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Test of Pecking Order Theory

Empirical evidence from Europe

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Abstract

This paper tests the pecking order theory of corporate leverage on a representative sample of publicly traded European firms, between 2006 and 2018, and further investigates differences between financing deficits and surpluses as well as differences between sectors. Similar research in the area does not find evidence supporting the pecking order theory for publicly traded American firms. The pecking order theory is rejected when testing European firms but shows a significant difference between financing deficits and financing surpluses as well as differences between sectors.

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Keywords: Pecking Order Theory, Financing Deficit, Financing Surplus, Capital Structure, Corporate Leverage

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1

Introduction & Literature Review

This chapter covers problem discussion, purpose and research questions and highlights the papers limitations. Further, this chapter discuss definitions and concepts and includes this papers literature review.

In this paper the pecking order theory of corporate leverage will be tested on a representative sample of publicly traded European firms, between the years 2006 and 2018, and further investigates if there is a difference between firms with financing deficits and firms with financing surpluses as well as differences between sectors. This can be important to better understand firms part of the European market, how their liability composition is structured and if there are differences between sectors. Similar research in the area, such as Frank and Goyal's (2003) and Shyam-Sunder and Myers's (1999) papers, did not find evidence supporting the pecking order theory when tested on a set of publicly traded American firms. The results of this paper is similar to previous research, the pecking order theory is rejected, when testing for a set of European firms. However, the previous research this paper is based on makes no comparison between firms with financing deficits and firms with financing surpluses and performs no comparison between sectors. This paper found that there is a significant difference between firms with financing deficits and firms with financing surpluses and differences between sectors.

In corporate finance, the topic of capital structure has been under the scope of research for quite some time. Capital structure attempts to explain the liability composition of corporations and according to one of the most influential papers in the area written by Modigliani and Miller (1958), a firm's capital structure does not affect the value of the firm. However, Modigliani and Miller (1958) make assumptions that could question the authenticity of their conclusion, they assume that the market is efficient, there is no asymmetric information and taxes, agency costs and bankruptcy costs are absent.

Although, the essential work of Modigliani and Miller (1958), Myers (2001) states that the proportion of debt and equity financing outlines most of the research within the area of capital structure. Graham and Leary (2011) supported Myers (2001) claim, and states that the general focus of corporate finance research published after the work of Modigliani and Miller (1958) has been on testing the two well-established views of capital structure: the pecking order theory and the static trade-off model. The static trade-off model is according to Myers (2001) based on the notation that companies are financed by both debt and equity. However, firms seek the

optimal debt level found at the balance point between the costs of potential financial distress and benefits associated with tax advantages. Myers (2001) also stated that there is no optimal target level for the choice between debt and equity that can be universally applied to all firms.

In previous literature, the capital structure between different sectors have been studied, Schwartz and Aronson (1967) came to the conclusion that the leverage compositions are different among sectors and that firms part of the Utilities and Real Estate sectors tend to issue a substantial amount of debt to cover the financing needs; and that more technology-oriented firms issue very little in comparison. A more recent paper in the area of capital structure, that focuses on differences between sectors, written by Talberg *et al.* (2008) concluded that the shipping industry which is part of the sector Industrials according to the Global Industry Classification Standard, GICS, is capital intensive *i.e.* requires large amounts of investments. Talberg *et al.* (2008) further concluded that firms included in the sector Information Technology use less fixed assets in comparison to other sectors. However, more recent capital structure literature has according to Parsons and Titman (2009) changed focus to examine the evolution of firm's capital structure over time.

The capital structure of firms may differ depending on if they have a financing deficit or a financing surplus, according to Chang and Dasgupta (2011), firms generally choose to issue debt when the financing deficit is positive and retire debt when the financing deficit is negative. A negative financing deficit is defined as a financing surplus.

This paper will focus on the pecking order theory, which is a well-established theory in corporate finance and a central piece within corporate leverage theories. The theory suggests that the presence of asymmetric information increases the cost of financing and therefore, according to Myers (1984), internal financing is preferred over external financing. The theory is based upon a three-step hierarchical system of financing decisions. (1) Financing through internal resources (retained earnings, initial equity); when all is consumed, (2) issue debt; and when debt is exhausted; (3) new equity should be issued. According to Myers (1984) and Myers and Majluf (1984), financing through internal resources endure no information asymmetry; while debt have a minor adverse selection problem; and equity is subject to large adverse selection problems. The pecking order theory can first be found in Myers's (1984) and Myers and Majluf's (1984) papers, however, the underlying argument of hierarchical order picking associated to finance issuing can be traced back to Donaldson (1961).

In previous research, contradictory evidence for the pecking order theory has been presented and various studies show results opposing the predictions of the theory. According to the pecking order theory, high-growth firms, *i.e* firms growing rapidly, in need of financing will end up with high debt ratios due to the reluctance of issuing equity because of information asymmetry. However, Barclay *et al.* (2001) and Smith and Watts (1992) found evidence that high-growth firms use less debt. However, aspects of the pecking order theory has also been supported in previous research. According to Allen and Winton (1995) from the viewpoint of risk-sharing, the optimal response to adverse selection and agency problems are debt-like contracts, which

follows the pecking order assumption that debt is associated with less adverse selection and therefore issued before equity. Fama and French (2002) found further support for the pecking order theory by concluding that more profitable firms have less leverage. Fama and French (2002) also found that debt covers most of the short-term variation in investments by examining dividends. These pecking order theory predictions are also in accordance to Myers's (1984) paper.

Shyam-Sunder and Myers (1999) tested the pecking order theory on a sample of 157 publicly traded American firms between 1971 to 1989, by defining a model were each dollar in financing deficit should be adjusted for with a dollar change in corporate debt. The simplest form of the pecking order model as described by Shyam-Sunder and Myers (1999) imply that when there is a financing deficit, a firm's internal cash flow should be used, if shown to be inadequate, the firm should issue debt. They also stated that equity is never to be issued unless the firm suffer from high costs associated with financial distress and no debt other than junk debt can be issued.

