

What is the sound of an invisible hand clapping
A study of the economy, from process to structure

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Introduction

Economics is well understood to depart from truth to substantiate an ideological position. The perpetual outcome of the perfect allocation and production of resources, unbeatable by anything apart from government intervention is clear evidence of this. It would be as acceptable to look into holy books for answers to the economy in such circumstances of gross misjudgment of the real world. What we find is the irony that this is actually a means to generating unlimited wealth in a stable system that maximises the potential of human society.

What we are do in this study is to abstract from historical information of real forms that create a structure, something that leads to a delimited course of events and results in all possible outcomes. Structures are hypothesised to be the collective result of interactions. Economics has throughout its entire history always hypothesised such abstractions. An example of a structure is a rule in an economy where everyone has the same amount of money they had last year plus one, this increase being created by printing of money. Over time we can see that such an economy will have GDP growth equal to the level of population. Perfect competition is another structure, where the real forms, assumptions as they are called in logic, are for many firms taking market determined prices and adjusting their production in accordance with such prices. The result of the perfect competition structure is for production to come first and be at full use of all resources. The debate on perfect competition lead to critics to argue that the assumptions do not fit the reality of observation. As such the debate carried on an archetype of abstractions, the debate itself was a process leading further from the path of truth as more

light was cast on it. From a structure we can take a mechanistic approach and consider the outcomes of various likely scenarios. At the core of a structure may be a decision making process, though clearly flows between nodes in the analysis can give certain processes effect.

Our thesis is that the debt based society will tend towards unstable crises and if it reaches ever higher levels of accumulation it will have ever more substantial crises. Whether the subprime credit crunch, the 1980s LDC debt defaults, the 1997 Asian Financial crisis, the great depression, the late 80s UK crash in asset markets, the Japanese deflationary decade of the 1990s, or those crises during the industrial revolution, we see a consistent pattern of debt leading to asset price inflation followed by bust, recession, insolvency and asset deflation. The key problem is that the level of wealth in an economy based on debt defines the level of credit availability especially at high levels of accumulation. There is also the problem that high levels of accumulation can lead to relatively illiquid markets being over stimulated by a hungry swarm of investors causing bubbles and high levels of volatility and/or price increases of assets. This locks in more debt into the system as people increase holdings leading to the precarious problems we see of negative equity and unhealthy balance sheets. The problem is too much wealth in a few hands and also interest compounding as a price of the beneficial effects of redistributing wealth into the hands of the most productive of users through the use of loans.

The second part of our thesis is that the key to economic change is structures, the one elucidated above of the debt based society being a kind of parent or common structure that finds itself present in many processes which dominate each of the aforementioned examples of boom and bust. The liberating aspect of our analysis is that this leads us onto hypothetical imaginary accumulation structures, that is structures which lead to growth of the economy. We suggest a model whereby debt is changed so that it cannot be lent with any positive interest rate and a negative discount rate achieved by a 2.5% tax on all assets and income, a zakat. What is curious about this is how this changes the overall structure of accumulation, with the investor losing all her wealth in a matter of less than 3 decades unless they find some means to keep their wealth increasing in value, though here they do not have the means to levy interest. The third concept introduced into this system is the interest free loan, call qard al hasana, a loan of goodness. This is in fact crucial as a concept for this system to work.

Key to this methodology is the hypothesis of looking at evidence and experience and arriving at identification of processes from which form structures of accumulation driving growth and macroeconomic variables. The problem in economics is that data collected depends on theory which identifies aspects of the world which one measures to create data, yet theory cannot move forward since to justify new theory one needs data. Therefore we admit in our approach the use of anecdotal information that presents opportunity further enquiry to establish and corroborate such hypotheses that come about from rational thought. The ability of market participants to appreciate such processes is evident therefore a similar approach of rational judgment whereby one considers the effects of some process and joins together those which have a logical relation, in that one can identify amid the network of cause and effect dominant trends among seemingly disparate events, allows us to have a certain faith in this.

The alternative methodology of economics is deemed to avoid the existence of

emergent effects from complex systems arising from many participants. It also represents a process imposing it on reality, whereas we suggest that looking at the elements of reality and considering the linkages between them allow for a more fruitful approach to theory and policy. We seek to consider that there are consistent features of economies which are replicated and repeat similar patterns. Given the same structure one can often expect the same outcome in respect of the local effect of a process brought out through analysis from the network of cause and effect of the economy. In addition there is the reliable belief that processes will interact forming structures of accumulation. Rule based behaviour of participants in the market will necessarily lead to processes of some effect or another, given that a rule imposes a tendency of behaviour. In addition processes will impose rules and indeed institutionally generate rules. The institutional structure of society will generate a rule, a process, a tendency which is an important aspect of the accumulation structure.

What must be understood is that this is simply a reinterpretation of what economists have been doing since Malthus, with the addition coming from the realisation that one can change aspects of the world to change the processes and corresponding accumulation structures. Thus this meta-theory is able to reinvent economics and allows us to reinvent economies. Order comes from the chaos as we slowly disprove hypothetical structures through experiments and collection of data related to the enquiry. The reason for this is the need to stimulate society to allow humanity to reach its potential and avoid problems we find arise from underperforming economies.

Numerous times economic theories have been discredited through a breakdown in relationships between variables. The reason why this occurs is because the underlying structure of the economy has not been elucidated but rather a process is found in theory, works for some time and then ceases to occur. The lack of depth of delving into the core mechanistic features of the economy is the cause of such problems. We hope to delve deeper, dig into economic theory to rescue and repatriate what is useful and what is dross.

The key reason why we think that the economy can have something said about it above mere random outcomes is that there are simple relationships entering among people and the object of enquiry is balances, numbers, which accumulate in the case of wealth or debt.

1. History of economic thought

A short study of the history of economic thought perhaps anti-Occidentally overlooking Ibn Khaldun's 'Muqadimmah', perhaps the earliest economics and sociology book, can begin with Adam Smith. His trade theory set a foundation for a central argument that echoes through history as right wing thought. The strength of the free unfettered market whose only bane is the state's uncomfortable and unwieldy presence and activity. Whilst the right has generated numerous exceptions to the rule, (it should be added that the right is an umbrella term bracketing numerous differences, schools and blends), such as defence or war being necessary state tools harkening back to Hobbes, it's political analogue maybe being Clausewitz when we seek to understand the dynamic that drives the state, or externalities such as pollution, another area that really has more in common with the right than left, paradoxical though it may sound before thought has been put into it in terms of present geopolitical structures and policy.

The left has been a minuet of voices digging holes in the arguments of the right, except perhaps Marx who brought truly excellent new ideas of social, intellectual and political relations to explain and develop a more thorough narrative of society. Ceding Marx from this argument, we see the Cambridge Debate, where Saffra showed incoherency in the right's theories of the efficacy, efficiency and affluence of capitalism were overturned by economists of the right with general equilibrium theory in order to undo his criticisms. Note that the initial position of being propagators of falsehoods did not lead to a reply of greater truth. Indeed the opposite was the case. Dinwiddy developed a general equilibrium model showing that the state was able to produce an economy as efficient as the market using the same analysis of the right. Note here that we again do not establish or indeed find any new light on how the economy actually works. What appears is a continual process in the economic thought of outflanking, criticising and then outflanking the opponents. As Sun Tzu said such a process with two armies continually outflanking one another leads them to go round in circles ever chasing one another, until they find that the reality of the war is senseless. A good tactic in war but not a process in science that leads to the truth in ideal. Following on from Dinwiddy's criticisms there was a production of the Dynamically optimised model and also a shift to simpler modelling of the ideal household who would maximise consumption and leisure using advanced mathematics. At no point is the reason for why such a process would occur in real life actually have been put into practice. Our point is that economists have been good students of the debate and poor students of the economy. The quasi-scientific reliance on abstraction and mathematics when the first method in science is to look and analyse and then abstract and model from there (see Sir Isaac Newtons early experiments with light and a prism) has undermined our understanding of the world and produced deleterious situations for economies. Much of the world languishes in poverty and there have been over 120 banking crises between 1970 to 2008. Whilst economics seeks to colonise other social sciences with its 'rational and rigorous tools' as shown by Ben Fine's work on economics imperialism, crises and recessions continue to dog the world. We seek answers with an attitude of seeking truth, perhaps as unbiased as we can be, for the betterment of mankind. We take these attitudes to be self-evident from any reading of successful sciences.

