

The relationship between supply factor and firm's capital structure: a US study

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Abstract

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The past work which has studied the impact of the factors of the firm's capital structure has always focused on the demand side. That is to maximize the firm's value through different capital structures, industries' bankruptcy costs and the tax shield. Several theories have been developed through these efforts, such as Trade-off and Pecking Order Theories.

Since the financial crisis in the second half of 2007, issues over the supply of credit have gained attention, so increasingly scholars are now taking supply factors such as the impact of access to public bond markets into account. In this way, this paper will discuss the relationship between the supply factors and firms' capital structure.

Keywords: Supply Factor, Credit Rating, Pecking Order Theory, Trade-off Theory

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Chapter 1 Introduction

1.1 Background

Past academic literature has supported the demand side of the capital structure decision. In 1958, Modigliani and Miller (MM) were the first in this area. They made several assumptions, such as there were no taxes, agency costs, bankruptcy costs and no information asymmetry, to prove that the capital market was efficient. Subsequently the original model was modified to consider corporate tax and private income tax. Since that time the Trade-off and Pecking Order theories were developed by Myers and Majluf (1984) to show that when a firm chooses its capital structure, the internal capital is the most preferred because of its cost.

As mentioned in the outset of the chapter, the supply factor such as the credit rating and the access of public bond market, need to be taken into account. Faulkender and Peterson (2006) found that the firms with access to the public bond market will have 35% more debt.

Then as Sufi (2006) researched in 2006 “the introduction of bank loan ratings leads to an increase in the use of debt by firms that obtain a rating, and in increases in

firms' asset growth, cash acquisitions, and investment in working capital”.

Therefore, as one important supply factor, the degree of access to the public debt market should also be taken into account of when accounting for firms’ practices in the real world.

1.2 Need for the study

What this paper intends to do is to test whether these two theories will work or not when we consider supply factors. In order to achieve this research objective, we need to apply three models to perform the test and three hypotheses will be made. The model which was produced by Faulkender and Petersen (2006) will be the first to be used to test whether the firms that have access to public debt markets have a positive impact on the firms’ financial leverage or not.

$$\begin{aligned} Q_{\text{observed}} &= \gamma_d X_{\text{demand factor}} + \gamma_s X_{\text{supply factor}} + \mu \\ &= \gamma_d X_{\text{demand factor}} + \gamma_s \text{Bond market access} + \mu \end{aligned} \quad \dots\dots 1.1$$

The second model is that of Shyam-Sunder and Myers’s (1999) and it will be used to test the effects of these two theories in the US market.

$$\Delta L_{mn} = \beta_0 + \beta_1 (L^*_{mn} - L_{mn-1}) + \mu_{mn} \quad \dots\dots 1.2$$

where L^*_{it} is the target debt level for firm m at time n . We take β_1 , the target-adjustment coefficient, as a sample-wide constant. The hypothesis to be tested is $\beta_1 \geq 0$, indicating adjustment towards the target, but also $\beta_1 \leq 1$, implying positive

adjustment costs.

The last model will be regression analysis to test these two theories and how they will affect firm, with access of bond markets, and their capital structure decision making.

1.3 Data

The literature of previous studies has been dominated by the US market as the financial environment is the most stable and the largest market in the world. In this vein, this paper will also use the U.S. data for listed companies. The data sample used for analysis was obtained from Compustat, for the period of 2000 and 2006.

Chapter 2: Literature Review

2.1 M&M Theory

Modigliani and Miller (1958) developed a proposition that has a seminal effect on the finance literature. They argued that under the assumption of a perfect market the value of any firm is independent of its capital structure. However, the assumption of the perfect market is impossible in real life, and in fact the cost of debt is less than the cost of equity. In this way the second proposition is derived from the first proposition, which describe that the yield on common stock and financial structure are linearly related. The last proposition is that in the firm there is a fixed cut-off point that is unaffected by the capital structure.

While this theory is very elegant, in the real world with the presence of taxes, bankruptcy costs and costs, to provide a meaningful approach to studying capital structure, the inclusion of market imperfections is necessary.

