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Theory and Practice of the Profitrate

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1. Introduction

The objective of the paper is to describe the relationship between the theory and the practice of the profitrate.

2. Theory of the Profitrate

The author owes the section completely to Kazuhisa Matsuda because the section is the summary of Chapter 7 'Internal Rate of Return and Profitrate' in his [1].

Concept of Profitrate

$$(\text{revenue} - \text{capital input}) \,/\, \text{capital input}$$

Let us assume only one term between input of capital and recovery of capital. It is the same thing for us to take a week, a month or a year as one term, which means we have a weekly profitrate, a monthly profitrate or a yearly profitrate. The profitrate is determined uniquely in this case.

Notation:

A_0 : the input at the zero period, which has the negative sign.

A_t : the revenue or recovery in Term t.

In the above case, the profitrate is

$$(A_1 + A_0)/(-A_0) \qquad \text{because } A_0 \text{ is negative.}$$

The term is the least duration necessary for input and recovery. If the capital is turned over twice a year, one term consists of six months. The flow of the capital is

$$\begin{array}{cc} A_0 & A_1 \\ & A_0 \quad A_1 \end{array}$$

If we compare the case that the capital is turned over once a year with the case that the capital is turned over twice a year, the term should be the six month term.

	Term 0	Term 1	Term 2
once	A_0	A_1	A_2
twice	A_0	A_1	
		A_0	A_1

	Term 0	Term 1	Term 2
once	−100	0	120
twice	−100	120	
		−100	120

Profit rates:

For every six months,

once ?

twice 20% $= (120-100)/100 = (A_1+A_0)/(-A_0)$

Firstly, let us assume that the series $A_0, A_1, \cdots, A_{n-1}$ as input because A_i $(i = 1, 2, \cdots, n-1)$ reduces additional investment.

Figure 1

(Term)	0	1	2	⋯	$n-1$	⋮	n	⋯
	A_0	A_1	A_2	⋯	A_{n-1}	⋮	A_n	
		A_0	A_1	⋯	A_{n-2}	⋮	A_{n-1}	A_n
			⋯	⋯	⋯	⋮	⋯	⋯
						⋮	A_0	A_1 ⋯
						⋮	⋯	⋯

Figure 1 shows that Term 0 to Term $n-1$ can be assumed as the input period of capital and the total amount of $A_n, A_{n-1}, \cdots, A_0$ in Term n can be assumed as the stationary

revenue. It should be noted that the total amount of revenues $A_1, \cdots, A_{n-1}$ reduces the same amount out of $\sum_{t=0}^{n-1} A_0^{(t)}$. Now we introduce profitrate i with which $A_0, A_1, \cdots, A_{n-1}$ in the left-hand side increase. The rate i is unknown and will be determined by the definition of profitrate in due course.

$n = 1$

Figure 2

$$\begin{array}{lcll} A_0 & \vdots & A_1 & \\ & \vdots & A_0 & A_1 \end{array}$$

$$(A_1 + A_0) \,/\, -A_0 = x - 1 = i \tag{1}$$

$n = 2$

Figure 3

$$\begin{array}{llcll} A_0 & A_1 & \vdots & A_2 & \\ & A_0 & \vdots & A_1 & A_2 \\ & & \vdots & A_0 & A_1 \quad A_2 \end{array}$$

$$(A_2 + A_1 + A_0) \,/\, -(A_0 x + A_1 + A_0) = x - 1 \tag{2}$$

We will have x in the following manner.

$$A_2 + A_1 + A_0 = (A_0 x + A_1 + A_0)(1 - x)$$

Consequently,

$$A_0 x^2 + A_1 x + A_2 = 0 \tag{3}$$

Turning to the internal rate of return, the internal rate of return i satisfies

$$-A_0 = A_1/(1+i) + A_2/(1+i)^2 \qquad \text{because} \quad \sum_{t=0}^{2} A_t (1+i)^{-t} = 0 \tag{4}$$

in the flow of investment between A_0 and A_2. Therefore, the internal rate of return defined as in (4) is equal to the profitrate defined as in formula (3). (If we substitute x for $1+i$ and multiply $\sum_{t=0}^{2} A_t (1+i)^{-t} = 0$ by x^2, we get $\sum_{t=0}^{2} A_t x^{2-t} = 0$, which is also formula (3).)

Returning to the previous point, the profitrate, if the flow of capital input consists of n terms, can be defined as

$$(A_n + A_{n-1} + \cdots + A_0) \Big/ -\left(A_0 \sum_{t=0}^{n-1} x^t + A_1 \sum_{t=0}^{n-2} x^t + \cdots + A_{n-1}\right) = x - 1 \qquad (5)$$

Hence,

$$A_0 x^n + A_1 x^{n-1} + \cdots + A_n = 0 \qquad (6)$$

We will have x, so i. Formula (6) is equal to the internal rate of return of n terms.

Secondly, let us assume only A_0 as input in the two term case and that $A_1 = A_2 = A$. Further, let us assume that we reserve the amount of D every term. D will be determined as

$$-A_0 = Dx + D$$
$$D = -A_0 / (1 + x) \qquad (7)$$

This means that A_0 is the input in Term 0 and A is recovered in Terms 1 and 2 respectively, which is divided into two parts, D and others. As a result, the profit is A less D which will be used to renew the investment A_0. The profitrate is as

$$(A - D)/-A_0 = \{A + [A_0 / (1 + x)]\} / -A_0 = x - 1 = i \qquad (8)$$

From (8),

$$A_0 x^2 + Ax + A = 0 \qquad (9)$$

We will have x, so also i from (9).

Let us consider next the case where A_1 is not always equal to A_2 in the case of $n = 2$. If we reserve D in Term 1 and Term 2, $D = -A_0/(1 + x)$. We try to have a constant amount of revenue E using A_1 and A_2, which means that the constant amount of E multiplied by 2 is equal to A_1 added by A_2. Also, A_i is assumed to grow with the profitrate i. Therefore, the following formula will obtain.

$$A_1 x + A_2 = Ex + E$$
$$E = (A_1 x + A_2) / (x + 1) \qquad (10)$$

Formula (10) means that E is the weighted average of A_1 and A_2 with x, which is equal to $1+i$, and 1. $E-D$ is the averaged profit because D is the averaged reserve and E is the averaged net revenue. Because the profitrate is the ratio of profit in one term to the capital investment at the beginning,

$$(E-D)/-A_0 = \{(A_1x+A_2)/(x+1) + A_0/(x+1)\}/-A_0 = x-1 = i \qquad (11)$$

From (11),

$$A_0x^2 + A_1x + A_2 = 0 \qquad (12)$$

We will be able to get x, so i from (12).

We can extend formula (12) to the case of n term flow in the following manner,

$$D = -A_0 \Big/ \sum_{t=0}^{n-1} x^t$$

$$E = \sum_{t=1}^{n} A_t x^{n-t} \Big/ \sum_{t=0}^{n-1} x^t$$

So, the profitrate equals

$$(E-D)/-A_0 = \left(\sum_{t=1}^{n} A_t x^{n-t} \Big/ \sum_{t=0}^{n-1} x^t + A_0 \Big/ \sum_{t=0}^{n-1} x^t \right) \Big/ -A_0 = x-1 = i \qquad (13)$$

From (13), we have

$$A_0x^n + A_1x^{n-1} + \cdots + A_n = 0$$

This is also formula (6) and the definition of the internal rate of return too.

The author finishes quoting Matsuda's idea. The reader is advised to see that the length in time is not relevant to the term when we discuss the profitrate. He will also notice the same relationship in the next section where the manufacturer's gross margin excluding the manufacturer's own distribution cost is constant in the consumer goods industry although the turnover period of capital is different from a sector, for example, butter to another sector, for example, pharmaceuticals.

