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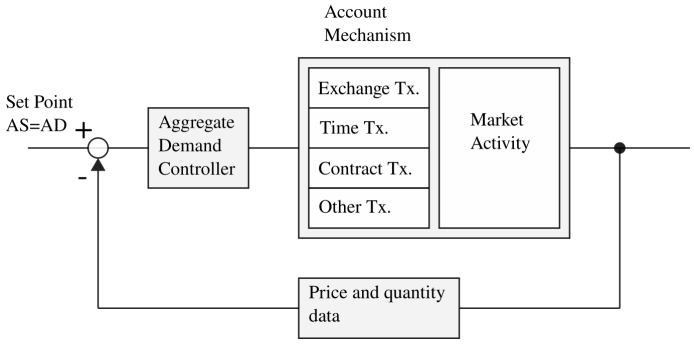
https://github.com/currency-engineering

In the early 1970s, the physicist Henri Rathgeber applied his training to the problem of macro-economic control, and in particular unemployment. His solutions were too ahead of their time to gain any attention. At the time he only had access to Australian unemployment and inflation data. I have re-articulated his reasoning, extended it and re-tested his theories with the large body of economic data now available. The result is a solution to a problem considered by David Hume in the 1770s, namely if currency is simply a unit of purchasing power one expects a doubling of money to have to real effects. On the contrary Hume observed that silver and gold flowing in from the Americas had the effect in increasing economic activity. Hume implicitly assumed that currency, something we can now think of as a digital system, was important, together with the human interaction and decision making through market processes. Now if currency is indeed important we must ask what techniques could be best used to attack the problem. Rathgeber's fundamental insight was this kind of problem required an engineering approach, and in particular the use of control system engineering. The application of these methods results relatively straightforwardly in a good understanding of currency and economic systems.



We identify three constraints or instabilities. Handling errors is an important requirement in all control systems. If there is an error rate that reduces economic agreements to actual transactions, we can determine a fundamental constraint on the markets equilibriation process as shown. Inflating the currency is an error correcting mechanism, which explains Hume's question of why increasing the supply of money increases economic activity. There is a destabilizing interaction between exchange transactions and lending transactions. Irving Fisher in 1908 showed that the interest rates written into contracts for lending must be adjusted to changes in the inflation rate. This results in a positive feedback instability where increases in the inflation rate force increasing real costs of production. Contract transactions are distinct from lending transactions and involve a payment for a change in contract status or ownership. A positive feedback instability occurs when the price of contracts changes over time and people enter the market to speculate on these changes.

The control solution is to separate out the different kinds of transactions types into an abstraction layer that sits over accounts. Destabilizing interactions can the be prevented by decoupling the transaction types by using the following mechanisms:

The error constraint is an unavoidable condition that can only be compensated for with sufficient inflation. The instability inducing interaction between exchange transactions and time transactions can be decoupled by using a unit of account of constant purchasing power in which to write contracts. This allows the inflation rate to be controlled without inducing instabilities. The instability in contract transactions can be eliminated by removing contract transactions entirely (time transactions are available for productive investment). This can be done by ensuring that repayments for lending must be directly from borrower to the original lender. Also be removing contract transaction functionality, we prevent bank accounts, allowing a monetary authority or algorithm to directly and precisely control aggregate demand by adjusting the purchasing power of all accounts in exact proportionality.

All currency designs up to date prevent constrain economic participants from driving markets to equilibrium, resulting in an unpredictable economy with sustained unemployment and poverty. Because digital currencies allow for the possibility of an abstraction layer over accounts, digital currencies are a means of implementing a currency design that is likely to solve fundamental economic problems. This abstraction layer is in general hidden from the account owner and accounts appear very much like accounts in any other digital currency.

My hope is to build a open-source digital currency in Substrate to test as a prototype, and to communicate the design requirements of working digital currencies to others.