

162 Probs Bk 3

Replacement

$$PV = a \frac{1 - I^{-n}}{i} + \frac{b I^{-n}}{i} = \frac{a}{i} - \frac{I^{-n}}{i} (a - b)$$

$$= \frac{a}{i} + \frac{b - a}{i I^n}$$

Max when $a = 0$

So b must rise w(n) & a fall

$$PV = \frac{a}{i} + \frac{b(1+f)^n - a(1-d)^n}{i I^n}$$

$$\text{Max } \frac{b(1+f)^n - a(1-d)^n}{(1+i)^n}$$

$$\approx b(1+f-i)^n - a(1-d-i)^n$$

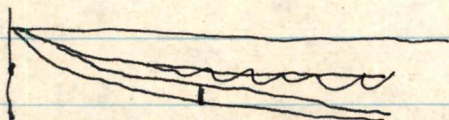
Let $b = a$; $f = 0$

$$\text{Then max } a[(1-i)^n - (1-d-i)^n]$$

$$= a \left[\frac{1}{(1+i)^n} - \frac{(1-d)^n}{(1+i)^n} \right]$$

$$= \frac{a}{(1+i)^n} \left(1 - (1-d)^n \right)$$

$$\approx a \left[(1+i)^{-n} - (1+i+d)^{-n} \right]$$

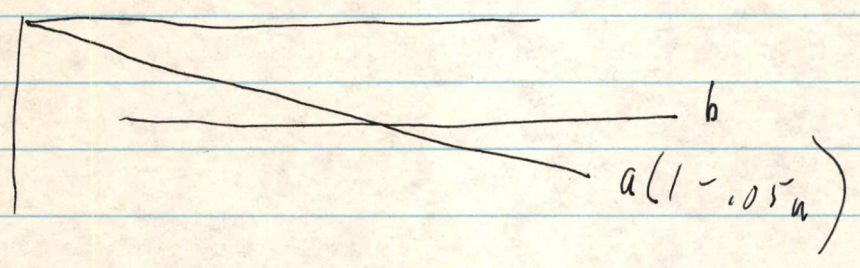


$i = .05$
 $d = .10$

n	$\frac{1.05^{-n}}{}$	$\frac{1.15^{-n}}{}$	$\frac{1.05^{-n} - 1.15^{-n}}{}$
10	.61	.25	.36
20	.38	.06	.32
15	.48	.12	.36
✓ 12	.56	.14	.37

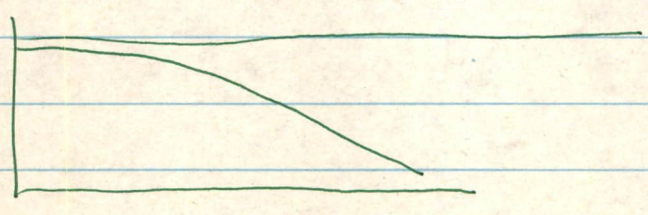
Arithmetic decay of a .

$a(1 - .05n)$

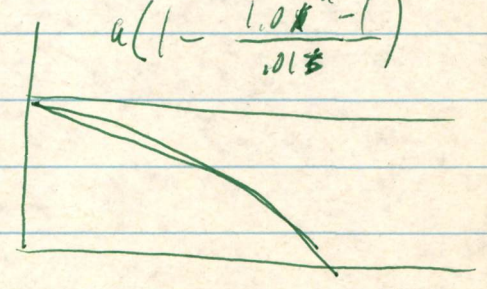


So simple?

