



Study on the Enterprise Sustainable Growth and the Leverage Mechanism

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Abstract

The sustainable growth is the necessary condition for the survival and the development of the enterprise, and it is thought as the scale to measure the strength of the enterprise. In this article, we first compared the James·C·VanHorne sustainable growth model and the Robert·C·Higgins sustainable growth model, and analyzed the main mechanism of two sorts of leverage, i.e. the influencing degree of different intervals to the profits, and established the sustainable growth model based on the leverage effect, and simply validated the data. The sustainable growth model based on the leverage effect could make the investors consider the functions of two sorts of leverage, design various financial indexes suiting for the survival and development of the enterprise, reasonably invest and finance to realize the sustainable growth of the enterprise before they grasp the investment and financing situation of the enterprise.

Keywords: Enterprise sustainable growth, Degree of Operating Leverage (DOL), Degree of Financial Leverage (DFL)

1. Introduction

The financial idea of the sustainable growth means the actual growth of the enterprise must harmonized with its resources. The quicker growth will induce the shortage of the corporate resources and even the financial crisis or bankruptcy. And slower growth will make the corporate resources can not be effective utilized, which will also induce the survival crisis of the enterprise.

VanHorne's sustainable growth model is the quantitative description of the sustainable growth rate which is the variance of the sales income, i.e. SGR or $\Delta S/S$.

$$SGR\left(\frac{\Delta S}{S}\right) = \frac{b\left(\frac{NP}{S}\right)\left(1 + \frac{D}{Eq.}\right)}{\left(\frac{A}{S}\right) - b\left(\frac{NP}{S}\right)\left(1 + \frac{D}{Eq.}\right)} \quad (1)$$

Where, A/S is the rate of the total assets and the sales, NP/S is the net profit rate, b is the retained profits ($1-b$ is the dividend ratio), $D/Eq.$ is the ratio of the debt and the equity, S is the sales in the recent year (the sales of the initial year), and ΔS is the absolute variance of the sales in the recent year.

But the sustainable growth rate model put forward by Higgins is to denote the sustainable growth rate as the quotient of the yearly retained earning variance and the initial net value.

$$g = \frac{E\left(1 - \frac{Div.}{E}\right)}{OE} = \frac{\Delta RE}{OE} \quad (2)$$

Where, g is the yearly net income growth rate or the sustainable growth rate, E is the yearly income, $Div.$ is the yearly dividend, ΔRE is the retained profit variance, and OE is the initial yearly net assets.

Higgins analyzed the variance of the growth rate form the sources of the growth, and he considered the important function of the return on equity and extended the sustainable growth rate formula as the expression including multiple variables influencing the corporate growth rate. Through this method, we can extend the formula.

$$g = \text{sales net profit rate} \times \text{asset turnover rate} \times \text{equity multiplier} \times (1 - \text{payout ratio}) = \frac{NP}{S} \times \frac{S}{A} \times \frac{A}{Eq.} \times \left(1 - \frac{Div.}{E}\right) \quad (3)$$

This model can be divided into three parts. The first part is the ratio about the management, i.e. the asset turnover ratio.

The second part is the ratio about the financial indexes, and it includes the equity multiplier and the payout ratio, and the third part is the sales net profit rate which can be further divided into the ratios about the management and the financial indexes. In this article, we will introduce DOL and DEL to indicate the influence of the leverage coefficient on the sustainable growth rate.

2. Leverage effect

2.1 Operating leverage

The generation reason of the operating leverage is that the resource consumption or the total cost in the production and management process must include a part of fixed costs. The existence and the variance of the fixed costs are the root of the operating leverage, and they are the essential, not the surface of the operating leverage effect. If the fixed costs don't exist in the total costs generated in the corporate management process, the operating leverage effect will not occur.

