The Merry Tale of the Rolls-Royce and the 7 Buicks
By [Dr. Mason Gaffney]

Article citation:
[Gaffney, Mason]. "The Merry Tale of the Rolls-Royce and the 7 Buicks." N.d. Study guide.

Fair Use Disclaimer
The Robert Schalkenbach Foundation, a non profit private foundation, is publishing this article, at no cost, pursuant to the Fair Use provisions of Section 107 of the Copyright Act which states that under certain circumstances, the fair use of a copyrighted material for purposes of criticism, comment, teaching, scholarship and research is not an infringement of copyright. If you have any concerns about the publication of this article, please contact us at **info@schalkenbach.org.**

The Robert Schalkenbach Foundation's Digital Collections and Archives is an extension of the Robert Schalkenbach Foundation's Engel Georgist Library. It collects, organizes, preserves, and provides free online access to researchers and the general public of Georgist literature including books, newspapers, pamphlets, scholarly articles and archival materials.

RSF is particularly proud to offer free online access to the works of the late Georgist scholar Mason Gaffney, made possible through the generosity of the Danica Foundation and with the consent of the Mason and Letitia Gaffney Trust.

Robert Schalkenbach Foundation: https://schalkenbach.org/
Engel Georgist Library: https://www.librarycat.org/lib/EngelGeorgistLibrary
RSF Digital Collections and Archives: https://schalkenbach.starter1ua.preservica.com/

II. E, 3, D

#20

The Merry Tale of the Rolls-Royce and the 7 Buicks

or

When $7 is less than $4

A Rolls-Royce is really built. With reasonable care, it lasts a long, long time. Let's say you may buy a Rolls to serve for 70 years; or a series of Buicks to last 10 years each. It might look as though one Rolls is worth 7 Buicks, but it's not that simple because you have to buy the Rolls' service up front, while you defer payment for 6 of the 7 Buicks.

1. One Rolls vs. 7 Buicks

For an illustrative problem, let's say the price of the Rolls (R) is 4x the price of each Buick. Which cost has the lower PV? For discounting, use i=.05. The discounted capital cost of the Buicks (DKB) is:

$$DKB = R/4[1 + I^{-10} + I^{-20} + I^{-30} + \ldots + I^{-60}] \qquad (1)$$

The expression in brackets is a geometric progression whose first term is 1, containing 7 terms, and whose rate of progression (r) is I^{-10}. The algebraic formula for such a sum is:

$$S = [1-r^n]/[1-r]$$

where S is the sum, r is the rate of progression, and n is the number of terms. Substituting in the facts of our case:

$$DKB = R/4 \times [(1-I^{-70})/(1-I^{-10})] = R/4 \times (1-.0329)/(1-.6139)$$

$$= R/4 \times .9671/.3861 = R/4 \times 2.5049 = .626\ R \qquad (2)$$

Thus, DKB of 7 Buicks is only 63% of the cost of one Rolls, even though the K of the first Buick alone is 25% of the cost of one Rolls. The DKB of all 7 Buicks is only 2.5x the K of the first Buick alone. The last 6 Buicks add only 150% to the DKB of the first Buick.

2. One Rolls vs. an infinite series of Buicks

Even if the Rolls lasted forever, an infinite string of Buicks would still have a lower present cost. $I^{-\infty} = 0$, which is only slightly less than the value of I^{-70} (.0329).[1] So:

$$DKB = R/4 \times 1/.3861 = R/4 \times 2.59 = .648\ R \qquad (3)$$

3. Sensitivity of DKB to i, and to the service life of each Buick (p)

2 other parameters have more effect than the life of the Rolls does on DKB. These two are:

1, the period of each Buick's service life (p);

2, the discount rate (i).

If i is low enough, and p is short enough, the Rolls is lower cost.

DKB > R when:

$$R/4 \times [(1-I^{-pn})/(1-I^{-p})] > R \qquad (4,A)$$

$pn \approx 70$. I^{-70} is only negligibly above zero, except for unheard-of low values of i, so we may simplify the math, with no significant loss of accuracy, by letting $I^{-70} = 0$.

The Rs cancel out, so (4,A) boils down to:

$$1 > 4 - 4I^{-p}$$

$$4I^{-p} > 3$$

$$I^{p} < 4/3 \qquad (4,B)$$

To simplify further, and put numbers on the conditions, take the natural log (Ln) of both sides of (4,B):

---

[1] .0329 is "slight" in this case because it is being compared with larger numbers. It is subtracted from 1 in the numerator, thus lowering the value by just 3.29%. Considering the roughness of business and economic data, 3.29% is "slight."

$$p\text{LnI} < \text{Ln}[4/3] = .288 \qquad (5)$$

To exploit the closeness of LnI to $\underline{i}$, multiply both sides of (5) by $\underline{i}$:

$$pi < .288 \times i/\text{LnI} \qquad (6)$$

Using your calculator, you can establish that when i=.05, i/LnI = 1.025. More generally, you can establish that $\underline{i}$ does not rise much above LnI for values of $\underline{i} < .14$ or so. Therefore, we may say, roughly, that, within the relevant range of values of $\underline{i}$:

$$i/\text{LnI} \approx 1.025 \qquad (7)$$

It follows that:

$$pi < .295 \qquad (8)$$

$$p < .295/i \qquad (9)$$

Recalling that we began with (4,A), (9) shows the condition that makes DKB > R. For example, if the discount rate is .05, than DKB > R for all values of $\underline{p}$ less than about 6 years. Not surprisingly, the Buick choice looks worse when each one lasts a shorter time.

It works the other way, too, of course. If p = 6 years, then DKB > R for all discount rates less than .05. Not surprisingly, lower discount rates favor the Rolls, because it is the more capital-intensive choice.

4. Tabular picture

As an exercise, construct a table of values of pi. Head the first column "p", and number the rows going down in ascending order, from 3 to 11 or so. Label the top row "i", and go from .02 on the left, up to .10 on the right. In the cells, put values of pi. Values in the upper left will be below .295; values in the lower right, above .295. Draw a solid, stairstep line through the table, from s.w. to n.e., separating values

above and below .295. This gives you a compact, 3-dimensional[2] picture of how p and i jointly determine this decision.

The string of Buicks is better when i is high (right side), and p is high (bottom).

5. A third variable affecting the choice is how much more the Rolls costs than each Buick. In the examples above, we have made the Rolls cost 4 times the price of each Buick (actually, they cost a good deal more than that). We can, however, use the numbers generated above, and substitute "x" for "4", and solve for x. That is, let:

$$B = R/x \qquad (10)$$

At i=.05, and p=10, we learned in (2) that DKB = R/x times 2.5049. Ergo, DKB < R when 2.5049/x < 1, i.e. when:

$$x > 2.5049 \qquad (11)$$

6. A fourth variable might be that the Rolls gives better service, turns more heads, and so on. Given the data developed above, that may be the only reason Rolls's sell at all. However, that can be handled by simple modifications of the methods already shown, so we let that go for now.

The main point shown is that durability or longevity in capital is not worth spending much extra money for. Rather than lock up extra capital in the Rolls, you could buy 3 more Buicks and keep 4 drivers on the road instead of one.

---

[2]The numbers in the table are the 3rd dimension. Thus, tables are often more useful than graphs, when displaying functions of more than one independent variable.