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Testing Trade-Off Theory of Capital Structure: Empirical Evidence from Indonesian Listed Companies

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ABSTRACT

The purpose of this research is to test the Trade-Off Theory of capital structure in public listed Indonesian companies by using Partial Adjustment Model. The model is applied to a specific balance panel data from 228 companies by using different regression techniques; Pooled Least Square (PLS), Fixed Effect Model (FEM), and Generalized Method of Moments (GMM). Findings of the research are Indonesian companies adjust their capital structures towards an unobservable target at the speed of 43.79% a year. It means that Indonesian companies need around 2 years and 3 months to adjust their existing capital structure toward a target. This finding supports the advantages of Trade-Off Theory over the Pecking Order Theory. This paper also highlights the long term parameter of dynamic model of capital structure and the determinants of capital structure.

Keywords: *Dynamic Capital Structure, Target Capital Structure, Partial Adjustment Model, Trade-Off Theory, Indonesia.*
JEL Classification: G32: *Corporate finance and governance; capital structure.*

1. INTRODUCTION

Capital structure is a mix of debts and equities used by a company to finance its investment. Capital structure is determined through a combination of equity and debt financing. Corporate financing is directed to obtain an optimal capital structure that will provide financial benefit of increasing the company value and reduce the risk of financial distress that will be able to drive the company into bankruptcy (Tanimura, 2001).

Debt Financing has advantage compared to equity financing from its tax shield, which is expected to increase the profitability and value of the company (Tanimura, 2001). Nevertheless, the greater amount of debt will lead company to bear risk of financial distress [Narungtanupon, 2000; Bar - Or, 2000]. The existence of a trade-off between the benefits and risks of debt is one of difficulties faced by management in determining the company's capital structure policy. Therefore, capital structure is becoming one of interesting topics in finance research (Howe and Jain, 2010).

The modern capital structure theory begins with the preposition of Modigliani Miller II, which reported the effect of debt on the firm value. According to this preposition, the company will benefit from the use of debt in the form of tax shield of the interest expense that can be deducted in calculating corporate taxes. The greater

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company use of debt, the greater tax benefits can be obtained. However, the company can not obtain such benefits in an unlimited amount. There is a certain limit to the amount of debt which is after passing it the benefits of the debt will be decreasing. This is due to the risks of bankruptcy associated with the use of excessive debt (Molina, 2002). Therefore, the optimal level of capital structure suggests the level of debt that balances bankruptcy costs with the benefits of debt financing.

In the development of capital structure theory appears Pecking Order Theory formulated by Donaldson in 1961 (Manurung, 2011). The theory concerns the order of source financing used by a company. Investment will be firstly financed from internal funds. If it is not enough, the company will issue debt. Equity is used as a backup source of financing. In 1969, Stiglitz proposed Trade-Off Theory which deals with the exchange of tax shield benefit derived from debt's interest expense and cost of using excessive debt. Based on this theory, the company will attempt to select a certain level of capital structure to balance costs and benefits of debt (Tanimura, 2001).
Dynamic capital structure theory was initialy put forward in 1986 by Zwiebel (Khalid, 2011). According to Zwiebel, a company choose a debt in voluntarily with its limitations to develop the company in the future. The next development of the capital structure theory presented by Fischer et al. (1989) who develops a dynamic capital structure. This theory seeks to overcome the drawbacks of the static model that does not take into account the possibility of restructuring the capital structure in response to changes in the value of assets that possibly occur at all times. Flannery and Rangan (2006) did a research to determine targeted capital structure using partial adjustment model. The model indicates that companies have a targeted capital structure and some of them close to one third gaps of actual debt and its target every year.

Mukherjee and Mahakud (2010) find specific company variables of *size*, intangible assets, and profitability as important variables in determining target capital structure and its speed of adjustment. Jiang *et al.* (2010) stated that products competition have significant influence to deviation of existing capital structure and targeted capital structure. The tighter competitions lead to the smaller capital structure deviation. Clark *et al.* (2010) gave empirical evidence to strengthen the conclusion that companies do adjustment to achieve target capital structure. They concluded that 26 395 companies in 40 countries made adjustment to target capital structure.

