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**The Natural Rate of Interest is Zero**

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## THE NATURAL RATE OF INTEREST IS ZERO

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The notion of “natural” (or “normal”) values and magnitudes is a recurring theme in the history of economics. It was central to the Classical Political Economy of Adam Smith and David Ricardo, and survived the transition to neoclassical economics in the work of authors such as Wicksell and Marshall. In modern economics, it has its most familiar usage in the notion of a natural rate of unemployment, but has been applied also to the analysis of economic growth rates and interest rates, among others. And while many economists reject the very notion of “natural” itself, this paper argues that in general there are significant instances in which natural magnitudes do apply to the economic system, and, specifically, that the natural, nominal, risk free rate of interest is zero under relevant contemporary institutional arrangements.

The next begins with a brief history of the notion of natural magnitudes, and examples are cited from the history of economic thought. This is followed by a discussion of modern monetary systems and their operation, concluding that the natural rate of interest is zero.

### **NATURAL OR NORMAL VALUES AND MAGNITUDES**

We use the word ‘natural,’ mimicking the sense that mainstream economists have at times attempted to use it regarding such issues as employment, growth, and interest rates. However, as Pack reminds us, “Natural and nature are complex words, fraught

with ambiguity and contradiction” (1995, p. 31). The sense in which we wish to employ the term *natural* here does not imply a ‘law of nature’, which may be why “Marshall replaced the evocative label ‘natural’ with the more prosaic ‘normal’” (Eatwell, 1987, p. 598). The notion of natural or normal values and magnitudes in political economy refers primarily to conditions that hold in the ‘general case’ rather than under ‘specific circumstances.’ (*ibid.*): (although in conversation ‘natural’ may be substituted for ‘equilibrium’ as a thinly disguised hyperbole). Terms such as ‘permanent’, ‘fundamental’, and ‘intrinsic’ were used in Pre-Smithian classical political economy by authors such as Petty, Cantillon, and Quesnay to indicate a similar meaning (Vaggi, 1987, pp. 606-607). Of course, the term natural has also been used to indicate ‘real’ as opposed to ‘monetary’ forces, magnitudes “ground out by the Walrasian system of general equilibrium equations” (Friedman, 1968, p. 8), or to indicate ‘equilibrium’ magnitudes (e.g., by Wicksell, 1898), and we do not wish to attach these meanings to our use of the term. Neither do we wish to invoke a “long-period” methodology, as in Garegnani (1976), despite the family resemblances between his use of the term and our own. Marshall may have clarified it the best when he wrote that “normal results are those which may be expected as the outcome of those tendencies *which the context suggests*” (1920 [1966], p. 28, emphasis added). In this case, it is of the utmost importance to first clarify the context, to which we now turn.

## **STATE ISSUED CURRENCY**

The primary, defining institutional arrangement characterizing the relevant context is that of a ‘tax driven’ state currency and flexible exchange rates. By state

currency we mean to indicate there is a government that taxes and has a monopoly of issue. A flexible exchange rate is commonly referred to as a ‘fiat’ currency, in other words a state-issued currency convertible only into itself (Keynes, 1930), as opposed to a fixed exchange rate policy such as a gold standard or other convertibility to any other commodity or currency (no currency boards, pegged currencies, or monetary unions) fixed by the state of issue. Examples of such monetary systems currently include the United States, Japan, and most of the world’s industrial economies, including the Eurozone, although the individual nations are no longer issuers of their currency.

There is a long tradition of analysis of state currency or “state money,” referred to by London School of Economics Professor of Banking and Finance and Bank of England monetary economist Charles A. E. Goodhart as the “Cartalist” (or Chartalist) school of monetary thought, and which he contrasts with the “metallist” (Mengerian, monetarist) tradition (Goodhart, 1998). While authors such as Schumpeter (1954) passed down a view of chartalism with a misplaced emphasis on “legal tender” laws, resulting in something of “legal” or “contractual” version of chartalism, Goodhart makes clear that the fundamental insight is that *the power of the state to impose a tax liability payable in its own currency is sufficient to create a demand for the currency and give it value.*

Recent research into the history of economic thought has revealed substantial evidence of past support for this thesis regarding tax-driven money: we now know that, throughout history, many more economists understood the workings of tax-driven money, and many of not most currencies in history were in fact tax-driven, contrary to what was previously thought to be the case (see, e.g., Wray, 1998, 2004; Bell and Nell, 2003; Forstater, 2005).

