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Measures for the Decision of Commitment of Resources: An Empirical Analysis of the Japanese Industries

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Summary

The approach to the decision on the amount of commitment of resources is still beyond the mathematical calculation in the real world. In this paper, hypothetical measures, though not inclusive, are proposed to examine the resource commitment behaviors of the five Japanese industries. Based on the measures, neither over nor under commitment, that is, moderation or steadiness around the average of the industry seems to be associated with the good performances.

Introduction

The essence of strategic decisions lies in dynamic commitment of resources to support and develop the foundation of businesses. The foundation of the firm's survival relies on not only the present profit making ability, but also its future profit generating ability. A strategy reflects a logic for committing and allocating resources to maintain ideal profitability over time.

The most difficult problem for the decisions is to cope with uncertainties attached, especially those with respect to performances which will be brought up through the commitment. Any proposals that are less uncertain are apt to be shortsighted and less profitable ones in the long run. In most cases alternatives that will contribute to sustaining the foundation for relatively long period of time are liable to accompany high uncertainties.

The decisions under the circumstances depend ultimately on the empirical judgment which has been formed historically. Indeed objective and scientific analyses and information-gathering activities will be implemented in order to evaluate performances of alternatives, but will not be able to wipe apprehensions of top managers away completely. They have to take risks themselves and therefore resort eventually to their own judgement.

In addition to their judgement, there will be some objective conditions that should be taken into account. They are the firm's ability of procuring resources and the constraints on performances, which have been prevailed as reflecting the expectations of outside stakeholders and internal members over time.

Then an interesting problem is what kind of criteria with which top managers would decide the limit of resources to be committed for the future. It's doubtful that they use the quadratic programming for the decision as in the theory of the portfolio selection. Here a few hypothesized measures for the decision will be proposed. Being unknon

whether top managers are actually adopting them, it can be said that they must have some measures or references which are simple and reflect their firm's historical attitudes toward uncertainty as pointed out by Penrose [1959].

This paper is an extension of the previous paper [1983].

A concept of the Foregone Present Profit

One of traditional and rational measures for the decision will be the expected return on committed resources being proposed. Besides it, the risk level involved in the proposal will be considered. But the problem is reliability of them. How much the analysts advocate their estimates, top managers would not put complete reliance on them. Therefore they have to have some kind of criteria of their own to judge reasonableness of the proposals. It may be a kind of the max-min principle. That is, they may set a limit of the commitment level that would not risks the firm's life. We often observe in the real world that the depreciation level being done is setting the limit.

A concept of the foregone present profit that will be hypothesized here is supposed to construct a basic criterion with which top managers make judgement whether a proposed commitment level of resources can be appropriated or not, to some extent, irrespective of any estimates of its profitability. This situation may be similar to that of an ordinary person who is going to participate in a gambling and decide the amount of stakes. He would probably determine the maximum percentage of his money, which can be committed as the stakes in the gambling, in advance. The limit may change as his earnings change. The same situation as the gambling may be applied to our case. The foregone present profit which will be defined as follows is comparative to the stakes.

$P_f(t)$: foregone present profit at time t
$I(t)$: interest paid at t
$R(t)$: interest and dividend received at t
$d(t)$: dividend pay-out ratio at t
$c(t)$: capital stock at t

Then $P_f(t)$ is defined by the following equation.

$$P_f(t)=\{I(t)-I(t-1)\}+d(t)\{C(t)-C(t-1)\}-\{R(t)-R(t-1)\} \tag{1}$$

The first term is an increment of the total interest paid for a period (a year) which has been brought up by procuring additional debts over the existing debts at $t-1$. The second one shows a part of P_f that has been generated by issuing new stocks. Only raising the dividend pay-out ratio without issuing new stocks does not increase P_f. The third one represents incremental proceeds from the current assets over those of the period $t-1$. In effect, P_f means the foregone present profit that would be sacrificed when the firm has

committed resources by borrowing additional debts, issuing new bonds and stocks or withdrawing from the retained earnings.

