Analytical Model for Estimating Goodwill Impairment

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ABSTRACT

This paper attempts to clarify the mechanism in which goodwill impairment occurs and comprehend the risk of goodwill impairment from the outside of companies. This paper provides a theoretical model to analyze the risk of occurrence of goodwill impairment with three factors: the largeness of acquisition cost measured by net assets of acquired company, the profitability of EBITDA to net assets and the multiple number of EBITDA to the acquisition value. Based on this analytical model, we simulate the risk and produce propositions on the relationship between the acquisition deal factors and the risk of occurrence of goodwill impairment. Some cases are provided to examine the explanatory power of the propositions.

Keywords: Goodwill impairment; Multiple number of EBITDA; Analytical model; Cross-border M&A.

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1. INTRODUCTION

A growing number of Japanese firms recently face the risk of goodwill impairment losses. Active M&A of Japanese companies at home and abroad led them to record goodwill as an intangible asset in their balance sheet. M&A involving Japanese companies has increased rapidly since the mid-1990s, and the number of M&A cases in the period from January to December 2022 increased by 1 percent from the previous year to 4,304, a record high. In terms of M&A value, the biggest growth over the past 20 years has been the acquisition of foreign companies by Japanese companies[1].

In parallel with the increase in the number and scale of M&As, the number of Japanese companies holding goodwill on their balance sheets is increasing, as is the amount of goodwill they hold. In fiscal year 2021, 1,535 out of 3,816 companies listed on the Tokyo Stock Exchange in Japan held goodwill. The total amount of goodwill held by these companies was 47,191.9 billion yen, and the average amount per company was 30.744 billion yen. The largest value of goodwill was 4,897.9 billion yen for the SoftBank Group, and the median value was 546 million yen[2].

[1] "M&A, Challenge of Japanese company, Jeopardy of American company." Asahi Shinbun, 2023, January 10, p. 4.
[2] NIKKEY NEEDS, FINANCIALQUEST DATA BASE. https://needs.nikkei.co.jp/services/financial-quest/

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Goodwill arises when a buyer acquires an existing business for a premium value. The value of goodwill represents the difference between the value which an acquiring company pays for an acquired company and that of net assets of the acquired company. The goodwill is classified as an intangible asset on the balance sheet on the premises that the assets of acquired company continues to generate surplus cash-in-flow in the future. The company must reduce the value of this intangible asset if the asset begins to generate less money than expected at the time of acquisition. When a company writes down goodwill, its value of goodwill recorded on the balance sheet is reduced and recorded as an extraordinary loss. The loss reduces the net income for the current term, which usually leads to the decline in the stock price of the company. In addition, a significant reduction in impaired goodwill carries the risk of putting the company out of business. For example, in February 2017, Toshiba, one of the electrical manufacturing giants in Japan, announced that the company recorded 712.5 billion yen as impaired goodwill and that the loss would turn the equity capital of the company to be negative. Thus, since enormous goodwill entails the risk of companies' existential emergency, understanding the risk of goodwill impairment loss is important not just for corporate managers but also investors.

We try to clarify the risk of goodwill impairment at the time of acquisition deal completed from the outside of companies in this research. We approach this research question in the following way. In the next section, we first present a theoretical model to analyze goodwill impairment. Based on the model presented, we propose three propositions regarding to occurrence of goodwill impairment. In the third section, we produce five cases for discussing the explanatory power of the propositions presented, followed by concluding remarks in the final section.

2. ANALYTICAL MODEL

Definition of goodwill

Goodwill is an intangible asset that arises when a company acquires another for a premium value. The premium value is the difference between the acquisition cost and the fair value of acquired company. The acquisition cost is the aggregate of the value of the consideration transferred, the amount of any non-controlling interest and the acquisition-date fair value of the acquiring company's previously held equity interest in the acquired company. The fair value of acquired company is the net assets recognized in the company which is the balance between all the identifiable assets it holds and the liabilities it assumed. Therefore, goodwill can be defined and measured as follows:

Goodwill = Consideration transferred +Amount of non-controlling interests
+Fair value of previous equity interests - Net assets identifiable.

As the above equation represents, goodwill does not represent identifiable assets because all the net assets identifiable are excluded which include all the assets that can be sold, transferred, licensed, rented and exchanged. Goodwill also does not represent contractual or other legal rights regardless of whether those are transferable or separable from the entity or other rights and obligations. A company's brand name, customer relationships and artistic intangible assets are included in examples of unidentifiable assets. Consequently, in the case that a company acquires another company with no minority shareholders, goodwill is equivalent to a remaining portion of the acquisition value of an acquired company which an acquiring company cannot specify as recognizable assets. Therefore, goodwill is an

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intangible and unspecified asset which should be amortized or impaired when its value is reduced.

