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［Article］

Application of Structure equation modeling in empirical accounting research: The re-investigation of the determinant in the depreciation period of the negative goodwill

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Abstract

In this study, I tried re-inspection by the structure equation modeling that reflects reality more in consideration of the theoretical relations among independent variables, depending on Takahashi (2011). As a result of this analysis, the possibility that the bigger a company is, the longer depreciation period of the negative goodwill is, was suggested.

Keywords: negative goodwill, structure equation modeling

1. Introduction

A purpose of this study is to investigate the usefulness through re-inspection of Takahashi (2011) about the structural equation model that can overcome a weak point from the view of statistical and accounting in an empirical accounting study. Takahashi (2011) examined whether the recognition of the manager about the future prospect was reflected by the choice during the depreciation period by making the determinant of the depreciation period of the negative goodwill clear. About a depreciation period of the negative goodwill, Takahashi (2011) suggested the possibility that the recognition of the manager for the period when an expense or a loss was produced by M&A was reflected in the choice about the depreciation period of the negative goodwill. I reconsider an inspection model while it cannot be said that the model is desirable although she analyze it using an ordered logistic-regression analysis in her research, and, therefore, depending on a hypothesis of Takahashi (2011) in the report and try the re-inspection using structure equation modeling.

There is the prior research (Henning and Shaw, 2003) showed that it becomes the signal of the purchase effect in criticism, and that an objective estimation is difficult about depreciation rule of the goodwill during the depreciation period. In addition, Umehara (2000) pointed out we do not get a rational and general conclusion about a distribution period of the goodwill, Kawamoto (2011) also pointed out that it is difficult to convert in one accounting processing from the point of various stakeholders. In the empirical research (Jennings et al., 2001, Kitagawa, 2006, Yamaji, 2008), we do not get consistent results yet. About the depreciation method of the negative goodwill, there is not general processing in contrast with goodwill (Umehara 2000). Though the result that the recognition of the manager was reflected is shown in the choice of the depreciation period of the negative goodwill according to Takahashi (2011), there is little empirical research

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about the depreciation period of the negative goodwill, and there is the room for research a lot.

The constitution of this paper is as follows. I review the actual situation about the negative goodwill in prior research in Section 2 and clarify an investigation hypothesis in Section 3. Moreover, I clarify a research method in Section 4 and describe a result, a conclusion and a future problem in Section 5.

2. Background

2–1. Prior Research

About the depreciation method of the goodwill, it is decided to depreciate the goodwill for the period when the effect amounts from Clause 32 of "accounting standards about the combine" announced in December, 2008. There is the claim (Kawamoto 2011) that the managers should estimate the upper limit of the purchase value, and we recognize significance about the depreciation rule that can compare managers' prediction and the result, while there is criticism (Yamauchi 2010) that the choice of the depreciation period cannot but become arbitrary. According to Henning and Shaw (2003), they showed the possibility that the recognition of the manager was reflected in the choice of the depreciation period of the goodwill. On the other hand, in Jennings et al (2001), Kitagawa (2006), and Yamaji (2008), the rational result was not provided about usefulness of the depreciation rule although they verified the value association of depreciation costs of the goodwill.

About a depreciation period of the goodwill, Hall (1993) verified from the viewpoint of economical conclusion by the choice of the accounting policy, and showed that the big company tended to choose shorter depreciation period. On the other hand, Kobayashi (2009) showed that the company which scale was big, and debt ratio was small, and high ratio of the goodwill to total assets chose long depreciation period. Takahashi (2011) pointed out that the determinant in the depreciation period of the negative goodwill be unclear without many prior studies about negative goodwill that stood on the actual situation of the negative goodwill. With that in mind, she expanded the argument about the depreciation period of the regular goodwill to discover the determinant and she focused and investigated whether manager's recognition about the future prospect in restructuring plans was reflected in a depreciation period of the negative goodwill. As a result, in the choice of the depreciation period of the negative goodwill, she mentioned it when the recognition of the manager was reflected in the period when an expense and a loss of the combine occurred. Because it was correlative, in analysis of Takahashi (2011), she investigated it using the model which removed one in two variables in the correlation between independent variables, but it cannot be said that modeling is enough without considering the theoretical relations between independent variables. Therefore, in this paper, I try re-inspection by structure equation modeling while depending on a hypothesis of Takahashi (2011) to reflect reality more not using an order logistic-regression analysis in her paper.

