

Living in Different Worlds: Forecasting Income Inequality, Why UBI Isn't Enough, and How to Fix It

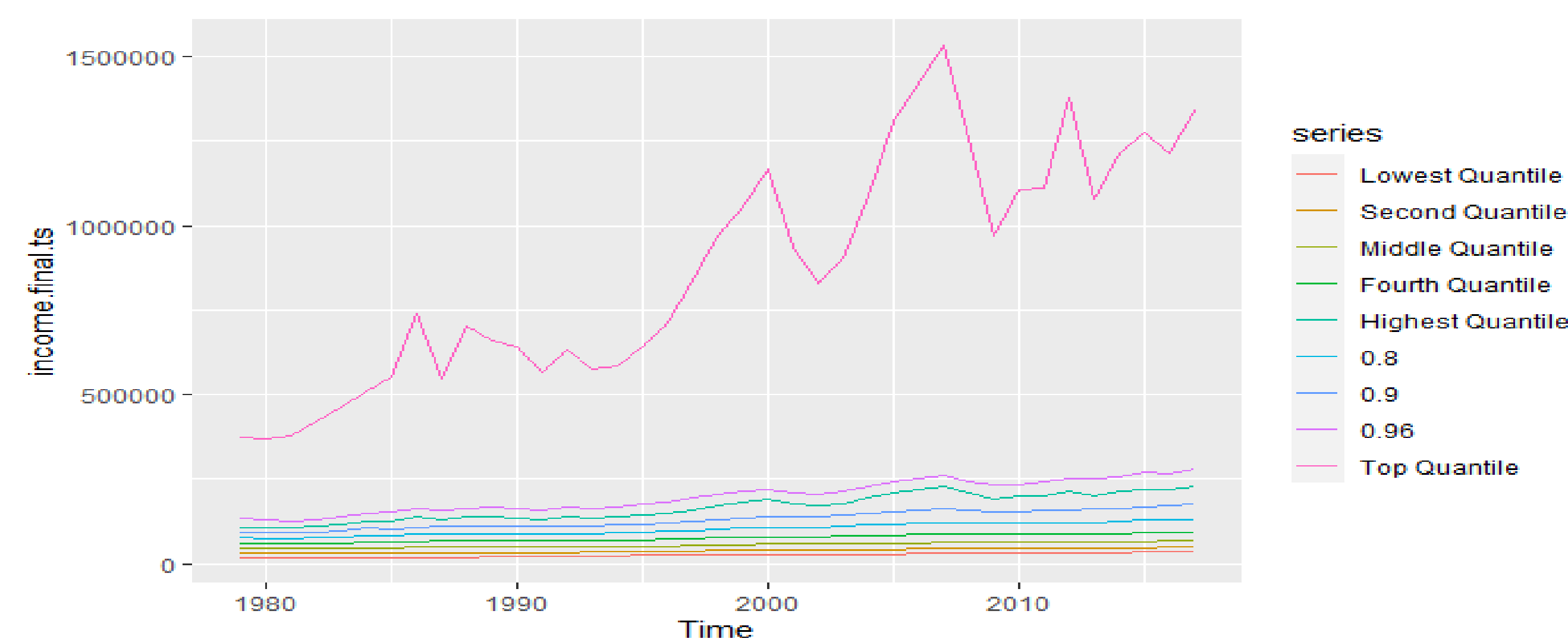
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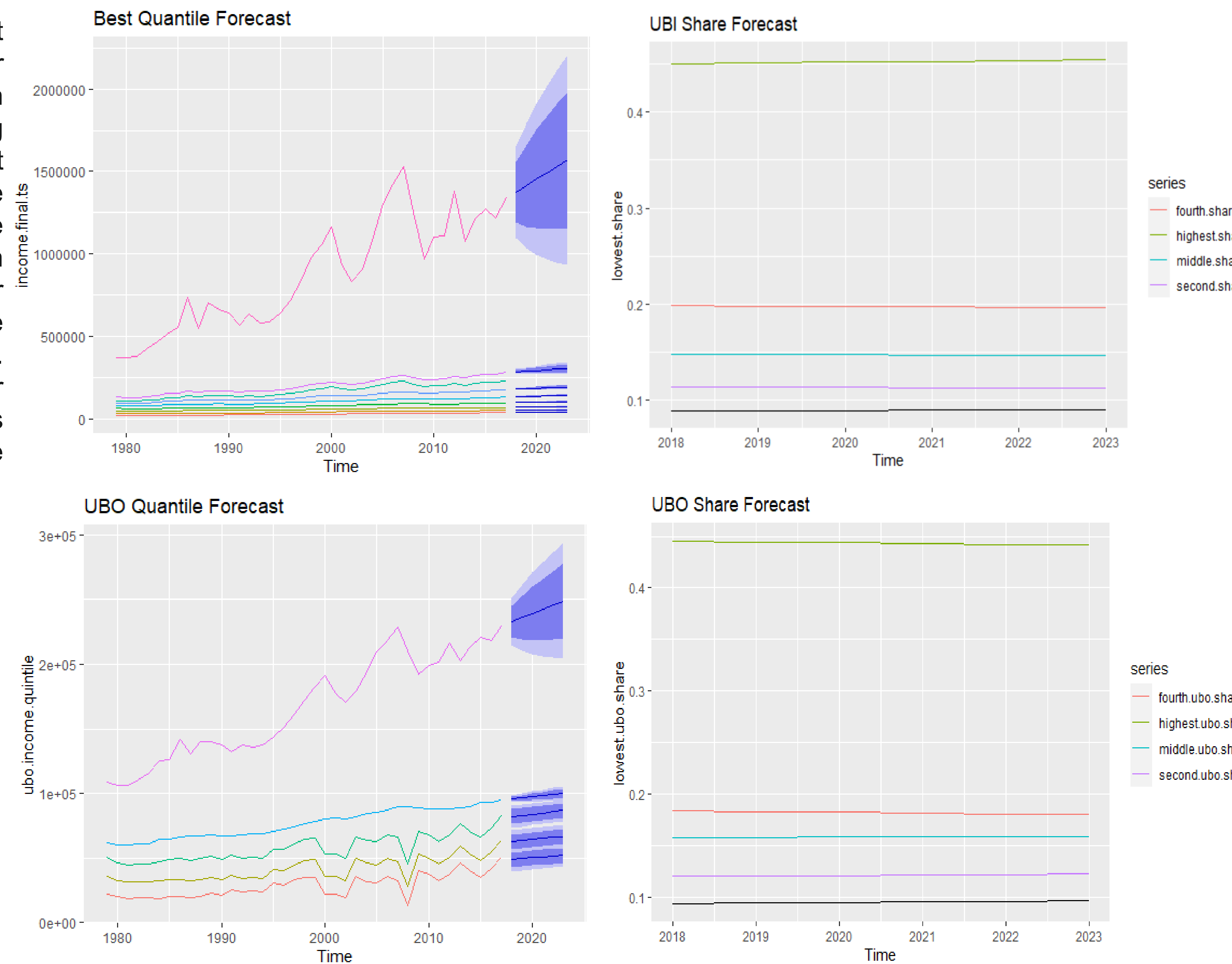
Graduate Program in Applied Economics

