

A Comprehensive Review on Capital Structure Theories

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Abstract

This study reviews different theories and hypothesis in regard with obtaining an optimal capital structure. Many researchers believe that capital structure includes share issuance, private investment, bank debt, business debts, leasing contracts, tax debt, retirement debt, deferred compensation for executives and employees, deposits, product related-debt and other probable debt. These theories and hypothesis include: Net income, net operational income, traditional approach theory, Miller and Modigliani theory, static trade-off theory, asymmetric of the information hypothesis, pecking order theory, signaling theory, agency cost theory, free cash flow hypothesis, dynamic trade-off theory and market timing theory. By applying these theories, we will be able to reach a maximum return with minimum risk and also increase the value of corporation. Because of the close relationship between profitability and capital structure in this paper is going to apply genetic algorithm model, support vector regression and profitability factor to reach an international range of optimal capital structure hoping to find an international point of capital structure in the future. **Key words:** Profit Margin, Support Vector Regression, International Optimal Capital Structure, Leverage, Genetic Algorithm.

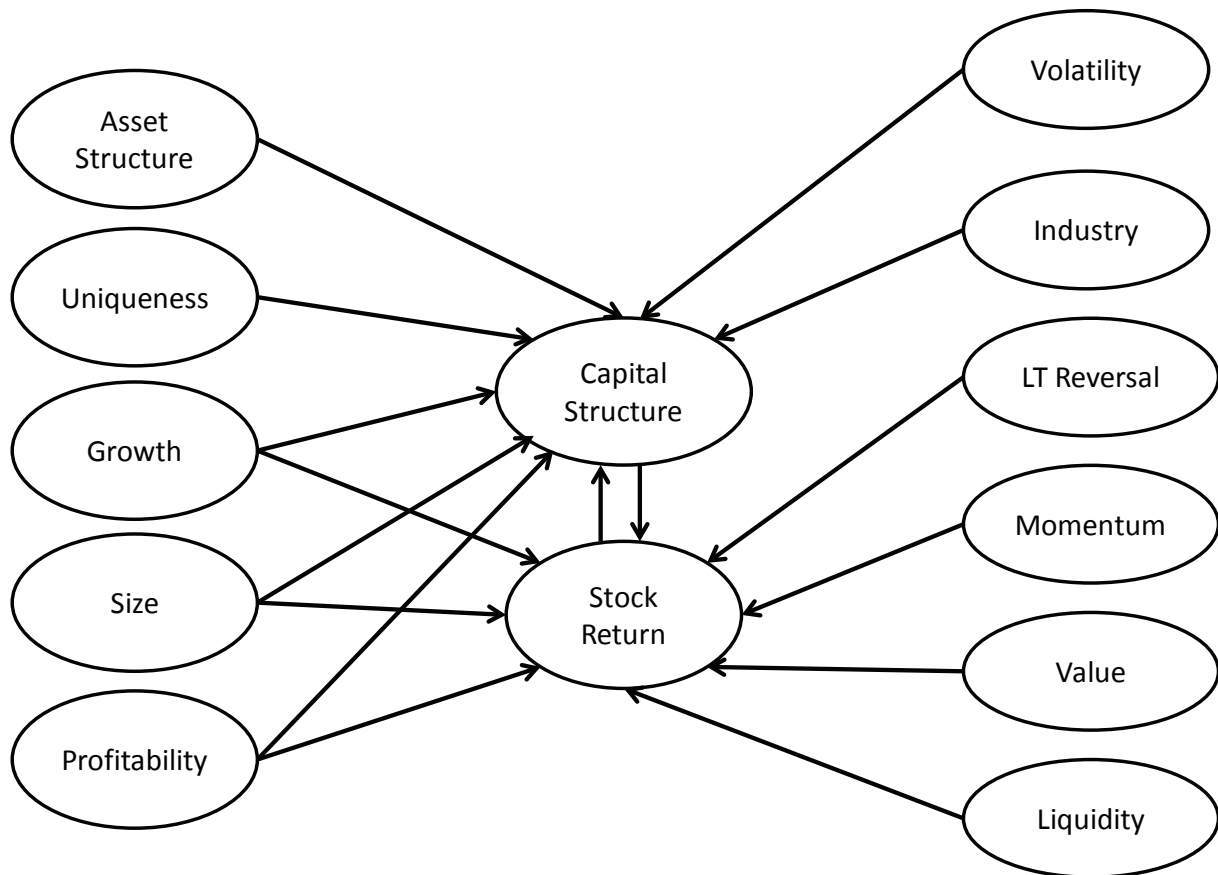
The studies on capital structure, especially optimal capital structure and tracking its results are highly regarded by many beneficiaries. The beneficiaries include researchers, senior corporate managers, financial managers and investors within the universities and industries. Their interest results from the necessity to answer the following questions:

1. When should they finance?
2. Which is the best way when they decide to finance?
Make use of leverage or issuance of shares?
3. Which option will be more beneficial if they decide to borrow? (Long-term debt or short-term debt)
4. If they decide to issue shares, which group of stocks should be issued and why? Alternatively, maybe, it is better to use retained profits to finance.

