

The Decreasing Fertility Rate in Japan

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INTRODUCTION

- This is a time-series of Japan’s fertility rate, from 2010 and it’s predicted outcome in the next 10 years.
- A contributing factor to a decrease in fertility rate could be because women value education more, the economy, not wanting to have children, etc.
- The decrease in fertility rate and increase in life expectancy has caused Japan to have an aging population.
- The Japanese is currently trying to increase this birth rate and fertility rate by giving parents a one-time \$3,000 (¥500,000) stipend for their child.

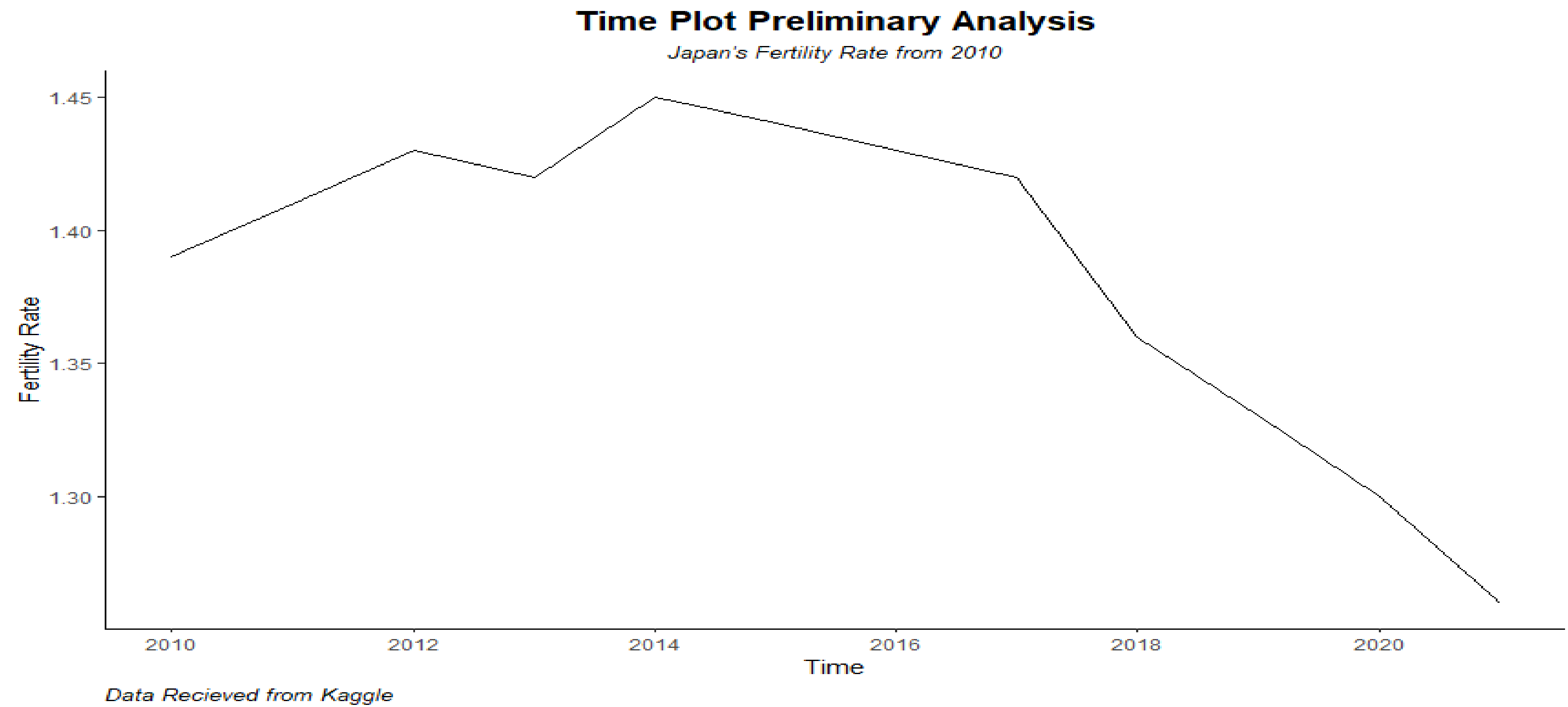
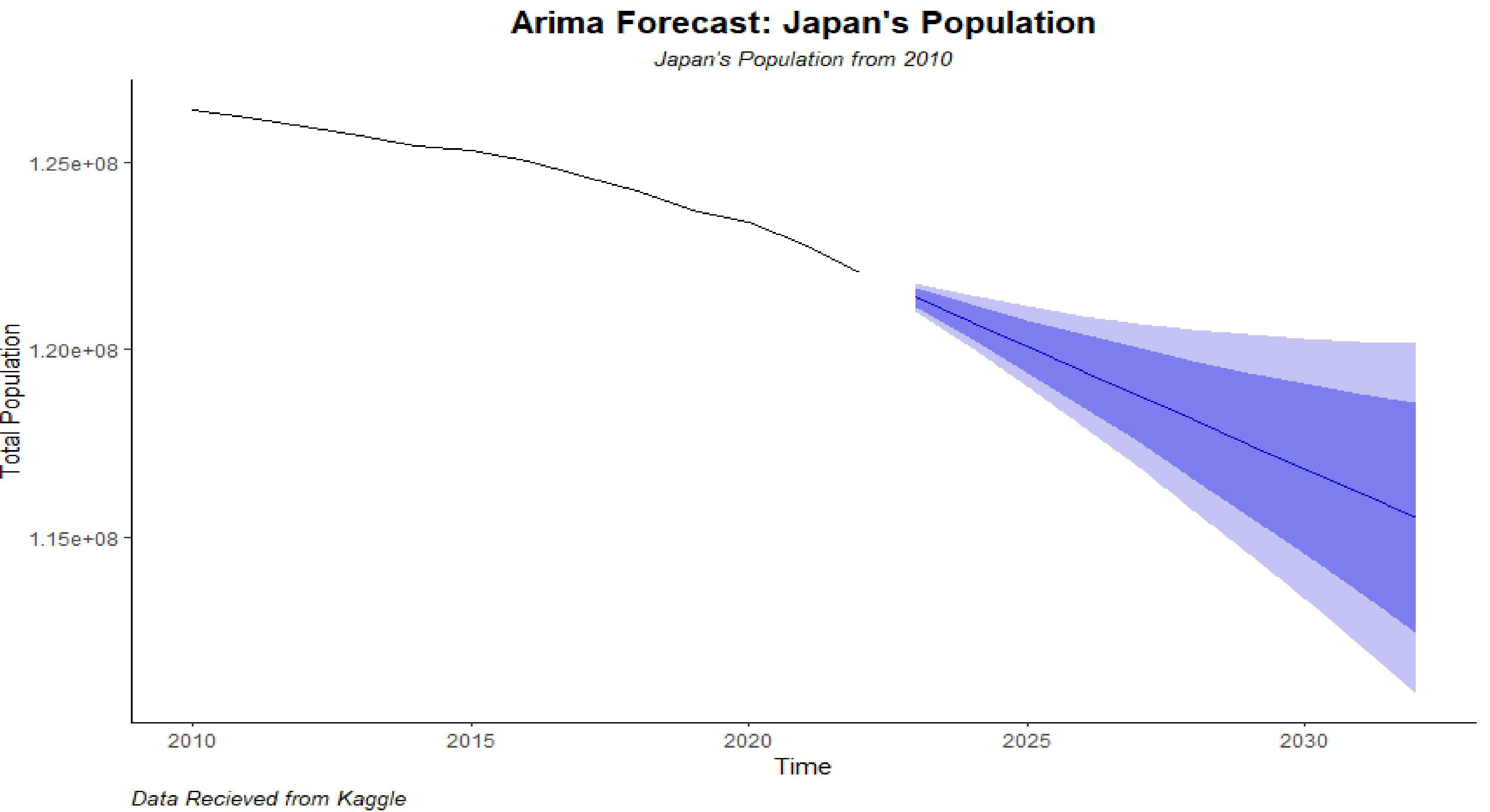
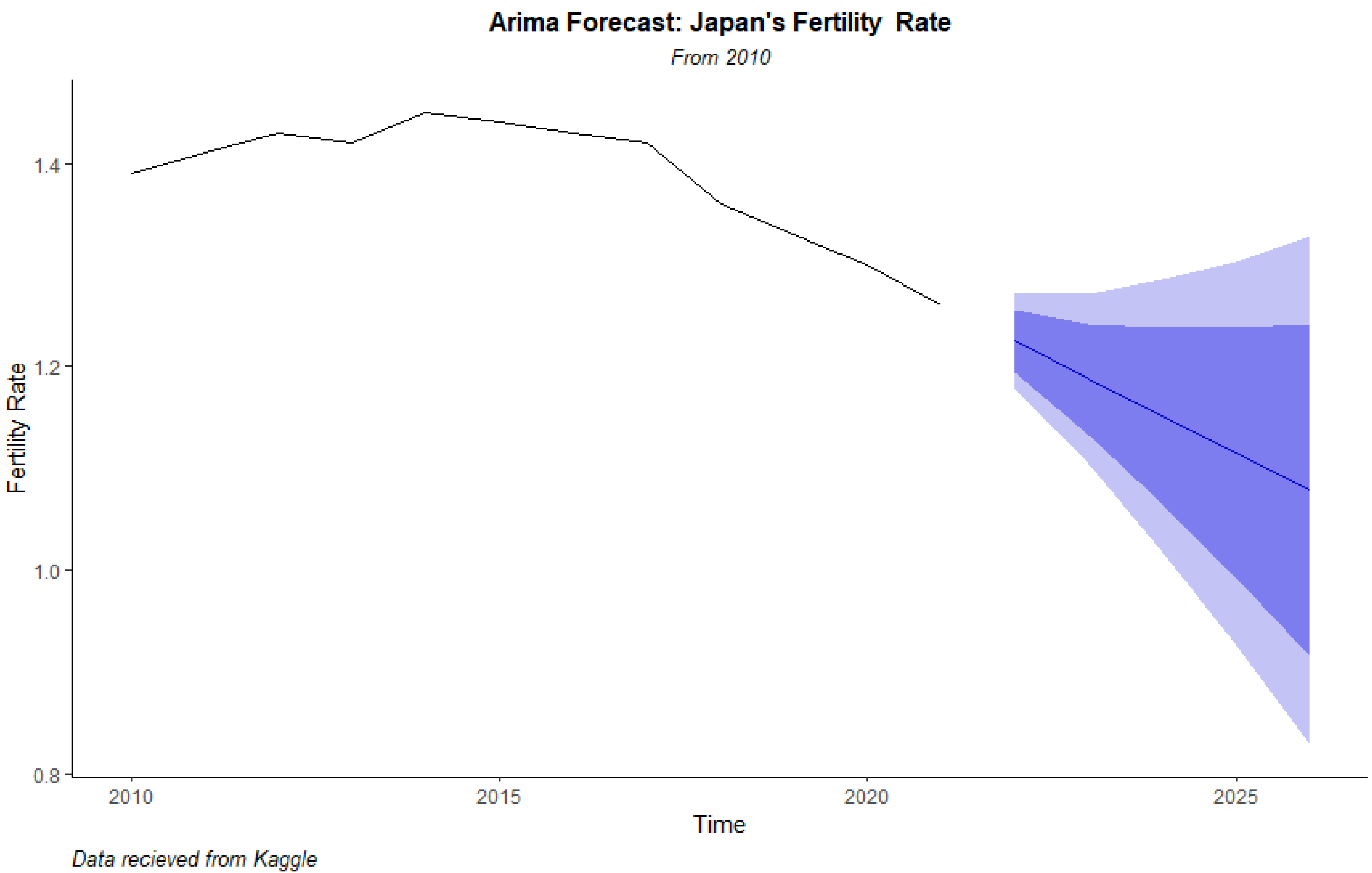
METHODS