The author finishes the discussion given by Matsuda by showing the following two points. Firstly, the profitrate is the growth rate of revenue-input, which is defined in

two cases assuming (1) $A_0, A_1, \ldots, A_{n-1}$ as input and (2) A_0 only as input. Secondly, the profitrate is the ratio of the profit at a term to the total input which includes two cases, that is, (1) $A_0, A_1, \ldots, A_{n-1}$ and (2) A_0 only.

3. Practice of the Profitrate

3.1 Survey and Results

The observations investigated in this paper consist of those collected in personal interview surveys of Japanese manufacturers. A survey of personal interviews with manufacturers which own their sales subsidiaries was conducted between July, 1987 and March, 1988, which the author will state in Chapter 4 in Seto [6]. Another personal interview survey of 23 Japanese manufacturers was conducted from September to October, 1986. The companies selected were large and manufactured a range of commodities, including edible oils, confectionery, butter, margarine, soy sauce, mayonnaise, ham, vitamin preparations, cosmetics, pet food, cameras, domestic electric washing machines, colour TV, motor scooter, tyres for automobiles, men's shoes, domestic paint, domestic detergent, lingerie, hosiery, women's sweater, men's and children's underwear and men's outerwear. These companies were able to recommend retailers to sell commodities they manufactured at prices they suggested.

The average percentages of final sales with the standard deviations in the larger outlet channel were 57.3 ± 16.53 for processed food, 65.0, which can be divided into two figures; 55.5 for department stores and 9.5 for supermarkets, ± 6.43 for clothes and 35.9 ± 14.70 for consumer goods other than processed food and clothes. Seto [2] showed that the British figures are in the same tendency. The average percentages of final sales with the standard deviations in the larger outlet channel were 65.6 ± 24.3 for processed food, 74.6 ± 24.8 for clothes and 49.1 ± 33.8 for other consumer goods.

Items surveyed are as follows. The number put at the beginning of each item means the item number attached to each specified manufacturer which is quoted in Figures 4, 5, 7 and 8 and Tables 3, 4 and 5 in the following paragraphs. The author has the precise value of the data, but he cannot show it because of confidentiality.

The RGM (Retailer's Gross Margin) can be defined as the realised retail selling price less the purchase price in percentage terms of the realised retail selling price. The WGM (Wholesaler's Gross Margin) can also be defined as the realised wholesale selling price less the purchase price in percentage terms of the realised retail selling price. The ODC (Manufacturer's Own Distribution Cost) can be defined as the total of wages for the sales department, the advertising cost, the physical distribution cost and support given to products in percentage terms of the realised retail selling price. The MGM (Manufacturer's Gross Margin excluding the ODC) can be defined as the selling price to wholesalers less the CM in percentage terms of the realised retail selling price. The CM (Cost of Manufacture) can be defined as the total of the cost of raw & materials, the labour cost and expenses for manufacture including the depreciated value and power in the factory.

We have two sorts of the realised retail selling price, the traditional small retailer's selling price or the retail selling price in the S-channel and the larger outlet's selling price or the retail selling price in the L-channel, the latter of which, further, is divided into the supermarket's selling price and the department stores' selling price.

The RGM and WGM include rebates respectively.

The cost of distribution can be defined as the total of the RGM, WGM and the ODC.

$$RGM + WGM + ODC + MGM + CM = 100$$

9 Cameras

Brand A, lens & shutter type, whose realised retail selling price was around 170 pounds sterling. Brand B, lens & shutter type, whose realised retail selling price was around 128 pounds sterling in 1987 if 1 pound sterling is 234 yens. Both of them have their own sales subsidiaries (MSS). The marketing channel of both of them was manufacturer, MSS, wholesalers and retailers in the traditional small retailer channel (S-channel)

and manufacturer, MSS and mass sale speciality stores including supermarkets in the larger outlet channel, L-channel. The cost of manufacture (CM) of brands A and B are around 30 and around 40 in the S-channel respectively and around 35 and around 40 in the L-channel respectively. The author took the average of the two in each channel. However, each value falls near Regression lines (1) and (2) if we deal with the data of each manufacturer separately. The average percentage of sales in the S-channel of the two was about 45, but more than 50 for brand A and about 30 for brand B.

Brand A was one of the brands the Japanese Government did the survey of in 1987.

13 Cosmetics

The author visited two large manufacturers, which gave him data of gross margins. However, the data of one manufacturer are used here. The values were of weighted average of all items manufactured by them. The reason why he chose their values was that the values were precise. They have their own local sales subsidiaries (MLSS). The marketing channel was manufacturer, MLSS and retailers in the S-channel and manufacturer, MLSS and supermarkets in the L-channel. The average percentage of the S-channel was about 80, which is falling in tendency, in the two manufacturers. The deviation is negligibly small.

Cosmetics is one of the items which the Japanese Government eliminated for their survey of prices. Cosmetics is one of the resale price maintained commodities which the Japanese Government approved of. This is why the Government eliminated it from the survey.

24 Tyres for automobiles

One of the largest manufacturers gave the author their data. The marketing channel of Japanese tyres for automobiles are different from

cameras and cosmetics mentioned above. They have no supermarket channel. Gasoline service stations and parts shops for automobiles retail tyres. The manufacturer have their MLSS. The marketing channel was manufacturer, MLSS and retailers. The values of the data were of weighted average. The Japanese Government did not survey the item.

14 Domestic paint

The author visited the largest manufacturer. It is not clear whether the values of the data were of the weighted average or of a specific brand. The manufacturer have their MLSS. The marketing channel was manufacturer, MLSS, secondary wholesalers and retailers in the two channels. The percentage of the S-channel was about 40 in 1986 in the manufacturer.

25 Motor scooters

The author visited one of the largest manufacturers. The values of the data were of the weighted average of all sorts of motor scooters manufactured. They have no supermarket channel. The marketing channel was manufacturer, MLSS and dealers.

The Japanese Government did not survey the item.

12 Pharmaceuticals

The author visited two large manufacturers, which gave him precise data. One company's answer was of two specific brands which the author asked. The MGM of one specific brand was near 20 whereas the MGM of another brand had minus sign. This suggested us we should take the weighted average of all sorts of pharmaceuticals like vitamin preparations. Another company's answer was of the weighted average of all sorts of pharmaceuticals like vitamin preparations. The author used the latter's answer in the regressions. The average percentage of the S-channel in

the two mentioned above was between 50 and 60 in 1986 if we classify convenience stores into the L-channel. However, the deviation is not small.

15 Pet food

The author visited three manufacturers when he conducted the survey of the production period and labour productivity. However, he visited only one of them to ask for the data of gross margins. It is not clear whether the values are of the weighted average or a specific brand, but probably of the former. The percentage of the S-channel in the manufacturer was about 30 in 1986.

The brand whose values of gross margins and the CM are used here was one of the brand the Japanese Government did the survey of in 1987 although they surveyed the retail price only.

8 Domestic detergent

The author visited two large manufacturers. Although they gave him their data, he used the data of a specific but important brand of one of them because another manufacturer did not give on a realised basis. The average percentage of the S-channel was about 70 in 1986 in the two manufacturers.

The brand whose values of gross margins and the CM are used here was one of the items the Japanese Government did the survey of in 1987 ([3]).