Different theories and hypothesis were presented by many researchers hoping to reach an optimal capital structure. These theories and hypothesis include: Net income, net operational income, traditional approach theory, Miller and

Modigliani theory, static trade-off theory, asymmetric of the information hypothesis, pecking order theory, signaling theory, agency cost theory, free cash flow hypothesis, dynamic trade-off theory and market timing theory. On one hand, these theories describe various financing methods, but none have been able to provide optimized model. Experimental results continued in this direction are also inconsistent and controversial. By applying these theories, they were to provide a model to reach the maximum return with minimum risk and increase the value of corporations. Since the determinants of capital structure are great, many models were presented by scientists like Titman and Wessels (1988) entitled LISREL model and Chen Yang, Few, Lee, Xiang, Gu and Wen, Lee (2009) entitled MIMIC model to evaluate them. Some of the determinants used by MIMIC model follow as: Expected growth, stock return, uniqueness, asset structure, profitability, volatility, industry classification, leverage, size, value, liquidity, Long term reversal and momentum.

Figure 1: Path diagram of the structural model (MIMIC)



In addition to mentioned factors, many other determinants exist that was applied by other researchers in other models. Some of them include: Historical market –to book ratio (Mahajan and Tartaroglu, 2008), political risk(Desai, Foley and Hines 2008), financial distress and competitiveness(Vasiliou and Daskalakis,2009), subsidiary debt(kolasinski,2009), common law legal origin, burden of proof, investor protection, disclosure requirements and public enforcement (Mishra and Tannous, 2010), ownership (Cespedes, Gonzalez and Molina,2010) and efficiency (Margaritis andPsillaki, 2010).Because of close relationship between profitability and capital structure, this paper is going to apply genetic algorithm model, support vector regression and profitability factor in order to reach an international range of optimal capital structure hoping to find an international point of optimal capital structure in the future.

Conceptual framework, relevant literature, review and background studies

Determination of a target capital structure and consequently, a target debt ratio, like to what capital structure theories describe, emplaces in the range of prescriptive theories but what distract it from the target cannot be answered under the prescriptive theory. Response to these questions is categorized in the domain of proof theories because it results from the real world. Furthermore, since the subject of capital structure is based on the concept of partial equilibrium analysis (neglect the secondary variables in order to consider the impact of main variables on topics of interest), many scientists, over the years, tried to analyze the structure of capital by presentation of new theories, take into account of new determinants or both of them. Before describing the relevant literature of capital structure together with the introduction of researchers of this scientific branch in detail, this paper will present an overview of capital structure theories below:

Table 1: Theories and approaches of capital structure

No	Theory/ Approach	Effect(1)	Effect(2)	Results
1	Net Income Approach(NI)	L↑	K↓, P↑	V↑
2	Net Operating Income Approach(NOI)	L↑	K	V
3	Traditional Approach	L↑	K↓	V↑
		L↑	K	V
		L↑	K↑	V↓
4	MillerandModiglianiApproach (Non-debt tax shield)	L↑	K↑, R↑	V↓
	(debt tax shield)	L↑	K↓	V↓
5	Static Trade Off Theory	L↑	K↓ Financial Distress↑	Trade-off→V↑
6	Asymmetric of Information Hypothesis	Asymmetric of information between shareholders and investors↑	Undervalue of shares for new investment↑	Benefit for new investors↑ loss for current shareholders↑
7	Pecking Order Theory	First internal sources and then external Sources↑	Endeavor to invest on positive net present value projects↑	Fist, benefit for present shareholders and then an opportunity for new investors↑
8	Signaling Theory	Financial decisions are signals for investors↑	-----	Asymmetric of information can be solved by signaling theory↑
9	Agency Cost Theory	Conflict of interest between management, shareholders and creditors↑	-----	V↓
		Conflict of interest between management, shareholders and creditors↑	-----	V↑
10	Free Cash flow Hypothesis	L↑ Dividend↑	Agency Cost↓	V↑
11	Dynamic trade Off	Correct future forecasting↑	-----	V↑
		Incorrect future forecasting↑	-----	V↓
12	Market Timing Theory	Overvalue of shares↑	Issuing new shares	V↑
		Undervalue of shares↑	Buyback their shares	V↑

