Business Performance of Firms Using Debt*

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Abstract

How does debt influence the business performance of firms? This study analyzes the relationship between growth and stability of firms using debt and the degrees of long-term average use of debt based on corporate data over about 30 years from the 1980s.

On the whole, a negative relationship was confirmed between the growth rates of sales and total assets as growth indicators and the debt ratio. For nonmanufacturing and medium-sized firms, however, the relationship is significantly negative between the growth rate of total assets and the debt ratio, but not significantly negative between the growth rate of sales and the debt ratio.

This study interprets the higher probability of operating loss as the indicator of less stability and examines the relationship between the probability and the debt ratio. The positive relationship is confirmed for all industries and manufacturing industries, indicating that higher debt ratios are accompanied by a higher probability of operating loss, or lower stability. The relationship is clearer for large firms than for medium-sized ones.

The results of the analysis using long-term average debt ratios suggests that debt-using firms' stability remains unhurt as far as growth is secured. An additional analysis using debt ratios in the beginning of the each analyzed period indicates that lower debt ratios in the beginning tends to lead to greater growth later and that higher debt ratios in the beginning tends to bring about greater stability later.

Keywords: debt, business performance, growth, stability, probability of bankruptcy, leverage
JEL Classification: G11, G32, G33

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I. Introduction

More and more firms refrain from investments using debt because of the decreased growth of the macro economy. It is said that at the same time, this situation becomes a factor of the stagnation of the macro economy. So now, let's check the performance of firms using debt in the mid-term and long-term, and what the modern meaning of using debt is.

Especially after the so-called bubble period, that is to say, since the 1980s, it is hard to see the future of economic conditions because of instability.

In Japan, especially in the high economic growth period, firms used a lot of debt to ensure growth leading to the emergence of high levels of debt. This was the macroeconomic condition.

Among practitioners and researchers of accounting and finance, it was a common recognition that debt harmed the stability of firms and that equity should be strengthened. But on the other hand, microeconomic research shed light on the fact that high growth firms had rather strong equity because of their high profitability.

If high growth is not against the lower use of debt, growth and stability are consistent. In this paper, we want to find the relationships between the use of debt and a firms' growth and stability in the long run, over a nearly 30 year span.

There are several studies doing these tests using data of listed companies, but there are no studies whose coverage includes non-listed companies. Especially, though the difference of tendencies between middle-sized firms and large firms is important, such studies haven't been done due to the lack of data of middle-sized firms. As the data of middle-sized firms were available this time, analysis became possible for this paper.

II. Related Literature

II-1. Use of Debt and Firms' Growth

Firms using debt grow in two ways. First, they can execute investments easily by raising funds through debt; second, their corporate value elevates due to the increase in sales or cash flow through those investments. In empirical research, the former is verified mainly in the context of estimating investment functions, and the latter in research of corporate value.

There are many theoretical and empirical studies about the relationship between the use of debt and the firms' growth, but many of them have been conducted with U.S. data. One stream of these studies examines whether leverage affects the firms' growth. Lang et al. (1996) and subsequent studies show that there is a negative relationship between leverage and the increasing rate of fixed capital as the proxy variable of a firms' future growth. The other stream of these studies examines how growth opportunities affect the level of capital structure. A good quantity of prior evidence shows that the market-to-book ratio as the proxy of a firms' growth opportunities is negatively correlated with leverage (for example, Rajan

and Zingales, 1995).

Koyama (2011) surveys prior studies focusing on Japanese firms. He says it is commonly viewed that firms with valuable growth opportunities used more debt to finance growth during the high economic growth period, so that their leverage ratio was higher than firms with poor growth opportunities. Debt financing was more easily available than equity financing during the high economic growth period, which is characterized by indirect financing. On the other hand, after the oil crisis, it is presumed that firms with valuable growth opportunities don't use debt so much.

To test this hypothesis, prior studies in Japan examine the relationship between the debt ratio (or leverage ratio or equity ratio)[1] and the actual growth rate of sales or net assets. Most of these analyses are conducted in the studies of the determinants of capital structure; the debt ratio therefore is used as the explained variable, and the growth rate as the explanatory variable.

Wakasugi (1987) examines the relationship between the growth rate of total assets and the equity ratio using a sample of Japanese firms listed on the first and second sections of the Tokyo Stock Exchange over the period 1965-1984. The number of firms whose data was available over the entire period was 826. A positive correlation is observed for the entire manufacturing industry, chemical industry, and electrical machinery industry. This means growing firms in these categories use more equity and less debt, though the coefficient of determination is small.

