Investigating the various factors affecting Singapore's birth rate

1.0 Aims, objectives, and background

1.1 Introduction

When considering issues that plague a country one often thinks of a country's employment rate, economy, and environment. Though these are issues that Singapore is constantly tackling one of the most unanswerable problems that the country has been constantly battling is the declining birth rate.

1.2 Aims and objectives

This project aims to investigate the Singapore's birth rate and its related affecting factors. Throughout this project the main issue at hand is Singapore's birth rate while the factors being investigated include but are not limited to the following:

1. Population rates
2. Divorce rates
3. Education rates

The investigation will be carried out by aiming to complete the following objectives

- Exploring various factors that are related to the main issue
    - Determining what external factors may be involved
    - The extent of the impact these external factors may have
- Investigating the relationship between the factors and the main issue
    - Is this causation or correlation?
    - Exploring articles that may agree/disagree with such relationship
- Determining if there is a quantitative relationship between factors and main issue
    - What type of data are we determining the relationship between?

2.0 Background

2.1 Scope

Through the filtering and assessing of the data chosen to the related factor conclusions will be drawn between the numerical data trends between the main issue and factors in order to achieve the aim of the project.

The project will focus on mainly the relationship between the 3 factors and the main issue. Though there will be analysis on the relative factors they will not bs used to directly draw conclusions, but instead use to show how the conclusions drawn may be affected.

All data used for each factor will be regarding Singaporean resident unless otherwise stated.

2.1 Research

When deciding the factors to look at research was done on the following questions:

Why is the birth rate low?

Why are current efforts not helping?

The information below was the deciding research for determining the three factors earlier mentioned.

Despite efforts from the government such as the baby bonus and other similar cash incentives, the main conclusion derived from the research shows that the cost of providing for a child outweighs the incentives provided. Which may actually encourage people who want to be parents to pursue a high level of education in order to be financially stable before starting a family; Furthermore, a general

consensus among the research conclude that the desire for a career also serves a deterrent from starting a family. Hence, the factor of education was decided in order to see if there is a relationship between the pursuit of a career having an effect on the birth rate.[1] Other factors were decided based on relation to the main issues. As in return of having a low birth rate, Singapore's population is also growing at a slower rate. Hence, population was decided as a second factor. This was to see if there was relative impact on the number of couples and in turn the birth rate[2].
In relation to families and birth rate, since much research pointed to a higher number of families meaning a higher birth rate. As a converse to that theory the factor of divorce was chosen to see if there was an effect as to whether a family staying together affected the birth rate. As even if the number of marriages increased the possibility of a couple divorcing before a child is produced may show that even with a greater push on marriages the birth rate may not necessarily increase.

3.0 Data

3.1 Data requirements

Three main factors were chosen. This is because including other possible factors would mean having to consider their related external factors as well. The sheer number of factors being taken into consideration would make the data convoluted and difficult to draw a relationship. Hence only three factors that are usually in the limelight as being related to the main issue was chosen for investigation.
Each factor will take into consideration 1 external factor that may be the contrasting effect against the main issue. This is to take into consideration the ethical impacts the project may have. By merely comparing quantitative data false relationship may be created due to the correlative nature of the data. Thus, possible causative external factors must be considered and compared against the data as well to show other possible relationships.

3.2 Choice of database

The following databases were selected:

- Data.gov.sg

Data.gov.sg was chosen as it is a government database and due to the data being purely values they lack external biasness affecting the data.
Due to the Singapore's media limitation laws journalistic voices have not been taken into consideration to prevent biasness. However, various public opinions have been considered in order to give various perspective regarding this issue and its respective relationships. This is to prevent any false conclusions drawn from the data correlation.

3.3 Choice of data

Annual Births and Fertility: Data represents the main issue that we are investigating.
Factor 1: Population of women
Relative factor: Number of marriages
Relation of population to birth rate may not be valid if despite a decrease in population the number of marriages increase

Factor 2: Divorce rate
Relative factor: Average Number Of Children Born to Married Singapore residents
By comparing birth rate among married residents to national birth rate we can draw a clearer conclusion as to whether divorce may be a valid factor. If rates are largely different it shows that even divorced couples may already have children

Factor 3: Live-Births By Educational Qualification
Relative factor: Median Age at first marriage of grooms and bride by education qualifications
By examining the two data's, we can see if there is an impact of the desire to have a career being a deterrent for women from being married or having children

For each factor, their data was selected on the basis that:

- The data referred to Singapore Residents
- The data was relevant to the explanation of how the factors may affect the main topic
- At least one relative data that could affect each factor was selected

3.4 Limitations and constraints of the data

Difference in data time period
Datasets have a varying time period, due to certain datasets not being up to date. This could affect the conclusions drawn from the data as since the data is not recent the status quo of the related factors may be different.

Difference in length of time covered by data
Though majority of the datasets cover a minimum of a decade, specific topics that have been recorded such as Average Number Of Children Born By Age Group Of Resident Ever-Married Females only have 2 years of data collected. The varying time periods covered by the data limit the comparisons that can be created between the datasets.

Difference in way the data is recorded
As the datasets record varying things from age to birth rate for varying races and age groups, when comparing the data trends against each other the comparison may not be fair. Furthermore, the time gaps in which each data is recorded also differs, with some data missing certain years while some data recording values on a monthly basis.

