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# Recursive Collective Actions Problems: the Structure of Procyclicality in Financial and Monetary Markets, Macroeconomies and Formally Similar Contexts

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Article:

# Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

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# Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

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## **Abstract**

The hallmark of a collective action problem is its aggregating multiple individually rational decisions into a collectively irrational outcome. Arms races, “commons tragedies” and “prisoners’ dilemmas” are well-known, indeed well-worn examples. What seem to be less widely appreciated are two complementary propositions: first, that some collective action problems bear iterative, self-exacerbating structures that render them particularly destructive, and second, that some of the most formidable challenges faced by economies, societies and polities are iteratively self-worsening problems of precisely this sort. Financial markets, monetary systems and macroeconomies in particular are rife with them – as are other complex systems subject to group-mediated procyclicality or “feedback” effects.

I call the mentioned challenges “recursive collective action problems,” and show that a great many familiar regulatory and policy challenges – including asset price bubbles and busts, consumer price hyperinflations and debt deflations, “paradoxes of thrift” and “recessionary spirals” – constitute instances of this general phenomenon. I also hazard suggestions as to how best to address such challenges. Key to the effort is first to recognize their shared structure, second to recognize that collective action problems require coherent collective agency for their solution, and third to recognize that the collective agents in question must act to render no longer individually rational such decisions as aggregate into collectively irrational outcomes. I close with specific examples of what problem-solving strategies informed by the “three recognitions” will tend to look like. The implications for macroeconomic and “macroprudential” finance-regulatory policy in particular are manifold. If we but attend to the shared nature, structure and pervasiveness of recursive collective action problems, I conclude, we can recoup much in the way of wealth and well-being that is now needlessly lost.

## 1. Introduction

Since Hobbes's day at the latest, and probably for much longer still, people have been aware of certain challenges that confront groups of rational agents, precisely by virtue of their being (a) groups of (b) rational agents. These challenges typically stem from either (a) the very fact or (b) certain possible structures of plural and consequently distributed rational agency. Challenges of the first sort are nowadays often called "coordination problems." They are rooted in the need of certain kinds of uniformity on the one hand, and the absence of any inherent tendency for such uniformity spontaneously to emerge on the other hand. Challenges of the second sort are now typically called "collective action problems." They stem from certain possible divergences between what it is individually rational to do, absent coordination, on the one hand, and what would be both collectively and, therefore, individually optimal to do, were reliable means of coordination available, on the other hand.<sup>1</sup>

The dominance of these terms – "coordination problems" and "collective action problems" – as names for what they now designate is in some ways regrettable. One reason is that, as is implicit in the foregoing, so-called collective action problems constitute a subclass of coordination problems, since collective action itself is a form of coordination; yet coordination and collective action are often discussed under their separate rubrics as if they bore no structural features in common. Another, related reason to regret the received terminology is that, on a "natural," untutored understanding of the words, a coordination problem is a collective action problem as surely as a collective action problem is a coordination problem. For, as is implicit in the preliminary definition of coordination problem given above, deliberate collective action of one sort or another is required to supply means of coordination itself.

Notwithstanding these reservations, however, for purposes of this discussion, we shall play with the terminological hand we have been dealt, and our focus will be on a particularly vexing subclass of collective action problems whose solutions require a particularly robust form of coordination.

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<sup>1</sup> The formal literature on coordination and collective action problems is vast. Still unsurpassed in both scope and sophistication is von Neumann, J., and O. Morgenstern, 1944, *Theory of games and economic decisions*, Princeton University Press. More philosophic treatment without sacrifice of formal rigor can be found in Lewis, D., 1969, *Convention: a philosophical study*, Princeton University Press.

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These problems are particularly rife in credit, monetary and broader financial markets, not to mention the macroeconomies that depend on them, meaning in turn that the mentioned robust form of coordination must find expression in the regimes pursuant to which these markets are supervised.

Now, as suggested earlier, the hallmark of a collective action problem is its tending to aggregate multiple individually rational decisions, absent coordination, into a collectively irrational outcome – an outcome that is ultimately suboptimal for each individual agent. In other words, it involves some situation in which individually rational action, when taken by multiple individually rational actors, ultimately proves self-defeating for each actor precisely because all actors (rationally) take it. The trajectory from individually rational decision to individual self-defeat is in this sense mediated, in these cases, by multiplicity itself; in that everyone doing the rational thing is precisely what brings on the suboptimal outcome. And so an individual or collective decision to endorse or permit every individual to act rationally in the relevant manner would itself be an individually or collectively irrational – because ultimately self-defeating – decision.<sup>2</sup>

There is in this sense a certain incoherence, a dilemmic or “tragic” character, inherent in any situation characterized by the presence of a collective action problem. “Commons tragedies” and “prisoners’ dilemmas” are probably the most oft-encountered examples of the paradoxical, “tragically” ironic phenomenon in question – examples the very names of which hint at the crossed-purposes problem that these problems present.<sup>3</sup>

Absent coordinated rationing of a scarce resource such as shared grazing land – “the commons” – is once said to have been, for example, “rational,” in a particular sense that we shall more fully and critically elaborate later, for each individual shepherd to permit his cattle to graze without restriction.

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<sup>2</sup> Here is one sense in which official endorsement of “unregulated markets” by, e.g., certain political parties, is, if sincere, collectively irrational. Likewise in the case of any individual’s endorsement of the same.

<sup>3</sup> The “prisoner’s dilemma” has been a staple of game-theoretic discussion and its associated literature for so long as to have long since become tiresome. It is, of course, treated, among many other places, in von Neumann and Morgenstern (1944), *supra* note 1. *The “commons tragedy”* is nearly as well-worn, particularly since its canonization in ever-cited Hardin, G., 1968, “*The tragedy of the commons*,” *Science* 162(3859), 1243-1248.

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For if one is competing for, rather than jointly managing, a scarce resource, and, crucially, cannot unilaterally change this background condition, then more grazing for one's cattle is nearly always "better," while less for one's own is simply more for one's competitors. Yet – and here, of course, is the tragedy – everyone acting thus rationally and grazing their cattle without restriction then depletes the commons more rapidly than it can be replenished, ultimately impoverishing everyone.

Similarly, absent coordinated testimony on the part of the "prisoners" in the "dilemma" that is named for them; it is in a certain sense rational for each prisoner to confess and thus "rat out" the other. Such is the "dominant strategy" for each prisoner in their capacity as an individually rational agent. Yet both prisoners' adoptions of their dominant strategy then seals the doom of each one of them. Hence, once again there is tragedy.

This much, I take, is more or less widely appreciated, certainly among choice theorists operating in various disciplines, and even, to a lesser extent, among laypersons. What seem to be less widely appreciated, however, are two complementary propositions. The first is that some collective action problems bear iterative, self-exacerbating properties.<sup>4</sup> The second is that some of the most formidable and all too common challenges faced by economies, societies and polities are iteratively self-worsening collective action problems of precisely this sort. Indeed, most, if not all, of the procyclicality that often plague financial and monetary systems and macroeconomies, denying them tolerable equilibria, seem to involve them.

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<sup>4</sup> The iterativity of some choice scenarios that confront choosers with collective action problems appears to be more widely appreciated than the self-exacerbation properties that attend many of the same. This might owe something to the moral of the story told by Axelrod and Hamilton (1981) [Axelrod, R., and W. Hamilton, 1981, "The evolution of cooperation," *Science* 211:4489, 1390-1396], an early work placing iteration center stage. As the title of this paper, shared by Axelrod's subsequent (1984) monograph of the same name, suggests, the focus here is on how iterated "games" afford opportunity for cooperative practices to emerge and develop, rather than how much worse things will steadily grow in many cases if it does not. Much the same can be said of Lewis's (*supra*, note 1) treatment of convention as the spontaneously emergent solution to a recurrent coordination problem. The present paper can in this sense be viewed as a complement to Lewis, Axelrod and Hamilton, and their progeny, focusing more on the urgency of the need for "cooperation" or "coordination" (especially of a particular kind discussed in section 4) than on the opportunity for the same afforded by "repeat playing."

