The determinants of firms' dividend policy

Empirical analysis based on firms in United States

Genius 666

Section 2:

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Section 1: Introduction

Dividend is the part of earnings a company distributes to its shareholders. Dividend policy is essential for investors to make investment decisions and for firms to manage capital allocation. Basically, dividend policy is determined by company's fundamental characteristics. First of all, size may affect dividend policy. We find 70.5% of companies in S&P mid-cap index pay dividends. However, the corresponding figure is 54% for small-cap companies. Secondly, profitability has positive effect on propensity of paying dividends (Fama and French, 2001). Charles Schwab & Co. finds 14% low profitability companies cut their dividends payment, while only around 5% top profitability companies cut dividends during 1990 to 2009. It is reasonable that more profitable company can generate excess income to cover dividends. Thirdly, growth opportunity is another determinant. Firms with less growth opportunity tend to pay dividends (Fama and French, 2001). Instead of paying dividends, high growth companies would reinvest on themselves due to lower capital cost. Furthermore, Mueller (1972) proposed the life cycle hypothesis, suggesting that firm's life-cycle stage would affect dividend payment. Also, DeAngelo, DeAngelo, and Stulz (2006) put forward that firms would pay more dividends when stepping into a more mature stage. Last but not least, liquidity of a company may also play a role in dividends. Companies with stronger cash flow have more resources to pay cash dividends. The purpose of this paper is to figure out what influences the company's decision to pay dividends. We will focus on 5 aspects which are size, profitability, growth opportunity, liquidity, and life cycle.

It is worth looking deeply into what factors influence the payment of dividends. As for companies, they can refer to their financial performance to determine dividend policy. On one hand, appealing dividend policy is good for companies' stock value and market image. Dividend payment sends positive information to stockholders and attract investors. On the other hand, dividend will distribute profits which may slow companies' development. It is critical to make a tradeoff between maintaining investors' loyalty or adding to company's future growth, especially for those young companies who want to leave a good impression on investors while sparing no efforts to develop. As for investors, they value dividend differently in their returns, depending on their preference. Knowing the status of a company, investors can better predict whether dividends will be paid and make their decision with the help of our work.

This paper focuses on US market specifically. We use the latest data from 2007-2018, while Denis and Osobov (2008) use data from 1926 to 1999, DeAngelo, DeAngelo, and Stulz (2006) use data from 1973 to 2002. Therefore, our paper is more representative of the current situation of US companies. In addition, DeAngelo, DeAngelo, and Stulz (2006) particularly focus on impact of life cycle on dividends policy, while we look at multiple factors, hoping to provide a more comprehensive perspective of dividends policy. In addition, we innovatively use panel logit

regression to control for time-constant omitted variables and consider the endogenous problem of cash flow in dividend distribution. We use receivables to total revenue as instrument variable.

Section 2: Data description

Our data was collected from the Center for Research on Security Prices (CRSP) and Compustat database. The sample consists of data of firms listed in NYSE, Nasdaq, and Amex from 2008 to 2017. We restricted our analysis to non-financial and non-utility firms by removing firms with North American Industry Classification System (NAICS) codes beginning with 22 and 52. Besides, we excluded firms with missing value and with negative total equities. To maintain enough within-group variation, we also exclude firms which never paid dividends and always paid dividends during the ten-year period.

We assume that the determinant factors of dividend distribution may include firms' return on assets, sustainable growth rate, total assets, cash to total asset and retained earnings to total equity, which are listed as below. Besides, the calculation of variables is listed in appendix 1.

Table 1: Variable Description

Variable name	Description
Dividend payment	If the firm paid dividend, dividend payment=1; Otherwise, dividend payment=0.
Return on assets (ROA)	ROA measures the profitability of a firm. All other things equal, firms with higher ROA are doing a better job of making profits.
Sustainable growth rate (SGR)	SGR measures the growth opportunity of a firm. All other things equal, firms with higher sustainable growth rates develop faster.
Total assets (TA)	TA measures the size of a firm. All other things equal, firms with more total assets are of larger size.
Cash to total assets (Cash/TA)	Cash to total assets measures the liquidity of a firm. All other things equal, firms with higher cash to total assets have higher liquidity.
Retained earnings to total equity (RE/TE)	Retained earnings to total equity measure the financial life cycle of a firm. All other things equal, firms with higher retained earnings to total equity are better established.