The operating leverage is defined as the influence or function of the sales variance to the profits in certain proportion of the fixed costs. The operating leverage is generally denoted by the degree of operating leverage (DOL), and it is the ratio of the earnings variance before interest and tax (EBIT) and the sales variance rate, i.e. the percentage of the profit variance before interest and tax ($\Delta EBIT$) induced by the output (or sales) variance. The formula of the operating leverage degree is

$$DOL = \frac{\Delta EBIT / EBIT}{\Delta S / S} \quad (4)$$

For the computation, according to formulas $EBIT = Q(P-V) - F$ and $\Delta EBIT = \Delta Q(P-V)$, the formula (4) can be changed to

$$DOL = \frac{Q(P-V)}{Q(P-V) - F} = \frac{S - C}{S - C - F} \quad (5)$$

Where, Q is the sales quantity, P is the sales unit price, V is the variable cost of the unit sales, F is the sum of the fixed costs, S is the turnover, and C is the amount of the variable costs which can be confirmed by the product of the variable cost rate and the sales amount.

From the formula (5), when the operating status of the enterprise tends towards the breakeven point, i.e. $(P-V)Q = F$, the operating leverage degree achieves the maximum, and the operating risk of the enterprise achieves the maximum. Any tiny changes about the variance will induce the large changes about EBIT, and the EBIT will slide between the profit and the loss. When other variables keep constant and the sales quantity Q gradually increases, the marginal contribution will increase and the proportion of the marginal contribution in the fixed assets will gradually increase, and the function of the operating leverage will gradually decrease, i.e. the operating risk of the enterprise will gradually decrease. For the enterprise with serious loss, the operating leverage can not fully exert the function, and the small change about the variable will contribute little to enhance the EBIT of the enterprise. Only when the financial status of the enterprise will begin to gradually improve, the operating leverage will gradually exert the function. This sort of change tendency embodies the instructive function of the DOL on the variance of the corporate sustainable growth rate.

2.2 Financial leverage

Financial leverage is the utilization of the debt financing when constituting the capital structure decision. And it is an important factor to measure whether the corporate capital structure is reasonable. People usually call the influence of the loan capitals as the financial leverage function. The financial leverage function of the debt usually is measured by the DFL which means the multiplier of the corporate equity capital income variance relative to the profit variance rate before the tax.

$$DFL = \frac{\Delta EPS / EPS}{\Delta EBIT / EBIT} \quad (6)$$

For the computation, according to $EPS = (EBIT - I)(1 - T) / N$ and $\Delta EPS = \Delta EBIT(1 - T) / N$, the formula (6) can be changed to

$$DFL = \frac{EBIT}{EBIT - I} \quad (7)$$

The reasonable usage of the financial leverage can bring extra profits for the corporate equity capital, and because the financial leverage is influenced by many factors, so the immeasurable financial risks will occur when obtaining the profits of the financial leverage. Therefore, we should seriously study the financial leverage and analyze various factors influencing the financial leverage.

The financial leverage coefficient can be used to predict the after-tax profit and the earnings per share of common stock, and its main function is to measure the financial risk degree of the enterprise. When the enterprise is in the loss, i.e. when the after-interest profit is less than zero, the financial leverage coefficient obtained through the formula (7) must be negative. When the enterprise achieves the critical point of the financial effect, i.e. when the after-interest profit of

the enterprise (i.e. EBIT-I) is zero, the financial leverage coefficient will be infinite, and the financial risk degree achieves the maximum. When the after-interest profit of the enterprise exceeds zero, the financial leverage coefficient is bigger, the influence of EBIT on the after-tax profit will be larger, and the financial risk degree will be higher, on the contrary, the financial leverage coefficient is smaller, the financial risk degree will be lower.

3. Establishment of the model

(1) The computation of the asset turnover ratio considers the influence of the operating leverage degree, and the computation formula of the asset turnover ratio utilizes the formula (5).

$$\frac{S}{A} = \frac{C + \frac{F}{DOL - 1}}{A} = \frac{C}{A} + \frac{F}{A} \times \frac{1}{DOL} \quad (8)$$

Where, C/A is the ratio of the variable cost and the total asset, and F/A is the ratio of the fixed cost and the total asset.

