Program Summary - Tom Midgley_Case Study_Bike Rental_Q1a.sas

Execution Environment

Author:	u63510871
File:	/home/u63510871/Tom Midgley_Case Study_Bike Rental_Q1a.sas
SAS Platform:	Linux LIN X64 3.10.0-1062.4.1.el7.x86_64
SAS Host:	ODAWS02-APSE1.ODA.SAS.COM
SAS Version:	9.04.01M7P08062020
SAS Locale:	en_AU
Submission Time:	14/11/2023, 3:23:44 pm
Browser Host:	122-199-34-14.IP4.SUPERLOOP.AU
User Agent:	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/16.4 Safari/605.1.15
Application Server:	ODAMID00-APSE1.ODA.SAS.COM

Code: Tom Midgley_Case Study_Bike Rental_Q1a.sas

```
/* ////////////////////////////// Q1a ////////////////////////////// */


/* Q1a - 1 Carry out one way ANOVA relating rented to wkday. */
/* Use contrast to test at least one a priori hypothesis of your choice */


/* Descriptive Statistics */

title 'Descriptive Statistics for Rented Bikes by Weekday';
ods noproctitle;
ods graphics / imagemap=on;

proc means data=MYDATA.SEOULBIKE chartype mean std min max median n nmiss range
    vardef=df clm alpha=0.05 cv skewness kurtosis qmethod=os;
var rented;
class wkday;
run;


/* Normality test */

title 'Normality Test for Rented Bikes by Weekday';
ods noproctitle;
ods graphics / imagemap=on;

proc sort data=MYDATA.SEOULBIKE out=Work.SortTempTableSorted;
    by wkday;
run;

proc univariate data=Work.SortTempTableSorted;
    ods select Histogram GoodnessOfFit QQPlot;
    var rented;

    /* Checking for Normality */
    histogram rented / normal(mu=est sigma=est);
    qqplot rented / normal(mu=est sigma=est);
    by wkday;
run;
```

```
proc delete data=Work.SortTempTableSorted;
run;



/* One way ANOVA with with contrast test */
proc glm data=MYDATA.SEOULBIKE plots(only)=(boxplot diagnostics) order=data;
    class wkday ;
    model rented=wkday;
    means wkday / hovtest=levene welch plots=none;
    lsmeans wkday / adjust=tukey pdiff alpha=.05 plots=(meanplot diffplot);

/*     Weekdays vs Weekends contrast test */
    contrast 'Weekdays vs. Weekends' wkday 1 -2.5 -2.5 1 1 1 1;

    title 'One-Way ANOVA for Rental by Weekday';
    run;
quit;
```

Log: Tom Midgley_Case Study_Bike Rental_Q1a.sas

Notes (10)

```
1          OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
NOTE: ODS statements in the SAS Studio environment may disable some output features.
73
74         /* ////////////////////////////// Q1a ////////////////////////////// */
75
76
77         /* Q1a - 1 Carry out one way ANOVA relating rented to wkday. */
78         /* Use contrast to test at least one a priori hypothesis of your choice */
79
80
81         /* Descriptive Statistics */
82
83         title 'Descriptive Statistics for Rented Bikes by Weekday';
84         ods noproctitle;
85         ods graphics / imagemap=on;
86
87         proc means data=MYDATA.SEOULBIKE chartype mean std min max median n nmiss range
88             vardef=df clm alpha=0.05 cv skewness kurtosis qmethod=os;
89         var rented;
90         class wkday;
91         run;

NOTE: There were 353 observations read from the data set MYDATA.SEOULBIKE.
NOTE: PROCEDURE MEANS used (Total process time):
      real time           0.07 seconds
      user cpu time       0.07 seconds
      system cpu time     0.01 seconds
      memory              10312.71k
      OS Memory           39876.00k
      Timestamp           14/11/2023 04:53:34 AM
      Step Count                        35  Switch Count  1
      Page Faults                       4
      Page Reclaims                     2321
      Page Swaps                        0
      Voluntary Context Switches        41
      Involuntary Context Switches      0
      Block Input Operations            976
      Block Output Operations           8
```

```
92
93
94          /* Normality test */
95
96          title 'Normality Test for Rented Bikes by Weekday';
97          ods noproctitle;
98          ods graphics / imagemap=on;
99
100         proc sort data=MYDATA.SEOULBIKE out=Work.SortTempTableSorted;
101         by wkday;
102         run;

NOTE: There were 353 observations read from the data set MYDATA.SEOULBIKE.
NOTE: The data set WORK.SORTTEMPTABLESORTED has 353 observations and 13 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time           0.00 seconds
      user cpu time       0.00 seconds
      system cpu time     0.00 seconds
      memory              1196.81k
      OS Memory           34996.00k
      Timestamp           14/11/2023 04:53:34 AM
      Step Count                        36  Switch Count  2
      Page Faults                       0
      Page Reclaims                     143
      Page Swaps                        0
      Voluntary Context Switches        13
      Involuntary Context Switches      0
      Block Input Operations            0
      Block Output Operations           272


103
104         proc univariate data=Work.SortTempTableSorted;
105         ods select Histogram GoodnessOfFit QQPlot;
106         var rented;
107
108         /* Checking for Normality */
109         histogram rented / normal(mu=est sigma=est);
110         qqplot rented / normal(mu=est sigma=est);
111         by wkday;
112         run;

NOTE: PROCEDURE UNIVARIATE used (Total process time):
      real time           6.31 seconds
      user cpu time       1.36 seconds
      system cpu time     0.12 seconds
      memory              34299.70k
      OS Memory           64644.00k
      Timestamp           14/11/2023 04:53:40 AM
      Step Count                        37  Switch Count  1
      Page Faults                       14
      Page Reclaims                     17143
      Page Swaps                        0
      Voluntary Context Switches        7986
      Involuntary Context Switches      4
      Block Input Operations            3560
      Block Output Operations           9096


113
114         proc delete data=Work.SortTempTableSorted;
115         run;

NOTE: Deleting WORK.SORTTEMPTABLESORTED (memtype=DATA).
NOTE: PROCEDURE DELETE used (Total process time):
      real time           0.00 seconds
      user cpu time       0.00 seconds
      system cpu time     0.00 seconds
      memory              171.71k
```

```
      OS Memory           58024.00k
      Timestamp           14/11/2023 04:53:40 AM
      Step Count                        38  Switch Count  2
      Page Faults                       0
      Page Reclaims                     15
      Page Swaps                        0
      Voluntary Context Switches        18
      Involuntary Context Switches      0
      Block Input Operations            0
      Block Output Operations           0


116
117
118
119         /* One way ANOVA with with contrast test */
120         proc glm data=MYDATA.SEOULBIKE plots(only)=(boxplot diagnostics) order=data;
121             class wkday ;
122             model rented=wkday;
123             means wkday / hovtest=levene welch plots=none;
124             lsmeans wkday / adjust=tukey pdiff alpha=.05 plots=(meanplot diffplot);
125
126         /*     Weekdays vs Weekends contrast test */
127             contrast 'Weekdays vs. Weekends' wkday 1 -2.5 -2.5 1 1 1 1;
128
129             title 'One-Way ANOVA for Rental by Weekday';
130         run;

131         quit;

NOTE: PROCEDURE GLM used (Total process time):
      real time           2.83 seconds
      user cpu time       0.84 seconds
      system cpu time     0.06 seconds
      memory              10449.12k
      OS Memory           66016.00k
      Timestamp           14/11/2023 04:53:43 AM
      Step Count                        39  Switch Count  24
      Page Faults                       2
      Page Reclaims                     14813
      Page Swaps                        0
      Voluntary Context Switches        2661
      Involuntary Context Switches      13
      Block Input Operations            240
      Block Output Operations           8136


132
133
134
135         OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
147
```

