

Optimal Debt and Profitability in the Tradeoff Theory

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This paper presents a tradeoff model in which leverage is negatively related to profits!

- ▶ Resolves a conundrum!
- ▶ **Robust** evidence is that leverage is negatively related to profits.
- ▶ Most tradeoff models predict the opposite.

Outline

- ▶ Review the model.
- ▶ Relate this model to other dynamic capital structure models.
- ▶ Empirical evidence.

This paper is not a walk in the park!



It's more like this!



The model has no extraneous details!

- ▶ Time is continuous and the firm has an infinite horizon.
- ▶ It is endowed with an EBIT-generating machine.
- ▶ EBIT is constant unless it gets hit with a shock that follows a Poisson process.
- ▶ The goal of the firm is to maximize distributions to shareholders.
- ▶ The firm has another technology that can further this goal: debt

Debt is also very simple!

- ▶ Infinitesimal maturity
- ▶ **No issuance costs!**
- ▶ Shareholders get the debt proceeds and then the firm has to repay the loan.
- ▶ The interest rate is the same as the shareholders' discount rate.
- ▶ Modigliani-Miller.

The model has frictions to break the Modigliani-Miller indeterminacy.

- ▶ EBIT is taxed and interest receives a tax deduction.
- ▶ The firm can default if debt is more than the present value of cash flows.
- ▶ The firm—less deadweight costs—is handed over to the lender.
- ▶ The zero-profit lender therefore charges a higher interest rate.

From this setup you get the classic tradeoff



Tax deduction

Distress costs
embodied in
the interest rate

Sometimes! The model has an interior solution and a corner solution

- ▶ The lender would never lend more than the value of the firm.
- ▶ When EBIT is sufficiently low, this constraint binds.
- ▶ Otherwise, we're at the interior seesaw solution.

In a time series, for a single firm, leverage is negatively related to profits!

- ▶ Ignoring the default constraint, the value of the firm is additively separable in debt and profits.
- ▶ So at the interior solution:
 - ▶ Optimal debt does not depend on EBIT.
 - ▶ Value depends positively on EBIT.
 - ▶ Leverage depends negatively on EBIT.

In a cross section, leverage is also negatively related to profits!

In an otherwise identical firm with a higher-mean distribution of profits:

- ▶ At the interior solution, more profits mean more tax shields.
- ▶ However, more profits usually imply that the firm may lose more if it defaults.
- ▶ Because default can happen at the next profit change, the second effect is large in present value terms.
- ▶ Optimal debt falls!

There is only one effect—not two—in a static tradeoff model

- ▶ Higher profits mean more tax shields.
- ▶ Higher profits have no effect on the default costs.
- ▶ This is the intuition in the minds of nearly all empirical researchers.

Consider a more conventional EBIT model of leverage (Strebulaev and Whited, 2012)

Everything is the same, except:

- ▶ EBIT follows a geometric Brownian motion.
- ▶ Debt is infinite maturity with optimal coupon, c .
- ▶ Linear issuance costs.

This model features inaction.

- ▶ The firm chooses an optimal coupon and the optimal default threshold.
- ▶ If the implied level of leverage gets too high \rightarrow default.
- ▶ If the implied level of leverage gets too low: refinance.

This model has the same time-series result.

- ▶ In the time series, because book debt is constant, leverage is negatively related to profitability.
- ▶ Andy has shown that this result is more general and not necessarily related to adjustment costs.

This model **can** have the same cross-sectional result.

- ▶ If the Brownian motion growth rate rises.
- ▶ The value of tax shields rises.
- ▶ If the default threshold is given exogenously by a liquidity requirement, . . .
- ▶ More profits usually imply firm may fall more if it defaults.
- ▶ Depending on the model parameters, leverage can **fall**.

When default is endogenous, this model has a different result.

- ▶ The value of tax shields rises.
- ▶ The optimal default threshold is decreasing in mean EBIT, so the firm keeps the default option open longer.
- ▶ The effect of the increased default costs is small.
- ▶ Optimal leverage rises!

I tested the result that the leverage of constrained firms is different from the leverage of unconstrained firms.

- ▶ Quarterly Compustat dataset from Danis, Rettl, and Whited (2014)
- ▶ Run a leverage regression with a dummy for whether profits are low.
- ▶ And an interaction of this dummy with profits.

Leverage is not related to profits for low-profit firms

	Coefficient	Standard Error
Size	0.033	0.002
Profits	-1.123	0.098
Tangibility	0.420	0.016
Market to book	-0.026	0.002
Risk	0.003	0.007
Low-profit dummy	-0.030	0.007
Interaction	1.256	0.125

Conclusion

- ▶ New EBIT model of capital structure.
- ▶ Makes the intuitive point that when profits change, **both** distress costs and tax benefits change.
- ▶ The only thing the paper needs is more discussion of ties to the rest of the literature.
- ▶ At least one prediction holds up in the data.