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ORDER: GOD'S, MAN'S AND NATURE'S

What, precisely, is meant by 'the Economy'?

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'The Economy' is a complex entity to conceptualize, let alone define on paper. For one, there are questions of scale. There can be big or small economies, the economy of a given household, of a nation or the entire globe. In the eighteenth century, Linnaeus advanced the concept of the oeconomy of nature that encompassed the earth's crust, all living organisms, and the atmosphere, essentially everything in the sublunar region. The economy in terms of production and exchange as the result of human agency was only fully conceived in the nineteenth century, as Michel Foucault, Keith Tribe, and I have argued. Ricardo gives the first complete account but even then it is strongly wedded to the annual harvest and nature's gifts; it is really John Stuart Mill (1844) who sees a detached realm for which humans are the proximate cause and central actors.

In the same decade, Friedrich List, in his 1841 *Das Nationale System der Politischen Oekonomie*, was one of the first to reflect on the scale and import of the term 'the economy', and argued that the best level of analysis is that of the nation, in contrast to the Greek notion of the household oeconomy, or in contrast to the eighteenth-century preference for what List called the cosmopolitan economy (he pointed to Hume, Steuart and Smith).

Several economists prominent in the interwar years, Friedrich Hayek and Gustav Cassel revisited the concept of 'the economy'. Hayek insisted that "what is commonly called a social or national economy is in this sense not a single economy but a network of many interlaced economies." But his gaze was focused at the study of "the economic process as a whole" (Cassel, 1924). Certainly, most of the data-gathering agencies

established in the interwar period, such as the Cowles Commission, and the emergence of econometric modelling, took the nation as the unit of analysis. The distinction is now deeply ingrained in economic pedagogy and practice. Microeconomists model the behavior of individuals or households, focusing on markets, whereas macroeconomist model the economy as a whole, focusing on the so-called 'leading indicators' of GDP, money supply, employment levels, and the interest rate.

In principle, macroeconomic phenomena can be reduced down to the microeconomic level and on down to individual intentions (psychological states) and in principle, physiological states (neuroeconomics). W.S. Jevons may have been the first, in the 1870s, to spell out this goal of reductionism. He emphasized the fact that all economic phenomena are the product of the human mind and that "the time may come, it almost seems, when the tender mechanism of the brain will be traced out, and every thought reduced to the expenditure of a determinate weight of nitrogen and phosphorus". But no one has managed to get there yet nor, I think is this necessarily desirable.

Gerard Debreu in the 1950s provided a formal definition of 'the economy' as a set of equations, it leaves open the question of scale. Note the strong commitment to individuals, consumers with preferences and producers with resources. Still, "the economy" is no more constituted by a system of equations than an electro-magnetic field is constituted by Maxwell's equations. Debreu gives us a mathematical model, but surely 'the economy' must be some combination of physical events, mental states, and social relations and it is far from clear that these could even in the fullness of time be reduced down to just physical events.

To their credit, "Arrow and Debreu are perfectly frank in disavowing any claims that general equilibrium theory provides a descriptively accurate picture of the economy" (Blaug 2003) and the model given here is thus like all models descriptively false. Instrumentalism among economists runs deep in the discourse, even back to Mill and Ricardo in the first half of the 19th century. For the classical theorists, the economy was depicted as the sphere for the production and distribution of goods and services between three distinct and antagonistic groups, landowners, capitalists, and laborers. There were many stylized assumptions—uniform wages, a unique moment for the division of the harvest, and the Malthusian population model. Mill posited the overriding motive of the pursuit of wealth, noting that no one was so absurd as to assume that people are thus constituted. The neoclassical economists reminded us that consumption is also an important dimension, but also elided the issue of the ownership

of capital, such that everyone became a producer and a consumer, an owner of stock. They also embraced methodological and ontological individualism, such that in principle all aggregates and all market phenomena could be reduced down to the more fundamental reality of individual interactions. For the strict neoclassical economist, there are no emergent properties.

