NON-LINEAR DYNAMIC PANEL DATA ANALYSIS FOR DEBT-EQUITY CHOICE AND ITS IMPACT ON MORAL HAZARD PROBLEMS

Fauziah Md. Taib, Anton Abdulbasah Kamil, Augustinus Setiawan*

Abstract:

Moral hazard agency problems take place when risky debt is issued. The dominant shareholders have opportunities to make decisions which effect wealth transfer. In several recent theories, debt-equity choice, which deals with agency problems assumes that financing and investment decisions are separable. These studies have been criticized due to the fact that both decisions are interdependent. The purpose of the presented paper is to test empirically the moral hazard problem of debt-equity choice in Indonesia. This study provides evidence that the level of debt is not secured by the sufficient collateral and is also not supported by growth opportunities. It seems that Indonesian companies use debt also to finance operations and not only for real investment.

Keywords: debt-equity choice, moral hazard, asset substitution problem, Indonesian companies

JEL Classification: C230, O530

1. Introduction

Moral hazard problem is one of main financial issues, which is related to debt-equity choice in Indonesian companies. These issues are related to both financing and investment decisions simultaneously. Previous studies assume that both decisions are separable. In several recent theories, particularly those which deal with agency problems, separation does not take place (Williamson, 1981).

Taking into account Indonesian financial issues, previous studies point out that Indonesian companies suffer from high level of debt (Claessens, Djankov, & Nenova, 2000; Husnan, 2001) and also they prefer debt to finance their investment regardless of the collateral assets or firm profitability (Kwik, 1994, 1996; Wibisono, 1998; Setiawan, 2004). Agency problem exists when risky debt is issued, due to shareholders having opportunities to make decisions, which effect wealth transfers from shareholders to debtholders. Besides, previous studies on debt-equity choice assume that financing and

* Fauziah Md. Taib, School of Management – University Sains Malaysia, 11800, USM, Penang, Malaysia; Anton Abdulbasah Kamil, School of Distance Education – University Sains Malaysia, 11800, USM, Penang, Malaysia (anton@usm.my); Augustinus Setiawan, School of Management – University Sains Malaysia, 11800, USM, Penang, Malaysia.

investment decisions are separable, they face some criticism due to the endogeneity problem (Jensen, Solberg, & Zorn, 1992; Agrawal, & Knoeber, 1993; Bathala, Moon, & Rao, 1994; Cho, 1998; Barnhart, & Rosenstein, 1998; Chen & Steiner, 1999; Setiawan & Fauziah, 2002).

The purpose of the presented paper is to test empirically the recent moral hazard problem of debt-equity choice in Indonesian companies. Taking into account the methodological critique, the presented study intends to examine this issue by employing the non-linear model with dynamic panel data. Panel data has ability to overcome the endogeneity problem (Baltagi, 2001; Gujarati, 2003). Furthermore a non-linear model can give more explanation relating to financing and investment decisions simultaneously.

The rest of the section is organized in the following manner. Short discussion related to theoretical framework and hypothesis development is presented in Section 2. Section 3 provides the empirical evidence and discussion related to the relationship between the level of debt and some explanatory variable that represent the moral-hazard problem in Indonesian companies. The final section presents the conclusion.

2. Theoretical Framework and Hypotheses Development

2.1 The Determinant of Debt-Equity Choice

This study prefers the ratio of total debt to total asset as a proxy of the level of firm's debt. This measurement was used by Brailsford, Oliver and Pua, 1999; Pandey, 2002; Rajan and Zingales, 1995. The reason for preferring this measurement is due to the Indonesian condition, in which as a developing country it often substitutes short-term debt for long-term debt and roll over short-term debt. Also, this measurement is expressed as a function of the set of traditional static trade-off variables, asymmetric information variable, and potential agency problem.

The level of debt may be explained by some factors such as: tangibility of fixed assets (collateral value, the ratio of fixed to total assets), the market-to-book ratio or Tobin's Q (usually thought of as a proxy for investment opportunities), firm size (measured as the natural logarithm of sales), profitability (earning before interest, tax and depreciation to total assets).

