

Pecking Order Models VS Static Tradeoff Models

Main Purpose: To statistically test traditional target adjustment models against alternative simple pecking order models. (Mainly time series analysis)

Results: Pecking order models, given assumptions and constraints, have a much greater time series explanatory power than the simple static tradeoff specification. In addition, the simple pecking order shows to have *statistical power* while the static tradeoff model does not. (At least for Mature Public firms)

The Static tradeoff model:

Predicts an optimal level of debt as a result of tradeoffs between tax advantages from interest and costs of financial distress. Empirically this suggests mean reverting behavior from actual debt ratios towards the optimum assuming that *target debt ratios are constant*. It also predicts a cross sectional relation between average debt ratios and asset risk, profitability, tax status and asset type. There is evidence that the three most important factors in the determination of a target debt ratio are: (P. Marsh; “Choice between equity and debt”)

- 1) Taxes
- 2) Type of assets
- 3) Uncertainty of operating income

Target adjustment specification:

$$Dit = a + bit (Dit^* - Dit-1) + eit$$

Note: The target debt ratio is unobservable, hence the historical mean book debt ratio is usually used as the proxy)

Empirical Evidence:

- 1) Mean reversion in debt ratios towards a target (*Taggard, Jalilvand, Harris, Opler and Titman*)
- 2) Significant coefficients in cross sectional models examining differences in debt ratios.
- 3) Target adjustment models appear to work well in explaining actual changes in debt ratio when dividends are allowed to fluctuate. (*Shyam and Sunder, 1988*)*

The Pecking order model:

This model states that firms prefer internal equity (i.e. retained equity) to external financing, but in the event of external financing debt is preferred to equity. Therefore debt ratios are the result of cumulative financing decisions over time as opposed to

moving closer to a long run target. Hence financial deficits are the driving force behind debt issues.

$$D_t = a + b \text{poDEF}_t^* + e_t$$

$$\text{DEF}_t^* = (\text{DIV}_t + X_t + \text{NET } W_t + R_t) - C_t$$

The pecking order model follows from how asymmetric information affects investment and financing decisions. It can primarily be explained by two factors: (*MYERS; capital structure puzzle*)

- 1) External financing is expensive because of the transaction costs involved with investment bankers (i.e. large fees and under-pricing usually seen in IPO)*
- 2) Since corporate insiders know more about the firm than outside investors, external equity mispricing is much more likely to occur. In other words, it increases the probability that corporate signals (like changes in dividend policy or equity issues and repurchases) could be strongly misinterpreted by markets. Leading to either over or under- pricing of securities, which could be detrimental in future investment funding.

This naturally leads to the idea that as long firms can issue safe debt they can escape most of the cost (asymmetric info) from equity financing (Also escape the liquidity constraints from equity)

So the asymmetric information problem takes on a primary role, whereas the tradeoff between expected bankruptcy cost and PV tax saving (target debt ratio) takes a secondary role, in the financing decisions of the firm.**

So from Myers and Majluf analysis (1984) we have two cases:

- 1) If cost of financial distress are ignore, then the firm will issue securities that will have the lowest stock price effects (hence shareholder's wealth). That implies issuing investment grade debt because, on average, that will have zero stock price effect. So in this case there will be no equity issues.
- 2) If costs of financial distress are high, the firm will only consider issuing equity as long as managers are relatively less optimistic that outsiders (security is over-priced). If in fact managers are more optimistic about future prospects than investors then no equity will be issued. (Costs of financial distress under this model takes a secondary role)

In addition, when a firm has a surplus (or $\text{DEF} < 0$) and there are taxes or other costs of holding excess cash, there will be an incentive by managers to pay down the debt. This assumes that information asymmetries are the only market imperfections managers have to face. This implies that firms may become net lenders i.e. paying

down the debt as opposed to repurchasing equity. (Although this prediction would change if there were costs associated with very low debt ratios)

Empirical evidence supporting Pecking order models:

- 1) Negative valuation effects from equity issues. * (Masulis; 1980)
- 2) Strong negative relationship between debt ratios and past profitability. This support the idea that as firms run out of internal funds they will first resort to debt before resorting to equity. On the other hand models based on tradeoff theory predict a positive relationship. **(Titman and Wessel 1998; Rajan and Zingales 1995)
- 3) The pecking order specification can be rejected from a simulated path of debt ratios using the simple target adjustment model while the target adjustment model cannot be rejected under a simulated path of debt ratios using the pecking order specification. Therefore they conclude that not rejecting the static tradeoff model under the actual path of debt ratios has little statistical power. (Hence the term statistical power). *** (Sunder, Myers/1999)

Results:

- 1) Simple target adjustment models provide some explanatory power for changes in debt ratios and its coefficient are statistically significant but the simple pecking order model has much better explanatory power.

Note: They used the sample mean debt ratio as the target debt ratio (i.e. assumed target debt ratios were unconditional and not firm specific)

Summary table 2:

- 1) Anticipated Vs Unanticipated deficits:

Looked at whether the good fit of the pecking order model has to do more with short-term adjustments (i.e. unanticipated deficits) than planned financing.

$$DEF_t = E_{t-1}(DEF_t) + Z_t$$

So that Z_t is a good predictor of debt changes if it is difficult to issue or repurchase equity in the short run. In other words, they were trying to see if most of the changes in debt ratios actually occurred due to short term liquidity constraints from equity issues than to a strict preference of debt over equity.

Used two instruments to proxy planned deficits: 1) Lagged deficits 2) lagged values for funds from operations and changes in net working capital (Cap Ex and Dividends not included).