Japanese Accounting Standards (JAS) require companies which hold the goodwill on the balance sheet to amortize it periodically with the straight-line method within 20 years or in its effective period. The standards also require the companies to perform goodwill impairment tests to check if the book value of the acquired company exceeds the recoverable amount from the business of acquired company. On the other hand, international Financial Reporting Standards (IFRS) and United States generally accepted accounting principles (GAAP) do not permit companies to amortize goodwill. However, both the accounting standards require companies to execute annual goodwill impairment tests to determine if a company's stated goodwill exceeds the recoverable amount from the business. If these tests result in goodwill being reduced, both the standards require the companies to report the reduction on its financial statements as a loss due to goodwill impairment.

Risk of goodwill impairment

For making analysis simple, suppose that a company acquires all the shares of another company at one time; and that the company makes financial statements in accordance with IFRS. If the recoverable amount (RA) from investment for the acquisition is less than the book value of the acquired company, the company must record impairment of goodwill. The recoverable amount from the invest is the greater of the true cash value of the company or its value- in-use (UV). The true cash value of the company is the fair value less costs to sell. The value-in-use refers to the present value of the free cash flows expected to be derived from the business of the acquired company. Since the value-in-use is usually greater than the true cash value, the recoverable amount is the value-in-use in most cases. Therefore, recoverable amount from the investment for acquisition is estimated as the present value of free cash flows expected in the future ($PFCF_i$, i=1, ∞). Consequently, companies must record goodwill impairment if the present value of free cash flows expected is less than the book value of the acquired company which is equivalent to acquisition value (AV).

$$\text{Goodwill impairment test: } AV > RA = UV = \sum PFCF_i,\ i=1,\ \infty.$$

The present value of free cash flows expected to be derived from the business of acquired company is often calculated by the DCF (discounted cash flow) method. In most cases, companies which acquire another company calculate the present value of its free cash flows as total of sum of the present value of free cash flows of first several years ($PFCF_i$, i=1, m-1) and the terminal value. The terminal value is the total of present value of free cash flow in future years after first several years. Based on the assumption that the free cash flow in the years after first several years continues to grow at a rate, terminal value is usually calculated by dividing the present value of the free cash flow in the year after first several years by the difference between the discount rate (k) and the growth rate (g).

$$UV = \sum PFCF_i\ (i=1,\ \infty) = PFCF_1 + PFCF_2 + \cdots + PFCF_{m-1} + PFCF_m/(k-g)$$

Since the difference between discount rates and growth rates normally is between several percent and a dozen percent, the terminal value is ordinally between several times and a dozen or two dozen times of the present value of FCF_m. The multiple number of 1/(k-g)

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(MN) becomes smaller when the difference between the discount rate and the growth rate becomes larger. In other words, when companies adopt the combination of a larger discount rate and a smaller growth rate, the multiple number of 1/(k-g) is a smaller one.

Companies must impair goodwill if the value-in-use becomes less than the acquisition value. Therefore, the threshold of execution of goodwill impairment is:

$$AV= UV= PFCF_1+PFCF_2+・・・+PFCF_{m-1}+PFCF_m * MN.$$

Table 1. The multiple number of 1/(k-g) with the combination of discount rates and growth rates

Discount rate(%)	Growth rate (%)					
	-2	-1	0	1	2	3
5	14.3	16.7	20.0	25.0	33.3	50.0
6	12.5	14.3	16.7	20.0	25.0	33.3
7	11.1	12.5	14.3	16.7	20.0	25.0
8	10.0	11.1	12.5	14.3	16.7	20.0
9	9.1	10.0	11.1	12.5	14.3	16.7
10	8.3	9.1	10.0	11.1	12.5	14.3
11	7.7	8.3	9.1	10.0	11.1	12.5
12	7.1	7.7	8.3	9.1	10.0	11.1
13	6.7	7.1	7.7	8.3	9.1	10.0
14	6.3	6.7	7.1	7.7	8.3	9.1
15	5.9	6.3	6.7	7.1	7.7	8.3
16	5.6	5.9	6.3	6.7	7.1	7.7
17	5.3	5.6	5.9	6.3	6.7	7.1
18	5.0	5.3	5.6	5.9	6.3	6.7
19	4.8	5.0	5.3	5.6	5.9	6.3
20	4.5	4.8	5.0	5.3	5.6	5.9
21	4.3	4.5	4.8	5.0	5.3	5.6
22	4.2	4.3	4.5	4.8	5.0	5.3
23	4.0	4.2	4.3	4.5	4.8	5.0
24	3.8	4.0	4.2	4.3	4.5	4.8
25	3.7	3.8	4.0	4.2	4.3	4.5

Estimation model from the outside of companies

It is difficult, however, for company outsiders to observe the free cash flows which the business of an acquired company will generate because the acquiring company estimates those cash flows inside but does not release the information. Therefore, company outsiders estimate the value-in-use of the business of the acquired company as follows.