Frank and Goyal (2003) saw potential in the simple pecking order model defined by Shyam-Sunder and Myers (1999), using the accounting identity funds flow deficit (=financing deficit, DEF). However, they argued that a sample size of 157 firms was a rather small sample of all the available publicly traded American firms. Therefore, Frank and Goyal (2003) used a sample of 768 publicly traded American firms during the period 1971 to 1989. They used the same time period as Shyam-Sunder and Myers (1999) to see if the pecking order theory was broadly applicable. In addition, Frank and Goyal (2003) tested the theory on the same sample between 1990 and 1998. Even though, the pecking order hypothesis was statistically rejected by both Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). Frank and Goyal (2003) found that the pecking order hypothesis could better be explained by large firms rather than mid and small sized firms. According to them this is due to the fact that large firms use relatively less equity financing than small firms, which they argue is because large firms have better reputations in debt markets, are usually more diversified and therefore are subject to lower information costs when borrowing. Frank and Goyal (2003) also found that the support for the pecking order theory declined over time.

In this paper, the pecking order theory can be rejected. Although, the theory can provide a good explanation of firms external financing. Shyam-Sunder and Myers (1999) found that when it comes to the choice of debt-equity, for mature public firms, the pecking order is a good explanatory model.

2
Method

This chapter covers method, data collection and motivates the choice of method and its limitations.

2.1 Choice of Method

This paper test, using the simple pecking order model created by Shyam-Sunder and Myers (1999) and then further developed and redefined by Frank and Goyal (2003), the financing behavior of 461 publicly traded European firms during the period 2006 to 2018. The selection of the firms part of this paper comes from the STOXX Europe 600 index which includes 600 firms from different countries, of different sizes and are well-traded on the European market. In addition, the pecking order model used in this paper controls for firm size and market value. Frank and Goyal (2003) found greater support for the pecking order theory for large firms rather than mid and small sized firms. Size is measured using total assets as proxy since Dang *et al.* (2018) concluded that this is the most accurate measure when empirically testing capital structure theories. Market value is controlled for since Modigliani and Miller's (1958) conclusion suggests that market value is not affected by capital structure and the proxy used in this paper is Price-to-book since it is a common indicator. Willim (2015) tested different market value proxies where Price-to-book were one of the ones represented in the research, but another market value proxy was recommended and therefore using Price-to-book could be a weakness of this paper. However, Price-to-book ratio also shows if firms are overvalued or undervalued since it is defined as market value in relation to book value and this is one of the reasons it is used as a proxy in this paper. This paper also includes the interaction between Price-to-book and DEF_{it} as a third control variable in order to control for the effect of Price-to-book for different values of DEF_{it}.

The paper is divided into three parts of analysis; first, the pecking order theory was tested on the whole sample; secondly, the same test performed on firms with financing deficits and firms with financing surpluses. The financing deficit is defined as a positive variable which implies that a negative value represents a financing surplus. As defined by the simple pecking order model, firms with financing deficits are treated the same way as firms with financing surpluses. Lastly, a sector comparison where the firms, based on the Global Industry Classification Standard (GICS), were divided in to eleven different sectors.

The test of the simple pecking order model requires the financing deficit of firms. The financing deficit variable defined by Shyam-Sunder and Myers (1999) is as follows:

$$DEF_{SSM} = DIV_{it} + I_{it} + \Delta W_{it} + R_{it} - CF_{it} \tag{2.1}$$

Notations defined as follows in Table 2.1:

Table 2.1: Variables used by Shyam-Sunder and Myers (1999) and Frank and Goyal (2003).

Notation	**Variable**
DIV_{it}	Cash dividends in year t
I_{it}	Net investments in year t
ΔW_{it}	Change in working capital in year t
CF_{it}	Cash flow after interest and taxes in year t
ΔR_{it}	Current portion of long-term debt in year t
ΔD_{it}	Net debt issued in year t
ΔE_{it}	Net equity issued in year t

Presented variables are the main variables used in Shyam-Sunder and Myers's (1999) and Frank and Goyal's (2003) papers and all other variables used to test the simple pecking order theory can be calculated using these.

Shyam-Sunder and Myers (1999) defined DEF_{SSM} with an additional variable, representing the current portion of long term debt (R_{it}) compared to Frank and Goyal (2003). Frank and Goyal (2003) excluded this variable in their definition of DEF_{it}, with the argumentation that this portion of current long term debt is included in working capital. However, they tested both approaches and found empirical evidence that the current portion of long-term debt does not belong in the definition of financing deficit. Therefore, Frank and Goyal's (2003) definition of financing deficit is used in this paper. The sum of DIV_{it}, I_{it} and ΔW_{it} are considered to be the variables representing financing needs. CF_{it} is deducted from the financing deficit since internal resources are assumed to be consumed first in the simple pecking order model. Financing deficit as defined by Frank and Goyal (2003) is presented in Equation 2.2.

$$DEF_{it} = DIV_{it} + I_{it} + \Delta W_{it} - CF_{it} = \Delta D_{it} + \Delta E_{it} \tag{2.2}$$

The empirical model representing the simple pecking order used by Frank and Goyal (2003) as well as Shyam-Sunder and Myers (1999) is presented in Equation 2.3:

$$\Delta D_{it} = a + \beta_{po} DEF_{it} + \epsilon_{it} \tag{2.3}$$

If the intercept a=0 and the coefficient β_{po}=1 the pecking order hypothesis is supported. Frank and Goyal (2003) stated that the error term is treated as a well-behaved error term.

2.2 Model

Equation 2.4 is the model used to evaluate the pecking order theory in this paper and the variables used are the same as the variables Frank and Goyal (2003) used, notations presented in Table 2.1. The control variables, C_1, C_2 and C_3, included are, Price-to-book, Size and the interaction variable between Price-to-book and Financing Deficit and are defined in Appendix 5.1. DIV_{it}, I_{it}, ΔW_{it} and CF_{it} are used to calculate the financing deficit, DEF_{it}, which is the models independent variable. ΔD_{it} is the models dependent variable. ΔE_{it} is used for validation of the definition of DEF_{it} and analysis of data, *i.e.* not in the model.

$$\Delta D_{it} = \alpha + \beta_{po} DEF_{it} + \sum_{j=1}^{J} \gamma_j C_j + \epsilon_{it} \quad , \epsilon_{it} \sim N(0, \sigma^2) \tag{2.4}$$

The null hypothesis is: The intercept, α, is equal to 0 and the pecking order coefficient, β_{PO}, is equal to 1.

