How an Interest Hike Destroys Capital
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A rise of real interest rates destroys part of the real value of existing capital, in increasing measure of its putative longevity.[1] This "Decapitalizing Effect" is an economic loss, a loss that is just as real as physical destruction. The cash flow from durable capital will, after a rise of interest rates, be divided more in favor of interest, less in favor of Capital Consumption Allowances (CCAs).[2] The basic mathematics of finance is available, and is quite precise and consistent. See Appendix hereto.

Conversely, a fall of real interest rates adds to the real value of existing capital, having the same effect as creating capital.[3]

Thus, the response to a shortness of available (soft) capital is economically to destroy part of durable (hard) capital. This raises the possibility of a macro-economic "glitch," (a perverse episode of harmful "positive feedback," often called a "vicious spiral.") This effect, variously described and with varying emphases, has been noted by Ricardo, Jevons, Boehm-Bawerk, Wicksell, Spiethoff, Hayek, and others. Ricardo's Chapter 1, "On Value," and Chapter 31, "On Machinery," are good introductions.

Those writings are nominally well-known, and at the same time treated as non-existent: a feat of compartment-mindedness that seems to characterize much economic writing. As Lionel Robbins points out, micro theory after 1870 became one of acapitalistic production.[4] Capital theory simply disappeared from the picture.[5]

The property tax rate on capital items affects their value just as would a rise in the (real) interest rate of the same percentage. A rise in the rate thus destroys existing real capital; a fall in the rate creates real capital. Note, this applies only to the part of the tax

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[1] "Longevity" here means economic life, in the full economic sense. It should not be confused with physical carcass life. The "full economic sense" means the duration and time distribution of cash or service flows, properly adjusted for the time value of money.

[2] The appropriate accounting adjustment on the asset side is called "marking to market value." The loss of value occurs whether or not it is formally recognized on the books.

[3] Both those effects are muted by countervailing effects on ground rents and land prices. This refinement is not pursued here, but that does not mean it is unimportant.

[4] Introduction to the English translation of Wicksell's Lectures (p.xiv).

[5] An attempt to reintegrate capital theory with micro and macro theory has been made by the writer, 1976, "Toward Full Employment with Limited Land and Capital." In Arthur Lynn, Jr. (ed.), Property Taxation, Land Use and Public Policy. Madison: Univ. of Wisconsin Press, pp. 99-166. Also in "Capital Requirements for Economic Growth." Joint Economic Committee, Congress of the United States, U.S. Economic Growth from 1976 to 1986: Prospects, Problems and Patterns. Vol. 8, pp. 56-75.

In both works, the effort was to use capital theory as a bridge to unify micro and macro theory.

that falls on capital as such; the other part, that falls on land, has no such effect.

Why Land is not Destroyed by Falling Prices

A rise in interest rates and/or property tax rates lowers market prices of land by a much larger factor than it lowers prices of existing capital, because the value of land derives from more remote future prospects, overall. Land prices, accordingly, are hypersensitive to interest rates.[6] Likewise, market prices of land are more sensitive to property tax rates than are market prices of items of capital. The most visible effect of tight money, therefore, is often the collapse of land prices. Many people, melding this effect in their minds with the lower price of real capital, interpret the fall of land price as a fall of national wealth.

However, *changes in the market price of land, when caused by inverse changes in interest rates, do not represent changes in social wealth*. In this respect they differ from changes in the market price, or DCF, of depreciable capital. Many potentially useful analyses of our subject are deeply flawed by failure to hew to this difference.[7] Land does not yield any CCAs. Changes in its value are purely redistributive, between those who do and those who do not own land.

Land prices are also sensitive to changes in expected growth rates of net income, both real and inflationary. These changes, likewise, do not represent changes in social wealth. They are simply a state of the public mind.

A third factor determining land prices is the current net income (cash or service flow). This may rise for purely distributive causes, e.g. a fall of the interest charge on financing a new building,[8] or a fall in wage rates. These changes, again, do not represent changes in social wealth.

Last, the service flow of land may rise because the land actually becomes more productive, e.g. from the spillover benefits of surrounding urban growth. This <u>may</u> represent a rise of real social wealth - I leave the question moot. The main point here is that <u>most</u> changes in land prices do not represent changes of real social wealth.

