# MONEY MATTERS

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by

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Whenever someone begins a talk the audience is anxious to discover two things: where the speaker is coming from, and where he's headed. Let me begin, then, by telling you about my attitudes regarding money.

I believe that money is absolutely essential to the operation of a free society, because it enables a wonderful scheme for assigning authority. Money represents -- among perhaps many other things -- transferable authority. Such authority is limited by the condition that any transfer of goods or services in exchange for money is, ideally, an entirely voluntary transaction, both for the seller and for the buyer. There is no coercion involved.

In contrast, any formal scheme of authority -- even those in which the authorities have been democratically elected -- depends, in the final analysis, upon coercion: the threat of the use of force. This freedom from coercion is truly a beautiful feature of the money-as-authority scheme.

But another characteristic of the system is even more important from a practical point of view. The transferability feature automatically provides for positive feedback. Thus profits, and hence more authority, accrue to those who exercise their authority to do things that are judged to be worthwhile by others with money.

Thus this scheme of money-as-authority gives every competent person a chance to exercise his initiative and good judgment. It allows a free society to function efficiently without depending upon the wonderfully improbable possibility that a group of benign and selfless geniuses will be elected by the uninformed masses to design and operate a huge bureaucracy capable of providing abundance and happiness for all.

So I'm very much for money and free enterprise. I am not, however, an honest-to-God, dyed-in-the-wool, true-believer. Good as it is, the system has shown itself to be imperfect in several ways. This is where I'm headed in this talk: to outline some of the flaws of the money-as-authority scheme, and to suggest a method of approaching the task of rectifying these flaws.

There is one important fault in the system that I do not intend to treat, except to mention here. It is obvious that one must assume that the people know what is good for them, on the one hand, and that the system is capable of offering all of the goods and services that the public wants, on the other.

To assert that the public, or part of it, does not always know what is good for it, is to admit to a certain elitism. I plead guilty, but ask you to consider popular addictions such as alcohol, gambling, and hard drugs. More innocent, but much more pervasive, is the interaction between bad taste and advertising which produces an embarrassing display of faddish gadgetry whose sole purpose is shameless strut. One hundred-twenty dollar basketball shoes, or eleven-thousand dollar, inaccurate, wind-up wrist watches, for example.

At the same time, the free enterprise system does not seem well adapted to the task of providing certain public functions. I have in mind such things as public safety, a pollution-free environment, spacious parks and gracious tree-lined streets, good libraries, or facilities for pure research. These matters we will assume to be the responsibility of the state, or the philanthropic super-rich.

Leaving these issues aside, there are. plenty of problems left. In fact, our society seems to be in a state of near crisis, and many of the difficulties facing our country seem to be aggravated by, if not caused by, a lack of money. The top of anyone's list would probably include these items:

High rates of taxation

Huge federal debt and ongoing deficits

Housing unaffordable for a large fraction of families

Infrastructure in shambles

Declining proportion of well-paying jobs

Unspeakable conditions of inner cities

Medical cost excessive and rising

These are some of the problems that we urgently need to solve but seemingly cannot, not because we lack the real resources -skilled labor, intelligent management, tools, materials or land - but because we simply haven't got the money.

Who could disagree with that statement? Well, no surprise, I do, for one. And my argument goes to the word simple. Money is not simple. Bankers do not understand money. Neither do economists. Nor do financiers. And, certainly, I do not understand money.

The last statement is easily believed, but how can it be that all of the brilliant minds that have studied money and the economy have not been able to make any real progress? Adam Smith and John Stuart Mill, J. P. Morgan, father and son, John Maynard Keynes, Paul Samuelson and Milton Friedman, Paul Volker and Alan Greenspan. These are not lightweights. Yet if you look at current theories of money and the economy, you find a wild diversity of opinions with virtually no consensus on anything.

The explanation is simply that Economics is no more of a science than is History.

Here I reveal a deeply held prejudice that many of you will not be comfortable with, namely, that while real progress outside science may be possible, it has yet to be observed. Before you dismiss this as outrageously presumptuous arrogance, let me say that science is not wonderful because of any superiority of the people who work at it. If it is wonderful, it is because the problems that are addressed are amenable to experimentation. Simply that.

So what's my point? What I want to do is to propose a scheme that would enable monetary theorists, economists and politicians to test their theories, to test their proposed solutions to problems, in a sort of quasi-scientific manner.