The model was further adjusted to study differences between firms with financing deficits and financing surpluses and sector specific effects.

2.2.1 Deficit and Surplus Comparison

In order to isolate the effects for the firms with financing deficits and financing surpluses separately, a dummy variable and an interaction term between this dummy variable and DEF_{it} was used. The dummy variable is used to capture the effect of the intercept, while the interaction term aims to capture the effect of the pecking order coefficient. The dummy variable is defined as:

$$PM = \begin{cases} 1 & \text{if } DEF_{it} > 0, \\ 0 & \text{otherwise.} \end{cases}$$

This allowed for potential differences between firms with financing deficits and financing surpluses to be seen through DEF_{it} and be captured by Equation 2.5. A $DEF_{it} > 0$ represents a financing deficit, therefore a financing surplus is defined as $DEF_{it} < 0$. The financing deficit is defined as a deficit in financing, therefore a negative financing deficit is a financing surplus. The following model was constructed to evaluate the pecking order theory for financing deficits and financing surpluses separately:

$$\Delta D_{it} = \alpha_{PM} + \beta_{poPM} DEF_{it} + \beta_{PM1} PM + \beta_{PM2}[PM * DEF_{it}] + \sum_{j=1}^{J} \gamma_j C_j + \epsilon_{it} \tag{2.5}$$

2.2.2 Sector Comparison

To study differences between sectors, sector dummy variables were used in the model in order to evaluate the effect for each sector. Another adjustment was made by using interaction terms between sector dummy variables and the financing deficit. These interaction terms were used to capture the effect of the pecking order coefficient per sector. The dummy variables are defined as:

$$S_n = \begin{cases} 1 & \text{if firm} \in \text{sector n,} \\ 0 & \text{otherwise.} \end{cases}$$

The following model was constructed to evaluate sector specific characteristics:

$$\Delta D_{it} = \alpha_S + \beta_{poS} DEF_{it} + \sum_{n=1}^{N} \beta_{Sn1} S_n + \sum_{n=1}^{N} \beta_{Sn2}[S_n * DEF_{it}] + \sum_{j=1}^{J} \gamma_j C_j + \epsilon_{it} \tag{2.6}$$

2.3 Data

The firms used to represent the European market in this paper comes from the index STOXX Europe 600, SXXP, as it were 2018. SXXP has a fixed number of 600 firms from 17 European countries *i.e.* UK, France, Germany, Switzerland, Austria, Belgium, Czech Republic, Denmark, Finland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain and Sweden according to STOXX Ltd (2019).

In this paper the firms were organized according to the Global Industry Classification Standard, GICS, instead of the classification given by STOXX Ltd. Frank and Goyal (2003) argued that firms categorized as Financials and Utilities are excluded according to standard practice which is then also applied in this paper. Excluding Financials is in accordance with Fama and French (1992) since they concluded that financial firms have high leverage and the economical meaning of this is not the same as for non-financial firms where high leverage usually indicates distress. Utilities generally displays high leverage-ratios and are many times linked to public sector according to MSCI(2019) and are not necessarily profit-oriented and could therefore display skewed data. Working capital and net debt issued are two of the main variables in the simple pecking order model. During the time period studied, most of the firms within the Financials sector and half of the firms within the Utilities sector did not report working capital consistently. Therefore, the lack of reporting was also a reason to exclude both these sectors from the sample of this paper. In total the two excluded sectors represented 139 firms and therefore the

whole sample consists of 461 firms. Full distribution of firms per sector is displayed in Table 2.2.

Table 2.2: Distribution of firms per sector in SXXP index.

Notation	Sector	Number of Firms
En	Energy	23
Ma	Materials	43
In	Industrials	124
CoDi	Consumer Discretionary	82
CoSt	Consumer Staples	59
HeCa	Health Care	54
InTe	Information Technology	30
CoSe	Communication Services	19
ReEs	Real Estate	27
Ut	Utilities	28
Fi	Financials	111
All	**Sum**	**600**

Distribution of firms per sector in SXXP index using Global Industry Classification Standard and notations.

The data in this paper is of panel data structure and studied between the years 2006 to 2018. All data except Price-to-book is scaled by net assets since it is already a ratio. According to Frank and Goyal (2003) scaling is used to control for firm size differences. All scaled variables are modified by removing extreme outliers, *i.e.* the 0.005 in both tails of the distribution are excluded. Robust standard errors are used in this paper. Robust standard errors are commonly used to correct for serial correlation effects when using panel data according to Stock and Watson (2008). Table 2.3 presents the descriptive statistics of the data set including the variables of the main model and the control variables for all the 5238 observations. Table 2.3 shows a high maximum Price-to-book value and this papers sample of European firms show numerous observations from the sector Consumer Discretionary that have large Price-to-book values in relation to all other sectors.

Table 2.3: Descriptive statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
ΔD_{it}	5238	0.038	0.379	-5.796	11.850
DEF_{it}	5238	0.095	0.430	-5.433	4.333
C_1	5238	4.758	25.528	0.086	941.397
C_2	5238	3.029	3.737	1.009	94.756
C_3	5238	0.282	48.636	-2425.733	1841.844

Descriptive statistics for the variables included in the model plus control variables. ΔD_{it} is Net Debt issued, DEF_{it} is Financing Deficit equal to the sum of Dividends Paid, Net Investment, Change in Working Capital minus Cash From Operations. All variables are scaled by net assets and the control variables,$\sum \gamma_j C_j$, are C_1 = Price-to-book, C_2 = Size and C_3 = Price-to-book*DEF_{it}.