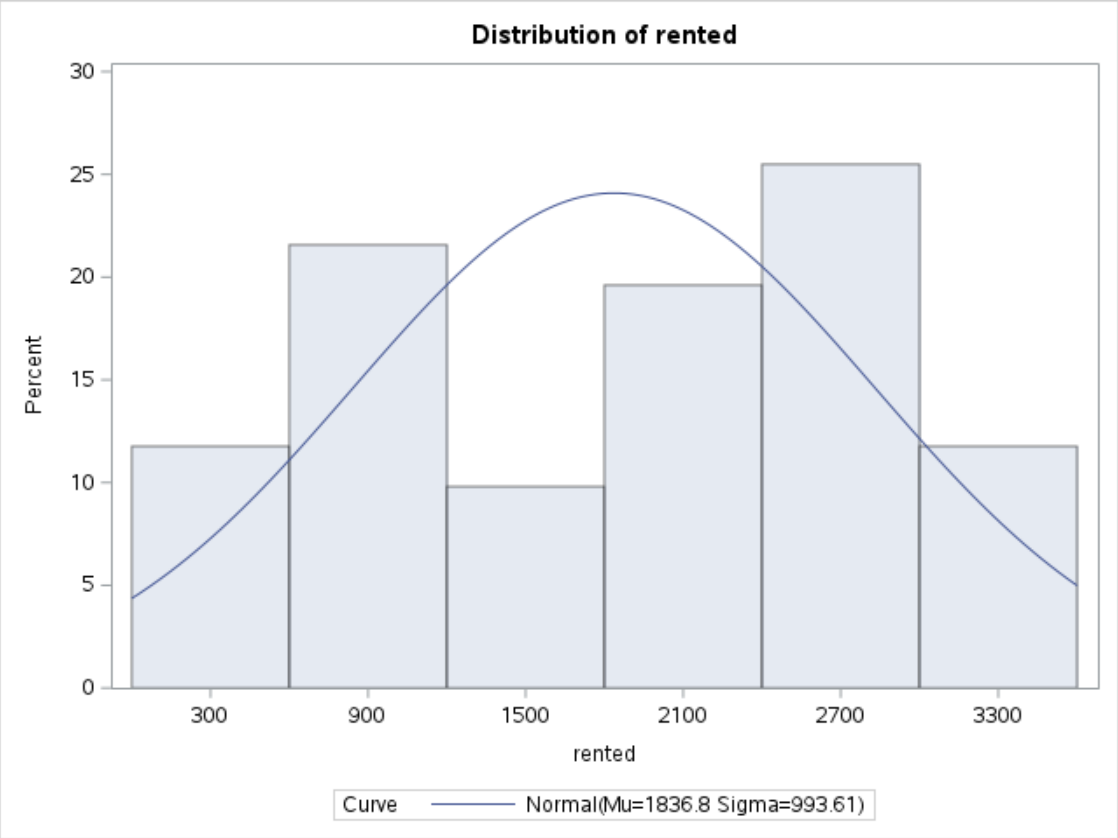
Results: Tom Midgley_Case Study_Bike Rental_Q1a.sas

Descriptive Statistics for Rented Bikes by Weekday

Analysis Variable : rented														
wkday	N Obs	Mean	Std Dev	Minimum	Maximum	Median	N	N Miss	Range	Lower 95% CL for Mean	Upper 95% CL for Mean	Coeff of Variation	Skewness	Kurtosis
Friday	51	1836.76	993.6068757	74.0000000	3365.00	1956.00	51	0	3291.00	1557.31	2116.22	54.0954904	-0.1990280	-1.3734744
Monday	52	1695.00	1063.99	39.0000000	3380.00	1930.00	52	0	3341.00	1398.78	1991.22	62.7724297	-0.0950255	-1.4044125
Saturday	51	1181.73	793.2850201	22.0000000	2451.00	1054.00	51	0	2429.00	958.6104829	1404.84	67.1293821	0.0937474	-1.5005394
Sunday	51	1089.47	831.6859348	17.0000000	2474.00	902.0000000	51	0	2457.00	855.5551497	1323.39	76.3385394	0.3171588	-1.4043850
Thursday	50	1669.18	1033.88	40.0000000	3418.00	1818.00	50	0	3378.00	1375.36	1963.00	61.9391722	-0.0566105	-1.4199188
Tuesday	48	1681.71	1022.04	30.0000000	3556.00	1831.00	48	0	3526.00	1384.94	1978.48	60.7737007	-0.0212439	-1.1397582
Wednesday	50	1734.82	1076.01	11.0000000	3384.00	2011.50	50	0	3373.00	1429.02	2040.62	62.0243880	-0.1349250	-1.4615030

Normality Test for Rented Bikes by Weekday

wkday=Friday



Normality Test for Rented Bikes by Weekday

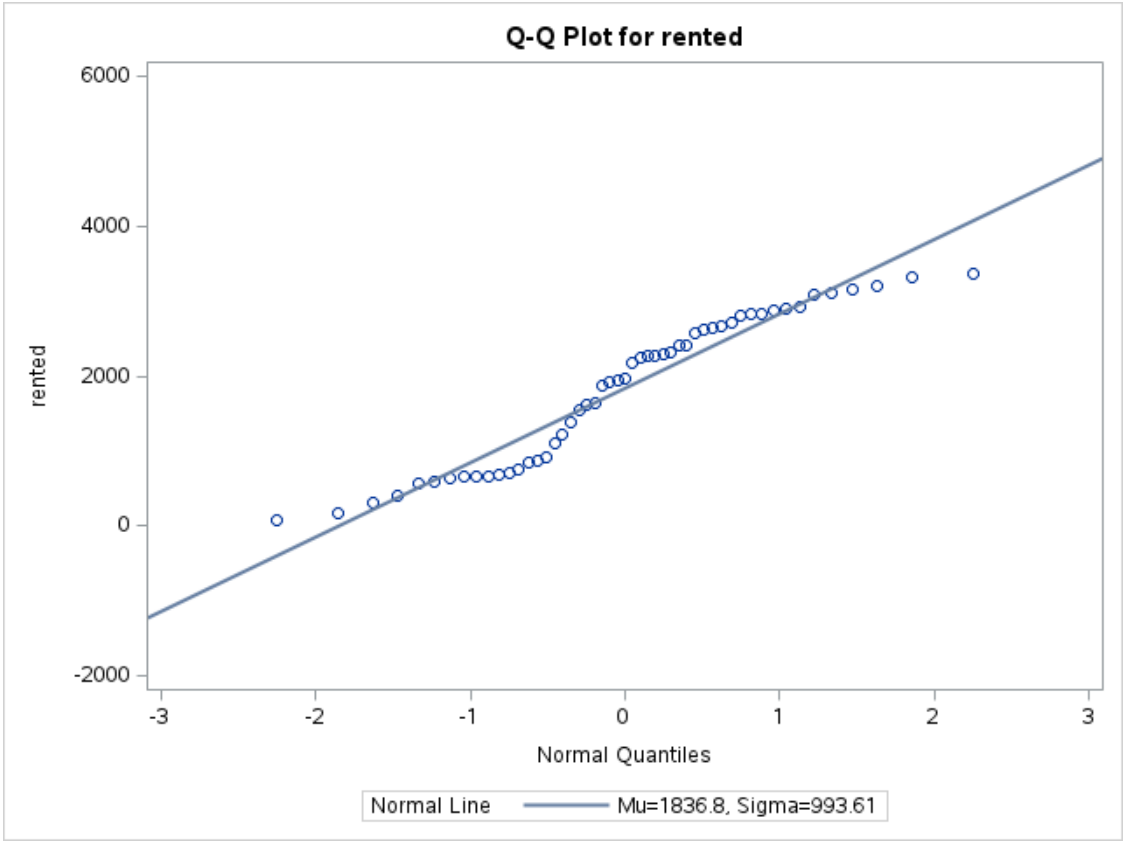
Fitted Normal Distribution for rented

wkday=Friday

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.13668151	**Pr > D**	0.018
Cramer-von Mises	**W-Sq**	0.22147290	**Pr > W-Sq**	<0.005
Anderson-Darling	**A-Sq**	1.36683235	**Pr > A-Sq**	<0.005

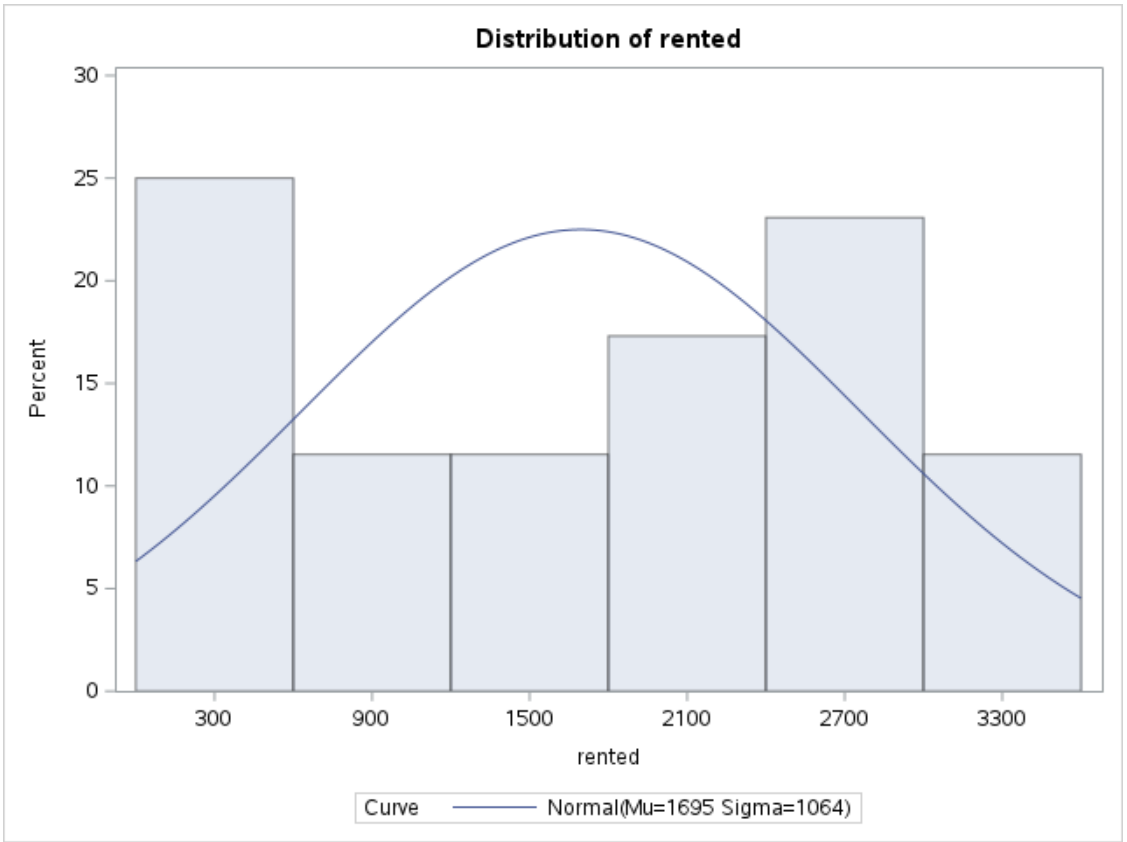
Normality Test for Rented Bikes by Weekday

