NJ & PA Crime Analysis

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Goals and Resources

Goal

Our hypothesis is that Pennsylvania experiences more serious crime than New Jersey.

We also wanted to discover influencing factors:

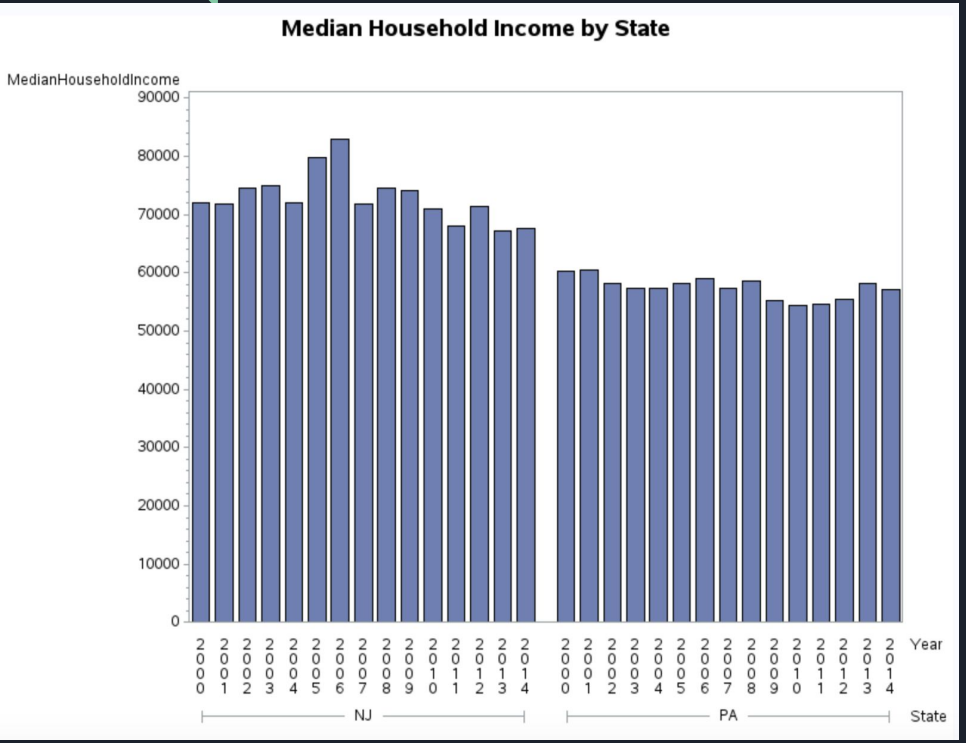
- differences in the poverty rate
- average CPI
- median household income for the regions.