But the scientific method demands that repeatable experiments be possible, and that all relevant parameters be individually controllable. How can it be imagined that Economics - still essentially a branch of History, regardless of all the fancy mathematics which has been introduced - how can it be imagined that Economics could ever be made scientific in this sense? The scheme that I have in mind would employ computer emulations of model economies to enable experiments that are scientific.

I need to explain this term - '<u>emulation</u>'. Emulation is the word that computer people have co-opted in reference to techniques for handling fairly simple interactions between very large numbers of entities. The scattering of neutrons within an atomic reactor, or the motions of individual stars in a galaxy, are good examples of problems where the emulation technique is useful. The technique is very straightforward: one just programs the computer to calculate all of the interactions between all of the zillions of entities, so as to keep track of the condition of each.

Now it turns out that for the first problem -- finding the neutron flux from a reactor -- the emulation technique is the only workable approach. Other problems, such as tracking the evolution of a galaxy of stars, admit another approach, which is referred to as a <u>simulation</u>, in which some theory -- here the laws of statistical mechanics -- are used to predict the system behavior. The computer is just used to handle the messy mathematics.

It is interesting that simulations of galaxy behavior succeed only for the simplest possible cases. If you really want the right answers, you have to grind out the emulation.

It is evident that the interactions of people in an economy are much more complicated that the interactions involved in the examples from Physics just mentioned. For this reason, I believe that any simulation of the dynamics of money in an economy is a waste of computer time. And to date, that is all that has been attempted, as far as I know.

Economic simulations are old hat. What goes in are abstract theories of economics: supply-demand curves, assumptions regarding saving and investment, formulas such as MV = PQ, which is supposed to relate the money supply, M, and its velocity, V, to gross domestic product, PQ, where Q is. the quantity of goods produced, and P is the average price. What comes out of such a simulation is well described by another bit of computer argot: GIGO - G-1-G-0 - which stands for 'garbage in, garbage out.'

In contrast, an economic emulation would attempt to faithfully imitate the behavior of individual human decision makers -- shop keepers, manufacturers, bankers, security dealers, consumers, etc., who by their exchange of information, money, goods and services, make an economy function. It would operate like a sort of all-move-at-once monopoly game.

Of course, there is no possibility of modeling an accurate representation of the real economy. Nor is there any need to do so, in my opinion. The fundamental issues regarding the dynamics of money can be explored using any model economy that gets the monetary facts straight. That is to say, the model must be strictly accurate only as regards the financial system.

I believe that even partial success in this endeavor would prove to be of immense value. I say this because I have a strong prejudice as to what we would discover as a result of such computer emulation experiments. What we would find, I feel, is that there are no monetary limitations as to what our culture can accomplish.

My guess is that we will be able to use such emulations to develop monetary strategies that will free us - give us the authority, that is - to do all of the needful and wonderful things that we know we could do, if only we had the money.

I do not intend to go into any detail regarding the structure and complexity of the economic model. It might be imagined, to keep things as simple as possible, that the model describes the transactions of a very simple and austere culture. The people might

be assumed to be satisfied with diet consisting of four or five staples plus one luxury food item - that sort of thing.

The model would be, in any case, a challenge to implement. Special programs would have to be written for each business function represented, and each of these would have to represented in the emulation by several variant copies in order to permit competition. The physical restraints on production would have to be carefully represented. The heart of the system would be a communication network linking buyers and suppliers by means of a bulletin-board type database that would show prices and permit orders to be made. I leave the details to the experts.

The important thing is that there is no guesswork required. No fancy theories. Every program that is needed can be put together by a business specialist working with a computer programmer. The program used to conduct a bank's business, for example, would be constructed by a banker.

Let me now discuss a few of the monetary problems that I think would be most profitable to study. I don't intend to address problems of current interest, such as. the effect of free trade on the standard of living, or the question as to whether reducing capital-gains taxes may, by boosting the economy, actually increase government revenues.

These are important issues, and certainly will be studied if ever an economic emulation is becomes a reality. The problems that I want to suggest for study have to do with the very structure of our monetary system, which I believe to be flawed, and also, importantly, with the attitudes that people, especially leaders, have regarding money.

