Modeling Economic Systems

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May 30, 2006

Abstract

How is it that 2 percent of the U.S. population commands over one-third of the nation's wealth? Is this how capitalism works? Our commercial sector, though regulated by the government, is heavily dominated by the forces of supply and demand - natural guiding entities that result from competition and opinions of the customers. The forces of supply and demand generaters economic growth and distribution, as modelled in this project.

Introduction

The goal of this project was to develop a model that would simulate interactions between simulated people and companies, reflecting the forces of supply and demand and the distribution of wealth. This model was scripted in NetLogo v.3.0 and published via NetLogo's built-in applet converter.

The scope of this project was a closed economy with no government regulation (in any form whatsoever, including, but not limited to, subsidies and taxes.) Furthermore, the subjects are assumed to have only three arbitrary needs, birthing the three corporations of this system.

Background

Since Adam Smith's revolutionary Wealth of Nations introduced the capitalistic economic theory, economists have debated over the validity of capitalism as the ideal economic system. In the 19th century, communism came into being, and during the 20th century capitalism and communism battled each other during the bitter cold war. However, the economic overlap of the systems have shed light into the validity of Adam Smith's claims. During the 1970s, heavy regulation by the U.S. government contributed to skyrocketing gas prices. In the Soviet Union, the relinquishment of government regulation of the economy increased the wealth of the Soviet population. Yet this project looks only at idealistic cases, i.e., pure capitalism vs. pure communism.

Procedure

This project builds off of the Bank Reserves model that is packaged with NetLogo. The Bank Reserves model is a representation of a society of agents buying and selling some arbitrary product amongst each other. In this model exists a bank, which loans out money and stores savings from the individuals. The purpose of the model is to track the distribution of wealth

in the capitalistic society. When one runs the model, one sees that, over time, the wealth of the society grows logistically. As the wealth peaks out, the distribution of the wealth results in a distribution of the wealth in a manner such that there are roughly equal populations of wealthy, poor, and middle-income individuals.

The first thing was to add in three corporations, each selling some arbitrary product - all that matters is that these products are similar in nature, thus producing competition. After crafting these corporate entities, the interaction method that allowed the agents (the people) to trade amongst themselves was removed. At this point, it became apparent that there were flaws in my economic model. These problems included all the corporations bankrupting and huge fluctuations in savings, wealth, and loans. Although the three said variables showed a general upward trend (which itself is a problem, as the three grow exponentially instead of logarithmically,) the three jump from tens of thousands of dollars in the red to thousands in the black, and vice-versa. Each of the agents were employed at one of the three companies, yet a constant wage was set for each company. Some other developments eventually included the AWOL interest system, a bonus system, and an investor model.

Evaluation and Analysis

The preliminary models were victim to an infinite money bug - a bug that caused the wealth in the system to skyrocket exponentially, eventually crashing. After trimming some of my methods out, the numbers have somewhat evened out, though they have not reached the total money / reserve percentage like they were supposed to have. However, the wealth distribution is normalized, and the distribution of wealthy, poor, and middle-class citizens is fairly even.

In observing the results between the models though (and ignoring the bugs,) there is evidence that reinvestment in companies evens the wealth distribution. However, this is partially superficial, as the investors never get a return on their investment. On the other hand, the companies make so much money, this will probably enter the model in the next simulation.

Discussion

The model shows that wealth becomes distributed with a right skew, i.e., fewer rich individuals than middle-class and poorer agents. As seen in figures 1 and 2 (below,) this is positive information. The screen captures were taken early in the simulation before the bug kicks in, but the results remain fairly constant throughout the simulation. In the end, the distribution of socio-economic classes is nearly even, though the wealthy citizens is noticeably higher in the capitalistic model.

The final graphs predict a linear growth pattern, which makes sense given the interest rate that is factored into the model. However, this presents a problem that eventually there will be an infinite amount of wealth in the system. The problem lies in the fact that prices are static, whereas in real life this increase in money would lead to inflation. While not a big problem, this does not reflect real-life. However, in real-life there would be more companies, more people, more banks, and more government regulation. So in the whole scheme of things, this minor discrepancy can be ignored.

