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Testing the pecking order model of corporate leverage: An empirical investigation of Turkish firms[1]

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Abstract

This research investigates the pecking order model of corporate leverage for a sample of 53 Turkish industrial firms listed on Istanbul stock exchange during the period from 2008 to 2017. The study tries to concentrate on the predictions about how corporate leverage varies with investments, profitability, risk, firm size and tangibility. The coefficients of corporate leverage determinants are estimated by using Ordinary Least Squares and Binary Logistic regressions. Confirming the pecking order model, it is found that firms prefer internal cash flows over external financing to fund investments. Moreover, the empirical results also show that more profitable and risky firms tend to borrow less. On the other hand, firms with more investments and larger firms tend to have more leverage. The findings of this study will help the managers to design a better strategy about capital structure which can maximize firm's performance.

Keywords: *Pecking Order Model, Leverage, Turkish Firms.*

1. Introduction

Capital structure decisions play a crucial role in determining and improving firm's performance. Choosing an appropriate mix of debt and equity that maximizes shareholders' value requires analyzing and investigating the determinants of capital structure. The finance literature offers two competing models of financing decisions, trade-off theory and pecking order theory. In the trade-off model, firms identify their optimal leverage by weighing the costs and benefits of an additional dollar of debt (Fama & French, 2002: 1). As an alternative to the trade-off theory, Myers (1984) suggests the pecking order theory. This theory is based on a financing pecking order. Firms prefer internal finance, if external finance is required, firms issue the safest security first. That is, they start with debt, then possibly hybrid securities such as convertible bonds, then perhaps equity as a last resort (Myers, 1984: 581).

This research investigates the pecking order model of corporate leverage for a sample of 53 Turkish industrial firms listed on Istanbul stock exchange during the period from 2008 to 2017. The findings of this study will help the managers to design a better strategy about capital structure which can maximize firm's performance.

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2. Literature

The tradeoff model of corporate leverage assumes that agency costs of debt and bankruptcy costs push firms to issue less debt, while agency costs of equity and the tax benefits of debt push firms to issue more debt (Bradley, Jarrell and Kim, 1984; Fama & French, 2002; Frank & Goyal, 2009). Accordingly, larger firms and firms with more profitability, less risk, less growing opportunities, high tax rates and more tangible assets tend to have high leverage.

The pecking order model suggests that the financing costs that produce pecking order behavior include the transaction costs associated with new issues and the costs that arise because of management's superior information about the firm's prospects and the value of its risky securities. Because of these costs, firms finance new investments first with retained earnings, then with safe debt, then with risky debt, and finally, under duress, with equity (Fama & French, 2002: 1). The pecking order theory predicts that firms with less profitability, less risk, more investment and less tangible assets tend to have high leverage.

Numerous studies have focused on determinants of capital structure choice. Titman and Wessel (1988), Karadeniz, Kandir, Balcilar and Onal (2009), Gülşen and Ülkütaş (2012), and Goh, Tai, Rasli, Tan and Zakuan (2018) found that, as predicted by the pecking order model, profitable firms tend to have less leverage. Rajan & Zingales (1995), Chen & Hammes (1997), Gaud, Jani, Hoesli and Bender (2003) and Frank & Goyal (2009) showed that larger firms and firms with more tangible assets tend to have more leverage while more profitable and growing firms have less leverage. Shyam-Sunder and Myers (1999) found greater confidence in the pecking order model (which predicts external debt financing driven by the internal financial deficit) than in the target adjustment model (which predicts that each firm adjusts gradually toward an optimal debt ratio). Fama and French (2002) provide evidence that leverage is negatively related to profitability and investment. They also pointed out a positive relation between leverage and firm size. Frank and Goyal (2003) indicated that net equity issues track the financing deficit more closely than do net debt issues, debt financing do not dominate equity financing in magnitude.