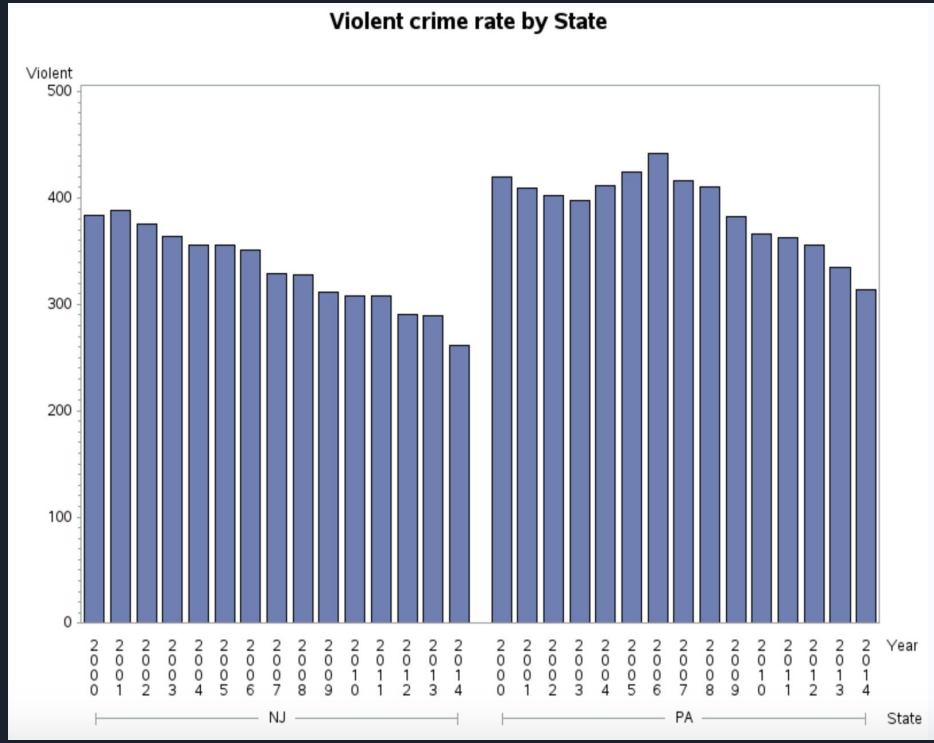
Resources

- crime statistics from the FBI
- poverty rates from departments of labor
- median income and CPI from FRED
- 2000-2014 data used

Serious crime is defined here by violent crime, murder, and robbery rates.

Predictions





Correlations

Pearson Correlation Coefficients, N = 15 Prob > |r| under H0: Rho=0						
	Murder	**Violent**	**Robbery**	**AverageCPI**	**PovertyPct**	**MedianHouseholdIncome**
Murder Murder	1.00000	-0.04646 0.8694	0.00513 0.9855	0.17440 0.5342	-0.13265 0.6374	0.44043 0.1004
Violent Violent	-0.04646 0.8694	1.00000	0.98050 <.0001	-0.97234 <.0001	-0.89244 <.0001	0.51585 0.0490
Robbery Robbery	0.00513 0.9855	0.98050 <.0001	1.00000	-0.92694 <.0001	-0.84597 <.0001	0.48917 0.0642
AverageCPI AverageCPI	0.17440 0.5342	-0.97234 <.0001	-0.92694 <.0001	1.00000	0.87549 <.0001	-0.40963 0.1294
PovertyPct PovertyPct	-0.13265 0.6374	-0.89244 <.0001	-0.84597 <.0001	0.87549 <.0001	1.00000	-0.55520 0.0317
MedianHouseholdIncome MedianHouseholdIncome	0.44043 0.1004	0.51585 0.0490	0.48917 0.0642	-0.40963 0.1294	-0.55520 0.0317	1.00000

Testing murder rates

H_0: the difference in true mean murder rate of NJ and PA is equal to 0.

H_A: the true difference in mean murder rate of NJ-PA is < 0.

We would not find a significant difference between the mean murder rates between NJ and PA

QQplots of MurderRate ViolentCrimeRate and AverageCPI by State

The TTEST Procedure

Variable: Murder (Murder)

State	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
NJ		15	4.2600	0.4171	0.1077	3.4000	4.9000
PA		15	5.3200	0.4161	0.1074	4.8000	6.1000
Diff (1-2)	Pooled		-1.0600	0.4166	0.1521		
Diff (1-2)	Satterthwaite		-1.0600		0.1521		

State	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
NJ		4.2600	4.0290	4.4910	0.4171	0.3054	0.6579
PA		5.3200	5.0896	5.5504	0.4161	0.3046	0.6562
Diff (1-2)	Pooled	-1.0600	-1.3188	Infty	0.4166	0.3306	0.5635
Diff (1-2)	Satterthwaite	-1.0600	-1.3188	Infty			

Method	Variances	DF	t Value	Pr > t
Pooled	Equal	28	-13.54	1.0000
Satterthwaite	Unequal	28	-13.54	1.0000

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	14	14	1.00	0.9928

Testing robbery rates

H_0: The difference of true median murder rate between NJ and PA is 0.

