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On Rational Expectations and Stabilization Policy

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On Rational Expectations and Stabilization Policy.

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1. Introduction

Last year, Thomas J. Sargent won the NAS Award for Scientific Reviewing [1], the CME Group-MSRI Prize in Innovative Quantitative Applications [2], and –along with Christopher A. Sims- the Nobel Memorial Prize in Economics for "their empirical research on cause and effect in the macroeconomy" [3]. Back in 1977, Sargent and Sims wrote together "Business Cycle Modeling Without Pretending to Have Too Much A Priori Economic Theory," a paper where they sustained that econometric models should explicitly incorporate the randomness of human behavior, not just as exogenous error terms, but endogenously as stochastic processes in order to carry out more realistic economic analysis with them [4].

Last year as well, I wrote an essay on "Some Unpleasant Monetarist Arithmetic", a paper Sargent published in 1981 along with Neil Wallace, where they argued that tighter monetary policies could eventually lead to higher rates of inflation if the fiscal authority does not adjust its budgets to the lower seigniorage revenue and the central bank lacks the independence to refuse bailing the government out when its accumulating debt is reaching dangerous levels as measured by its ratio to GDP [5].

Also in 1981, Sargent and Robert E. Lucas (Nobel winner in 1995) edited together *Rational Expectations and Econometric Practice*, a book published in two volumes and containing essays from many different famous economists, but mostly from Sargent himself[1]. One of these essays, "The Observational Equivalence of Natural and Unnatural Rate Theories of Macroeconomics" will be the main focus of this paper [6].

[1] List of writers present (number of essays authored or co-authored in parenthesis): Sargent (11), Lucas (4), Robert J. Barro (3), John F. Muth (3), Wallace (3), Gregory C. Chow (2), Lars Peter Hansen (2), Bennett T. McCallum (2), Edward C. Prescott (2), Guillermo A. Calvo (1), Stanley Fischer (1), C.W.J. Granger (1), Robert E. Hall (1), Finn E. Kydland (1), Sims (1), John B. Taylor (1), and Kenneth F. Wallis (1).

2. Deterministic Rules versus Rules Without Feedback.

Milton Friedman of the University of Chicago (Nobel winner in 1976) began the doctrine known as "monetarism", which asserts that –due to the ignorance of the timing and magnitude of the effects of active policies- instructing central banks to keep the nation's money supply growing on a steady path is the best way to prevent recessions [7].

By the "timing and magnitude of the effects of active policies," advocates of passive rules refer to the fact that policies meant to stabilize the economy may end up being more destabilizing instead, as there is a lag from the leading economic indicators that identify the recession, a bureaucratic lag to implement the counter-active policy, and then another lag for the policy to take effect in the economy, which varies in impact considerably [8]. Thus, like the helmsman of a cruiser, overturning the wheel every time he identifies that the ship is not going straight may cause the cruiser to go in zigzags all its way to destination [9].

Some neo-classical economists agree that Friedman's rule without feedback (from leading economic indicators) might indeed be better than deterministic rules, but for *more* reasons that the ones monetarists list: Mainly, due to Muth's concept of "Rational Expectations," which values individuals as intelligent agents willing to get as informed as economically profitable in order to improve their new forecasts while correcting their past, mistaken ones [10].

As Kydland and Prescott (Nobel winners in 2004) explain, putting the ignorance of the timing and the magnitude of the effects of active policy aside, a stronger argument towards passive rules is that a dynamic economic system has agents that not only look at past and current policy decisions and at the current state of the economy, but they also try to "look" at future policy actions by making rational expectations about what these might be [11].

3. Consequences of Incorporating Rational Expectations.

Gregory N. Mankiw calls “Time Inconsistency” when the fiscal or monetary authorities make promises about what their policies will be in the future, to later carry out different (as in opposite) policies to what were promised [8]. With the incorporations of rational expectations, policymakers may still get to deceit the general public a few times maybe, but soon these agents will not deem their announcements reliable. When their trust on them eventually depletes, fiscal or monetary authorities will lose their power to carry out effective policymaking.