The idea of a tax-driven currency was once common knowledge. The 1946

*Encyclopedia Britannica* entry on “Money” stated it very clearly:

If the government announces its readiness to accept a certain means of payment in settlement of taxes, taxpayers will be willing to accept this means of payment because they can use it to pay taxes. Everyone else will then be willing to accept it because they can use it to buy things from the taxpayers, or to pay debts to them, or to make payments to others who have to make payments to the taxpayers, and so on. (Lerner, 1946, p. 693)

Neither was this a “new” idea, as it can be found in the writings of economists and others going back to Adam Smith and beyond. Smith, in his famous treatise *An Inquiry into the Nature and Causes of the Wealth of Nations* wrote:

A prince, who should enact that a certain proportion of his taxes should be paid in a paper money of a certain kind, might thereby give a certain value to this paper money. (Smith, 1776, p. 312)

The Father of Economics well-understood that taxation is the key to understanding the value of state money (in fact he used the example of Massachusetts’ 1692 issue of paper money as an example). So did a diverse array of economists that came after him, including John Stuart Mill, William Stanley Jevons, Phillip H. Wicksteed, and John Maynard Keynes, among many others (see Forstater, 2005).

A key distinction is that between the government as *issuer* of a currency and the non-government agents and sectors as *users* of a currency. Households, firms, state and local governments, and member nations of a monetary union, are all currency *users*. A State with its own national currency is a currency *issuer*. The issuer of a national currency operates from a different perspective than a currency user. Operationally, government spending consists of crediting a member’s bank account at the government’s

central bank, or paying with actual cash. Therefore, unlike currency users, and counter to popular conception, the issuer of a currency is not revenue-constrained when it spends. The only constraints are self-imposed (these include no overdraft provisions, debt ceiling limitations, etc.). Note that if one pays taxes or buys government securities with actual cash, the government shreds it, clearly indicating operationally government has no use for revenue per se.

When the U.S. Government makes payment by check in exchange for goods and services (including labor), or for any other purpose, the check is deposited in a bank account. When the check ‘clears,’ the Fed (i.e., Government) credits the bank’s account for the amount of the check. Operationally, ‘revenue’ from taxing or borrowing is not involved in this process, nor does the government ‘lose’ any ability to make future payments per se by this process. Conversely, when the U.S. government receives a check in payment for taxes, for example, it debits the taxpayer’s account to the amount of the check. While this reduces the taxpayer’s ability to make additional payments, it does not enhance the government’s ability to make payment, which is in any case operationally infinite. In the case of direct deposit or payment by electronic funds transfer, the government simply credits or debits the bank account directly and, again, without operational constraint. The government of issue in such circumstances may be thought of as a “scorekeeper.” As in most games, there is no reason for concern that the scorekeeper will run out of points. On the other hand, non-government agents can only spend when in possession of sufficient funds from current or past income, or from borrowing. They are

indeed revenue constrained—their checks will ‘bounce’ if there are not sufficient funds available.

Given that a government of issue is not revenue constrained, taxation and bond sales obviously must have other purposes (see Bell, 2000). As we have already seen, taxation (and the declaration of what suffices to settle the tax obligation) serves to create a notional demand for the government’s (otherwise worthless) currency. The process can be viewed in three stages:

1. THE GOVERNMENT IMPOSES A TAX LIABILITY PAYABLE IN ITS CURRENCY OF ISSUE.
2. FACED WITH THIS NEED FOR UNITS OF THE GOVERNMENT’S CURRENCY, TAXPAYERS OFFER GOODS AND SERVICES FOR SALE, ASKING IN EXCHANGE UNITS OF THE CURRENCY.
3. THE GOVERNMENT ‘ISSUES’ ITS CURRENCY—SPENDS—IN EXCHANGE FOR THE GOODS AND SERVICES IT DESIRES.

The non-government sector will be willing to sell sufficient goods and services to the government to obtain the funds needed to pay tax liabilities and satisfy any desire to net save (financial assets) in that unit of account. Note that, from inception, and as a point of logic, in order to actually collect taxes, the government, as the monopoly issuer of the currency, must, logically, spend (or lend) first. Note that it would be logically impossible for the government to collect more than it spends (or run a budget surplus), unless it had already previously spent more than it collected (past budget deficits). Thus the normal budgetary stance to be expected under these institutional arrangements is a budget deficit.



The government budget deficit is also “normal” in the sense that it is the mirror image of the non-Government surplus in the basic macroeconomic accounting identity:

$$\text{Government deficit} = \text{non-Government surplus}$$

where non-Government surplus includes both the domestic (or resident) private sector and the foreign (non-resident) sector, which includes foreign firms, households, and governments. It is therefore equivalent to the well-known identity:

$$(G - T) = (S - I) + (M - X)$$

Government budget deficit = domestic private sector surplus + foreign sector surplus where the foreign sector surplus is another way of expressing the trade deficit. The government budget deficit permits both the domestic private sector and the foreign sector to ‘net save’ in the government’s unit of account. Only a domestic government budget deficit permits the domestic private sector and foreign sector to actualize their combined desired net saving.

