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Empirical Analysis of Enterprise Financial Sustainable Development Based on the Structural Equation. Examples of Automobile Listed Company in China

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Abstract

Based on the sustainable development model of Van Horne extended dynamic equilibrium and the structural equation model, this paper uses the signed rank test of Wilcoxon to judge whether the automobile manufacturing enterprises achieve sustainable development or not. Furthermore, it tests the data reliability and validity dependent on the coefficient of Cronbach's α and principal component analysis. Finally, it utilizes the structural equation to explore the reasons that cause unsustainable development. The results show that the listed company failed to realize sustainable development, 56.46% appear excessive growth and the remaining are insufficient. Besides, the sequence reasons leading to the unsustainable development of are as follows: the profit ability, operation ability, growth ability and debt paying ability.

Keywords: Structural Equation, Sustainable Development, Automobile Manufacturing.

Introduction

China is in the process of industrialization, automobile industry covers a wide range of relative industries. The development of automobile industry could generate employment; enhance technological progress and the upgrading of the industrial structure. According to the state planning of the 12th Five, it puts forward the challenges that automobile industry is facing, from the ascension of scale and efficiency, brand construction, the handle of core technology, the appearance of new alternative energy, the development of core supporting parts and risk management ability. Here, from the view of financial, how to realize the sustainable development, what reasons lead to the unsustainable development and how to coordinate the different financial ability show great significance.

Literature Review

The sustainable development of enterprises, it is the collaborative development of sorts of different financial ability. For the definition, it also has different understanding and emphasis. Guo Fuchu (2006) put forward the cultivation of five financial abilities. These are the sustainable development ability of financing, investment, profit, payment and governance. The sustainable development rate is the enterprise, individual and society. Van Horne (1988) came up with the steady equilibrium model and the dynamic equilibrium model in the conditions of issuing new shares and un-issuing new shares respectively, then came up with the sustainable growth rate = (sales net interest rate × asset turnover ×equity multiplier ×retained yield)/(1 - sales net interest rate × asset turnover × equity multiplier ×retained yield). This paper based on the Van Horne relaxed condition of issuing new shares of the dynamic equilibrium model, puts forward the four dimensions of profit ability, operation ability, debt-paying ability and growth ability to study the sustainable development of enterprises.

To the research of financial sustainable development, one is directly dependent on the single financial index to verdict the status of sustainable development, such as Shuiying and Rongqiu (2000), through the index of return on equity (ROE), to measure the capability of capital accumulation and development. Song Jianfeng (2000) found that the sustainability of earnings per share (EPS) could predict the sustainability of the healthy development for listed companies. Hongjun (2000) argued that ownership structure influences governance structure and incentive mechanism, and then affect the sustainable development of the listed company. These above can only be the reflection of one aspect, the absence of all-round analysis and the utility of different financial indicators may cause the adverse conclusion for the same company.

The second based on the cross-section regression analysis, to discriminate the listed company will fall into financial distress or not. Such as Jing (1999); Shinong, Xianyi (2001); Xiuhua (2002) take the listed company of ST(Special Treatment) and un-ST as samples, and use the indexes of earnings growth, return on assets, current ratio, long-term liabilities, shareholders' equity ratio and asset turnover, equity concentration and gross profit margin to predict the listed company financial crisis. These studies have assumed that the continuous loss of listed company which means the companies fall into financial distress, it can be said that financial distress impacts enterprise sustainable development, but does not suggest that the company do not fall into financial distress is sustainable development. Furthermore, it also cannot predict the status of enterprise's sustainable development and coordination degree.

The third aspect is through the establishment of sustainable growth model. Kaixi (2001) analyzed the sustainable growth model of earnings per share and discussed the effectiveness of management efficiency, assets consumption, capital structure, distribution and financing policy for the profit after tax growth. Yonghong (2002); Dongwei (2005) chose kinds of financial indicators of listed companies to construct a sustainable development model, and use panel-data for empirical research. It analyzed the long-term performance of listed companies in China and revealed the formation mechanism of the sustainable development of the inner link between among different financial indicators. These models consider the interaction of company's financial resources, capital structure and dividend policy, but it cannot take the company's various financial capacities into consideration.

