CS5001 Project 6 Report

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1 Problem Description

1.1 Economic inequality is a topic that has been frequently examined in economic studies. Economic inequality exists in nature. This means one can not choose to be born with wealth or poverty, but what can be changed is their status later in life, by hard-working.

In this project, we further explore the work produced by Justin Allman (and his colleagues) and use a programming perspective to simulate a real-life example of how lottery redistributes the money from low-income groups to middle and high-income groups in the form of scholarships.

This comprehensive project starts with a coding template and further practices our knowledge in lists, loops, Python random, and a variety of methods.

2 Follow-Up Questions

2.1 How much of the wealth does the high income half possess by the end of eight decades? How about the low income half?

The solution to this question changes every-time when we re-run the program. In the case shown in figure 1, the high income group possesses 54.91% of the community's wealth, while the low income group possesses 45.09% of the community's wealth.

```
C:\pythonProject\venv\Scripts\python.exe C:/pythonProject/venv/CS5001/project06/LotteryAndWealth.py
No artists with labels found to put in legend.  Note that artists whose label start with an underscore are ignored when legend() is called with no argument.
Decade 0: The high income group possesses 50.469168900804284% of the community's wealth, while the lowincome group possesses 49.53083109919571% of the community's wealth.
Decade 1: The high income group possesses 51.392150285139216% of the community's wealth, while the lowincome group possesses 48.607849714860784% of the community's wealth.
Decade 2: The high income group possesses 52.911477616963985% of the community's wealth, while the lowincome group possesses 47.088522383036015% of the community's wealth.
Decade 3: The high income group possesses 53.7137069547603% of the community's wealth, while the lowincome group possesses 46.2862930452397% of the community's wealth.
Decade 4: The high income group possesses 54.77318889641164% of the community's wealth, while the lowincome group possesses 45.22681110358835% of the community's wealth.
Decade 5: The high income group possesses 55.129076086956516% of the community's wealth, while the lowincome group possesses 44.8709239130434% of the community's wealth.
Decade 6: The high income group possesses 55.025553662691165% of the community's wealth, while the lowincome group possesses 44.974446337308355% of the community's wealth.
Decade 7: The high income group possesses 54.90598290598291% of the community's wealth, while the lowincome group possesses 45.094017094017094% of the community's wealth.

Process finished with exit code 0
```

Figure 1: Wealth of high income vs low income possessed after eight decades

2.2 Did anything about this assignment surprise you? If so, what?

Yes, at first I thought it will be the high income half that contributes to the low income half through lottery since everyone pays one dollar to play one time, thus everyone will be having the exact same luck. For example: you can be winning the jackpot of $212,535 no matter if you are poor or rich. And since there will be a even distribution, the wealth curve will be slowly shifted to normal distribution. The results have shown an exact opposite answer against my initial assumption, which surprised me.

2.3 Occasionally, when running simCommunity(), the scatter plot displays one or more blue and red lines much higher than the rest. What does that line mean?

On average, the rich accumulate wealth over time because they start with an above-average wealth base, which allows them to receive better educational resources and a higher quality of life. In contrast, it is difficult for the poor to change their status quo because their wealth base is below average, making it difficult for them to break out of the cycle of poverty.

Due to the randomness of lottery tickets, people often get big prizes because of good luck, resulting in the wealth of these people staying at a very high level. The line represents these people who have won the jackpot.

2.4 The lottery and scholarship simulation is only a small factor that contributes to the wealth gap in the United States. Use the internet to find information about how wealth is distributed in your country. For example, how much wealth does the richest 1% of the population have in comparison to the bottom 50%? Use the internet to identify major sources of wealth disparity in your country.

One of the best terms to answering this type of question is by looking the 'Gini index' which is a indicator used internationally to measure residents' income gap in a country or region. The maximum Gini coefficient is "1," and the minimum is "0". The closer the Gini coefficient is to 0, the more equal the income distribution is.

It has been determined by global organizations such as the United Nation that 0.4 is usually the 'warning line' of the income distribution gap. This means that values above this line will be all considered as 'economic disparity'.