We are now in a position to demonstrate our proposition: the natural rate of interest is zero. First, to reiterate the argument thus far: Under a state money system with flexible exchange rates, the monetary system is tax-driven. The federal government, as issuer of the currency, is not revenue-constrained. Taxes do not finance spending, but taxation serves to create a notional demand for state money. Spending logically precedes tax collection, and total spending will normally exceed tax revenues. The government budget, from inception, will therefore normally be in deficit, which also allows the non-

government sector to ‘net save’ state money (this in fact has been observed in all state currencies).

## **THE NATURAL RATE OF INTEREST IS ZERO**

If spending is not revenue constrained, why does the government (conceived here as a consolidated Treasury and Central Bank) borrow (sell securities)? As spending logically precedes tax collection, the government must likewise spend sufficiently before it can borrow. Thus, government spending must also, as a point of logic, precede security sales. To site a ‘real world’ example, market participants recognize that when Treasury securities are paid for, increasing treasury balances at the Fed, the Fed does ‘repos’ on the same day; the Fed must ‘add’ so the Treasury can get paid.

Since the currency issuer does not need to borrow its own money to spend, security sales, like taxes, must have some other purpose. That purpose in a typical state money system is to manage aggregate bank reserves and control short-term interest rates (overnight inter-bank lending rate, or Fed Funds rate in the U.S.).

In the contemporary economy, government ‘money’ includes currency and central bank accounts known as member bank reserves. Government spending and lending adds reserves to the banking system. Government taxing and security sales drain (subtract) reserves from the banking system. When the government realizes a budget deficit, there is a net reserve add to the banking system. That is, Government deficit spending results in net credits to member bank reserves accounts. If these net credits lead to excess

reserve positions, overnight interest rates will be bid down by the member banks with excess reserves to the interest rate paid on reserves by the central bank (0% in the case of the US and Japan, for example). If the central bank has a positive target for the overnight lending rate, either the central bank must pay interest on reserves or otherwise provide an interest bearing alternative to non interest bearing reserve accounts. This is typically done by offering securities for sale in the open market to drain the excess reserves. Central bank officials and traders recognize this as “offsetting operating factors,” since the sales are intended to offset the impact of the likes of fiscal policy, float, etc. on reserves that would cause the fed funds rate to move away from the Fed’s target rate.

Our main point is, in nations that include the US, Japan, and others where interest is not paid on central bank reserves, the ‘penalty’ for deficit spending and not issuing securities is not (apart from various self imposed constraints) ‘bounced’ government checks, but a 0% interbank rate, as in Japan today.

The overnight lending rate is the most important benchmark interest rate for many other important rates, including banks’ prime rates, mortgage rates, and consumer loan rates, and therefore the fed funds rate serves as the ‘base rate’ of interest in the economy. In a state money system with flexible exchange rates running a budget deficit—in other words, under the ‘normal’ conditions or operations of the specified institutional context—without government intervention either to pay interest on reserves to offer securities to drain excess reserves to actively support a non-zero, positive interest rate, the natural or normal rate of interest of such a system is zero.

This analysis is supported by both recent research and experience. Japan's experience in the 1990s shows clearly that large government budget deficits as a proportion of GDP (in the neighborhood of 7%) and a debt/GDP ratio of 140% do not drive up interest rates, as conventional wisdom would have it. In fact, the overnight rate has stayed at near 0% for nearly a decade. In addition, Fullwiler (2004) demonstrates that concerns about technological change in financial markets and other recent developments such as financial deregulation disrupting the interest rate channel of monetary policy are misplaced. On the contrary, since the 1990s, market rates have become even more closely linked to the fed funds rate (*ibid.*):

The fact that banks are obligated to use reserve balances to settle their customers' tax liabilities ensures that a non-trivial demand for reserve balances will exist, which itself ensures that the federal funds rate target will remain 'coupled' to other interest rates. (*ibid.*)

That the natural rate of interest is zero is also supported by recent experimental evidence. Wray (2001) reports on a community service program run in the Economics Department at the University of Missouri—Kansas City. Students are 'taxed' in the Department's own currency and must perform community service to obtain units of that currency. The Department's 'Treasury' could offer interest-earning 'bonds', purchased by students with excess (non-interest-bearing) units of the school's currency, but the rate of interest offered is entirely up to the discretion of the Departmental Treasury. If the Treasury did not offer interest-earning bonds, the base rate on the currency would be zero:

[T]he "natural base interest rate" is zero on ... hoards created through deficit spending...[U]nless the Treasury chooses to intervene to maintain a positive base rate (for example, by offering interest on bonds), deficits necessarily imply a zero base rate. (Wray, 2001, p. 50)

Note that deficits with the department's currency are "natural" in the sense that they result from the student demand to net save units of that currency.

