

Trade-off and Pecking Order Theories: An Empirical Evidence Using Panel Data Analysis from Select Indian Sectors

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Abstract: The purpose of the study is to assess the explanatory power of the two foundational theories of capital structure i.e. the Trade-off and the Pecking order theory separately. Drawing a sample of 20 listed firms across three prominent sectors including Healthcare, Energy and Information technology based on secondary data collected from CMIE Prowess database for the period ranging from 2011 to 2024, and with the help of panel data estimation technique, the results obtained empirically reveals that all the three sectors show comparatively stronger alignment with the trade-off theory than the pecking order theory. The study provides insightful information for the financial managers and the stakeholders to make better decisions.

Keywords: Capital structure, Pecking order theory, Trade-off theory.

I. Introduction

Capital structure gained popularity in 1950's with propositions laid by Durand (1952) [1] who brought forward the idea of employing leverage in the capital structure, thus reducing the cost of capital thereby, creating value for the firm. Though, this proposition was later declined by (Modigliani and Miller, 1958) [2] on the grounds of irrelevance and ever since then the topic has remained relevant and a contentious area in the field of corporate finance literature. The descensus among the researchers has led to capital structure, an area for ongoing research as well as gaining widespread attention across the world due to its practical implication in the corporate world besides being an intriguing area in research.

A firm's capital structure remains nuclear and an enduring challenge in the corporate finance theory as it affects the financing decision regarding the financial choices a manager faces during the decision making. The capital structure choice also has a bearing on the investment, dividend and other corporate decisions, hence given its multifactorial nature, there is no unified theory that can explain the financing behaviour of different firms across contexts. Furthermore, seeing the dynamic nature of today's world, the role of long-term financing mix is fundamental to carrying out the operations smoothly and profitably. Many eminent researchers have laid the foundation with their exemplary work in the respective domain. While talking about capital structure, our initial understanding goes with a pattern or a structure of funds that a firm incorporates with respect to its operating, financial, and investment needs. These funds are especially long-term funds, which comprises debt, equity, hybrid securities, and retained earnings, etc., which are classified as internal and external funds. In our study, we will discuss the two theories of capital structure: one is the trade-off theory, and the other is the pecking order theory, which have proved to be cornerstones in the field of capital structure theories. Analysing the financing pattern of the selected sectors (the healthcare sector, the energy sector and the information technology sector) through the lens of the two theories would be an interesting and insightful study. Factors like research and development, tools and equipment, bulk manufacturing, high upfront costs, and other related factors create an urge for the long-term funds to meet the industry requirements. Even if there might be a plethora of options available in the market for raising funds, which among the long-term sources, separately or in combination, should be chosen to facilitate

these capital-intensive industries and sectors in their operations and sustain the industry demands is a crucial decision to make, and here is where the capital structure decision comes into play. The efficient mix and the proportion in which long-term sources of funds should be incorporated form the basis of the capital structure.

Besides the ones that have proved to be disruptive as the trade-off and the pecking order theory, the other significant theories include agency cost theory, signalling theory, and the market timing theory. While, comparing the trade-off and pecking order theories, the nature of these theories are a bit contrasting owing to the different assumptions underlying them and their predictions in relation to the financing choice, as cited by many scholars. Hence, there is no consensus with respect to the dominance of one theory over the other, as also stated by Myers (1984)[3] in his paper “the capital structure puzzle.” After Modigliani and Miller proposed the capital structure irrelevance theory, (Kraus and Litzenberger, 1973)[4] in the trade-off theory further explained that leverage would matter in the case of an imperfect capital market, stressing the benefits and costs of employing debt.

This study is undertaken on three different sectors to study and test both the theories separately as well as to search for sufficient grounds where both the theories seem to complement each other rather than treating them as exclusive.

II. Conceptual Framework and Literature Review

The Trade-off theory of capital structure is believed to be one of the dominant theories of capital structure, germinated from the idea of balancing the benefits of tax shields against the distress cost involved in incorporating debt to the capital structure. The model basically evolved after (Modigliani and Miller, 1963) [5] let go off the assumption of “without taxes”, thus bringing the model closer to reality by incorporating taxes into the picture, and accepting debt a cheaper source of finance compared to equity, due to the benefits of tax shield that an indebted firm enjoys in comparison to a firm with no debt. Thereafter, models that surrounded it, suggested a point in the capital structure which is considered to be optimal, where the tax benefits exactly offset the distress cost of debt. The Distress cost of debt relates to the potential financial problems that may arise, like the bankruptcy costs or the deadweight costs in the form of legal and administrative expenses.

