

Chicago Crime Analysis

By JULIAN GOMEZ AND HOLLY MICHALAK

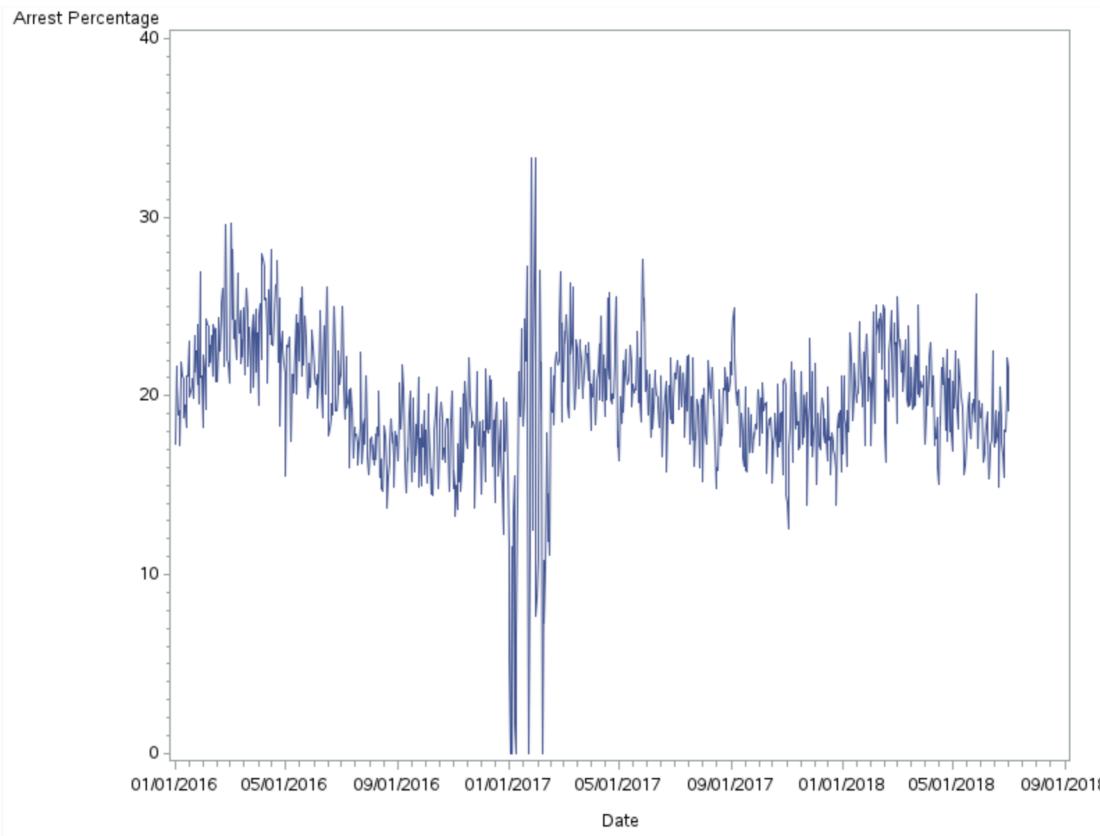
Introduction

- Change in season has different patterns in crime
- People spend more time outdoors in warmer weather than cooler weather.
- There is an apparent relationship between crime rate and season.

