Taxes and Financing Decisions

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Overview

Taxes and corporate decisions

➢ What are the tax effects of capital structure choices?
➢ How do taxes affect the cost of capital?
➢ How do taxes affect payout decisions?
➢ How do taxes affect firms’ real investment decisions?
Trade-off theory

Firm value

Debt vs. equity: \((1 - \tau_d)\) vs. \((1 - \tau_c)(1 - \tau_e)\)

Target capital structure

Leverage

\[ V_U + \text{tax shields} \]

\[ V_U + \text{tax shields} - \text{distress costs} \]
Main argument

Internal equity is cheaper than external equity

➢ Cash distributions trigger personal taxes

➢ Tax deferral benefit of retained earnings helps offset the tax disadvantage of equity

Our goal

➢ Quantify this effect

➢ Study the impact on capital structure, payout policy, and the cost of capital
Example

Firm has $1

➤ Distribute now
  Investors get $(1 - \tau_e)$, grows to $(1 - \tau_e)[1 + r(1 - \tau_i)]$

➤ Distribute next year
  Grows to $1 + r(1 - \tau_c)$, investors get $(1 - \tau_e)[1 + r(1 - \tau_c)]$

➤ Retaining better if $\tau_c < \tau_i$
  Internal equity has tax benefits if $\tau_c < \tau_i$

➤ Trade-off: accelerate taxes vs. double taxation
Example

This paper

- Clarify and generalize this idea (the example makes strong implicit assumptions)

- Miller (1977): \((1 - \tau_c)(1 - \tau_e) > (1 - \tau_i)\)?

- Understand the implications for a firm’s capital structure, payout policy, and cost of capital
Overview

Clarify the literature

➢ Capital structure

➢ Dividend taxes
Outline

➤ Simple model with two periods

➤ Discuss the literature

➤ Implications for corporate behavior

➤ Empirical estimates of the tax costs of equity
### Model

Study tax effects

No agency conflicts, information asymmetries, or distress costs

<table>
<thead>
<tr>
<th>$t = 0$</th>
<th>$t = 1$</th>
<th>$t = 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment opportunity, $Y$</td>
<td>Project pays $Y + P_1$</td>
<td>Liquidation</td>
</tr>
<tr>
<td>Raise $D_0$, $S_0$</td>
<td>Repay debt</td>
<td>Equity distribution, $\delta_1$</td>
</tr>
<tr>
<td>Cash: $C_0 = D_0 + S_0 - Y$</td>
<td></td>
<td>Raise $D_1$, $S_1$</td>
</tr>
<tr>
<td></td>
<td>Investigate cash in riskless asset</td>
<td></td>
</tr>
</tbody>
</table>


Assumptions

➤ Debt is short term

➤ Risk neutral investors, interest rate = r

➤ Project return \( P_1 > Y r \) \[no bankruptcy\]

➤ Taxes

Corporate tax rate is \( \tau_c \), personal tax rates are \( \tau_i, \tau_{dv}, \tau_{cg} \)

Capital gains taxed on realization (trading at \( t = 1 \) exogenous)

Liquidating dividends not taxed on portion that represents capital repayment
Assumptions

Classic tax system

- Corporate profits, after interest, taxed at $\tau_c$
- Personal income taxed at $\tau_i$, $\tau_{dv}$, $\tau_{cg}$

Imputation system

- Personal tax credit for corporate taxes already paid on dividends
- Effectively: $\tau_{dv} = 1 - (1 - \tau_i) / (1 - \tau_c)$
Model

Exogenous trading

\[ t = 0 \quad t = 1 \quad t = 2 \]

**Investors:**

Trade \( \alpha \) of their shares

Realize gains of \( \alpha (V_1 - S_0) \)

Tax basis = \( (1 - \alpha) S_0 + \alpha V_1 \)
Model

Taxes

<table>
<thead>
<tr>
<th>t = 0</th>
<th>t = 1</th>
<th>t = 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>No taxes</td>
<td>Corporate tax</td>
<td>Corporate tax</td>
</tr>
<tr>
<td></td>
<td>Capital gains tax on a fraction of shares</td>
<td>Personal tax on dividends / liquidating repurchase</td>
</tr>
<tr>
<td></td>
<td>Personal tax on dividends / repurchases</td>
<td></td>
</tr>
</tbody>
</table>
Tax effects

- Debt financing
- New external equity
- Internal equity / retained earnings
Cashflows

