

Testing the Trade Off and Pecking Order Models of Capital Structure

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Abstract: *In this paper, we test two-models of capital structure by using Shyam-Sunder and Myers (1999) approach for finding the capital structure behaviour of U.K. firms, whether firms follow pecking order or trade off model. Sample size consists of 60 firms and 51 firms; observation period ranges from 1992 - 2012 and 1995 - 2012. By using panel data regression in the two-sample size and periods, empirical results show that neither model is appropriate for giving any conclusive result for the capital structure behaviour of U.K. firms.*

Keywords: *capital structure, pecking order, trade off model, empirical, behaviour of U.K. firms.*

I. Introduction

"How do firms choose their capital structures?"

The answer is, "We don't know."

Stewart. C. Myers (1984)

How do firms should choose their capital structures to maximise the value of the firm it is one of the most debatable topics in the field of corporate finance for more than 50 years. Modigliani and Miller (1958) find that capital structures do not matter for maximising the value of the firm in a perfectly competitive market.¹ From that onwards, capital structure issue has been a rising concern among corporations as well as for many academicians. It is an obvious question for many academicians such as Myers, Majluf, Fama, Rajan, French, Zingales and so on, what could be the rational strategy to increase the value of the firm by having an optimal capital structure. Is there any optimal capital structure that can create long-term benefits for the firm shareholders? As we know balance sheet is made up of asset side and financing side, financing side is a combination of two component debt and equity. In this case, our aim is to see whether firms can adopt any financing policy to increase the value of the asset by only mixing up with different combinations of debt and equity, and what are the driving forces for which firms go for debt over equity or vice versa. Many theories of capital structure have been put forward to find the optimal capital structures for the firms such as trade off theory, pecking order theory and free cash flow theory. One of the dominating theories among them is "trade off theory or target adjustment theory" where the firm maximise its value until the breakeven point of tax advantage associated with borrowings and the cost of financial distress (Modigliani and Miller, 1958; Myers and Majluf, 1984; Shyam- Sunder and Myers, 1999; Fama and French, 2001). In the trade off theory, company is looking for a leverage ratio where they can take the maximum benefit of the tax shield from debt but without affecting their financial distress (Shyam- Sunder and Myers, 1999; Fama and French, 2001). This theory also says that company will change their leverage structure when they see the deviation from their target level of debt. It is more or less an ongoing process of adjusting the capital structure towards the firms predetermined target leverage ratio. Many variables can determine the debt policy of a firm such as profitability, size, investment opportunity, tangibility of the asset and so on. In the simple trade off model company with high profit will borrow more and more to get the maximum benefit of the tax shield (Myers and Majluf, 1984; Myers, 1984). Some others claim that when a company increases its size it can borrow more because the probability of going under financial distress is less for a company that has more decentralised assets (Rajan and Zingales, 1995; Frank and Goyal, 2003; Hussain and Nivorozhkin, 1997). However, one thing that we have to take into consideration is that variables of optimal capital structure are different in business-to-business, countries to countries. Explanation and empirical results of other variables will be discussed in the literature review part of the paper. Another very common theory of capital structure is "pecking order theory" (Myers and Majluf, 1984; Myers 1984). This theory claims that company will borrow when their investment or dividend payment is higher than their earnings or retained earnings that they generate. Those companies following pecking order they do not have any target leverage ratio. Although the tax advantage of debt may be substantial but still the driving force of debt will be the investment opportunities that they have. In pecking order theory, equity issue is seen as a last resort of financing, equity is only used in extreme cases such as when the cost of financial distress is very high

