

## *Discussion by* Frank Hahn

### **1. A Different Approach**

The discussions we have been having yesterday and today have been much more general than I expected them to be. I thought we would look at specific models and at specific questions and see whether there are any specific answers we can have. Instead, we spent a good deal of time on what I would like to call *understanding theories*. That is to say, you want some sort of model which allows you to understand the institution of money, for instance. And that is done in rather a historical way.

Some of those things I was going to say this afternoon already came up this morning, so I will be very brief about them. I think that there are legitimate questions you can ask yourself, such as, How does money ever come to be used? How do financial institutions become what they are? But I don't believe that even that is the best understanding strategy. And it is quite dangerous.

The way I would like to proceed is slightly different. That is to start off with all the monetary institutions and ask, What would have to be the case if these institutions are to survive? Now that is not the same question of how something comes to be what it is; it is a question of how something remains what it is. And that's different. For instance, you might ask yourself, Given our monetary institutions, are there any coalitions which could form to bypass the monetary system altogether and improve themselves? That would be a sort of Nash idea one might have. It is quite a different kind of question than starting with a barter world with  $n(n-1) / 2$  trading posts and saying, Why is it that someone would do something to invent money?

I have been often pleasantly taken with the American hopefulness. It seems to be that there is a great deal of history people write in which they say the world goes from one situation to a Pareto superior situation, then on to another Pareto superior situation. It is reminiscent of *Candide* that somehow or other if something has a benefit to all of us it will happen. Now I have almost exactly the opposite view. That is, history illustrates how often it is the case that something that is to the benefit of everyone together doesn't happen. And my question is much rather, Why doesn't it happen? For instance, why don't all party coalitions form? They don't form because of the cost of coalition formation—they have to find each other, and you might even add Marxist social consciousness to that. I find it much more interesting

to wonder why there is a failure in our societies for Pareto-improving moves to be made rather than to assume, well, if something is Pareto improving, then surely sooner or later it will come to pass.

## **2. Specialization, Infinity, and Pareto Efficiency**

There are three other points I want to make on this very general level before I come to something we are more interested in.

One is that it is quite interesting how rarely one sees the discussions of the use of money making the point which was made by Adam Smith and which somehow the Arrow-Debreu paradigm stops us from making: that the extent of the market governs the division of labor; there are increasing returns, if you like. But the function of money, in allowing specialization, in allowing a really fine division of labor, is obviously something one ought to look into. Of course one has to postulate a double coincidence before people can specialize in something and to have the division of labor carried very far. But the reason this question is very rarely asked is that in most of our models the division of labor is not a great thing because we always have diminishing returns anyway. We don't have models with increasing returns to specialization, and that is why it gets neglected. But I think, compared with bringing traders together, the function of money in allowing specialized productions is of greater importance.

Also on this level of generality, there is the problem of infinity. My own view is that it is a pseudoproblem. The idea is that if you take a finite horizon the world comes to an end, and if money had no value then, then it can't have value in the period before that, and it can't have value before that, and so on. And you are in trouble because you said you were going to look at a world which is always in rational expectations equilibrium. Well, for some purposes I find these rational expectations equilibria extremely interesting. They have sufficient intellectual meat in them to make us want to work with them. But they are not necessary to account for the positive value of money. The Grandmont-Younes-Laroque way of simply saying there is some finite probability people attach to money having a positive exchange value in the future is all you need for money to have a positive exchange value today. That seems to me pretty good and very convincing. And I don't know why we have to worry about the infinite-horizon problem. It is a serious problem; I am quite happy to worry about it as a sort of intellectual game problem. But to say we don't understand money because we haven't quite settled the infinite-horizon thing, I think, is not real.

