TAX LIFE, LAND PRICES, AND RRAT

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INTRO.

Once, buildings were written off for tax purposes over something purporting to be the economic life of the building. Then Congress and the industry began discovering the Commons variation of the George principle. They began shortening tax lives and steepening the gradient of depreciation paths, turning the income tax into a sort of "graded tax plan" whereby the income from depreciable buildings was taxed at a lower rate than the income imputable to (or derived from) non-depreciable land.

This movement peaked when the fiery battle-cry of "10-5-3" pierced the air. It seems like yesterday -- was it really 15 years ago? Anyway buildings actually did get 15 years for a quite a while. The results, or at least the ensuing events, have to get a mixed evaluation. We have built up the largest surplus of office space in world history. Said office space now constitutes one of the most fragile and perilous elements of collateral behind bank loans, probably outdoing farm loans, energy loans, shipping loans and foreign loans in its contributions to recent bank failures and perils. Along with our surplus we have achieved instability and a high degree of wasted capital which has higher uses elsewhere.

We have managed to magnify investment opportunities in a magnificent Keynesian way, or at least a Heller way, without however solving the problems of unemployment, homelessness, malnutrition, poverty, bad education, lack of medical care, and so on that presumably were the original objectives of encouraging investment.

Evidently there is more to tax reform than just exempting certain kinds of buildings from the full fury of the rates. Come to think of it, it is a left-handed sort of benefit to workers to have wages taxed higher so that capital in buildings and machinery may be taxed lower. So, without any assumption as to good or bad, let us look at the effects of shortening tax lives to less than economic lives of buildings.

A. Defining RRAT

Our method is to find the rate of return after tax (RRAT). I choose this criterion instead of present value because RRAT is standardized for different periods of time. Another acceptable approach would be to use the annual value of an investment, but that is not calculated in these notes. It will be a useful exercise to recalculate the findings in terms of annual values, and see to what extent that changes anything.

RRAT is calculated from the following formula:

$$RRAT = \frac{\frac{a}{P}(1-t)(1-I^{-n}) + \frac{t}{x}(1-l)(1-I^{-x})}{1-\frac{F}{P}\left[(1-s)+ls\right]I^{-n}}$$

where a=cash flow before taxes
P=present cost of building plus land
t=tax rate on ordinary income
x=tax life
l=land element (non-depreciable) as a fraction of P
I=1+i, where i is the same as RRAT
n=years before sale
F=future sale price after n years
s=tax rate on capital gain

The "default values" of the parameters are:

a/P=.12
P=1
t=~~4~~.5
l=.4
F=1
s=.2
x=n

The reason for having x=n is that a building owner has much to gain by selling as soon as depreciation runs out, letting the next owner redepreciate from a new basis. This presupposes a certain slippage in allocating basis between land and building, a point to be explored.

The tax code of course reads that 60% of capital gains are excluded from taxable income, which argues for substituting .4t in lieu of s. However "capital gains treatment" involves much more than that, and for that reason I am keeping the separate notation, which allows us the flexibility to contemplate different ratios than .4.

Solution of (1) is of course an iterative process, since RRAT appears on both sides of the equation (hidden in I on the right side). This can be done automatically with the HP38E hand calculator, or the newer HP12, or various other models. It can also be done surprisingly quickly by trial and error by programming the right side into a programmable calculator and trying various values. Isaac Newton also had his method, and there are others.

B. Inspection of (1) lets us anticipate and outline our findings.

1. Tax life, x, taken by itself, has little effect on RRAT. x appears twice in the 2nd term in the numerator, first to reduce the value and then to increase it. The effect is muted again by a high value of "l", the non-depreciable land share.

2. The marginal RRAT (from an increment to building volume or quality on a given site) entails a marginal land input of zero, and is calculated by setting l=0. This raises the sensitivity of RRAT to x. However this heightened sensitivity is lowered again when we consider that F/P is also lowered by adding inputs which are 100% depreciable, unless the increment is to longevity itself.

3. RRAT is quite sensitive to x (as a decreasing function) if we assume that F/P is constant, meaning it is unaffected by the time of sale. That assumption implies that land value appreciation is offsetting building depreciation.

That assumption is strengthened by the fact that F is raised by the buyer's future ability to redepreciate; and the lower is the value of x, the greater is that benefit.

In a more formal and complete model we would follow this through infinite time, and it would then be obvious that a low value of x lets you depreciate more times in each period (e.g. each 30 years). In the present model, however, we subsume all that in these heuristic observations about probably effects on F, as seen from the perspective of the first-generation holder.

4. With low values of x and n, RRAT becomes very sensitive to F/P, and also to s and to l. Thus the effect of x on incentives depends mainly on resale values; on tax treatment of capital gains; and the share of basis which is depreciable. These become more important than ordinary income and tax rates. It also becomes much more important how much of basis you write off than when. That is, understatement of the land value share is a larger loophole than fast write-off.