2.2 Trade-off Theory

With the inclusion of the tax element, Modigliani and Miller (1963) adjusted their

first proposition of the M&M Theory to take account of it. The conclusion they now offered was that the levered firm would have a higher value than an unlevered firm because of the tax deductible of the interest cost. In this way, a firm should finance totally by debt. However, this is still unrealizable in real life since we cannot use debt infinitely without considering the costs of financial distress. That is to say, when the debt ratio increases, the related cost of using debt will rise as well. What is more, from the Kraus and Litzenberger (1973) study, we can conclude that when a firm's tax benefit is fully covered, the firm's value will reach its maximum.

The M&M Theory was further expanded by other researchers, such as Jensen (1986), who takes the free cash flow factor into account. His theory implies that managers of firms with large free cash flows may have a preference to take part in mergers. This behavior exacerbates or may even destroy the commonality of interest between shareholders and managers. In addition, the firm with poor management will do worse when compared it with the performance prior to a merger. In this way, debt cannot be infinitely borrowed.

Other risks can also be caused by large amounts of debt. From the Myers (1977) study, the firms may abandon the higher profit projects when the debt is higher than the normal level. Furthermore, Jensen and Meckling's (1976) study indicate that the cost of debt is not a constant proportion of the amount of debt, as the service cost increase with the increased debt since the creditors need higher rewards for larger

risk.

The leverage ratio has been proved to affect the firms operation. Firstly, some relationships have been found and proved. Bradley and Kim (1984) proved that the debt amount and the expected costs of financial distress are negatively correlated while Mackie-Mason (1990) found out that the leverage and tax shield are positively correlated. Moreover, Miller and Modigliani (1966) offered the result that the debt ratio and interest tax shield have a positive relationship. That is to say the firms always want to borrow more in order to gain more shield.

Bradley and Kim. (1984) showed that the optimal firm leverage is related inversely to expected costs of financial distress and to the (exogenously set) amount of non-debt tax shields. Smith and Watts (1992) find a negative relationship between the growth opportunities and the debt level. Then, the researchers made the conclusion that the capital structure has a direct impact on firms' management or directly affected by the management.

Long and Malitz (1985) got the conclusion that a major factor which influences corporate leverage decisions is the type of investments a firm undertakes. Hovakimian et al (2001) agreed that firms often make financing and repurchase decisions that offset those earnings-driven changes in their capital structures and stock prices play an important role in determining a firm's financing choice. Rajan

and Zingales (1995) find that the correlation between profitability and capital structure will be reduced if the investment opportunity is related with profitability. Bevan and Danbolt (2002) contend that determinants of capital structure change with respect to each measure of debt used.

After the firm considers every situation and to achieve the ideal debt amount, it will use historic data of the debt to equity ratio, and make adjustments to reach the ideal debt. That is to say for the firms whose leverage is below the ideal level, it will increase it and the firms which leverage higher than the ideal level, it will decrease it. However, it is impossible for a firm to keep a constant level by value of fluctuating stock prices or cash flows. In this way, the dynamic trade-off theory was developed by Fischer et al (1989). In this theory the firms' debt ratio can be move in a range which can be accepted by the firms, but the debt ratio needs to move over time to the ideal level.

2.3 Pecking Order Theory

From the view of the Trade-off Theory, high profitability has a positive relationship with the leverage ratio, since the firm with high profitability is not constrained by the bankruptcy cost and has the benefit of the tax shield. However, it cannot be denied that there is something, such as information asymmetry and the existence of

transaction costs, that are taken into consideration in the Trade-off Theory.

Myers and Majluf (1984) comment that the Trade-off Theory does not explain firms' financing behavior. They derive this conclusion that the modified Pecking Order Theory recognizes both asymmetric information and the costs of financial distress. These two costs will rise when the firm climbs up the pecking order. The high possibility of financial distress costs and also of future positive-NPV projects may be given up since the firm may not like to finance them by issuing common stock or other risky securities. The firm can reduce these costs by issuing stock now, even it is not immediately needed, in order to move the firm down the pecking order. In other words, a flexible financial situation is valuable and the firm may rationally issue stock to acquire it.