It P_a and P_p are the actual profit and the potential profit respectively, then

$$P_p(t)=P_a(t)+P_f(t) \tag{2}$$

P_p means the profit when no commitment of additional resources has been done with replacement being continued. Henceforth, P_p, P_a and P_f are all divided by the total assets at t to be the ratio in order to control the profit size effect. Furthermore let's take a ratio of P_p to P_a or of P_f to P_a to make measures like decision criteria as in the case of the gambling. Both of them increase as P_f increases or P_a decrease.

Examples of behaviors increasing P_f or decreasing P_a are, in order to put resources into capabilities which will support the foundation of businesses, such as the tangible assets, or R & D activities;

——borrowing additional debts or issuing new bonds over the outstanding debts of the previous period

——issuing new stocks (including dividend stocks)

——withdrawal from the retained earnings

On the other hand, activity examples increasing P_a or lowering P_f are;

——repaying the existing debts or redempting the outstanding bonds with funds of lower costs

——positive retention (turning out to obtain some proceeds)

——redempting the capital stock

——liquidating the assets

Depreciation which will be caused by additional assets will lower P_a in later successive periods, offset by the increase of Pa in the same periods that might be effectuated by the commitment. Also increased expenses for capabilities, such as R & D costs, advertizing costs, may lower the profit level by being deducted from revenues. These effects will appear in P_a, not in the form of P_f.

The ratios represent a kind of the permissible level of the foregone present profit relative to the actual profit. The higher they are, the more aggressive the attitude will be seen. But the values of the ratios do not necessarily reflect the absolute level of resources committed. Even the same percentage may mean the different levels of the foregone present profit and then committed resources, depending on the absolute levels of P_a.

$P_f=0.0$ or $P_p/P_a=1.0$ will not mean no commitment. For example, any positive retained profit at t will generate some earnings. Then P_f will not be zero, *ceteris paribus*. Therefore in the case of no commitment of resources at all, P_p/P_a will be less than 1.0. $P_f(t)=0.0$ or $Pt(t)/P_a(t)=1.0$ nearly means that the level of commitment corresponding to the retained profit at t is being done besides replacement.

Calculation of the Measure

The firms picked up in this analysis were selected from the five Japanese industries, the chemical and allied products, the iron and steel, the general machinery, the electrical machinery, equipment and supplies and the precision instruments and machinery industry. The five industries accord with the two digit classification of the Japan Standard Industrial Classification. The firms are all listed on the Tokyo Stock Exchange Market. The total number of the firms is 395. The data coverage is from 1965 to 1980. P_f of each firm was calculated for each year according to (1) from 1966 to 1980. P_a is represented by the net income plus non-operating revenues less non-operating costs. The data source is the Kaigin Corporate Financial Data tape.

The frequency distributions of the average P_p/P_{as} of each firm of the industries for the 15 years are shown in Table 1. In making the average P_p/P_a, the averages of P_p and P_a for the 15 years are used, in order to diminish significant effects of possible abnormal values of particular years when taking the ratio in each year. It's clear that the capital intensive industries, such as the chemical & allied products, the iron & steel industry, show the relatively high averages. It implies that those industries have required higher levels of the sacrifice.

The hypothesis test at 5% significant level whether the two averages of any two industries are different each other shows the results like Fig. 1. The circles of Fig. 1 depict the same average groups. The one group (circled by full lines) consists of the iron & steel, the chemical & allied products and the general machinery industry and the other group's members are the general machinery, the precision instruments & machinery and the elec-

