The Application of Multi-Factor Model in Analyzing Corporate Payout Ratio
——Take Apple as an Example

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ABSTRACT

By taking Apple as an example, herein, multiple linear regression analysis of sample data was carried out to obtain the conclusions of the influencing factors of cash dividend policy of listed companies. The results show that the company's short-term solvency has significant impact on the payout ratio. The current ratio, equity attributable to shareholders of the parent company/interest-bearing debt, EBITDA/ total operating income and net cash flow per share from operating activities (%) are negatively correlated with the dividend payout ratio. While quick ratio, total equity/debt attributable to shareholders of the parent company, interest multiple earned (EBIT/ interest expense), operating profit/total debt, the number of inventory turnover days and return on equity (annualized) are positively correlated with the dividend payout ratio.

Keywords: multiple linear regression analysis, dividend payout ratio, Apple

1. INTRODUCTION

Based on the dividend distribution theory, more dividend distribution will increase corporate value, and it will reduce retained earnings at the same time. If companies borrow heavily, their cost of capital will increase dramatically, undermining their profitability. Public companies can pay dividends in cash or stock. When a stock dividend is chosen, the number of shares outstanding and the value of each share will be increased and decreased, respectively. Paying stock dividends can send a message to the market that the company will have greater development in the future. This information will increase the stock price. In addition, public companies may choose to increase equity, reducing capital reserves for equity.

Dividend theory mainly contains two kinds of types, namely dividend irrelevant theory and dividend related theory. Dividend irrelevant theory means that dividend policy has nothing to do with corporate value. The premise of this theory is that the value of a company is only determined by the risks and benefits of its operation under perfect market conditions. While dividend correlation theory, in which it is believed that stock prices will be affected by the company's dividend policy, contains dividend signal transmission theory, dividend customer effect theory and dividend agency cost theory. Dividend signaling theory holds that dividend policy is a tool for managers to transmit information about corporate earnings to the market. According to the dividend customer effect theory[1], different shareholders have different preferences, including dividend and capital gain, to obtain investment income, resulting in different dividend policies. The theory of dividend agency cost holds that dividend distribution can reduce companies' the agency cost. Up to now, there are no unified explanations of dividend theory in academic circles.

Herein, we reported the influencing factors of cash dividend policy of Apple by using multiple linear regression analysis.

2. LITERATURE REVIEW

2.1 Dividend payout ratio and profitability

Lintner[1] (1956) selected 28 companies from more than 600 mature listed companies to conduct a detailed investigation and concluded that most companies pay more attention to the relative change of dividend payment level rather than the absolute value. Listed companies

will set the dividend payout ratio as a specific value and maintain a dividend payout ratio for a long time in the future dividend distribution. Baker, Powell & Veit (2002) [2] conducted a questionnaire survey on CEOS, CFO and other management personnel of American companies listed on NASDAQ, concluding that the company's current and future earnings are very important to the formulation of dividend policy.

2.2 Dividend payout ratio and growth opportunities

Rozeff[3] (2006) selected 1,000 listed companies from 64 industries for empirical research and found that there is a significant negative correlation between the company's revenue growth rate and cash dividend payout rate. The higher the expected annual growth rate, the lower the cash dividend payout rate.

2.3 Relationship between dividend payout ratio and industry category

According to the research results of Dhrymes & Kurz[4] (1967), we can conclude that there are obvious differences in cash dividend policies among different industries. Compared to companies in mature industries, emerging industries have greater potential for future development and will face more investment opportunities, so that the company will appropriately reduce the level of cash payment.

2.4 Cash Flow

Jensen & Michael C[5] (1986) found that the payment of cash dividends was negatively correlated with the company's disposable free cash flow.

2.5 Equity Structure

Rozeff[6] (1982) took 1,000 American companies as samples for empirical analysis and found that companies with higher shareholding ratio of external shareholders and lower shareholding ratio of insiders tend to have higher dividend payout ratio.

2.6 Debt Level

Kalay[7] (1982) found that companies using financial leverage would limit dividend payment because dividend payment would cause wealth transfer.