3.5 Data ethics

The following comparison and conclusions are made purely on the trend of data and should not be taken as factual factors of causation of the main issue. Many relative factors were not taken into consideration and any conclusions should not be used as basis to discriminate

4.0 Data Processing and Formatting

4.1 Data Processing

Libraries imported:

```
import matplotlib.pyplot as plt
import pandas as pd
import csv
```

Data loading:

```
with open("crude-birth-rate.csv") as birthRate:
  birthR = csv.reader(birthRate,delimiter=",")
  birthL = [] #data list
  for column in birthR:
    birthL.append([column[0],column[2]]) #filling the list
```

Data filtering:

2 methods of data filtering were attempted:

Method 1: #not suitable for data that doesn't have consistent data throughout the year

```
#removing data before year 2010
  birthL.remove(birthL[0]) #removing header
  dataY = int(birthL[0][0]) #year the data starts
```

```
startY = 2010 #year of data we want
diffY = startY - dataY
birthL = birthL[diffY:]
print(birthL)

#lists for respective axis
bYear = []
bRate = []
for b in birthL:
    bYear.append(b[0])
    bRate.append(float(b[1])/10)
```

Method 2: #not suitable for data not arranged in order of years

```
dataY = 0
for column in genderR:
    genderL.append([column[0],column[1],column[3]])
    if column[0] != 'year':
        if int(column[0])<2010:
            dataY += 1
#removing data before year 2010
genderL.remove(genderL[0])
genderL = genderL[dataY:]
```

4.2 Matplotlib

Code to plot graphs:

```
plt.plot(bYear, bRate)
plt.bar(bYear, bRate, color ='maroon', width = 0.4)
plt.title('Birth Rate Vs Year')
plt.xlabel('Year')
plt.ylabel('Birth Rate')
plt.show()
```