It is obvious that the character of the monetary system is dictated neither by the laws of Nature nor those of God. It is purely an invention of Man. It evolved without any conscious planning, and incorporates many arbitrary features, some of them rather bizarre. A good example is the fact that banks create and destroy money. Today every economist understands this, yet many bankers adamantly deny that they engage any such nefarious activity.

I feel strongly - but cannot, without the emulation, prove - that we may be able to modify our monetary system so as to give ourselves permission, as I have said before, to do all of the needful and wonderful things that we know we could do, if only we had the money.

Here are the four problem areas.

Problem 1. Interest and Debt. All of the money that exists in our country was born with a twin called debt. Unfortunately, the twins are never identical: the one called debt is always larger. This is because interest is demanded.

Problem 2. Inflation, Booms and Busts. The value of money and other assets is in the eye of the would-be-beholder, and humans are linear extrapolators.

Problem 3. The Need for Income Redistribution. The rich get richer and the poor get poorer.

Problem 4. Selfishness and the Need. for Understanding MoneyDynamics. Everyone seems to suffer from what might be called the National Salary Delusion.

Let us consider each of these in some detail.

First, regarding debt and interest. Everyone understands the idea that increased production and wealth can result from the development of new tools and new techniques.

This concept lies behind our acceptance of the idea that money invested should earn profits, if all goes well. But our monetary system, in the absence of deliberate action by the Federal Reserve Banks, has no mechanism for the creation of such profits. Absent Fed action, the whole affair is a zero-sum game with respect to money. If somebody gains, somebody else must lose. In this respect our monetary system fails to imitate reality, where it is clear that everyone may profit from a new development.

Since I just mentioned the Fed, you may think that that institution can do what needs to be done, namely, create the money that should rightly correspond to the real profits. But, alas, the Fed cannot do this. It can, of course, increase the money supply, but it can only do this by creating a more-than-equal amount of debt. Interest must be paid.

So the system has this built-in flaw. There is never enough money to pay off all of the obligations. So how have we managed to get this far? There are essentially two answers. First, one can have crashes, in which all the unpayable debt is declared to be "bad", and the system is reset to zero, as it were, and re-started. This is disastrous to the weaker banks and to those unable to meet mortgage obligations. And, of course, the working class suffers horribly in the accompanying recession or depression.

The second way to keep the game afloat is to develop an insensitivity to the enormous numbers that describe the debt, and to put in place mechanisms to forestall bank runs and other panics. The FDIC and certain reforms instituted by the SEC are examples of this approach. There is a problem with this geometric ballooning of debt, however. If

the rate of interest on the debt exceeds the real rate of growth of the economy, there is a threat, if not a certainty, of inflation.

The Fed has in recent times raised interest rates with the stated objective of fighting inflation. The rates have often been hiked to levels that greatly exceeded the real rate of growth of the economy. No one seems to realize that businessmen will not hesitate, in boom times, to simply pass on the extra cost of borrowing to their customers. It seems obvious that raising interest rates in such a situation will promote inflation. (I spoke to an economist at the Federal Reserve Bank of Cleveland. He admitted after a long pause that such an effect might be possible, but he didn't think it could be important.) A cynic might think that Paul Volker and, now, Alan Greenspan, have in mind the interests of bankers rather than that of the Nation.

What sort of things might be tried in the emulation as possible corrective modifications to the system to eliminate this problem? How about having the treasury spend debt-free money into the economy at a rate that corresponds to an honest estimate of the current rate of growth of the economy? Such a scheme would put our monetary system in correspondence with reality. We could then keep the debt under control, and let foolish bankers fail without dragging down the prudent one as well.

Maybe this is craziness, maybe not. But with an economic emulation we have a chance of testing this concept, or others that might be suggested.

Let's turn to the second problem with the monetary system: Speculation and Inflation.

Humans are clever to first order: they have a keen appreciation for the present value of an asset and for the rate at which that value is changing. But they have never had any luck with the second derivative -- the rate at which the rate of change is changing. And no wonder -- the 2nd derivative is inherently jumpy -- it's ultra sensitive to small changes in the value of the asset.

So people tend to believe that current trends will go on forever. Humans live by straight-line extrapolation. Sometimes on a logarithmic scale. Thus if real estate prices in Southern California have been doubling every three years, people, including especially bankers, will assume that they will continue to do so. If Wal-Mart has been regularly doubling and splitting, folks will buy in, expecting more of the same.