As easy as it is to witness production in a factory, or exchange in a farmer's market, or the liquidation of a bond, none of these are, strictly speaking, 'the economy'. Hopefully, little is needed to motivate the claim that one cannot observe 'the economy'. It is a theoretical construct, a system made up of a number of so-called 'leading indicators', the GDP, the interest rate, unemployment rate, inflation rate, money supply, population level, etc. These can only be ascertained by costly data gathering and analysis, and this necessitates a temporal lag. In sum, we can purportedly 'observe' the economy of three months ago, or a year ago, but it is virtually impossible to know the economy at the moment. Lots of sciences encounter difficulties of this sort—stellar astronomy or meteorology comes to mind—and this should not be seen as an insurmountable problem. It may be comparable to observing 'the climate'. One can measure atmospheric pressure, wind streams, and model these with a system of differential equations, but the problem lies in stitching these indicators together.

The same is true in economics. There is no consensus on what weight to give the leading indicators, nor how to weave them together. Measurement is also problematic. The standard accounting issues with capital alone make GDP measures problematic. Even more problematic is the absence of bridge principles between microeconomics, the analysis of prices and markets, and macroeconomics, the study of the economy writ large. Maarten Jansen twenty or so years ago tried to carry out a reduction of the macroeconomy to microfoundations, but showed that it is not possible. Others, David Laidler for example, have shown that even in treating core phenomena such as money, similar problems crop up. The only monetary holdings that have genuine efficacy are what are known as 'high-powered money', the money that the central authority loans the commercial bank. But this cannot be reduced down to individual holdings or demand, and operates at a macro rather than micro level. As Kevin Hoover has argued, "the economy" as treated by macroeconomists necessarily has emergent properties.

Mainstream economists still harbor hopes for finding the means to reduce macroeconomics to microeconomics, and with the recent trends toward behavioral

economics and neuro-economics, the Jevonian dream of linking utility deliberations to brain states may have a new lease on life. But what remains under-examined is the commitment to the individual, and for this reason I welcome John Searle's efforts to link social facts to collective intentionality. This in turn casts a spotlight on what is meant by a social fact, or more specifically, an institutional fact, and whether these have a robustness as emergent properties at the macroeconomic level. Searle takes money as his example, but I think the interest rate is a far better candidate. The interest rate is a number, or rather, a ratio or percentage. Strictly speaking, it is a yield, or rate over time. As a number it fits the notion of language-dependent facts (I will here buy wholesale into the view that mathematics—at least number theory-- is a kind of language, a system of symbolic representations). As a social fact, it is publicly understood, although it is unclear to me that interest rates are exclusively dependent on human recognition. In any event, it may prove to be one of the most universal and robust feature of human relations, if indeed it is paired up with rates of reproduction or attitudes to time and risk (in short, it does not require the existence of money which some anthropologists argue is not universal).

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The interest rate has served as a leading indicator of economic flourishing since the seventeenth century. Thomas Mun, one of the most widely read economists of that period, observed circa 1640 that Holland had the enviable rate of three per cent. In England, the legal ceiling was set at five per cent in 1692 and for most of the nineteenth century, British consuls—secure government bonds, paid three per cent. In this respect alone I would submit, the interest rate is one of the most stable and objective features of our world. I don't have knock-down arguments for this proposition; my approach is rather to merge what I know about the history and philosophy of economics with the more general understanding of objectivity advanced by those in science studies. My assertion is akin to when philosophers of science, having sunk deeply into the quagmire of sorting out the epistemic standing of scientific laws, come to assert that traffic laws are the best obeyed laws. In short, I'm interested in motivating the view that stable kinds may best be found right at hand, within the human sciences, because it is there that we have better intuitions about what we don't know or what we can't measure reliably

I here use stable kinds in the following sense: a phenomenon that is relatively observer-independent, for which there is a high degree of consensus, and which is relatively invariant under transformation. Note that this is not about absolute stability,

but only relative stability. My focus is on phenomena that can be measured and that are situated at the core of a given theory, such as the gravitational constant or the charge of an electron. Like most stable objects in our world, these are not readily observed, so that appears to take these things down an epistemic notch, but in my view this is really not the source of much difficulty. We have to use some instruments and subscribe to some conventions or abstractions—the centre of mass or the absences of friction in the torque arm of Cavendish's balance, for example—to get scientific measurements off the ground. But I believe these cases fit the three criteria I have noted here and the interest rate is another candidate.