Research on Trade-Off Theory is conducted through dynamic partial adjustment model (PAM) and it successfully identified the presence of a certain speed of adjustment to the target (unobserved) capital structure (Flannery and Rangan, 2006). PAM results are generally used to support the Trade-Off Theory compared to Pecking Order Theory. Nevertheless, Reinhard and Li (2010) revealed weaknesses that PAM approach cannot distinguish Trade-Off Theory and Pecking Order Theory. Therefore, the "gap research" of capital structure seems still to be open.

Financial research in the context of Indonesian companies is interesting to do given the prospect of relatively high economic growth. OECD (2012) predicts Indonesia will has GDP growth rate between 2011 to 2030 by 5.3% and will stand at the third rank in the world after India's average GDP growth of 6.7% and China by 6.6%. In the long term perspective of 2011 to 2060, Indonesia's average GDP growth rate is predicted to remain high at 4.1%, slightly above the Chinese average growth of 4%, and will be in the second rank after India that was estimated to have an average GDP growth of 5.1%.

The research aims to test Trade-Off Theory of capital structure using a partial adjustment model to prove the presence of adjustment to achieve targeted (unobservable) capital structure in Indonesian public companies listed in Indonesian Stock Exchange. It also investigates the determinants that significantly influence the capital structure. The research will give benefit to management companies, financial regulator, and financial researchers. The future research which can be developed includes the influence of debt issuance to the company share price. The industry clustering into three level of DER, namely high, medium, and low will give more specific views of speed adjustment in those industries. The rest of the paper will be organized as follows: data and methodology that consists of data, regression model and estimation technique, and operational variables; Results and Analysis; and conclusion remarks.

2. DATA AND METHODOLOGY

2.1 Data

The data used in this research is secondary data from quarterly and annual financial statements of the company. The annual financial statements are financial statements audited by a public accounting firm, therefore the validity, accuracy, and consistency of the data used are reliable, while the quarterly financial report is unaudited statements. Quarterly financial statement data is used to determine the variable of volatility of cash flows while the annual financial statements are used to determine the other capital structure determinants.

The data population is public companies listed on the Indonesia Stock Exchange by December 30, 2011 as many as 442 companies grouped in 9 sector industries. The screening process is done to determine the research sample by excluding companies that:

- From the banking, financial services, insurance, and related financial sector (industry sector code 8), because the pattern of corporate financing of financial firms is different to non-financial firms and its capital structure are regulated by government.
- Do Initial Public Offering after 2005.
- Do not have the value of the variables used in this study.
- Do not have a complete financial statement data in 2005 to 2011.

After the screening process, 228 samples of company from 8 industry sectors are obtained and it is presented on Table 1.

2.2 Regression Model and Estimation Technique

In determining the speed of adjustment of companies listed on the Indonesia Stock Exchange in achieving the target capital structure, we used panel data with Partial Adjustment Model. The model is based on the Partial Adjustment Model following Flannery and Rangan (2006). Capital structure used in this study is debt to equity ratio that is ratio between debt to debt plus equity.

Target debt ratios that will vary between companies or over time is given by:

$$DER^*_{i,t+1} = \beta X_{i,t} \quad \text{.....} \quad (1)$$

Showing all variables of $X_{i,t}$, the formula on (1) can be written as follows:

$$DER^*_{i,t+1} = \gamma + \beta_1 SIZE_{i,t} + \beta_2 FIXA_{i,t} + \beta_3 TAX_{i,t} + \beta_4 SDCF_{i,t} + \beta_5 INTR_{i,t} + \beta_6 INTA_{i,t} \quad \text{.....} (2)$$

Note:

$DER^*_{i,t+1}$	:	Targeted debt to equity ratio of firm *i* in year *t+i*
$X_{i,t}$	:	Vector of firm characteristics associated costs and benefits of various debts to equity ratio, consist of the size of the company (SIZE), fixed assets (FIXA), tax benefit (TAX), the volatility of cash flows (SDCF), the fixed charges (INTR), and intangible assets (INTA).
. β	:	Vector coeficient
. γ	:	Constanta

The standard model for estimating the partial adjustment model over the ratio of initial capital structure of the target in respective periods is:

$$DER_{i,t+1} - DER_{i,t} = \lambda (DER^*_{i,t+1} - DER_{,t}) + \delta_{i,t+1} \quad \text{.....} \quad (3)$$

Note:

$DER^*_{i,t+1}$	:	Targeted debt to equity ratio of company *i* in year *t+1*,
λ	:	Company's speed of adjustment to close the gap between actual debt and targeted debt level.

