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DETERMINANTS OF RETURN ON EQUITY: NASDAQ-100 INDUSTRY SECTORS

Thesis theme:

**The qualification and regulation
of the financial efficiency of the company**

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The DuPont method.

The original DuPont method is illustrated below [1].

$$\text{Return on Assets (ROA)} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} = \frac{\text{Net Income}}{\text{Total assets}} \quad (1)$$

The original DuPont method was used as a measure of profitability (profit margin) and efficiency (asset turnover). As debt financing (leverage) became common in companies, the financial leverage (equity multiplier) was added to the original DuPont formula which later became the modified DuPont method. The formula of the modified DuPont method is presented below [2].

$$\text{ROE} = \frac{\text{Net profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Shareholder's equity}} \quad (2)$$

Another modification was introduced which further decomposed the components and resulting in extended DuPont method which is presented below [3].

$$\begin{aligned} & \frac{\text{Net Income}}{\text{Avg. shareholders' equity}} \\ &= \frac{\text{Net income}}{\text{EBIT}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Avg. total assets}} \\ & \times \frac{\text{Avg. total assets}}{\text{Avg. shareholders' equity}} \end{aligned} \quad (3)$$

Where,

EBT- earning before taxes

EBIT- earnings before interest and taxes

In addition to the components of extended DuPont method, price to earnings (P/E), Price to book (P/B) and current ratio are also incorporated in the analysis.

Since the units of measure of the variables are different, the linear functional form of the model is transformed into a logarithmic functional form which is also known to reduce dispersion of variable's values. The regression results are presented in both original and logarithmic values. The OLS regression analysis is carried out on two major industry sector samples: technology and consumer. The former consists of the largest information technology companies of the world, whereas, the latter consists of the largest consumer companies in the world.

Empirical results.

The first model presents a R-squared equal to 0,8621 for original values and the second model presents higher R-squared value of 0.9847. The results with logarithmic values are better due to higher R-squared value. The F-test results for both normal and logarithmic values are statistically significant for a significance level of 1%. The Root MSE is much lower for regression model using logarithmic values, indicating much higher accuracy compared to the model with normal values. Therefore, only the results of second model are considered.

According to the results, tax burden, interest burden, operating margin, asset turnover, financial leverage ratios (extended DuPont components) have the most impact on return on equity. The impact of P/E and P/B is lower compared to extended DuPont components. The CUR ratio is not statistically significant.

As was the case with the results of OLS for technology sample, the results of the second for consumer sector model are considered as R-squared, F test and Root MSE indicate higher accuracy. According to the results, tax burden, interest burden, operating margin, asset turnover, financial leverage ratios (extended DuPont components) are the main drivers of ROE. The CUR, PE and PB ratios are

not statistically significant, therefore, a conclusion cannot be withdrawn regarding the influence of these variables on return on equity.

Table 1.
Description of dependent and independent variables and the expected relation between them

Variable	Abbreviation	Description	Ratio	Unit of measure	Type of association
Return on equity	ROE	Amount of income returned as a percentage of shareholders equity	$ROE = \frac{\text{Net income available for common shareholders}}{\text{average total common equity}} \times 100\%$	%	n/a
Tax burden	TB	The proportion of the company's profits retained after paying income taxes	$TB = \frac{\text{Net income available for common shareholders}}{\text{Pre-tax income}} \times 100\%$	%	+
Interest burden	IB	Measures the effect on interest on ROE	$IB = \frac{\text{Pre-tax income}}{\text{Operating income (loss)}} \times 100\%$	%	+
Operating margin	OM	Measures how much is left of revenue considering cost of goods sold and operating expenses	$OM = \frac{\text{Operating income}}{\text{Net sales}} \times 100\%$	%	+
Asset turnover	AT	Measures the efficiency of a company's use of its assets in generating sales revenue	$AT = \frac{\text{Net sales}}{\text{Average total assets}}$	€	+
Financial leverage	FL	Is the use of borrowed capital to increase potential return of an investment	$FL = \frac{\text{Average total assets}}{\text{Average total common equity}}$	€	(+) / (-)
Price-to-earnings	PE	Measures a company's current share price relative to its per-share earnings	$PE = \frac{\text{Last price}}{\text{Earnings per share}}$	€	-
Price-to-book	PB	Compares a stock's market value to its book value	$PB = \frac{\text{Last price}}{\text{Book value per share}}$	€	+
Current ratio	CUR	Measures a company's ability to cover its short-term liabilities with its current assets	$CUR = \frac{\text{Current assets}}{\text{Current liabilities}}$	€	+

Note: The ratios are acquired from Bloomberg database and were used to calculate the variables in study. The notation n.a. means that is an expected relation is not applicable. ROE is the dependent variable

Source: Author's calculations using Bloomberg data retrieved on 23.02.2016

Table 2.
Results of the OLS regression analysis for the technology sector sample, using original measurement units and logarithmic values