In order to avoid this asymmetric information problem, the firm can finance by internal funds instead of external funds. Based on the above explanatory, Myers (1984) got the idea that in the longer term, financial intermediaries may be less central to the development of firms, but in the early stages of the growth of firms and economies, an efficient banking system may be an essential requirement for expansion. What is more, a level of preferred capital structure is to use internal funds, then followed by external debt, and then external equity.

Besides information asymmetry, the above condition can also be explained by

transaction costs. Donaldson (1961) considered that processing of financing behavior by firms can also be affected by transaction costs. That is retained earnings can be used first because they can be used without transaction fees. Then, debt is prior to securities because the transaction fee is lower (Baskin, 1989). In this way equity has always been abandoned when debt is available. Only when a firm cannot use debt to finance, at that point equity can be chosen. This can also be used to explain the negative relationship between a firm's profitability and debt ratio.

However, Fama and French (2005) do not agree with the above opinion that the costs of issuing equity are high. They comment that transaction costs and asymmetric information problems may not seriously restrict equity issues. In this case, equity issues are not the last choice. The incentive to avoid repurchases to maintain debt capacity disappears, and the asymmetric information problems that are the focus of the pecking order are not the sole or perhaps even an important determinant of capital structures. They also raised the situation that exchanges of stock in mergers often have tax benefits that can offset transaction costs and any asymmetric information problems and stock issued to employees may have motivation benefits that outweigh issuing costs. In this way, the financial process is still from internal funds to external funds, but the equity may not be the last choice.

While the Pecking Order Theory appears to be better than the Trade-off Theory, models are still be needed to test it. Baskin (1989) finds in the case of the USA, that

a firm's debt level has a positive relationship with its past growth rate and a negative relationship with its profitability. This has the same prediction with the Pecking Order Theory. The finding of Allen (1993) indicates that firms' debt ratios are negatively related to their profitability thus supporting the Pecking Order Theory. Tong and Green (2005) use the Chinese market find that a firm's debt level is positively related to its dividend and negatively related to its profitability. Aggarwal and Zong (2006) find firms' internal cash flows and their investment level can move in a same direction, which is consistent with the Pecking Order Theory. In this way, we can be sure of that the Pecking Order Theory has a stronger explanatory power than the Trade-off Theory.

2.4 Effect of Credit Supply on Firms' Capital Structure

Both the theories considered so far only consider the demand part, but not the supply factors, and they make the assumption that the credit supply is elastic. Stiglitz and Weiss (1981) point out that if a bank tries to attract the customers of its competitors by offering a lower interest rate, it will find that its offer is countered by an equally low interest rate when the customer being competed for is a good credit risk, and will not be matched if the borrower is not a profitable customer of the bank.

Faulkender and Petersen (2006) measure leverage using market debt ratios. They

found that the firms with a debt rating have a debt ratio that is higher by almost 10.5 percentage points. These firms' average debt ratio is 28.4 percent, versus 17.9 percent for the sample of firms without a rating. Firms with public debt have higher leverage than the firms without public debt, and this increases the firm's debt by 59 percent. Because of these they find that firms with access have significantly greater leverage.

These two papers link the supply factor with the capital structure, but further study is still needed since we need to test whether the Trade-off Theory and the Pecking Order Theory still hold when the supply factor is considered.

Chapter 3: Methodology

3.1 Introduction to Research Design

In order to test whether the Trade-off Theory and Pecking Order Theory can better explain the firms' capital structure with access to the capital market than the firms without access as covered in the earlier chapters, we will take the supply factor into account. We can develop three hypotheses and run tests on their efficacy.

3.2 Sampling Design

In order to test the assumption of this paper, the data from the American market, the largest market in the world were obtained from the data base of COMPUSTAT with and it is classified with the Standard Industrial Classification (SIC). The tested period is from 2000 to 2006. From the Rajan and Zingales (1995) study, this paper will exclude the data from the financial institutions since their conclusion is that the leverage ratios for financial institutions will be higher than those of non-financial firms. In addition, the data from the public and utility sectors will not be taken into account because of their business model, leverage ratios will be high. Finally, this paper will use a sample of 259 US firms.

3.3 Measurement Procedure

The supply factor will be tested using the Trade-off and Pecking Order theories.

