Econometric Simulation of the Gobal Current and Capital

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Abstract

Econometrics is the field concerned with creating functioning and accurate mathematical models of economic systems. The advent of computers has revolutionized the field. The processing power associated with them has lead to an explosion in the breadth and span of economic models and the associated economic theory. The goal of this project is to take advantage of these facts to create a functioning predictive economic simulation of global inequity.

Background

An economic market is an aggregate of countless decisions of individual actors making semi-rational decisions. This project will investigate global currency markets. Agent-based modeling is the rational choice for this simulation.

The landscape in the simulation is a finite number of countries that record the money supply of each nation. The agents in the simulation will represent the businesses interacting between the differing countries. The businesses are the vectors for the movement of wealth. They are linkages between two countries one exporting to the other. The import and exports directly constitute the current account. Through a heuristic each business will choose a country in which to produce and a country in which to market its products. The profit (or loss) the agent creates is the basis for the capital account. Theoretically this is either absorbed by the business or given to the shareholders. Regardless this money will then be reinvested, so the profits of the companies is a good estimate for the capital account. Through some heuristic the companies will decide where to reinvest the profit or loss

The next important feature of the project is the heuristic. There are numerous heuristics that are applicable to the project. For the current account, the most pertinent heuristics are supply and demand and Paul Krugman's new trade theory. The capital account heuristic is far harder to accurately predict because of this limitation there are two viable heuristics for this project; reinvestment in country of incorporation or a probability distribution for reinvestment weighted by a chosen value for a liquidity bias.

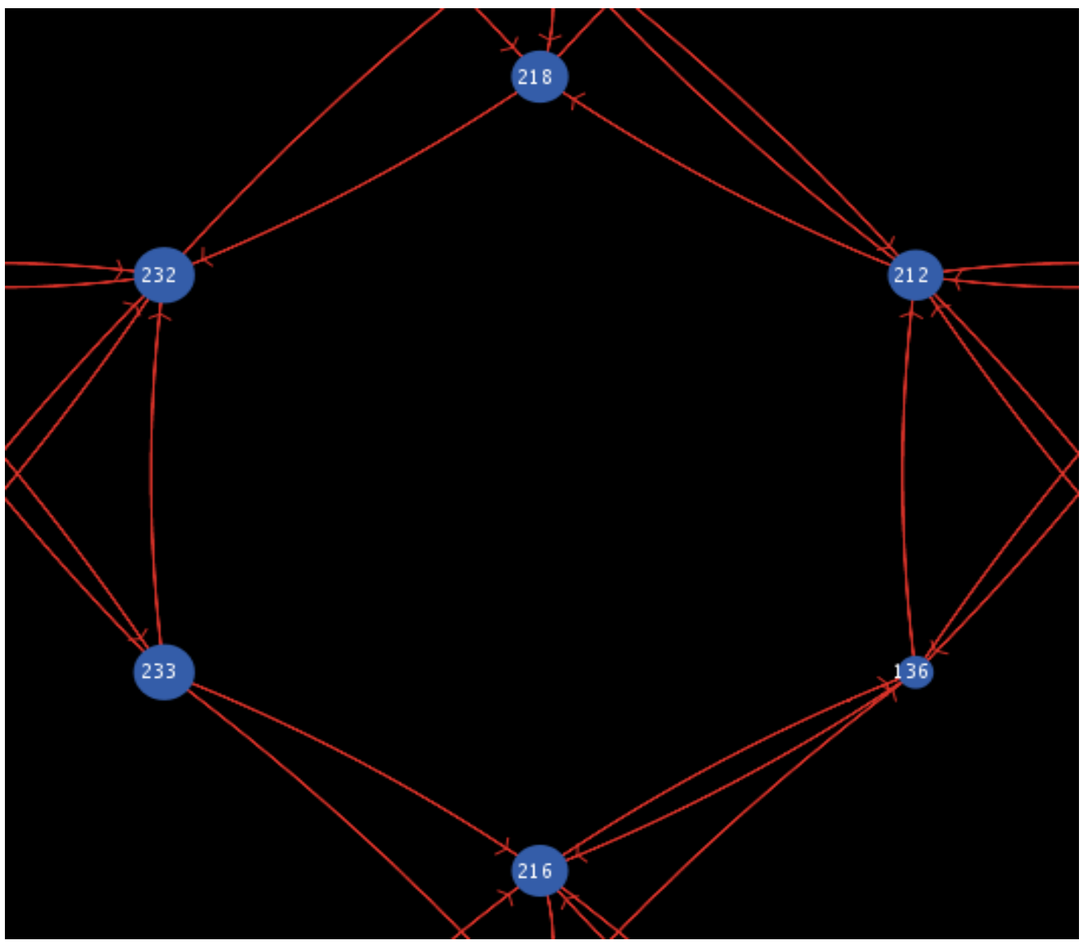


Figure1. Sample model display capital account wealth flows

Procedures

The model consists of two things a landscape, which is a finite number of countries, and agents that interact with the nations representing the businesses that are responsible for wealth flows in the country. The model sets a world with a finite number of countries and a finite number of businesses. Then each timestep the businesses will use one of three heuristics (selected by the user) to evaluate potential countries of production and marketing. They will then move money from one country to another; this represents the flow of wealth due to the current account (imports and exports). In the real world the economic profit realized by these companies would return to their stockholders or move into the business and be reinvested in the world economy this flow of wealth is the capital account (investment). The agents in the model do the same thing; their profit (the difference in the cost of production in one country and the cost of marketing in another) is reinvested according to a heuristic (again chosen by the user). All these changes are represented in a diagram where the countries are circles whose size is directly correlated to their money supply. The agents are represented by arrows between the different countries pointing in the direction of wealth flow.