Table 2.4 presents corporate cash flows, as averages, where it can be concluded that the financing deficit is similar between sectors. Real Estate and Health Care has the highest average financing deficits while Consumer Discretionary and Communication Services has the lowest average. This can be motivated by the firm specific characteristics and investment needs which indicates that some differences can be seen between sectors.

Table 2.4: Corporate cash flows per sector

Variable	**En**	**Ma**	**In**	**CoDi**	**CoSt**	**HeCa**	**InTe**	**CoSe**	**ReEs**
DIV_{it}	0.050	0.066	0.077	0.214	0.129	0.075	0.072	0.170	0.032
I_{it}	0.140	0.036	0.034	0.059	0.035	0.024	0.022	0.077	0.100
ΔW_{it}	0.220	0.206	0.268	0.399	0.291	0.280	0.318	0.376	0.050
CF_{it}	0.305	0.245	0.271	0.625	0.353	0.248	0.301	0.573	0.050
ΔD_{it}	0.066	0.016	0.038	0.029	0.035	0.044	0.041	0.065	0.048
ΔE_{it}	0.040	0.047	0.070	0.019	0.067	0.088	0.070	-0.015	0.085
DEF_{it}	0.106	0.063	0.108	0.048	0.102	0.131	0.111	0.050	0.133

Corporate Cash Flows as averages per sector scaled over net assets between the years 2006 to 2018. Financing Deficit is the sum of Cash dividends, Net Investments, Change in Working Capital minus Cash flow after interest and taxes. Frank and Goyal (2003) also provided this information but per time period studied.

2.4 Discussion

The results from a conducted Hausmann test suggests that fixed effects estimation is suitable. This implies that using random effects estimation might affect the pecking order coefficient to be inconsistent. This due to systematic differences in coefficients. Fixed effects are constant across entities and random effects vary across entities according to Kreft and De Leeuw (1998). Searle *et al.* (1992) concluded that fixed effects estimation examine the effects itself while random effects estimation consider the underlying population. This paper still uses random effects set per firm to identify firm specific effects in β_{PO}. See appendix Table 5.3. Frank and Goyal (2003), argued that either a fixed effect model or random effect model may be used given that the classical error term assumptions apply and that all year-firm combinations are equally important independent observations. One of the classical error term assumptions address that the independent variable should not be correlated to the error term, *i.e.* endogeneity. According to Johnston and DiNardo (1972), violating this assumption gives rise to bias which can arise from simultaneity, when an omitted variable influences both the dependent variable and independent variable or when the independent variable is measured with error. The bias of the coefficient

might still be consistent given that the correlation is not contemporaneous. This papers model uses ΔD_{it} as dependent variable and DEF_{it} as independent variable where the variables are from the same time period. This implies that the correlation is contemporaneous and the results are therefore arguably biased.

The defintion of financing deficit used in this paper, developed by Frank and Goyal (2003), might not correspond to the actual financing deficit. This could affect the validity of the conclusions in this paper. The simple pecking order model defined by Shyam-Sunder and Myers (1999) assumes that cash flow after interest and taxes is always preferred over debt and equity. This assumption might not always hold in practice.

3

Results & Analysis

In this paper, a sample of 461 European firms is studied during the period 2006 to 2018. Firstly, the pecking order theory is tested on the whole sample using the same approach as Frank and Goyal (2003); secondly, the same test is made on firms with a financing surplus and firms with a financing deficit; and finally, the sample is divided into sectors, were a sector comparison is made.

3.1 Empirical Tests

Table 3.1 presents the results from the test made on the whole sample. With a statistical significance level of 0.01, the combined test of $\alpha = 0$ and $\beta_{po} = 1$ can be rejected and therefore, the sample of European firms in this paper between 2006 to 2018 show no evidence of acting in accordance to the pecking order theory. Independently, the intercept, $\alpha = 0$, cannot be rejected but the pecking order coefficient, $\beta_{po} = 1$, can be rejected with a statistical significance level of 0.01. Table 3.1 also shows the control variables and their significance.

Firm size is not statistically significant which contradicts Frank and Goyal's (2003) findings where they find greater support for the pecking order theory for large firms. Table 3.1 shows that firm size is positively correlated to Net Debt Issued which implies that large firms use less equity financing than small firms. Frank and Goyal (2003) argued that this could be explained by the better reputation that large firms have in the debt markets compared to smaller firms and also due to the fact that large firms are more diversified when it comes to risk exposure which implies that the information costs of borrowing are lower. Price-to-book and Price-to-book*DEF_{it} are both statistically significant at the 0.01 level and negatively correlated to Net Debt Issued. This implies that a higher market value in relation to book value will decrease the amount of debt issued in relation to equity. According to Modigliani and Miller's (1958) findings, market value does not affect capital structure which this paper contradicts and finds evidence that it does. This could be explained by the fact that this paper does not enforce the same assumptions as made by Modigliani and Miller (1958). The interaction term between Price-to-book and DEF_{it}, C_3, is negative and therefore an increase in DEF_{it} will decrease the effect that Price-to-book has on Net Debt Issued, ΔD_{it}. A high value of Price-to-book indicate that the firm is considered overvalued compared to its book value and the findings in Table 3.1 displays that an overvaluation, *i.e.* a high Price-to-book value, would decrease the portion of debt in a firms liability composition.

The results from Table 3.1 displays that the sample of European firms during the period 2006 to 2018 issue 48% of their financing deficit as debt and therefore, according to Equation 3.1 the remaining 52% as equity. This implies that the external financing is covered by more equity than debt.

Table 3.1: Empirical tests made on the whole sample.

