

Goodhart's Law: Its Origins, Meaning and Implications for Monetary Policy

By K. Alec Chrystal

(City University Business School, London)

and

Paul D. Mizen

(University of Nottingham)

Prepared for the Festschrift in honour of Charles Goodhart to be held on 15-16
November 2001 at the Bank of England.

We are grateful for comments and suggestions from Christopher Allsopp, Michael
Artis, Forrest Capie, Charles Goodhart, Andy Mullineux, Simon Price, Daniel
Thornton, Peter Westaway and Geoffrey Wood.

12 November 2001

1. *Introduction*

Many distinguished economists have their name associated with some theory, concept or tool in economics. Obvious examples include: Giffen goods, the Pigou effect, Nash equilibrium, the Coase theorem, the Phillips curve, the Rybczynski and Stolper-Samuelson theorems, Ricardian equivalence, the Engle curve, the Edgeworth-Bowley box, Tobin's q , and the Lucas critique. However, very few economists are honoured by having their name associated with a "law". Charles Goodhart joins Sir Thomas Gresham, Leon Walras, and Jean-Baptiste Say in a very select club.

In this paper we explain Goodhart's Law and the context in which it arose, and discuss whether it has the qualities that will help it survive over time. Mainly this requires that it can be adapted to new circumstances as the world changes. Gresham's law, for example, was invented to describe the problems that arose from the artificial fixing of gold and silver prices but it turned out to have applicability to a wider range of monetary regimes wherever currency substitution was possible. Dollarisation in Ecuador, and other countries, would be a contemporary example of 'good money drives out bad'.

We shall focus particularly closely on the comparison between Goodhart's Law and the enormously influential Lucas Critique. It could be argued, that Goodhart's Law and the Lucas critique are essentially the same thing. If they are, Robert Lucas almost certainly said it first. However, while both Goodhart's Law and the Lucas critique relate to the instability of aggregate macroeconomic relationships, we shall argue that there are significant differences. In particular, while the Lucas Critique has affected macroeconomic methods in general, Goodhart's Law has been more influential in monetary policy design -- monetary targets are out and inflation targets are in.

2. *What is Goodhart's Law and how did it arise?*

The original statement of Goodhart's law can be found in one of two papers delivered by Charles to a conference in July 1975 at the Reserve Bank of Australia (RBA), Goodhart (1975a, b)¹. It reached a wider audience when the key paper was published

¹ The original papers were reproduced in Volume I of Papers in Monetary Economics, Reserve Bank of Australia, 1975 under the titles 'Monetary Relationships: A View from Threadneedle Street' and 'Problems of Monetary Management: The UK Experience'.

in a volume edited by Courakis (1981) and then again in a volume of Charles' own papers (Goodhart, 1984). The context is very clear, but since the statement of the law was a (jocular) aside rather than the main point of the paper, the interpretation is open to some questions.

Throughout the post-WWII period up until 1971, sterling had been pegged to the US dollar (with major devaluations in 1949 and 1967) and monetary policy was dominated by this constraint. Exchange controls were in place and the main clearing (commercial) banks were subject to various direct controls on their balance sheet expansion. In August 1971, however, the US closed the gold window and temporarily floated the dollar. There was a short-term patch-up of the pegged rate system under the Smithsonian Agreement of December 1971, but sterling floated unilaterally from June 1972. Some alternative to the dollar as nominal anchor and some guiding principles for monetary policy in the new regime were needed.

Goodhart (1975a) outlines how research originating from the Bank and that of outside academics had indicated that there was a stable money demand function in the UK. The implication of this finding for monetary policy was deemed to be that the relationship could be used to control monetary growth via the setting of short-term interest rates, without resort to quantitative restrictions. The relevant section of the key paper reads as follows:

“The econometric evidence seemed to suggest that, one way or another, whether by restraining bank borrowing or by encouraging non-bank debt sales, higher interest rates did lead to lower monetary growth. In one fell swoop, therefore, these demand-for-money equations appeared to promise:

- (1) that monetary policy would be effective;
- (2) that an ‘appropriate’ policy could be chosen and monitored;
- (3) that the ‘appropriate’ level of the monetary aggregates could be achieved by market operations to vary the level of interest rates.

[.....] these findings, which accorded well with the temper of the times, helped to lead us beyond a mere temporary suspension of bank ceilings towards a more general reassessment of monetary policy. The main conclusions of this were that the chief intermediate objectives of monetary policy should be the rates of growth of the monetary aggregates, i.e. the money stock, in one or other of its various definitions, or DCE (and not particular components of these, such as bank lending to the private sector), and that the main control instrument for achieving these objectives should be the general

price mechanism (i.e. movements in interest rates) within a freely competitive financial system.” (Goodhart, 1975)

The ‘competition and credit control’ reforms, which removed direct controls on bank lending, had been introduced in September 1971 and a dramatic surge in bank intermediation, leading to broad money growth rates in excess of 25%, had resulted in 1972 and 1973. The conclusion drawn by policy makers in 1973 was that the only option was to supplement monetary targets with direct controls on banks through Supplementary Special Deposits known as ‘the Corset’ (See Zawadzki, 1981). Modest interest rate changes seemed powerless in the face of this monetary expansion and the previously stable money demand function seemed to have broken down. This was clear well before 1975, but Goodhart (1975b) was a summary of the current problems of monetary management, as the title suggests.