The central bank clearly controls short-term interest rates in a state currency with flexible exchange rates, and there are a number of good reasons for setting the overnight rate at its natural or normal rate of 0%, and allowing markets to factor in risk to determine subsequent credit spreads (see Mosler, 2004). The Japanese experience has already demonstrated that this does not cause inflation or currency depreciation. If anything, lower rates support investment, productivity, and growth. While changing rates can have important distributional or micro effects (and that can spur employment and output growth, such as shifting income from 'savers' to working people), the net income or macro effect is zero since for every dollar borrowed from the banking system there is a dollar saved, as the Fed clearly recognizes in its literature. Additionally, it can be argued that asset pricing under a 0 interest rate policy is the 'base case' and that any move away from a 0 rate policy constitutes a (politically implemented) shift from this 'base case.'

## **INTEREST RATES UNDER A FIXED EXCHANGE RATE REGIME**

While this paper focuses on a floating exchange rate regime, a brief summary of interest rate determination in a fixed exchange rate regime offers context as well as contrast to the prior discussion.

Inherent in a fixed exchange rate is the risk of government not honoring its legally binding conversion features. Historical examples of this type of default in fixed

exchange rate regimes abound, and recent examples include Argentina and Russia failing to honor conversion of their currencies into \$US at their central banks. History is also filled with examples of default under various gold standards, with the U.S. itself technically defaulting in 1934 when it both devalued the \$US versus gold and permanently suspended domestic convertibility. Bondholders were subject to this default as well since the \$US they received at maturity were subject to the new terms and conditions.

Market forces translate this default risk into a term structure of interest rates. Default risk is a function of maturity and credit worthiness, with the 'risk free' rate being the return on holding the object of conversion itself. So in contrast to a floating exchange rate regime, where the term structure of interest rates is necessarily a political decision generally reserved for the central bank, with a fixed exchange rate regime the term structure of rates is a function of market forces.

In the case of a gold standard, the risk free rate is negative, as it is the storage charge of holding physical gold. In fact, for all practical purposes, there is no such thing as 'risk free', as physical gold can be stolen or otherwise lost even with the most expensive guarding techniques. In the case of conversion into another government's currency, such as the \$US, the 'risk free' rate is the risk free rate of \$US deposits, which is the rate on US Treasury securities or deposits at US Government-insured institutions. This is the case today in Hong Kong, for example, where the risk free rate is that of the risk free rate of the \$US.

With a fixed exchange rate, governments that spend by issuing currency and not borrowing risk having those outstanding units of currency converted to the reserve currency (or gold, as the case may be) at the central bank. Therefore government borrowing functions to protect central bank reserves and keep the government from defaulting on its legal conversion requirements. Since holders of the currency have the option of conversion to the reserve currency at the central bank, govt. securities can be thought of as ‘competing’ with the conversion option, with market forces determining the indifference levels. This explains the very high interest rates paid by governments with perceived default risk in fixed exchange rate regimes, in contrast to the ease a nation such as Japan has in keeping rates at 0 in a floating exchange rate regime, despite deficits that would undermine a fixed exchange rate regime.

In recent history, today’s central bank systems with floating exchange rate policies have followed fixed exchange rate (mostly gold standard) regimes. We suggest that policy makers used interest rate data collected under these fixed exchange rate regimes as well as their experience of using interest rates for reserve management and macroeconomic policy under fixed exchange rate regimes to guide them after shifting to floating exchange rates. The various correlations between interest rates and economic variables were assumed to continue under the new floating exchange rate regime, including the current notion of ‘real rates’ versus ‘inflation,’ etc.

Mainstream analysis of the U.S. ‘twin deficits’ is but one example of being ‘out of paradigm’ with respect to exchange rate policy. One reads daily of the U.S. facing a day of reckoning due to ‘borrowing from abroad’ to fund its imports. While this may have had much validity under fixed exchange rate arrangements, with floating exchange rates a current account deficit is instead the result of nonresidents realizing savings desires of \$US financial assets. There is no ‘funding risk’ for the U.S. nor are U.S. interest rates per se a function of the trade balance.