The tangibility of assets represents the effect of the collateral value of the firms in case they borrow from the banks/financial institutions (Titman & Wessels, 1988; Rajan & Zingales, 1995; Fama & French, 2000). As collateral, it protects lenders from the conflict with debt holders. This conflict causes the debt-holders to face risk of adverse selection and moral hazard problems (Jensen & Meckling, 1976). The tangibility of assets is represented by the value of fixed asset plus inventories divided by total assets (Moh'd, Perry & Rimbey, 1998; Wald, 1999). Our aim focus on investment decision, then investment value will add the fixed asset. We do not take the traditional measure, the ratio of current assets divided by total assets, because with using the current assets, we cannot see an increase in investment. That's why in our definition we do not include cash and short-term trade receivables form a usual part of collaterals.

Growth Opportunities; Tobin's Q plays an important role in many financial interactions (Chung & Pruitt, 1994), and has been employed to explain a number of diverse corporate phenomena, such as the relationship between the level of debt and agency problem (de Jong & Dijk, 1998), determinant of debt-equity choice (de Jong, 1999; Rajan & Zingales, 1995). Basically, the definition of Tobin's Q represents two key concepts: (i) growth opportunities and (ii) firms' performance. The first concept is defined as the market's expectation of the value of future projects, over which the management has discretion. The second concept is a performance measure, *i.e.* it measures the value of specific firm, relative to the costs of assets (de Jong, 1999).

The relationship between the firm debt and growth opportunities reflects the moral hazard problems. These problems arise in the conflict between shareholders and debtholders, when the certain condition occurs, for example the insufficient legal framework for investor protection. If the companies prefer debt for financing the risky debt, it can be concluded that this choice gives an impact to moral hazard problems. When a project is successful, shareholders get the rights to control all the residuals. But if a project fails, shareholders have no other responsibilities except for their shares. On the contrary, the debtholders only benefit from the interest when a project proves to be successful. If it fails, the debtholders bear the entire burden of the failure (Jensen & Meckling, 1976; Shleifer & Vishny, 1997).

Profitability: Generally, previous studies measure profitability as operating income before interest and taxes divided by total assets (Brailsford *et al*., 1999; Rajan & Zingales, 1995; Titman & Wessels, 1988; Wald, 1999). Myers and Majluf (1984) predict that, as a result of asymmetric information, companies will prefer internal to external sources, whereby companies with high levels of profit tend to finance investment with retained earning rather than by the raising of debt finance. They also predict a negative relationship because firms will prefer to finance the firm with internal funds rather than debt.

Firm Size: Some previous studies employed natural log of total asset as a proxy of firm size due to the reason that total assets represent the real investment (Brailsford *et al*., 1999; Rajan & Zingales, 1995; Titman & Wessels, 1988; Wald, 1999). The Pecking order theory assumes that large firms can easily finance their investments directly from capital market, hence it can be argued that larger firms can have lower leverage (Smith & Warner, 1979; Drobetz & Fix, 2003). On the contrary, in the trade-off theory, firm size is assumed to have a close relationship with leverage since it affects the firm's risk of default and bankruptcy costs. Therefore, large-scale firms can have higher leverage since bankruptcy costs account for a smaller portion of their capital (Titman & Wessels, 1988).

2.2 Moral Hazard Problem

Moral hazard agency problem occurs under asymmetric information because borrowers can alter their behaviour after the transaction has taken place in ways that the lender regards as a non desirable. Moral hazard is the ethical consequences of actions of economic agents in maximizing their own utility to the detriment of others. These economic agents do not foresee or refuse to see or consider the full consequences,

sometimes unintended, of their actions, hence unwilling to take the responsibilities for their actions.

Taking into account the agency problem in Indonesian companies, it can be predicted that in the Indonesian setting, shareholders and debtholders conflict is more appealing than shareholders and managers conflict (Setiawan, 2004). Anderson, Mansi, and Reeb (2003) have similar vein that in family-controlled businesses there can have a detrimental effect on the shareholders and debtholders relation, and bear the higher cost of debt, and the agency cost of debt are typically described in terms of the asset substitution or the risk shifting problem. It seems that it has been widely known that some Indonesian big companies have close relationship with the bank or in other case they borrow from their group bank. But it goes beyond the scope of this study discussing this interlocking between Indonesian big companies and some commercial bank.

Asset Substitution Hypothesis

Asset substitution can be examined by the link between the level of debt and growth opportunities (Smith & Watts, 1992; Rajan & Zingales, 1995). In the studies which have emphasis on moral hazard problem, the collateral value becomes an important discussion. Debt can be secured by collateralisation of tangible assets in a debt contract because debt becomes less risky (de Jong, 1999).