Model Selections and Construction

Model Selection

This paper is based on the structural Equation model (Structure Equation Modeling, SEM) to study the sustainable development situation and the influence factors. SEM is the application of linear equation system indicating the relationship of observation variables and latent variables. What is more, it is the statistical combination of factor analysis and path analysis. The use of factor analysis and Bayesian theory effectively solve the measurement of theoretical variable, using path analysis verify and explore the relationship between the variables, so as to avoid the condition that a single variable represents the sustainable growth, but the multivariate analysis of the indexes, latent variables and interaction effects.

Sample Selection

According to the listed company industry classification of the CSRC (China Securities Regulatory Commission), the car listed companies in this paper comprise the vehicle and parts production enterprises. Besides, it choose the financial data of 21 automobile listed companies as samples that meet time span from 2002 to 2011 from the database of CSMAR(China Stock Market & Accounting Research). What is more, this paper takes SPSS18.0 for the statistical analysis, data reliability, validity analysis and signed rank test of Wilcoxon, employs AMOS17.0 to construct the structure equation and complete path analysis.

Data Test and Index Selection

The data in this paper, firstly, completed the normalization processing based on the formula (1), then convert it to a five interval-scale. After the successive test of reliability and validity, and finally choose 18 financial indicators. Among them, the actual growth and sustainable growth represent the latent variable of growth gap. The profit margin on sales, net profit growth rate, net profit rate of total assets, earnings per share, return on equity and cost profit margin represent the latent variable of profitability. Accounts receivable turnover, current assets turnover rate, inventory turnover ratio, total assets turnover signify the latent variable of operation ability. Current ratio, quick ratio and cash ratio represent the latent variable of debt-paying ability. Retained earnings, capital accumulation and total asset growth represent the latent variable of growth ability.

$$y_i = \frac{x_i - \min(x_i)}{\max(x_i) - \min(x_i)}$$
(1)

$$y_i = \frac{100(x_i - \min(x_i))}{\max(x_i) - \min(x_i)}$$
(2)

$$F_i = \sum_{i=1}^{k_i} X_i * W_i$$
(3)

$$F = \sum_{i=1}^{k_i} F_i$$

(4)

This paper uses the coefficient of Cronbach's α to test the reliability of the variable, the higher the value, the better of stability. The total coefficient of Cronbach's α is 0.786 and the ability coefficient of profit, operation, debt-paying and growth are 0.812, 0.624, 0.837 and 0.529 respectively. The reliability test of total factor, profit ability and debt-paying ability are relative ideal while it is just general satisfied for the operation ability and growth ability. But on the whole, these are more than 0.5 and meet the reliability requirements. The Cronbach's α coefficient is shown in table 1.

Table 1. The results of reliability test after translating into five interval-scales

Latent variable	Variables (n)	Coefficient	Total coefficient
Profitability	6	0.812	
Operation	4	0.624	0.786
Debt-paying	3	0.837	
Growth	3	0.529	

Table 2. The value of KMO for four abilities

Profitability	0.795	Operation	0.650
Debt-paying	0.703	Growth	0.536

The paper, bases on the KMO (Kaiser-Meyer-Olkin) and Bartlett, detects the data whether suitable for exploratory factor analysis or not. The results are 0.795, 0.650, 0.703 and 0.536 shown in table 2, both greater than 0.5. Therefore, it is suitable for exploratory factor analysis.

Empirical Researches
The condition of sustainable growth for car listed company
The paper, through the paired samples and Wilcoxon signed rank, to demonstrate the growth excessive or insufficient.

Table 3. The statistical description of actual growth rate and sustainable growth rate

	mean	maximum	minimum	n	S. D.
Actual growth rate	0.1807	0.93	-0.48	209	0.01784
Sustainable growth rate	0.1222	1.15	-0.60	209	0.01103

Table 4. The statistics results of Wilcoxon signed rank test

Actual —	Positive	Negative	equal	mean	S.D.	t	df	Sig.
Sustainable	118	91	0	0.058	0.301	2.8	209	.000

Table 3 reflects the mean of actual growth (0.1807) is greater than the sustainable growth (0.1222) and Table 4 shows the results of Wilcoxon test, the positive rank number is 118 accounting for 56.46%, negative rank number is 91 constituting 43.54% and the equal is

zero. The significance probability of T test is less than 0.000 and the mean with the subtraction of the actual growth and sustainable growth is 0.058, then it reject the original hypothesis under the significance level a = 0.05. Namely, there is significant difference between the sustainable growth and actual growth and it do not realize the sustainable development. Compared with the previous studies, Li Xiuzhu (2007), Ding Xin, Lu Nan (2009) reached the same conclusion and appeared excessive growth. The next will discuss what cause the unsustainable growth.

