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A RESEARCH ON CORPORATE BANKRUPTCY IN JAPAN

— using Qualitative Data —

by

Daisuke Okamoto

Key Words

Corporate Appraisal, Top Management, Qualitative Factor,
Preventive Factor for Bankruptcy, Accelerative Factor for Bankruptcy

1. Introduction

This research is concerned with corporate appraisal. Corporate appraisal is a measurement of the total potential ability of a firm for long term survival and growth.¹⁾ Generally, this means the study of excellent companies in order to identify their growth factors. While it is useful to study successful firms, in reality, there are many firms which do fail. In this research I wish focus on these failed firms, and study them in order to explore what kinds of factors arrest their growth as well as to identify which factors drive them into bankruptcy.

This research on failure factors is one of corporate appraisal, because exploration of failure factors is closely related to that of survival factors, and is also connected with growth factors. As I have investigated corporate bankruptcy using financial data elsewhere,²⁾ in this research, I wish to focus on non-financial, qualitative data. In earlier investigations of bankruptcy which focus on non-financial data, in general, most of them mention CEO (Chief Executive Officer) factors. For small businesses, which constitute the largest number of corporate bankruptcies, the CEO factors may be very important. For this reason I will mainly focus on the CEO factors and explore which factor is the most serious for corporate bankruptcy.

2. Present Conditions for Corporate Bankruptcy using Bankruptcy Statistics

To comprehend the present conditions for corporate bankruptcy in Japan, let us

1) R. Shimizu (1981) p. 7.

2) D. Okamoto (1987, a).

examine the following elements: the number cases of bankruptcy, the total amount of liability, the age of the firms, and the stated cause of bankruptcy as given in *Tosan Geppo* (Monthly report of bankruptcy by TOKYO RESEARCH). This report includes failed firms which had a minimum of ¥10 million in liabilities at date of bankruptcy.

First, Table 1 shows the number of cases of bankruptcy as well as the total amount of liabilities from fiscal 1972 to fiscal 1986, a period of fifteen years. In fiscal 1986 the number of cases of bankruptcy in Japan amounted to 16,886, a figure which has been decreasing since fiscal 1984. This tendency is due to the fact that the "super easy money policy with the lowest official discount rate strengthens the relationship between small firms and financial institutions,"³⁾ i.e. the small firms had easy access to funds from banks and other financial institutions.

The total amount of liabilities in fiscal 1986 was ¥3,571 billion with a decreasing tendency. This is due to the fact that there were no bankrupt firms with more than ¥100 billion in liabilities in fiscal 1986, however in fiscal 1985, bankruptcies in excess of ¥500 billion occurred. e.g. THE SANKO STEAMSHIP Co., Ltd. (¥520 billion in liabilities.) Finally, in regard to large sized bankruptcies which had more than ¥10 billion

Table 1. Number of cases of Bankruptcy and Total Amount of Liabilities
(Tosan Geppo 1987.3)

Fiscal year (Apr.—Mar.)	Number of cases of bankruptcy*)	Total amount of liabilities**)
1972	6,905	779,987
1973	9,449	905,570
1974	11,738	1,702,149
1975	13,224	2,705,202
1976	16,606	2,400,122
1977	17,987	3,234,613
1978	15,409	2,046,737
1979	16,535	2,358,076
1980	18,212	2,872,074
1981	17,397	2,472,227
1982	17,351	2,405,216
1983	19,959	2,894,433
1984	20,363	3,468,857
1985	18,319	4,411,340
1986	16,886	3,571,636

*) Including failed firms which had a minimum of ¥10 million in liabilities at date of bankruptcy

***) million yen

3) Tokyo Shoko Research (1987) No. 8.

in liabilities, there were 34 cases in fiscal 1986, compared to 28 cases in fiscal 1985.⁴⁾

Next, Table 2 shows the relationship between bankruptcy and the age of the firm since 1976. The rate of bankruptcy for firms less than 6 year old has been decreasing since 1978, while the rate of bankruptcy for firms more than 21 years of age has been increasing since 1979. The reason for that is the decrease of corporate foundation cases in low growth economy, therefore the cases of young corporate bankruptcy have been decreasing. This is because of an inability on the part of the old firms to adapt to the turbulent environment such as large changes in the industrial structure and technological innovations.

Finally, Table 3 shows the causes of bankruptcy. The number one cause is depression of the self-owned industry and it constitutes 42.2% of all bankruptcies. Next, inefficient management and chain-reaction bankruptcy follow.

To summarize, the present conditions for bankruptcy are as follows: Although the number of cases have been decreasing as a whole, the number of bankruptcies of rather large firms have been increasing, especially in regard to those firms which are somewhat old and are in a depressed industry. Let us now see if these explanations hold.