Overview

We often hear that Americans live in wholly different economies, and that we “live in different Americas”. This discussion was again brought to light after the presidential runs of Elizabeth Warren and Andrew Yang, both addressing income inequality and their own methods of solving it. Using Historical Income Distribution data from the Tax Policy Center, we see that not only will the highest 1% of earners continue to increase their share of the total growth in the economy, Andrew Yang’s Universal Basic Income does little to address income inequality over the medium-term. Later, I propose an alternative to the Universal Basic Income in which rather than a regular transfer payment, children born to a certain income quintile receive a one time payment that is fully invested in the stock market—a Universal Basic Option. Not only does this have the ability to move an individual up to a higher income quintile within a relatively short amount of time, the best models show that over the long term, the the UBO returns faster relative income changes than the UBI. Finally, the UBO costs a relatively minuscule \$3.1 billion a year relative to the UBI’s \$2.8 trillion.



Data Analysis & Visualization



Data Modeling

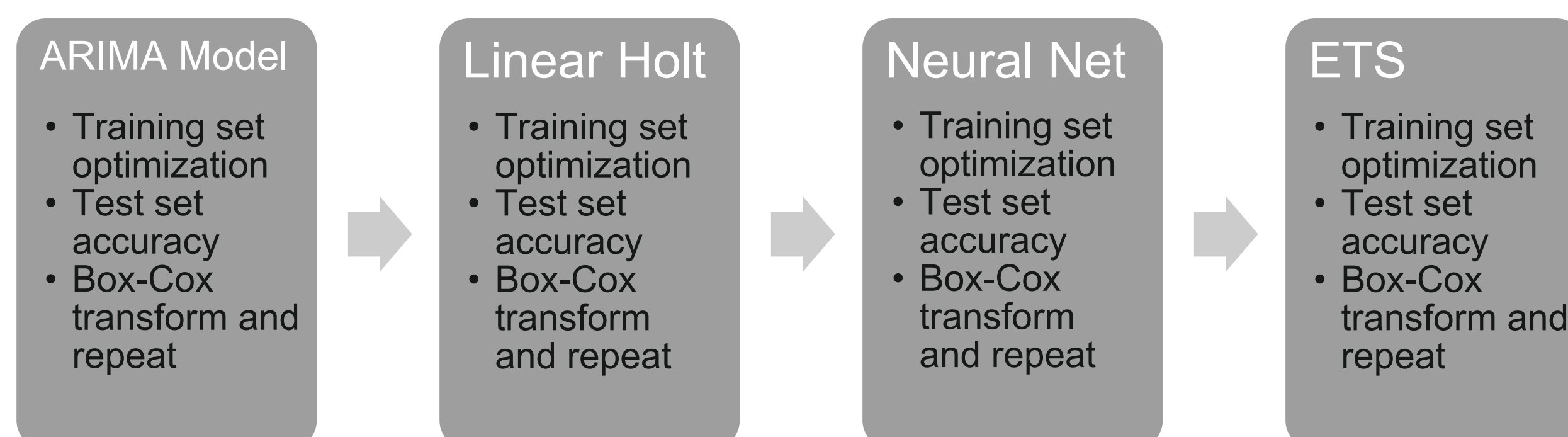
The best model for describing past observations was shown to be the ARIMA model as shown by the RMSE. That said, the linear Holt models of the middle quintile and above were better at capturing the test set of 2014-2017. Interestingly, according to the AICc, the ARIMA model was better at capturing all the previous observations across all quintiles. This is further complicated by the fact that the linear Holt model has an alpha weight of 0.999, which is practically an integrated model of order 1 with constant drift.