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As for the iterative, self-exacerbating character of some collective action problems, this appears to stem from the fact that some actions taken by some actors at one moment can rationally warrant specific responsive actions, taken by other actors within the same domain of action at subsequent moments, which can then “feed back” procyclically into yet further rationally responsive decisions taken within the same domain by the original actors. This cycle can continue with no natural resting point – no equilibrium – and result in situations that are suboptimal at best and disastrous at worst. The iterativity in these cases is, in this sense, as rooted in plural agency as is the aggregative nature of the decisions in question, while also being rooted in that same other-regard and mutuality – the mutual responsiveness – which characterizes so much of human behavior.

As for the commonality of collective action challenges of this iterative, self-exacerbating type, we shall see this in the particular examples that I shall consider. One thing we will see in particular is that financial markets and macroeconomies are rife with them.

I call these iterative cases of the classic collective action problem “recursive collective action problems” (recap). They are collective action problems by virtue of their aggregating multiple individually rational decisions into collectively irrational outcomes. They are recursive collective action problems by virtue of their mutuality-rooted iterativity and iterativity-rooted self-exacerbation properties, with each new individually rational but collectively self-defeating action in the sequence effectively inducing further such individually rational actions along the same ultimately self-defeating lines. My aim in this paper is both to limn the shared structure of these problems in a bit more detail, and to demonstrate how a great many familiar regulatory and policy challenges – including those presented by asset price bubbles and busts, consumer price inflations and debt deflations, bank runs and financial panics, “paradoxes of thrift” and “liquidity traps” – all constitute instances of the phenomenon under consideration.

I also hope in the paper to hazard some helpful suggestions as to how best to address recap challenges. Key to the effort in this case is, first, to recognize these challenges’ shared structure; second, to recognize that collective action problems require coherent collective agency for their solution; and third, to recognize that the collective agents in question must, in general, act precisely to render no longer individually rational such individually rational decisions as tend to aggregate into collectively irrational outcomes.

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The paper is accordingly structured as follows. Section 2 first characterizes the structure of recaps in a bit more detail, focusing in particular on the forms of rationality and mutuality that they involve. Section 3 then lays out a number of specific instances of the recap apt to be familiar to many, even if their shared structure as recaps is not. My hope is that this will both (a) render recaps, as abstractly characterized in section 2, more concretely appreciable, and (b) aid policymakers in framing solutions to the particular problem examples selected, all of which are particularly salient at present – a time marked by post-bubble, post-bust debt-deflation. Picking up on that last aim, section 4 turns from the common form that all recaps share to the common form that solutions to recaps must accordingly take. Once again, the hope is both to illuminate something important about particular forms of collective action and to afford practical guidance to would-be problem-solving policymakers. Section 5 then concludes and looks forward.

### **2. Structure of the problem**

It will be helpful to commence our discussion by characterizing, now with a bit more care, the structure and basic attributes that seem to be borne by all problems of the kind under consideration. Then, in section 3, we will consider a number of specific instances of this common problem type.

A recursive collective action problem, we suggested earlier, is a situation in which (1) multiple decisions that are individually rational in the absence of coordination (2) aggregate into collectively irrational outcomes, the outcomes of which then (3) render it rational for agents to take yet more decisions along the same lines as in (1), thereby compounding the irrationality at work in (2), ad infinitum.<sup>5</sup> Conditions (1) and (2) are what render these problems “collective action” problems. Condition (3) is what renders them “recursive,” possessed of the familiar “feedback-fed” self-worsening property that deprives some interactions among multiple agents of tolerable equilibria. We can say a bit more about each of these conditions, all three of which are individually necessary and jointly sufficient to constitute a recursive collective action problem.

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<sup>5</sup> Or at any rate, ad suboptimum, in a sense to be further elaborated later.



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### 2.1 Individually rational

The form of individual rationality involved in a recursive collective action problem is not particularly exotic. It is simply the form familiar to economists and choice theorists more broadly, pursuant to which chosen means are reasonably believed by the choosing agent to conduce to desired ends.<sup>6</sup> Typically some form of “maximization” is involved in the choosing, such that the agent’s choices are consistent with maximizing the degree to which some antecedent preference or set of commensurable preferences is satisfied.<sup>7</sup> The shepherds familiar to the commons tragedy, for example, aim to maximize the availability of nutrients to their animals. The prisoners perplexed by the prisoners’ dilemma, for their part, aim to minimize terms of imprisonment, hence to maximize time free of prison.

There are, of course, all manner of objections to “instrumental,” or “means” rationality of this familiar variety. There are claims that it has no positive explanatory value, for example, in view of the ease with which putative ends can be recharacterized post hoc as to “rationalize” means and the decisions that have led to them.<sup>8</sup> So are there Aristotelian-style claims to the effect that ends, too, can be (now normatively) rational or irrational, meaning that instrumentalist accounts of rationality à la Hume are too limiting in view of the concept of rationality’s ineluctably normative valence.<sup>9</sup>

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<sup>6</sup> The consensus choice for locus classicus of this take of rationality appears to be Hume, D., 1739, A treatise on human nature. Since Weber (1903) [Weber, M., 1903, *The Protestant work ethic and the spirit of capitalism*], it has been common to refer to this form of rationality as “instrumental.”

<sup>7</sup> See, e.g., Weber (1903), *idem*.

<sup>8</sup> This and related concerns are nicely laid out and discussed, for example, in Jose Luis Bermudez (2009) [Bermudez, J-L., 2009, *Decision theory and rationality*], as well as in some other of the many works out there on the subject. Among the more searching and pioneering of contemporary investigations of decision theory and rationality are the papers collected in Davidson, D., 1980, *Essays on actions and events*.

<sup>9</sup> See, e.g., Foot (2001) [Foot, P., 2001, *Natural goodness*], for a philosophically sophisticated, Aristotelian meditation on the rational critique to which ends can be subject. For a cognate jurisprudential take on the subject, see Finnis, J., 1980, *Natural law and natural rights*. For an early expression of skepticism about instrumental rationality by two economists, see Stigler, G., and G. Becker, 1977, “*De Gustibus Non Est Disputandum*,” *American Economic Review* 67:2, 76-90.

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None of these concerns, critically important as they are in other contexts, need trouble us here once they are acknowledged. For our purpose in the present discussion is simply to show that, in some circumstances, in which the applicability of this form of rationality appears to be uncontroversial, everyone doing the individually rational thing in isolation can issue in everyone doing the collectively irrational thing in aggregate, in a manner that not only prevents maximization of what each agent individually prefers, but actually can maximize what each individual disprefers.

### 2.2 Collectively irrational

The collective irrationality involved in a collective action problem is understood by essential reference to the individual rationality whose end it frustrates. That is to say, it involves subversion of precisely that end which the agents in question are rationally seeking in their disaggregated, individual capacities. This is precisely why the individually rational decisions that aggregate into an irrational outcome are often said to be collectively irrational, or collectively self-defeating, as well as why the resultant choice situation is said to be “tragic,” ironic or paradoxical. The understanding upon which those characterizations are predicated is that the individual decisions are (rationally) aimed at something – some end – and that the particular circumstance in which those decisions are being taken is then structured in such a way as renders the end more elusive precisely when all individuals (rationally) pursue it.

In light of collective irrationalities being thus indexed, in the context of a collective action problem, to individual rationality as just characterized in 2.1, it is, of course, subject to the same sorts of objections we noted before to apply to individual rationality as there defined. Also as there, though, so here, none of these important objections ought to prevent our plowing ahead for present purposes. For our purpose, again, is simply to show that, in some circumstances, in which the applicability of this form of rationality is not particularly controversial or contested, everyone doing the individually rational thing can result in everyone doing the collectively irrational thing, such as then not only prevents maximization of what is preferred, but again actually maximizes that which is dispreferred.

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### 2.3 Recursively self-exacerbating

What renders a recursive collective action problem “recursive” is its self-amplification characteristics, these in turn being rooted in part in the “maximization” behavior associated with rationality as characterized in 2.1 and 2.2. The recursion at work here, in other words, stems from the form of rationality described in 2.1, just as the irrationality described in 2.2 trades on it. Indeed, the element of recursion stems from the crosswise interaction of individual rationality and collective irrationality themselves – the mutuality of some human decision-making – when decisions that aggregate can be iterated.