L= Leverage, K= Cost of capital, V= Value, R= Expected return, ↑= increase and ↓= decrease

1. Net Income Approach (Ni)

In a long term with the combination of low-cost source of financing (more debt) and expensive source of financing (less stock) in capital structure, a firm reaches a descending

cost. Greater use of debt in capital structure will reduce capital expenditure. It means that weighted average cost of capital and stock price is influenced by the degree of financial leverage. In this theory, there is no belief to reach an optimal capital structure. (Mundy, 1992)

1. Determinants like profitability, size, return and so on.

Figure 2: The Conceptual Figure of Ni



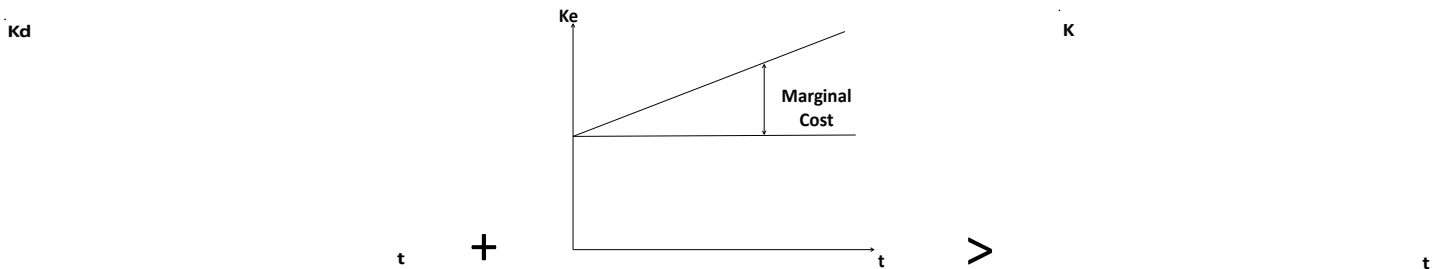
Kd: Cost of debt, Ke: Cost of share issuance, K: Capital cost and T: Tax

2. Net Operating Income Approach (Noi)

In this approach, like the previous one, the idea of optimal capital structure does not exist. In this approach, the hidden

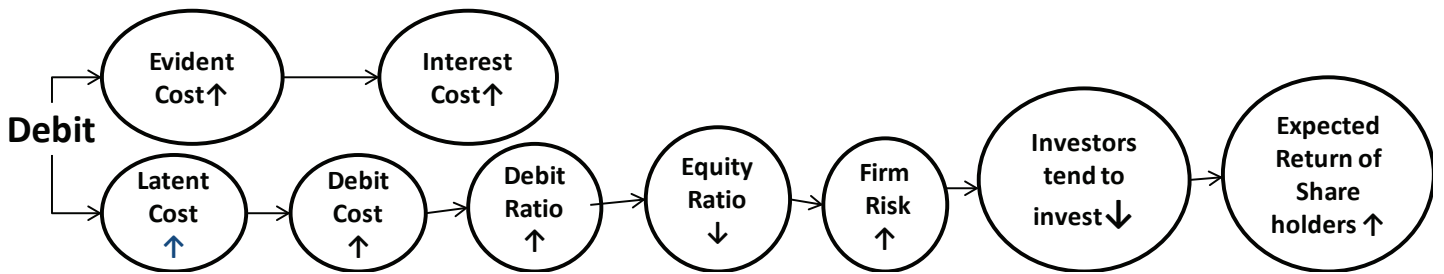
cost of debt was identified by → Durand. Consequently, hidden cost of debt fades the benefits of using debt as a cheaper source of finance (Baum and Crosby, 1988).