Zhang and Kanazaki (2007) find that firms with more tangible assets, more non-debt tax shields and larger firms have more leverage while profitability was shown to be negatively related to leverage. Fosberg (2008) argues that firms finance their financial deficits with debt. Furthermore, debt capacity enhances the positive relation between financial deficits and debt. Güner (2016), and Burucu and Öndeş (2016) studied the variables affecting capital structure decisions of Turkish firms. They showed that firm size, liquidity and profitability negatively affect the debt ratio. However, Güner (2016) pointed out a negative relation between leverage and growth opportunities while Burucu and Öndeş (2016) showed that growth rate and growth opportunities are positively related to leverage. Erol, Aytekin and Abdioğlu (2016) found that profitable firms and firms with more liquidity, less growth opportunities, and more tangible assets tend to have more leverage. Ilyukhin (2017) found that leverage is negatively related to growth opportunities and profitability, and positively related to firm size and industry mean leverage. On the other hand, the effects of business risk and tangibility are insignificant.

M'ng, Rahman and Sannacy (2017), and Cevheroglu-Acar (2018) found a negative relation between leverage and profitability. Moreover, they found that larger firms and firms with more tangible assets tend to have more leverage. Khémiri and Noubbigh (2018) found a non-linear (U-shaped) relationship between leverage and profitability. Vijayakumaran and Vijayakumaran

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(2018) indicated that leverage increases with tangibility and firm size, and decreases with profitability, risk and growth opportunities. Kiracı and Aydın (2018) examined the factors affecting total debt, short-term debt and long-term debt ratios. According to the results of the study, total debt ratio decreases with growth opportunities and liquidity; long-term debt ratio increases with fixed assets, firm size and liquidity, and decreases with growth opportunities; short-term debt ratio decreases with firm size, growth opportunities, fixed assets and liquidity.

3. Data and methodology

3.1 Data

The data have been obtained from financial statements belonging to 53 industrial firms listed on Istanbul Stock Exchange during the period from 2008 to 2017. The resulting unbalanced panel data provide 507 firm-year observations.

3.2 Estimation techniques

To investigate empirically the pecking order model of corporate leverage, this study employs two stages. In the first stage we examine whether firms with more investment opportunities relative to operating cash flows have higher leverage compared to firms with lower investment opportunities relative to operating cash flows. In this context, we consider the current and future investment. Fama and French (2002) argue that in a simple pecking order world, debt increases when investment exceeds internal funds and falls when investment is less than internal funds. In a more complex view of the model, firms with larger future investment maintain low-risk debt capacity and tend to have less current leverage.

The operating cash flows ratio (OCF) is measured as (operating cash flows / total assets) and is used as a proxy for internal funds. Our proxy for investment opportunities (INV) is (total assets t – total assets t-1) / total assets t (Fama and French, 2002: 8). The investment opportunities in period (t) have been considered as current investment. Future investment is the investment opportunities in period (t+1).

Firm-years are broken into two parts based on the median value of operating cash flows ratio. Firm-years with high (low) operating cash flows ratio are those ranked in above (below) the median value. The firm-years are also independently divided into two parts based on the median value of current investment. Firm-years with high (low) current investment are those ranked in above (below) the median value. Then, we select two groups. The first group (G1) contains firm-years that have high current investment and at the same time have low operating cash flows ratio (a group with more current investment relative to internal funds). The second group (G2) contains firm-years that have low current investment and at the same time have high operating cash flows ratio (a group with low current investment relative to internal funds). We employ T-Test and Man-Whitney Test to investigate whether the two groups have different leverage. Leverage (Lev) is calculated as the ratio of total debt to total assets. The previous procedures and tests will be repeated in the same way for future investment. In this case, we construct two groups as follows. (FG1) contains firm-years that have high future investment and at the same time have low current operating cash flows ratio while (FG2) contains firm-years that have low future investment and at the same time have high current operating cash flows ratio.