Previous studies use tangibility of fixed assets as a proxy of secured debt. The collateralisation of tangible assets in a debt contract may mitigate this agency problem, because debt becomes less risky (Stulz & Johnson, 1985; Titman & Wessels, 1988; de Jong, 1999).

Firm size can be used as a proxy of company's expansion since it reflects the companies' assets in place. This study attempts to examine whether the high level of debt used for real investment were reflected by the total assets or not. The positive relationship is predicted due to the answers Indonesian companies made regarding financial decision related to their investments. If this study proves this relationship, this finding means that there is a real investment; hence the moral hazard problem seems not to be occurring. Otherwise, the rejection this relationship and proof that there is insignificant link between firm size and the level of debt will indicate the moral hazard problem. Indonesian companies employ high level of debt not for real investment only, also for supporting their liquidity problems. In line with the intended aim of this paper, the null hypothesis is used in order to formulate hypothesis 1 ($\beta_2 = 0$). *Hypothesis 1: there is no relationship between firm size and firm debt.*

Tangibility of assets is one of the determinants of asset substitution problem. It can be predicted that if the level of firm debt increases and the tangibility of assets is negatively related to firm debt, the asset substitution problem – risk shifting might take place. Asset substitution happens when companies substitute current projects for projects, which have higher risk (Jensen & Meckling, 1976), as the debt holders are compensated for the given risk of the current projects, wealth is transferred from debt holders to shareholders (de Jong, 1999: p. 138). Adjusting the properties of the debt contract can mitigate these conflicts. For example, a covenant can contain restrictions on payment of dividends. Due to this reason, if the level of debt increases and dividend

is used as a proxy of covenants, and if the dividend is positively related to the level of debt, the asset substitution might take place (de Jong, 1999; Myers, 1977; Smith & Warner, 1979).

Due to this study attempts to examine the moral hazard problem to occur in Indonesia, it will be assumed that there is no relationship between the level of debt and tangibility of fixed assets ($\beta_3 = 0$).

Hypothesis 2: *there is no relationship between tangibility of asset and firm debt.*

As reported, Indonesian companies suffer from high level of debt and logically bank requires more collateral to secure the debt. The insignificant relationship indicates the debts are not secured by sufficient collateral. The acceptance of this hypothesis suggests that moral hazard is relevant in the context of Indonesian companies. On contrary, irrelevant relationship indicates the high level of debt was not secured by sufficient collateral. This condition reflects the situation that the debt is more risky, and it might create the risk-shifting problem from shareholders (companies) to debtholders.

Profitability can be used as a proxy for examining the moral hazard problem (Williamson,1981).The finding of linear model only can be used for discussing the direction of the relationship between profitability and the debt (significant with negative or positive relationship). This discussion has been criticized because it does not consider the financial behaviour since there is a different debt risk between companies that obtain high profit and low profit. Non-linear model has advantages to examine the relationship between two variables due to the parameter coefficient which explains a few significant increases or reductions in a variable which will influence other variables. So, it not only explains the direction of the existing relationship. The advantage of non-linear models is that they help in explaining how far the changes in profit result in an increase in debt. The relationship between increase in profit and increase or decrease in debt will explain the agency problem simultaneously between financing and investment decisions.

Table 1
Mean Value of Variables for 1994 to 2000

			Mean			
Year	**TD/TA**	**Log(TA)**	**FA/TA**	**P/TA**	**Q**	**TDL/TAL**
1994	0.6788	13.1078	0.3477	0.0073	1.2098	0.6981
1995	0.4663	12.3448	0.3646	0.1058	1.3008	0.4381
1996	0.5182	12.5741	0.3811	0.0898	1.1827	0.4663
1997	0.5687	12.8206	0.3853	0.0503	1.1272	0.5182
1998	0.7030	13.1961	0.3756	-0.0172	0.9960	0.5687
1999	0.7683	13.3453	0.3832	-0.0468	1.1921	0.7030
2000	0.7881	13.4018	0.3804	0.0404	1.4963	0.7683

Note: TD is total debt; TA is total assets; FA is fixed assets plus inventories; P is profitability; Q isTobin's Q; TDL is total debt t – 1; TAL is total asset t – 1.