In general, after an acquisition deal completed, an acquiring company makes a certain amount of investment in order to bolster the business of the acquired company. As a result, the amount of free cash flows in several years after the acquisition will not be large. Company outsiders then ignore the amount of free cash flows in those years and try to estimate the value- in-use of the acquired company as the product of the present value of FCF in the year after first several years and MN.

$$AV=UV \fallingdotseq PFCF_m * MN$$

Company outsiders can know the value of AV. They however neither know the present value of FCF_m or the value of MN because they do not have information about how the

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managers of the acquiring firm set the growth rate of free cash flows (g) and the discount rate (k) for the business of the acquired company. They alternatively try to determine the value of MN by replacing the present value of FCF with the EBITDA of the acquired company at the time of the acquisition deal completed. Eventually, the threshold equation[3] for outsiders of company to estimate goodwill impairment is:

$$AV = EBITDA*MN$$

The multiple number (MN) in this equation means the number of years the acquiring company can recover the acquisition cost in terms of EBITDA of the acquired company. The amount of EBITDA exceeds that of the free cash flow amount in just the sum of taxes, investment in facilities to keep the business continue and changes in its working capital.

Although the size of the difference between EBITDA and free cash flow depends on how much the acquiring company invests in the acquired company's business, EBITDA is roughly more than twice of free cash flows from business operations because the taxes are usually around 40 percent of the EBIT. Therefore, when the normal MN of free cash flow (AV/FCF) is assumed to be around roughly eight to twenty-five, the NM of EBITDA (AV/EBITDA) is estimated to range roughly four to twelve or thirteen. Consequently, company outsiders consider that companies are to record goodwill impairment when they find out that they cannot recover the money they invested for the acquisition within the number of years of MN of EBITDA. A large MN of EBITDA means that the acquiring company's investment in the acquired company will take longer to recover. A longer payback period increases the risk of goodwill impairment losses because the longer the payback period is, the more likely it is that major negative changes in the economic environment will occur. Therefore, we propose to set the MN of EBITDA as an indicator of the risk of goodwill impairment losses.

Furthermore, we add the term of (1/NA) to the both hands of the above threshold equation to transform each variable from absolute to relative values. Then we get a generalized threshold equation for goodwill impairment.

$$AV/NA = EBITDA/NA*MN, \text{ or } GW/NA+1= EBITDA/NA*MN$$

The left hand side of this equation represents the size of the acquisition value (AV) measured by the worth of net assets (NA). Since acquisition value is the sum of the values of goodwill and net assets, the left hand side of this equation simultaneously represents the sum of 1 and the size of goodwill value (GW) measured by the worth of net assets (NA). On the other hand, the right hand side of this equation represents the product of the profitability of EBITDA to net assets (EBITDA/NA) and the multiple number (MN). Since the values of acquired company (AV), net assets (NA) and goodwill (GW) are determined at the time the acquisition deal is completed, the multiple number of EBITDA (MN) is automatically determined by the combination of these three values.

[3] This equation is similar to the EBITDA multiple formula: EV/EBITDA. EV is the enterprise value which includes in its calculation the market capitalization of a company ,short-term and long-term debt and any cash or cash equivalents on the company's balance sheet.

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Table 2. Multiple number with combinations of Profitability of EBITDA to Net Assets and Size of Acquisition Value measured by Net Assets.

AV/NA	Profitability: EBITDA/Net Assets															
(GW/NA+1)	35%	34%	33%	32%	31%	30%	29%	28%	27%	26%	25%	24%	23%	22%	21%	20%
6	17.1	17.6	18.2	18.8	19.4	20.0	20.7	21.4	22.2	23.1	24.0	25.0	26.1	27.3	28.6	30.0
5	14.3	14.7	15.2	15.6	16.1	16.7	17.2	17.9	18.5	19.2	20.0	20.8	21.7	22.7	23.8	25.0
4	11.4	11.8	12.1	12.5	12.9	13.3	13.8	14.3	14.8	15.4	16.0	16.7	17.4	18.2	19.0	20.0
3	8.6	8.8	9.1	9.4	9.7	10.0	10.3	10.7	11.1	11.5	12.0	12.5	13.0	13.6	14.3	15.0
2	5.7	5.9	6.1	6.3	6.5	6.7	6.9	7.1	7.4	7.7	8.0	8.3	8.7	9.1	9.5	10.0
1	2.9	2.9	3.0	3.1	3.2	3.3	3.4	3.6	3.7	3.8	4.0	4.2	4.3	4.5	4.8	5.0
AV/NA	Profitability: EBITDA/Net Assets															
(GW/NA+1)	19%	18%	17%	16%	15%	14%	13%	12%	11%	10%	9%	8%	7%	6%	5%	4%
6	31.6	33.3	35.3	37.5	40.0	42.9	46.2	50.0	54.5	60.0	66.7	75.0	85.7	100.0	120.0	150.0
5	26.3	27.8	29.4	31.3	33.3	35.7	38.5	41.7	45.5	50.0	55.6	62.5	71.4	83.3	100.0	125.0
4	21.1	22.2	23.5	25.0	26.7	28.6	30.8	33.3	36.4	40.0	44.4	50.0	57.1	66.7	80.0	100.0
3	15.8	16.7	17.6	18.8	20.0	21.4	23.1	25.0	27.3	30.0	33.3	37.5	42.9	50.0	60.0	75.0
2	10.5	11.1	11.8	12.5	13.3	14.3	15.4	16.7	18.2	20.0	22.2	25.0	28.6	33.3	40.0	50.0
1	5.3	5.6	5.9	6.3	6.7	7.1	7.7	8.3	9.1	10.0	11.1	12.5	14.3	16.7	20.0	25.0

