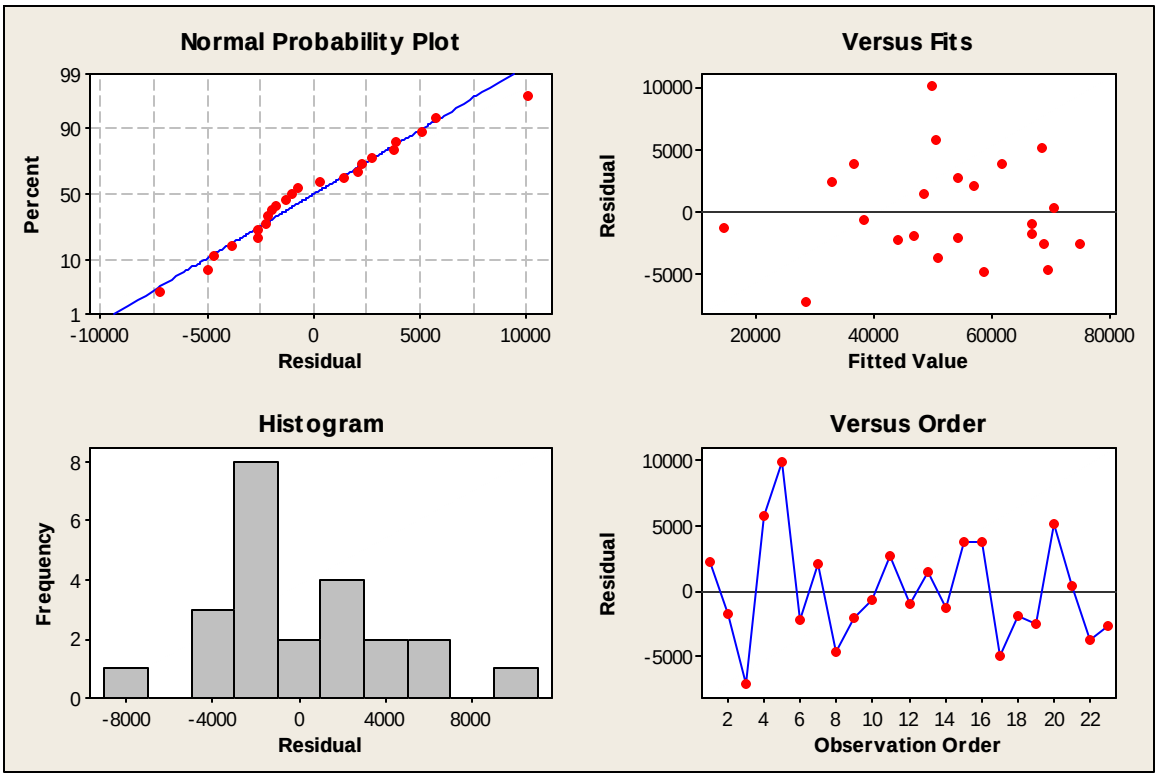
Lag	ACF	t statistic	df	*P*
1	-0.02	-0.09	20	0.93
2	-0.24	-1.13	19	0.27
3	-0.35	-1.61	18	0.13
4	0.04	0.16	17	0.88
5	0.10	0.41	16	0.68
6	-0.03	-0.13	15	0.90

Regression summary of best model with standardized variables; Milner Irrigation District

```
Predictor       Coef  SE Coef      T      P    VIF
Constant   -0.00000  0.05658  -0.00  1.000
sALLOC      0.38273  0.06419   5.96  0.000  1.231
sHEISE      0.44998  0.06829   6.59  0.000  1.394
sETR       -0.47104  0.06236  -7.55  0.000  1.162

S = 0.271330   R-Sq = 93.6%   R-Sq(adj) = 92.6%

Analysis of Variance

Source          DF       SS      MS      F      P
Regression       3  20.6012  6.8671  93.28  0.000
Residual Error  19   1.3988  0.0736
Total           22  22.0000
```

Regression equation of best model (raw variables); Milner Irrigation District

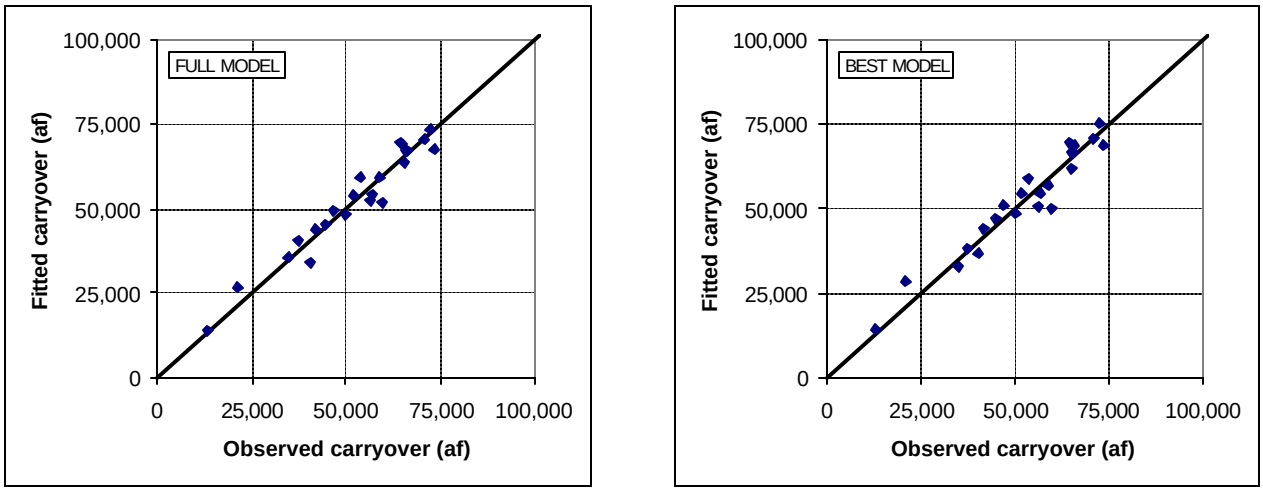
```
CRY = 129838 + 1.12 ALLOC + 6.97 HEISE - 6238 ETR
```