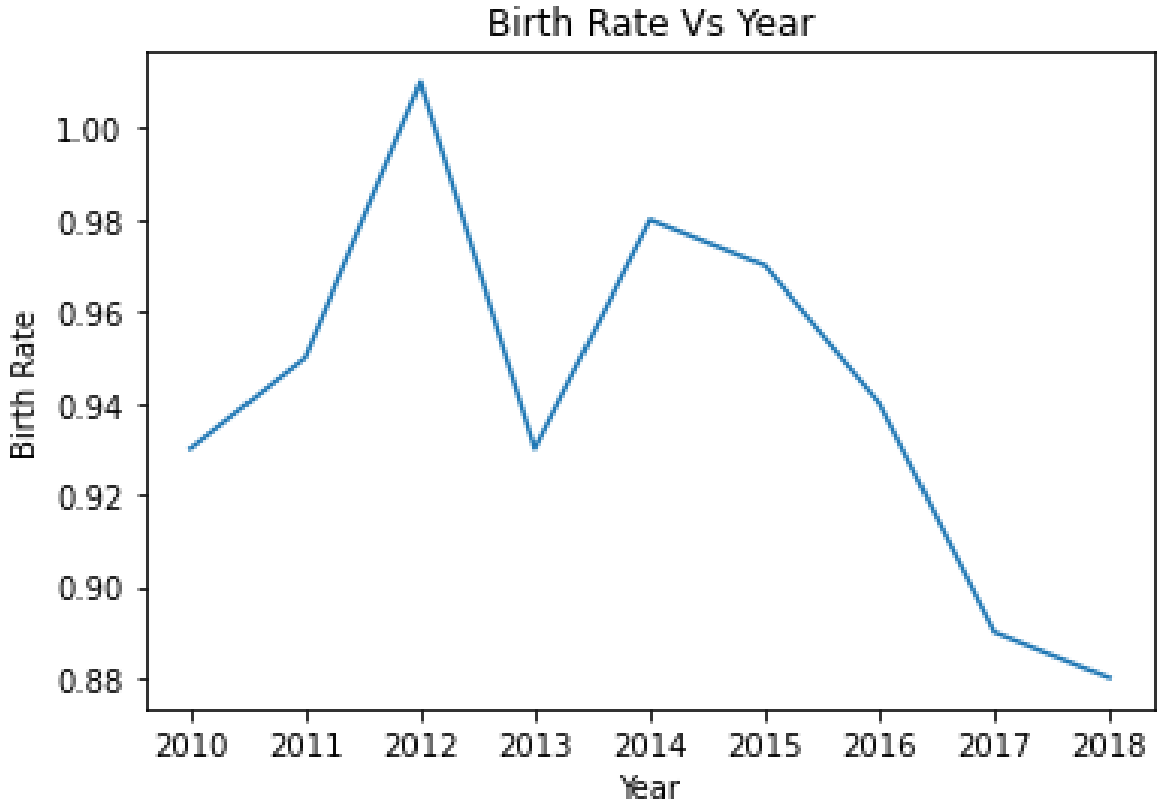
4.3 Pandas

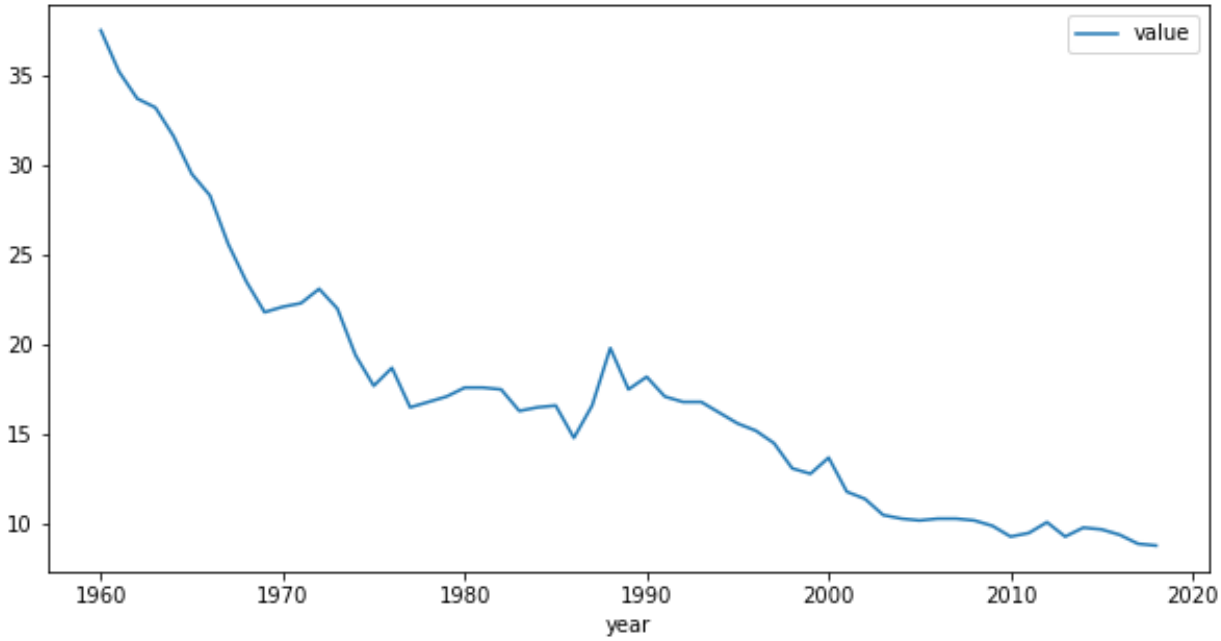
Code to filter and plot data for analysis:

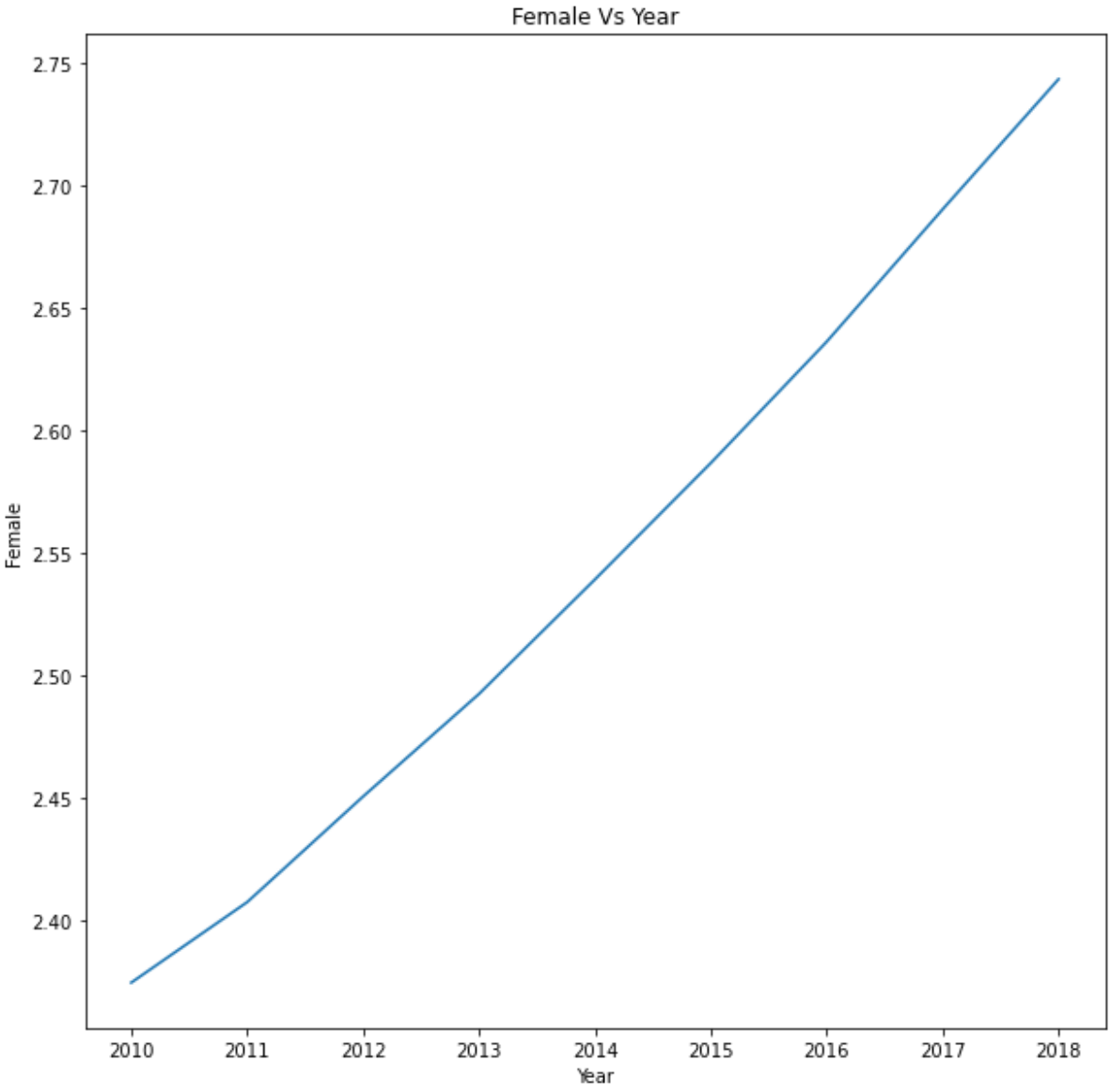
```
df = pd.read_csv("crude-birth-rate.csv")
df[df["year"]>2009]
df.plot.line(x='year',y='value')
```

