

Manager Characteristics and Capital Structure: Theory and Evidence

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- *Dynamic tradeoff* models
 - capital structure determined by tradeoff between tax benefits of debt and costs of financial distress
 - manager behaves in the interests of shareholders
 - manager-specific characteristics have no effects on financing decisions
- *Dynamic agency* models
 - manager-shareholder agency conflicts—key determinant of capital structure
 - with some recent exceptions, all agents are risk-neutral

Introduction and Motivation

- Initial step towards unified theory—tradeoff and agency theories
- Capital structure reflects the effects of
 - external imperfections arising from taxes and bankruptcy costs
 - internal imperfections arising from agency conflicts between undiversified managers and diversified shareholders
- New implications for the effects on capital structure of
 - manager-specific characteristics—ability, risk aversion and disutility of effort
 - firm characteristics—long-term risk and short-term risk

- Theoretically/empirically investigate—effects of managerial discretion on capital structure
- Dynamic structural model
 - taxes, bankruptcy costs
 - managerial discretion in effort and financing
- Derive manager's dynamic incentive contract; implement it through financial securities
 - dynamic capital structure — inside equity, outside equity, long-term debt and short-term debt (or cash)
 - Testable implications linking manager characteristics to long-term and short-term debt
- Empirically analyze testable implications

- Testable implications
 - Long-term debt declines with manager ability and inside equity ownership
 - Short-term debt declines with manager ability and increases with inside equity ownership
 - Distinct components of firm risk—long-term risk and short-term risk—differing effects on debt structure
 - Long-term debt increases with short-term risk, but decreases with long-term risk
 - Short-term debt declines with short-term risk, but varies non-monotonically with long-term risk
- Significant empirical support

The Model—Basic Setup

- Date zero—owner-manager obtains external financing for investment $I > 0$
- Combination of equity and debt; amount raised could exceed I
- Manager's initial ownership stake— $g_{initial} \in (0, 1)$
- Earnings *before interest, taxes and manager compensation* (EBITM)
 - manager, shareholders, debtholders, and government (through taxes)
 - No personal taxes; corporate tax rate $\tau \in (0, 1)$
- Symmetric taxation, negligible security issuance costs, constant risk-free interest rate

The Firm's EBITM Flow

In any period $[t, t + dt]$, if the manager exerts effort $e(t) > 0$, the EBITM flow is

$$dQ(t) = \underbrace{P(t)dt}_{\text{EBITM flow from existing assets}} + \underbrace{P(t) \left[(\ell + e(t)) dt + sdW(t) \right]}_{\text{Incremental EBITM flow generated by manager}} - \underbrace{\lambda P(t) dt}_{\text{Short-term debt payments}}$$

Earnings generated by manager's human capital

- $\ell > 0$ is the manager's observable and constant ability
- s —risk of firm's earnings—*short-term risk*
- $\lambda P(t) dt$ —short-term debt financing of firm's working capital requirements (inventories, accounts receivable, employee wages, etc.)

The Firm's Long-Term Risk

- Process $P(\cdot)$ —determines the *level* of EBITM flow

$$dP(t) = P(t)[\mu dt + \sigma dB(t)],$$

- σ —firm's *long-term risk*
- Long-term risk and short-term risk have differing effects on capital structure

The Objectives of Outside Investors and the Manager

- Outside investors risk-neutral, while manager is risk-averse

$$U(c, e) = E \left[\int_0^{\infty} \exp(-rt) \left(U(dc(t)) - \frac{1}{2} \kappa e(t)^2 dt \right) \right].$$

- Manager has quadratic (mean-variance) preferences

$$U(x) = x - \frac{1}{2} \gamma x^2.$$

The Long-Term Debt Structure

- Long-term debt—infinite maturity, non-callable, and completely amortized—coupon payment rate θ
- For now, firm's capital structure—equity, long-term debt, and short-term debt associated with working capital requirements
- Implementation of manager's contract
 - *dynamic* capital structure—equity, long-term debt, and cash reserve that offsets short-term debt