Table 1 The Frequency Distribution of P_a/P_f of the Industries

The industries / P_p/P_a	Chemical & allied products		Iron & steel		General machinery		Electrical machinery, equipment & supplies		Precision instruments & machinery	
	No. of firms	Percentage	No. of firms	Percentage	No. of firms	Percentage	No. of firms	Percentage	No. of firms	Percentage
0.000-0.999	10	8.9%	3	7.1%	23	18.7%	14	15.4%	3	11.1%
1.000-1.099	63	56.3%	15	35.7%	73	59.4%	70	76.9%	20	74.1%
1.100-1.199	22	19.6%	12	28.6%	16	13.0%	3	3.3%	2	7.4%
1.200-1.299	5	4.4%	7	16.6%	3	2.4%	2	2.2%	1	3.7%
1.300-1.399	4	3.6%	2	4.8%	2	1.6%	0	0.0%	0	0.0%
1.400-1.499	1	0.9%	1	2.4%	1	0.8%	0	0.0%	0	0.0%
1.500-	7	6.3%	2	4.8%	5	4.1%	2	2.2%	1	3.7%
Total	112	100.0%	42	100.0%	123	100.0%	91	100.0%	27	100.0%
Mean of P_p/P_a		1.124		1.162		1.102		1.052		1.057

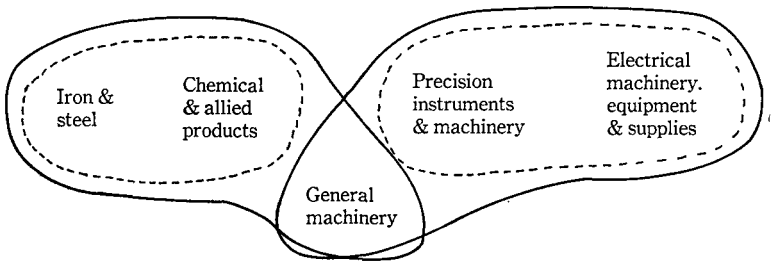

Fig. 1 The Same Average Groups

trical machinery, equipment & supplies industry. That is, the iron & steel and the chemical & allied products industry make one sub-group (enclosed by dotted lines) and the precision instruments & machinery and the electrical machinery equipment & supplies industry form the other sub-group. They don't intersect in the absence of the general machinery industry. If we classify these industries in terms of the level of P_p/P_a, the iron & steel and the chemical & allied products industry show the highest P_p/P_a level and the precision instruments & machinery and the electrical machinery, equipment & suppies industry the lowest P_p/P_a. The general machinery is ranked as the intermediate class. This classification seems to be consistent with the capital intensiveness to be required in each industry.

The Determinant of P_f

If we take the ratio P_p/P_a as a representation of the criterion to judge the reasonableness of the committed resources' level, there may be certain reasons for differences in the value of the ratio among the firms. Although there are no data available on the internal processes relevant to generating the value of the ratio, an analysis of the effects of some objective factors that are seemingly influential, is worthy to be done. Table 2 summarizes the results of the regression analyses whose dependent variable is the average P_f for the 15 years with the independent variables of the average P_p, the average equity ratio AEQR (the equity over the total assets), the average market value of stocks over the book value AMV, and the average total assets growth ratio AAGR, the sales growth ratio ASGR, for the same years and the average sales size SZ (the arithmetic mean of sales in 1966 and 1980). All values are normalized in this analysis.

The significant variable throughout the industries is the total assets growth ratio AAGR. The result is such as might be expected. The second variable of interest is P_p. The estimates of the two industries are not significant, but we should note the negative signs of the variable. This implies that the firm with higher profitability tends to reduce the foregone present profit ratio P_f. That is, P_f will not increase in proportion to the potential profit ratio.