The beautiful thing about the interest rate, at least the nominal rate, is that it is easy to observe. It appears as an autonomous object, a number attached to a per cent, and has only one dimension, namely time. In fact it is a return, usually but not necessarily monetary, on an asset, financial or physical. John Locke gave us the first taxonomy of interest rates, the market rate (what is observed locally), the legal rate (the ceiling set by law) and what he called the natural rate, the one that would obtain if there was no monopolistic banking, or in modern parlance, if financial and capital markets were perfectly competitive. Locke presented arguments to remove the legal ceiling and undertake institutional reforms so that the market rate converged on the natural rate.

At present there are many species of market rates such as the overnight rate, the prime rate, LIBOR (London Interbank Offered Rate, set daily), or the usurious rates set by the credit card companies. Economists mostly theorize using the "pure interest rate", the risk-free rate of return on for example a 30-day US treasury note. Most interest rates are nation-specific, but there are methods for transcending national divides given the market for foreign currencies. The general view is that the monetary authority and commercial banks of an economically-advanced nation will set the interest rate in the short term in response to long term global decisions for investment and saving.

Interest rates fluctuate all the time, but those are the nominal interest rates. It is the real interest rate, defined as the nominal rate minus expected inflation that is the best candidate for stability over long periods of time. This is given by the Fisher equation, named after Irving Fisher, who did his doctorate with J. Willard Gibbs the physicist at Yale in the 1890s, and who many still regard as the greatest American economist of the twentieth century. In a host of theoretical models, the real interest rate is stationary, or "mean-reverting" in the sense of a variable that reverts to a constant average. Although speculation in the financial markets creates what Fisher called "the

dance of the dollar," this is generally viewed as surface noise. The real interest rate is governed by non-monetary forces, the accumulation of capital and, more fundamentally, attitudes to the future.

Probably all of you in this room have some if not a precise idea of the current prime interest rate announced by your national monetary authority, and most of you may also have some ideas about projected trends over the next three to five years because of tables of mortgage charts at your local bank. You might also have invested in the bond market, and thus have some idea about yields over the short and long term, knowing too that the price of bonds is inversely related to the interest rate. There is, in short, a spectrum of interest rates and even in a world of zero inflation; there would be a spectrum of rates because of the heterogeneity of capital assets in terms of risk, liquidity, and depreciation. The bond market is critical in stabilizing the interest rate, mostly because the government (G7) as lender is as risk-free as one finds in this world. The power of arbitrage in financial markets also motivates the proposition that the rates of return across all financial assets tend to equality, thus establishing a unique market rate of interest. Arbitrage is the business of making low-risk profits from price discrepancies for the same or similar asset. Donald MacKenzie's recent book on *Material Markets: How Economic Agents are Constructed* (2009), which I highly recommend, emphasizes the sophisticated technology (mostly computers) that promotes arbitrageurs to cull funds in a matter of microseconds. But his study also highlights the human factors, the bandwagons and cognitive limits, which inject imperfection into arbitrage and by implication, into the tendency of interest rates to converge.

Because the real interest rate is unobservable, it depends on measurements of inflation, the Consumer Price Index. As Duke philosopher-economist Kevin Hoover has argued, these indexes are inherently fuzzy, in part because they must impose linearity on what is inherently non-linear and in part because they must select an arbitrary starting point and consumption bundle which requires arbitrary background assumptions: the "Laspeyres, Paasche, and Fisher, are the economists' Fahrenheit and Celsius" (Hoover 2001, 232). For anyone who knows Hasok Chang's recent work on the measurement of temperature, there are some obvious parallels with respect to the folk/theoretical divide and with respect to the retreat to ordinality. There are pre-scientific notions about money's purchasing power, of being richer or poorer, just as there are of being hotter or colder. Measuring devices got underway in the late seventeenth century—the political arithmetic of William Petty and Edmund Halley

compares well to the nascent thermometers of Fahrenheit and Celsius, and by the mid-eighteenth century the silver price of corn had become the measuring rod based on extensive data on the metallic content of currency, including historic debasements and devaluations, and fluctuating price of corn.