3.3.1 Supply Factor and Firms' Leverage

In order to obtain the relationship between the supply factors and firm's leverage we need to develop the hypotheses. These are given below:

H₀: Supply factor has no impact on firms' leverage.

H₁: Supply factor has a positive impact on firms' leverage.

From the literature review of Chapter 2, the assumption is that the H₀ will be rejected, since it is expected that the supply factor of access to the debt market will have a positive relationship with the firm's financial leverage.

The model that will be employed to test this relationship is one developed by Faulkender and Petersen (2006) and referenced in Chapter 1 as Equation 1.1.

$$\begin{aligned} Q_{\text{observed}} &= \gamma_d X_{\text{demand factor}} + \gamma_s X_{\text{supply factor}} + \mu \\ &= \gamma_d X_{\text{demand factor}} + \gamma_s \text{Bond market access} + \mu \end{aligned} \quad \dots\dots 1.1$$

where Q_{observed} is the firm's leverage ratio (L), which is the total debt divided by total assets. $X_{\text{demand factor}}$ are the demand factors of the company, which consist of current ratio (CUR), intangible assets of total assets (INT), property, plant, and equipment of total assets (PPE), tax burden (TAX), operating profit margin (PRO) and market-to-book ratio (MTB).

Bond market access will equal 1 if the firm has the access of the debt market and it will equal 0 if it has no access of the debt market. These data can be found from the Standard and Poor's (S&P).

μ is the error term.

From the explanation above the new function can be expressed as:

$$L_{mn} = \beta_0 + \beta_1 \text{CUR}_{mn} + \beta_2 \text{INT}_{mn} + \beta_3 \text{PPE}_{mn} + \beta_4 \text{TAX}_{mn} + \beta_5 \text{PRO}_{mn} + \beta_6 \text{MTB} + \beta_7 \text{Bond market access} + \mu_{mn} \quad \dots\dots 3.1$$

3.3.2 Supply Factor and Trade-off Theory

The second hypothesis is between the supply factor and the trade-off theory.

H_0 : Supply factor has no impact on the test of the trade-off theory

H_1 : Supply factor has a positive impact on the test of the trade-off theory

Since firms without the access of the bond market cannot get to the optimal point of the leverage level, in this way, the factor of access to the bond market can help to explain the trade-off factor in a much better way. In order to prove this assumption this paper will employ a model to Equation 3.2.

$$CS_{mn} = \beta_0 + \beta_1 CUR_{mn} + \beta_2 INT_{mn} + \beta_3 PPE_{mn} + \beta_4 TAX_{mn} + \beta_5 PRO_{mn} + \beta_6 MTB + \mu_{mn} \quad \dots\dots 3.2$$

In this model the CS is a measure of the leverage ratio with the other variables having the same meaning as in Equation 1.1.

After test of Equation 1.2 which referenced in Chapter 1, the Shyam-Sunder and Myers's (1999) model will be used.

$$\Delta L_{mn} = \beta_0 + \beta_1 (L^*_{mn} - L_{mn-1}) + \mu_{mn} \quad \dots\dots 1.2$$

If the trade-off model works in the American market, the β_0 will be equal to zero and the β_1 will be larger than zero and smaller than one. This means that the leverage level moves towards the target.

$$CS_{mn} = \beta_0 + \beta_1 CUR_{mn} + \beta_2 INT_{mn} + \beta_3 PPE_{mn} + \beta_4 TAX_{mn} + \beta_5 PRO_{mn} + \beta_6 MTB + \beta_7 \text{Bond market access} + \mu_{mn} \quad \dots\dots 3.3$$

Then the above model will be used to calculate Equation 1.2.

The expected result is that γ_0 is equal to zero and γ_1 is larger than zero and smaller than one. What is more, if the supply factor can help to better explain the trade-off theory then γ_1 will be larger than β_1 . This means the H_0 will be rejected.

3.3.3 Supply Factor and Pecking Order Theory

Our hypothesis is as follows:

H_0 : Supply factor has no impact on the test of the Pecking Order Theory

H_1 : Supply factor has a positive impact on the test of the Pecking Order Theory

From the literature review, firms with access of the debt market can enter it easier than the firms without. This means the supply factor can help to better explain the Pecking Order Theory, so the H_0 should be rejected.