Table 2 shows that the multiple number of EBITDA becomes larger as the EBITDA profitability to net assets becomes lower or the size of acquisition value measured by the worth of net assets becomes larger. For example, in the case that a company acquires another company with the size of acquisition value two, then the multiple number of EBITDA becomes 6.7 with the 30 percent profitability, 8 with the 25 percent profitability and 10 with the 20 percent profitability of EBITDA to net assets. On the other hand, if a company acquires another company with the 30 percent profitability of EBITDA to net assets, The multiple number of EBITDA becomes 6.7 with the size of acquisition value two, 10 with the size of acquisition value three and 13.3 with the size of acquisition value four. In short, the risk of goodwill impairment becomes larger as the EBITDA profitability to net assets becomes lower or the size of acquisition value measured by the worth of net assets becomes larger.

Propositions on the risk of goodwill impairment

Figure 1 explains changes in the magnitude of the risk of goodwill impairment graphically. The vertical axis of this diagram shows the size of the acquisition value measured by the worth of net assets. The horizontal axis is the largeness of multiple number of EBITDA. The line extending from the origin to the upper right is the line of the product of the EBITDA profitability to net assets and the multiple number of EBITDA. The slope of this line is the profitability of EBITDA to net assets. As the combination of EBITDA profitability to net assets and the size of acquisition value measured by the worth of net assets determines the largeness of multiple number of EBITDA in Table 2, the intersection of the line of the EBITDA profitability and that of the size of acquisition value determines the largeness of multiple number of EBITDA. Based on the diagram in Figure 1, we can see three scenarios in which the magnitude of the risk of goodwill impairment is larger.

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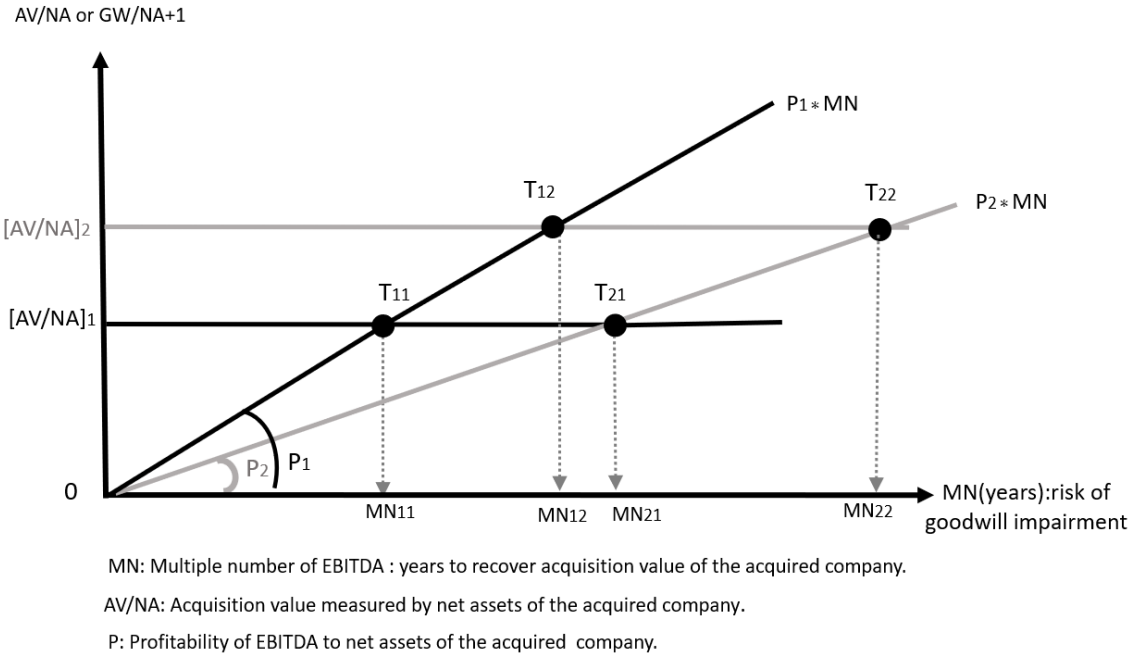

MN: Multiple number of EBITDA : years to recover acquisition value of the acquired company.