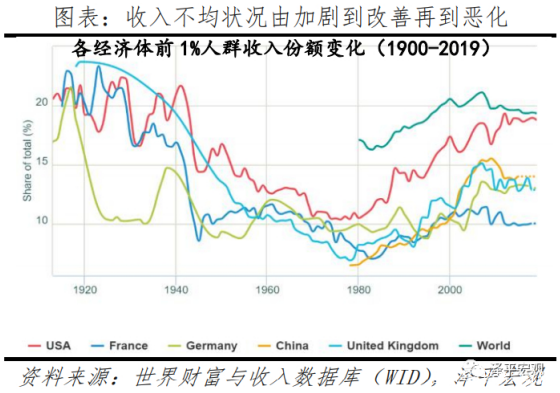

Figure 2: Wealth inequality comparison between China and the world from 1900 to 2019. Source: WID

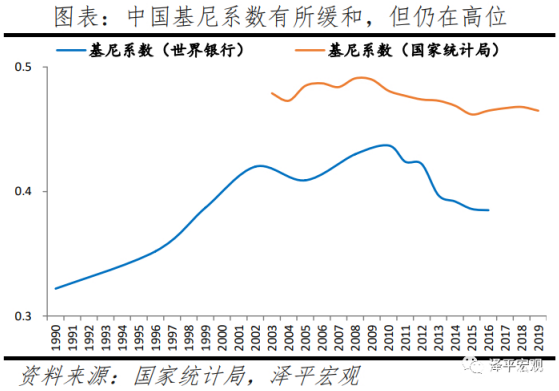

Figure 3: Gini index of China from 1900 to 2019. Source: blue line - World Bank, red line - National Bureau of Statistics of China

From both figure 2 and figure 3, we can conclude that China has been showing 'economic disparity' since 2000, mainly contributing to China's dramatic development since 2000.

During this time phrase, China went through multiple key events in its history, such as the Beijing Olympic Games in 2008, the founding of huge technological giants such as Tencent and Alibaba, and the categorization of '985' and '211' universities, etc.

Another significant reason China shows such an enormous wealth gap is its population, which is the largest in the world.

Some other contributing factors include:

- Social mobility

- Structural differences: urban-rural gap, regional gap, and industrial gap
- Geological factors
- Wage gap between industries

2.5 There are many disadvantages to economic inequality, including but not limited to: stifled economic growth, increased crime, decreased health, increased political inequality, and decreased education. Pick one possible negative consequence of economic inequality, research it, and write a short paragraph about how economic inequality might cause that outcome.

One direct linkage between economic inequality and negative consequences (unintended consequences) is discrimination.

Discrimination means the unjust or prejudicial treatment of different categories of people or things, especially on race, age, or sex.

In China, since the wealth gap is so significant, and even a relatively small portion of poor people can be represented by a huge amount, given the fact that China represents the largest population in the world, with 1.4 billion and is still developing.

Students born in a low-income family background will have to work much harder than students who were lucky enough to be born in a tier-1 city such as Beijing or Shanghai because most top-level universities are located in these tier-1 cities.

Since students from low-income families already have to face the disadvantage of geological factors, they may not compete fairly with students from high-income families because students from high-income families can spend extra money for all kinds of after-school tutorials. Also, there are usually better connections between wealthy families that offer referrals directly into high-wage job positions.

Given the above factors, students from low-income families are hard to break the status quo because employers are often biased and might discriminate against students from weaker backgrounds. Moreover, there is an illusion in organizations and universities where a selection process presents that students from wealthy families must have been educated better than those from the poors, so they think students from high-income families are more likely to succeed, which is not always the case.

2.5 Brainstorm one way you could help prevent, reduce, or counter the growing wealth gap.

What we need here is a win-win solution. This means, by not making anybody worse off, we want to break the status quo and make both parties happy. One way I am thinking is the peer-tutoring program.

It is very likely to find students with high grades, talents, and potentials among low-income group students because they tend to work much harder. Now, this is not a bias, at least in China.

We can develop a platform that allows wealthy family students struggling with their studies to talk with these students who might not have been so wealthy but are good at school to help each other. This might also be the next wonderful entrepreneur opportunity in China.

3 Required Elements

3.1 Figure 4 shows the plot diagram after running the program. We can see similar results after each run because the trend presented in the diagram is almost identical to each run. We can learn from this diagram that the more times players play the lottery, the more they lose, given the winnings represented in the x-axis in negatives.