Construction and Operation of the Initial Structural Equation Model

The paper based on the observation variables of actual growth and sustainable growth, represents the latent variable of growth gap, and then constructs other four latent variables; these are the ability of profit, operation, debt-paying and growth. Lastly, explores the causes of the growth gap through the confirmatory path analysis. The results of initial structure equation model as shown in figure 1:
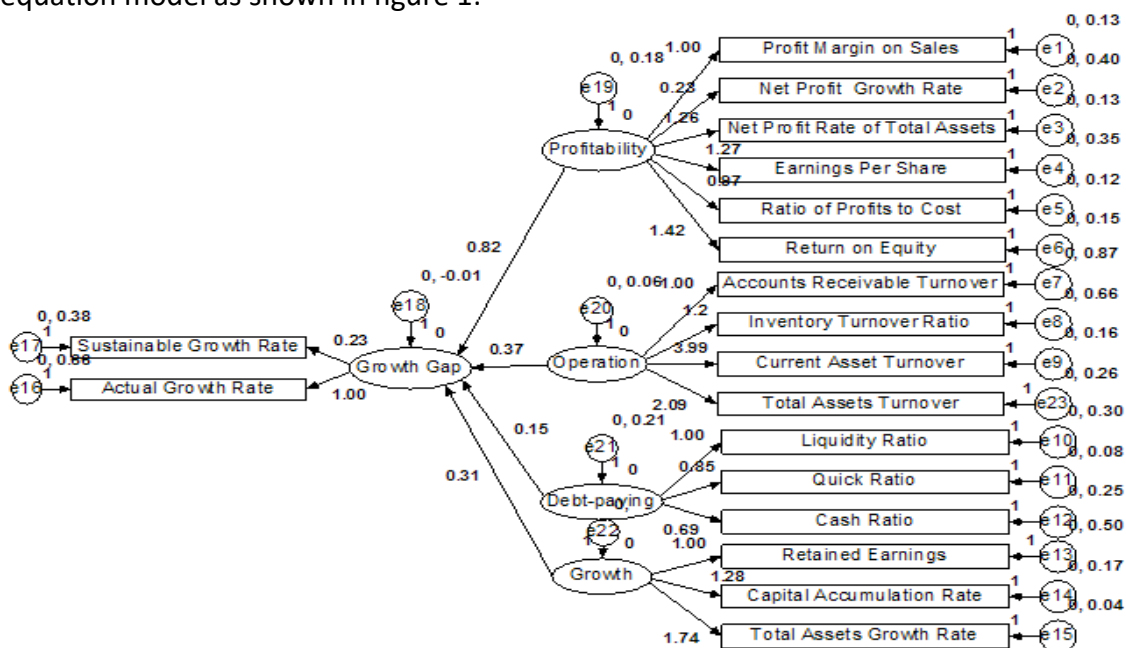

Figure 1. Operation result of the initial structure equation model

Table 5. Fitting index of the structural equation model

Fitting index	x²/df	RMESA	GFI	NFI	AGFI	CFI	PCFI
Index value	6.541	0.245	0.631	0.542	0.583	0.569	0.489

Figure 1 shows the relative contribution of latent variables to growth gap, the path coefficients are 0.82, 0.20, 0.15 and 0.31 respectively. Whereas the fitting values of GFI, NFI, AGFI and CFI are less than 0.9. Accordingly, the model is not ideal.

Therefore, the paper needs to modify the initial model. From the statistical M.I. (Modification Indices) of structure equation model, the M.I. values of four latent variables, total assets turnover and debt-paying ability, earnings per share and retained revenue, net profit growth rate and retained earnings are high, indicating that there are covariant