Another benefit of debt recognised by (Jensen and Meckling, 1976) [6] in their Agency theory was the mitigation of conflict among the corporate managers, stakeholders and the debtholders arising out of free cash flow in the hands of managers. Instead of acting stewards for all the stakeholders, the managers sometimes look for personal benefit. Using debt in the capital structure helps the managers stay more disciplined with relation to the free cash flow than opting for investment opportunities that may not be viable for the wealth creation of the other stakeholders i.e. (shareholders & bondholders).

Now, the debate around debt is debt apparently being a cheaper source of finance, the firms should be raising its funds entirely through debt i.e. 100% debt should be employed by the firms as an optimum capital structure, though the reason for not employing 100% debt was given by (Modigliani and Miller, 1963) [5] paper that the firms cannot opt for as much debt as possible due to flexibility concerns, and to maintain “reserve borrowing capacity”. Further Myers (1977) [7] in their paper discussed about personal income taxes which will fade the tax advantages that the shareholders enjoy in the form of higher share prices by paying for capital gains. These arguments further support a firm not opting for 100% debt in its capital structure. Further rationale against trade-off, suggests that incorporating debt involves diminishing the future growth opportunities of the firm, due to inverse relation present between debt and the ratio of future growth value to value of the firm as stated by Myers (1977) [7] in their paper Determinants of corporate borrowing. The concept of non-debt tax shields brought forward by (DeAngelo and Masulis, 1980)[8] advanced the trade-off model by recognising other ways of corporate tax shield by incorporating allowances for depreciation and depletion, investment tax credits, besides just employing debt into the structure. Therefore, companies having non debt tax shields shares a negative relation with debt, as the nondebt tax shields can substitute debt leading the firm to have lower optimal debt ratios.

On one hand where the trade-off is built on the idea of firms attaining to reach a target debt ratio, which further helps the firm in reaching an optimal capital structure, yet there are inconsistencies observed with the trade-off theory and these inconsistencies paved the way for a better explanation of the firm's choice of capital structure leading to the pecking order theory, which might provide rationale for firms not opting for the trade-off model Myers (1984)[3]. Choice of capital structure also conveys information to the outside investors, and this information is often perceived adversely by them due to the presence of asymmetric information. Thus, the pecking order theory stems from the idea of information asymmetry mentioned firstly by Donaldson (1961),[9] which was further refined by (Myers and Majluf, 1984)[10]. They stressed on the sequence of choice of capital structure to avoid signalling and misinformation cost derived by the investors based on the assumption that managers are known to have superior information about company's affair than the stakeholders, hence an equity issue is often seemed as a negative signal resulting in the fall in the stock prices, therefore it's better to adhere to the hierarchy of funds i.e. choosing internal finance like retained earnings to external finance and debt to equity in case of external finance, while considering the investment opportunities. In their paper, (Myers and Majluf, 1984)[10] also suggested of maintaining a financing slack or reserve borrowing power by limiting dividends thereby increasing the marketable securities and the cash flows when in need.

Later the traditional capital structure model was compared to pecking order theory by (Shyam-Sunder and C. Myers, 1999)[11]. The trade-off model is driven by the firms attempt to reach a target debt which is also the optimal point in the capital structure whereas in pecking order model, external debt is derived from the financial deficit which the firm faces due to the imbalance occurring between the firm's investment needs and its internal cashflows. The study was undertaken on 157 American publicly traded firms from 1971 to 1989 and the results emphasized that pecking order model has superior time series explanatory power than the trade-off model and also can be rejected if the firm follows target debt ratio in its capital structure, whereas the static trade-off cannot be rejected, even if the firm follows pecking order model due to the cumulative effect of prior capital structure choices and cumulative need for external financing.