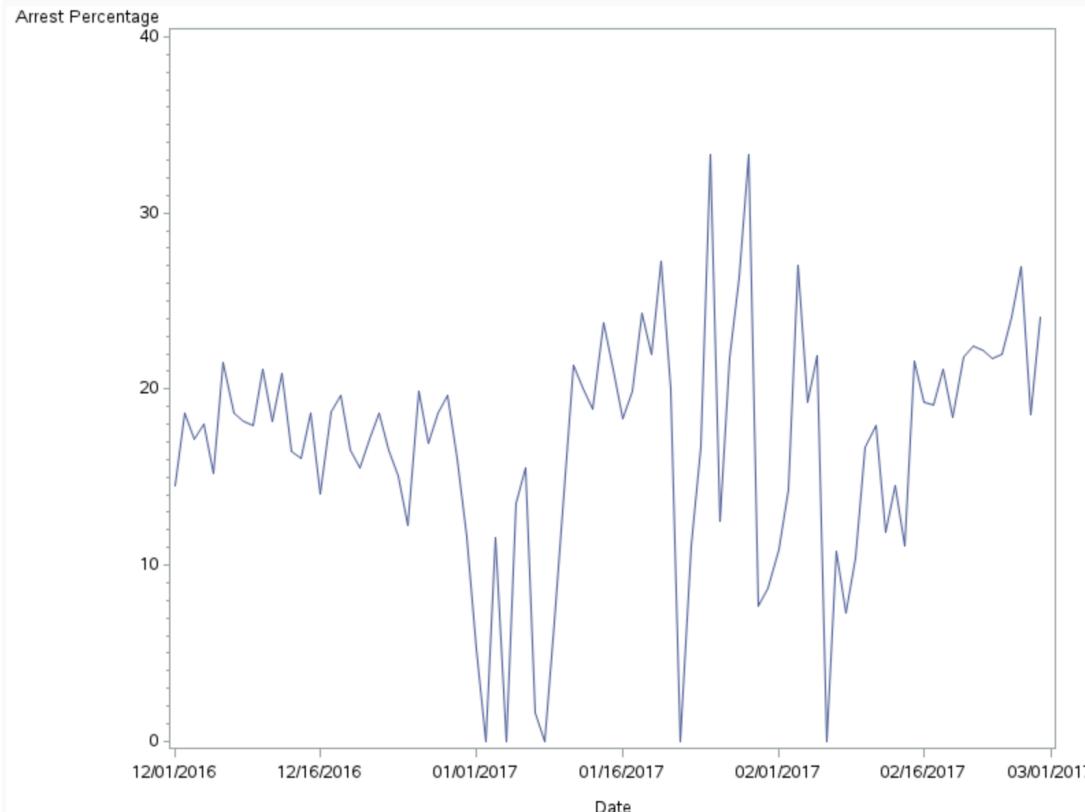
Hypotheses

- The percentage of arrests increases during the warmer (spring and summer) months and decreases during the cooler months (fall and winter).
- There are more reported crimes on weekends than weekdays.

Time Plot on Arrest percentage 2016-2018



Time Plot in January 2016 to February 2017



T- Test

The TTEST Procedure							
Variable: Arrest_Percentage							
Weather	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
cool		422	18.7970	4.0872	0.1990	0	33.3333
warm		492	20.4703	2.7148	0.1224	13.7281	29.6724
Diff (1-2)	Pooled		-1.6733	3.4175	0.2267		
Diff (1-2)	Satterthwaite		-1.6733		0.2336		