Firm’s cashflows

➢ Arrival to date 1: \( C_1 = Y + P_1 (1 - \tau_c) + (C_0 - D_0) [1 + r (1 - \tau_c)] \)

➢ Exit from date 1: \( C_1' = C_1 + D_1 + S_1 - \delta_1 \)

➢ Arrival to date 2: \( C_2 = (C_1' - D_1) [1 + r (1 - \tau_c)] \)
Transactions at date 1

**Proposition**

Issuing debt to hold as cash (i.e., to invest in the riskfree asset) has no effect on value, regardless of tax rates

**Implications**

Debt does not create value, via interest tax shields; only important if it changes equity

Using cash to pay down debt doesn’t affect value either

In transactions with equityholders, it doesn’t matter where cash comes from or goes to
Equity financing at date 1

External equity

➢ Raise $S_1$ at date 1

➢ Shareholders’ $CF_2 = \pi_2 + S_1 [1 + r (1 - \tau_c)(1 - \tau_e)]$

$\tau_e$ is either $\tau_{cg}$ or $\tau_{dv}$

➢ NPV

Invest $S_1 = $1 in the firm: $1 + r (1 - \tau_c)(1 - \tau_e)$

Invest $1 outside the firm: 1 + r (1 - \tau_i)$
Equity financing at date 1

**Proposition 2 (Miller)**

- If the firm uses *repurchases*, the tax benefit of external equity is:

\[
PV(S_1) = S_1 \frac{r}{1 + r(1 - \tau_i)}[(1 - \tau_c)(1 - \tau_{cg}) - (1 - \tau_i)]
\]

- If the firm uses *dividends*, the tax benefit of external equity is:

\[
PV(S_1) = S_1 \frac{r}{1 + r(1 - \tau_i)}[(1 - \tau_c)(1 - \tau_{dv}) - (1 - \tau_i)]
\]
Equity financing at date 1

Internal equity: retained earnings vs. repurchases

➢ Distribute all cash at date 1

\[ t = 1: \quad CF_1 = C_1 - \tau_{cg} (C_1 - S_0) \]

➢ Fully retain, distribute at date 2

\[ t = 1: \quad CF_1 = -\alpha \tau_{cg} (V_1 - S_0) \]
\[ t = 2: \quad CF_2 = C_2 - \tau_{cg} (C_2 - TB_1) \]

\[ [V_1 = PV(CF_2)] \]
Equity financing at date 1

**Proposition 3**

The tax benefit of internal equity at date 1, or the PV of retained cash vis-à-vis a share repurchase, is

$$PV(RE_1) = RE_1 \frac{r (1 - \tau_{cg})}{1 + r(1 - \tau_i) - \beta \tau_{cg}} \left[ (1 - \tau_c)(1 - \beta \tau_{cg}) - (1 - \tau_i) \right]$$

where $\beta = TB_1 / V_1$, the tax basis relative to current price when the firm doesn’t repurchase.

$\beta$ determines how much tax is triggered by repurchase at $t = 1$
Equity financing at date 1

Case 1: $\beta = 0$  \[\alpha = 0, S_0 = 0\]

- Internal equity has tax benefit (better than debt) if $\tau_c < \tau_i$

\[
PV(RE_1) = RE_1 \frac{r (1-\tau_{cg})}{1+r(1-\tau_i)} \left[(1-\tau_c) - (1-\tau_i)\right]
\]

- Trade-off

  If firm distributes at date 1, shareholders get $C_1 (1 - \tau_{cg})$, grows to $C_1 (1 - \tau_{cg}) [1 + r (1 - \tau_i)]$

  If firm retains the cash, it grows to $C_1 [1 + r (1 - \tau_c)]$, shareholders get $C_1 (1 - \tau_{cg}) [1 + r (1 - \tau_c)]$
Equity financing at date 1

Case 2: $\beta = 1$ [accrual taxation, $\alpha = 1$]

- Internal and external equity are equivalent

$$PV(RE_1) = RE_1 \frac{r (1 - \tau_{cg})}{1 + r(1 - \tau_i) - \tau_{cg}} \left[(1 - \tau_c)(1 - \tau_{cg}) - (1 - \tau_i)\right]$$

$$\approx RE_1 \frac{r}{1 + r(1 - \tau_i)} \left[(1 - \tau_c)(1 - \tau_{cg}) - (1 - \tau_i)\right]$$