Goodhart’s Law is the statement missing from the square brackets in the quotation above. It says: **“Ignoring Goodhart’s law, that any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes”**. This makes the observation that previously estimated relationships (especially between the nominal interest rate and the nominal money stock---item (3) in the full quote above) had broken down. But as we shall see below this does not necessarily have any implications for the stability or otherwise of the demand function for real money balances, even though this was how the law was later interpreted.

The proximate meaning of the law is clear. Bank economists thought that they could achieve a particular rate of growth of the money stock by inverting the money demand equation that had existed under a different regime. But in the 1971-1973 period this did not work, as it appeared that the old relationship had broken down. The “law” states that this will always happen when policy makers use such statistically-estimated relationships as the basis for policy rules.

The 1974-79 Labour Government introduced monetary targets, but they continued to attempt to hit them by means of direct controls in the form of the Corset. When the Conservative administration of Margaret Thatcher took over as the UK government in 1979, monetary policy took a new turn. Chancellor of the Exchequer, Geoffrey

Howe, labelled by his predecessor Denis Healey as a 'believing monetarist', attempted to target the growth rate of the money supply (£M3) by use of the official interest rate, after exchange controls were abolished in October 1979 and the Corset then became impossible to maintain. Targets were set for £M3 (broad money excluding balances in foreign currency) to lie in the range 7-11 per cent for the period 1980-81 falling by one percent per annum to 4-8 percent by 1983-4. In the event, however, money growth overshot its target by 100 per cent in the first two-and-a-half years. The abolition of exchange controls and the Corset (and the financial innovations that followed) meant that the relationship between broad money and nominal incomes fundamentally altered (see Goodhart, 1989).

Although it was becoming apparent by 1982 that the velocity trend had changed, partly because the relaxation of credit controls and exchange controls had redirected much foreign business back through the British banking system, Nigel Lawson, the new Chancellor appointed in 1983, reasserted his confidence in monetary targeting by publishing further growth targets often for several years ahead. The Medium Term Financial Strategy was largely unsuccessful, however, (at least in controlling money growth) and this led to the conclusion that monetary targeting of all types was flawed. It was dropped in the summer of 1985 in favour of exchange rate shadowing.

Not only was the link from the policy interest rate to money unstable but so also was the link from (broad) money to aggregate demand. Monetary stability seemed (in some people's view) to be achievable by a fixed exchange rate in which the money supply was endogenous rather than by a money targeting policy. We return later to the issue of whether 'money' should have an active role in monetary policy. At this stage we just note the irony that Charles Goodhart is probably one of the few UK economists who does think that money matters and yet his law was repeatedly quoted in the 1980s to support the case for ignoring money entirely, or at least for monetary targets having no explicit role in monetary policy. We shall show some evidence on why this was in the next section.

A number of observations on the context in which the law arose are now appropriate. First, it should not have been too surprising, even at the time (1971-3), that removal of direct quantitative controls would lead to a surge of bank intermediation and that

some adjustment period would follow. That this happened is not in itself evidence that the demand for money is in any sense unstable. Indeed, as Artis and Lewis (1984) have pointed out (and we revisit their results below), subsequent adjustments to prices, output and interest rates did return money balances relative to nominal GDP to their long-run relationship by the second half of the 1970s. The supply shock of a new operating procedure and abolition of credit rationing caused agents to acquire excess nominal money balances, but these were rapidly eliminated in the standard textbook fashion by bidding up goods and property prices---the 25 per cent plus money growth in 1972-3 led to 25 per cent plus inflation in 1974-5. Equally, the abolition of the corset in 1980 could have been expected to lead to a surge of broad money growth in the early 1980s. That this surge happened at a time when the economy was heading into a sharp recession and inflation was falling in no way proves that money does not matter....it just indicates that it is not the only thing that matters.

Far from Goodhart's Law having an immediate impact on policy in the mid-1970s, events persuaded even politicians that money mattered and that money growth needed to be controlled in order to avoid excessive inflation². Goodhart's Law only really came into its own as an influence on policy in the early 1980s when, following abolition of the Corset, broad money growth again surged. But, as noted above, this time the rapid growth of broad money coincided with a sharp recession and a decline in inflation, so the usefulness of monetary targets came into serious question.

Simultaneously the financial markets experienced a period of deregulation and product innovation that altered the conventional role for money as a non-interest-bearing asset. Explicit targets were eventually dropped.

² Not all were persuaded however. Denis Healey, the UK Chancellor of the Exchequer, was sceptical of monetarist theories and monetary statistics. Raising doubts about the ability of economic forecasters to predict accurate ranges for monetary growth, he claimed to have decided to 'do for economic forecasters what the Boston Strangler did for door-to-door salesmen – to make them distrusted forever'. The statistics on which the forecasts were based were received several weeks after the end of month collection date and were prone to revisions, so that new vintages of the monetary numbers could tell quite different stories to the early data. Goodhart recalls his experiences in the Bank of England, discussing the data on monthly growth rates in relation to a five month moving average as a guide to the trend:

'The standard deviation from the moving average is large in relation to the calculated values of that moving average. We receive the data several weeks after the monthly make-up date. The noise in the series is so loud that it takes us several months to discern a systematic trend with any confidence. ... So the movements in the series, when the systematic trends can be interpreted, tell you where you have been, not necessarily where you are going. That at least is something.' Goodhart 1989 pp. 112-113.