AV/NA: Acquisition value measured by net assets of the acquired company.

P: Profitability of EBITDA to net assets of the acquired company.

Figure 1. Risk of Goodwill Impairment.

Firstly, under the condition that the line of EBITDA profitability stay unchanged, the upper the AV/NA line is, the righter the intersection of two lines is. Consequently the multiple number of EBITDA goes right to be larger. In the diagram, this case shows that the shift of AV/NA line from $[AV/NA]_1$ to$[AV/NA]_2$ moves the intersection from T_{11} to T_{12}, and moves the multiple number of EDITDA from to $MN_{11}$to $MN_{12.}$ A case that a higher location of AV/NA line leads to higher risks of goodwill impairment suggests that the risk of goodwill impairment becomes larger when a company acquires another company with relatively high acquisition costs compared to the worth of net assets. The relatively risky size of AV/NA depends on how investors evaluate potential target companies in the financial markets.

Incidentally, when a company acquires a public company at the market capitalization of the company, the size of the acquisition value measured by the worth of net assets is approximately equal to PBR(Price Book-value Ratio) of the company. For example, as of the end of November 2022, the weighted average PBR of Japanese public companies is 1.2 for 1825 companies in the prime section, 1.0 for 1444 companies in the standard section, and 4.4 for 491 companies in the growth section. Therefore, in the Japanese stock market, the cases that a company acquires a public company belonging to the prime section or standard section at a price of 2 or more of AV/NA are regarded as relatively expensive acquisitions. Similarly, in the growth section of Japanese stock market, the cases that a company acquires a public company at price of 5 more of AV/NA are considered to be relatively expensive acquisitions. In these cases of acquisitions, the probability of goodwill impairment should be high. Based on the above discussion, we raise the first proposition.

> Proposition 1: The risk of goodwill impairment becomes large when a company acquires another company with relatively high cost compared to its net asset value.

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Secondly, under the condition that the AV/NA line stays unchanged in the diagram, the EBITDA profitability lines with a lower slope move the intersection to rightward and make the multiple number of EBITDA larger. In the diagram, this case shows that the declining of EBITDA profitability from P_1 to P_2 moves the intersection from T_{11} to T_{21}, and moves the multiple number of EDITDA from $MN_{11}$to MN_{21}. A case in which a lower slope line of multiple number of EBITDA leads to higher risks of goodwill impairment suggests that the risk of goodwill impairment becomes larger when a company acquires another company with relatively low profitability of EBITDA to net assets. It depends on the kind of industry that the acquired company belongs how low the profitability of EBITDA to net assets is. That is because that each industry has its standard profitability. Therefore, how low the profitability of EBITDA to net assets should be estimated by its average profitability of the industry.

Table 3. Profitability of EBITDA to net assets of 87 manufacturing industries in 2021 fiscal year

87 manufacturing industries	EBITDA (million yen)	Net Assets (million yen)	EBITDA/ Net Assets (%)
Average	531,255.7	2,837,998.5	16.7
Standard Deviation	1,132,982.6	5,940,366.5	5.1
Max	9,483,600.0	50,979,071.0	28.7
Minimum	2,110.0	24,474.0	1.9
Median	212,941.0	1,082,182.0	16.8

Data source: NEEDS-Financial QUEST.

Let's look at real data for Japanese public companies as an example. Table 3 shows the EBITDA profitability to net assets (FY2021) for 87 manufacturing industries in Japan. The data for each industry are the weighted averages for companies belonging to each industry. The average value in Table 3 is the arithmetic average for each industry. The EBITDA profitability for Japanese public companies (manufacturers) is 16.7%. Most of them are estimated to be distributed between approximately 11 percent and 22 percent. In the case of acquiring an average Japanese manufacturing company with 17 percent EBITDA profitability, the payback period is 11.8 years for the size of acquisition value 2 and 17.6 years for the size 3. Acquisitions with a payback period of 10 years or more are usually consider to be risky ones. Therefore, we may say that most of companies in Japanese manufacturing industries are not a proper target for M&A due to poor profitability. Then we provide the second proposition on the relationship between the risk of goodwill impairment and the profitability of the acquired company.

> Proposition 2: The risk of goodwill impairment is larger when a company acquires companies with a lower profitability.

