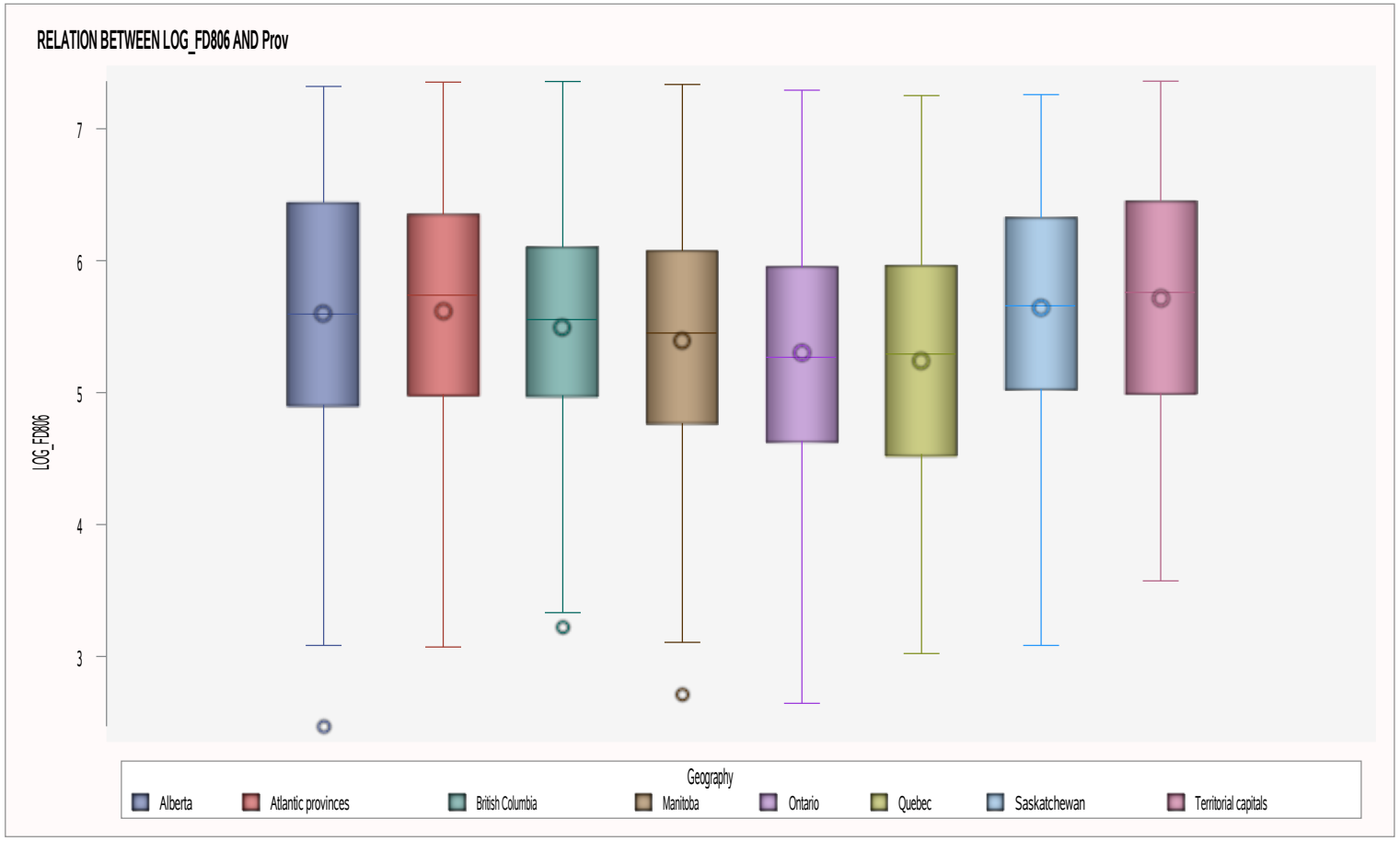
BIVARIATE ANALYSIS OF Prov AND LOG_FD806 FOR ANA.MODEL2
RELATION BETWEEN LOG_FD806 AND Prov