The following model is obtained from rearrangement of model number (3) with substitution of $DER^*_{i,t+1} = \beta X_{i,t}$:

$$DER_{i,t+1} = (\lambda \beta) X_{i,t} + (1 - \lambda) DER_{i,t} + \delta_{i,t+1} \quad \text{.....} \quad (4)$$

This mode states that managers take the necessary steps to close the gap between current debt ratio ($DER_{i,t}$) and the targeted debt ratio ($DER^*_{i,t+1}$).

2.2 Operational Variables

The research hypothesis is that a certain speed of adjustment given of the companies to reach its target capital structure. This hypothesis is supported by empirical study which stated that the company would seek to adjust

their capital structure to reach the target capital structure [Flannery and Rangan 2006; Tian and Raul, 2009; Mukherjee and Mahakud 2010; Jiang *et al.*, 2010; Pungaliya, 2010; Kouki and Said 2012].

Independent variable of the research consists of tax benefits, fixed costs, the net cash flow volatility, intangible assets, net fixed asset, and size of the firm. **Tax benefits** come in the form of tax shield of interest expenses that can be deducted in calculating the corporate income tax. The number of tax benefits depends on the tax rate and interest expenses from the company debts. **Fixed costs** are a permanent burden to be borne by the company in the form of interest expenses and other financial charges. The level of fixed costs is negatively correlated to the amount of debt. The higher fixed cost will make company's ability to increase debt will be diminishing. **Cash flow volatility** is measured by standard deviation of net cash flow. Cash flow volatility is negatively correlated to the amount of debt. The greater the standard deviation of cash flows, the company's ability to raise the amount of debt will decrease. **Intangible asset** is intangible asset owned by company such as patent, trade mark, and research and development costs. The higher intangible asset, the company ability to obtain debt will increase. **Fixed asset** is tangible asset owned by company to support operational activity, such as land, building, machinery, and vehicle. The greater the company fixed assets, the company's ability to add debts will increase. ***Size*** is measured by company total assets. The greater the company total assets, the company's ability to raise debts will be greater because of the bigger guaranty of assets.

Dependent variable is capital structure in the form of debt to equity ratio. It is the ratio between the book value of debt and the sum of total book value of debts and equity. Total debt comprises of short term and long term interest bearing debts.

3. RESULTS AND ANALYSIS

3.1 Descriptive Statistic

Descriptive statistic on the data of debt to equity ratio and research variables used on 228 companies in the period of 2005 to 2011 is presented in Table 2. It shows that mean of debt to equity ratio for all 228 companies is 0.4379 with the standard deviation of 0.5023. The highest DER is 9. 9437 and the lowest DER is 0.0000000268. This imply that there is a public companies listed in Indonesia Stock Exchange which is heavily depend on debt in financing their investment. On the other hand, there is a company which heavily using equity to finance its investment.

3.2 Estimation Result

Testing the research hypothesis is done by using partial adjustment model. Estimation is done by using a dynamic model. Evaluation of the model specification begins with the evaluation of the suitability of three alternatives of regression used, PLS, *Fixed Effects*, and GMM. System of Generalized Method of Moments (GMM) is used in a balance panel data to determine whether the rebalancing behavior of capital structure consistent with a model of partial adjustment (Nguyen and Shekhar, 2007). The evaluation is conducted to assess the regression model that fit and proper to explain the dynamic nature of capital structure adjustment. Recapitulations of estimation results from three models are presented in Table 3.

In a dynamic model, one form of the test is to compare the dynamic parameter *Der0 L1* (which means *Der0* one period lag) produced by GMM method to *Der0 L1* generated by the PLS and FEM method. The purpose of this test is to see whether there is a bias in the resulting parameters. The fourth column in Table 3 shows that the estimation of the parameters by GMM produced coefficient *Der0 L1* of 0.5621, which is statistically highly significant.