Some debate has occurred, for example Keynes and Neo-Keynesians, as well as institutional economists such as Williamson. In each case the economist in critique used the existing right wing economics as a baseline and nested their own critique within this framework. Our hypothesis of theory as a narrative generated by a system of cultural scientific norms and institutions leads us to believe that the initial conditions of a subject if continued through nesting lead to a continuance of a trend, which if it is originally biased away from truth will lead the student astray from the truth. Just as a country with the initial condition of being highly resource endowed with oil will over time develop industries related to oil, so too does knowledge follow a similar trajectory given its initial conditions and mechanism of change. Thus we argue retaining the form, whether due to the economic norm of 'rigorous argument' (which is essentially taken to mean agreeing in the main with previous dominant wings of the economics profession), of economics is unnecessary for our purpose, which is stated as developing knowledge in order to unleash the potential of mankind.

2. Accumulation structures

We define several means of re-interpreting theory in economics. Firstly there are processes, this is what we call theoretical models often over emphasising mathematics that whilst having an internal consistency due to their logical nature are openly known to not be realistic. We take this to be evidence that logical structures such as those, but not limited to, found in mathematics can lead to deterministic outcomes in respect of the local (independent) activity of a process. The meaning of processes will be elucidated with a number of hypothesised examples from economic history. What is evident is that economists have always, especially in applied senses, been talking about processes. What they dismembered from such theory was the examination of the events in history and act of thinking about possible reasons why something can occur by calling all such activity 'not rigorous' in other words not finding itself expressing the process in mathematics which shows the naivety of the economist. The fact that theories from economics are not used by business people in decision making suggests that the economist's position that the market has rational expectations in other words the best understanding of the system, is incoherent. What we believe is that the individual may not be cognisant of the emergent effects of the systems and processes and structures of the economy. The sum of water molecules makes a wave which individual water molecules are unaware of and do not purposely create. Processes are inherently a means to talk about what we are talking about in economics. There is also the possibility of structures having a dynamic that draws in individuals who even though they may oppose the structure are bound to the process' outcome, such as a bank run.

The presence of wealth that is calculated from asset price multiplied by the quantity of assets must be discerned from money wealth, that is savings in cash. The central process in debt capitalism is the expansion of credit to raise the level of calculated wealth through asset price rises some of which is cashed in or borrowed against to raise money wealth. The 2008 financial crisis involved this process going into reverse as a credit crisis from calculated wealth falling due to home repossessions depressing house prices lead to a solvency crisis that threatened to demolish money wealth. The counterfactual of bank insolvency leading to this was seen in the Great Depression of the thirties. A bank bailout by governments has so far alleviated such an outcome from happening. The key problem in this process is the reduction in demand and incomes from the fall in asset prices, given that assets have become significant in size to have substantial effects on the economy. As incomes fall there is a rise in people becoming behind on loan repayments. The rule that banking uses is that if someone does not pay their loan off then they are repossessed. This is crucial to the banking business model. Yet it is the reason why such a process occurs. There is no other rule for banking that would stop this feedback effect whilst also stopping people taking out loans and not repaying them even if they were more than able to afford them. Thus we see the need for a deeper change in the system to avoid this problem that leads eventually and always to financial and then economic collapse.

We discuss some examples of accumulation structures finding this to be an interesting line of analysis in that it shows the policy maker how to create simple yet empirically effective for some time ways of maintaining and increasing growth.

The US early 21st Century involved an environment of low interest rates set by the Federal Reserve and also low cost products due to expansion of productive capabilities in China now entering a new phase of development. A combination of this and a deflationary Japan where expansive accumulation had already occurred and the monetary authorities were pursuing a similar raising of money supply which flowed to America through an investor strategy called the 'carry trade' (near zero interest loans from Japan were borrowed and then lent out in the US at higher rates, thus pumping much money into the US financial system).

The almost inexhaustive productive capacity of China allowed the tiger of inflation to be tamed in the US. At the same time it a number of financial institutions took it as their policy to lend money to the US citizens which became pumped into the economy, whether via the housing market (itself meaning that owners of assets saw the amount of wealth they had and money they had through asset sales and remortgaging rising considerably) or directly in the form of loans for purchases. These purchases were often from China, thus China would see an inflow of dollars which it promptly lent back to US financial institutions (including government sponsored ones such as Fannie Mae) thus creating for some time a near unstoppable virtuous cycle. While the cycle did breakdown because of the problems we argue are endemic to all interest based economies, we can still respect the many years of growth this accumulation structure involved. It's sheer simplicity was overlooked by economists. We argue that the fact that many economic models find little accuracy in predicting the future is because the underlying accumulation structures are not being consciously examined.

Another example of an accumulation structure is the industrial policy of Japan. A network of financial and manufacturing institutions known as the Keiretsu (originally formed from the Zaibatsu after the Second World War) would in symbiosis with MITI (a government organization that aided technological catch up with the advanced world up until a very sophisticated level of development) bring Japanese society to be the second richest nation by GDP in the world. The asset bubbles that lead to a decade of lost development brought this structure to an end as Japanese banks which had provided the monetary impulse to the technological development of Japanese products were saddled with large bad debts and so were the subject perhaps of a credit crunch.

The US is a good example of many very complex and interesting accumulation structures. The internet 'revolution' was a technological development of the late 20th Century. This involved a great hysteria akin to Tulip mania in the Netherlands about a technology that was billed as being the future for all of the capitalist system. Most internet business' never made any profit in the first phase of this, yet people were drawn into creating many different kinds of websites by their ability to exit the market through becoming listed on stock exchanges. Such was the belief that this was a truly endless money making activity that employees would accept payment in share options. The pattern was for investors to put money into a thriving stock market raising asset prices and leading to more money flowing into the economy. Clearly this system also crashed, yet it seems that it may not have, since the problem of the internet was that there was over-entry to the market with every firm adopting a strategy of obtaining 'first mover advantage', where the first one to be in the market dominates forever that market. To do so they had to spend most of the cash raised on the stock market on advertising. The lack of development of value adding activity and the innate propensity for a market such as

the internet to have perfect information about prices, led to a situation of over-competition and thus collapse as prices could never be competed up in such a fierce environment to attain profitability.

Going back further, the initial stages of mass production with mass communications and transportation networks being established allowed the Western world to develop in much the same way as the internet revolution was supposed to have done. This is another kind of accumulation structure that lead to the development over time of many new firms who over time became flush with capital.

An early example of an accumulation structure is Malthus. Here the analysis focuses on a class of agricultural labourers who also need to eat. An interesting part of this is that the structure is projected forward to lead to a policy problem. The theory is that population growth is geometric in progression whilst agricultural production is arithmetic in projection. Thus Malthus argued one day the system would lead to starvation. Clearly this focuses the mind on the problem and indeed the problem has been solved with advances in agricultural productivity from institutions and technological development.

What can be seen is that accumulation structures, being simple connections between flows, whilst often transient, are a useful method for developing policy and talking about what we want to know about in economics, taken as its objective 'the unleashing of the human potential'.

3. The definition of a process

We have in our previous book, "A theory of belief, culture and social science", that the social world is divided or at least can be analysed as a collection of processes. Some we know about, some exist, some are simply hypothetical abstractions. The method of determining which is true depends largely on data collection and corroboration, experimentation through policy especially variation in policy historically as well as variation in similar yet different countries. A process can be defined as a sequence of events that are linked by a quasi-causal or strict causal framework. A process repeated may not have the same effects or run the same course. A process implanted into a different environment, a different time or under different circumstances may indeed run differently. Yet we acknowledge that there are some things in existence that create 'unifactuals', that is the same course of events in all counterfactual universes. This depth of some processes to create a similar tendency of outcome is at the heart of our analysis and gives it some policy power. Yet we caution the reader and policy maker to notice the flux and floss of any dynamic in society, the transient yet somehow echoing nature of human history.