Table 2 shows the descriptive statistics of each variable. We divided the data into two groups, including dividend payers and nonpayers. Then we calculated the median and standard deviation of the two groups. From Table 2, we can see that dividend payers have more profitability and liquidity. Besides, firms that are larger and more mature are more likely to pay dividends. However,

it also shows that nonpayers also tend to have higher sustainable growth rate since they may need to invest more retained earnings to further development.

Table 2: Summary Statistics

	Mean		Standard Deviation	
	payers	non-payers	payers	non-payers
ROA	4.5%	2.4%	36.3%	56.9%
SGR	4.7%	5.4%	94.0%	78.7%
TA	1024	462	20124	11528
Cash/TA	9.4%	13.9%	15.7%	18.1%
RE/TE	40.1%	15.3%	989.8%	683.2%
Number of firms	3703	4093	3703	4093

Section 3: Assumption

Hypothesis 1: The greater retained earnings/total equity (RE/TE) value, the higher the probability that the company will distribute cash dividends.

Hypothesis 2: The greater the total net profit margin (ROA), the higher the probability that the company will distribute cash dividends.

Hypothesis 3: The higher the sustainable growth rate (SGR), the lower the probability that the company will distribute cash dividends.

Hypothesis 4: The larger the company size (LogTA), the higher the probability that the company will distribute cash dividends.

Hypothesis 5: The higher cash to total assets ratio (Cash/TA), the higher the probability that the company will distribute cash dividends.

The panel logit model function is:

$$P\left(Y_{i,t} = 1 \middle| X_{i,t}\right) = \frac{1}{1 + e^{-X_{i,t}\beta}}$$

Section 4: Model Selection and Interpretation

4.1 Model Selection

Table 3: Panel logit regression result

Model 1 to 4 are fixed effects logit regression, model 5 is random effects logit regression. Model 4,5 add dummy time control. Model 4 use OIM standard error.

	(1)	(2)	(3)	(4)	(5)
ROA	4.204037***	4.132***	4.236***	4.280***	4.447***
	(.38345)	(0.378)	(0.390)	(0.424)	(0.326)
SGR	-2.074 ***	-2.070***	-2.132***	-2.140***	-2.239***
	(0.161)	(0.161)	(0.171)	(0.183)	(0.158)
Logta	1.224 ***	1.271***	1.252***	0.776***	0.206***
	(.0744)	(0.076)	(0.078)	(0.081)	(0.024)
CASH/TA		1.306***	1.298***	1.085***	0.309
		(0.377)	(0.376)	(0.390)	(0.257)
RE/TE			0.020***	0.024**	0.037***
			(0.009)	(0.011)	(0.008)
Year effects	No	No	No	Yes	Yes
AIC	2976	2971	2962	2846	4641
p-value for time control	--	--	--	0.000	0.000

Number of observations is 7796.
Standard errors are in parentheses.
*** significant at 1%, ** significant at 5%, * significant at 10%.

Model 4 is the selected model.

We start regression with profitability, growth and size indicators and then add *cash to total assets* and *retained earnings to total equity* as control variables for firm's liquidity and life cycle. They are good for the model's explanation power by lowering AIC. The result is the same for random effects models which are shown in appendix. The AIC is lowest for both fixed and random effects models with dummy time control, containing most information. Also, likelihood ratio test of dummy time control has a p-value < 0.05, indicating time do have effects on decision of paying dividends while other things equal. The Wu-Hausman test provide a p-value < 0.05, therefore the random effects model is inconsistent though more efficient. We choose the fixed effect with dummy time control at last.

The fixed effect logit estimator is inconsistent in the presence of serial correlation and hetero-scedasticity (Wooldridge, 2003). We control these two problems by using observed information matrix (OIM) to modify maximum likelihood estimators' standard error.

The panel logit regression result all supports our hypothesis. *ROA, total assets, cash to total assets and retained earnings/total equity* all have positive coefficients, and *sustainable growth rate* has a negative coefficient. More importantly, all the five variables are statistically significant in our final choice of model 'Fixed Effects with Dummy Time Control'.

4.2 Model Interpreting

Table 4: Average marginal effects of variables

Variable	Average Marginal Effect
ROA/10	6.71%
SGR/10	-3.34%
Logta/10	1.20%
(Cash/TA)/10	1.69%
(RE/TE)/10	0.04%

We calculated Average Marginal Effects (AME) of all the coefficients to make a deeper analysis of the results. The original unit for independent variable is 1 or 100% which is too large for our variables (ratios) in real life. We divide all independent variables by 10 and then calculate the AME for better interpret the effects. The unit change is 0.1, that is 10% for ratios. Table 1 above shows the AME of every variable.

