Taxation and the optimal constraint on corporate debt finance: why a comprehensive business income tax is suboptimal

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Peter Birch Sørensen [1]

Abstract

The tax bias in favour of debt finance under the corporate income tax means that corporate debt ratios exceed the socially optimal level. This creates a rationale for a general thin capitalization rule limiting the amount of debt that qualifies for interest deductibility. This paper sets up a model of corporate finance and investment in a small open economy to identify the optimal constraint on tax-favoured debt finance, assuming that a given amount of revenue has to be raised from the corporate income tax. For plausible parameter values, the socially optimal debt-asset ratio is 2–3% points below the average corporate debt level currently observed. Driving the actual debt ratio down to this level through

limitations on interest deductibility would generate a total welfare gain of about 5% of corporate tax revenue. The welfare gain would arise mainly from a fall in the social risks associated with corporate investment, but also from the cut in the corporate tax rate made possible by a broader corporate tax base.

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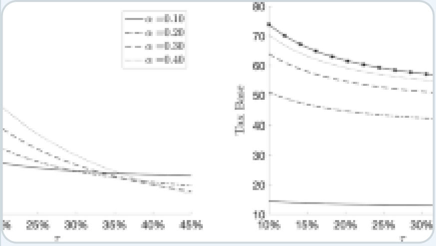

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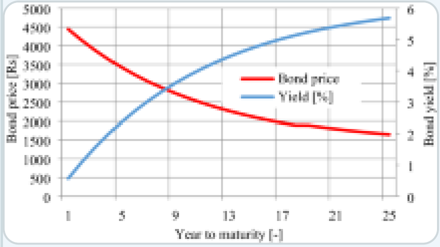

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Notes

1. The likely revenue loss has often been overstated in the debate on the ACE. According to the estimates by Mooij (2012), an ACE system would involve a budgetary cost of around 15% of current corporate tax revenue, on average for a selection of advanced economies.

2. The paper by Møen et al. (2011) studies internal as well as external debt shifting finding that a significant part of the increase in domestic corporate debt induced by a higher corporate tax rate stems from internal debt shifting by multinationals. See Schjelderup (2016) for a survey of the literature on the tax sensitivity of debt in multinational companies.

3. See Sect. 5.2.2 for an elaboration of this point.

4. For example, according to table 1 in Chen et al. (2007), the difference between the average yield on US corporate bonds with an AA-rating and medium maturity (7–15 years) and the average yield on comparable maturity treasury bonds from 1995 to 2003 was 146.27 basis points. For AAA-rated corporate bonds, the yield spread was 82.44 basis points, and for A-rated bonds, it was 177.68 basis points.

5. This value of η is higher than the user cost elasticity found in most of the empirical studies surveyed by Hassett and Hubbard (2002), but as we shall see in the next section, the quantitative results from our model are not very sensitive to the value of η.

6. To derive the optimal constraint on debt finance from formula (21) and the resulting welfare gain from formula (30), I use an iterative solution algorithm implemented in an Excel spreadsheet available on request.

7. Recall from (8) that the relationship between the cost of finance (q) and the cost of capital (c) is $c=q/\left({1-\tau } \right)$.

8. Another way of explaining the firm's preference for debt over new equity is that a manager who believes that the stock market undervalues the company's shares will want to finance new profitable investment by debt rather than new shares to avoid " giving away a free gift" to new investors.

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Author information

Authors and Affiliations

University of Copenhagen, Copenhagen, Denmark

Peter Birch Sørensen

Corresponding author

Correspondence to Peter Birch Sørensen.