Table 2. Firm Age and Bankruptcy (Tosan Geppo 1987.1)

Firm age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
LT 6 years	59.3	55.8	59.2	58.4	53.2	45.3	42.9	40.4	37.5	36.0	34.4
6-10 years	17.2	18.0	16.9	17.4	19.2	23.4	23.5	22.4	22.4	21.2	19.8
10-16 years	12.9	13.7	12.7	12.8	14.2	16.6	17.1	18.6	20.2	20.9	21.5
16-20 years	3.3	4.1	3.9	4.1	4.6	5.3	6.1	6.8	7.2	8.0	8.4
MT 21 years	7.3	8.4	7.3	7.3	8.8	9.4	10.4	11.8	12.6	13.9	15.9

Table 3. Cause of Bankruptcy (1986.1-12, Tosan Geppo 1986.12)

Cause	Number of cases	%
Inefficient management	3201	18.3
Lack of capital	1288	7.4
Chain-reaction	2246	12.9
Past ineptness	1710	9.8
Accidental cause	437	2.5
Low creditability	174	1.0
Depression of the self-owned industry	7381	42.2
Worthless debt	482	2.8
Excessive stocks	101	0.6
Bold expansion strategy	456	2.6

4) Ibid., No. 8.

3. *Analysis of Corporate Bankruptcies by QAQF*

In this chapter, the factors which drive a firm into bankruptcy will be identified by using actual data from the failed firms. At the same time, the nonfailed firms which are similar to failed firms in terms of size, industry, and area will be analyzed and a border between the failed and nonfailed firms will be identified.

3.1 Sample, Data Characteristics, and Statistical Methodology

This sample of firms consists of 174 failed firms and 149 nonfailed firms. The former are firms which went bankrupt during the period 1983.6–1984.10. As mentioned earlier, the latter are nonfailed firms which are similar to the former in terms of size, industry, and area. These 323 firms are all small businesses and their capital size ranges from ¥1 million to ¥100 million (mean is ¥24 million). There are 32 Research items (independent variables) which will be mentioned later.⁵⁾

QAQF was used as a statistical method.⁶⁾ The reasons are as follows. Firstly, it is used to analyze qualitative factors. Secondly, to check statistically whether each factor is a serious cause for bankruptcy by setting up the dependent variable of whether bankruptcy occurs or not. Thirdly, to check the importance of factors which are proven to be statistically significant by using D value analysis.

In the case of ordinary QAQF, the F-test is used as the statistical significance test, however, in this research, the FD-test, which I devised, is used. I have written in detail about the FD-test in “F kentei no ouyou ni yoru Non-Parametric Kentei no Kokoromi (A study on Non-parametric-Test using F-test)”⁷⁾, but it should be noted that the premises of FD-test are that the dependent variable must be observed as a two-state nominal scale and further, a continuous distribution must be supposed behind that variable. In this research, the dependent variable is set to be a nominal scale of 1 and 0, where 1 represents the failed firm and 0 represents the nonfailed firm. That variable can be seen in Figure 1. Nonfailed firms are all observed as 0, but generally these firms can be divided into the three following categories:

- ① Highly successful firms which have no possibility of bankruptcy. (dependent variable Y is not 0, but $Y < 0$)
- ② Marginal firms which are barely surviving. ($Y \approx 0$)
- ③ Virtually failed firms which have not yet failed (e.g. because of strong support from financial institutions). ($Y > 0$)

Although all failed firms are observed as 1, these too can be divided into the following three categories:

-
- 5) The sample is originally from the research of TEIKOKU DATA BANK TOSAN MONDAI KENKYUKAI (study group of bankruptcy), which I attended as observer.
 - 6) QAQF is an abbreviation of Quantitative Analysis for Qualitative Factors, developed by the Study Group of Management Ability in Keio University, and used by Committee of Management Ability Research in MITI.
 - 7) D. Okamoto (1987, b).

