TS Project Proposal | Due: 9/30/2021

Forecasting and Predicting World Freshwater Use Per Capita

Introduction

Water is the most important resource on our planet, as it is the basis of all life. As the world population grows, more stress is being put on the Earth's freshwater resources. Forecasting global freshwater withdrawals will give policymakers and activists an idea of what direction foreign and domestic policy needs to go to secure freshwater for the future while meeting the needs of a growing population. The *UN World Water Development Report 2019*[1] projects a 20 to 30% global increase in water demand from current water use levels. Another report states that the global water footprint/demand can be reduced to sustainable levels if consumption patterns change, regardless of population growth (Ercin and Hoekstra, 2013). Water use has also been forecasted using historical world production and consumption trends (Arto, et al. 2012). Many researchers attribute changes in demand for water to factors such as climate change, changing standards of living, social influence, economic development, etc. It will be beneficial to look at an econometric model that estimates the effect of other variables on per capita global freshwater use.

Time Series Data Summary

The following table is a summary of the cleaned and filtered time series datasets that will allow me to forecast freshwater use per capita. The data were collected from 1901 to 2014 with 2011-2013 missing. Both datasets were collected from *Our World in Data*, an organization that provides reliable data to researchers to make progress against some of the world's leading issues.

Water: https://ourworldindata.org/world-population-growth

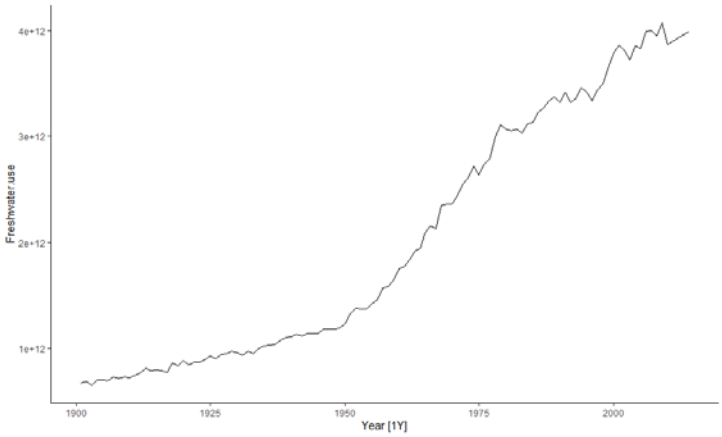
Population: https://ourworldindata.org/water-use-stress#global-freshwater-use

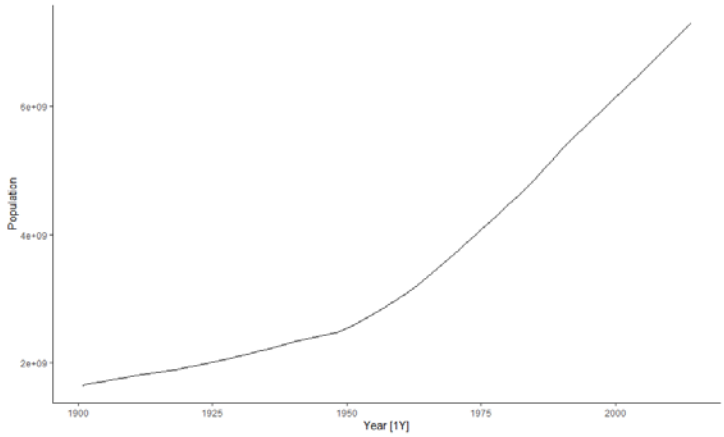
Time Series	Definition	Frequency	Number of Observations	Mean	Min	Max	Std. Dev.
Water	Global freshwater withdrawals for agriculture, industry and domestic uses from 1901 to 2014, measured in cubic meters (m^3) per year. Missing 2011-2013.	Annual	111	1.97e+12	6.55e+11	4.07e+12	1.15e+12

[1] Note: All current sources in the proposal have been linked instead of cited in APA format until project is approved.

Population	World population from 1901 to 2014 based on Gapminder data, HYDE, and UN Population Division (2019) estimates.	Annual	111	3.47e+09	1.66e+09	7.29e+09	1.65e+09

Time Series Plots: Freshwater Use (left) & Population (right)





Possible Forecasting Method

I will be doing both a time series forecast as well as econometric analysis. Some other explanatory variables I may want to consider are changes in food production, standards of living, and world economic growth. The likely forecasting horizon will be long-term (> 1 decade) based on previous forecasts of the same/similar issues that forecast out to 2030 or further. A simple but effective way to measure the accuracy of the forecast is to leave the last few observations from the time series out of the forecast, build a forecasting model, plot the forecast line with the actual observations that were omitted, and measure the error between the forecast and the actual values.

Conclusion

Forecasting world freshwater use per capita will benefit policymakers and activists looking to make changes to our water consumption habits to secure freshwater availability for future generations. Scientists might be able to use this forecast to give policymakers a timeline of freshwater resource depletion as the world population continues to grow, as it will give them an idea about how much our water consumption habits are changing. This forecast will benefit anyone who cares about sustaining our most valuable resource. Water is a necessity to every living thing on Earth, so learning more about how much is used can benefit us all.