wkday=Friday



Normality Test for Rented Bikes by Weekday

wkday=Monday



Normality Test for Rented Bikes by Weekday

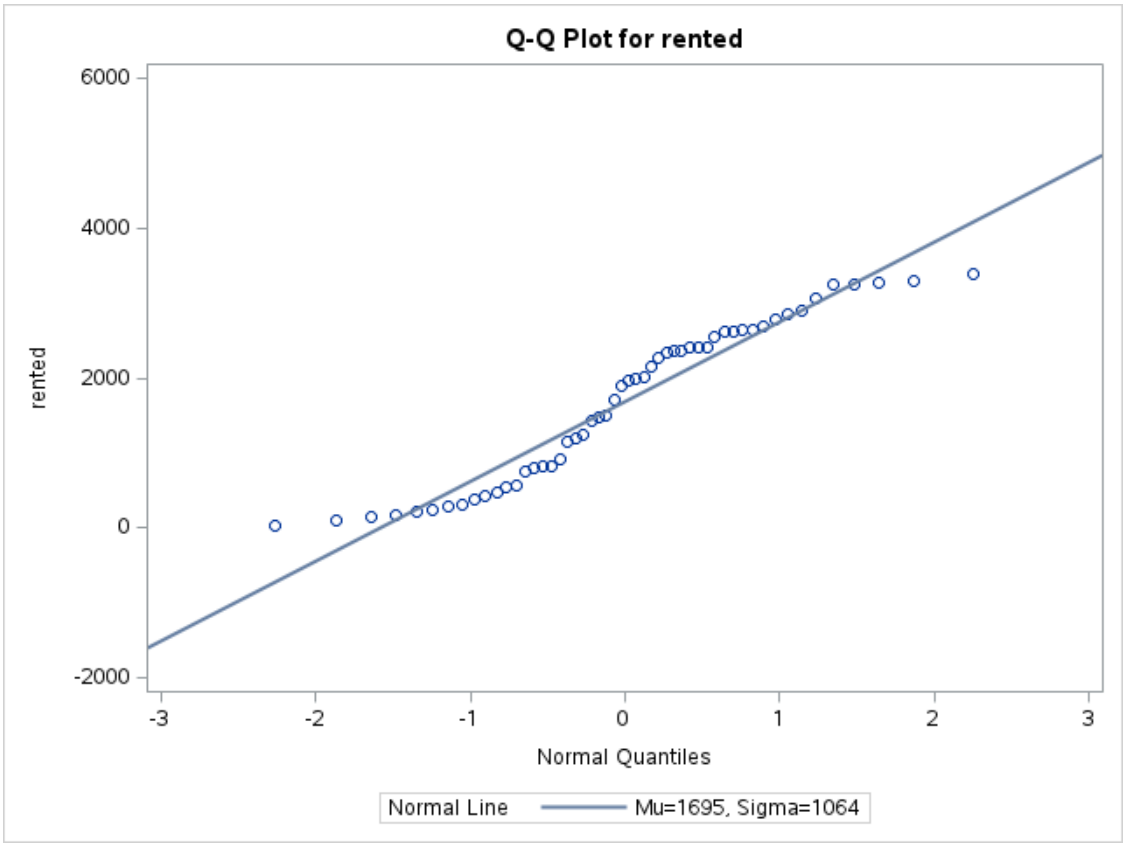
Fitted Normal Distribution for rented

wkday=Monday

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.13383729	**Pr > D**	0.020
Cramer-von Mises	**W-Sq**	0.20881174	**Pr > W-Sq**	<0.005
Anderson-Darling	**A-Sq**	1.29751708	**Pr > A-Sq**	<0.005

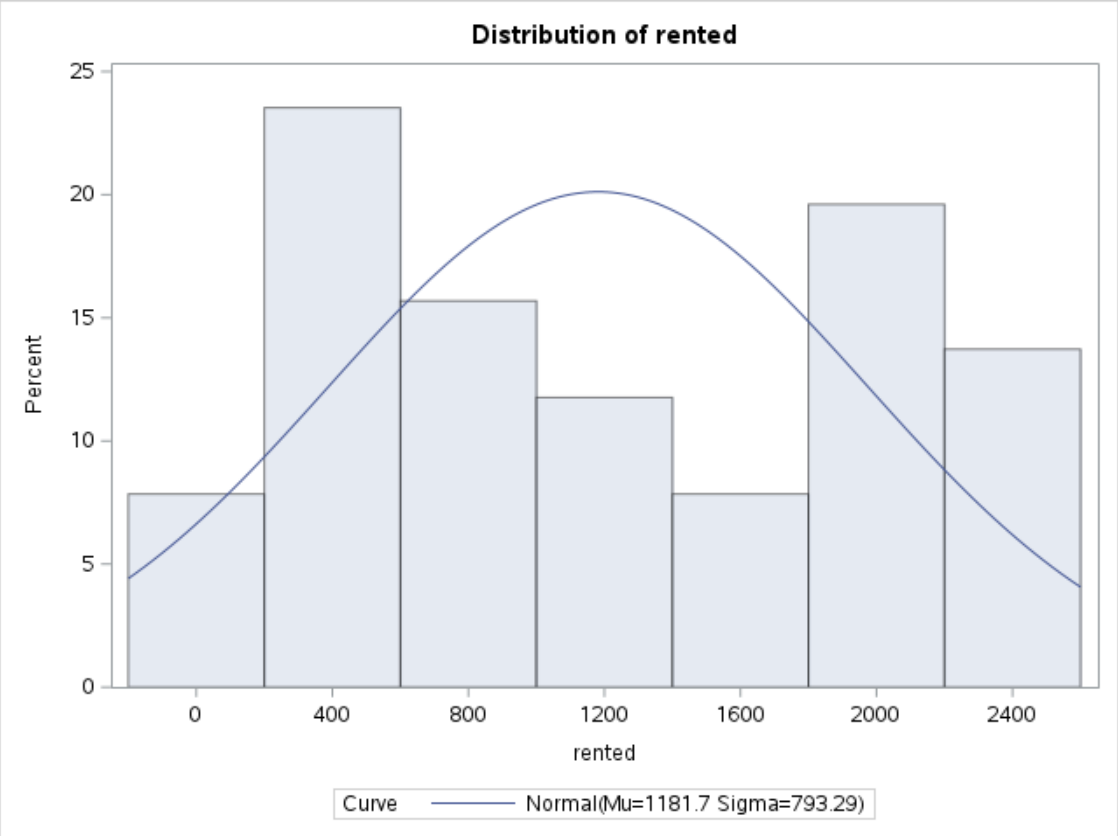
Normality Test for Rented Bikes by Weekday