Koyama (2011) examines the determinants of the equity ratio of 60 Japanese firms over the period 1976-1985, and finds that the debt ratio of growing firms is lower. He presumes that this is because firms with a high growth rate can't heighten their debt ratio to restrain financial risks, and it is also unnecessary for them to do so as they have enough internal funds.

Fukuda and Hirota (1996) analyze the determinants of the debt ratio and the main bank loans to know how bank relationships affect corporate finance in Japan. Their sample consists of 582 Japanese manufacturing firms listed on the first section of the Tokyo Stock Exchange. They found that there was a negative relationship between the growth rate of sales (1984-1987) and the debt ratio, but a positive relationship between the growth rate and the main bank loans.

Tuji (2000) analyzes the determinants of capital structure of Japanese manufacturing firms listed on the first section of the Tokyo Stock Exchange over the period 1966-1995, and finds that profitability, firm size, and R&D expenditure are the most reliable factors. After the

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[1] The definition of each ratio in this paper is shown below.
Debt ratio=Debt/Total Assets
Leverage ratio=Debt/Equity
Equity ratio=Debt/Equity
All ratios are calculated on book value basis. As Total Assets=Debt + Equity, these three ratios must have the same information content, though the results in empirical studies sometimes differ (for example, Ota, 2004).

bubble economy period, the ratio of borrowing is also reliable. The increasing ratio of sales was significantly negative only during the period from 1974-1980, and from 1981-1985. This means the explanatory power of the growth of Japanese firms isn't as high as that of U.S. firms.

Shibusawa (2013) tries to explain the firms' growth using the leverage ratio. In this study, the actual growth rate of sales, total assets, and net assets are used as the proxy variables of the firms' growth. The sample consists of Japanese firms listed on the first and second sections of the Tokyo Stock Exchange over the period 1960-2009, and the number of firms whose data was available over the entire period is 328.

Negative relationships were confirmed between the leverage ratio and the growth rate of total assets for entire industries and the manufacturing industry for the entire period. During the high economic growth period (1960-1975), positive relationships were found between leverage and the growth rate of total assets for entire industries, the manufacturing industry, and the nonmanufacturing industry.

During the period from 1976-1990, there was a positive relationship between leverage and the growth rate of sales, but a negative relationship between leverage and the growth rate of total assets for entire industries. For the manufacturing industry and nonmanufacturing industry, a positive relationship is observed between the leverage ratio and the growth rate of sales.

During the period 1991-2009, there is a significantly negative relationship between leverage and the growth rate of sales and total assets for entire industries, total assets for the manufacturing industry, and all growth rates for the nonmanufacturing industry.

It is concluded that Japanese firms grew using debt positively during the high economic growth period and the stable growth period, but negatively after the long lasting economic slump.

In this way, prior studies in Japan often show the negative relationship between the use of debt and the firms' growth, but not always. The results aren't stable, and the data collection period is limited in many studies.

II-2. Use of Debt and Firms' Stability

The stability of firms using debt is discussed in two aspects. First, there is an aspect of profitability, i.e. whether a firm is managed stably with enough profit; second, an aspect of going concern, i.e. whether they go bankrupt or not because of serious deficit. The former is discussed in the studies of financial leverage, and the latter in the studies of bankruptcy prediction.

Studies about financial leverage are concerned with ways to cut risks and to provide returns to bondholders and stockholders, but this is not our concern.

It is often pointed out that leverage is determined in accordance with the balance of profitability and bankruptcy risk (for example, Kurosawa, 1992). Such theory argues how the use of debt affects corporate financial decisions, but our concern is how firms' performance

goes as a result of using debt.

There are many prior studies about bankruptcy prediction, and we can obtain many suggestions from them. First, we must know which financial variable to observe as the indication of bankruptcy. Firms go bankrupt potentially because of a lack of management ability, but directly because of deficiency or insolvency (Ota, 2004). There is no accepted answer to what indicates bankruptcy, but for example, in the auditing standard, auditors consider a firms' ability to continue by checking considerable decreases in sales, recurring operating losses or negative cash flow from operating activities, material operating loss, recording of ordinary loss or net loss, material negative cash flows from operating activities, and deficiency.

Early representative studies of bankruptcy prediction has been done by Beaver (1966). In this study, he chooses 30 financial ratios and tests their ability to predict bankruptcy. 30 ratios are divided into 6 groups – cash flow ratios, net income ratios, debt to total assets ratios, liquid assets to total assets ratios, liquid assets to current debt ratios, and turnover ratios. Bellovary et al. (2007) reviews the bankruptcy prediction studies from 1930-2004, and shows a list of the factors included in five or more studies. We can read that frequently used ratios haven't changed from Beaver (1966).