The MEANS Procedure

Analysis Variable : LOG_FD806														
Geography	N Obs	N	N Miss	Minimum	Lower Quartile	Median	Mean	Upper Quartile	Maximum	Quartile Range	Coeff of Variation	Lower 95% CL for Mean	Upper 95% CL for Mean	Skewness
Alberta	958697	958697	0	2.47	4.90	5.60	5.60	6.44	7.32	1.54	17.11	5.60	5.60	-0.29
Atlantic provinces	629768	629768	0	3.07	4.97	5.74	5.62	6.35	7.35	1.38	16.90	5.61	5.62	-0.41
British Columbia	969907	969907	0	3.22	4.97	5.55	5.49	6.10	7.36	1.14	16.17	5.49	5.49	-0.29
Manitoba	299857	299857	0	2.71	4.76	5.45	5.39	6.07	7.34	1.32	17.20	5.39	5.40	-0.23
Ontario	2882375	2882375	0	2.64	4.62	5.27	5.30	5.95	7.29	1.33	17.62	5.30	5.30	0.02
Quebec	2104687	2104687	0	3.02	4.52	5.29	5.24	5.96	7.25	1.44	17.79	5.24	5.24	-0.20
Saskatchewan	271874	271874	0	3.08	5.01	5.66	5.64	6.33	7.26	1.31	15.62	5.64	5.64	-0.29
Territorial capitals	11711	11711	0	3.57	4.99	5.76	5.71	6.45	7.36	1.47	16.60	5.70	5.73	-0.28



One-way ANOVA Assumptions
In order to run a one-way ANOVA the following assumptions must be met:
1.The response of interest is continuous and normally distributed for each treatment group:
Normality test: PROC UNIVARIATE NORMAL and QQPlot for each group.
2.Treatment groups are independent of one another. Experimental units only receive one treatment,and they do not overlap.
3.There are no major outliers.
4.A check for unequal variances will help determine which version of a one-way ANOVA is most appropriate
(Levene's test, Null hypothesis: variances are equal between groups):
A .If variances are equal, then the assumptions of a standard one-way ANOVA are met.
B. If variances are unequal, then a Welch's one-way ANOVA is appropriate.

Normal Distribution?
Null hypothesis: sample has a normal distribution
CLT :
a.If it looks normal and each group have more than 30 observations
b.If moderately skewed, each group must have more than 100 observations
*rule of thumb: If skewness is between -1 and -0.5 or between 0.5 and 1, the distribution is moderately skewed.
*if the sample size is over 2000, the Kolmgorov test should be used. If the sample size is less than 2000, the Shapiro test is better.

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Alberta

Moments			
N	958697	**Sum Weights**	958697
Mean	5.59782167	**Sum Observations**	5366614.84
Std Deviation	0.95784837	**Variance**	0.91747349
Skewness	-0.2933758	**Kurtosis**	-0.4036799
Uncorrected SS	30920931	**Corrected SS**	879578.166
Coeff Variation	17.1110911	**Std Error Mean**	0.00097826

Basic Statistical Measures			
Location		**Variability**	
Mean	5.597822	**Std Deviation**	0.95785
Median	5.595083	**Variance**	0.91747
Mode	6.439478	**Range**	4.85031
		Interquartile Range	1.54433

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Alberta

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	5722.199	**Pr > |t|**	<.0001
Sign	**M**	479348.5	**Pr >= |M|**	<.0001
Signed Rank	**S**	2.298E11	**Pr >= |S|**	<.0001

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.065737	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	548.8601	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	3884.935	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.32095
99%	7.30953
95%	7.08369
90%	6.84050
75% Q3	6.43948
50% Median	5.59508
25% Q1	4.89515
10%	4.35773
5%	4.01241
1%	3.39786
0% Min	2.47064

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Alberta

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
2.47064	3940	103	7.18200	4355	6
3.08374	3250	66	7.27414	2361	14
3.39786	5372	152	7.30361	5912	108
3.43108	3237	59	7.30953	8411	3
3.52812	3248	19	7.32095	5649	123

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Atlantic provinces

Moments			
N	629768	Sum Weights	629768
Mean	5.61588116	Sum Observations	3536702.25
Std Deviation	0.94909276	Variance	0.90077707
Skewness	-0.4111892	Kurtosis	-0.3415584
Uncorrected SS	20428979.2	Corrected SS	567279.674
Coeff Variation	16.9001575	Std Error Mean	0.00119596