Figure 1 Actual Observed Data by (0-1) Nominal Variables

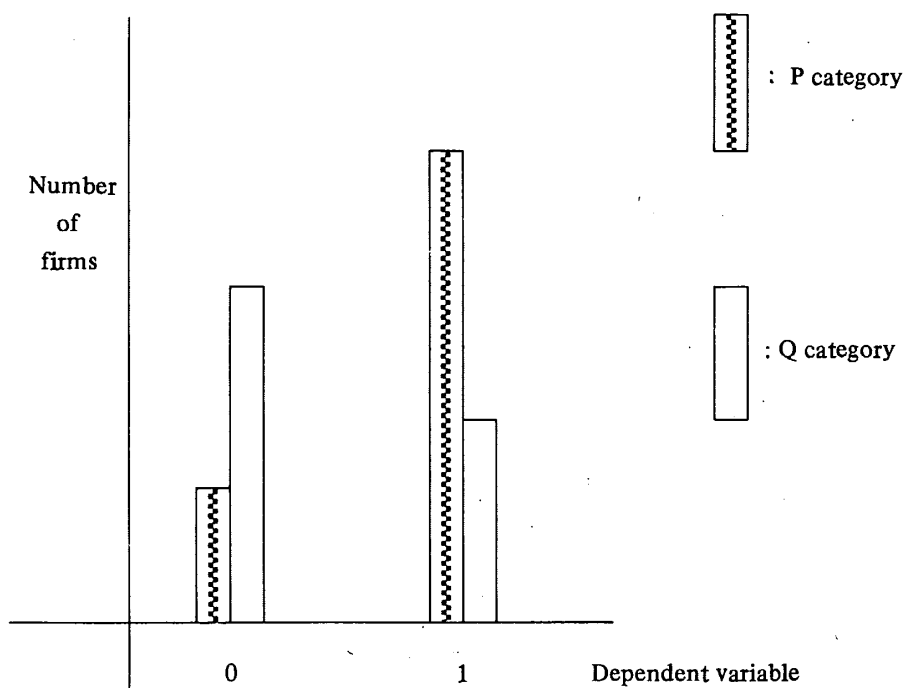
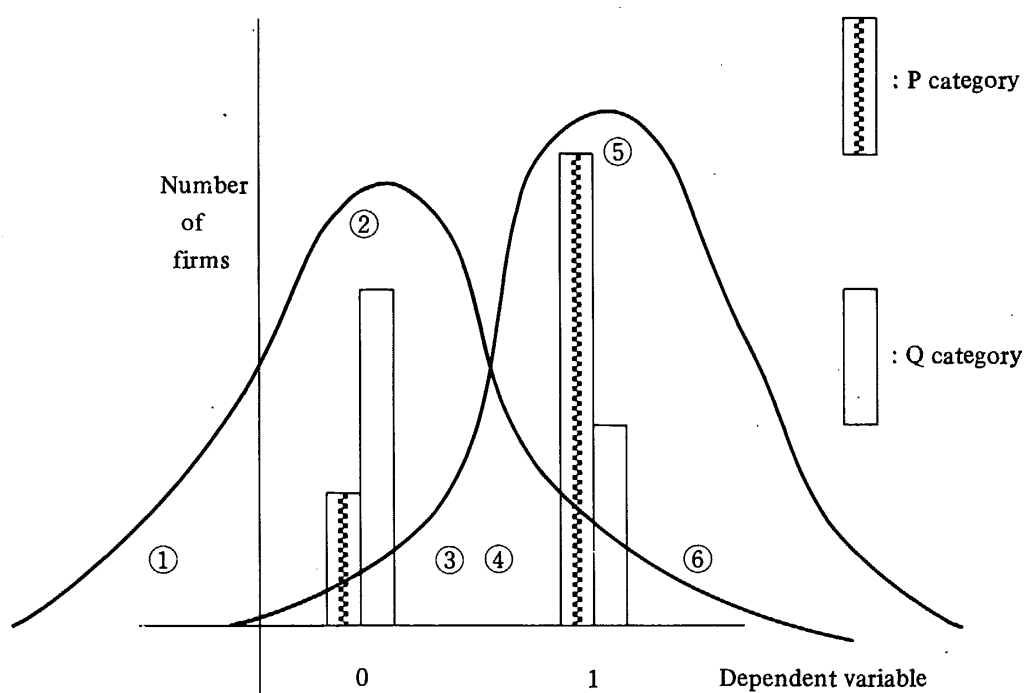


Figure 2 Continuous Distribution supposed behind the Variable



- ④ Essentially nonfailed firms which went bankrupt (e.g. because of chain-reaction bankruptcy). ($Y < 1$)
- ⑤ Unsuccessful firms which would be expected to go bankrupt. ($y \approx 1$)
- ⑥ Unsuccessful firms which would be expected to have gone bankrupt earlier but which have been supported for a rather long period. ($y > 1$)

Consequently, a continuous distributions may be supposed behind the dependent variables (see Figure 2). Therefore, the dependent variable satisfies the above premises of the FD-test.

3.2 Empirical Results of QAQF

3.2.1 CEO (chief executive officer) factors

It is often said that KSF (Key Success Factor) for a firm is people. In particular, the CEO is the most important factor for a firm. As stated above, most of the earlier investigations mentioned CEO factors. Particularly for small businesses, his/her role becomes most important. Therefore, let us check the relationship between the CEO factors and the ROB (Risk of Bankruptcy).

