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## On the role of reflexivity in economic analysis

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Soros' theory of reflexivity is meant to apply to a variety of social processes. In economics, it implies that many processes will be subject to "boom-bust" patterns in which expected outcomes deviate for a considerable time from the actual path, and that the actual path in turn deviates from the underlying fundamentals. This is in sharp contrast to the reigning notions in orthodox economics. The hypothesis of Rational Expectations (RE) requires that the views of all participants will converge to a "single set correct of expectations" and the Efficient Market Hypothesis (EMH) posits that actual outcomes deviate from equilibrium in a random manner save for occasional exogenous shocks. In this paper I show that Soros' argument is similar to the classical and Keynesian notions of equilibration as a turbulent process in which actual and expected variables gravitate around some fundamental value. But Soros makes the important further contribution of emphasizing that the fundamental value itself will generally be affected, but not fully determined, by (diverse) expectations and actual outcomes. I demonstrate that Soros' theory of reflexivity can be formalized and that the resulting system is stable in the sense that expected and actual variables will gravitate around a possibly moving fundamental value. The paper ends with a discussion of an alternate economic paradigm in which the principle of reflexivity would be central.

**Keywords:** finance; expectations; cycles; reflexivity; rational expectations

**AEA categories:** B40; B41; E32; G00

### 1. Introduction

Soros' theory of reflexivity is meant to apply to social systems. In these, the expectations and aspirations of thinking participants shape their actions, and by so doing, shape the system of which they are a part. At the opposite pole, there are natural systems in which the subjective aspect may lead to a change in outcome but will not alter the laws of nature. Biological systems lie in between. In the latter domain, Soros recognizes that a chimpanzee or a dolphin or even a sophisticated computer program may be similar to a thinking participant in some aspects. But in his view, humans are unique in terms of language, reasoning, and culture (Soros, 2013, pp. 318–319).

Human society is characterized by what Soros calls the *human uncertainty* principle. This involves two basic propositions. The *principle of fallibility* says that the multiple participants in any social act will generally have different views of the likely outcomes. Even the view of any one participant will be driven by a multiplicity of values which may not be self-consistent. So there is good reason to expect that the set of participants will have contradictory views whose net effect will be biased with respect to the actual outcomes. The *principle of reflexivity* says that the actions of participants based on their

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various views will generally change the reality to which they refer. In the natural world, actions change the state of nature but not the laws of nature, whereas in the social world, actions can change the laws of social life itself (Soros, 2013, pp. 310, 311, 319).

The human uncertainty principle implies that many economic processes will be subject to ‘boom–bust’ patterns in which expected outcomes deviate for a considerable time from the actual path and that the actual path in turn will deviate from the underlying fundamentals. This is a tri-partite affair: diverse and conflicting expectations about a variable (say a stock price) affect its actual path, which will in general deviate from the path justified by fundamentals (such as earnings per share). These divergences may not only persist for some time, but may also affect the fundamentals themselves, thereby initiating a self-reinforcing process that can lead to ‘far-from-equilibrium’ outcomes (Soros, 2013, pp. 322–324). Implicit in Soros’ argument, to which I will return, is the notion that expectations cannot not simply create the fundamentals they suppose. Hence, as the process continues, actual outcomes get further away from the fundamentals. The growing gap in turn undermines expectations, until at some point there may be a sharp reversal in views: the boom engenders its own bust. Figure 4 in Soros’ essay illustrates this general pattern. But he is careful to add that his argument also encompasses ‘near equilibrium’ processes in which the actual levels of variables fluctuate closely around the levels determined by fundamentals (Soros, 2013, pp. 323, 326).

This view stands in sharp contrast to the reigning notions in orthodox economics. The hypothesis of rational expectations (RE) requires that the views of all participants will converge to a ‘single set correct of expectations’, and the efficient market hypothesis (EMH) posits that actual outcomes deviate from equilibrium in a random manner save for occasional exogenous shocks (Soros, 2013, pp. 318, 320–322, 325–327). From Soros’ point of view, these are very special cases involving particular types of near equilibrium outcomes. The general case is quite different.