2–2. The actual situation of the depreciation period of the negative goodwill in Japan

Sample selection

According to Takahashi (2011), I extracted the negative goodwill which occurred in combine from April, 2006 to March, 2010 during the application period of the old standard to grasp the actual situation of the depreciation period of the negative goodwill. I used Nikkei financial data NEEDS and the sample choice requirements are as follows.

① Including negative goodwill, a negative goodwill amortization or negative goodwill depreciation profit more than 1 million yen and more than 1 fiscal term in consolidated statement from April, 2006 period to March, 2010 period.
② I can obtain securities reports from April, 2006 period to March, 2010 period more than one term.
③ I can confirm the combine that occurred of the negative goodwill from securities report, and get various data which are necessary for analysis.
④ In the period when combine was carried out, there is not the change of the accounting period.
⑤ When plural combine is gathered and are listed, the combine to acquire and the combine to merger do not be gathered.

In addition, I referred to combine-related notes not a basic important matter for consolidated financial statements making of the securities report or the notes of an important accounting policy to identify a depreciation period of the negative goodwill which occurred every combine according to Takahashi (2011).

TABLE 1　Depreciation period of the negative goodwill（n＝110）

	Depreciation period (Year)										
	1	1.5	2	3	5	6	7	8	10	20	Total
2006					1						1
2007	4				12			1	1		18
2008				4	11	1			2	1	19
2009	3	1		4	20				2		30
2010	7		1	5	26		1		1	1	42
Total	14	1	1	13	70	1	1	1	6	2	110

Table 1 showed each depreciation period in 110 cases that negative goodwill was produced in combine. According to table 1, a depreciation period of the negative goodwill includes 70 items choosing five years. As for this, it is thought that the commercial law, the rule of the depreciation period in Corporate Tax Law affect the choice of the depreciation period same as Takahashi (2011). By the item except five years, there are many companies choosing one-time depreciation. It is thought that this was chosen among the importance of the amount of money based on a rule of old standard three 2 (5). In addition, it may be said that the depreciation period of the goodwill negative is shorter than the depreciation period of the goodwill, it was shown in Kobayashi (2009) that verified about a depreciation period of the goodwill.

3. Hypotheses

In this paper, I depend on the hypotheses of Takahashi (2011) and focus on the relations the cost after the combine or the period was related with the cost be occurred by the combine. As a characteristic of the combine in Japan, Takahashi (2011) pointed out that there are many relief mergers, and the group combine. Therefore, according to Takahashi (2011), in the case of relief merger, revival plan becomes clear and may perform immediate restructuring after combine, so the manager anticipates in a short term an expense or a loss occurred after combine, and may choice shorter depreciation period. In addition, it is thought that the manager chooses a long depreciation period in anticipation of a long-term management plan without assum-

ing that selling a company in a short term in the case of the combine within the group. From two above-mentioned viewpoints, I set a hypothesis same as Takahashi (2011).

H1: When negative goodwill occurs in relief-type merger, the manager chooses a shorter depreciation period.

H2: When negative goodwill occurs in the combine within the group, the manager chooses a longer depreciation period.

4. Analysis Method

4−1. Description statistic and Scatter diagram matrix

According to Takahashi (2011), the samples for analysis of this study is 96 companies that was excluded an item of the lump-sum depreciation from 110 companies. I showed the description statistic of each variable in table 2 and showed the scatter diagram matrix in figure 1.