The previous studies have pointed out that Indonesian companies suffered from high level of debt. This fact as reported in Table 1. It shows that the lowest of the mean debt ratio is 0.4663 in 1995 and the highest is 0.7881 in 2000. On contrary, it seems as poor performance as reflected by the profitability ratio. As reported in Table 1, it can be

assumed that the profitability declined before the crisis and increased during the crisis period. In 1995 the profitability ratio is 0.1058, and declined to 0.0503 in 1997. During the crisis, profitability ratio is -0.0172 in 1998 and increased to 0.0404 in 2000.

Based on Indonesian companies' condition and in line with the intentions of this study, **hypothesis 3** is formulated as follows: *there is a negative relationship between the profitability and the level of debt.*

If this study proves the negative relationship and finds that the coefficient parameter of profitability is $\beta_4 < 1$, it means that the increase in profit is greater compared with the change in debt.

Growth opportunities reflect investment opportunities, companies will have an incentive to invest when Tobin's Q is greater than 1, and they will stop investing only when it is less than 1 (Brealey & Myers, 1988). Table 1 states that the mean of Tobin's Q of Indonesian companies is greater than 1. Moral hazard problems occur when increase in debt has no relationship with growth opportunities. This situation shows that the use of debt has no relationship with market conditions, as logically investments are always related to the market. So it can be said that the level of debt that is not related to growth opportunities indicates that the debt has high risk (Jensen & Meckling, 1976; Stulz & Johnson, 1985).

This condition also indicates that high risky debt will cause moral hazard problems. The hypothesis related to these growth opportunities takes the null form that is there is no relationship between the increase in debt and growth opportunities in Indonesian firms. If this hypothesis is accepted, it can be said that moral hazard problems exist in Indonesia. Therefore **hypothesis 4** is summarized as follows: *growth opportunities do not have a relationship with the level of debt.*

Past debt, variable other than solving economic problems related to the problem of joint determination problem in financial issues, is used to examine the relationship between past levels of debt with the current level of debt. For the situation in Indonesia, it is calculated that there is a positive relationship between past debt and current debt. ***Hypothesis 5***: *Past debt is positively related to the increase in debt.*

2.3 Model Development

There are two models considered in this study. First, in linear model, $\left(\dfrac{TD}{TA}\right)$ is assumed that it will be influenced by which is measured from log Total Assets, fixed assets $\left(\dfrac{FA}{TA}\right)$, profitability $\left(\dfrac{P}{TA}\right)$, Tobin's Q (Q) as a proxy for growth opportunities and the previous period level of debt $\left(\dfrac{TDL}{TA}\right)$. The use of time lags will provide more detailed analysis and will provide answers as how past factors will influence current situation.

Financing decisions always face the question of the influence of past on the current condition. Is it that the current debt is influenced by the past debt and other variables? Surely this statement is correct. Financing decisions are not made in only one period.

Dynamic model which increases the time lag is able to provide answers to this question. So, in this model, time lag t-1 is added to consider the effect of the increase in debt. The linear model in this study is as mentioned in model 1:

$$\left(\frac{TD}{TA}\right)_{it} = \beta_1 + \beta_2 \log(TA)_{it} + \beta_3\left(\frac{FA}{TA}\right)_{it} + \beta_4\left(\frac{P}{TA}\right)_{it} + \beta_5 Q_{it} + \beta_6\left(\frac{TDL}{TA}\right)_{it} + \varepsilon_{it} \qquad (1)$$

where: β_1, β_2, β_3, β_4, β_5, β_6 are parameter coefficients
ε_{it} is error term of i-th firm and at t (time)
β_1 is the constant term, or intercept, of the equation.

Second, the use of non-linear model in the examination of financing decision is able to provide information on how large is the contribution from one factor in influencing other factors. Non-linear model is used in this study as mentioned in model 2.

$$\log\left(\frac{TD}{TA}\right)_{it} = \beta_1 + \beta_2 \log(TA)_{it} + \beta_3 \log\left(\frac{FA}{TA}\right)_{it} + \beta_4 \log\left(\frac{P}{TA}\right)_{it} + \beta_5 \log(Q)_{it} + \beta_6 \log\left(\frac{TDL}{TA}\right)_{it} + \varepsilon_{it} \qquad (2)$$

The findings in model 2 provide the benefit in terms of the examination of financing decisions because the value of β shows the extent of the increase in the dependent variable, for example the partial derivative of $\beta_2 = \dfrac{\delta\left(\dfrac{TD}{TA}\right)}{\delta(TA)}$ shows that the increase in the level of debt $\delta\left(\dfrac{TD}{TA}\right)$ is due to the change in tangibility of fixed assets $\delta(TA)$. The value of β indicates the level of influence the sensitivity of the change and the direction of the change in independent variable on the dependent variable.