Two steps will be followed to test whether the supply factor can help to better explain this theory or not. The first one is to test whether it holds in the American market or not, so the following model will be used:

$$\Delta L_{mn} = \beta_0 + \beta_1 (\Delta L_{mn} + \Delta E_{mn}) + \mu_{mn} \quad \dots\dots 3.4$$

where ΔE_{mn} is the change in equity from year n to the year n+1 when others have the same meaning as above. If the Pecking Order Model holds, then $\beta_1=1$ and $\beta_0=0$.

The second step is to process to test the Pecking Order Theory in Equation 3.5.

$$\Delta L_{mn} = \beta_0 + \beta_1 (\Delta L_{mn} + \Delta E_{mn}) + \gamma_2 (\Delta L_{mn} + \Delta E_{mn}) \text{ Bond market access} + \mu_{mn} \quad \dots\dots 3.5$$

If the Pecking Order Theory is validated the sum of β_1 and γ_2 will be larger than the β_1 , and β_0 should be equal to zero.

3.4 Data Collection Procedures

With the benefit of previous studies (see Chapter 2), this paper will use the following determinants to test whether the supply factor can better explain the firms' capital or not: liquidity, intangibility, tangibility, non-debt tax shield, profitability, growth opportunity and credit rating. Among these determinants, the credit rating is used to test the effect of access to bond markets.

Chapter 4: Results

Table 4.1 Statistical summary of Variables (2000-2006)

	Obs.	Mean	Std. dev.	Min	Max
L(CS)	1813	0.197	0.183	0	0.533
CUR	1813	2.625	2.468	0.536	10.193
INT	1813	0.097	0.125	0	0.398
PPE	1813	0.309	0.235	0.027	0.808
TAX	1813	0.255	0.158	-0.082	0.433
PRO	1813	0.047	0.235	-0.737	0.287
MTB	1813	1.429	1.261	0.207	4.868
ΔL_{mn}	1813	0.004	0.043	-0.082	0.110
$\Delta L_{mn} + \Delta E_{mn}$	1813	0.017	0.087	-0.120	0.278
L^*_{mn}	1813	0.198	0.131	-0.251	0.413
$L^{\#}_{mn}$	1813	0.198	0.140	-0.227	0.437
$L^*_{mn} - L_{mn-1}$	1813	-0.006	0.116	-0.248	0.188
$L^{\#}_{mn} - L_{mn-1}$	1813	-0.005	0.110	-0.244	0.160

We can conclude from the Table 4.1 that most firms do not have really high leverage.

The intangible assets do not take a large part of the total assets while the INT is

smaller than PPE. The PRO has a positive but not very large mean indicating that most companies are not highly profitable. In addition, the financing deficit and the change of debt are really small indicating that the firms have stable capital structures. Furthermore, the leverage ratio L^*_{mn} and $L^{\#}_{mn}$ is also low, indicating that these firms do not have high leverage ratios in these years. All the above implies that these firms all have low but stable debt levels during 2000 to 2006, which may affect the test of two theories

Table 4.2 Mean of Firms' Characteristics (2000-2006)

	Rated	Obs.	Non-rated	Obs.	Mean Difference
L(CS)	0.323	738	0.115	1075	0.208
CUR	1.256	738	3.564	1075	-2.308
INT	0.131	738	0.073	1075	0.058
PPE	0.421	738	0.232	1075	0.189
TAX	0.297	738	0.225	1075	0.072
PRO	0.131	738	-0.019	1075	0.148
MTB	1.691	738	1.048	1075	-0.643
ΔL_{mn}	0.006	738	0.003	1075	0.003
$\Delta L_{mn} + \Delta E_{mn}$	0.002	738	0.025	1075	-0.023

L^*_{mn}	0.286	738	0.134	1075	0.152
$L^{\#}_{mn}$	0.322	738	0.114	1075	0.208
$L^*_{mn}-L_{mn-1}$	-0.043	738	0.012	1075	-0.061
$L^{\#}_{mn}-L_{mn-1}$	-0.010	738	-0.002	1075	-0.008

From the Table 4.2, it can be easily concluded that the credit rated firms get higher leverage than the firms' do not. In this way the first hypothesis has been proved. Furthermore, the firms with credit rating have lower CUR, more INT, higher TAX and higher PRO. All these data prove that the rated firms need more debt than the unrated firms, so the firms characteristics are really important to test the impact factors of the firms' capital structure.