As for Japanese firms, Shirata (2003) observes the changes of 72 financial ratios over the period 1992-2000, and finds that the external debt ratio and the retained earnings to total assets are the most stable variables which represent characteristics of the bankruptcy firms immune from the changes of the economic environment.

There are many prior studies about bankruptcy prediction, and they suggest that

① The number of factors included in the model is not so important. Even a two factor model can show high accuracy.
② Operating income or cash flow from operating activities is especially significant.
③ It is necessary to pay attention to interest expenses or ordinary profit/loss.

As far as debt is concerned, the financial structure is surely important, but it is more important to analyze to what extent the profitability of business is influenced by the use of debt. Ordinary profit/loss is a financial item peculiar to Japan, and net profit and operating profit are usually used internationally.

II-3. How Prior Studies are related to Our Analysis?

In this paper, we analyze how firms grow depending on the degree of use of debt. We focus on the growth of total assets in association with the initial investments, and the growth of sales in association with the cash flow generated from business. As for stability, we analyze how firms are exposed to the risks of bankruptcy depending on the degree of use of debt. As a proxy of stability, we focus on the number of years when operating loss was recorded, and divide it by total measurement periods. We call this ratio the operating loss probability.

III. Hypotheses and Methods

In this paper, we examine the relationship between the use of debt and the firms' growth and stability for about 30 years since the 1980s. For this purpose, we regress growth and stability on the degree of use of debt.

Consistent with prior studies, we presume that the more firms use debt, the lower their growth and stability become. As we now face a period of lower growth and a more unstable macroeconomic environment than past years, we must check whether these relationships can continue. When firms pursue their growth and stability, they are supposed to control the degree of use of debt, so it is important to know the relationship between debt and the firms' growth and stability.

We consider business performance from two aspects—a firm's growth and stability—and examine the relationship between the debt ratio and the business performance of firms whose data was included in Financial Statements Statistics of Corporations by Industry continuously over a certain period. The debt ratio is debt/total assets on a book value basis. Growth is measured by the actual growth rate of total assets and sales. We define stability as the operating loss probability. We analyze the relationship between these variables not only for all industries, and all sizes, but also by industries and by sizes.

IV. Construction of Basic Data and Variables

Our basic data consists of Japanese firms whose date is included in the Financial Statements Statistics of Corporations by Industry continuously over the period 1983-2013 (Table 1). The entire analysis period is 30 years, but reflecting the change of economic structure before and after the bubble economy period, we divide it into 2 periods; the former 10 years (1983-1992) and the latter 20 years (1993-2013).

The explanatory variable is the debt ratio defined as average debt/average total assets for the period targeted in the analysis. We calculate the average of the beginning value of the first period and the ending value of each period. With respect to growth, the dependent variable is the average growth rate of sales and total assets for 30 years. With respect to stability, we count the number of years recording operating loss, and divide it by the number of entire analysis years. We refer to this as the operating loss probability, and assume the lower this probability, the higher the stability (See Table 2).

As we are interested in the long-term relationship, it is rational that we analyze only firms which exist over entire periods. It is true that this causes the restrictions that ① there is so-called survival bias, and ② most SMEs ran out of data as the statistics were made changing the samples for SMEs every few years, but we think these restrictions are not serious problems.

Table 1. Descriptive Statistics of the Data, 1984-2013

All Industries, All Sizes (million yen)

	Number	Mean	Std. Dev.	Minimum	Maximum
Sales	42,624	199,947	860,122	0	21,400,000
Total Assets	42,625	206,349	672,841	620	15,100,000
Operating Profit	42,612	7,254	33,090	-481,000	1,270,000
Debt Ratio	42,625	0.6	0.23	0	3.88

Average by Industries (million yen)

Industries	Number	Sales	Total Assets	Operating Profit	Debt Ratio
Manufacturing	24,273	159,844	175,664	6,616	0.58
Non-Manufacturing	18,352	254,195	247,856	8,116	0.64

Average by Sizes (million yen)

Sizes	Number	Sales	Total Assets	Operating Profit	Debt Ratio
Large	38,595	227,471	235,457	8,250	0.59
Medium	3,999	23,872	20,136	879	0.66
Small	31	2,370	1,973	75	0.38

Note 1: The number of total assets consists of 1,375 firms * 31 years=42,625 firm-years.
Note 2: The average numbers by industries and by sizes of total assets.