¹ . Modigliani and Miller assume business takes place in a perfect capital market, where there are no market frictions. (such as tax , transaction cost and asymmetric information cost)

or company has been already very high leverage ratio (Myers, 1984). "Free cash flow theory" is introduced by Jensen (1986) is also a very commonly used theory in creating the debt structure for a firm. In the free cash flow theory, company adopts debt policy by seeing the access cash that the company accumulates after their all profitable investment. Mature firms mostly use it, when they have very minimum scope for growth and there is a chance that company manager may destroy value of the firm by investing in a negative NPV (net present value) project and where the agency cost of free cash flow is severe between shareholders and managers. Creation of debt can be seen as a way for a mature firm's to reduce the agency conflict as well as for increasing efficiency of the manager, if the company can find any other way of reducing agency cost, they may not go for this financial risk. To find the validity of Shyam-Sunder and Myers (1999) models, our empirical result shows that neither model is appropriate for predicting the change in level of debt at least for our sample companies. In the first analysis, pecking order beta coefficient for 60 sample companies is 0.294, which is significantly lower than what is expected. On the other hand, trade off beta coefficient is - 0.2651, which is totally out of line with the theory of Shyam-Sunder and Myers (1999). In the second analysis, where sample size is 51 firms, pecking order beta coefficient is 0.005751, whereas trade off beta is -0.3192 both results are not statistically significant to provide any precise answer for capital structure behaviour of U.K. firms.

II. Literature Review

Myers and Majluf (1984) explain that information asymmetry between managers and shareholders are the major issue, whether the firm will finance external fund by equity or debt. Their study shows that, because of the information asymmetry firms will issue safest security first where the cost of information superiority is small. They also find that company will build up a financial slack such as retained earnings to invest in the new project, as retained earnings have no information cost. If the retained earnings are not sufficient enough for covering the investment company will issue debt to raise funds to reduce the cost of information superiority and lastly in extreme cases companies will issue equity to cover the cost. Their model is a systematic process, where first choice is safest security and then the risky security. Equity is seen as the most risky security as it contains more information cost.

Jensen (1986) examines the agency cost associated with the free cash flow and the impact of agency cost in firm capital structure. When a firm accumulates a huge amount of cash without paying out to shareholders, it can create an agency conflict between managers and shareholders. To reduce the agency conflict between these two parties' debts can play an important role. Moreover, debt issue and buy back shares can increase the market confidence about the company and that might help to increase the share price. He builds the model called "Control hypothesis" where he explains that debt creation can also be seen as an indirect way of controlling managers. This hypothesis can be helpful for the mature company but for the small company it may not work, because the small firm requires debt for their profitable investment not for controlling manager. Rajan and Zingales (1995) examine the capital structure behaviour in the G7 countries (e.g., USA, United Kingdom, Japan, Germany, Canada, France, and Italy) and the factors that affect the leverage of G7 countries firms from 1987-1991. In their samples, they eliminated financial (banks and insurance) firms to reduce the bias of the minimum capital requirements of those firms. Rajan and Zingales (1995) find that there is a correlation exists in between the entire G7 countries about the leverage ratio. As more or less all, the countries are financially well developed and they can borrow capital from market and as well as from the bank. They also find that, tangibility of asset and firm size is always positively related with leverage but, for Germany the scenario is opposite, firm size is negatively related with debt at least in their sample periods. Profitability is negatively related with leverage it is also consistent with the findings of Titman and Wessels (1988), and Huang and Song (2002). However, which is not consistent with trade off model, as trade off model says that profitability and debt is positively related (Myers, 1984; Myers and Majluf, 1984).

Shyam-Sunder and Myers (1999) examine that which model is the most useful and fitted for the corporate financing behaviour in the context of U.S firms. Their sample consists of 157 firms, data ranges from 1971 to 1989. Empirical results are given by extensive use of OLS analysis and Monte Carlo simulation. They find that pecking order model is more suitable for mature firms in their sample, as most of the mature firms will invest their new project from retention or debt, but they have no target adjustment benchmark. Target adjustment's model performs better when tested separately but when tested jointly with pecking order model its performance falls. Moreover, they also find that superior performance of pecking order is not due to the fact that company borrows deficit from debt, but they find that this is something predetermined by the company that they will borrow from debt.

