Defining Rent, Annuitizing K_0

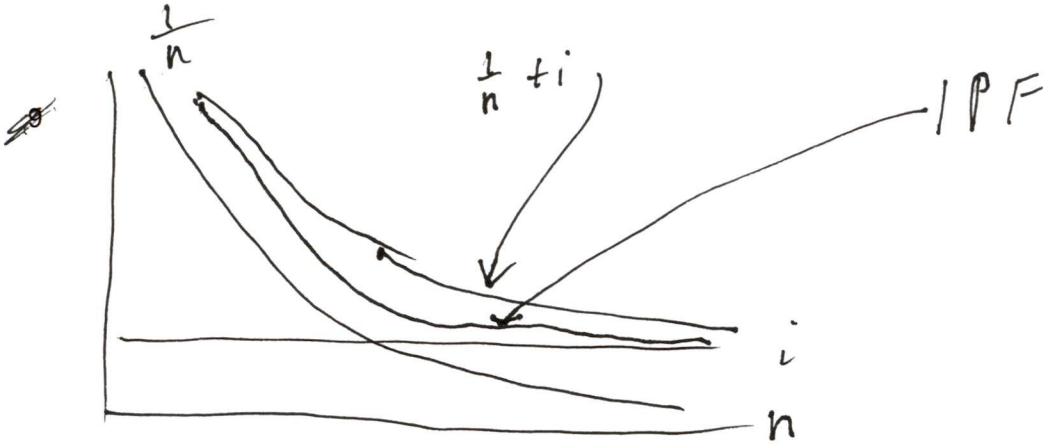


Table I points.

1. cols 3 + 4 show the annualized cost of K
2. $\frac{1}{n}$ + .05 [Col. 3] is a rough approx of IPF (Col 4), but overstates it
3. Col. 5 shows their ratio. $(\frac{1}{n} + i)$ overstates IPF by a max of 28% when $n = 30$
4. Col 6 shows $DCFF_n$ as fn of n. a kind of hockey stick curve rising sharply w. n but flattening out to asymptote at $\frac{1}{i}$
5. Col 7 is $DCFF/n \to 0$ as $n \to \infty$. This is land; there rent is all net inc., there is no recovery of principal.
6. Col 8 is growth of a single sum (a "point" value, as vs a "flow" value) An eg. is growth of inv. value of stumpage. Value after 60 yrs is mostly product of K – Labor input is $1/q \cong 5\%$ There is also stored up rent, w. int.
7. Col 9 is disc. factor for a pt. value. 5.4% over 60 yrs.

$$\frac{1 - I^{-n}}{i} \times I^n = \frac{I^n - 1}{i} \qquad \frac{(1+i)^1 - 1}{i} = \frac{i}{i} = 1$$

$$\frac{K \times [n \cdot IPF - 1]}{K \times n \cdot IPF} = 1 - \frac{1}{n \cdot IPF} = 1 - \frac{DCFF}{n}$$

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$i = .05$

n (1)	$\frac{i}{n}$ (2)	$\frac{i}{n}+.05$ (3)	IPF (4)	DCFF (6)	DCFF/n (5)	$\frac{\frac{i}{n}+.05}{IPF}$ (3)/(4)	1.05^n (8)	1.05^{-n} (9)	FVF (6)×(8) (10)	FVF/n (11)	$\frac{DCFF}{n}$ (12)	nx IPF
1	1	1.05	1.05	0.95	0.95	1.0	1.05	.952	1.0	1.0	.05 / 0.95	1.05
2	.5	.55	.54	1.86	.93	1.02	1.103	.907	2.05	1.03	.07 / 1.93	1.09
3	.33	.38	.37	2.72	.91	1.03	1.158	.864	3.15	1.05	.09	1.11
4	.25	.30	.28	3.55	.89	1.07	1.22	.82	4.33	1.08	.11	1.12
5	.20	.25	.23	4.33	.87	1.09	1.28	.78	5.54	1.11	.13	1.15
—	—	—	—	—	—	—	—	—	—	—	—	
10	.10	.15	.13	7.72	.77	1.15	1.63	.61	12.6	1.26	.23	1.3
—	—	—	—	—	—	—	—	—	—	—		
20	.05	.10	.08	12.46	.62	1.25	2.65	.38	33.01	1.65	.38	1.6
—	—	—	—	—	—	—	—	—	—	—		
30	.033	.083	.065	15.37	.51	1.28	4.32	.23	66.4	2.21	.49	1.95
—	—	—	—	—	—	—	—	—	—	—		
60	.017	.067	.053	18.93	.32	1.26	18.7	.054	354.0	5.90	.68	
—	—	—	—	—	—	—	—	—	—	—		
∞	.000	.050	.050	20.00	.00	1.00	∞	0	∞	∞	1.000	

Notation

i = i.r.

n = term in years

IPF = $= \frac{i}{1-I^{-n}} = \frac{1}{DCFF}$

DCFF = $= \frac{1-I^{-n}}{i} = \frac{1}{IPF}$

a = annual cf = 1

I = $(1+i)$

Land rent = Gross rent − e − K_0 × IPF

N.C.F. = g.r. − e

e = expenses

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$n = 30$

i	$1/n$	$1/n + i$	IPF	$\frac{1/n + i}{IPF}$	I^{30}	I^{-30}					
(1)	(2)	(3)	(4)	(5)	(6)	(7)					
.00	.033	.033	.033	(3)/(4) 1.0	1.0	1.0					
.01		.043	.039	1.10	1.35	.74					
.03		.063	.051	1.24	2.43	.41					
.05		.083	.065	1.28	4.32	.23					
.072		.105	.082	1.28	8.05	.12					
.10		.133	.106	1.25	17.45	.06					
.15		.183	.152	1.20	66.2	.02					
.22		.253	.221	1.14	390	.003					

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$(1+i)^{-n}$

n \ i →	.01	.03	.05	.072	.10	.12					
(1)	(2)	(3)	(4)	(5)	(6)	(7)					
1	.99	.97	.95	.93	.91	.89					
5	.95	.86	.78	.71	.62	.57					
10	.91	.74	.61	.50	.39	.32					
20	.82	.55	.38	.25	.15	.10					
30	.74	.41	.23	.12	.057	.033					
50	.61	.23	.087	.03	.009	.003					
100	.37					.000,1					
∞											

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