Table 4.3 Supply Factor on Firms' Leverage (2000-2006)

	Coefficient	p-value
CUR	-0.023	0.00***
INT	0.146	0.00***
PPE	0.223	0.00***
TAX	-0.042	0.04**
PRO	-0.043	0.00***
MTB	0.035	0.00***
RATE	0.089	0.00***

CONS	0.202	0.00***
Adj. R-square	0.5825	
F-test	362.38	0.00***
Observations	1813	

From the Table 4.3, it is clear that the coefficient of RATE is larger than zero while its p-value is smaller than the 1% significant level. This means if the firms have been rated their leverage ratio will increase. In addition, the negative sign of the CUR's coefficient means that the assumption of the Pecking Order Theory is correct.

The positive sign and small p-value of the coefficient of INT and PPE indicate that the firm's capital structure can be explained both by the Trade-off Theory and Pecking Order Theory. Furthermore, the negative coefficient and small p-value of TAX means that the tax burden is consistent with the Pecking Order Theory. Meanwhile, the data of MTB also indicate this.

Therefore, from the above explanation the Pecking Order Theory is holds in this period while the Trade-off Theory is rejected.

Table 4.4 Supply Factor and Trade-off Theory (2000-2006)

	Without Credit Rating	With Credit Rating
--	-----------------------	--------------------

	Coef	p-value	Coef	p-value
CONS	0.004	0.00***	0.004	0.00***
$L_{mn}-L_{mn-1}$	0.036	0.00***	0.038	0.00***
Adj. R-square	0.0088		0.0092	
F-test	17.00	0.00***	17.87	0.00***
Observations	1813		1813	

From Table 4.4, the constants are different from zero but close to zero in both models, which prove the hypothesis of the Trade-off Model. The small adjusted R-square shows the low explanatory power of the Trade-off Theory. In this way, the supply factor has some effect on firms' capital structure, but it is really small.

Table 4.5 Supply Factor and the Pecking order Theory (2000-2006)

	Without Credit Rating		With Credit Rating	
	Coef	p-value	Coef	p-value
CONS	-0.001	0.03**	0.005	0.07*
$\Delta L_{mn} + \Delta E_{mn}$	0.435	0.00***	0.289	0.00***
Bond market access			0.007	0.00***
$(\Delta L_{mn} + \Delta E_{mn}) * \text{Bond}$			0.359	0.00***

market access				
Adj. R-square	0.3502		0.4241	
F-test	2.18	0.00***	1.86	0.00***
Observations	1813		1813	

From the results in Table 4.5, the positive intercept is consistent with assumptions, but the small coefficient of $\Delta L_{mn} + \Delta E_{mn}$ indicate that the Pecking Order Theory does not hold in the U.S. market during this period. What more, the small adjusted R-square indicates that the explanatory power of the supply is low.

Chapter 6 Conclusion

This paper has tested two theories of capital structure: the Trade-off Theory and the Pecking Order Theory in the U.S. market during 2000-2006. The study applied and extended the study of Shyam-Sunder and Myers's (1999) to take the credit rating into account as a standard to access of public debt market. At first, this paper tested the relationship between credit rating and firms' leverage, As expected, the results showed that firms with a credit rating had a higher leverage than firms without, which is a similar result to the previous literature. However, when testing the Trade-off Theory and the Pecking Order Theory, this paper did not present the expected results.

Although both theories did not perform well, the Pecking Order Theory provides a better explanation power. Finally, after the credit rating variable was added into the model, the results of the Pecking Order Theory were improved, suggesting greater confidence in this model with the supply factor. However, the improvement of the Trade-off theory with the supply factor concerned is not significant.

Therefore as a conclusion, the Pecking Order Theory can better explain the capital structure in firms with access to the public debt market, while the Trade-off Theory cannot. In other words, the supply factor has a significant positive effect on the

explanatory power of the Pecking Order Theory, but little effect on the explanatory power of the Trade-off Theory.

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