The GMM's coefficient value is below the estimated coefficients *Der0 L1* generated by the PLS method of 0.78422 and above the estimated value generated by the FEM method of 0.46586. The results are in line with the conclusion stating that the PLS method is likely to produce a lagged dependent variable coefficient too high, while the FEM tends to produce the same parameter too low (Nguyen and Shekhar, 2007). Therefore, the exact parameters will have the estimated value between FEM estimation results and PLS, which is the value generated by the GMM models.

The results of the GMM model calculations show the estimated speed of adjustment is 1 - 0.5621 = 0.4379 or 43.79% per year, which mean that the company closed 43.79% gap between the current level of debt with a debt level that is targeted. In other words, it takes about 2 years and 3 months for the average public company in Indonesia to make adjustments to the current capital structure to reach the target capital structure. The relatively fast adjustment rate to the target DER implies that the existence of the Trade- Off Theory outperform the existence of the Pecking Order Theory in corporate decision-making of capital structure (Mukherjee and Mahakud, 2010).

The level of the adjustment speed by companies in Indonesia is relatively faster than the speed of adjustment from India companies and USA companies. Mukherjee and Mahakud (2010) estimated that the speed of adjustment by Indian companies was 33% per year. Estimation by Flannery and Rangan (2006) on United State of America public companies in the period of 1965 to 2001 found that the speed of adjustment was 34.4%. Elsas and Florysiak (2013) tested the adjustment speed on companies in United Stated of America in the year of 1965 to 2008 and they found the adjustment rate was 34.9%.

The differences of adjustment level across countries indicating that in general structural differences exist in the structure of microfinance institutions and banks (Ariff and Hassan, 2008). The adjustment rate in Spain is very high amounted to 0.79 due to lower transaction costs for borrowing funds in Spain (Miguel and Pindado, 2001). For Spanish company, bank credit is very important and become the main source of credit for the company. Therefore, the degree of rapid adjustment indicates lower agency costs between creditors and shareholders.

Columns 2 and 3 on Table 3 show the results of the data from the PLS and FEM models. PLS model identifies variables tax benefit ($p > 1\%$), interest expense ($p > 5\ \%$), and the standard deviation of the net cash flow ($p > 10\%$) as significant determinants of capital structure. FE model in column 3 identifies variables of tax benefit and interest expense as significant determinants of capital structure, same as the PLS, but the standard deviation of the variable net cash flow is not significant, in contrast to the identification of the PLS. Variable SDCF, INTR, and INTA in both PLS and FE models have the expected sign of negative, but the coefficients of these three variables are not significant. Only variables SDCF is significant at $p > 10\ \%$ in the PLS model. The estimate result of the variable FIXA shows negative sign that do not comply with the expected sign. This happens both with PLS estimates and the FEM models. Both models also produce coefficient of FIXA that are not significant.

The results of the GMM estimations show all of the variables have the expected sign, except for the variable FIXA. Unlike the PLS and FEM model, the GMM system model generate significant variables, including variables FIXA. The results of the GMM model suggest that the instruments used are valid. Of the six variables used, only one variable FIXA which has a negative sign, inconsistent with the predictions of financial theory or some of the results of empirical research.

The result of SIZE parameter estimation is statistically significant and has a positive relationship with the DER. Mukherjee and Mahakud (2010) explains the positive relationship between firm size and the DER reflect three things. First, large companies are likely to have better access to financial markets to obtain long-term debt. Second, the ratio of bankruptcy costs on firm value is higher for smaller companies because of the costs include fixed costs can be ignored by large companies. Because the bankruptcy costs increase with the debt, then the small-scale company will borrow less debt than large company. Third, the positive coefficient of SIZE aligned with the prediction that small firms are more vulnerable to liquidity risk if they face financial distress because banks generally will firmly against small firm.