The second observation is that, notwithstanding the general loss of interest in money during the 1980s, there is plenty of evidence that there remains a plausible and stable long-run money demand relationship. Once allowances are made for the types of financial innovation that occurred in the 1980s, such as the introduction of interest bearing current accounts and money market mutual funds, and some distinction is allowed between retail and wholesale balances the money demand function returns to normality. Were we to use a Divisia measure of money we would find that the correction for the effects of financial innovation would restore the stable money demand function, which is in any event evident using standard simple-sum aggregates within specific sectors, if not at the aggregate level³.

The third observation is that, while the apparent breakdown of the money demand relationship that led to the original statement of Goodhart's Law persuaded the authorities to return to the use of direct controls, there is a plausible interpretation of Goodhart's Law that would imply that such controls will not work for long. For example, let us suppose that over some period it were shown that the growth rate of broad money (M4) was a good leading indicator of inflation, so that the authorities decided to control the growth rate of banks' deposit liabilities by the fiat imposition of quantitative ceilings. Without other measures to control aggregate demand, the previously existing statistical relationship between broad money and inflation would be expected to shift as other channels of intermediation evolve, bypassing the distortions to the financial system. Indeed, this is exactly what happened in the second half of the 1970s, even though Goodhart's Law was intended to apply to the prior period when direct controls were absent. £M3 was controlled directly because that had been correlated with inflation (with a lag), but inflation picked up anyway and the controls were unsustainable once exchange controls were abolished. In many ways this is a better example of a statistical relationship breaking down when

³ See for example Drake and Chrystal (1994) and (1997), and Drake, Chrystal and Binner (2000)

‘pressure was put on for control purposes’ than the 1971-3 episode which spawned to original statement⁴.

A fourth and final observation at this stage is to note that, while there is plenty of recent evidence of stable money demand functions, it could be argued that this is only true because monetary authorities are no longer ‘putting pressure on this particular statistical relationship for control purposes’. The focus on inflation targeting has killed off interest in stable (or otherwise) money demand functions. We are not aware of anyone having tested Goodhart’s Law by comparing the stability of money demand functions in money targeting countries with those in non-money targeting countries. Whether stable money demand functions led to monetary targeting or the other way round is difficult to determine. The argument is always circular and counterproductive to the process of getting a fair test, because countries with the most stable money demand relationships are more likely to choose monetary targeting as a policy objective. But there is no evidence of which we are aware to suggest that monetary-targeting countries have *more* unstable money demand functions than others. Schmid (1998) argues that the Bundesbank’s success can be attributed to the dominance of the universal banking system, and the low inflation environment that gave no incentive for banks to develop new financial instruments. Without significant deregulation and liberalisation of financial markets that had taken place elsewhere, German monetary policy was presented with fewer challenges because the basic financial relationships, including the money demand function, were essentially reliable.

3. *The Artis and Lewis riposte*

In this section we redo the Artis and Lewis (1984) analysis with an updated data set. We calculate the inverse of velocity of circulation of money, using a measure of annual broad money defined by the Capie and Webber (1985) data series for £M3 spliced onto the official series for M2 (also known as ‘retail M4’) from 1982. The aggregate income series is based on national income up to 1948 and official GDP at

⁴ There is a prior claim to have named the re-adjustment of a previously stable statistical relationship, known as the Le Chatelier (1888) Principle. This states that if a constraint is made on a system at equilibrium the system will adjust to overcome the effect of this constraint.

market prices thereafter⁵. Plotting the resulting velocity series against the Consol rate (see Chart 1) shows that the money demand function (estimated over the period 1920 – 2000 excluding the data points for the years 1973 –1977) is remarkably stable. The fitted regression line is drawn in black. The regression line estimated by Ordinary Least Squares is:

$$\log (M/Y) = \begin{matrix} 0.305 \\ (0.046) \end{matrix} - \begin{matrix} 0.538 \\ (0.026) \end{matrix} \log (R) + \text{dummies}$$

R-squared = 0.852 ; F(5,75) = 86.327 [0.0000]
Standard error of equation = 0.103225; Durbin Watson = 0.372; N = 81

This compares favourably to Artis and Lewis' estimate over 1920 –1981 of

$$\log (M/Y) = \begin{matrix} 4.717 \\ (0.046) \end{matrix} - \begin{matrix} 0.536 \\ (0.028) \end{matrix} \log (R) + \text{dummies}$$

R-squared = 0.88; N = 58

Our regression line is remarkably similar in slope to previous studies, although the intercept differs due to the fact that our data series are scaled differently. As with the Artis and Lewis paper we can observe the disequilibrium period in the early 1970s on Chart 1 (which was removed using dummy variables before estimating the regression line)⁶. The breakdown of the demand for money function is apparent during the period preceding the creation of Goodhart's law, although the relationship quickly re-established itself.

We now repeat this exercise but this time using the official M4 series instead of M2. The outcome gives a very clear illustration of why Goodhart's law was widely quoted in the 1980s as being the explanation of why monetary targeting was inappropriate. Here we calculate inverse velocity using a monetary aggregate based on Capie and Webber's data up to 1963 then splicing with M4 to the present⁷, divided by the same

⁵ A consistent M2 series is only available from 1982, and M3 cannot be used after the mid-1980s owing to building society conversions.