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Atlantic provinces

Basic Statistical Measures			
Location		**Variability**	
Mean	5.615881	**Std Deviation**	0.94909
Median	5.738828	**Variance**	0.90078
Mode	4.333099	**Range**	4.28184
		Interquartile Range	1.37771

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	4695.691	**Pr > |t|**	<.0001
Sign	**M**	314884	**Pr >= |M|**	<.0001
Signed Rank	**S**	9.915E10	**Pr >= |S|**	<.0001

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.052851	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	365.0699	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	2531.387	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.35361
99%	7.32214
95%	7.03277
90%	6.73863

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Atlantic provinces

Quantiles (Definition 5)	
Level	**Quantile**
75% Q3	6.35141
50% Median	5.73883
25% Q1	4.97369
10%	4.32665
5%	3.89182
1%	3.25810
0% Min	3.07177

Extreme Observations					
Lowest			**Highest**		
Value	**Freq**	**Obs**	**Value**	**Freq**	**Obs**
3.07177	840	866	7.34003	776	314
3.07177	347	477	7.34357	669	397
3.15274	132	211	7.35014	1360	458
3.21165	209	844	7.35109	759	825
3.21727	186	246	7.35361	491	335

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=British Columbia

Moments			
N	969907	**Sum Weights**	969907
Mean	5.49258536	**Sum Observations**	5327296.99
Std Deviation	0.88839624	**Variance**	0.78924789
Skewness	-0.2858383	**Kurtosis**	-0.3704013
Uncorrected SS	30026129.7	**Corrected SS**	765496.26
Coeff Variation	16.174464	**Std Error Mean**	0.00090207

Basic Statistical Measures			
Location		**Variability**	
Mean	5.492585	**Std Deviation**	0.88840
Median	5.553541	**Variance**	0.78925
Mode	6.246301	**Range**	4.14116
		Interquartile Range	1.13596

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	6088.848	**Pr > |t|**	<.0001
Sign	**M**	484953.5	**Pr >= |M|**	<.0001
Signed Rank	**S**	2.352E11	**Pr >= |S|**	<.0001

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=British Columbia

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.051237	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	491.1901	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	3618.11	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.35843
99%	7.20510
95%	7.04319
90%	6.60932
75% Q3	6.10216
50% Median	5.55354
25% Q1	4.96620
10%	4.14804
5%	3.87867
1%	3.36246
0% Min	3.21727

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=British Columbia

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
3.21727	1553	1057	7.10462	9539	1056
3.33220	6907	1095	7.19090	3791	936
3.36246	3183	951	7.20510	5467	1104
3.44042	4303	1074	7.21127	1683	1094
3.63627	3779	1046	7.35843	4907	990

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Manitoba

Moments			
N	299857	**Sum Weights**	299857
Mean	5.39213173	**Sum Observations**	1616868.45
Std Deviation	0.92721768	**Variance**	0.85973263
Skewness	-0.2306575	**Kurtosis**	-0.4166667
Uncorrected SS	8976163.64	**Corrected SS**	257795.988
Coeff Variation	17.1957535	**Std Error Mean**	0.00169326

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Manitoba

Basic Statistical Measures			
Location		**Variability**	
Mean	5.392132	**Std Deviation**	0.92722
Median	5.451725	**Variance**	0.85973
Mode	4.481872	**Range**	4.62243
		Interquartile Range	1.31947

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	3184.461	**Pr > |t|**	<.0001
Sign	**M**	149928.5	**Pr >= |M|**	<.0001
Signed Rank	**S**	2.248E10	**Pr >= |S|**	<.0001

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.037604	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	95.38586	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	635.7575	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.33580
99%	7.16667
95%	6.82778
90%	6.63637

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Manitoba

Quantiles (Definition 5)	
Level	**Quantile**
75% Q3	6.07496
50% Median	5.45172
25% Q1	4.75548
10%	4.16200
5%	3.81110
1%	3.25810
0% Min	2.71337

Extreme Observations					
Lowest			**Highest**		
Value	**Freq**	**Obs**	**Value**	**Freq**	**Obs**
2.71337	1520	1317	7.08978	1941	1130
3.10727	381	1272	7.13096	1147	1222
3.25810	2580	1253	7.16667	1520	1141
3.26805	1551	1237	7.27891	505	1270
3.38608	846	1231	7.33580	1566	1186