Table 2 The Analysis of the Determinants of P_f

Industry	AEQR	AAGR	AMV	ASGR	SZ	P_p	R^2
Chemical & allied products	−.43999* (3.2098)	.66251* (4.5669)	−.16431** (1.3612)	−.08920 (.6842)	−.04111 (.5467)	−.03807 (.2158)	.4519
Iron & steel	−.04572 (.2568)	.83345* (7.0170)	−.16734** (1.4632)	−.04832 (.33738)	n.a.	−.43836* (2.3484)	.7636
General machinery	.02782 (.1891)	.94140* (6.0246)	−.57530* (4.8252)	−.22253* (1.7149)	−.08320 (1.1004)	−.10996 (.6231)	.3722
Electrical machinery, equipment & supplies	.11746 (.7289)	.90758* (4.0929)	−.08783 (.8138)	−.23924 (1.0233)	−.21077* (2.4439)	−.59476* (3.2089)	.4028
Precision instruments & machinery	.53031* (2.2128)	.92120* (3.0737)	−.32574* (1.7764)	−.11749 (.3853)	−.33753* (2.1771)	−.59176* (2.3893)	.6739

* significant at 5% level
** significant at 10% level
(t-value)

We might interpret it in two ways. The first is that as getting profitable, the firm is inclined to be conservative or to decrease the foregone profit ratio. The second one makes us imagine a person who has to spend certain level of the required stakes without regard to his small cash in hand in a gambling which is prohibiting him from retiring for certain periods of time. In the gambling there would be also an affluent person who feels the stakes cheep. It is not certain which is the case in this analysis. Probably the two interpretations would hold.

The similar case is found in the results of the variable AMV. AMV and P_p will be positively correlated. The correlation coefficients are .79 in the chemical & allied products, .19 in the iron & steel, .72 in the general machinery, .54 in the electrical machinery, equipment & supplies and .58 in the precision instruments & machinery industry. Therefore the degree of significance will be disturbed, especially in the industries with the high correlation coefficients. Then we should combine these variables' effects to see the effects of profitableness on P_f.

The effects of the average sales which are proxies for the size of the firm, are also interesting. Although only the last two industries show the significant results, the signs are all negative but the iron & steel industry. It's suggested that the size will not increase P_f, granting that it may suppress.

The financial safety measure of AEQR seems to have complicated effects. The significant two estimates exhibit two opposite effects. The negative sign means that the low financial safety does not operate repressively on the foregone profit ratio. This seems to show the often quoted discription of the Japanese firms' one of the traits. The positive sign reveals the opposite.

The sales growth ratio ASGR has weak effects. Only looking at the signs, it does not correlated with extension of P_f.

In addition to P_p/P_a, the second measure closer to aggressiveness than P_p/P_a, which

Table 3 $P_p=a+b(P_a)$

Industry	Constant	P_a	R^2
Chemical & allied products	.34136	.98969* (297.0773)	.9987
Iron & steel	.51169	.96110* (88.9336)	.9948
General machinery	.24073	.99225* (235.4604)	.9978
Electrical machinery, equipment & supplies	.26292	.98885* (185.7804)	.9974
Precision instruments & machinery	.25235	.99672* (69.1643)	.9948

* significiant at 1% level

will be named AG, deserves to be introduced. This is the ratio of the actual P_p to the theoretical P_p. The theoretical P_p is calculated by the following equation to be estimated.

$$P_p=a+b(P_a) \tag{3}$$

Table 3 summarizes the estimated results of the equation. They show surprisingly high correlations, even if P_f is small relative to P_a. That we are using the average values for the 15 years may contribute to these high correlations. If picking up a theoretical P_a of a firm in a particular year estimated from the equation, we may find a large difference from the actual value. A policy, if any, will be better reflected in the average value, not in a particular year's one.

AG is the ratio of the actual P_p to the estimated value P_p. If the ratio is over 1.0, then its firm can be said more aggressive than average. The ratio can be expected to represent a more intrinsic attitude toward committing resources, deprived of the general