⁶ The series used in this regression are non-stationary, so to deal with the potential spurious regression problem we estimated the relationship using the Johansen procedure for the sample 1920 - 2000. We found evidence of a single cointegrating relationship with slightly smaller intercept and slope coefficients than the OLS estimates.

⁷ The official series for M4 starts in 1963, so we are using the longest run of this available.

income measure as before. We plot this against the Consol rate in Chart 2. The estimate of the regression line is calculated using a similar method and is compared to the data points. From 1982 onwards we can see a steady increase in the ratio of money to income for a given interest rate, which represents the effect of financial innovation. As the broader components of money included in M4 (but not in M2 and thus held mainly by firms and other financial corporations (OFCs)) offered more competitive rates of interest and/or sterling wholesale financial activity increased, so the stock of M4 increased relative to income. The set of data points clearly represents a different money demand function for the 1980s and 1990s which has shifted to the right, even though the demand function for retail deposits (M2) was broadly unchanged.

This shift we would argue is probably little to do with the use of M4 as a targeted aggregate but rather is the product of financial liberalisation and the rapid growth of wholesale money markets in London. In the Loughborough Lecture, the then Governor of the Bank of England, Robin Leigh-Pemberton (1986), identified the behaviour of financial intermediaries (banks and building societies) and other financial intermediaries (OFIs such as securities dealers, investment institutions, and leasing companies, etc) as largely responsible. Deregulation of the banking sector, and the removal of foreign exchange controls in 1979, encouraged banks to look for funds in the wholesale markets rather than from its retail-deposit base. OFIs increased both sides of their balance sheets from 1980, contributing considerably to the growth in broad money under much the same influences as the banks, with whom they were engaged in closer competition in existing and newly-developed markets as financial markets were liberalised. Together these factors increased the wholesale component of money balances in relation to income as revealed by a comparison of Charts 1 and 2.

4. Goodhart's Law and the Lucas Critique

Goodhart's Law (1975) predates the publication of the Lucas critique (1976), but the Lucas paper was presented at a Carnegie-Rochester conference in April 1973 and circulated more widely prior to publication (Savin and Whitman, 1992) so, if Goodhart's Law and the Lucas critique are the same thing, Lucas said it first. What is

reasonably clear is that both statements were arrived at independently and at a time when there were many big shocks hitting major economies---viz. the general move to floating exchange rates in 1973 and the oil price shock. The question we address in this section is whether Goodhart's Law and the Lucas critique could be different faces of the same coin.

Before we assess the relation between Goodhart's Law and the Lucas Critique we must consider earlier contributions by Heisenberg and Haavelmo. Heisenberg introduced a concept of invariance known as the Heisenberg Uncertainty Principle. This states, in the context of quantum physics, that the observation of a system fundamentally disturbs it. Hence, the process of observing an electron, which requires that a photon of light should bounce off it and pass through a microscope to the eye, alters the characteristics of the physical environment being observed because the impact of the photon on the electron will change its momentum. A system cannot be observed without a change to the system itself being introduced.

Perhaps an even more relevant and long-running literature is that in social science that discusses the problems of research on social interactions where both the observation of behaviour and the public reporting of it can change the behaviour observed. It is not just that people behave differently when they know that they are being watched, but also their belief systems can change when they later read what has been written about them. In a very clear sense, the intervention of researchers can change the nature of the relationships being studied.

Haavelmo (1944) offered observations on the problem of invariance applied to economics in his article 'The probability approach in econometrics'. The invariance issue is illustrated by the problem an engineer faces in attempting to record the relationship between use of the throttle and the speed of a car. Although he may observe that this relationship appears to be well defined for a level track under uniform conditions, it will alter when the conditions are allowed to vary.

Nevertheless, there will be some conditions that are invariant even if other aspects of the environment change, examples include the physical laws describing gravitation, thermodynamics etc. Haavelmo considered that there are degrees of 'autonomy' that define how likely it is that a relationship will vary with variation in the other

conditions of the experiment. Physical laws are ‘autonomous’ in the sense that they do not change, but other relationships such as the relation between throttle and speed are variant or ‘non-autonomous’ to differing degrees. Autonomous relations have properties that appear to be laws, but non-autonomous relations do not.

In the field of economics, decisions of the private sector determine the state of the economic system, but the public sector, in the process of choosing and implementing policy actions, has an effect on the system itself such that the system is not invariant under different policy actions (or rules). Both Lucas and Goodhart have made the point in different contexts that modellers need to take into account the invariance (or lack of it) of each part of the model to variations elsewhere in the system.

The Lucas Critique takes this point and applies it to econometric modelling. Different policy making behaviour influences the expectations of private agents and this changes behaviour in a rational-expectations model. The limitation of modelling exercises as a guide to policy arises from the fact that models typically do not allow for the impact of policy changes on the model itself. Lucas defines the evolution of the economy in the stylised form of the following equation

$$(1) \quad y_{t+1} = F(y_t, x_t, \mathbf{q}, \mathbf{e}_t)$$

where y_{t+1} is a vector of state variables, x_t is a vector of exogenously determined variables, \mathbf{q} is a vector of parameters to be estimated and \mathbf{e}_t is a vector of shocks; F is the functional form relating the state variables to their past, to exogenous variables and to shocks. The estimated relationships in the form of decision rules, technological relations and accounting identities are assumed to be immutable functions (F) with fixed parameter values (\mathbf{q}). If this were true, different settings for the policy variables would generate different time paths for the exogenous variables, x_t , which could be compared and evaluated using some loss function.