TABLE 2 Description statistic of each variable

(n = 96)

	Mean	Median	SD	Min	Max
YEAR	1.958	2.000	0.053	1.000	3.000
RELIFE	0.042	0.000	0.021	0.000	1.000
COMMON	0.250	0.000	0.044	0.000	1.000
FOWN10	0.365	0.000	0.049	0.000	1.000
OI	0.028	0.021	0.005	−0.119	0.156
ASSET	11.017	11.075	0.150	7.140	14.434
LIABILITY	0.543	0.534	0.020	0.145	0.943
NGW	0.019	0.011	0.003	0.000	0.198

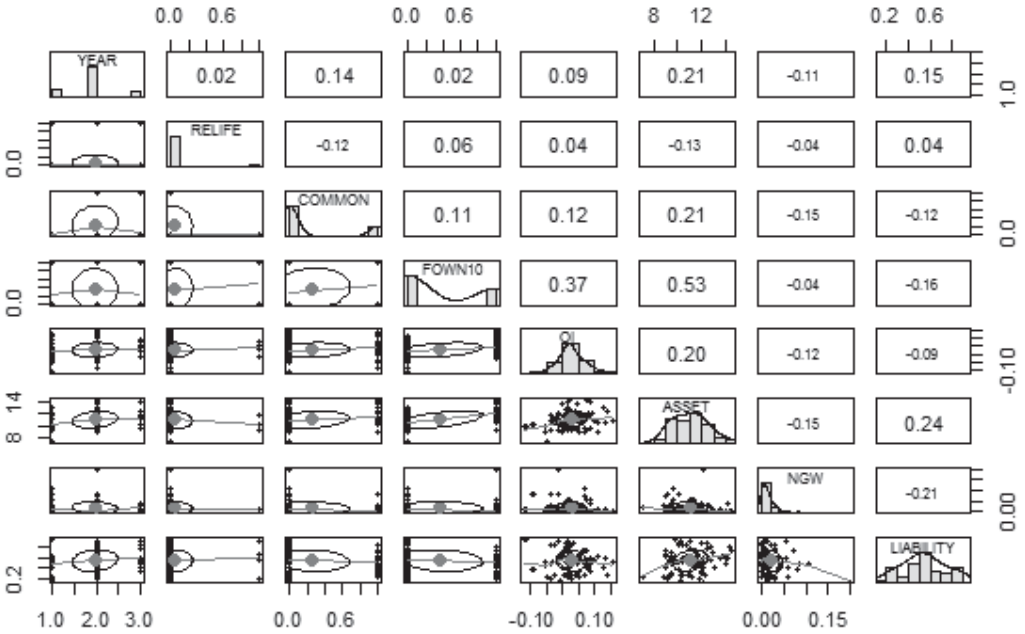

FIGURE 1 Scatter diagram matrix

(Top right corner: Spearman correlation coefficient, The lower right: Smooth line)

4–2. Model

In Takahashi (2011), she verified the model which removed one in two variables because there was the correlation between independent variables. However, she did not consider the theoretical relations between independent variables. Therefore, in this paper, I try re-investigation by structure equation modeling to reflect reality more not using an order logistic-regression analysis in Takahashi (2011).

$$YEAR = a_1 + b_1 \times RELIFE + b_2 \times COMMON + b_3 \times FOWN10 + b_4 \times OI + b_5 \times ASSET + b_6 \times NGW + b_7 \times LIABILITY + \psi_1 \quad \cdots (1)$$

$$RELIFE = a_2 + c_1 \times COMMON + c_2 \times FOWN10 + c_3 \times OI + c_4 \times LIABILITY + \psi_2 \quad \cdots (2)$$

$$FOWN10 = a_3 + d_1 \times COMMON + \psi_3 \quad \cdots (3)$$

$$NGW = a_4 + e_1 \times RELIFE + e_2 \times COMMON + e_3 \times FOWN10 + \psi_4 \quad \cdots (4)$$

According to Takahashi (2011), Dependent variable YEAR which is a depreciation period of the negative goodwill is an ordinal variable; If a depreciation period is over one year within less than five years equal to 1, five years equal to 2, and more than five years equal to 3. From table 1, there was the most five years depreciation in the choice of depreciation period of the negative goodwill, and subsequently there was in order of one-time depreciation, and, three years depreciation. Therefore, I classified them in three following categories; under five years, five years, and more than five years