Now the value of land and the value of stocks have an influence on our money supply, since such assets are routinely pledged as collateral to secure loans. Also bankers, including Fed bankers, are not immune to the error of linear extrapolation. Thus every new darling of speculation will cause an increase in the money supply, and of course, an increase in the debt.

The world has seen some duesies. The tulip-bulb mania, the South Seas Bubble, The three-decker leveraged holding companies of the late twenties, the overpriced Florida and Texas condos of the Eighties, the swirl of corporate takeovers financed with junk bonds.

Again what might be done to eliminate, or at least discourage, such excesses? It would seem an easy matter to modify the banking laws to prevent bankers from accepting as legitimate collateral the wildly inflated asset values of an overheated market. Such laws would, in my guesstimation, do much to prevent the inflation of real estate values, since it is almost exclusively the banker who legitimizes increases in these values. Again, with a proper computer emulation, we may be able to gain insight, and so devise strategies to correct these aberrations.

The third problem is the need for redistribution of incomes. Two things can prevent the truth of the line, 'The rich get richer and the poor get poorer': The first and best is growth in the economy, and the second is that great Satan of the Republican party, Government intervention.

Clever people with money will unfailingly produce attractive goods and services that they will offer in advertisements made irresistible with super-liminal promises of sex and status. The non-rich will buy these offerings eagerly, often on credit using plastic that demands 20% interest. The money thus percolates upward. Since the non-rich must be relied upon to do the consuming that is the basis for the whole economy, there is an imperative need to somehow coax the rich into putting the money back into the hands of the non-rich.

To this day, we have mostly relied on expansion. We 'grow the economy,' as is now fashionable to say, good grammar notwithstanding. The investment by the rich re-circulates the income to the non-rich who are employed to build the systems that will increase production and expand the distribution system.

The question is -- can this go on forever? "No problem!" says the linear extrapolator. But realistically, there are two great impediments, already visible and rising, that insure that further growth in the production of material goods must slow and finally cease altogether.

The first is the environmental consequences of growth in this area. The day can be calculated when the continent will be completely paved over, when every fish will have been caught, when fresh air and exhaust will be indistinguishable.

The second ominous phenomenon is, strangely enough, the ever-increasing productivity of workers. Since an ever-shrinking fraction of the potential work force will be sufficient to produce the goods that can be sold to the ever-shrinking fraction of the population that can find employment, there will develop a permanently unemployed underclass. In fact, the beginnings of this is already a feature of our time. And in the not very distant future artificial intelligence will begin its inevitable decimation of the white collar workforce.

Arguments to the effect that there are plenty of jobs for highly trained technicians, and that all that's needed is more and better education, fail to stand up under quantitative analysis. Picker XRAY may be advertising in the help-wanted columns, but their needs will be filled by one or two well-trained specialists with IQs in the 165 range. The truth is that ordinary human beings are becoming,. and soon will be, obsolete.

This suggests that there may be a need to modify our thinking about the relation between working and consumption. It is, after all, deeply paradoxical that tremendous advances in productivity should lead to a situation in which a tiny group of people, fortunate enough to be endowed with abilities not yet automated, will live in unthinkable luxury, while the vast majority are left to scrabble in the leavings of their betters.

Beginning with the New Deal, liberals had been successful in using the income tax laws to implement an artificial re-distribution- of incomes. Tax the rich, and spend the money back into the economy.

Some of the projects, such as the federal highway system, sponsored growth generally as well as accomplishing the return of money to the non-rich. Unfortunately, the highways themselves and the industry whose growth they fostered were damaging to the environment.

Other projects were eco-neutral, but did little to encourage growth generally. I have in mind NASA's Moon Race - or the wonderful foolishness of controlled fusion using magnetic confinement - or Star Wars - or all of the glamorous weaponry of the Cold War: the SR71, the Trident Sub, The Stealth Bomber, WOW! - Great stuff. Some people, mostly liberals, think that all such spending was, and is, a terrible waste of precious money. I don't, as you will see when I get to the last great problem, that of our attitudes regarding money. I think that such spending is not only harmless, but actually beneficial.

Incidentally, one area of the recent growth is one of that poses no threat to the environment, and is ideal with respect to income re-distribution, since it is very labor intensive. It is also universally accepted as being in the best interest of all people. Yet,

paradoxically, its growth is seen as a noxious thing, and many study groups have been formed to formulate strategies to stifle its growth. Can you guess what I refer to? It's medicine, of course! Or "Health Care," as we are now expected to say.