7 Hams & bacons

The author visited three largest manufacturers in 1983. He visited two of them in 1986. However, he could not use the data of roast hams of one of them. The retailers' gross margins, RGM, of roast hams are much higher than other processed food like butter, margarine, edible oils

and so on for their rapid turnover period in outlets. The turnover period of roast hams in retail outlets were two or three weeks in the two channels in 1986 whereas the turnover periods of butter, margarine, edible oils, mayonnaise, confectionery and soy sauce were between two and three months, between one and two months, between 15 and 20 days, between one and two months, between one and two months and between one and two months respectively in the S-channel and between one and two months, within one month, between 10 and 20 days, within one month, 0.6 in month and within one month respectively in the L-channel. The author should have asked for the data of the weighted average of all sorts of products. However, it is still true that the weighted average of the RGM of hams & bacons will be higher than other processed food mentioned above. The percentage of the S-channel was between 40 and 45 in 1986 in the manufacturer whose data are used here.

The brand whose values of gross margins and the CM are used here was one of the brands the Japanese Government did the survey of in 1986 ([3]).

1 Butter

The author visited three largest manufacturers in 1983. He visited two of them in 1986. Although both of them gave the answers, the author used them as follows; he adopted the largest manufacturer's CM, but the second largest manufacturer's RGM in the L-channel. The largest manufacturer's RGM was higher than the second largest's. The data were of specific brands, whose grams were equal to each other. As the reader remembers, the CM and RGM are expressed as a percentage of the realised retail selling price. The second largest manufacturer replied to him that their reduced price was higher than the largest manufacturer's. This might be the reason why the second largest manufacturer's RGM was

lower than the largest manufacturer's. The largest manufacturer's market share was overwhelmingly large. This leads the two manufacturers to different policies. The amount of the RGM multiplied by quantity sold at the outlet, (larger quantity sold is often attained by rapid turnover), will be large although the RGM be lower in the largest manufacturer whereas the second largest manufacturer go in the direction that the cost of manufacture which is not in percentage terms but in money terms itself should be large when quality is stressed. The author thinks it is better to ask for gross margins, the retailer's, the wholesaler's and manufacturer's gross margins, the manufacturer's own distribution cost and the cost of manufacture not expressed as a percentage but in money terms if we want to compare those of a manufacturer to those of another manufacturer, which is the case we have just mentioned above. However, the author describes the relationship between many different items, which is the reason why he asked for the gross margins and the cost of manufacture in percentage terms.

The author was not given answers about the S-channel from the second largest manufacturer. The percentage of the S-channel was between 15 and 20 in 1986 in the manufacturer.

The butter was one of the items the Japanese Government did the survey of in 1977. They surveyed the wholesale and retail prices. They surveyed, however, the retail price only in 1982. They eliminated the butter from 1987 survey at last, which coincides with the downward trend of butter demand.

4 Margarine

The author visited a large manufacturer, which gave him data of a specific brand which was one of the brands the Japanese Government did the survey of ([3]). The percentage of the S-channel was around 10 in 1986 in the manufacturer.

3 Edible oils

The author visited a large manufacturer, which gave him data of a specific brand.

Table 1 Price Indices of Japanese Selected Commodities, 1987

		S-channel	Chained supermarket	Other supermarket
Hams of quality		100.0	96.9	97.2
Hams		100.0	94.1	95.8
Edible oils	brand A	100.0	109.7	109.6
Margarine	brand A	100.0	108.5	108.3
Soy sauce, thick	brand A	100.0	94.7	96.2
Mayonnaise	brand A	100.0	97.5	98.7
Biscuits	brand A	100.0	95.5	96.1
	brand B	100.0	94.6	95.5
Domestic electric refrigerator	brand A	100.0	92.4	99.8
Domestic electric washing machine, semi-automatic	brand A	100.0	95.6	89.6
	brand B	100.0	90.7	96.4
Domestic detergent	brand A	100.0	105.7	107.1
	brand B	100.0	106.3	107.0
Vitamin	brand A	100.0	102.6	90.6
Colour TV of 21 inches	brand A	100.0	94.5	93.4
	brand B	100.0	98.2	90.0
Camera	brand A	100.0	96.0	94.1
Pet food	brand A	100.0	101.1	101.6

Source: Statistics Bureau [4]

As the reader will see in Table 1, realised retail selling prices of edible oils and margarine in the L-channel were more than those in the S-channel. However, the values of edible oils given from the respondent were based on the weighted average of regularly realised prices and reduced prices in the L-channel. The price index of the specific brand mentioned above in the L-channel is 89 if the price in the S-channel is 100. The CM was around 30 in the S-channel and around 50 in the L-channel. If we multiply 50 by 0.89, we have 44.5, which is much larger than 30. However, the author hesitates to draw a conclusion that the answer for the S-channel

is inconsistent with the answer for the L-channel. The author relies on the respondent, whom he met and discussed with 1983 and 1986. The author is afraid that he was not careful in designing the survey. Figure 4 shows that the CM of the edible oils falls far from the regression line, although this does not necessarily mean that the value for the S-channel is not reliable. The percentage of the S-channel was between 30 and 40 in 1986 in the manufacturer.

5 Mayonnaise

The author visited a large manufacturer, which gave him the data of the weighted average of all sorts of grams. As far as the physical distribution and the settlement of transaction are concerned, the former are getting separated from the latter. The transaction, and consequently the settlement, is conducted between the manufacturer and the wholesalers, for example, Kokubu, Meiji, Ryohshoku and so on, the wholesalers and supermarkets in the L-channel and the wholesalers and the secondary wholesalers, the secondary wholesalers and retailers in the S-channel in turn. The physical distribution is, however, conducted between the manufacturer and the supermarkets in the L-channel and the manufacturer and the secondary wholesalers in the S-channel. This sort of skipping is applicable to edible oils, butter and margarine. However, the largest manufacturer of butter and margarine can deliver their products not to supermarkets or traditional small retailers but to the wholesalers, Kokubu, Meiji, Ryohshoku and so on. The percentage of the S-channel was between 35 and 40 in the manufacturer.

6 Confectionery

The author visited two large manufacturers, which he thinks most reliable, in 1986 although he visited three in 1984. The data are of the

weighted average of all sorts of confectionery of one of them. The weighted percentage of the S-channel was 45, which includes sales in convenience stores and was accompanied by the large variance, in 1986, in the manufacturer.

2 Soy sauce

The author visited two large manufacturers, one of which gave their data of a specific brand which was one of the brands the Japanese Government did the survey of ([3]) in 1987.

11 Colour TV

The author visited the largest three manufacturers. However, they did not complete his questionnaire although they replied partially. We have '1987 National Survey of Prices' (Initial Version) (published in September, 1988 by the Statistics Bureau, Management and Coordination Agency, The Government of Japan), which shows the RGM in the S-channel of the selected items including colour TV. Table 2 shows that the RGM was 20.1 in the S-channel in 1987, which is also the year when the author did the survey. However, it should be noted that the RGM includes rebates in the author's questionnaire whereas not in the Government's Survey. However, one of the three mentioned above gave their precise data of the cost of manufacture, which will be used in the following section, expressed as a percentage of the manufacturer's delivery price to their local sales subsidiaries. Further, we can use the annual report reported to the Treasury Department, the Government of Japan, from the manufacturer in order to get the manufacturer's own distribution cost although the value of the manufacturer's own distribution cost in the annual report includes not only the value for the colour TV but also the value for the domestic electric refrigerator, the domestic electric washing machine,

the video tape recorder and so on. The second reply included the RGM in the L-channel. The third reply included the RGM, WGM and ODC in the two channels. However, it depends on the size of inches how much RGM the retailer can receive. The colour TVs of the size between 14 and 21 in inch were more competitive than the 29 inch colour TV. Consequently, the retailer could get more RGM from selling the 29 inch colour TV. The second and third replies did not specify the size. As a result, we could not have the precise values of the RGM, WGM, ODC and CM. This is the reason why the author did not use the data to compute the regression line between the cost of distribution and the cost of manufacture in the following section.