Regression coefficient of fixed assets is statistically significant but has a negative sign. The negative relationship between fixed assets with debt levels can be caused by tangible fixed assets that be associated with a higher information asymmetry that would make the external equity financing is cheaper than debt financing. Tax benefits from the tax shield of interest expenses have a positive relationship with the DER and statistically significant. The positive influence of the tax benefits of DER indicates that companies will maximize the use of debt to get a large tax benefit. This is consistent with the trade-off theory of capital structure.

Volatility of net cash flows that reflect the company's financial risk has a negative relationship with debt and statistically significant. It can be explained that the company which has a large cash flow fluctuations will seek to reduce the level of debt, due to the lack of company ability to meet debt payment obligations and principal repayment of debt in the whole tenor of debt. Interest expense and finance charges arising from the use of debt have a negative and significant relationship to the DER. The greater the interest expense to be paid, the greater possibility the company goes into financial distress. Therefore, the greater the company's interest expense is likely for the company to reduce the level of debt after considering the tax benefits derived from interest expense of the company.

Intangible assets have a negative relationship with the DER and significant. The greater value of intangible assets indicates that the company has great potential to promote growth, thus requiring more funds to finance the growth. However, the financing is done by using a cheaper external equity.

The result of GMM estimation supported by the Sargan test / Hansen J and accepted at the level of 5% (p-value = 0.026). Autocorrelation test which is performed with Arrelano - Bond test showed no autocorrelation. Arrelano - Bond test results are acceptable to the 1% significance level (p-value = 0.0083). It shows that all of the variables used are valid instruments. Results of test F/Wald Chi produce the F value of the GMM models for 14563.81 larger than the OLS and FEM models. This supports the GMM as a better and efficient model than OLS and FEM models. Therefore, the research results using dynamic data panel model indicate that behavioral finance of companies in Indonesia are consistent with the partial adjustment model.

3.3 Long-term Parameters

The advantage of the application of dynamic capital structure model using a partial adjustment models is it can produce the long-term parameters (Ariff and Hassan, 2008; Gujarati and Porter, 2009; Maddala, 2005). The long-term coefficient value is obtained by dividing each coefficient estimates of the independent variable of the dynamic regression equation with one minus the estimated value of the lagged dependent variable. The estimation results in Table 4 show the coefficient of lagged DER (*Der0 L1*) of 0.5621. It means that the company is still using 56.21% of debt they had in the previous year and debt levels are altered by 43.79% or 1 - 0.5621. The figure shows the company's speed of adjustment to achieve the target capital structure is 43.79%.
By using the long-term calculation formula, it can be obtained long-term value of parameters of TAX variable amounted to 0.0084266. It is calculated by 0.00369 / (1 - 0.5621). This value differs from the value of short-term TAX variable coefficient of 0.00369 as presented in Table 3. Long-term parameters of the entire variable of dynamic capital structure model calculated in the same manner are presented in Table 4.

The calculation results in Table 4 show that the estimated coefficient value of all long-term parameters are greater than the estimated value of short-term variables. Therefore, it can be concluded that the result of short-term estimates was undervalued compared to long-term estimation results.

4. CONCLUSION REMARKS

This study aims to examine the application of the trade-off theory of capital structure using a dynamic model of partial adjustment in public listed company in Indonesia. Estimation of speed of adjustment rate is conducted to all companies regardless of whether there is any deviation from the company's capital structure target levels and how much deviation occurs. Estimation is done by using a dynamic model. The estimation results show that firm-specific variables in total assets, total fixed assets, tax benefits, and the volatility of net cash flow, interest expense, and intangible assets are statistically significant. The speed of adjustment rate to the target capital structure amounted to 43.79%. This indicates existence of optimal (target) capital structure in public listed companies in Indonesia and the company wants and strives to achieve it.

Corporate managers can optimize the tax benefits derived from the company's debt, with regard to bankruptcy costs arising from the use of excessive debts. Therefore, it is very important for managers to be able to estimate the target capital structure of the company and make it as a guide in formulating corporate financing policies. Corporate managers should consider the adjustment costs that will be incurred if the company changes its corporate financing with other variables, such as the flexibility of the manager, the direct costs of debt and equity. Positive and significant relationship between firm size and tax benefits with the speed of adjustment to target capital structure gives a signal to the manager that the cost to maintain a low level of debt becomes more expensive than the cost of other adjustments that must be faced by the company to achieve an optimal or targeted capital structure. Therefore, managers must take systematic steps to achieve the target within a reasonable time.