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Furthermore, to confirm our results, we employ a binary logistic regression model to predict whether or not firms with high investment relative to internal funds have higher leverage. We use the following logistic regression models:

$$\text{logit (Y)} = \ln\left(\frac{\pi}{1-\pi}\right) = a + \beta_1 (G_{it}) + \beta_2 (\text{Size}_{it}) + \beta_3 (\text{Tangibility}_{it}) \quad \text{(L1)}$$

$$\text{logit (Y)} = \ln\left(\frac{\pi}{1-\pi}\right) = a + \beta_1 (FG_{it}) + \beta_2 (\text{Size}_{it}) + \beta_3 (\text{Tangibility}_{it}) \quad \text{(L2)}$$

where:

Y: is a dummy variable and represents leverage (Lev). Accordingly, Y is a variable set to one if Lev is higher than or equal to the median value (highly levered firms), and set to zero otherwise (less levered firms).

π: is the probability of a firm i to be highly levered in period t.

G_{it}: is a dummy variable set to one if a firm i in period t belongs to the first group (G1), and set to zero if a firm i in period t belongs to the second group (G2).

FG_{it}: is a dummy variable set to one if a firm i in period t belongs to the group (FG1), and set to zero if a firm i in period t belongs to the group (FG2). This variable considers the future investment.

Size: is firm size and computed as the natural logarithm of total assets (Frank and Goyal, 2009; Fama and French, 2002). Frank and Goyal (2009) argue that the pecking order model predicts a negative relation between leverage and firm size. Large firms are better known, as they have been around longer. On the other hand, Fama and French (2002) argue that larger firms are likely to have less volatile earnings and net cash flows. If so, then the pecking order theory would predict a positive relation between leverage and firm size. Accordingly, the pecking order model makes an ambiguous prediction on the relation between leverage and firm size.

Tangibility: is the ratio of tangible assets to total assets. Low information asymmetry associated with tangible assets makes equity issuances less costly. Thus, the pecking order model predicts a negative relation between leverage and tangibility (Frank and Goyal, 2009: 9).

In the second stage we concentrate on the predictions about how corporate leverage varies with investment opportunities, profitability, business risk, firm size and tangibility, using OLS regressions. We estimate the following OLS regressions:

$$\text{Lev}_{it} = ß_0 + ß_1 (\text{INV}_{it}) + ß_2 (\text{ROA}_{it}) + ß_3 (\text{Risk}_{it}) + ß_4 (\text{Size}_{it}) + ß_5 (\text{Tangibility}_{it}) + \varepsilon_{it} \quad \text{(M1)}$$

$$\text{Lev}_{it} = ß_0 + ß_1 (\text{INV}_{it}) + ß_2 (\text{ROA}_{it}) + ß_3 (\text{Size}_{it}) + ß_4 (\text{Tangibility}_{it}) + \varepsilon_{it} \quad \text{(M2)}$$

ROA: is profitability and measured as the ratio of earnings before interest and taxes to total assets (Titman and Wessel, 1988: 6). Rajan and Zingales (1995) argue that changes in profitability will be negatively correlated with changes in leverage if dividends and investments are fixed, and if debt financing is the dominant mode of external financing.

Risk: is a variable estimates earnings volatility and computed as the standard deviation of (ROA) for the previous 4 years. Using this variable reduces the firm-year observations from 507 to 295. We estimate additional model without the variable Risk (the second model). However, Fama and French (2002) argue that firm size may serve as a proxy for risk (volatility). We use the variable (Size) in both models.

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4. Empirical results

4.1 spearman rank correlation results

Table 1. Spearman rank correlation coefficients

	Lev	ROA	OCF	Size	Risk	Tangibil-ity	INV (t)	INV (t+1)	N
Lev	1								507
ROA	-0.16**	1							507
OCF	-0.039	0.398**	1						507
Size	0.04	0.314**	0.314**	1					507
Risk	-0.141*	-0.012	-0.006	-0.14*	1				295
Tangibility	0.068	-0.25**	0.025	-0.022	-0.10	1			507
INV (t)	0.226**	0.239**	-0.061	0.105*	0.02	-0.08	1		452
INV (t+1)	0.158**	0.112*	0.094*	-0.007	0.01	-0.04	0.13**	1	452

N is the number of observations. * $P < 0.05$, ** $P < 0.01$.