Figure 3: The Conceptual Figure of Noi



Kd: Cost of debt, Ke: Cost of share issuance, K: Capital cost and T: Tax

Figure 4: Evident versus hidden cost of debt

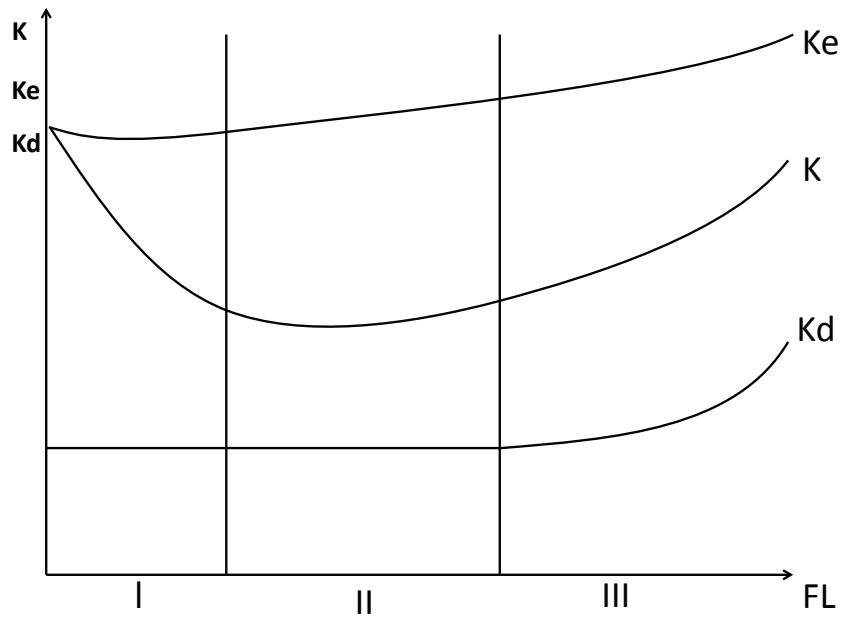


3. Traditional Approach

it is based on the belief that optimal capital structure always exists, and we can increase the value of firms by making use of leverage. It is a combination of two previous

approaches (NI and NOI). It has three stages. The range that capital cost is the least is called optimal range of financial leverage (stage II), and the capital structure of this area is called optimal capital structure.

Figure 5: The Conceptual Figure of Traditional Approach



Second stage (II): shareholders awareness of company's risk.

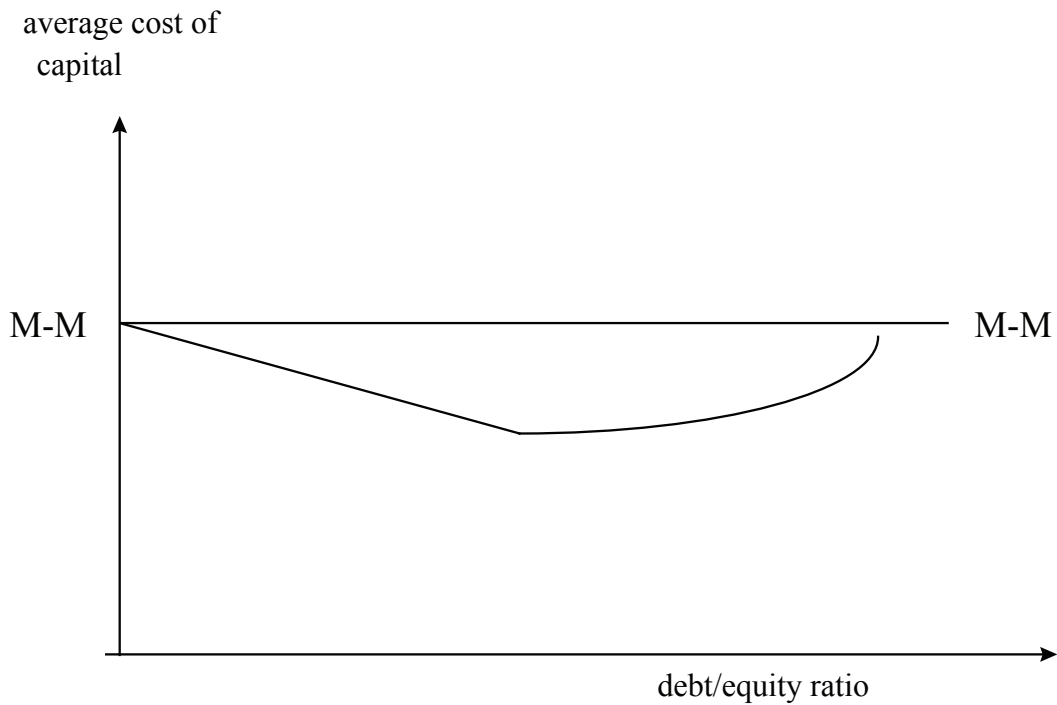
Third stage (III): shareholders and creditors awareness of company's risk.

