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Analysis of Federal Funds Rate, Discount Rate, and Government Spending Correlation with U.S. Poverty

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ABSTRACT

Every year, the U.S. federal government makes economic decisions that impact the wellbeing of our society. One common yearly goal of the federal government is to reduce the amount of people living in poverty. Both the official and supplemental poverty measures are based on estimates of the level of income needed to cover basic needs. Those who live in households with earnings below the basic needs income level are considered to be in poverty. To effectively control the U.S. poverty rate, the federal government must make decisions regarding how much money it spends on the public and how it sets various interest rates. The degree to which the federal government changes its actions each year depends on economic and societal conditions of the time period and often affects the U.S. poverty rate. Businesses also have a large influence on those living in poverty through their decisions and strategies, which affect worker morale and productivity. The main focus of this paper is to determine the degree to which the federal government can implement or change major economic policies to reduce the U.S. poverty rate. To analyze the relationships between federal economic policies and the U.S. poverty rate, statistical analysis mainly using regressions was done; inferences about how the federal funds rate, the discount rate, and federal government spending impact the U.S. poverty rate were also made.

Introduction

Poverty is more than a lack of income. It has a range of different socioeconomic dimensions, such as the ability to access services and social protection measures, to express opinions and choices, and to assume decent work and opportunities. Poverty is also the root cause of many human rights and labor rights violations. For example, child labor, forced labor, and human trafficking are each deeply connected to poverty. On a smaller scale, businesses can help with the U.S. poverty rate by protecting the rights of poor employees working minimum wage jobs. However, it is the job of the federal government to protect the wellbeing of those living in poverty on a broader scale by providing support through welfare programs or by altering certain economic policies.

Literature Review

The amount of government spending is a fiscal policy that can correlate with the U.S. poverty rate because spending can often help the poor by providing welfare. Mayer et al. (2016) studied the effect of state government spending on the distribution of economic growth. To do this, they created a regression model of the per capita income increase of families of various income levels from 1959-2008. They then compared the average income growth rates of families for each of the five decades of the time period with the different rates of average state spending for each decade. Mayer et al. took data from the historical files for the Finances of State Government for fiscal years from 1956 to 2009.

For families of all income percentiles, the percent increase in per capita income was significantly higher during the first decade from 1959 to 1968, with an overall increase of 3.721 percent in total family income. This

decade was the only decade where the average state expenditure exceeded the average state revenue with a ratio of 1.045. The next four decades had expenditure to revenue ratios of 0.966, 0.913, 0.898, and 0.877, respectively, and there was a steady decline in the income growth of families on average for each decade. While Mayer et al.'s data showed a clear positive correlation between the average state government spending and income increase, the data does not specify average income increases for each of the individual income percentiles and only reports the overall income increases for all incomes. The 10th and 30th percentile income per capita increased slightly more during the first few decades than in the more recent decades, but it was unclear as to whether that increase is significant. In addition, the effects of state government spending on income, although similar to federal government spending, are not identical. Thus, the positive correlation between state government spending and overall income from Mayer et al.'s results does not clearly suggest that federal spending is correlated with the U.S. poverty rate.

Monetary policies set by the federal reserve could also impact the U.S. poverty rate and include the federal funds rate and the discount rate, which are the interest rates at which banks lend money to other banks and at which the federal reserve lends money to banks, respectively. There could be a correlation between these two interest rates and the U.S. poverty rate because they both affect the interest rate that banks lend money out to the public. Agu & Nyatanga (2020) conducted a study to determine the effects of multiple macroeconomic variables and oil prices on poverty in Nigeria. In this study, they ran regressions of each of the predictor variables on the Nigeria poverty rate. The national interest rate (the discount rate of the Central Bank of Nigeria) was one notable predictor variable that they concluded was statistically significant. They found that a 1% increase in the interest rate led to a 2.735% increase in poverty in the long run, and this relationship was statistically significant at the 5% significance level.

Another study conducted by Matschke et al. (2023), measured the effect of U.S. monetary policy on emerging markets of various countries in the world (stated in Endnotes of the study). Emerging markets are exposed to financial spillovers from U.S. monetary policy (Matschke et al.). When the Federal Reserve raises the federal funds rate, international investors decrease foreign investments, which leads to less foreign debt. The federal funds rate was shown to have a significant negative relationship with foreign debt. This reduced debt could lead to more domestic welfare and potentially reduce the U.S. poverty rate. The result of this study contrasts with that of the Nigeria study as it indicates an increase in a form of national interest rate decreases the national poverty rate. The results of these two studies suggest that monetary policies relating to interest rates can affect the national poverty rate differently based on the country's level of development. In a developed country like the U.S., increasing an interest rate likely leads to a decrease in poverty, while in a developing country like Nigeria, increasing an interest rate likely leads to an increase in poverty.

Purpose

The purpose of this paper is to measure how well the federal funds rate, the discount rate, and federal government spending can predict the poverty rate in the U.S.. It is interesting to see how certain federal actions can impact the number of people living in poverty and the trends of these actions on the U.S. poverty rate; significant relationships could help the federal government and possibly businesses or local governments with decision making to mitigate poverty. The main question I will consider is: Can the federal government effectively manipulate certain interest rates and annual spending to reduce the U.S. poverty rate? The following data analysis and regressions using RStudio will attempt to answer this question. I will use various methods to compare and determine the effects of the predictor variables on the response variable.