## 2. Notions of equilibrium

I regret to say that I have little direct experience with economic equilibrium. Indeed, so far as I am aware, none at all. I sometimes see suggestions that we shall be moving toward equilibrium next year or perhaps the year after, but somehow this equilibrium remains firmly in the offing.<sup>1</sup> (Sir Gordon Richardson, Governor of the Bank of England, 1979)

Soros distinguishes reflexive processes from what he calls ‘equilibrium’, by which he means a state-of-rest. The latter is by far the most prevalent notion of equilibrium in both orthodox and heterodox economics (Blanchard, 2000, pp. 46–51). Yet, on Soros’ own argument, even far-from-equilibrium booms eventually give way to busts. Implicit in his theory is a distinction between *equilibrium* as a state and *equilibration* as a turbulent gravitational process. In the former, expected and actual values coincide with fundamental values up to a random difference, as in RE and EMH; in the latter, the three can differ for extended periods of time in a characteristic boom–bust process.

I would argue that turbulent gravitation is also an essential concept in the classical tradition and in Keynes. According to Adam Smith, the ‘actual price at which any commodity is commonly sold is called its market price. It may be either above, or below, or exactly the same with its natural price . . . The natural price . . . is, as it were, the central price to which the prices of all commodities are continually gravitating. Different accidents may sometimes keep them suspended a good deal above it, and sometimes force them down even somewhat below it, But whatever the obstacles which hinder them from settling in this center of repose and continuance, they are constantly tending toward it’

(Smith, 1973, pp. 158, 160, 161). The conventional reading of Smith is that each market price settles down at its long run equilibrium level at its ‘center of repose and continuance’. Such a reading is abetted by the fact that much of Smith’s analysis is focused on the properties of natural wages, profits, and prices. But what Smith actually says is that while various factors keep market prices above or below natural prices, competition forces the former back toward (and even beyond) the latter. Market prices are ‘continually gravitating’ around natural prices (Kurz & Salvadori, 1995, p. 5). David Ricardo appears to move closer to what Soros calls a near-equilibrium conception when he reduces gravitation to ‘accidental and temporary deviations of the actual or market price of commodities from ... their ... natural price’. Yet, elsewhere he clarifies this saying that market prices will not be ‘*much* above, or much below, their natural price’ for ‘*any length* of time’. This is perfectly consistent with considerable deviations over shorter intervals (Ricardo, 1951, pp. 88, 91, emphasis added).

Keynes points out that there is no reason to believe that actual aggregate demand emanating from the expenditures of thousands and thousands of consumers and firms would just match the demand expected by tens of thousands of firms. The investment component of actual demand is ruled by expectations of the various estimates of the long term profitability of individual capital goods being put into place, and these particular expectations are notoriously volatile, subject to ‘tides of irrational optimism and pessimism’ that are dominant in the short run. On the other side, aggregate supply is ruled by the short term profit expected by thousands of individual firms from the anticipated sales of their finished products. The normal state of affairs would be an imbalance between the two sides, i.e. a positive or negative aggregate excess demand in the commodity market. Keynes goes even further to say that the business cycle is regulated by variations in expected rates of profit (Snowdon & Vane, 2005, p. 59).

Yet, when it came for formalizing his arguments in his 1933 lectures three years before the publication of the general theory (GT), and subsequently in the first draft of the book, Keynes himself used a static set of IS–LM equations to summarize his argument (Snowdon & Vane, 2005, p. 113). In 1937, one year after the GT, both Harrod and Hicks presented papers expressing Keynes’s theory in terms of a static system of simultaneous equations. Keynes gave his cautious approval to Hicks’ paper, although he did complain that Hicks had downplayed the importance of the volatility of expectations. Hicks’ exposition was close to a Walrasian general equilibrium model, and his famous diagram dominated the exposition of Keynesian and orthodox economics thereafter (Nevile, 2000, p. 133; Snowdon & Vane, 2005, p. 169). There are Keynesians who rightly point out that the IS–LM representation in terms of stable functions has tended to sidestep Keynes’ own emphasis on the volatility of both constituent relations (Asimakopulos, 1991, p. 95). One might say that a much more appropriate representation would be one in which both curves continually fluctuate in response to shifting expectations, and sometimes move in tandem in the face of changes in confidence. For instance, a rise in business confidence would shift the IS curve upward and raise output while at the same time it might reduce the demand for idle funds which would shift the LM curve outward and reduce the interest rate at any given level of output. Then a boom could be initially attended by rising output and stable or falling interest rates until various limits began to assert themselves. At some point, confidence might collapse, leading to a sharp fall in the IS curve as the expected rate of profit falls and a sharp inward shift in the LM curve as holding idle money becomes the more attractive alternative. The parallels with Soros’ boom–bust arguments are evident.