In my view, Medicine, Education, and Research in general are the areas of growth that should be cultivated for the purpose of providing the income re-distribution necessary for a stable economy. All are eminently useful, environmentally neutral, and labor intensive. With computer emulation, we might see whether such a strategy is viable.

Before leaving this problem of income re-distribution, I'd like to mention two radical ideas that have been put forward by conservatives.

Henry Ford's idea was to pay workers enough to buy the stuff that they made. When he raised his workers wages to five dollars for a nine-hour day, he more than tripled the prevailing rate of pay for factory workers. What would happen if we were to follow his example, raising the minimum wage to, say, $13.50?

Conservatives would predict disaster, and today's "liberals" would probably agree that it would not be a good thing. But with an emulation, we might get the real answer.

The other radical idea comes from that darling of conservatives, Milton Friedman. His answer to poverty is a negative income tax. I know he'd not accept this mechanism as a substitute for growth in effecting income redistribution, but still it would be nice to know how such a scheme would work. Again, computer emulation would be useful.

The final thing that I want to address is not really a structural problem of our monetary system, but rather has to do with our attitudes regarding money. We are all more-or-less selfish, I believe, but this is not in itself a bad thing. However, it's my view that this natural impulse, coupled with a basic misunderstanding of the nature of money dynamics, is responsible for many of our apparent problems and, perhaps more importantly, the opportunities, past, present, and future, that we may have missed or will miss.

So let's consider current attitudes toward money. It is my contention that nearly everyone suffers from what may be called the "National Salary Delusion."

Most of us grew up in homes where the Father was the breadwinner. His annual income was limited and predictable from year to year. If we spent more than he made, we were in trouble. That is the way it was, and is now, except that now it's likely that Mom is also out there working.

If, as apparently natural, we apply this image of the Household unconsciously to the Nation, we expect that there is something like a National Salary. We are prepared to believe that money spent is simply gone. We are prepared to believe that the amount of money that can be spent in a year is limited by this imaginary National Salary.

Let's look at these two ideas; first, that money spent is gone; and second, that there is only so much money available to be spent annually.

What happens to the money you spend? First, it becomes part of somebody's sales. Part of those sales, and so part of what you spent, becomes income to the owners and workers of that firm. The rest of the money, and so part of what you spent, goes to the suppliers of the first firm, and so becomes part of their sales, of which part becomes income to their workers and owners, and so on, and on-and-on, 'till all of it shows up as income. And not just all of it -- it will likely turn over three to five times a year.

None of the money leaks out of the system, and hence, of necessity, some of it, a tiny fraction, comes back to you. And, if you are a typical person - that is, if other people spend as you do - the same tiny fraction of what each and every one of them spends will come through your hands as income. And the total of all of those tiny contributions to your income will add up to exactly what you spent in the first place.

This may sound strange. It may help to think of the depression that would swiftly overtake us if every person decided to cut his spending to the absolute minimum, or the wild boom that we would experience if everyone were to spend without regard for the future.

These things are a simple consequence of the fact that the monetary system is closed. One may make an apt analogy to hydraulics: money is like an incompressible fluid flowing in a system that has no storage tanks.

To naive people, banks may appear to store money. But, as you all know, the largest part of any new deposit in a bank is swiftly loaned out, and this process is repeated by other banks, resulting ultimately in a geometric sum which exceeds the original deposit by a handsome multiplier, a factor of five under the present reserve requirement.

Let's apply these ideas to taxation. What happens to all of the money that is sent to Washington in taxes? The Government spends it, of course, but that doesn't mean that it is done away with. No. It comes back to us. The system is closed. None of the money spent putting the astronauts on the Moon made the trip with them. All of that money is right here on the ground, here in the USA, going from hand to hand, being counted again and again as income. It's still here - you've got some in your wallet right now.

What do you think would happen if the Government were to suddenly disappear - so that no one would have to pay taxes? What would happen to your income? Everyone makes the mistake of thinking that their income would be unaffected, so that they'd have much more to spent on the good life. But they're forgetting that the system is closed. The money you pay in taxes is no different from the money that you spend otherwise. I have argued that the money you and others spend diffuses through the economy and comes back to you, if you are a typical person. The same is true for the money you pay in taxes. It follows that if no one paid taxes, the result would be that your income would be reduced by exactly the amount that you formerly paid in taxes. If, it must be said, if you are a typical person. The system is closed and there are no storage tanks.