My last point at this level of generality is one which, I think, is more important to make in America than perhaps in other places: it is the tremendous attraction Pareto efficiency has for theorists. One produces a simple model, and one then asks oneself, Will the equilibria of that be Pareto efficient in some way? Yet even with quite modest complications of models, Pareto efficiency already goes out of the window. I mean, I know of no model with a stock exchange (other than the Diamond model and even that is already restricted Pareto efficiency) in which you can say that the economy is going to be Pareto efficient in equilibrium. Indeed, when you have a share market it is not at all clear what the criterion function for the managers of firms should be. And on top of that, you have the missing market problems, you have any number of reasons why any allocation you see in the world is not going to be Pareto efficient.

Now it is true that it is quite interesting to take a very simple model and just ask, In this model what will the world look like? and try to isolate particular effects. But this leads people to say, This shows that monetary institutions can or can't sustain a Pareto optimum. That is a slightly pompous attitude, considering that it is only in a very stripped-down version of the world that we ought to be looking for Pareto efficiency.

Indeed, I think one of the most interesting research problems for us is to get alternative notions of efficiency which are not the Pareto efficiency kind but which one could call *institutional efficiency* problems. I mean, for instance, the work by Grossman and Hart on social Nash optima and production social Nash optima. There are any number of versions of the world we can look at in defining Pareto efficiency. In particular, it seems to me that if we say one social arrangement is Pareto inefficient, then we ought to be able to say that someone could do something about it. If there is no way to do anything about it, then it is not interesting to say it is Pareto inefficient. That is because we have to define it relative to the movements we can make in the particular state we are interested in. And that leads to quite different notions of efficiency—richer ones, but also less satisfactory ones. We lose some of these beautiful theorems which we all know about.

### 3. Non-Walrasian, Bootstrap Equilibria

I have now come to what I consider a much more interesting question which I haven't heard discussed at all at this conference. If you look at the current work on rational expectations or at Lucas' model or at any of this kind of literature, you find that the dominant equilibrium notion, the particular description of the economy, is Walrasian. Now the Walrasian equilibrium isn't by any means the only equilibrium notion we can have. I don't mean we ought to look at models with rigid prices, but we ought to look at models of sequences of markets in which in each particular sequence prices may be nonclearing. There may be, for instance, involuntary accumulation of inventories or rationing or some combination of these. The question now is whether the sequence of markets always has to approach a Walrasian long-run or stationary, rational expectations equilibrium or could it get stuck somewhere quite differently; could it go to some other point.

There is every prospect that a sequence of short-period equilibria in which agents receive both price and quantity signals may get stuck at an equilibrium which is not a Walrasian equilibrium at all. Now I am not saying stuck forever because I don't know what's going to happen forever. But I am saying stuck for a long time. And if you take that view, then money and monetary policy take on quite different aspects; matters become more interesting.

You see, one of the things I have always found very hard to understand is the following syllogism: A Walrasian equilibrium is homogeneous of degree zero in the money stock and prices and, let us add, expected prices. Therefore, an increase in the quantity of money will lead to an equiproportionate increase in prices. That seems to be a complete nonsequitur. The fact that an equilibrium is homogeneous in that way doesn't tell you where the economy will move if you inject more money. In order to get the sentence to make sense you have to add that the Walrasian equilibrium is unique; that the Walrasian equilibrium is the only equilibrium you are going to look at; and that you are going to say that the economy pretty smartly goes from one

equilibrium to another, that it very quickly finds itself in equilibrium again. I think all of these things are extremely dubious, and I was hoping, actually, that this conference would be discussing some of these aspects rather than the meta-questions of why we have money at all, what the peasants did when they were bargaining women for cows, what the world looked like then.

The point about much of the irritation I personally find with some of the literature on money is that the most important premise on which it is built, namely, that the Walrasian equilibrium is a paradigm we should look at, is never discussed—it is taken for granted.