Table (1) shows the results of the non-parametric Spearman rank correlation coefficients between leverage and other variables. We find that leverage is negatively related to profitability and risk. The relation between leverage and both the current and future investment is positive. On the other hand, the correlations between leverage and operating cash flows, firm size and tangibility are not significant. We also find that the relation between risk and firm size is negative, which is consistent with the argument that larger firms are less risky. Finally, the results indicate a positive relation between current investment and future investment, which means that investment is persistent.

4.2 T-Test and Man-Whitney Test results

Table (2) presents mean and median values of leverage, operating cash flows ratio and investment for the groups G1, G2, FG1, FG2. We find that G1 (a group with more current investment relative to operating cash flows) has higher leverage compared to G2 (a group with low current investment relative to operating cash flows). The mean and (median) values of leverage for G1 are higher [0.51 (0.51)] compared to G2 [0.386 (0.355)]. The difference between the two groups is significant at 1% level based on T-Test and Man-Whitney Test. These results are consistent with the predictions of the simple version of pecking order model. We also find similar results for future investments. Table (2) shows that FG1 (a group with more future investment relative to current operating cash flows) has more leverage compared to FG2 (a group with low future investment relative to current operating cash flows). The mean and (median) values of leverage for FG1 are higher [0.478 (0.488)] compared to FG2 [0.37 (0.33)], which is inconsistent with the complex version of pecking order model.

Table 2. T-Test and Man-Whitney Test results

	N	**Lev**	**INV (t)**	**OCF**
G1	110	0.51 (0.51)	0.242 (0.205)	-0.025 (-0.004)
G2	115	0.386 (0.355)	0.0059 (0.038)	0.117 (0.104)
T-Test (Sig)		0.000**	0.000**	0.000**
Mann-W (Sig)		0.000**	0.000**	0.000**
	N	**Lev**	**INV (t+1)**	**OCF**
FG1	112	0.478 (0.488)	0.204 (0.172)	-0.021 (-0.0025)
FG2	112	0.37 (0.33)	0.004 (0.037)	0.104 (0.087)
T-Test (Sig)		0.000**	0.000**	0.000**
Mann-W (Sig)		0.000**	0.000**	0.000**

Figures without parentheses are mean values. Median values are in parentheses. N is the number of observations. ** significant difference between the two groups at 1% level.

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4.3 Binary Logistic Regressions results

Table (3) presents the results of logistic regressions. Following the results of the first model, we find a positive and significant relation between the probability of the firms to be highly levered and the variable G. This result indicates that firms with more current investment relative to operating cash flows (firms in G1) are more likely to be highly levered compared to firms in G2. The estimated coefficient on firm size is positive and significant. Thus, larger firms have more leverage. On the other hand, the tangibility coefficient is not significant. In the second model we find a positive sign for the variable (FG) which considers future investment. Hence, firms with more future investment relative to operating cash flows (firms in FG1) are more likely to be highly levered. However, the estimated coefficients on Size and Tangibility are not significant.

Table 3. Binary Logistic Regressions results

Models	Constant	G	FG	Size	Tangibility	Nagelkerke R^2	Sig	N
L1	-6.26** (0.002)	1.51** (0.000)	-	0.257** (0.008)	1.057 (0.201)	0.161	0.000	225
L2	-1.1 (0.593)	-	1.16** (0.000)	0.01 (0.92)	0.392 (0.646)	0.102	0.001	224

N is the number of observations. Sig represents the significance of the model based on (Omnibus Tests of Model Coefficients). P values are reported in parentheses. ** indicate significance at the 1%, level.