Examples of processes include the invisible hand of Adam Smith, which allocates production and consumption such that there is never any suboptimal result. This is a common type of process that theoretically stems from having two countervailing forces that act in tension to one another to obtain the equilibrium result. The equilibrium result is then connected to an often tautological definition of perfection, optimality or 'the very best that can be done'. An economics lecturer once said having been asked the question, "where is economic theory in reality, where are indifference curves, Edgeworth's box, etc", answered : "well this may not be true but can you find a better way of doing

economics?" Sometimes it takes time but inevitably the mind can achieve any task.

The Keynesian multiplier though expressed in a mathematical model is another example of a process. It may be that feedback occurs between consumption income and investment, though one wonders if Keynes deliberately let the feedback flows fall to zero over time due to the need to stick to an equilibrium of sorts, a norm that permeates economics yet has little grounding in a world of flux.

Keynes also talked of the process of redistribution of money to the poor as causing the economy to become richer, since he formulated the model such that the poor spend a greater proportion of their income than the rich.

Some processes are empirically observed, such as 'learning by doing', whereby over time a firm becomes more productive in a new activity or that house price rises lead to growth (since they are clear correlates).

As discussed earlier processes can occur when many participants in the market all follow the same rule. This may be due to a fashion in management strategy, for example if everyone follows a first mover strategy in the same market there will be overcompetition and thus potential collapse of the industry. If everyone follows Porter of following niche strategies then there is less competition as everyone carves their only little piece out of the economic pie and remains content. Cultural aspects can lead to certain processes, for example, if the common belief world is for there to be gold in a certain area, the message will pass around the country and many will flock to that place as was seen in the early US gold rush.

Examples of structures:

Process (1)-mark to market of assets leading to falling share prices of banks that lead to bank runs, failures leading to lower asset prices thus mark to market weakening of balance sheets of banks

-rules therefore create and are part of processes and structures. Without regularity there can be no regularity in outcome, thus division analytically between flux and order
-over borrowing leading to delinquencies on loans leading to repossessions leading to fall in house price leading to lower recovery rate on loans leading to lower value for asset backed securities held by banks (setting off process 1), also lower wealth because of lower house prices -> lower credit -> spending -> lower incomes -> higher delinquencies -> feedback. Interesting repetition of the mark to market process which is the same issue as house price falls, a negative feedback loop within a negative feedback loop that is expanding and driver it. Core and periphery feedback loop/ cascading circles?

-short selling of stock: buy stock in future when its price has fallen. Creates an interest to reduce price of stock. By building up a position in a stock and then selling it at a time of illiquidity (relative to news on the stock and market) you make money from shorting which can then be used to build up more of a position in the stock which you can then short again. Investment strategies can be processes when they are large enough.

Presence of big players with capital far higher than market's volume allow this to occur as well. Banning of short selling lead to the sudden falls in various stocks being somewhat impeded. Naked shorting is in fact possibly worse as one does not need to build up a position in the stock prior to the slamming of shares on the market in one go.

The fact that people will sometimes short a stock which is falling means that this process

can become a case of herd phenomena driving stocks ever lower. Existence of hedge funds may be linked to this process.

- low interest policy leading to increasing levels of debt fueling a boom
- borrowing of money by governments which is then lent onto business to allow them to finance large investments that allow them to repay these loans, which are then used to lend to more business'
- new technology structure: internet, railroad, mass production. Hype from a new technology create a buzz of excitement for investing in these technologies which then raises capital for this which pumps up value of business' and thereby raises incomes
- emerging market hype; capital flows into a small economy raise value of assets and business' thereby pushing growth higher
- engine of growth (e.g. industry agriculture interaction) which redistributes some of its gains to another sector which thrives on it symbiotically, e.g. city - uk relation, Microsoft windows-ibm pc symbiosis
- patron-client networks (khan) symbiosis between state and firm through corruption and loans to finance investment
- mass production -> lower prices and higher incomes/employment -> more demand -> more mass production
- new deal public works program: better infrastructure leading to redefining of space for economy, lower cost to operate business therefore more business and jobs and also more demand for goods due to more employment to do public works
- growth triangles; trade in an area leads to growth through feedback between several distinct geographical areas
- chandler: new technologies lead to increase in production from economies of scale and scope at lower prices, thus expansion of markets size in US. Also lead to accumulation by corporate entities. Allowed greater investment, making more jobs and growing economy.
- tariffs creating import substitution in LDC growth, similar to chandler
- Taiwan; extensive product differentiation leading to higher value added through specialisation and niching (less competition, a la porter).
- crowding out investment; process of reducing availability of credit to firms. Simmering a bubble by government selling bonds to crowd out investment that is becoming unproductively speculative.
- printing money and pumping it into the economy
- oil rich countries raising prices of oil and then reinvesting money in an economy
- a hierarchy of rich- service industry - manufacturing industry relations.
- capitalism itself

4. What is an economy?

Consider a network of relations and flows which changes and mutates both on a system wide level and on a subset of this network at different rates. Implementing a structure as a policy causes a system wide change in the network of relations, though processes often can cause the emergent effect of a system wide change, consider capitalism and technological development leading to mass production techniques and therefore a system wide change, whether by way of the introduction of the factory to

liberation of women. Note that a system wide change can be an on going activity therefore the full understanding of a structure is on the dynamic path it takes, not just its endpoint, but the linkage of various outcomes which may be ordered as a time series of connected events or perhaps even counterfactuals, or as a network of associated effects, an idea map that will itself become realised and have a certain amount of symbolic power.

The flows between nodes cause changes in balance sheets in each node. The collective balance sheet gives macroeconomic variables. It is however arbitrary often to consider theoretical processes such as a Keynesian consumption function or a Friedman demand for money function to determine the kind of data one should collect and the terms used for its organisation. The use of empirical regularities can be problematic due to the constantly shifting nature of the network's configurations. One structure can become another, indeed often there may be several structures and many processes being carried out. The task of the theoretician and empiricist is to find and identify and measure these processes and structures.

Taking the point further we can already see that the use of regulation, by creating processes which lead to different structures (often not the one envisioned by the regulator) affecting the network configuration.

We do not need to know exact details of the network configuration to determine policy, since what we are looking for is to find policy that creates structures through initiating and guiding processes that then affect and eventually alter the system wide structure.

5. What is the surrounding space that determines how a process will work?

There is a legal, cultural (including belief world, idea maps, life worlds and time geography), institutional (whether in terms of regularities and replication of contracts, relations, interactions such as the terms and rules by which a bank gives a loan, e.g. on the basis of an asset), accounting rules (e.g. mark to market for asset backed securities leading to processes of falls in bank shares and viability). Fiscal policy: this is based on creating the structure to alter behaviour (such as tax breaks for investment) though government is often over-reliant on this (for example encouraging families through tax breaks, possibly the most unromantic reason to get married). Mathematical: logic will determine how these above contours to the space around a process work. One aside is that there is also the counterfactual of a structure, e.g. a banking sector can disappear given suitable events.

6. Suboptimal optimality

The core idea in the economic theories of the right is the idea of markets being optimal. Ranging from always optimal to in the long run optimal to being a deviation from optimal due to something the government must either do or not do, this idea we will argue is actually a reality imposed on reality.