Table 4 shows the relationship between the business career of the CEO in a self-owned business and ROB. Here, the career is divided into 4 categories according to the length of career; 1: less than 10 years, 2: 10-14 years, 3: 15-19 years and 4: more than 19 years. The findings show that firms who have a CEO whose length of career in business is short, have an overwhelmingly high ROB.⁸⁾ It is statistically significant. It can then be stated that the shorter the length of CEO's career in his/her own business, the higher ROB.

Table 5 shows the relationship of ROB to the seniority of CEO as top management. This item does not denote statistical significance, however, the tendency seems to be that ROB decreases as the seniority increases, but it increases again if the seniority continues for over 19 years. This may be because CEO with long seniority has developed too much self confidence and his/her way of thinking is no longer flexible.

Table 4. Business Career of CEO

	Mean of dependent variable
LT 10 years	<u>*0.742</u>
10-14 years	0.657
15-19 years	0.585
MT 19 years	0.477

Table 5. Seniority of CEO

	Mean of dependent variable
LT 10 years	<u>0.583</u>
10-14 years	0.492
15-19 years	0.469
MT 19 years	0.565

8) As the dependent variable shows that a firm went bankrupt if it is 1, and didn't go bankrupt if it is 0, a firm in a category with larger mean of the dependent variable has a high ROB. The underline shows the maximum ROB among the categories, and * shows the statistical significance with a 5% level.

Table 6. Fund Raising Ability of CEO

	Mean of dependent variable
Yes	0.373
No	<u>*0.736</u>

Table 7. Financial Management Ability of CEO

	Mean of dependent variable
Yes	0.161
No	<u>*0.770</u>

Table 8. Technological Development Ability of CEO

	Mean of dependent variable
Yes	0.344
No	<u>*0.595</u>

Table 9. Scientific Thinking of CEO

	Mean of dependent variable
Yes	0.283
No	<u>0.638</u>

Table 10. Marketing Ability of CEO

	Mean of dependent variable
Yes	0.438
No	<u>*0.745</u>

Table 11. Environmental Adaptability of CEO

	Mean of dependent variable
Yes	0.239
No	<u>*0.749</u>

Table 12. Leadership of CEO

	Mean of dependent variable
Yes	0.442
No	<u>*0.780</u>

Table 13. Entrepreneurship of CEO

	Mean of dependent variable
Yes	0.453
No	<u>*0.678</u>

Table 14. Knowledgeable Advisors with CEO

	Mean of dependent variable
Yes	0.247
No	<u>*0.659</u>

Table 15. Background of CEO

	Mean of dependent variable
Marketing	0.532
Engineering	0.467
Other	<u>*0.667</u>

Table 6 shows the relationship between the ROB and the fund raising ability of the CEO. A firm with a CEO who lacks the fund raising ability has an overwhelmingly higher ROB than a firm with one who has. It is statistically significant. Further, the financial management ability of CEO also shows a statistically significant relationship to the ROB (see Table 7). Though firms go bankrupt in various ways, many firms are stuck completely for want of money, become insolvent, and go bankrupt. Therefore, the fund raising and financial management abilities of CEO may be very important factors for considering corporate bankruptcy.

In regard to the CEO's ability for technological development, scientific thinking and marketing, all of these factors bear a strong relationship to the ROB and are statistically significant (see Tables 8–10). If there is solid process toward new product development utilizing scientific thinking and good technological development abilities concurrent with large sales and good marketing strategies, the ROB will be small. In other words, these abilities can be called environmental adaptability, and show a consistent relationship to a low ROB as do leadership and entrepreneurship (see Tables 11–13). Consequently, the findings show that most of abilities of the CEO which were mentioned as important factors have an overwhelming strong relationship to the ROB.

The relationship between the presence of knowledgeable advisors assisting the CEO and the ROB is also statistically significant (see Table 14). Though most of abilities of the CEO are important, there are few CEOs who have all of them. Therefore, the presence of knowledgeable advisors who can assist the CEO becomes very important.

In order to examine the relationship between the ROB and background of the CEO, 3 categories were created; 1: Marketing, 2: Engineering, 3: Other (see Table 15). The findings show that firms where the CEO has either a marketing-background or an engineering-background, these firms have low ROB. This result is consistent with the importance of marketing and technological development ability of the CEO mentioned earlier.

Aside from the aforementioned seniority factor of the CEO factors which does not denote statistical significance in regard to the CEO are age (less than forty, forties, fifties or more than fifty), the CEO type, (founder, successor or other), and academic career (primary school, junior high school, senior high school or university) (see Tables 16–18)⁹⁾. Finally, the reputation of the CEO shows statistical significance relative to the ROB (see Table 19).