wkday=Monday



Normality Test for Rented Bikes by Weekday

wkday=Saturday



Normality Test for Rented Bikes by Weekday

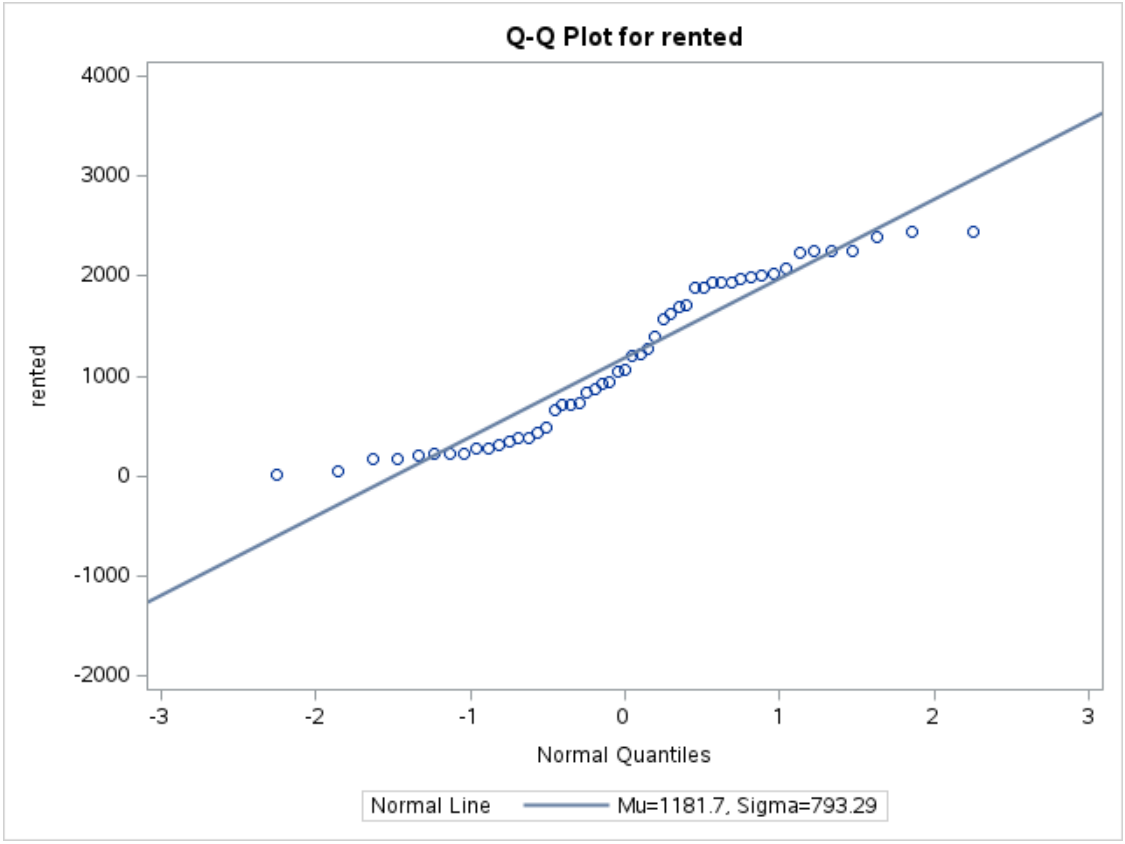
Fitted Normal Distribution for rented

wkday=Saturday

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.14464839	**Pr > D**	<0.010
Cramer-von Mises	**W-Sq**	0.23832009	**Pr > W-Sq**	<0.005
Anderson-Darling	**A-Sq**	1.54989631	**Pr > A-Sq**	<0.005

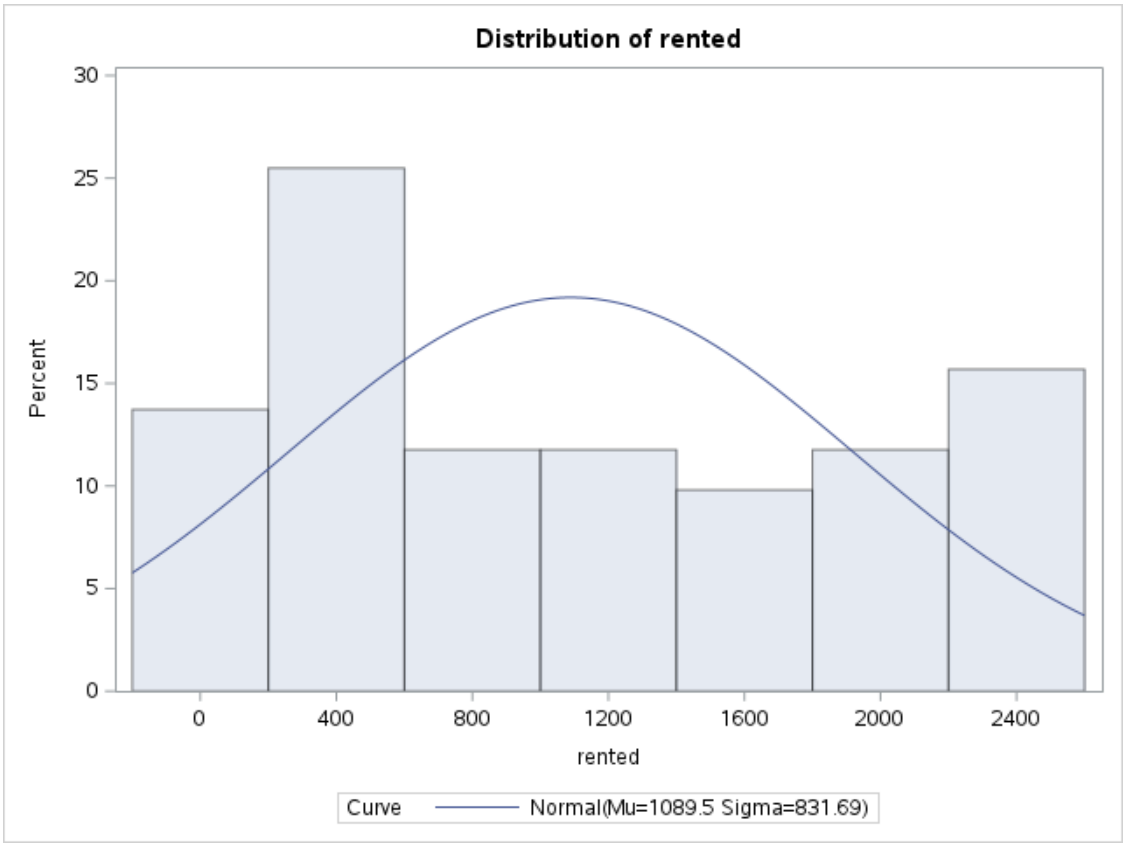
Normality Test for Rented Bikes by Weekday

wkday=Saturday



Normality Test for Rented Bikes by Weekday

wkday=Sunday



Normality Test for Rented Bikes by Weekday

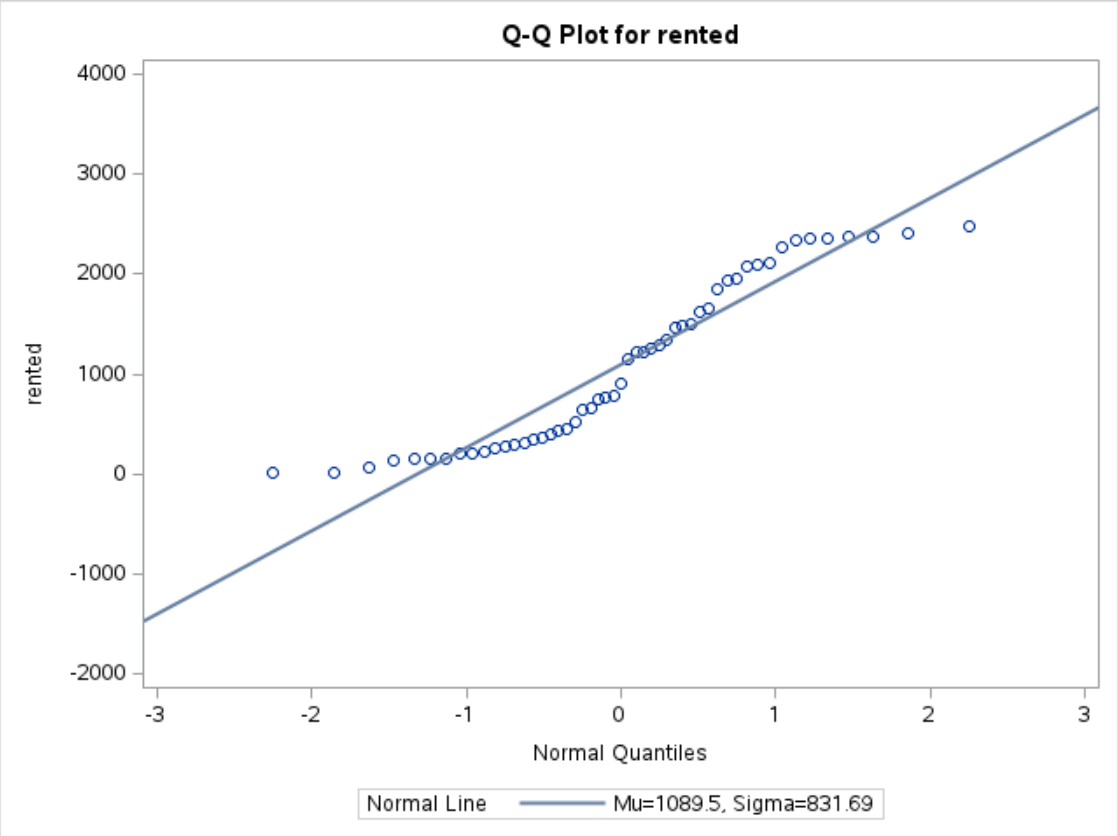
Fitted Normal Distribution for rented

wkday=Sunday

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.15405852	**Pr > D**	<0.010
Cramer-von Mises	**W-Sq**	0.26395214	**Pr > W-Sq**	<0.005
Anderson-Darling	**A-Sq**	1.77611707	**Pr > A-Sq**	<0.005