The Lucas Critique notes that the historical conditions under which the model was estimated would *not* be invariant under different policy regimes and that the functional forms and parameter values will necessarily vary with different policy

choices. If the policies were set using the known function $G(\cdot)$ of a vector of the state variable, a vector of parameters and a vector of shocks:

$$(2) \quad x_t = G(y_t, \mathbf{l}, \mathbf{h}_t)$$

then the economy would generate the following sequence:

$$(3) \quad y_{t+1} = F(y_t, x_t, \mathbf{q}(\mathbf{l}), \mathbf{e}_t)$$

such that the parameters of the model would be a function of the parameters of the policymaking process. Far from evaluating the implications of different policies using the historically estimated model (1) with \underline{F} and \mathbf{q} , the consequences should be modelled using the policy rule (2) and response (3), which is dependent on the policy parameters chosen for (2). Hence Lucas and Sargent (1981) concluded that ‘... [historically-estimated, policy invariant] econometric models are of *no* use in guiding policy’.

It is apparent from this analysis that the Lucas Critique is a statement about economic modelling and policy evaluation. It is a statement by a theorist about methodology of economic enquiry. The Critique makes statements about the inappropriateness of modelling an economy *as if* the structure were invariant across policy regimes, because expectations about policy choices will feed back to the crucial equations estimated in the model. Lucas proposes a remedy, through the development of the rational expectations literature and the related VAR modelling, a method that either uncovers the deep parameters of behavioural equations, or restricts itself to modelling the implementation of existing rules for fixed policy regimes in such a way that historically estimated models are not distorted (see Savin and Whitman, 1992). All of this is purely methodological, and refers to the way that modelling ought to be done.

The Lucas Critique develops a variation on the identification problem in econometrics, where the true structure of a system of economic relationships is unobservable from the available data because there are no independent variables to identify the individual equations. Economic models are described in such a way that

policy choices and exogenous variables influence the future value of state variables, but the Lucas Critique reminds the modeller that even the structure and parameters of the model can change with different policy choices. Despite Haavelmo's prior claim to define the identification problem in the context of the invariance problem, Hoover (1994) indicates the significance of Lucas' work in a neat summary that notes 'Lucas was not the first to recognise the invariance problem explicitly, his own important contribution to it is to observe that one of the relations frequently omitted from putative causal representations is that of the formation of expectations' (p69).

So where does Goodhart's Law fit into this methodological setting? Is it just a variation of the insights of Haavalmo and Lucas? Goodhart's Law, as the discussion above has illustrated, arose in the context of a specific monetary control problem. In this sense, the Law is an application of the invariance problem to a particular institutional, monetary phenomenon. The observation arises from the performance of a 'statistical regularity', but lays down implications that follow from the application of policy based on these apparent regularities, rather than the guiding principles for econometric models. Nevertheless the idea is closely linked to the Lucas Critique by Goodhart himself⁸, and Goodhart in jest refers to his Law as a 'mixture of the Lucas Critique and Murphy's law' (p377)⁹.

The distinctive feature of Goodhart's Law is its institutional application. The context is that of policymaking by the monetary authorities e.g. the government or a delegated, and possibly independent, central bank, and the understanding of the channels of the monetary transmission mechanism. Although many of these channels operate through accounting identities, which are true by definition, some are based on statistical relationships, which can and do change. The Law observes that, although a statistical relationship may have the appearance of a 'regularity' by dint of its stability over a period of time, it has a tendency to break down when it ceases to be an *ex post*

⁸ Explaining the monetary targeting experiments in the US and the UK and the reasons for the, Goodhart notes 'What finally caused the exercises to be abandoned was not the rise in unemployment but the increasing instability and unpredictability of the key relationships between money, and nominal incomes. Was this an inevitable concomitant of the introduction of such new rules and control methods, or was it just happenstance? In part it was, I believe, such a concomitant illustrating again the power of the Lucas critique and Goodhart's Law in this field' p377 Goodhart (1989).

⁹ Citation of Goodhart's Law outside of the world of academics and policymakers has tended to emphasise the similarities to Murphy's Law at the expense of the Lucas Critique, usually with the benefit of hindsight.

observation of related variables (given private sector behaviour) and becomes instead an *ex ante* rule for monetary control purposes. When stated in this way it becomes apparent that the essential feature of the Lucas Critique (and the more general problem of researchers' interventions in social science) - the lack of invariance of the system to the modeller/observer's interventions - is central to Goodhart's Law. Within the context of the monetary transmission mechanism, whenever the authorities attempt to exploit an observed regularity, the pattern of private sector behaviour will change as it observes that the authorities have begun to treat a variable that was previously an indicator of the policy stance (through some statistically defined relationship) as an intermediate target or objective of policy for control purposes.

A further distinctive feature of Goodhart's Law is that, whereas the Lucas Critique applies to changes in private sector behaviour induced by policy changes, GL in focusing on institutions of policy making can induce other changes in public sector behaviour as well. For example, a government that has set itself the constraint of a monetary target may resort to hitting this target by means of changing its own fiscal behaviour. This change in fiscal stance will itself lead to further changes in private sector behaviour which reinforce the change in underlying statistical relationships. Thus GL is not just about directly induced changes in private sector behaviour. It is also about implications affecting other policy areas within the public sector, which then have yet further impacts on the private sector.