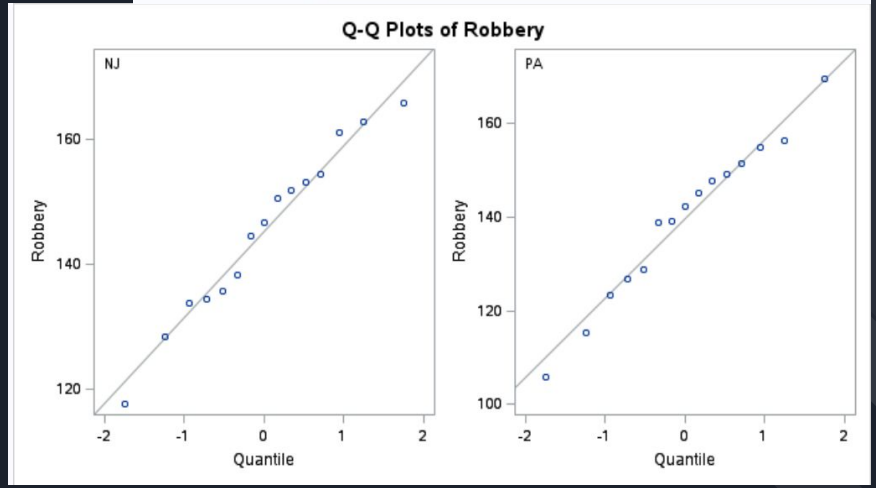
H_A:The difference of true median murder rate between NJ and PA is < 0

The data of the Q-Q plot was normal enough to use a lower-tail t-test.

- We could not find a significant difference between New Jersey and Pennsylvania robbery rates.

Method	Variances	DF	t Value	Pr > t
Pooled	Equal	28	0.81	0.2132
Satterthwaite	Unequal	26.84	0.81	0.2134

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	14	14	1.52	0.4398



Testing violent crime rates

H_0: The difference between true mean of violent crime of NJ-PA=0

H_A: The difference between true mean of violent crime of NJ-PA<0

- **The data is not normal enough to use a t-test.**
- **We will use the Wilcoxon Sum-Rank Test.**
- **Conclude that New Jersey has a higher violent crime rate.**

The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable Violent Classified by Variable State

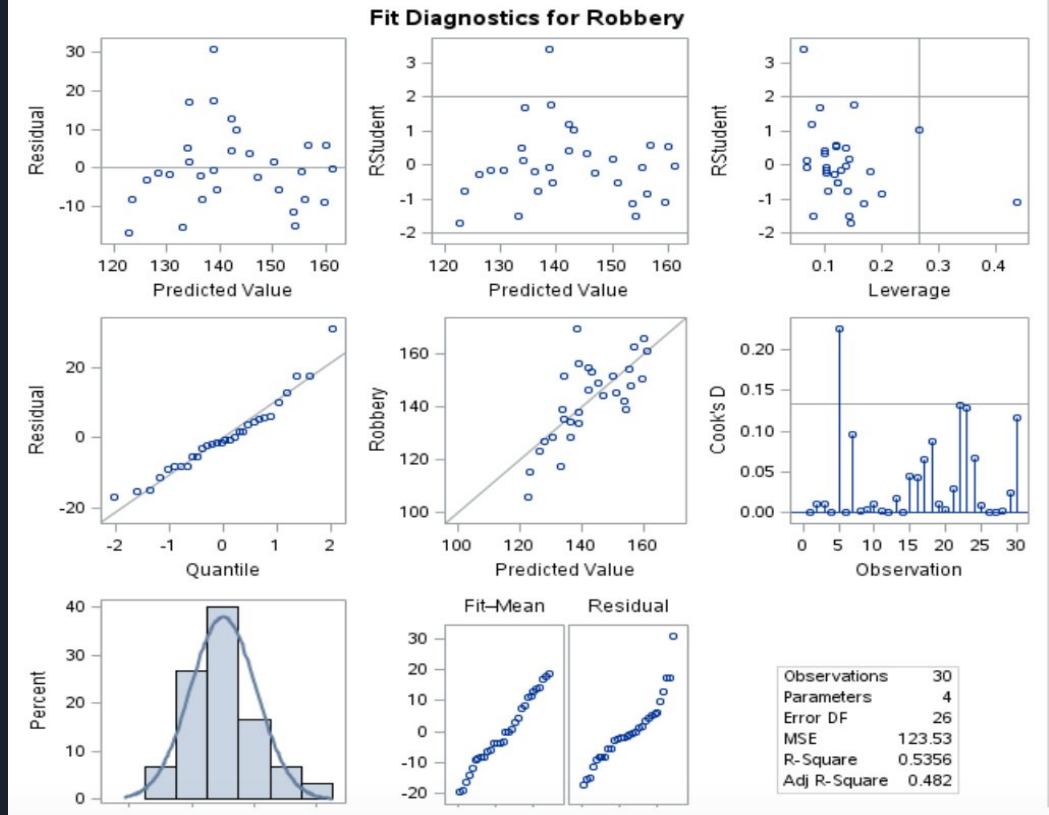
State	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
NJ	15	150.0	232.50	24.109127	10.0
PA	15	315.0	232.50	24.109127	21.0

