Banking Panics and Depression: A Monetarist-Keynesian Synthesis

John Bryant

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By John Bryant

The recurrent banking panics of the 19th century and the Great Depression of the 1930s are clear examples of the failure of our system of free enterprise. However, to this day, economics has failed to produce a satisfactory explanation for these events. This failure is disquieting, as we would like to know, for example, why we have not experienced similar events in the postwar period, and whether we are now "due," as some fear.

Although no satisfactory explanation for banking panics and depression has emerged, existing theory can give us guidance in searching for one. Indeed, it is argued in this paper that an explanation for these anomalous events is immediately at hand, an explanation which has simply been overlooked. Moreover, this explanation generates a true Monetarist-Keynesian synthesis.

The natural place to look for an explanation for failure of our free enterprise system is known failures in the economic model of competitive equilibrium. Twenty years ago Paul Samuelson introduced a failure of competitive equilibrium in his pure consumption-loans model [5]. He showed that with overlapping generations of finite-lived individuals in a model with no last period, the competitive equilibrium need not be Pareto optimal. Moreover, he introduced the concept of a negative net worth entity, the "social contrivance" of fiat (unbacked) money, the use of which makes everyone better off and yields Pareto optimality. We can, then, model recurrent banking panics and depression as recurrent and once-and-for-all collapse of a fiat money system, respectively. Bryant [1] demonstrates that such collapse of a fiat money system can generate reduced production and mass unemployment.

There are, however, several problems with modeling banking panics and depression as collapses of a fiat money system. First, one must determine what events precipitate a collapse of a fiat money system and why. The collapse of a negative net worth entity causes a net loss, and therefore is something economic agents seek to avoid. Second, fiat money models typically have the property that with reinstitution of a fiat money system, the economy revives instantly in full bloom. The introduction of a negative net worth entity generates excess profits, and is entered into with alacrity. However, during the Great Depression deposit insurance and additional bank regulations were introduced, actions which should have reinstituted banks' role as providers of fiat money. However, the economy did not spring back to health as a result. Lastly, very generally, fiat money is a solution to the capital overaccumulation problem of the competitive economy. In models more elaborate than Samuelson's, fiat money has value because its existence keeps the economy from accumulating excess capital. This suggests that the collapse of a fiat money system is bad because it causes a period of excess accumulation of capital. Whether or not one is a Keynesian, it surely is wrong to view the banking panics and Great Depression as periods of excess demand for investment!

The above remarks suggest that one look for a model with the "social contrivance" of a positive net worth entity that solves a capital underaccumulation problem. Is there such a model? Indeed there is. Cass and Yaari [4], in an elaboration of Samuelson's model, briefly introduce just such a positive net worth entity. Not surprisingly, the possibility of such an entity arises in a model of overlapping generations of finite-lived individuals with no <u>first</u> period. And this entity has just the symmetric properties one would expect. Because it is a positive net worth entity, economic agents gain from its collapse, they lose from initiating it, and if constrained to reinstitute it

following a collapse, they do so to the smallest extent possible. Lastly, collapse of the positive net worth entity causes a capital underaccumulation problem, a drop in the demand for investment.

All the above facts stem from a basic observation on our positive net worth entity. In a model with fiat money, given that otherwise there will be no fiat money in the future, it is Pareto improving to introduce fiat money and maintain it for all time. Symmetrically, in a model with our positive net worth entity, it is Pareto superior that there will have always been this entity than that it will have never existed. But one cannot introduce a social contrivance at a point in time and guarantee that it has always existed!

Now we turn to a simple model with the positive net worth "social contrivance." Naturally, to get simplicity one must trade off realism. Therefore we finish the paper with an interpretation of the model which, hopefully, clarifies its implications for the real world.

The Model

The model is one without production or investment of any kind. It is a pure exchange model. Time is discrete and without beginning or end. $N > 0$ individuals are born each period, and they live two periods. An individual born in period t is of the tth generation. There is a single transferable but nonstorable consumption good. Each individual is endowed with $L > 0$ units of this consumption good in her second period of life, but is endowed with nothing in her first period of life. Let C_1 and C_2 be an individual's consumption of the consumption good in her two periods of life. Every individual has the same utility function $U(C_1,C_2) = \sqrt{C_1} + \sqrt{C_2}$.

As the model stands, there is no possibility of exchange. Everyone simply consumes L in her second period of life and gets $\sqrt{L}$ as utility. Notice,

however, that if <u>every</u> old person hands over half her endowment to a young person, then everyone consumes L/2 in each period of life and gets $2\sqrt{L/2} = \sqrt{2}\sqrt{L} > \sqrt{L}$ as utility. Because there is no first old person, no one is hurt in this scheme. But suppose that individuals of generation t suddenly decide to hand over no goods. Previous generations still get $C_1 = L/2$, $C_2 = L/2$. However, generation t gets $C_1 = L/2$, $C_2 = L$. Generation t+1 gets $C_1 = 0$, $C_2 = L$. Clearly, generation t+1 will not start the string of gifts again, because all it can do thereby is lose second-period consumption. So all future generations get $C_1 = 0$, $C_2 = L$. These observations explain the existence and properties of our positive net worth "social contrivance."