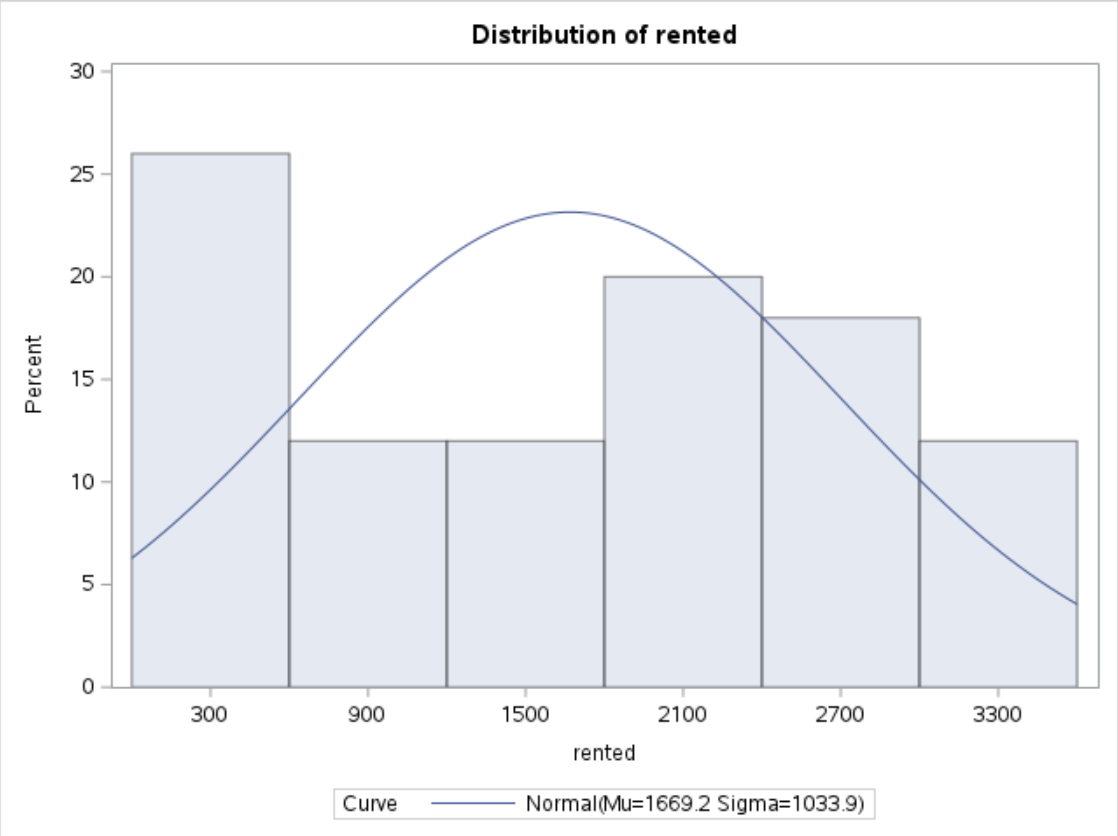
Normality Test for Rented Bikes by Weekday

wkday=Sunday



Normality Test for Rented Bikes by Weekday

wkday=Thursday



Normality Test for Rented Bikes by Weekday

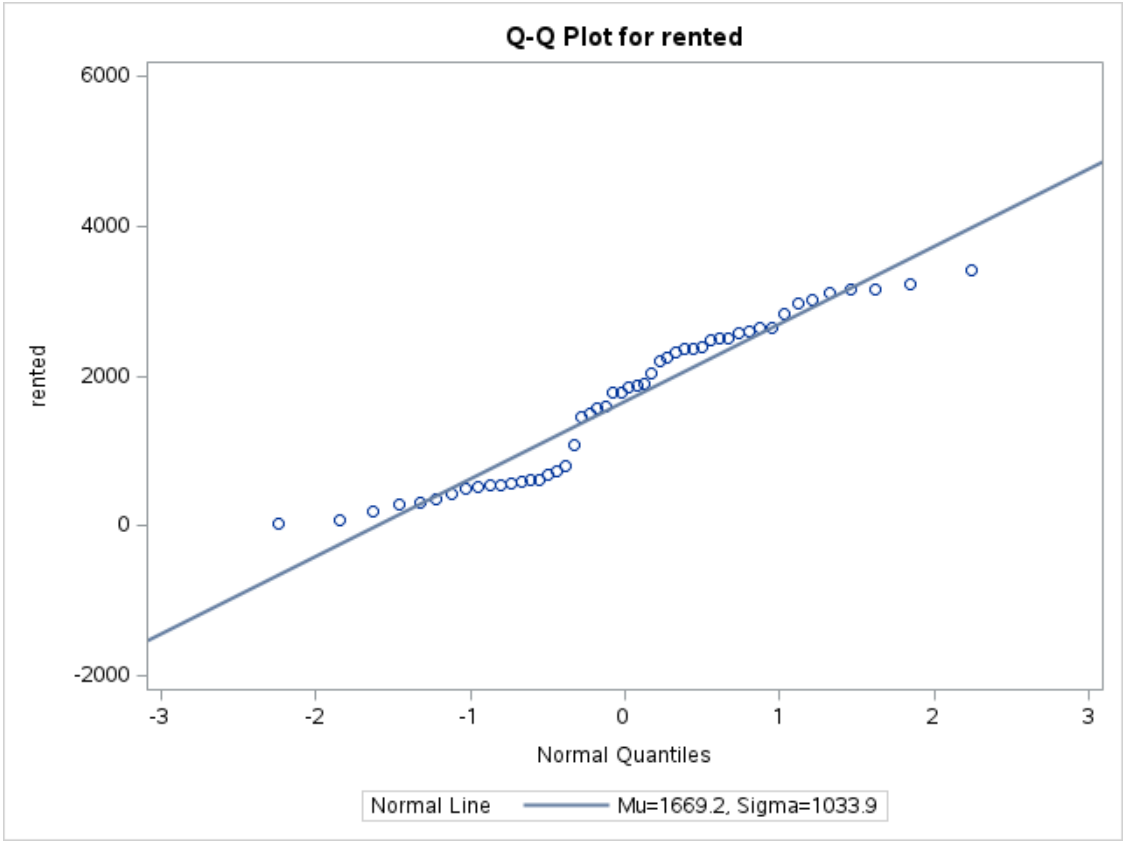
Fitted Normal Distribution for rented

wkday=Thursday

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.16109428	**Pr > D**	<0.010
Cramer-von Mises	**W-Sq**	0.23004185	**Pr > W-Sq**	<0.005
Anderson-Darling	**A-Sq**	1.43751779	**Pr > A-Sq**	<0.005

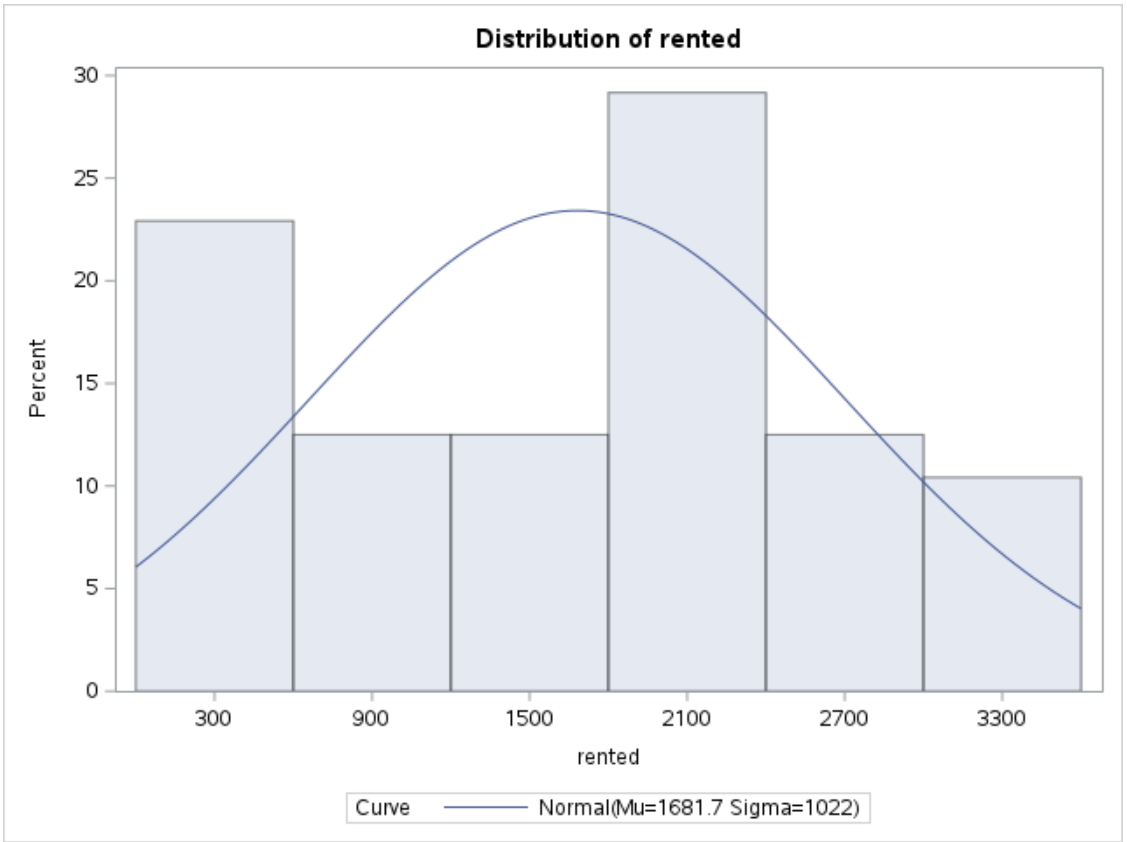
Normality Test for Rented Bikes by Weekday