Consider the oil market. An excess of want leads to higher prices being bid yet this rise in prices makes supply increase. This is not an indication of optimality but rather we describe it as a process. The set of processes can be seen to be replicable

chains and networks of causality. If something is not replicable then it is simply an event, a shock in the common economic parlance. For example, a rise in prices of oil changes the flows between owners of oil and consumers of oil. The spillover of oil owner's rising revenues onto nodes connected to it, such as elements up the supply chain or people who supply to people who are involved in oil, whether a restaurant or a government in an oil rich country, raises flows to these areas. Thus we see oil rich countries becoming richer with oil price rises. However, the change in flows towards the oil rich country can reduce the level of growth in the consumer country, which then finds itself poorer, with spillover effects on that. Thus we see an indication of the fact that there is as sub optimality in optimality, in the sense that there exist two different universes, one with the process of rising prices leading to a change in distribution, whilst there is also a universe where the distribution is otherwise where this process does not occur.

Consider the effect of changing rules in a system. With a certain rule change there is a different set of processes occurring. As a process occurs it alters flows and balance sheets between nodes, causes new institutions to develop, thus altering the configuration of the flux network.

Rationalisation of the system, the idea that any social system is in some sense predestined to have a purpose and meaning, a function, is a similar problem to anthropomorphism. Yet as a human may see themselves as part of a divine plan, they are far more complex in terms of their internal psychological processes and external social processes which they are influenced by. Given free will, there is no reason for a system made up of these systems to add up to a system with an inherent meaning. Given no planned creation of the system, there is no reason for processes to necessarily come to a meaning. Rather the individual considers the system around them to have a meaning, in the economist's world, a perfection that cannot be exceeded. The system is thus ascribed to have such an association, the system is reinterpreted rather than being influenced.

At the present time we can class different aspects of the system as historically generated categories; assets, income, spending, taxes and debt. Assets are a claim of ownership which entitles a flow of income, this claim being something that can be transferred at a price. Spending is a very nebulous area, however it generally is the connection of one node to another. It involves a change of ownership of something, a good, or a renting of ownership of something, for example a leasing of an asset or the use of someone's skills and time, such as going to a nail bar. In the modern world one cannot own a person, slavery has been prohibited, so there is a historical aspect to this concept which is evident. What this leads us to question is whether the bondage of debt, whereby someone gives an increase on the amount they borrow, is actually something necessary for a society. One can have an alternative to this, the Islamic system of zero interest. The key argument here is that the system is evidently historically generated and thus the key things which shape the space around which networks flux and flow is the not singular in outcome and therefore the idea of an optimality, which one would argue is something that has to occur as a unique answer, is not possible. There are many possibilities for an economy to take and thus there is not the necessary condition for optimality which is that there can only be one world. The capitalist world. Whilst this is an accepted reality, this is not accepted in the economist's mathematical vocabulary.

7. Parent processes

Consider the sea. Analysis of it as an individual water molecule would not tell you about waves and tides, which are evident simply by watching the sea. The emergent effects of the sea on earth are the tides and waves. The structure of earth and its relation to the moon create this effect, as well as the structure of water. The parent process is this structure, moon moving around earth in the presence of the 'sticky' nature of water molecules. Water ions lead to a sticky nature to it, as water molecules have a weak bond to one another, giving the effect of waves. Were water molecules to have a rigid lattice structure, such as a crystal, then the effect of the moon would have no effect on them. The key point is that we can understand and even predict emergent effects by looking at how things are connected and understanding the surrounding structure. We take this as our analogy for the thrust of the discussion in this book. Identification of waves has occurred prior to the understanding of the water molecule, a piece of evidence that suggests that we can understand the emergent effects of the economy simply by looking at it. Indeed many of the currents and flows of the structures of the economy are discussed since they are sometimes intended. On top of that we can add value to such beliefs by considering the system wide implementation of them, so a nascent technological industry diffuses and becomes an engine of growth (for example the internet boom). If one considers the complexity of waves and tides from such a simple system as the earth and moon and weak covalent bonds between molecules of water, then the economy, with its far more complex layer of structures and processes, must be far more complex.

8. Speculation.

Smith brought in the distinction between unproductive and productive economic activity and this has been a common current of thought, for example in saying that corruption or rent-seeking is unproductive. Speculation may be defined for buying an asset for its own sake based on the expected increase in its value. One cannot typically speculate on buying a car. Is this necessarily bad. The rational expectations hypothesis asserts that markets price in value of an asset based on the information available. Clearly though studies have shown that changes in market price do not correlate well with information, were a single decision to be possible from any piece of information. What is noted by the literature is that there are bubbles or rises in asset prices due to previous rises in asset prices which continue till they burst and then there is a large fall in asset prices.

For our purposes we can talk of unproductive speculation and productive speculation. In the sense we wish to exclude the part of speculation which is more akin to gambling as opposed to what is useful for the economy. The distinction is also between intrinsic value and self fulfilling dynamics. This leads one to understand speculation as a counterfactual phenomena in the sense that it is plausibly multistage, that is that it can occur that speculation leads to a useful activity or that it leads to a feedback dynamic. Speculation occurs in asset markets, it does not occur in stable consumer goods markets. Nor does one call investment speculation, such as a firm buying another firm or more machinery, yet the activity is the same. The volatility of the complex system of

financial markets, where numerous statistics and data are interrelated lead profitable opportunities, often participants outguessing each other. One note is that over time accumulation structures lead to the existence of high wealth funds allowing markets to be swamped and leading to volatility. In other words if \$1 billion of shares are bought in a market which typically trades \$1000 of shares there is going to be a rise in prices which may indeed draw in others to this through the change in the belief world- 'the gold rush' phenomena.

9. The role of argument

Leaving the scientific pretensions of economics behind we suggest that consensus can still occur (in other words little truth is possible). One needs to create persuasive arguments. Such arguments have corroborating data and prediction in terms of replicability. Such arguments are logical in terms of internal consistency. Such arguments have an obvious quality when considered. Such arguments hold on to reality, in that they are based on something that can be observed. Structures are created from real aspects of the world, so debt is a real thing in the world. Debt is a replication of a contract that is fuzzily made up of several rules; lending, repayment, repossession of collateral in case of non-repayment, for a finite term. The structure of accumulation created from debt has led to a process of sustained growth for many years in capitalism through a chain of bubbles in various asset markets; external emerging markets, stock market, housing. Essential to debt is the fact that it allows transfer of wealth to those who can use it to add value to things and allows such value adding processes to continue. It leads to a disparity that eventually closes down capitalism because the wealthy get richer and the poor often more indebted. Between 1970 to 2008 there were over 120 credit crises across the world. Many crises were clustered together as contagions and often lead to currency crises and in cases, sovereign default. The evidence for the problems of capitalism based on debt are considerable enough to discuss alternative means to achieving the same end of accumulation without the instability.

Concurrent chains of bubbles which feedback between each other, such as the stock market boom of 1990s that fed into housing, then into commodities and oil when housing collapsed in 2007. Essentially this is caused by excessive wealth and excessive money. Given the size of various markets there can be the problem of an imbalance of holders of wealth and funds with the size of those markets.

Consider discounting of an asset flow. This necessitates an asset flow increasing in value, since the idea is that over time an asset is worth less than now. Reversal of this metric leads to a different kind of process/ force in the economy. Such a reversal of discounting leads to at low levels an expansion in the value of time now, with a lowering of demand for assets, unless there is a long term reliable income flow to make up for the negative discount. Bubbles are far more difficult to occur in the presence of negative discounting. What does a discount that is positive mean? To buy an asset now, $D(t) + D(t+1)d$, or $D(t)/(1+I)^t$ summed to infinity with negative discount leads to $\lim_{t \rightarrow \infty} t > \infty$, $I > 0$ leads to convergence however $I = -0.025$ leads to $D(t)/0.975$. Leads to loss of all money someone has after 27 years, given no return on investment to counter the loss from zakat.

10. The key investor decision in the Islamic economy

Zakat

At the core of the accumulation structure of the Islamic economy is the fact that the investor has no way of making money except by investing in profit sharing contracts with business'. This immediately reduces the impact of shocks on business in an economy since a major part of their costs, financing, moves with the level of profits that they make.