- Dynamic incentives through contracts—contingent on contractible EBITM flow
- Outside investors are *competitive*
- Incomplete contracting—single-period contracts enforceable
- In each period, contract between manager and competitive outside shareholders
 - division of earnings (net of taxes and interest payments)

- Debt payments serviced entirely when firm is solvent—dilution of equity in financial distress
- Bankruptcy occurs endogenously when equity value falls to zero (Leland, 1994)
- Firm controlled by debtholders as all-equity firm—manager continues
- Appendix B—modify model to allow for manager to continue servicing debt after equity value falls to zero
- Calibrate and numerically analyze modified model—implications unchanged

- Bankruptcy costs—proportional reduction in future earnings

$$P(T_b) = (1 - \zeta)P(T_b^-).$$

- market imperfections external to manager-firm relationship
- Post-bankruptcy period otherwise identical to pre-bankruptcy period

Participation and Incentive Compatibility

- Contract: $\Gamma \equiv [dc_m(\cdot), e(\cdot)]$ —manager's compensation payments $dc_m(\cdot)$ and effort choices $e(\cdot)$, before and after bankruptcy.
- Bankruptcy time T_b —stopping time
- Dynamic participation constraints
 - at *each* date, value of future payout flows to shareholders \geq value of stream of reservation payout flows $P(t)dt$
- Incentive compatibility—optimal for the manager to exert effort $e(\cdot)$

The Optimal Contract and Long-Term Debt Structure

- Long-term debt structure and contract maximize manager's total expected utility
- Payoff at date zero—proportion $g_{initial}$ of total proceeds from financing net of investment outlay I
- Proceeds from debt and equity issuance—equal to their respective *market values*

The Optimal Contract and Long-Term Debt Structure

- Manager's payoff at date zero = $g_{initial}[\mathbf{D}(0) + \mathbf{S}(0) - I]$ and *continuation value* is $\mathbf{M}(0)$
- The optimal long-term debt coupon θ^{opt} and the manager's optimal contract Γ^{opt} solve

$$(\theta^{opt}, \Gamma^{opt}) = \arg \max_{(\theta, \Gamma)} \underbrace{U(g_{initial}(\mathbf{D}(0) + \mathbf{S}(0) - I))}_{\text{Initial Payoff}} + \underbrace{\mathbf{M}(0)}_{\text{Continuation Value}}$$

Derivation of Equilibrium

- Step one: Optimal contract for given long-term debt structure
- Step two: Optimal long-term debt structure
- For given long-term debt structure θ

$$\begin{aligned} dc_m(t) &= \overbrace{a(t)dt}^{\text{performance-invariant compensation}} + \overbrace{b(t)(1-\tau)(dQ(t) - \theta dt)}^{\text{performance-dependent compensation}}, t < T_b \\ dc_m(t) &= a(t)dt + b(t)(1-\tau)dQ(t), t > T_b \end{aligned}$$

Dynamic Capital Structure

- Equilibrium contract—implemented through “inside” equity and dynamic short-term lending or borrowing
- Manager’s compensation in period $[t, t + dt]$

$$dc_m(t) = b \left[\begin{array}{l} \text{Total After-Tax Payout Flow} \quad \text{Long-Term Debt Interest Payment} \\ \underbrace{dc_{tot}(t)} \quad - \quad \underbrace{\theta dt} \\ \text{Short-Term Debt Payments} \\ - \left((1 - \tau)\lambda P(t) - \frac{a(t)}{b} \right) dt \end{array} \right]$$

Dynamic Capital Structure

- Manager's optimal compensation structure—inside equity stake b and additional payments

$$dc_{sd}(t) = \left((1 - \tau)\lambda P(t) - \frac{a(t)}{b} \right) dt$$

incurred by *all* equity holders—inside and outside—in each period.