In this way, the change of the asset turnover ratio is influenced by the ratio of the variable cost and the total asset, the ratio of the fixed cost and the total asset and the operating leverage degree. From the formula (8), when the ratio of the variable cost and the total asset and the ratio of the fixed cost and the total asset is bigger, the asset turnover ratio is higher, and the increase of the fixed cost will also induce the decrease of the operating leverage degree, and both integrated effect will influence the increase of the enterprise. When the operating status of the enterprise tends towards the breakeven point, i.e. when it tends towards the (P-V)Q=F, the operating leverage degree achieves the maximum, and the asset turnover ratio of the enterprise tends toward zero and the enterprise presents the zero growth. When other variables keep constant and the sales Q gradually increase, the marginable contribution increases, and the proportion of the marginable contribution in the fixed assets gradually increase, and the function of the operating leverage gradually decreases, and both integrated effect will make the growth rate of the enterprise gradually decrease, which accords with the analysis of the operating leverage.

(2) The computation of the net profit rate should consider the influence of the financial leverage coefficient, and the formula (7) can be utilized to change the computation formula of the net profit rate.

$$\frac{NP}{S} = \frac{(EBIT - I)(1 - T)}{S} = \frac{(EBIT / DFL)(1 - T)}{S} = \frac{EBIT}{S} \times \frac{1}{DFL} \times (1 - T) \quad (9)$$

In the formula (9), EBIT/S is the rate of the earnings variance before interest and tax, and the rate of the income tax is supposed as 40% in the article.

So the change of the net profit rate will be influenced by the profit rate before the interest and tax and the variance of the financial leverage coefficient. The above analysis of the financial leverage coefficient value comes into existence vice versa, and when the financial leverage coefficient is negative, and the after-tax profit is less than zero, and the net profit rate is negative, and the enterprise will be recombined or bankrupted. When the financial leverage coefficient is infinite, the net profit rate tends towards zero, and when the financial leverage coefficient is positive and the increase of the financial leverage coefficient is induced by the increase of the loan interest, and the profit after tax will increase because of the tax shield, i.e. the net profit rate increases and the growth rate of the enterprise increases, on the contrary, the financial leverage coefficient is smaller, the growth rate of the enterprise is lower.

From the formula (8), the formula (9) and the formula (3), we can obtain the sustainable growth model of the leverage effect.

$$g = \left(\frac{EBIT}{S} \times \frac{1}{DFL} \times (1 - T) \right) \times \left(\frac{C}{A} + \frac{F}{A} \times \frac{1}{DOL} \right) \times \frac{A}{Eq.} \times \left(1 - \frac{Div.}{E} \right) \quad (10)$$

From the formula (10), the influencing factors of the corporate sustainable growth rate include the profit rate before the tax and interest (EBIT/S), the degree of financial leverage (DFL), the rate of the variable cost and the total asset (C/A), the ratio of the fixed asset and the total assets (F/A), the degree of operating leverage (DOL), the equity multiplier (A/Eq.) and the payout ratio (Div./E).

4. Model example and application meaning

When simulating the sustainable growth model based on the leverage effect, suppose the F/A, the EBIT/C, the A/Eq. and the Div./E are fixed, and the interest on debt of the enterprise is unchangeable (10% in the article). Under the situation that some conditions are fixed, in the continual accounting period, we simulate the change tendency of SGR and prove the model through the example.

Example: To indicate the sustainable growth rate, we design the primary inputs or variables of the first year of certain company (seen in Table 1).

Suppose the company has sufficient subsequent equity capitals to increase of the variable costs.

Utilize the formula (10) to compute the sustainable growth rate, and the change tendencies of the obtained SGR and other variables are seen in Table 2.