Frank and Goyal (2003) test the pecking order theory of capital structure and leverage of publically traded companies in the U.S. market to see the leverage behaviour of those firms. Mainly, they test three basic points of view, 1. Corporate financing pattern. 2. Implication of pecking order according to Shyam-Sunder and Myers (1999). 3. Effectiveness of pecking order to those firms that face the severe adverse selection problems. Their samples are taken from year 1971 to 1998, excluding financial firms, regulated firms and firms with major

merger within estimation periods. After analysing over a large sample of data set they find that, in their sample period's external financing is heavily used, which is not consistent with the findings of Myers (2001). They also find that in the external financing equity financing on an average exceeds the debt financing and which is just the opposite findings of Myers (2001) and Shyam-Sunder and Myers (1999). When sample size increases between mature firms and small firms' pecking order became less evident, Small firms prefer more equity when they need for external funding.

Fama and French (2002) examine whether the pecking order or trade-off is more applicable for predicting the leverage and dividend behaviour of companies, which changes with profitability and investment opportunity from 1965 to 1999. They reveal that for predicting dividend payment two models more or less have no contradiction. They also find that firms with higher profits have lower leverage and, which is consistent with the pecking order model (Myers, 1984; Myers and Majluf, 1984; Bevan and Danbolt, 2002; Rajan and Zingales, 1995), and in this case trade off model lack its power. On top of that, their study finds that, those firms pay dividends, for short term variation in earnings and investment, they follow pecking order where equity issue is very insignificant, which is also a confirmation of Fama and French (2001) findings. They also find that sometimes companies issue equity in extreme financial weakness, which is consistent with pecking order theory (Myers, 1984; Myers and Majluf, 1984).

Huang and Song (2002) examine determinates of Chinese listed firm's capital structure. Their samples are 1000 listed companies' data up to the year 2000 and they used OLS analysis for empirical analysis. Basically, they test, whether the Chinese companies' capital structure is different with the developed country's capital structures where the bond market is well-developed and the factor that determines other country's capital structure is they have the same impact on Chinese companies' capital structure. They find that Chinese companies are more or less follows the static trade off rather than pecking order, which is consistent with developed countries capital structure (Rajan and Zingales, 1995). Moreover, the factor that affects the developed countries capital structure has the similar effect on Chinese companies'. Nevertheless, there is some difference can be seen in the Chinese companies' capital structure characteristics as most of the companies are state-owned enterprise profits do not change their capital structure. On an average fifty per cent of external financing is obtained by equity market rather than the bond market, because the bond market is not well developed in China. Pandey (2001) examines the capital structure and its determinants in the Malaysian markets. As most of the capital structure studies are performed in the developed countries, but very limited work is done in the emerging markets like Malaysia. His samples are 106 companies in every estimation period, data ranges from 1984 to 1999. He is mainly focusing on the capital structure behaviour of Malaysian firms by using different variables such as "growth, investment opportunity, profitability, size, risk and tangibility" with different types of debt ratios of Malaysian companies. He finds that the Malaysian companies are mainly following pecking order theory for capital structure, where trade-off is optional. Profitability and leverage relationship is negative in all the estimation periods. On top of that, this study also finds that negative relationship between profitability and leverage is the only factor that has an impact on the capital structure of the Malaysian firms'.

De Medeiros and Daher (2004) examine the capital structure behaviour of Brazilian firms by using data of 371 firms from 1995 to 2002, and the determinants of capital structures are examined by using Rajan and Zingales (1995) model. Their study finds that Brazilian firms prefer pecking order more rather than trade off model where retained earnings is mostly used for new investments. Moreover, they also find that tangibility of assets and debt is an important factor for determining the capital structure of the Brazilian firms. Companies are reluctant to issue debt to take the tax advantage, because of high inflation and interest cost in the Brazilian market.

Bevan and Danbolt (2002) conduct study on the capital structure behaviour of only U.K. companies, to see whether the results are consistent with the findings of Rajan and Zingales (1995) about G7 countries' capital structure. Their samples are 822 companies, following the standard practice of excluding the financial companies. They find that most of the results are similar to the results of Rajan and Zingales (1995). Tangibility of asset and gearing is significantly positively related. Profitability, growth opportunities, and firm size are negatively related with gearing, which is consistent with the findings of Rajan and Zingales (1995). Their study also reveals that around sixty two per cent of total liabilities are consisted of trade credit and equivalents. This finding suggests that to understand the corporate gearing of the U.K. companies at least for their estimation periods one has to look every component of debt that the company possesses, only looking at the long-term debt is going to be misleading.