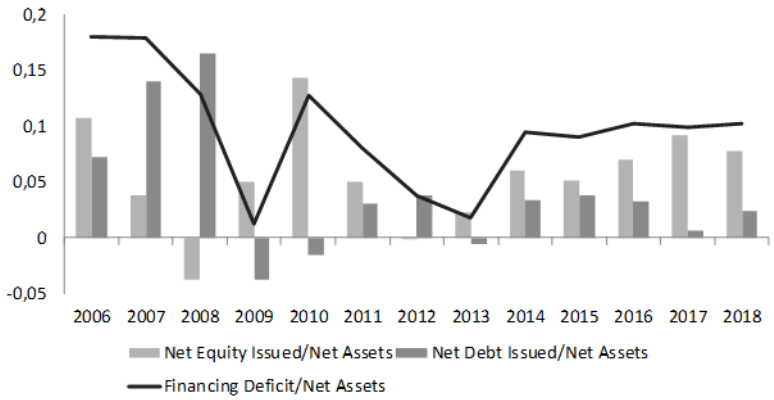
	[observations]
	5238
	All sectors
α	-0.042
	(0.034)
β_{PO}	0.480***
	(0.047)
γ_1	-0.002***
	(0.001)
γ_2	0.015
	(0.013)
γ_3	-0.002***
	(0.001)

*Indicates significance at the 0.10 level.
**Indicates significance at the 0.05 level.
***Indicates significance at the 0.01 level.

Pecking order theory test for the time period 2006 to 2018 with a sample size of 7800 observations. Firms classified as Financials and Utilities according to Global Industry Classification Standard, 1807 observations in total, are excluded. An additional 755 observations was excluded due to missing reporting of relevant data, therefore, resulting in a sample size of 5238 observations. The following regression is estimated: $\Delta D_{it} = a + \beta_{po} DEF_{it} + \sum \gamma_j C_j + \epsilon_{it}$ where ΔD_{it} is Net Debt issued, DEF_{it} is Financing Deficit equal to the sum of Cash dividends, Net Investments, Change in Working Capital minus Cash flow after interest and taxes. All variables are scaled by net assets and the control variables, $\sum \gamma_j C_j$, are C_1 = Price-to-book, C_2 = Size and C_3 = Price-to-book*DEF_{it}. Standard errors are reported in parentheses.

Figure 3.1 presents the debt-equity difference in external financing for the sample of European firms studied. The debt-equity structure changes around 2008, this might have been caused by the 2008 financial crisis. As seen in Figure 3.1, equity is generally representing the majority of the financing deficit over time with exception of 2007 and 2008. Table 5.1 states that external financing is covered by more equity than debt which can be observed in Figure 3.1.

Figure 3.1: Average Financing Deficit over Net Assets, Net Debt Issued over Net Assets, and Net Equity Issued over Net Assets, 2006 to 2018.



Average Financing Deficit over Net Assets, Net Debt Issued over Net Assets, and Net Equity Issued over Net Assets, 2006 to 2018. This figure plots annual averages of the stated ratios for the period 2006 to 2018 of the sample of European firms. Financials and Utilities are excluded. The following relation is: $DEF_{it} = \Delta D_{it} + \Delta E_{it}$. Financing Deficit is the sum of Net Debt Issued and Net Equity Issued. Net Debt Issued is long-term debt issuance minus long-term debt reduction. Net Equity Issued is current period total equity minus prior period total equity. All data is gathered from Bloomberg (2019).

3.1.1 Deficit and Surplus Comparison

Table 3.2 display the results from the firms with a financing deficit and firms with a financing surplus separately. With a statistical significance level of 0.01, the null hypothesis can be rejected for both groups. However, the pecking order coefficient is closer to one for the firms with a financing deficit than those with a financing surplus, even though, a deficit and a surplus is treated the same way in the model. A F-test of equality of variances, found in Appendix 5.3, show that the variances are unequal at the significance level of 0.01 which implies that, this together with the results from Table 3.2, the pecking order coefficients in the two samples are not equal. Table 3.2 also shows that the sample of European firms during the period 2006 to 2018, with a positive financing deficit, *i.e.* deficit in funds, finance approximately 68% of their deficit with debt and the remaining 32% with equity. The sample of European firms during the same time period with a negative financing deficit, *i.e.* surplus in funds, finance approximately 22% of their surplus with debt and the remaining 78% with equity. This is in accordance with Chang and Dasgupta's (2011) findings that firms generally issue debt when the financing deficit is positive and retire debt when the financing deficit is negative. The control variables Price-to-book and Price-to-book*DEF_{it} are unchanged in magnitude and significance in relation to the empirical tests made on the whole sample, see Table 5.1. However, the control variable Size is still not statistically significant but the magnitude of the coefficient decreased from 0.015 to 0.004.

Table 3.2: Empirical tests made on firms with a financing deficit and firms with a financing surplus separately.

[observations]		
5238	Financing Deficit	Financing Surplus
$\alpha_{PM} + \beta_{PM1}$	-0.054*	-0.070**
$\beta_{poPM} + \beta_{PM2}$	0.678***	0.219***
γ_1	-0.002***	
	(0.001)	
γ_2	0.004	
	(0.014)	
γ_3	-0.002***	
	(0.001)	

*Indicates significance at the 0.10 level.