Methods

Data Collection

The units of observation of this study were the individual years from 1989-2022, excluding the years 1990, 1991, 1992, and 1994 as a result of missing data for the U.S. poverty rate for these years. All data was downloaded from the FRED dataset, which consisted of Excel csv files of the data. Due to the limitations of the datasets used, which had data for a set number of years, the random and independent conditions were not met. The normality condition for sampling distributions was met due to the sufficiently large sample size of 30. For the variables, I decided to use one response measure for each year. The response variable, the U.S. poverty rate, had data that was already given as a single measure each year, so no changes were made. The three predictor variables were not given as a single value for each year. For the federal funds rate and the discount rates, the data provided by the FRED was given as monthly rates, so I took the mean rate for each year for both rates. The federal government spending data provided was given quarterly, so I summed the quarterly spendings for each year to get a single spending amount for each year. After getting all the predictor variables' values for each year, I combined the data for the U.S. poverty rate variable and the three predictor variables into a single csv file, and matched them by year. All data was quantitative, except for the years, which were categorical. The raw data is shown in table 1 below.

Table 1. Raw Data.

Year	U.S. Poverty Rate	Discount Rate	Federal Funds Rate	Federal Government Spending (Billions of Dollars)
1989	12.8	6.92	9.22	4807
1993	15.1	3	3.02	6178
1995	13.8	5.21	5.84	6638
1996	13.7	5.02	5.3	6863
1997	13.3	5	5.46	7037
1998	12.7	4.92	6.4	7154
1999	11.9	4.62	4.97	7347
2000	11.3	5.73	6.24	7632
2001	11.7	3.41	3.89	8069
2002	12.1	1.17	1.67	8555
2003	12.5	2.1	1.13	9174
2004	12.7	2.39	1.35	9686
2005	13.3	4.25	3.21	10394
2006	13.3	6.02	4.96	11043

2007	13	5.79	5.02	11712
2008	13.2	2.17	1.93	12828
2009	14.3	0.4	0.16	13941
2010	15.3	0.73	0.18	15059
2011	15.9	0.75	0.1	15231
2012	15.9	0.75	0.14	15094
2013	15.8	0.75	0.11	15081
2014	15.5	0.75	0.09	1554
2015	14.7	0.77	0.13	16023
2016	14	1.02	0.4	16512
2017	13.4	1.63	1	16969
2018	13.1	2.46	1.83	17958
2019	12.3	2.75	2.16	18994
2020	11.9	0.58	0.38	26679
2021	12.8	0.25	0.08	28514
2022	12.6	1.85	1.68	24154

Statistical Analysis Process

Prior to doing any multiple linear regressions, I decided to see if there was a correlation between each of the predictor variables and the U.S. poverty rate. To do this, I ran a model for poverty on each of the individual predictor variables to see how well each of them correlated with the U.S. poverty rate. From the simple linear regression models, the significant p-values, 0.0115 and 0.0165, for the federal funds rate and the discount rate, respectively, suggested that the slopes for both were likely not zero and that there was some correlation between these interest rates and the U.S. poverty rate. The r^2 values for the federal funds rate and the discount rate models were 0.207 and 0.1887, showing a weak positive correlation between each of them individually and the U.S. poverty rate. For the federal government spending, the slope was not significantly different from 0 due to the very high p-value of 0.662, and the r^2 value was only 0.006913.

The residual plots for the federal funds rate and the discount rate seemed to have a slight pattern while the residual plot for the federal government spending had a clear pattern. The three normal probability plots were also slightly curved at the tails. This makes the previously stated inferences biased.

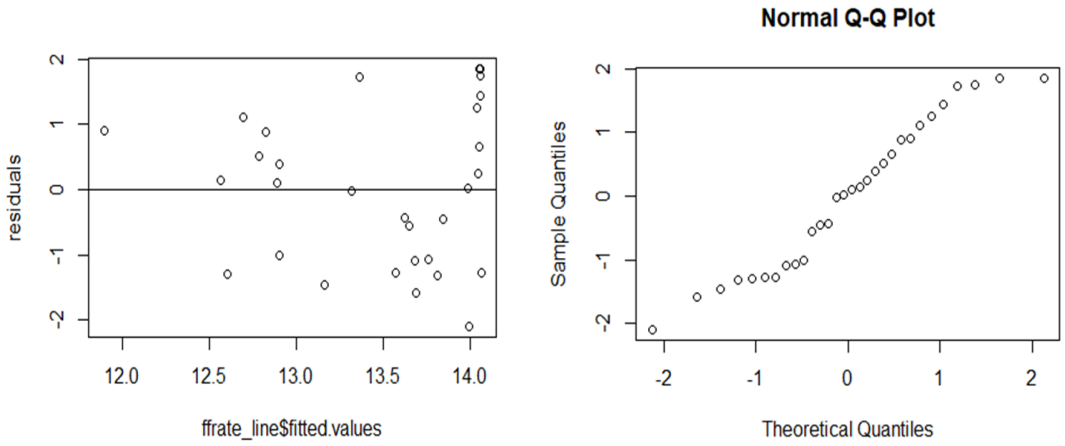

Figure 1 and Figure 2. Residual plot and normal probability plot for the U.S. poverty rate on the federal funds rate.