wkday=Thursday



Normality Test for Rented Bikes by Weekday

wkday=Tuesday



Normality Test for Rented Bikes by Weekday

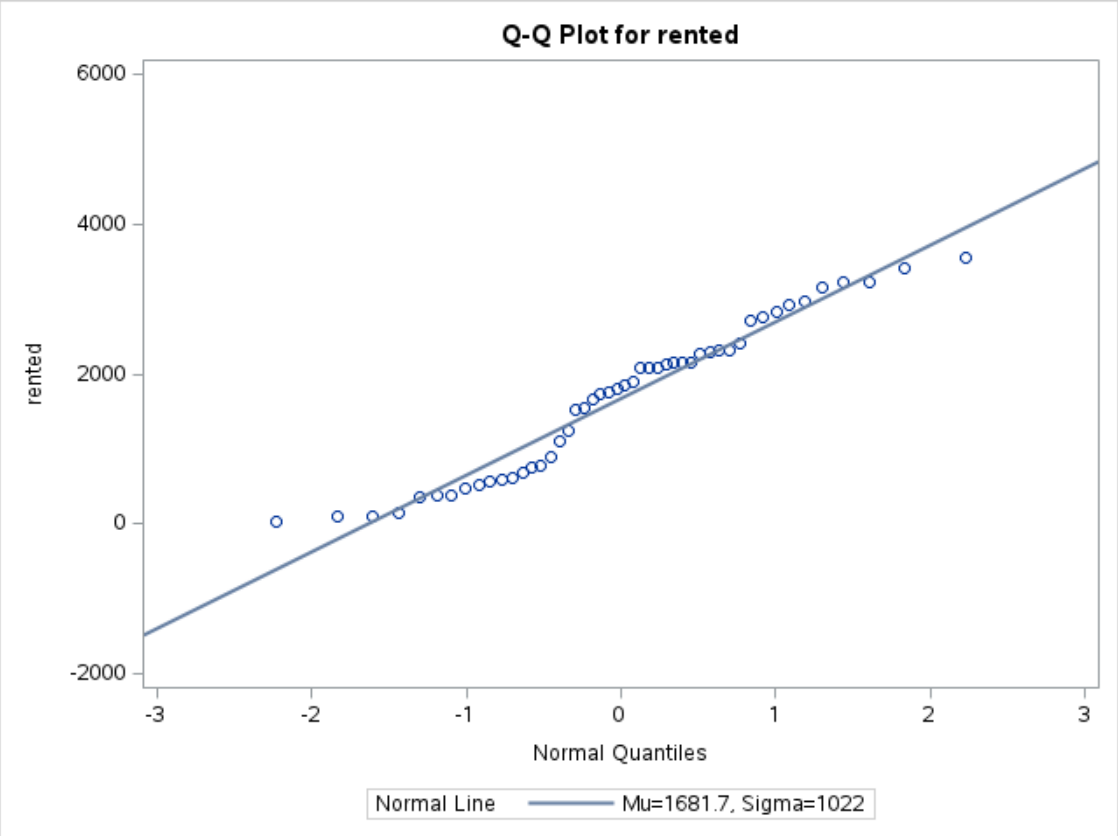
Fitted Normal Distribution for rented

wkday=Tuesday

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.12129391	**Pr > D**	0.077
Cramer-von Mises	**W-Sq**	0.13086470	**Pr > W-Sq**	0.043
Anderson-Darling	**A-Sq**	0.81737098	**Pr > A-Sq**	0.034

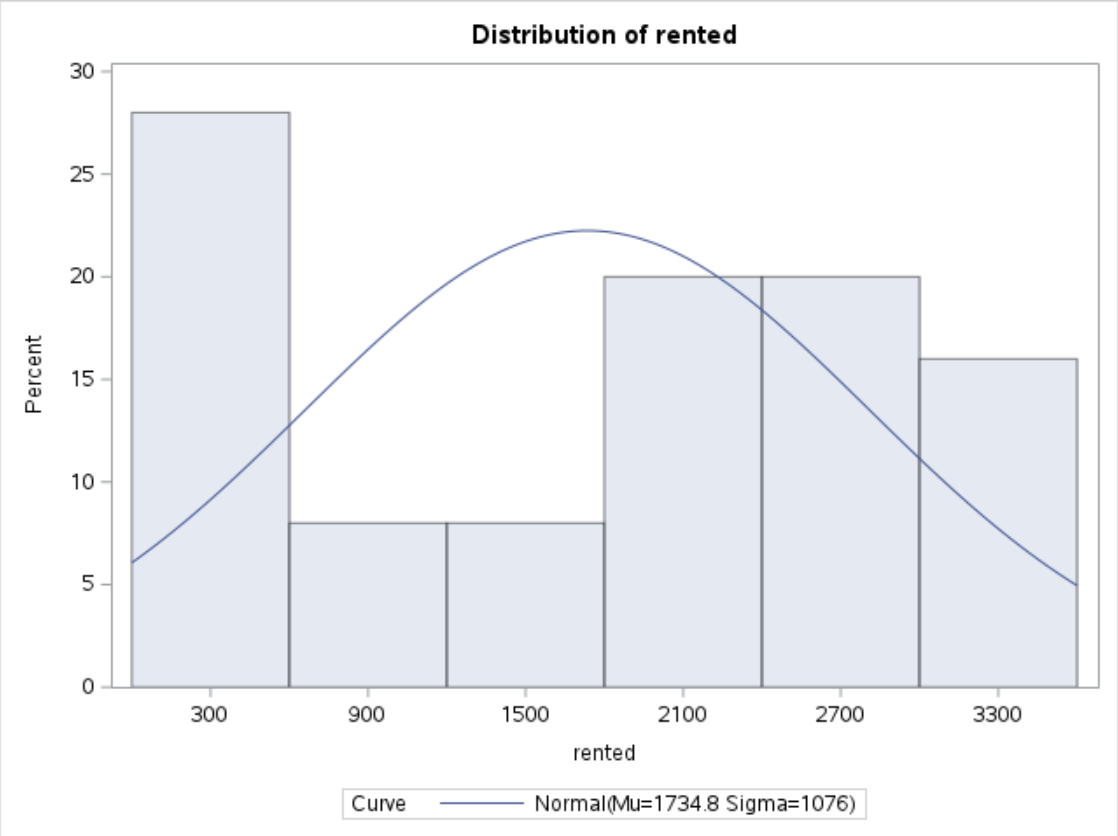
Normality Test for Rented Bikes by Weekday