3. Empirical Evidence and Discussion

In order to answer the question how Indonesian companies choose debt or equity for financing their investment, two independent data sets are needed. The set of first data comes from the financial statements of Indonesian public listed companies for the period 1993 to 1996 (before the crisis) and second set of the financial statements of Indonesian public listed companies during the crisis, 1997 to 2000. The 75 Indonesian companies' data are collected from Jakarta Stock exchange, the Indonesian Capital Market Directory from 1994 to 2001, and JSX Watch 2002 (Bisnis Indonesia).

This study excluded financial firms due to regulations in force and because the nature of the activities is different from non-financial firms. Another reason is that the financial and security sector companies due to their financial characteristics and use of leverage are substantially different from other sectors (Pandey, 2001).

There are two models that are employed in linear model and non-linear model. The findings of statistical analysis for linear model have been presented in Table 2 and 3. With regard to the fit model analysis, before the crisis, it reports that the R-squared of common model is 0.8513, fixed effect model is 0.8732, and random effect model is

0.8654. During the crisis, there is the lowest R-squared which occurs on common model with R-squared 0.9098.

Concerning the non-linear model as reported in Table 4, 5, the lowest R-squared is 0.503367 for random effect model (unweighted statistics including random effect) before the crisis. During the crisis period, the lowest adjusted R-squared is 0.7434 for the common model.

The F test is a measure of overall significance of the estimated regression line (Gujarati, 1999). All of these models have probability of F test which is 0.00. It means there are significant relationships between the independent and dependent variables, and it can be concluded that these models could fit the data.

Firm size: Before the crisis, regarding linear model as reported in Table 2, firm size (log (TA)) positively related to the level of debt for all model (β_2 is 0.0170 for common, and significant at 0.00; for fixed effect β_2 is 0.0289 significant at 0.05; for random effect β_2 is 0.0175 significant at 0.00). Although this finding seems different to non-linear finding that reported no significancy except for fixed effect (as shown in Table 4: β_2 is 0.0895 and probability is 0.0161), this finding can be assumed similar. The value of β_2 is too small, therefore it can be assumed that firm size have a small influence to the increase in industry debt. The insignificant relationship for the non-linear model shows that the increases in total assets do not have a significant influence on the increase in debt. So this debt is not used for increasing real investments as shown in total assets. During the crisis, all statistical findings report that there is no significant relationship. Insignificant relationship between firm size and the level of debt indicate that the issuance debt of Indonesian companies is not used to support real investments that are represented by their total assets. Hypothesis 1 is accepted for both the pre and post crisis periods.

Tangible of fixed assets: This study employs total fixed assets divided by total assets as proxy collateral assets. Linear model find non-significant relationship for all models and all periods study (Table 2 and 3). This finding is similar with non-linear model except for fixed effect as reported in Tables 4 and 5. From the findings of the linear and non-linear models, for common and random it shows that debt is not significantly related to collateral for the period before and after the crisis which proved the existence of moral hazard because there is no sufficient collateral for debt. For both the before and after crisis periods, hypothesis 2 is accepted.

Profitability, whether in the linear model or non-linear model, shows that there is a significant negative relationship, for the period before and after crisis (Tables 2 to 5). So it is concluded that hypothesis 3 in this finding is accepted. Before crisis, the linear model shows that $\beta_4 = -0.584$ for the common model, $\beta_4 = -0.764$ for the fixed effect model and $\beta_4 = -0.618$ for the random effect model. For the non-linear model, Table 4 shows that $\beta_4 = -0.0346$ for the common model; $\beta_4 = -0.051$ for the fixed effect model, and $\beta_4 = -0.031$ for the random model. β_4 shows the relationship between the increase in profit and increase in debt. Analysis of the statistic shows that β_4 is $0 > \beta_4 < 1$. This finding shows that the change in the opposite direction $(0 > \beta_4)$ and the change in profitability is larger $\delta\left(\dfrac{P}{TA}\right)$ than the increase in debt $\delta\left(\dfrac{TD}{TA}\right)$ due to $\left(\delta\left(\dfrac{P}{TA}\right) > \delta\left(\dfrac{TD}{TA}\right)\right)$.