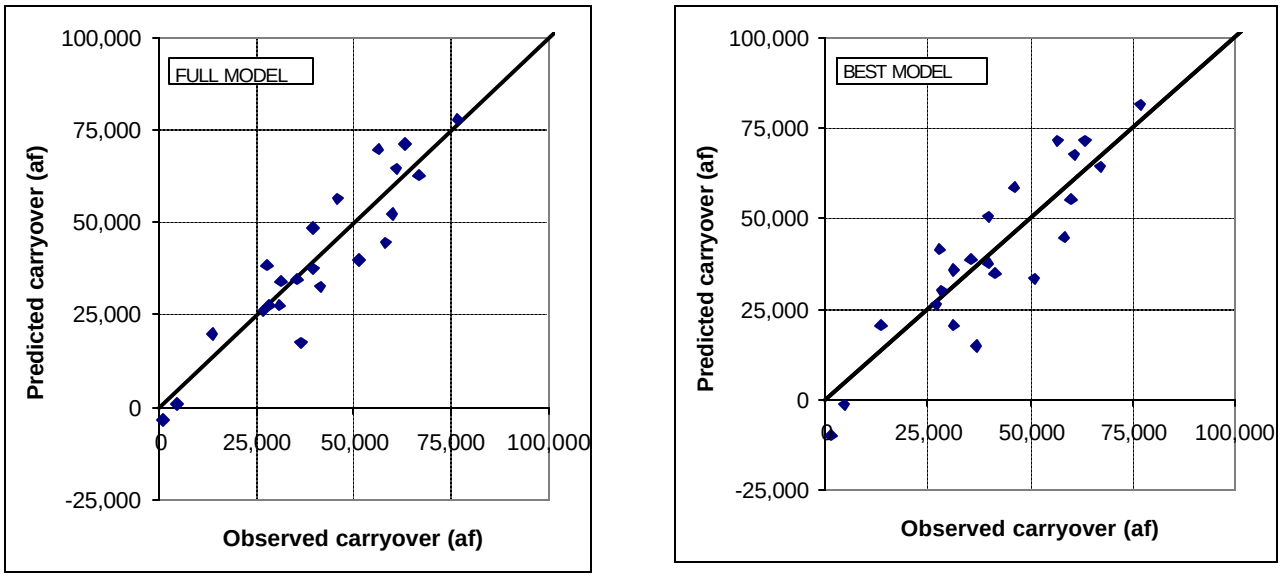
Residual analysis for best model (raw variables); Milner Irrigation District.

Analysis of autocorrelation in best-model residuals; Milner Irrigation District.

Lag	ACF	t statistic	df	*P*
1	-0.02	-0.08	20	0.93
2	-0.35	-1.70	19	0.11
3	-0.21	-0.91	18	0.38
4	0.00	-0.02	17	0.99
5	0.15	0.61	16	0.55
6	0.08	0.34	15	0.73



Fitted versus predicted carryover; Milner Irrigation District. Line $y = x$ is shown for reference.



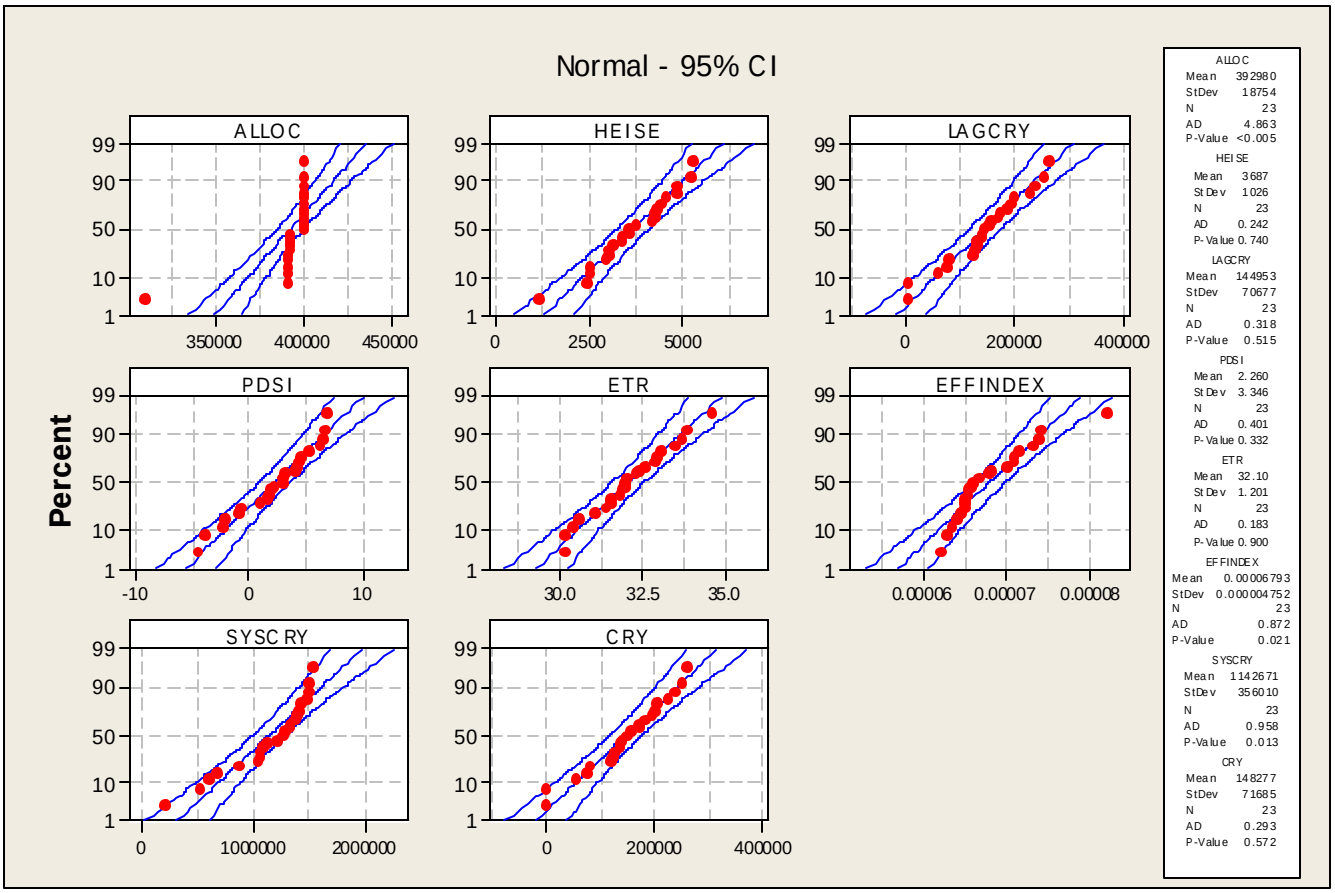
Predicted versus observed carryover, 1987-2008, with line $y = x$; Milner Irrigation District.

Comparison of carryover differences "predicted – observed" (best model) between calibration and prediction periods, after correction for 1st-order serial autocorrelation in differences.

	Calibration period	Prediction period
Number of paired observations	22	21
# positive differences	13	10
Sign test* exact *P*-value (up to rounding)	$P = 0.542$	$P = 1$
Mean difference	101	-726
Approximate *P* for comparison of means**	$P \sim 0.65$	

*Binomial test of H_0: Pr{difference > 0} = 0.5, versus two-sided alternative.
**Permutation test for H_0: mean calibration-period difference = mean prediction-period difference, versus two-sided alternative.

