14. A Monetary Model of Capitalism

Many of the foundations on which neoclassical macroeconomics is built arose from persevering with methodological choices that the 19th century Founding Fathers of Neoclassicism made out of expediency rather than preference. They assumed that all economic processes occurred in equilibrium, so that they could model the economy using comparative statics rather than using more difficult dynamic differential equations; they avoided thinking about money and modeled the simpler process of barter instead; they ignored uncertainty about the future and, as Keynes put it, tried to "deal with the present by abstracting from the fact that we know very little about the future" (Keynes 1937, p. 215) and so on.

Though these choices made it easy to concoct simple parables about supply and demand, they actually made mathematical modeling of the economy harder, not easier. The absurdities that later neoclassicals added—from fallacy of the horizontal demand curve to the intellectual travesty of the "Representative Agent"—were products of clinging to these simple parables, despite the deep research that contradicted them.

Economists trained on these methods are now scrambling to make ad hoc modifications to the core neoclassical parable to produce hybrid models that mimic the real world phenomenon of the Great Recession—which, according to the parables, cannot occur.[178] Though such models will superficially ape reality, they will do so for the reasons that Solow gave, that the addition of various "imperfections" results in a model that "sounds better and fits the data better" simply because "these imperfections were chosen by intelligent economists to make the models work better..." (Solow 2001, p. 26).

This is the difficult road to relevance—take a theoretical framework in which the real world phenomenon you are trying to describe cannot happen, and tinker with it until something resembling reality emerges. It will not last. Once the global economy emerges from this crisis, if this approach still dominates economics, then within decades these "imperfections" will go the way of the Dodo. Economists will return to the core parable, and the crisis we are now in will be seen as the result of bad Federal Reserve policy,[179] rather than a manifestation of

[178] I discuss one instance of this—Krugman's attempt to build a model of debt-deflation—at the end of this chapter (Eggertsson and Krugman 2010).

[179] The nominated policy failing this time would probably be the alleged deviation from the Taylor Rule after 2001—the case Taylor himself is already making.

capitalism's innate instability—amplified by a finance sector that is almost designed to generate Ponzi Schemes.

We have to do better than that. We have to start with foundations from which the phenomena of reality emerge naturally by constructing monetary models of capitalism built on the melded visions of Marx, Schumpeter, Keynes and Minsky.

Methodological Precepts

An essential first step towards a meaningful macroeconomics is to acknowledge the one profound lesson from the failure of the neoclassical experiment: that Strong Reductionism is a fallacy. Macroeconomic phenomena—and even phenomena within one market—are emergent properties of the dynamic, disequilibrium interactions of individuals and social groups in a rich institutional environment, constrained by the physical, temporal and environmental realities of production. These phenomena will not be predictable from the behavior of isolated individuals. Instead, macroeconomics is a self-contained field of analysis, and it must be reconstructed as such. The Reductionist route must be abandoned.

There are basically two routes by which models of a new "Emergent Phenomena" macroeconomics could be built: the "bottoms-up" approach that has always dominated economics, but modified in the light of the modern knowledge of Complex Systems; or the "tops down" approach that typified the work of Marx, Schumpeter, Keynes and Minsky, in which the economy is described at the level of aggregates—evolutionary change, social classes, aggregate production, aggregate debt levels and so on.

The former approach takes the macroeconomic phenomena as given, and attempts to build computer-based multi-agent models in which those macroeconomic phenomena arise as emergent properties of the models. The latter works at the level of aggregates, and puts the verbal models of the great non-neoclassical thinkers into the form of dynamic equations.

Most economists who are trying to build macroeconomic models that transcend the neoclassical dead-end are taking the former approach (Barr, Tassier et al. 2008; Seppecher 2010).[180] This approach is worthwhile, though there are inherent difficulties in it that I discuss briefly later. I have taken the latter approach of trying to put the Marx-Schumpeter-Keynes-Minsky vision directly into mathematical form.

Doing this turned out to be far easier to do than I expected, once I made money the starting point of my analysis of capitalism.

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[180] Seppecher's Java-based model is accessible at http://p.seppecher.free.fr/jamel/.

ENDOGENOUS MONEY

One of the many issues on which Keynes failed to convince his fellow economists was the importance of money in modeling the economy. One reason for this was that money's explicit role in the *General Theory* itself was restricted largely to the impact of expectations about an uncertain future, and the difference between real and nominal wages. Keynes acknowledged that money did not feature heavily in his technical analysis, and that he saw a substantial continuity between monetary analysis and the Marshallian model of supply and demand:

> whilst it is found that money enters into the economic scheme in an essential and peculiar manner, *technical monetary detail falls into the background*. A monetary economy, we shall find, is essentially one in which changing views about the future are capable of influencing the quantity of employment and not merely its direction. But *our method* of analyzing the economic behavior of the present under the influence of changing ideas about the future is one which *depends on the interaction of supply and demand, and is in this way linked up with our fundamental theory of value*. We are thus led to a more general theory, which includes the classical theory with which we are familiar, as a special case. (Keynes 1936, pp. xxii- xxiii; emphases added)

It is therefore difficult to attack neoclassical "supply and demand" oriented models of money as misrepresentations of Keynes. Nonetheless, the Post Keynesian school of thought has made the fundamental importance of money a by-word of its analysis. An essential aspect of this has been the empirically-based analysis of how money is created (detailed in the previous chapter) which contradicts the conventional fractional reserve banking, "money multiplier" model of money formation.

Having empirically eliminated one model of money creation, another was needed—but the initial attempts to do so were clumsy. Rather than the "vertical money supply curve" of Hicks's IS-LM model, some Post Keynesian economists proposed a "horizontal money supply curve" in which banks simply passively supplied whatever quantity of credit money that firms wanted, at the prevailing interest rate. This model, known as "Horizontalism" (Moore 1988), led to a lengthy dispute within Post Keynesian economics over whether the money supply curve was horizontal, or sloped upwards (Dow 1997).

This dispute put the empirically accurate findings of Post Keynesian researchers into the same methodological straightjacket that neoclassical economics itself employed: the equilibrium analysis of intersecting supply and demand curves. Though this was hardly the intention of the originators of endogenous money analysis, it effectively made monetary analysis an extension of supply and demand analysis.

Participants in this debate were aware of the limitations of this approach—as Sheila Dow observed, "[T]he limitations of a diagrammatic representation of a non-deterministic organic process become very clear. This framework is being offered here as an aid to thought, but it can only cope with one phase of the process, not with the feedbacks" (Dow 1997, p. 74). But one of the great ironies of economics is that, because critics of neoclassical economics were themselves trained by neoclassical economists, most critics weren't trained in suitable alternative modeling methods, like differential equations or multi-agent simulation.

For real analytic progress to be made, a watertight basis for Keynes's assertion that money "enters into the economic scheme in an essential and peculiar manner" was required, as well as a methodological approach that captured the feedback effects that diagrams and equilibrium analysis could not.

The former was supplied by the "Monetary Circuit" school in Europe, and specifically the Italian economist Augusto Graziani. Graziani argued that, if money is treated as just another commodity subject to the "laws" of supply and demand, then the economy is effectively still a barter system: all that has happened is that one more commodity has been added to the mix, or singled out as the commodity through which all barter must occur. This is quantitative change, not qualitative, and yet something qualitative must change if a monetary economy is to be distinguished from a barter system.

Graziani's brilliant insight was that, for a monetary economy to be clearly distinguished from a barter economy, *the monetary economy could not use a commodity as money*. Therefore money had to be a non-commodity—something that was intrinsically worthless, and which could not be simply produced as commodities themselves can:

> a commodity money is by definition a kind of money that any producer can produce for himself. But an economy using as money a commodity coming out of a regular process of production, cannot be distinguished from a barter economy. (Graziani 1989, p. 3)

This then led to a simple but profound principle:

> A true monetary economy must therefore be using a token money, which is nowadays a paper currency. (Graziani 1989: 3)

The fact that a monetary economy uses a token—something that is intrinsically worthless—as a means of exchange implies two further key conditions 'In order for money to exist':

> b) money has to be accepted as a means of final settlement of the transaction (otherwise it would be credit and not money);

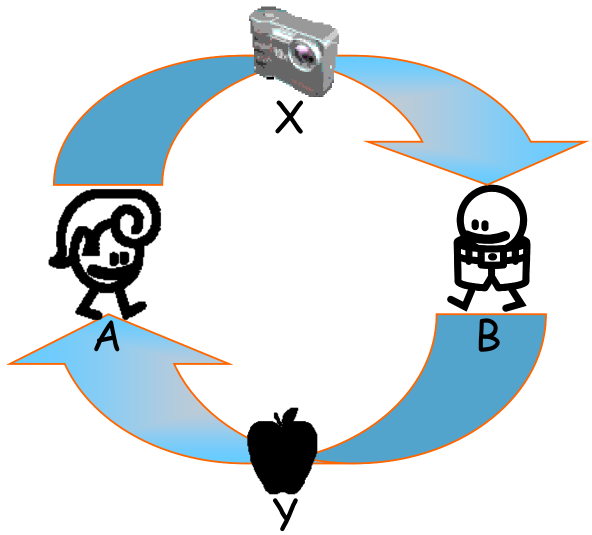
c) money must not grant privileges of seigniorage to any agent making a payment. (Graziani 1989: 3)

From this he derived the insight that "any monetary payment must therefore be a triangular transaction, involving at least three agents, the payer, the payee, and the bank":

> The only way to satisfy those three conditions is to have payments made by means of *promises of a third agent*, the typical third agent being nowadays a bank... Once the payment is made, no debt and credit relationships are left between the two agents. But one of them is now a creditor of the bank, while the second is a debtor of the same bank. (Graziani 1989: 3; all emphases in original)

This perspective clearly delineates a monetary vision of capitalism from the neoclassical barter paradigm. As shown in Figure 139, in the neoclassical world, transactions are two sided, two commodity, barter exchanges: person *A* gives person *B* one unit of commodity *X* in return for some number of units of commodity *Y*. Calling one of these 'the money commodity' does not alter the essentially barter personality of the transaction.

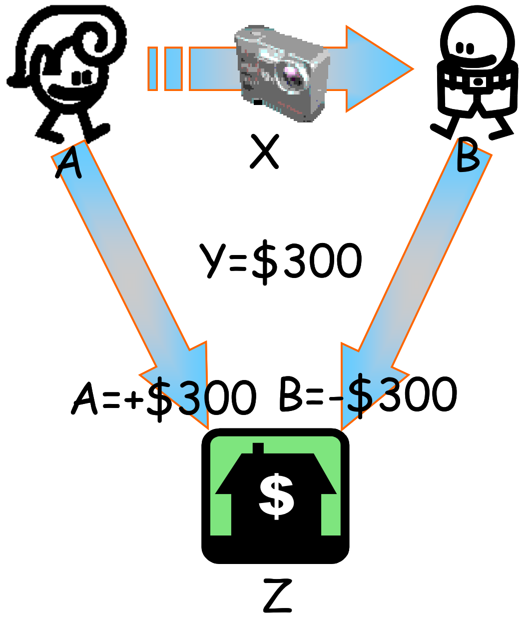
Figure 139: The neoclassical model of exchange as barter



But in our monetary world, transactions are three-sided, single commodity, financial exchanges, as portrayed in Figure 140: person B instructs bank Z to debit

Y units of currency from B's account, and credit A's account with the same amount, in return for which person *A* gives person B one unit of commodity X.

Figure 140: The nature of exchange in the real world



Banks are thus an essential component of capitalism, and are inherently different to industrial firms. Firms produce goods (and services) for sale by combining labor and other commodities in a production process that takes both time and effort. Banks generate and honor promises to pay that are used by third parties to facilitate the sale of goods.[181] Therefore firms and banks must be clearly distinguished in any model of capitalism:

> Since in a monetary economy money payments necessarily go through a third agent, the third agent being one that specializes in the activity of producing means of payment (in modern times a bank), *banks and firms must be considered as two distinct kinds of agents*... In any model of a monetary economy, *banks and firms cannot be aggregated into one single sector*. (Graziani 1989: 4; emphasis in original)

This simple but profound perspective on what is the essence of a monetary capitalist economy yielded two essential requirements for a model of capitalism:

[181] And they incur essentially no costs in doing so—the cost of "producing" a dollar is much less than a dollar. This is the source of Graziani's third stricture that the system can't enable banks to exploit this opportunity for seigniorage.

- All transactions involve transfer of funds between bank accounts;
- The minimum number of classes[182] in a model of capitalism is three: capitalists, workers and bankers.

It also implied that the best structure for modeling the financial side of capitalism is a double-entry system of bank accounts. This led me to developed a means to derive dynamic monetary models of capitalism from a system of double-entry book-keeping accounts (Keen 2008; Keen 2009; Keen 2010; Keen 2011), and a remarkable amount of the Marx-Schumpeter-Keynes-Minsky perspective on capitalism arose naturally out of this approach.

I'll outline the simplest possible version of this model before expanding it to provide a monetary version of the Minsky model outlined in Chapter 13.

A "Pure Credit" Economy

Our modern monetary economy is a system of such complexity that it makes the outrageous contraptions of Rube Goldberg, Heath Robinson and Bruce Petty appear trite by comparison: the Bank of International Settlements, Central Banks, commercial banks; merchant banks, hedge funds, superannuation funds, building societies; fiat money, credit money, multiple measures of money (Base Money, M0, M1, M2, M3, Broad Money); Reserve Ratios, Taylor Rules, Basel Rules…

Many of these components were instituted to try to control bank lending after the catastrophe of the Great Depression; many others were responses by the financial system to evade the intentions of these controls. To my cynical eye, the evasive maneuvers of the financial system have been far more effective than the regulatory structures themselves, and in essence our financial system approximates the behavior of the almost completely unregulated private banks of the "Free Banking" period in the 19th century.

Refer to Figure 141: A 19th century private bank note

For that reason, my base monetary model is a pure credit economy with no government or central bank, in which the private bank prints its own paper notes, and where transactions involve transferring paper notes from the accounts of the buyers to that of the sellers. There are 3 classes—workers, capitalists and

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[182] Economists normally say "agents" here rather than classes—given the microeconomic focus of neoclassical modeling, and the pejorative association that class was given by 19th century politics. I use the term classes because social classes are an objective reality in capitalism, and because the SMD conditions,which, as Alan Kirman, put it, suggest that "If we are to progress further we may well be forced to theorise in terms of groups who have collectively coherent behaviour… Thus demand and expenditure functions if they are to be set against reality must be defined at some reasonably high level of aggregation. The idea that we should start at the level of the isolated individual is one which we may well have to abandon." (Kirman 1989, p. 138)

bankers—and, in the simplest possible model with no Ponzi Lending behavior, firms are the only borrowers, and they borrow in order to be able pay the wages needed to hire workers.

Five accounts are needed to describe the basic monetary flows in this system:

1. A Vault, in which the bank stores its notes prior to lending;
2. A "Bank Safe", into and out of which interest payments are made;
3. Deposit Accounts for firms, into which money lent by the banks is put and through which all the firm sector's transactions occur;
4. Deposit Accounts for workers, into which their wages are paid; and
5. A Loan Register, which is *not* an account as such, but a ledger that records the amounts that have been lent by the banks to firms, and on which loan interest is charged.

The basic monetary operations that occur in this simple model are:[183]

1. The banking sector makes loans to the firm sector;
2. The banks charges interest on outstanding loans;
3. Firms pay the interest;
4. Firms hire workers;
5. Workers and bankers consume the output of the firms; and
6. Firms repay their loans

These operations are shown in Table 20, which (based on the standard accounting practice of showing "Assets minus Liabilities equals Equity") shows the economy from the point of view of the banks, with the banking sector's assets on the left hand side of the ledger and its liabilities and residual equity on the right hand side.[184]

Actual transfers of money are shown in normal text, while operations that are not money transfers but accounting operations—such as the bank recording that interest due on loans has been paid—are shown in italics.

Table 20: A pure credit economy with paper money

	Bank Assets		Bank Liabilities plus Equity		
			Liabilities (Deposits)		Equity
Operation	Vault	Loan Ledger	Firms	Workers	Safe
Lend Money	- Lend Money		+ Lend Money		

[183] To register as a bank, and therefore to be able to print its own notes, "Free Banking" banks still had to meet various regulatory requirements, and normally also purchase state government bonds of an equivalent value to their initial printing of notes. In what follows, I'm taking these operations as given, and focusing just on the banking operations that followed incorporation.

[184] My thanks to Peter Humphreys from the School of Accounting at UWS for advice on how to lay out this table in accordance with standard banking practice.

Record Loans		- *Lend Money*			
Charge Interest		+ *Charge Interest*			
Pay Interest			- Charge Interest		+ Charge Interest
Record Payment		- *Charge Interest*			
Deposit Interest			+ Deposit Interest		- Deposit Interest
Hire Workers			- Wages	+ Wages	
Bankers consume			+ Banks Consumption		- Bankers Consumption
Workers consume			+ Workers Consumption	- Workers Consumption	
Loan Repayment	+ Loan Repayment		- Loan Repayment		
Record Repayment		- *Loan Repayment*			

Since all the entries in this table indicate flows into and out of accounts (or additions and subtractions from the loan ledger), a remarkable thing is possible: a dynamic model of this monetary model can be derived just by "adding up" the entries in the columns, as in Table 21.

Table 21: The dynamics of a pure credit economy with no growth

Rate of change of…	Equals…
Vault	- Lend Money + Repay Loans
Loan Ledger	+Loan Money – Repay Loans
Firm Deposits	+ Loan Money – Charge Interest + Deposit Interest –Wages + Bankers Consumption + Workers Consumption – Repay Loans
Worker Deposits	+ Wages – Workers Consumption
Safe	+ Charge Interest – Deposit Interest – Bankers Consumption

This model can be simulated if we put values on these flows. Some of these are obvious: the interest charged, for example, will equal the rate of interest on loans times the amount currently recorded on the Loan Ledger; interest paid is the rate of interest on deposits times the amount currently in the firms' deposit accounts.[185]

Others—lending from the Vault, payment of wages, consumption by workers and bankers and loan repayment—will in the real world depend on a whole host

[185] I have ignored interest on workers' deposit accounts simply to make the table less cluttered. They are included in my more technical description of this model in the paper "Solving the Paradox of Monetary Profits" (Keen 2010), which is downloadable from http://www.economics-ejournal.org/economics/journalarticles/2010-31.

of factors, but to model the simplest possible system, I relate them here to the balances in these other accounts, and use constants rather than variables simply to see whether the model is viable: obviously, if it's impossible to find a set of constants that makes this model viable, then no set of variables is likely to do it either.

Thus lending from the Vault is modeled at occurring at some constant rate times the amount of money in the Vault; the flow of Wages is some constant times the balance in firms' deposit accounts; workers' and bankers' consumption depend on the balances in the workers deposit accounts and the Safe respectively; while the flow of loan repayments is some constant times the amount of loans outstanding.

The constants (known as "time constants" in dynamic modeling)[186] used tell us how many times in a year the given account will turnover—so a value of ½, for example, indicates that the balance in the relevant account will be turned over every 2 years. One obvious value here is that for workers' consumption: since workers wages are paid on a weekly basis, and most of workers' incomes are expended on consumption, the constant for Workers Consumption will be 26—indicating that the balance in the workers accounts turns over 26 times a year. For the sake of illustration, I use ½ for lending money (so that the Vault turns over every 2 years), 3 for wages, 1 for bankers' consumption, 26 for workers' consumption, 1/10 for loan repayment, and I set the rate of interest on loans to 5% and the rate of interest on deposits to 2%.

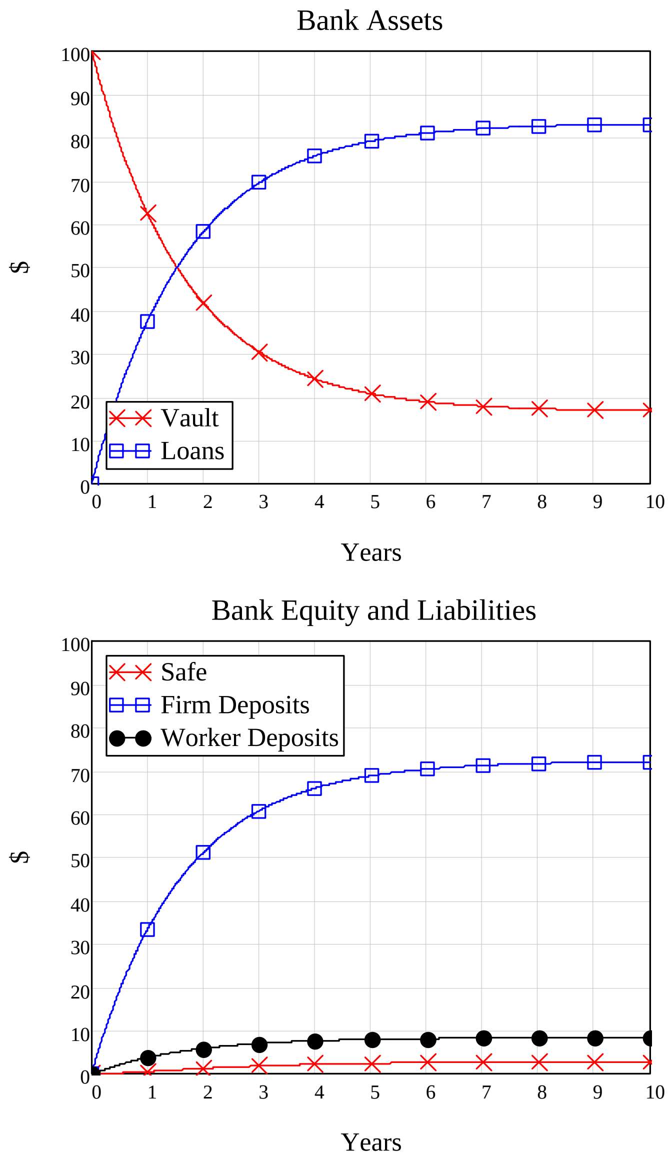
If the model starts with $100 million initially in the Vault and no money in any other account, then after ten years, the amount in the Vault falls to 16.9 million, with $83.1 million in outstanding Loans, $2.7 million in the Safe, $72.1 million in Firm deposit accounts, and $8.3 million in the Workers' deposit accounts—see Figure 142.[187] It is also possible to calculate the annual wages bill and bank earnings. The annual wages bill is the time constant for wage payments times the balance in the firms' deposit account, which is 3 times $72.1 million or $216.3 million, while bank gross earnings are the rate of interest on loans times the outstanding loan balance (5% times $83.1 million or $4.16 million) minus the rate

[186] See http://en.wikipedia.org/wiki/Time_constant for an exposition. These are normally expressed as fractions of a year—so that the assumption that workers turn their accounts over 26 times a year means that the time constant for workers' consumption is 1/26—but to simplify the exposition I'm expressing them in times per year instead.

[187] This point was disputed by early Circuitist literature, but this was an error of logic due to a confusion of stocks with flows (for a detailed exposition on this point, see Keen 2010, pp. 10-12).

of interest on deposits times the firms' deposit balance (2% times $72 million or $1.44 million), for a net bankers' income of $2.7 million per annum.

Figure 142: Bank accounts



Capitalists' income isn't as obvious in this simple model, and to explain it properly will require incorporating production and pricing as well. But we can imply what profits are by realizing that net annual income in this simple model equals the sum of wages plus profits—the income of bankers cancel out and adds nothing to aggregate income (see Table 22).

Table 22: Net incomes

Class	Net Income components	Amounts
Workers	Wages	216.3
Capitalists	Profits minus Loan Interest plus Deposit Interest	72.1 – 4.16 +1.44
Bankers	Loan Interest minus Deposit Interest	4.16 – 1.44
Total Income	Wages plus Profits	288.4

Since wages represent part of the net surplus generated in production, profits must represent the remainder. If workers wages represent, say, 75% of net income, then profits represent 25%—so in this numerical example they equal $72.1 million.[188]

Annual income in this example is thus $288.4 million—almost 3 times the amount of money in the model, and precisely 4 times the amount of money in Firms' deposit accounts. How can this be? Marx's insight into why Say's Law is invalid in a capitalist economy holds the key. Remember that Say's Law holds under simple commodity production (*Commodity→Money→Commodity*), but not in capitalism, because that also has the circuit *Money→Commodity→More Money*? Marx also pointed out that this "Circuit of Capital" takes time: it involves getting money in the first place, using it to hire workers and buy inputs, combine them in a production process, ship the finished goods and finally sell them to customers. There is thus a time lag between outlaying *M* and earning *M+*, which Marx called this the "period of turnover". This can be significantly shorter than a year, though it's highly unlikely to be as short as the example Marx himself gave:

> "Let the period of turnover be 5 weeks, the working period 4 weeks... In a year of 50 weeks ... Capital I of £2,000, constantly employed in the working period, is therefore turned over 12½ times. 12½ times 2,000 makes £25,000" ((Marx and Engels 1885, Chapter 16: The Turnover of Variable Capital).

Expressed as a fraction of a year, Marx's example gives a value of 1/12.5 for the period of turnover—and in general the smaller the number, the faster a given amount of money turns over, and the more profit (and wages) that can be

[188] It is just a coincidence that this equals the equilibrium amount in the Firms Deposit accounts—a different wage/profit share would return a different profit level.

generated. Marx's numerical example was extreme, but the basic insight is correct that a given sum of money can finance several times as much turnover in a given year.

The period of turnover can also be derived for our example, using the facts that the value of the time constant for wages is 3, and 75% of national income goes to workers as wages. Total income—wages plus profits—is thus 4 times the amount of money in the Firms' deposit accounts. The turnover period is therefore one year divided by 4: it takes 3 months, in this toy economy, to go from M to M+.

Though the turnover period is an unfamiliar concept, it's related to the well-known if less-well-defined concept of the velocity of money. The turnover period tells us how often the money in Firms' Deposit Accounts turns over; the velocity of money in this model is the value of wages plus profits (GDP, which is $288.4 million in this example) divided by either the total money supply ($100 million) or the money in active circulation, which is the sum of the amounts in the Deposit accounts plus the Safe ($83.1 million). Measured the former way, the velocity of money is 2.88; measured the latter way, it's 3.47.

This is an incredibly simple system, but even at this point it can give us some insights into why Bernanke's QE1 was far less effective than he had hoped—and why it would have been far more effective if the money had been given to the debtors rather than to the banks.

A Credit Crunch

The crisis of 2007 was not merely a credit crunch (where the problem is liquidity) but the end point in process of Ponzi Lending that made much of the US economy insolvent. However the credit-crunch aspect of this crisis can be simulated in this model by halving the rate at which the Bank lends from the Vault, and doubling the speed at which firms try to repay their debts. The time constant for bank lending therefore drops from ½ to ¼—so that the amount in the Vault turns over every 4 years rather than every two—while that for repaying debts goes from 1/10 to 1/5—so that loans are repaid every 5 years rather than every 10.

The credit crunch has a drastic impact upon both bank account balances and incomes. The level of loans drops from over $83 million to under $56 million, while the amount in the Vault—and therefore inactive—rises from $16.9 million to $44.1 million.

Refer to Figure 143: A credit crunch

All incomes drop substantially as well: wages drop from $216 million to $145 million per year, profits drop from $72 million to $48.5 million, and bank income drops from $2.7 million to $1.8 million—a 32.8% drop.

Now let's consider what would happen if an injection of $10 million was made one year after the crunch began, into either the Vault, or into the Deposit accounts of the Firms. The former approximates what Bernanke did in his attempt to exploit the mythical "Money Multiplier", the latter approximates what might have happened if the bailout had gone to debtors rather than to the banks—and this is also very similar to what was in fact done in Australia, where the Rudd Government effectively gave every Australian with a pulse $1,000 to spend.[189]

The results are intriguing, complex even though the model itself is simple, and the reverse of what Obama was told would happen by his neoclassical advisors.

WHOSE BAILOUT WORKS BEST?

The Bank bailout injects $10 million into the Vault over a one year period; the Firm and Worker bailouts inject the same amount of money over the same period of time into the deposit accounts of the firms or workers.

If you believed that the most important thing was to get lending going again after a credit crunch, then the Bank bailout wins hands down: neither the Firm nor the Worker bailouts affect the level of loans at all, which remain on the depressed Credit Crunch trajectory, while the Bank bailout leads to loans falling less steeply, so that ten years after the Crunch, they are $5.5 million higher than they would have been without the bailout.

Refer to Figure 144: A Bank Bailout's impact on loans

However, if you believed that the most important thing was to restore economic activity, then the Bank bailout is the least effective way to do this!

Profits and wages do rise because of the Bank bailout, but the rise in income is far greater when the Firms or Workers receive the bailout than when the Banks do.[190] The increase in incomes is immediate and large in the case of the Firms' bailout, versus gradual and modest for the Bank bailout.

Refer to Figure 145: A Bank Bailout's impact on incomes

The only people that do better if the Bailout goes to the Bankers … are the Bankers. Not only do they do better under their Bailout than if nothing is done, they do worse if the Bailout goes to Firms or Workers than if there is no bailout at all! The reason is that the Firm (or Worker) bailout increases the deposit accounts of the Banks while leaving their Loans unaffected. Their payment of

[189] A cash handout of $960 was sent to every Australian over 18 who had a tax return for the previous year.

[190] There is only a transient difference between the Firm and Worker bailouts on this front, while the Bailout it being made. Workers' consumption is higher for the duration of the Bailout if they receive the money—since they spend almost all of what they receive—but their incomes are slightly lower than when the firms get the Bailout.

interest to the rest of the economy therefore increases, while their receipts of interest payments remain the same.

Refer to Figure 146: A Bank Bailout's impact on Bank income

This is a very basic and incomplete model, and much more needs to be added to it before any definitive implications could be drawn about the impact of a government bailout during a credit crunch.[191] But the differences between this simple dynamic model, and the even simpler but false money multiplier model that lay behind Obama's decision to bail out the banks rather than the public, tempts me to write what Obama *could* have said, if his advisers were not neoclassical economists:

> And although the banks have argued that government money would be more effective if it were given to them to lend, rather than going directly to families and businesses– "where's our bailout?," they ask – the truth is that an additional dollar of capital in a bank will dribble out slowly through the choked arteries of our sclerotic financial system, while that same dollar, if given to families and businesses, will enter circulation rapidly, a process that will cause a faster pace of economic growth.

But that's enough of fantasy. Let's bring this model up to date in terms of how money is created endogenously today, and extend it to include production, prices and growth.

A MODERN CREDIT CRUNCH

The model we've just considered has a fixed amount of money in it, and since it's a paper-money system, the banks would need to print more notes if they wanted to expand the money supply. However, the majority of banking transactions have always involved the buyer writing a check drawn on an account in a bank, rather than handing over paper notes in return for goods—and today's innovation of electronic transfer banking has taken this one step further. The fact that these promises by banks to pay are accepted as money in their own right is what makes it possible for banks to expand the money supply simply by creating a new loan. The new loan creates a debt between the borrower and the bank, and it also creates additional spending power.

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[191] However, a more complete model is as likely to amplify these basic results as it is to attenuate them. For example, the injection of fiat money puts the banking sector's assets and liabilities out of balance, when an essential aspect of banking practice is that they are balanced. The Firms bailout could thus force the banks to lend more rapidly to bring their assets back into line with their liabilities, thus amplifying the boost from the fiat money injection.

It's this capacity to create money "out of nothing" that state policies like Reserve Requirements and Basel Rules attempted to control, but the empirical evidence shown in the last chapter shows that these control mechanisms have failed: the banks create as much new money as they can get away with, because fundamentally, banks profit by creating debt.

We can model this endogenous creation of both debt and new money (in a check-account or electronic-money banking system) by adding two new rows to the table—one in which the Firms' Deposit Accounts are credited with new money, the second in which the new debt the Firms have to the Banks is recorded on the Loan Ledger (see Table 23).

Table 23: A growing pure credit economy with electronic money

	Bank Assets		Bank Liabilities plus Equity		
			Liabilities (Deposits)		Equity
Operation	Vault	Loan Ledger	Firms	Workers	Safe
Lend Money	- Lend Money		+ Lend Money		
Record Loans		*- Lend Money*			
Charge Interest		*+ Charge Interest*			
Pay Interest			- Charge Interest		+ Charge Interest
Record Payment		*- Charge Interest*			
Deposit Interest			+ Deposit Interest		- Deposit Interest
Hire Workers			- Wages	+ Wages	
Bankers consume			+ Banks Consumption		- Bankers Consumption
Workers consume			+ Workers Consumption	- Workers Consumption	
Loan Repayment	+ Loan Repayment		- Loan Repayment		
Record Repayment		*- Loan Repayment*			
Lend New Money			+ New Loan		
Record New Loan		*+ New Loan*			

This extension helps explain why banks are so willing to create debt, and discourage its repayment: the source of bank profits is interest on outstanding debt, and the more debt that is out there, the more they make. The amount of outstanding debt will rise is existing money is turned over more rapidly, if new money is created more rapidly, and is debts are repaid *more slowly*. Banks therefore have an innate desire to create as much debt as possible—which is why it is unwise to leave the level of debt creation up to the financial sector. As the Great Recession shows, they will be willing to create as much debt as they can, and if they can persuade borrowers to take it on—which is easy to do when banks finance a Ponzi Scheme—then the economy will ultimately face a debt crisis where the banks' willingness to lend suddenly evaporates.

Refer to Figure 147: Bank income grows if debt grows more rapidly

The extension also provides the means to link this purely monetary model to the cyclical Minsky model I outlined in the previous chapter, in a manner that is consistent with the argument that aggregate demand is the sum of income *plus the change in debt*.

In the model above, all expenditure financed consumption—we were in a "Say's Law" world in which aggregate demand equaled aggregate supply, and there was no change in debt. However we now consider firms that wish to invest, and who are willing to take on new debt to finance it—which also causes new money to be created. Aggregate demand is now income plus the change in debt, where incomes finance consumption, and the change in debt finances investment. The new loans thus provide the money needed finance the investment that was an integral part of the Minsky model.

For simplicity, I assume that new money is created at a constant rate relative to the current level of debt (which halves when the Credit Crunch strikes); in the full Minsky model, this is a function of the rate of profit.

To link the two models, one more component is needed: a formula that describes how prices are set. For obvious reasons, this doesn't involve working out where "marginal cost equals marginal revenue". However, the equation I use is based on the proposition that prices will tend converge to a level that equates the monetary value of demand and the monetary value of supply. At the same time, the equation conforms to the empirical research into how firms set prices (see Chapter 4)—that they involve a markup on the wage cost per unit of output—which is the theory of price setting used by Post Keynesian economists (Lee 1998; Downward 1999).[192]

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[192] The equation is derived in Keen 2010, pp. 17-19. The basic idea is as follows. The monetary value of demand equals wages plus profits, and as explained above this equals the money in the Firms' Deposit accounts, divided by the turnover period. The monetary value of supply is the price level times output, and output is labor times average labor productivity. The number of workers employed in turn equals the monetary value of wages divided by the wage rate. In this simple model, the monetary value of wages also depends on the balance in the Firms' Deposit accounts: it's equal to the amount in the Firms' Deposit Accounts, divided by the turnover period, and multiplied by the share of surplus that goes to workers. Some cancelation yields the result that in equilibrium, the price level

We also need an explanation of how wages are set, and this raises the vexed issue of "the Phillips Curve". As explained earlier, a properly specified Phillips Curve should have 3 factors in determining money wages—the employment rate, its rate of change, and a feedback from inflation—but for simplicity here I'll just use the first factor (all 3 are used later in my monetary Minsky model).

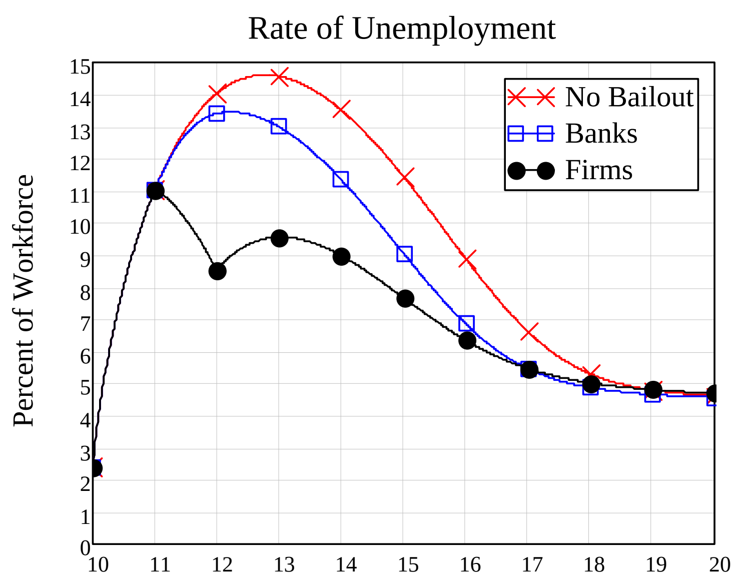
The results of this model amplify the case made in the money-only, no-growth model. The Firms bailout works better on every front, on every metric—except one (any guesses which one?).

Loans recover more rapidly when the firms are bailed out rather than the banks;

Refer to Figure 148: Loans grow more with a debtor bailout

The rate of unemployment is turned around almost instantly with the firm bailout, and never reaches the extreme levels that apply with the bailout going to the banks (see Figure 149);

Figure 149: Unemployment is better with a debtor bailout



Both profits and wages are higher if the firms get the bailout money rather than the banks;

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will equal the wage level, divided by labor productivity and multiplied by the inverse of workers' share of surplus. A dynamic equation has prices converging to this level over time.

Refer to Figure 150: Profits do better with a debtor bailout

The only losers from the bailout going to the firms rather than to the banks are … the banks (did you guess right?). Once again, not only do they do worse if the firms get the bailout rather than them, they do worse under the firms' bailout than they do from no policy intervention at all.

Refer to Figure 151: Bank income does better with a Bank bailout

This is still a very simple model, and much more needs to be done to complete it—from replacing time constants with variables (which I do in the Minsky model to come), through to properly modeling government finances as well as those of private banks (which I haven't yet done). But again it reaches results that are the opposite of the neoclassical "money multiplier" model that Obama, acting on the advice of his neoclassical advisors, actually followed. Given the poor response of the economy to the stimulus and QE1, I think it's reasonable to argue that it's time Obama—and politicians in general—looked elsewhere for their economic advice.

FROM TRANQUILITY TO BREAKDOWN

To a neoclassical economist, the most striking aspect of the Great Recession was the speed with which apparent tranquility gave way to sudden breakdown. With notable, noble exceptions like Nouriel Roubini, Robert Shiller, Joe Stiglitz and Paul Krugman, they paid little attention to the obvious Bonfire of the Vanities taking place in asset markets, so in a sense they didn't see the warning signs, which were obvious to many others, that this would all end in tears.

My model, in contrast, is one in which the Great Moderation and Great Recession are merely different phases in the same process of debt-financed speculation, which causes a period of initially volatility to give way to damped oscillations as rising debt transfers income from workers to bankers, and then total breakdown occurs when debt reaches a level at which capitalists become insolvent.

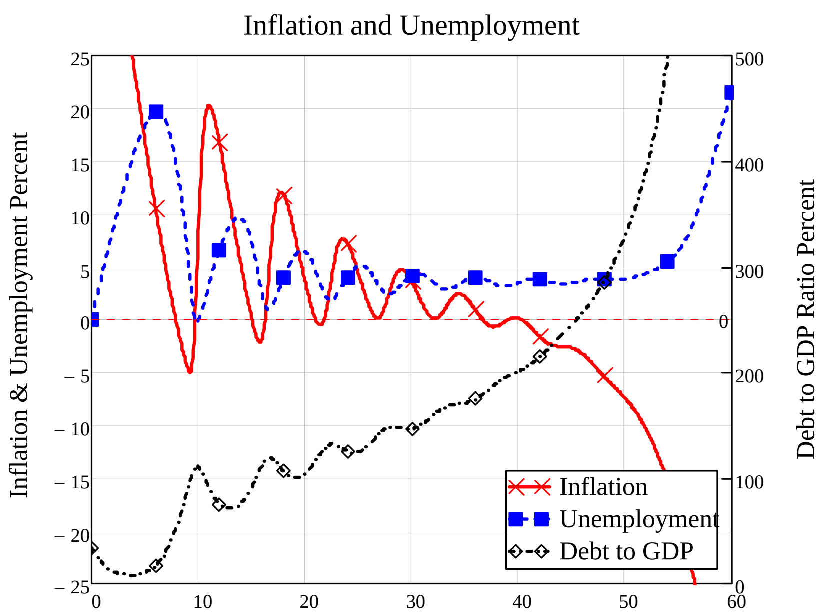
The fixed parameters used in the previous models are replaced by functions where the rates of money creation and relending and debt repayment depend on the rate of profit, and where the rate of change of wages depends on the level of employment, its rate of change, and the rate of inflation. The link between the monetary and physical models is the creation of new money, which finances investment.

The model generates as sudden turnaround in output as any neoclassical model hit by "exogenous shocks", but unlike those models there is continuity between the Great Moderation and the Great Recession.

Refer to Figure 152: Modeling the Great Moderation and Great Recession--Output

The model's numbers and the magnitude of its crash are hypothetical,[193] and the main question is whether its qualitative behavior matches that of the US economy—which it clearly does. A period of extreme cycles in unemployment and inflation is followed by diminishing cycles which, if they were the only economic indicators one focused upon, would imply that a "Great Moderation" was occurring. But the third factor ignored by neoclassical economics—the ratio of debt to GDP—rises in a series of cycles until it takes off exponentially (see Figure 153).

Figure 153: Modeling the Great Moderation and Great Recession--Inflation, Unemployment and Debt



The qualitative similarity of this pattern to the actual US data (prior to the massive intervention by both the Government and the Federal Reserve) is striking—see Figure 154.

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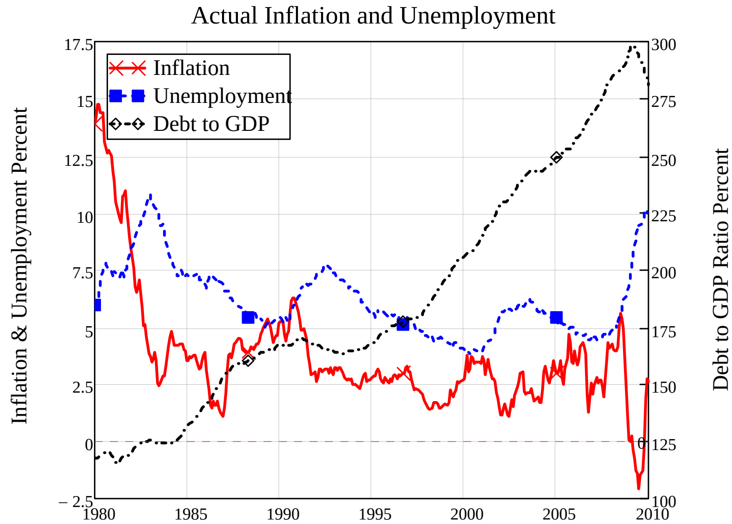
193 Fitting a nonlinear model to data is something mathematicians describe as a "non-trival" exercise—which in lay speak is something that takes eons to do and requires supercomputer processing power. I will do this for my next book with a far more complex model than the one shown here.

Figure 154: The Great Moderation and Great Recession--Actual Inflation, Unemployment and Debt



As in my 1995 model, though capitalists are the ones who actually take on debt, in practice the workers pay for it via a fall in their share of national income.

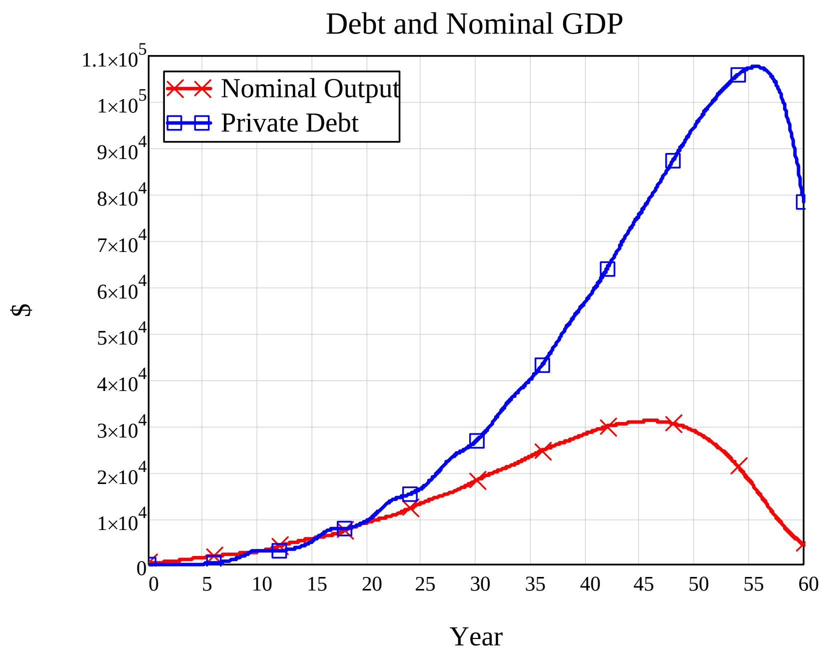
Refer to Figure 155: Income distribution--workers pay for the debt

Refer to Figure 156: Actual income distribution matches the model

This strictly monetary model generates one aspect of Minsky's hypothesis that my 1995 model could not: the "deflation" part of the process of debt-deflation. Debt rises in a series of booms and busts as in my 1995 paper, but as well the rate of inflation falls in a cyclical manner until it becomes accelerating deflation.

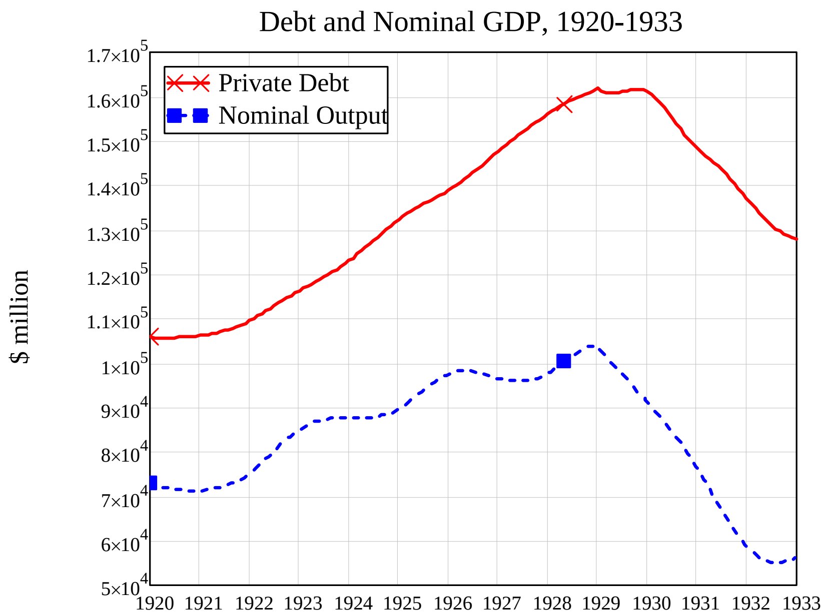
This generates the phenomenon observed in the early years of the Great Depression: the debt to GDP ratio continues to rise, even though nominal debt is falling (see Figure 157).

Figure 157: Debt and GDP in the model



The model dynamic is more extreme than the data because the model doesn't yet include the impact of bankruptcy—which reduces debt during a Depression. But again, the qualitative similarity between the model and the empirical data is striking—see Figure 158.

Figure 158: Debt and GDP during the Great Depression



MAKING MONETARY MODELING ACCESSIBLE: QED

I originally developed the models in this chapter using differential equations, and I found it very difficult to extend them, or explain them to other economists who weren't familiar with this approach to mathematics. Then a chance challenge to the accuracy of my models—Scott Fullwiler asserted that there must be errors in my models from the point of view of double-entry bookkeeping—inspired me to see whether I could in fact explain my models using double-entry bookkeeping.

Not only did that prove possible, it also transpired that a double-entry bookkeeping layout of financial flows could be used to generate the models in the first place.

This overcame a major problem that I had with using System Dynamics programs like Vissim (www.vissim.com) and Simulink (http://www.mathworks.com/products/simulink/) to build models of the financial sector. While these technologies were brilliant for designing engineering products like cars, computers and airplanes, they were poorly suited to modeling financial flows.

These programs use "wires" to link one variable to another, and this is fine for physical processes where, for example, a wire from the fuel injector module to the cylinder module indicates a flow of gas from one point to another, and only one such link exists per cylinder. However, in a model of financial flows, the same term could turn up as often as 3 times in one diagram: once for the source account for some monetary transfer, once for its destination, and once to record it on a ledger. This resulted in almost incomprehensible models, and made "wiring up" such a model extremely tedious.

I now use my double-entry bookkeeping methodology to develop models like the one in this chapter, and a simulation tool has also been developed for me to showcase this method. It's free, fairly easy to use, and you can both simulate the models I've shown in this chapter and build your own using it.

It's called QED—which stands for Quesnay Economic Dynamics—and can be downloaded from my blog at http://www.debtdeflation.com/blogs/qed/.

CONCLUSION

There are many aspects of this model of which I am critical. For example, it doesn't distinguish borrowing for investment from borrowing for speculation, the government sector isn't incorporated, and many factors that are variable in reality (such as interest rates and the markup that sets prices) are constants in the model. But these missing aspects can be easily introduced into later extensions of the model—a topic that I will take up in my next book *Finance and Economic Breakdown*—without needing to make the absurd assumptions that neoclassical economics makes when it tries to combine more realism with the fantasy that everything happens in equilibrium.

It is also possible—indeed it is essential—to make this theory one not merely of macroeconomics, but of finance as well. In counterpoint to the false neoclassical dichotomy between macroeconomics and finance on the basis of the counterfactual proposition that debt has no macroeconomic effects, a valid economic theory has to explain the behavior of both the macroeconomy and the financial markets. Such a coherent theory has not yet been developed. However, there are several realistic models of the behavior of financial markets themselves, which we'll now consider.