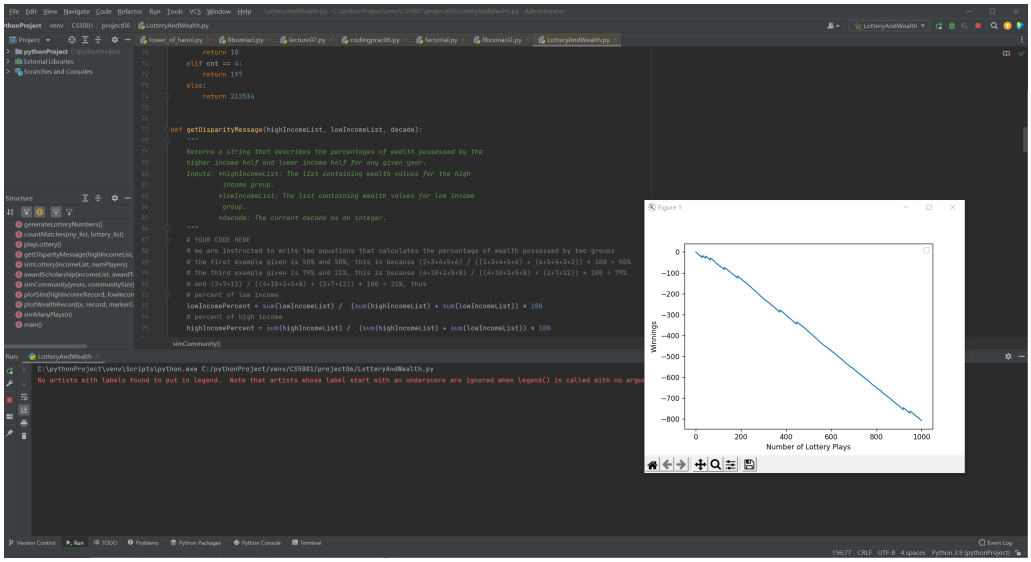

Figure 4: Plot diagram after running simManyPlays(1000)

3.2 Figure 5 shows the plot diagram with print statements after running the program. We can also see similar results after each run because the trend presented in the diagram is almost identical to each run. We can learn from this diagram that the high-income group possesses higher community wealth than the low-income group in all scenarios.

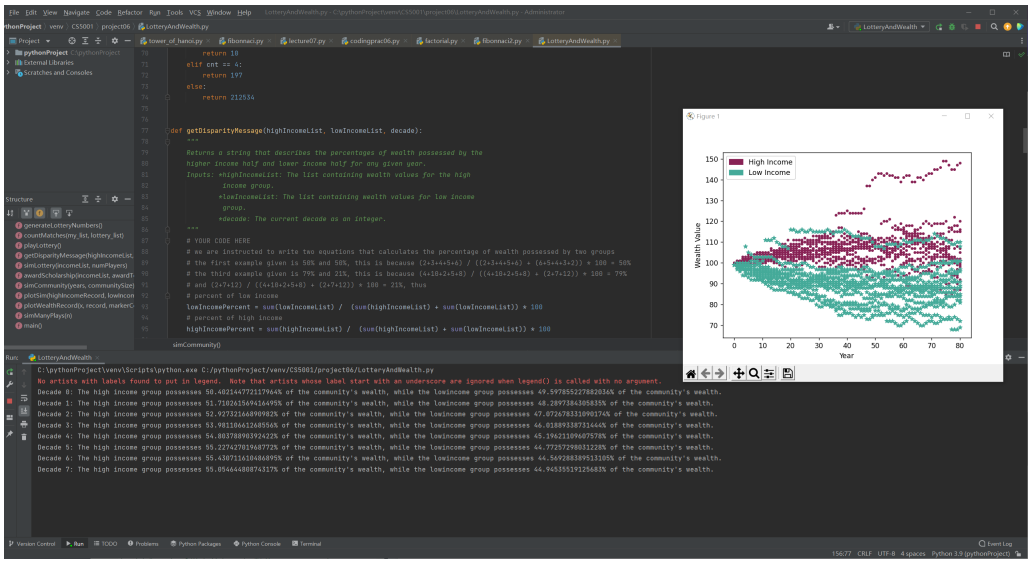

Figure 5: Plot diagram with print statements after running simCommunity(80, 30)

4 Reflection

4.1 After completing the simulation, I was genuinely amazed by how a structured template can help us organize our thinking towards the problem's solution. I am now more assured when designing my code, given the skills I have learned so far when starting my code with templates. Although templates might not always be available, I have had enough taste of the design of templates and can now write my draft start from scratch.

Another takeaway is the spark of interest in data visualization, which I believe will be covered a couple of weeks from now. I have fully experienced the convenience of diagrams provided in such a complex coding environment and appreciate how these diagrams can make our lives so much easier.

5 Acknowledgements

5.1 Website consulted:
$https://www.w3schools.com/python/ref_random_sample.asp$
- Introduction to the random.sample() method
$https://www.w3schools.com/python/ref_list_count.asp$
- Introduction to the list.count() method
$https://northeastern.instructure.com/courses/102943$
- Module videos from professor John Park
Lottery and the Wealth Gap Documentation

- Written by Kaitlyn Zeichick, Stephanie Lin, and Colleen Lewis. Acknowledgements: Justin Allman, Fiona Callahan, Henry Sojico

5.2 Website used for debugging:
https : *//pythontutor.com/visualize.htmlmode* = *edit*