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Predicting Attitudes Toward the Environment Artificial Intelligence for the Humanities

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Predicting Attitudes Toward the Environment

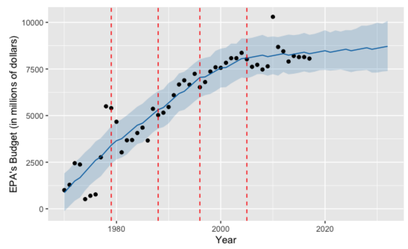
Artificial Intelligence for the Humanities
Emily Rachfal, Kenyon College Class of 2020

Introduction

Everyone seems to have an opinion about the environment, and with lots of different views being spread, it can sometimes be hard to tell what is actually being done to make improvements to the earth. While we might hope that everyone is individually doing their part to help the cause, the financial help of the government is also needed for an issue this broad. By noticing when shifts in public opinions happened in the past, and comparing them to major environmental events or government policies happening around the same times, it may be possible to find correlations; this could help to gain wider support of spending on the environment.

Currently, the average trend shows that the government has been increasing the amount of money it's been spending on the environment. The United States Environmental Protection Agency's (EPA) budget is plotted against time in years in the graph below, from 1970 to 2017 [1]. The plot also shows the predicted trends for the next 15 years. The red dotted lines show changepoints over time of when the general trends shifted.

Figure 1: EPA's Budget over Time



About the Technology

For this project, I used change point detection to try to identify times when the probability distribution of a time series changed. I used a programming library known as Prophet, which is a procedure for forecasting time series data [2]. Prophet itself is coded from Stan, which is a platform for statistical modeling and high-performance statistical computation [5]. This backend code uses Bayesian statistics to analyze prior beliefs in order to help predict data in the future.

I used the statistical software R in order to analyze the data that I was exploring [4]. When plotting times series, the conditions are set such that there could be at most 5 changepoints; these represent abrupt variations in data. The plots also show 15 years into the future since the data has been collected, with a blue line showing the estimated trend and a light blue band around the line showing potential deviation from what is predicted.

The General Social Survey

The motivation for this project derives from a question given in the General Social Survey (GSS) [3]. The GSS, started in 1972, works to study American public opinion and values. The survey is administered over the phone to approximately 3000 respondents across the country. Overall, the survey takes participants about 90 minutes. Due to the extent of these surveys, the data for a year is collected from April through August. From 1972-1994, the survey was conducted annually, with the exception of three different years where it was not able to run due to limited funding. As of 1994, the GSS is conducted every other year.

Motivating Question

The question that I was interested in exploring appeared in all years of the GSS but the first. The question was read to participants as part of a collection of questions prefaced by

"We are faced with many problems in this country, none of which can be solved easily or inexpensively. I'm going to name some of these problems, and for each one I'd like you to tell me whether you think we're spending too much money on it, too little money, or about the right amount"[3].

The second item in the list that was asked about was:

"Are we spending too much, too little, or about the right amount on improving and protecting the environment?"[3].

Participants could respond in one of four ways: too much, about right, too little, or don't know.

Graphing the Past to Predict the Future

Figure 2: Percent who think the government is spending too much on the environment over time

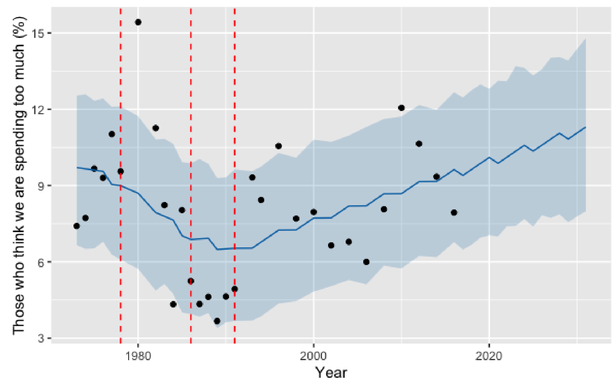


Figure 3: Percent who think the government is spending the right amount on the environment over time