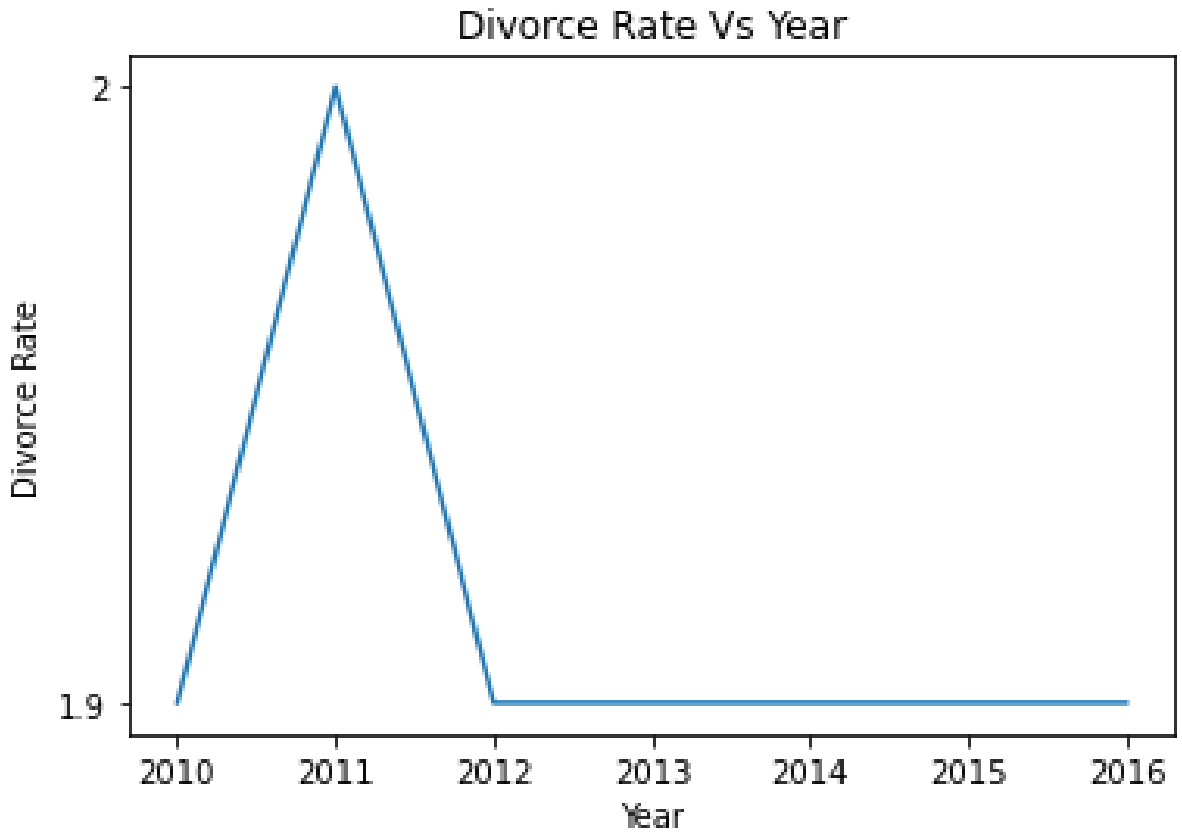
5.0 Data analysis

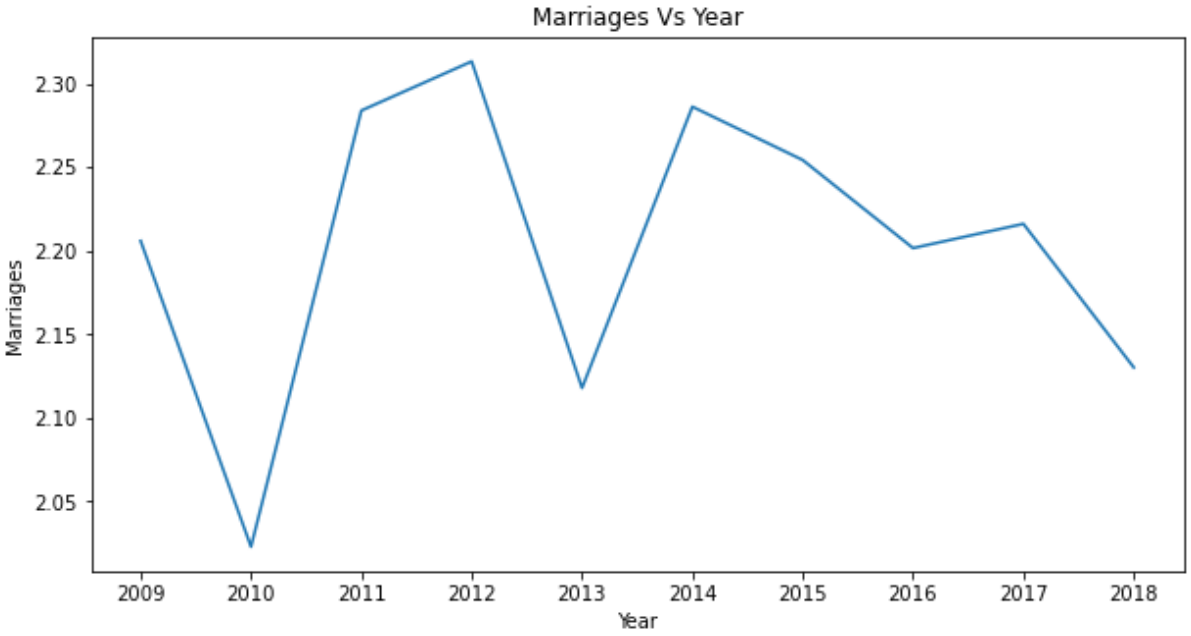
5.1 Data Graphs

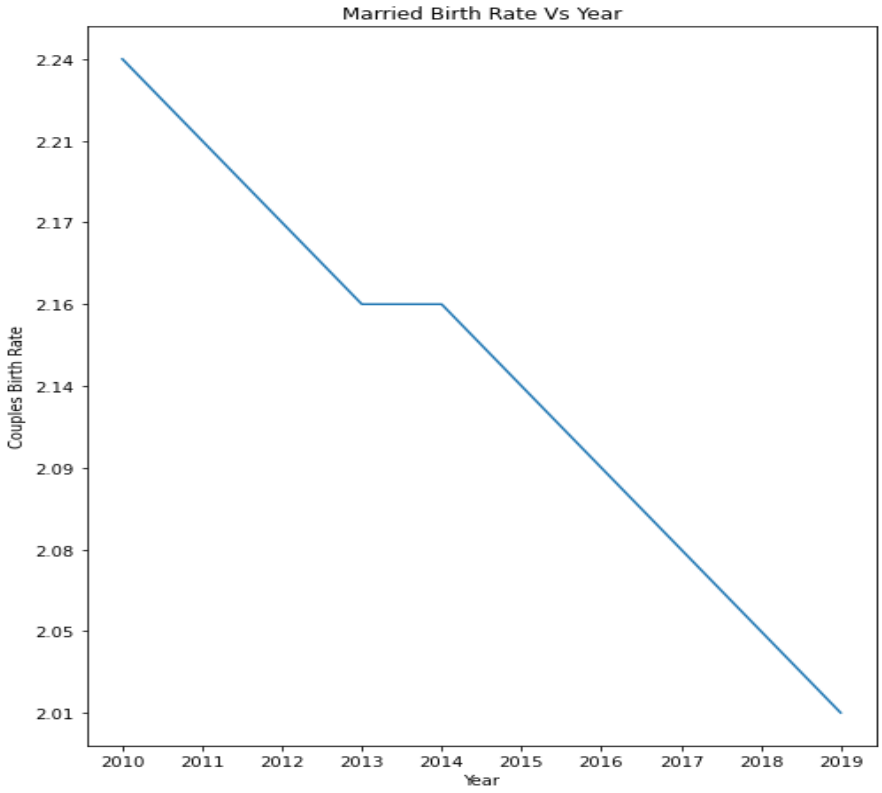




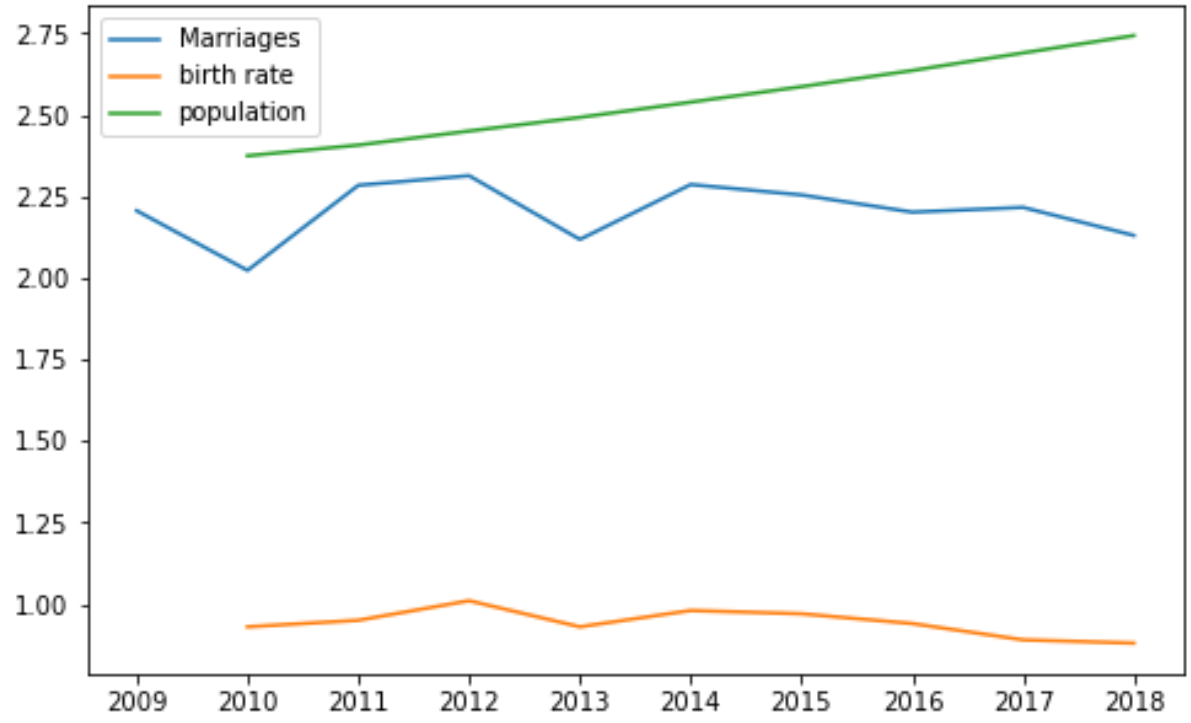

Female Vs Year
Female
Year
2.75
2.70
2.65
2.60
2.55
2.50
2.45
2.40
2010
2011
2012
2013
2014
2015
2016
2017
2018


Divorce Rate Vs Year
Divorce Rate
2
1.9
2010
2011
2012
2013
2014
2015
2016
Year


Marriages Vs Year
Marriages
2.30
2.25
2.20
2.15
2.10
2.05
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year