- Dynamic short-term borrowing or lending
- Capital structure—Inside equity, outside equity, long-term debt, and risk-free short-term debt (or cash)

- Long-term debt
 - declines with manager ability,
 - increases with her risk aversion,
 - increases with her disutility of effort
 - increases with short-term risk

Manager Characteristics and Long-Term Debt—Intuition

- Long-term debt structure maximizes sum of manager's initial payoff and continuation value
- For given long-term debt coupon θ , manager's initial payoff is $g_{initial}[F_{\theta}(0) - I]$ — $F_{\theta}(0)$ is firm value *net of the manager's stake*
- Manager characteristics affect *surplus* in each period—captured by manager in equilibrium
- Manager characteristics affect continuation value, but not her initial payoff

Manager Characteristics and Long-Term Debt—Intuition

- Optimal long-term debt choice reflects tradeoff between
 - beneficial effects of *ex post* debt tax shields on initial payoff
 - increased likelihood of bankruptcy
- Surplus in each period increases with manager ability—increases *relative importance* of continuation value
- She chooses lower long-term debt—increases continuation value; lowers initial payoff
- Increase in risk aversion, disutility of effort, or short-term risk—lowers surplus manager generates in each period
- Marginal effect of continuation value lowered—manager “effectively” becomes more myopic

Risk-Free Rate, Effective Corporate Tax Rate and Bankruptcy Costs

- $r = 4.5\%$, corporate tax rate $\tau = 0.15$ (Graham, JFE, 2000), bankruptcy costs = 0.15 (Andrade and Kaplan, JF, 1998)

Short-Term Risk and Long-Term Risk

- $\sigma = 0.29$; the median asset volatility for firms in our sample
- $s = 0.125$ to match median standard deviation of the after-tax return on assets in our sample

Manager Characteristics

- $g_{initial} = 0.035$ to match median CEO percentage ownership (including options) in our sample
- manager's ability ℓ , risk aversion γ , disutility of effort κ , and working capital financing parameter λ chosen to match
 - median inside equity ownership,
 - median ratio of CEO cash compensation to assets,
 - median short-term debt ratio,
 - median long-term debt ratio,
 - median ratio of firm value to asset value.

Manager Characteristics and Short-Term Debt

- The short-term debt ratio declines with ability
 - increase in ability increases "cash" portion of manager's compensation, which lowers short-term debt
- As manager's ability increases, firm moves from holding positive short-term debt to one holding surplus cash
- Short-term debt declines with the manager's risk aversion
 - increase in risk aversion increases costs of risk-sharing
 - manager's cash compensation increases, which lowers short-term debt

The Effects of Long-Term Risk

- The firm's long-term risk has differing effects
- Long-term debt ratio declines with long-term risk
- Decline in long-term debt with long-term risk has positive effect on firm's short-term debt
- The increased likelihood of bankruptcy—negative effect on short-term debt
- Short-term debt varies non-monotonically

The Effects of Short-Term Risk

- Long-term debt *increases* with short-term risk
 - Increase in short-term risk has negative effect on surplus in each period—costs of risk-sharing
 - Lowers marginal effect of continuation value on long-term debt structure choice
- Increase in short-term risk lowers power of incentives—increases “cash” portion of manager’s compensation
 - negative effect on short-term debt
- Long-term debt declines with long-term risk and increases with short-term risk
- Short-term debt declines with short-term risk, and varies non-monotonically with long-term risk

Testable Hypotheses

- **Hypothesis 1:** The long-term debt ratio declines with the manager's ability.
- **Hypothesis 2:** The short-term debt ratio declines with the manager's ability.
- **Hypothesis 3:** The long-term debt ratio declines with the manager's inside equity stake.
- **Hypothesis 4:** The short-term debt ratio increases with the manager's inside equity stake.
- **Hypothesis 5:** The long-term debt ratio declines with long-term risk.
- **Hypothesis 6:** The long-term debt ratio increases with short-term risk.
- **Hypothesis 7:** The short-term debt ratio declines with short-term risk.