Table 4 The Analysis of the Determinants of AG

Industry	AEQR	AAGR	AMV	ASGR	SZ	R^2
Chemical & allied products	−.35042* (3.0680)	.39369* (2.3536)	−.07815 (.6300)	−.04019 (.2589)	.09402 (1.0451)	.2083
Iron & steel	−.43903* (3.6470)	.72163* (6.5286)	−.20949** (1.6128)	n.a.	−.09537 (.9118)	.6469
General machinery	−.12380 (1.1270)	.22501 (1.2363)	−.13726 (.9904)	−.03692 (.2329)	−.04734 (.5189)	.0478
Electrical machinery, equipment & supplies	−.11784 (1.0284)	.86006* (3.4322)	−.07295 (.6082)	−.43594** (1.6518)	−.13007** (1.3318)	.2215
Precision instruments & machinery	.49183* (2.0133)	.33758 (.8379)	−.15264 (.6287)	−.10582 (.2812)	−.24476 (1.1695)	.3644

* significant at 5% level
** significant at 10% level
All values are normalized.

tendency of the industry.

Then let's consider the effects of the same factors as in the case of P_f except P_p. Table 4 shows the results. Other than the average total assets growth, AEQR explains well relatively. The signs are all negative but the precision instruments & machinery industry, that affirm the trait above mentioned. The low financial safety has not restrained aggressiveness mostly. It might reflect severe competition in the Japanese industries. The other variables' effects on aggressiveness are not clear.

Relations of Profitability to P_p/P_a and AG

Let's turn our attention to the relationships between profitability that is the average P_a for the 15 years and the measures, P_a/P_a and AG. Table 5 summarizes the regression results.

In the first four industries, the relations between P_a and P_p/P_a are all significant at 5% significance level. They show the consistent patterns throughout the industries.

The quadratic terms are positive. They mean there is no optimum of P_p/P_a which maximizes P_a. Calculating the values of P_p/P_a which minimize P_a shows 1.667 in the chemical & allied products, 1.468 in the iron & steel, 2.371 in the general machinery and 1.403 in the electrical machinery, equipment & supplies industry. These levels are so high that there are few firms beyond them. Therefore within the range of plausible values, we will be able to say that, the lower P_p/P_a, the higher P_a.

Table 5 $P_a=a+b(P_p/P_a)+c(P_p/P_a)^2$, $P_a=a+b(\mathrm{AG})+c(\mathrm{AG})^2$

Industry	Constant	(P_p/P_a)	$(P_p/P_a)^2$	AG	AG^2	R^2
Chemical & allied products	74.9131	−93.6874* (6.8786)	28.0965* (5.9734)			.4574
	−141.7574			326.1327* (4.5075)	−177.0886* (5.5241)	.2013
Iron & steel	88.7709	−121.8721* (6.5017)	41.5034* (5.8109)			.6934
	12.0721			n.a.	−7.0607* (2.8401)	.1678
General machinery	30.9149	−30.2758* (4.8990)	6.3842* (4.1297)			.2289
	−19.6694			48.5385** (1.4933)	−22.9318** (1.6492)	.0303
Electrical machinery, equipment & supplies	99.6179	−142.4780* (3.018)	50.7726* (2.6408)			.2476
	−190.6817			393.5581* (3.3109)	−196.0802* (3.3081)	.1119
Precision instruments & machinery	−20.0287	48.3040** (1.6296)	−22.5667* (1.8275)			.1719
	−19.4401			52.2849* (2.5406)	−26.9834* (2.3516)	.2245

* significant at 5% level

** significant at 10% level

On the other hand, in the precision instruments & machinery industry the quadratic term's sign is negative. It means that there is a value that maximizes P_a. It is 1.070 which is just above the mean 1.057. But over 1.07, the relation is the same as those in the four industries. In this industry, there are several firms which maintain low P_p/P_{as} with the lower performances. They pull the curve down to make concavity.