## **CONCLUSION**

The notion of natural or normal magnitudes and values in economics refers to the results expected as the outcome of a specified institutional context. The relevant institutional context specified herein is a monetary system with a state (or tax-driven) currency and a floating exchange rate policy. There is significant historical and theoretical support for such a system’s relevance. It has been shown that in this context, the government budget will normally be in deficit, corresponding to net savings of financial assets in the non-government sectors. Deficit spending will result in net central bank reserve credits in the aggregate banking system, which will drive the short-term overnight inter-bank lending rate to zero. While government security sales may be used to drain the excess reserves to maintain some positive overnight rate, or the central bank may pay interest on reserve balances, absent such government intervention the base rate of interest is zero. In other words, the natural rate of interest is zero. As many other key rates of interest in the economy continue to follow the fed funds rate very closely, this will serve as the base rate in the economy, with markets determining the credit spreads



through risk assessment. Furthermore, there are a number of reasons why allowing the rate of interest to settle at its natural rate of zero makes good economic sense.

## **BIBLIOGRAPHY**

- Bell, Stephanie, 2000, “Do Taxes and Bonds Finance Government Spending?” *Journal of Economic Issues*, 34 (September), pp. 603-620.
- Bell, Stephanie A., and Edward J. Nell, 2003, *The State, the Market, and the Euro: Chartalism versus Metallism in the Theory of Money*, Cheltenham, U.K.: Edward Elgar.
- Eatwell, John, 1987, “Natural and Normal Conditions,” in J. Eatwell, M. Milgate, and P. Newman, eds., *The New Palgrave: A Dictionary of Economics*, London: Macmillan.
- Forstater, Mathew, 2005, “Tax-Driven Money: Further Evidence from the History of Thought, Economic History, and Economic Policy,” in Mark Setterfield, ed., *Complexity, Endogenous Money, and Exogenous Interest Rates*, Cheltenham, U.K.: Edward Elgar.
- Friedman, Milton, 1968, “The Role of Monetary Policy,” *American Economic Review*, 58, March, pp. 1-17.
- Fullwiler, Scott, 2004, “Setting Interest Rates in the Modern Money Era,” *C-FEPS Working Paper No. 34*, Kansas City, MO: Center for Full Employment and Price Stability.
- Garegnani, Pierangelo, 1976, “On a Change in the Notion of Equilibrium in Recent Work on Value and Distribution,” in M. Brown, K. Sato, and P. Zarembka, eds., *Essays in Modern Capital Theory*, Amsterdam: North-Holland.

- Goodhart, Charles, 1998, "The Two Concepts of Money: Implications for the Analysis of Optimal Currency Areas," *European Journal of Political Economy*, Vol. 14, pp. 407-432, reprinted in S. Bell and E. J. Nell, eds., *The State, the Market, and the Euro: Chartalism versus Metallism in the Theory of Money*, Cheltenham, U. K.: Edward Elgar, 2003.
- Keynes, John Maynard, 1930, *A Treatise on Money*, New York: Harcourt Brace.
- Lerner, Abba P., 1946, "Money," in *Encyclopedia Britannica*.
- Marshall, Alfred, 1920 [1966], *Principles of Economics*, eighth ed., London: Macmillan.
- Mosler, Warren, 2004, "Revisiting the Liberal Agenda," *C-FEPS Special Report 04/02*, Kansas City, MO: Center for Full Employment and Price Stability.
- Pack, Spencer, 1995, "Adam Smith's Unnaturally Natural (yet Naturally Unnatural) Use of the Word 'Natural'," in I. Rima, ed., *The Classical Tradition in Economic Thought*, Cheltenham, U.K.: Edward Elgar.
- Schumpeter, Joseph, 1954, *History of Economic Analysis*, ed. E. B. Schumpeter, New York: Oxford University Press.
- Smith, Adam, 1776 [1937], *An Inquiry into the Nature and Causes of the Wealth of Nations*, New York: Modern Library.
- Vaggi, Gianni, 1987, "Natural Price," in J. Eatwell, M. Milgate, and P. Newman, eds., *The New Palgrave: A Dictionary of Economics*, London: Macmillan.
- Wicksell, Knut, 1898, *Interest and Prices*, New York: Augustus M. Kelley.
- Wray, L. Randall, 2004, *Credit and State Theories of Money*, Cheltenham, U. K.: Edward Elgar.

Wray, L. Randall, 2001, "Buckaroos: The Community Service Hours Program at the University of Missouri—Kansas City," *Economic and Labour Relations Review*, Volume 12, supplement, pp. 46-61.

Wray, L. Randall, 1998, *Understanding Modern Money*, Cheltenham, U. K.: Edward Elgar.