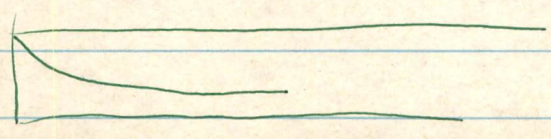
$a(1 - 1.05^{-n})$



$a(1 - \frac{1.05^{-n} - 1}{.05})$



✓ $a(1 - \frac{1 - I^{-n}}{i})$



Payback & Volume & Land Fructification of 2 uses of K

I, A, Yields a $\frac{1-I^{-40}}{i} \equiv A$

B, Yields 10 a $\frac{1-I^{-4}}{i} \equiv B$

$$\frac{B}{A} = \frac{10 a \frac{1-I^{-4}}{i}}{a \frac{1-I^{-40}}{i}} = 10 \frac{DCF(4)}{DCF(40)}$$

Values of $\frac{DCF(40)}{DCF(4)}$

$$\frac{A}{B} = \frac{1}{10} \frac{DCF(40)}{DCF(4)}$$

i	$DCF(4)$	$DCF(40)$	Ratio	$\frac{A}{B}$
.02	3.90	32.83	8.41	.841
.05	3.55	17.16	4.84	.484
.08	3.31	11.92	3.60	.360
.15	2.85	6.64	2.33	.233

So you get higher PV by dividing yr. K into 10 parts.
However, for fuller picture, need to follow this thru time.
Must replace B every 4 years. B yields 10 x the cash flow. Is the PV of its K cost less than 10 x as much?

Use $i = .05$ ^{DKB} of strings of ~~10~~ ^{B's} is $\frac{K}{10} (1 + I^{-4} + I^{-8} + \dots + I^{-36})$

$$= \frac{K}{10} \frac{1-I^{-36}}{1-I^{-4}} = \frac{K}{10} \frac{1-.173}{1-.823} = \frac{K}{10} \frac{.827}{.177} = \frac{K}{10} \times 4.67 < K$$

II. What if we follow this ~~A~~ B route over 40 yrs?
We recover and reinvest the K every 4 yrs.

a. To oversimplify, we cd. see the K as being sunk for the full 40 yrs, ~~same~~ as A route. Then, we get 10x the cash flow from ~~same~~ K.

However, most of the CF from B goes for CCA, so this wd overstate its advantage.

b. Use method of III (p. 1)

IV. B route ~~is better~~ ^{somewhat} gives higher net returns to K.

Same time, ~~is~~ gives much higher volume, and use of labor. Somewhat higher use of land. Much shorter payback pd.

I. $B > A$ when

$$10a \frac{1 - I^{-4}}{i} > a \frac{1 - I^{-40}}{i}$$

$$10 - 10I^{-4} > 1 - I^{-40}$$

$$9 > 10I^{-4} - I^{-40}$$

Tues. 11A

September 23, 1982

To: Public Utility Board, and Director of P.U.D.

From: Mason Gaffney

Re: Suggested elements of reporting to Board on our financial status as affected by plant expansion and off-balance-sheet financing

At our last meeting it was suggested that requests for information should come through the Board as a whole, rather than a proposed committee on information flow. Further to that idea, I submit the following for your consideration.

1. Summary of debt

a. Revenue bonds, outstanding and authorized, with schedules of sale and repayment, and explanation of sources of cash for debt service.

b. Off-balance-sheet debt under take/pay contracts

Debt, present and prospective, and our share of same

Long term obligations in leases, supply contracts or other (suggest calculating present value of future obligations, to make commensurable with regular debt.)

c. Other, if any (notes, etc.)

2. Debt service requirements

a. Revenue bonds

b. Off-balance-sheet debt, itemized as above in 1, b.

c. Use of new loans to pay interest on old, and analysis of scheduling out of this phase, and impact of same on our rates. (Here, as in (b), the concern is with "invisible interest" which is accumulating into our debt structure.)

Ross's Ponzi plan!

ank

3. Contingent liabilities

a. Debt authorization of take/pay vendors, for which we could become liable. What is upper limit on our liability, if the management overspends, or if our partners default?

b. Monitoring and control over debt expansion by vendors.

c. Monitoring and control over reasonableness of expenditures, and cost overruns.

d. Rate regulation of vendors. What body or bodies regulate? By what criteria? How are we protected against unreasonable rates?