wkday=Tuesday



Normality Test for Rented Bikes by Weekday

wkday=Wednesday



Normality Test for Rented Bikes by Weekday

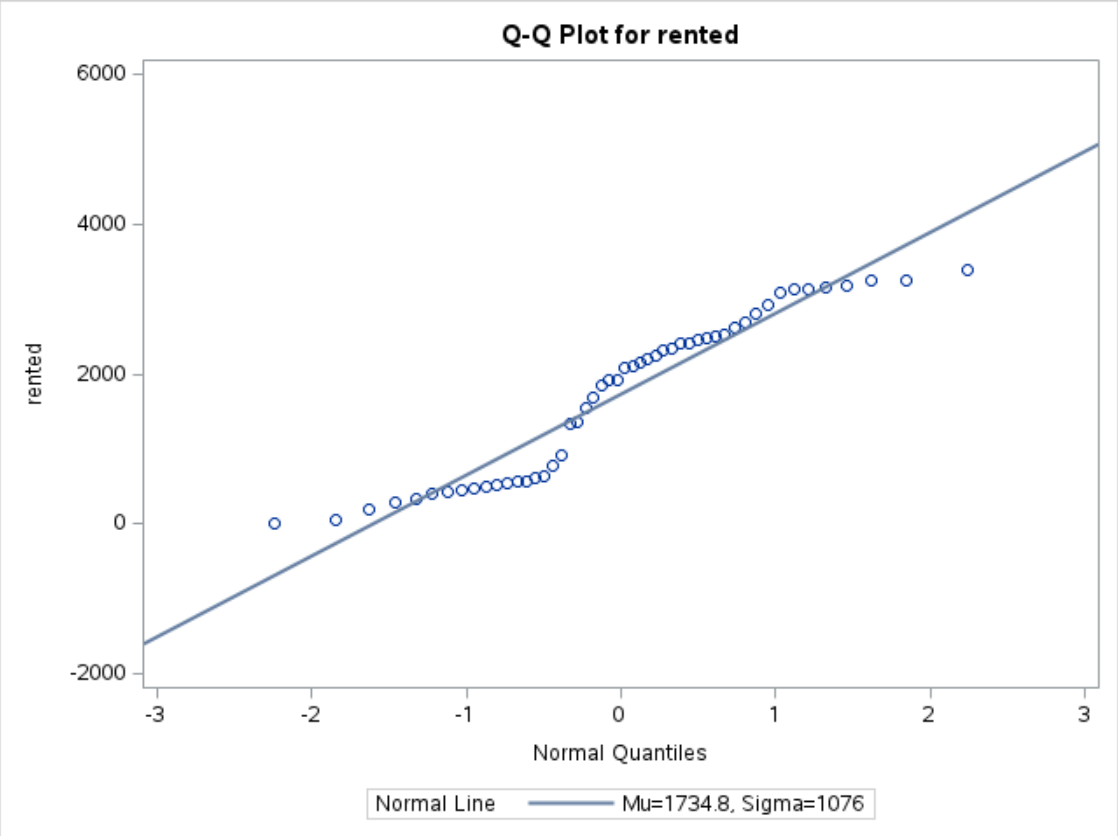
Fitted Normal Distribution for rented

wkday=Wednesday

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	**D**	0.16619929	**Pr > D**	<0.010
Cramer-von Mises	**W-Sq**	0.26812598	**Pr > W-Sq**	<0.005
Anderson-Darling	**A-Sq**	1.67818829	**Pr > A-Sq**	<0.005

Normality Test for Rented Bikes by Weekday

wkday=Wednesday



One-Way ANOVA for Rental by Weekday

Class Level Information		
Class	**Levels**	**Values**
wkday	7	Friday Saturday Sunday Monday Tuesday Wednesday Thursday

Number of Observations Read	353
Number of Observations Used	353

One-Way ANOVA for Rental by Weekday

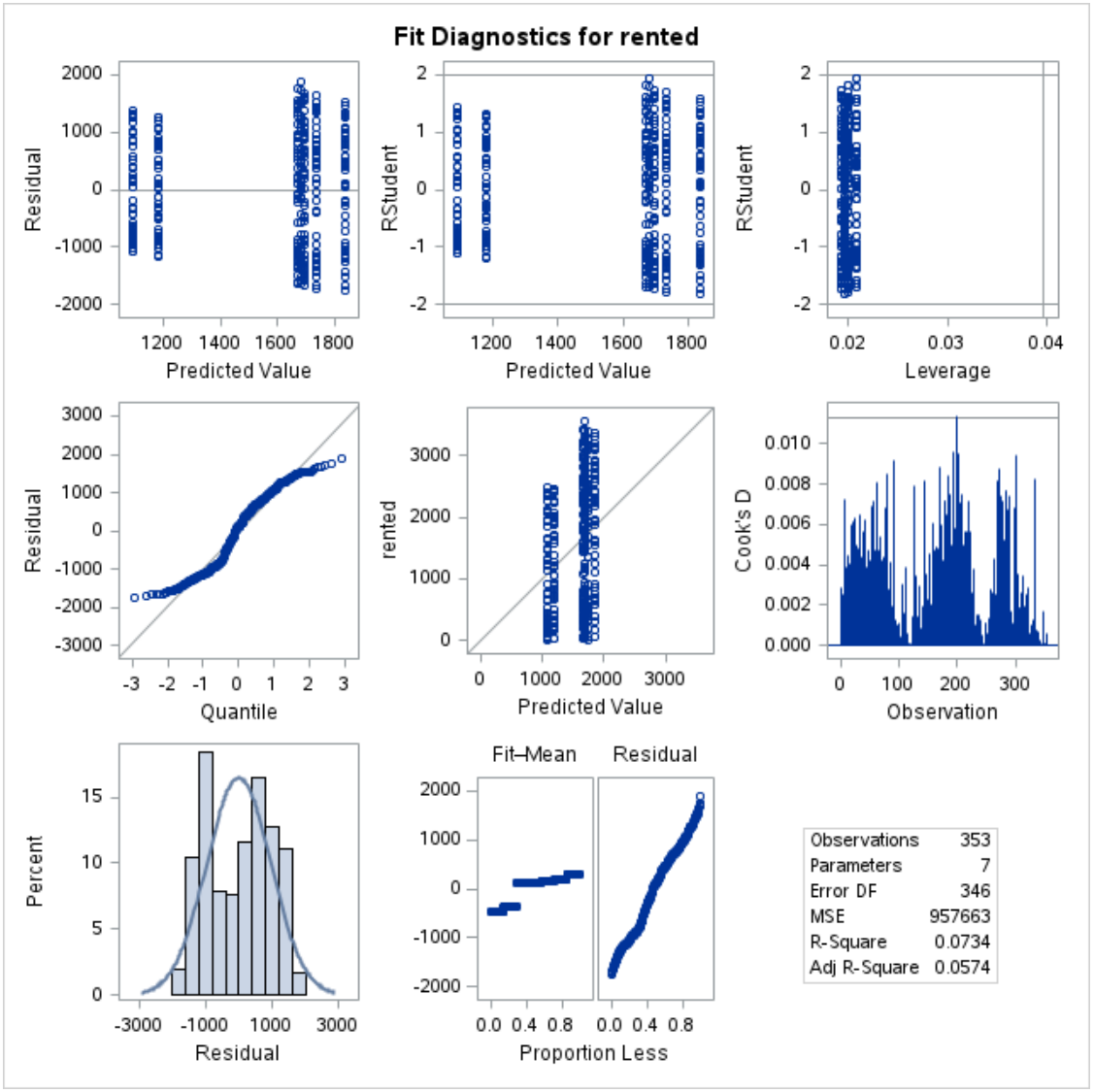
Dependent Variable: rented

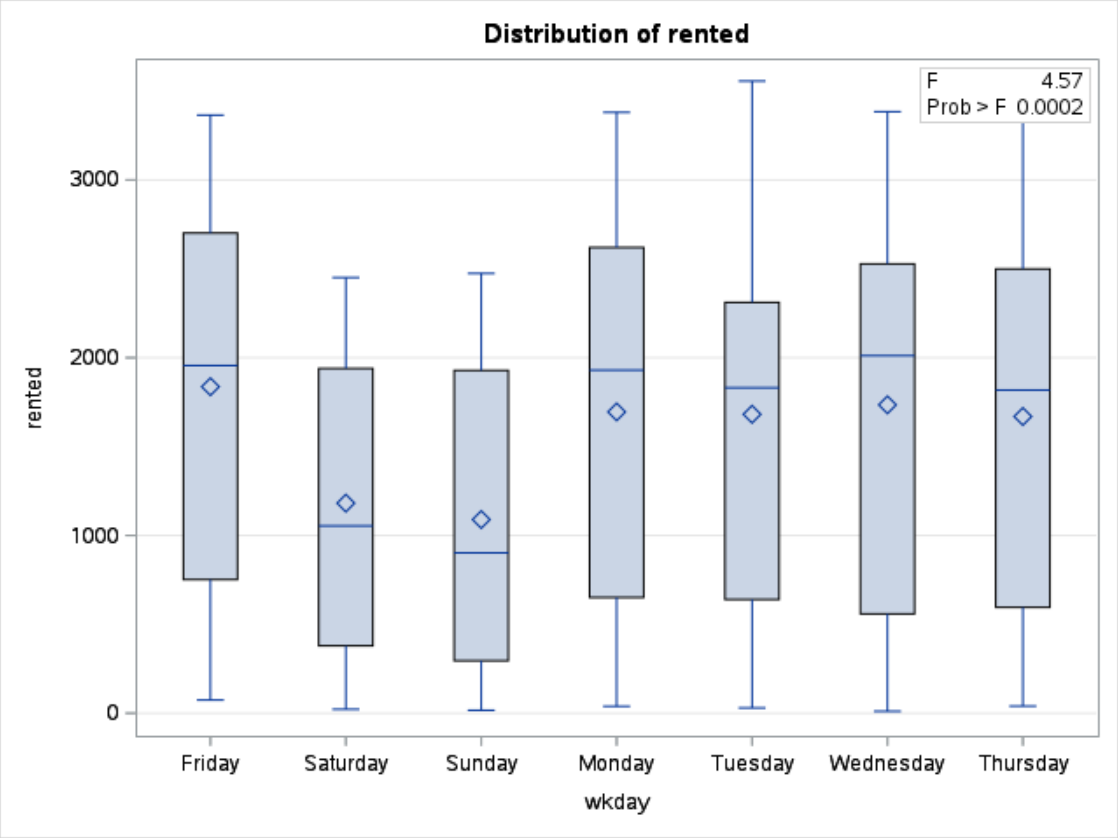
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	26265699.2	4377616.5	4.57	0.0002
Error	346	331351550.7	957663.4		
Corrected Total	352	357617249.9			