Bancel and Mittoo (2001) go on to the work for finding the capital structure behaviour in the seventeen European (e.g., Finland, Ireland, Italy, France, Germany, Luxembourg, Netherlands, Norway, Portugal, Spain, Switzerland, Sweden, U.K. Austria, Belgium, Greece, and Denmark) countries. They find that financial flexibility is the major determinants of the European firm's capital structure. They also find that more than seventy per cent of managers prefer to issue equity, and they think that share price reduction is one of the main

issues in issuing equity for new investment. The reason behind the issuing equity is that managers want to maintain a predetermined debt to equity ratio.

DeAngelo and DeAngelo (2007) find that financial flexibility is one of the most prominent determinants of capital structure, which is also a confirmation of the findings of Bancel and Mittoo (2001). Firms can forego interest tax shield today for preserving the debt capacity for the future when they require capital for investment. Company is paying out their excess cash as dividends to increase their financial flexibility and at the same time, they can reduce the agency cost of excess cash, which is pointed out by Jensen (1986). By paying out dividend, managers are also creating a reputation for payment in the future time so that they can issue equity when they needed.

Frydenberg (2004) in his review article about capital structure states that most of the companies in the market are following each other capital structure. Companies' do not want to deviate from their competitors' capital structure, because investors can see the abnormality in the company capital structure and may penalise their share price. After all, whatever strategy a company may follow for their capital structure but survival is the most important issue in the market.

Hussain and Nivorozhkin (1997) conduct an empirical research in the Poland stock market listed firms to see the capital structure and the determinants of the leverage to those companies. Their findings show that mature companies are highly leveraged, as they are more diversified so that the risk of bankruptcy is low, which is also consistent with the findings of Titmen and Wessels (1988), and Frank and Goyal, (2003). They also find that profitable firms depend more on equity, which is not consistent with the traditional pecking order theory of Myers and Majluf (1984). Nevertheless, small listed firms sometime depend on the bank loan for external funding. Moreover, they do not find any significant evidence about the capital structure of Polish companies, whether the firm follows pecking order or trade off. Their findings are more or less a combination of trade off and pecking order that is depend on the firm maturity and the size.

Bharath et al (2009) examine the impact of asymmetric information in determining the capital structure for U.S. firms from 1973- 2002, as asymmetric information is one of the main driving force of pecking order theory. After analysing with different variables of capital structure such as profitability, size, and investment opportunities, they find that asymmetric information does affect the U.S. firms for developing capital structure. Furthermore, their study find that those firms face more asymmetric information cost, to cover one dollar of deficit they have to issue thirty cents of more debt than those firms who face little asymmetric information cost. Huang and Ritter (2009) examine the market timing and the speed of adjustment towards target leverage for the U.S. firms. They find that the firms have used external funding significantly in their sample period of 1964 - 2001. A large proportion of external funding generated from equity when the cost of equity is lower than debt and issue debt when the cost of equity is high. Their study also finds that market timing is an important factor for determining capital structure. Many firms engage in issuing equities when the cost of equity is low for building a financial slack, so that firms can use this financial slack when the cost of equity is high. Moreover, they find that firms adjust their target level of debt with a moderate speed. For book leverage the speed of adjustments is 17%, whereas for market leverage adjustment speed is 23.2% per year.

Lipson and Mortal (2009) conduct a cross-sectional study in NASDAQ listed firms for examining liquidity and its impact in the firm capital structure. Their study finds that liquidity is an important issue when company has to decide between debt and equity financing. They find that firms with higher liquidity prefer to take new funds by issuing equity, because firms with higher liquidity have lower cost of equity. They also find that, there is a negative relationship exists between liquidity and leverage; company with a higher liquidity leverage ratio is thirty seven per cent whereas company with a lower liquidity leverage ratio is fifty five per cent.