The divorce with high theory, however, is obvious. The layperson's knowledge of the value of his assets no more relates to the efficacy of high-powered money and Friedmanian monetarism than the assessment of household temperature relates to mean kinetic energy and Maxwellian thermodynamics. But economists have laboured long and hard to find the means to measure the real money supply, taking into account the range of monetary and credit instruments, as well as devise price indexes that map onto representative consumption patterns. These are still imperfect measurements and, as a result, we can not know the real interest rate with certainty. Moreover, the problems are augmented by the difficulties in measuring capital assets. As Hoover points out, measurements of the real interest rate not only "inherits the fundamental fuzziness of the general price level" but must also "average across non-homogeneous maturities and risk classes" (Hoover, 235).

Systematic and government funded indexes such as the CPI got underway in the 1930s. The meeting at Bretton Woods in 1944 created the IMF and a system of fixed exchange rates pegged to the US dollar. This was dismantled in 1971, when the States went off the gold standard and the world essentially shifted to one of fiat money and floating exchange rates. By the 1980s, economists began to entertain the idea that there was a "world real interest rate", and that with enough smoothing out, it could be seen to be equal for the dominant economic nations such as the G7. After all, interest rates are determined by decisions to save and to invest and at the global level, aggregate savings must equal aggregate investment. This was also facilitated when, in 1993, international organizations--the IMF, OECD, and World Bank—agreed on uniform schema for measuring the leading indicators.

Empirical studies of the "world real interest rate," such as the one here by Brigitte Desroches and Michael Francis at the Bank of Canada, suggest that there is not one single rate, nor one constant rate. But the investigators admit to obvious limitations in their results, the decision to settle upon one particular interest rate (e.g. five-year bonds), a select group of nations, and reliance on heterogeneous CPIs and exchange rates. Normalizing for exchange rates proves even harder than normalizing for price indexes. The authors of this particular investigation argue that the increased integration of capital

markets world-wide has led to significant co-movement in national interest rates, findings that agree with other empirical studies that take a larger or smaller sample of countries or different financial instruments. So here in the 1970s, some national rates are rising and some falling, but by the 1990s they seem to be in step with one another. They also argue that there has been a gradual downward trend over the past twenty-five years. Nevertheless, the main factors that affect the world real interest rate, especially factors that influence the demand for investment such as the aging population and growth in the labour force among the G-7 nations, are highly stable. Given what we know about demography, they conclude that "since most of the key variables tend to change slowly, it is unlikely that they will be a source of significant changes in world interest rates in the near future."

In this slide, the two investigators have averaged out the seven nations. It is easy to view the ocillations as one of manifest instability. Looking just at the dotted line, from 1971 to 2006, the real rate had a variance of just over six per cent, although smoothed out it averages around four per cent. But this is still relatively stable if you imagine a world where the interest rate jumped around every day by magnitudes of ten, 5 per cent one day, 15 the next. In short, the interest rate fluctuates up and down, but it does so in a stepwise and continuous fashion and if one smooths out the fluctuations over a longer period, ten or twenty years, it tends to level out and become very steady.

