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FIAT MONETARY REGIME AND COOPERATION THEORY

Fiat Monetary Regime is a serious problem for world policy makers. A major obstacle to the operation and indeed survival of this “current unprecedented fiat monetary regime” or system are the member nation-states with competing and often conflicting agendas. In short, nationalism may simply overwhelm the monetary regime.

Is it possible to modify existing nation-state institutions and policies so that each participant nation-state in the fiat monetary regime acts as in a free market to promote an end that was no part of its intention, as though led by the Smithian invisible hand? For useful insight this paper turns to the theory of cooperation.

Key Words: Fiat Monetary Regime, theory of cooperation, strategies of cooperation, “Tit-for-Tat” strategy, nation-state, sovereignty.

The Issue

The operation and indeed survival of the unprecedented fiat monetary regime depends on its nation-state participants. Historically, governments of nation-states do attempt to secure various domestic goals by unsustainable inflationary policies. Governments pursuing accommodating monetary and fiscal policies should be on notice that they can not count on being supported by other countries. Clearly,

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they would have to be tougher in allowing, for instance, cost-push or wage-price spiral inflation to have its normal effects in causing unemployment and less than capacity operation of their economies. It would be equally clear to employers and unions that they could not count on the government to support their inflationary actions by inflationary monetary and fiscal policy.

How are countries persuaded to behave consistently and predictably and not attempt to achieve temporary domestic or international advantages at the expense of another country? Is it possible to modify existing institutions and policies so that each participant acts as in a free market to promote an end that was no part of their intention as if led by the Smithian invisible hand? For suggested insights we turn to cooperation theory.¹

Cooperation Theory

Can a worldwide managed fiat monetary regime operate without the benefit of conscious action by planners and governments in an area where independent egoistic nations and domestic special interests face each other in a state of near anarchy? Can these diverse domestic and international monetary interests evolve reliable cooperative strategies so as to provide an anchor to the long-term price level? Can cooperation emerge in a world of diverse domestic monetary interests and sovereign states? In short, can cooperation evolve out of uncooperation? Specifically, how can cooperation get started at all? Can cooperation strategies survive better than their rivals? Which cooperative strategies will do best, and how will they come to predominate? As it turns out, our cooperation theory can help us in gauging the utility of such monetary reform proposals as a monetary growth rule in promoting cooperation, and indeed, the likely success of the reform itself and the viability of a managed fiat monetary regime.

Many of the problems facing these nations and domestic monetary interests take the form of an iterated Prisoner's Dilemma.² In the Prisoner's Dilemma game

¹ George Macesich, *Monetary Reform and Cooperation Theory* (New York: Praeger Publishers, 1989); George Macesich, *Money and Monetary Regimes: Struggle for Monetary Supremacy* (Westport, CT, London: Praeger Publishers, 2002); George Macesich, *World Banking and Finance: Cooperation Versus Conflict* (New York: Praeger Publishers, 1984). I draw on these studies in what follows.

² First formulated in about 1950 by Merrill M. Flood and Melvin Dresher and later formalized by Albert W. Tucker, according to Douglas R. Hofstadter, "Metamagical Themas: Computer Tournaments of the Prisoner's Dilemma Suggest How Cooperation Evolved." *Scientific American* May 1983: 16–23. Prisoner's Dilemma derives its name from a game that has no satisfying solution, that is, whatever choice is recommended by "rational considerations" has something wrong

two individuals (or nations) can either cooperate or defect. The payoff to a player is in terms of the effect the action will have. No matter what the other does, the selfish choice of defection yields a higher payoff than cooperation. If both defect, however, both do worse than if they cooperated.

For purposes of illustration let us assume “A” (developed-creditor nations) and “B” (developing-debtor nations) in Figure 1 agree to trade. Both are satisfied as to the amounts they will be receiving. Assume further that for some reason the exchange is to take place in secret. Both argue to place money in a designated location. Let us assume that neither A nor B will ever meet again nor have further dealings.

Figure 1

Prisoner’s Dilemma (A - Developed/Creditor Nations)
B = Developing Debtor Nations;
the game is defined by: $T > R > P > S$ and $R > (S + T) / 2$.