The process, in essence, runs thus: individuals first act rationally to maximize some desired variable, call it  $x$ . In so doing, they employ means that, absent the presence of other actors, are well adapted to that task of maximization. Multiple individuals acting thus individually rationally, however, not only frustrates the maximizing purpose, but actually works to minimize that purpose’s satisfaction. Individuals have less of what they seek – less  $x$  – after all of them seek more, than if none of them had sought to maximize – rather than, say, “satisfice” – in the first place.<sup>10</sup>

When this happens, however, individuals who do not adjust their preferences simply repeat their maximizing actions, since their ends are still unfulfilled and, indeed, less fulfilled than they would have been had not everyone acted individually rationally. Hence the process repeats itself, ad infinitum or at least ad suboptimum, such that each round of individually rational decision-making, paradoxically, carries each individually rational agent further from maximal  $x$ . No tolerable equilibrium, in other words, characterizes such sets of interactive decisions. They are, in this sense, procyclical – a fact that bears critically upon their salience for macroeconomic and finance-regulatory purposes.

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<sup>10</sup> In referencing the concept of “satisficing,” I am, of course, alluding to the work of Herbert Simon, particularly as encountered in Simon, H., 1947, *Administrative behavior* and Simon, H., 1956, “*Rational choice and the structure of the environment*,” 63 *Psychological Review* 63:2, 129-138. The idea is that cognitive limitations in many circumstances render optimization behavior taking the form of boundless maximization quite futile, such that decision-making often does better to proceed on the basis of some threshold of acceptability rather than some maximandum. Careful philosophic treatment of Simon’s idea can be found in Slote, M., 1989, *Beyond optimizing: a study of rational choice*.

### 3. Some common instances of the problem

We noted, in introducing this discussion, that recursive collective action problems are pervasive, and that they are particularly common in the guise of many procyclicality that vex financial markets and macroeconomies. It will be helpful now to run through some well-chosen examples. There are several reasons to do so. One is to render the phenomenon under discussion – recaps and their characteristic structure – more concrete and accessible to intuition. Another is to illuminate the nature of these familiar instances of our general problem by drawing attention to their shared structure as recaps – certain aspects of which structure find implicit expression in elements of these problems' popular names that I will scare-quote on first mention. Finally, and relatedly, a third reason for offering the particular examples treated here is to provide an indication of how we might best solve these pervasive, destructive and presently salient problems by a common method that responds to their common structure, the subject of section 4.

#### 3.1 Arms "races"

Let us begin with a very simple example, relative to whose basic core all subsequent examples seem to constitute only slightly more complex variations. So first consider two parties, each of whom aims to maintain parity with – or perhaps, under conditions of uncertainty, to maintain a certain incremental "margin of safety" relative to – the other by stockpiling an equal, or marginally greater, number of weapons than the other. The ultimate aim in each party's case is to maintain "security."<sup>11</sup>

Given this end, it is instrumentally rational, absent coordination, for party 1 to define its aim relative to party 2's stockpile – say, by aiming for rough parity with party 2's stockpile, or for parity with party 2's stockpile plus some small increment, "d," to compensate for uncertainty as to just how large party 2's stockpile actually is.

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<sup>11</sup> See generally Schelling, T., 1960, *The strategy of conflict*; Halperin, M., and T. Schelling, 1961, *Strategy and arms control*; and Schelling, T., 1966, *Arms and influence*. Much more, of course, has been written on the structure and dynamics of various species of arms race, much of it for obvious reasons during the period extending from the late 1940s through the late 1980s. Indeed much of the early work in "game theory" itself, a good bit of it sponsored by the Rand Corporation, appears to have been occasioned by the arms race dynamic of the "Cold War." And earlier contributions, dating back to the 1930s, themselves of course came along during times of significant international tension.

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The problem here, of course, is that, as in all collective action problems, what is sauce for the goose is likewise sauce for the gander. It is just as rational for party 2 to define its aim relative to party 1's stockpile – say, by aiming for parity with party 1's stockpile plus increment  $d$  – as it is for party 1 to define its aim relative to party 2's stockpile. The parties' aims are in this sense mutual – they are mutually regarding – and that is indeed part of the problem; the sense in which the problem is group-mediated.

And so, if you'll pardon a pun, we are off to the races. Starting from a position of rough but uncertain parity, party 1 adds  $d$  to its stockpile “just to make sure.” Party 2 responds by adding  $2d$  to its stockpile –  $d$  to match, another  $d$  “just to make sure.” Party 1 then responds to the response by adding  $2d$  – again  $d$  to match, plus another  $d$ 's worth to achieve a buffer. And so on. The race is self-reinforcing and self-exacerbating. It is recursively procyclical.

Arms accordingly accumulate steadily in number and expenses grow with them, ad infinitum, yet the parties are no better off, security-wise, late in the game than they are early in the game. Indeed, they are likely much worse even on the security front alone, irrespective of pecuniary expense, given both (1) the dangers of stockpiled weapons and (2) the temptations to launch preemptive wars during brief intervals of relative advantage, occasioned by all arms races. Hence, the race is enormously wasteful – a sheer deadweight loss for both parties in pecuniary and in security terms. That is to say, that it subverts the very ends in terms of which the parties' means rationality is to be understood.

Of course, the example is stylized. Real arms races are more complex and nuanced than this.<sup>12</sup> But the essential idea applicable to all variations on the stylized example is nevertheless clear: the aim of each party is greater security attained cost-effectively; and yet the race, by steadily increasing the quantum of arms and encouraging preemptive aggression during brief intervals when advantages are had, renders all less secure, while also occasioning enormous pecuniary expense. And things only grow worse in these very respects with each iteration.

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<sup>12</sup> For some such nuance, see Schelling (1960) and Halperin and Schelling (1961), *idem*.

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Critically, moreover – a point that will figure quite prominently later – neither party can unilaterally quit, let alone stop, the race without thereby relinquishing its aim of security. That is why unilateral disarmament is nearly universally eschewed. It is as individually irrational to stop racing, in other words, as it is individually rational and collectively irrational to continue racing. You're damned if you do, collectively and hence ultimately individually, and damned if you don't, individually. This is precisely the sense in which arms races, like all collective action problems, are "tragic" (in the Attic Greek rather than the modernly trivialized, synonymous-with-"disaster" sense of the word).

### 3.2 "Positional goods" competitions

Now suppose we are not talking about nations and weapons, but neighbors and homes. If a number of neighbors inhabit a society in which all wish to attain and hold status relative to others, and status is signaled by home size, each inhabitant of the society in question might wish to own a home slightly larger – and certainly no smaller – than those of their neighbors. Beginning from an initial position of rough but perhaps uncertain parity, then, one neighbor might contract to add a floor or some other addition to their house. Other neighbors might then respond in kind. Still other neighbors might then follow suit. Thus, foiled in their initial attempt to either get a leg up or to ensure that they are not a leg down, the first neighbor might now add yet another addition, triggering further responsive moves by the others. And so on, along the familiar group-mediated, mutually responsive, self-augmenting "procyclical" trajectory.

In time, these continual rounds of home additions might come to be experienced as significant burdens by the homeowners. Nobody really wants all that space for purposes of habitation, let alone the pecuniary expenses incurred in acquiring it. They just all want, like the residents of Lake Woebegone, to be "above average" – or at least to be sure that they are not below average. The problem is that this competition can never be won, and it is very expensive – not to say wasteful – to continue on the resultant treadmill. At the same time, as with the arms race, so here no one can unilaterally end the race – all one can do is surrender and "unilaterally disarm," which is precisely what renders the race a species of "treadmill."

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Positional goods arms races of this sort occur not only in the realm of housing, of course, but across many spheres of potentially conspicuous consumption activity.<sup>13</sup> Hence, there is reason to suppose that all might be rendered better off if such “races” might be contained via some commonly applicable method. We will come to that in section 4.