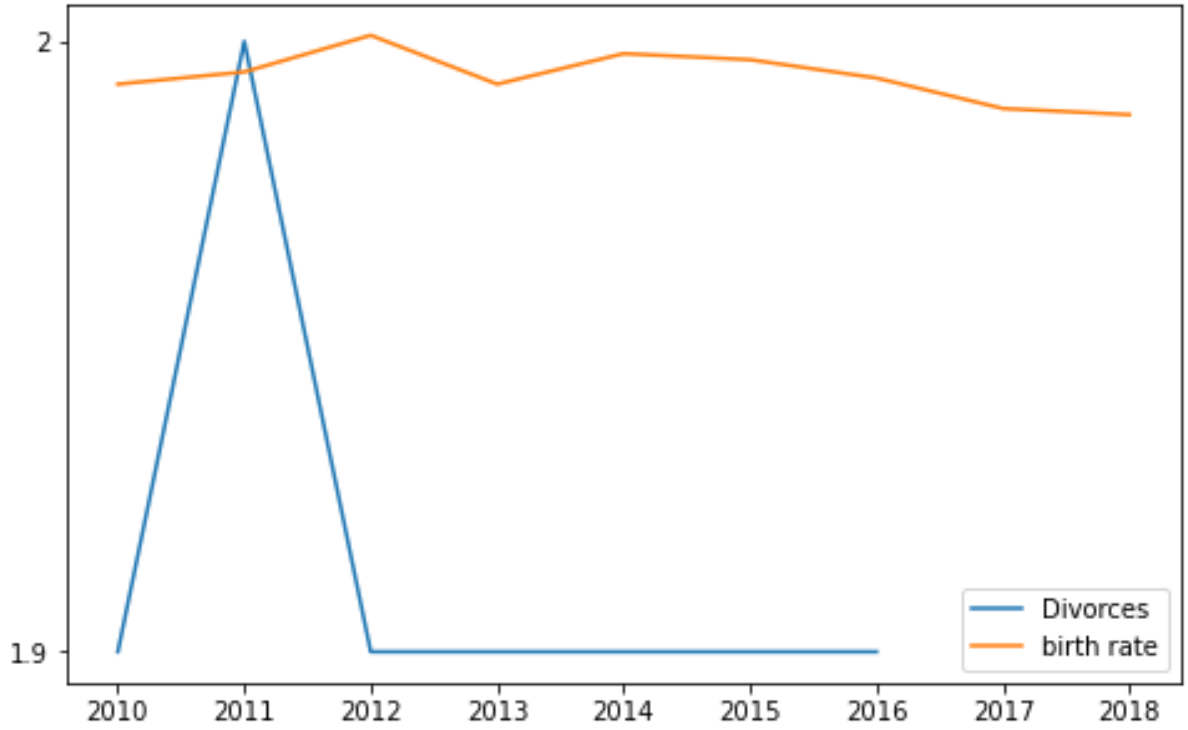


5.2 Correlation

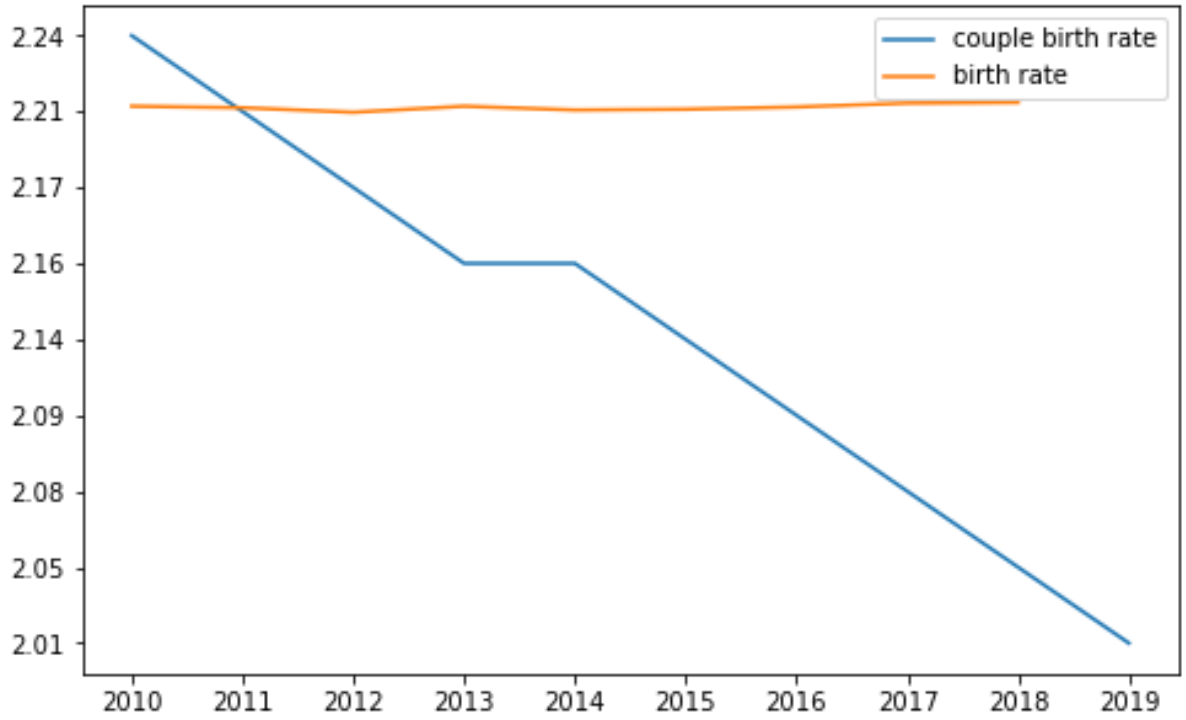


As seen in the graph above despite the population increasing the birth rate is decreasing, meaning the rise in population is unlikely from a rise in birth rate. Potential reasons could be an increase in immigrants or residents who have naturalised in Singapore. The population of