Before the crisis, profitability increased from 0.0073 in 1994 to 0.1058 in 1995 (Table 1). Taking into account the finding, it means that the increasing of the profitability only can reduce the small amount of debt and then the profitability starts to decrease and fall to become 0.053 in 1997 (Table 1) and in this time the level of debt increased. Although, the increase in the level of debt is not as big as the decline in profitability, Indonesian firms can be assumed to suffer from the liquidity problem. The big increase in profitability is only able to decrease the level of debt by only a small amount and then it was followed by a time of increase in profit then reduction in profit and an increase in the level of debt during the crisis, there is a very small change in the increase in firm liquidity. The value of β_4 as shown in Table 5 is $\beta_4 = -0.08$ for the common model, $\beta_4 = -0.067$ for the fixed effect model and $\beta_4 = -0.089$ for the random effect model. The highest value for β_4 is -0.089 for the random model (before crisis $\beta_4 = -0.031$).

This finding shows that there is an increase in liquidity in Indonesian firms but this may be caused by their inability to obtain debt due to the majority of Indonesian banks which also face liquidity problems, resulting in their inability to grant loans.

Tobin's Q, whether it be the linear or non-linear model as shown in Tables 2 and 4 before the crisis shows that there is no significant relationship with the level of debt for all models. During the crisis (Tables 3 and 5), the linear model shows a significant relationship but the non-linear model did not find a significant relationship. Although the linear model shows a significant relationship but the value of β_5 is small ($\beta_5 = 0.073$ for common model, $\beta_5 = 0.066$ for fixed effect model and $\beta_5 = 0.072$ for random effect model). Hence, hypothesis 4 can be accepted for all the periods.

Before the crisis, there is no significant relationship that the level of debt is not supported by growth. This means that Indonesian firms take debt as to protect their continued survival because this study also finds that existence of an increase in debt also does not have a relationship with total assets which is a proxy for firm size.

The study on the relationship between profitability and the level of debt shows Indonesian firms only used the trick of paying debt with debt. The big increase in profit is needed to decrease the level of debt. A larger increase in profit is needed to reduce the level of debt. It can be concluded that they do not have real ability to make financial decisions. These conditions had been calculated in a few previous studies that is in other words, businesses in Indonesian are built on weak policies.

During the crisis, there is a difference between the linear and non-linear model. From the findings of the linear model, it can be said that growth, which is reflected in the Tobin's Q value has a positive relationship with the level of debt but from the non-linear model, it is seen that the increase in investment opportunities is not connected with the increase in the level of debt. This phenomenon can be explained by the absence of investment opportunities. Although the linear model shows that there is a significant relationship but the value of β_5 is relatively small as can be seen in Table 3.

Past debt whether for the linear or non-linear models shows that there is a positive relationship between the past debt and the present level of debt whether before the crisis, during the crisis and after the crisis except for the fixed affect model during the crisis, which finds an insignificant relationship. Therefore, it can be concluded that hypothesis 5 can be accepted in this test.

Prior debt is measured by time lag t-1. Therefore, debt in 1997 is measured as the past debt in 1996. The positive relationship shows that past debts have an effect on current debt, increasing debt from *t*-1 will cause current debt to increase. The positive direction of β_6 in the non-linear model $(0 < \beta_6)$ shows that the increasing past debt will cause current debt to increase, and the value that $\beta_6 < 1$ $\left(\delta\left(\dfrac{TDL}{TAL}\right) > \delta\left(\dfrac{TD}{TA}\right) \right)$ indicated the increasing in the past is greater that in the present debt. Table 4 shows that $\beta_6 = 0.710$ for the common model, $\beta_6 = 0.338$ for the fixed effect model and $\beta_6 = 0.749$ for the random model. Table 4 shows that $\beta_6 = 0.710$ for the common model, $\beta_6 = 0.338$ for the fixed effect model and $\beta_6 = 0.749$ for the random model. This value shows that Indonesian firms are very dependent on the past level of debt. Firms will take on debt for expansion and for its operations. As shown from the value of β_6 it can be said that an increase in debt *t*-1 $\delta\left(\dfrac{TDL}{TAL}\right)$ will cause and smaller increase in debt in t $\delta\left(\dfrac{TD}{TA}\right)$.

Residual debt should also be examined from the view of how firms repay their debt. Based on the means data of the level of debt, it can be seen that the level of debt was declining. Before the crisis in 1994 the means is 0.678772; in1995 is 0.466263; in 1996 is 0.518233; in1997 is 0.568686. Taking into account the above discussion, it means that the big drop in debt *t* -1 only reduced debt t in a small proportion. This means that Indonesian firms had been badly affected by the debt trap.