### 3. Moving centers of gravity

Soros' second contribution is to point out that the fundamental value, the center of gravity of actual outcomes, is itself a moving target. This is why he refers to the path of the fundamental value as a 'trend' around which the actual value gravitates, as illustrated in Figure 4 of his essay. Once again, there are echoes of this point in classical and Keynesian traditions. It was obvious to the classicals that the natural prices around which market prices fluctuate are themselves continually changing in the face of ongoing technological change and the varying distribution of the social product (Smith, 1973, pp. 159, 165, 166). And of course in Keynes the expected and actual rates of return change not only over the cycle but also over time.

### 4. Stability of reflexive gravitation

Soros' third, and distinguishing contribution, is his argument that the fundamental value will generally be *affected*, but not fully determined, by (diverse) expectations and actual outcomes. This is a crucial point, because the responsiveness of the fundamentals is central to the generation of a boom while its partial autonomy is the basis for the eventual bust. Without the latter aspect, expectations would fully rule the roost and booms could only end for external reasons. What is at stake here is the stability of reflexive gravitation.

In his previous writings, Soros laid out the elements of his theory of reflexivity, which I will illustrate here with reference to financial markets. He advances three general theses: expectations affect actual values, actual values can affect fundamentals, and expectations in turn are influenced by the behavior of actuals and fundamentals. On the first proposition, a general expectation that a stock's price will rise will tend to raise its market price (Soros, 2009, pp. 3–5, 8, 10, 66–71, 73). The second proposition, which is 'the crux of the theory of reflexivity', is 'that market prices can influence the fundamentals' (Soros, 2009, p. 59). The first two propositions therefore imply that expectations affect both 'market prices ... [and] the fundamentals they are supposed to reflect' (Soros, 2009, pp. 66–71, footnote p. 73). The third proposition is that expectations are in turn influenced by both actual and fundamental prices. This proposition is stated less directly than the other two, but is nonetheless implicit in Soros' statements. For instance, he says that the 'change in fundamentals may then reinforce the biased expectations in an initially self-reinforcing *but eventually self-defeating process*' (Soros, 2009, p. 59, emphasis added). One may say that as actual values pull away from fundamentals, the growing distance between the two undermines the confidence that the boom will continue. Path dependence is a natural consequence of this theory, which means that social systems are non-ergodic. Market events 'are best interpreted as a form of history. The past is uniquely determined, the future is uncertain' (Soros, 2009, p. 106). Hence, 'financial markets cannot possibly discount the future correctly because they do not merely discount the future; they help to shape it' – even to the extent of affecting the fundamentals which they are supposed to reflect (Soros, 1994).

This argument can be formalized in a simple manner (Shaikh, 2010). Let  $p$  be the actual price,  $p^e$  be the average expected price, and  $p^*$  be the fundamental price (which of course depends on a particular specification of fundamentals). Then  $(p^e - p)$  which is the excess of the average expected price over the market price is a measure of the *degree of bullishness* in the market, while  $(p - p^*)$  which is the excess of the market price over the fundamental price is a measure of the *degree of overvaluation* in the market. We can now translate the preceding propositions into a set of formal relations between bullishness and overvaluation. The notion that actual prices are affected by expectations can be expressed as the proposition that the actual price will rise if the expected price is greater than the

Table 1. A formalization of reflexivity theory.

