The growth of U.S. GDP per Capita in the 21st Century:

An Example of Data Project for Eco3410

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September 12, 2019

Introduction

Gross Domestic Product (GDP) measures the monetary value of all products and services produced within a country's border in a certain period of time (usually a year). The long-run growth rate of GDP per capita in the U.S. is 2% (Jones, 2016). Given the two significant bubbles (the Internet bubble in the late 1990s and the housing bubble in the early 2000s) that went to bust and caused billions of dollars losses in the economy, does the annual GDP (per capita) growth rate of the U.S. in the 21st century still rival the long-run average? This is the question we set out to answer in this project.

Data

We collect a data set of annual growth of GDP per capita of the U.S. spanning from 2000 to 2018 from the World Bank.[1] Yearly fluctuations in GDP growth are random because unexpected domestic and international factors (such as the bursting of the bubbles) may impact the economy. The summary statistic of the data set is presented in Table 1 below and the boxplot is presented in Figure 1.

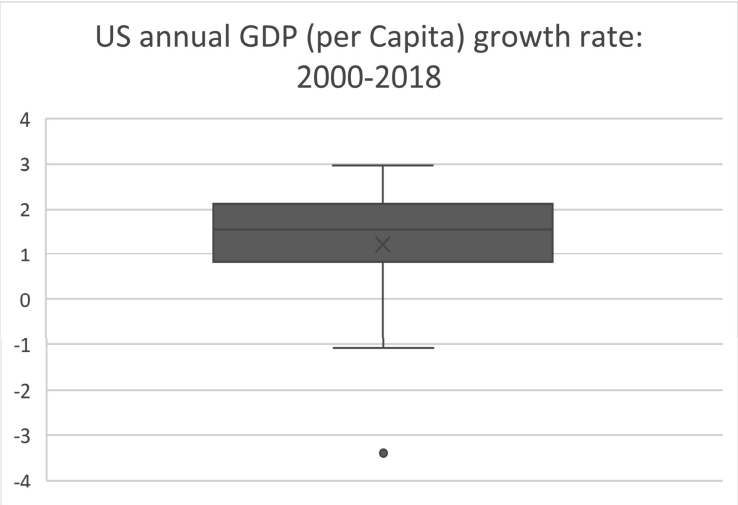
Table 1: Summary statistics: the GDP per capita growth rates in 2000–2018

Mean	Median	Std.Dev.	Skewness	Kurtosis
1.22	1.56	1.48	−1.84	4.47

During this period, the U.S. attained its maximum of annual growth rate in 2000 (2.975 percentage points), one year before the burst of the Internet Bubble. The economy actually shrinked in 2009 by 3.39 percentage points at the nadir of the Great Recession, the lowest growth rate recorded during this period. Both the summary statistics and the boxplot reveal that the data is left skewed. The mean is 1.22 percentage points, less than the 2.0 long-run average and less than the median at 1.56.

[1] https://data.worldbank.org/, accessed September 10, 2019.

Figure 1: The Boxplot of the US GDP per capita annual growth rates in 2000–2018



Hypothesis Test

The hypothesis is to test if the average GDP per capita growth rate in the 2000s (μ in notation) is equal to or greater than 2.0. The data point to otherwise, and we wonder whether that is statistically true. The null hypothesis is $H_o : \mu = 2.0$ and the alternate hypothesis $H_a : \mu < 2.0$. The corresponding test statistic is t-test:

$$t = \frac{\overline{X} - \mu}{\frac{s}{\sqrt{n}}} = -2.30\,,$$

where$\overline{X}$ is the sample mean, s is the sample standard deviation, and n is the sample size. We set the significance level of the test at 0.05, and the corresponding critical value is −1.73. Since −2.30 < −1.73, the null hypothesis is rejected.

Conclusion

Have the U.S. Internet bubble and the housing bubble disrupted the economic growth of U.S. in the 21st century? We collect the GDP per capita growth data from 2000 to 2018 to analyze to answer this question. We find that, based on our statistical evidence, the average GDP growth rate during this period is indeed lower than the long-run growth rate of 2%.

References

[1] Jones, Charles I., 2016. The Facts of Economic Growth. In *Handbook of Macroeconomics* (Vol. 2, pp. 3-69). Elsevier.