3. RESEARCH SCHEME DESIGN

3.1 Theoretical basis and hypothesis of influencing factors of cash dividend policy

In this paper, we reported the internal factors that may affect apple's cash dividend distribution policy. Firstly,

the following theoretical assumptions are proposed:

(1) Profitability

Profits are positively correlated with the willingness of pay cash of companies. If the profit of a listed company is stable, then it has an excellent image in the market and can obtain funds with relatively low cost of capital. Companies are willing to distribute profits to shareholders in return for their investment.

Hypothesis 1: The more profitable a company is, the more inclined it is to pay cash.

(2) Debt level

Corporate debt will bring the following impacts: firstly, the company will face increased financial risks. Therefore, the company will be more inclined to choose to retain earnings to avoid further deterioration of financial situation. Secondly, according to the research results of Smith & Warner[8], we can find that in order to protect their rights and interests, creditors will impose constraints on the management of the company through various restrictive clauses, such as restricting the company's payment of cash dividends.

Hypothesis 2: The higher the debt level, the more inclined the company is to withhold cash.

(3) Cash flow

A company needs to have enough cash to deal with the daily production and operation activities, so the company will give full consideration to the company's cash flow at the moment of distribution.

Hypothesis 3: The more cash-rich the company, the more inclined it is to pay out cash.

(4) Equity structure

Ownership structure includes ownership attribute and ownership concentration. The equity attribute actually is the identity of the shareholder, which can be an individual, an institution and a country. Ownership concentration is used to measure the distribution of the company's equity and is often expressed by the shareholding ratio of the largest shareholder. According to the theory of dividend customer effect, different shareholders have different preferences for dividend forms. Shareholders of tradable shares have less preference for cash dividends because they can benefit from the price differences between the shares. On the contrary, non-tradable shareholders do not have a spread as compensation, so they tend to prefer cash dividends.

The influences of ownership concentration on cash dividend can be considered from the perspective of agency cost. The higher the ownership concentration, the lower the agency cost, so that major shareholders have less incentive to rely on cash dividends to reduce agency costs. However, as the factor of ownership concentration contains a large subjective component and is easily

affected by sudden macro risks. Therefore, this paper does not take ownership concentration as an influential factor of dividend payout ratio.

Hypothesis 4: Ownership concentration does not affect the company's dividend payout ratio.

(5) Liquidity

Liquidity is the ability of a company to turn its assets into cash without losing their value. When the company has strong liquidity, that is, it can obtain funds without huge cost when it is in urgent need of funds, the company will not reserve a lot of cash at present, and the company is more likely to pay cash.

Hypothesis 5: The stronger the liquidity, the higher the company's delivery level.

(6) Growth

Generally, companies will prioritize internal financing and consider external financing later. This is because external financing tends to be more complicated and needs longer waiting times along with higher risks.

Hypothesis 6: The stronger the growth capacity, the lower the company's payout level.

(7) Macro environment

Since the global financial crisis in 2008, financial risks have been accumulating in various countries around the world. Financial authorities in some countries have not taken appropriate measures to release and defuse risks. In addition, as black Swan events occur frequently, the international financial environment has increasingly impacted the company, making it difficult to maintain stability and sustainability of the company's decisions.

Hypothesis 7: The company's payout ratio is not affected by macro risks in the short term.

3.2 Determination of variables

This paper studies the cash payout data of Apple Inc., taking the cash dividend payout rate as the explained variable, starting from apple's financial data from 2011 to 2021. Firstly, the financial data can be divided into five categories: short-term debt paying ability, long-term debt paying ability, operating ability, profitability and growth ability. Then, all factors are analyzed by the dividend payout ratio via one-way regression analysis, and their R^2 is calculated. Then the correlation coefficient between the dividend payout ratio and each factor were calculated, and the factor with large correlation coefficient R^2 was selected as independent variable to conduct multiple regression analysis with the dividend payout ratio.

3.2.1 Analysis of financial indicators of short-term solvency

Among them, the financial indicators to measure short-term solvency are current ratio, quick ratio, monetary capital/current liabilities, operating profit/current liabilities, net cash flow from operating activities/current liabilities. With the dividend payout ratio as the explained variable and the above five financial indicators as independent variables, five times of unitary regression analysis were conducted respectively and the correlation coefficients between them were calculated. The results are shown in **Table1**. From the results in the table, the flow ratio and quick ratio were selected, which were denoted as X_1 and X_2, respectively.