### 3.3 Labor-shedding recessionary “spirals”

Now let us consider a number of firms that are in competition with one another. At some point, some “shock” to the macroeconomy – a brief fuel price spike or stock market drop, for example – might yield a diminution in demand for these firms’ products that would, absent any responsive measures taken by the firms, be merely temporary. Because the duration is uncertain, however, and because these firms are in competition with one another, such that one firm’s greater profitability than another’s will typically result in higher capitalization by investors, each firm will be tempted to shed some of its labor. This, after all, will be profitable, at least in the short to medium term, given the decline in revenue wrought by the demand diminution wrought by the “shock.”<sup>14</sup> And seeking higher profit and growth is widely considered to be rational in this context. To relinquish profits is to lose investors, incur a higher cost of capital and thereby risk individual downward spiraling into insolvency.

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<sup>13</sup> The term “positional goods arms race” appears to originate with my colleague Robert Frank, who has done more than almost anyone to draw attention to the phenomenon in question. See, e.g., Frank, R., 1986, *Choosing the right pond*; Frank, R., 2012, *The Darwin economy*; and a host of other works in between. The characterization of these “races” as recursive collective action problems appears to originate with the present author. See Hockett, R., 2013, “*The libertarian welfare state*, Challenge 56:2, 100-114. The locus classicus in introducing competitively “conspicuous” consumption is of course Veblen, T., 1899, *The theory of the leisure class*. Another evocative example of a positional goods competition, that involving standing audience members at a theatrical performance, figures in a recent op-ed by one of the present author’s mentors in support of a legal initiative launched by the present author to address that massive recursive collective action problem which is the continuing slump in the mortgage market and consequent continued debt deflation in the national macroeconomy. See Shiller, R., 2012, “*Reviving real estate requires collective action*,” New York Times, June 23, available at [http://www.nytimes.com/2012/06/24/business/economy/real-estates-collective-action-problem.html?\\_r=0](http://www.nytimes.com/2012/06/24/business/economy/real-estates-collective-action-problem.html?_r=0). For more on the sense in which slumps and debt deflations constitute recursive collective action problems, see *infra*, Parts 3.3 and 3.8.

<sup>14</sup> Of course the example is, like those that precede it, again stylized. It is sufficiently costly to shed and then reemploy labor that firms expecting the diminution in demand to be brief will not bother laying off labor. When, however, the diminution is expected to continue for some time to come, or when sufficient uncertainty attends the question, it will grow correspondingly “rational,” cost-wise, to shed the labor.

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But now, of course, every firm's rational actions, in the sense just described, results in aggregate demand contracting yet further economy-wide. For unemployed laborers do not purchase as much as employed laborers. The resultant contraction in demand now replicates the effect of the earlier "shock." Revenues decline further, meaning that individual firms find it rational to shed yet more labor to protect profitability. This then collectively contracts demand all the further. The cycle continues. In effect, then, we have here another arms race, with labor-shedding playing the same role as arms-stockpiling. And just as in that case, so here, no one participant can stop the process. To try that is to try unilateral disarmament, thus to risk losing precisely what you shed labor to retain – profitability. So the process repeats itself – each round recurs – in procyclical fashion, "spiraling" downward toward an intolerable equilibrium.

Of course, as with the arms race example, so here the envisaged scenario is stylized. Real slumps are more nuanced than this, with many firms seeking to avoid layoffs for as long as they can for any number of reasons, some firms being less affected than others, and so forth.<sup>15</sup> But the recursive and "paradoxical" structure of the problem is discernible nevertheless even in more nuanced reality. What is individually rational to do, and irrational not to do, proves to be collectively irrational to do and individually irrational not to attempt to redress. It is self-defeating, as well as self-worsening, via a process of iteration. Such is the structure of self-worsening "downward spirals" and ongoing "slumps" in a macroeconomy.

### 3.4 Bank "runs"

Now consider a system of fractional reserve banking without deposit insurance. All depositors in a certain bank know that the bank does not have sufficient liquid assets on hand to accommodate all of them should they all decide to withdraw all of their funds at one instant. This does not ordinarily trouble them, however, because (1) it is in general highly unlikely that all depositors will wish to withdraw all funds at one time, and (2) the bank's investing a large portion of all deposits in assets less liquid than cash enables the bank to earn returns that are passed on in part to depositors in the form of interest borne by their accounts.

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<sup>15</sup> As further elaborated in footnote 14.



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## Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

But suppose now that some rumor or other piece of information apparently bearing upon the bank's ultimate solvency, which for whatever reason is not altogether implausible on the surface even if happening to be factually false, begins to spread among depositors. Each depositor knows that, in the event that the bank's solvency really is shaky, the bank will not be able to pay all of its depositors what it owes them. Hence, any depositor who is early in the queue to withdraw funds will be less likely than other depositors to lose anything. At the same time, should the information that has occasioned concern ultimately prove untrue, any such depositor can simply place their funds back in the same or some other bank without loss once the truth is established. So they lose virtually nothing by going ahead and withdrawing early,<sup>16</sup> while they risks losing everything if they do not.

What all of this means, of course, is that all depositors can find it individually rational to seek to beat all of the others to the bank to withdraw, and indeed individually irrational not to do so. No one depositor can end the run unilaterally. It also means that, with each withdrawal by someone other than you, the likelihood grows that you might lose something or everything should your bank fail. In effect, then, a form of recursive "bums' rush," much like an arms race, can commence, with every individual withdrawal rendering further such withdrawals that much more prudent – more rational – and hence likely. The run is in this sense self-reinforcing. It is recursive.

If a race like this does commence, and the bank is actually solvent at bottom, the depositors will then have brought on the very eventuality in contemplation of which they have acted. The liquidity crisis with which they confront the bank will, in such a case, have transitioned into a full-blown solvency crisis, leaving most depositors empty-handed in the aftermath. And this can be so, again, even where the bank is, absent the run, perfectly solvent at its core. What is more, inasmuch as the "information" that precipitates such a run on one bank often can be as little as "news" to the effect that there have been runs on some other banks, the "run" phenomenon can bring down an entire banking system – indeed, before deposit insurance, it often did.<sup>17</sup>

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<sup>16</sup> They suffer merely the inconvenience of the withdrawal and ultimate redeposit.

<sup>17</sup> See, e.g., the colorful instances in past U.S. banking history recounted in Gary Gorton, G., 2010, *Slapped by the invisible hand*.

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Such is the sense in which bank runs are often described as “contagious.”<sup>18</sup> So contagion itself can be underwritten by what is, at bottom, a recursive collective action problem.

As with the arms race and labor-shedding race, then, so with the race to the bank during a run: multiple individually – and at each iteration, increasingly – rational decisions here aggregate into a collectively – and with each iteration, increasingly – irrational, self-defeating outcome for all but a very few depositors. The only exceptions are those who are first in the queue, who might be analogized to arms-racers who succeed in launching preemptive strikes against other arms-racers. It is perhaps theoretically possible for someone to “win” such races, but, by far, most parties “lose,” with the likelihood of winning sufficiently low for each racer as to render the race worse, in a probabilistic sense, for each racer than if there was no race at all. And yet also here, as again in the typical arms racing case, no single racer can stop the race or exit it in any satisfactory manner by unilaterally disarming.

### 3.5 Consumer price “inflations” and “hyperinflations”

Now suppose that it is Tuesday, and that you ordinarily purchase your groceries on Fridays. Some of your neighbors typically do likewise, while others typically shop on Thursdays and still others shop on Wednesdays. All of you now suddenly notice that prices advertised on the grocery store billboards are a bit higher today than they were yesterday. Some of you had also noticed, last week, that prices then were a bit higher than they were several days earlier. Either today or tomorrow or Thursday, it might begin to look likely, then, that prices will be a bit higher later this week than they are now – even if, in fact, whatever induced the earlier price rises is no longer at work by this point.

Against this backdrop, it might well appear to be individually rational for you to purchase your groceries today, Tuesday, rather than waiting till Friday. Prices might very well, after all, be higher by then. Matters will look likewise to your neighbors: today, Tuesday, looks better than Wednesday or Thursday as well – for again, prices might well be higher by then.

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<sup>18</sup> For an account of that “contagion” that marked the “Asian Financial Crisis” of the late 1990s, see, e.g., Hockett, R., 2002, “From macro to micro to “mission creep,” Columbia Journal of Transnational Law, 153, 177-190.