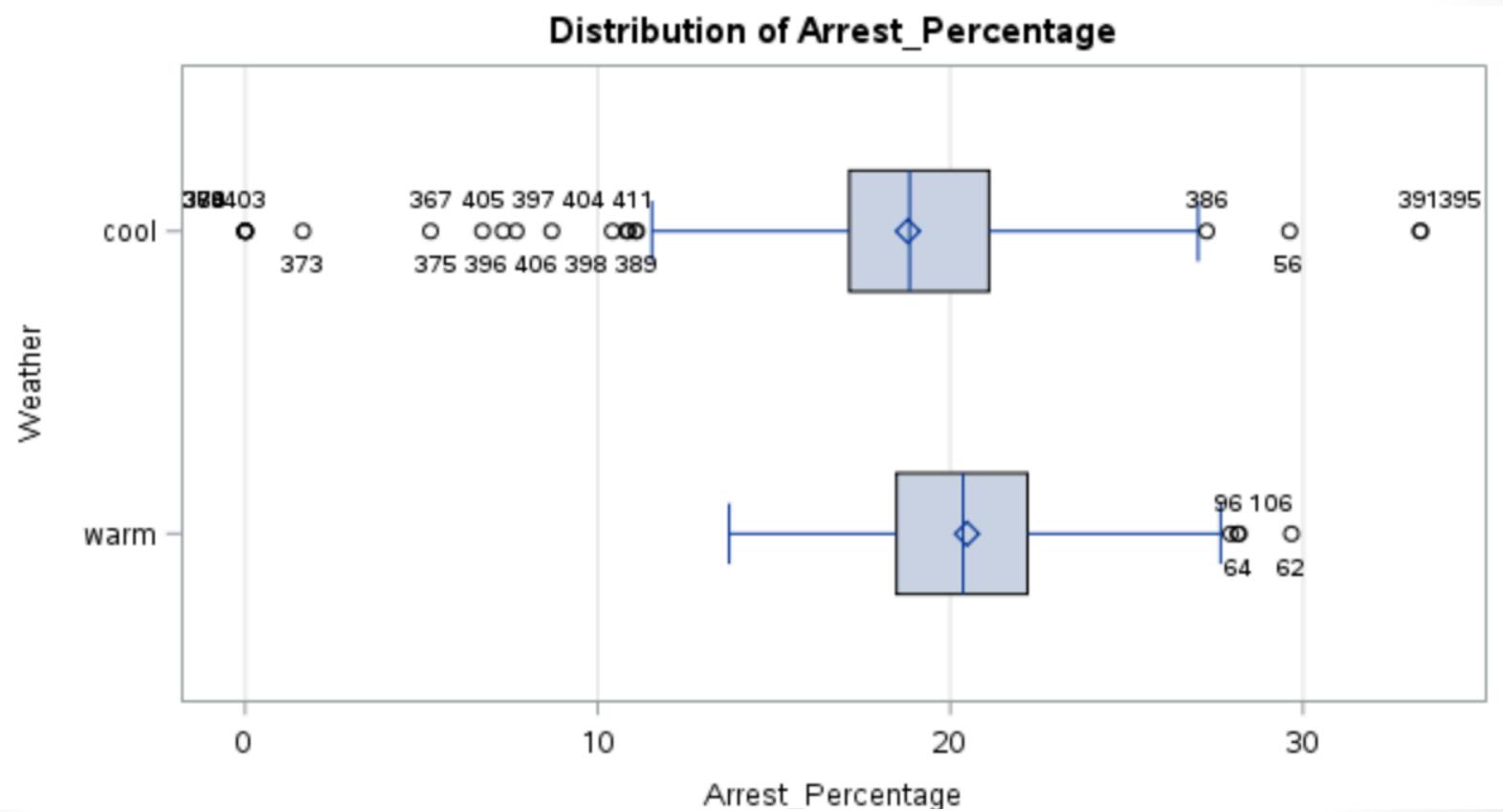
Weather	Method	Mean	95% CL Mean	Std Dev	95% CL Std Dev
cool		18.7970	18.4060	19.1881	4.0872 3.8288 4.3833
warm		20.4703	20.2299	20.7108	2.7148 2.5551 2.8959
Diff (1-2)	Pooled	-1.6733	-lnfty	-1.2999	3.4175 3.2676 3.5819
Diff (1-2)	Satterthwaite	-1.6733	-lnfty	-1.2886	

Method	Variances	DF	t Value	Pr < t
Pooled	Equal	912	-7.38	<.0001
Satterthwaite	Unequal	712.43	-7.16	<.0001

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	421	491	2.27	<.0001

- The variances are unequal.
- The mean arrest percentage for cooler weather is less than the percentage for warmer weather.