I set two proxy variables in an explanation variable according to Takahashi (2011). Those are RELIEF which means relief-type merger and COMMON which means the combine within the group. Pointing out in Takahashi (2011), it is difficult to judge the relief-type merger objectively. Therefore, the relief-type merger is limited in the case the purpose of the combine written in financial statement or in a timely disclosure document such as turnaround or management support, and the dummy variable which becomes 1 under the above condition is satisfied. COMMON also is limited in the case the purpose of the combine written in financial statement or in a combine-related explanatory note, and the case when the minority stockholders of the subsidiary do not exist. Therefore COMMON is the dummy variable which becomes 1 under the above condition is satisfied.

Subsequently, I include control variables that may affect the choice of the depreciation period like Takahashi (2011). Those are OI which indicates the ordinary profit of t period and FOWN10 which indicates the high foreign ratio of shareholding. FOWN10 is the dummy variable which becomes 1 under the acquiring company's foreign ratio of shareholding is more than 10% in the end of t period when combine was carried out. OI is the value that divided the estimated ordinary profit reversal of amortization by total assets in t period. The managers have the incentive to manage profit using the amortization of the negative goodwill because it will become the nontrade profit when the ordinary profit is low. Pointing out in Takahashi (2011), the amortization of the negative goodwill is written off as non-operating profit, so managers have the incentive to manage profit when the ordinary profit is low. In addition, in Takahashi (2011), she uses OI as dummy variable whether the estimated ordinary profit reversal of amortization is deficit in t period. However, I just used the estimated ordinary profit reversal of amortization in t period because the variable's information had been disappeared by converting quantitative data into qualitative data.

Furthermore, I include ASSET, LIABILITY and NGW as control variables with reference to the variable (end of period total assets, debt ratio and ratio of goodwill for total assets) that influenced significantly in

Kobayashi (2009). ASSET is total assets of the end in t period (natural logarithm). LIABILITY is a debt ratio (after negative goodwill deduction) to total assets of the end in t period. NGW is a ratio of negative goodwill to total assets of the end in t period.

In Takahashi (2011) she investigated with the model that removed one in two variables in the correlation, because there was correlative relationship among independent variables. However, the theoretical relations are not considered among independent variables. Specifically, it include relations of COMON and NGW. Although she set hypothesis to choose longer amortization period of negative goodwill, if this hypothesis is right, ratios of negative goodwill to total assets may increase because managers have an incentive to merge or acquire a company cheaper in the combine within the group. Therefore, between COMON and NGW, it is thought that there is a relationship of the interaction theoretically. Because ordered logistic-regression analysis can't solve the problem of such an interaction, I investigate it using structure equation modeling to consider the problem theoretically. By the structure equation modeling, we can analyze the model which interlace several factor and solves multiple regression at the same time. The figure of pass which schematized a model as follows.