**Indicates significance at the 0.05 level.

***Indicates significance at the 0.01 level.

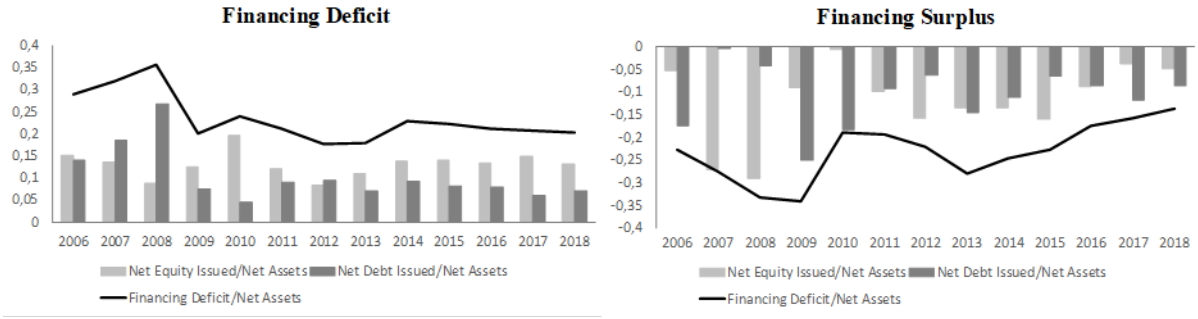
Pecking order theory tests for sub-samples for observations with Financing Deficit and Financing Surplus. The sample size is 7800 observations and the sample period is 2006 to 2018. Firms classified as Financials and Utilities according to Global Industry Classification Standard, 1807 observations in total, are excluded. An additional 755 observations was excluded due to missing reporting of relevant data, therefore, resulting in a sample size of 5238 observations. The table presents sub-samples: Financing deficit, i.e. positive DEF_{it} and financing surplus, i.e. negative DEF_{it}. The following regression is estimated: $\Delta D_{it}=\alpha_{PM} + \beta_{poPM}\ DEF_{it}+\beta_{PM1}$ PM + β_{PM2} [PM*DEF_{it}]+$\sum \gamma_j C_j+\epsilon_{it}$ where ΔD_{it} is Net Debt issued, DEF_{it} is Financing Deficit equal to the sum of Cash dividends, Net Investments, Change in Working Capital minus Cash flow after interest and taxes. All variables are scaled by net assets and the control variables,$\sum \gamma_j C_j$, are C_1 = Price-to-book, C_2 = Size and C_3 = Price-to-book*DEF_{it}. Standard errors are reported in parentheses. PM is a dummy variable for financing deficits and financing surpluses.

Figure 3.2 presents the debt-equity difference in external financing for firms with a financing deficit and firms with a financing surplus. The debt-equity structure changes around 2008 for both groups, this might have been caused by the 2008 financial crisis. Figure 3.2 also presents an explanation of the results in Table 3.2. Net debt is mostly used to finance the financing deficits in 2007 and 2008 but equity is used to finance the majority of the deficit after 2009. Net equity covers most of the financing surplus in 2007 and 2008 but in 2009 this changes and net debt increases vastly compared to net equity, both during 2009 and 2010. After 2010 the composition of debt and equity evens out more but still fluctuates in magnitude over the course

of the remaining 8 years.

Figure 3.2 provides a visual representation of the observations with a financing deficit and the observations with a financing surplus and how the debt-equity structure of these varies over the years from 2006 to 2018.

Figure 3.2: Average Financing Deficit and Financing Surplus over Net Assets, Net Debt Issued over Net Assets, and Net Equity Issued over Net Assets, 2006 to 2018.



Average Financing Deficit over Net Assets, Net Debt Issued over Net Assets, and Net Equity Issued over Net Assets, 2006 to 2018. This figure plots annual averages of the stated ratios for the period 2006 to 2018 of the sample of European firms which are also divided into two groups, firms with positive and firms with negative Financing Deficits. A negative Financing Deficit is a Financing Surplus. Financials and Utilities are excluded. The following relation is: $DEF_{it} = \Delta D_{it} + \Delta E_{it}$. Financing Deficit is the sum of Net Debt Issued and Net Equity Issued. Net Debt Issued is long-term debt issuance minus long-term debt reduction. Net Equity Issued is current period total equity minus prior period total equity. All data is gathered from Bloomberg (2019).

Figure 3.3 shows the distribution of DEF_{it} observations with a financing surplus in regard to those observations with a financing deficit. Of the observations part of the sample, 1557 have a financing surplus which corresponds to approximately 30% of the total amount of observations. The remaining 3681 observations have a financing deficit. These observations are represented in Figure 3.2.

Figure 3.3: Distribution of DEF_{it}

Distribution of deficits and surpluses over the sample with gaps in panel data allowed. this figure displays the number of observations with a financing surplus and the number of observations with a financing deficit. 1557 observation have a negative DEF_{it} and 3681 observation have a positive DEF_{it}.

3.1.2 Sector Comparison

How did the sectors differ from the broader population? Jointly, all the 461 firms showed no evidence of the pecking order theory. Shown in Table 3.3 are the results from the sector comparison. In Table 3.3, when studying the magnitude of the pecking order coefficients, larger coefficients can be found in sectors such as, Energy, Industrials, Consumer Staples and Real Estate. However, Energy is the only sector were the coefficient is not different from 1 with a statistical significance at the 0.01 level. A joint test, investigating the null hypothesis for Energy *i.e.* $\alpha_S + \beta_{S1} = 0$ and $\beta_{poS} + \beta_{S2}$=1, shows that the null hypothesis can be rejected at the 0.1 significance level. Overall, the coefficients are different among sectors. This is in accordance with Schwartz and Aronson's (1967) conclusion that leverage compositions is different between sectors. However, according to Schwartz and Aronson (1967), Real Estate firms tend to issue a substantial amount of debt to cover the financing needs which cannot be identified in this papers results in comparison to other sectors. They also conclude that technology-oriented firms issue very little debt in comparison to Real Estate firms. This is in accordance with this papers results as the Information Technology sector have a smaller pecking order coefficient in magnitude compared to the Real Estate sector. The difference between the two pecking order coefficients are 24%.

Table 3.3 shows that the firms part of the Energy sector during the period 2006 to 2018 finance approximately 75% of their deficit with debt and the remaining 25% with equity. Even though Energy is the only sector were the coefficient is not different from 1 at the 0.01 significance level, Consumer Staples is the only sector with a pecking order coefficient larger in magnitude. Firms part of the Consumer Staples sector during the period 2006 to 2018 finance approximately 86% of their deficit with debt and the remaining 14% with equity. This displays that the support of the pecking order theory is not necessarily dependant on the magnitude of the pecking order coefficient. The control variables Price-to-book and Price-to-book*DEF_{it} are unchanged in magnitude and significance in relation to the empirical tests made on the whole sample, see Table 3.1. However, the control variable Size is still not statistically significant but the magnitude of the coefficient decreased from 0.015 to 0.012.

Table 3.3: Empirical tests per sector.