relationships. The modification of structural equation model is shown in figure2:
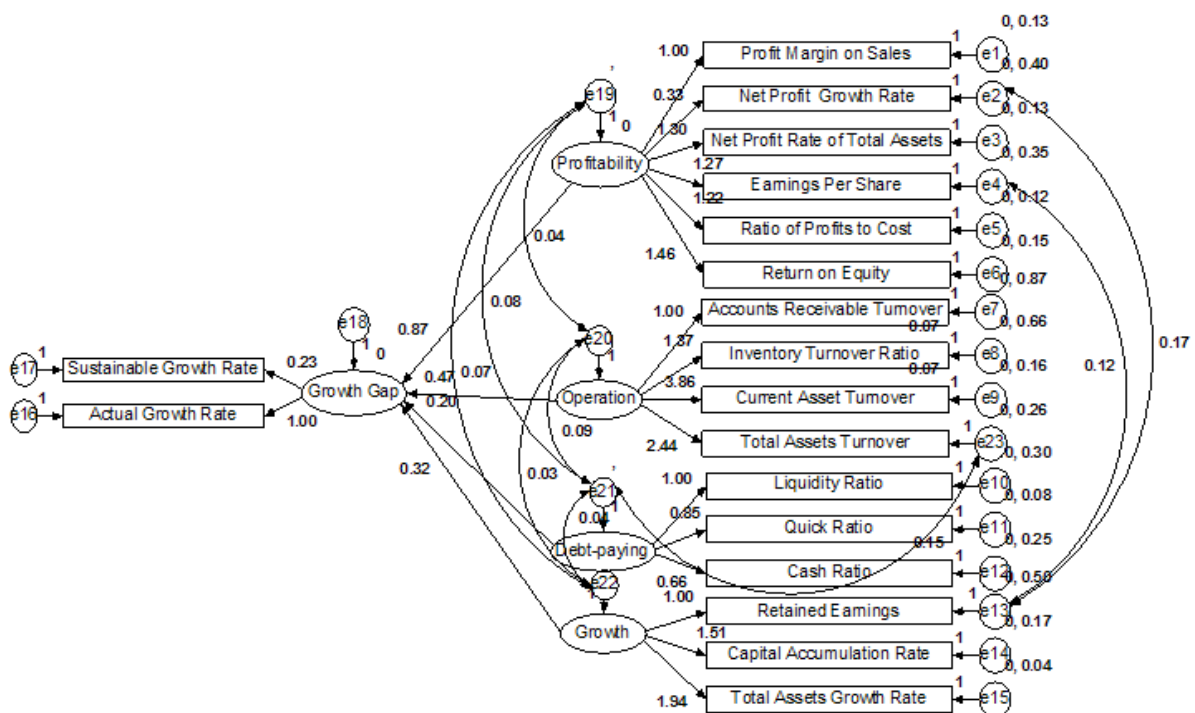

Figure 2. The revised results of structural equation model

Table 6. The fitting index of structural equation model

Fitting index	x^2/df	RMESA	GFI	NFI	AGFI	CFI	PCFI
Index value	1.575	0.067	0.913	0.915	0.840	0.955	0.57

Table 6 shows the fitting index value of structural equation model, in addition to AGFI slightly less than 0.9, other fitting indexes reach significance level, x^2 / df < 2, RMESA <0.08, PCFI > 0.5, GFI, NFI and CFI are greater than 0.9, therefore the correction model is relatively ideal.