Thirdly, simultaneous shifts of the AV/NA line and the EBITDA profitability line move the intersection of the two lines upper right and make the multiple number of EBITDA larger. In the diagram, the shifts of the two lines move the intersection from T_{11} to T_{22}, and the multiple number of EDITDA from to $MN_{11}$to MN_{22}. These cases occur when net assets erode to make AV/NA larger and the profitability of EBITDA to net assets decreases to make the

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slope of the line smaller. For example, the case that the net assets erode to make AV/NA larger is the case that technology patents held by the acquired company become obsolete or their validity period expires resulting in a larger value of AV/NA. Although the shrinkage of net assets seems to increase the profitability of EBITDA to net assets in calculation, it usually leads to a simultaneous decrease in the amount of EBITDA due to the diminishing of net assets' ability to generate cash. Eventually, the slope of EBITDA profitability line becomes smaller and the line shifts to the right.

Furthermore, in the case that the external political or macroeconomic environment is expected to change significantly, it is highly probable that the EBITDA amount decreases and the EBITDA profitability line eventually shifts to the right. In cross-border M&A, in which companies acquire a foreign company, the profitability of the acquired foreign company's business is highly dependent on foreign political and macroeconomic factors that are difficult for domestic managers to predict and control. If the acquired company is a public company, a decline in the earnings of that company's business will depress its share price, resulting in a smaller net worth and a higher AV/NA value. Based on the above discussion, we provide the third proposition.

> Proposition 3: The risk of goodwill impairment will be increasing after the acquisition deal is completed in the case that the business of an acquired company is involved in high levels of technological innovation or in an environment where political and macroeconomic factors change significantly.

3. CASES AND DISCUSSION

In this section, we produce five cases to check the explanatory power of the propositions. We chose cases in which Japanese companies acquired a company in a foreign country because those cases are more likely to have high risk to impair goodwill. Another reason for taking cross-border M&As of Japanese companies is that those companies which acquired foreign companies are likely to produce financial statements in conformity to IFSR.

In the analysis for some cases, EBIT was used instead of EBITDA due to data collection difficulties. The largeness of EBIT is less than that of EBITDA by the amount of depreciation and amortization. Therefore, the profitability of EBIT to net assets is smaller than that of EBITDA, and the multiple of EBIT is larger than that of EBITDA.

Case 1: Japan Post Holdings' acquisition of Toll Holdings in Australia

Japan Post Holdings is a Japanese publicly traded, state-owned conglomerate headquartered in Tokyo. It is mainly engaged in postal and logistics business, financial counter services, banking business and life insurance business. On November 4, 2015, the company was listed on the Tokyo Stock Exchange. Japan Post Holdings acquired an Australian logistics firm, Toll Holdings for approximately 620 billion yen (A$6.5 billion, US$4.9 billion) in February 2015[4]. Toll holdings was an Australian transportation and logistics company with some 1200 sites in about 50 countries, mostly in Asia and the Pacific.

[4] "Japan Post Announces Acquisition of Australian Logistics."2015/02/18 Nihon Keizai Shinbun evening edition, 2015, February p. 1.

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The amount of identifiable net assets of Toll Holdings was 139.9 billion yen and 474.4-billion-yen worth of goodwill was recorded. EBIT of Toll Holdings was 41.2 billion yen for accounting year at March 2014. The initial combination of (AV/NAs ratio, profitability, multiple number of AV/Earnings) was (4.4, 29.4%,14.9) as of the date the acquisition deal completed. However, in April 2017, Japan post holdings reduced the value of Toll holdings to 220 billion yen by approximately 400 billion yen[5].

The main reason for the company to have reduced the value of the acquired company was that the acquired company's cash inflows reduced because of economic downturn in China and Australia. The president of Japan Post admitted at the press conference in April 2017 that the company bought Toll Holdings a little bit high price. This case of failure can be a case which support the first proposition. The ratio of acquisition value to net assets of the acquired company (AV/NAs) was 4.4, which means that Japan Post paid more than three times of money for Toll's intangible power to generate free cash flows than the real assets. We can see that the acquisition cost was too large to recover the invested money. We can also understand that the acquired company had a fluctuating earning structure because their business heavily depended on the business abroad. This case can also be a case to support the appropriateness of the third propositions.

Case 2: Kirin Holdings' acquisition of Schincariol in Brazil。

Kirin Holdings is one of the biggest holding companies in Japan whose major operating units include Kirin Brewery Company, Mercian Corporation and Kirin Beverages Company. Schincariol was a Brazilian brewery and drink company, the second largest in the country after AmBev.

In November 2011, Kirin Holdings paid 315.3 billion yen in total to buy out the shareholders in Schincariol and, in November 2012, Kirin changed Schincariol's name to Brazil Kirin.[6] The amount of identifiable net assets of Brazilian company was 101.9 billion yen and 213.4-billion-yen worth of goodwill was recorded. EBITDA of the company was 25.6 billion yen for accounting year ended in December 2010. The initial combination of (AV/NAs ratio, profitability, multiple number of AV/Earnings) was (3.1, 25.1%, 12.3).