Both the models were criticised by (Chirinko and Singha, 2000)[12] on the basis of limited empirical power to reject the pecking order hypothesis given by (Shyam-Sunder and C. Myers, 1999)[11] even when the order is violated. Thus, the model fails to incorporate the other alternative financing determinants present for a firm to consider. The major reasons given for weak explanatory power was, it tests a joint hypothesis including the sequence that pecking order model follows and secondly the proportion of equity and debt, thirdly hierarchy might be violated if the firm resorts to equity financing after retained earnings rather than issuing debt but the model fails to observe this deviation in order and lastly in case where the firm follows a constant proportion of debt-equity mix, R^2 equals one giving misleading results.

The criticisms with respect to pecking order theory as mentioned by (Frank and Goyal, 2003),[13] reflected a departure from debt issues for the firms facing financial deficit, rather they issued equity to finance the deficit, moreover for a broader section of firms covering all sizes, financing deficit was observed to be of least significance, even the large mature firms showed weak form of consistency with the pecking order theory. It also adds that financing deficit only adds marginally to the firms financing explanatory power, Thus, it cannot supplant the significance of traditional leverage. The significance of pecking order deteriorated with time, not only due to the emergence of small firms during 1990's as mentioned by (Frank and Goyal, 2003),[13] involving information asymmetry, but also because of equity being a pertinent source of finance besides debt.

A study on both the trade-off and the pecking order theory by (De Jong et al., 2011),[14] conducted on the US firms, focused on the cases when both the theories agree on similar financing behaviour and situations where the trade-off and pecking order model disagree. They considered for both the situation of financial deficit and financial surplus and found an interesting contrast. With regards to the issue decisions at times of financing deficit, the firms financing behaviour shows consistency with the pecking order theory while considering the repurchase decision for the firms experiencing financing surplus, the firms are more aligned with the trade-off model.

A study on the French firms belonging to SBF-250 index, conducted by Atiyet (2012),[15] for a 5-year period employing panel data technique with the objective of comparing the explanatory power of the trade-off against the pecking order theory, where the results revealed that the financing behaviour of the French firms showed stronger support for the pecking order theory compared to trade-off theory. This alignment can be due to the presence of information asymmetry leading to higher selection costs, hence the change in debt is mostly lead by financing deficit rather than target debt ratio.

An attempt to reconcile the trade-off and the pecking order theory was done by Dedes (2011),[16] where he employed 121 Swedish firms, as sample from the period 2000 to 2009, he classified the sample as small firms, large firms and all firms, and tested both the theories. His results showed features consistent with both the models i.e. trade-off and pecking order. For the smaller firms and the whole sample of firms, he found trade-off model was reflected in their financing behaviour, but for the large firms, the financing behaviour favoured the pecking order theory. Another significant objective that he tried to study was the exclusivity of the two theories and with respect to that objective the results showed that both the theories can be reconciled under sufficient conditions, thus negating that the two theories are mutually exclusive, or incompatible and the financing behaviour of the large firms showed evidence in support of the Reconciliation. Another study conducted by (Serrasqueiro and Caetano, 2014),[17] on the Small and Medium enterprises(SME's) in Portugal, using a dynamic model for estimation found that the old and profitable SME's supports the pecking order model, while the large size SME's follows the trade-off model. Thus, both the models find relevance in the capital structure decisions, concluding that both the models are not exclusive and can be used to understand the financing behaviour of the SMEs.

Hastutik et al., (2023) [18] conducted an SLR using 140 articles between 2000 and 2020. The purpose of the SLR was to determine the optimal structure, which led to trade-off theory and pecking order theory in Indonesia. The findings revealed differences in management in determining the capital structure. Further, their study suggested differences in empirical studies of the two theories. Finally, they concluded that a manager would prefer the trade-off theory when considering the optimal capital structure. However, when a family manages, the company tends to select the pecking order theory.

A comparative study was conducted by Colombo et al., (2023)[19] to examine whether new startup companies follow classical pecking order and trade-off theories of capital structure. They collected data from 40 startup companies based in Brazil. The study finds that startups initially entirely depend on their founders for finance, and once the firms start generating returns it leads to adherence to a pecking order. Similarly, firms avoid debt at the initial stage, which is in line with trade-off theory.