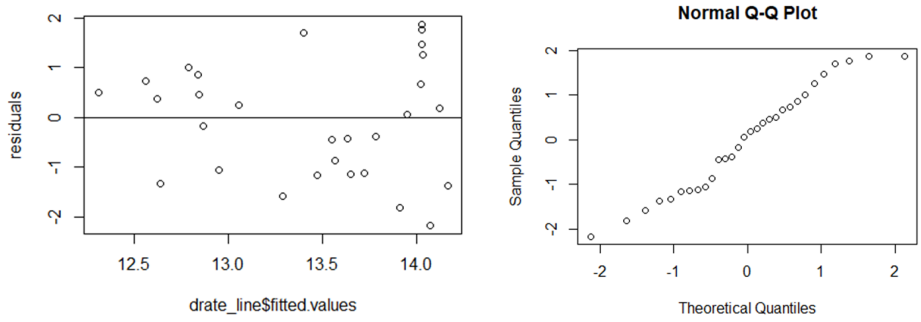

Figure 3 and Figure 4. Residual plot and normal probability plot for the U.S. poverty rate on the discount rate.

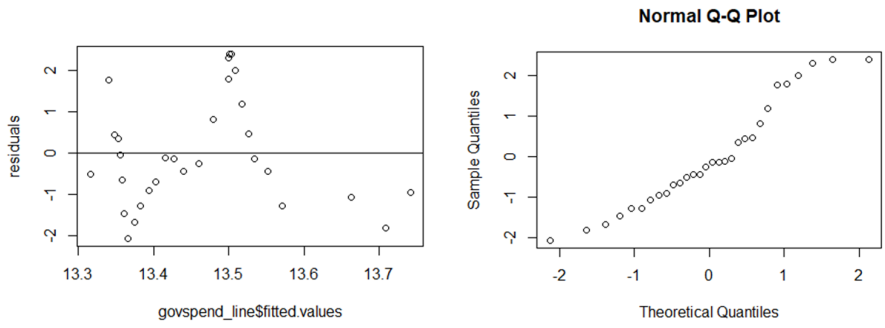

Figure 5 and Figure 6. Residual plot and normal probability plot for the U.S. poverty rate on federal government spending.

Note: The remaining portion of the methods section continues to describe the process I took to analyze the raw data and come to a conclusion after the simple linear regressions. Any corresponding models, tables, or plots described in this portion are explicit in the results section.

After observing each of the individual regressions, I ran the full model of the U.S. poverty rate on the three predictor variables. The residual plot for the full model had a slight pattern, so the conditions for an inference were not met. The p-values for the federal funds rate and the discount rate became much larger compared to their simple linear regressions, indicating that there was likely multicollinearity between the two interest rates. To check my suspicion for multicollinearity between the discount rate and federal funds rate, I ran a linear regression between them and found that they were closely related.

Next, I decided to run all the two predictor models, taking an approach similar to best subsets because I had already run four out of the seven possible regressions for three total predictor variables. Since I had previously determined the multicollinearity between the federal funds rate and the discount rate, I was not surprised at the small R^2 value in the summary statistics for the two predictor model using the federal funds rate and the discount rate as predictors. When comparing the models of the federal funds rate and federal government spending against the model of the discount rate and federal government spending, I found that the two predictor model using the federal funds rate and federal government spending had smaller p-values and a larger R^2 value by a decent margin, suggesting that it was a better model. Since any change to one of the interest rates would almost certainly directly change the other interest rate and both interest rates have similar relationships with the U.S. poverty rate and federal government spending, I decided to focus on just the federal funds rate.

Afterwards, I tried various combinations of different transformations on the predictor variables to try to improve the R^2 value of the original model with the federal funds rate and federal government spending, which was only 0.3047. After testing transformations for the two predictor models, I found that the best transformation was keeping federal government spending the same and taking the natural log of the federal funds rate. The R^2 value was significantly higher than before being 0.5758 and both the predictor p-values became very small. Unfortunately, the normality condition for error was not met because the normal probability plot was not linear.

Then, I tested a second order interaction model with the federal funds rate and federal government spending to see if it could give a higher R^2 value or suggest any new relationships between the variables. After testing various combinations, I found that the interaction model with the most significant p-values and R^2 value was the one using the square of the federal funds rate and the interaction term between the federal funds rate and federal government spending, but it had a lower R^2 value than the transformed model. It also did not meet the equal variance and normal conditions, so I continued my analysis using the transformed model of federal government spending and the federal funds rate.