Furthermore an investor will have a tendency not to engage in unproductive, which we take to mean non-value adding, speculation, such as occurs in all booms and through short selling, busts. For to do so would mean that they stand to lose much of their wealth from the zakat tax. This is a strong incentive to invest in productive value adding activity where an input is made greater in value by a production process and is then sold. Services, whereby someone is employed to perform an activity for a customer, whether a hairdresser or a personal shopper, using equipment that is combined with this is the same kind of value adding activity and is thus productive.

The existence of a tendency creates a process that sets in place a social norm, that is that productive activity becomes cemented into the system with the zakat tax there to provide the incentive for this social norm to be complied with. This process is that the class of investors over time will be streamlined to only include those who successfully engage in productive profit sharing business, whilst those who unproductively speculate will lose their money due to the zakat tax. A sense of urgency is also engendered by zakat, since simply hoarding one's money and waiting for the appropriate moment to invest becomes a path to losing all ones money.

The effect of zakat on the poor who are the sole beneficiaries of this means that where in debt based capitalism they find their liquidity problems overcome by interest bearing loans, they instead receive reasonable payments from this. They may find their escape route from poverty through a grant of zakat given to them to build their skills, enhance their mental state, start a business or be able to relocate for employment. Crucially whilst those at the top are under pressure to maintain profitability, those who slip from the top have a safety net of some description. The traditional argument of the right that redistribution to the poor leaves them with no incentive to work can be placated with a coherent program to enhance the importance of a work ethic in education, the family and in the media (for example hard work is glorified rather than the less sober celebrity of today), through emphasising the involvement of the poor in developing a supported plan to escape from poverty (for example through successful people mentoring and coaching them), through a direction of the zakat collections towards programs that develop skills and provide the necessary tools to open the door to the escape route from poverty rather than complete reliance on cash handouts, though that is not to say that the flexibility of some cash payments especially in a patron-client relation akin more to a parent giving a complete set of moral, emotional, intellectual, experiential and financial help to their child (this model works because the greatest indicator of social success is the social class of one's parents)

The final area zakat affects is to solve the problem of accumulation structures leading to a small group of people with wealth so excessive that bubbles occur as the

amount of wealth becomes substantially more than the liquidity of asset markets. Whilst beneficial for a short time the bubble always bursts and many find their confidence in investing shattered, their portfolios significantly dented in value and the feedback effects and contagion among a host of asset prices leads to considerable problems.

Qard al Hasana

The problem many in Islamic economics have considered is how to finance mortgages for buying houses? The solution often proposed is to modify a mortgage contract to simulate a normal interest loan by means of exploiting loop holes in the Islamic prohibition of interest. We suggest that consideration of the accumulation structure of an Islamic economy provides a different and perhaps more juristically acceptable approach.

As we maintained above the investor has the choice of letting all their money be drained away by zakat, investing in profit sharing business contracts (which may lose value if the business goes bust or does not make money). There is a third alternative for the investor who wishes to maintain a balanced portfolio in respect of risk and reward, that of qard al-hasana. This is an interest free loan which would not be subject to a zakat tax. Clearly some charities and social organisation would benefit from such loans, though clearly for a risk free investment there is the loaning of qard al hasana to government. Government now has a means to fiscal policy since it can now attract bond holders because of the financial structure of the rules of zakat and no interest loans.

The government now lends on the qard al hasana to people wishing to buy a home, effectively becoming a national bank for private individuals. People repay their loans and are assessed carefully by the government for their ability to pay. Because the government determines how many people get loans to buy houses and how much they will be loaned, the government has a significant control of house prices and can stop bubbles in this crucial market. The problem of the debt based society is that house prices especially get out of control and bubble, leading to contradictions and imbalances in the economy that lead to inconsistent policy responses (they need to simultaneously reflate and deflate the economy). With houses not feeling the effects of substantial speculative credit flows they remain a smaller share of the total wealth of the economy. Variations of the model, for example, levying zakat on house prices marked to market or on sale of the house, can be considered. Another lever the government has is varying the rate of zakat so as to control money supply or attract more borrowing. A higher rate of zakat would increase the level of qard al hasana to the government thus reduce money supply if the government does not spend the money. Clearly such activity is beneficial in a boom. We would hypothesise that oscillation is a necessary feature of the economy, given herding of expectations, shocks and perhaps unseen mathematical consequences of complex systems. Reducing the level of zakat would put more money into the system as people would have more wealth, while using reserves from qard al hasana built up in good times can be used to stimulate ailing recessions, those oscillations already far less pronounced than under debt capitalism.

The qard al hasana system of mortgages allows for a more Shariah compliant approach to financing house purchases, which are the basis of a family and thus a key physical representation of a fundamental institution in society. It allows for deficits to be

run by such a government which would not be able to borrow. Thus fiscal policy can become an effective and Shariah compliant (in the sense that even government does not borrow with interest) means to stabilising an already very stable system.

Money supply increases through 'printing money' by the government can be allowed through simple creation of money, in the form of grants to study, have healthcare for those in need or ill, create or expand a business or engage in public works and infrastructure, which allow for steady increases in growth through expanding value adding activity, moral purpose as a central vision for society (with all its externalities on reducing crime and enhance quality of life), whilst also developing human capital and the experience and potential of being human. The fact that this system does not feedback when taken as a whole allows for money supply to be steadily increased whilst maintaining incentive structure to work hard and work well to the benefit of society. It is this that the debt based society misses out on and it is the reason why interest is banned and trade is allowed. Debt capitalism sees printing money as inflationary because of the exponential feedback loop between credit, assets, prices and wages. Whilst the US in the early 21st Century had rid itself of the wage price spiral it did not deal with the credit asset spiral to the point where asset prices outstripped affordability for many people, enough of whom became the shock that marked the turning point in that country's economic outlook.

The above analysis of an Islamic economy compliant with Shariah is evidently based on closed economy assumptions and from the initial point in history as an institutional structure. Note that such a system does not necessarily evolve out of individual optimisation or indeed from current history of western capitalism. Thus whilst it is argued that this system is superior in the long term in respect of stability and growth it does not deal with the flows, shocks and system of a global economy. One interpretation is that such a closed system is in fact a global system given a single world currency. In the interest of avoiding future generations establishing wars to create such a system we would caution against such an interpretation, if only for the fact that we can analyse and involve open economy issues in respect of a two part world, one of western debt capitalism and one of the Islamic economy. Clearly the next step after that would be to analyse various networks of countries trading freely with varying distributions of system accumulation structures.

11. The Open economy Islamic accumulation structure

Consider the elements of an open economy. In respect of Shariah interest is forbidden, thus hot money flows are limited to the level of accumulation of wealth in an economy. (define Islamic liquidity) Also interest is not part of the system, thus a debt capitalism tool of affecting currency rates is not present. What should be noted is that the two are inherently linked, one is the cure for the other. Given that interest rates cannot both be used to control currency and economy there is a freeing up of policy from a conventional economist's analytical perspective.

Consider the Mundell-Flemming model. Interest rate differentials between countries lead to changes in currency and corresponding processes, whether through demand for trade or changes in money supply. The historical concept of a currency must

be noted. It is money moving through different lands which may accumulate as reserves under some central bank institutional structures for settlement, though it may obtain balance through an exchange market. The problem of the Mundell-Flemming model is the network interpretation of it, whereby a global recession leads to cascading interest rate cuts, similar to beggar-thy neighbour trade policy in the Great Depression of the 1930s. In such a circumstance there is no change in the key variable in the Mundell-Flemming model of interest rate differentials across countries in situations where everyone is reducing interest rates to stimulate their economy. This does not mean that the internal stimulation of the market cannot occur from this, however this model works considerably different when put into a network of countries analysis. This is a point we hope to leverage in the movement of our analysis from open economy to network of countries.