Going further into the ARIMA models, we still find that they usually take the form of either ARIMA (0, 1, 0) or ARIMA (1, 1, 0). This was true of most of the models regardless of the income quintile. Similar results can be found looking at Box-Cox-transformed data.

AICc	Models			Best Model
	Lowest	Middle	Highest	
ARIMA	589.09	634.18	805.81	ARIMA
Linear Holt	650.4042	1022.331	9182.902	

RMSE	Models (Training/Test)			Best Model
	Lowest	Middle	Highest	
ARIMA	462/1597	926/2970	9320/11647	
Linear Holt	502/2124	977/2889	9448/8101	Linear Holt*

Model Selection Process



The data set contains historic income data from 1979-2017 distributed by quintile and then further divides the highest quintile into 50%-25%-20%-5% distributions. I also downloaded S&P 500 historic data for the same time period, as well as differenced year-over-year returns for the use of my UBO research.

For the purposes of this project, we assume that each time series is independent of the others. Further, all the income values are realized to 2017 dollars to make inflation negligible. We also use Box-Cox transformation to normalize the data and further analyze which model is the best. Since we are only dealing with yearly data, there was no seasonality to consider, which severely limited the scope of the possible models. That said, incomes are only calculated, at most, once a year, and changes in income (raises) occur even less frequently.

Discussion

Firstly, the time series and forecast of current economic conditions (top left) shows the stark contrast between the top 1% and the rest of America. The data also shows that depending on the forecast model, the highest quintile continues to extend its lead over the lowest three quintiles. Given the economic situation of the past three years, it would be safe to assume that the difference has widened substantially, and it will take an even longer time for any fiscal policy to make up the income gap.

What the UBI forecasts show is that not only does it fail to provide generational income-class mobility, the income gap increases over time similarly to how it does currently (top right). While the purpose of the UBI is to provide a safety net to those who need it immediately, the income gap continues to grow at a reported cost of \$2.8 trillion a year. My proposed plan of a guaranteed portfolio at birth not only shows greater returns and allows an individual to jump to a higher income quintile faster, but also starts to skew share of national income towards the benefiting quintiles (bottom left, bottom right), it costs a fraction of the price at \$3.1 billion a year given child birthing rates and only assuming \$12,000 (the yearly income under the proposed UBI).

Conclusion

Income inequality remains a problem in US Macroeconomics. And without proper intervention, the income gap will only widen. In this study, we have found that every adequate model shows increasing income inequality over the horizon. Further, we see that the Universal Basic Income, while addressing many things such as the immediate need for liquidity in lower-earning families and a safety net during shocks to the economic system, does not adequately address income inequality and income mobility. In conclusion, my proposed plan of a Universal Basic Option addresses every consideration while costing a fractional 0.11% of the proposed UBI, or 8.1% of the yearly gains made by solely the top 1% of incomes.

Further Considerations

- How would a promise of a UBO effect immigration? If migrants looking for a better life are given the promise of a portfolio for their children, will the rate of immigration increase?
- Simply due to the immediate scope of this project, I was unable to perform MLE on a minimum sufficient size for a UBO to address income inequality. That said, we could also adjust the estimate higher to increase the rate of income distribution normalization.
- The forecast for S&P earnings is also based on the historical returns dating back from 1980-on. We know that the returns in the financial markets have steadily outperformed year-over-year. Thus, the UBO's effect on income inequality may also change at a proportionate rate.
- This also does not take into consideration the cost for maintaining such a portfolio. That said, my calculations were solely based off of a portfolio with 100% in the S&P 500.
- Integrating a UBO into the model describing incomes from 1979 on shows how closely integrated the incomes become with the movement in the S&P. This increased exposure highlights the connection between Wall Street and Main Street.
- Finally, this integration of the financial market into the income forecast highlights the increased need for individual financial literacy among the general populous. It would become clear that divestment would reduce the rate of return year-over-year, thus not immediately flooding the goods and services market with the same kind of liquidity a UBI would.