Mendes et al., (2023)[20] conducted a study on tourism SMEs of Portugal to find the determinants of capital structure. They employed econometric linear regression using data from 606 SMEs. The findings suggest that the firms follow the norms of pecking order and tradeoff closely.

Agyei et al., (2020)[21] examine the theories in order to understand which of them predicts the financial decision better using panel data analysis from 187 SMEs in Ghana. The results indicate that profitability, age, liquidity, growth, size, and tangibility of assets all have a significant impact on SMEs' capital structure, while risk is insignificant. Lastly, the study concluded that the funding decisions reflect predictions of pecking order theory.

Going through the literature review, we found a lot of studies have been conducted to assess both theories but majorly have been undertaken by the developed countries. Also, the studies have concentrated on the firm's characteristics and how they determine its capital structure. Besides that, a number of empirical studies undertaken in the recent capital structure literature have shown features consistent with both the significant theories of corporate finance, and mixed evidence has been found on their practical relevance.

III. Objectives of the Study

Specifically, our objectives are

- To assess the static trade-off theory across the three Indian sectors chosen
- To examine the pecking order theory on those sectors.

The current study would therefore be an extension of the prior studies and will deepen the understanding of the capital structure dynamics of the Indian sectors by contributing valuable insights to the existing research employing current sector data.

Hypothesis for the study: In line with our objectives the two hypotheses are to be tested, in order to examine which of the two theories represent the capital structure choice of the selected sectors. The hypothesis are adopted as given in (Shyam-Sunder and C. Myers, 1999)[11]

H₁: To test the pecking order theory we adopted the (Shyam-Sunder and C. Myers, 1999)[11] model. The financing deficit is positively related to change in debt, and the coefficient of financing deficit equals one i.e. $b_{po}=1$. Here, financing deficit implies the excess of investment needs over the cash flow generated by the companies.

H₂: For testing the static trade-off theory the coefficient of trade-off should be greater than zero but less than one i.e. $b_{to} > 0$ & $b_{to} < 1$, implying the existence of adjustment costs in the form of positive transaction cost to reach the target debt ratio as given by (Shyam-Sunder and C. Myers, 1999)[11].

IV. Methodology

4.1 Sample Selection

The three significant sectors i.e. healthcare, energy and the information technology were chosen as these sectors consisted of greater number of companies with almost zero missing variables, as well as only those companies which are listed on BSE index was selected. The data was extracted from CMIE Prowess IQ database which works on interactive querying, the database entails large number of listed and unlisted Indian companies including 56080 companies with their financial information along with analytical ratios. The database is controlled and updated by CMIE (Centre for Monitoring Indian Economy). The firms under each sector were selected based on the available data for a minimum time span of 13 years ranging from 2011 to 2024.

4.2 Model Selection

The appropriate estimation technique employed to assess the two models is panel data methodology. The panel data is most suitable considering the nature of data, and the two models as it captures both the time series and cross-sectional component in the data. It helps in examining the change in explanatory variables i.e. change in long term debt, change in fixed assets, change in working capital over the period of time. It also accounts for the individual heterogeneity across the time period. The analysis has been done using R Studio software, serving as a primarily tool and offering robust capabilities for statistical analysis of the data. The proposed study will encompass a deductive and analytical approach to facilitate the testing of the tradeoff and the pecking order theory.

4.3 Testing the Trade-off theory

Trade-off theory – The trade-off model basically is based on the firms attempt to reach the target leverage ratio, in order to optimise the capital structure of the firm. Accordingly, the firms' strategically takes decision regarding issuing debt aiming to remain close to that target mix. This strategy is followed by the firms, with the objective of balancing tax shields with distress cost of debt.

Three ways to determine the target debt ratio for the trade-off theory are as follows:

- Depending on the firm Characteristics i.e. growth rate, Tangibility, profitability, effective tax rate and non-debt tax shields, the target or the optimal debt is determined.
- Depending on the history of a particular firm's debt used in the prior years, measured by historical average.
- Depending on the industry median of the debt i.e. the debt level of the industry to which the firms belong.