4.4 OLS Regressions results

Table (4) presents OLS regressions predicting leverage level. The first model shows that the coefficients of profitability, risk and investment are consistent with the pecking order model. We find that leverage decreases significantly with profitability and risk, and increases significantly with investment. However, the coefficients of firm size and tangibility are not significant. The second model is estimated without the variable Risk. The coefficients of this model are consistent with the estimates of the first regression, except for Size, which has a positive and significant coefficient. We have found in (table 1) that the relation between size and risk is negative. Thus, we can conclude that the positive sign on firm size in the second model is in line with the negative effect of risk in the first model, indicating that larger firms are less risky and consequently tend to have more leverage.

Table 4. OLS Regressions results

		Dependent Variable: Leverage	
Models	**Leverage predictions of the pecking order model**	**M1**	**M2**
Constant		**0.260** (0.098)	**0.160** (0.200)
INV	Positive	**0.164*** (0.033)	**0.190**** (0.002)
ROA	Negative	**-0.632**** (0.000)	**-0.427**** (0.001)
Risk	Negative	**-0.624*** (0.042)	-
Size	Positive/ Negative	**0.013** (0.098)	**0.014*** (0.028)
Tangibility	Negative	**0.044** (0.507)	**0.048** (0.399)
Adjusted R^2		0.079	0.042
F		6.033** (0.000)	5.96** (0.000)
N		295	452

N is the number of observations. P values are reported in parentheses.

*, ** indicate significance at the 5%, 1% levels, respectively.

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5. Conclusion

The pecking order model of corporate leverage (discussed by Myers (1984)) suggests that the information asymmetry problem causes a firm to finance their investment opportunities first with internal funds. Firms would prefer to issue debt rather than equity if the internal funds are not sufficient. Issuing equity will be the last resort. This research investigates the pecking order model of corporate leverage for a sample of 53 Turkish industrial firms listed on Istanbul stock exchange during the period from 2008 to 2017. We test whether firms with more investments relative to internal funds have more leverage compared to firms with low investments relative to internal funds. To investigate this issue, we employ a binary logistic regression model. The results showed that firms with more investments relative to operating cash flows are more likely to be highly levered. We also concentrate on the predictions about how corporate leverage varies with investments, profitability, risk, firm size and tangibility. Using Ordinary Least Squares (OLS) regressions, we find that leverage increases with investment opportunities and firm size, and decreases with profitability and business risk. On the other hand, the ratio of tangible assets to total assets is not significantly related to corporate leverage. Confirming the pecking order model, these results imply that more profitable and risky firms tend to have less leverage. Moreover, larger firms and firms with more investment tend to have more leverage. Overall, these results indicate that pecking order model can explain financing decisions of Turkish firms.

References

Bradley, M., Jarrel, G. A., & Kim, E. H. (1984). On the Existence of an Optimal Capital Structure: Theory and Evidence. *Journal of Finance*, 39(3), 857-878.

Burucu, H., & Öndeş, T. (2016). Türk İmalat Sanayi Firmalarının Sermaye Yapısını Etkileyen Faktörlerin Analizi. Çankırı Karatekin Üniversitesi, *İktisadi ve İdari Bilimler Fakültesi Dergisi*, 6(1), 201-225.

Cevheroglu-Acar, M. G. (2018). Determinants of Capital Structure: Empirical Evidence from Turkey. *Journal of Management and Sustainability*, 8(1), 31-45.

Chen, H., & Hammes, K. (1997). Capital Structure, Theories and empirical results - a panel data analysis. *Paper presented at Conference on Financial Regulation*, Groningen, Netherlands.

Erol, A. F., Aytekin, S., & Abdioğlu, N. (2016). İşletmelerin Sermaye Yapılarının Belirlenmesinde Finansal Hiyerarşi Teorisinin Kullanımı ve BIST'te Bir Uygulama. *KSÜ Sosyal Bilimler Dergisi,* 13(1), 113-128.