Table 2. Descriptive Statistics of Explained Variables and Explanatory Variables

All Industries, All Sizes

Variables	Number	Mean	Std. Dev.	Minimum	Maximum
Average Debt Ratio of Last 30 years	1,375	0.596	0.2	0.063	2.463
30 years' Average Growth Rate of Sales	1,374	0.01	0.039	-1	0.145
30 years' Average Growth Rate of Total Assets	1,375	0.023	0.025	-0.076	0.152
Probability of Operating Loss of Last 30 years	1,375	0.094	0.121	0	0.9

Average by Industries

Industries	Number	Debt Ratio	Growth Rate of Sales	Growth Rate of Total Assets	Probability of Operating Loss
Manufacturing	783	0.567	0.01	0.024	0.109
Non-Manufacturing	592	0.636	0.009	0.022	0.073

Average by Sizes

Sizes	Number	Debt Ratio	Growth Rate of Sales	Growth Rate of Total Assets	Probability of Operating Loss
Large	1,245	0.595	0.011	0.025	0.09
Medium	129	0.615	0.001	0.013	0.126
Small	1	0.655	-0.033	-0.021	0.233

Note: The average numbers by industries and by sizes of total assets.

V. Results

V-1. Growth and Debt Ratio

The results of regression analyses about growth are reported below. Judgement of significance is the significance level of 5%, but even 10% and 15% cases are reported if they are significant.

Table 3 reports the result of growth rate of sales and total assets which are regressed to debt ratio. With the whole 1984-2013 period, the coefficient of the growth rate of sales and total assets is significantly negative. In the divided year's analysis, with the 1984-1993 period, the coefficient of sales is not significant, but that of total assets is significantly negative and with the 1994-2013 period, both the coefficient of sales and total assets are significantly negative.

Table 4 reports the results by grouping the manufacturing industry and nonmanufacturing industry. About the manufacturing industry, with a whole period and with divided periods, the coefficient is significantly negative. About the nonmanufacturing industry, the coefficient of total assets is significantly negative and that of sales is not significant.

Table 5 reports the results by grouping the large firms and medium-sized firms. About large firms, in almost all cases the coefficient is significantly negative, but about the sales of the 1984-1993 period, the level of significance is 10%. About medium-sized firms, the coefficient of total assets is significantly negative, but that of sales is not significant.

Table 6 reports the results by the group of each industry of manufacturing during the whole period. About sales, 5% is significant in chemical, production machinery and automobile. And 10% is significant in fabricated metal products and general-purpose machinery, 15% is significant in electric machinery. About total assets, 5% is significant in chemical, petroleum and coal, iron and steel, fabricated metal products, and seven machinery

Table 3. Use of Debt and Growth (All Industries, All Sizes)

Sales

1984-2013 fiscal year n = 1,374 adj R^2= 0.068

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.051	0.0051	-10.07	0.00
Constant	0.040	0.0032	12.63	0.00

1984-1993 fiscal year n = 1,374 adj R^2= 0.0006

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.0088	0.0064	-1.36	0.17
Constant	0.042	0.0044	9.46	0.00

1994-2013 fiscal year n = 1,375 adj R^2= 0.050

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.049	0.0057	-8.6	0.00
Constant	0.026	0.0035	7.5	0.00

Total Assets

1984-2013 fiscal year n = 1,375 adj R^2= 0.11

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.042	0.0032	-13.26	0.00
Constant	0.049	0.002	24.28	0.00

1984-1993 fiscal year n = 1,375 adj R^2= 0.047

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.057	0.0068	-8.3	0.00
Constant	0.98	0.0047	20.93	0.00

1994-2013 fiscal year n = 1,375 adj R^2= 0.07

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.37	0.0036	-10.22	0.00
Constant	0.027	0.0022	12.26	0.00

Table 4. Use of Debt and Growth (by Industries)

Manufacturing Industries

Sales

1984-2013 fiscal year n = 783 adj R^2= 0.16

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.091	0.0075	-12.51	0.00
Constant	0.062	0.0045	13.87	0.00

1984-1993 fiscal year n = 792 adj R^2= 0.025

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.037	0.0079	-4.65	0.00
Constant	0.053	0.0052	10.30	0.00

1994-2013 fiscal year n = 783 adj R^2= 0.12

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.080	0.0079	-10.11	0.00
Constant	0.045	0.0046	9.94	0.00

Total Assets

1984-2013 fiscal year n = 783 adj R^2= 0.15

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.048	0.0041	-11.90	0.00
Constant	0.052	0.0024	21.29	0.00

1984-1993 fiscal year n = 792 adj R^2= 0.11

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.083	0.0082	-10.09	0.00
Constant	0.11	0.0054	20.62	0.00

1994-2013 fiscal year n = 783 adj R^2= 0.045

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.030	0.0048	-6.15	0.00
Constant	0.024	0.0028	8.57	0.00