Higher profitability implies higher probability of dividend payment. For every 10% increase in ROA, the average probability increases by 6.71%. Companies with better growth opportunity are less likely to pay dividend. The average probability of paying dividend will decline by 3.34% when sustainable growth rate grows by 10%. Larger companies have less probability to pay dividend. When logarithm total assets grow by 10%, the company will be 0.69% more likely to pay dividend. Cash amount is also a positive driver of companies to pay dividend. If cash accounts for 10% more in total assets, the willingness of a company to pay dividend will be 1.69% larger on average. Companies that are closer to the 'mature' stage in life cycle are more probable to pay dividend. When their retained earnings to total equity increases by 10%, they are 0.04% more likely to pay dividend.

Besides the financial variables, the time variable also affects companies to pay dividends. For years 2008, 2009 and 2010, companies are less willing to pay dividend. It's mainly because companies did not have adequate resources to pay dividend during the global financial crisis.

In total, companies care more about shareholders' loyalty instead of revenue growth when they have higher profitability, less growth opportunity, larger size, adequate cash amount, and are more mature in the life cycle.

4.3 Prediction accuracy test

We randomly chose 4 companies outside our dataset in year 2008 and used our model to predict the probability of paying dividend. The result proves high accuracy of our model. The two companies with predicted probability of more than 50% did pay the dividend in 2008, and the others did not.

Table 5: Model prediction

Dividend payment	RE/TE	ticker	ROA	LogTA	SGR	Cash/ta	Predicted probability
0	-23.15%	PRFT	10.11%	5.08	11.89%	3.93%	13.79%
0	-57.59%	PDFS	-73.93%	4.86	88.54%	25.87%	5.98%
1	48.72%	CYD	2.62%	7.25	6.74%	6.29%	60.58%
1	81.87%	CHD	7.32%	7.89	14.27%	8.40%	73.21%

Section 5: Conclusion

The analysis in this paper shows that profitability, company size, cash and maturity all have positive effects on increasing possibility of dividend payment. And growth opportunity has a negative effect on dividend payment. Our results are consistent to the research result of Fama and French (2001), DeAngelo, DeAngelo, and Stulz (2006) and Denis and Osobov (2008), who used logit model and took average of the coefficients through different years. Our paper confirms their finding using the most recent data and using the panel logistic regression.

The fact that large companies with higher profitability and lower growth rate implies that the board should consider paying dividends, while fast growing companies should pay fewer dividend for investment opportunities exceed the internal generated capital. Our model is also helpful for investors to make their decision. As we all know, dividend payment is a very important factor to consider for conservative investors. Given these results, they should focus on more profitable, larger, sufficient in cash and relatively mature companies.

The conclusions above are subject to a number of limitations.

External validity:

In this paper, we analysis firms in United States. We are not sure whether the result can be applied in other countries, such as UK, China. Each country has unique regulation, cultural, investor preference. The causality of paying a dividend may be different across countries.

Internal validity:

1. Omitted variable bias

The fixed effect model successfully controls for time constant variable omitted bias. However, we still omit some time-varying variables. These variables which both influence dependent variable and correlate with existing independent variables, causing at least one coefficient estimator biased and inconsistent. We fail to include them for they can't be easily measured, or it is hard to find data for all companies.

a. Management Style

Management and operation style vary from company to company, when the financial situations are healthy, dividend initiations and dividend omissions could just be board's preference. Conservative leadership companies have higher dividend possibility (Pelt & Thomas, 2013). Meanwhile management style also affects companies' financial situation. For example, a company with a radical board may choose to invest and expand aggressively, resulting in high *sustainable growth rate*.

b. Shareholder structure

Different shareholder structure will also influence company's decision of paying dividend or not. Individual investors are more risk averse and prefer a steady cash flow while institutional investors like investment banks have ways to hedge risks, so they require less on dividend. Research shows that companies with more individual shareholders are more likely to pay dividend (Khan,2006). Omitting shareholder's structures could also cause bias because the shareholder's structure is associated with firm's life cycle *retained earnings to total assets*, startup companies are mostly financed by Private Equity and institutional investors.