Three years after the acquisition, in December 2015, Kirin reduced the value of its subsidiary in Brazil by 114 billion yen as an extraordinary loss because its business in Brazil was losing money due to the economic downturn in the country[7]. As a result, Kirin sold the business in the country to Heineken International in 2017[8].

One of causes of Kirin's failure in this acquisition was that the acquisition cost increased during the deal. The company firstly planned to pay 200 billion yen to buy out Schincariol. However, the company actually paid more than 300 billion yen to take over it after all. This premium cost became a burden to recover the investment. In other words, this acquisition investment was too expensive to recover. We can see that a high ratio of AV/NAs, 3.1 and a relatively low profitability of EBITDA to net assets, 25.1% indicated the risk of acquisition

[5] "Japan Post Holdings' naive acquisition strategy, Australian subsidiary with no prospects for improvement, stumbles on international logistics route." Nihon Keizai Shinbun morning edition, 2017, April 22, p. 5.
[6] "Kian beer acquires Brazilian beer and soft drink major for 200 billion yen, foothold in South America.", Nihon Keizai Shinbun evening edition, 2011, August 2, p.1.
[7] "Kirin Brewery posted an extraordinary loss in its Brazilian business." Nikkei Sangyo Shinbun, 2015, December 22, p. 14.
[8] "Kirin withdraws from Brazil, sells subsidiary to Heineken, 100 billion yen, concentrates on Asia." Nihon Keizai Shinbun morning edition, 2017, January 20,p. 11.

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premium to recover. Therefore, we may say that this case can be a strong case to support the logics in both the first and second propositions.

Case 3: Shiseido's acquisition of a U.S. Cosmetics

Shiseido is a Japanese multinational personal care company which provides a skin care, hair care, cosmetics and fragrance products. It is the largest firm in the industry in Japan and the fifth largest cosmetics company in the world.

Shiseido paid 156.5 billion yen to acquire a US cosmetics maker, Bare Escentuals in October 2010[9]. The amount of identifiable net assets of Bare Escentuals was 65.0 billion yen and 91.5-billion-yen worth of goodwill was recorded. EBIT of the company was 18.1 billion yen in December 2008. The initial combination of (AV/NAs ratio, profitability, multiple number of AV/Earnings) was (2.4, 27.8%, 8.6) as of the date the acquisition deal completed.

After the acquisition, the US subsidiary was losing money because it changed its marketing strategies from mass-marketing on TV to individual based one in department stores. Since the US subsidiary's business had been stagnated, Shiseido reduced the value of its subsidiary in US by 28.6 billion yen in 2013 and 65.5 billion yen in 2017[10]. Total amount of impairment for Bare Escentuals was nearly equal to the amount of goodwill which Shiseido recorded for its US subsidiary at the time of the acquisition.

This acquisition case does not seem to fit to any logics of the propositions. The multiple number of EBIT to the acquisition (8.6) was healthy, and the ratio of acquisition value to net assets (2.4) was not so large. Therefore, we can say that this acquisition deal was not likely to have high risks of goodwill impairment. The main cause of reducing the value of the US subsidiary was a shrinkage of cash flows brought by a failure of changing marketing strategy. Therefore, we may say that it would be difficult to estimate the risk of goodwill impairment which might occur from an improper decision making of top management in the subsidiary after the acquisition based solely on the released information to the public.

Case 4: Daiichi Sankyo's acquisition of Ranbaxy in India.

Daiichi Sankyo Company is a global pharmaceutical company and the second largest pharmaceutical company in Japan. It achieved 1044.9 billion yen in revenue in 2021 fiscal year. In 2008, the company took a majority (64%) stake in Indian generic drug maker Ranbaxy at the deal value of approximately 488.4 billion yen or 4.6 billion US dollars[11]. The amount of identifiable net assets of Ranbaxy was 79.7 billion yen and 408.7-billion-yen worth of goodwill was recorded. EBITDA of Ranbaxy was 23.64 billion yen for the accounting year ended in December, 2007. The initial combination of (AV/NAs ratio, profitability, multiple number of AV/Earnings) was (6.1, 29.7%, 20.7) as of the date the acquisition deal completed.

However, in March 2009, Daiichi Sankyo reported an extraordinary loss of 354 billion yen in conjunction with Ranbaxy's business failure[12]. The US government banned the Indian

[9] "Shiseido acquires US cosmetics, a pioneer in natural materials." Nihon Keizai Shinbun evening edition, 2010, January 15,p.1.

[10] "Shiseido paid painful tuition, US subsidiary and impairment loss, totaling more than 90 billion yen, M&A, discerning power questioned." Nihon Keizai Shinbun morning edition, 2017, November 2, page 16.

[11] "Daiichi Sankyo Acquires Ranbaxy, President Shoda Says, "Leverage Growth Opportunities"." Nikkei Sangyo Shinbun,2008, June 12, p. 11.