Gaffney to PUB & PUD, p.2

4. Payment priorities

a. Seniority of different kinds of debt noted above. Is the seniority of take/pay obligation affected by non-performance?

b. Legal opinion on validity of making later-issued vendor bonds senior to our own earlier-issued bonds. Has this been adjudicated? Will it need to be?

c. Financial consultant's opinion of effect of take/pay obligations on our own credit rating; and hence on our borrowing rate. (IPA 14% bonds were reported in January to be selling at a discount to yield over 15%. Is it wise for us to climb into bed with such an agency?)

5. Provision of reserves, if any, for unpleasant surprises.

a. Beck's opinions are based on explicit assumptions, some of which are best-case assumptions, to wit:

-- disposal of spent fuel to be solved by feds. But recent protests against disposal in Colorado River watershed suggest there may be more to worry about here.

-- needed permits will be forthcoming with no delays. (But Harry Allen has been stalled on the drawing boards for 8 years for want of same.)

-- cost estimates by the operating agency are valid. (Yet cost overruns are commonplace. IPA, for example on June 11, 1982 announced a large increase in cost estimates. I do not remember when I last saw a cost under-run.)

-- load forecasts (called "requirements", for some reason) by member agencies like us are still valid. (But this year so far, electric usage in the U.S. is down 2% under 1981. The recession is of course a factor. But a slow but massive drop in demand is a reasonable expectation when the adjustment involves replacement of millions of little electric motors, light bulbs, cooling systems, etc., and a learning period for changing old habits and mind-sets. Have we been misled by the lag in response into thinking there is no response to high power rates?)

(Beck's assumptions re Palo Verde are on p. A-39 ff., SCAPPA Prospectus for \$570 million 1982 bond issue. I am extending these to other projects in general.)

How valid are these best-case assumptions? Does Beck believe them to be true, or do they mean that it is our worry to assess these risks? The latter is my reading, for they have clearly absolved themselves of any responsibility on these points, by listing them as assumptions.

The question here then is, if these risks are passed on to us as I believe, have we factored them into our evaluations, and if so, how?

b. Other possible unpleasant surprises not mentioned by Beck

-- taxes by exporting states. (There is a high risk that Utah will descend upon IPP, now that UP&L is scaling down its share. Taxes, regulations and in lieu payments could hurt us, and would seem to be not ultra vires, under the recent Commonwealth Edison decision, so long as some customers are in Utah.)

-- effect of delayed load growth on unit costs

-- effect of partner desertions on unit costs. (E.g., SMUD is deserting Palo Verde; UP&L and L.A. DWP are cutting back on IPP. We have conflicting accounts of how this will affect rates.)

(Comment: desertions should trigger inquiry into causes of desertion. Does SMUD know something that we should know?)

-- need for early unscheduled replacement, or special maintenance or workover of plant components, especially in nuclear plants. (Many alarming things are published in this vein, e.g. unexpected brittleness or material decay caused by radiation. We need ongoing life forecasts, based on the latest information.)

-- higher interest rates. (This has already added more than 20% to IPP construction costs, and of course a good deal more than that, therefore, to debt service costs.)

-- linkage-of-risk. (A higher market level of interest rates adds to the risk of a capital-intensive project; this in turn lowers the credit rating of weak agencies, raising their specific interest costs, which adds to risk again, etc. Thus, many an indifferent project is nearer to the danger of wipe-out than a simple calculation will show. For example, S&P has downgraded IPP's credit from A+ to A, due to the cost overrun at IPP, which overrun is itself caused by higher interest rates -- WSJ, 8/9/82.)

-- cost overruns (repeated here for emphasis, with apologies.) Are we set up to monitor these; and have we reserved any power to control them, if so? Would we have done better than CPUC, a larger and presumably more generously staffed agency, did at Helms Creek? If not, what should we do about it now?

-- rapid obsolescence caused by new breakthroughs such as (one may hope) direct solar generation of hydrogen. (Science and technology, like demand, respond to new price signals after some lag. A lot of brains have been shifted into energy technology since 1973, and it is getting time to expect usable results.)