Since the transformed model did not meet the normality condition, I could not rely on a parametric test to come to an appropriate conclusion and had to use a non parametric test for inference. I decided to start with a randomization test on the transformed model of poverty on federal government spending and the natural log of the federal funds rate to test if there was some relationship between the variables. Using randomization, each of the transformed poverty values were assigned to random predictor variables for the transformed two model predictors, for a total of 10000 samples. Then, I produced the distribution of the R^2 values for the samples to test the hypotheses: H_0: R= 0, H_a: R ≠ 0. The p-value for the randomization was sufficiently small, so I was able to reject the null.

Due to knowing there was some relationship, I decided to use bootstrapping to create confidence intervals for the transformed model of the federal funds rate and federal government spending to estimate the amount of relationship the predictor variables had with the U.S. poverty rate. Sampling with replacement was done from the original dataset to create 10000 random samples of equal size to the original sample. These 10000 samples were used to create three bootstrap distributions: one for the coefficient of federal government spending, one for the coefficient of the natural log of the federal funds rate, and one for the R^2 value. From these three distributions, I obtained three 95 percent confidence intervals to estimate the three respective parameters.

Results

Regressions

Full Model

```
Coefficients:
                   Estimate Std. Error t value Pr(>|t|)
(Intercept)       1.570e+01  9.629e-01  16.307 3.59e-15 ***
Poverty$GovSpend -9.269e-05  4.856e-05  -1.909   0.0674 .
Poverty$Drate    -2.067e-02  3.989e-01  -0.052   0.9591
Poverty$FFrate   -3.744e-01  3.282e-01  -1.141   0.2643
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.16 on 26 degrees of freedom
Multiple R-squared:  0.3048, Adjusted R-squared:  0.2245
F-statistic: 3.799 on 3 and 26 DF,  p-value: 0.02205
```

Figure 7. Summary of multiple linear regression of the U.S. poverty rate on the federal funds rate, the discount rate, and federal government spending.

The p-values for the federal funds rate and the discount rate became much larger in comparison to their p-values in their respective individual linear regressions, at 0.9591 and 0.2653 compared to the previous p-values of 0.0115 and 0.0165, indicating that there was likely multicollinearity between the two interest rates. The federal government spending p-value decreased from 0.662 down to just 0.0674, which suggested that the effect of either one of the interest rates on the U.S. poverty rate influenced the effect of federal government spending on the U.S. poverty rate and that a model of federal government spending with either of the interest rates would be better than the model with just federal government spending.

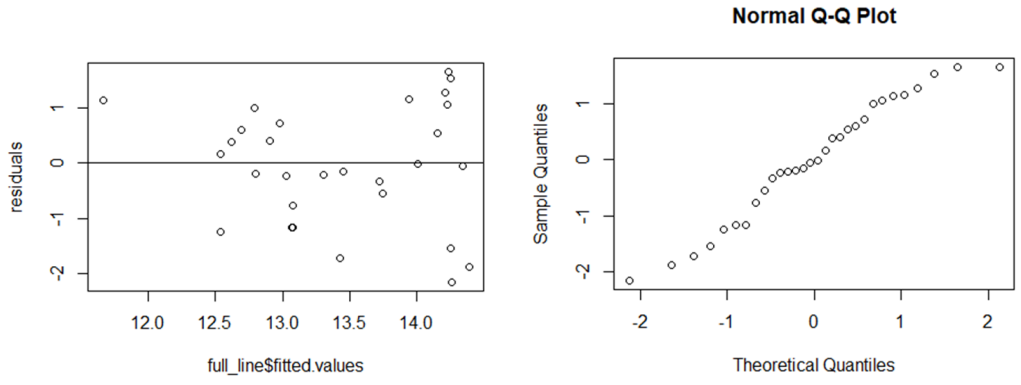

Figure 8 and Figure 9. Residual plot and normal probability plot for the full model.

The residual plot for the full model had a slight pattern due to a potential outlier on the left, making the conditions for inference not met and the previous statements subject to bias.

Check for Multicollinearity

```
Residual standard error: 0.5514 on 28 degrees of freedom
Multiple R-squared:  0.9305, Adjusted R-squared:  0.928
F-statistic: 374.6 on 1 and 28 DF,  p-value: < 2.2e-16
```

Figure 10. Summary of simple linear regression between the discount rate and the federal funds rate.

The R^2 value of 0.9305, translating to a Variation Inflation Factor of 1/(1-0.9035) = 10.362 > 5, indicated strong multicollinearity between the two predictor variables. A two predictor model of either the federal funds rate with federal government spending or the discount rate with federal government spending would likely be a better model than a model with both the federal funds rate and the discount rate. This suggested that the full model and the two predictor variables model using the federal funds rate and the discount rate were not good models for predicting the U.S. poverty rate.

```
Residual standard error: 1.874 on 28 degrees of freedom
Multiple R-squared:  0.4677, Adjusted R-squared:  0.4487
F-statistic:  24.6 on 1 and 28 DF,  p-value: 3.097e-05
```

Figure 11. Summary of simple linear regression between federal government spending and the federal funds rate.

```
Residual standard error: 1.542 on 28 degrees of freedom
Multiple R-squared:  0.4562, Adjusted R-squared:  0.4368
F-statistic: 23.49 on 1 and 28 DF,  p-value: 4.215e-05
```

Figure 12. Summary of simple linear regression between federal government spending and the discount rate.