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So you and your neighbors rationally accelerate your purchase of groceries. You buy today, Tuesday, rather than later in the week when prices might be higher.

But note that, by acting rationally in this manner, by purchasing your groceries today rather than later in the week, your collective actions can bring on or worsen the very eventuality in the contemplation of whose possibility you have chosen to shop now – to wit, higher prices. All of you are driving prices yet higher than they would otherwise be by accelerating your demand for the products you are buying. But that fact cannot warrant refraining from purchasing on the part of any of you acting separately, for none of you can single-handedly prevent prices rising any more than you can stop the most salient losses wrought by an arms race by unilaterally disarming. You are accordingly once again damned if you do, collectively, and damned if you don't, individually. And, matters of course, continue to unfold in this manner, and indeed worsen, indefinitely. For your all-inducing price acceleration gives you reason to accelerate purchasing behavior yet further, thereby inducing yet more rapid price acceleration, and so on, procyclically.

Some such dynamic as this is what characterizes any self-reinforcing, procyclical consumer price inflation or “spiral,” as they used to be called. On the one hand, it is individually rational, once prices seem likely to rise somewhat in future, to act preemptively by accelerating one's purchasing decisions. Insofar as one's expectations of such price rises are plausible, moreover, it is symmetrically irrational not to do so. And yet, everyone continuing on the treadmill collectively brings on, and steadily worsens, precisely those losses that stepping onto the treadmill is meant individually to minimize.

### 3.6 Asset price “bubbles”

Now consider again the immediately preceding example – that of a consumer price inflation – but change the object of purchase from groceries to financial assets of one sort or another. In addition, for at least some cases, add one more element to the story – viz. the availability of credit at low cost to purchase the assets in question, which later one can then sell after appreciation to pay off one's debt while still pocketing a non-trivial margin.<sup>19</sup>

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<sup>19</sup> For present purposes, “low-cost” credit can be either or both (a) credit available at low interest rates and (b) credit available on the basis of little down payment or collateral – hence high-leverage availability.

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## Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

In such cases, we shall have told the tale of an asset price bubble, which is merely a price inflation in respect of financial assets rather than groceries. In the credit-augmented case, for its part, we shall simply have told the tale of a particularly dangerous – because even less amplitude limited – rendition of such inflation. Indeed, where credit comes into the picture, the asset price bubble can readily become something more than a mere inflation. It can become a full hyperinflation, by which price rises occurring at, say, velocity “ $v$ ” during one iteration directly induce further rises at velocities vastly exceeding  $v$  over subsequent iterations.

There are two reasons for financial assets being particularly vulnerable to this pattern, both of which constitute sides of one coin. First, people often – perhaps typically – purchase financial assets these days less to consume or even to “hold” them than to “flip” or resell them. Hence, there is no natural “satiation” point where their purchase is concerned, as there is in the case of most consumer goods. Buyers will buy for as long as the prices are rising, and indeed aim to profit by sales after such price rises in ways that they typically do not, save in exceptional circumstances, in the case of consumer price inflations. Second, because, in light of the first point, people will rationally borrow in order to buy for as long as the asset price rises exceed rises in credit costs – something that is, again, much less common in consumer goods markets, even when consumer credit is available – there is no “natural,” consumption-rooted limit to the price levels that might be attained by financial assets. These can rationally rise for as long as credit remains sufficiently cheaply available to purchase them.<sup>20</sup>

Since a credit-fueled asset price bubble is just a (particularly dangerous) form of inflation, it bears the same rationality structure as inflation. It is individually rational, instrumentally speaking, for market participants to borrow in order to buy financial assets for as long as their prices rise faster than credit costs – for as long as, that is, there is a “spread” for speculative buyers to arbitrage or “leg.”

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<sup>20</sup> For fuller elaboration of this point, as well as careful comparison and contrast of credit-fueled asset price hyperinflations and more garden-variety consumer price inflations, see Hockett, R., 2010, “A fixer-upper for finance,” *Washington University Law Review* 87:6, 1213-1291. See also Hockett, R., 2009, “Bailouts, buy-ins, and ballyhoo,” *Challenge* 52:2, 36; and Hockett, R., 2011, “Bubbles, busts, and blame,” *Cornell Law Forum* 37:1.

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By the same token, however, it is just as collectively irrational, again instrumentally speaking, for market participants to keep participating. For at some inherently uncertain point, the credit will run dry, people will begin selling off assets to pay down their debts left from earlier credit-financed purchases, and prices will then commence dropping at least as precipitously as they rose, leaving debt deflation and consequent recessionary spiral in their wake.<sup>21</sup> And yet, once again, no individual can unilaterally terminate either process.

It should also be noted, if only in passing, how the individual rationality of decisions to purchase assets during the course of a bubble can, in effect, radiate outward, rendering other decisions at least temporarily rational as well. It is more rational, for example, at least for a time, to lend to an otherwise less worthy borrower during a credit-fueled asset price hyperinflation, at least if the asset to be purchased with the loaned funds is itself to collateralize the loan; for the expected value of the loan rises with the value of the collateral. It is likewise more rational, for similar reasons, to “extend” oneself further as a borrower under such circumstances, as well as to assign higher credit ratings as a rater to borrowers. And if one is in competition with others, it is not only individually rational to do these things, but individually irrational not to do them – for reasons similar to those that oblige firms to shed labor during recessions.

It also bears noting that it is even individually rational under the circumstances here described, for some of the same reasons, for some “functional” regulators to permit more on the part of borrowers and lenders than they would otherwise do – at least if, like other functional regulators, they are regulating individual persons or institutions for their individual safety and soundness rather than entire financial systems for their “systemic stability.”<sup>22</sup> That last proviso offers a hint as to what we shall have to conclude in section 4 in the way of how to address recaps.

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<sup>21</sup> The latter is, of course, discussed *supra*, section 3.3. For more on debt deflations, see *infra*, sections 3.7 and 3.8.

<sup>22</sup> See again Hockett, R., 2010, “A fixer-upper for finance,” *Washington University Law Review* 87:6, 1213-1291. For yet more on the critical distinction between institutional and systemic focus on the part of financial regulators, see Hockett, R., forthcoming, “The macroprudential turn: from institutional ‘safety and soundness’ to systemic ‘financial stability’ in financial oversight,” *Virginia Law and Business Review*; and Hockett, R., and S. T. Omarova, 2014, “Private means to public ends: governments as market actors,” *Theoretical Inquiries in Law* 15:1, 53-76.

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The key is to supplement functional “microprudential” regulators, whose mandates tend toward procyclicality in many cases, precisely by virtue of the recursive collective action problems to which their constituencies are subject, with system-focused, countercyclically acting, “macroprudential” regulators, who are optimally situated to adopt regulatory strategies of the type discussed in section 4.<sup>23</sup>

### 3.7 “Fire sales” and asset price “busts”

Now consider the bank run example adduced in section 3.3. And as we did just now in section 3.6, alter the object of the activity in question. Change the asset from which one “runs” from a bank deposit of the section 3.3 variety to a financial instrument of the section 3.6 variety, saleable on the securities markets. In such a case, we shall have a “run” on assets, a.k.a. “fire sale,” which is structurally identical to a run on a bank. A holder of the asset receives plausible information – perhaps no more than rumors – concerning the issuer’s or asset’s ultimate soundness. They know that, if others receive the same information and begin selling their holdings, the asset will quickly lose value in the market. It is accordingly in their interest – it is individually rational, instrumentally speaking – to sell their holdings before others sell theirs. That way they minimize pecuniary loss and salvage value. This is all the more true insofar as they can always purchase the asset back – possibly even at lower, post-panic cost – should the earlier information prove ultimately unfounded.

Once again, however, what is sauce for the goose here is sauce for the gander: it is just as individually rational for most or all other holders of the asset to aim to be quick to shed holdings as it is for the first agent. But lo, everyone acting instrumentally rationally in this way brings on the very result that was feared – a precipitous drop of the asset’s value and associated collective calamity. And each such drop induces further such drops at accelerating rates, per the familiar recursive, feedback-fed dynamic. As in the bank run example, moreover, all of this will be so, even if the rumors prove ultimately to have been unfounded, and no individual can stop the rumor-fed process from occurring.