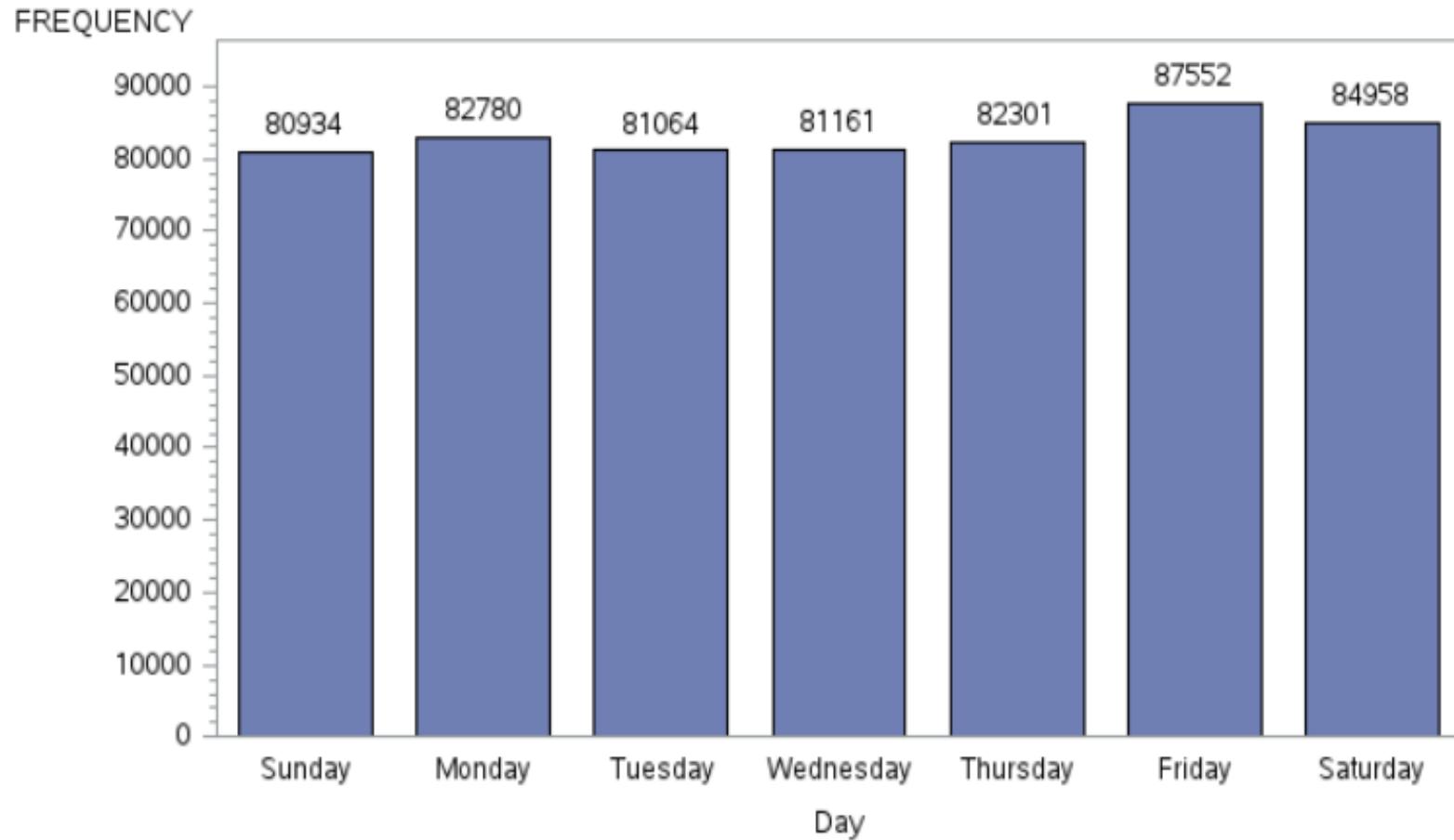
Boxplot of Arrest Percentage by Weather



Two-way ANOVA

- The mean frequency of reported crimes per day for each day of the week is equal to the population mean
- The mean frequency of reported crimes per day for each season is equal to the population mean
- Is there any interaction between the mean for day of the week and season?

Crimes Reported by Day of Week



Two-way ANOVA with Interaction

The GLM Procedure
Dependent Variable: COUNT Frequency Count

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	27	5841287.64	216343.99	14.71	<.0001
Error	886	13031074.56	14707.76		
Corrected Total	913	18872362.21			