Our "social contrivance" of a positive net worth entity allows us to converge to the $C_1 = L/2$, $C_2 = L/2$ allocation. Let us suggestively call this entity the "banking system." The banking system behaves as follows. Each period it takes delivery from the old on promises for goods issued when they were young. Then the banks sell these goods to the current young competitively for promises to deliver goods in the following period. The net worth of the banking system is the value of the promises of future delivery which it holds.

Let P_t be the units of goods which a young person of generation t gets for the promise of one unit of goods next period. Each individual is a price taker and takes P_t as given. Let ℓ_t be the units of goods promised by a typical individual of generation t. Let us generalize our model just a bit, and assume that every individual of generation t is endowed with $L_t > 0$ when old. Then the problem of the young individual of generation t is:

$$\max_{\ell_t} \sqrt{P_t \ell_t} + \sqrt{L_t - \ell_t}.$$

This is solved uniquely by ℓ_t satisfying

$$(1) \qquad P_t/\ell_t = 1/(L-\ell_t).$$

While the individual views herself as choosing ℓ_t given P_t, the actual amount of goods purchased, $NP_t\ell_t$, is determined by the promises to deliver issued by generation t-1. Therefore, in equilibrium, the price P_t is determined by $NP_t\ell_t = N\ell_{t-1}$. Plugging this equilibrium condition into (1) and rearranging yields:

$$(2) \qquad \frac{\ell_t}{\ell_{t-1}} = \left(\frac{L_t-\ell_t}{\ell_t}\right).$$

Expression (2) is very suggestive. It has the following immediate implications for $\ell_{t-1} > 0$.

$$(3) \qquad \ell_t > \ell_{t-1} \text{ if and only if } \ell_t < \tfrac{1}{2} L_t$$

$$(4) \qquad \ell_t < \ell_{t-1} \text{ if and only if } \ell_t > \tfrac{1}{2} L_t$$

$$(5) \qquad \ell = \ell_{t-1} \text{ if and only if } \ell_t = \tfrac{1}{2} L_t.$$

Suppose as assumed earlier that $L_t = L$ for all t. Then (2)-(5) imply that a nonzero sequence $\{\ell_t\}$ is either monotonically increasing with limit L/2, monotonically decreasing with limit L/2, or constant at L/2.

Expression (2) is a quadratic in ℓ_t which has positive root

$$(6) \qquad \ell_t = \tfrac{1}{2}[\sqrt{(\ell_{t-1})^2+4L_t\ell_{t-1}}-\ell_{t-1}].$$

Notice from (6) that $\ell_{t-1} = 0$ implies $\ell_t = 0$; that if $\ell_{t-1} > 0$, ℓ_t is increasing in L_t; and ℓ_t is increasing in ℓ_{t-1}. Moreover, if the sequence $\{L_t\}$ is increasing without bound, then a nonzero sequence $\{\ell_t\}$ is also increasing without bound.

We have assumed that each generation honors its promises to deliver goods. But suppose generation t fails to do so. It, of course, is better off. Generation t+1 is worse off, but it cannot be said that generation t broke a promise to generation t+1, because generation t+1 was not alive when any promises were issued. Perhaps it can be said that generation t has broken its promise to

generation t-1. But generation t-1 does not care whether the promise is broken! No individual in his individual capacity has a claim against individuals of generation t! The banking system is, indeed, a social contrivance.

We have named our positive net worth entity "banking system." Clearly, to maintain the net worth, the banking system must be regulated. If the regulation is perfect, we get our solution. Instead, let us suppose that the regulation is imperfect. Specifically, let us assume that at the cost of K units of second-period consumption an individual can avoid meeting $\alpha \cdot 100$, $1 \geq \alpha \geq 0$, percent of her promised delivery. An individual of generation t will exercise this option if not exercising it implies that

$$(7) \qquad \alpha \ell_t - K > 0.$$

When the individual exercises her option to avoid delivery, she extracts a portion of the net worth of the banking system. We call this event a "banking panic," as all individuals do so at the same time.

Now let us examine the behavior of our model with imperfect regulation. First, assume, once again, that $L_t = L$ for all t. Then for any $K < L/2$ and any $\alpha > 2K/L$ there will come a time when this condition (7) is met. Indeed, with $\alpha < 1$, this occurs repeatedly. With each banking panic ℓ is reduced, but then climbs smoothly back towards L/2. If $\alpha = 1$, there is one terminating banking panic, and ℓ remains at zero thereafter. Second, assume that $\{L_t\}$ is increasing without bound. Then $\{\ell_t\}$ also is increasing without bound. Therefore, for <u>any</u> $\alpha > 0$, $K > 0$, there will come a time when the individual exercises the partial delivery option.