Appendices

Technical appendix

Approximations to risk premiums

The private after-tax risk premium included in the cost of corporate finance is

$$\begin{aligned} p\left(\beta \right) \equiv \left({1-\beta } \right) p_\mathrm{e} \left(\beta \right) +\beta \left({1-\tau } \right) p_\mathrm{d} \left(\beta \right) . \end{aligned}$$

(32)

A second-order Taylor approximation of this expression around $\beta =\bar{\beta }$ yields

$$\begin{aligned} p\left(\beta \right) \approx p\left(\bar{{\beta }} \right) +\frac{\hbox {d}p\left(\bar{{\beta }} \right) }{\hbox {d}\beta }\left({\beta -\bar{\beta }} \right) +\frac{1}{2}\frac{d^{2}p\left(\bar{{\beta }} \right) }{\left({\hbox {d}\beta } \right) ^{2}}\left({\beta -\bar{\beta }} \right) ^{2}, \end{aligned}$$

(33)

where

$$\begin{aligned} \frac{{\hbox {d}p\left({\bar{\beta }} \right) }}{{\hbox {d}\beta }}= & {} \left({1 - \tau } \right) p_\mathrm{d} \left({\bar{\beta }} \right) - p_\mathrm{e} \left({\bar{\beta }} \right) + \left({1 - \bar{\beta }} \right) p_\mathrm{e}^{{\prime }} \left({\bar{\beta }} \right) + \bar{\beta }\left({1 - \tau } \right) p_\mathrm{d}^{{\prime }} \left({\bar{\beta }} \right) , \end{aligned}$$

(34)

$$\begin{aligned} \frac{{\hbox {d}p^{2} \left({\bar{\beta }} \right) }}{{\left({\hbox {d}\beta } \right) ^{2} }}= & {} 2\left[{\left({1 - \tau } \right) p_\mathrm{d}^{{\prime }} \left({\bar{\beta }} \right) - p_\mathrm{e}^{{\prime }} \left({\bar{\beta }} \right) } \right] + \left({1 - \bar{\beta }} \right) p_\mathrm{e}^{{\prime }{\prime }} \left({\bar{\beta }} \right) + \bar{\beta }\left({1 - \tau } \right) p_\mathrm{d}^{{{\prime }{\prime }}} \left({\bar{\beta }} \right) .\nonumber \\ \end{aligned}$$

(35)

The social risk premium is

$$\begin{aligned} p_\mathrm{s} \left(\beta \right) \equiv \left({1-\beta } \right) p_\mathrm{e} \left(\beta \right) +\beta p_\mathrm{d} \left(\beta \right) . \end{aligned}$$

(36)

In the absence of tax ($\tau =0$), private and social risk premiums would coincide, and firms would minimize their cost of finance by minimizing the expression in (36), implying the first-order condition

$$\begin{aligned}&\hbox {d}p_\mathrm{s} \left({\bar{\beta }} \right) /d\bar{\beta } \equiv 0 \quad \Rightarrow \nonumber \\&p_\mathrm{d} \left({\bar{\beta }} \right) - p_\mathrm{e} \left({\bar{\beta }} \right) + \left({1 - \bar{\beta }} \right) p_\mathrm{e}^{{\prime }} \left({\bar{\beta }} \right) + \bar{\beta }p_\mathrm{d}^{{\prime }} \left({\bar{\beta }} \right) = 0. \end{aligned}$$

(37)

Inserting (37) into (34), we get

$$\begin{aligned} \frac{\text{ d }p\left(\bar{{\beta }} \right) }{\text{ d }\beta }\equiv -\tau a,\quad a\equiv p_\mathrm {d} \left(\bar{{\beta }} \right) +\bar{\beta }p_\mathrm {d}^{{\prime }}({\bar{\beta }}). \end{aligned}$$

(38)

Moreover, defining

$$\begin{aligned} b\equiv \frac{d^{2}p\left(\bar{{\beta }} \right) }{\left({\hbox {d}\beta } \right) ^{2}}, \end{aligned}$$

(39)

and inserting (38) and (39) into (33), we obtain

$$\begin{aligned} p\left(\beta \right) \approx p\left(\bar{{\beta }} \right) -\tau a\left({\beta -\bar{\beta }} \right) +\frac{b}{2}\left({\beta -\bar{\beta }} \right) ^{2}, \end{aligned}$$