Variables	Model 1: Normal values				Model 2: Logarithmic values					
	Estimated coefficient	Standard Robust Error	p-value	VIF	Estimated coefficient	Standard Robust Error	p-value	VIF		
TB	0.13	0.066	0.066	*	2	0.98	0.149	0.000	***	2.25
IB	0.21	0.106	0.065	*	2.2	0.54	0.248	0.041	***	2.5
OM	0.67	0.126	0.000	***	1.46	0.87	0.056	0.000	***	2.2
AT	22.22	5.403	0.000	***	1.68	0.87	0.058	0.000	***	3.04
FL	6.95	1.456	0.000	***	1.79	0.71	0.128	0.000	***	3.26
PE	-0.01	0.034	0.723		1.94	-0.13	0.071	0.090	**	4.03
PB	0.39	0.081	0.000	***	1.56	0.20	0.079	0.020	**	4.28
CUR	-0.13	0.680	0.845		1.41	-0.05	0.033	0.180		1.72
Constant	-54.72	13.621	0.001	***		-6.33	1.577	0.001	***	

n = 32
R-squared= 0.8621
F-Test (8, 23) = 126.97 ***
Root MSE = 3.9997
Ramsey test: F (3, 20) = 0.28

n=32
R-squared= 0.9847
F-test (8, 23) = 1009.39 ***
Root MSE = 0.06749
Ramsey test: F (3, 20) = 0.19

Notes: * means that the coefficient presents a 10% level of significance; ** means that the coefficient presents a 5% level of significance; *** means that the coefficient presents a 1% level of significance

Source: Author's calculations using Bloomberg data retrieved on 23.02.2016

Table 3. Results of the OLS regression analysis for the consumer sector sample, using original measurement units and logarithmic values

Variables	Model 1: Normal values				Model 2: Logarithmic values					
	Estimated coefficient	Standard Robust Error	p-value	VIF	Estimated coefficient	Standard Robust Error	p-value	VIF		
TB	0.25	0.185	0.193	2.71	0.91	0.079	0.000	***	1.89	
IB	0.07	0.124	0.555	1.28	1.05	0.064	0.000	***	1.63	
OM	1.47	0.221	0.000	***	2.28	0.87	0.079	0.000	***	7.3
AT	18.48	6.268	0.007	***	1.91	0.88	0.094	0.000	***	9.01
FL	14.96	2.876	0.000	***	2.77	0.93	0.057	0.000	***	6.28
PE	0.00	0.284	0.990	2.75	6.25	-0.12	0.081	0.149		
PB	0.09	1.086	0.936	2.05	6.78	0.12	0.092	0.196		
CUR	0.54	1.863	0.775	1.79	1.87	-0.01	0.015	0.538		
Constant	-86.91	25.759	0.002	***		-8.45	0.749	0.000	***	

n = 34
R-squared= 0.9022
F-Test (8, 25) = 25.48 ***
Root MSE = 13.339
Ramsey test: F (3, 22) = 98.97***

n=33
R-squared= 0.9934
F-test (8, 24) = 1082.18 ***
Root MSE = 0.0805
Ramsey test: F (3, 21) = 1.82

Notes: * means that the coefficient presents a 10% level of significance; ** means that the coefficient presents a 5% level of significance; *** means that the coefficient presents a 1% level of significance

Source: Author's calculations using Bloomberg data retrieved on 23.02.2016

In order to get an understanding of industry effects the results of regression analysis for all companies should be compared with the industry samples.

Table 4. Comparative analysis of OLS regression results

Variables	Nasdaq-100 componnets			Technology sector			Consumer sector			Other sectors		
	Estimated coefficient	p-value		Estimated coefficient	p-value		Estimated coefficient	p-value		Estimated coefficient	p-value	
TB	0.94	0.000	***	0.98	0.000	***	0.91	0.000	***	1.00	0.000	***
IB	0.95	0.000	***	0.54	0.041	***	1.05	0.000	***	1.01	0.000	***
OM	0.89	0.000	***	0.87	0.000	***	0.87	0.000	***	1.02	0.000	***
AT	0.90	0.000	***	0.87	0.000	***	0.88	0.000	***	1.00	0.000	***
FL	0.89	0.000	***	0.71	0.000	***	0.93	0.000	***	1.02	0.000	***
PE	-0.10	0.037	**	-0.13	0.090	**	-0.12	0.149		0.01	0.267	
PB	0.14	0.042	**	0.20	0.020	**	0.12	0.196		0.00	0.922	
CUR	-0.03	0.132		-0.05	0.180		-0.01	0.538		0.00	0.985	
Constant	-8.24	0.000	***	-6.33	0.001	***	-8.45	0.000	***	-9.39	0.000	***

Source: Author's calculations using Bloomberg data retrieved on 23.02.2016

As shown in table 4, extended DuPont components are the main drivers of ROE independent of sample. This finding empowers the viability of DuPont analysis as a sophisticated tool for financial ratio analysis. According to table 4, PE and PB ratios are not statistically significant in consumer sample. The underlying reason could be intra-sector wide dispersion of ROE and other indicators in consumer sector. Even though Consumer sector companies operate in the same sector their nature of operations and business model varies. Whereas, technology sector is more homogeneous.

References:

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