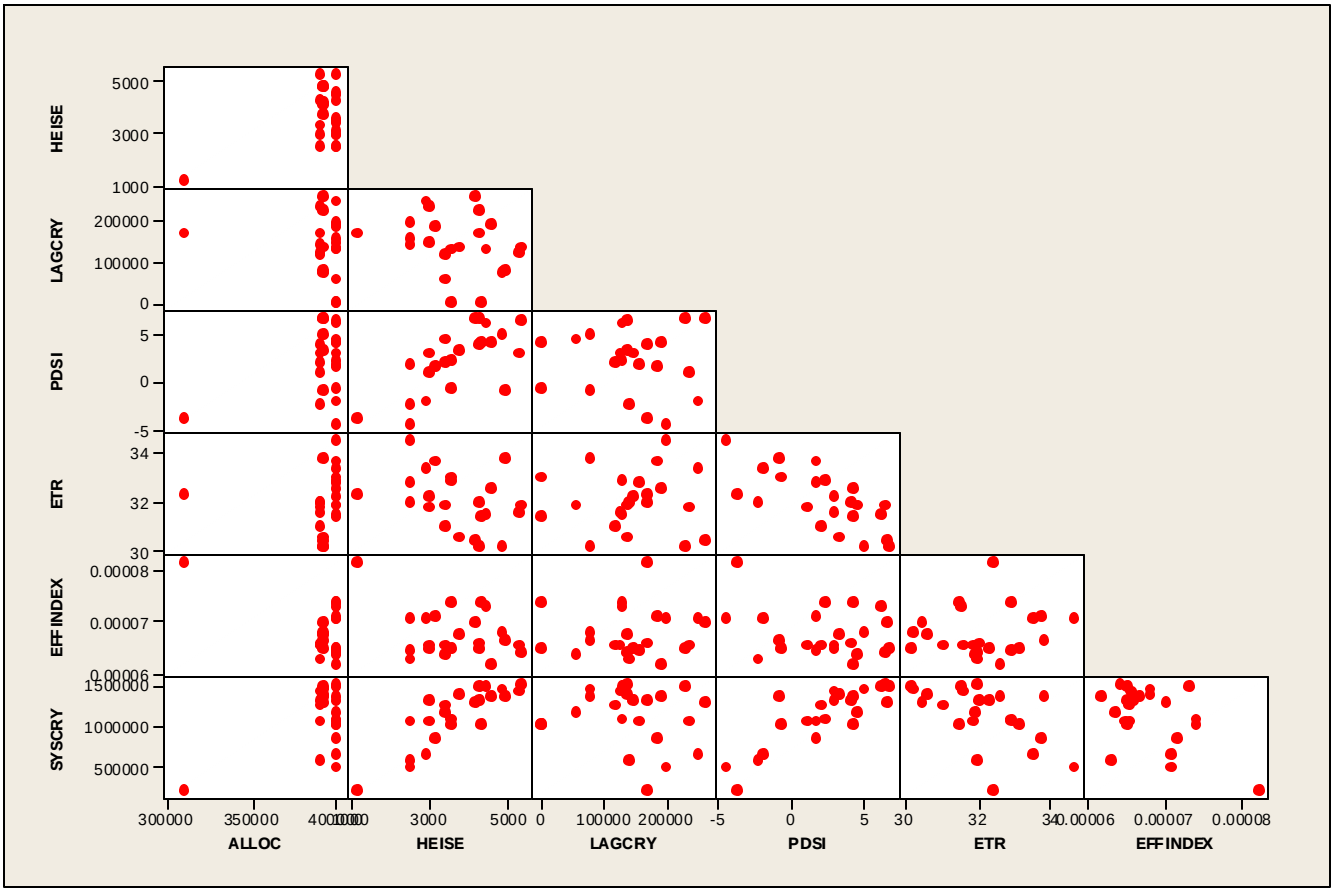
AMERICAN FALLS RESERVOIR DISTRICT 2



Normal probability plots of raw data; American Falls Reservoir District 2.

Pearson correlations among independent variables; American Falls Reservoir District 2.

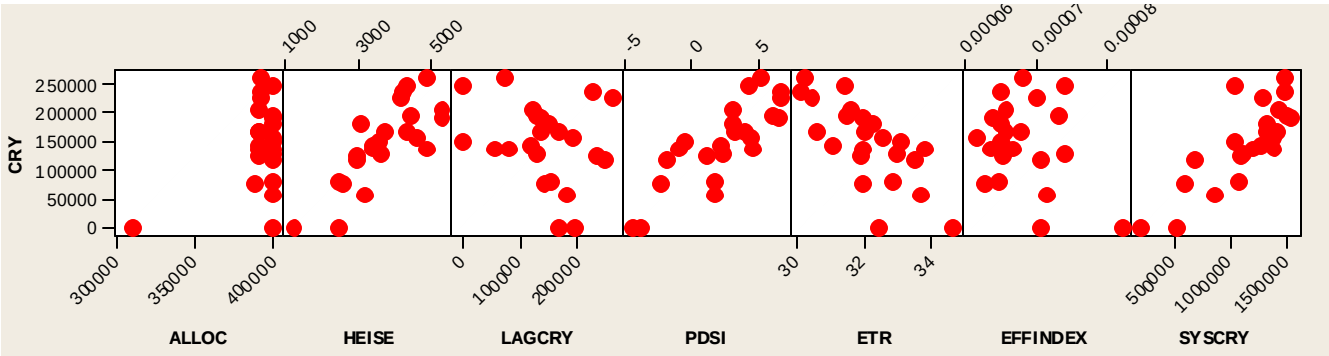
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
ALLOC	1.00						
HEISE	0.47	1.00					
LAGCRY	-0.12	-0.25	1.00				
PDSI	0.38	0.70	-0.04	1.00			
ETR	0.08	-0.37	0.02	-0.69	1.00		
EFFINDEX	-0.57	-0.35	0.04	-0.27	0.13	1.00	
SYSCRY	0.50	0.85	-0.17	0.84	-0.53	-0.51	1.00



Scatter plots among raw independent variables; American Falls Reservoir District 2.

Pearson correlation between carryover and each independent variable; American Falls RD2.

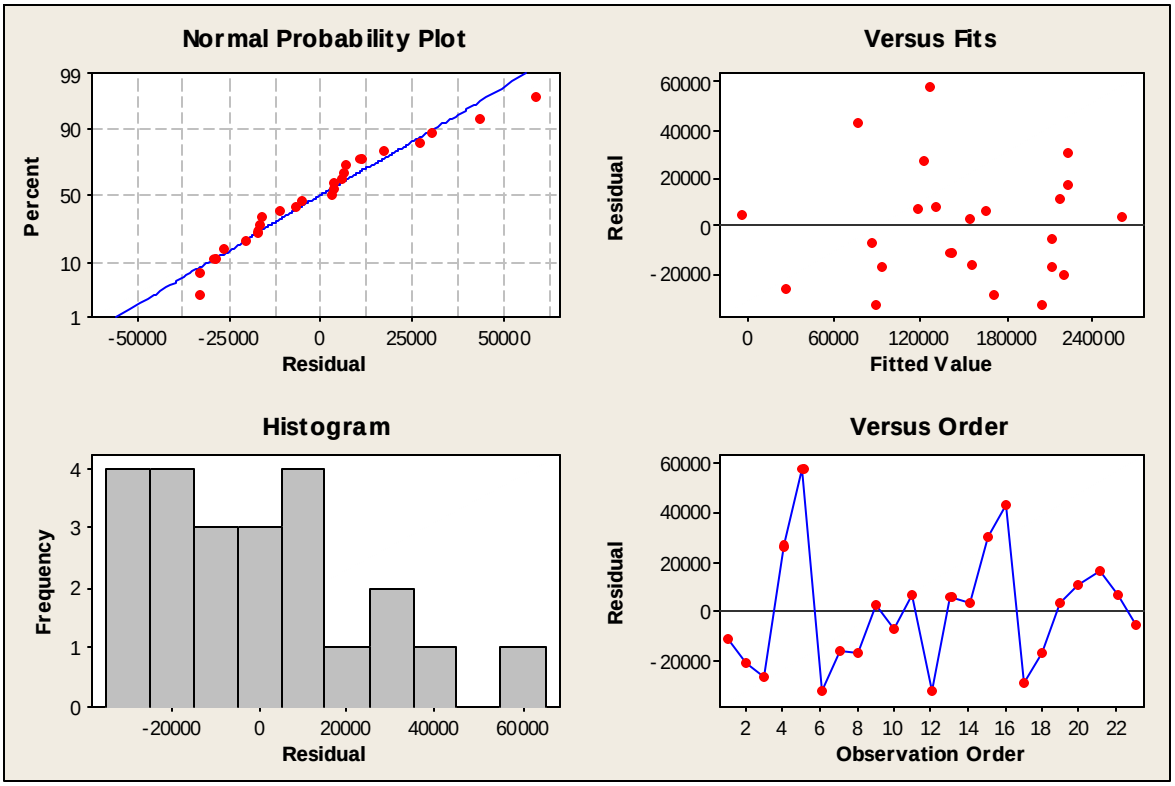
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
CRY	0.38	0.80	-0.24	0.82	-0.72	-0.26	0.81