Now in a discussion between Keynesian economics and, let us say, new monetarism, you have got to somehow get the debate up to the point where it is discussable. Keynes, as you know, was a very careless writer, very sloppy. I think the *General Theory* contains nothing which we would recognize as a proof of any proposition. Nonetheless, Keynes had a certain vision of the economy, a vision I share, and I think it is very relevant to monetary theory. It is, roughly speaking, that an economy can have *bootstrap equilibria*. That is to say, there are equilibria which are perfectly rational for each of the agents, which nonetheless are very bad equilibria, and which can be actually changed through either monetary or fiscal policy. Now obviously this is not the time to start this discussion, but what I want to say is that if you are going to challenge the Keynesian view you must also show that there is no coherent and empirically persuasive account of non-Walrasian equilibrium.

My view is that the troubles which have arisen recently, but have been around all the time, is that Keynes and the Keynesians were totally ignorant of value theory. They had no micro theory worth having. I don't think Keynes even understood it. But if one is going to discuss anything that looks like Keynesian economics, then I am pretty certain one will have to look at small economies in which agents are sufficiently large to have some quasi-monopoly power. I cannot for the life of me see why it would be taboo to look at such economies. We look casually around, and General Motors doesn't look very small, and trade unions don't look very small—there are large agents around. And when there are large agents around, then the Walrasian model isn't so helpful. The question now is, How can we describe an equilibrium of a world in which there are these large agents? If we started with that, I am pretty sure that we could finish (this is conjecture, of course) with bootstrap equilibria. By that I mean a world which is what it is because each individual, in looking at the optimum reactions, say, Nash-like ones, assumes that the other agents are going to continue doing what they are, and the other agents' policy makes each particular individual's action rational. Now if there are bootstrap equilibria like that, and that is an open question, then the problems of policy become quite different.

In recent years Malinvaud and others in France have tried to formalize models of this kind, but they go to the other extreme, from having prices very flexible to having prices absolutely rigid. At the moment, however, there are others in this country and elsewhere studying hybrid models in which one looks at price changes and price adjustments as well as these quantity constrained equilibria. My impression is, to put it at its weakest, that there are being fashioned equilibrium notions which have as much claim to our attention as the Walrasian ones. And if that for now is to be granted, then the idea of money becomes quite different. The whole question of whether or not even anticipating monetary policy correctly would mean that monetary pol-

icy would have no effects is very much at risk. And indeed, one would now like to discuss and construct rational expectations equilibria in which both prices and quantity distributions enter into the rational theories of agents. It would be surprising if in such a world Keynesian propositions found no support.

Now I would have very much enjoyed it if we had had some debate on this issue because the moment one says that the equilibrium notion is Walrasian all opponents have to go quietly. By this I mean that a rational expectations–Walrasian equilibrium has the properties which are claimed for it. But it is an equilibrium which carries very little conviction—not only because of the rational expectations part, which is perhaps the least damnable, but also because in this world there is no description of how the world could ever have become what it is. Why is the world in rational expectations equilibrium? Some answer, We only understand equilibrium. I think that is a play on words. The economies we study out of Walrasian equilibrium may be in a different kind of equilibrium. It seems a logical mistake to assert that everything that is not a Walrasian equilibrium is a disequilibrium. There are an enormous number of interesting and important equilibrium notions which we ought to explore.

#### 4. A Note on Trading Uncertainty

There is only one other thing I wanted to say, and I shall finish on that. It is that we had very little talk yesterday or today about the liquidity of assets. In recent years Krepps and Goldman have been studying the question of how far the holding of money gives flexibility. One of the things about flexibility and money is that you may face trading uncertainties (not price uncertainties) which a Walrasian model completely rules out. By *trading uncertainty* I mean whether or not you will be able to trade what you want to trade at the going price. Now it is clear that trading uncertainties exist and that you may want to insure yourself against some of them. Indeed, trading uncertainties may give you a ranking of assets by liquidity. In any case, a formal theory of liquidity is still lacking, and yet it seems quite important for monetary theory. There is clearly room here for some interesting non-Walrasian work.