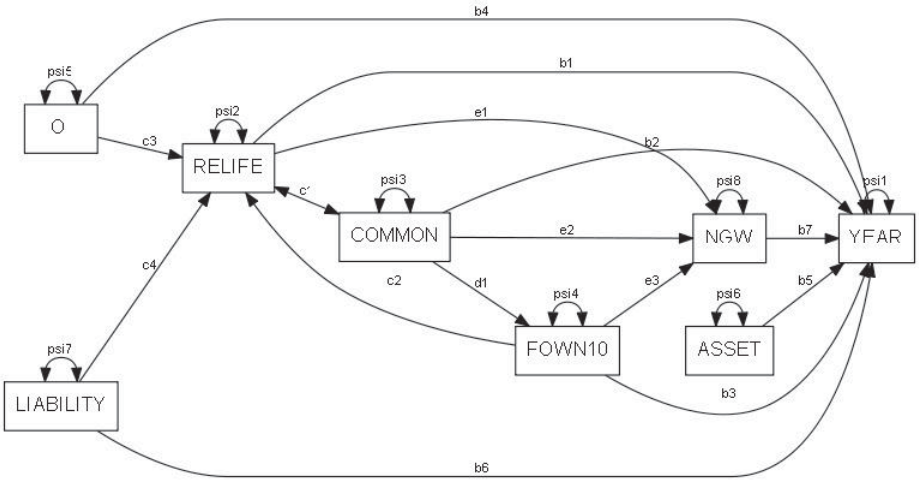

FIGURE 2 Figure of pass with each variable

The path from b_1 to b_7 indicates the relationship among YEAR that depended on Takahashi (2011) and other variables. The path from c_1 to c_4 indicates affecters of COMMON, FOWN10, OI, and LIABILITY that has an influence for RELIFE. RELIFE is aimed for the short-term rebuilding, but it is expected that COMMON is aimed for long-term management, so it is thought that the c_1 path shows a negative association. Because the foreign stockholder tends to make much of short-term profit, and it is concerned that the relief-type merger leads to the aggravation of achievements, FOWN10 is hard to take the relief-type merger when foreign ratio of shareholding is high. Therefore, it is expected that FOWN10 has a negative influence for RELIFE. If the managers have the motivation to moves from deficit to surplus in the ordinary profit, it is thought that the managers are willing to take relief-type merger, because it is expected to improve the numerical value in the short term in financial statements. Thus, as for the relations of c_3, it is expected that OI has a negative influence for RELIFE. If the managers have the motivation to decrease the debt ratio to total assets, it is thought that the managers are willing to take relief-type merger when if debt ratio is high,

because it is expected to improve the numerical value in the short term in financial statements. Thus, as for the relations of c_4, it is expected that LIABILITY has a positive influence for RELIFE.

d_1 is a path indicating relations between COMMON and FOWN10. There are few floating stocks in the combine in the group, so foreign ratio of shareholding get lower. Therefore, it is expected that COMMON has a negative influence for FOWN10. The path from e_1 to e_4 indicates affecters of RELIFE, COMMON, FOWN10, and LIABILITY that has an influence for NGW. In the case of a relief-type merger, the acquired company is purchased cheaply. So the ratio of negative goodwill to total assets of the acquiring company will rise. Therefore, it is expected that RELIFE has a positive influence on NGW. In the case of a relief-type merger, the acquired company may be purchased cheaply depending on the power relationship between the parent company and the subsidiary. Similarly, when foreign ratio of shareholding is high, it is expected that the managers have the motivation to merger cheaply, and it is thought that a ratio of negative goodwill for total assets becomes higher. Thus, it is expected that COMMON and FOWN10 have a positive influence for NGW.

5. Conclusion and Implication

As a result of analysis, only a pass of b_5 was significant. This result suggests that there is the possibility to have a long deprecation period of the negative goodwill in the company which an asset scale is big. Therefore, the result to support for both H_1 and H_2 was not provided. In addition, the AIC was 157.7 in an ordered logistic-regression analysis used in analysis of Takahashi (2011). On the other hand, the AIC was 127.2 by the structure equation modeling in this analysis, and an adaptation degree of the model was improved.

From this analysis and Kobayashi (2009), it is suggested that the company which asset scale is big tend to have long depreciation period regardless of a plus or minus of the goodwill. The next two point are cited as the reason from the viewpoint of profit smoothing.

At first, the bigger company is, the more the merger opportunities are. So, it has big influence to profit in the current term if manager choose short depreciation period. Generally, the quantity of the merger amount of money, a timing of the merger, and a depreciation period of the goodwill depend on the managers' discretion. If managers have the motivation to control influence on profit for the current term, the manager can control influence in comparison with the case a depreciation period of the goodwill is short. Furthermore, the manager can leave room for discretion by setting a long depreciation period of the goodwill when there is on the occasion of posting impairment of the goodwill or a large amount of non-operating profit. In other words, the manager can keep accounting processing to plan profit equalization by setting a long depreciation period of the goodwill if a manager is going to plan profit equalization in the long term.

In this study, depending on Takahashi (2011), I tried re-inspection by the structure equation modeling that reflects reality more in consideration of the theoretical relations among independent variables. As a result of this analysis, the possibility that the bigger a company is, the longer depreciation period of the negative goodwill is, was suggested. Moreover, the adaptation degree of the model for data was improved, too.