- Collected the fertility Rate data set from Kaggle.
- Created a time series of the data, and selected the variables that was going to be used in the time-series.
- Did a preliminary analysis on the time series.
- Checked to see if the data was stationary or seasonal. The data was stationary.
- Forecasted an Error, Trend and Seasonal Model (ETS Model)
- Forecasted an Autoregressive Model (ARIMA Model)
- An ARIMA Model was ultimately preferred because the forecast was more reliable.
- Compared the Fertility ARIMA Model to the Population ARIMA Model.

RESULTS

- The Arima plot for Fertility Rate and Population follow a similar trend.
- Both graphs illustrates a decrease, They also have a similar increase between 2025 and 2020.
- This indicates that there may be some correlation between the two.
- Although Fertility Rate and Population has a similar trend, there appears the Fertility Rate has a steeper difference in variability.
- This could indicate Japan’s Fertility rate deceased more rapidly compared to the population.

Professor: Dr. Austin Brown



DISCUSSION

- **In conclusion, unless Japan introduces more political policies to increase the population will more is mor likely to steadily decrease, and the fertility rate is more likely to rapidly decrease.**
- **This will also affect the birth rate. As fertility rate decreases, the birth rate is more likely to decrease, which then will affect the population.**

References:

(Japan’s plan to increase population)
<https://www.dw.com/en/will-japans-new-plan-to-boost-birth-rates-work/a-64091588>

(Tokyo Foundation to increase birth rates)

<https://www.tokyofoundation.org/research/detail.php?id=958#:~:text=Hoping%20to%20avert%20a%20demographic,rules%20to%20tighten%20fiscal%20discipline>.

R CODE

```
#Perform preliminary analysis time Plot
birthrate.tsautoplot(birthrate.ts)+ ggtitle("Time Plot Preliminary Analysis") + labs(y = "Fertility Rate", subtitle = "Japan's Fertility Rate from 2010", caption = "Data Recieved from Kaggle")+ theme_classic()+ theme(plot.title = element_text(size = 15, face = "bold", hjust = 0.5), plot.caption = element_text(size = 10, face = "italic", hjust = 0), plot.subtitle = element_text(size = 10, face = "italic", hjust = 0.5))
```

```
#Use autoplot to plot forecast Fertility model
autoplot(fcst_arima)+ ggtitle("Arima Forecast: Japan's Fertility Rate")+ labs(y = "Fertility Rate", subtitle = "From 2010", caption = "Data recieved from Kaggle")+ theme_classic()+ theme(plot.title = element_text(size = 12, face = "bold", hjust = 0.5), plot.subtitle = element_text(size = 10, face = "italic", hjust = 0.5), plot.caption = element_text(size = 10, face = "italic", hjust = 0))
```

```
#Forecasting Population
autoplot(population.ts)+ ggtitle("Time Plot Preliminary Analysis") + labs(y = "Japanese Population", subtitle = "Japan's Population from 2010", caption = "Data Recieved from Kaggle")+ theme_classic()+ theme(plot.title = element_text(size = 15, face = "bold", hjust = 0.5), plot.caption = element_text(size = 10, face = "italic", hjust = 0), plot.subtitle = element_text(size = 10, face = "italic", hjust = 0.5))
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