Garvey and Hanka (1997) examine the impact of hostile takeover and the cost of financial distress in the firm capital structure. Their study finds that capital structure decision not always influenced by trade off or pecking order. They find that leverage ratio is totally depends on the companies managers. As manager has the discretionary power of choosing the capital structure, if the manager perceives any hostile takeover information, he increases the debt level to protect the firm from takeovers, and when he thinks that firm can go into a financial distress manager reduce the debt level. Overall, their study shows that managers are not looking for any optimal leverage ratio; in the real life, the main aim is to secure the manager's own job.

III. Explanation Of Models

The pecking order model:

As we discussed earlier in the simple pecking order theory company will only borrow when their retained earnings are not sufficient for profitable investment or paying dividends. In this theory, the only variable that determines the issue or retires of debt is the deficit. Deficit is given by

$$DEF = DIV_t + CAP. EXT + \Delta NW C_t - OP. NCF_t$$

Where, DIV = Dividend, CAP. EX = Capital expenditure, NWC = Net working capital and OP. NCF = Operating net cash flows. The testable hypothesis is,

$$\Delta D_t = a + b_p \text{DEF}_t + e_t(1)$$

Where, D_t = level of debt, DEF_t = Deficit and b_p = Pecking order coefficient

In the strict pecking order theory, we expect our result should produce $a = 0$ and $b_p = 1$. The basic intuition behind this as explained by Shyam-Sunder and Myers (1999), in the strong form of market efficiency, company will not issue equity. Therefore, their assumption is that company will raise the deficit from debt, and that is why any change in level of debt should explain by the beta of the coefficient (b_p) it equals to unity 1. But in practice, it is very difficult to find a strong form of efficiency, in that situation semi strong form of efficiency allows a firm to issue some equity (Chirinko and Singha, 2000).

The trade-off model:

In the trade off model, we have to evaluate whether the change in level of debt is explained by the mismatch between the target levels of debt and the current level of debt. If the trade-off model calculated by Shyam- Sunder and Myers (1999) holds it should produce a $b_T > 0$, which is an indicator of firm capital structure moving towards that target debt level.

$$\Delta D_t = a + b_T(D_t^* - D_{t-1}) + e_t \quad (2)$$

Where D_t^* is the target level of debt. Target level of debt is just an average of firm's past year's debt because as it is pointed out by many researchers, such as Shyam- Sunder and Myers (1999), Huang and Song (2002); optimal debt level is not observable, so the average of past years debt could be a proxy for target level of debt. Therefore, D_t^* is the benchmark for evaluating the current level of debt.

IV. Data And Methodology

To derive the empirical analysis for testing pecking order and trade off model; first of all, we excluded all the financial firms. As it is also a general practice among financial researchers to exclude the financial firms (Shyam- Sunder and Myers, 1999; Bevan and Danbolt, 2002; Fama and French, 2001). For the empirical analysis, data are divided into two groups, one group consists of 60 companies; sample period ranges from 1992-2012, and another group consists of 51 companies, from 1995 to 2012². To find the validity of the two models, at first we run the regression with 60 samples with actual numbers and another regression with 51 samples with ratios. The second analysis is performed by scaling all the variables of capital structure (dividends, capital expenditure, debt, change in working capital and operating cash flow) with total assets as it is also an important determinant of testing these two models (Shyam-Sunder and Myers, 1999; Fama and French, 2001; Rajan and Zingales 1995).

V. Empirical Methods

Table 1.1 summarises the regression's results of sixty sample companies from 1992 to 2012, for both pecking order theory and trade off theory. In the pecking order theory, we expect a beta coefficient is equal to 1, but in that case, the beta coefficient is only 0.294, which is not in line with the theory given by Shyam-Sunder and Myers (1999). Beta coefficient is significantly lower than what we expect; in that case empirical results do not support the Eq. (1) totally, it is partially true for the sample. Results show that deficit is not totally explained by the change in level of debt. R^2 is only 0.07 which is not so significant to support the model. Overall results show that Eq. (1) do not provide any conclusive results for predicting change in level of debt at least in the given estimation periods. The contradiction between theory and the empirical results may be a reason of sample selection and sample size. Shyam Sunder and Myers (1999) samples are 157 firms, whereas **Table 1.1** results consist of only 60 samples. Nevertheless, pecking order results partially support the model for predicting change in level of debt, whereas trade off results is totally out of line with the result of Shyam-Sunder and Myers (1999). The beta coefficient is significantly negative (-0.26157), whereas we expect $b_T > 0$, so evidence is not supporting the Eq. (2) at all. Although R^2 is higher than what is predicted in the pecking order theory, but it is not helping the beta coefficient to support the analysis of Shyam- Sunder and Myers (1999). This is suggesting that alternative test is required to increase the robustness of the model which can be used in any sample.