Table1 The financial indicators to measure short-term solvency.

Indicators	R^2	The correlation coefficient
Current ratio	-0.453	0.205
Quick ratio	-0.466	0.217
Monetarycapital/current liabilities	0.118	0.014
Operating profit/current liabilities	-0.106	0.011
Net cash flows/current liabilities from operating activities	-0.13	0.017

3.2.2 Analysis of financial indicators of long-term solvency

Financial indicators to measure long-term solvency are total net cash flow from operating activities/liabilities, net cash flow from operating activities/interest-bearing debt, net cash flow from operating activities/net debt, equity/liabilities attributable to shareholders of the parent company, total EBITDA/debt, earned interest multiple (EBIT/ interest expense), ratio of long-term debt to working capital, operating profit/total debt, with dividend payout ratio as the explained variable, the above nine financial indicators as independent variables, Nine unary regression analyses were conducted respectively and the correlation coefficients between them were calculated, which are shown in **Table 2**. According to the results in the table, the total of equity/debt attributable to the shareholders of the parent company, the total of equity/interest-bearing debt attributable to the shareholders of the parent company, the interest multiple earned (EBIT/ interest expense) and the total of operating profit/debt are selected as four factors, which are respectively written as, X_3, X_4, X_5, and X_6.

Table 2 Financial indicators to measure long-term solvency.

Indicators	R^2	The correlation coefficient
Total net cash flows/ liabilities from operating activities	-0.266	0.071
Net cash flows from operating activities/interest-bearing debt	-0.191	0.036
Net cash flow/net debt from operating activities	0.106	0.011
Total equity/liabilities attributable to shareholders of parent company	-0.604	0.365
Equity/interest-bearing debt attributable to shareholders of the parent company	-0.438	0.192
Total EBITDA/Liabilities	-0.23	0.053
Interest multiple earned (EBIT/ interest expense)	-0.835	0.697
Ratio of long-term debt to working capital	-0.057	0.003
Total operating profit/liabilities	-0.236	0.056

3.2.3 Analysis of the financial indicators to measure the operation capability

Financial indicators to measure operational capabilities are business cycle, inventory turnover days, the accounts receivable turnover days, the inventory turnover ratio, current asset turnover, fixed asset turnover, total assets turnover ratio, dividend payout ratios as be explained variable, the above seven financial indicators as independent variable, respectively, seven times a yuan regression analysis and compute the correlation coefficient between them, the results in **Table 3**. According to the results in the table, the number of inventory turnover days is selected, with a total factor, denoted as X_7.

Table 3 Financial indicators to measure operational capabilities.

Indicators	R^2	The correlation coefficient
Operating cycle	0.233	0.054
Inventory turnover days	0.486	0.236
Accounts receivable turnover days	0.053	0.003
Inventory turnover	0.211	0.044

Current asset turnover	0.103	0.011
Fixed asset turnover	0.048	0.002
Total asset turnover	0.297	0.088

3.2.4 Analysis of financial indicators to measure profitability

Financial indicators to measure profitability are: Return on net assets (years), the net interest rate of the total assets (years), return on total assets (years), return on invested capital (years), the net interest rate of the sales, operating profit/total operating revenues, operating costs/operating revenue, net profit/business revenues, earnings before interest and tax/business revenue, EBITDA/business revenues, With the dividend payout ratio as the explained variable and the above ten financial indicators as independent variables, ten unitary regression analyses were conducted respectively and correlation coefficients between them were calculated, as presented in the **Table 4**. According to the results in the table, return on equity (annualized) and EBITDA/ total operating income are selected, representing two factors, X8 and X9, respectively.

3.2.5 Analysis of financial indicators to measure growth ability

Financial indicators to measure the ability to grow are: Earnings per share - basic (%), net cash flow per share from operating activities (%), year-on-year growth rate of total operating revenue (%), operating profit (%), total profit (%), net cash flow from operating activities (%), with dividend payout ratio as explained variable, the above six financial indicators as independent variables, Six unary regression analyses were conducted respectively and the correlation coefficients between them were calculated. The results are shown in **Table 5**.

Table 4 Financial indicators to measure profitability.