The R^2 values of 0.4677 and 0.4562 for both these regressions were reasonably small and showed that there was no multicollinearity between federal government spending with either of the two interest rates.

Two Predictor Models

```
Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.568e+01  8.763e-01  17.898  < 2e-16 ***
Poverty$GovSpend -9.248e-05  4.749e-05  -1.947  0.06196 .
Poverty$FFrate   -3.903e-01  1.148e-01  -3.400  0.00211 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.138 on 27 degrees of freedom
Multiple R-squared:  0.3047, Adjusted R-squared:  0.2532
F-statistic: 5.916 on 2 and 27 DF,  p-value: 0.007404
```

Figure 13. Summary of multiple linear regression of the U.S. poverty rate on federal government spending and the federal funds rate.

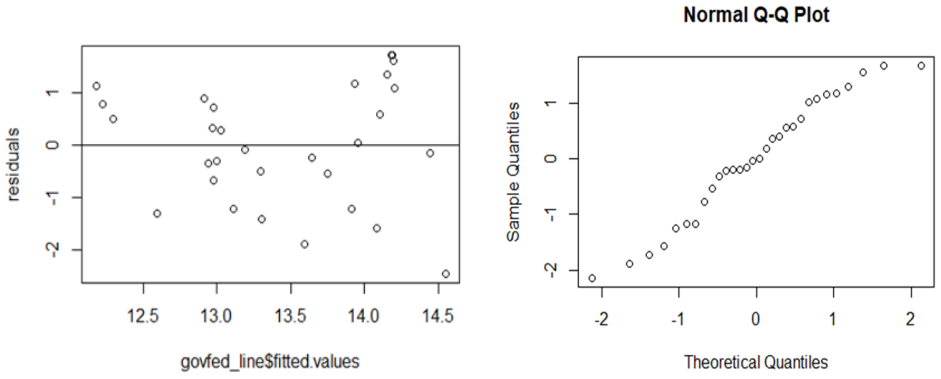

Figure 14 and Figure 15. Residual plot and normal probability plot for the U.S. poverty rate on federal government spending and the federal fund rate.

```
Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.579e+01  9.654e-01  16.353 1.56e-15 ***
Poverty$GovSpend -8.348e-05  4.815e-05  -1.734  0.09436 .
Poverty$Drate    -4.459e-01  1.430e-01  -3.119  0.00428 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.167 on 27 degrees of freedom
Multiple R-squared:  0.2699, Adjusted R-squared:  0.2159
F-statistic: 4.992 on 2 and 27 DF,  p-value: 0.0143
```

Figure 16. Summary of multiple linear regression of the U.S. poverty rate on federal government spending and the discount rate.

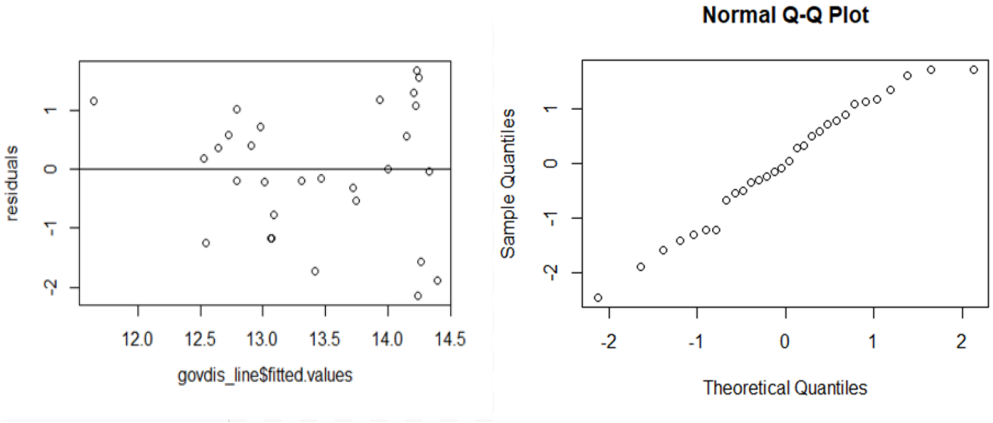

Figure 17 and Figure 18. Residual plot and normal probability plot for the U.S. poverty rate on government spending and the discount rate.

Comparing the two predictor model of the federal funds rate and federal government spending with the two predictor model of the discount rate and federal government spending, the former had smaller individual p-values and a larger model R^2 value, suggesting that it was a better model. It had a p-value of 0.06196 for federal government spending vs. the p-value of 0.09436 for federal government spending in the discount rate and federal government spending model. The p-value for the federal funds rate was also smaller at 0.00211 vs. 0.00428 for the discount rate. The R^2 value was 0.3047 for the federal funds rate model vs. 0.2699 for the discount rate model.

While the residual plot for the discount rate model had a slight pattern due to a potential outlier point on the left, the residual plot for the federal funds rate model was random. I continued my analysis using the federal funds rate and federal government spending model because it had a higher R^2 value and met the conditions for inference in its non transformed model.