As far as the open economy Islamic accumulation structure goes, with accumulation at low levels and a norm against speculation, then the economy to economy links are simply trade and capital movements. Whilst there is the problem of disintermediation of the interest prohibition through capital movements from the Islamic economy to the Debt capitalism economy, we disregard this issue as one similar to tax evasion, important yet not crucial to the analysis at this stage of its development. If capital is not allowed to leave the Islamic economy through legal rules, given that the Western debt capitalism will have no takers for borrowing on a profit sharing basis since this is not an institutional debt structure that exists in the West (except perhaps stock markets, though consider the zakat rules in that respect reducing speculative outflows from the Islamic economy) then there is a conservation of capital within the Islamic economy unless there is an expansion of the profit sharing contract form into the Debt capitalism economy, in which case the model has a different process which we shall discuss later. On the other hand the Western economy does not have prohibition of external investment in instruments that are legal. Thus we would anticipate a net inflow of capital into the Islamic economy in such an open economy two country model.

The second point going back to our analysis of the Mundell-Flemming model is that there is an unlocking of the problem of interest rate differentials determining national income. In a global recession interest rates cease to be a means to raise external trade if both countries reduce interest rates. The absence of interest rates in the Islamic country mean that a different determination of the level of capital flows will be in evidence. *Ceteris paribus* in respect of trade the level of the currency of the Islamic economy will appreciate over time. Trade is dependent on the capabilities of the economy in terms of supply, however given equal capabilities and an initial condition of 1:1 exchange rate between the two nations there is an advantage over time to the Western economy's exporters due to this price advantage. Therefore the flows of currency are towards the Islamic economy for capital and towards the Western economy for exports. The ability of the Islamic economy to manage money creation better allows Western exports to be demanded in a structure that in fact leads to a win-win situation for both economies, since the Western exports raise growth and accumulation there.

Money creation in the Islamic economy raises demand for Western currency due to their exports being demanded, appreciating the Western currency. Thus the use of money creation is to allow external balance in this analysis of payments. Exports generate accumulation in the West and thus allow for more capital to enter the Islamic

economy. Thus the Islamic accumulation structure in symbiosis with the Western economy allows for a pathway out of recession, depression through growth.

12. Inflation or Price feedback in an Islamic economy

Doesn't have feedback from credit and asset cycles therefore much of reason for price feedback is gone. However there is the issue of money creation raising the amount of demand to very high levels. Clearly there is some issue of using money creation to balance payments, however from the foregoing analysis there is a clear reason to believe that with stable prices for imports from the west and money creation primarily used to fund those purchases which become recycled in terms of raising capabilities from capital flows from the West, that there is a stability of consumer goods prices. Clearly there is some case for the external importing of inflation, however the presence of a local industrial sector that can compete with the imports alleviates this problem.

13. The stability of network flows of money under profit sharing investment (musharaka) as opposed to interest based ones

Analysing an economy as a shifting network of economic agents which are the nodes connected by flows of money is on first blush fraught with the problem of over illumination. That is that one can consider the incredible transient complexity of this. Conventional wisdom is to consider parts of this, for example a supply chain. A raw materials producer is paid by a manufacturer who is paid by a wholesaler. Were each of these business' to pay loan repayments on a fixed basis then we see that there is a problem of collapse of the chain given that there is a shock which substantially reduces the wholesaler's income and thus purchases along the chain.

The Islamic business loan is called 'musharaka', whereby a bank takes a share in profit which over the business cycle might be expected to be as profitable as one that takes interest. Given a shock to income there is an obvious greater stability to the supply chain since each borrower is facing lower if not nil costs for repayments.

Consider though a more complex network, whereby many firms at each level of the supply chain are involved alongside business service industries that serve all members of the supply chain.

Examining interest rate change effect on loans given varying amounts of capital invested and related sensitivity to cash flow shocks

EBITDA Return on investment =10%

Loan to capital = 80%

Capital = \$10

Loan = \$80

Loan repayment = \$8

After tax profit = \$2

If repayment increases by more than 25% then there is a bankruptcy

In recession income is falling often by a greater percent than the costs are falling, even with interest rate cuts. Thus where return on investment is low there is a natural problem of greater chance of bankruptcy. Thus debt capitalism is volatile and prone to crises. Once the rot sets in there is a great deal of depreciation and unutilised capacity as cost cutting and personal restriction of expenditure become a process of recession. Higher levels of loans as a proportion of profit lead to greater sensitivity of the firm's in the network to changes in income flows. Networks can collapse therefore under the debt capitalist system more easily. The network may reconfigure however a key problem is the creation of unutilised capacity as existing firms are made insolvent and do not become taken over by anyone else due to a lack of confidence in being able to turn around such business' and also due to the fact that there is in fact less money in the system as well as the issue that finding investors is much harder. The fact that the progress of loans is ever increasing given that banks believe they make more profit by lending ever larger amounts leads to the precarious position where an economy becomes highly indebted and thus very sensitive to random perturbations in income and shocks resulting in lower flows. The Islamic economy does not have the same set of issues since the musharakah naturally incentivises banks to invest wisely and with a great deal of due diligence and monitoring to overcome asymmetric information between the borrower and lender. In essence debt capitalism depends on loans to progress yet there is an innate tension between loans and growth, since they create both the boom and the bust. As capitalism develops it finds itself with more accumulated wealth and thus more potential loans to give thus it collapses given the network sensitivity to shocks and perturbations from the ever higher levels of possible indebtedness. The Hegelian dialectic here is clear. The paradox of a rational Islamic economy is ironic in the extreme.

14. The T matrix money flow analysis

The big caveats: any idealisation of the world is necessarily not going to completely describe the world. A perfect representation of the universe would be another identical universe. This does not just mean that models refer to local structures and mechanisms but also that thought itself following rules will follow a certain course of development whether in the mind of the scientist or in debate through the centuries. This is to be cognisant that everything that has a determining structure will follow a course biased towards that structure. Since a model produces repeatable results in the mind so too does the structure of thought. This is an unashamedly subjective belief yet it is one that analysis of the flaws in the history of thought show with alarming alacrity, whether in terms of the problematic divergence of economics from reality to the development of Christianity during the medieval period to extend biblical teaching to hunting witches and burning believers at the stake or going on crusades. True many sciences have shown progress towards an ideal truth, yet this does not mean that they do not as structures follow something of a quasi-deterministic path influenced by cultural, historical and social frameworks. See Foucault for a well researched and elegant argument to confirm.

We develop and analyse the results of a network of three nodes each giving a percentage of their wealth to others. What we find in this preliminary analysis is a difficult problem for economics. When a clear and fair representation of the economy is put into an excel simulation, why are the results so perplexing? . The model stands as

being either a non-conservative system in respect of it being a part of a system or being conservative (given no money supply increase) in respect of the entire system. It does however elucidate a very interesting point that money being neither created or destroyed lead to a stability in overall wealth yet this is at odds with reality. Perhaps this disputes with the model, yet the model is clearly and plainly an accurate representation of the economic system. We hope the reader will try to simulate this model in a spreadsheet as given to try to elucidate a problem which we find nebulous yet exciting.

Networks of agents giving money to each other

model definitions

1. vector X of $x(i)$ agents with initial values of wealth
2. matrix T which represents transfer of money between agents
3. each row of $T(i)$ sums to q , this represents whether people can spend more or less than they earn
4. output vector of $x(i)$ with end values of wealth after transfer
5. The results of the output vector are run again and again with the T matrix to denote each period of time and produce a plot given below.