C Cooperation	R - 3, 3 Mutual Cooperation	S = 0, 5 Sucker’s Payoff
D Defection	T = 5, 0 Temptation to Defect	P = 1, 1 Punishment for Mutual Defection

Now if both A and B carry out their agreement both stand to gain. It is also obvious that if neither A nor B carried out the agreement, neither would have

with it, in spite of the fact that nothing remains unknown about the situation. In other words, the chooser cannot do better by finding out more; hence the dilemma. Robert Axelrod and William D. Hamilton, “The Evolution of Cooperation.” *Science* March 27, 1981: 1390–1396; Douglas R. Hofstadter, “Metamagical Themas,” *Scientific American* May 1983: 16–26; Anatol Rapoport and A. M. Chammah, *Prisoner’s Dilemma* (Ann Arbor: University of Michigan Press, 1965); D. Luce and H. Raiffa, *Games and Decisions* (New York: John Wiley and Sons, 1976): 94–102; M. Cohen, T. Nagel, and T. Scanlon, eds., *War and Moral Responsibility* (Princeton, N.J.: Princeton University Press, 1974); B. Balassa and R. Nelson, eds., *Economic Progress, Private Values, and Public Policy: Essays in Honor of William Felner* (Amsterdam: North-Holland Publishing Company, 1977); M. Taylor, *Anarchy and Cooperation* (New York: John Wiley and Sons, 1976); Robert Axelrod, *Evolution of Cooperation* (New York: Basic Books, 1984); Andrew Schotter, *The Economic Theory of Social Institutions* (Cambridge: Cambridge University Press, 1981); Andrew Schotter and Gerhard Schwodiauer, “Economies and the Theory of Games: A Survey,” *Journal of Economic Literature*, June 1980: 479–527.

what it wanted. It is equally obvious that if only one carried out its end of the bargain—say A—B would receive something for nothing since they will never again meet nor have further dealings. There is this incentive for both A and B to leave nothing. As a result neither A nor B get what they initially wanted. Does the logic present cooperation? That is the Prisoner's Dilemma.

The iterated Prisoner's Dilemma can be made more quantitative and in that form studies by the methods of game theory and computer simulation. In order to do this we build a "payoff matrix" presenting hypothetical values for the various alternatives such as in Figure 1.

In this matrix, mutual cooperation by A and B yields to both parties 3 points. Mutual defection yields to both 0 points. If A cooperates but B does not, B gets 5 points because it is better to get something for nothing. The number 3 is called the "reward for cooperation" R. The number 1 is called the "punishment" or P. The number 5 is T for "termination," and zero is S, the "sucker's payoff." The conditions necessary for the matrix to represent a Prisoner's Dilemma are the following:

$$T > R > S \quad (1)$$

$$\frac{T + S < R}{2} \quad (2)$$

The first condition (1) says that it is better to defect no matter what the other side does. The second condition (2) in effect guarantees that if A and B get locked into an out phase alteration, for example, A cooperates but B defects in one period and B cooperates but A defects in the second period, A will not do better. In fact, A will do worse than if A cooperated in each period.

If A and B will never meet again (unlikely situation in our example) the only appropriate solution indicated by the game is to defect always. This strategy is correct even though both could do better if they cooperated. Thus in the case of Prisoner's Dilemma played only once, to defect is always the best strategy.

In the case of our iterated Prisoner's Dilemma game where the same two participants may meet more than once, a much greater set of options is available. Strategy would include a decision rule that determines the probability of cooperation or defection as a formation of the history of interactions thus far. If, however, there is a known number of interactions between a pair of individuals, to defect always is still evolutionarily stable (for example, individuals using the strategy of defection cannot do better by another strategy). The reason is that the defection

on the last interaction would be optimal for both sides. And, of course, so would defection on the next to the last interaction and on back to the first.

On the other hand, the number of interactions is not fixed in advance but given by some probability, W , that after the first interaction the same two individuals (nations) will meet again, other strategies accrue evolutionarily stable as well. Indeed, when W is sufficiently great, there is no single best strategy regardless of the behavior of the other in the population. The matter, however, is not hopeless.

In fact, Axelrod and Hamilton demonstrate that there is a strategy that is stable, robust, and viable.³ Accordingly, evolution of cooperation can be conceptualized in terms of these separate questions:

1. *Robustness*. What type of strategy can thrive in a variegated environment composed of others using a wide variety of more or less sophisticated strategies.
2. *Stability*. Under what conditions can such a strategy, once fully established, resist invasion by mutant strategies?
3. *Initial viability*. Even if a strategy is robust and stable, how can it ever get a foothold in an environment that is predominantly noncooperative?

The authors submitted various strategies to a computer tournament drawing upon contributors in game theory from economics, mathematics, political science, and sociology. The result of the tournament was that the best strategy was one of cooperation in the first move and then doing what the other player did on the preceding move. Thus “tit for tat” is a strategy for cooperation based on reciprocity.