(40)

as stated in (6) in Sect. 2. Further, by using (37), we can write the second-order Taylor approximation to the social risk premium (36) around $\beta =\bar{\beta }$ as

$$\begin{aligned} p_\mathrm{s} \left(\beta \right) \approx p_\mathrm{s} \left(\bar{{\beta }} \right) +\frac{1}{2}\frac{d^{2}p_\mathrm{s} \left(\bar{{\beta }} \right) }{\left({\hbox {d}\beta } \right) ^{2}}\left({\beta -\bar{\beta }} \right) ^{2}, \end{aligned}$$

(41)

where

$$\begin{aligned} \frac{d^{2}p_\mathrm{s} \left(\bar{{\beta }} \right) }{\left({\hbox {d}\beta } \right) ^{2}}=2\left[{p_\mathrm{d}^{\prime } \left(\bar{{\beta }} \right) -p_\mathrm{e}^{\prime } \left(\bar{{\beta }} \right) } \right] +\left({1-\bar{\beta }} \right) p_\mathrm{e}^{{{\prime }{\prime }}} \left(\bar{{\beta }} \right) +\bar{\beta }p_\mathrm{d}^{{{\prime }{\prime }}} \left(\bar{{\beta }} \right) \end{aligned}$$

(42)

From (35), (39), and (42), it follows that

$$\begin{aligned} \frac{d^{2}p_\mathrm{s} \left(\bar{{\beta }} \right) }{\left(

{\hbox {d}\beta } \right) ^{2}}=b+\tau \left[{2p_\mathrm{d}^{\prime } \left(\bar{{\beta }} \right) +\bar{\beta }} p_\mathrm{d}^{{{\prime }{\prime }}} \left(\bar{{\beta }} \right) \right] \end{aligned}$$

(43)

In Sect. 5.1, we introduced the second-order approximation

$$\begin{aligned} p_\mathrm{d} \left(\beta \right) \approx \frac{k}{2}\beta ^{2}. \end{aligned}$$

(44)

Using (43) and (44), we may therefore write (41) as

$$\begin{aligned} p_\mathrm{s} \left(\beta \right) \approx p_\mathrm{s} \left(\bar{{\beta }} \right) +\frac{b_s }{2}\left({\beta -\bar{\beta }} \right) ^{2},\quad b_s \equiv b+3\tau k\bar{\beta } \end{aligned}$$

(45)

Equation (45) is seen to be identical to Eq. (27) in the main text. Note from (32), (36) and (44) that

$$\begin{aligned} p_\mathrm{s} \left(\bar{{\beta }} \right)= & {} p\left(\bar{{\beta }} \right) +\tau \bar{\beta }p_\mathrm{d}\left(\bar{{\beta }} \right) \nonumber \\= & {} p\left(\bar{{\beta }} \right) +\tau \frac{k}{2}{\bar{\beta }}^{3} \end{aligned}$$

(46)

When calibrating the model, I use (46) and the specification of \(b_s \) stated in (45) to ensure consistency between the approximations made in (40), (44) and (45).

The cost of capital and its derivatives

From (4), (6), (8) and (44), one finds that

$$\begin{aligned} c= & {} \left({\frac{1}{1-\tau }} \right) \left[{r-\tau \beta \left({r+\pi } \right) +{\mathop {\overbrace{{\left({1-\bar{\beta }} \right) p_\mathrm{e} \left(\bar{{\beta }} \right) +\bar{\beta }}{(1-\tau) } p_\mathrm{d} \left(\bar{{\beta }} \right) } }\limits ^{\equiv p\left(\bar{{\beta }} \right) }}}\right. \nonumber \\&\left. {-\tau a\left({\beta -\bar{\beta }} \right) +\frac{b}{2}\left({\beta -\bar{\beta }} \right) ^{2}} \right] , \end{aligned}$$

(47)

$$\begin{aligned} \frac{\partial c}{\partial \beta }= & {} \frac{b\left({\beta -\bar{\beta }} \right) -\tau \left({r+\pi +a} \right) }{1-\tau }, \end{aligned}$$

(48)

$$\begin{aligned} \frac{\partial c}{\partial \tau }= & {} \frac{c-\beta \left({r+\pi +a} \right) +a{\bar{\beta } - 0.5k\bar{\beta ^{3}}}}{1-\tau }. \end{aligned}$$

(49)

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