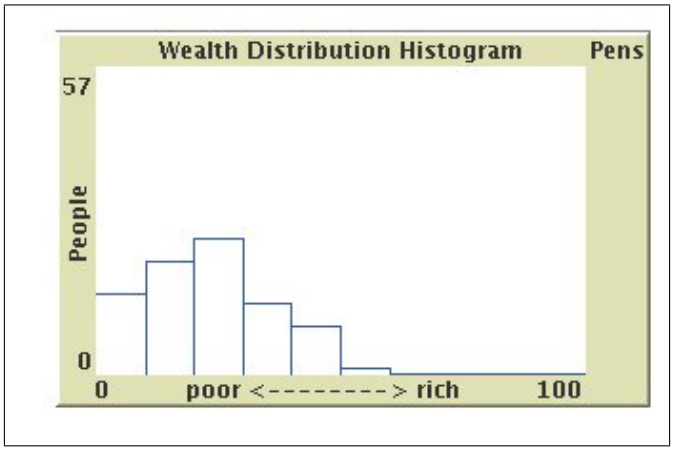

Figure 1: A histogram of the wealth distribution

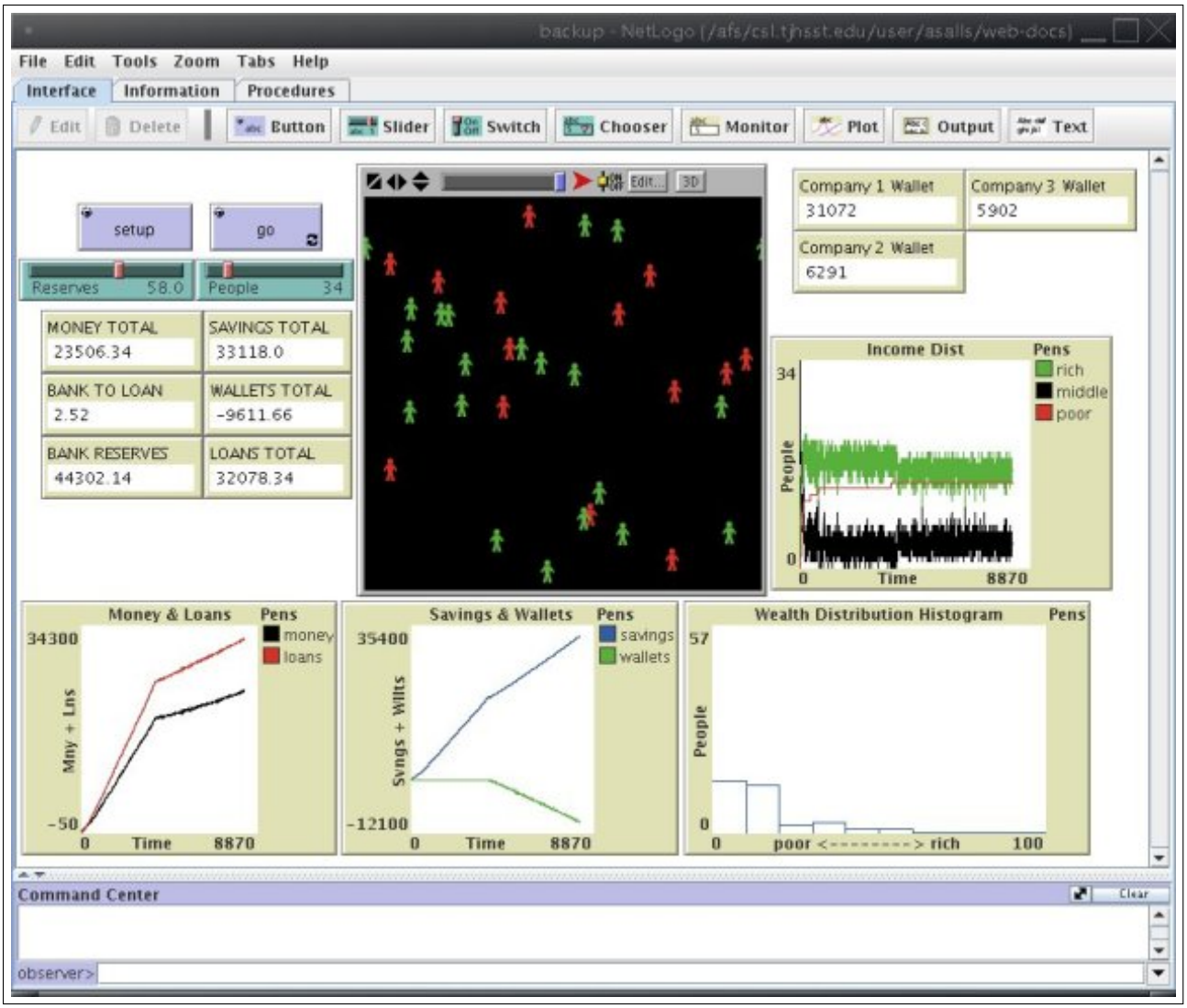

Figure 2: A screen capture of the entire model GUI

Conclusion

There are numerous uses for this model, namely watching the effect of a contained economy, which includes interest. This interest results in the continuing increase in wealth seen in Figure 3 below. The main point is to see the distribution of wealth, which normalizes in the long run given no government restrictions or external factors. However, this is a very simplified model wherein there is no change in population with a perfect oligopoly.

References

[1]http://www.bized.ac.uk/virtual/home.htm

Business Education website from Great Britain which has many business models that I looked at

[2]http://www.frbsf.org/publications/education/greateconomists/grtschls.html

Site lists the pros and cons of five schools of economic thinking. More of foundation/background info for model.

[3]Wealth of Nations, Adam Smith

Underlying laissez-faire

[4]http://216.239.51.104/search?q=cache:R-q0X0HdMT8J:www.newschool.edu/cepa/publications/wor

Another model on wealth distribution

[5]http://www.globalpolicy.org/socecon/inequal/2005/10compendium.pdf

Paper on the wealth inequality in the world; Paper presented to the United Nations Millenium+5 summit.

[6]http://www.globalpolicy.org/socecon/inequal/2003/0801gap.htm Paper describing wealth inequality in the United States, specifically the gap between richest of the rich (profession of choice: CEO) to skilled and unskilled workers.