During the crisis, there is no change in this condition for the common model where β_6 is 0.817; and for the random model, β_6 is 0.761, both significant at 1% level. The means value of the level of debt for 1998 is 0.703023; for 1999 is 0.768326; for 2000 is 0.788100. The increase in debt by Indonesian firms in year t is smaller than compared with year t-1. This means that during the crisis, firms find it difficult to obtain loans.

4. Conclusion

Based on the above discussion, it can be concluded that before the crisis, Indonesian firms have a preference for debt not only for expansion but also to protect its survival or in other words, prevention from liquidation. Total assets as a proxy for firm size show the small significant relationship in the linear model and not significant in the non-linear model. Also the absence of real investment, there is insufficient collateral for debt. This issue becomes a moral hazard problem because the debt is a high-risk debt. The non-linear model used in this study is able to provide clearer explanations that is big increase in profit to lower business debt for Indonesian firms to encourage firms to take on more debt to repay the past debt. Also the debt is not related to total assets. An increase in total debt results from real investments with the increase in debt. The debt becomes very high risky because it is not supported by available business opportunities. Based on these indicators, moral hazard problems in the form of asset substitution and wealth transfer in Indonesia exist and there is no significant difference in moral hazard between conditions before and after crisis.

Table 2
Summary of Linear Model Statistical Finding of Panel Data Analysis for the Period 1994–1997 (before the crisis)

Dependent Variable: TD/TA					Number of cross-sections used: 75	
Sample: 1994 – 1997					Total panel (balanced) observations: 300	
Method: Pooled Least Squares					Method: GLS (Variance Components)	
White Heteroskedasticity-Consistent Standard Errors & Covariance						
		Common		**Fixed Effect**		**Random Effect**	
Variable		Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	β_1	0.062492	0.3755			0.058354	0.4358
LOG (TA)	β_2	0.017030	0.0067	0.028072	0.0260	0.017589	0.0034
FA/TA	β_3	-0.001484	0.9784	0.046994	0.5297	0.005826	0.9073
P/TA	β_4	-0.584097	0.0000	-0.764462	0.0000	-0.618598	0.0000
Q	β_5	0.001898	0.8695	0.032352	0.1086	0.006059	0.5966
TDL/TAL	β_6	0.592733	0.0000	0.504039	0.0000	0.576692	0.0000
						GLS Transformed Regression	
R-squared		0.8538		0.906746		R-squared	0.867667
Adjusted R-squared		0.8513		0.873260		Adjusted R-squared	0.865417
S.E. of regression		0.1388		0.128105		S.E. of regression	0.132009
F-statistic		343.4261		27.07792		Durbin-Watson stat.	1.529927
Prob(F-statistic)		0.00		0.000000		Mean dependent var.	0.557988
Mean dependent var.		0.558		0.557988		S.D. dependent var.	0.359839
S.D. dependent var.		0.359839		0.359839		Sum squared residual	5.123372
Sum squared residual		5.659726		3.610392		F-statistic	921.8122
Durbin-Watson stat.		1.407772		2.070682		Prob(F-statistic)	0.0000

Table 3
Summary of Linear Model Statistical Finding of Panel Data Analysis for the Period 1998–2000 (during the crisis)

Dependent Variable: TD/TA					Number of cross-sections used: 75	
Sample: 1998 – 2000					Total panel (balanced) observations: 225	
Method: Pooled Least Squares					Method: GLS (Variance Components)	
White Heteroskedasticity-Consistent Standard Errors & Covariance						
		Common		**Fixed Effect**		**Random Effect**	
Variable		Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	β_1	0.112883	0.1505			0.126936	0.2485
LOG (TA)	β_2	-0.012678	0.1443	-0.066936	0.1560	-0.013919	0.1041
FA/TA	β_3	0.011521	0.8500	0.158807	0.4552	0.021294	0.7557
P/TA	β_4	-0.815913	0.0000	-0.718562	0.0000	-0.806018	0.0000
Q	β_5	0.073542	0.0109	0.066098	0.0739	0.072767	0.0000
TDL/TAL	β_6	1.041060	0.0000	0.995005	0.0000	1.040752	0.0000
						GLS Transformed Regression	
R-squared		0.911842		0.949496		R-squared	0.923576