Effect of Lower Land and Capital Values on New Saving

A rise of interest rates tends to raise savings rates via a strong wealth (or portfolio)

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[6]"Interest rates" is used here to subsume all the conditions of availability of loans, or equity funds. It is recognized that selective credit controls may cause interest rates relevant to land purchase to move differently from other interest rates.

[7]See David F. Bradford, 1990, "What is National Saving?", in Walker, Bloomfield, and Thorning, <u>The U.S. Savings Challenge</u>. Boulder: Westview Press, at p. 47. Here, Bradford seems to include land price increments as part of national saving, implying they constitute an increase of national wealth. This is a particularly frustrating case because Bradford has taken pains to treat land separately: he is so near, but still so far from getting it right.

[8]This is separate from the cap rate applied to the net income of land to find the selling price. Land prices are doubly sensitive to the interest rate for this reason alone.

effect. It lowers the current market price of land, especially. To a lesser extent it lowers the prices of items of durable capital.

How does this work? There is a diminishing marginal utility of total wealth held (for retirement, for business use, for consumer capital, etc.). The fall of asset prices as a store of value thus tends to raise savings rates.

At the same time, a rise of the Marginal Rate of Return (MROR) on new investing raises the reward of saving as vs. consuming income. This is a substitution effect, maintained or conceded by all.

The traditional counter-argument has been that there is a countervailing income effect: higher income from given sums invested tends to weaken the impulse to save. This counter-argument in turn, however, is offset and more than outweighed by the wealth effect recited above. The wealth effect reinforces the substitution effect, making saving respond positively to interest rate hikes.

Conversely, a fall of interest rates raises the market price of land, swelling portfolio values, weakening the incentive to save. In the extreme, if there is no reward for saving (interest rate = 0), and no property tax on land values, land prices would rise infinitely high. This, along with associated absurdities, would end all saving. These *reductios ad absurdum* clearly indicate that savings rates must be positively related to interest rates.[9]

APPENDIX 1: Mathematical and Graphical Explanations of the Decapitalizing Effect

Market prices of capital fall when $\underline{i}$ rises. This has the same effect as physically destroying part of the capital stock, even though its cash flow remains the same, and its carcass is undamaged. To demonstrate and visualize why this is so, use one of these methods.

a. One way is to graph the function $a \cdot I^{-n}$, under a horizontal curve representing $\underline{a}$, where $I=(1+i)$. Shade the area between the curves, out to any terminal value of $\underline{n}$. The shaded area is interest; the unshaded area is the value of the capital.

When $\underline{i}$ rises, the decay curve falls, so the given cash flow ($\underline{a}$) is divided differently: more goes to interest, less to capital.

b. A second way is algebraic, showing how one year's cash flow is divided between interest and capital recovery.

In year one, capital recovery = $a \cdot I^{-n}$. When $\underline{i}$ rises, I^{-n} falls, so a lower fraction of $\underline{a}$ goes for capital recovery. The same is true in each succeeding year: therefore, it is true for all

[9] At zero interest, everyone could borrow infinitely to consume infinitely, and repay all debts infinitely at no cost. Saving would become negative, with no constraint whatever on consuming. In fact, no one would even have to work, when all could borrow and refinance indefinitely without cost. The notion, often seriously advanced, that interest is not needed to promote net saving, is indeed absurd.

the years, taken conjointly.

c. A third way, also algebraic, is to show how the entire cash flow over life is divided between interest and capital recovery.

$$\text{Interest} = na - a(1-I^{-n})/i$$

$$\text{Int}/na = 1 - (1-I^{-n})/in$$

The right side is an increasing function of i.

Capital is lost because interest, which always takes priority, now claims a higher share of the given cash flow. Capital recovery gets less. The sum of expected capital recoveries is the current DCF.[10]

We have seen this math before. The following is repeated from "Payback Time: Knowing and Controlling it," pp. 11-13. Statements in **bold type** are added for this Appendix.

e. Share of interest in cash flow.

A large fraction of cash flow (a) is net income to the investor, over and above recovery of capital or principal (P). How much is recovery of P?[11]

In the reading on "DCF," section on Finite Flows, I had you draw a "cume curve" showing the growth of DCFF with n. This curve heads up bravely at first from the origin, at nearly 45^o, but then bends over and flattens out, approaching a horizontal asymptote. Label it "P". Draw another curve, a straight line heading up at 45^o from the origin and never bending. This curve shows n, and is the cumulative cash flow. Label it "n". A point on the P-curve tells you what P is normally required to buy an income stream whose total value is n. All the cash flow above P has to be interest. The vertical gap between curves widens as n rises. The curves thus make it clear that the share of interest in cash flow is an increasing function - a rapidly increasing function - of n. **The share of interest is also a rapidly increasing function of i.**

The curves give a conspectus. Curves are most useful when used in double harness with the curves' algebraic definitions, which in turn generate real numbers (the numbers are no more real than the algebra, but may seem that way because you are more used to them). When you have graphs, equations and numerical tables reinforcing each other you really get a handle on things.