Wilcoxon Two-Sample Test	
Statistic	150.0000
Normal Approximation	
Z	-3.4012
One-Sided Pr < Z	0.0003
Two-Sided Pr > |Z|	0.0007
t Approximation	
One-Sided Pr < Z	0.0010
Two-Sided Pr > |Z|	0.0020
Z includes a continuity correction of 0.5.	

Robbery Regression

- We could not find a significant relationship between robbery and our selected variables
- Our model accounts for 53.56% of the variance in robbery
  - Missing a lot of the picture
  - Still worth taking a look?

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	279.06518	52.81916	5.28	<.0001
PovertyPct	PovertyPct	1	-3.81149	3.97038	-0.96	0.3459
AverageCPI	AverageCPI	1	-0.25777	0.16747	-1.54	0.1358
MedianHouseholdIncome	MedianHouseholdIncome	1	-0.00056013	0.00056994	-0.98	0.3348

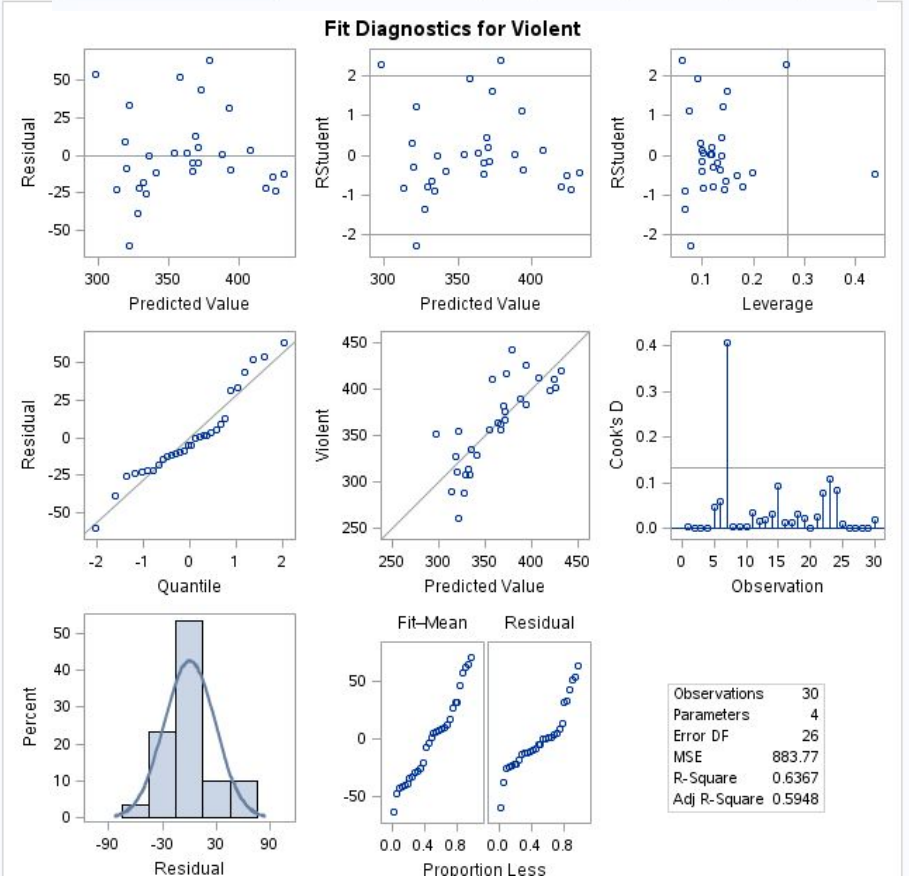


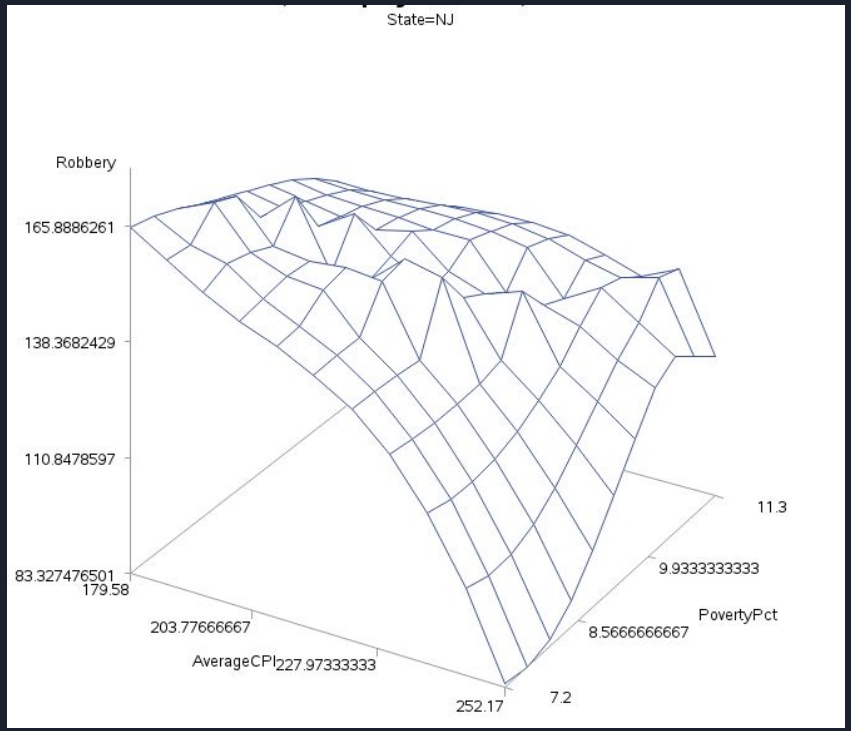
Violent Crime Regression

- Our model found a significant relationship between violent crime rates and both, AverageCPI and MedianHouseholdIncome
- Our model accounts for 59.48% of the variance in robbery
  - Missing a lot of the picture

Parameter Estimates

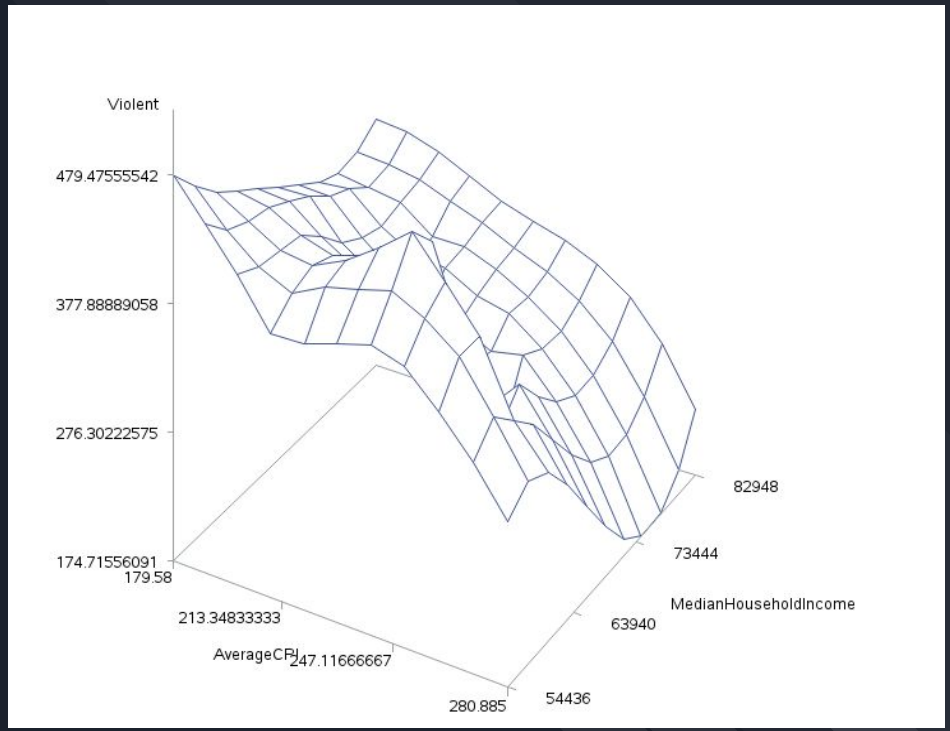
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	944.45346	141.27758	6.69	<.0001
PovertyPct	PovertyPct	1	-0.00429	10.61973	-0.00	0.9997
AverageCPI	AverageCPI	1	-1.26344	0.44793	-2.82	0.0091
MedianHouseholdIncome	MedianHouseholdIncome	1	-0.00450	0.00152	-2.95	0.0066