Goodhart's Law has been closely tied to the breakdown of the demand for money function. In part this is because the context in which Goodhart's Law first emerged, as the previous section has emphasised, was in relation to the poor performance of the demand for money function in the early 1970s. The breakdown of the relationship between interest rates and money growth (and perhaps also of the relationship between money and nominal incomes) was the basis for the original RBA paper published in 1975, as direct controls were relaxed and then replaced by the 'Corset', leading to unexpected behavioural changes by the banks. The link has also been supported by the fact that the most familiar application of the Law is given by the analysis of the 'monetarist experiment' of the Medium Term Financial Strategy in the early 1980s. Here the decision to use monetary aggregates as intermediate targets for

policymaking in the United Kingdom coincided with a reversal in the velocity trend for broad money (£M3), which had not been anticipated. The assumption that the relationship between nominal incomes and money would be re-established was to prove unfounded (at least for aggregate M4) and the onset of financial innovations during the 1980s again altered the behaviour of the banking system and the public at large that further undermined any statistical basis for monetary targeting.

In discussion of the implications of changes in policy rules for the estimation of interest and income elasticities in the money demand function, Gordon (1984) shows that instability in the money demand function may be induced by policy changes such as the switch from interest rate to monetary base targeting. This is cited with approval by Goodhart in his discussion of the monetary targeting experiences in the US and the UK¹⁰. It is little wonder that Goodhart's Law has been associated so closely with money demand functions, but this is only one of its many applications.

5. The Long Arm of the Law

Goodhart's Law is not only about the demand for money. In general application it refers to any 'statistical regularity', which is relied upon 'for control purposes', it is therefore equally applicable to a range of other behavioural statistical relationships. We could take the recent interest in the Taylor rule, for example. Some authors have considered that it should be treated as more than an estimate of the policy reaction function, and should be used as a guide for policy (Taylor, 2001). Others have evaluated the estimated function to explore its feasibility in this respect (Clarida *et al.* 1998, Nelson, 2000, and Orphanides, 2001)¹¹. We shall consider some of the issues relating to this point in this section.

¹⁰ More recently the US demand for money relationship has been rehabilitated to some extent. Lown *et al.* (1999) have show that the unusual growth of the M2 aggregate in the US, and hence the uncharacteristic behaviour of velocity, was largely due to the financial condition of depository institutions. Revisions to the data accounting for capital constrained banks and thrifts remove the anomaly in the demand for money function. Equally, Carlson *et al.* (2000) allowing for depository restructuring that led households to readjust their portfolios towards mutual funds deals with the velocity shift of the early 1990s. This also reinstates the stable broad money demand function. Ball (2001) has a simpler solution still. By extending the data set beyond the 1980s the instability in parameter values is removed and an income elasticity of 0.5 and a negative interest semi-elasticity is restored.

The Taylor rule might be thought of as the present day equivalent of the ‘stable’ money demand of the 1970s. Proposed by John Taylor (1993), the Taylor rule has emerged as a simple but robust estimate of the monetary policy rule operated by a range of central banks. Clearly the rule has some major advantages in that it is simple, depends on only two variables that require data that are relatively easy to collect, and it provides a timely indicator of the instrument setting given inflation and output. Above all it seems to be able to explain the past history of monetary policy setting, particularly in the United States, but increasingly also for other G7 countries, following the taming of inflation by independent central banks using inflation targets (cf Clarida *et al.* 1998). While minor changes such as forward versus backward looking behaviour and closed versus open economy characteristics offer minor improvements, the basic rule appears remarkably robust (Taylor 2000, 2001). But how robust would this rule remain, with its parameter values of 1.5 on inflation and 0.5 on the output gap, if the relationship were to be used for control purposes?

The point where Goodhart’s Law becomes relevant is when this ‘statistical regularity’ ceases to be an *ex post* summary of central bank behaviour (an estimate of the reaction function) in the context of flexible exchange rates, independent central banks and inflation targeting, but is adopted as a policy rule ‘for control purposes’. In this guise, the rule is liable to break down the moment a central bank decides to use the Taylor rule as the *ex ante* determinant of interest rate changes. But no central bank has chosen to set interest rates according to the Taylor rule criterion alone, so it is difficult to make an evaluation of the robustness on these grounds. Attempts to determine the robustness of the rule have therefore amounted to tests of the properties of the rule under different model assumptions (e.g. backward versus forward-looking models, closed versus open economy specifications etc). In this respect the rule performs very well indeed (see Taylor 2000, 2001 for a review), but we are interested in whether the use of the rule for control purposes might alter its properties. The question is whether the rule would be reliable as a simple policy rule for *ex ante* rate setting. We can make some observations even in the absence of any evidence from its use for control purposes.

¹¹ Note that a number of papers consider the predictions of the Taylor rule against the actual outturn using historical or real-time data to evaluate the policy not the rule. Examples include Taylor (1999), Orphanides (2000) and Nelson (2000).

Ben McCallum (2000) has argued that if the Taylor rule is valid then we can arm a ‘clerk with a calculator’ in place of a monetary policymaker. Svensson (2001) for one has argued that this is a dangerous step to take since a simple policy rule like the Taylor rule is an inappropriate description of current policymaking. The inflation forecast targeting approach adopted by most independent central banks is better understood as a commitment to a targeting rule. This is more than an instrument rule since the whole monetary regime is defined by the targeting rule and the instrument rule is only implied. The reaction function for the solved out system is model specific, and allows for any extra-model information useful for meeting the objective and allows for judgment on the part of policymakers. It is not a fixed-coefficient policy rule with an invariant relationship between a small group of variables. This would suggest that monetary policy should not be executed by clerks but by experts with relevant experience.