Hypothesis

for any size of matrix, given certain parameters of T there is a an underlying system

this system is represented simply by a triangle of three nodes which has an exponential result when plotted

given the parameter $q > 1$

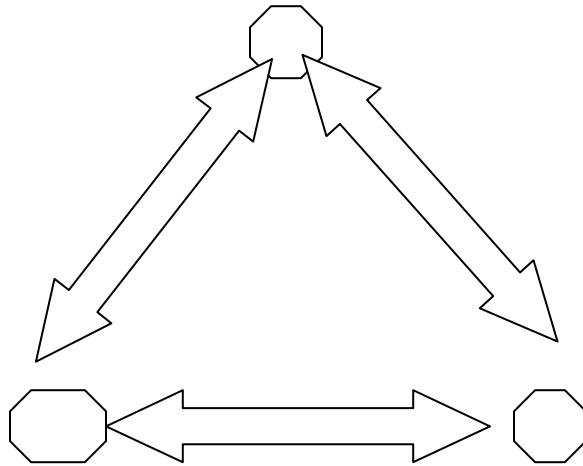
Matrices in the model

X	1	2	3
$x(i)$	1	1	1
T	J	1	2
i	1	0	0.1
			0.9

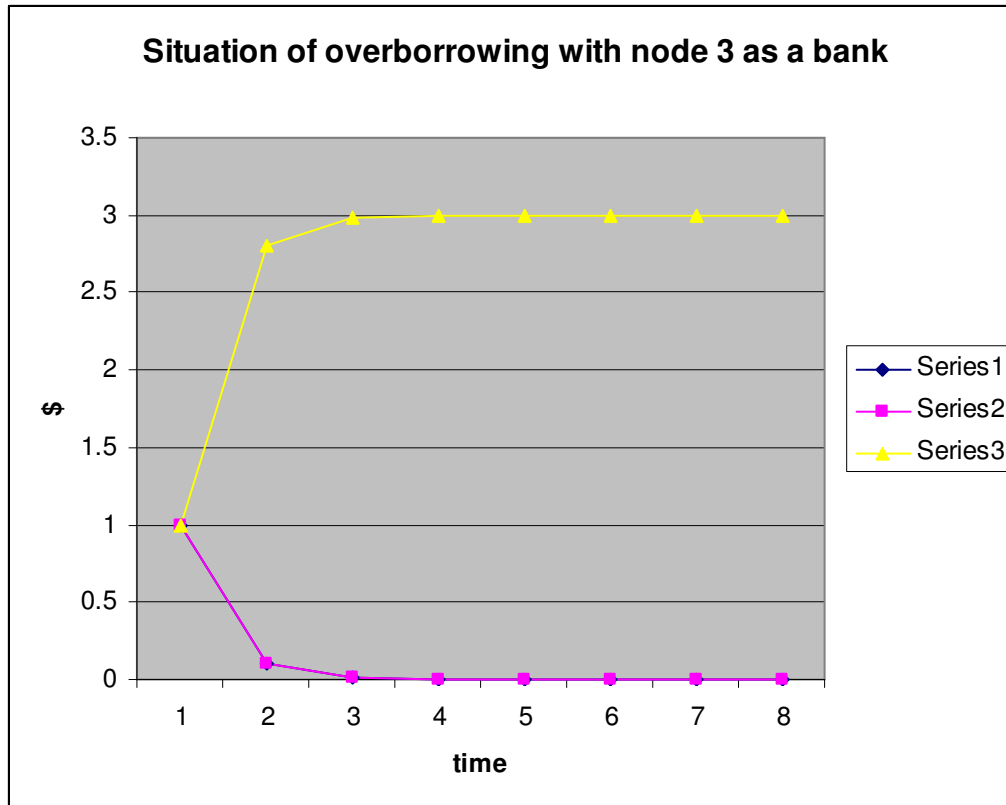
2	0.1	0	0.9
3	0	0	1
	income	income	income
	of 1	of 2	of 3

income of (i) from all other nodes less expenditure from (i) to all other nodes

1's end wealth	$x(2) \times T(1,2)$	+	$x(3) \times T(1,3)$	+	$x(1) \times T(1,1)$
2's end wealth	$x(1) \times T(2,1)$	+	$x(3) \times T(2,3)$	+	$x(2) \times T(2,2)$
3's end wealth	$x(1) \times T(3,1)$	+	$x(2) \times T(3,2)$	+	$x(3) \times T(3,3)$



The triangle network – a fundamental structure composed of three nodes each trading with each other.

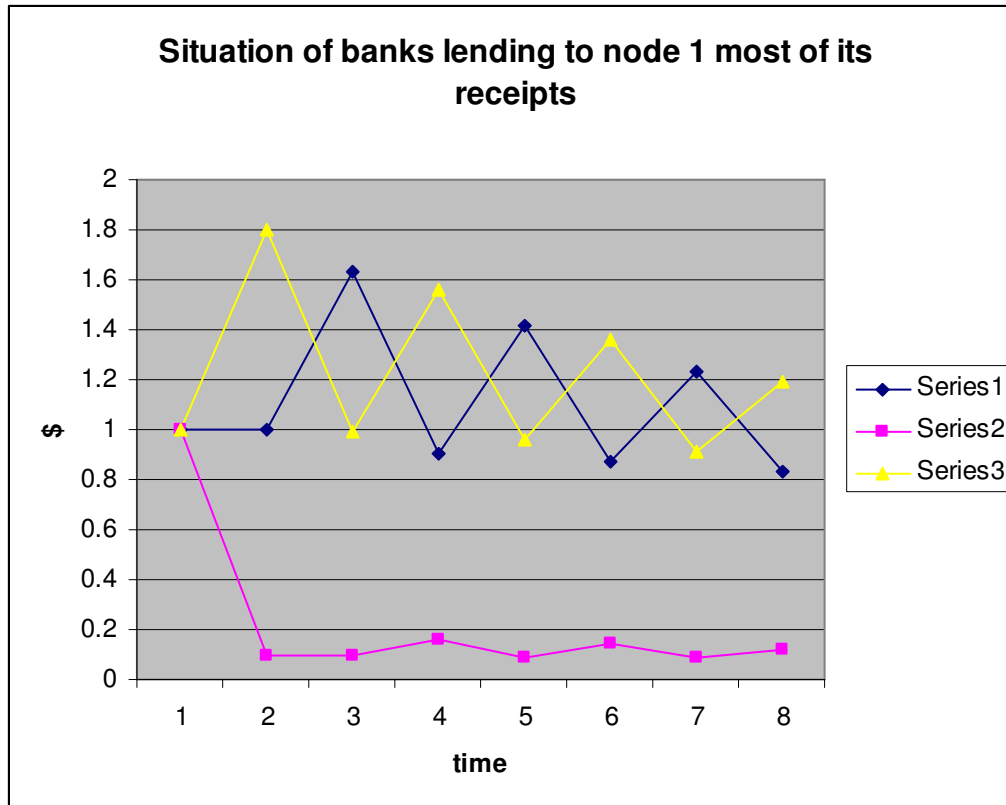


Graph 1.0

Given the initial T matrix given above we see graph 1.0's simulation of initial values of wealth being equal at \$1. The simulation can be seen as node 3 (the yellow line) being a bank which is being repaid loans of 90% of the incomes of each of the other nodes. The other two nodes are taken to be in a trading relationship where they give each other equal amounts. Because there is a conservative system where $q=1$ for all nodes the total wealth of the system at any point (one might call this the GDP) is always 3, the sum of initial wealth.

We can interpret this as a situation of a liquidity trap, whereby banks cease to relend out money which is paid to them. Clearly in this scenario, 'Main Street' becomes broke early on.

What should be clear from the reader who implements these equations in a spreadsheet is that any system whereby the level of $q = 1$ will always remain stable, with the distribution of wealth changing according to the parameters of the T matrix.