Next we turn to the second results, the relations between P_a and AG. AG over 1.0 means more aggressive than average. The four industries but the iron & steel seem to suggest that there are optimum levels of aggressiveness within the reasonable ranges. The optimum P_{as} are found at .92 of AG in the chemical & allied products, 1.058 in the general machinery, 1.003 in the electrical machinery, equipment & supplies and .968 in the precision instruments & machinery industry. In the iron & steel industry there seems to be a trend that aggressiveness lowers P_a. The standard deviation and the mean of AG in each industry are .059 and 1.016 in the chemical & allied products, .087 and 1.049 in the iron & steel, .084 and 1.000 in the general machinery, .048 and .992 in the electrical machinery, equipment & supplies and .130 and .985 in the precision instruments & machinery industry respectively. Judging from these, except the chemical & allied products industry, the three industries have their optimum AGs around their averages. In the chemical & allied products industry, lower AG gives the maximum. In that sense it resembles the iron & steel industry.

To summarize the results, it seems to be able to say that, with respect to P_p/P_a, high values or too low values of it have been combined with low profitability. This will happen when the firm is trying to maintain the ratio at a certain level irrespective of its profit level and is in no hurry to raise the profit level to reduce the ratio to the reasonable level, willingly or not. In the precision instruments and machinery industry there is found also such a case as might be expected. That is, with too low profit level the firm can not afford to maintain the required commitment level.

Turning to AG, there seems to exist the optimum aggressiveness around the industrial

Table 6 Performance Indexes of the Industries

	Chemical & allied products	Iron & steel	General machinery	Electrical machinery, equipment & supplies	Precision instruments & machinery
Sales growth ratio	13.53%	13.03%	14.25%	15.04%	15.00%
Total assets Growth ratio	11.50%	10.86%	12.08%	12.77%	12.68%
Fixed assets Growth ratio	9.73%	8.50%	8.99%	9.46%	10.20%
Coefficient of variation of sales growth ratio	.25	.20	.29	.28	.24
Net income/sales	9.05%	6.92%	8.19%	7.25%	7.62%
Pa	6.14%	4.24%	5.77%	6.28%	5.58%
Equity ratio	27.63%	21.22%	30.56%	29.91%	25.24%

All figures are calculated averages of the firms in the analysis.

average but in the iron & steel industry. It is not clear why the iron & steel industry shows that pattern, but it may be due to its stability but high stakes. Table 6 exhibits some of the industries' performances. The growth ratios are lowest and the coefficient of variation of the sales growth ratio is smallest. The equity ratio is lowest. In effect, in this industry the firm has been required the relatively high stakes in spite of its low profitability, less financial safety and the low industrial growth. Chances to grow rapidly are limited. Also innovative possibilities may be less. Therefore the firm that can meet the required level of commitment which is less relative to its profit level, contributes to the pattern.

In the other four industries the optimum values seem to be centered around the averages. It suggests that aggressiveness should be intermediate in the long run, neither higher nor lower than the industrial average of aggressiveness.

The effects of P_p/P_a and A on Profit Variability

The second performance measure is variability of P_a that is the coefficient of variation of P_a. Table 7 shows the results of the analysis. The first three industries are offering the same patterns that the low P_p/P_a leads to low variability of the profit ratio. In the general machinery industry the maximum variability is realized at 3.27 of P_p/P_a where there is no firms at all. Then in the three industries higher P_p/P_a are linked with high variability with in the reasonable ranges of them.

On the other hand, the electrical machinery, equipment & supplies and the precision

Table 7 $VP_a=a+b(P_p/P_a)+c(P_p/P_a)^2$, $VP_a=a+b(\mathrm{AG})+c(\mathrm{AG})^2$

Industry	Constant	(P_p/P_a)	$(P_p/P_a)^2$	AG	AG^2	R^2
Chemical & allied products	−9.1552	9.2930* (14.7274)	n.a.			.6635
	103.7068			−212.1365* (6.6307)	109.2018* (6.6644)	.2895
Iron & steel	−7.7499	8.5703* (2.6779)	n.a.			.1520
	n.a.			n.a.	n.a.	n.a.
General machinery	−29.6783	35.2363* (8.2281)	−5.3287* (4.9719)			.7233
	7.6057			−16.5058 (.4388)	11.11741 (.6909)	.0296
Electrical machinery, equipment & supplies	26.7195	−53.3287* (3.4730)	27.2334* (4.3544)			.5947
	44.4087			−90.3571** (1.6541)	46.8316* (1.7165)	.0421
Precision instruments & machinery	85.5514	−140.0142* (9.2236)	56.4934* (8.9334)			.7839
	50.3801			−94.6576* (19.9409)	45.0580* (17.0242)	.9589