Focusing on our objective to test for the trade-off theory which implies that the firm have a target debt ratio, we calculate the debt based on the firm's historical average of the debt to total asset ratio employed by the firm in its prior years. Adopting the (Shyam-Sunder and C. Myers, 1999)[11] hypothesis, the simple trade-off model is :

$$\Delta D_{it} = a + b_{TA}(D^*_{it} - D_{it-1}) + e_{it} \quad (1)$$

The model represents the simplest target adjustment equation, where ΔD_{it} change in leverage ratio, with 'i' denoting firm and 't' denoting the firm year.

b_{TA} represents the coefficient of Trade-off model.

D^*_{it} shows the firms Target leverage ratio for each firm from the year 2013-2024 based on the history of debt ratio issued by the firm, and it is assumed to remain constant over time. The methodology for calculating the target leverage is similar to the one employed by prior researchers Taggart (1977),[22] Marsh (1982),[23] (Shyam-Sunder and C. Myers, 1999). [11]

D^*_{it-1} represent the year above the current year.

Table 1: List of variables and their definition used in the study

Variables	Estimation
Leverage to total book value of the asset's ratio	Long term debt/ total assets
Working capital	Current assets – Current liabilities
Fixed assets	Total assets - current assets
Cash flow	Net income + Depreciation
Financing Deficit	$\Delta FA + \Delta WC + \Delta LTD - CF$

4.4 Testing the Pecking order Hypothesis

The Pecking order (PO) theory stem from the idea of Information asymmetry as given by (Meyers and Majluf, 1984),[10] it says that the managers are supposed to have superior information about the firm's performance, its true value and its future ventures than what the external stakeholders might have, hence when the firms find any positive NPV projects or favourable investments opportunities, its viable to choose internal sources of funds over debt, debt over issuing stock, and lastly stock to avoid any under-funding issues. Following the hierarchy would save the firm from issuing undervalued securities in the market.

PO Model given by (Shyam-Sundar and Meyers, 1999)[11] was based on the association between the financing deficit and change on the debt, the model involves changes in debt regressed on financing deficit and this financing deficit is owing to the in-equilibrium between the firm's investment needs and its retained earnings including cash in hand and other marketable securities. Furthermore, if this deficit is positive, it implies that the firm's investment needs outrun the available retained earnings and the firms will issue debt to finance the deficit and if the difference is positive which means surplus than the firms would retire the debt or equity as the case maybe.

$$\Delta D_{it} = a + b_{po}DEF_{it} + e_{it} \quad (2)$$

Here the dependent variable ΔD_{it} denotes Change in Debt ratio with 'i' denoting firms and 't' denoting firm years. The letter 'a' represents constant, and a should be equal to zero according to the pecking order hypothesis and b_{po} denotes the pecking order coefficient which should be equal to one for the firms to follow pecking order. e_{it} represents the error term.

Based on the model many subsequent studies were undertaken by the researchers to find the financing deficit. In our study we have taken an alternative estimation of financing deficit given by (Sogorb-Mira and Lopez-Gracia, 2003),[24] the same has been used by (Dedes and Cornelius, 2010)[16] in their studies.

$$DEF_t = \Delta \text{Fixed assets} + \Delta \text{Working capital} + \Delta \text{Long term debt} - Cf_t \quad (3)$$

Where DEF_t represents financing deficit and Cf_t is defined as cash flows calculated as earnings after tax added depreciation. This particular model is being considered in our study owing to data insufficiency. The other variables for calculating deficit includes change in fixed assets plus change in working capital plus change in long term debt, the change represented by ' Δ ' sign.

Table 2: Sector results

	Healthcare	Information Technology	Energy
Trade off (b_{to})	0.4881220 (R.E)	0.51794892 (R.E)	0.222371 (F.E)
p-value	0.000	0.000	0.000
R ²	0.24596	0.26774	0.14258
Hausman test (TO)	0.1745(0.6761)	0.000013 (0.9972)	33.705(0.0000)
Pecking-order(b_{po}) (F.E)	0.11935 (R.E)	0.21278 (F.E)	0.321605 (F.E)
p-value	0.000	0.000	0.000
R ²	0.2108	0.3092	0.6548
Hausman test (PO)	1.1137 (0.2913)	33.932 (0.0000)	7.2659 (0.0070)