The formulas which can be used include

$$NP_{i+1} = NP_i \times (1 + SGR_{i+1})$$

$$EBIT_{i+1} = (EBIT_i - D \times 10\%) \times (1 + SGR_{i+1}) + D \times 10\%$$

$$S_{i+1} = EBIT_i + C_i + F$$

$$C_{i+1} = C_i \times EBIT_{i+1} / EBIT_i$$

$$A_{i+1} = (C_{i+1} + F) / 2$$

$$DFL_{i+1} = EBIT_i / (EBIT_i - D \times 10\%)$$

$$DOL_{i+1} = (S_i - C_i) / (S_i - C_i - F)$$

$$DL_{i+1} = DFL_{i+1} \times DOL_{i+1}$$

$$SGR_{i+1} = \frac{EBIT_i}{S_i} \times \frac{1}{DFL_{i+1}} \times (1 - 40\%) \times \left(\frac{C_i}{A_i} + \frac{F}{A_i} \times \frac{1}{DOL_{i+1}} \right) \times \frac{A_i}{(A_i - D)} \times (1 - 0.05)$$

Table 2 shows the changes of the profit before the interest and tax, the sales income, the variable costs, the DOL, the DFL, the total leverage degree and the growth rate under the situation that the rate of the profit before the interest and tax and the variable costs, the ratio of the objective assets and the total costs and the objective payout ratio are fixed and there are not subsequent fixed costs and debt financing, i.e. in the continual accounting period, the sustainable growth rate of the enterprise is positively proportional with the DOL and the DFL and the total leverage degree, which indicates that if the enterprise keeps fixed objective asset sales rate and other fixed indexes, so the growth rate of the company will gradually decrease, i.e. the functions of two sorts of leverage will be weakened, and the changes of the enterprise growth rate, the DOL and the DFL gradually change slowly, which also reflects the positive correlation among three parties.

The financial leverage is the reasonable utilization of the debt, and the operating leverage is the reasonable utilization of the fixed costs. We suppose under the situation that other factors influencing the leverage and the initial fixed costs of the enterprise increase and the increase of the initial fixed costs are only assumed by the increase debts, and we can obtain the change tendency of the corresponding sustainable growth rates of the different fixed costs (seen in Table 3).

From Table 3, we can see that when the increase of the initial fixed costs is assumed by the fixed debt, with the increase of the fixed costs, the DOL and DFL of the enterprise will increase, and the total leverage degree will increase, and the sustainable growth rate will increase, which indicates the tax shield function of the debt, and the positive correlation among the DOL, DFL and the SGR.

Through the example analysis of the model, managers can obtain the change tendency of the SGR in the continual accounting period. Through the combination of these two sorts, managers can analyze the growth mode which suits for the actuality of the industry to realize the optimal growth.

The analysis of the leverage effect possesses strong instructive meaning for the SGR of the enterprise.

- (1) The leverage effect exists objectively, and its reasonable utilization will increase the value of the enterprise.
- (2) The leverage effect has the associated effect, and the existence of the DFL restricts managers, and we should consider the pressure of the repayment and the possibility of future bankruptcy when reasonably utilize the tax offset function of the interest. When the existence of the DOL restricts that the managers reasonably arrange the proportion of the fixed costs, we should also consider the operating ability and the financing ability of the enterprise.
- (3) The leverage effect reflects the risks faced by the enterprise, and the comprehensive risk management combining with the information offered by the risk management department will produce good effect.

First, managers should analyze the leverage effects of the enterprise and make DOL and DFL in the values that they can exert active functions when they make decisions, and then obtain the reasonable values of various operating rates from the analysis of the growth rate model, and realize the optimization of the corporate capital structure and the operating efficiency.

5. Conclusions

In this article, we analyzed the disadvantages of the sustainable growth model, established the sustainable growth model based on the leverage degrees, and proved that the fixed costs and the debt interest influenced the leverage degrees and influenced the main rule of the corporate growth in the subsequent period, and the final conclusion was that the SGR is positively proportional with two leverage coefficients, and the DFL possessed the instructive function for the investors, and investors could obtain the initial investment of the corporate fixed costs, the proportion of the debt capitals and the objective value of the relative financial rates through the prediction analysis when they studied out the SGR in the next period.

The SGR model based on the leverage effect in this article supposed that the enterprise could possess sufficient subsequent equity capitals to compensate the capital demands induced by the continually increase of the variable costs when the enterprises had not subsequent fixed costs and debt financing kept unchangeable in the continual period. In practice, to suit of the economic tendency of the increasingly drastic market competition and the increasingly expanding enterprise size, the investment of the fixed costs and the debt financing can not be kept constant, which is the disadvantage of the model, and we should further explore and study it in future works and leanings.