Sims (2001), in a review of Taylor’s book *Monetary Policy Rules*, questions the lack of attention to the fit of the monetary policy rule and the ‘uncritical acceptance of the notion that there has been clear improvement in monetary policy’. The Rudebusch-Svensson (1999) backward looking model does not reject parameter stability even though monetary policy behaviour has not been stable during periods of the sample in the United States. Sims notes that there has been a major change to the Fed’s operating procedures during the period October 1979 – December 1982 yet this does not violate the Chow test for parameter stability when conducted (by Sims) on the full sample 1961:1 – 1996:2. This is explained by the fact that the differences in the interest rate behaviour ‘are well within the range of sampling error’. While the finding is used by Sims to question the uncritical assumption that monetary policymaking has improved, it also shows that the Taylor rule may act as a stable summary of central bank behaviour even during periods when monetary policy making is far from stable and changes to actual operating procedures induce considerable interest rate volatility. One of the more surprising results from the literature on Taylor rules is the stability of the parameter values *ex post*. The notion that the parameter values generated by Taylor’s simulation exercise on US data should be so widely applicable to historical regimes reported by Taylor (1999b) or a range of monetary policy operating procedures is startling.

Consistent parameter values may not be the basis for good performance in setting rates, however. The performance of the Taylor rule as a predictor of the next rate change has been evaluated in-sample and out-of-sample in recent work by Chavapatrakul, Mizen and Kim (2001). There are three main conclusions that emerge from the paper. The first is that the Taylor rule, for all its durability at the quarterly frequency over a range of industrialised countries, does not emerge as a robust relationship at the monthly frequency with which UK monetary authorities set interest rates. Only for a very specific three-month horizon, with a quadratically-detrended output series, can the Taylor rule be replicated over the sample 1992 – 2001. More worryingly, within sample, the Taylor rule predicts base rate changes reasonably accurately within sample, but it does so because the main prediction is ‘no change’ and this occurs about 70 per cent of the time. It has the same accuracy in forecasting as a stopped clock, which can also be right some of the time (twice a day). Out of sample, the same result holds, and alternative wider-information sets dominate the rule. This suggests that irrespective of whether the rule would remain robust to the decision to change its use for control purposes, its performance is inferior in rate setting compared to quite simple alternatives, let alone committee members who exercise judgement.

Of course, if central banks were very successful in applying a policy rule to offset shocks accurately, then the Taylor rule would certainly break down as a description of policy. This is because activity would be maintained at potential output and inflation would be exactly on target. Official interest rate changes would be unrelated to the output gap and deviations from the inflation target. Rather they would be closely related to the shocks that policy had been required to offset.

However, as Mervyn King has noted, there is certainly a great deal of common sense in the Taylor rule in retrospect in a world in which central banks cannot identify and offset shocks *ex ante*. “Central banks that have been successful appear *ex post* to have been following a Taylor rule even if they had never heard of that concept when they were actually making decisions.” (*Inflation Report* press briefing February 10th 1999). Any sensible central banker should change interest rates in response to projected deviations of inflation from target and widening output gaps. However, the difference

between the use of the rule as a summary of past behaviour and as a predictor of future behaviour is considerable. Goodhart's Law suggests that a change in the use of the rule would tend to undermine the dependability of the statistical regularity. Fortunately no central banker has succumbed to the temptation to take this satisfactory *ex post* relationship between the short-term interest rate, inflation and output deviations from trend and attempt to use it as an *ex ante* guide for monetary policy making, so perhaps the statistical regularity is safe.

6. Wider Implications for Monetary Policymaking

Goodhart's Law identifies the problem for monetary policymakers as the unreliability of any statistical regularity that is subsequently used for control purposes. The question this raises is whether it dooms all statistical regularities to fail. Otmar Issing has reflected on this and concludes: 'If this theorem [Goodhart's Law] were generally valid, which Goodhart himself definitely does not claim, central bank policy would be faced by an additional and virtually insurmountable difficulty.' In a reversal of the logic generally applied to Goodhart's Law he then argues that, far from undermining the case for monetary targets, "The vicious circle posited by Goodhart's Law can under certain preconditions be broken in the case of monetary targeting. By pursuing a steadfastly stability-oriented policy, the central bank can establish an anchor for inflation expectations and positively influence the stability of money demand." (Issing, 1997) Thus, he argues that a monetary target, perhaps acting as a twin pillar in an inflation targeting strategy, can pin down inflation expectations and establish the money demand function as a stable statistical relationship. The failure in the past was over reliance on the stability of the money demand function for the implementation of monetary policy. Issing's point is that the stable money demand function is an outcome of a credible monetary framework that embeds a monetary target or reference value, and whose focus is inflation expectations.

But was the problem to do with the particular choice of statistical relationship on which to depend? If we had chosen a different empirical regularity would we have faced the same problem? This is a question of the choice of instruments and targets. The historical record shows that the interest rate-money-output-inflation nexus was unstable and therefore the choice of money as an intermediate variable was an unfortunate one. Recent monetary thinking has taken the short-term interest rate as

the instrument and the forecast of future inflation as the ultimate objective. This may be a better choice simply because there are many channels of transmission through which the interest rate can influence future inflation (see Bank of England, 1999), but also because inflation is the ultimate objective and not an intermediate target.