c. Accessibility to capital market

According to He, Zhong, Chen, Huang, Pan, and Shi, if a company could borrow money easily and sufficiently from the bond market, they might unwilling to pay the dividend. Also, financing ability through different channels is highly related to a company's profitability and maturity. Therefore, failure to include this variable could cause OVB.

d. Market sentiment

Market sentiment is the conjecture of individual stocks and the stock market. Market sentiment is passive when major investors see bad financial data. Companies would pay dividend to reverse the passive emotion and comfort shareholders. Sentiment sensitivity of individual stock is an important cross-sectional determinant on dividend policy (Savickas, Robert, Bo Zhao, 2012) and exclude it could cause OVB because sentiments are associated with those financial data.

2. Simultaneous causality

We suspect *cash to total assets* as an endogenous variable for it has simultaneous causality with *dividend payment*. That is, when a firm pays dividend, it will decrease cash percentage; Meanwhile, a firm is more willing to pay dividend when holding plenty of cash. The two-way effects make estimator biased and inconsistent. We then find an instrument variable *receivable to total revenue*. It has negative correlation with *cash to total assets* (the more a firm makes credit sales, the less cash it holds), but won't influence firms on dividend decision. It's a strong instrument variable, but the Wu-Hausman test afterward shows that *cash to total assets* is not endogenous. However, there is no strict statistic test now when "just identified" situation (same number of instrument variable and endogenous variable). So, there is still a possibility that we find a weak instrument, the two-stage regression (OLS and ML) are not reliable.

3. Measurement Error

Measurement error is another factor which may cause endogeneity. Sources of the error may be imperfect methods of recording and estimating financial data, unobserved true values. For example, failure to be in accordance with generally accepted accounting principles (GAAP) will cause recording the data with inappropriate methods. And omitting some transaction or making mistakes in recording financial statements will cause bias in independent variables. Moreover, if an independent variable with errors is somehow correlated to another independent variable, it will cause huge bias.

4. Multicollinearity

Multicollinearity is a much serious problem in panel logit regression. The estimator's standard error would increase dramatically when the correlation between variables increase (Hanushek and Jackson, 1997). The trend won't be too serious when correlation < 0.5. In our model, the correlation between *ROA* and *sustainable growth rate* is 0.62. However, the latter is an important causal factor of dependent variable and contains lots of information. So, it can't be removed. We choose model unbiased but inefficient.

Appendix I: Variables calculation

To better represent the whole year, the variables in this paper, are measured by the average of the metrics of two consecutive years.