The interest rate is part physical and part monetary. In the long run, it is assumed that the rate of return on physical assets (think profits) will equal the rate of return on financial assets (think interest payments). The idea is that if one could obtain 6 per cent with a loan to a bank, but only 5 % profit making steel, it would make sense to lend the funds. The increased supply of loanable funds would bring the bank rate down on par with the profit rate, and vice versa. Moreover, since most capitalist ventures are funded by bank loans, the convergence of the two is all the more apparent because the same agents are involved. Since capital is relatively mobile, and entrepreneurs are always seeking the highest return, there will be strong forces at work to bring about a uniform profit and hence uniform interest rate. David Hume advanced this argument in an essay on the interest rate in 1752. More importantly, in stripping the interest rate of its monetary properties, he maintained that the interest rate "depends on the habits and ways of living of the people, not on the quantity of gold and silver." When the prodigality and luxurious spending of the feudal aristocracy was superseded by the frugality and prudence of the merchants, interest rates came down. Frugality and prudence are

about planning for a rainy day, looking to the future or what we now call the temporal discount rate.

At the surface, the interest rate is the price that clears the market for loanable funds. There are lenders and borrowers which conform to the laws of supply and demand, and the interest rate is where the two intersect (here I've presented them as non-linear functions). But what creates those two functions is the human motive to produce and even among hunters and gatherers this requires capital. So at a more fundamental level, the interest rate is said to be the price of capital, or more precisely, equal to the marginal product of capital.

This not an uncontroversial claim and the controversy mostly feed on the difficulties of defining capital because it is so heterogeneous. Although it is in principle created by human labor, almost no economist since Marx has tried to reduce capital to socially-average homogeneous units of labor. Marx only had physical capital in mind; today there are at least four main categories, physical, human, social and natural. Think of how hard it is to measure the stock of human knowledge, or assign a dollar-value to the replacement of the wildlife in the Gulf of Mexico. Nevertheless, as Dan Hausman showed in his first book, *Captial, Profits, and Prices* (1981), there are still good arguments to motivate the existence of single determinate interest rate even given the problems of arriving at a satisfactory theory of capital. The way out of the tunnel has much to do with the fact that the interest rate is fundamentally about inter-temporal rates of exchange.

Capital may be described as roundabout modes of production and about deferred consumption (abstinence as it was once known), and its accumulation is thus shaped by dispositions to the future. In that respect, the interest rate is seen as the rate at which society is willing to trade present consumption for future consumption. Usually the reduction down to the "social time preference rate" is as far as the analysis goes, and the set of dispositions that would govern these are normally deemed to be psychological. It is often maintained that we systematically underestimate future wants and thus over-value present consumption given the true intensity of future utilities at the margin. Such "impatience," as Irving Fisher deemed it, is part of what keeps the interest rate positive.

If you think of money as essentially "promises to pay," so future-oriented actions, then credit is on the same continuum, stretched out in time. Something is given up in the present in exchange for something in the future, or vice versa if one is the borrower.

The fact that the future payment is different reflects the payment of interest, the price for inter-temporal exchange. Money and credit are found as far back as we have written records, at least to ancient Sumerian tablets. More recently, Thales of the Sixth Century BCE purportedly took out a contract with a right to lease all the olive presses in the vicinity just prior to the harvest. Aristotle related this story to show the value of philosophy—Thales, you may recall, made a hefty sum by predicting good weather-- but it reminds us that inter-temporal contracts were a well-established feature of the ancient Mediterranean. More reliably, we know that Cicero had a mortgage for his estate at 6% interest and, according to Pliny, such arrangements were not uncommon.

But one can have credit and interest rates even without the existence of money. Paul Samuelson maintains in one of his most famous papers, "An Exact Consumption-Loan Model of Interest with or without the Social Contrivance of Money" (1958), that Robinson Crusoe would have had an interest rate if he wished to consume in old age while no longer producing his subsistence, to trade with "Mother Nature". If goods effortlessly perish, like ice, then the interest rate would be negative. If the goods effortlessly augment, like yeast or rabbits, then the interest rate would be positive.[1] Samuelson arrives at the discount rate R as a function of time t, for the rate between the unit of a present good at time t traded for one in the next period, t +1 given the interest rate *i*. This formula is as follows:

$Rt = 1/(1 + it)$

This helps to see the interest rate in terms of a price (ratio of exchange) such that Rt is the price of tomorrow's unit good expressed in a terms of today's unit good. If there is inter-temporal equilibrium in terms of a single representative good and single agent, then the aggregate discounted value of the agent's life consumptions must equal the discounted value of his productions.