The robustness of “tit for tat” is reported by the authors as dependent on three features: It was never the fact to defect, it was provokable into retaliation by a defection of the other, and it was forgiving after just one set retaliation. Tit for tat displaced all other rules. It is a robust strategy that can thrive in a variegated environment.⁴

The authors then demonstrate that once “tit for tat” has gone to fixation it can resist invasion by any possible mutant strategy provided that individuals who interact have a sufficiently large probability, W , of meeting again.

Since “tit for tat” is not the only strategy that can be evolutionarily stable, it raises the problem of how an evolutionary trend to cooperative behavior could ever have started in the first place. Axelrod and Hamilton provide several illustrations where benefits of cooperation can be harvested by groups of closely-related individuals.

³ Axelrod and Hamilton, “Evolution of Cooperation.” 1395.

⁴ *Ibid.*, p. 1393. The strategy of “tit for tat” was submitted to the tournament by Anatol Rapoport.

Clustering can also lead to a “tit for tat” strategy even when virtually everyone is using an all D (Defection) strategy. Suppose that a small group of individuals is using “tit for tat” and that a certain proportion, p , of the interactions of the members of the cluster are with other members of the cluster. Then the average score attained by members of the cluster using “tit for tat” strategy is

$$p(R/(1-w) + (1-p)\{S + WP/(1-w)\}) \quad (3)$$

If the members of the cluster provide a negligible proportion of the interactions for the other individuals, then the score attained by those using D is still $P/(1-w)$. When p and w are large enough, a cluster of “tit for tat” individuals can then become initially viable in an environment composed overwhelmingly of all D .

Can the reverse happen? That is, once a strategy of “tit for tat” becomes established can it be displaced? According to the authors the answer is no. This is because the score achieved by the strategy, that comes in a cluster is a weighted average of how it does with others of its kind and with the predominant strategy. Each of these components is less than or equal to the score achieved by “tit for tat.” Thus the strategy arriving in a cluster can not intrude on “tit for tat.” In other words, when w is large enough to make “tit for tat,” an evolutionarily stable strategy, it can resist intrusion by any cluster of any other strategy.

In sum, cooperation based on reciprocity can get started in a predominantly uncooperative environment and can defend itself once fully established argue Axelrod and Hamilton. They underscore that the gear wheels of social evolution have a ratchet.⁵

It is noteworthy for our purpose that “tit for tat” won the various tournament games not because it managed to beat the other players but by eliciting behavior from the other player that allowed both to do well. Indeed, it was so consistent in generating initially rewarding results that it achieved a higher overall score than any other strategy in the tournament.

So-called “non-nice” or tricky strategies designed to sound out how much an opponent “minded” being defeated against typically backfired causing severe breakdown of trust. In other words, attempts to use defection in a game to “flush out” an opponent’s weak spots turns out to be very costly. Indeed, it proved more profitable to have a policy of cooperation as often as possible, together with a willingness to retaliate swiftly in a restrained and forgiving manner.

Furthermore, straightforwardness and simplicity is the best approach. Being so complex as to be incomprehensible is very dangerous indeed. Too complex a

⁵ *Ibid.*, p. 1394.

strategy can appear as chaotic. The use of a random strategy can appear as one that is unresponsive to the other player. An unresponsive strategy provides no incentive for the other player to cooperate with you.

The significance of these results for the fiat monetary regime and reform is clear. Self-seeking and byzantine strategies by individual nations or groups of nations will have very little to show for their efforts.

Among the other important lessons for our monetary discussion derived from Axelrod's tournament efforts is that previously game theories did not take their analysis far enough. That is, it is important to minimize echo effects in an environment of mutual power. He argues that a sophisticated analysis calls for going "three levels deep." The first level is the direct effect of a choice. Since a defection always earns more than cooperation, this is easy. The second level is the indirect effect, which takes into account that the other side may or may not punish a defection. The effect in the third level is the fact that in responding to the defection of the other side, one may be repeating or even amplifying one's own exploitative choice. Thus a single defection may be successful when considered for its direct effects and perhaps even for its secondary effects. The tertiary effects, however, may be the real costs when one's own single defection turns into unending mutual recriminations. In effect, many of the players actually wound up punishing themselves, the other player simply serving as a mechanism to delay the self-punishment by a few moves.

In essence, there is a lot to be learned about coping in an environment of mutual power. Indeed, Axelrod reports that many expert strategists from economics, political science, mathematics, sociology, and psychology made the systematic error of being too competitive for their own good, not forgiving enough, and too pessimistic about the responsiveness of the other side.