Non-manufacturing Industries

Sales

1984-2013 fiscal year n = 591 adj R^2= 0.0013

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.0087	0.0065	-1.34	0.18
Constant	0.015	0.0043	3.36	0.00

1984-1993 fiscal year n = 582 adj R^2= -0.0004

	coefficient	standard error	t-value	p-value
Debt Ratio	0.0093	0.011	0.88	0.38
Constant	0.037	0.0077	4.87	0.00

1994-2013 fiscal year n = 592 adj R^2= 0.0008

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.010	0.0082	-1.21	0.23
Constant	-0.0013	0.0053	-0.25	0.80

Total Assets

1984-2013 fiscal year n = 592 adj R^2= 0.075

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.036	0.0052	-7.0	0.00
Constant	0.045	0.0035	13.11	0.00

1984-1993 fiscal year n = 583 adj R^2= 0.013

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.034	0.011	-2.92	0.00
Constant	0.086	0.0083	10.31	0.00

1994-2013 fiscal year n = 592 adj R^2= 0.091

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.044	0.00	-7.75	0.00
Constant	0.030	0.00	8.23	0.00

Table 5. Use of Debt and Growth (by Sizes)

Large Firms

Sales

1984-2013 fiscal year n = 1,244 adj R^2= 0.075

	coefficient	standard	t-value	p-value
Debt Ratio	-0.55	0.0055	-10.07	0.00
Constant	0.045	0.0034	12.69	0.00

1984-1993 fiscal year n = 1,200 adj R^2= 0.0014

	coefficient	standard	t-value	p-value
Debt Ratio	-0.012	0.0070	-1.65	0.10
Constant	0.045	0.0048	9.30	0.00

1994-2013 fiscal year n = 1,245 adj R^2= 0.053

	coefficient	standard	t-value	p-value
Debt Ratio	-0.051	0.0061	-8.36	0.00
Constant	0.028	0.0037	7.56	0.00

Total Assets

1984-2013 fiscal year n = 1,245 adj R^2= 0.11

	coefficient	standard	t-value	p-value
Debt Ratio	-0.042	0.0034	-12.52	0.00
Constant	0.050	0.0021	23.54	0.00

1984-1993 fiscal year n = 1,201 adj R^2= 0.044

	coefficient	standard	t-value	p-value
Debt Ratio	-0.057	0.0075	-7.51	0.00
Constant	0.10	0.0051	19.56	0.00

1994-2013 fiscal year n = 1,245 adj R^2= 0.068

	coefficient	standard	t-value	p-value
Debt Ratio	-0.037	0.0038	-9.56	0.00
Constant	0.028	0.0023	11.82	0.00

Medium-Sized Firms

Sales

1984-2013 fiscal year n = 129 adj R^2= 0.0063

	coefficient	standard	t-value	p-value
Debt Ratio	-0.015	0.011	-1.35	0.18
Constant	0.010	0.0073	1.42	0.16

1984-1993 fiscal year n = 174 adj R^2= 0.0012

	coefficient	standard	t-value	p-value
Debt Ratio	0.017	0.016	1.10	0.28
Constant	0.017	0.012	1.45	0.15

1994-2013 fiscal year n = 129 adj R^2= 0.023

	coefficient	standard	t-value	p-value
Debt Ratio	-0.031	0.016	-2.01	0.047
Constant	0.0076	0.010	0.78	0.44

Total Assets

1984-2013 fiscal year n = 129 adj R^2= 0.12

	coefficient	standard	t-value	p-value
Debt Ratio	-0.038	0.0088	-4.28	0.00
Constant	0.036	0.0058	6.21	0.00

1984-1993 fiscal year n = 174 adj R^2= 0.027

	coefficient	standard	t-value	p-value
Debt Ratio	-0.036	0.015	-2.41	0.017
Constant	0.070	0.011	6.20	0.00

1994-2013 fiscal year n = 129 adj R^2= 0.079

	coefficient	standard	t-value	p-value
Debt Ratio	-0.038	0.011	-3.47	0.00
Constant	0.022	0.0070	3.14	0.00

Table 6. Use of Debt and Growth (by Detailed Industries)