$$\frac{RE}{TE}_t = \frac{(RE_{t-1} + RE_t)/2}{(TE_{t-1} + TE_t)/2}$$

$$ROA_t = \frac{Net\ Income_t}{(TA_{t-1} + TA_t)/2}$$

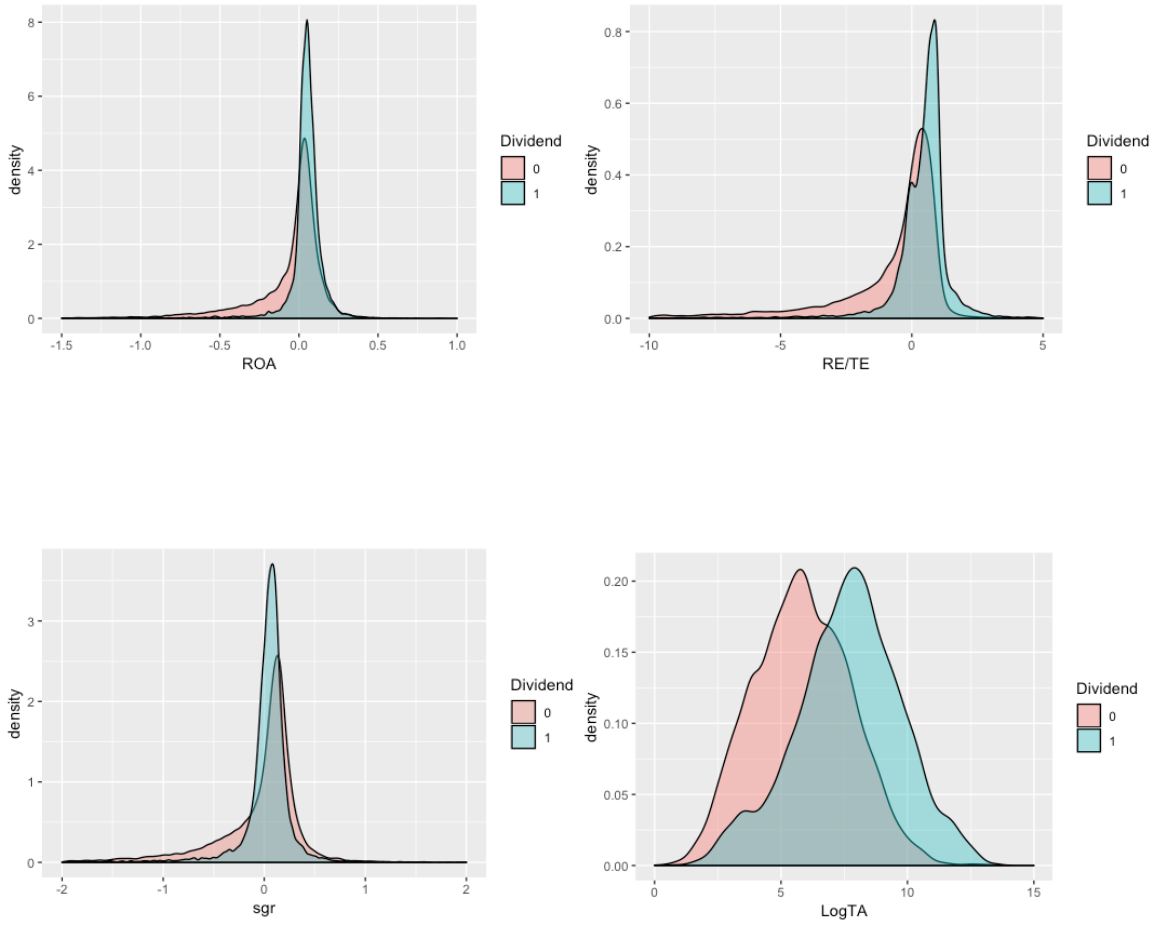
$$SGR_t = ROE \times \frac{Net\ Income_t - Dividend_t}{Net\ Income_t}$$

$$\frac{Cash}{TA}_t = \frac{(Cash_{t-1} + Cash_t)/2}{(TA_{t-1} + TA_t)/2}$$

$$\frac{Receivables}{Total\ Revenue_t} = \frac{(Receivables_{t-1} + Receivables_t)/2}{Total\ Revenue_t}$$

Appendix II: Density Plot for variables

Figure 1: Density plot of variables in case of dividend payment



Appendix 3: regression results

Table 6: Fixed effect logit regression results

	(1)	(2)	(3)	(4)
ROA	4.204037***	4.132***	4.236***	4.280***
	(.38345)	(0.378)	(0.390)	(0.424)
SGR	-2.074 ***	-2.070***	-2.132***	-2.140***
	(0.161)	(0.161)	(0.171)	(0.183)
Logta	1.224 ***	1.271***	1.252***	0.776***
	(.0744)	(0.076)	(0.078)	(0.081)
CASH/TA		1.306***	1.298***	1.085***
		(0.377)	(0.376)	(0.390)
RE/TE			0.020***	0.024**
			(0.009)	(0.011)
Year effects	No	No	No	Yes
AIC	2976	2971	2962	2846
p-value for time control	--	--	--	0.000

Number of observations is 7796.
Standard errors are in parentheses.
*** significant at 1%, ** significant at 5%, * significant at 10%.

Table 7: Random effect logit regression results

	(1)	(2)	(3)	(4)
ROA	3.879***	3.896***	4.131***	4.447***
	(0.306)	(0.307)	(0.312)	(0.326)
SGR	-1.938***	-1.938***	-2.133***	-2.239***
	(0.144)	(0.145)	(0.154)	(0.158)
Logta	0.256***	0.264***	0.249***	0.206***
	(0.022)	(0.023)	(0.023)	(0.024)
CASH/TA		0.259	0.244	0.309
		(0.244)	(0.007)	(0.257)
RE/TE			0.031***	0.037***
			(0.007)	(0.008)
Year effects	No	No	No	Yes
AIC	4854	4855	4847	4641
p-value for time control	--	--	--	0.000

Number of observations is 7796.
Standard errors are in parentheses.
*** significant at 1%, ** significant at 5%, * significant at 10%.

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