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<sup>23</sup> See again sources cited idem.

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At the same time, however, the run on assets example stands to the bank run example rather as the asset price bubble example stands to the consumer price inflation example: losses are magnified here because busts follow bubbles in which agents have incurred significant debt in making their bubble-magnified purchases. Those debt obligations do not fall with the prices of assets that the borrowed funds have purchased, meaning that people are left with significant “debt overhang” in the wake of these busts in a manner they are not after typical bank runs. They are left “underwater.”

This is precisely why recessionary spirals of the kind considered above in 3.4 are most severe after credit-fueled asset price bubbles and busts – which the latter themselves are among the most forceful of “shocks” of the sort mentioned there. Those with debt overhang do not spend as do those without overhang. They (slowly) pay down debt. Hence, Irving Fisher’s profound diagnosis of the depression of the 1930s as a “debt deflation.”<sup>24</sup> Much of the world is living through such a debt deflation even at the time of this writing – a deflation following on from that asset price hyperinflation that went into reverse, then to bust, over 2007-09.

It also bears noting here that, just as in the case of the asset price bubble, so here with the bust, that which renders it instrumentally rational for individuals to act in manners that aggregate into collectively dysfunctional outcomes also can render it rational for other agents to act reinforcingly. It is financially rational, for example, for a creditor who sees their debtor’s collateral plummeting in value either to accelerate the debt or to place a “margin call” demanding that the collateral be topped-off – all the more so if mark-to-market accounting practices are widely followed, or even imposed, by regulators.

It is similarly rational for microprudential regulators who key liquidity or capital requirements to asset risk to demand more buffer of regulated entities whose asset values begin dropping during such runs. But that, in turn, further fuels such fire sales – liquidations – of assets.

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<sup>24</sup> The locus classicus is Irving Fisher, I., 1932, *Booms and depressions: some first principles* (1932). For a recent diagnosis of the present period as one of Fisher-style debt deflation, see Alpert, D., R. Hockett and N. Roubini, 2010, “*The way forward: moving from the post-bubble, post-bust economy to renewed growth and competitiveness*,” White Paper, The New America Foundation.

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Creditors and microprudential regulators accordingly act procyclically here just as they do during the price run-ups that are the antecedent bubbles. They do so because they are individually rational while caught in the grip of a recursive collective action problem. The problem is ultimately soluble only by means of the kind sketched in section 4.

### 3.8 “Debt deflations” and “paradoxes of thrift”

Now recall the labor-shedding example of section 3.4, and consider the sense in which it amounts to a means by which agents rationally endeavor to cut expenditures – labor expenditures – and thereby save funds. Well, there are, of course, other ways to cut expenses. One can simply refrain from spending on other things – things such as consumer goods. Any time that one holds off on spending – including spending on investment goods – in turn, one saves. And at times, it can be individually rational to do so – as the labor-shedding example itself might have made plain. In the wake of an asset price bust of the sort considered in section 3.7, for example – particularly during a debt deflation of the sort also there noted – there is every reason for individuals to hold off spending and repair personal balance sheets.

But lo, as in the case of labor-shedding, so here: what is individually rational can be collectively and self-augmentingly self-defeating, insofar as everyone saving causes further economic contraction, hence lower aggregate spending still, hence yet more contraction, and so on. Ironically, each person saving more can result in all people – that is, the macroeconomy – saving less in these cases. For gross income shrinks, individual incomes thus shrink, and ultimately there’s less to save.

This particular tragic irony bears a name – it is the celebrated Keynesian “paradox of thrift.”<sup>25</sup> The paradox is paradoxical precisely because what is individually rational proves to be collectively irrational. And the irony is tragic, precisely because it would be just as individually irrational, absent some means of acting collectively, for any one person to eschew the individually rational action that aggregates into the collectively irrational outcome.

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<sup>25</sup> The locus classicus in this case is Keynes, J. M. 1936, *The general theory of employment, interest and money*. For a recent discussion of the causal connection between present day debt deflation and savings-undercutting thrift, see Alpert, Hockett, and Roubini, *idem*.



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Such are, of course, the paradox and tragic irony that afflict all collective action problems. It is simply more acute when the problem is recursively self-worsening.

### **4. Addressing the problem through its structure**

Recursive collective action problems as just characterized are both formidable and, often, devastating. That they are potentially devastating is clear from the brief sampling of particular manifestations provided in section 3, all of which involve not merely irony, but indeed “tragic” irony. That they are formidable is presumably clear from their “paradoxical” – their “ironic” – characteristics as analyzed in section 2: they are collective irrationalities that spring from the aggregation of individual rationalities, the latter of which we cannot expect – or even sensibly wish – to extirpate. What to do then?

The key, I suggest, lies in focusing upon two of these problems’ three basic features: first, the collective aspect of their collective irrationality; and second, the rational aspect of their individual rationality. To solve our most formidable recursive collective action problems, in short, requires our first assuming collective agency and then collectively acting to render certain individual decisions – those that aggregate into collective calamity in each kind of recap – no longer instrumentally rational. The remainder of this section briefly elaborates on this fundamental idea.

#### **4.1 Collective rationality via collective agency**

For collectively irrational outcomes to be possible, something has to be missing – some prerequisite to collective rationation and resultant action. What is missing, in fact, is a locus or situs at which collective rationation and associated rationality can operate. In short, what is missing is collective agency, at least in the sphere of activity in question – arms stockpiling, home buying, asset purchasing, or what have you. To solve a collective action problem in these spheres requires collective action itself in these spheres, hence some form of collective agency. The relevant collectivity must be able to act in concerted fashion, either directly or via some agent duly authorized to act in the name and on behalf of all in the collectivity.

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Where the collectivity in question either is, or is part of, a polity or some other aggregate of persons in whom the attributes of sovereignty vest – that is, a state – the most common form of such agency is a government or government instrumentality. In a state or other polity, government is the collective agent par excellence. It is the collective agent under whose ultimate collectivity-vested authority, and with whose supplemental assistance of various kinds, all individual and other, substate collective agents will operate.

Even the most diehard of libertarians in effect acknowledge this collective agency function of government – when, for instance, they say that the “first duty” or “essential role” of governments is “national defense.” The reason is that collective defense itself poses a classic collective action problem – namely that subspecies typically referred to as the “free rider problem.”<sup>26</sup> It is individually rational, the story here runs, for each member of a collectivity in need of defending to let others do the job or foot the bill where defense is concerned, then to enjoy the positive externalities generated by their doing so. Border defense, after all, is a largely non-excludable public good. But this means that defense will be systematically underprovided if its provision is left to voluntary contributions of effort or funds; for it means that the latter is individually irrational. Hence even in libertarian fantasies, for collective defense at least, the collectivity appropriately authorizes an agent – a government – to “provide for the collective defense.” In so doing, they solve a classic collective action problem.

How governments discharge the appointed function, however, is as instructive for present purposes as the fact that they do it. For one way of looking at conscription, mandatory subscription – a.k.a. taxation – or both, is a means by which those collective agents known as governments render it no longer individually rational to do that which, when all do it, results in collective, and hence individual, calamity. Collectivities in these instances, in other words, charge their governments with rendering it no longer instrumentally rational for individuals to attempt to free-ride or shirk. Here lies the key to understanding how best to address all other recaps, including those sampled in section 3.

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<sup>26</sup> The locus classicus in this case is, of course, Olson, M., 1962, *The logic of collective action*, the ubiquity of which is such as to lead the present author almost to wish that he did not have to cite it. For a skeptical take on the utility of “free rider problems” as explanations or justifications of sundry policy measures, see Tuck, R., 2008, Free riding.

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#### **4.2 Conforming individual to collective rationality by collectively changing the individual calculus**

Collective agency is necessary, but not sufficient to solve a collective action problem. What else is required? The key to our answer lies in that other constitutive feature of the collective action problem additional to aggregation – viz. the individual rationality of the decisions that aggregate into collectively irrational outcomes in these situations. The duly appointed collective agent must, in short, act in the name of all to change the calculus of each, such that certain erstwhile individually rational decisions that aggregate into collectively irrational outcomes cease to be individually rational.