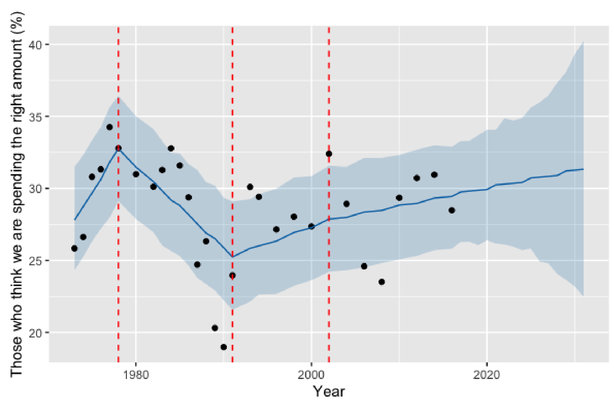
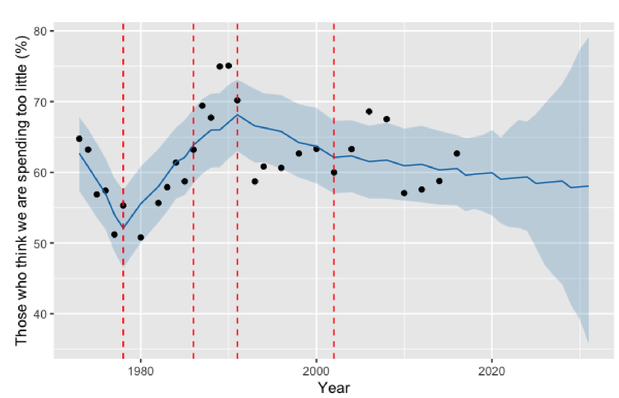


Figure 4: Percent who think the government is spending too little on the environment over time

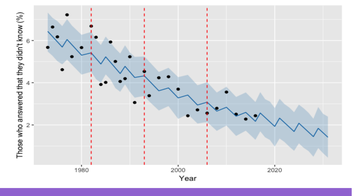


Analysis

Interesting trends can be seen from the results of the GSS over the years. Since around 1991, there has been an increase in people who believe that the government is spending too much money on the environment, and this is a trend that seems likely to continue, as can be seen in Figure 2. Figure 3 and Figure 4 indicate that in general as the percent of people who think the government is spending the right amount on the environment goes up and the percent of people who think the government is spending too little goes down, and vice versa. The trends for these two plots both have changepoints more recently than the plot for people who think we're spending too much, which leads to less certainty towards what the future will bring; this can be seen in the forecast of the graphs by the increasing width of the blue band. It is also interesting to see similar positioning of changepoints in many of the graphs. This indicates that there may have been outside factors causing people's change in perception in how much they thought the government should be spending in 1978, 1986, 1991, and 2002.

Additionally, the graph to the right shows how the percent of people who answered "don't know" has decreased over time, with slightly differing changepoints. This trend seems likely to continue in the future, with this being the response for close to 2% of people surveyed.

Figure 5: Percent who responded that they didn't know over time



Further Work

There are limitations to the connections that can be made due to the fact that there was limited data available. The data that was used was only collected every year or every other year; thus it is not possible to determine what the trends were throughout the years. It also should be noted that the Prophet library works better for seasonal data and may have given more interesting results with a larger dataset. The data that was available from the GSS is collected from April through late-August of the year, yet people may have a different opinion depending on when they responded to the survey. Thus answers may vary from person to person in a way that was not accounted for. Also, I do not have all of the background needed to fully interpret where each of these changepoints in the graphs are coming from. It would help to have an expert be able to give context to some of these trends to try to see if there is any correlation to events that were happening in the world during some of the years where the attitude shifted. It is important to note that even with context we would not be able to know if something was the cause of these shifts, we could only find possible correlations.

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