4. Miller and Modigliani Theory

their well-known theory (Debt tax shield and non-debt tax shield) is based on several assumptions as followings:

perfect and frictionless markets, no transaction costs, no default risk, no taxation, both firms and investors can borrow at the same interest rate.

Figure 6: The Conceptual Figure of Miller and Modigliani Theory



4-1) Non-debt tax shield (capital structure irrelevance): More or less use of debt in capital structure brings no benefits for the company.

4-2) Debt tax shield (tax benefits): because debt composes a tax shield, the higher proportion of leverage will be of benefit to each company concerned it and it will decrease the capital cost. In this theory, Miller and Modigliani consciously neglect some debt obligations like financial distress and bankruptcy.

5. Static Trade-Off Theory

Jensen and Meckling (1976) suggest that the firm's optimal capital structure will involve the tradeoff among the effects of corporate and personal taxes, bankruptcy costs and agency costs, etc. Trade-Off theory suggests that corporate should consider a reasonable debt ratio and tries to achieve this goal in a long term. Through this way, a firm can benefit greatly by using of debt as a cheap source of financing. Tax saving is one of the advantages that results from using of debt and consequently, the cost of potential financial distress is considered as a disadvantage of using debt, especially when the firm relies on too much debt. This theory suggests a trade-off between the tax benefit and the disadvantage of higher risk of financial distress.

6. Asymmetric of Information Hypothesis

In capital structure's theories, asymmetric of information means that in comparison with external investors, managers have more information about the rate of internal cash flows, investment opportunities and, generally, about the future landscape and real value of the company. Less information of external investors can lead to undervaluation of shares. There for information disclosure must be regarded regularly as an important factor. Asymmetric information means a situation in which one party in a transaction has more superior information compared to another. It could be a harmful situation because one party can take advantage of the other party's lack of knowledge. It can also lead to two main problems: 1) adverse selection 2) moral hazard (Investopedia glossary).

7. Pecking Order Theory of Financing Choice

Pecking order theory is the consequence of Asymmetric information (Myers, 1984). The pecking order theory does not take an optimal capital structure as a starting

point, but instead asserts that firms prefer to use internal finance (as retained earnings or excess liquid assets) over external finance. If internal funds are not enough to finance investment opportunities, firms may or may not acquire external financing, and if they do, they will choose among the different external finance sources in such a way as to minimize additional costs of asymmetric information. In order to minimize external cost of financing, firms prefer to use debt leverage at first, then issuance of preferred stock and finally issuance of common stock. The results of pecking order theory follow as: internally generated funds first, followed by respectively low-risk debt financing and share financing. The pecking order theory regards the market-to-book ratio as a measure of investment opportunities. Empirical evidence supports both the pecking order and the trade-off theory. Empirical tests to see whether the pecking order or the trade-off theory is a better predictor of observed capital structures find support for both theories of capital structure.

8. Signaling Theory

Financial decisions are signals sent to investors by managers in order to compensate information asymmetry. These signals are regarded as the main core of financial relationships.

9. Agency Cost Theory

It proposes that the optimal capital structure is determined by agency cost, which results from conflict of interest among different beneficiaries (Jensen and Mackling, 1976).

9-1) Conflict of interests between managers and stakeholders.

9-2) Conflict of interests between stakeholders and holders of corporate debt securities.

10. Free Cash Flow Hypothesis

Free cash flow is the amount of cash that a company has left over after it has paid all of its expenses, including investments (Investopedia glossary). It is important because it allows a company to pursue opportunities that enhance shareholder value. Without cash, it's tough to develop new products, make acquisitions, pay dividends and reduce debt (Investopedia glossary). Related to capital structure, this theory expresses that mitigation of free cash flow by paying interest of debt and dividends prevent a manager

from probable deviations to abuse company's income for personal purposes. Because of law requirements, paying the principal and interest of debt is preferred to paying dividends to diminish the level of free cash flow (Jensen, 1986).

11. Dynamic Trade-Off Theory

Constructing a timing model of market requires identifying a number of aspects that are typically ignored in a single-period model. Expectations and adjustment costs play important roles in dynamic trade-off theory. In a dynamic model, the correct financing decision typically depends on the financing margin that the firm anticipates in the next period. Some firms expect to pay out funds in the next period, while others expect to raise funds. If funds are to be raised, they may take the form of debt or equity. More generally, a firm undertakes a combination of these actions.