Results:

1) PO coefficients are still statistically significant when both instruments are used independently as well as when they are combined in the same regression**

2) Constants are not different from zero. **

These statistically significant coefficients indicate that most of the changes in debt ratios are driven by anticipated deficits i.e. (firm prefer to issues debt over equity when financing).

Summary table 3:

Statistical Power:

In order to test statistical power, they generated hypothetical time series of debt issues or retirements, (one series for each of the 157 sample companies), using either the simple target adjustment model or the pecking order model. At the end you will have two simulated debt financing histories based on actual investments and operating data.

So, for example, if the pecking order model is to have any statistical power it should be rejected once it is tested against the simulated path of debt ratios generated by the target model. The same principle applies to the target adjustment specification.

Assumptions in the generation process of debt ratios using the target model:

- 1) The actual historical mean book debt ratio was used as a proxy for each firms' target. (1971:1989)* Also used an adjustment coefficient of .41 (avg. coefficient computed in actual data with the use of unconditional target debt ratio)
- 2) A third simulated debt ratio path was generated by allowing the target debt ratios to vary year-by-year as well as firm-by-firm. . The target debt ratios were determined by firm characteristics such as:

$$D_{it} = a + b_1(\text{plant}) + b_2(\text{R\&D}) + b_3(\text{Tax}) + b_4(\text{Earnings})$$

In addition specific number coefficients were assumed. Even so, for most sample companies their target debt ratio did not vary much over time. ***

Results:

- 1) The Pecking order model had no explanatory power for the simulated data based on both target adjustment specifications. Therefore these test have the power to reject the pecking order model.
- 2) On the other hand (Column 1) the target adjustment specification fits the simulated pecking order series just as well as in the actual data. Therefore

they infer that usual tests for target models lack power (This is based on a target that seems to *change very little* overtime, however. The same result holds when 3 and 5 year moving average target debt ratios were used)**

- 3) Mean reversion of debt ratios from pecking order specification (due to strings of years with financial deficits, followed by strings of surpluses) could generate good fit and significant target coefficients. Even when it had nothing to do with optimal debt ratios.

Summary:

- 1) Pecking order models seem to be a good descriptor of actual financing behavior.
- 2) Pecking order models performs well under actual data with strong and significant coefficients
- 3) Therefore the strong performance of the pecking order models does not occur because firms finance unanticipated cash needs with debt in the short run.
- 4) The Monte Carlo simulation shows that the simple target adjustment model is not rejected even when it is false. Although the pecking order model, when false, can easily be rejected.

Criticisms:

- 1) If we rely on the *agency cost theory* then these negative valuation effects (from issuing equity and repayment of debt) could be explained by information effects (or signaling effects). This results from the fact that lower debt ratios signals lower expected future cash flows, hence lowering the firm's value (Shareholder's wealth).
- 2) The *negative relationship* between debt ratios and profitability can also be explained if high past profitability is perceived to be a proxy for higher growth opportunities. These higher growth opportunities could represent intangible assets that would increase the costs of financial distress. Hence higher profitability means higher expected bankruptcy costs giving rise to lower targets. (Explained by the tradeoff model)
- 3) The inclusion of capital expenditures in deficit calculations could actually increase the proportion of unanticipated deficits over total deficit (increase the significance of the constants). This means that a greater portion of the variability of actual debt ratios may actually be coming from unanticipated deficits. This can be interpreted as firm issuing debt because of short-term equity constraints. (This would lower the significance of the PO coefficients). This is especially true for firms facing greater uncertainty in their capital budgeting decisions.
- 4) All of the firms in the sample represent large public firms that belong at the maturity stage of the industry life cycle. This may be one of the reasons why it would be difficult to proxy for these moving target debt ratios. This difficulty arises because most of these firms undergo relatively small changes in their capital expenditures,

operating income, net working capital and dividend policy. Hence attempts to proxy for these moving target debt ratios would be much more sensitive to changes in these variables over the sample period. In other words small adjustments to the target could mean accepting a false positive over a pecking order simulation while any big adjustments to the target could mean rejecting it over actual changes in debt ratios.

Of all this leads to the idea that we should include firms in the sample that go through a significant portion of the life cycle in order to better proxy for these moving optimal debt ratios. (This will also require a larger sample period). If target adjustment coefficients show to have statistical power as well significance over actual debt ratio paths then debt issues could be totally consistent with increases in target debt ratios as firms expand.

- 5) When testing target adjustment models over actual and simulated data (PO) it was assumed that the adjustment coefficient would remain constant. Nevertheless this is far from reality since most firms are constantly changing and are different from each other. Therefore allowing for firm varying coefficients could give us a much different result. (Supported By Jalilvand and Harris; 1984)
- 6) But even if all of the above modifications fail to validate the statistical power of the target adjustment model, the pecking order theory would still need to explain differences in capital structure across industries. The evidence of persistent inter industry differences in leverage is consistent with the idea of an optimal debt ratio i.e. tradeoff between tax shields and bankruptcy costs. Usually the three most important determinants of optimal debt ratios are taxes, types of assets and uncertainty in operating income. For example, even though pharmaceutical firms in general have high earning and low debt ratios, which would be consistent with the pecking order model, could also be consistent within a static tradeoff framework. This is due to the fact that these firms also have high operating income uncertainties as well as a high proportion of intangible assets.
- 7) Pecking order models don't perform well in explaining low debt (sometimes zero) and high equity financing characterizing small growth firms.