3.2.2 Product, organization and business environmental factors

Table 20 shows the relationship between the ROB and the life cycle of the main product. The findings show that the firms which have a decline-stage main product are subject to an overwhelmingly higher ROB than firms which have an introduction-stage, growth-stage or maturity-stage main product. This finding means that even firms with excellent CEOs and healthy financial conditions can not succeed if the main product is

9) Concerning the sex distribution, female CEO were 3 in all of the 323 firms, and only 1 in 174 failed firm.

Table 16. Age of CEO

	Mean of dependent variable
LT Forty	0.556
Forties	<u>0.614</u>
Fifties	0.490
MT Fifty	0.505

Table 17. CEO Type

	Mean of dependent variable
Founder	<u>0.576</u>
Successor	0.467
Other	0.519

Table 18. Academic Career of CEO

	Mean of dependent variable
Primary school	<u>0.553</u>
Junior high school	0.500
Senior high school	0.541
University	0.538

Table 19. Reputation of CEO

	Mean of dependent variable
Good	0.306
Bad	<u>*0.894</u>

Table 20. Life Cycle of Main Product

	Mean of dependent variable
Stage introduction, growth, maturity	0.442
Decline	<u>*0.771</u>

Table 21. Morale of Employees

	Mean of dependent variable
High	0.258
Low	<u>*0.732</u>

Table 22. Rate of Part Time Employees

	Mean of dependent variable
High	0.525
Low	<u>0.526</u>

Table 23. Age Group of Employees

	Mean of dependent variable
Twenties	<u>0.585</u>
Thirties	0.529
Forties and over	0.533

Table 24. Labor Union

	Mean of dependent variable
Yes	<u>0.545</u>
No	0.535

Table 25. Age of Firm

	Mean of dependent variable
LT 10 years	<u>*0.712</u>
10-19 years	0.519
20-29 years	0.477
MT 29 years	0.510

no longer successful.¹⁰⁾

In regard to employees, the relationship between the ROB and the morale of the employees also shows statistical significance. That is, high morale shows a negative correlation with the ROB (see Table 21). On the other hand, the rate of part time employees, the age of the employees, and the presence of labor unions does not show statistical significance (see Tables 22–24). Though it is frequently said that firms go bankrupt because of powerful labor unions, these finding do not support that contention.

With regard to the age of the firm, those businesses less than ten year old have a high statistically significant ROB (see Table 25). Although bankruptcy statistics show that many old firms go bankrupt, the fact is that a great many old firms survive and younger ones have a higher risk in terms of rate. Similar results can be seen in regard to the primary cause of bankruptcy (management problem, see Table 26). The primary cause of bankruptcy was investigated for the failed firms and management problems for nonfailed firms. Important factors were divided into four categories and their relationship with ROB was checked. These factors are; 1: customer, 2: management and strategy, 3: business climate, 4: other. As a result, firms which have problems with customers have statistically significant high ROB. In bankruptcy statistics, it is said that a depressive business climate is the primary cause of bankruptcy, nevertheless, not all firms went bankrupt in a depressive business climate, quite a few firms survived. Consequently, a depressive business climate cannot be the primary and direct cause of bankruptcy. Worthless debt or bankruptcy of customer may be more serious.

Other factors which denote a statistically significant relationship to the ROB are sales conditions, changes of main bank, and business conditions [I, II] (see Table 27–30).

Table 26. Primary Cause
(Management Problems)

	Mean of dependent variable
Customer	<u>*0.844</u>
Management & strategy	0.504
Business climate	0.389
Other	0.633

Table 27. Sales Conditions

	Mean of dependent variable
Dispersive	0.481
Concentrated	<u>*0.700</u>

Table 28. Changes of Main Bank

	Mean of dependent variable
Yes	<u>*0.698</u>
No	0.490

Table 29. Business Conditions (I)

	Mean of dependent variable
National	0.467
Regional	<u>*0.589</u>

10) For a more important matter, see chapter 4.

Table 30. Business Condition (II)

	Mean of dependent variable
In-house producer	0.540
In-house producer with subcontractor	0.429
In-house producer and subcontractor	<u>*0.635</u>
Subcontractor	0.571

Not statistically significant factors are the type of industry, fixed property conditions of the head office and the main factory (ownership or lease) and the purchase conditions.

4. Preventive Factors and Accelerative Factors for Bankruptcy

4.1 The Concept of PFB and AFB

First of all, let us consider the relative importance of factors which are shown to be statistically significant for corporate bankruptcy by QAQF as mentioned in chapter 3. Here the notion of the D value of the QAQF is useful.¹¹⁾

The D value represents a statistical quantity with which to measure the degree qualitative factors (independent variables) affect the dependent variable. It represents the difference between the largest and smallest values of category means of the dependent variable, (on the condition that the factor is statistically significant). If the difference is small, the factor, regardless of its category (or states), is not so highly related to the dependent variable. In other words, it doesn't have a strong effect, even if it is statistically significant. On the other hand, if the difference is large, the factor is considered to have a great effect.