Sales (The Coefficient of the Debt Ratio, 1984-2013 fiscal year)

	coefficient	standard error	t-value	p-value	n	adj R^2
Food	-0.001	0.016	-0.06	0.96	74	-0.014
Textile Products	-0.036	0.038	-0.96	0.35	26	-0.0034
Lumber and Wood Products	-0.048	0.024	-1.99	0.30	3	0.60
Pulp, Paper and Paper Products	-0.033	0.031	-1.08	0.30	14	0.013
Printing and Allied Industries	-0.11	0.078	-1.46	0.24	5	0.22
Chemical and Allied Products	-0.26	0.023	-11.33	0.00	133	0.49
Petroleum and Coal Products	-0.050	0.034	-1.45	0.18	13	0.084
Ceramic, Stone and Clay Products	-0.022	0.022	-1.0	0.32	35	0.0001
Iron and Steel	-0.012	0.017	-0.72	0.48	36	-0.014
Non-Ferrous Metals and Products	0.033	0.035	0.96	0.34	33	-0.0023
Fabricated Metal Products	-0.031	0.018	-1.73	0.091	40	0.049
General-Purpose Machinery	-0.047	0.025	-1.88	0.073	27	0.088
Production Machinery	-0.026	0.011	-2.26	0.027	73	0.054
Business Oriented Machinery	-0.066	0.021	-3.16	0.00	25	0.273
Electrical Machinery Equipment and Supplies	-0.024	0.015	-1.58	0.12	51	0.029
Information and Communication Electronics Equipment	-0.048	0.018	-2.71	0.01	49	0.12
Motor Vehicles, Parts and Accessories	-0.058	0.019	-3.1	0.00	73	0.11
Other Transportation Equipment	-0.043	0.041	-1.04	0.32	17	0.0049
Miscellaneous Manufacturing Industries	-0.023	0.023	-1.01	0.32	56	0.0002

Net Assets (The Coefficient of the Debt Ratio, 1984-2013 fiscal year)

	coefficient	standard error	t-value	p-value	n	adj R^2
Food	-0.018	0.014	-1.25	0.22	74	0.0075
Textile Products	-0.030	0.028	-1.06	0.30	26	0.0047
Lumber and Wood Products	-0.049	0.052	-0.94	0.52	3	-0.0612
Pulp, Paper and Paper Products	-0.054	0.030	-1.83	0.093	14	0.15
Printing and Allied Industries	-0.16	0.066	-2.46	0.091	5	0.56
Chemical and Allied Products	-0.041	0.007	-5.61	0.00	133	0.19
Petroleum and Coal Products	-0.096	0.037	-2.58	0.025	13	0.32
Ceramic, Stone and Clay Products	-0.051	0.021	-2.42	0.021	35	0.13
Iron and Steel	-0.053	0.016	-3.24	0.00	36	0.21
Non-Ferrous Metals and Products	-0.005	0.030	-0.15	0.88	33	-0.032
Fabricated Metal Products	-0.064	0.014	-4.46	0.00	40	0.33
General-Purpose Machinery	-0.084	0.024	-3.44	0.00	27	0.29
Production Machinery	-0.057	0.011	-5.06	0.00	73	0.26
Business Oriented Machinery	-0.075	0.022	-3.35	0.00	25	0.30
Electrical Machinery Equipment and Supplies	-0.057	0.015	-3.88	0.00	51	0.22
Information and Communication Electronics Equipment	-0.058	0.017	-3.43	0.00	49	0.18
Motor Vehicles, Parts and Accessories	-0.089	0.017	-5.18	0.00	73	0.26
Other Transportation Equipment	-0.031	0.030	-1.02	0.32	17	0.00
Miscellaneous Manufacturing Industries	-0.070	0.020	-3.48	0.00	56	0.17

industries like electric machinery and automobile and miscellaneous. 10% is significant in lumber and wood products and pulp & paper.

Concerning the nonmanufacturing industry, we also estimated the results by the group of each industry but significant results are rare. This is because the difference of each industry is large, contrary to the manufacturing industry.

There are some industries whose sample size is enough and the results are significant. The growth rate of sales of construction and retail trade are 5% significantly negative. About gas, heat supply and water supply, 5% are significantly negative. The growth rate of total assets of mining and quarrying of stone and gravel, construction and wholesale and retail trade, and pure holding company are 5% significantly negative. About real estate, 10% are significantly negative. About electricity, 10% are significantly negative.

V-2. Stability and Debt Ratio

The results of regression analyses about stability are reported below.

Table 7 reports the results of the probability of operating loss which are regressed to debt ratio. With the whole 1984-2013 period, the coefficient is 15% significantly positive. In the divided period's analysis, with the 1984-1993 period, the coefficient is not significant, but is 15% significantly positive for the period of 1994-2013.

Table 8 reports the results by grouping the manufacturing industry and nonmanufacturing industry. About the manufacturing industry, with the whole period and with divided periods, the coefficient is 5% significantly positive. About the nonmanufacturing industry, the coefficient is not significant.