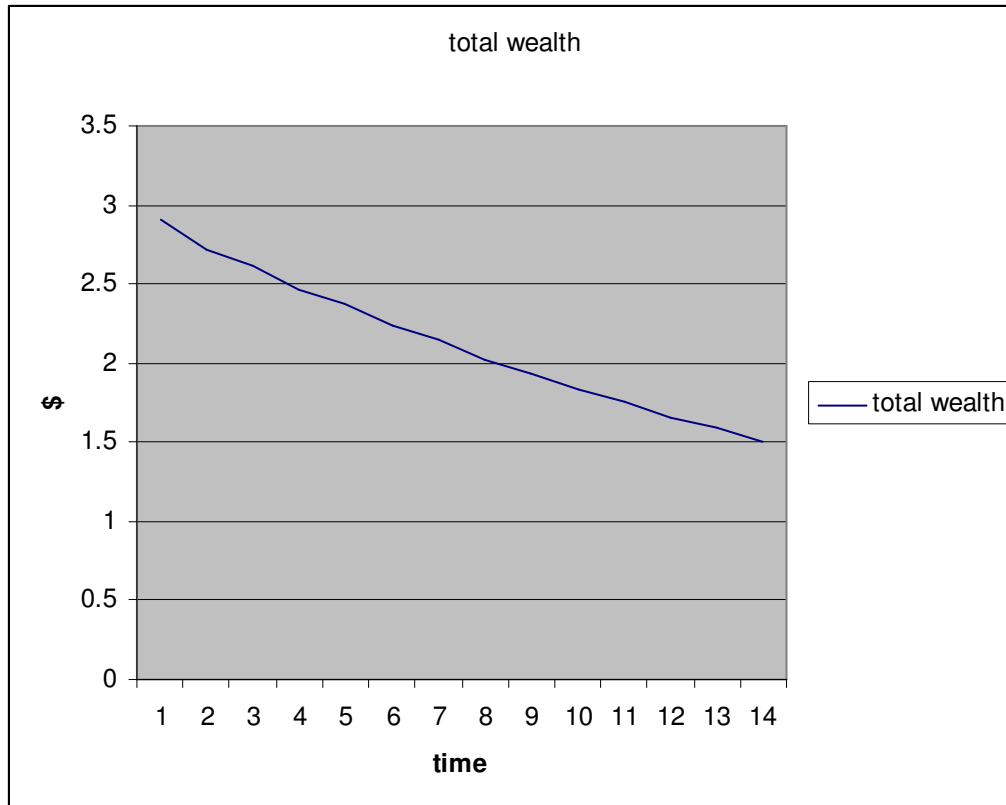


Graph 1.1

T	J			
		1	2	3
1		0	0.1	0.9
2		0.1	0	0.9
3		0.9	0	0
		income of 1	income of 2	income of 3

With the same initial conditions and a slightly different T matrix, this time with the bank recycling the loan repayments to a single 'entrepreneur' node, node 1, we see that a different plot occurs. Here the entrepreneur and bank remain rich while the poor unlinked node, node 2, has a low and stable income.

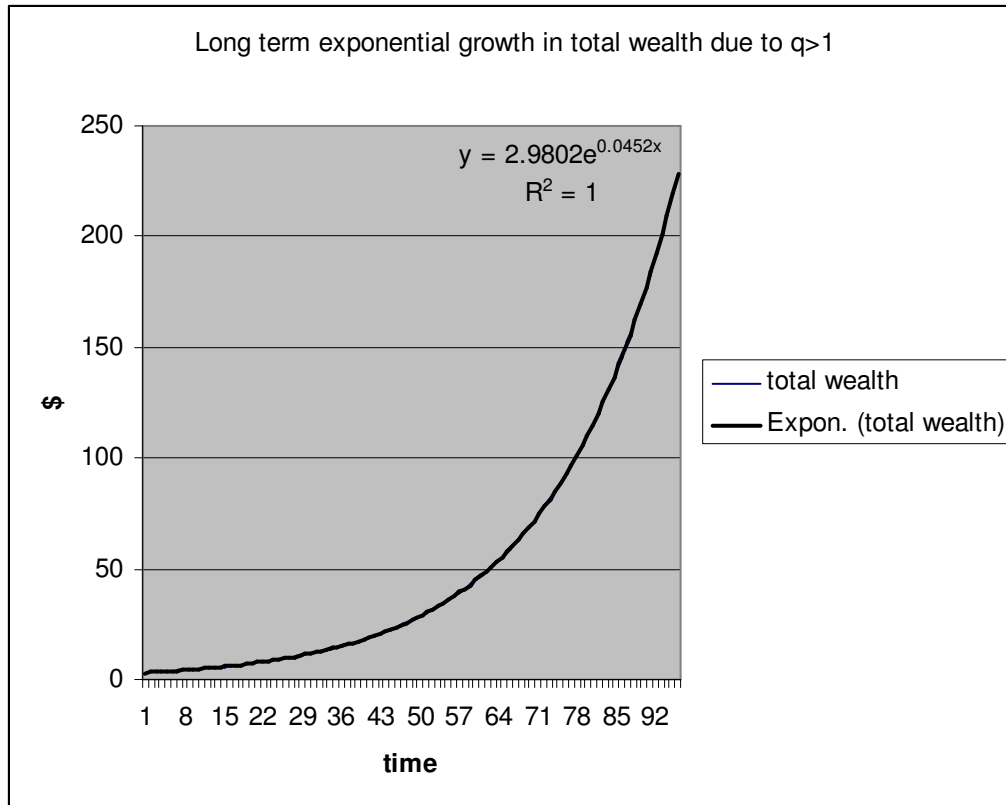
An interesting point to notice is the downward slope in all series of graph 1.1 denotes a gradual fall in total wealth. See graph 1.2 for the total wealth plot as a sum of all node's incomes.



Graph 1.2

The reason for this is that the q 's in the T matrix do not add up to 1, in the case of the 'bank' node, 3, there is a 90% recycling of income to node 1, but no other amount is recycled. This is actually quite hard in an open or complete economy setting to bring to life. The nature of an economy is for money not to be destroyed. What should be noted is the theoretical point that a dissipative system has the quality that not all of the money is recycled within the system. Where one to consider an external system to this 3 node one, where the bank node had to pay 10% of their income, one would see that it would actually result in such a development.

An interesting phenomena occurs when one considers the situation where $q > 1$ for any node. What has been found in simulation is that this always leads to an exponential progression in total wealth. This plot is shown in graph 1.3 with the accompanying parameters for the T matrix.



Graph 1.3

T	J			
		1	2	3
1		0	0.1	0.9
2		0.1	0	0.9
3		1.1	0	0
		income of 1	income of 2	income of 3

We regressed the plot with an exponential equation. This equation is shown on the chart and the R-squared shows a perfect fit with this regression. In this T matrix, the bank, node 3, gives 110% of its income to node 1. Whilst this is a fairly simplified situation with less relevance to directly influencing policy, it elucidates an important point. This system where $q > 1$ leads to an ever rising amount of growth. Thus the system is not conservative but instead we call it, exponential. We leave the reader to try, as we have done, to experiment with different nodes have different parameters such that $q > 1$ only to find a repetition of this exponential, though with varying coefficients on the fitted equation.

The generality of $q > 1$ which can only happen when there is a long term increase of money in the system above income, which can happen if people are able to borrow externally from the system in relation to their income (which is a general historical norm of banking) sheds some light on the existence of booms in the capitalist economy as well as bubbles. Interpreting the T matrix as transactions involving assets one sees the same

effect if there is more money loaned over time.

A naive implication is that to raise GDP growth to exponential levels one simply needs an ever increasing amount of loans whilst one supports consistently rising levels of consumption. Such an approach was the underlying money flow system of early 21st Century America and indeed much of the West.

The naivety comes from the lack of full analysis of the finite state automata of the loan contract. This is the set of rules and procedures which govern a loan. A person receives money from a bank and repays the principal and interest over time. If they fail to make a number of payments then their collateral is sold by the bank to repay some of the loan, thus the borrower has an interest in repaying their loan. However if a large proportion of borrowers fail to pay then this leads to a depressing of asset prices which reduces the bank's recovery rate on loans and thus raises questions about the liquidity and even solvency of the bank. Thus the bank is following blindly its usual process but the process itself is the problem.

Thus the tension that exists in the loan contract based on collateral, whereby a delinquent loan leads to repossession of the asset, in order to avoid a situation where the bank loses profitability due to loans not being repaid, and thus depreciation in value of the asset leading to lower profitability on loans.

Loan -> Bank Profit -> repossession -> Bank Profit

What we argue is that when such repossessions occur, when a liquidity trap ensues perhaps, or just when confidence in profitability of business stymies lending, there is a change in the system from exponential to dissipative. Thus we see a potential underlying structure to boom and bust.