Scatter plot of carryover versus each independent variable; American Falls RD2.

Regression summary of full model with standardized variables; American Falls Reservoir District 2.

```
Predictor       Coef  SE Coef      T      P    VIF
Constant   -0.00000  0.08444  -0.00  1.000
sALLOC       0.2453   0.1324   1.85  0.084  2.352
sHEISE       0.4145   0.1718   2.41  0.029  3.958
sLAGCRY    -0.08647  0.09172  -0.94  0.361  1.129
sPDSI        0.0489   0.2123   0.23  0.821  6.049
sETR        -0.5297   0.1441  -3.67  0.002  2.787
sEFFINDEX    0.1467   0.1238   1.19  0.254  2.055
sSYSCRY      0.0742   0.2485   0.30  0.769  8.286

S = 0.404945   R-Sq = 88.8%   R-Sq(adj) = 83.6%

Analysis of Variance

Source          DF       SS      MS      F      P
Regression       7  19.5403  2.7915  17.02  0.000
Residual Error  15   2.4597  0.1640
Total           22  22.0000
```



Residual analysis for full model (raw variables); American Falls Reservoir District 2.

Analysis of autocorrelation in full-model residuals; American Falls Reservoir District 2.

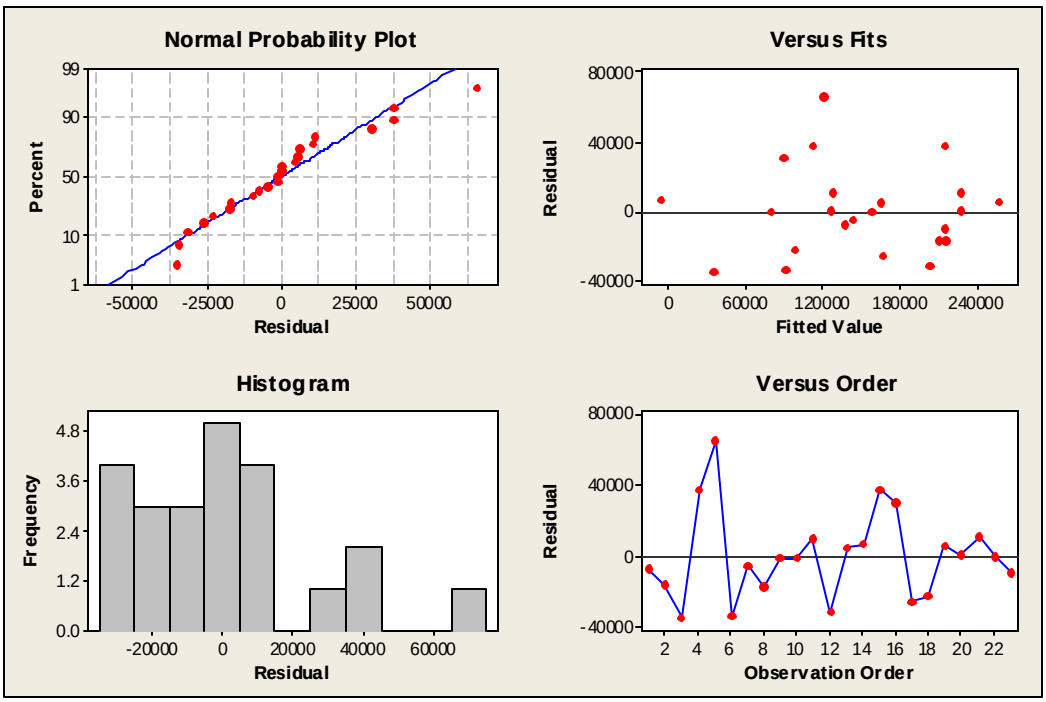
Lag	ACF	t statistic	df	*P*
1	0.07	0.34	20	0.74
2	-0.35	-1.65	19	0.11
3	-0.32	-1.39	18	0.18
4	-0.05	-0.20	17	0.85
5	0.23	0.92	16	0.37
6	0.22	0.83	15	0.42

Regression summary of best model with standardized variables; American Falls RD2

```
Predictor       Coef  SE Coef      T      P    VIF
Constant   -0.00000  0.07989  -0.00  1.000
sALLOC       0.2706   0.1139   2.38  0.029  1.944
sHEISE       0.5039   0.1049   4.80  0.000  1.648
sETR       -0.57314  0.09428  -6.08  0.000  1.332
sEFFINDEX    0.1439   0.1019   1.41  0.175  1.556

S = 0.383128   R-Sq = 88.0%   R-Sq(adj) = 85.3%

Analysis of Variance

Source          DF       SS      MS      F      P
Regression       4  19.3578  4.8395  32.97  0.000
Residual Error  18   2.6422  0.1468
Total           22  22.0000
```

Regression equation of best model (raw variables); American Falls RD2

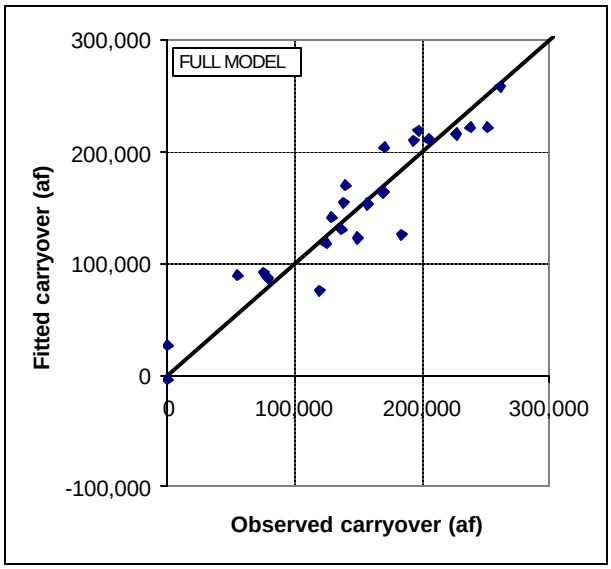
```
CRY = 562804 + 1.03 ALLOC + 35.2 HEISE - 34218 ETR + 2.17E+09 EFFINDEX
```