Table 2 Wholesale Price Indices of Japanese Selected Commodities (Tokyo), 1987

Items, brands	(1)	(2)	(3)
Instant noodles in cup, specified brand A (1 cup)	79.1	85.0	100.0
Canned salmon, specified brand A (1 can, 190g)	73.8	78.6	100.0
Natural cheese, a specified brand (1 carton, 100g)	75.0	79.0	100.0
Margarine, specified brand A (1 carton, 450g)	65.6	66.7	100.0
Soy sauce, thick, specified brand B (1 bottle, 1ℓ)	81.1	85.3	100.0
Soy sauce, thick, specified brand C (1 bottle, 1ℓ)	79.2	82.0	100.0
Sugar, specified brand A (1 bag, 1kg)	76.3	81.1	100.0
Sugar, specified brand D (1 bag, 1kg)	74.5	82.7	100.0
Sugar, specified brand E (1 bag, 1kg)	69.3	73.7	100.0
Instant curry, specified brand C (1 carton, 220g)	79.9	81.3	100.0
Biscuits (soft), specified brand A (1 carton, 20 pieces)	67.7	76.2	100.0

Items, brands	(1)	(2)	(3)
Biscuits (soft), specified brand C (1 carton, 26 pieces)	79.9	82.6	100.0
Biscuits (hard), specified brand A (1 carton, 28 pieces)	74.2	80.5	100.0
Chocolate (domestic), specified brand A (1 bar, 42g)	79.6	80.5	100.0
Chocolate (domestic), specified brand B (1 bar, 42g)	74.8	79.2	100.0
Chocolate (domestic), specified brand C (1 bar, 42g)	76.1	81.1	100.0
Potato chips, specified brand A (1 bag, 100g)	73.7	79.9	100.0
Potato chips, specified brand B (1 carton, 115g)	74.7	78.3	100.0
Potato chips, specified brand C (1 carton, 58g)	74.2	77.2	100.0
Instant coffee, specified brand A (1 bottle, 150g)	76.7	81.8	100.0
'Sake', special grade, specified brand A (1 bottle, 1.8ℓ)	75.3	79.4	100.0
'Sake', special grade, specified brand B (1 bottle, 1.8ℓ)	75.3	76.8	100.0
'Sake', first grade, specified brand A (1 bottle, 1.8ℓ)	72.3	77.1	100.0
'Sake', first grade, specified brand B (1 bottle, 1.8ℓ)	72.3	74.8	100.0
'Sake', second grade, specified brand A (1 bottle, 1.8ℓ)	69.3	80.0	100.0
'Sake', second grade, specified brand B (1 bottle, 1.8ℓ)	69.3	76.5	100.0
Beer, specified brand A (1 bottle, 633 mℓ)	81.3	83.5	100.0
Beer, specified brand D (1 bottle, 633 mℓ)	76.8	83.2	100.0
Whisky (domestic), specified brand A (1 bottle, 720 mℓ)	79.2	81.3	100.0
Whisky (domestic), specified brand B (1 bottle, 720 mℓ)	78.5	80.9	100.0

Items, brands	(1)	(2)	(3)
Whisky (imported), specified brand A (1 bottle, 750 mℓ)	80.5	85.6	100.0
Whisky (imported), specified brand B (1 bottle, 750 mℓ)	72.7	78.0	100.0
Domestic electric refrigerator (four doors), specified brand B (1 set)	61.1	74.1	100.0
Domestic room air-conditioner specified brand C (1 set)	66.1	72.0	100.0
Thermos bottle (about 2.2ℓ), specified brand A (1 bottle)	66.2	74.2	100.0
Thermos bottle (about 2.2ℓ), specified brand B (1 bottle)	70.4	75.9	100.0
Domestic liquid detergent for kitchen, specified brand A (1 bottle, 600 mℓ)	73.3	83.3	100.0
Domestic detergent for laundry, specified brand A (1 box, 4.1kg)	82.0	90.2	100.0
Medicine for cold (multi-purpose cold remedies) specified brand A (1 package, 12 wrappers)	42.9	52.7	100.0
Medicine for cold (multi-purpose cold remedies) specified brand C (1 package, 50 tablets)	63.7	64.9	100.0
Gastroenteric Medicine (multi-purpose remedies) specified brand A (1 package, 12 wrappers)	44.7	55.8	100.0
Vitamin preparations (multi-vitamins), a specified brand (1 package, 100 tablets)	73.0	78.9	100.0
Colour TV, 21 inches, specified brand A (1 set)	72.7	79.9	100.0
Notebooks, specified brand A (1 volume, No.6, 179mm×252mm)	52.9	56.8	100.0
Films (domestic) specified brand A (1 roll, 24 exposures)	79.7	82.7	100.0
Shampoo, specified brand A (1 bottle, 310 mℓ)	77.1	79.2	100.0
Shampoo, specified brand B (1 bottle, 240 mℓ)	61.4	80.1	100.0

Items, brands	(1)	(2)	(3)
Toothpaste, specified brand A (1 piece, 170g)	64.0	87.2	100.0
Toothpaste, specified brand B (1 piece, 160g)	71.2	79.0	100.0

Notes:

(1): Price of commodity delivered to the secondary wholesalers from the original wholesaler or the manufacturer's sales subsidiary expressed as a percentage of the realised retail selling price in the S-channel

(2): Price of commodity delivered to the retailer from the final wholesaler expressed as a percentage of the realised retail selling price in the S-channel

(3): Realised retail selling price in the S-channel

Source: Statistics Bureau [4]

10 Domestic electric washing machine

The author visited two of the largest three manufacturers. One of them gave the precise data of the CM, which will be used in the following section, expressed as a percentage of the realised retail selling price in the S-channel. However, we have no precise values of the RGM, WGM and ODC. This is the reason why the author did not use the data of the CM to compute the regression line between the cost of distribution and the cost of manufacture.

Domestic electric refrigerator

The author visited two large manufacturers, but they did not give him their data of gross margins and the cost of manufacture.

Video tape recorder

The author visited two large manufacturers, but they did not give

him their data of gross margins and the cost of manufacture.

17,22 Lingerie

The author visited three large manufacturers, two of which gave him their data of the S-channel, L-channel and the department store channel, the last of which is not studied in the paper. When the author visited one of them in 1984, they replied that they would make the six year plan for manufacture and sale based on the long term life cycle. However, they had to change their policy of such a long term cycle to the shorter because long term life cycle products are now diminishing. The transaction between them and retailers were based on 'no return' in the S-channel. However, the other manufacturer transact with retailers on 'return' basis in some case and 'no return' basis in other case in the S-channel and 'return' in the department store channel.

'Return' means that retailers can deliver back commodities which are left on the shelf to the manufacturer. This condition reduces the RGM which is determined at the beginning of the transaction.

As far as the computation formula is concerned, we might have to take a bargain price into account. However, the author thinks that the values given are of the realised retail selling price excluding the bargain price. Further, item number 17 is based on 'no return'.

The Japanese Government did the survey of the lingerie of the manufacturers mentioned above. However, it is not clear whether the values given to the author are of the specific brands which the Japanese Government did the survey of or not.

The data of the L-channel given by one of the manufacturers are of the 'private brand' produced for the supermarket. Each supermarket place their order based on their specification to the manufacturer. 'No return' is applied to this case.

23 Hosiery

The author visited a large manufacturer, which gave their data. Although they gave their data of the S-channel and the department store channel, the author could not use the data of the department store because the values were answered with wide intervals.

In [3], the Japanese Government did the survey of the brand which the manufacturer gave the author their data of.