Now people - even members of congress - understand these things, but only as regards the initial transaction. Thus a base-closing will be mourned locally, but cheered in all remote regions. Welfare mothers are seen as the sole beneficiaries of their monthly checks. We talk as though they literally ate the money. But the truth is that part of my income, and even part of your income, comes indirectly from such payments.

Consider the interest on the National Debt. It is uniformly treated as a pure and heavy burden, as though the money were burnt. But the truth is that it contributes mightily to the National Income, and hence to your income, even if you own no Treasury bills, notes or bonds.

Money spent is not simply gone. What we have is not a National Salary, but a National Money-Go-Round.

Now let me turn to the other question, namely, what determines how much money can be spent annually.

Imagine that prices are stable and that the FED is not FEDdling with the money supply. In such a situation - unlikely though it may be - the amount of money that we can spend as a nation is exactly proportional to the number of transactions that can be executed. It is not necessary that these transactions implement economically meaningful activity such as making steel, or baking bread, or building houses. If we were to limit transactions to such useful activities, then the amount of money we could spend would be proportional to the total of useful work done. It is not true that there is a monetary limit to how much money can be spent. The answer really depends on how clever we are at deploying our resources and on how hard we willing to work.

Another related point of great importance has to do with our thinking regarding costs. Ignoring particulars, we assess costs strictly in terms of the dollars spent. But the real cost should logically be assessed in terms of what sacrifices had to be made in connection with the particular project. If the real resources used in the project -- labor,

management, tools, real estate, etc. -are not brought into shortage as a consequence of implementing the project, then the real cost of the project should be counted as zero. I believe this to be the case for all of NASA's projects, and indeed, for of all of the much more numerous and generally much larger projects executed by the military-industrial complex during the Cold War.

So there is no National Salary. It is a delusion that fosters jealousy, bitterness and pessimism. Under its influence the electorate encourages lawmakers to slash useful programs that do not adversely affect any other aspect of the economy. It is a delusion that undermines our confidence to carry out the glorious dreams of the wise and bold men who founded our Nation. We seem now to feel unable to even maintain the country that we inherited from our fathers. What a shame. We really ought to do something about this.

These ideas are only conjecture on my part. But if I am right about these things, verification using computer emulations of model economies should be easy. And if it turns out that I am right, then those who develop and demonstrate these emulations should be able to convince the people who mold public opinion of the error of our needlessly tight-fisted monetary policies. This done, corrective measures could be undertaken.

Let me try to summarize all of this. I believe that if one considers only the human and material assets available in the United States, it is hard to be anything but wildly optimistic about the future. Startling discoveries in every field of science come at an accelerating rate from our universities and other research institutions. These are swiftly adapted to produce striking advances in the technologies of Medicine, Engineering, Communications, and Computers. Our productivity is the world's highest, and continues to grow at world-class rates.

And yet, alas, and yet, because of what are judged to be insurmountable fiscal problems, the consensus attitude regarding the future is very pessimistic.

The War on Poverty, now an embarrassment, is presumed lost as we turn our backs on the ever-increasing percentage of families who fall below the poverty line. Indeed, the poor are now being blamed for what the more fortunate judge to be an insupportable tax burden. The unsightly homeless now face laws that make a misdemeanor crime of merely being motionless in a city. Despite staggering unemployment rates among young people, politicians agree that we must soon delay retirement into the mid-seventies.

We are influenced in everything we do by the nagging worry that the mounting debt must inevitably bankrupt the whole system. Struggling to achieve the well-advertised

'good life' as real earning decline, ordinary people feel deeply resentful of media-provided scapegoats: welfare recipients, instant millionaire athletes, and political insiders.

It is my belief that there is no reason for all of this pessimism. I believe that our fiscal problems have their root in the flawed design of our monetary system, and, perhaps even more, in the attitudes that people have toward taxation and spending. I believe that this situation can be corrected, so that our fiscal condition properly reflects the real condition of our country, which is robust and full of wonderful promise.

But effective corrective measures cannot be designed by applying the unverified theories of Adam Smith or John Maynard Keynes or Milton Friedman. Only scientific understanding will suffice. I hope that computer implemented emulations of model economies, such as I have hastily sketched, may in the future facilitate the required understanding.

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