It can be said that the larger the D value, the higher the relative importance. So, let us arrange the factors in the order of their D value (see Table 31). The factor which has the largest D value is the financial management ability of the CEO. The reputation of the CEO and the environmental adaptability of the CEO are second and third in importance. How is this order important? Surely it shows the relative importance of bankruptcy factors, but, to make it more clear, I wish to introduced two notions: Preventive Factors for Bankruptcy and Accelerative Factors for Bankruptcy. The definitions are as follows.

Preventive Factor for Bankruptcy (PFB): If a factor, whose state is desirable for the firm, decreases the ROB, this factor can be called Preventive Factor for Bankruptcy.

Accelerative Factor for Bankruptcy (AFB): If a factor, whose state is undesirable for the firm, increases the ROB, this factor can be called Accelerative Factor for

11) R. Shimizu (1980) pp. 221-214.

Table 31. D Value Table

Serious factors for bankruptcy (Significance level: 5%)	D value
Financial management ability of CEO	0.609
Reputation of CEO	0.588
Environmental adaptability of CEO	0.510
Morale of employees	0.475
Primary cause (Management problems)	0.454
Knowledgeable advisors with CEO	0.412
Fund raising ability of CEO	0.363
Scientific thinking ability of CEO	0.355
Leadership of CEO	0.339
Life cycle of main product	0.329
Marketing ability of CEO	0.307
Business career of CEO in own business	0.265
Technological development ability of CEO	0.251
Age of firm	0.235
Entrepreneurship of CEO	0.225
Sales condition	0.219
Change of main bank	0.208
Business condition (II)	0.206
Background of CEO	0.200
Business condition (I)	0.123

Bankruptcy.

If the relationship where [a factor's state is desirable \Rightarrow ROB is low] is true, then this factor is PFB, so that it is a sufficient condition for low ROB. On the other hand, where the relationship [a factor's state is undesirable \Rightarrow ROB is high] is true, then this factor is AFB, and is a sufficient condition for high ROB. Suppose a state of factor is considered simply as two states, i.e. desirable and undesirable, and the ROB condition is also considered to be two states, i.e. high and low, the relationship in Figure 3 will hold.

According to the argument in Figure 3, serious factors for bankruptcy can be classified in the following 3 categories.

- ① PFB and also AFB
- ② PFB only
- ③ AFB only

In regard to the factor which belongs to ① factor (PFB and also AFB), if its state is

Figure 3 PFB and AFB

A : a factor's state is desirable for the firm
 F : ROB of the firm is high
 \neg : negation

$[\alpha]$	$A \rightarrow \neg F$	$[\gamma]$	$\neg F \rightarrow A$
$[\beta]$	$\neg A \rightarrow F$	$[\delta]$	$F \rightarrow \neg A$

PFB : If the factor's state is desirable, the ROB is low.

$[\alpha]$ The fact that the factor's state is desirable is a sufficient condition for low ROB.

$[\delta]$ The fact that the factor's state is undesirable is a necessary condition for high ROB.

AFB : If the factor's state is undesirable, the ROB is high.

$[\beta]$ The fact that the factor's state is undesirable is a sufficient condition for high ROB.

$[\gamma]$ The fact that the factor's state is desirable is a necessary condition for low ROB.

desirable, it is a necessary and sufficient condition for low ROB. And if its state is undesirable, it is a necessary and sufficient condition for high ROB. Therefore, this factor is the most serious one with which to decide the destiny of the firm, that is, fail or non-fail.¹²⁾ It should be noted that factors which have a large D value in QAQF must be ① factors (PFB and also AFB). Because the dependent variable of QAQF in this paper is 1 (when fail) or 0 (when nonfail), the magnitude of the D value shows the importance of this factor for corporate bankruptcy. Therefore, high-ranking factors in the D value table (Table 31) must be ① factors (PFB and also AFB).

Concerning ② factor (PFB only), if its state is desirable, ROB may be low. But if its state is undesirable, ROB is not always high. Finally, ③ factor (AFB only), if its state is undesirable, ROB may be high, but the reverse is not always true.¹³⁾

4.2 Classification of Critical Factors

using the Statistical Significance Test of Binomial Distribution

In this section, let us classify the serious factors in Table 31. First, let us consider the financial management ability of the CEO which denoted the largest D value. Table 32 shows the frequencies of presence of this ability. In 174 failed firms, twenty firms had capable CEOs and 151 firms had incapable CEOs (NA for 3 firms). δ : $F \rightarrow \neg A$ in

12) In this case, all of α , β , γ , and δ hold true in Figure 3.