The cash flow above P is n-P. The share of interest in the total cash flow is therefore:

$$\text{Share of interest} = (n-P)/n = 1-P/n = 1 - (1-I^{-n})/ni \qquad (12)$$

Table 3 gives the numbers from (12).

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[10] In 3-factor economics, including land as the third factor, the loss of K is tempered by a loss of rent. This important factor is not treated here, but treated separately, later.

[11] P stands not just for Principal, but also for Present Value, Purchase Price, Planting Cost, Primary Outlay, etc. -- handy that they all start with P.

Table 3: Share of interest in cash flow				
n\i	.05	.10	.15	.20
5	.13	.24	.33	.40
10	.23	.39	.50	.58
20	.38	.57	.69	.76
40	.57	.76	.83	.88
80	.76	.88	.92	.94

Table 3 says that if you borrow at 10%, amortized over 40 years, then 76% of all the payments you make go to pay interest. The other 24% pays off the loan. It's a hard fact of life: deal with it.

On the other hand, if you can pay up front, there is good news. If you buy a house for $100,000 and it yields you a service flow worth $10,000/year (in foregone rent), then in 40 years you will have received $400,000 from it, for your outlay of just $100,000. (The even better news is that the service flow is not taxable, while the interest on your loan is deductible. But wait, there is more bad news: that is why houses cost so much to buy.)

An operation is "capital-intensive" when a high share of cash flow goes to feed the banker or investor. That occurs, basically, when interest rates are high, and payments are long deferred, strung out in the far future. Normally that occurs when capital is durable, heavy and expensive, like the Rolls-Royce in Reading III,E,3.

APPENDIX 2: The Economic Consequences of Falling Land Prices

A drop in land prices has no "Decapitalizing Effect" in the sense of destroying real capital.[12] Nevertheless, it is part of the process resulting from higher interest rates, and must be considered.

Land is dangerous to use as debt collateral, because its price is so highly sensitive to interest rate changes. It is even more dangerous to let it become the collateral backing demand deposits. Here are some items. In Norway, Sweden, Denmark, and Finland, land values have fallen, and banks are in deep trouble. Governments are bailing them out.[13] In Southern California, land values have dropped sharply since 1989, in varying percentages depending on locale. Speculative outlying acreage has dropped over 50%; sales are

[12]On the contrary, by weakening the factor of locational obsolescence, it will tend to raise the ratio of building value to land value in many areas, thus raising the value of real capital. This important thread is not pursued here.

[13]Some common force makes land prices drop at about the same time, around the world. That force is the worldwide capital market.

stagnant; lenders are hurting. In Japan, in 1990, the Finance Ministry ordered banks to stop lending for real estate transactions. At the same time, the Bank of Japan raised interest rates.

Kichinosuke Sasaki, a heavily indebted developer, estimated a 50% drop of land and stock prices, from the peak. Today, 1996, Yosushi Kudo estimates a 75% drop.

Selective controls on credit extended by commercial banks may be used to prevent collateralizing land values. Another method would be to make mortgages taxable property, as provided for, for example, in the 1879 California Constitution. Such a provision is enforceable because mortgages (or deeds of trust) are always publicly recorded, along with land titles themselves. Such a provision would also ease the political case for raising property taxes, which otherwise fall solely on equity holders, and appear to exempt lenders (except as they erode collateral security).

Why are banks not lending much since early 1993? Interest rates are low, but collateral requirements are very high. There are two problems, at least. Banks are leery of any real estate collateral now. Also, they lack the needed capital: their past losses on bad loans have drained their capital and other reserves. Both of those result from their losses.

When banks stop lending on land, it further weakens the demand for land, so banks lend even less. This is a “positive feedback loop,” or snowball effect, but what began it? The sequence is that first, a land boom fizzles, for its own endogenous reasons. Banks take losses. Their reserves and surpluses (capital) dwindle. Then they stop lending, giving the snowball another push.