Early Excess Capacity vs. Later Twinning
By [Dr. Mason Gaffney]

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Early excess capacity vs. later twinning (40)

This paper is given in the form of a question and answer.

QUESTION #44.

You are planning a water system for Boomtown. A 12" main will do for 5 years; then you will have to twin it. Or, for 50% more, you could lay an 18" main, with 125% more capacity. (Looks like a winner, a 125% rise in capacity for a 50% rise of cost - but look out, you have to carry that idle capacity for a few years.)

a. Boomtown borrows at 12%. Which is the better choice?

b. At what interest rate would it be a toss-up?

c. Were the leaders who oversized such things as water mains in the past "foresighted," or "spendthrift"? What parameters determine the wisdom or folly of oversizing today to meet possible future needs?

ANSWER #44:

Life of mains is not given, but is implied to be so long you can treat it as infinite.

Let K = capital cost of 12" main.

a. Cost of option one is:

$$K(1 + 1.12^{-5}) = 1.567 \cdot K$$

Cost of option two is:

$$1.5 \cdot K$$

Option two is a little cheaper. It also gives you 12.5% more capacity. (At Boomtown's growth rate, if it lasts, the last 12.5% will come into use after 11 years, adding to DCF a dollop which we will ignore here, but bring in later.)

b. $K(1 + 1.i^{-5}) = 1.5K$

$$1.i^{-5} = .5$$

$$1.i^{5} = 2$$

$$i = 2^{1/5} - 1 = .149$$

(The Rule of .72 is losing accuracy as i gets into the mid-teens.)

c. By oversizing they achieved economies of scale at the cost of investing in a lot of idle capital over many years. They

were "wise" when and if:

-- demand grew fast
-- real interest rates were low[1]
-- scale economies were real and large
-- depreciation was slow
-- obsolescence was slow
-- their works served to capture control of valuable natural resources (e.g. water rights) or markets or quotas
-- they got subsidies and tax shelters

Otherwise, they were foolish. Those who let them grab valuable natural resources, subsidies, and tax shelters were foolish in any event. The history of California could and should be written around these themes.

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[1] High inflation is included here.