As a limit of this paper, it cannot be said that the model of this study investigates a depreciation factor of the negative goodwill of all, because I investigate the model and a hypothesis depending on Takahashi (2011) without executing exploratory data analysis. In addition, there is the room arranging a potentiality variable

TABLE 3 The Results of Structure Equation Model

	Estimate	Std Error	z value	Pr(>|z|)	Path
b1	0.155	0.258	0.602	0.547	YEAR <--- RELIFE
b2	0.132	0.121	1.095	0.273	YEAR <--- COMMON
b3	− 0.146	0.107	− 1.369	0.171	YEAR <--- FOWN10
b4	0.985	1.093	0.901	0.367	YEAR <--- OI
b5	0.080	0.035	2.291	0.022	YEAR <--- ASSET
b6	0.220	0.257	0.859	0.390	YEAR <--- LIABILITY
b7	− 0.540	1.834	− 0.294	0.769	YEAR <--- NGW
c1	− 0.011	0.009	− 1.229	0.219	COMMON <--> RELIFE
c2	0.027	0.042	0.642	0.521	RELIFE <--- FOWN10
c3	0.158	0.435	0.363	0.717	RELIFE <--- OI
c4	0.039	0.102	0.377	0.706	RELIFE <--- LIABILITY
d1	0.125	0.113	1.103	0.270	FOWN10 <--- COMMON
e1	− 0.008	0.014	− 0.541	0.589	NGW <--- RELIFE
e2	− 0.010	0.007	− 1.473	0.141	NGW <--- COMMON
e3	− 0.001	0.006	− 0.166	0.868	NGW <--- FOWN10
psi1	0.249	0.036	6.892	0.000	YEAR <--> YEAR
psi2	0.040	0.006	6.891	0.000	RELIFE <--> RELIFE
psi3	0.189	0.027	6.892	0.000	COMMON <--> COMMON
psi4	0.231	0.034	6.892	0.000	FOWN10 <--> FOWN10
psi5	0.002	0.000	6.892	0.000	OI <--> OI
psi6	2.160	0.313	6.892	0.000	ASSET <--> ASSET
psi7	0.040	0.006	6.892	0.000	LIABILITY <--> LIABILITY
psi8	0.001	0.000	6.892	0.000	NGW <--> NGW

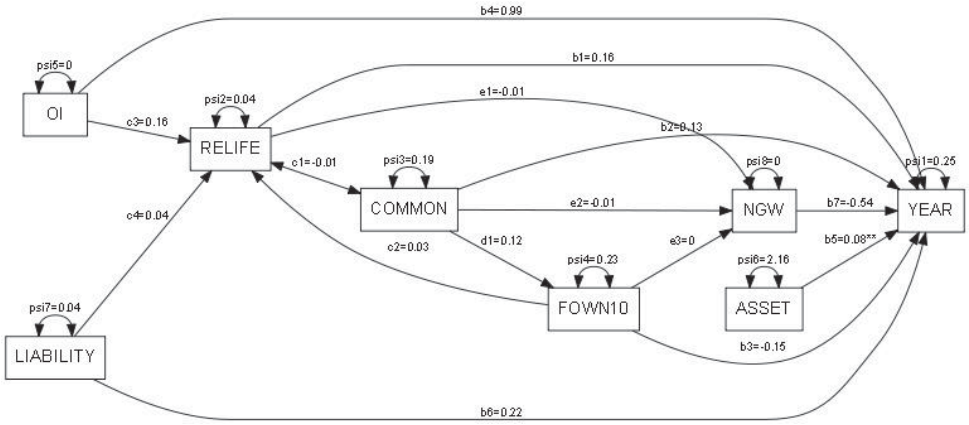

FIGURE 3 Figure of pass after analysis

newly, because I analyze observation variables without setting the potentiality variable that is a characteristic of the structure equation modeling. Furthermore, the inspection by the model that considered time series be necessary because I analyze pooled data with disregard to it.

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