Table 9 reports the results by grouping large firms and medium-sized firms. About large firms, through the whole period, the coefficient is 10% significantly positive, but in the divided period's analysis, through the 1984-1993 period, the coefficient is not significant, but is 10% significantly positive during the 1994-2013 period. About medium-sized firms, the coefficient is not significant.

Table 10 reports the results by the group of each industry of manufacturing through the whole period. About sales, 5% is significant in chemical, production machinery, fabricated metal products, general-purpose machinery, production machinery and automobile. And 10% is significant in non-ferrous metals and products, business oriented machinery and other transportation equipment.

Concerning the nonmanufacturing industry, we also estimated the results by the group of each industry but there were few significant results. This is because the difference of each industry is large, contrary to the manufacturing industry,

Table 7. Use of Debt and Stability (All-Industries, All-Sizes)

1984-2013 fiscal year n = 1,375 adj R^2= 0.0010

	coefficient	standard error	t-value	p-value
Debt Ratio	0.025	0.016	1.56	0.12
Constant	0.079	0.010	7.70	0.00

1984-1993 fiscal year n = 1,375 adj R^2= 0.0006

	coefficient	standard error	t-value	p-value
Debt Ratio	0.026	0.019	1.37	0.17
Constant	0.040	0.013	3.11	0.00

1994-2013 fiscal year n = 1,375 adj R^2= 0.0011

	coefficient	standard error	t-value	p-value
Debt Ratio	0.029	0.019	1.57	0.12
Constant	0.096	0.011	8.46	0.00

Table 8. Use of Debt and Stability (by Industries)

Manufacturing Firms

1984-2013 fiscal year n = 783 adj R^2= 0.025

	coefficient	standard error	t-value	p-value
Debt Ratio	0.099	0.022	4.57	0.00
Constant	0.054	0.013	4.17	0.00

1984-1993 fiscal year n = 792 adj R^2= 0.023

	coefficient	standard error	t-value	p-value
Debt Ratio	0.10	0.024	4.42	0.00
Constant	0.00	0.016	-0.11	0.91

1994-2013 fiscal year n = 783 adj R^2= 0.019

	coefficient	standard error	t-value	p-value
Debt Ratio	0.10	0.026	4.02	0.00
Constant	0.077	0.015	5.20	0.00

Non-manufacturing Firms

1984-2013 fiscal year n = 592 adj R^2= -0.0005

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.021	0.025	0.85	0.39
Constant	0.087	0.016	5.25	0.00

1984-1993 fiscal year n = 583 adj R^2= 0.0021

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.044	0.030	-1.48	0.14
Constant	0.077	0.022	3.54	0.00

1994-2013 fiscal year n = 592 adj R^2= -0.0013

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.013	0.027	-0.50	0.62
Constant	0.094	0.017	5.41	0.00

Table 9. Use of Debt and Stability (by Sizes)

Large Firms

1984-2013 fiscal year n = 1,245 adj R^2= 0.0016

	coefficient	standard error	t-value	p-value
Debt Ratio	0.028	0.016	1.73	0.084
Constant	0.074	0.010	7.25	0.00

1984-1993 fiscal year n = 1,201 adj R^2= -0.0005

	coefficient	standard error	t-value	p-value
Debt Ratio	0.012	0.0020	0.61	0.54
Constant	0.047	0.014	3.48	0.00

1994-2013 fiscal year n = 1,245 adj R^2= 0.0015

	coefficient	standard error	t-value	p-value
Debt Ratio	0.032	0.019	1.70	0.09
Constant	0.091	0.011	8.06	0.00

Medium-Sized Firms

1984-2013 fiscal year n = 129 adj R^2= -0.0077

	coefficient	standard error	t-value	p-value
Debt Ratio	-0.010	0.069	-0.15	0.88
Constant	0.13	0.045	2.92	0.00

1984-1993 fiscal year n = 174 adj R^2= 0.012

	coefficient	standard error	t-value	p-value
Debt Ratio	0.091	0.052	1.75	0.082
Constant	0.00	0.039	0.00	1.00

1994-2013 fiscal year n = 129 adj R^2= -0.008

	coefficient	standard error	t-value	p-value
Debt Ratio	0.00	0.080	0.00	0.97
Constant	0.15	0.050	2.91	0.004

Table 10. Use of Debt and Stability (by Detailed Industries, Manufacturing Firms)