Thesis	
Market prices rise (fall) when sentiment is bullish (bearish)	$\dot{p} = f\left(p^e - p\right)$
Fundamental prices may rise (fall) when the asset is overvalued (undervalued)	$\dot{p}^* = h\left(p - p^*\right)$
Expectations are self-feeding but are undermined as a bubble grows	$\dot{p}^e = j\left(p - p^e, p - p^*\right)$

actual price, i.e. if the market is bullish. The notion that fundamentals can be affected by market prices can be expressed as the proposition that the fundamental price may rise if the actual price is above the fundamental price, i.e. if the asset is overvalued. Soros gives the example of debt and equity leveraging that permit companies to ‘improve their earnings per-share at inflated prices – at least for a while’ (Soros, 2013, pp. 319–320). Finally, the notion that expectations are self-reinforcing but will be undermined as the market price moves further away from fundamentals can be expressed as the proposition that the average expected price responds positively when the actual price is above the previous expected price (because actual outcomes have turned out to be even better than expected) but responds negatively to the gap between market and fundamental prices (i.e. negatively to the degree of overvaluation, which is the size of the bubble). Hence, a growing gap between market and fundamental prices progressively undermines the ebullience of the market. One can then see why a boom would be initially self-reinforcing but eventually self-defeating. Table 1 summarizes these possible mapping, with the notation  $f()$ ,  $h()$ , and  $j()$  signifying functional relations,  $\dot{p}$  signifying the change in  $p$ , etc., and the sign under particular terms indicating the direction of their linkage. Obviously all relations may be subject to shocks of various sorts.

In my previously cited paper, I proved the stability of the preceding system in the case of simple linear and nonlinear functional forms for the three relations. Here, I show that the reflexive process is stable – i.e. that its booms turn into corresponding busts – even in the case of general functional forms (Appendix A). I should add that everything said here in terms of asset prices could equally well apply to other variables such as rates of profit, so that the general system can also be the basis for a reflexive theory of business cycles, gravitation of market prices around classical ‘natural’ prices, etc. Finally, it is important to keep in mind that any posited functional forms would be valid only as long as the underlying social structure is maintained. There are times in which all roads lead to Tahrir Square and all bets are off. This too is inherent in Soros’ general notion of social reflexivity.

## 5. Elements of a new paradigm

Soros expresses the hope that his notion of the human uncertainty principle will be embodied into a new paradigm of social interactions (Soros, 2013, pp. 327–328). This is certainly a hope I share. Following in the classical tradition, I had long emphasized the turbulent nature of market gravitation around the fundamental values of variables. But after encountering Soros’ argument, I came to realize that I had failed to take into account the crucial effects of expectations and actual outcomes on the fundamentals themselves. In a forthcoming book *Modern Political Economy: Real Competition and Turbulent Dynamics*, I have tried to take the full set of effects into account.

This brings up two further points. First, a methodological break with standard economics is necessary but not sufficient. One must also have a consistent theoretical argument on a variety of more concrete principles. For instance, Ricardo and Keynes have similar notions of turbulent gravitation. Yet, they evidently disagree on the role of effective demand in the determination of output and employment. Ricardo adamantly affirms Say's Law, which is to say that 'demand is only limited by production' (Ricardo, 1951, p. 290). Keynes is equally adamant that production is generally limited by demand at least up to full employment. These are fundamental, one might say, paradigmatic differences in economic theory resting on a common methodological foundation.

The second point is undoubtedly more controversial. Neoclassical theory approaches the economic system as an idealized structure in which the hyperrationality of individual agents underpins the supreme optimality of the market. In this perfectly ordered form, the system equalizes all prices for comparable goods, all wage rates for comparable labors, and all profit rates for comparable degree of risk. Moreover, it fully utilizes all available resources, including available plant, equipment, and labor. All of this is accomplished without error, instability, or crisis. Soros suggests that the long success of this construction has something to do with 'physic envy' (Soros, 2013, pp. 317–318). I would argue that it was (and continues to be) successful because it serves the convenient social function of idealizing the system, of justifying what he calls 'market fundamentalism' (Soros, 2013, pp. 318, 320).