18 Women's sweater

The author visited a large manufacturer, which gave their data of the S-channel, L-channel and the department store channel. In the case of the women's sweater and women's dress, bargain sale often occurs in the following manner. Let us take the case of the women's sweater as an example. Seventy percent are sold, but thirty percent are usually left on the shelf in the retailer in the S-channel. The retailer deliver this thirty percent back to the manufacturer. The manufacturer sell them at the reduced price of fifty percent at a time of the year. They have no MGM from the bargain sale. The values of the data given from the manufacturer were the average weighted by the seventy percent and the thirty percent in the S-channel. It is not necessary to take the bargain price into account in the L-cannel because the supermarket sell the sweater of their private brand on their own account.

Although the department store deliver back the sweater of the manufacturer's brand unsold to the manufacturer, we need not to concentrate on this channel because the channel is eliminated to consider in the paper.

The Japanese Government did the survey of the retail price only of the sweater, but they did not specify any brand.

16 Men's and children's underwear

The author visited a large manufacturer, which gave the author their data of the three channels. There is no 'return' in the three channels.

The Japanese Government did the survey of the retail and wholesale price of the children's, but of the retail only of the men's. In [3], the Government surveyed the brand which the manufacturer gave the author their data of.

19 Men's jacket

The author visited a large manufacturer, which gave him their data of the L-channel. Although jackets are certainly of the manufacturer's brand, the product which is delivered to supermarket A is different from the product to B. It was reduced in number of products to 1/3 during five years from 1982 that supermarket A deal with the same product as supermarket B deal with.

Japanese Government did the survey of the men's jacket, but they did not specify any brand.

20 Men's walking shoes

The author visited a large manufacturer, which gave him their data of the S-channel and the department store channel. They do not transact with supermarkets.

The Japanese Government did the survey of the item by specifying some brands, one of which was also the brand the author surveyed of.

21 Crockery

The author visited two large manufacturers including the largest, but they did not give their data except replies for Table 5.

3.2 Discussion

The author starts the discussion by estimating the relationship between the cost of distribution (CD) and the cost of manufacture (CM). Figure 4 with Regression line (1) in it shows that the manufacturer's gross margin (MGM) which is defined as 100 less the sum of the CD and CM is constant in the traditional small retailer channel (S-channel) where the CM, CD, ODC and RGM are expressed as a percentage of the realised retail selling price. This is a remarkable fact we have got from his survey. However, as the reader will notice, this finding is based on the cross sectional data. Can we state that the CM will decrease by one unit if the CD increase by one unit of a manufactured goods such as an electric washing machine, cosmetics, women's lingerie or butter? What we definitely state is that the MGM is invariant throughout the consumer goods industries quoted above at a time of the time serial flow. This, of course, does not mean the MGM is constant at any time of the flow.

As the reader has seen, the author excluded a point to compute Regression line (1) of the S-channel. As the author pointed out, it is of edible oils. The author thinks he should pursue the reason why this point falls below far from the line in the next survey.

Table 5 shows that to what extent the following margins and costs have changed during five years since 1982. As far as the ODC and MGM are concerned, the ODC has increased in the two channels, but the MGM has still remained stable in part, where machine making industries, domestic detergent, crockery and some sorts of clothes belong and decreased particularly in the food-processing industry in the S-channel. The table shows, however, that the MGM has decreased uniformly almost all industries in the L-channel. The upward trend in the ODC and the downward trend in the MGM, and cost reduction movement, which will be described and discussed later, resulted in the statistics given in Figures 4 and 5. The author thinks the increased distribution cost contributes to the constant MGM situation. We have three examples as follows.

Table 3 Interval Values in the S-channel, 1986

Item number	RGM	WGM	ODC	CD	CM	Item number	RGM	WGM	ODC	CD	CM
1	c	c	c	g	l	13	h	e	d	p	d
2	e	b	e	k	j	14	i	e	c	o	f
3	d	c	b	i	f	15	f	c	e	l	i
4	e	c	d	j	h	16	g	e		k	i
5	e	a	f	j	h	17	j	e		n	f
6	f	c	d	l	e	18	g	d		k	m
7	g	d		j	k	19				–	–
8	d	c	e	j	j	20	g	c	f	o	f
9	d	g		k	h	21				–	–
10	unknown	unknown	unknown	k	i	22	i	f		n	d
11	unknown	unknown	unknown	k	i	23	g	e		k	h
12	g	b	d	m	f	24	e	d		i	k
						25	c	c	c	g	m

Notes:

a: under 5 b: 5–10 c: 10–15 d: 15–20 e: 20–25 f: 25–30
g: 30–35 h: 35–40 i: 40–45 j: 45–50 k: 50–55 l: 55–60
m: 60–65 n: 65–70 o: 70–75 p: 75–80 q: 80–85

Item numbered as 19 and 21 are eliminated from the computation.

Although the precise data were given to the author, he cannot show them because of confidentiality.

Table 4 Interval Values in the Supermarket channel, 1986

Item number	RGM	WGM	ODC	CD	CM	Item number	RGM	WGM	ODC	CD	CM
1	b	b	c	g	m	13	h	f	c	q	d
2	c	b	g	k	j	14	i	e	c	o	f
3	d	c	b	h	k	15	f	c	e	l	i
4	d	b	d	j	i	16	i	e		m	f
5	e	a	f	k	h	17	m	c		o	d
6	e	b	d	k	g	18	l	f		q	d
7	g	d		j	k	19	i	c		k	g
8	d	c	e	k	j						
9	e	f		k	h						
10	unknown			unknown	unknown						
11	unknown			unknown	unknown						
12	g	b	d	l	g						

Notes: See Notes under Table 3.

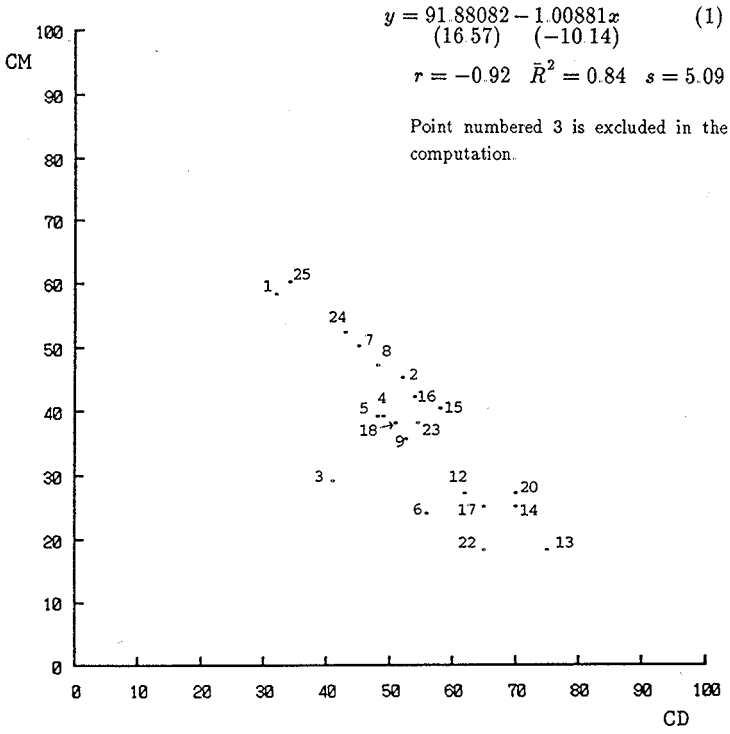
Table 5 To what extent have the following margins and costs changed between 1982 and 1986?

