Economic Policy Simulation and Optimization

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Abstract

There are several variations on gubernatorial economic policy around the world. Given different populations and demographics, economic policy changes. How can we best predict the ramifications of a given policy? Can we produce an optimal policy? Computer simulations and optimization using genetic algorithms may be able to provide policy makers with the data to answer these questions.

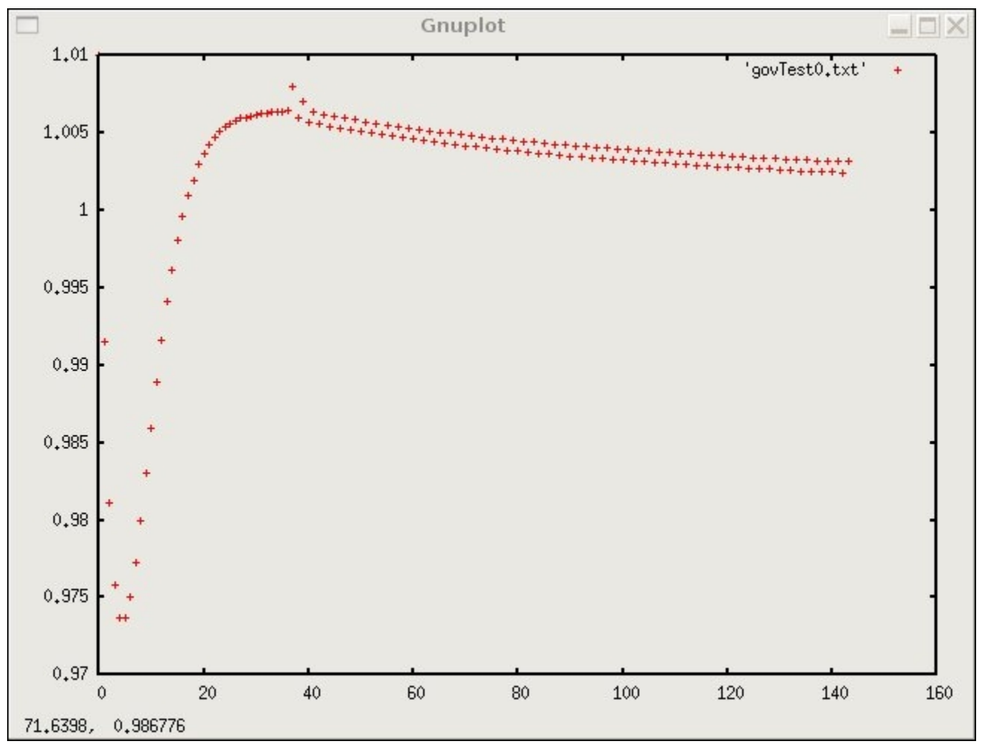
Purpose and Methodology

The core of this project is an agent based model system to provide data of government and population economic and subjective satisfaction over time. Changing demographics and complicated economic systems may obstruct desired outcomes in certain economic policy, disrupting social order. Computer models can provide prediction data quickly and at a low cost to economists, businessmen, and policy makers. Data from the model and perhaps from the genetic algorithm based optimization can guide those involved in economics.

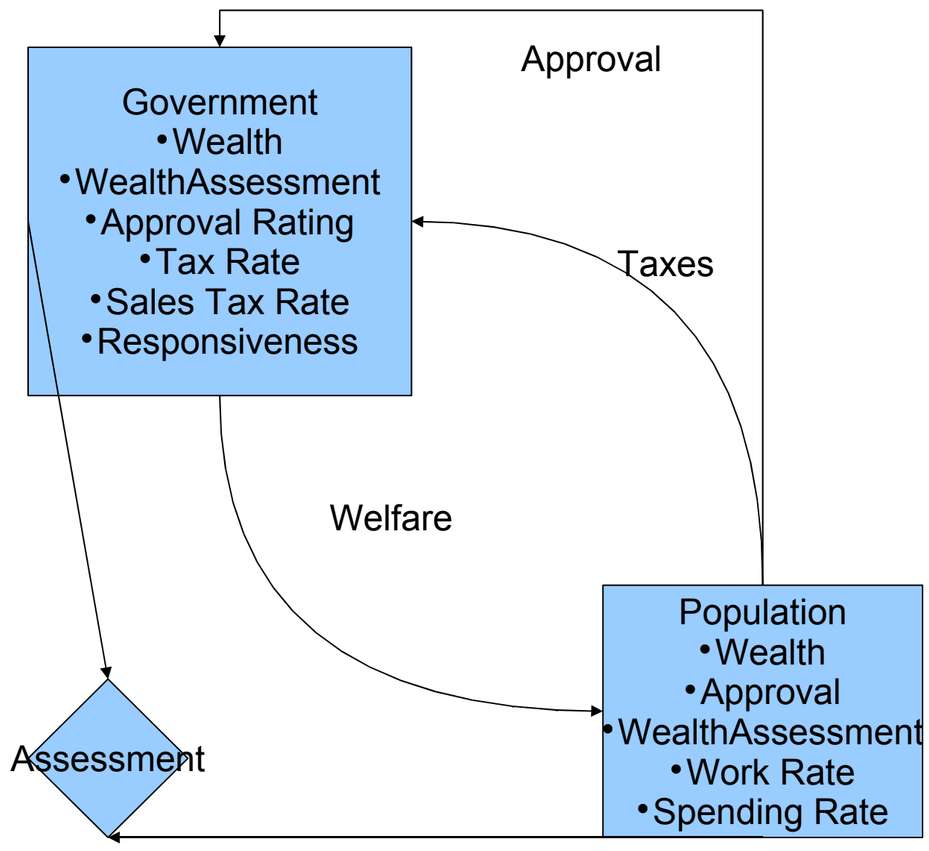
The project will be coded in Java using JGrasp. Over a 12 year cycle, a population will consume and produce, and an authority ("government") will tax and implement welfare programs. The economics and relative health of the population and governing body will be assessed. Data from the model will be analyzed, possibly using a genetic algorithm to find out what policies are best.

Data and Results

Currently using varied data, there is an overwhelming trend of the total civilian wealth plummeting and leveling out, while the total government wealth continues to go up. The assessment, which is defined as the current wealth divided by the previous month's wealth for the total civilian population averaged with the same assessment for the government wealth, is mostly erratic. Currently the assessment is not optimal, but the optimization stage that will be implemented may mitigate poor data.



Sample Assessment Data Over 12 "years"



Background

Tax burden and sudden changes in tax policy are detrimental to approval ratings according to Vermeir's model in Taxation and Presidential Approval: Separate Effects from Tax Burden and Tax Structure Turbulence?. The formula for their approval rating depends on more factors but can be modified or serve as a base example for my approval rating system. To weight factors into my final assessment, I must look at social causality as well as direct causality, as public opinion is just as much perception and relative thought as much as concrete. According to Mao and Gratch in Evaluating a computational model of social causality and responsibility, responsibility and blame assessments must be made to model accurate social cause/effect. An agent based model is ideal because of the varying demographics in populations.

As for optimization, there are several approaches to attain the "best" policy. The assessment determined in the model and other data will be put under optimization algorithms. One possible algorithm is the genetic algorithm. In Optimization in a Distributed Processing Environment using Genetic Algorithms with Multivariate Crossover, a genetic algorithm is employed to find the best result of a multi-faceted problem. By "breeding" data, one may find the best result, similar to the process of natural selection in biology. More heuristics and possibly "variable neighbor search" techniques can improve data output as found by researchers in Minimizing makespan in permutation flow shop scheduling problems using a hybrid metaheuristic algorithm.