An important precursor to modern dynamic trade-off theories was Stieglitz (1973), who examines the effects of taxation from a public finance perspective. Stieglitz's model is not a trade-off theory, since he took the drastic step of assuming away uncertainty.

The first dynamic models to consider the tax savings versus bankruptcy cost trade-off are Kane et al. (1984) and Brennan and Schwartz (1984). Both analyzed continuous time models with uncertainty, taxes, and bankruptcy costs, but no transaction costs. Since firms react to adverse shocks immediately by rebalancing costlessly, firms maintain high levels of debt to take advantage of the tax savings. Much of the work on dynamic trade-off models is fairly recent and so any judgments on their results must be somewhat tentative. This work has already fundamentally altered our understanding of mean reversion, the role of profits, the role of retained earnings, and path dependence. As a result, the trade-off class of models now appears to be much more promising than it did even just a few years ago.

12. Market Timing Theory

The market-timing theory of capital structure argues that firms time their equity issues as follows:

12-1) They issue new stock when the stock price is perceived to be overvalued, and buy back own shares when there is undervaluation. Consequently, fluctuations in stock prices affect firm's capital structures. There are two versions of equity market timing that lead to similar capital structure dynamics. The theory assumptions are:

- a. The first assumes economic agents to be rational.
- b. The second theory assumes the economic agents to be irrational (Baker and Wurgler, 2002).

12-2) Managers issue equity when they believe it's cost is irrationally low and repurchase equity when they believe it's cost is irrationally high. It is important to know that the second version of market timing does not require that the market actually be inefficient. It does not ask managers to successfully predict stock returns. The assumption is simply that managers believe that they can time the market. In a study by Graham and Harvey (2001), managers admitted trying to time the equity market, and most of those that have considered issuing the common stock report that "the amount by which our stock is undervalued or over-valued" was an important consideration. Baker and Wurgler (2002) provide evidence that equity market timing has a persistent effect on the capital structure of the firm.

12-3) Companies tend to stock issuance only when they ensure that investors are interested in future profit of the company.

12-4) In regard to market timing, managers believe that increase or decrease the volume of shares effect on stock buying and selling (Malcom and wurgler, 2000).

Capital Structure and Profitability

Many researchers believe that capital structure includes share issuance, private investment, bank debt, business debts, leasing contracts, tax debt, retirement debt, deferred compensation for executives and employees, deposits, product related-debt and other probable debt. Capital structure is usually measured by the following ratios: ratio of debt to total asset, the equity ratio to total asset, a debt ratio to the equity and equity ratio to debt.

Profitability is defined as the ability of a firm to gain profit. Profitability is the result of all financial plans and decisions. The ratio of profit to sell, return on asset (ROA) and return on equity (ROE) are generally applied to measure profitability.

Genetic Algorithm

Genetic algorithm is one of the exploration algorithms that find the answer randomly. This algorithm, which is a trial-and-error algorithm, first presented by Holland and performs based on genetic of living animals, factors and

circumstances that are effective on their life. This method is based on Darwin’s theory that emphasis on the principle of survival of the strongest animals. This algorithm is used to solve complex optimization problems that no special laws exist for them.

To solve a problem by using this method, and also to evaluate the responses, you should represent the theoretical responses of the problem in a special way. There are several ways to display and coding that the most common and important of them are binary way and floating decimal view. At first, the initial population that shows the answers is randomly selected. Each member of the population called chromosomes is one of the problem responses. Each of these chromosomes is selected from the series of numbers with equal length that is called a gene. Genetic algorithm based on repetition. The population of each repetition or act is called generation. The members of this generation are evaluated based on a value function. In this process, new generation tries to assign a higher value of function in order to be closed to the target. In each repetition, chromosomes are married to each other with a certain probability, and its consequence is one or some new chromosomes that are called “Child.” A mutation with a special probability may occur in children and consequently, the amounts of one or more genes change. In the final stage, children are being evaluated according to value function. New generation is generated based on the children value and parents value (the first generation that produced these children). This process is repeated until the present generation will converge to the optimum solution or the optimum sub-solution. There are different mutant and cross operators who are chosen based

on the complexity of the problem.