It is prudent, in any technologically dynamic field, to add a percentage to amortization costs to cover probable obsolescence, even though one cannot identify the specific new technique that will do it. This is particularly germane when one gets locked into long-term commitments to given techniques.

-- provision for future decommissioning costs. Do we really know how much this will cost, or when? (Note that Edison is currently striving to put a reserve annuity for decommissioning San Onofre into its rates.)

Each of these possible unpleasant surprises has the capability of pushing a speculative project over the precipice. Since our projects mostly seem to be "alligators" (i.e. negative cash flow investments) they might be considered speculative today, even if such investments were standard back in the heady days when the early thinking and planning were done. If our consultant has left them out of his analysis, as would appear, then it is for us to factor them in, so let us ask staff to do so.

*Right
higher
should lead
to less
fanciful
projects*

Let us never protect ourselves from bad news, but face it quickly before it gets worse.

6. Disaster plans for disengaging and minimizing losses in the event that projects prove nonviable and are aborted. On what terms can we drop out?

7. Alternative supply sources, ranked by estimated unit cost (delivered basis, standardized for time of delivery, etc.)

8. Effect on our rates of incorporating new sources.

a. Initial impact. (I have not seen an explanation of SONGS' effect that I could follow, nor, I surmise, have various reporters who try to explain it in the news.)

b. Long run impact

i. As initially forecast

ii. As revised in light of latest data and outlook

9. Imputed rate of return earned on ratepayers' equity in our system, resulting from their "forced savings" as we draw on current receipts to finance system extensions, expansion and upgrading in excess of maintenance and replacement.

An alternative methodology is to calculate the system net worth, based on assumed interest rates.

(My concern here is that we not overstate the productivity of borrowed funds by pooling them with "free" capital supplied from ratepayers' equity. I seek assurance that this is not the case.)

10. Schedule of capital flows needed to replace and maintain worn and obsolete facilities.

a. Information supplied to Beck, cited on p. A-39.

b. Regular updating of same (assuming it is well done to begin with.)

11. Ongoing monitoring of new opportunities

a. New technology

Last week, Berkeley announced a new, cheap way to generate hydrogen directly by sunlight. Will this allow plant siting in the South Coast Air Basin again? Will it obviate environmentally caused delays? Should we wait for others to investigate and perhaps develop this hopeful new breakthrough, or follow through ourselves, alone or through SCAPPA?

b. Old technology revived.

Dr. Moore of UCR Coop. Extension makes a good case for wood energy, using Eucalyptus grown in the Sta. Ana River bottoms. Is this one of the "many small solutions adding up to one big solution" which many observers believe will meet our overall energy needs? I do not know, of course, but are we set up to seek out and evaluate such ideas? If not, let us become so.

The Papago Indian Tribe uses solar pumps in parts of its water system. A small item, even if viable, but are we open to ideas like this that might save a little here, a little there? Marine buoy lights operate from solar cells -- could our street lights? It would be good to get periodic reports indicating a continual scanning of such possibilities, with a broad radar.

And my reaction paper

c. DWR surplus

The loss of Prop.9 this spring must have left DWR with surplus generating capacity, which they had lined up or built in anticipation of massive pumping requirements. Can we buy, lease or contract for capacity? Could SCAPPA? This was all low-cost, at least the way DWR figured it. Could we have a report on this capacity, who has it, and how we can get some?

d. Transmission from areas of surplus. Reduced national demand would seem to increase the export surplus from some areas, as well as release line capacity to wheel it to us. Successful anti-trust actions (did we not just win a round?) should help, too.

e. Cogeneration.

We are surrounded by cement plants. Are we courting them avidly? Have we ever put a consultant to work on this? There are several new consulting firms that specialize in this field.

f. New (and old) techniques for levelling off peaks, saving capital

- "load management", shedding, etc.
- peak-load pricing
- creating class of interruptible service
- other

Periodic reports on these and similar matters would give the Board an opportunity to indicate whether it wants more (or less) activity in these areas.