- Intuition

Payout triggers no new taxes $\rightarrow$ no deferral benefit

Shareholders pay tax on first-period earnings regardless of payout decision
Equity financing at date 1

Proposition 4: Retained earnings vs. dividends

With dividends, the tax benefit of internal equity at date 1, or the PV of retained cash vis-à-vis dividends, is

\[
PV(RE_1) = RE_1 \frac{r (1 - \tau_{dv})}{1 + r(1 - \tau_i) - \alpha \tau_{cg}} [(1 - \tau_c)(1 - \alpha \tau_{cg}) - (1 - \tau_i)]
\]

Observations

- 1 - \tau_{dv} in numerator not 1 - \tau_{cg}
- \alpha not \beta in brackets
- Tax cost of dividends depends, in sign, on \tau_{cg} not \tau_{dv}
Why is $\alpha \tau_{cg}$ important?

➤ Suppose $\alpha = 0$

Example from introduction: dividend tax is a sunk cost

$$\text{PV}(RE_1) = RE_1 \frac{r(1 - \tau_{dv})}{1 + r(1 - \tau_i)} [(1 - \tau_c) - (1 - \tau_i)]$$

➤ If $\alpha > 0$

Same except shareholders also pay capital gains taxes at $t = 1$ determined by $\alpha \tau_{cg}$
**Interpretation**

Impact on capital structure?

Impact on payout policy?

Impact on the cost of capital and investment?
Capital structure

Trade-off theory

- No distinction between internal and external equity
- Target leverage ratio
- Tax cost of equity depends on \((1 - \tau_c)(1 - \tau_e) - (1 - \tau_i)\)

\([\tau_e \text{ ambiguous; avg. of } \tau_{dv} \text{ and } \tau_{cg}]\)
Capital structure

Our results

- Internal equity generally less costly than external equity

  Equivalent only if $\alpha = \beta = 1$ and either

  1: Firms use repurchases

  2: Firms use dividends and $\tau_{cg} = \tau_{dv}$

  [with dividends, internal equity is cheaper if $\alpha \tau_{cg} < \tau_{dv}$]

  [King, 1974; Auerbach, 1979]
Capital structure

Our results

➤ **Incentives to lever up smaller than often assumed**

For firms with internal cash, trade-off between debt and retained earnings, not debt and new equity

\[
\text{Dividends: } (1 - \tau_c)(1 - \alpha \tau_{cg}) - (1 - \tau_i)
\]

\[
\text{Repurch: } (1 - \tau_c)(1 - \beta \tau_{cg}) - (1 - \tau_i)
\]

Neither depends on \(\tau_{dv}\)

➤ **Profitable firms (w/ internal cash) should have lower leverage**

➤ **Internal equity may have tax benefits even if firms never want to issue new equity**
Capital structure

Our results

- **No target debt ratio**

  Debt ratio should be a function of internal cashflows

  Leverage up when the firm has a cash deficit, down when it has a cash surplus

  Pecking order?
Payout policy

Dividend puzzle

➢ Form: why do firms use dividends not repurchases?

➢ Timing: why do firms pay dividends vs. retain the cash?

\( \tau_{dv} \) vs. \( \tau_{cg} \)

**Observation 1**
Retaining good if \((1 - \tau_c)(1 - \alpha \tau_{cg}) - (1 - \tau_i)\), which doesn’t depend on dividend taxes

**Observation 2**
Inconsistent with view that profitable firms have too little leverage
Cost of capital

Trade-off theory

\[ WACC = \frac{D}{V} (1 - \tau_c) r_D + \frac{E}{V} r_E \]
Cost of capital

Our results

Cost of capital also depends on the firm’s mix of internal and external equity

<table>
<thead>
<tr>
<th></th>
<th>Dividends</th>
<th>Repurchases</th>
</tr>
</thead>
<tbody>
<tr>
<td>External equity</td>
<td>$r \frac{(1 - \tau_i)}{(1 - \tau_{dv})}$</td>
<td>$r \frac{(1 - \tau_i)}{(1 - \tau_{cg})}$</td>
</tr>
<tr>
<td>Internal equity</td>
<td>$r \frac{(1 - \tau_i)}{(1 - \alpha \tau_{cg})}$</td>
<td>$r \frac{(1 - \tau_i)}{(1 - \beta \tau_{cg})}$</td>
</tr>
</tbody>
</table>