Interpretation of the Model

As long as one accepts the interpretation of the net positive worth entity as the banking system and the mass choice of the partial delivery option as panic, then we clearly have a model of recurrent and a once-and-for-all banking panic. However, we also promised an explanation of decreased investment demand. Naturally, one would also want an explanation for reduced production and mass unemployment. As the model has no production, no labor, and no capital, it clearly requires some imaginative interpretation to generate such explanations. We provide below a brief interpretation addressing these matters.

First, let us consider the banking panic. It is, of course, not at all a stretch of the imagination that banks play a role in facilitating borrowing and lending. Nor is it a stretch of the imagination that they are regulated positive net worth entities. However, the imperfection of regulation may seem unlikely in this simple model. Nor can it be claimed that a coherent model of the process of regulation is presented here or elsewhere. Indeed our imposing ad hoc imperfection can only indicate possibilities. However, intuitively it does seem very possible that in reality actual regulation is not perfect. In the first place, the regulation of financial institutions may not have been purposefully designed to protect net worth. Moreover, the world is much more complex than our model, making appropriate regulation less obvious. Also, market participants, both regulated banker (lender) and borrowers, have motive to circumvent the regulation, to make the regulator's job difficult. They may, for example, overstate the value of a bank's portfolio of loans by understating the associated risk.

In our banking panic a whole generation is made better off by circumventing regulation. When interpreting a simple model, it is often unwise to take its implications too literally, and this is one of those occasions. The essence of what the model is capturing is that for each transaction taken separately, all

the participants have motive to circumvent the regulation. More generally, most or all individuals may be better off if regulation cannot be circumvented, but individuals in each of their transactions have motive to circumvent the regulation. All individuals want a viable banking system, but each banker must be competitive in offering deals, and each bank customer tries to get the best deal she can. In the Appendix we briefly sketch a model of spatial separation having such properties (see also [6]).

Now we turn to production, employment, and investment. The model is easily modified to have endowments of labor and a production technology. Moreover, input of labor today producing goods tomorrow can be interpreted as the result of a technology involving capital. Very generally, capital is a means of using today's labor to produce goods more efficiently tomorrow. This is what our (0, L) endowment pattern is capturing, the trade-off of labor today for goods tomorrow available to those who enter the economy. In such a production model, the banking panic can indeed produce reduced production, reduced employment, and reduced demand for capital (see Bryant [3]). Moreover, an increasing $\{L_t\}$ sequence can be interpreted as an advancing economy, an economy using higher and higher technology. Very generally, an advancing economy is one which produces a more and more favorable rate of exchange of labor today for goods tomorrow.

This paper was motivated by the question of why we have not had a banking panic in the postwar period, and if we are now "due." We finish the paper by using our analysis to provide a disquieting answer. Stricter regulation, a higher K and lower α in our model, can put off a collapse, perhaps indefinitely. The stricter banking regulation imposed in the 1930s can explain why we have had a respite from banking panics. However, we also saw in our model that unless the new regulation is perfect, an ever-advancing economy will eventually reach the "panic stage." And our economy certainly has advanced since the 1930s! Moreover, recently there have been two disquieting developments. We have both the

application of advanced technology to financial markets, presumably providing more efficient means to circumvent regulation, and a move towards deregulation of the financial markets. It is worth noting in this regard that the continued existence of deposit insurance provides no solace. Deposit insurance protects depositors, but it does not protect the net worth of banks! Lastly, we note that our model indicates that the more advanced the society, the more potentially disastrous a banking panic is. The worst case is that we lose all the advantage of being an advanced economy. Our land is hardly capable of supporting two hundred million self-sufficient farmers! Naturally, one need not take this worst case seriously to be disquieted by recent events.

Appendix: The Appalachian Trail

The Appalachian Trail begins in Maine and "ends in Georgia." That is to say, it ends nowhere. Each day N infinitely-lived individuals start on the Trail in Maine. All along the Trail, a day's walk apart, are campgrounds. Each campground has two campsites, a and b. Each site has room for N individuals. They are allocated on a first come, first serve basis. Each individual must spend two nights at a campground to recover. On day t, $L_t > 0$ consumption goods are provided to each individual at every site b by one of the campground's rangers. Nothing is provided to site a. The consumption goods cannot be transported between campgrounds, but can be transported between sites at a campground. Another ranger also regulates a "bank." Each individual at a site (a) bids for the handouts from site (b) with promises of handouts next period. The ranger enforces promises. However, at the cost of a bullet hole destroying $\bar{b}$ goods, a camper can outrun the ranger.

Consider an individual of generation t. Let his consumption of the consumption good at sites a and b, respectively, in campground j be c_j^a, c_j^b. Then, for any i, j with i > j, and for any compact constraint set $T \subset R_+^4$, he chooses c_j^a, c_j^b, c_i^a, c_i^b in T to maximize the function

$$U_t(c_j^a, c_j^b, c_i^a, c_i^b;\ i,j) = \sqrt{c_j^a} + \sqrt{c_j^b} + \sqrt{c_i^a} + \sqrt{c_i^b}.$$

On the Appalachian Trail banking panics make everyone worse off.

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