12. Careful forecasting of Edison rates, updated, with analysis of causes.

Our investments in generating plant are justified by the premise of a continuing upsurge in Edison rates. However, a main cause of Edison's upsurge is its recent expansion into high-cost investments in new generating capacity. It is not evident how we can beat Edison by duplicating the very thing that is pushing up their rates, unaided as we are by old, low-cost sources such as those that keep their rates below avoided cost today.

Edison now appears to be retrenching on expansion plans. Will this cause their future rates to level off? I know we are mad at them, and frightened, too, but are we jumping from the frying pan into the fire? A careful analysis of this seems called for.

A frightful scenario is the following:

- 1, We borrow long term at today's rates
- 2, Market rates drop
- 3, CPUC & FERC lower Edison's allowable rate of return on equity
- 4, We spend 30 years digging out from under high-cost debt, while Edison's retail rates remain constant, or drop.

How likely is that frightful scenario? What other forecasts are guiding our actions? On what evidence are they supported?

13. General considerations on reporting

a. Reports should be on paper, and delivered in plenty of time for study and absorption by Board members.

b. Where a bottom-line conclusion or number is the end result of a series of calculations, some of which are judgmental, or use judgmental inputs, it is useful to show (flow-chart or equation) the route followed to the bottom line, with judgment factors flagged.

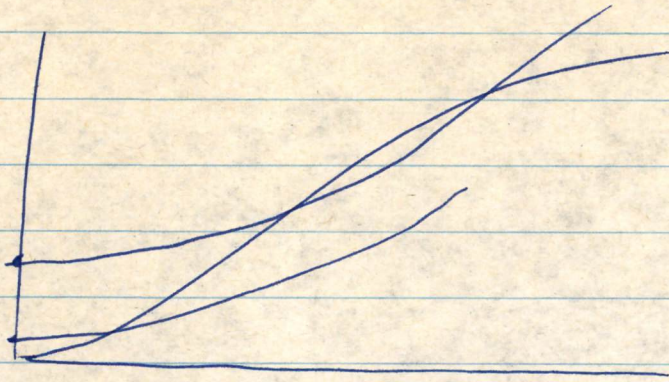
"Judgments" are of two kinds: forecasting, which is inevitable; and value judgments (e.g. re distribution of services and burdens, or the desirability of growth, or the kind of growth.) Value judgments should be avoided to the extent possible, and, if made, should not be imposed on the electorate whom we are here to serve, but reflect their values.

A good beginning is in the format of the Beck report, where they carefully list their assumptions, and separate them from their "Opinions" (which are, however, conclusions rather than value judgments.) As indicated earlier, I am not persuaded that the Beck people have used this device in the best possible way, but at least it is a precedent for orderly itemization of assumptions, and segregation of judgments from assumptions.

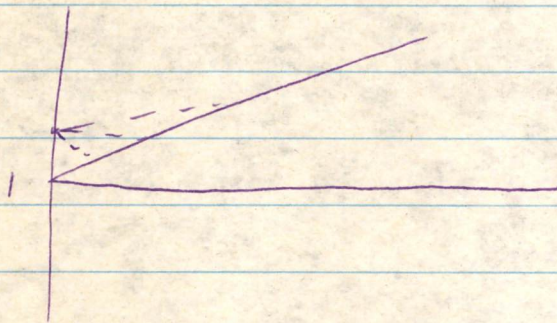
c. It is fairer to the Board to present information, where possible, in the manner of Items #7 and #11, above: that is, as menus of possibilities, as opposed to "Yes or No", which is too much like a Soviet election. The Board should serve the function of choosing and applying criteria for priority among many options; or at least know what those criteria are, and have some input on them.

When proposals come to us one at a time, we do not see the whole system. The only alternative to "Yes" is "No", and who wants to be an abominable No-man? But this then downgrades the Board to a passive, subordinate role, and hardly justifies the time we put in.





Price of labor relative to K wd. be indep. of labor cost, and depend wholly on i , were it not for land?



Labor can also rise relative to price of product. But this requires a ~~change~~ ^{fall} of i , so i still expresses price of labor relative to K .