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Table 1. Table of primary inputs or variables

Symbols	Primary inputs or variables	Sum or ratio
S	Initial owner equity capital (million Yuan)	600
EBIT/C	Ratio of EBIT with variable cost (invariable)	60/380
A/S	Objective asset selling rate (invariable)	0.45
Div./E	Objective payout ratio (invariable)	0.05
i	Debt interest rate (%)	10
D	Debt capital (million Yuan) (invariable)	180
F	Fixed cost (million Yuan) (invariable)	160
NP	Initial retained profits (million Yuan)	25

Table 2. SGR change tendency in the continuity interval

Period	1	2	3	4	5	6	7	8	9	10	11
NP	25	29.7	35.0	41.5	48.5	56.7	66.1	77.0	89.6	104.2	121.1
EBIT	60	67.9	76.8	87.1	98.9	112.5	128.2	146.3	167.3	191.7	219.8
S	600	658	724	799	885	985	1100	1233	1387	1566	1772
C	380	430	487	552	626	712	812	927	1060	1214	1392
A	270	295	323	356	393	436	486	543	610	687	776
DFL		1.429	1.361	1.306	1.261	1.223	1.191	1.163	1.140	1.121	1.104
DOL		3.667	3.357	3.082	2.837	2.618	2.423	2.248	2.094	1.956	1.835
DL		5.238	4.568	4.025	3.576	3.201	2.884	2.616	2.387	2.192	2.025
SGR(%)		18.78	17.96	17.42	17.05	16.80	16.62	16.48	16.38	16.30	16.23

Table 3. SGR change tendency with changeable fixed costs in the continuity interval

Period Variable		1	2	3	4	5	6	7	8	9	10	11
		F=140 D=160	DFL		1.364	1.308	1.261	1.223	1.191	1.163	1.140	1.120
DOL			3.333	3.058	2.813	2.595	2.401	2.229	2.075	1.940	1.820	1.715
DL			4.545	3.998	3.549	3.174	2.859	2.593	2.366	2.173	2.008	1.867
SGR(%)			18.25	17.64	17.23	16.94	16.73	16.58	16.46	16.36	16.28	16.22
F=150 D=170	DFL		1.395	1.334	1.283	1.241	1.206	1.177	1.152	1.130	1.112	1.096
	DOL		3.500	3.207	2.948	2.716	2.510	2.325	2.162	2.016	1.888	1.774
	DL		4.884	4.278	3.783	3.372	3.028	2.736	2.489	2.279	2.099	1.945
	SGR(%)		18.49	17.78	17.32	16.99	16.76	16.59	16.47	16.37	16.29	16.22
F=160 D=180	DFL		1.429	1.361	1.306	1.261	1.223	1.191	1.163	1.140	1.121	1.104
	DOL		3.667	3.357	3.082	2.837	2.618	2.423	2.248	2.094	1.956	1.835
	DL		5.238	4.568	4.025	3.576	3.201	2.884	2.616	2.387	2.192	2.025
	SGR(%)		18.78	17.96	17.42	17.05	16.80	16.62	16.48	16.38	16.30	16.23
F=170 D=190	DFL		1.463	1.389	1.329	1.280	1.239	1.205	1.175	1.151	1.129	1.111
	DOL		3.833	3.506	3.216	2.958	2.727	2.520	2.336	2.171	2.025	1.896
	DL		5.610	4.870	4.275	3.786	3.379	3.036	2.746	2.498	2.287	2.107
	SGR(%)		19.13	18.16	17.54	17.13	16.84	16.64	16.49	16.39	16.30	16.23
F=180 D=200	DFL		1.500	1.418	1.353	1.300	1.256	1.219	1.188	1.161	1.138	1.119
	DOL		4.000	3.654	3.350	3.078	2.835	2.618	2.423	2.249	2.095	1.958
	DL		6.000	5.183	4.533	4.002	3.561	3.191	2.878	2.612	2.385	2.191
	SGR(%)		19.54	18.39	17.68	17.21	16.89	16.67	16.51	16.39	16.31	16.24