The Coefficient of Debt Ratio (1984-2013 fiscal year)

	coefficient	standard error	t-value	p-value	n	adj R^2
Food	-0.030	0.083	-0.36	0.72	74	-0.012
Textile Products	0.063	0.229	0.28	0.78	26	-0.038
Lumber and Wood Products	0.12	0.033	3.5	0.18	3	0.85
Pulp, Paper and Paper Products	0.010	0.102	0.10	0.92	14	-0.082
Printing and Allied Industries	0.153	0.148	1.0	0.38	5	0.018
Chemical and Allied Products	0.080	0.033	2.4	0.017	133	0.036
Petroleum and Coal Products	0.084	0.176	0.48	0.64	13	-0.069
Ceramic, Stone and Clay Products	0.015	0.096	0.16	0.88	35	-0.030
Iron and Steel	0.12	0.131	0.95	0.35	36	-0.0030
Non-Ferrous Metals and Products	0.017	0.160	0.11	0.91	33	-0.0319
Fabricated Metal Products	0.26	0.084	3.0	0.00	40	0.17
General-Purpose Machinery	0.29	0.108	2.7	0.012	27	0.20
Production Machinery	0.23	0.072	3.2	0.002	73	0.11
Business Oriented Machinery	0.18	0.094	2.0	0.062	25	0.11
Electrical Machinery Equipment and Supplies	0.063	0.077	0.82	0.42	51	0.00
Information and Communication Electronics Equipment	0.066	0.094	0.70	0.49	49	-0.011
Motor Vehicles, Parts and Accessories	0.21	0.061	3.5	0.001	73	0.13
Other Transportation Equipment	0.27	0.127	2.1	0.054	17	0.17
Miscellaneous Manufacturing Industries	0.022	0.117	0.19	0.85	56	-0.018

There are some industries whose sample size is enough and results are significant. About electricity, gas and water supply and scientific, professional and technical services, etc. 5% are significantly negative. All others are not significant.

VI. Conclusions

In this paper, we find that firms with low debt ratios grow more. We can't see significant relationships between the debt ratio and the firms' growth in some cases, but positive relations were never found. We also find that firms with a low debt ratio show more financial stability. This result suggests that a high growth rate of firms doesn't mean such firms sacrifice their stability. It isn't true that firms can't grow because of the availability of debt; rather the degree of use of debt becomes lower when they grow.

Appendix. Relationship between the Beginning Debt Ratio and Growth/Stability

In this paper, we focus on the long-term relationship between the debt ratio and the firms' growth and stability, but these results only imply two-way relationships.

One method to observe the effect of using debt on the firms' growth and stability is to examine the relationship between the beginning debt ratio and the firms' subsequent growth and stability. The main results are shown below.

Of course, such results don't always mean a one-way relationship. For example, it's possible to interpret that the beginning debt ratio becomes low when high growth is expected, or firms may repay early as they grow. It's important to compare with the results of long-term relationships.

Table 11 shows the results for the entire period. As for growth, when the beginning debt ratio is lower, the subsequent growth rate is higher. As for stability, when the beginning debt ratio is higher, the subsequent stability is also higher (i.e. the probability of operating loss is lower), and this result isn't consistent with that of long-term analysis. These tendencies were found even when the period was divided.

Table 11. Relationship between Beginning Debt Ratio and Growth
(All-Industries, All-Sizes)

Sales 1984-2013 fiscal year

n = 1,374 adj R^2= 0.040

	coefficient	standard error	t-value	p-value
Beginning Debt Ratio	-0.039	0.005	-7.62	0.00
Constant	0.037	0.004	9.97	0.00

Total Assets 1984-2013 fiscal year

n = 1,375 adj R^2= 0.091

	coefficient	standard error	t-value	p-value
Beginning Debt Ratio	-0.037	0.003	-11.28	0.00
Constant	0.050	0.002	21.41	0.00

Table 12. Relationship between Beginning Debt Ration and Stability
(All-Industries, All-Sizes)

All Industries
1984-2013 fiscal year n = 1,375 adj R^2= 0.0014

	coefficient	standard	t-value	p-value
Beginning Debt Ratio	-0.028	0.016	-1.72	0.085
Constant	0.113	0.012	9.67	0.00

Nonmanufacturing Industries
1984-2013 fiscal year n = 592 adj R^2= 0.0098

	coefficient	standard	t-value	p-value
Beginning Debt Ratio	-0.062	0.024	-2.62	0.009
Constant	0.119	0.018	6.55	0.00

However, when observed by industries, the results of stability of manufacturing firms were the same as those of the long-term analysis. It means the positive relationship between the beginning debt ratio and firms' stability is found only in the cases of nonmanufacturing firms. The results by sizes aren't shown here, because the results change when the analysis period is divided.

The results of growth by industries and by sizes aren't shown either. These results were the same as those of the long-term relationship analysis.

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