Take the “Some Unpleasant Monetarist Arithmetic” paper mentioned in section 1, Sargent and Wallace argued that if we incorporate rational expectation into the model, agents predicting a looser monetary policy in the future may start decreasing their money balances *before* the increase in the money stock, trying to avoid being the holders of money at the time this happens by spending their money while it still has a high purchasing power; however, this increase in the velocity of circulation (as money then becomes like a ball on fire) generates inflation *before* the money stock increases [5].

A similar argument is made by Barro in his defense of Ricardian equivalency: if we incorporate rational expectations into the model, people will start saving the extra disposable income resulting from lower current taxation, preparing themselves for the future higher taxes that will be necessary to impose by the government to pay for the current deficit [12].

These are but two of many examples of how incorporating rational expectations into economic models may drastically change the conclusions derived from them, sometimes opposing our standard economic theory (and common sense): lower money growths may lead to higher rates of inflation just as lower taxes may lead to higher rates of savings. In what is known as the “Lucas critique” (of econometric policy evaluation), Robert Lucas makes the case that the invariance assumption fails to hold in models with rational expectations [13].

4. Rational Expectations and Stabilization Policy.

Sargent pretends to make of "The Observational Equivalence of Natural and Unnatural Rate Theories of Macroeconomics" just a footnote to the Lucas critique. He calls the econometric models that only have a one-way causality (from the variables on the right-hand side to the one on the left) "reduced forms"; as -in Economics- most variables have mutual influence with some other economic variable, so the causality is reciprocal (at least with some lags), and failing to take this into account would cause your model to be unrealistically simplistic, and thus with conclusions that may not actually hold in reality.

Whenever this double dependency is taken into consideration, the variable in the right-hand side is said to be "endogenous" (or endogenously incorporated into the model), while variables still assumed to have just a one-way causality are considered to be exogenous[2]. Sargent argues that models that allegedly prove that deterministic rules are better than rules without feedback, do so only because they are reduced forms, and that once we take the "endogeneity" into account, then "Friedman's simple k-percent growth rule for the money supply" might be at least as good a response to the business cycle as discretionary rules.

It is important to clarify that Sargent is not necessarily making an argument in favor of rules without feedback, because he actually thinks that some flexibility in the rules might be beneficial (as in the case of the "Taylor Rule" [14]); the only thing he claims in this paper is that "the standard proof of the sub-optimality of Friedman's rule fails spectacularly [under the invariance assumption of reduced forms]" [6].

[2] For instance, in the simplistic aggregate demand model "Y = C + I + G; C = a + b*Y", Consumption would be said to be endogenous (because it is also a function of Income), while Investment and Government Spending would be considered exogenous as they are independent of the Income level.

5. Reflections.

The reader may be wondering –and with very good reason- about the relationship between incorporating rational expectations to an economic model and incorporating endogeneity to an econometric model:

Using the example that Sargent provides, let us pick a "goal variable" (such as the increase in Gross National Product from its long run trend) that is serially auto-correlated, so that the ΔGNP at any point in time depends strongly on the previous ΔGNPs (because of institutional factors that are somewhat constant over time) in a way that it can be fairly expressed as a function of the weighted mean of past ΔGNPs (with bigger weights assigned to the most recent periods, of course).

Now, let us pick a "potential policy instrument" (such as the increase in Monetary supply) so that current and past ΔMs strongly influence the current ΔGNP so that at any point in time ΔGNPs can also be fairly expressed as a function of the weighted mean of current and past ΔMs (again, with decreasing weights to further lags).

Then, if your target is to minimize the variance of the current level of the ΔGNP (because that is what stabilization policy is about: reducing the amplitude of the cycles), you want to set your function of the weighted mean of current and past ΔMs equal to a function of the negative weighted mean of past ΔGNPs, so that when the two functions net each other, your current ΔGNP is *always* a *same* constant, thus making the variance of the "goal variable" equal to zero.

This is what Sargent refers to as the typical and over-simplistic argument favoring deterministic rules. However, the moment that you admit that the potential policy instrument is a function of the goal variable, your regression analysis becomes endogenous, as there is now a mutual influence (i.e. a reciprocal causality) between the potential policy instrument and the

goal variable. *One can expect rational agents to start incorporating this inter-dependency when making their forecasts, thus altering the parameters of the regression.*

Appendix.