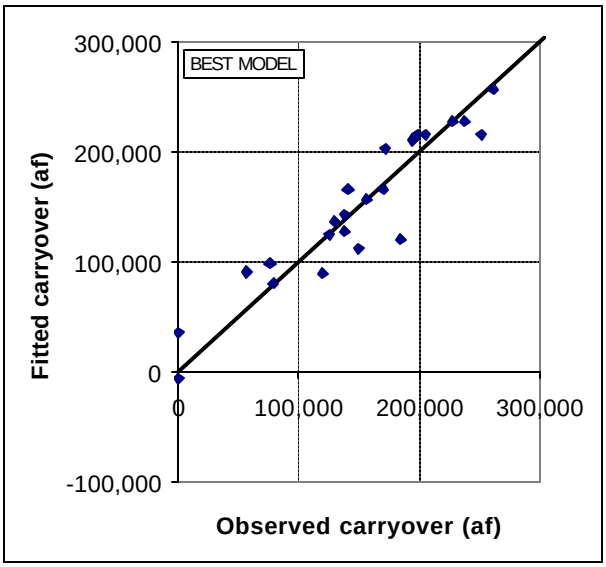


Residual analysis for best model (raw variables); American Falls RD2.

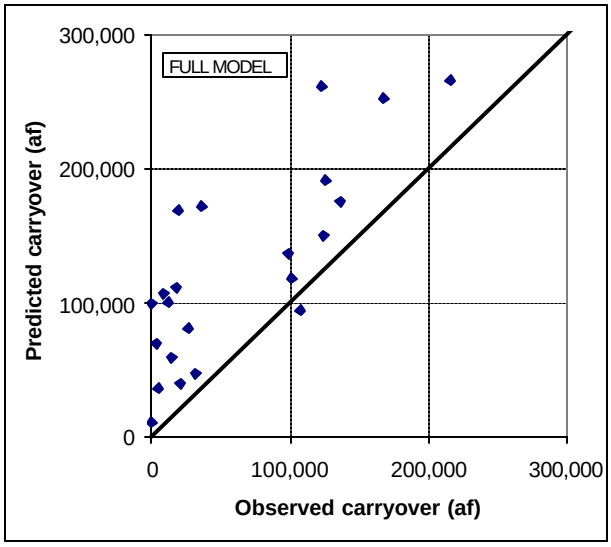
Analysis of autocorrelation in best-model residuals; American Falls RD2.

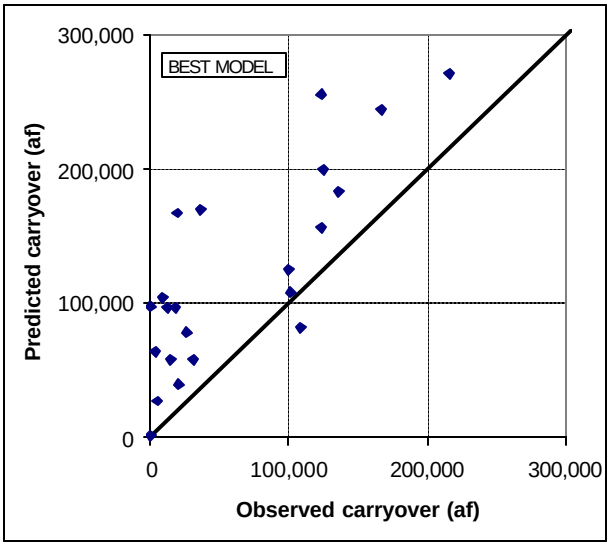
Lag	ACF	t statistic	df	*P*
1	0.04	0.18	20	0.86
2	-0.39	-1.85	19	0.08
3	-0.27	-1.15	18	0.26
4	-0.06	-0.26	17	0.80
5	0.16	0.62	16	0.54
6	0.22	0.86	15	0.40





Fitted versus predicted carryover; American Falls RD2. Line $y = x$ is shown for reference.





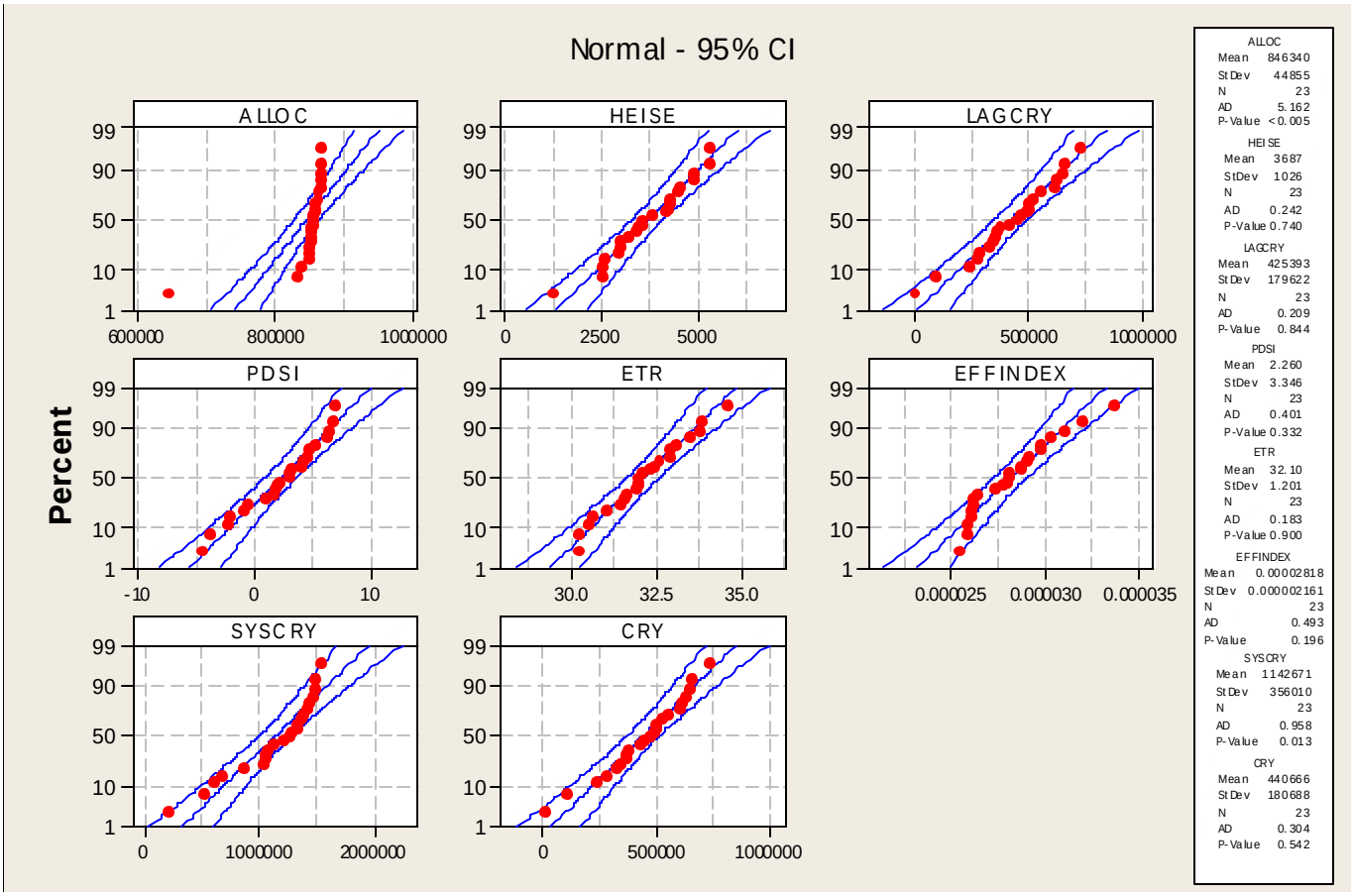
Predicted versus observed carryover, 1987-2008, with line $y = x$; American Falls RD2.