Item number	S-channel RGM	WGM	ODC	MGM	L-channel RGM	WGM	ODC	MGM
1	4	4	3	2	4	4	4	2
2	2	2	5	2	3	1	5	1
2	2	2	4	no answer	2	2	5	no answer
3	3	2	3	3	4	1	4	2
4	4	4	3	2	5	4	4	2
5	3	2	4	3	3	2	4	2
6	4	3	5	1	4	3	5	1
7	4	–	4	3	3	–	5	3
8	3	3	3	3	3	3	4	2
9	5	4	5	3	5	–	5	3
9	3	3	4	3	3	3	4	3
10	not asked for				not asked for			
11	2	2	4	2	2	2	4	2
12	3	3	4	1	4	3	4	1
13	3	4	2	2	3	4	2	2
14	3	3	3	3	3	2	3	2
15	2	2	5	3	2	2	5	3
16	3	2	4	unknown	5	1	4	2
17	3	3	3	3	4	2	4	2
18	4	3	4	2	5	2	5	2
19	not asked for				4	1	5	1
20	3	2	4	2	3	2	4	2
21	4	3	4	3	3	3	5	3
21	2	2	4	3	3	2	4	3
22	4	2	4	3	4	2	2	3
23	4	4	5	4	5	2	5	unknown
24	3		2	4				
25	4		2	3				

Notes:

1: Reduced a lot
2: Reduced a little
3: Stayed the same
4: Increased a little
5: Increased a lot

Figure 4 Scatter Diagram between CM (y) and CD (x) in the S-channel of the Japanese Consumer Goods Industries, 1986



Returning to the previous point that the CM be reduced by one if the CD increases by one in the S-channel, we have no definite proof of the causal relationship. However, we have an example. The author would like to ask the reader to remember that machine-making industries have recovered their MGM during five years. The CM of a domestic electric washing machine, which was semi-automatic and belonged to the cheapest class in price, was reduced from 47 to 41 expressed as a percentage of the realised retail selling price for five years. However, the Japanese Government started levying a tax on that sort of washing machine in the third year. The tax was levied on the shipment, so 10 will become around 5 expressed as a percentage of the retail selling price. This means that the manufacturer just recovered their MGM at the end of the fifth year because they could not transfer the tax to consumers under competitive circumstances. The realised retail selling price was about 100 pounds sterling between 1982 and 1987, but the specification was altered as follows. The same sort of switchboard was made to applicable to every sort of washing machine, the steel plate was pressed to four mm. The number of screws, which was used for the bottom sheet plate, was reduced to 1/2. Forty-seven percentage consists of thirty-six of raw and materials, three of labour costs and eight of expenses including the depreciation, and forty-one consists of thirty of raw and materials, two point nine of labour costs and eight of expenses within factory.

As far as the trend of labour costs is concerned, the percentage has remained steady. However, the average of labour productivity which is defined as man-hours to be put into one unit of semi-automatic electric washing machine in higher, middle or bottom class in this case was eleven in 1987 whereas sixteen in 1982 when the man-hours in 1968 were 100. This means that the labour costs for the washing machine should have been reduced to 2.0625 in 1987 if the machine were the averaged and the inflation rate of the price of the product and wage is the same. This calculation informs that the manufacturer must have reduced man-hours put into the product which belongs to higher or average class in greater degree.

The second example is of a ultra compact passenger car manufacturer. The CM has been reduced to around 65 during five years since 1982 if the CM in 1982 is 100. It

was about 6 less than that of 1982 if we express the cost reduction as a percentage of the realised retail selling price. However, the CD has increased during the same period. As a result, the manufacturer just recovered the MGM. The value of 6 consists of 3 of expenses including depreciations, 2 of labour costs and 1 of raw and materials.

Consumer electronics such as colour TV and VTR belong to one of the most competitive industries in Japan. Further, yen has been rising since 1986. It oppressed Japanese consumer electronics manufacturers to compete with each other in the domestic market. As a result, the CD has increased, which had to reduce the MGM. The Japanese consumer electronics manufacturers have their own sales subsidiaries. Although we have no example how the CM has varied if the retail selling price is 100, we have an example which is based on that the selling price to their local sales subsidiaries is 100. In 1982 the CM of a colour TV was about 71, which had been reduced to around 67.5 in 1986. This cost reduction in percentage terms contributed to the constant MGM. As far as the variation in elements is concerned, the percentage of raw and materials was reduced from around 67.5 to around 64.5 and around 2.5 to around 2 of expenses including depreciations whereas the labour costs remained constant.

As far as the VTR is concerned, the market has been more competitive than the colour TV's. As a result, the manufacturers could not, probably, recover the level of MGM although the author has a document only, which informs that the CM still remained constant during four years between 1982 and 1986. The reader will be able to use the Appendix for further discussion about the constant MGM.

Now, we considered the theory of profitrate in Section 1. What is the relationship between the theory and the practice? Figure 6 shows the conceptual relationship, which is the duplication of Figure 1, between them if we add the following paragraphs.

Figure 5 Scatter Diagram between CM (y) and CD (x) in the Supermarket Channel of the Japanese Consumer Goods Industries, 1986

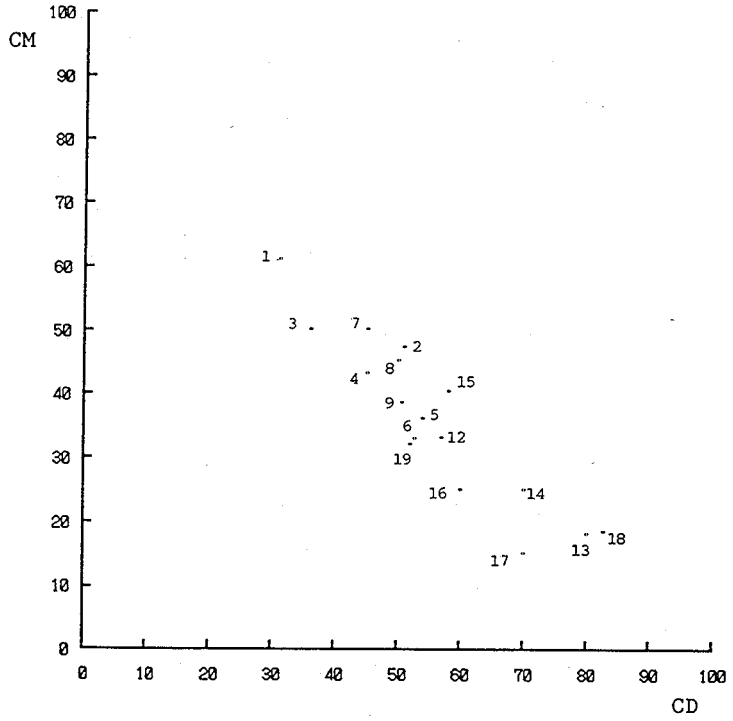


Figure 6

(Term)	0	1	2	···	$n-1$	⋮	n	···
	A_0	A_1	A_2	···	A_{n-1}	⋮	A_n	
		A_0	A_1	···	A_{n-2}	⋮	A_{n-1}	A_n
			···	···	···	⋮	···	···
						⋮	A_0	A_1 ···
						⋮	···	···

The term is defined as the turnover period of circulating capital. This definition is applicable to the definition of the profitrate given by Matsuda. The formula

$$(A_n + A_{n-1} + \cdots + A_0) \Big/ - \left(A_0 \sum_{t=0}^{n-1} x^t + A_1 \sum_{t=0}^{n-2} x^t + \cdots + A_{n-1} \right) = x - 1$$

is the duplication of Formula (5). The author thinks the formula is applicable to the investment of capital for equipment and machinery. From the beginning of the j-th term the depreciable value is gradually transferred into the product by the end of the term j. The A_j is recovered with $i = x - 1$ together with the value of raw & materials and wages by selling the product. However, not only A_j but also the value of raw & materials, wages and investment in the distribution process, which we call as CD, should grow because they are also capital invested. In other words, the input CM + CD will be recovered at the end of the j-th term with the MGM. CM + CD + constant MGM = 100, which means that the sum of the CM and CD is constant. Consequently, the constant MGM divided by the constant (CM + CD) is constant in the S-channel. Capital which is put into at the beginning of the period in terms of CM and CD, thus, is recovered with the constant profit rate which is expressed as the constant MGM divided by the constant (CM + CD).