13) In ② factors' case (PFB only), only α and δ hold true in Figure 3. In ③ factors' case (AFB only), only β and γ hold true in Figure 3.

Table 32. Frequencies of Presence of Financial Management Ability of CEO

Failed firms which had		Nonfailed firms which had	
CEO with the ability	20 firms	CEO with the ability	104 firms
CEO without the ability	151 firms	CEO without the ability	45 firms
No answer	3 firms	Total	149 firms
Total	174 firms		

Figure 3 may be hold true, i.e. CEOs of high ROB firms lacked financial management ability.¹⁴⁾ In this case, binomial distribution can be applied, because each firm (CEO) is classified into 2 exclusive categories (capable or incapable). So, let us test the null hypothesis “ $F \rightarrow \neg A$ is not true”. This test is done by approximating the standard normal distribution (mean: 0, variance: 1) as follows.

$$Z = \frac{(r \pm 0.5) - Np}{(Npq)^{\frac{1}{2}}}$$

p: Expectation of probability in which an event occurs

q: Expectation of probability in which an event does not occur. $q = 1 - p$

N: Number of samples

r: Number of cases in which an event actually occurs.

In regard to the sign of 0.5, it is minus when $r > Np$, plus when $r < Np$.

In this case $p = q = 0.5$ (because the null hypothesis is “ $F \rightarrow \neg A$ is not true”), $N = 171$, $r = 151$, and sign of 0.5 is minus (because $r > Np$)¹⁵⁾.

$$Z = \frac{(151 - 0.5) - 171 \times 0.5}{(171 \times 0.5 \times 0.5)^{\frac{1}{2}}} = 9.9413$$

Using the table of percentiles for normal distribution, the critical region for the statistical significance test (5% level) is $|Z| \geq 1.645$.¹⁶⁾ Consequently, the null hypothesis can be rejected, $F \rightarrow \neg A$ can hold true, and financial management ability can be PFB.¹⁷⁾

Next, in 149 successful firms, 104 firms had capable CEOs and 45 firms had incapable CEOs. Here $\gamma: \neg F \rightarrow A$ in Figure 3 may hold true, i.e. CEOs of low ROB firms have financial management ability. As well as failed firms' case, let us test the null hypothesis “ $\neg F \rightarrow A$ is not true” by using binomial distribution. In this case $p = q = 0.5$,

14) Firms which were observed as failed firms are considered as ④, ⑤, and ⑥ in Figure 2, so they can be called high ROB firms.

15) The same result can be obtained when $r = 20$ and $+0.5$.

16) A one-tailed test was done regarding the alternative hypothesis.

17) The fact that $\delta: F \rightarrow \neg A$ is proved to be true means $\alpha: A \rightarrow \neg F$ is also true, because α is the contraposition of δ . See chapter 5.

$N = 149$, $r = 104$, and sign of 0.5 is minus.

$$Z = \frac{(104 - 0.5) - 149 \times 0.5}{(149 \times 0.5 \times 0.5)^{\frac{1}{2}}} = 4.7515$$

The critical region for the test is also $|Z| \geq 1.645$ and the null hypothesis can be rejected. Consequently, $\neg F \rightarrow A$ can hold true and financial management ability can also be AFB.

By putting together the results of the two tests, the conclusion is that financial management ability of the CEO is ① factor (PFB and also AFB). By testing 15 factors of Table 31 using the same method, we arrive at Table 33.¹⁸⁾ You can see that high-ranking factors in the D value table are ① factors (PFB and also AFB).

In addition to the financial management ability of the CEO, other factors assessed as ① factors (PFB and also AFB) are environmental adaptability, fund raising ability of

Table 33. Z Value of PFB & AFB by Binomial Test

	PFB	AFB	Conclusion
Financial management ability of CEO	*9.9413	*4.7515	PFB·AFB
Reputation about CEO	*3.7581	*9.9946	PFB·AFB
Environmental adaptability of CEO	*8.1587	*4.4239	PFB·AFB
Morale of employees	*7.6380	*3.9590	PFB·AFB
Knowledgeable advisors with CEO	*9.3296	0.1638	PFB
Raising ability of CEO	*2.9737	*5.8985	PFB·AFB
Scientific thinking ability of CEO	*9.0737	1.3108	PFB
Leadership of CEO	—	*8.8477	AFB
Life cycle of main product	—	*9.0116	AFB
Marketing ability of CEO	1.4487	*7.8646	AFB
Technological development ability of CEO	*7.2396	1.0262	PFB
Entrepreneurship of CEO	0.8387	*5.8985	AFB
Sales condition	—	*8.1923	AFB
Change of main bank	—	*9.0116	AFB
Business condition (I)	*2.1538	0.8192	PFB

* shows statistical significance with 5% level ($Z \geq 1.645$)

— shows a hypothesis could not be built.