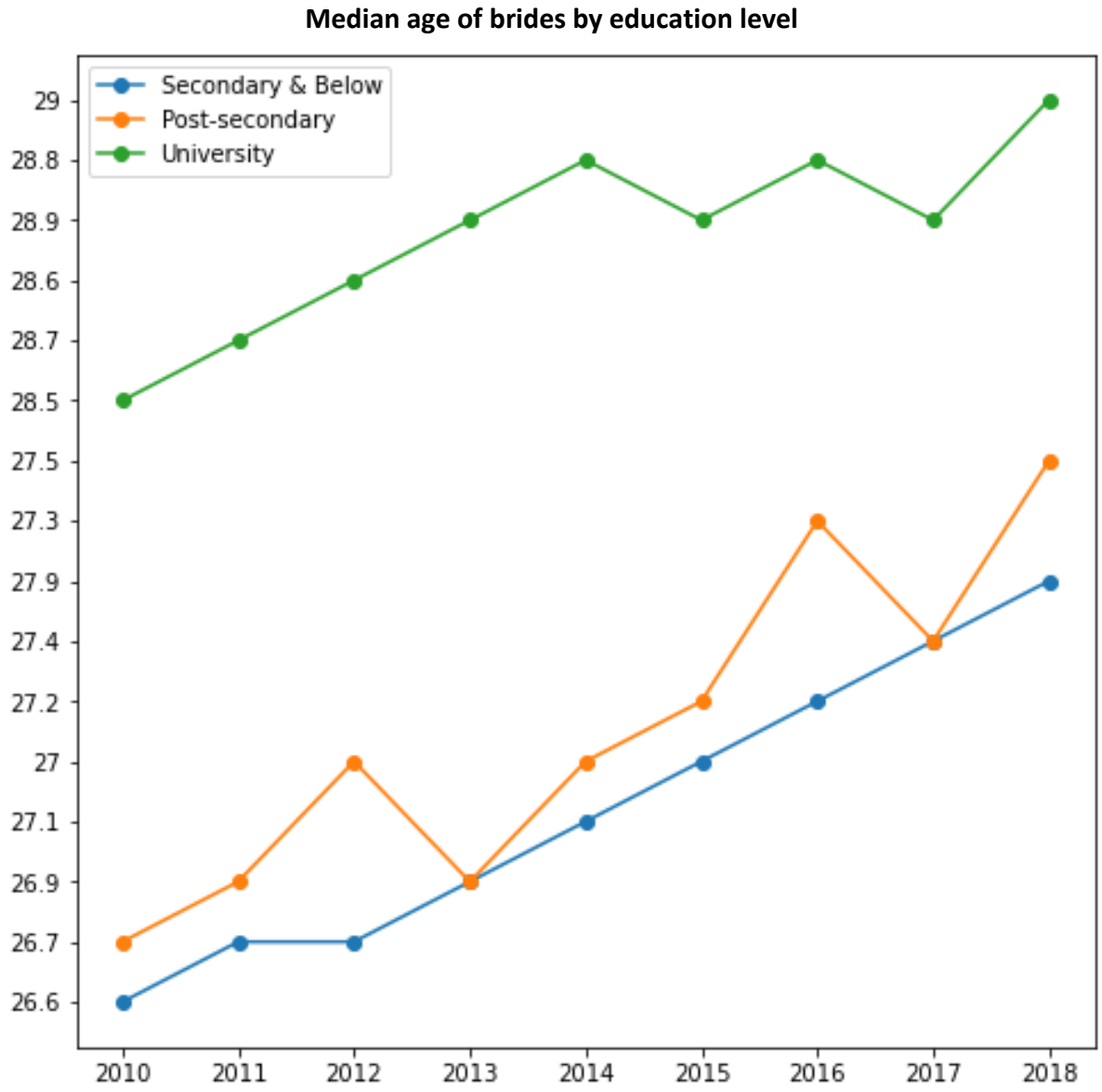
women also does not have any affect on the number of marriages. However, there is some correlation between the number of marriages and the birth rate. It is possible that due to a decrease in the number of marriages there is a decrease in couples and thus in return a decrease in the birth rate.