* significant at 5% level

** significant at 10% level

instruments & machinery industry exhibit the convex functions which mean that there are optimum values of P_p/P_a bringing the minimum variability. The optimum values are .979 and 1.239 respectively. Especially the precision instruments & machinery industry provides an interesting implication. It says that the higher P_p/P_a, the lower the variability up to 1.239 beyond which there are only two firms. They pull the curve up to form concavity. Different with the profit level, the desirable performance accompanies with the high commitment. Its implication is if you want to decrease variability, you should commit more to some extent.

The optimum P_p/P_a in the electrical machinery, equipment & supplies industry is lower than the average 1.052. The firms which are beyond .979 occupy more than 85% of the total firms. Then most of the firms except the ones lifting the curve up make the same pattern as those in the first three industries. But the characteristic feature is that the firms with the lowest class of P_p/P_a exhibit high variability of the profit as in the precision instruments & machinery industry.

The first three industries show the same trends as the cases of the profit level. Lower P_p/P_{as} are linked with lower variability of the profit ratio.

The estimated effects of AG on the variability are significant in the three industries. Judging from these, the optimum aggressiveness exists as in the case of the profit level in each of these industries. Except the precision instruments & machinery industry it exists under the average, meaning conservative. They are .971 in the chemical & allied products, .964 in the electrical machinery, equipment & supplies and 1.054 in the precision instruments & machinery industry. But three optimum values including that of the precision instruments & machinery industry lie within one sigma range. Therefore these values can be said to center around the industrial averages.

The Sales Growth Ratio, P_p/P_a and A

Table 8 shows the results of the regression analyses with the independent variables of P_p/P_a and AG. With respect to P_p/P_a, the relationships are not clear throughout the industries. Only one significant case at 5% significance level in the chemical & allied products industry implies that higher P_p/P_{as} accompany with the low sales growth as in the profit performances.

But AG provides different patterns. They imply that relatively high aggressiveness is connected with the high sales growth. It seems to contradict the results of the analysis of the determinants of AG. The miserable significance of the sales growth ratio in Table 4 is perhaps due to multicollinearity. The correlation coefficients between the sales growth ratio and the total assets growth ratio are .80 in the chemical & allied preoducts, .71 in the iron & steel, .82 in the general machinery, .92 in the electrical machinery, equipment & supplies and .84 in the precision instruments & machinery industry.

The optimum values of AG are 1.087 in the chemical & allied products, 1.189 in the

Table 8 $ASGR=a+b(P_p/P_a)+c(P_p/P_a)^2$, $ASGR=a+c(AG)+c(AG)^2$

Industry	Constant	(P_p/P_a)	$(P_p/P_a)^2$	AG	AG^2	R^2
Chemical & allied products	15.2472	n.a.	−1.3127* (2.2711)			.0447
	−55.3432			127.6415* (2.2144)	−58.7069* (2.0079)	.0873
Iron & steel	10.9110	n.a.	1.5455** (1.5864)			0.591
	6.3422			6.0367* (3.0332)	n.a.	.1869
General machinery	n.a.	n.a.	n.a.			n.a.
	−51.6258			114.2495* (3.5725)	−48.0363* (3.5111)	.0964
Electrical machinery, equipment & supplies	n.a.	n.a.	n.a.			n.a.
	−164.3354			338.1639* (2.5271)	−158.1929* (2.3708)	.1187
Precision instruments & machinery	−1.3932	32.2174 (.8745)	−15.7511 (.9560)			.0697
	−2.2627			34.4710 (1.2143)	−17.1227 (1.0818)	.0689

* significant at 5% level

** significant at 10% level

general machinery, 1.068 in the electrical machinery, equipment & supplies, and 1.006 in the precision instruments & machinery industry. These are all above the averages and except the last industry are beyond one sigma range. But concavity means that too high aggressiveness represents the lower performance. Only the iron & steel industry seems to be favorable to the more aggressive firms. Perhaps in this industry, the most effective mean to support the foundation has been the modernized productive capacity. Then aggressiveness has been valid for the growth more than in the other industries.