Comparison of carryover differences "predicted – observed" (best model) between calibration and prediction periods, after correction for 1st-order serial autocorrelation in differences.

	Calibration period	Prediction period
Number of paired observations	22	21
# positive differences	12	18
Sign test* exact *P*-value (up to rounding)	$P = 0.832$	$P = 0.001$
Mean difference	-331	28433
Approximate *P* for comparison of means**	$P \sim 0.007$	

*Binomial test of H_0: Pr{difference > 0} = 0.5, versus two-sided alternative.
**Permutation test for H_0: mean calibration-period difference = mean prediction-period difference, versus two-sided alternative.

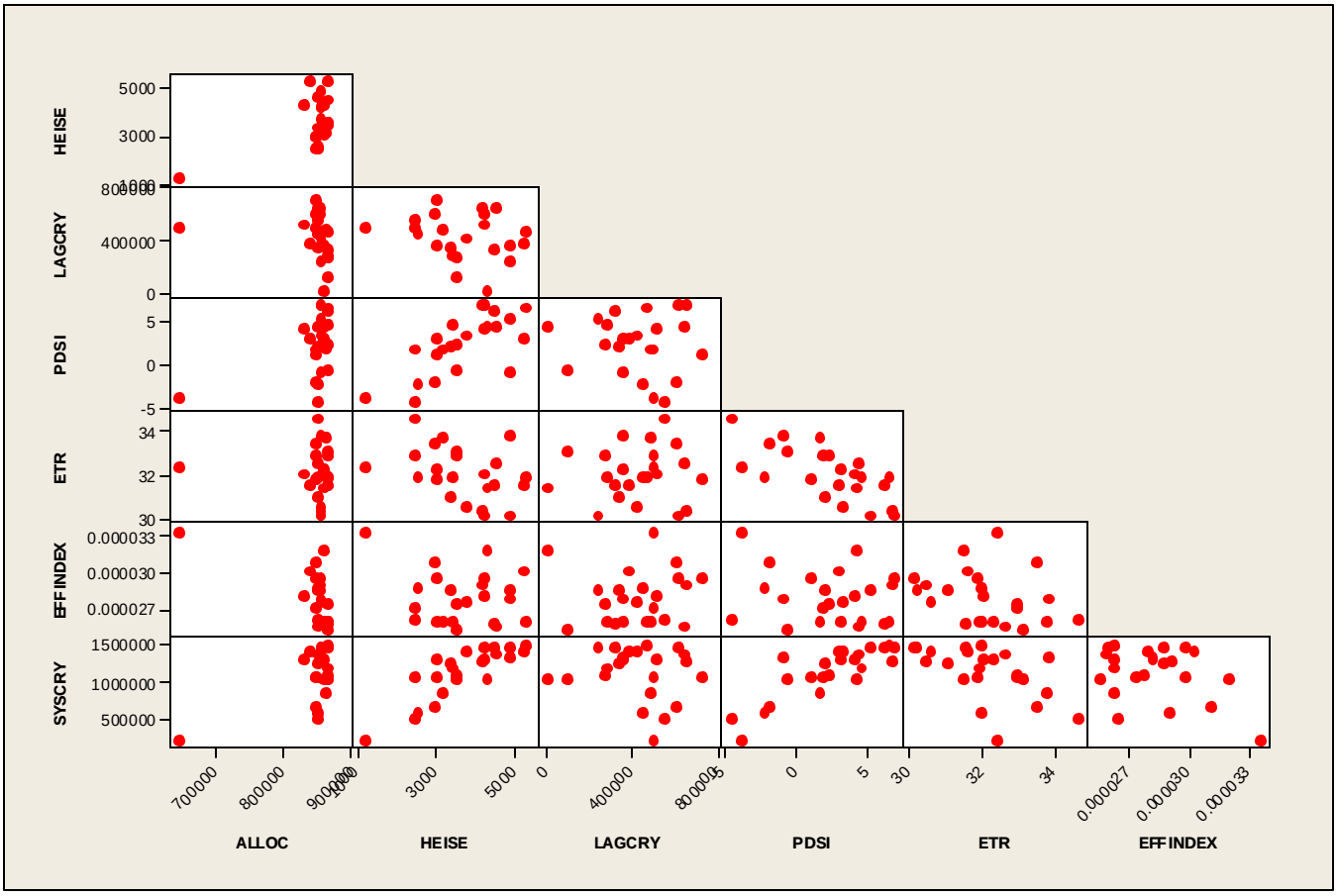
NORTH SIDE CANAL COMPANY



Normal probability plots of raw data; North Side Canal Company.

Pearson correlations among independent variables; North Side Canal Company.

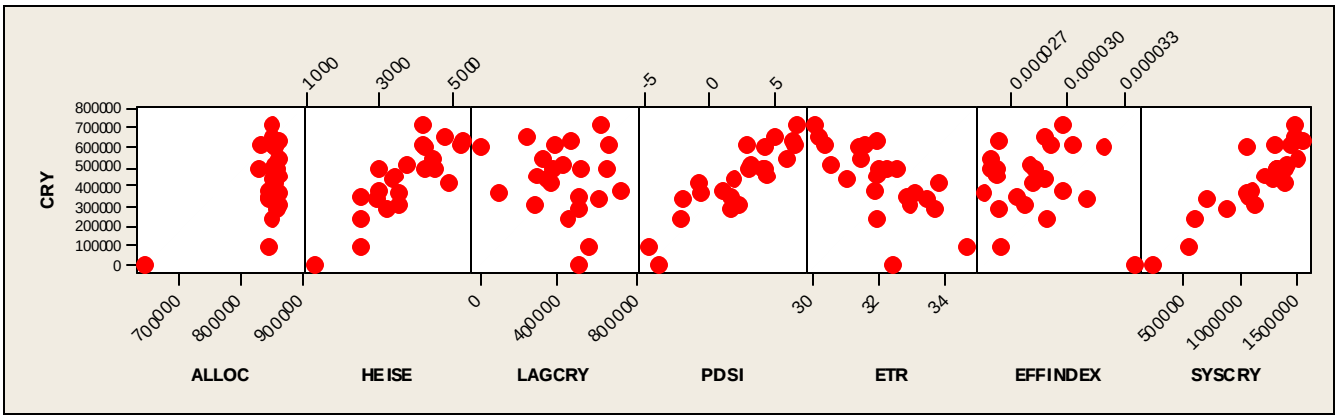
	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
ALLOC	1.00						
HEISE	0.52	1.00					
LAGCRY	-0.18	-0.22	1.00				
PDSI	0.42	0.70	-0.08	1.00			
ETR	-0.04	-0.37	0.06	-0.69	1.00		
EFFINDEX	-0.62	-0.23	0.09	-0.23	-0.27	1.00	
SYSCRY	0.57	0.85	-0.14	0.84	-0.53	-0.39	1.00



Scatter plots among raw independent variables; North Side Canal Company.