As seen from the graph above despite a spike in the number of divorces in 2011 the birth rate remained relatively the same with an increase from the previous year. This shows that the number of couples that remain together generally do not affect the birth rate at least not to an extent that makes it a determining factor.



Though the birth rate among couples generally decreases the overall birth rate maintains relatively the same. In conclusion, the birth rate is not affected by the number of couples staying together as the birth rate among couple decreases however the effect on the birth rate is not very great. Hence, its likely a overall decrease in birth rate among couples and divorcees.



As seen from the graph above as the education level increases the median age of marriage increases. Therefore, it could be concluded that the desire to pursue a higher level of education may be deterrent for women to get married. However, as the median age of marriage for lower levels of education has also increased there are likely other deterrents rather than just a desire for a higher level of education.

Birth rate by mothers' education level

As seen in the graph above as the level of education of the mothers increases the birth rate increases. Thus, showing that pursuing a higher level of education is unlike to deter women who have decided to have children.

6.0 Summary

In conclusion, there is data showing that the desire for a higher education level and the number of marriages may have a proportional relative effect on the birth rate based on the correlation the datasets have shown. There is no numerical data showing a correlative relationship between the divorce and population factor on the birth rate.

All conclusions drawn, however, should not be take as a direct reason for the main issue. This is because conclusions were drawn base solely on the numerical data on various factors that may be in return affects by other factors. Hence, there is unlikely a strong direct relationship between the datasets due to the inability to remove the effect other factors may have on the dataset.

As the world changes and time passes the data may also not be relevant to the current status quo now especially since with the current status quo being the world facing a pandemic.

8.0 References and Resources

Research links:
https://www.valuechampion.sg/the-real-reason-why-the-baby-bonus-wont-work[1]
http://country.eiu.com/article.aspx?articleid=291132812&Country=Singapore&topic=Economy&subtopic=Forecast&subsubtopic=Economic+growth#:~:text=Singapore's%20resident%20population%20(defined%20as,tend%20to%20have%20fewer%20children.[2]
https://www.valuechampion.sg/the-real-reason-why-the-baby-bonus-wont-work

Data links:
Births and Fertility, Annual 2018
https://data.gov.sg/dataset/births-and-fertility-annual?resource_id=2ba37efc-5411-4f1f-aecf-ea2455c9236d
Gender ratio
https://data.gov.sg/dataset/resident-population-by-ethnicity-gender-and-age-group?resource_id=d5d35678-cd15-4f43-b347-d671d1870655
Number of marriages
https://data.gov.sg/dataset/number-of-civil-marriages
Live-Births By Educational Qualification, Ethnic Group of Mother and Birth Order 2020
https://data.gov.sg/dataset/live-births-by-educational-qualification-ethnic-group-of-mother-and-birth-order
Median Age at first marriage of grooms and bride by education qualifications
https://data.gov.sg/dataset/median-age-at-first-marriage-of-grooms-and-brides-by-educational-qualification-annual?view_id=d1a89ed2-d097-4570-accd-d499643eab2b&resource_id=e25a47ed-a41f-410e-b947-a4e30c1b308e
Crude divorce rate 2016
https://data.gov.sg/dataset/divorce-rates-annual?view_id=cf086a14-a927-42d6-8e8b-df95a7c722cc&resource_id=90fb728d-2444-4a59-aaf2-861956539518
Average Number Of Children Born By Age Group Of Resident Ever-Married Females, Annual 2019
https://data.gov.sg/dataset/average-number-of-children-born-by-age-group-of-resident-ever-married-females-annual?resource_id=76a7eb04-0193-4775-81f7-b0e9b8b5714f