R-Square	Coeff Var	Root MSE	rented Mean
0.073446	62.97246	978.6028	1554.017

Source	DF	Type I SS	Mean Square	F Value	Pr > F
wkday	6	26265699.18	4377616.53	4.57	0.0002

Source	DF	Type III SS	Mean Square	F Value	Pr > F
wkday	6	26265699.18	4377616.53	4.57	0.0002


Fit Diagnostics for rented
Residual
Predicted Value
RStudent
Predicted Value
RStudent
Leverage
Residual
Quantile
rented
Predicted Value
Cook's D
Observation
Percent
Residual
Fit–Mean
Residual
Proportion Less
Observations 353
Parameters 7
Error DF 346
MSE 957663
R-Square 0.0734
Adj R-Square 0.0574



One-Way ANOVA for Rental by Weekday

Levene's Test for Homogeneity of rented Variance ANOVA of Squared Deviations from Group Means					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
wkday	6	1.317E13	2.195E12	3.67	0.0015
Error	346	2.067E14	5.974E11		

Welch's ANOVA for rented			
Source	DF	F Value	Pr > F
wkday	6.0000	5.46	<.0001
Error	153.3		

One-Way ANOVA for Rental by Weekday

Level of wkday	N	rented	
		Mean	Std Dev
Friday	51	1836.76471	993.60688
Saturday	51	1181.72549	793.28502
Sunday	51	1089.47059	831.68593
Monday	52	1695.00000	1063.99268
Tuesday	48	1681.70833	1022.03639
Wednesday	50	1734.82000	1076.01149
Thursday	50	1669.18000	1033.87627

One-Way ANOVA for Rental by Weekday

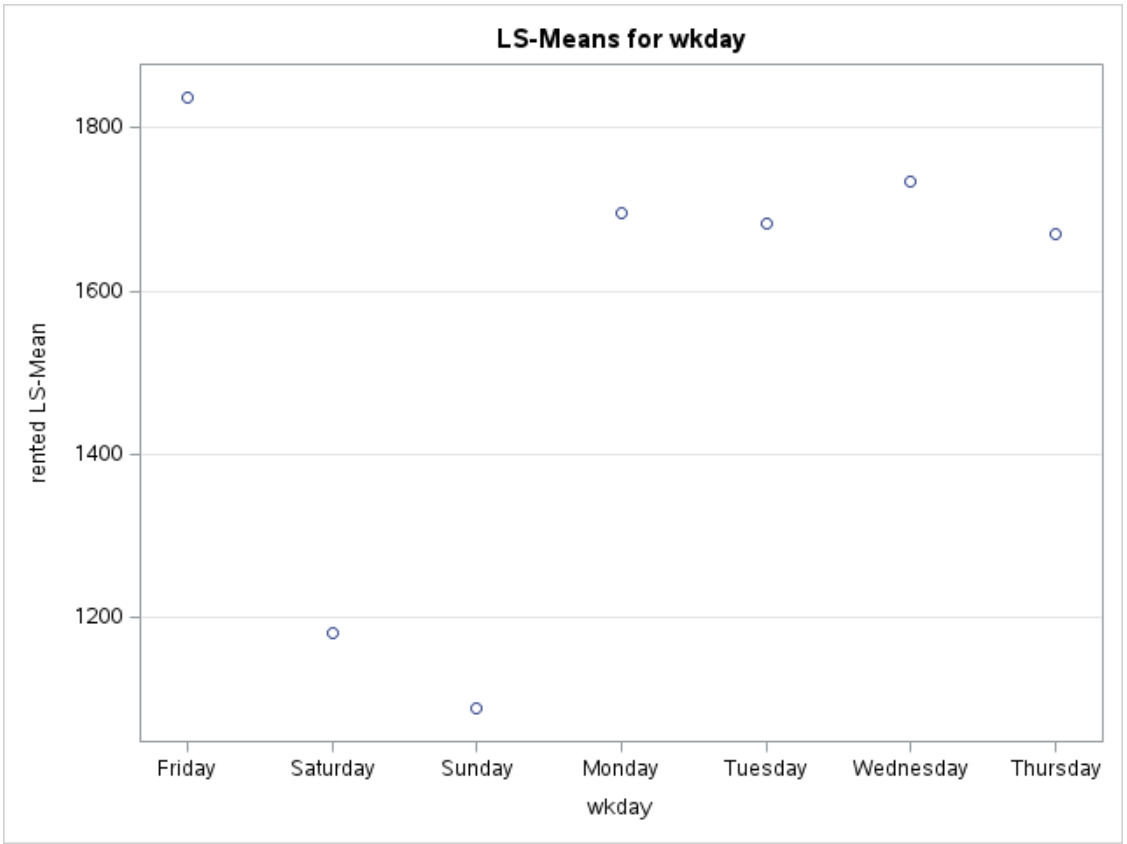
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

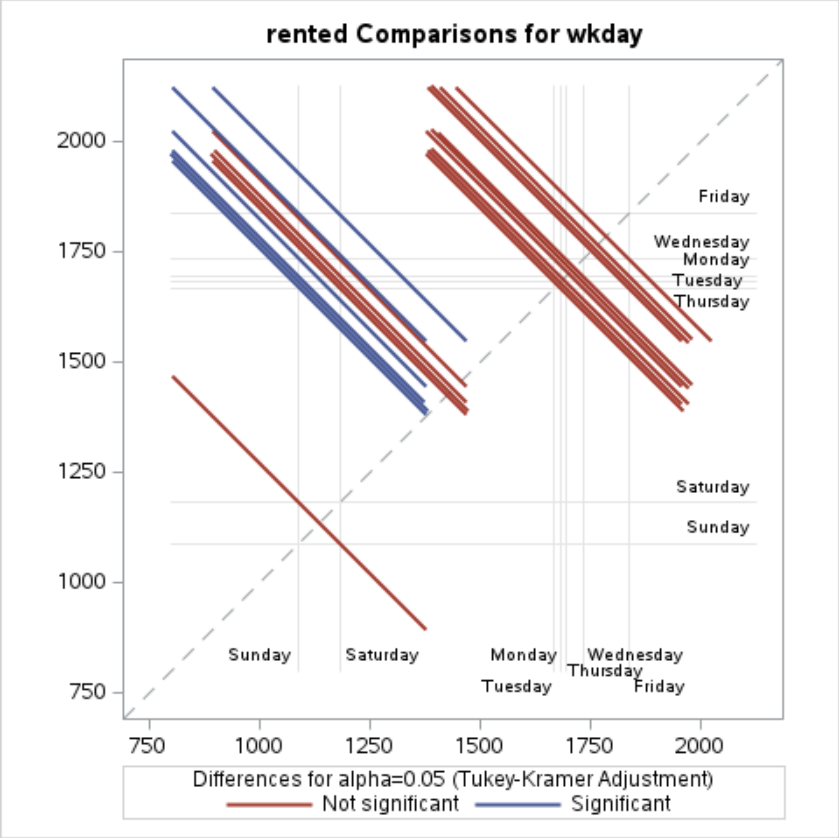
wkday	rented LSMEAN	LSMEAN Number
Friday	1836.76471	1
Saturday	1181.72549	2
Sunday	1089.47059	3
Monday	1695.00000	4
Tuesday	1681.70833	5
Wednesday	1734.82000	6
Thursday	1669.18000	7

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

Dependent Variable: rented

i/j	1	2	3	4	5	6	7
1		0.0141	0.0026	0.9903	0.9860	0.9985	0.9780
2	0.0141		0.9991	0.1114	0.1482	0.0706	0.1614
3	0.0026	0.9991		0.0301	0.0442	0.0175	0.0485
4	0.9903	0.1114	0.0301		1.0000	1.0000	1.0000
5	0.9860	0.1482	0.0442	1.0000		1.0000	1.0000
6	0.9985	0.0706	0.0175	1.0000	1.0000		0.9999
7	0.9780	0.1614	0.0485	1.0000	1.0000	0.9999	





One-Way ANOVA for Rental by Weekday

Dependent Variable: rented

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
Weekdays vs. Weekends	1	25061808.64	25061808.64	26.17	<.0001