Leverage and CEO Variables

- *Leverage Variables*: Firms' long-term debt and short-term debt data from Compustat
- *CEO's percentage equity ownership* from Execucomp—number of shares of common stock and options (weighted by respective 'deltas')
- *CEO Ability*: Five proxies
 - CEO Cash Compensation
 - CEO Cash Compensation to Assets Ratio
 - Industry-adjusted (4-digit SIC) return on assets
 - CEO Tenure
 - Ratio of CEO Tenure to CEO Age

Proxies for Long-Term and Short-Term Risk

- Long-Term Risk—firm value volatility
- Short-term Risk—standard deviation of quarterly return on assets
- Construct measures over different time horizons for robustness

Manager Ability and Debt Structure: The Empirical Evidence

- Long-term debt ratio declines with all five measures of manager ability
- Short-term debt ratio declines with all five measures of managerial ability
- Coefficients of control variables consistent with previous evidence

Economic Significance

- 1% increase in cash compensation—.11% decline in long-term debt, .38% decline in short-term debt.
- As point of comparison, a 1% increase in past stock returns is associated with a .03% decrease in the long-term debt ratio

Manager Ownership and Debt Structure: The Empirical Evidence

- Long-term debt ratio declines with manager's inside equity stake
- The relation between short-term debt ratio and inside equity stake is negative and marginally significant
- Effects of manager ability on debt structure continue to hold even after controlling for manager ownership

Economic Significance

- A 1% increase in the manager's equity stake— .04% decline in long-term debt.

Long-Term Risk, Short-Term Risk, and Debt Structure: The Empirical Evidence

- Negative relation between long-term debt ratio and long-term risk
- Positive relation between long-term debt ratio and short-term risk
- Negative relation between short-term debt ratio and short-term risk

Manager Ownership and Capital Structure: Endogeneity, Validity, and Strength of Instruments

- Instrumental variables

$$\text{CEO ownership}_{i,t} = f(\text{Average industry CEO ownership}_{i,t}, \text{LnAssets}_{i,t}, \text{Advertising and R\&D expenses}_{i,t}, \text{Past stock returns}_{i,t}, \text{Market-to-Book}_{i,t}, \text{Long-term risk}_{i,t}, \text{Short-term risk}_{i,t}) \quad (1)$$

- Second stage: Use predicted value of CEO ownership from first stage
- Conclusions from previous tests unchanged
- Instrument strength: Stock and Yogo (2004) test
- Instrument validity: Hahn and Hausman (2002) test
- Proper identification: Anderson-Rubin and Hansen-Sargan tests

Manager Characteristics and Incremental Debt Financing

- Additional robustness tests: Incremental financing decisions of firms (Strebulaev, 2007)
- Net new issuance of long-term and short-term debt
- Effects of manager characteristics generally robust to these tests

Conclusions

- Managerial discretion and manager-specific characteristics on dynamic capital structure
- Structural model that incorporates managerial discretion in financing and effort
- Implement manager's dynamic contract through financial securities—dynamic capital structure—outside equity, inside equity, long-term debt and short-term debt
- Long-term debt ratio declines with manager's ability, increases with risk aversion, and increases with disutility of effort.
- Numerical implementation and calibration

Conclusions

- Short-term debt declines with managerial ability
- Long-term risk and short-term risk have differing effects on long-term debt and short-term debt
- Long-term debt declines with long-term risk and increases with short-term risk
- Short-term debt declines with short-term risk and varies non-monotonically with long-term risk
- Empirical analysis—link between manager and firm characteristics to capital structure
- With the exception of relation between short-term debt and manager ownership, we show empirical support for all testable implications
- Managers play a central role in determining firms' optimal financial policies