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Ontario

Moments			
N	2882375	**Sum Weights**	2882375
Mean	5.30040293	**Sum Observations**	15277748.9
Std Deviation	0.93412537	**Variance**	0.87259021
Skewness	0.02419881	**Kurtosis**	-0.5652113
Uncorrected SS	83493356.2	**Corrected SS**	2515131.33
Coeff Variation	17.6236672	**Std Error Mean**	0.00055021

Basic Statistical Measures			
Location		**Variability**	
Mean	5.300403	**Std Deviation**	0.93413
Median	5.267394	**Variance**	0.87259
Mode	4.678792	**Range**	4.64785
		Interquartile Range	1.32530

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	9633.386	**Pr > |t|**	<.0001
Sign	**M**	1441188	**Pr >= |M|**	<.0001
Signed Rank	**S**	2.077E12	**Pr >= |S|**	<.0001

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Ontario

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.039775	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	847.0641	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	7154.464	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.29261
99%	7.24642
95%	6.89946
90%	6.58360
75% Q3	5.94694
50% Median	5.26739
25% Q1	4.62163
10%	4.01530
5%	3.90258
1%	3.30689
0% Min	2.64476

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Ontario

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
2.64476	15313	1591	7.17072	18757	1394
3.30689	15881	1597	7.23335	5785	1338
3.37143	1772	1455	7.24642	6213	1386
3.58129	14896	1545	7.28909	12702	1429
3.58574	6267	1599	7.29261	12196	1353

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Quebec

Moments			
N	2104687	Sum Weights	2104687
Mean	5.23877013	Sum Observations	11025971.4
Std Deviation	0.93216345	Variance	0.86892871
Skewness	-0.1950948	Kurtosis	-0.6476333
Uncorrected SS	59591351.7	Corrected SS	1828822.08
Coeff Variation	17.7935552	Std Error Mean	0.00064254

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Quebec

Basic Statistical Measures			
Location		**Variability**	
Mean	5.238770	**Std Deviation**	0.93216
Median	5.292802	**Variance**	0.86893
Mode	5.754000	**Range**	4.22920
		Interquartile Range	1.44218

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	8153.255	**Pr > |t|**	<.0001
Sign	**M**	1052344	**Pr >= |M|**	<.0001
Signed Rank	**S**	1.107E12	**Pr >= |S|**	<.0001

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.041222	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	875.923	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	6349.62	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.25157
99%	7.09923
95%	6.65562
90%	6.42652

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Quebec

Quantiles (Definition 5)	
Level	**Quantile**
75% Q3	5.96343
50% Median	5.29280
25% Q1	4.52124
10%	3.96119
5%	3.53777
1%	3.27790
0% Min	3.02237

Extreme Observations					
Lowest			**Highest**		
Value	**Freq**	**Obs**	**Value**	**Freq**	**Obs**
3.02237	4062	1865	6.99027	10294	1909
3.03495	8060	1835	6.99866	5455	1875
3.05777	7665	1858	7.09923	7410	1873
3.27790	16121	1868	7.17749	11846	1705
3.30689	7416	1627	7.25157	2957	1687

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Saskatchewan

Moments			
N	271874	**Sum Weights**	271874
Mean	5.63878298	**Sum Observations**	1533038.48
Std Deviation	0.88073409	**Variance**	0.77569254
Skewness	-0.2887928	**Kurtosis**	-0.5745512
Uncorrected SS	8855361.17	**Corrected SS**	210889.857
Coeff Variation	15.619223	**Std Error Mean**	0.00168912

Basic Statistical Measures			
Location		**Variability**	
Mean	5.638783	**Std Deviation**	0.88073
Median	5.658018	**Variance**	0.77569
Mode	3.814631	**Range**	4.17511
		Interquartile Range	1.31152

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	3338.293	**Pr > |t|**	<.0001
Sign	**M**	135937	**Pr >= |M|**	<.0001
Signed Rank	**S**	1.848E10	**Pr >= |S|**	<.0001

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Saskatchewan

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.055935	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	175.6252	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	1242.856	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.25885
99%	7.18062
95%	6.97271
90%	6.76542
75% Q3	6.32522
50% Median	5.65802
25% Q1	5.01370
10%	4.50347
5%	4.15685
1%	3.58269
0% Min	3.08374