Heterodox economics, most notably Post Keynesian theory, generally takes the opposite tack from neoclassical theory. It emphasizes the inefficiencies, inequalities, and imbalances generated by the system. In the place of perfect competition we get imperfect competition; in the place of automatic full employment we get persistent unemployment. Market outcomes now appear as conditional on history, culture, politics, chance, and most of all, on power: oligopoly power, class power, and of course, state power. Unemployment is more probable than full employment, while inflation and crises are always possible. From this point of view, there is an ever present need for social and economic intervention to fill in the spaces between the actual and the desired. What pure neoclassical economics promises through the workings of the invisible hand of the market, Post Keynesian theory promises through the visible hand of the state. Modern orthodox macroeconomics, New Keynesian and even New Behavioral economics, now tilts in the Post Keynesian direction in trying to incorporate a range of imperfections into the standard framework so as to make the pure theory more 'realistic' (Snowdon & Vane, 2005, pp. 29, 343, 360–365, 411–428).

The irony is that both sides end up viewing reality through an imperfectionist lens. Neoclassical economics begins from a perfectionist base and introduces imperfections as appropriate *local* modifications to the underlying theory. Heterodox economics generally accepts the perfectionist vision as adequate to some earlier stage of history but argues that imperfect competition is the rule rather than the exception. In either case, the perfectionist base lurks heavy in the background.

I would argue that if we are to truly make a break with the orthodoxy, we must start from an altogether different foundation. Theories of hyperrational behavior must be replaced by those of actual behavior, perfect competition replaced by real competition, and optimal micro- and macroeconomic processes replaced by turbulent reflexive processes. This, at any rate, has been my project for a long time.

## Note

1. 'The Pursuit of Equilibrium', *Euromoney*, October 1979, cited in Davies (2002, p. 659).

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## Appendix A

Defining  $\pi^e \equiv (p^e - p)$  as the degree of bullishness and  $\pi \equiv (p - p^*)$  as the degree of overvaluation, and noting that  $(p - p^e) = -\pi^e$  appears with a positive sign in the expectations function, we can express the relations in Table 1 as a  $2 \times 2$  nonlinear differential equation system.

$$\dot{\pi}^e \equiv (\dot{p}^e - \dot{p}) = j\left(\frac{\pi^e}{-}, \frac{\pi}{+}\right) - f\left(\frac{\pi^e}{+}\right) = k\left(\frac{\pi^e}{-}, \frac{\pi}{+}\right), \quad (0.1)$$

$$\dot{\pi} \equiv (\dot{p} - \dot{p}^*) = f\left(\frac{\pi^e}{+}\right) - h\left(\frac{\pi}{+}\right). \quad (0.2)$$

This system has an equilibrium point (not necessarily a state of rest) at  $\dot{\pi}^e = 0$  and  $\dot{\pi} = 0$  which means that expected, actual, and fundamental prices all gravitate around each other. Note that the equilibrium consists of two relations ( $p^e = p, p = p^*$ ) among three variables, so that it is consistent with moving paths for the fundamental price ( $p^*$ ). The Jacobian of this system is

$$\begin{pmatrix} \partial k / \partial \pi^e & \partial k / \partial \pi \\ \partial f / \partial \pi^e & \partial h / \partial \pi \end{pmatrix} \text{ with } \partial k / \partial \pi^e < 0, \partial k / \partial \pi < 0, \partial f / \partial \pi^e > 0, \partial h / \partial \pi < 0 \text{ and trace}$$

$\text{Tr} = \partial k / \partial \pi^e + \partial h / \partial \pi < 0$ , determinant  $\text{Det} = (\partial k / \partial \pi^e)(\partial h / \partial \pi) - (\partial f / \partial \pi^e)(\partial k / \partial \pi) > 0$ . In addition,  $(\partial k / \partial \pi^e)(\partial h / \partial \pi) \neq 0$  so that by Olech's theorem the equilibrium of this system is asymptotically stable in the large (Gandolfo, 1997, pp. 354 and 355).