	[observations] 5238								
	Energy	Materials	Industrials	Consumer Discretionary	Consumer Staples	Health Care	Information Technology	Communication Services	Real Estate
$\alpha_S + \beta_{S1}$	-0.043	-0.023	-0.058	-0.012	-0.078**	-0.032	-0.020	-0.040	-0.059*
	(0.034)	(0.031)	(0.039)	(0.033)	(0.034)	(0.030)	(0.0342)	(0.052)	(0.030)
$\beta_{poS+}\beta_{S2}$	0.745	0.243***	0.578***	0.299***	0.855***	0.447***	0.359***	0.355***	0.602***
	(0.157)	(0.181)	(0.076)	(0.101)	(0.054)	(0.115)	(0.093)	(0.139)	(0.036)
γ_1					-0.002***				
					(0.001)				
γ_2					0.012				
					(0.012)				
γ_3					-0.002***				
					(0.001)				

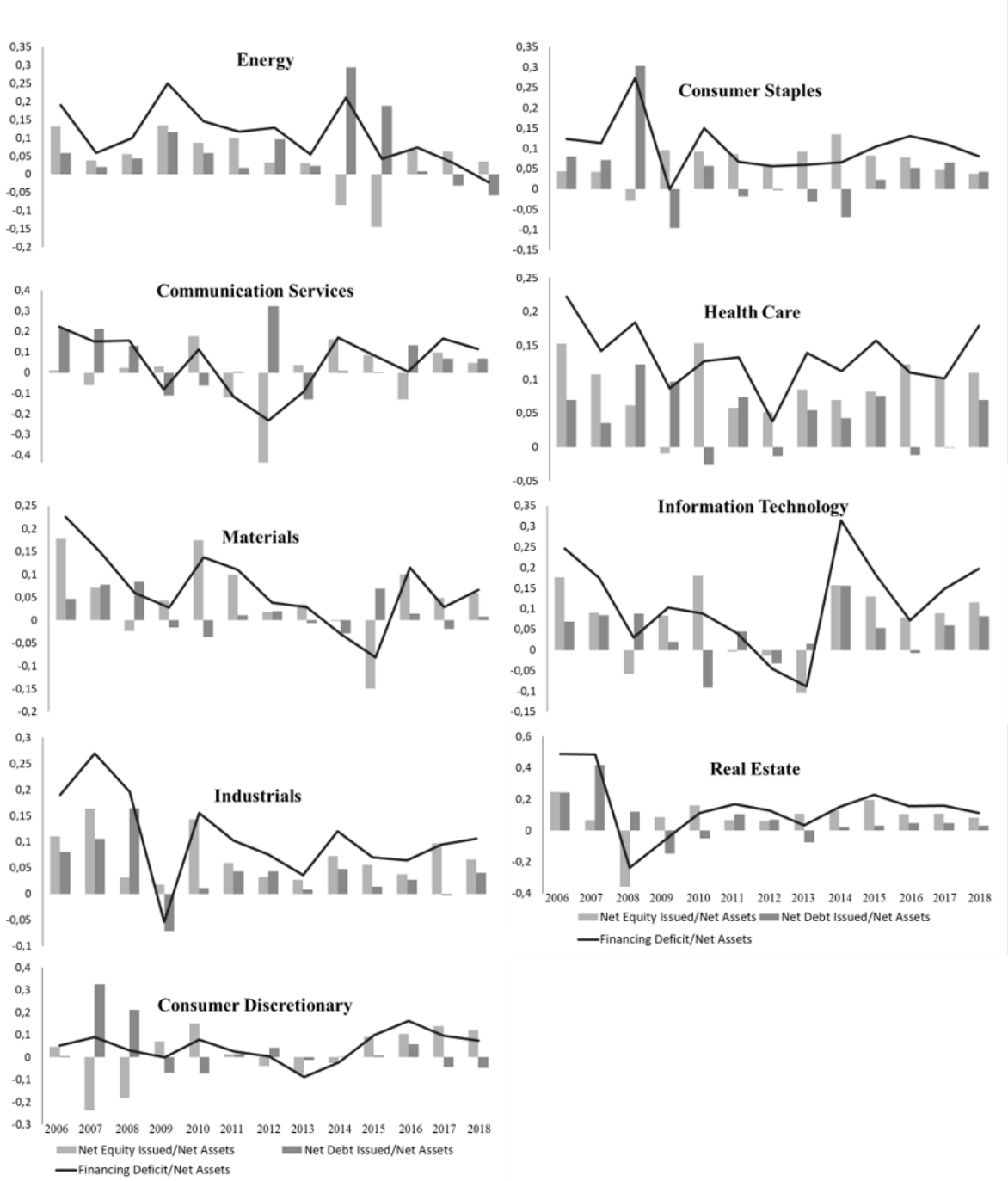
*Indicates significance at the 0.10 level.
**Indicates significance at the 0.05 level.
***Indicates significance at the 0.01 level.

Pecking order theory tests for sub-samples of sectors. The sample size is 7800 observations and the sample period is 2006 to 2018. Firms classified as Financials and Utilities according to Global Industry Classification Standard, 1807 observations in total are excluded. An additional 755 observations was excluded due to missing reporting of relevant data, thus, resulting in a sample size of 5238 observations. The table presents sub-samples: Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Information Technology, Communication Services and Real Estate. The following regressions is estimated: $\Delta D_{it} = \alpha_S + \beta_{poS}\, DEF_{it} + \Sigma\beta_{Sn1}S_n + \Sigma\beta_{Sn2}[S_n*DEF_{it}] + \Sigma\gamma_j C_j + \varepsilon_{it}$ where ΔD_{it} is Net Debt issued, DEF_{it} is Financing Deficit equal to the sum of Cash dividends, Net Investments, Change in Working Capital minus Cash flow after interest and taxes. All variables are scaled by net assets and the control variables, $\Sigma\gamma_j C_j$, are C_1 = Price-to-book , C_2 = Size and C_3 = Price-to-book*DEF_{it}. Standard errors are reported in parentheses. Sn are sector dummy variables.