Dependence of RRAT on resale value, F, is a hazardous matter. F is stochastic. This part of the incentive to build comes from anticipations of F, which are highly unstable, subject to mass psychology and herd movements and the other elements of "irrational expectations" which dominate the real world. It is tempting to congratulate ourselves here and say "Hooray, we have harnessed the unearned increment of land values to a useful purpose; it is an incentive to build." But not only is this incentive notably unstable it is on balance a net depressant of RRAT. This can be seen by multiplying top and bottom of (1) by P; dividing P into two parts, Land and Building; and varying the value of the Land element. This exercise is left to the reader.

F is affected by 1) Future land value; 2) Future residual building value; 3) Future residual tax shelter value. 4) Future financing conditions at time of planned resale. We could seek and find equilibrium conditions based on (2), where (2) equals what is left after depreciation actually taken. Every true model builder would applaud. But in the real world (1) is wildly variable and unpredictable, and has in the past figured in many cycles of boom and bust before 1929, even in the absence of the additional uncertainty from (3). (4) is also highly unstable and unpredictable. Now we add to the pot the factor of (3), which is probably not as wild as (1) or (4), but which magnifies their influence on the RRAT.

5. The sensitivity of RRAT to a/P declines as x and n decline; and as t increases (s remaining constant). This to say that the ordinary income of a building -- the thing that economic theory says should provide the incentive to build it -- declines to a secondary factor in the equation.

6. The influence of t on RRAT declines as x and n decline (again, s remaining constant). In the example given below, the effect of t on RRAT is even perverse for values of x less than 7.

7. The influence of l on RRAT rises as x falls. This is because (1-l) in the numerator of (1) is divided by x.

C. Tables of RRAT as affected by various factors sketched above.

1. Here we depart from our default assumption that n=x. Here we hold n=50 while x varies. This shows the pure effect of fast write-off without sale after x years. A sale is assumed at n=50 at a price F=P; but F=0 would not change RRAT much.

In order to walk us into the procedure, Table 1 using t=.4 shows more steps than will be shown in later tables. In order to adapt (1) for solution on the HP12 I divided the cash flow into 3 parts. PMT A is the sum of (a/P)(1-t) (which is .12x.6=.072) and t(1-l)/x (which is .4x.6/x=.24/x), and PMT A extends for the first x years. PMT B is just .072, and extends for the next span of years, 50-x. Last, PMT C is .88xF/P. PMT C represents sale at the end of 50 years. .88 is the tax factor in the denominator of (1), using our default values.

Table 1: RRAT with different values of x, while n=50; t=.4

x	50-x	.24/x	PMT A	PMT B	PMT C	RRAT(%)
10	40	.024	.096	.072	.88	8.54
15	35	.016	.088	〃	〃	8.31
18	32	.0133	.0853	〃	〃	8.20
28	22	.0086	.0806	〃	〃	7.94
50	00	.0048	.0768	〃	〃	7.64

When solving by trial and error on the programmable calculator it is not necessary to follow the exact procedure shown above; but any procedure that breaks (1) down into its components is useful in helping us grasp the factors at work.

Table 2A shows how the effect of x on RRAT is muted at higher values of l. But it is actually not very great even for l=0.

Table 2A: RRAT (%) for different values of x and l. n=50, t=.4

l \ x:	10	15	18	28	50
.0	9.61	9.18	8.93	8.45	7.97
.4	8.54	8.31	8.20	7.94	7.64
.9	7.37	7.34	7.32	7.28	7.24

The top row of Table 2A, where l=0, shows the effect of x on RRAT for the marginal increment of capital on fixed land. There is some effect, but it is quite modest compared with others we will see when resale is a factor.

Table 2B shows how the matter changes when n=5, so that resale is a factor to conjure with.

Table 2B: RRAT for different values of x and l; n=5; t=.5

l \ x:	5	10	15	18	28	50
.0	.1291	.1077	.0949	.0892	.0763	.0615
.4	.1003	.0895	.0822	.0822	.0707	.0610
.9	.0665	.0651	.0641	.0635	.0621	.0602

Table 3 illustrates how the resale date changes RRAT, for any given value of x.

Table 3: RRAT for different n, with x=5, l=.2, F=P, t=.5

n	R
4	
5	.1146
20	.0912

Table 4A shows the sensitivity of RRAT to F, with n=5, x=5, l=.5, and s=.2, t=.5

F/P	RRAT
1.0	.0934
1.3	.1315

Note how a 30% increase in F/P causes a more than 30% rise in RRAT. Now for the first time we see a high degree of responsiveness of RRAT to a parameter. Future sale value, F, is clearly a major factor.

Table 4B shows the sensitivity of RRAT to s, with n=x=5, l=.2, and F=P.

Table 4B: RRAT with different s, when n=x=5

s:	.0	.2	.5	.8	1.0
RRAT:	.1400	.1146	.0704	.0160	

Here we see an extreme degree of sensitivity. The preferential rate on capital gains in tandem with fast write-off and fast turnaround is of the greatest value.

Tables 5A and 5B show the sensitivity of RRAT to ordinary cash flow, a, for high and low values of n and x.

Table 5A: RRAT with different a/P when n=x=50, $\ell = .2$

a/P	RRAT
.12	.0676
.04	.0264

Here, RRAT depends closely on a/P, as it should.