Cost of internal equity doesn’t depend on $\tau_{dv}$

Investment-to-cashflow sensitivity

Cost of capital $\neq$ expected stock return
Literature

Hennessy and Whited (2004)

- **Dynamic model**
  Taxes, uncertainty, issuance costs, bankruptcy costs

- **Flat tax on distributions, no other personal taxes**
  In essence: firms use dividends and $\alpha \tau_{cg} = 0$

- **Maximizes the tax advantage of retained earnings**
  Drives many of their dynamics
  Same as example in introduction: retaining better if $\tau_c < \tau_i$
Trapped equity

- Auerbach (1979), Poterba and Summers (1985)

- Dividend policy is irrelevant even with taxes

Equity value = \( \frac{1 - \tau_{dv}}{1 - \tau_{cg}} (A_t - D_t) \)

If pay $1 today, shareholders get \( 1 - \tau_{dv} \)

If retain, value goes up by \( \frac{1 - \tau_{dv}}{1 - \tau_{cg}} \); after capital gains taxes = \( 1 - \tau_{dv} \)

- Implication: \( \tau_{dv} \) doesn’t affect cost of capital or investment
Our results

➢ Trapped equity only if tax rates are just right: only if internal equity has zero tax costs

Miller-like equilibrium: \((1 - \tau_c)(1 - \alpha \tau_{cg}) = (1 - \tau_i)\)

➢ Even if trapped equity doesn’t hold, \(\tau_{dv}\) does NOT affect the cost of internal equity

If retained earnings or debt is the marginal source of funds, \(\tau_{dv}\) doesn’t affect investment decisions
Empirical results

Estimate tax costs of equity for a large sample of U.S. firms

➢ Tax costs depend on
  Tax rates
  Interest rates
  Fraction of capital gains taxed each period / tax basis of shares

➢ Perspective of representative investor
  Typical tax rates
  Average tax basis of all shareholders
Tax basis of shares

**Tax basis** = average purchase price

- **Estimate using prices and trading volume**

- **Proportional trading**
  All investors holding a stock are equally likely to sell

- **Different propensities to trade**
  Recent purchasers are more likely to sell than long-time investors
Trading probabilities

Ivkovic, Poterba, and Weisbenner (2004)

- Cumulative prob. of sale
- Hazard rate (prob of a sale conditional on holding to month t)
Tax basis of shares

Proportional trading

➤ Tax basis evolves as $TB_t = v_t P_t + (1 - v_t) TB_{t-1}$

➤ Recursively substituting:

$$TB_t = \sum_i w_{t-i}^t P_{t-i}$$

$$w_{t-i}^t = v_{t-i} \prod_{j=0}^{i-1} (1 - v_{t-j})$$

➤ Examples

$$TB_1 = v_1 P_1 + (1 - v_1) TB_0$$
$$TB_2 = v_2 P_2 + (1 - v_2) v_1 P_1 + (1 - v_2)(1 - v_1) TB_0$$

...
IPW hazard rates

Hazard rates, $h_i$, imply that trading volume evolves as

\[
\begin{align*}
    v_1' &= h_1 \\
    v_2' &= h_1 v_1' + h_2 (1 - v_1') \\
    v_3' &= h_1 v_2' + h_2 (1 - h_1) v_1' + h_3 (1 - h_2) (1 - v_1'),
\end{align*}
\]

Infer the fraction of shares held today that were bought last month, the month before, and so on.

Treat abnormal trading volume in three ways

- Ignore completely
- Scale hazard rates up and down
- Scale hazard rates down, truncate volume at predicted level
Data

1966 – 2003

7,066 NYSE and Amex stocks on CRSP

Daily (proportional) and monthly (IPW hazard rates) data

\( \alpha \) is annual trading volume

Truncate estimates of \( \alpha \) and \( \beta \) at one
## Trading volume and tax basis, 1966 – 2003

Pooled time series and cross section of monthly estimates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std</th>
<th>Q1</th>
<th>Median</th>
<th>Q3</th>
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</thead>
<tbody>
<tr>
<td>Trading volume</td>
<td>0.47</td>
<td>0.32</td>
<td>0.20</td>
<td>0.38</td>
<td>0.72</td>
</tr>
</tbody>
</table>