The main purpose of undertaking this analysis is to improve the result of **Table 1.1** analysis, whether the variables of pecking order or trade off model gives a better results by scaling with total assets or not. Moreover, to find is there any relationship exists between total assets and leverage ratio for pecking order and trade off model. The evidence shows that after scaling with total assets, results for both the models are not statistically significant to improve the earlier analysis. Pecking order beta is 0.005751. Nevertheless, in earlier

² In the initial sixty sample companies, many companies are missing data regarding total assets from 1992 to 1994. If I exclude all the companies those are missing data from 1992 to 1994 sample size became only five. Then to make sample size bigger I cut down data from 1992 to 1994, finally I get fifty one companies as samples.

results in Table 1.1 beta coefficient is 0.294 which has some statistical power to hold the theory of Shyam-Sunder and Myers (1999). Trade off model beta is significantly negative (- 0.3192) than the earlier result of (- 0.26157), again this is not supporting the theory with the total assets as well. Therefore, we do not find any relationship between leverage and total assets for our sample.

VI. Figures And Tables

Table 1.1: Regression results for both pecking order and trade off model consisting 60 samples:

1992- 2012	Beta Coefficient	Standard error	R Squared	T statistics	Calculated statistics = Coefficient-1/ Standard error	T
Pecking order model	0.294206	0.027802	0.070099	9.503099	-26.4654	
Trade off model	-0.26157	0.015857	0.185079	-16.4949	-79.5568	

Table 1.2: The regression result for 51 samples scaling all the variables with total assets, from 1995 to 2012.

1995-2012	Beta coefficient	Standard error	R Squared	T statistics	Calculated statistics= Coefficient-1/ standard error	T
Pecking order	0.005751	0.023463	0.0000694	0.245096	-42.376	
Trade off	-0.3192	0.022935	0.157261	-13.9175	-57.5189	

VII. Conclusion

In this paper, we tried to show some previous study of capital structure by different authors as well as two empirical tests to find the validity of Shyam-Sunder and Myers (1999) models with two different sample size, (60 and 51 firms). Empirical result shows that Eq. (1) and Eq. (2) is not appropriate for predicting the actual change in debt for pecking order and trade off model in both cases. In the first test, (**Table 1.1**) pecking order beta coefficient is only 0.294 which is significantly lower than what is expected in the actual model. On the other hand, trade off beta is -0.2651 which totally contradict the theory. In the second test (**Table 1.2**) pecking order beta is 0.005751 and trade off beta is significantly negative (- 0.3192). Therefore, our test is not supporting the evidence of Shyam-Sunder and Myers (1999) models, which can explain the capital structure behaviour of our samples. The contradiction between Shyam-Sunder and Myers (1999) theory and actual empirical results can be a reason for sample selection problem or error in the Shyam-Sunder and Myers (1999) models. Chirinko and Singha (2000) find a serious error in the models; they argue that Shyam-Sunder and Myers (1999) is not considering equity in their models at all, but in real life sometimes equity issuance dominates the debt funding (Frank and Goyal; 2003). The ignorance of equity in the equation is reducing the robustness of the models to fit into any given sample, for that reason Shyam-Sunder and Myers (1999) model is neither able to evaluate the trade-off nor pecking order specification (Chirinko and Singha, 2000). So to sum it up, we can comment that Shyam-Sunder and Myers (1999) models cannot be a first cut choice for understanding the capital structure. Further research required regarding the treatment of equity issue, maybe after that we can come up with a conclusive decision regarding optimal capital structure.

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