Part 5 (Reflections) explained with words why rules without feedback are not necessarily worse than deterministic rules. In his paper, Sargent makes the argument mathematically using linear algebra (matrix) notation and –more importantly- using level variables rather than differentials. Although with his formulation Sargent concludes only that rules without feedback *might be just as good as* deterministic rules, here I make a case using standard algebra and variable differentials to conclude that "Friedman's simple k-percent growth rule for the money supply" is actually better.

For simplicity, let us assume –without loss of generality- that the function of the weighted mean of current and past ΔMs "$F_1 = \sum_{i=1}^{N}(w_i * \Delta M_{t-i+1})$" with decreasing weights to further lags actually assigns a weight of 1 to the current ΔM (i=1) and 0 to all past ΔMs (i≠1). Similarly, the function of the weighted mean of past ΔGNPs "$F_2 = \sum_{i=1}^{N}(w_i * \Delta GNP_{t-i})$" assigns a weight of 1 to the most recent ΔGNP (i=1) and 0 to all others (i≠1). Then, "$\Delta GNP_t = \beta_1 * F_1 + \beta_2 * F_2$" becomes

(1) **"$\Delta GNP_t = \beta_1 * \Delta M_t + \beta_2 * \Delta GNP_{t-1}$".** Lagging it once:

(2) "$\Delta GNP_{t-1} = \beta_1 * \Delta M_{t-1} + \beta_2 * \Delta GNP_{t-2}$". Incorporating (2) in (1):

(2.5) "$\Delta GNP_t = \beta_1 * \Delta M_t + \beta_2 * [\beta_1 * \Delta M_{t-1} + \beta_2 * \Delta GNP_{t-2}]$". Simplifying:

(3) **"$\Delta GNP_t = \beta_1 * \Delta M_t + \beta_1\beta_2 * \Delta M_{t-1} + \beta_2^2 * \Delta GNP_{t-2}$".** Lagging the main regression a second time:

(4) "$\Delta GNP_{t-2} = \beta_1 * \Delta M_{t-2} + \beta_2 * \Delta GNP_{t-3}$". Incorporating (4) in (3):

(4.5) "$\Delta GNP_t = \beta_1 * \Delta M_t + \beta_1\beta_2 * \Delta M_{t-1} + \beta_2^2 * [\beta_1 * \Delta M_{t-2} + \beta_2 * \Delta GNP_{t-3}]$". Simplifying:

(5) **"$\Delta GNP_t = \beta_1\Delta M_t + \beta_1\beta_2\Delta M_{t-1} + \beta_1\beta_2^2\Delta M_{t-2} + \beta_2^3\Delta GNP_{t-3}$".** Generalizing for the Tth lag:

(5.5) "$\Delta GNP_t = \beta_1\Delta M_t + \beta_1\beta_2\Delta M_{t-1} + \ldots + \beta_1\beta_2^T\Delta M_{t-T} + \beta_2^{T+1}\Delta GNP_{t-T-1}$". In sigma notation:

(6) **"$\Delta GNP_t = \sum_{i=1}^{T+1}(\beta_1 \beta_2^{i-1} \Delta M_{t-i+1}) + \beta_2^{T+1} \Delta GNP_{t-T-1}$".** Neglecting the last term ("$\beta_2^{T+1} \approx 0$") and pulling out the constant from the summation, we get that:

(7) **"$\sum_{i=1}^{T+1}(\beta_2^{i-1} \Delta M_{t-i+1}) = (1/\beta 1) \Delta GNP_t$".** Keeping in mind that, in Friedman's Rule, the increase in Monetary supply, 1+k, comes from the long run average growth in GNP, then:

(7.5) "$\Delta M_{t-i+1}/M_{t-i+1} = 1+k$" for every "$1 \leq i \leq T+1$" implies that (8) "$\Delta M_t = (1+k)*M_t$" is actually the rule (without feedback) for increase in Monetary supply that eliminates the variance of the Gross National Product from its long run trend, which concludes the proof. The reader may find some similarities with the Cagan Model [15].

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