Support Vector Regression

Support vector regression is a variety of regressions that its theory is defined as follows: suppose that the training data follow as, where X represents the input patterns.

$$\{(x_1, y_1), (x_2, y_2), (x_3, y_3), \dots, (x_i, y_i)\} \subseteq X \times R$$

In the regression of ϵ -SV the aim is to find the function of $f(x)$ where the maximum output difference of $f(x)$ (y_i from x_i) from real y_i become equal to ϵ for total training data, and the function of $f(x)$ remain with no curve like a straight-line.

$$f(x) = \langle w, x \rangle + b \text{ with } w \in X, b \in R$$

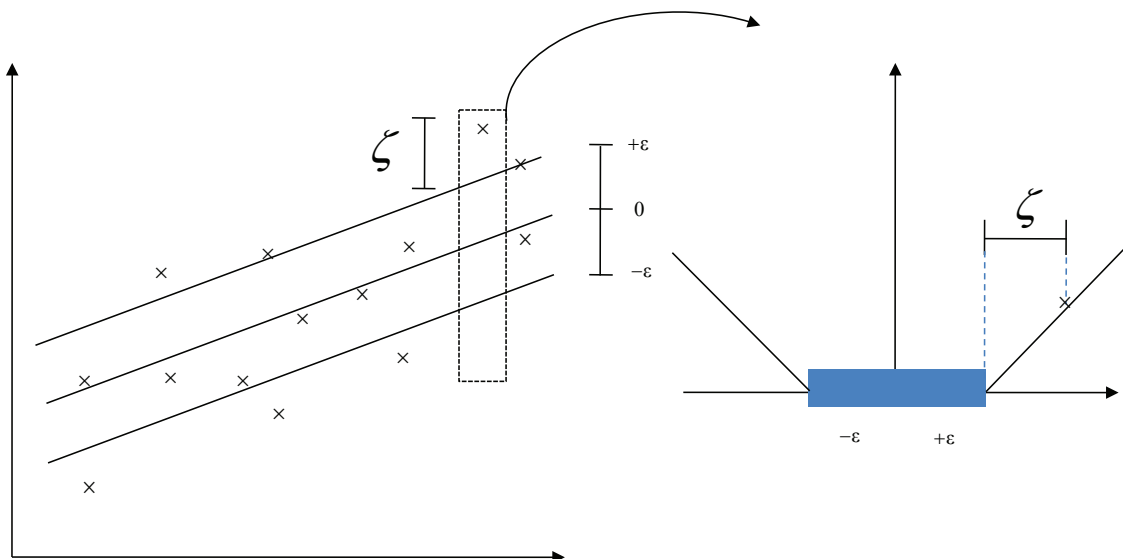
Where $\langle \cdot, \cdot \rangle$ reveal the inner product in the space of X, and no curve in $f(x)$ means little (w). One way to ensure is to minimize the norm of (w) where this problem can be solved as a convex optimization problem.

Figure 2 Shows this Problem Graphically. This Problem Can Be Resolved as a Dual Problem.

$$\text{minimize } \frac{1}{2} \|w\|^2$$

$$\text{Subject to } \begin{cases} y_i - \langle w, x_i \rangle - b \leq \epsilon \\ \langle w, x_i \rangle + b - y_i \leq \epsilon \end{cases}$$

Figure 7: Support Vector Regression



Based on abovementioned theories, a lot of researches have been done regarding the capital structure. It seems the inception of these researches goes back to early 1950s and scientists like Linter (1956), Hirshlifer (1958) and Modigliani and Miller (1958). However, the related researches were done before. After the mentioned researchers, the most basic related researches belong to Jensen and Meckling (1979) about “theory of economical unit”, managers behavior, agency cost and capital structure with an emphasis on static trade-off theory.

Myers and Majluf (1984) that examined determinants of capital structure from the asymmetric of information perspective. Myers (1984) regarded the mystery of capital structure and presentation of pecking order theory of financing choice in his paper. Titman and Wessels (1988) studied the capital structure determinants. David Alen (1993) tested pecking order theory on Australian capital market. Rajan and Zingales (1995) with a paper entitled “what do we know about capital structure? Some international evidence” examined capital structure. Angel and Zechner (2004) examined the effects of dynamic capital structure on credit risk, Chingfu, Alice, Lee and Cheng, Lee (2007) in a study carried out jointly between the state university of New Jersey and San Francisco state university, identified growth as the most important factor in capital structure that is affected by profitability, capability of liquidation, non-taxed debt and special values.