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Saskatchewan

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
3.08374	1372	2064	7.14419	1518	2153
3.34850	523	2027	7.18054	888	1965
3.58269	838	2140	7.18062	1691	2058
3.70549	629	2083	7.20541	1060	1940
3.72014	497	1944	7.25885	1377	1961

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Territorial capitals

Moments			
N	11711	**Sum Weights**	11711
Mean	5.71392282	**Sum Observations**	66915.7502
Std Deviation	0.94859878	**Variance**	0.89983964
Skewness	-0.2810241	**Kurtosis**	-0.9449775
Uncorrected SS	392888.554	**Corrected SS**	10537.1222
Coeff Variation	16.6015329	**Std Error Mean**	0.00876568

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Territorial capitals

Basic Statistical Measures			
Location		**Variability**	
Mean	5.713923	**Std Deviation**	0.94860
Median	5.759879	**Variance**	0.89984
Mode	4.574092	**Range**	3.78783
		Interquartile Range	1.46558

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	651.8517	**Pr > |t|**	<.0001
Sign	**M**	5855.5	**Pr >= |M|**	<.0001
Signed Rank	**S**	34289808	**Pr >= |S|**	<.0001

Tests for Normality				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.082104	**Pr > D**	<0.0100
Cramer-von Mises	**W-Sq**	16.42393	**Pr > W-Sq**	<0.0050
Anderson-Darling	**A-Sq**	115.1312	**Pr > A-Sq**	<0.0050

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	7.36074
99%	7.30971
95%	7.08256
90%	6.93674

The UNIVARIATE Procedure
Variable: LOG_FD806

Freq: WeightD

Geography=Territorial capitals

Quantiles (Definition 5)	
Level	**Quantile**
75% Q3	6.45063
50% Median	5.75988
25% Q1	4.98504
10%	4.25135
5%	4.13772
1%	3.78328
0% Min	3.57291

Extreme Observations					
Lowest			**Highest**		
Value	**Freq**	**Obs**	**Value**	**Freq**	**Obs**
3.57291	18	2183	7.27783	46	2293
3.78328	115	2265	7.28773	45	2171
3.85757	157	2299	7.30971	58	2215
3.91562	58	2278	7.32818	59	2169
3.94119	33	2302	7.36074	43	2179

Null hypothesis: equal variances
a.If variances are equal, then a pooled t-test is appropriate
b.If variances are unequal, then a Satterthwaite (also known as Welch's) test is appropriate

The GLM Procedure

Class Level Information		
Class	**Levels**	**Values**
Prov	8	Alberta Atlantic provinces British Columbia Manitoba Ontario Quebec Saskatchewan Territorial capitals

Number of Observations Read	2327
Number of Observations Used	2327
Sum of Frequencies Read	8128876
Sum of Frequencies Used	8128876

The GLM Procedure

Dependent Variable: LOG_FD806

Frequency: WeightD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	172580.537	24654.362	28485.7	<.0001
Error	8.13E6	7035530.477	0.865		
Corrected Total	8.13E6	7208111.014			

R-Square	Coeff Var	Root MSE	LOG_FD806 Mean
0.023943	17.28520	0.930322	5.382190

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Prov	7	172580.5368	24654.3624	28485.7	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Prov	7	172580.5368	24654.3624	28485.7	<.0001

The GLM Procedure

Levene's Test for Homogeneity of LOG_FD806 Variance ANOVA of Absolute Deviations from Group Means					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Prov	7	4166.6	595.2	2107.67	<.0001
Error	8.13E6	2295703	0.2824		

Welch's ANOVA for LOG_FD806			
Source	**DF**	**F Value**	**Pr > F**
Prov	7.0000	28314.2	<.0001
Error	220971		

The GLM Procedure

Level of Prov	N	LOG_FD806	
		Mean	**Std Dev**
Alberta	958697	5.59782167	0.95784837
Atlantic provinces	629768	5.61588116	0.94909276
British Columbia	969907	5.49258536	0.88839624
Manitoba	299857	5.39213173	0.92721768
Ontario	2882375	5.30040293	0.93412537
Quebec	2104687	5.23877013	0.93216345
Saskatchewan	271874	5.63878298	0.88073409
Territorial capitals	11711	5.71392282	0.94859878