Pearson correlation between carryover and each independent variable; North Side Canal Company.

	ALLOC	HEISE	LAGCRY	PDSI	ETR	EFFINDEX	SYSCRY
CRY	0.52	0.84	-0.16	0.89	-0.70	-0.10	0.89



Scatter plots of carryover versus each independent variable; North Side Canal Company.

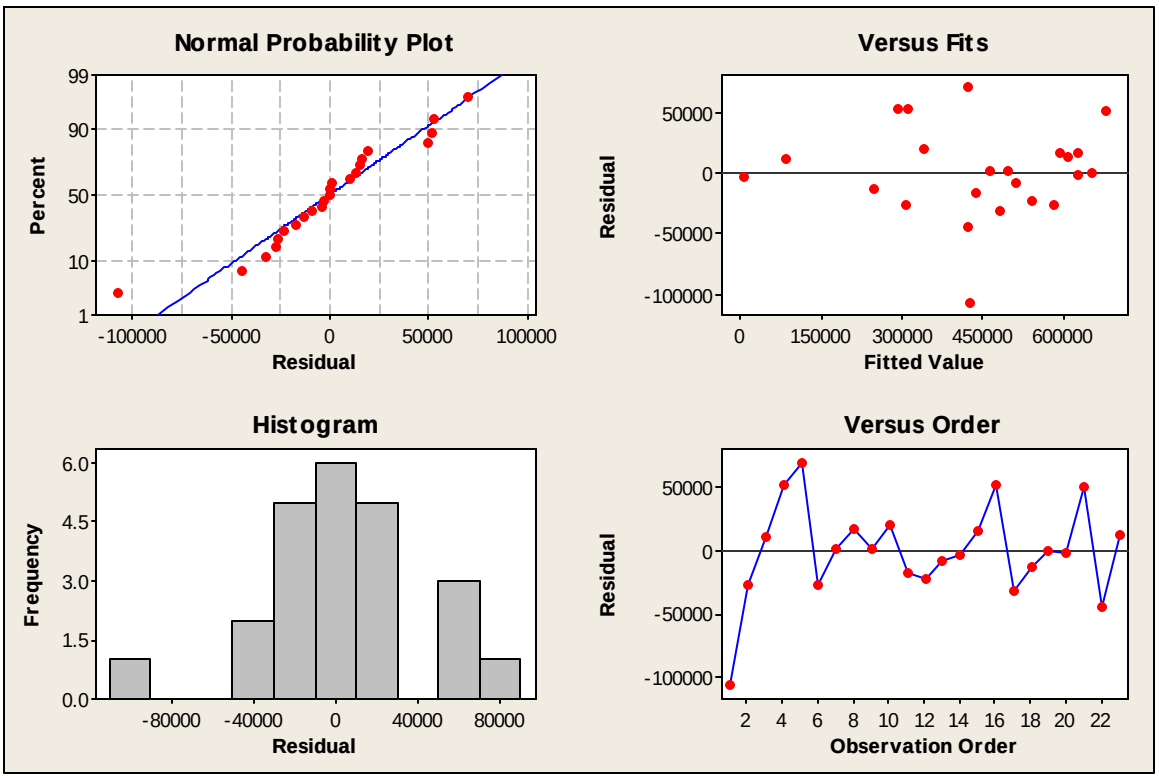
Regression summary of full model with standardized variables; North Side Canal Company.

Predictor	Coef	SE Coef	T	P	VIF
Constant	-0.00000	0.05250	-0.00	1.000	
sALLOC	0.22692	0.07913	2.87	0.012	2.173
sHEISE	0.2309	0.1190	1.94	0.071	4.914
sLAGCRY	-0.00844	0.05630	-0.15	0.883	1.100
sPDSI	0.3565	0.1220	2.92	0.011	5.166
sETR	-0.1316	0.1060	-1.24	0.234	3.898
sEFFINDEX	0.24917	0.09342	2.67	0.018	3.029
sSYSCRY	0.2922	0.1581	1.85	0.084	8.671

S = 0.251774 R-Sq = 95.7% R-Sq(adj) = 93.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	7	21.0491	3.0070	47.44	0.000
Residual Error	15	0.9509	0.0634		
Total	22	22.0000			



Residual analysis for full model (raw variables); North Side Canal Company.

Analysis of autocorrelation in full-model residuals; North Side Canal Company.

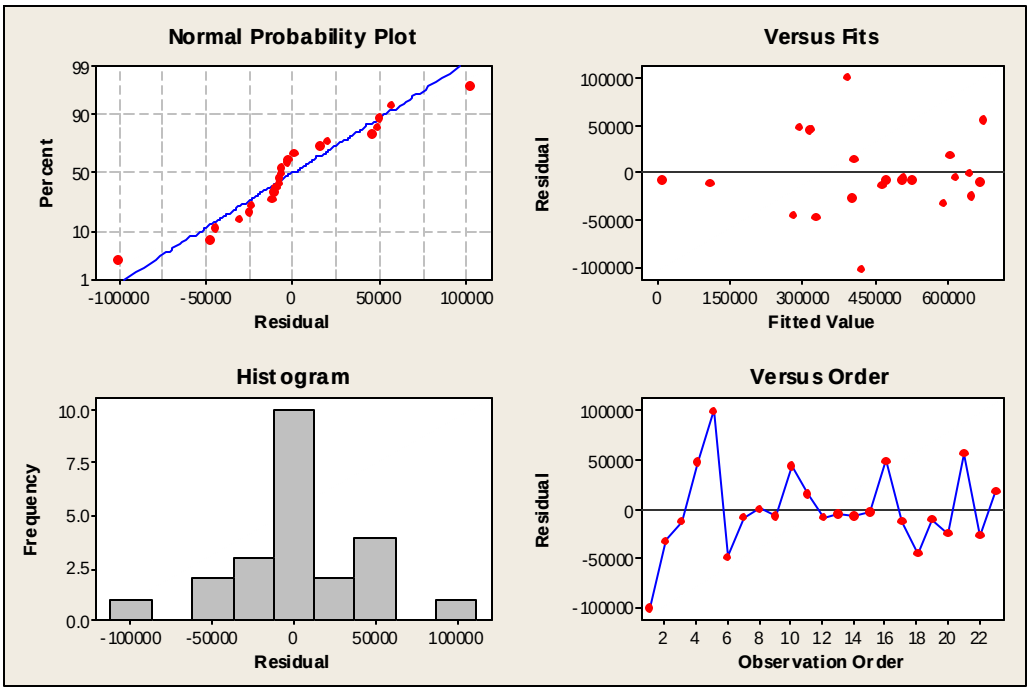
Lag	ACF	t statistic	df	*P*
1	0.06	0.29	20	0.78
2	-0.14	-0.65	19	0.52
3	-0.27	-1.28	18	0.22
4	-0.29	-1.28	17	0.22
5	0.28	1.16	16	0.26
6	-0.01	-0.03	15	0.98