Fama, E. F., & French, K. R. (2002). Testing Trade-Off and Pecking Order Predictions about Dividends and Debt. *Review of Financial Studies*, 15(1), 1-33.

Fosberg, R. H. (2008). Debt Capacity and Debt Financing. *Journal of Business & Economics Research*, 6(8), 21-26.

Frank, M. Z., & Goyal, V. K. (2003). Testing the pecking order theory of capital structure. *Journal of Financial Economics 67*, 217–248.

Frank, M. Z., & Goyal, V. K. (2009). Capital Structure Decisions: Which Factors Are Reliably Important?. *Financial Management*, 38(1), 1-37.

Gaud, P., Jani, E., Hoesli, M., & Bender, A. (2003). The Capital Structure of Swiss Companies: An Empirical Analysis Using Dynamic Panel Data. *The International Center for Financial Asset Management and Engineering (FAME), Research Paper 68*, 1-28.

Goh, C. F., Tai, W. Y., Rasli, A., Tan, O. K., & Zakuan, N. (2018). The Determinants of Capital Structure: Evidence from Malaysian Companies. *International Journal of Supply Chain Management*, 7(3), 225-230.

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Gülşen, A. Z., & Ülkütaş, Ö. (2012). Sermaye Yapısının Belirlenmesinde Finansman Hiyerarşi Teorisi ve Ödünleşme Teorisi: İMKB Sanayi Endeksinde Yer Alan Firmalar Üzerinde Bir Uygulama. *ZKÜ Sosyal Bilimler Dergisi*, 8(15), 49-59.

Güner, A (2016). The Determinants of Capital Structure Decisions: New Evidence from Turkish Companies. *Procedia Economics and Finance 38*, 84 – 89.

Ilyukhin, E. V. (2017). The Determinants of Capital Structure: Evidence of Russia. *Journal of Corporate Finance Research,* 14(4).

Karadeniz, E., Kandir, S. Y., Balcilar, M., & Onal, Y. B. (2009). Determinants of Capital Structure: Evidence from Turkish Lodging Companies. *International Journal of Contemporary Hospitality Management*, 21(5), 594-609.

Khémiri, W., & Noubbigh, H. (2018). Determinants of capital structure: Evidence from sub-Saharan African firms. *The Quarterly Review of Economics and Finance 70*, 150-159.

Kiracı, K., & Aydın, N. (2018). Determinants of Capital Structure: Empirical Evidence from Traditional Airlines. *International Journal of Economic and Administrative Studies 21*, 173-186.

M'ng, J. C. P., Rahman, M., & Sannacy, S. (2017). The determinants of capital structure: Evidence from public listed companies in Malaysia, Singapore and Thailand. *Cogent Economics & Finance 5*, 1-34.

Myers, S.C. (1984). The Capital Structure Puzzle. *Journal of Finance*, 39(3), 575-592.

Rajan, R.G., & Zingales, L. (1995). What Do We Know About Capital Structure? Some Evidence from International Data. *Journal of Finance*, 50(5), 1421-1460.

Shyam-Sunder, L., & Myers, S.C. (1999). Testing Static Tradeoff against Pecking Order Models of Capital Structure. *Journal of Financial Economics 51*, 219-244.

Titman, S., & Wessels, R. (1988). The Determinants of Capital Structure Choice. *Journal of Finance*, 43(1), 1-19.

Vijayakumaran, S., & Vijayakumaran, R. (2018). The Determinants of Capital Structure Decisions: Evidence from Chinese Listed Companies. *Asian Journal of Finance & Accounting,* 10(2), 63-81.

Zhang, R., & Kanazaki, Y. (2007). Testing Static Tradeoff against Pecking Order Models of Capital Structure in Japanese Firms. *International journal of accounting & information management*, 15(1), 24-36.

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