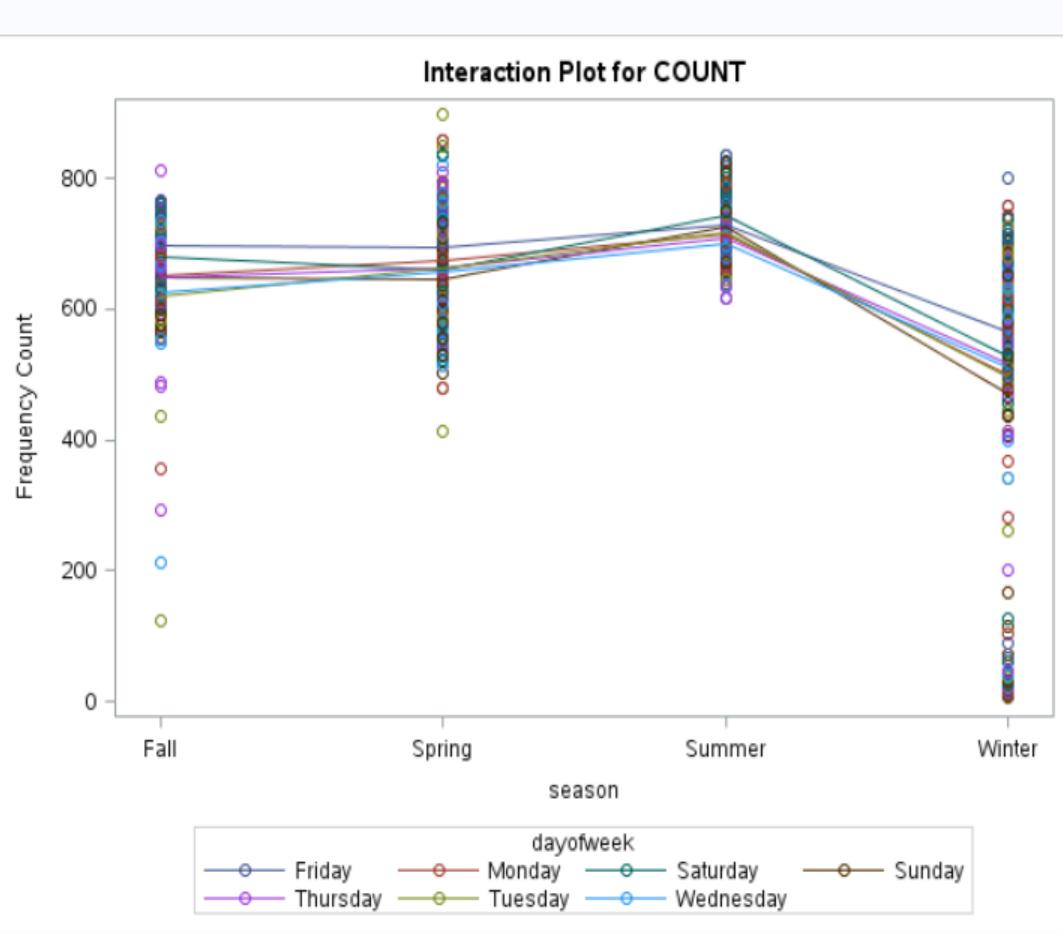
Source	DF	Type I SS	Mean Square	F Value	Pr > F
season	3	5450387.320	1816795.773	123.53	<.0001
dayofweek	6	251453.439	41908.906	2.85	0.0094
season*dayofweek	18	139446.884	7747.049	0.53	0.9466

Source	DF	Type III SS	Mean Square	F Value	Pr > F
season	3	5450725.587	1816908.529	123.53	<.0001
dayofweek	6	255354.788	42559.131	2.89	0.0085
season*dayofweek	18	139446.884	7747.049	0.53	0.9466