However, the turnover period of an item is different from another item in length. This means that each item grows with the constant rate in different length of the

turnover, which consists, of course, of the sum of the production period and distribution period. As a result, the Japanese manufacturers concentrate on shortening the turnover period, which the reader will observe in Seto [6].

Now we turn to the relationship between MGM and the profit share used in Funke's article. Funke used the concept from OECD National Accounts to describe an important role to determine the profitrate, which 'is strongly related to the internal rate of return on investment' if it is inflation adjusted (Funke [4]). His profit share is defined as the share of net operating surplus in net value added in the manufacturer. The difference between net operating surplus and net value added is equal to compensation of employees, so that the wage share can be obtained as the converse of the profit share. This means that the denominator is the manufacturer's value added. Comparing to this, the author's MGM is expressed as a percentage of the realised retail selling price, which means that the denominator includes not only the manufacturer's value added, but also the wholesaler's value added and the retailer's value added though the denominator includes the cost of materials and the depreciation in addition to them.

As far as the regression line in the L-channel given in Figure 5 is concerned, we have

$$\underset{(15.26)}{y = 83.13177} \underset{(-8.92)}{- 0.85003x}, \qquad r = -0.92, \qquad \bar{R}^2 = 0.83, \qquad s = 5.29 \tag{2}$$

This regression line shows using seventeen points that the MGM was not constant, but decreases as the CD increases in the L-channel.

The reason why the MGM decreases as the CD increases is that the CM cannot be reduced enough to recover the constant MGM when the CD increases. If we focus on the extreme three points in the right-hand side in Figure 5, it turns out that these three have small market shares in the supermarket channel. They are women's lingerie, women's sweater and cosmetics. Their final sales in the supermarket channel are between $10 \sim 20$ in percentage. They make profit from the S-channel and the department store channel. If we eliminate these three points and compute, we get

$$\underset{(11.40)}{y = 85.54006} \underset{(-6.16)}{- 0.89431x}, \qquad r = -0.87, \qquad \bar{R}^2 = 0.74, \qquad s = 5.10 \tag{3}$$

Comparing Regression line (3) with (2), we see that the regression coefficient in the (3) is quite nearer 1 than the regression coefficient in the (2). The author thinks, on the one hand, that this might suggest industries whose percentage of the final sales in the supermarket are small should change their policy to making profit from the supermarket channel if the percentage becomes larger. However, on the other hand, it seems to be natural that the MGM becomes smaller as the CD becomes larger because the supermarket has buying power. Further, as the reader will notice in Chapter 7 (Table 7–15) in Seto [6], the final sales of domestic electric appliances like washing machines and refrigerators and consumer electronics like colour TV and video tape recorders in the supermarket channel which includes mass sale speciality stores have risen to between 40 and 70 in percentage while this tendency has not yet stopped. The resale price maintenance power of the manufacturers of domestic electric appliances and consumer electronics to the supermarket decreases as the percentage increases because the manufacturer must depend on the supermarket. On the one hand, we have three points whose sales percentages in the supermarket channel are small and whose MGM are below the level. On the other hand, we have two industries, domestic electric appliances and consumer electronics, whose sales percentages in the supermarket channel are not necessarily large but whose resale price maintenance power becomes weaker as the percentage becomes larger. If the examples mentioned above are consistent, the solution is that they intend to make profit not from the supermarket channel, but from the S-channel. However, the manufacturers of domestic electric appliances and consumer electronics will have to change their manufacturing and distribution system to make profit from the supermarket channel because the percentage in sales in the supermarket channel has been growing more and more, which the reader will see in Chapter 7 in Seto [6].

The author still adheres to the estimation of the regression coefficient of the CD. What would happen if we eliminate the point numbered 1 in Regression line (3)? The following regression line (4) are computed with the thirteen points. The result is

$$\underset{(8.40)}{y = 80.91135} \underset{(-4.46)}{- 0.81062x}, \qquad r = -0.80, \qquad \bar{R}^2 = 0.61, \qquad s = 5.19. \tag{4}$$

The absolute value of the regression coefficient has become smaller than the value in the (3). Further, if we eliminate the point numbered 1 only, we have the following regression line computed with sixteen points.

$$\underset{(12.67)}{y = 80.33114} - \underset{(-7.40)}{0.80438x}, \qquad r = -0.89, \qquad \bar{R}^2 = -0.78, \qquad s = 5.32. \tag{5}$$

The absolute value of the regression coefficient has become smaller than that of the (2). As a result, we have found that (1) the MGM becomes smaller as the CD becomes larger and (2) the extreme point in the left-hand side contributes to improving in the MGM whereas the extreme point in the right-hand side contributes to worsening the MGM, which means the smaller CD contributes to improving in the MGM and the larger CD contributes to worsening the MGM.

At the end of the paper, the author would like to study the coefficient of determination in respect to selecting independent variables. Assuming that the CD determines the CM to an extent, that is to say, to the extent of the value of the coefficient of determination, the CD determines the CM to the degree of 0.84 in the S-channel whereas 0.83 in the supermarket channel. However, on the one hand, Figure 7 shows with Regression line (6)

$$\begin{aligned} y &= b e^{cx} \\ \log y &= \log b + cx \\ \log y &= \underset{(48.73)}{4.22027} - \underset{(-9.44)}{0.02468x}, \qquad r = -0.93, \qquad \bar{R}^2 = 0.85, \qquad s = 0.15 \\ y &= 68.05186\, e^{-0.02468x} \end{aligned} \tag{6}$$

that the RGM ($\bar{X}$) determines the CM as well as the CD in Regression line (2) of supermarket channel. On the other hand, Figure 8 shows with Regression line (7)

$$\underset{(11.38)}{y = 64.03254} - \underset{(-5.02)}{0.97557x}, \qquad r = -0.76, \qquad \bar{R}^2 = 0.56, \qquad s = 8.27 \tag{7}$$

Figure 7 Scatter Diagram between CM (y) and RGM (x) in the Supermarket Channel of the Japanese Consumer Goods Industries, 1986

$$\log y = \underset{(48.73)}{4.22027} - \underset{(-9.44)}{0.02468x}$$

$$r = -0.93, \quad \bar{R}^2 = 0.85, \quad s = 0.15$$

$$y = 68.05186\, e^{-0.02468x} \qquad (6)$$

Points numbered 7, 10 and 11 are excluded from the computation.