Discretized Gini Coefficient

$$G = 1 - \frac{\sum_{i=1}^{n} f(y_i)(S_{i-1} + S_i)}{S_n}$$

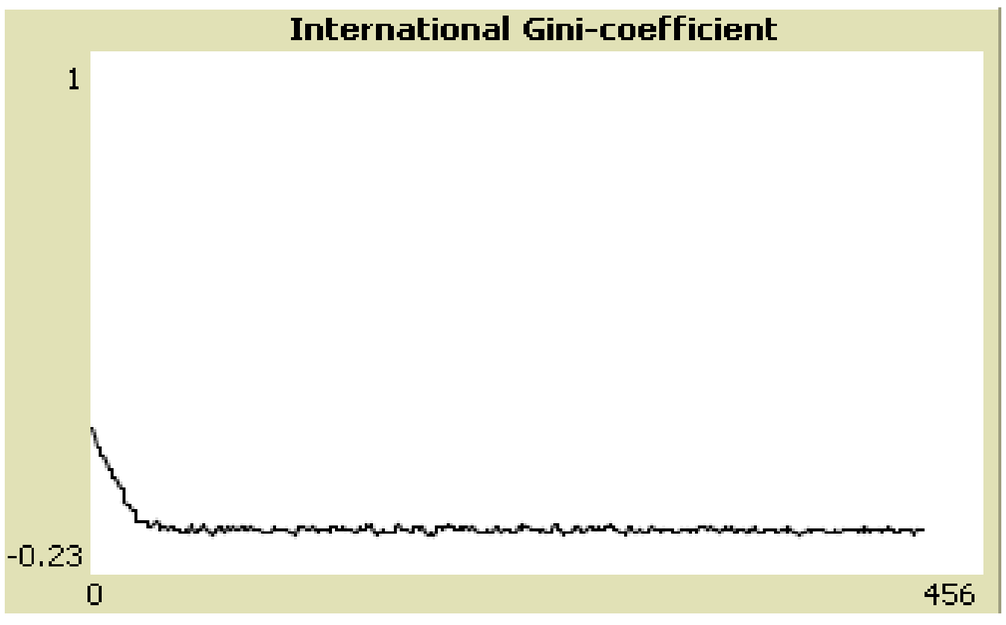
where

$$S_i = \sum_{j=1}^{i} f(y_j)\, y_j \text{ and } S_0 = 0$$

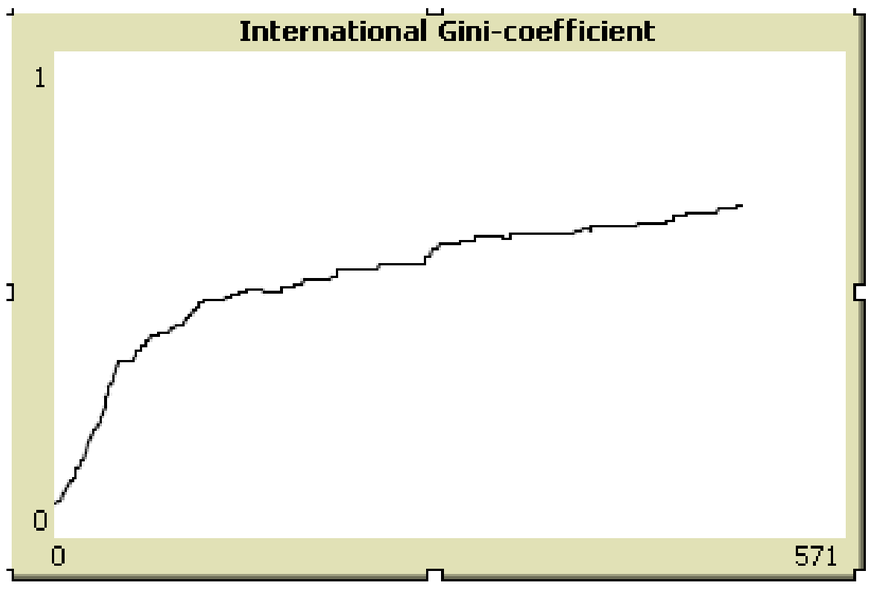
Results

The key result of the project is the comparison between the differing heuristics for the supply and the interactions that the capital account creates. The surprising discovery is that randomized choices lead to an equlibrium in a simple system without the capital accont.. A probabilistic interpretation for the heristic leads to any immediate equitable equilibrium

The other important result is the effect of the capital accunt. The capital account in a risk averse system can lead to an inequitable equilibrium. The two graphs below show the striking difference between the two options. What is occuring is that business in a risk averse economy invest in economies that are seen as stable and expecially in the dominant global currency this causes these countries to receive an incredible influx in the capital account even though they are constantly losing money in the current account. This is actually quite relevant to the real world as it is identical to the situation the US now finds itself in – enourmous trade deficitand a capital account surplus. This also is a worrying omen because when the capital account is removed these ecnoomies contract immediately.



Non-Risk Averse Economy



Risk Averse Economy