Indicators	R^2	The correlation coefficient
Return on Equity (annualized)	0.796	0.633
Net interest rate on Total Assets (annualized)	0.17	0.029
Return on Total Assets (annualized)	-0.021	0
Return on invested Capital (annualized)	-0.011	0
Net profit margin on sales	0.063	0.004
Operating profit/total operating income	-0.342	0.117
Total operating cost/total operating revenue	0.053	0.125
Net profit/gross operating income	0.063	0.004

Ebit/gross operating income	-0.331	0.11
EBITDA/ Total operating revenue	-0.413	0.17

From the results in the table, the net cash flow (%) generated by operating activities per share is selected, with one factor in total, denoted as X_{10}.

3.3 Determination of model function form

Inspired by Fama-French's three-factor model [9] and "Estimation for dirty data and flawed models" [10,11], construct multiple regression model. The model expression is as follows:

$$Y=\alpha+\mu$$

Where: coefficients α, β_i (i =1,2... 10) is the parameter to be estimated, and is the random error term.

3.4 Description of main estimation and test methods

In this paper, multiple linear regression analysis of sample data is carried out to obtain the conclusions of the influencing factors of cash dividend policy of listed companies. The analysis results are shown in **Table 6-7**.

According to the figure, $R^2=0.923$, $P < 0.001$，The model has good fitting effect. Therefore, the model is:

$$Y=0.928-2.143X_1+2.004X_2+0.414X_3-0.043X_4$$
$$0.001X_5+0.072X_6+0.026X_7+0.002X_8-0.031X_9-0.001X_{10}$$

Table 5 Financial indicators to measure the ability to grow.

Indicators	R^2	The correlation coefficient
Earnings per share - Basic (%)	-0.385	0.148
Net cash flow from Operating Activities per share (%)	-0.46	0.212
Year-on-year growth rate of Total Operating revenue (%)	-0.017	0
Operating profit (%)	0.112	0.013
Total profit (%)	0.098	0.01
Net cash flows from operating activities (%)	0.033	0.001

Table 6-7. The conclusions of the influencing factors of cash dividend policy of listed companies

Model	R	R2	Adjusting R2	Error of standard estimate	Change statistics				
					R2 change	F change	df1	df2	Sig.F change
1	.961a	.923	.889	.0408889607	.923	27.511	10	23	.000

Predictor variable: X_{10}, X_4, X_5, X_9, X_6, X_7, X_1, X_8, X_3, X_2.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	99.0 % confidence interval for B	
	B	standard error	Trial version			Upper limit	Lower limit
1 (constant)	.928	.500		1.855	.076	-.477	2.333
X1	-2.143	1.063	-3.591	-2.016	.056	-5.126	.841
X2	2.004	1.096	3.324	1.829	.0.80	-1.072	5.080
X3	.414	.184	1.280	2.249	.034	-.103	.930
X4	-.043	.020	-.741	-2.161	.041	-.099	.013
X5	-.001	.000	-.646	-3.635	.001	-.001	.000
X6	.072	.108	.071	.665	.513	-.232	.375
X7	.026	.011	.443	2.439	.023	-.004	.057
X8	.002	.001	.483	2.261	.034	.000	.004

X9	-.031	.013	-.499	-2.374	.026	-.068	.006
X10	-.001	.000	-.175	-2.394	.025	-.001	.000

Dependent\: dividend payout ratio.

4. CONCLUSIONS

According to the results of the model, the company's short-term solvency has significant impact on the payout ratio. The current ratio, equity attributable to shareholders of the parent company/interest-bearing debt, EBITDA/ total operating income and net cash flow per share from operating activities (%) are negatively correlated with the dividend payout ratio. While quick ratio, total equity/debt attributable to shareholders of the parent company, interest multiple earned (EBIT/ interest expense), operating profit/total debt, the number of inventory turnover days and return on equity (annualized) are positively correlated with the dividend payout ratio.

It can be seen that the effect of similar indicators on dividend payout ratio is not necessarily in the same direction, which means that more in-depth research on multi-factor model is needed, such as principal component analysis, heteroscedasticity analysis, the influence of macro factors on stocks etc., which are used to revise and improve the model. In addition, the assumptions of the model in this paper are more stringent. When the conditions are relaxed (for example, the impact of the macro environment on the company or the influence of the controlling shareholders on the company's policies, etc.), more rigorous conclusions can be drawn.

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