In a non-zero sum world a nation does not have to do better than another nation to do well for itself. The more player nations interacting the better. As long as A does well it is alright if the others do as well or a little better. It is pointless for A to be envious of the success of another country because Prisoner's Dilemma of long duration success of the others is virtually a prerequisite of A doing well for itself.

Clearly this principle holds, for example, for debtor and creditor countries—an important issue in the ongoing dialogue over monetary reform and the fiat monetary regime. A country that borrows from another can expect that the loan will be mutually beneficial. There is no point in the borrower being envious of the creditor's terms and interest. Any attempt to reduce it through an uncooperative practice, such as not making interest and principal payments on time as agreed, will only encourage the creditor to take retaliatory action. Retaliatory action could take many forms, often without being explicitly labeled as punishment, including

poorer credit ratings, less prompt deliveries of needed materials, fewer discounts, and in general less favorable market conditions for the debtor country's goods and services. In short, the retaliation could make the loan quite expensive. Instead of worrying about the relative profits of the creditor, the debtor should worry about whether another borrowing strategy would be better. For instance, it can lift domestic restrictions on interest paid on savings and bank deposits, thereby mobilizing greater domestic savings that reduce external borrowing requirements.

The significance of the environment for the endogenous evolution of institutions à la Hayek are the results reported by Axelrod and others in the "ecological tournaments."⁶ The tournament consists not only of single subjective replay but also of an entire cascade of hypothetical replays, each one's environment determined by the preceding replay. In particular, if you take a program's score in a tournament as a measure of its "fitness," and if you interpret fitness to mean "member of progeny in the next generation," and finally if you let next generation mean "next tournament," then what you get is that each tournament's results determine the environment of the next tournament. This type of iterated tournament is called "ecological" because it stimulates ecological adaptation (the shifting of a fixed set of species populations according to their mutually defined and dynamically developing environment) as contracted with the mutation-oriented aspects of evolution, where new species can come into existence.

Carrying on the ecological tournament generation after generation results in the environment gradually changing. At the start both poor and good programs or strategies are equally represented. As the tournament goes on the poorer programs drop out while the good ones remain. The rank order of the good ones now will change since the field of competitors has changed.

In short, success breeds success only if the successful programs are permitted to interact. In contrast, if the success of some programs is due mostly to their ability to exploit less successful programs, then as these exploit prone programs are gradually squeezed out, the exploiter's base of support is eroded and it too will bail out, and indeed, as Axelrod points out, playing with rules that do not score well is eventually self-defeating. No being nice may look promising at the start, but in the long run the effect is to destroy the very environment upon which its success depends.

Cooperation based on reciprocity can gain a foothold through at least two different mechanisms. One is through *Kinship* or closely related individuals and/or institutions. For instance, banks and the debtor-creditor relationship between developing and developed countries is such a relationship.

⁶ The discussion in the following two paragraphs draws on Hofstadter, "Metamagical Themas," pp 24–25.

A second mechanism to overcome a strategy of total defection (All *D*) is for the instant strategy (cooperation) to arrive in such a cluster so that they provide a nontrivial proportion of the interaction each has. In addition to the debt/credit relationship between developed and developing nations, the extensive trade relations that now make for increasing world interdependence provides such a cluster.

As reported by Axelrod and Hamilton a computer tournament approach will demonstrate that a strategy of “tit for tat” will fare better than alternative strategies. It is robust. It does well in a variety of circumstances. It is stable, especially against a wide variety of mutant strategies. Cooperation can indeed prosper. It can emerge in a world of egoists without central control by starting with a cluster of individuals/nations who rely on reciprocity.

In short, advice given to players of the Prisoner’s Dilemma might also serve world bankers as well as national leaders, including monetary authorities and others, in developing and developed nations in dealing with the current opportunities before the world. Don’t be envious, don’t be first to defect, reciprocate both defection and cooperation and don’t be too clever. Those guidelines will serve the participant nations in the current fiat monetary regime.

To be sure, allowance must be made in the application of our Prisoner’s Dilemma game to ideology, bureaucratic policies, and quality of leadership. Nevertheless, the insights are very useful as this study demonstrates. Our process of understanding and approach to problems of cooperation is enhanced by the knowledge that mutual cooperation can indeed emerge without central control or plan by starting with a cluster of units that rely on reciprocity. When it is learned that *X* will lead to *Y*, and *Y* is felt to be desirable, there is an inclination to encourage *Y* but not prohibiting it. The process of trial and error in dealing with such global issues as the current fiat monetary regime, monetary reform, trade, and political issues is slow and painful. The conditions for cooperation and mutually rewarding strategies based on reciprocity are time.