Samuelson's paper focuses on finding a solution to the problem of transferring resources from a younger and productive generation to those older and retired and thus gives credibility to the American system of Social Security that was very young at the time. He not only motivated the existence of the interest rate, but also derived a theorem that in his words was a "paradoxical result," namely that the interest rate would equal the rate of population growth. The proof requires a number of stylized assumptions (there is only one perishable good, and no capital). The exact wording of the theorem is as follows: "Every geometrically growing consumption-loan economy has an equilibrium market rate of interest exactly equal to its biological percentage growth rate" (Samuelson

1958, p. 472). In this sense, the interest rate, as Samuelson deems it, is a biological phenomenon. With characteristic modesty, Samuelson writes “I seem to be the first, outside a slave economy, to develop a biological theory of interest relating it to the reproductivity of human mothers” (473).

It could be argued that this gives added robustness to the interest rate, assuming the model could be mapped onto the actual world, and that is a big IF given the number of stylized assumptions made by the model. But suppose it does. Then this would also suggest that the interest rate is a hybrid of the natural and the social. One might quibble with Samuelson’s appeal to biology since rates of reproduction are clearly governed by cultural and economic factors. But this link also serves to explain why real interest rates are likely to remain low. As Malthus remarked, God sends with every stomach a pair of hands. Insofar as capital goods are made by human labor, as population grows so too will the stock of capital. As the capital stock grows, and the methods of production become more roundabout, productivity will rise, the differential between current and future levels of consumption will be slight, and the interest rate, seen as equal to the marginal contribution of waiting or impatience, will become low. Ever the consummate stylist, Samuelson finishes his paper suggesting that economists do additional research on “the difficult analysis of capital models which grapple with the fact that each and every today is followed by a tomorrow” (Samuelson, 482).

In conclusion, let me return to the three criteria for objective stable kinds that I posited near the start. The nominal interest rate is one we face as consumers and producers in the capitalist system and seems to be an object that is observer-independent. That is less true when it comes to real interest rates since this will depend on decisions made by econometricians and other bureaucrats who devise price indexes, but presumably there are built in checks toward objectivity. Certainly there is a high degree of consensus on a given interest rate at a given point in time. Even in the case of the key commercial banks feeding the daily rate to the office in London that produces LIBOR (on which hinges the multi-trillion dollar derivatives market), there is, as MacKenzie points out, a strong propensity to herd. Finally, although interest rates fluctuate continuously, there is a tendency over long periods of time for the real interest rate to revert back to a mean, somewhere in the vicinity of two to four per cent. This is not exactly invariant, but it appears to be a kind of robustness. What is meant by a transformation is again open to debate. Perhaps the great transformation from feudalism to capitalism fails the test, but efforts by monetary authorities or even the

cartel of major banks are still thwarted by the larger scale patterns of global investments and savings. And these, coupled with the equilibrating forces in the financial markets, offer propensities that suggest all the more that real interest rates will remain low. This may be further grounded in the declining rate of biological reproduction among the G7. The classical economists, Smith to Mill, worried about the interest rate becoming so low that the capitalist process would grind to a halt, the so-called stationary state. But as Dan Hausman puts it succinctly, "we might never reach a point when production cannot be increased by increasing the roundaboutness of production". In sum, we know that the real world interest rate is not uniform across nations or across time, but there is more uniformity than not, and we can offer fairly compelling reasons as to why that is the case.

[1] Knud Wicksell (1911) devised a famous model for understanding capital and motivating the interest rate with the example of grape juice effortlessly becoming wine. Profit $P = x – w(1 + r)^t$ where x is the value of the wine sold, w the cost of the juice, r the rate of interest and t the time of storage. He showed that the the rate of interest is equal to the marginal product of the period of storage (see Hausman 1981, 40-44).