This study uses the DER based on the book value of equity and interest bearing current and long term debts. Future researches can be developed using the market value of equity, splitting debt into three groups; current debt, long term debt, and total debt, as well as classifying the company into three; large-scale enterprises, medium, and small, to see the effect of the grouping on the estimation results. Research can also be extended by investigating the effect of the issuance of debt on the company's stock price.

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Table 1 Number of Companies per Sector Industry under Study

Nbr.	Sector	Sector Code	Number of companies	Percentage (%)
1	Agriculture	1	13	5.7
2	Mining	2	13	5.7
3	Basic industry and chemicals	3	43	18.9
4	Various industry	4	34	14.9
5	Consumer goods	5	28	12.3
6	Property and real estate	6	25	11.0
7	Infrastructure, utility, and transport	7	20	8.8
8	Trade, services, and investment	9	52	22.8
	Total		228	100

Source: the research data

Table 2 Descriptive Statistic of Research Variables Data

Nbr.	Variable	Number of data	Mean	Median	Maximum	Minimum	Standard Deviation
1	DER	1.596	0.4378	0.3935	9.9437	0.0000000268	0.5023
2	SIZE	1.596	4.563,33	1.136,97	153.521,00	0.1440	11.389,34
3	FIXA	1.596	2.076,28	335,58	76.420,00	0.000001	6.370,37
4	TAX	1.596	29,49	4,49	1.569,13	0.00000025	88,51
5	INTR	1.596	106,24	15,79	6.276,51	0.000001	332,48
6	INTA	1.596	94,30	0,00	8.732,28	0,00	554,18
7	SDCF	1.596	108,43	16,64	4.720,52	0.0056	290,32

Source: the research data
Note:
Number 1, value in ratio
Number 2 to 7, value in billion rupiah

Table 3 Estimation Result of Dynamic Capital Structure Panel Data

Variables	Dynamic Model		
	PLS	FEM	GMM
Der0 L1.	0.7842 [a)] (0.01453)	0.4658 [a)] (0.02488)	0.5621 [a)] (0.007017)
Constanta	0.0777 [a)] (0.01038)	0.2106 [a)] (0.01914)	0.1600 [a)] (0.00623)
SIZE	0.00000031 (0.00000166)	0.0000025 (0.0000038)	0.00000372 [a)] (0.00000024)
FIXA	-0.00000208 (0.0000026)	-0.0000036 (0.00000817)	-0.000011 [a)] (0.0000049)
TAX	0.003065 [a)] (0.0010678)	0.00288 [b)] (0.00122)	0.00369 [a)] (0.0001056)
SDCF	-0.000055 [c)] (0.000034	-0.0000378 (0.0000392)	-0.000043 [a)] (0.00000183)
INTR	-0.000698 [b)] (0.0002766)	-0.000667 [b)] (0.000316)	-0.000867 [a)] (0.0000272)
INTA	-0.0000163 (0.000169)	-0.00000178 (0.0000301)	-0.00000312 [a)] (0.0000011)
Test of dynamic parameter (Der0 L1.)	Der0 L1. PLS>GMM>FEM : 0.78422 > 0.5621 > 0.46586		
F/Wald Chi Test	437.98 [a)]	51.63 [b)]	14563.81 [a)]
Sargan test for over identifying restrictions		64.0061 [b)]	
Arellano-Bond test for zero autocorrelation		-2.6402 [a)]	

Source: the research data
Note: [a)] : Significant at 1%, [b)] : Significant at 5%, [c)] : Significant at 10%,
( ) : Deviation standard

Table 4 Long-term Parameters of Dynamic Capital Structure Model

Variable	Dynamic Model
	GMM
Der0 L1.	1.28362640
Constanta	0.36547157
SIZE	0.00000850
FIXA	(0.00002512)
TAX	0.00842658
SDCF	(0.00009820)
INTR	(0.00197990)
INTA	(0.00000712)

Source: the research data