Our theory provides us with a good example of the endogenous unplanned aspect of social institutions that is counter to the usual social-scientific views of institutions as planned or designed mechanisms given exogenously to the theorist. It is F. A. Hayek who suggested research into the unplanned or unconscious interaction of social agents in order to investigate the spontaneous or unintended social institutions they create.⁷

⁷ F. A. Hayek, *The Counter-Revolution in Science* (New York: Free Press, 1955). See also Schotter, *The Economic Theory*, and Martin Shubik, “A Theory of Money and Financial Institutions: Fiat Money and Noncooperative Equilibrium in a Classical Economy.” *International Journal of Game Theory* 7, No. 1, 1971/1972: 243–268.

Indeed, it is a major theme of Hayek's social philosophy that emergent or spontaneous outcomes, or more descriptively, the unintended consequences of human action are both efficient and desirable.⁸ It may well be that the marketplace is finding ways to accomplish changes in the world's monetary regime without the benefit of conscious action by government.

The theory of cooperation gives insight into the importance of credibility for monetary authorities in their operation of the fiat monetary regime. Credibility can be achieved through the pursuit by monetary authorities of a "nice strategy," that is, one of "tit for tat" as in our illustration. Such a strategy—as we have discussed—is simple and straightforward.

On the other hand, playing with non-nice strategies is eventually self-defeating. Not being nice may look promising at the start but in the long-run the effect is to destroy the very environment upon which its success depends. A non-nice strategy is one of discretionary monetary policies, since they do depend upon ambiguity and duplicity for their success by exploiting the short-term non-neutrality of money. These policies are so complex as to be incomprehensible. Indeed, they are so complex as to appear chaotic. They provide no incentive for constructive cooperation on the part of other players in the economy.

Our earlier discussion of the ecological tournament underscored the importance of a changing environment based on "good" programs or strategies. Our discussion also underscored the importance of minimizing echo effects in an environment of mutual cooperation. It is as important to avoid the systematic error of too competitive a strategy as it is to avoid being too pessimistic about the responsiveness of the other side and not forgiving enough. In effect, the practitioners of non-nice strategy in our ecological tournament actually wound up punishing themselves, the other player simply serving as a mechanism to delay the self-punishment by a few moves. On the domestic level this is sharply illustrated in the American monetary experience in the nineteenth century and the internal struggle for monetary supremacy between banks and government. On the international level we have the examples of the French Indemnity of 1871 and the German reparations of 1919.

Although the lessons of history are seldom unequivocal, it is useful, nonetheless, to turn to past experience as we have in this study to underscore the impor-

⁸ F. A. Hayek, *The Constitution of Liberty* (Chicago: Henry Regnery Co., 1960); F. A. Hayek, *Law Legislation and Liberty, Rules and Order*, Vol. 1 (Chicago: University of Chicago Press, 1973); and Volz, *Mirage of Social Justice* (Chicago: University of Chicago Press, 1976). To be sure, Hayek's view of the endogenous nature of institutions takes place within a specified environment namely, one where general rules are adhered to. The environment guarantees that only efficient institutions orders-outcomes will emerge. See Roger A. Arnold, "Hayek and Institutional Evolution." *The Journal of Libertarian Studies* 4, No. 4 (Fall 1980): 341–352.

tance and consistency of our theoretical discussion. Though other episodes come readily to mind, there such historical episodes serve to illustrate our discussion. One is the American experience during the turbulent 1830s and 1840s and the environment of distrust created by the political struggle for monetary supremacy carried on by the government and banks. The period is characterized by the Bank War, distribution of surplus revenue (Deposit Act of 1836), the Specie Circular, and capital flaws.

The second is provided by the French Indemnity Payment of 1871, which set going non-nice strategies that actually wound up punishing their practitioners in the post-World War I era. The third illustrations the German reparations payments issued during the post-World War I years. This episode considerably disturbed the international scene of the 1920s and 1930s. In good measure the reparation issue so embittered the Germans (as the earlier indemnity payment of 1871 embittered the French) that they became ever more receptive to extremists whose claims and solutions culminated in World War II. This stands in marked contrast to American's "nice" strategy embedded in the Marshall Plan of 1947 for the reconstruction of post-World War II Europe. The Soviet Union and its friends declined all invitations to participate, embracing instead a non-nice strategy that in good measure has served to punish its practitioners.