[12] "Daiichi Sankyo writes off goodwill of 354 billion yen, with Ranbaxy shares plummeting." Nihon Keizai Shinbun morning edition, 2009, January 6, p.15.

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subsidiary's export to the country because the company had safety and hygiene troubles in its factories. The main cause of impairment of Ranbaxy's assets including the huge goodwill was the company's reduced cash flows after the acquisition. In this case, reduced cash flows were not able to be a base enough to recover the acquisition cost. The acquisition value must have been a little too high to recover. The AV/NAs ratio is 6.1. We judge that 6.1 was so large that the acquired company was not able to recover excessive part of payment for the acquisition value with 29.7 percent-profitability of the acquired company's net assets. In this sense, this case of acquisition can be a case to support the first and second propositions.

Table 4. Performace of Ranbaxy after the acquisition (Billion yen/Percent)

Accounting year	Mar. 2009	Mar. 2010	Mar. 2011	Mar. 2012	Mar. 2013	Mar. 2014	Average	Profitbility
Sales	38.6	146.7	173.1	176.6	187.1	222.7	181.2	100.0
EBIT	0.6	6.3	27.7	20.4	21.8	-1.0	15.0	8.3
Current Earnings	-23.9	13.0	40.0	-3.4	19.1	N.A.	17.2	9.5
Net Income	-16.2	4.2	23.3	-33.7	9.4	-14.6	-2.3	-1.3

Source: Annual Reports of Daiich Sankyo. Data in Mar. 2009 including three months from October to December.

Case 5: Suntory's acquisition of Beam Whisky in US

Suntory Holdings is a whisky, beer and soft-drinks maker based in Osaka, Japan. The company paid 1.65 trillion yen in cash ($16 billion)[13] to buyout Jim Beam, the second-largest maker of American whiskey behind Brown-Forman in April 2014[14]. The amount of identifiable net assets of Beam company was 768.7 billion yen and 657.4-billion-yen worth of goodwill was recorded. Free cash flow of the company was 120 billion yen at the time of acquisition. The initial combination of (AV/NAs ratio, profitability, multiple number of AV/Earnings) was (1.9, 15.6%,11.9).

On the press conference at the time of the acquisition completed, president of the company was confident in recovering the 1.65 trillion-yen-investment within approximately 15 years by its 120-billion-yen cash flows. The multiple number of EBITDA to acquisition value would be smaller than 15 years because EBITDA is greater than free cash flow. Furthermore, since AV/NAs ratio, 1.9 was not so large, this acquisition deal seems to have no problem itself. Suntory has not reduced the goodwill which was generated from this acquisition deal so far. Therefore, this case can support the appropriateness of the first proposition.

However, the problem is not business of the acquired company but that of the acquiring company. Suntory financed huge amount of money from banks and held enormous amount of goodwill and other intangible assets to amortize. At the end of 2014, the company held 2.45 trillion-yen interest-bearing debt and 1.12 trillion-yen goodwill to amortize. In December 2015, the company had to amortize 68 billion- yen-worth of intangible assets including goodwill in its income statement. The company then changed its accounting reporting policy from Japan's standard to IFRS in December, 2017. The company officially said that the changing policy of accounting reports was to enhance international comparability of business performance. However, now the company does not have to amortize enormous amount of goodwill based on IFRS.

[13] The purchase price includes Beam's debt.

[14] "Suntory acquires Jim Beam, America's top whiskey company, making it the third largest distilled liquor in the world, worth 1.65 trillion yen." Nihon Keizai Shinbun morning edition, 2014, January 14, p. 1.

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4. CONCLUSION

We attempted to clarify the mechanism in which goodwill impairment occurs and comprehend the risk of goodwill impairment at the time of acquisition deal completed from the outside in this research.

We provided a theoretical explanation with a graphical model to analyze for these research questions and clarified that we can estimate the risk of occurrence of goodwill impairment by the combination of three factors: The multiple number of EBITDA to the acquisition value, the size of acquisition value measured by the worth of acquired company's net assets, and the profitability of EBITDA to net assets of acquired company. This analytical model is applicable for comparative analysis of acquisition deals of various sizes, as all factors in this model are transformed into standardized factors. Based on the analytical model, we proposed three propositions on the relationship between the acquisition deal factors and the risk of occurrence of goodwill impairment: the risk of goodwill impairment becomes large when a company acquires another company with relatively high cost compared to its net asset value; the risk of goodwill impairment is larger when a company acquires companies with a lower profitability; and the risk of goodwill impairment will be increasing after the acquisition deal is completed in the case that the business of an acquired company is involved in high levels of technological innovation or in an environment where political and macroeconomic factors change significantly.

We produced some cases to examine the explanatory power of these propositions proposed. However, we must admit that we need more evidence to ensure the appropriateness of these propositions. Statistical tests with more data need to be conducted in the future to examine the explanatory power of the propositions.

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