- 18) For 5 factors as a management problem, the business career of the CEO in a self-owned business, the age of the firm, the business conditions [II], and the background of the CEO, binomial distribution can not be applied. See chapter 5.

the CEO and the morale of the employees. These are the most important and serious factors for bankruptcy. As mentioned earlier, many failed firms have been completely unable to secure money and have become insolvent, therefore, fund raising and financial management ability becomes important. To cope with changing environment and adjustment of product strategy etc., environmental adaptability also becomes important. Further, if the morale of the employees sinks to a low level, the vitality of the firm will disappear and the ROB will become high. Incidentally, the reputation of the CEO is also a ① factor (PFB and also AFB). This is because it is more general and understandable to view a small business externally by reputation rather than by financial statement, etc.¹⁹⁾

Other important factors can be classified into ② factor (PFB only) or ③ factor (AFB only). In regard to ② factor (PFB only), the presence of knowledgeable advisors working with the CEO, the ability to think scientifically, and have a clear understanding of technological development on the part of the CEO, as well as consideration of business conditions [I] were enumerated. If these factors' states are desirable for the firm, the ROB may become low, but if they are undesirable, ROB will not necessarily be high.

Many CEOs manage their firms without advisors. Even if a firm does not have a technology-oriented new product because of the lack of ability for scientific thinking and an inability to use technological development by the CEO, the firm can survive with niche-strategy and a market-oriented new product. Further, with regard to business conditions [I], there are many firms which maintain intimate relations and good coordination with regional communities. Consequently these factors are not ③ factors (AFB only) but become ② factors (PFB only).

With regard to ③ factors (AFB only), leadership, marketing ability and entrepreneurship of the CEO, product life cycle, sales conditions, and main bank were also enumerated. If these factors' state are undesirable, the ROB may be high, but if desirable, the ROB will not necessarily be low. The CEO who lacks leadership, marketing ability, and entrepreneurship must be disqualified from top management, and product strategy which has only a decline-stage main product must also be disqualified. These factors are necessary conditions for corporate survival.

5. *Limitations*

In the preceding chapter, the concept of PFB and AFB was introduced and classified by using binomial distribution. While the result was reasonable and understandable, there are still a few limitations.

First, let us look at the relationship between growth factors and PFB or AFB. In this paper, the perspective has been to examine whether a firm will fail or not fail. However, if a firm survives, a growth firm is still indistinguishable from a non-growth firm. The difference has not been identified. Therefore, the growth factors have remained un-

19) R. Shimizu (1986) p. 124.

examined, and their relationship to PFB and AFB has not yet been identified. This problem is still awaiting a solution.

Second is the method of classification. In this paper, in order to classify PFB and AFB, γ and δ in Figure 3 were affirmed, but α and β could have been used. If such had been the case, the same method of testing for significance could not be used because the denominator might have changed largely according to factors.²⁰⁾

Third is the statistical significance test using binomial distribution. In this study, we have been able to arrive at some satisfactory conclusions, however it should be noted that factors which have more than 3 categories, such as the 5 factors in note 18 cannot be analyzed and the method is incomplete. This is another problem awaiting a solution.

6. *Summary and Conclusions*

The purpose of this research was to identify the important qualitative factors for corporate bankruptcy. For this purpose, the data from 174 failed firms and 149 non-failed firms were analyzed by QAQF. 20 factors, such as the financial management ability of the CEO were proved to have statistically significant importance for corporate bankruptcy.

Further, the concept of the Preventive Factor for Bankruptcy (PFB) and the Accelerative Factor for Bankruptcy (AFB) were introduced and the serious factors were classified. Here, the PFB is a factor which lowers the ROB when its state is desirable for the firm, and the AFB is a factor which heightens the ROB when its state is undesirable for the firm. Using binomial distribution and classifying the serious factors into ① factors (PFB and also AFB), ② factors (PFB only), and ③ factors (AFB only), the financial management ability of the CEO, environmental adaptability of the CEO, the fund raising ability of the CEO, the morale of employees, and the reputation of the CEO were identified as ① factors (PFB and also AFB). ② factors (PFB only) were the presence of knowledgeable advisors with the CEO, the scientific thinking ability of the CEO, and the technological development ability of CEO, etc. ③ factors (AFB only) were the entrepreneurship of CEO, the leadership of the CEO, and the product life cycle, etc.

It is the author's opinion that classifying serious factors for bankruptcy according to the PFB and AFB is a very useful method even if there are a few limitation.

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20) As mentioned earlier, α is contraposition of δ and β is contraposition of γ , it is logically sufficient when δ and γ are testified.

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