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

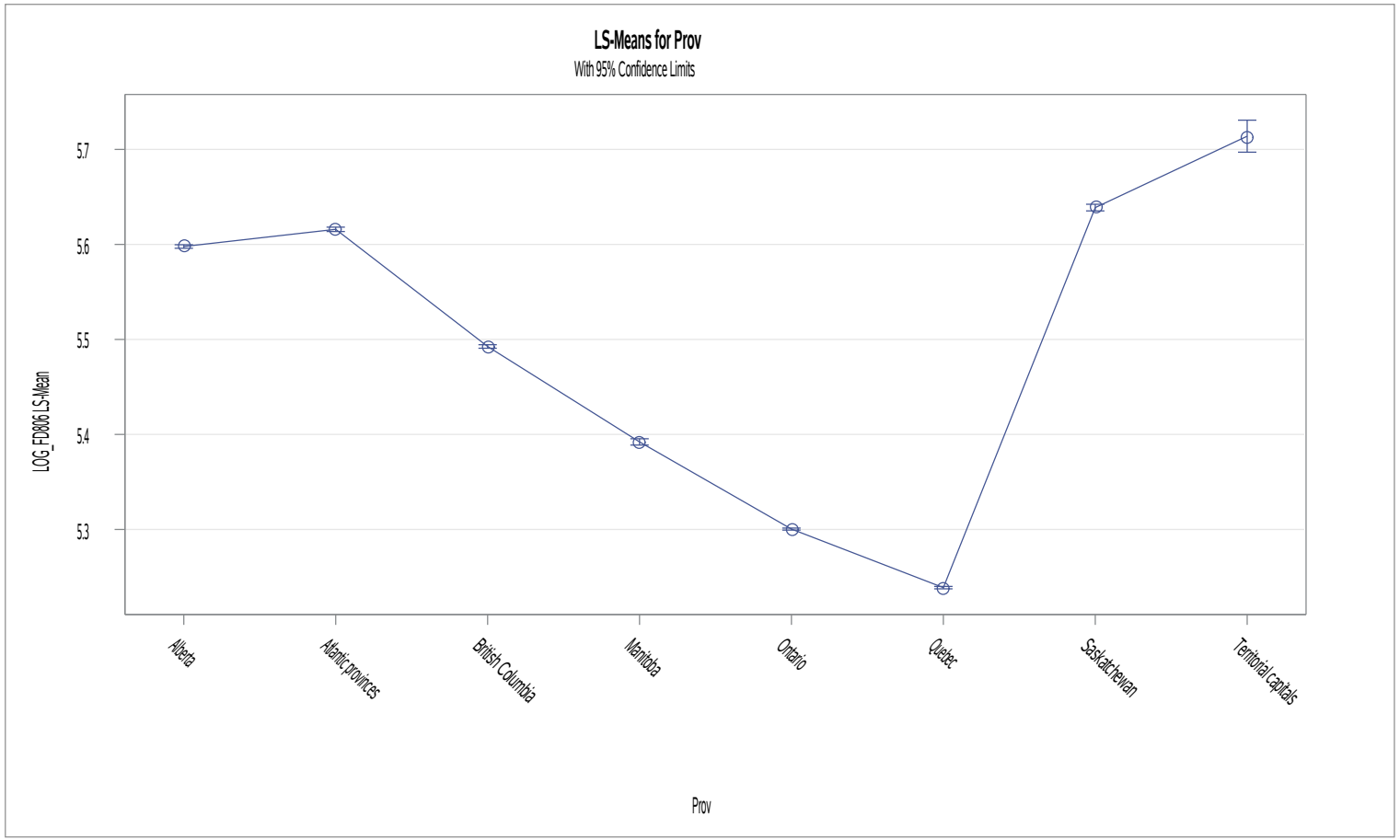
Prov	LOG_FD806 LSMEAN	LSMEAN Number
Alberta	5.59782167	1
Atlantic provinces	5.61588116	2
British Columbia	5.49258536	3
Manitoba	5.39213173	4
Ontario	5.30040293	5
Quebec	5.23877013	6
Saskatchewan	5.63878298	7
Territorial capitals	5.71392282	8

Least Squares Means for effect Prov
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: LOG_FD806

i/j	1	2	3	4	5	6	7	8
1		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
2	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
3	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001
4	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001
5	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001
6	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001
7	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001
8	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer



The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer