The Flow of Capital[*]

Mason Gaffney

It is a common belief that capital is needed to make jobs, and the more the better. The moral is always "be nice to capitalists," and usually landholders sneak in with them, although land is not formed, as capital is, by human saving or investing. In Section II we will see that investment makes jobs, and investment is capital in motion. Capital-in-motion is an economic flow. But to begin let us here look briefly at the usual meaning of capital as an economic fund, a static quantity of stored-up wealth. Its relationship to labor and land is one of co-existence, not of sequence; a relationship in parallel, not in series.

I. Capital as a Fund

Much capital substitutes for and displaces labor. Cattle and sheep are good examples. In British history sheep have a long record of displacing the rural population, in something called the "enclosure" movement in England, and "the clearances" in Scotland and Ireland: the people were cleared away to make place for the sheep. Clearances and enclosures brought many of our ancestors over here from over there. Likewise, range cattle in the U.S. have preempted large areas, and their owners have fought the settlers in a thousand horse operas for young viewers. Range cattle today are one of the least labor-using of farm enterprises.

Trees are another kind of capital that crowds out labor. Most American farming goes back to clearing off trees. On tree farms labor may plant the trees, and 80 years later go back to harvest them. In between the capital in the trees needs little help from labor; it just ties up the land.

Farm machinery has done more than anything to depopulate rural America in our times. Machines displace workers in many other industries, too: automation, cybernetics, robots, spray painters, office machines, pool sweeps, computers, word processors, modern presses and a thousand other things do the jobs of human workers. The ambition of many industrial engineers is a plant to turn out a product "untouched by human hands."

The prospect that a machine may take our jobs is enough to send shivers through most of us. Ned Ludd (he smashed machinery), John Henry (he was a steel-driving man), and Karel Capek (he wrote a play, *R.U.R.*, which stands for "Rossum's Universal Robots") are names all associated with man's recurring nightmare that machines will take over the world. There may be labor-using forms of capital, too, but it is easier to think of labor-saving forms. Whatever else capital may be and do, it is not unambiguously clear that more capital means more jobs.

Ordinary texts generally skirt this issue. About all they tell us is that capital formation may increase "growth." They don't say who gains from growth, and are often vague on specifying growth of what? Other macro writers go farther and allege that labor gains when capital grows. They use a device that you will often see in economic reasoning, the "Cobb-Douglas function," a mathematical artifice that sneaks in[1] an implicit assumption that more capital always means more jobs for labor. Since ordinary macro texts leave this out we will too, other than mentioning it here.

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[*] WP 29

[1] I mean no disrespect for Paul Douglas the man, who later became one of the least sneaky and most admirable human beings ever to grace the U.S. Senate.

II. Investment, or Capital as a Flow.

We may also view the relations of labor and capital in sequence. This is the evident meaning of those who say capital employs labor. Static capital like farm machines may displace labor, but labor produces the farm machines, and capital-in-motion, or "investing", is the "income-creating expenditure" that employs these factory hands. Labor works to produce capital. Here, capital serves to spread labor over more time. For example, say labor works to build a house. We invest an extra 20% in stouter materials and better workmanship in order to make the house last 100% longer: the house gives no more service/year, but more years of service before we need labor to build a new house. Thus capital lets us apply labor less often. Of course the first year we use 20% more labor. But over time we do so only half as often, so the number of jobs drops to .5 x 1.2, which is 60%, of the original amount.

Or again, let's compare growing bamboo, which matures in a year, and Douglas-fir, which may take 80 years. Planting and harvesting bamboo makes jobs every year; Douglas-fir every 80 years. When we get to the end of the 80-year cycle, most of the value of the timber has been added by capital, in the form of what is called "capitalized interest," i.e. accumulated compound interest on the planting cost. I'll show you how to figure that quickly. Financing timber while you wait for it to mature is a way of substituting capital for labor.

Besides that, with bamboo we get a building material that requires much labor to assemble and maintain; with Douglas-fir, highest-quality structural lumber. Both in the production of the material and the use of it, bamboo is labor-using and Douglas-fir is capital-using. To analyze this sequential relationship of labor and capital we need more input, which follows in Section E.

A. The wages-fund theory

You may get the impression from modern texts that macroeconomics originated in 1936, but that is wrong: it was rather revived from a long nap of 40 years. Eighteenth and nineteenth-century political economists (the "classical" economists) had a macro-economics which they called the "Wages-fund theory." Adam Smith, David Ricardo, John Stuart Mill, Stanley Jevons and many lesser lights all espoused it. The "Austrian School" economists like Gustav Spiethoff and Eugen von Bohm-Bawerk and Friedrich von Hayek rephrased it without abandoning it, and Knut Wicksell, arguably the smartest economist of all time, improved on it and reaffirmed it strongly.

But Francois Quesnay, protégé of Madame Pompadour, Royal Physician to Louis XV, and house intellectual at Versailles, scooped us all in 1758. Production, he says, requires "advances" of capital—today we say "front money" or "investment." According to A.R.J. Turgot, Quesnay's disciple, "*Richesse mobiliere amassé d'avance est un prealable indispensable pour toute la production*" (liquid capital stored up ahead is a prior necessity for all production). (Turgot was Finance Minister for a time under Louis XV until the local greed lobbies got him sacked when he tried to reform the tax system.)

In American folklore one spoke of "priming the pump"—you had to pour water into the top of an old fashioned water pump before it would draw. The Kingston Trio (pop songsters in the '50s) put it memorably in "The Ballad of Desert Pete." A thirsty traveler in the desert spies an old water pump with a note on it.

> "Yeah, you've got to prime the pump,
> Work that handle like there's a fire.

Under that rock you'll find some water
I left in a bitters jar.
Now there's just enough to prime it with
So don't you go drinkin' first.
Just pour in the water and pump like mad:
Buddy, you'll quench your thirst."
The traveler hesitates, but ---
The note went on "Have faith, my friend
There's water down below.
You've got to give until you get:
I'm the one that ought to know.
You've got to prime the pump,
You must have faith and belief
You've got to give of yourself
'fore you're worthy to receive
Drink all the water you can hold
Wash your face to your feet.
Leave the bottle full for others.
Thank you kindly."—Desert Pete
P.S. The pump worked.

Returning to Quesnay, he broke it down into four kinds of advances which, being French, he called *avances* (f.). *Avances souveraines* build public works or infrastructure; *avances foncieres* clear land, fence it, and improve it with buildings; *avances primitives* take care of movable capital like farm machines and animals; and *avances annuelles* carry current expenses that are recouped within less than a year. All these advances of capital were necessary before any return or production of more capital was possible. We still call the cash flow of a firm its "revenue," which is French for "come back." "Receipt" means "take back," and "return" means "turn back," which all amount to the same idea; you've got to be forthcoming, to make advances, to give until you get.[2]

Some other names for liquid capital are circulating capital, ready capital, working capital, accounts receivable, realizable capital, disposable capital, mobile capital, "putty" (as opposed to clay) capital, consumer goods, and ripe goods. The concept refers simultaneously to money held by the investor, and ripe goods held by retailers to validate and give value to the money.

B. How glitches develop

A shortage of ready capital can make the economic machine seize up or freeze or stall, like a car that runs out of gas. The macro-economy is not "glitch-less" like the hypothetical micro-economy postulated in Econ. 100A. Capital is freely and quickly convertible from the circulating to the fixed state, but not so easily converted back again. Fixing capital in highways, office towers, drilling rigs, monumental water projects, or ocean vessels is irreversible over long periods. Thus, there can be a shortage of liquid capital at the same time there is a surplus of fixed capital, causing a "glitch."[3]

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2 "Recoup" comes from "cut back" (in modern French it means "cut again"). I surmise this alludes to recovering capital without replacing it, thus cutting back your commitment or exposure. It could also refer to redeeming coupons, although in the modern practice one clips coupons only to collect interest, not capital.

3 As brilliant an economist as the much-decorated Paul Samuelson missed this point completely when, during the capital shortage of the 1980s, he denied there was one. He supported his point by citing excess capacity in

The problem may even become self-aggravating when liquid capital is required as a solvent to activate and recover value from the fixed capital. That is always true of "Construction Work in Progress" (CWIP), like a bridge that is 99% complete. Unfinished structures are totally useless until they finally go "on line." Feedstock is needed for a refinery; spare parts to repair vehicles and machines; goods to stock a store; hay to feed the cows; materials to flow through a factory; seed corn for the farm; and fuel to move a tractor. Liquid capital is also needed to meet the payroll while materials move through a business and value is added. A business that runs out of working capital is called "insolvent" and shuts down, even though its fixed capital may exceed its debts.

A single business in trouble may be saved by others. But a whole economy that runs short of liquid capital has a hard time recovering any value from its fixed capital, and has to start all over again with new savings. There you can have a big, big glitch. In the 19th century it was clear to contemporaries that the several severe depressions in America resulted from freezing most of the nation's capital, plus more borrowed from Europe, into premature public works like canals, railroads, and roadways. Brazil has done the same thing in the last 20 years, and our own behavior is only marginally improved over the debauches of the past.

Nowadays, with world capital markets, a nation in trouble can borrow abroad—if there is something to borrow. In 1929 Austria wanted its capital to stay home, and imposed exchange controls, triggering off a wave of the same behavior in other nations. Of course, such foolishness could never happen again—could it? What happens if Japan dries up, if West Germany turns all its capital exports to East Germany, if the Soviet Union soaks up world capital, etc. etc.? Something to worry about.

C. The new dismal scientists

Ordinary models, both Keynesian and Monetarist, bypass all this. They deal mainly with money and its circulation. They presuppose, in effect, that real supply responds automatically to the touch of spending and may be taken for granted. Real supply refers both to the supply of factors of production, and also to the supply of ripe goods ready to consume.

Faced with roaring inflation in the 1970s the best-known economists and government advisers threw up their hands and said "Tsk, tsk, too bad, we have to choose between inflation and unemployment. You ordinary people need a scolding: you must face the facts, tighten your belts and make sacrifices." Experts with that attitude rise to the top because they take the pressure off public officials to do something effective. But, alas, they made modern economics a new "dismal science", a science of choice where all the choices are bad.

People got sick of such dismal messages and inaction, so in the 1980s we had a run at "supply-side economics." The good idea in it is that we have plenty of demand, even too much, it is time to unleash the forces of production. This was to be done by untaxing production. The problem is, the actions did not match the rhetoric. Payroll taxes actually rose. Taxes were lowered on the income of land and *old* capital, but incentives to invest in *new* capital were actually lowered by repealing provisions like fast write-offs and the investment tax credits.

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the form of fixed capital. The problem, rather, was shortage of liquid capital. Freezing capital is irreversible in the short run, so fixed capital is not on tap to meet a shortage of liquid capital.

Property taxes on land were lowered by Prop. 13 and its clones, but land is irreproducible: taxes on it are a stimulus to production, not a drag. Governments ran huge deficits to lower current taxes and create the kind of euphoria that wins elections. However, this led mainly to multiple rises in the selling prices of corporate shares and real estate, things that already exist and are in large measure irreproducible. The court economists are reduced to muttering weakly that all would be well if we stop taxing capital gains. No one else believes it, for the excellent reason that it is false.

What to do? The classical wages-fund theory was (and remains) more optimistic. It says you can make jobs without inflation by speeding up the circulation of capital.

D. The genius of David Ricardo

David Ricardo expressed this by dividing capital into two kinds, circulating and fixed. Circulating capital is consumer goods—he said "subsistence"—which labor consumes while working to replace it. This came to be known as the "Wages Fund." Fixed capital is plant and equipment which works side-by-side with labor, in parallel. It is useful, but you can't eat it.

What happens, asked Ricardo, if labor produces more inedible fixed capital instead of replacing the Wages Fund? Nothing changes at first, but soon there is a shortage of subsistence. Workers can't all be paid unless they take a wage cut. Conversely, of course, to make more jobs you need more capital in the wage fund. You do this first by not depleting it; second by new saving. How about reconverting fixed capital to circulating form? Yes, but converting circulating into fixed capital is a one-way street; getting it back again is slow, and sometimes impossible.[4]

Ricardo recognized that the division between fixed and circulating capital is fuzzy. He used the distinction just as a teaching device, to help others get the idea. He was one very smart person—smart enough that he didn't have to prove it, and so could make things simple for others. He knew that most people need something they can feel secure with, just as beginning skiers need the snowplow. He knew that most people can grasp differences of kind quicker than differences of degree. A driving instructor showing a nervous novice how to shift gears on a stick-shift will not say "Now gradually raise the clutch with your left foot as you gradually accelerate with your right." No, he says "Raise the clutch up half-way, then accelerate." He knows that riding the clutch like that is bad news for clutches; but the novice can learn that later. First he needs a method he can handle.

Ricardo knew that "fixed" capital actually circulates too, it just circulates more slowly. And some "circulating" capital actually circulates more slowly than some "fixed" capital. So when we speak of raising the ratio of circulating to fixed capital, that is shorthand for speeding up the circulation rate of all capital, which involves dozens of different kinds of adjustments.

Speeding up capital turnover makes a higher share of it liquid, that is available for anything, anything at all. It increases the fund of *richesses mobilieres amasse d'avance* which is prerequisite to most production. Note the word *mobilieres*. Liquid wealth is mobile, you can

4 An excellent question to test your resourcefulness is this. List five or more separate ways to recover capital faster from a fixed plant or structure. (Anyone who says salvage it for scrap just doesn't understand the problem; anyone who says torch it for fire insurance is slightly crooked.)

mobilize it. It is 100% disposable, available, on tap, ready for use right now.[5] That is what the world lives on from day to day, and when you control that you can do great things.

Frozen capital is available, too, but only in a different sense. It can only be used and recouped slowly, and according to its specific designed purpose. It releases its value in the form of service flow. It pays that out only at a fixed rate that is predetermined by its design. A quality building of 80-year life yields back its capital slowly over that period. To extract the service flow faster, and recover the capital faster, one would have suddenly to transform it into many cheap temporary shelters. This is impossible. Most of the capital is trapped in a queue, like a line of escaping prisoners crawling through a narrow tunnel. Again, it is like the cellulose inside a large log of firewood, unable to reach the "action edge" where it burns (cf. Section F,2, *infra*).

One of Quesnay's allies learned this lesson well. He was a smart fellow too, Pierre Samuel Du Pont. Having tried in vain to stave off the French Revolution by showing the way of social justice through economic analysis and constructive reforms he fled to America. Here he found a better pupil in his friend Thomas Jefferson.

He also brought his son Irenee Eleuthere, a chemist who founded America's longest-lasting family company, I.E. Du Pont de Nemours. The family now runs Delaware, General Motors, and a few other little things. They have dropped the social justice, but the family does know how to manage capital and stay solvent. A classic story of American business is how their agent, Donaldson Brown, saved GM from insolvency by introducing financial controls that required every Division to speed up its capital turnover. Old Francois Quesnay and his disciple Pierre S. Du Pont would have approved.

E. Wages-fund in a money economy

Ricardo worked out the theory in barter terms. His readers could relate to that, in 1817, because many English workers took their pay in real goods from the company store, an arrangement called "the truck system." The basic economic relationship was crystal clear: labor works up raw goods and gets back finished goods. Capitalists stand in between and carry the goods over the time needed for finishing.

Today of course workers get paid in money and are emancipated from the company store, which is good. But this also drops a veil of money over the real transaction involved, and divides it into two parts, which confuses many people (and not just students, either). Advancing subsistence now involves paying money wages, and also supplying finished goods for the money to buy. And these are done by different individuals at different times so it is not the individual employer, but capitalists collectively who "advance subsistence" to workers.

Conventional macro writers in ordinary texts focus their discourse mainly on the monetary flows, neglecting the real flows that give money its meaning. Modern "supply-side economics" and "neo-Austrian economics" are efforts to bring real goods flows back into the picture, but thus far are, alas, feeble and abortive, twisted and corrupted by the special pleading and political ambitions of their best-known votaries.

F. Allegories

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5 The French for disposable or available is *disponible*. The Spanish is the same, and also *aprovechable*. The German is *zur Verfugung*, or *verfugbar*.

1. Pipelines. A standard metaphor in macroeconomics is to picture the economy as a pipeline filled with goods in process. They go in the receiving end and, after some time, out the delivery end. The goods in the pipeline are capital, and the amount of capital required is the transit time multiplied by the rate of flow. Transit time is the "period," and rate of flow is "throughput" (In the simple model, these correspond to the input-output ratio.). Say, for example, the period is 36 mos. and the flow is $100/mo., then the capital required is $3600. The turnover of the capital is 1/36 per mo., or 1/3 per year. Turnover is always the reciprocal of the period.

To get more throughput with the same capital, cut the pipeline in half and make two, each half as long but with the same flow. Now the flow is $200; the period is 18 mos.; and turnover is 1/18 per mo., or 2/3 per year; and the capital is the same as before, $3600. But each month you hire twice as many workers and supply them with twice as much subsistence delivered from the output end of the pipes.

Of course life is not that simple, and the model doesn't show that we lose some productivity by doing this. We'll see later how to handle that trade-off. But we'll also see that when there is a surplus of unemployed labor needing jobs, and a shortage of capital, wages and interest rates (and land rents, too) adjust so as to home in on full employment by shortening pipelines.

2. Paper, kindling, and logs. Wood burns at the surface, so when you light paper or excelsior you get a lot of action, whoosh, because they are all surface; and the flame dies fast because there is little reserve below the action surface. So you throw on some kindling next, which has a higher ratio of volume/surface, but still not so much but what you have to keep feeding more. Last you put on a big log with a very high ratio of volume/surface, and it burns a long time while you are unemployed.

The log requires a larger fireplace, and is bulky to store, hard to come by, hard to handle, hard to start, and hard to put out when you've had enough, so why burn logs? To save labor. Comparing logs to kindling, logs are a way of substituting capital for labor.

3. Tires and roads. Tire treads are consumed "where the rubber meets the road," at the surface. The deeper the tread, the more life. So why not make all treads extra deep? Because the extra capital stored in the deeper tread can be used to make another, cheaper tire, and you can run two cars at once on cheap tires rather than one on expensive tires. Of course you have to replace the cheap tires more often, and that takes labor, but that's the point, isn't it? Instead of one set of tires needing replacing every three years, you have two sets needing replacing every two years, and a lot more jobs.

Paving, too, is consumed where the road meets the rubber, at the surface, and thicker paving lasts longer. But it also freezes up a lot of capital idly waiting for years before it reaches the surface and becomes useful. That idle capital could be used instead to build other roads right now. Instead of one road needing little maintenance you can have two roads each needing a lot of maintenance, and making a lot of jobs.

4. Tree farms vs. hamburger joints. The ordinary fast-food joint enjoys little prestige in this world, but it sure makes a lot of jobs, more than most of our "major industries." Say you have just $100 of capital to run a business, how can you generate enough volume to keep busy? By turning it over fast. If you turn it over once a day, there is a yearly volume of $36,500 with just $100 of capital. Suppose instead you put that into planting Douglas-fir trees, to be harvested in

80 years. Now your annual volume is $1.25. That is how different things can be. Think about it—I'll use this example again, and dot the i's and cross the t's.

5. More examples. Once you get the idea, you can think of a hundred examples, for they are all around you and the principle is universal. That is why it is worth mastering. Try making up a few examples from your experience and observation. You can think of things that would never occur to me.

I think of it this way. All capital consists of an "action edge" where it gives service and wears out; and a reservoir of value in storage for future use. Capital makes jobs when it is made, and again, usually, when its action edge gives service. In between it is out of use—*hors de combat*, as Quesnay would have said—and might as well not exist so far as present needs are concerned.

6. Principles and their abuses. The point is that factor proportions are adjustable. If labor is cheap and surplus, and capital is scarce and dear, it makes sense to spread the capital thin by building cheaply and often. But if labor is scarce and dear, and capital abundant, then the reverse makes sense.

Neither option is inherently good or bad, moral or immoral. But both principles get abused, and therefore misunderstood. Abuse of the early replacement principle is called bad names like planned obsolescence, jerry-building, el cheapo, shoddy, and throwaway. Abuse of capital-intensity is called gold-plating, monument-building, padding, ego-tripping, conspicuous consumption, etc. All these epithets can be colorful and expressive of real abuses, but don't let them blind you to the real economic principles at work from day to day in all human affairs.

7. Knut Wicksell and the grape juice. Knut Wicksell, an uncommonly smart Swede, worked this all out pretty well in his *Lectures on Political Economy*, 1901. He built an excellent little model there of a macro-economy. Like all model-builders he simplified reality to make a point. In his model all the capital consists of grape-juice maturing into wine. (OK, give him a break, there were no computers in 1901, they used their imaginations.)

At the beginning all wine matures over a 5-year cycle. They start a new one each year and drink the one started 5 years earlier, so at any time there are 5 harvests in storage. But the work force grows while no one saves anything (too drunk, probably), and how will they feed and employ the new workers? Easy, says Wicksell, they just cut the cycle down to 4 years, increasing the throughput by 20% with the same capital. Now there are 4 harvests in storage all the time, and more harvests. The wine isn't as good, but you can't have everything.

Wicksell also considers the effects of compound interest and land rent, which I am leaving out for now. The point is it is easy to change the ratio of labor to capital in order to use all the supply of both in tandem with each other.

G. Glitches on the way to Wicksell's utopia.

But if it is that easy, why is capital-flow ever a macro choke? Because it isn't always that easy. It's easy to tap a vat of wine as fast as you please, that is liquid capital. But here are some examples of frozen capital.

1. WPPSS, the Washington Public Power Supply System, sunk some $5B into nuclear power plants which, for various reasons, it never completed. That capital is frozen, probably forever: no way you can put a tap on an inoperative plant.

2. Our own fair River City (Riverside, California) sunk over $100M into buying a small piece of SONGS, the San Onofre Nuclear Generating Station, using borrowed money. Interest on the debt is over $1M per month. But the value of power generated at SONGS covers a good deal less than that, so we have to pour in more capital each month to pay the uncovered interest. Some of that we borrow, and some we take from the ratepayers by raising rates (we have a monopoly and they can't shop across the street), but it's all capital. So instead of recovering capital we keep putting more in, and will continue to until that happy day, which may or may not ever come, when SONGS' output covers interest on all the capital sunk into it.[6]

3. Canada has sunk Billions of dollars seeking oil in the High Arctic Islands. Even at $30/bbl that was premature, but now the price has dropped way below that, there is no way to get it out without losing even more Billions.

4. Southern Californians have invested more Billions down here in planting avocado trees, quintupling the bearing acreage in 10 years, 1972-81. Result: price collapse, and we were not able to recover any of that capital[7] until prices bounced back in about 1989. Almonds, grapevines, and several other fruits and nuts using living cellulose for capital are in the same fix.

5. Texas and other oil patches are littered with costly steel well-casings, drilling rigs, and other idle capital that got halfway through the pipeline and got stuck there, trapped like the prisoners in The Great Escape who were behind the fat Major who couldn't squeeze through the venturi.

6. In the 1850s South Carolina wanted a railroad to the west, which involved drilling a tunnel through Stump House Mountain. They got halfway through, ran out of money, and quit. Of course southerners are a little dreamy, but about the same time the penny-pinching Yankee bankers of Massachusetts were doing the same thing with Hoosac Mountain in the Berkshires. There are few investments as plainly unrecoverable as an unfinished tunnel, so remember the futility of those two rat holes, it epitomizes the whole point.

7. Politicians love to spend money, and to help justify big water projects they've developed a little trick of lending them money (our money, that is) without interest. When people got after them for that they learned to charge token interest at about 3% so they could deny they were lending without interest. Thus the Granite Reef Aqueduct, which carries Colorado River water to help enrich the Maricopa County gang[8] around Phoenix, will yield back a 3% return on the Federal investment if everything goes on schedule (which it never does), and if there are no cost overruns (which there always are), and if the water has no other uses (which it has). Now if we take out interest charges at current rates—say 12%—before paying back any principal (as law

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6 That was written originally about 1984. Since then SONGS has come on line and is doing better on a current basis. It is still difficult or impossible to get a straight accounting of all the capital sunk in it historically. Embarrassed officials and consultants cooked the books. The invisible capital input extracted from ratepayers has never been accounted for. Future waste disposal costs are underfunded, and the effort is to shift costs to Federal taxpayers.

7 Some *individuals* recovered capital by fabulous tax write-offs. This does not mean *society* recovered the capital, however. The cost was simply transferred from certain favored individuals to other taxpayers.

8 Charles Keating, Jr., was a prominent member of that gang. He managed to go bankrupt anyway, taking hundreds of millions of the savings of other people with him.

and custom require), that capital will never be recovered. It may never be anyway. The same is true of most of the pork barrel public works projects in the country.

8. Before 1979 most of the S&Ls put their funds into 30 and 40-year term loans at fixed interest rates. Suddenly interest rates leaped up to double digits, unheard of! To keep their depositors they had to pay them higher rates than they themselves were collecting. And they were stuck. And so was much of the real capital people had financed with the 40-year low-interest loans, because when people can borrow cheap they build things whose marginal yield is as low as the rate at which they borrow. But that in turn limits the ability of S&Ls to make new loans, they are all tapped out. The U.S. Government and other lenders have rescued the S&Ls; and foreign lenders are rescuing them, in the short run. What that means down the road is something to worry about.

All those examples have something in common with big logs in the fire: the rate at which they release stored value is limited by their physical structure. Release can be slower than planned, but rarely is it much faster.

A shortage of liquid capital is signaled by a high interest rate. A high interest rate stops new long investments, but it does not speed recovery of capital already committed to old ones. It often slows or stops it, when it cuts off capital needed to complete unfinished works, or to operate finished ones. You can't burn logs without kindling, and you can't plant without seeds. That is how shortage of liquid capital can choke the macro-economy. It can happen with a bang or a whimper, but it has happened and might happen again.

H. How to summarize it all: the fund/flow ratio

Turn back to the pipeline allegory, F.-1. above. The fund of capital (K) is the period (P) times the flow (F).

$$K = P \cdot F \tag{1}$$

Several relationships are restatements of that. First, the period is the fund/flow ratio:

$$P = K/F \tag{2}$$

Second, the flow is the fund/period ratio:

$$F = K/P \tag{3}$$

Third, turnover is the flow/fund ratio:

$$T = 1/P = F/K \tag{4}$$

Last, flow is the product of the fund and the turnover:

$$F = K \cdot T \tag{5}$$

(5) is the bottom line for macro-economics. Business volume is the product of capital times turnover. GNP and employment vary directly with business volume.

What is the value of K in America today? No one knows very accurately because those who measure it get it all mixed up with land values, which are not funds and never turn over. But it is

in the ballpark somewhere near 3 times national income, indicating a mean period of about 3 years. Raising that to 3.5 equals misery; lowering it to 2.5 means full employment.

I. (“eye”). Real flows and money flows

Faster turnover increases supply-side volume and spending volume in sync. More ripe goods come to market, that is, supply. But these must be replaced, so investors spend money to replace them, that creates income and therefore demand.

Is that circular? Simultaneous and continuing is more like it, and so is the whole macro-economy. What primes the pump is anticipation. Grocers spend today to replace produce they expect to sell tomorrow, and that spending circulates the cash with which groceries are bought. That’s how the system works and has always worked. Tree farm owners don’t spend today because they don’t expect to sell tomorrow. But make the capital flow and money flows with it.