Figure 3.4 presents the debt-equity difference in external financing per sector. The debt-equity structure changes around 2008 for most sectors, this might have been caused by the 2008 financial crisis. The sectors Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Information Technology, Communication Services and Real Estate show no evidence for the prediction of the pecking order theory according to Table 3.3, which is supported by Figure 3.4 where it can be seen that each of the mentioned sectors as well as the Energy sector show inconsistent portions of debt-equity structures over time.

There is no evidence from Table 3.3 that the pecking order theory can be rejected for the Energy sector. The Energy Sector in Figure 3.4 shows a sizable increase in debt issued in relation to equity issued in 2014 and 2015. Since the Energy sector consists mainly of oil and gas firms according to GICS, this increase in debt issued could be explained by the 2014 oil crisis which largely decreased oil prices world wide according to BBC (2014). However, the majority of years have more equity issued than debt. The Consumer Staples sector's debt-equity structure is, in difference to the Energy sector, affected around the years of the 2008 financial crisis. Besides that, Net Equity Issued covers the larger portion of DEF_{it} for the majority of the years between 2006 to 2018, with a decreasing trend at the end of the time period studied.

Figure 3.4: Average Financing Deficit over Net Assets, Net Debt Issued over Net Assets, and Net Equity Issued over Net Assets per sector, 2006 to 2018.



Average Financing Deficit over Net Assets, Net Debt Issued over Net Assets, and Net Equity Issued over Net Assets, 2006 to 2018. This figure plots annual averages of the stated ratios for the period 2006 to 2018 of the sample of European firms and also divided per sector, i.e. Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Information Technology, Communication Services, and Real Estate. Financials and Utilities are excluded. The following relation is: $DEF_{it} = \Delta D_{it} + \Delta E_{it}$. Financing Deficit is the sum of Net Debt Issued and Net Equity Issued. Net Debt Issued is long-term debt issuance minus long-term debt reduction. Net Equity Issued is current period total equity minus prior period total equity. All data is gathered from Bloomberg (2019).

4
Conclusion

The pecking order theory is tested using a sample of European firms during the time period 2006 to 2018. The pecking order theory can be rejected. However, the test provides information about the issuance of external financing. It can be concluded that the sample of firms in this paper issue more equity than debt over the studied period. Frank and Goyal (2003) concluded that large firms have stronger support for the pecking order theory. However, this paper can neither confirm nor deny the effect of firm size on Net Debt Issued. Market value is negatively correlated to debt issuance, therefore an increase in market value decreases the support for the pecking order theory.

When testing the pecking order theory on firms with a financing deficit and a financing surplus separately, there is no evidence for the prediction of the theory. However, the pecking order coefficient is closer to one for the firms with a financing deficit than those with a financing surplus. Testing firms with a financing surplus show that equity financing is dominating debt financing in magnitude.

When sector specific effects are considered, the support for the theory is different between sectors. The pecking order theory for the Energy sector can be rejected at the 0.1 significance level. All other sectors show no evidence for the prediction of the theory and can be rejected at the 0.01 significance level. The Energy sector consists of mainly oil and gas firms according to GICS and showed an increase in debt issued in relation to equity issued in 2014 and 2015. The oil crisis in 2014 could be an explanation for why the null hypothesis cannot be rejected for the Energy sector at a higher significance level than 0.1.

The empirical evidence shows issues for the simple pecking order model and therefore other adjustments are needed to improve the explanatory power. The financing deficit provides information that enables analysis of external financing. Regardless, other pecking order theory tests might provide further insights.

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5

Appendix 1

5.1 Selection criteria

The data set used was mainly chosen for its proper representation of the European market based on STOXX country classification model and is the index "SXXP". The country selection criteria used for SXXP are the following according to STOXX Ltd (2019):

1. Only countries that are classified as Advanced by the World Bank in terms of Gross National Income, GNI, per capita are considered eligible for Developed Market status by STOXX. In numeral terms, this means having a GNI per capita equal to or greater than the maximum cut-off value.
2. Countries must have a market capitalization equal to or greater than the 20th percentile.
3. The total value of shares traded must be equal to or greater than the 40th percentile.
4. Countries must have free currency convertibility on on-shore and off-shore markets.

The selection criteria for the 600 firms in SXXP are according to STOXX Ltd (2019):

1. Assignation to country of primary listing, based on the country with the largest trading volumes.
2. Each stock is selected on the basis of sector classification.
3. All firms are selected on the basis of size and number of shares.

Table 5.1: Control variables and definitions.

Notation	**Variable**
C_1	Price-to-book ratio
C_2	Size
C_3	Price-to-book*DEF$_{it}$

Three control variables are included in this papers model, C_j, in order to control for market value and size.

5.2 F-test of equality of variances

Table 5.2: F-test of equality of variances between DEF_{it} for financing deficits and financing surpluses.

	[observations] 3680	[observations] 1557
	DEF_{it} Financing Deficit	DEF_{it} Financing Surplus
Mean	0.2324	-0.2316
Variance, σ	0.1006	0.2311
df	3679	1556
F		2.2968
P(F≠f) one-tail		4.01163E-92
F Critical one-tail		1.0722

The table displays a test of quality of variances between DEF_{it} for financing deficits and financing surpluses. The F-value is larger than F Critial one-tail which implies that the null hypothesis, $\sigma_{FD} = \sigma_{FS}$, can be rejected.

5.3 Hausman Test

Table 5.3: Hausman Test

[observations] 5238	Coefficients			
	Fixed Effects b	Random Effects B	Difference b-B	sqrt(diag(V_b-V_B)) S.E.
DEF_{it}	0.477	0.480	-0.003	0.003
C_1	-0.000	-0.002	0.002	0.000
C_2	0.019	0.148	0.005	0.001
C_3	-0.001	-0.002	0.001	0.000

The table displays a Hausman test of consistency on the papers main regression.

$$chi2(4) = (b-B)'(V_b - V_B)^{-1} * (b-B) = 128.57 \longrightarrow Prob > chi2 = 0.000 \tag{5.1}$$