Source: Authors

Table 3: Stationarity Test

Industry	Theory	Variable	Chi-square	p-value
Healthcare	Trade-off	Change in debt ratio (Dependent variable)	313.39***	0.000
	Pecking order	Change in debt ratio (Dependent variable)	313.39***	0.000
Energy	Trade-off	Change in debt ratio (Dependent variable)	226.52***	0.000
	Pecking order	Change in debt ratio (Dependent variable)	226.52***	0.000
Information technology	Trade-off	Change in debt ratio (Dependent variable)	252.98***	0.000
	Pecking order	Change in debt ratio (Dependent variable)	376.36***	0.000

Source: Authors

V. Interpretation

Examining the data collected for the healthcare sector we found that its financing behaviour can be better explained by the trade off theory than the pecking order theory as we can see from the hypothesis results. Basing on the coefficient for the respected theories, the trade off coefficient (b_{to}) is greater than zero, (b_{to} = 0.49) which fulfils the condition for trade off (Shyam-Sunder and C. Myers, 1999)[11] whereas the pecking order coefficient (b_{po}) in this sector, is much lesser than one (b_{po} = 0.12), however significant and cannot be ignored completely. For testing the above models i.e., the trade-off and the pecking order, Hausman test has been applied for each sector to choose between random effect and fixed effect for each model, where R.E denotes random effect and F.E denotes fixed effect in the table. The Hausman test results for the Healthcare sector suggest Random effect as a better fit for both the trade-off and the Pecking order model.

Examining the Information Technology sector, we found that, the choice of capital structure is more consistent with the Trade off model, with the coefficient fairly greater than zero (b_{to} = 0.52) as compared to the pecking order

model, the coefficient of which is fairly less than one ($b_{po} = 0.21$) and significant. The Hausman test conducted over both the models depict random effect as a well fit for the trade-off model whereas fixed effect best suited the pecking order model.

Study on the Trade off model and the Pecking order model performed on the energy sector revealed that the concerned sector is consistent with the trade off model owing to its coefficient greater than zero ($b_{io} = 0.22$) satisfying the basic condition for Trade off model whereas for the pecking order condition i.e. the coefficient required to be one wasn't satisfied ($b_{po} = 0.32$), hence implying that the energy sector showing more inclination towards the Trade off theory compared to The Pecking order theory. However, compared to the other two sectors, the pecking order coefficient is higher and significant. The Hausman test results for the respective sector suggests Fixed effect a better fit in case of both the trade-off and pecking order theory.

For all the three sectors we have found significant statistical results implying the explanatory power of both the theories, with the magnitude of the coefficient of the Trade-off model being higher than the Pecking order model exhibiting a stronger influence on the capital structure decisions of the firms. Consequently, Trade off model is found to be more consistent for the firms under study which suggests that balancing the tax-benefits from debt against the cost of financial distress are relatively laid greater emphasis than maintaining a financial hierarchy as proposed by the Pecking order theory. However, both the theories can be seen as complementary rather than exclusive owing to their explanatory power in the financing decision of the firms.

Stationarity results

The unit root test was adopted for checking the stationarity of the data for the study period across all the sectors. And the results for the both the tradeoff and the pecking order model for the three sectors show the absence of unit root implying that the data is stationary thus, ensuring robustness of the results.

Concluding Remarks

The study focuses on the classical capital structure theories viz., pecking order and trade-off in the specific sector namely healthcare, information technology and energy. The study examined the relevance of these classical theories in the modern technological sectors. The study advocates largely the classical theories of capital structure still stand relevant today to these modern age economic sectors. The outcome of this study shows an inclination towards the trade-off theory more than the pecking order theory implying debt as a core source of finance for these sectors owing to their industry characteristics and need. However, the significant statistical results suggest the explanatory power of both the theories in the capital structure decisions of the respective sectors. Variations may be observed with respect to following a particular theory throughout and this variation signifies that firms based on their financial status quo, and with the changing dynamic environment they seem to adjust their capital structure accordingly. Based on the same rationale future studies can incorporate more industries or sectors, across different countries to study if the firms switch from one capital structure model to another with the changing dynamics of sectors, industries, markets and firms internal financing needs. The future studies may also include dynamic models of trade-off and look for their possibility of reconciliation of the theories.

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