Implications of the Analysis

The decision of committing resources for building the foundation of businesses in the long run has been used to be approached as the allocation decision. The mathematical programming [1982], risk analysis [1984] and Product Portfolio Management are typical approaches to the decision. But in these approaches the limit of commitment is given or a parameter. Under uncertainty deciding the limit would not be a direct conclusion from mere mathematical exercises. It will involve or reflect a posture of the firm formed historically toward its future uncertainty.

The hypothetical measures introduced in this analysis are trying to express the posture in terms of the ratios of the potential profit (including the foregone present profit) to the actual profit and also to the theoretical potential profit. The higher these ratios, the more aggressive the posture.

Calculating the former ratio suggests that there seems for a dominant range within which the ratio is likely to locate to exist in each industry. The range is 1.000–1.199. It implies that the distributions are stable and similar. But the average values will be different according to the required commitment levels of the industries reflecting competitive and technical factors such as the capital intensity, the degree of technological progresses, etc.

Judging from the relationships between the ratio and the performances, we will be able to say that higher values mostly do not represent the desirable performances. Also too low values (implied by the precision equipment industry) provide no good results. Moderately lower values than averages seem to be desirable. Therefore under given competitive situations, these desirable values may give references with which firms assess their postures. Combining with the results of AG, that the firm with average aggressiveness shows the desirable profit performances, the good performers show steadiness among the firms in the long run.

Why is the case if not analytically understood here. The good performers will appear in two ways. The first case is that the firm committing much resources may obtain returns high enough to cover them to make a conservative or moderate value of the ratio. This will be achieved by the high capabilities such as innovative technological or marketing abilities. The second case will be for the firm with the average abilities. It knows its bounded capabilities and is prudent or selective in committing resources. Both firms never behave above or below their circumstances. The converged values of such behaviors, if any, might be the moderate values. If assuming the case, we will be able to regard the steady values as the references for the decision of committing resources.

If we pay our attention only to the sales growth ratio, it is persuasive that the high growth ratio requires relatively high aggressiveness. But if combining it with the argument above, also we might say that sustaining high growth would not necessarily lead to long run high profitability.

Conclusions

The decision of the amount of resources to be committed for the future foundation of businesses has been considered as the problem of the balancing the ratio of the foregone present profit to the actual profit. The analyses of the measures for that purpose have suggested that relatively lower or moderate values of the ratio and the average aggressiveness are linked with the good profit performances in the relatively long period of time. So far as the industries taken up are concerned, the negative correlation of the foregone present profit with the potential profit (so the actual profit) holds. We can find steadiness of the behaviors among the firms.

Looking only at the values of the ratios, we might call the steadiness as being conservative in the sense that they do not maintain the same ratio as the profit level increases.

Though not being clear why such values have brought up the good performances, they may be interpreted respectively as the average consequence of the industrial aggregate inclusive of competitions and innovations in the long run.

Indeed the high sales growth ratio is related to the high values of commitment or aggressiveness, it seems not to lead to the long run profitability.

The results derived here may give some materials to the research on the decision of committing resources in the aggregate level for the uncertain future. But the attention is limited here. That is, the problem is that the commitment also includes other than picked up here. Fore example, we should consider it as the form of expenses, such as costs for human talents, R & D, marketing, etc. In this paper we have not taken them into account explicitly. The concept of "Optimum Mass" of the strategic investment by Ansoff [1984] seems to be closer to the inclusive commitment. The extension of the commitment may bring about more implications.

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