A Supercession Lottery
DRAFT VERSION 0.1.1

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I. THE SUPERCESSION LOTTERY MODEL

ALL OF THE FOLLOWING SHOULD BE CONSIDERED TENTATIVE AND LIKELY TO CHANGE.

This chapter presents investigations towards a model that is intended to bridge between current capitalist mechanisms and a Stochastic Economy in which natural resources flow only at optimal rates determined more by long term strategic supply considerations than short term money profits. Thus, what is presented is an assessment of a possible tactic to be employed on the way toward a system for more viable long term management of natural resources.

The basic aims of the Supercession Lottery model are to have demand set a price on a lottery ticket for some resource supplied at a limited rate, while at same time ensuring greater long term resilience of producers that bid for the tickets. That is, the system is intended to apply price mechanisms to the chance of winning a specific lottery, but also to avoid excessive monopolisation of the lottery by only a few producers. Investigation of key questions will be undertaken with the use of computer simulations. Core issues will include:

- Whether prices are fair and do not inflate excessively;
- Whether resilience of producers is sufficiently supported;
- Whether monopolisation by a few producers is avoided.
- Other... Boom and bust cycles ameliorated?
- Other ... TBD

Essence of the model: A supplier supplies a (raw) material factor at a rate $r(t)$, which may vary over time. When supplies of the good become available they are placed under a lottery system. The supplier calculates their costs and a desired profit margin, and releases tickets at that price which is driven by the competition of other suppliers.

Producers then commit to lottery tickets, one per producer, in order to attempt to win the good. When they commit to tickets they are entering into a contract to pay if they win the lottery. But also, entrants to the lottery can 'supercede' the tickets of others. Mechanism: They commit to the cheapest ticket held by some holder, but at the average price over all tickets in a lottery at the time. The difference between the two prices is paid to the initial ticket holder. The initial ticket holder is therefore compensated for the loss of the possibility of winning the lottery.

Lots of questions about this... More details below.

II. A SIMULATION

A simulation of the Supercession Lottery model will be constructed in the following way. A number of suppliers, N_s, of one type of good exists. Each supplier initially offers their goods via a lottery at time intervals chosen from an exponential random distribution whose mean is chosen from a normal distribution, $\mathcal{N}(1,1)$. However, the length of the time interval can be reduced by an amount proportional to the profit the supplier made from the previous lottery (function TBD). Supplier costs are calculated as a function of this adjusted time interval. Each supplier attempts to insert their product into the lottery system at a price which compares favourably with the lotteries of competing suppliers, while at the same time covering their costs. As part of the process of setting prices the supplier can choose how many tickets to release for a given lottery. [But perhaps there must be at least two tickets?]

If a supplier fails to attract any buyers to a lottery during the time interval for which a lottery runs, then an additional cost is incurred (function TBD), and the supplier must make a calculation to consider dropping the lottery entry price for the next round. If a supplier fails to clear his stocks before additional supplies become available then a supplier may run more than one lottery in parallel. Each extant lottery of some supplier should end when new goods become available, when a draw to determine the winner is made. (If no buyer enters an extant lottery before its end then no draw is made.) For the current version of the simulation it is assumed that suppliers have time to calculate their revenues and costs before the price on the new lottery is set. This short delay, fixed for all suppliers, is presumed to be absorbed into the supply cycle time. Suppliers publicly post the expected time of arrival of new supplies. (In this first model there are no added delays in supply cycle times, but later investigations might cover the effect of noise upon actual arrival times of new supplies.)

In this initial model, all suppliers are considered to supply goods to lotteries in the same unit amounts. So supplier prices become the supply price per unit of goods for each supplier.

The model will be implemented in two forms. In the first form there are no spatial distances and therefore no shipping costs associated with these. There will be a global minimum supply time for suppliers, set to half of the smallest initial supply cycle time. Similarly buyers will have a global minimum production cycle time set in the same way. This will mimick, for example, financial markets where the cycle limits are theoretically the same for all players in each group.

In the second form, suppliers and buyers are distributed randomly in a 2-D space, such that there is a transport cost associated with shipping the goods to the lottery winner. Buyers must therefore not only seek the cheapest lottery ticket, but also factor in the transport costs for buying from a distant market. Shipping costs are assumed to be a fixed function of distance. In this form of the model, each supplier or buyer will have an individual minimum cycle time set to be half of their initial cycle time. This pattern of minima will reflect the possibility of varying conditions of production in different locations.

Each buyer attempts to find the cheapest ticket available at the time, including shipping costs, and may also elect to supercede the tickets of other buyers. A buyer initially seeks tickets at lotteries at time intervals chosen from an exponential random distribution whose mean is chosen from a normal distribution, $\mathcal{N}(1,1)$. This is the production cycle time of the buyer. If a lottery is won after the expiry of the current production cycle then their mean production time is increased by (some function TBD). The decision to supercede another buyer's ticket is considered as a function of the relationship between production cycle time and the expected ending times of the available lotteries. Buyers have a production cost per unit of supplied goods that is directly proportional to their production cycle time. It is assumed that buyers sell their products efficiently and that one thing that dictates whether buyers make a profit is whether they can purchase supplies for less than their own production costs. It might also be the case that an interim substitute for potential profit is the possibility of receiving payments from ticket supercessions in the lotteries.

III. QUANTITIES MEASURED

For a given set of initial conditions:
Ratio of extant buyers to suppliers over time, $R_N(t) = N_b(t)/N_s(t)$.
Ratio of mean production cycle time of buyers to that of suppliers. $R_T(t) = \langle\tau_b(t)\rangle/\langle\tau_s(t)\rangle$.
Variances of production cycle time in both groups.
Number of no-draw lotteries over time: $L_0(t)$.
Form 2: Mean shipping cost accepted by buyers as a function of time: $\langle S_b(t)\rangle$
Others TBD...