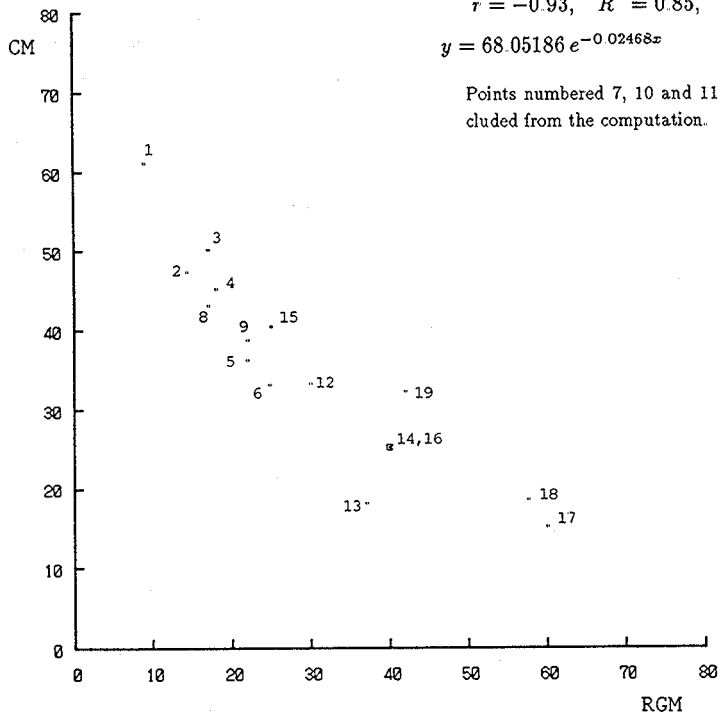
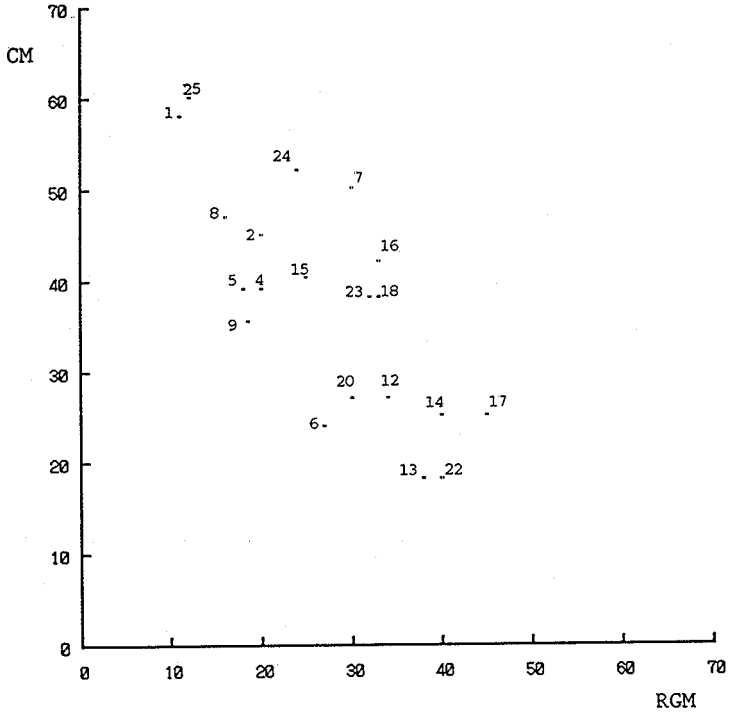


Figure 8 Scatter Diagram between CM (y) and RGM (x) in the Japanese S-channel, 1986



that the RGM (X) can determine the CM not as well as the CD in Regression line (1) of S-channel. As a result, we could state that (1) the RGM performs an important role to determine the CM in the supermarket channel, but (2) the WGM or the ODC performs a role to determine the CM together with the RGM in the S-channel. Further, it will be more important to point out that Regression line (2) and Figure 7 show the manufacturer cannot reduce the CM enough to compensate for an increase in the CD or RGM in the supermarket channel in the circumstances that manufacturers' final sales in the supermarket channel are small depending on the sort of industry.

Table 5 shows that the ODC increased during five years from 1982 in the two channels. This certainly oppressed the MGM. However, the increased ODC contributed to shortening the distribution period without prolonging the production period, which includes the turnover period of finished goods stock, with the help of information. The reader will observe the situation in Chapter 8 in Seto [6].

4. Conclusion

The practised 'profitrate' is not relevant to the length in time of the term. The reader is asked to remember that the theoretical profitrate is also not relevant to the length in time of the term. However, this irrelevance oppresses the manufacturer to try to recover their capital invested as soon as possible.

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Appendix

We have found the direction along which the Japanese manufacturer go on in the paper. In the S-channel the manufacturer concentrate on shortening the production period and distribution period based on the statistical fact that the MGM was constant throughout the items surveyed as shown by Regression line (1). In the supermarket channel, the manufacturer focus on, first of all, reducing the CD to reach the constant MGM.

However, here is a problem, which is concerned with the degree of reliability of the data of the clothing industry, that is, of the item numbers 16, 17 and 18 in the S-channel. As far as item number 16, men's and children's underwear, is concerned, the author asked for the reply twice. In the first reply, which the author uses to compute Regression line (1), they probably gave him the subcontractor's gross margin only as the MGM, which he guesses using the second reply. This will mean that the brand manufacturer's (see the following remark) gross margin is included in the CD in the first reply. The CM remains, needless to say, the same. The 'interval' value of the CD in the second reply was j whereas k in the first reply. If we use the second reply to compute, Regression line (1) varies to $y = 90.98697 - 0.99884x$, $r = -0.92$, $\bar{R}^2 = 0.84$, $s = 5.17$, t-values are 16.75 and -10.19. It will, therefore, still be true that the MGM was constant throughout the items surveyed in the S-channel in 1986.

Remark

Manufacturers of item numbers 16, 17, 18, 22 and 23 are called the brand manufacturer. Although they make products on their own in some cases, they have subcontractors that make products for their parent brand manufacturers based on the parent's specification. The brand manufacturers transact directly with retailers in the two channels.

However, we have another problem still in relation to the clothing industry. The gross margin, the RGM or WGM, varies to an extent depending upon the conditions of settlement of the transaction between the brand manufacturer and the retailer in the S-channel although the gross margin does not vary in the supermarket channel because the brand manufacturer makes the supermarket's private-brand-product for the supermarket. As far as item number 17, lingerie, in the S-channel is concerned, the respondent replied twice. The 'interval' values of the CD and CM in the second reply were j and h respectively whereas m and e in the first reply. The difference is large, but the point (j, h) falls near Regression line (1). The first reply is based on 'no return'. It determines the RGM whether 'return' is applicable or not. The RGM in the first reply is 128 if the RGM in the second reply is 100. The best will be the weighted average as shown in the case of item number 18, women's sweater, in the paper.

When the author reported the contents of the paper at the meeting held by Kansai District Branch, the Japan Society of Commercial Sciences in July, 1990, we started the discussion by evaluating the degree of reliability of the data used and reached the topic why the MGM was constant throughout the items surveyed in 1986 in the S-channel. The author could not answer and cannot still now answer exactly. However, he would like to discuss the topic in the following manner.

The empirical CM — RGM relationship in the S-channel in (7) show that the large variance around the regression line is characteristic of the relationship. The RGM can explain the CM by 56 per cent only. As a result, we will notice that the WGM and ODC can explain the CM by 28 per cent if we compare Regression line (1) with Regression line (7) whereas the WGM and ODC cannot explain the CM in the supermarket

channel although the sum of the WGM and ODC change the exponential relationship to the linear relationship, which Regression lines (2) and (6) show, in the supermarket channel. Where does the difference between the two channels come from? Table 1 and Table 5 will probably help us to resolve the problem. Table 1 shows the situation where the traditional small retailer adheres to the substantial price maintenance based on the manufacturer's recommendation. This situation is different from that of the supermarket channel. The author thinks the situation is the first cause. The second cause is the moderate increase in the ODC in the S-channel compared with the rapid increase in the supermarket channel for five years to 1986.

Thus, we should add several words to the statement mentioned in the first paragraph in this Appendix. In the S-channel the manufacturer concentrate on shortening the production period and distribution period based on the statistical fact that the MGM was constant throughout the items surveyed as shown by Regression line (1) if the traditional small retailer adheres to the substantial price maintenance based on the manufacturer's recommendation whereas it will still be true that the manufacturer focus on, first of all, reducing the CD to reach the constant MGM.