Regression summary of best model with standardized variables; North Side Canal Company

```
Predictor       Coef  SE Coef      T      P    VIF
Constant   -0.00000  0.05465  -0.00  1.000
sALLOC      0.23642  0.08201   2.88  0.010  2.154
sHEISE      0.38408  0.08635   4.45  0.000  2.388
sPDSI        0.4188   0.1207   3.47  0.003  4.667
sETR        -0.2091   0.1005  -2.08  0.053  3.233
sEFFINDEX   0.16941  0.08598   1.97  0.065  2.368

S = 0.262085   R-Sq = 94.7%   R-Sq(adj) = 93.1%

Analysis of Variance

Source          DF       SS      MS      F      P
Regression       5  20.8323  4.1665  60.66  0.000
Residual Error  17   1.1677  0.0687
Total           22  22.0000
```

Regression equation of best model (raw variables); North Side Canal Company

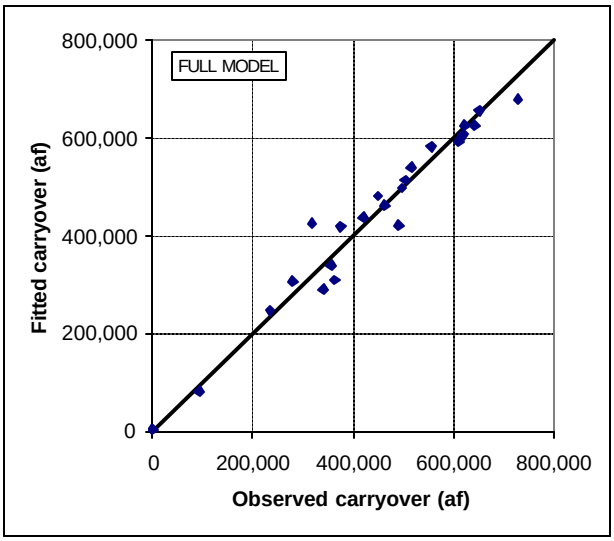
```
CRY = - 55390 + 0.952 ALLOC + 67.6 HEISE + 22613 PDSI - 31460 ETR + 1.42E+10 EFFINDEX
```

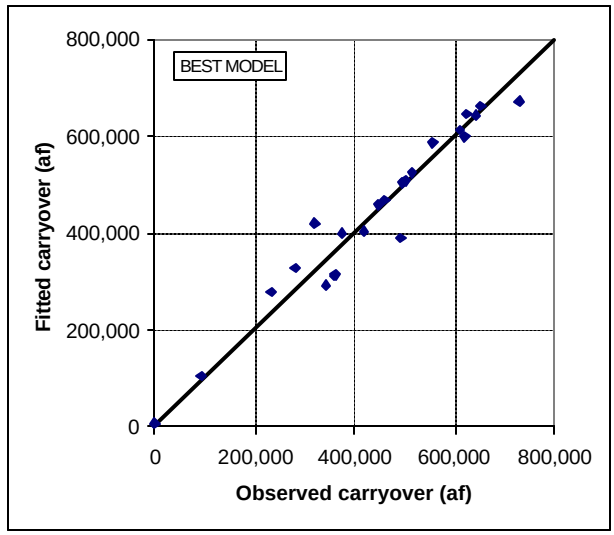


Residual analysis for best model (raw variables); North Side Canal Company.

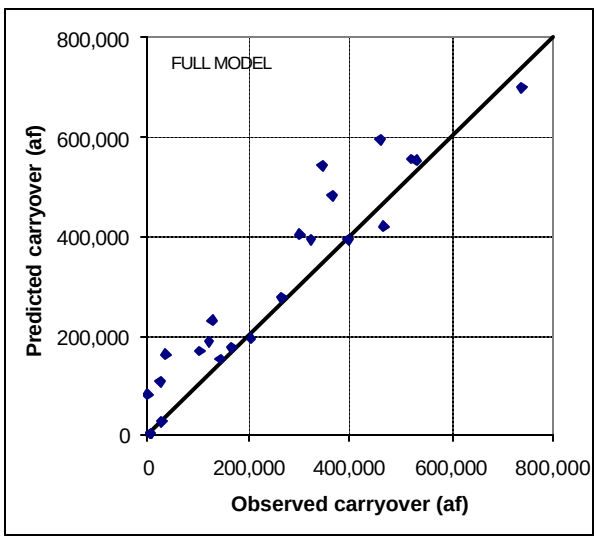
Analysis of autocorrelation in best-model residuals; North Side Canal Company.

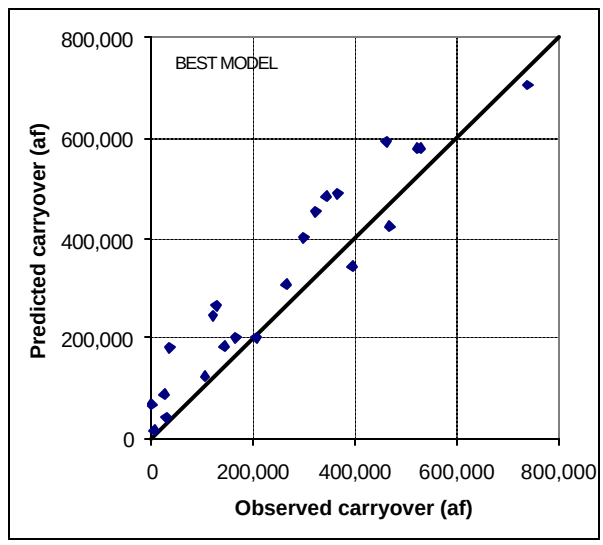
Lag	ACF	t statistic	df	*P*
1	0.02	0.12	20	0.91
2	-0.13	-0.64	19	0.53
3	-0.29	-1.35	18	0.19
4	-0.34	-1.47	17	0.16
5	0.31	1.26	16	0.23
6	0.16	0.59	15	0.56





Fitted versus predicted carryover; North Side Canal Company. Line $y = x$ is shown for reference.





Predicted versus observed carryover, 1987-2008, with line $y = x$; North Side Canal Company.

Comparison of carryover differences "predicted – observed" (best model) between calibration and prediction periods, after correction for 1st-order serial autocorrelation in differences.

	Calibration period	Prediction period
Number of paired observations	22	21
# positive differences	14	16
Sign test* exact *P*-value (up to rounding)	$P = 0.286$	$P = 0.027$
Mean difference	-4606	35931
Approximate *P* for comparison of means**	$P \sim 0.01$	

*Binomial test of H_0: Pr{difference > 0} = 0.5, versus two-sided alternative.
**Permutation test for H_0: mean calibration-period difference = mean prediction-period difference, versus two-sided alternative.