Transformed Model

```
Coefficients:
                      Estimate Std. Error t value Pr(>|t|)
(Intercept)          1.511e+01  4.989e-01  30.296  < 2e-16 ***
Poverty$GovSpend    -1.183e-04  3.529e-05  -3.352  0.00238 **
log(Poverty$FFrate) -8.180e-01  1.359e-01  -6.017 2.02e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8893 on 27 degrees of freedom
Multiple R-squared:  0.5758, Adjusted R-squared:  0.5443
F-statistic: 18.32 on 2 and 27 DF,  p-value: 9.388e-06
```

Figure 19. Summary of transformed multiple linear regression of the U.S. poverty rate on federal government spending and the natural log of the federal funds rate.

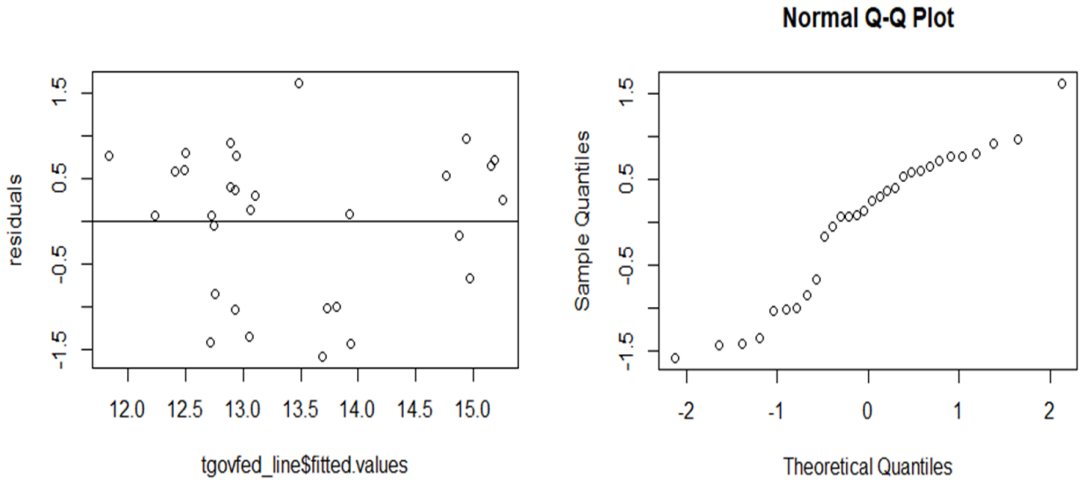

Figure 20 and Figure 21. Residual plot and normal probability plot for the U.S. poverty rate on federal government spending and natural log of the federal funds rate.

Both the p-value for federal government spending and the p-value for the transformed federal funds rate were much smaller than before at 0.00238 and 0.00000202, respectively. The R^2 value nearly doubled to 0.5758. However, the normal probability plot did not seem linear, so the condition for normality in the errors was not met. An interaction model was tested next to see if it better shows the relationship between the variables.

Interaction Model

```
Coefficients:
                                 Estimate Std. Error t value Pr(>|t|)
(Intercept)                     9.501e+00  2.086e+00   4.554 0.000118 ***
Squarefrate                    -1.865e-08  6.180e-09  -3.019 0.005774 **
Poverty$GovSpend                6.432e-04  2.366e-04   2.719 0.011741 *
Poverty$FFrate                  4.969e-01  2.744e-01   1.811 0.082185 .
Poverty$GovSpend:Poverty$FFrate -7.901e-05  2.491e-05  -3.171 0.003985 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.9695 on 25 degrees of freedom
Multiple R-squared:  0.5331, Adjusted R-squared:  0.4584
F-statistic: 7.137 on 4 and 25 DF, p-value: 0.0005616
```

Figure 22. Summary of second order model for a multiple linear regression of U.S. poverty rate on the federal funds rate, square of the federal funds rate, federal government spending, and the interaction term between the federal funds rate and federal government spending.

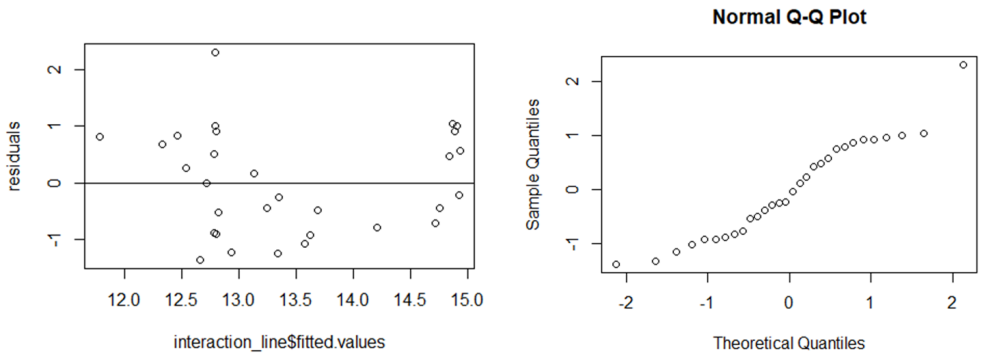

Figure 23 and Figure 24. Residual plot and normal probability plot for the second order model.