- Main effects both significant

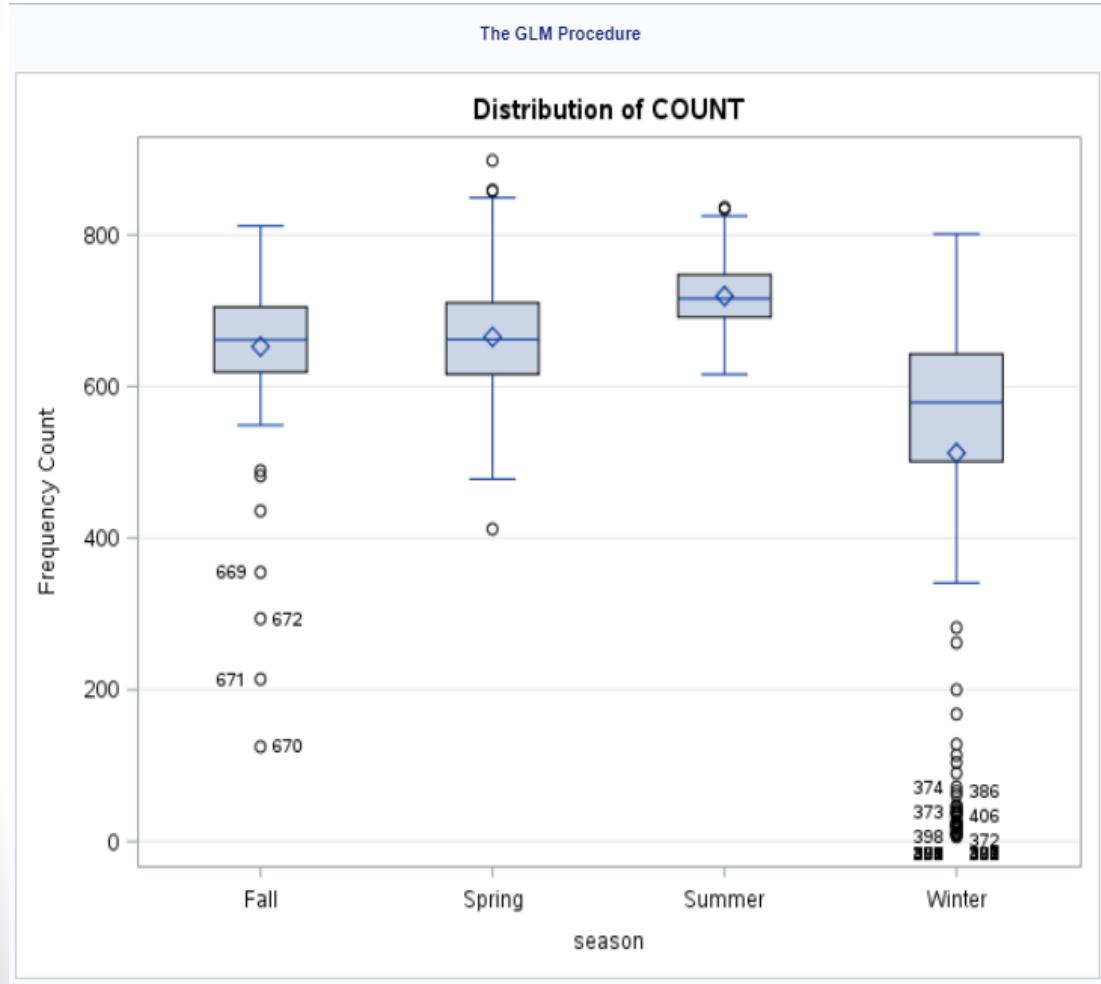
- Interaction not significant

Interaction Plot



- Lines are parallel,
interaction not significant

Boxplots



SNK Test

COUNT SNK Grouping for Means of season (Alpha = 0.05)

Means covered by the same bar are not significantly different.

season Estimate

Summer 719.19



Spring 665.37



Fall 652.69



Winter 512.39



COUNT SNK Grouping for Means of dayofweek (Alpha = 0.05)

Means covered by the same bar are not significantly different.

dayofweek Estimate

Friday 668.34



Saturday 648.53



Thursday 633.08



Monday 631.91



Wednesday 624.32



Tuesday 623.57



Sunday 617.82



Remove Interaction

The GLM Procedure

Dependent Variable: COUNT Frequency Count

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	5701840.76	633537.86	43.48	<.0001
Error	904	13170521.45	14569.16		
Corrected Total	913	18872362.21			

- Main effects are both still significant

- Results of SNK do not change

Source	DF	Type I SS	Mean Square	F Value	Pr > F
season	3	5450387.320	1816795.773	124.70	<.0001
dayofweek	6	251453.439	41908.906	2.88	0.0088

Source	DF	Type III SS	Mean Square	F Value	Pr > F
season	3	5460172.889	1820057.630	124.93	<.0001
dayofweek	6	251453.439	41908.906	2.88	0.0088

Conclusion and Limitations

- Both t-test and ANOVA found statistical significance, not really practical significance or importance
- Opportunity for time series analysis
- Narrow down dataset, e.g. one type of crime
- Added temperature data (more quantitative variables)