Adjusted R-squared	0.909830	0.921981	Adjusted R-squared	0.921831
S.E. of regression	0.177799	0.165386	S.E. of regression	0.165544
F-statistic	453.0374	34.50743	Durbin-Watson stat.	1.706294
Prob(F-statistic)	0.000000	0.000000	Mean dependent var.	0.753150
Mean dependent var.	0.753150	0.753150	S.D. dependent var.	0.592102
S.D. dependent var.	0.592102	0.592102	Sum squared residual	6.001653
Sum squared residual	6.923111	3.966095	F-statistic	844.3708
Durbin-Watson stat.	1.486302	2.474365	Prob(F-statistic)	0.000000

Table 4
Summary of Non-Linear Model Statistical Finding of Panel Data Analysis for the Period 1994–1997 (before the crisis)

Dependent Variable: TD/TA			Number of cross-sections used: 75		
Sample: 1994 – 1997			Total panel (balanced) observations: 257		
Method: Pooled Least Squares			Method: GLS (Variance Components)		
White Heteroskedasticity-Consistent Standard Errors & Covariance					
		Common		**Fixed Effect**		**Random Effect**	

Variable		Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	β_1	-0.455755	0.1497			-0.361605	0.0832
LOG (TA)	β_2	0.018008	0.3719	0.089567	0.0161	0.013071	0.3591
LOG (FA/TA)	β_3	0.060890	0.2105	0.185021	0.0253	0.052047	0.1184
LOG (P/TA)	β_4	-0.034745	0.0824	-0.051654	0.0867	-0.031859	0.0876
LOG (Q)	β_5	0.021822	0.6723	0.107678	0.3813	0.013705	0.7397
LOG (TDL/TAL)	β_6	0.710774	0.0000	0.338386	0.0006	0.749391	0.0000
						GLS Transformed Regression	
R-squared		0.589507		0.742190		R-squared	0.556373
Adjusted R-squared		0.581330		0.627122		Adjusted R-squared	0.547536
S.E. of regression		0.327057		0.308653		S.E. of regression	0.340000
F-statistic		72.09189		6.450020		Durbin-Watson stat.	1.835735
Prob(F-statistic)		0.000000		0.000000		Mean dependent var.	-0.825615
Mean dependent var.		-0.825615		-0.825615		S.D. dependent var.	0.505460
S.D. dependent var.		0.505460		0.505460		Sum squared residual	29.01561
Sum squared residual		26.84848		16.86218		F-statistic	423.6598
Durbin-Watson stat.		1.893409		2.191172		Prob(F-statistic)	0.000000

Table 5
Summary of Non-Linear Model Statistical Finding of Panel Data Analysis for the Period 1998–2000 (during the crisis)

Dependent Variable: TD/TA Number of cross-sections used: 65						
Sample: 1998 – 2000 Total panel (balanced) observations: 133						
Method: Pooled Least Squares					Method: GLS (Variance Components)	
White Heteroskedasticity-Consistent Standard Errors & Covariance						
		Common		**Fixed Effect**		**Random Effect**
Variable		Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	β_1	-0.221899	0.2720			-0.286214	0.3218
LOG (TA)	β_2	-0.008128	0.5808	-0.090712	0.3875	-0.007659	0.6975
LOG (FA/TA)	β_3	0.044098	0.2978	0.386660	0.0481	0.047742	0.3186
LOG (P/TA)	β_4	-0.080343	0.0010	-0.067972	0.0806	-0.089455	0.0000
LOG (Q)	β_5	0.073934	0.1479	0.033580	0.7639	0.075276	0.1380
LOG (TDL/TAL)	β_6	0.817236	0.0000	0.030059	0.8164	0.761073	0.0000
						GLS Transformed Regression	
R-squared		0.753157		0.913647		R-squared	0.794618
Adjusted R-squared		0.743439		0.819070		Adjusted R-squared	0.786532
S.E. of regression		0.291583		0.244862		S.E. of regression	0.265970
F-statistic		77.49937		9.660344		Durbin-Watson stat.	2.347635
Prob(F-statistic)		0.000000		0.000000		Mean dependent var.	-0.697423
Mean dependent var.		-0.697423		-0.697423		S.D. dependent var.	0.575660
S.D. dependent var.		0.575660		0.575660		Sum squared residual	8.983976
Sum squared residual		10.79761		3.777320		F-statistic	132.2392
Durbin-Watson stat.		2.078649		3.669976		Prob(F-statistic)	0.000000

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