Plotting Robbery as a function of CPI and PovertyRate, reveals that average CPI is what drives robbery rates.

Lower poverty and higher CPI= Decreased Robbery

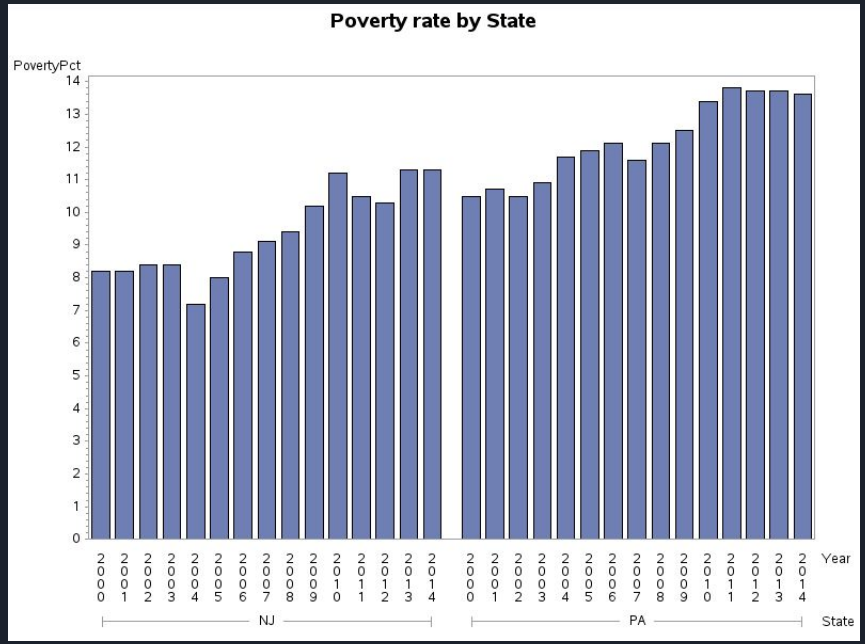


Plotting Violent crime rates as a function of CPI and Median Household Income, reveals that CPI is also what drives violent crime rates.

Higher MedianIncome and Higher CPI= Decreased Violent

Findings

- Poverty rate and Average CPI seem to be decent predictors for robbery rates for PA and NJ.
- Average CPI and Median Household Income are significant to understanding violent crime rates of PA and NJ.
- NJ has Higher Median Income, Higher CPI, and a lower poverty rate compared to PA. Our model finds that NJ has less violent crime, partially for these reasons



Conclusion

- Average CPI and Median Household Income were the only significant predictors we could find for analyzing crime data.
- PA has a higher violent crime rate than NJ.
- Would be interesting to see other variables (gun laws, education) play into our model.

Overall, Pennsylvania was significantly higher in mean violent crime rates.

(Murder and robbery rates were not significantly different)

Poverty rate, CPI, and Median Income are all correlated with the differing rates of serious crime between the two states.