Explore the Causes to the Growth Gap Based on Structure Equation Model

In view of the variation analysis of sustainable growth and the actual growth, Chen Jian (2009) concluded that the sensitivity of factors to the sustainable growth is different. The most sensitive factor is the asset turnover and the equity multiplier, namely the ability of operation and debt-paying, followed by the profit margin on sales, i.e. profitability, finally retained earnings, i.e. growth ability. Wang Aina (2009), Zhao Guanhua (2009) studied the causes of financial distress through the comparison of ST and un-ST companies, discovered that the main characteristics of the distress was a decline in margins and the cutoff of free cash flow, namely the profitability decline and liquidity shortage.
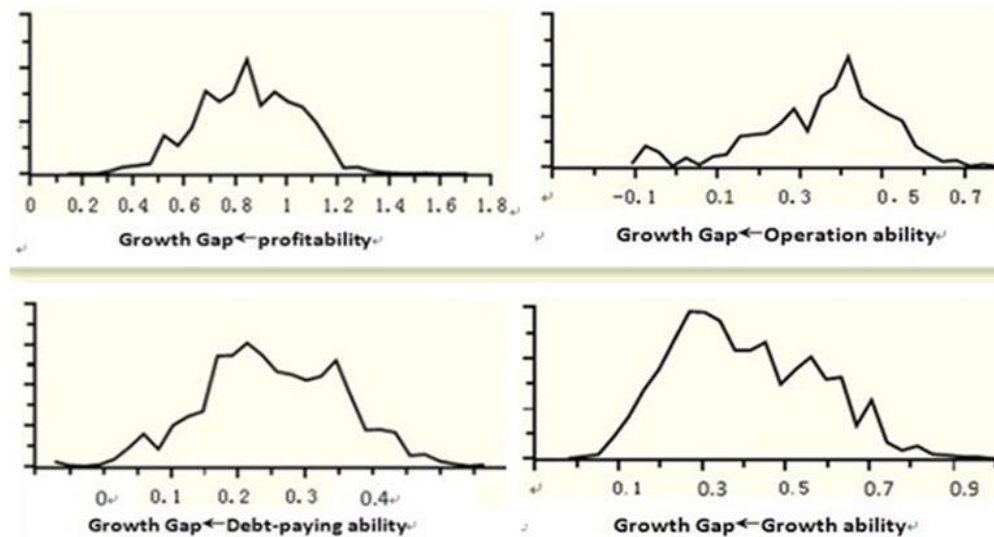
Figure 3. Coefficient of latent variables to growth gap with Bayesian distributions

Table 7. The path coefficient of regression and parameters

Path	Estimate	S.E.	C.R.	P
Growth gap←profitability	0.87	.046	5.622	.000
Growth gap←operation ability	0.47	.031	0.876	.031
Growth gap←debt-paying ability	0.20	.079	1.928	.054
Growth gap←growth ability	0.32	.009	2.288	.022

The study shows that the path coefficients of profitability, operation, debt-paying and growth are 0.87, 0.47, 0.20 and 0.32 respectively, demonstrating that the factors cause unsustainable growth from big to small followed by profitability, operation ability, growth ability and debt-paying ability, as shown in figure 3 and table 7. Profitability is the mirror of enterprise profit ability, the income for investors and the source of capital interests for creditors. The path coefficient is 0.87. From the sequence of relative importance, these observation variables constituting latent profitability are return on equity, return on total assets, earnings per share, profit margin on sales, ratio of profits to cost and profit growth rate, the path coefficients are 1.46, 1.30, 1.22, 1.00, 0.96 and 0.33 respectively.

Operation capacity places the second and the path coefficient is 0.47. The relative path coefficients of current asset turnover, total assets turnover, inventory turnover and receivable turnover are 3.86, 2.44, 1.37 and 1.00 separately. For the accounts receivable turnover in a certain period, the faster the turnover, the higher the efficiency. It is not only beneficial to call in a loan and decrease the possibility of loss on bad debts, but also improve the liquidity and short-term debt repayment. Furthermore, the inventory turnover can not only signify the market condition, but also be used to measure the inventory management.

Growth ability is consistent with the increase of assets and market share in the unpredictable market environment. The coefficients of total assets growth rate, capital accumulation rate and retained earnings are 1.94, 1.61 and 1.00. Besides, the growth ability is directly affected by profitability and vise verse, the profitability exerts the cumulative effect on the enterprise growth. The observation variables of debt-paying ability are the liquidity ratio, quick ratio and cash ratio, the path coefficients are 1.00, 0.85 and 0.66 respectively. Here in order to meet the test of reliability and validity, the paper eliminates the long-term

index of debt-paying ability. Hence, there is a problem that only short-term index of debt-paying ability.

At the same time, the covariance between four latent variables is small, but there are the influences between each other. Seen from Figure 2, the covariance between total assets turnover and latent variable of debt-paying ability is 0.15, indicating that the asset turnover not only affects the management of enterprise asset, but also impacts the enterprise's debt-paying ability. What is more, the net profit growth rate and earnings per share have a direct impact on the retained earnings and the covariance coefficient is 0.1 and 0.12.

Rankings of Sustainable Ability in Automobile Manufacturing Enterprises

From the Figure 2 of revised structure equation model, the observation variable path coefficient of profitability w_1=(1.00、0.33、1.30、1.22、0.96、1.46); the path coefficient of operation w_2=(1.00、1.37、3.86、2.44); the path coefficient of debt -paying ability w_3 =(1.00、0.85、0.66) and the path coefficient of growth ability w_4 = (1.00、1.61、1.94). Firstly, the paper translates the sample data into centesimal system through the formula (2), then multiply by the coefficient of relative proportion of the total score according to formula (3). Lastly, calculates the summation according to formula (4) and all the financial ability of each enterprise show in table 8.