The significant p-value of 0.005774 for the square of the federal funds rate suggested that there was a nonlinear relationship between the U.S. poverty rate and the federal funds rate. The significant p-value of 0.011741 for federal government spending suggested that there was a linear relationship with the U.S. poverty rate when combined with the federal funds rate. The significant p-value of 0.003985 for the interaction term suggested that the effect of either the federal funds rate or the federal government spending on the U.S. poverty rate impacted the effect of the other predictor on the U.S. poverty rate. However, these interpretations could be biased as a result of the patterns exhibited in the residual plot and the curvature in the normal probability plot. The R^2 value of 0.5331 was also lower than that

of the transformed model of federal government spending and the federal funds rate, so I went back to using the transformed model for continued analysis.

Non Parametric Analysis

Randomization

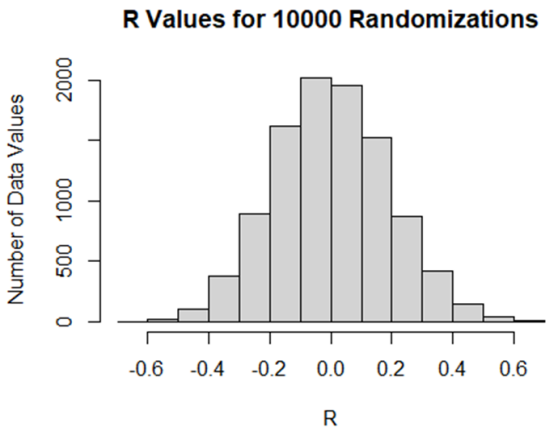

Figure 25. Randomization histogram of the distribution of R values for 10000 samples with the U.S. poverty rate randomly assigned to the natural log of the federal funds rate and federal government spending variables.

The randomization test was used to test the null and alternative hypotheses: H_0: R = 0, H_a: R ≠ 0. In the distribution, 0 out of the 10000 randomized samples had an absolute value of R that was equal to or greater than the absolute value of R of 0.759 in the original model of the U.S. poverty rate on the natural log of the federal funds rate and federal government spending. There was significant evidence to reject the null hypothesis. The randomization test suggested that there was a relationship between the U.S. poverty rate and the natural log of the federal funds rate and federal government spending, leading me to quantify that relationship with bootstrapping.

Bootstrapping

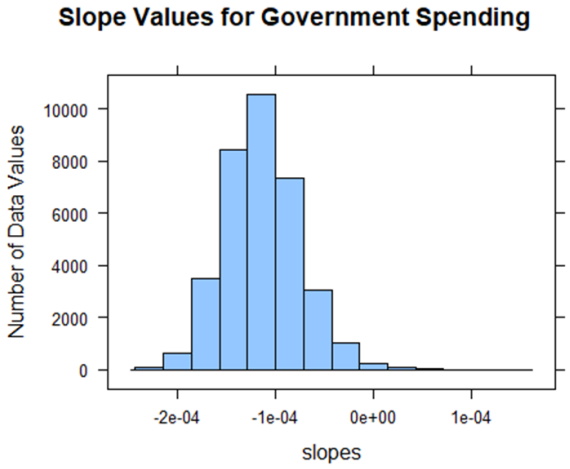

Figure 26. Bootstrap distribution histogram of the distribution of federal government spending slope values for 10000 samples created from random sampling of data from the model of U.S. poverty rate on the natural log of the federal funds rate and federal government spending.

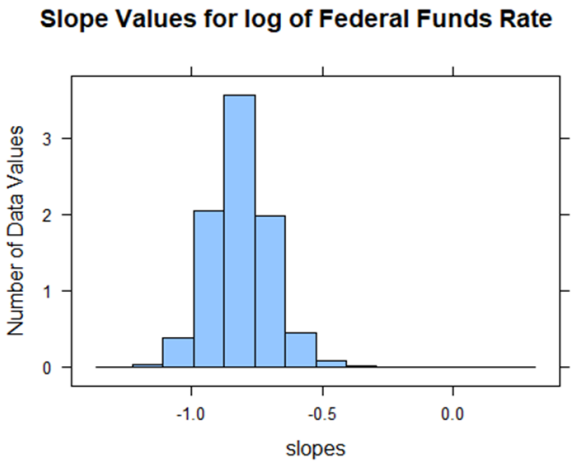

Figure 27. Bootstrap distribution histogram of the distribution of the natural log of the federal funds rate slope values for 10000 samples created from random sampling of data from the model of U.S. poverty rate on the natural log of the federal funds rate and federal government spending.

The bootstrap distributions for the slope of both federal government spending and the natural log of the federal funds rate shows that both are negatively correlated with the U.S. poverty rate. The 95 percent confidence interval for slope of federal government spending is (-0.000183,-0.0000318), which shows that federal government spending only slightly changes the U.S. poverty rate. The 95 percent confidence interval for slope of the natural log of the federal funds rate is (-1.026,-0.575) and shows that a unit change to the federal funds rate can have a large effect on the U.S. poverty rate.