**Estimates of $\beta$, assuming the initial basis = .5P_1**

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean</th>
<th>Std</th>
<th>Q1</th>
<th>Median</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional</td>
<td>0.85</td>
<td>0.18</td>
<td>0.72</td>
<td>0.92</td>
<td>1.00</td>
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<tr>
<td>IPW</td>
<td>0.77</td>
<td>0.22</td>
<td>0.59</td>
<td>0.80</td>
<td>1.00</td>
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<tr>
<td>IPW scaled</td>
<td>0.80</td>
<td>0.20</td>
<td>0.64</td>
<td>0.84</td>
<td>1.00</td>
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<tr>
<td>IPW truncated</td>
<td>0.73</td>
<td>0.23</td>
<td>0.54</td>
<td>0.73</td>
<td>1.00</td>
</tr>
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**Estimates of $\beta$, assuming the initial basis = P_1**

<table>
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<tr>
<th>Method</th>
<th>Mean</th>
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<th>Q1</th>
<th>Median</th>
<th>Q3</th>
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</thead>
<tbody>
<tr>
<td>Proportional</td>
<td>0.88</td>
<td>0.16</td>
<td>0.79</td>
<td>0.98</td>
<td>1.00</td>
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<tr>
<td>IPW</td>
<td>0.81</td>
<td>0.21</td>
<td>0.64</td>
<td>0.88</td>
<td>1.00</td>
</tr>
<tr>
<td>IPW scaled</td>
<td>0.85</td>
<td>0.18</td>
<td>0.72</td>
<td>0.94</td>
<td>1.00</td>
</tr>
<tr>
<td>IPW truncated</td>
<td>0.80</td>
<td>0.22</td>
<td>0.62</td>
<td>0.87</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Tax basis, 1966 – 2003

PROP

IPW truncated
Tax costs of equity

If firms use dividends

External: \[ \frac{r}{1 + r(1 - \tau_i)} [(1 - \tau_c)(1 - \tau_{dv}) - (1 - \tau_i)] \]

Internal: \[ \frac{r (1 - \tau_{dv})}{1 + r(1 - \tau_i) - \alpha \tau_{cg}} [(1 - \tau_c)(1 - \alpha \tau_{cg}) - (1 - \tau_i)] \]

If firms use repurchases

External: \[ \frac{r}{1 + r(1 - \tau_i)} [(1 - \tau_c)(1 - \tau_{cg}) - (1 - \tau_i)] \]

Internal: \[ \frac{r (1 - \tau_{cg})}{1 + r(1 - \tau_i) - \beta \tau_{cg}} [(1 - \tau_c)(1 - \beta \tau_{cg}) - (1 - \tau_i)] \]
## Tax costs of equity, 1966 – 2003

### Pooled time series and cross section

<table>
<thead>
<tr>
<th>β est.</th>
<th>( \tau_c = \text{top} )</th>
<th>( \tau_c = .66 \text{ top} )</th>
<th>( \tau_c = .33 \text{ top} )</th>
<th>( \tau_c = 0 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std</td>
<td>Mean</td>
<td>Std</td>
</tr>
<tr>
<td><strong>Tax costs if firms use dividends (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>--</td>
<td>-2.31</td>
<td>1.07</td>
<td>-1.70</td>
</tr>
<tr>
<td>Internal</td>
<td>--</td>
<td>-1.02</td>
<td>0.45</td>
<td>-0.42</td>
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<tr>
<td><strong>Tax costs if firms use repurchases (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>--</td>
<td>-1.80</td>
<td>0.72</td>
<td>-1.05</td>
</tr>
<tr>
<td>Internal</td>
<td>Prop</td>
<td>-1.62</td>
<td>0.68</td>
<td>-0.87</td>
</tr>
<tr>
<td></td>
<td>IPW</td>
<td>-1.54</td>
<td>0.68</td>
<td>-0.80</td>
</tr>
<tr>
<td></td>
<td>IPW-scale</td>
<td>-1.57</td>
<td>0.67</td>
<td>-0.82</td>
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<tr>
<td></td>
<td>IPW-trunc</td>
<td>-1.51</td>
<td>0.67</td>
<td>-0.76</td>
</tr>
</tbody>
</table>

\( \tau_c \) represents the top marginal corporate tax rate.
Tax costs of equity, 1966 – 2003

-3.0%
-2.5%
-2.0%
-1.5%
-1.0%
-0.5%
0.0%
-0.5%
-1.0%
-1.5%
-2.0%
-2.5%
-3.0%


External equity
Internal equity
Summary

- Debt vs. internal equity vs. external equity
- Tax advantage of internal equity depends on capital gains taxation
- Implications for capital structure, payout policy, and cost of capital