Table 8. The rankings of sustainable development for automobile enterprises

Company	Profitability		Operation		Debt-paying		Growth		Total	
	S	R	S	R	S	R	S	R	S	R
Faw	62.87	2	28.43	6	52.92	1	28.29	10	172.51	1
SAIC	68.76	1	26.50	9	44.02	2	28.91	8	168.19	2
Foton	61.25	5	60.07	1	16.73	20	27.48	12	165.53	3
Dongfeng	61.53	4	23.97	13	41.85	3	29.00	7	156.34	4
King Long	55.45	9	35.14	5	29.75	11	32.56	4	152.89	5
Jiangling	51.52	10	42.47	3	28.84	13	28.60	9	151.42	6
Jianghuai	43.48	13	47.42	2	23.35	16	32.61	3	146.86	7
Yutong	61.88	3	10.73	21	41.73	4	31.40	5	145.75	8
Yaxing	56.66	8	14.60	19	41.43	5	25.42	17	138.12	9
Changan	47.23	11	37.62	4	16.19	21	33.42	2	134.46	10
CNHTC	59.05	6	20.10	15	26.01	15	25.95	14	131.11	11
Jinbei	41.51	15	27.88	7	33.81	8	27.70	11	130.90	12
Xingma	37.24	16	27.57	8	31.51	9	33.74	1	130.05	13
DFS	57.65	7	26.11	11	18.73	19	26.37	13	128.86	14
Shuguang	42.62	14	24.04	12	30.70	10	31.15	6	128.50	15
Zhongtong	46.18	12	17.10	17	29.70	12	25.44	16	118.42	16
Haima	27.65	20	22.93	14	40.52	6	25.47	15	116.58	17
Ankai	33.40	18	19.32	16	36.26	7	24.06	18	113.04	18
FAW Xiali	34.56	17	26.22	10	19.64	18	21.92	20	102.34	19
Bothwin	28.27	19	13.34	20	27.06	14	21.95	19	90.62	20
Guihang	25.64	21	16.72	18	23.17	17	15.53	21	81.05	21

NOTE: S and R on behalf of the Score and Ranking respectively

From Table 8, it shows the unbalance of different abilities in the first echelon of the Faw and SAIC. The debt-paying ability and profitability of Faw rank number one and two,

demonstrating the strong profitability and sufficient cash flow to deal with credit risk. While the growth ability ranks the tenth and there is a bottleneck of growth. Similarly, the SAIC is analogous to Faw with high profitability and ample cash flow. However, the operation capacity and growth ability place in ninth and tenth, explaining the problem in assets operation management and impetus of growth. From the last of Guihang, the poor profitability will lead to the un-coordination of different abilities in the sustainable development.

Research Conclusions and Suggestions

The realization of the sustainable development is the system within the synergy of financial abilities, features an enterprise lasting vitality and development capability. This paper, based on the structural equation model, explores the reasons that cause unsustainable development. The results show that the listed company failed to realize sustainable development, the sequence of the reasons are as follows: the profitability, operation ability, growth ability and debt-paying ability. Subsequently, the suggestions of this study are as follows:

(1) Improve the profitability; optimize the internal control and management of cost and cash flow; avoid the idle assets and excessive spending in management cost. Furthermore, the enterprise should implement the scientific and stringent marketing and credit policy to exploit the market and control the risk.

(2) Enhance the operation efficiency of enterprise's assets; strengthen the aging analysis of accounts receivable, control losses of bad debt, elevate the utilization efficiency of inventory turnover and fixed asset, so as to accelerate the asset liquidity. Based on ABC (Activity-Based Costing Management) to optimize the resources allocation and business process, facilitate the capital turnover and boost the enterprise capital efficiency.

(3) The company should strike balance with ability of profitability, operation, debt-paying and growth, intensify the integration with the capital factors of equity capital, financial leverage and dividend payments. Coordinate financial strategy with industry development cycle of initial, growth, maturation and decline. According to the different stages of enterprise, the enterprise should adopt appropriate financial strategy at the right time, such as stripping or M&A, to realize the complementary advantages and the sustainable development.

Acknowledgments

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