How to do that? It is actually quite simple. Return for a moment to the collective defense example just considered. The individually rational decision that aggregates, when replicated by multiple actors, into calamity, absent a collective agent in the form of a government, is the decision to shirk or to free ride. What does a collective agent then do in this circumstance to avert collective calamity? The government simply changes the free rider's calculus in either, or both, of two ways. It either (1) conscripts the free rider, in effect forcing them to take up arms on pains of imprisonment or worse, (2) conscripts the free rider's resources, again on pain of imprisonment or worse, so as to fund the collective defense, or (3) does both. Either way, it acts to render free-riding no longer "free," hence no longer individually rational.

In effect, government instrumentalities must do the same thing in solving each of the problem instances considered above in section 3. All that differs from case to case is the particular means employed, which of course varies according to those salient particulars which distinguish one recap from another.

In the case of an arms race, for example, parties wishing to stop the operation of the treadmill simply merge into – they jointly constitute – the requisite collective agent via the medium of contract (in this case, treaty), then mutually authorize subagents to inspect certain sites and verify mutual compliance with the agreement. This they can do with relative ease in view of their small number. Insofar verification then can be reasonably relied upon, it becomes no longer rational to produce or procure more weapons.

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For doing so will incur significant costs – those occasioned both by the new weapons purchases and by subsequent iterations once the race is renewed – while affording no offsetting benefits, any of which are quickly cancelled out by retaliatory procurements by competitors.<sup>27</sup>

Positional goods arms races are handled in a subtly different, but functionally equivalent, manner to that employed in the case of actual arms races. Because individual market participants are not themselves states or distinct loci of sovereignty, they need not content themselves with simulated collective agency in the form of contract or treaty – nor are they apt to be able to do so if numerous. Instead, then, they delegate to their already existent collective agent – their shared government – the task of rendering “racing” no longer individually rational. How? The simplest way probably is to employ graduated taxation schemes that render each later stage in the iterative “racing” process proportionally more expensive to each “racer” than earlier stages. That way, escalation in the race is phased out, and each erstwhile competitor is able, in effect, to rely upon others to attribute their decision to stop racing to the presence of the taxation regime, rather than to pretax incapacity to compete.<sup>28</sup>

The best-known collective solution to the bank run problem, as well as one such solution to a run on financial assets problem, involves rendering it no longer individually rational to “run.” In the bank run case, deposit insurance is, of course, the response in question. By assuring each depositor that any loss, up to some reasonable ceiling, occasioned by a bank’s failure will be fully compensated, the deposit insurer eliminates the principal factor – possible loss – that renders “running” individually rational. It thereby prevents mere liquidity troubles from morphing into full-on insolvencies. While in theory this function can be, and historically has been, played at least imperfectly by privately ordered bank liquidity-pooling collectives such as clearing houses, governments with their monopolies on force and, therefore, taxation authority, hence on the “full faith and credit” that comes with such authority, often prove much more reliable.<sup>29</sup>

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<sup>27</sup> See generally work by Schelling and Halperin & Schelling cited *supra*, note 11.

<sup>28</sup> See generally work by Frank, Hockett and Shiller cited *supra*, note 13.

<sup>29</sup> See, e.g., Gorton, *supra* note 17, for more both on the historic role of clearing houses in addressing runs, and on the design of the Federal Reserve System as a form of publicly backstopped, quasi-private clearinghouse arrangement.

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It should also be noted that deposit insurance, though inherently countercyclical at least in virtue of its run-stemming properties, can be designed in more and in less countercyclical renditions. The U.S. Federal Deposit Insurance system, for example, until 2005, operated procyclically where its method of premium assessment was concerned. For it assessed premia only when the insurance fund fell below a stipulated floor level, which, of course, typically occurred only during times of multiple bank failures – meaning assessments were made principally during times of stress in the banking industry. Happily, the U.S. Congress rectified this in 2005 and 2006, through legislation that effectively renders the assessment system countercyclical. In effect, then, this legislation implicitly recognizes deposit insurance’s function as a solution to a recursive collective action problem.

Turning now to the case of a run, not on bank deposits, but on financial assets, the collective agent now acts to render it no longer individually rational to run in a manner analogous, but not identical, to that afforded by deposit insurance. Here, the agent – typically, but not necessarily, a central bank – announces its willingness to purchase all assets of a particular type at some floor rate which, on the one hand, amounts to a “penalty rate” relative to the asset’s price prior to the run, while, on the other hand, constituting a rate well above market rate during the run.<sup>30</sup>

Playing the “market maker of last resort” in this manner, the collective agent operates from “two sides,” as it were, to render it no longer individually rational to dump assets.<sup>31</sup> From the down side, the collective agent renders it no longer worthwhile for the asset-holder to sell the asset at a price below the announced threshold, hence effectively preventing the asset from plummeting below that threshold pursuant to the familiar self-fulfilling prophecy dynamic.

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<sup>30</sup> See Hockett and Hockett and Omarova sources cited supra, notes 20 and 22. See also Bagehot, *infra* note 31, who first articulated the importance of the “penalty rate.”

<sup>31</sup> *Idem*. The canonical articulation of the vaunted “lender of last resort” role played by central banks is, of course, Bagehot, W. 1873, *Lombard Street: a description of the money market*. The ways in which “market-making” has become the new “lending” for these purposes is discussed in Hockett and Hockett & Omarova as cited supra, notes 20 and 22, as well as in Mehrling, P., 2011, *The New Lombard Street*.

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## Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

From the up side, in turn, the collective agent affords, via the penalty in the penalty rate, incentive for asset holders to hold on to their assets rather than selling them even to the collective agent – at least, where there is reason to suppose that the asset is being systematically undervalued by the panic-struck market, such that its value will recover in time once it has weathered the storm via other holders continuing to hold the assets by virtue of the collective agent's guarantee.

It also bears noting that, as in the case of deposit insurance, so here the collective agent who acts in the requisite manner to address an acute recursive collective action problem acts countercyclically and, in that sense, macroprudentially. The agent acts countercyclically in blunting the recursion, and macroprudentially in acting on behalf of the full collectivity of participants in the "macro-market" in question – the financial system as a whole. Any finance regulatory regime that would aim to be complete, must include at least one such countercyclically acting macroprudential regulator – a regulator both cognizant of this function and able to discharge it along the lines sketched in this section.<sup>32</sup>

In the case of inflations, debt deflations, paradoxes of thrift, credit-fueled asset price bubbles and layoff-led recessionary spirals, again the key to solving the problem is for the collective agent to render no longer individually rational those decisions that tend to aggregate into the collectively irrational consequences in question. In these cases, however, the means of doing so combine individual decision-targeting with more macro-level action.

Begin with the credit-fueled asset price bubble. The key to this phenomenon, recall, is the spread between low borrowing costs and high capital appreciation rates during the boom, which it is individually rational for market actors to arbitrage, or "leg." One means of rendering participation in the bubble dynamic no longer individually rational, then, is for the collective agent, now acting as a countercyclical macroprudential financial regulator, to close that spread from either, or both, of the two ends.

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<sup>32</sup> See again Hockett and Hockett and Omarova sources cited supra, notes 20 and 22.

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## Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

The authority can thus tax capital gains at gradually higher rates, tax asset “flipping” transactions à la Tobin, tax credit extensions at gradually higher rates or simply place hard limits on extensions of credit or incurrings of leverage – via lending limits, debt-to-income (DTI) or loan-to-value (LTV) ratio maxima, or reserve and capital minima.<sup>33</sup>

Turning from individual decision-targeting to more macro-level action, the collective agent can also rein in credit by blunter means – for example, by raising interest rates via traditional monetary policy instruments.<sup>34</sup> Alternatively, the regulator might target particular classes of asset that seem to be prey to bubble dynamics at a given time, by “shorting” those assets in the markets on which they are traded.<sup>35</sup> This would lie somewhere between more individual decision-targeting action such as margin requirements on the one hand, and more macro-level action on the other. In effect, it would be a bubble-side counterpart to run-side last resort market-making.