Desai, Foley and Hines (2008) from Harvard and Michigan University studied multinational firms of United States from 1982 to 1999. They reached a conclusion that fluctuation of capital return in a high-risk country is more than that of other low-risk countries. As a result, the multinational firms decrease their leverage level in order to diminish risk, Mahajan and Tartaroglu (2008) from Texas university and Wichita state university, with a paper entitled “Equity market timing and capital structure international evidence”, examined market timing theory in G7 countries. Results proved that leverage is negatively related to the historical market-to-book ratio in all G-7 countries. Vasiliou and Daskalakis (2009) from Greece, studied the different institutional characteristics on capital structure in Greek firms compared to other countries firms from 2002 to 2004. The results showed that Greek firms avoid long term debt for three reasons: 1) Lower development of Greek financial intermediaries relative to other countries. 2) Increase of capital during previous years (1998-2000) as much as possible. 3)

Take more attention to disadvantages of leverage, namely the financial distress, than its benefits, i.e. tax shield

or lowering agency costs of equity. In another research Chen Yang, Lee, Gu and Wen Lee, (2009) appraised co-determination of capital structure and stock return in Taiwan Stock market by applying LISREL model. Two external factors of profitability and growth were identified as common determinants between debt ratio and stock return. Both are negatively related to leverage and positively to stock return. Mishra and Tannous (2010) from Canada assessed multinational and nonfinancial firms of Canada during 2000-2001 by making use of LTD (long term debt) model. They looked for finding whether the stock laws of the host countries have an impact on U.S. multinational firms or not. Results propose that long-term debt is positively related to following factors:

1. Firm common law legal origin
2. Burden of proof
3. Investor protection
4. Disclosure requirements
5. Public enforcement.

It is also negatively related to political risk. Cespedes, Gonzalez and Molina (2010) investigated 806 Latin American firms since 1996-2005. They examined determinants of capital structure. Results propose that ownership based firms avoid issuing shares because they don't want to lose or to decrease the control right of the firm. Finally, Margaritis and Psillaki (2010) studied the relationship between capital structure, ownership and firm performance in French firms since 2002-2003. Results demonstrated that use of debt in capital structure leads to augmentation in stock price. They indicated that the impact of efficiency on leverage is positive. They also represented that concentrated-ownership structure firms utilize more debt in their structures.

Conclusion

This paper mentioned many different theories of capital structure. In net income approach (NI) and net operating income approach (NOI) is no belief to reach an optimal capital structure but traditional approach is based on the belief that optimal capital structure always exists, this approach is a combination of (NI) and (NOI). Miller and Modigliani theory includes: Non debt tax shield that capital structure bring no benefits for company, and debt tax shield that the higher proportion of leverage will be of benefit to company. Static trade-off theory suggest trade-off between the tax benefit and disadvantage of higher risk of financial distress. Asymmetric of the information hypothesis managers have information about the rate of

internal cash flows but less information of external investor can lead to undervaluation of shares. Pecking order theory regards the market-to-book ratio as a measure of investment opportunities. Signaling theory that financial decisions are signals sent to investor by managers in order to compensate information asymmetry. Agency cost theory has 3 conflict of interest for different beneficiaries. Free cash flow hypothesis that it is important because it allows a company to pursue opportunities that enhance shareholder value. Dynamic trade-off theory that exception and adjustment costs play important roles in dynamic trade-off theory, in this model, the correct financing decision typically depends on the financing margin that the firm anticipates in the next period. Market timing theory of capital structure argues that firms time has important roles.

In this study, the close relationship between profitability and capital structure cause to apply genetic algorithm model, support vector regression and profitability factor to reach an international range of optimal capital structure hoping to find an international point of capital structure. It is vitally important that investors be aware of ratios of capital structure such as: ratio of debt total asset, the equity ratio to total asset, a debt ratio to the equity and equity rate to debt. Also (ROI) and (ROE) are generally applied to measure profitability. Genetic algorithm model is used to solve complex optimization problem that no especial laws exist for them and support vector regression that it is a mathematic method to reach maximum outputs.

Finally, in this paper we could prove that a lot of researches have been done regarding the capital structure, the most important factors in capital structure that is affected by profitability, capability of liquidation, non-taxed debt and special values. At the another studies identified two external factors of profitability and growth were identified as common determinants between debt ratio and stock return, Both are negatively related to leverage and positively to stock return. Results propose that long-term debt is positively related to following factors: 1) Firm common law legal origin 2) Burden of proof 3) Investor protection 4) Disclosure requirements 5) Public enforcement. Also have examined determinants of capital structure, Results propose that ownership based firms avoid issuing shares because they don't want to lose or to decrease the control right of the firm. They indicated that the impact of efficiency on leverage is positive and represented that concentrated-ownership structure firms utilize more debt in their structures.

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