Table 5B: RRAT with different a/p when n=x=5, $\ell = .2$

a/P	RRAT
.12	.1145
.04	.0722

Here, RRAT is much less sensitive to a change in a/P. Other factors connected with resale are dominating the matter.

Table 6 shows that RRAT is remarkably insensitive to t, on our assumption that s is independent of t, when n and x are low-valued. In the example, in fact, RRAT changes perversely with t, for values of n and x below 7. This effect testifies remarkably to the great importance of future sale values relative to current cash flow, when write-off is very fast.

Table 6: RRAT for different n, x, and t, $\ell = .2$

n	x	t: .2	.5	.8
5	5	.1019	.1146	.1272
6	5	.1033	.1097	.1162
6	6	.1020	.1062	.1105
7	7	.1021	.1003	.0985
8	8	.1021	.0958	.0895
50	50	.0991	.0676	.0356

How, one might ask, can there be a perverse effect of t on RRAT? It is because the assumption that F=P says the real estate does not depreciate. To write it off at all is therefore a freebie; and when you write it off fast enough the freebie is worth more than the tax. The value of the freebie rises with t because s remains constant at .2.

Table 7 shows how RRAT varies with different values of l, at different values of n and x. This matter has been touched upon before, but not drawn together in this way. Here we see that RRAT is sensitive to l for low values of x. The implication is that it now becomes very important for taxpayers to understate l, i.e. to allocate non-depreciable land value to depreciable building value, thus depreciating land. This has always been a matter of some import, but fast write-off raises it to a matter of highest import.

Table 7: RRAT for different l, n, and x.

n	x	l: .0	.5	.9
5	5	.1291	.0934	.0665
5	50	.0615	.0608	.0602
50	5	.0973	.0754	.0627
50	50	.0695	.0647	.0609

When x=50, l doesn't matter. But when x=5, l matters; and when both x and n=5, l matters a lot more.

D. Summary of findings

1. In the absence of a resale effect there is little effect of x on RRAT. The traditional position as expressed by Richard Slitor some years back is that the "double-dipping effect" resulting from repeat depreciation is minor. The finding here is the reverse. Double-dipping is what gives short tax life its major oomph to raise RRAT.

2. The marginal effect of low x on RRAT is greater than the average effect, because no additional land is required, so l=0 in Eqn. (1). However even this marginal effect assumes little importance until it is coupled with very fast write-off and turnaround.

3. Resale coupled with fast write-off makes for a big boost to RRAT, provided that resale is at a good price, F, relative to base cost, P.

4. Resale effects make RRAT highly sensitive to F/P and to s. This is true of both the average and the marginal values of RRAT.

Some likely bad effects from this have been and may be noted:

a. Artificial churning of the market in young and mature buildings is stimulated. In the market for raw land an active, churning market is probably a very good thing, as it obviates the need for each firm to build up its own reserves of empty land for future possible expansion. But in the market for adolescent and mature buildings there may be more harm than good.

b. Building design is modified to emphasize resale value over current service flow. Specialization of buildings is sacrificed to dull, safe standardization.

c. There is an artificial premium on building longevity into buildings, to maximize future resale values. This creates social damage of a kind often called "Ricardo Effect", from the material in Chap. 1 of Ricardo's Principles on the effects of freezing circulating capital into fixed capital.

d. There is a locational bias given to investment. Investment is drawn artificially to those locations where land values are expected to rise most. The ancient apologists for land speculation, like Hibbard and Ely and Knight, praised "the lure of the unearned increment" for drawing investment into frontier expansion, which their ideology taught them to assume was a good thing. Others more correctly labelled this a locational distortion.

Today the same bias probably draws capital excessively from central city to suburb and from rustbelt to sunbelt. I can vouch with feeling that it has drawn too much into avocado development in Southern California, where bearing acreage has quintupled in the last 10 years, and prices crashed. Rational Expectations, anyone?

e. Harnessing unearned increments to serve as functional incentives to stimulate investment is not an achievement for which we should congratulate ourselves.

First, such increments are extremely unstable, and the expectation of them as much or moreso. This element of incentive to invest is therefore highly destabilizing.

Second, the existence of high and stable land values, such as might result from a period of increments, is highly depressing to the incentive to invest, for the simple and basic reason that so much of the return must now go to the landholder. When values are falling, it is that much moreso of course. But even rising values are less stimulating than would be stable values at a zero level. It can be shown (but hasn't been here as yet) that the effect of land values as part of an investment is to lower the ROR (with or without taxes) unless the ROR on the land alone exceeds that on the rest of the investment -- in which case, however, the investor will prefer to hold the land vacant.

5. It remains true that universal expensing of all new capital formation would achieve that part of the Georgist aim of untaxing capital while continuing to tax land, as Commons advocated. That would still leave the question of whether it is right to exempt capital while continuing to tax work, and I don't think that is even a question. But apart from that the present system perverts the Commons proposal beyond any acceptance. The shortening of lives is not enough by itself to raise RRAT substantially, but only in conjunction with fast turnaround, double-dipping, depreciating land, and exempting much of unearned increments from the income tax, all of which are odious.