Now consider a consumer price inflation. Here, the more familiar means of collectively addressing the problem is for the collective agent – in most jurisdictions, the central bank or monetary authority – to render accelerated purchases no longer individually rational by reining in the credit-money supply via traditional monetary policy measures: more restrictive discounting, interbank rate setting and open market operations in treasury or other securities. By “tightening money” in this manner, the hope is that the authority will induce market participants into holding off on their purchases longer, thereby draining off price-pushing pressures brought on by excessively high-frequency purchasing activity. In so doing, the authority in question is, of course, once again acting countercyclically. And in doing that, it is implicitly acting to solve a recursive collective action problem.

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<sup>33</sup> See again Hockett and Hockett and Omarova sources cited supra, notes 20 and 22.

<sup>34</sup> See again Hockett and Hockett and Omarova sources cited supra, notes 20 and 22.

<sup>35</sup> See again Hockett and Hockett and Omarova sources cited supra, notes 20 and 22. Also Hockett, R., 2011, “How to make QE more helpful: by Fed shorting of commodities,” Benzinga Financial, October 14, available at <http://www.benzinga.com/news/11/10/1988109/how-to-make-qe-more-helpful-by-fed-shorting-of-commodities>.

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## Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

Though the method of “tight money” is more broad-brush and blunt than the more carefully targeted macroprudential tools mentioned in the previous paragraph but one, it bears noting that those more narrowly targeted tools could, in effect, be at least partly approached in the realm of consumer goods and services markets. A central bank or monetary authority could, for example, as noted in the previous paragraph, engage in open market operations that target financial instruments other than treasuries, thereby tamping down inflations that afflict some submarkets more than others.<sup>36</sup> By the same token, it could place a floor under some goods or services while simultaneously pushing back on inflationary pressures in respect of other goods and services. In a sense, innovation of this sort is, of course, already under way, via a form of the “market-maker of last resort” function noted, in the case of Fed treatment of housing-associated financial assets.<sup>37</sup>

Turning now to debt deflations, paradoxes of thrift and layoff-led recessions, here again the collective agent can render no longer individually rational such decisions as aggregate into the collectively dysfunctional outcome through a combination of more narrowly targeted and more broadly sweeping methods. In the case of a debt deflation and associated paradox of thrift, for example, the debt overhang that renders it individually rational to hold off on spending can be trimmed from either, or both, of two ends – the debt end and the equity end, so to speak. To pare back debt overhang from the debt end, narrowly targeted means – in particular, principal reductions – do the trick.<sup>38</sup>

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<sup>36</sup> See Hockett and Omarova, *supra* note 22. Also Hockett, R., 2011, “How to make QE more helpful: by Fed shorting of commodities,” *idem*.

<sup>37</sup> *Idem*.

<sup>38</sup> These, in turn, can be done via a variety of means. Bankruptcy courts do the job in the case of consumer debt overhang. Owing to a perversity of the Bankruptcy Code – the Chapter 13 “primary residence” exclusion – other means have been thought to be needed for mortgage debt overhang. For a “lease swap” way round the Chapter 13 problem, see Hockett, R., 2011, “How about home lease swapping as underwater mortgage cure,” Benzinga Financial, October 14, available at <http://www.benzinga.com/news/11/10/1987688/how-about-home-lease-swapping-as-a-mortgage-market-cure>; and Hockett, R., 2011, “Lease swaps as mortgage market cure,” *Dorf on Law*, October 16, available at <http://www.benzinga.com/news/11/10/1987688/how-about-home-lease-swapping-as-a-mortgage-market-cure>. For a municipal eminent domain solution that has been gaining traction of late, see Hockett, R., 2012, “It takes a village,” *Stanford Journal of Law Business and Finance* 81:1; Hockett, R., 2013, “Paying Paul and robbing no one: an eminent domain solution for underwater mortgage debt,” *Current Issues in Economics & Finance* 19:5, 1-12; and Hockett, R., 2014 “We don’t follow, we lead”: How New York City will save mortgage loans by condemning them,” *Yale Law Journal Forum*.



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## Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

To work from the equity end, either narrowly targeted means such as those now being employed by the Fed to maintain a floor under home prices, or broader monetary and fiscal policies, can be employed, the choice among them to be determined by reference to the comparative unintended follow-on effects apt to be associated with each.<sup>39</sup>

In the case of a layoff-led recession and associated paradox of thrift, again, the collective agent can employ either or both narrow and broader means of rendering the decisions that aggregate into the collectively dysfunctional outcome no longer individually rational. Broadly, for example, the fiscal and monetary policy measures already alluded to have the effect of increasing aggregate demand in a manner that boosts incomes and, thereby, renders purchasing and, ultimately, employment activity more attractive. Similarly, were a government to adopt countercyclical, “employer-of-last-resort” hiring policies providing employment to all who sought it, but for temporary intervals could not find it, it would be employing a relatively broad-sweeping measure tending directly to increase purchasing power and indirectly to increase wages hence purchasing power, thereby rendering consumer spending activity more individually rational economy-wide.<sup>40</sup>

More narrowly contoured means toward the same ends include, for example, negative interest, stamped money and dated voucher programs to discourage hoarding, and tax incentives to induce greater hiring and/or employee retention by employers.<sup>41</sup>

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<sup>39</sup> On the “narrower” means, see again Hockett and Hockett and Omarova sources cited supra, notes 20 and 22. On the broader means, by way of both monetary and, especially, fiscal policy, see Alpert, Hockett, and Roubini, supra note 23. See also Hockett, R., and R. Frank, 2012, “*Public infrastructure investment, renewed economic growth, and the U.S. fiscal position*,” working paper, available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1987656](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1987656).

<sup>40</sup> A suggestion along these lines is offered and elaborated in Hockett and Omarova, supra note 22. See also Wisman, J. D., 2013, “*The growth trap, ecological devastation, and the promise of guaranteed employment*,” *Challenge* 56:2, 53-78; and Wray, R., 2013, *Modern money theory*.

<sup>41</sup> Stamped money proposals appear to originate with Gesell, S., 1929, *The natural economic order* (translation by Pye, 1929) (originally published 1916, as *Die natürliche Wirtschaftsordnung durch Freiland und Freigeld*). Negative interest for its part figured in Lord Keynes’ original International Clearing Union plan for what became the International Monetary Fund, and has recently been floated as a possible means by which to render Fed QE policies more effective. See Hockett, R., 2013, “*Bretton Woods 1.0: an essay in constructive retrieval*,” *New York University Journal of Legislation and Public Policy* 16. Employment-inducing tax incentives, finally, are for their part a staple of American policy proposals, most recently in President Obama’s 2013 State of the Union Message.

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## Recursive collective action problems: the structure of procyclicality in financial and monetary markets, macroeconomies and formally similar contexts

In all such cases, again, the collective agent in question would be acting countercyclically in addressing a recursive collective action problem. We could go on to adduce further such examples, but presumably by this point the case has been made.

### **5. Conclusion**

We have covered a good bit of ground here – one hopes, for the present, enough such ground. None of the policy challenges addressed here are unfamiliar, nor is the notion of a collective action problem in connection with which we have considered them. What might be new here, however, is our bringing them together in thought in a manner that helpfully illuminates both their shared structure and, therefore, the sorts of means requisite to solving them. The value added, in short, assuming there's any, lies in our highlighting two facts. First, that these particular problems are, in fact, classic collective action problems – indeed, particularly devastating renditions of the same by virtue of their recursive properties. And second, that these hitherto intractable problems are accordingly soluble by recourse to familiar collective means – means whose legitimacy as responses to classic collective action problems is readily made plain, and which work by rendering no longer individually rational such decisions as tend in aggregate to issue in such problems.

Assuming that highlighting those facts has been valuable, however, it still is the case that more remains to be done. For one thing, there might well be other hitherto intractable challenges that face polities, which are in the nature of recursive collective action problems but have not been noticed as yet to be such, including by the present author. For another thing, there might be additional means of addressing such problems that have thus far escaped notice, including again that of the present author. It is to be hoped, then, that by (a) identifying the species of challenge here considered, (b) drawing out the shared structure common to all instances of this species of challenge and finally (c) identifying what all solutions to such challenges must therefore have in common, we have at least facilitated the discovery of both more such challenges and more means of addressing the same.

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