On the other hand monetary policy may have been more successful over the 1990s because we have abandoned ‘statistical regularities’ altogether ‘for control purposes’. This is potentially where reliance on a simple policy rule for monetary policy setting rather than a targeting rule could upset the achievements that have been made. The development in the literature of robust, forward-looking rules takes us further from the simplest equations, and increasingly towards approaches that build in judgment and other information relevant to the policymaker.

If the use of intermediate variables is always flawed then it is important for the ECB to assert that its monetary pillar is not intended as a target as such but rather as an anchor to inflation expectations over the medium term (see Issing, 1997; Issing et al 2001). The role for central banks has been known for some time to be one of ‘teaching by doing’ (King, 1996) in the realm of monetary policy. Artis *et al* (1998) explain this point with the phrase ‘do what you say and say what you do’. The influence of the policymaker should be positive: explaining the process and the outcomes ensures that the public builds trust in the independent central bank as a monetary institution. The gains from this trust are demonstrable in theory and in practice.

We have come some way from the circumstance in which the central bank takes the world as given and fails to recognise the importance of shaping expectations. Goodhart’s Law, in as much as it resembles the Lucas critique in the monetary policy sphere, is consistent with the implication that failure to recognise the importance of expectations over behavioural relationships will result in failure. The name of the game in the 1990s and beyond is to attach the public’s expectation of inflation to the inflation target. Central banks now shape expectations rather than ignoring them.

7. Conclusions

The conclusion we draw from this article is that Goodhart's Law has many parallels in the world of physics, econometrics and economic modelling, but it has a unique niche to itself in the field of monetary policymaking. The development of the ideas can be traced to the breakdown of the demand for money function during the 1970s, when monetary targeting was in vogue, but we have shown that its application does not stop there. The concept of relying on a simple statistical regularity for policy purposes applies equally to the Taylor rule and other simple policy rules as it does to the demand for money function. Central banks should avoid the temptations that these apparently stable relationships pose for policymaking, remembering that the very same case was made in the early 1970s for the demand for money function. The role for central banks in the 1990s and beyond is to explain monetary policy, removing the mystique, and focusing expectations of future inflation on the inflation target. The operation of monetary policy involves the use of short-term interest rates in the pursuit of the final objective of monetary policy, and involves many different lines of transmission with a thorough explanation of the process. The temptation to squeeze this complex set of relationships into a simple statistical regularity that can then be used to set policy will recur, but Goodhart's Law is a warning against it. None of this, of course, implies that central banks can safely ignore "money", and we feel sure that Charles himself would not wish his law to be quoted solely with that end in mind. Inflation is inevitably about one thing: the value of money.

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Chart 1: Deviations from long run money demand

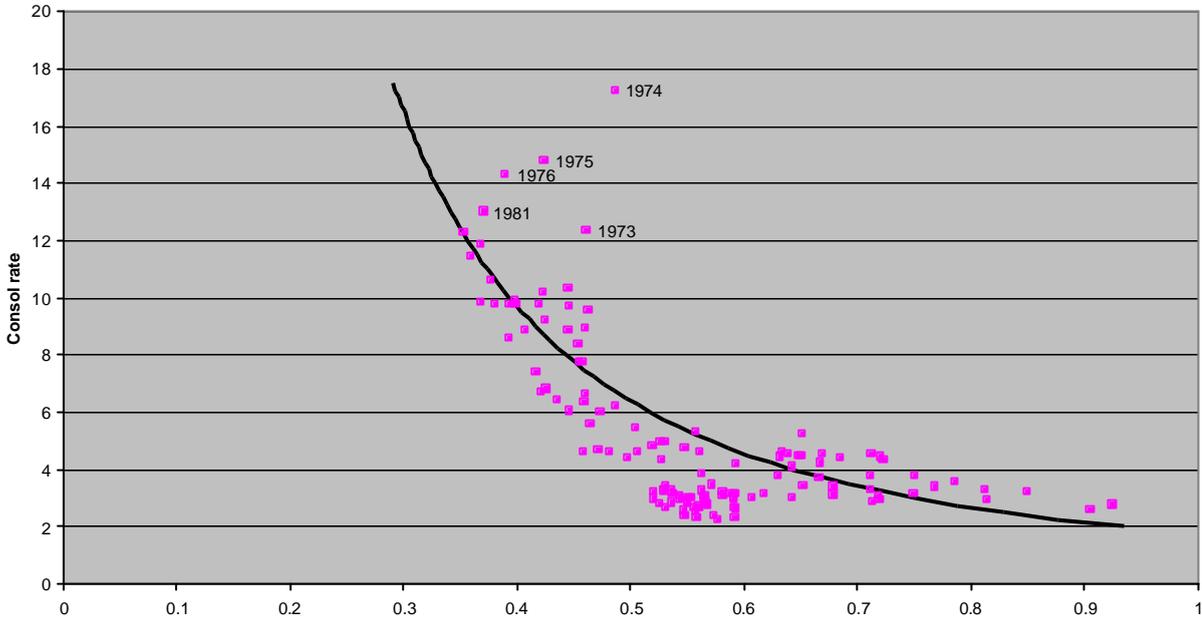


Chart 2: Deviations from long run money demand