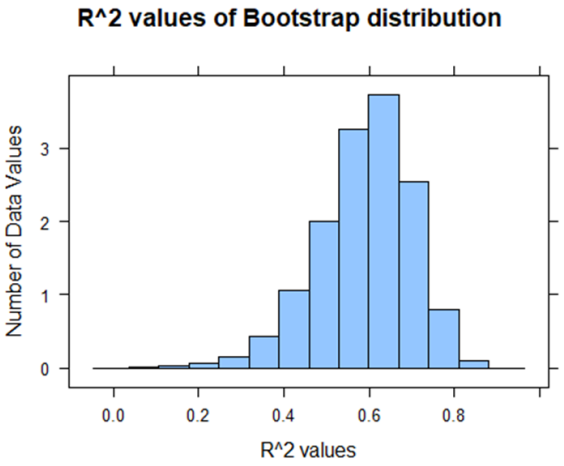

Figure 28. Bootstrap distribution histogram of the distribution of R^2 values for 10000 samples created from random sampling of data from the model of U.S. poverty rate on the natural log of the federal funds rate and federal government spending.

The 95 percent confidence interval for the R^2 value is (0.338,0.775). We are 95 percent confident that this interval captures the true amount of variation in poverty that the natural log of the federal funds rate and federal government spending can account for. This suggests that the model of the U.S. poverty rate on the natural log of the federal funds rate and federal government spending is moderately strong.

Conclusion & Discussion

Important Findings

In my research, I was able to identify key relationships between the four variables. Firstly, I determined that the discount rate and the federal funds rate are very closely correlated. Although I did not do previous research on how these are related, it makes sense that they have a high correlation because the increase of the interest rate at which the federal reserve lends money to banks would likely lead to a corresponding increase in the rate at which banks lend money to each other. The federal funds rate and the discount rate on their own are also negatively related with the U.S poverty rate, which I determined in my results. This corroborates the results of Matschke et al. (2023), which found a change in a national interest rate affects the U.S. poverty rate in the opposite way. The decrease in poverty from an increase in a national interest rate makes sense because higher interest rates lead to less borrowing and lower inflation, which could prevent common prices from rising as much in comparison to the rise of incomes of lower wage workers.

Additionally, I found that the combined effect of federal government spending with either the federal funds rate or the discount rate on the U.S. poverty rate is more significant than its individual impact on the U.S. poverty rate. In Mayer et al. (2016), more federal government spending led to an increase in income for the general population, but the increase in income for lower income individuals was not clearly more during periods of higher spending unlike the increase for higher income individuals, suggesting that federal government spending does not have a clearly significant impact on the U.S. poverty rate. My results are similar to Mayer et al., as I also found that federal government spending on its own does not have a clear impact on the U.S. poverty rate. This unclear effect could be due to the variable effects of too little federal government spending or too much federal government spending in times of high inflation or recessions, which could have different effects on the U.S. poverty rate than more normal amounts of federal government spending.

The new conclusion I came to in my results that I did not find in any previous research is that a combination of the relationship of either the federal funds rate or the discount rate and federal government spending can significantly increase each predictor variable's effect on the U.S. poverty rate. From my results of the combined model, the discount rate and the federal funds rate are negatively related to the U.S. poverty rate. Federal government spending is also negatively related, although by a much smaller margin. Still, the significant negative relationships of either the federal funds rate or the discount rate when used with federal government spending to account for the change in the U.S. poverty rate and the moderately strong amount of variation in the U.S. poverty rate that these variables combined can account for, suggests that it is possible for the federal government to effectively change national interest rates along with the size of its budget to reduce poverty in the U.S.. The ability of the federal government to reduce the U.S. poverty rate by altering certain economic policies is significant. If the federal reserve and federal government focus on changing some of its economic policies, in the long run, we can gradually reduce the U.S. poverty rate.

Future Implications

While I was able to come to a reasonable conclusion about the relationships amongst the four variables, the analysis I performed was likely biased. In the future, similar research could be done to test the effects of a larger number of other monetary or fiscal policy variables on the U.S. poverty rate or unemployment rate; combining time series and regression analysis could determine the change of these variables over time and what combination of variables is most significant. Research could also be done on related business decisions or local government decisions that involve data and money. Such research could provide information on the differences between federal and local decisions, and suggest ways that we can mitigate poverty on a smaller scale; both local governments and companies play a pivotal role in decision making to support lower income workers' morale and productivity. Yet, if we were focused on benefiting the poor, the middle income families and the rich would be impacted, so research on how the same decisions impact them is also necessary. Finally, future research could use blocking to account for confounding variables. Potential research on how economic decisions of other countries affect their poorer populations can help explain how such decisions' impacts on the poor differ in developed and developing countries or in countries with differing cultures.

Reflection

Throughout writing this research paper, I worked on my ability to research and review previous works of literature and to effectively combine and analyze data. In addition to developing these skills, I also deepened my understanding of important economic policies including how they impact the general society and how they are related to one another. The knowledge I gained from my research has given me insight into common societal and economic issues that I am interested in and plan to continue researching in the future. As I utilized multiple linear regressions, non-parametric tests, and transformations, I also gained experience in step by step analysis of data. Overall, the skills I gained through writing this paper will aid me in future research and statistical analyses that I will do at the university level and beyond; I am extremely grateful that I was able to learn so much as a high schooler.

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