

CONSERVATIVE ACCOUNTING YIELDS  
EXCESSIVE RISK-TAKING – A NOTE

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# Conservative Accounting Yields Excessive Risk-Taking – A Note

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## Abstract

In this note we analyze the role of business taxation for corporate risk-taking under different accounting principles (such as mark-to-market, lower-of-cost-or-market and historical cost). We demonstrate that conservative accounting may imply incentives to overinvest in risky assets. If tax loss offset opportunities are less than perfect, the mark-to-market principle penalizes risky investment whereas more conservative accounting leaves the risk choice unaffected.

**JEL classification:** H25, M41, G32

**Keywords:** accounting; risk-taking; business taxation; corporate investment

## 1 Introduction

According to the literature<sup>1</sup>, the choice of accounting principle may affect corporate risk-taking if, first, accounting numbers serve as a performance indicator in principal-agent relationships, e.g. between outside investors and managers,<sup>2</sup> and second, if markets are dysfunctional, e.g. suffer from liquidity constraints.<sup>3</sup> In this note, we offer a third perspective. We argue that accounting principles are crucial in understanding how corporate taxes affect risk-taking.<sup>4</sup>

We build a model in which investors have complete information and markets are perfect. A representative risk-neutral firm invests in one unit of an asset. It chooses from a continuum of assets differing in income and risk properties. Perfect competition among investors drives up asset prices until the expected payoff is equal across all income and risk categories. The corporate tax base is determined following specific accounting principles of which we consider three: mark-to-market (MM, henceforth), pure historical cost (HC) and lower-of-cost-or-market (LCM). We derive the corporation's exposure to risk (risk-neutrality) and the level of investment (investment neutrality).

We demonstrate that, with perfect loss offset, HC and MM accounting are risk-neutral and potentially investment neutral (depending on the relative size of the tax rates involved). However, the LCM rule implies an inefficiently high exposure to risk. The reason is that it introduces an asymmetry into corporate taxation: whereas asset depreciations lead to a tax credit, asset appreciations are ignored. Given that the LCM principle is sometimes considered to induce conservative (i.e. risk-averse) investment behavior, this finding may be regarded as a surprise. With imperfect loss offset, the LCM and the HC principles are risk-neutral. The MM principle, however, implies a penalty for risky assets, i.e. the risk exposure is inefficiently small. The reason is that, whereas asset appreciations trigger a tax payment, asset depreciations do not yield a tax credit.

Usually, financial and tax accounting follow two distinct set of rules; tax accounting is usually rather conservative, i.e. taxation is often based on lower-of-cost-or-market or historical cost systems instead of market prices. Nevertheless, most countries impose

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<sup>1</sup>See Fields, Lys and Vincent (2001) for a survey.

<sup>2</sup>See Plantin et al. (2008), Edgerton (2011) as well as Shackelford et al. (2011). McNichols and Stubben (2008) empirically examine the effect of earnings management on firms' investment decisions. Graham et al. (2010) find on the basis of a survey of tax executives that avoiding financial accounting tax expenses is as important as saving "cash taxes" concerning the location decision and repatriation decision of foreign investments.

<sup>3</sup>Allen and Carletti (2008) show that mark-to-market accounting can lead to contagion effects in situations where accounting based on historical cost does not. Plantin et al. (2008) demonstrate that mark-to-market accounting may lead to suboptimal decisions by injecting artificial volatility into transaction prices. For a comprehensive discussion on fair value accounting and its impact on the financial crisis see Laux and Leuz (2009) and IMF (2008).

<sup>4</sup>There are very few theoretical contributions that recognize the role of accounting principles for the analysis of corporate taxation (or business taxation in general). An early exemption is Kanninen and Soedersten (1995) who analyze the limitations of reporting principles on a firm's dividend policy. A general framework for analyzing corporate taxation and accounting rules is provided by Shackelford et al. (2011).

a minimum level of book-tax-conformity<sup>5</sup>, and there has recently been a debate on the virtues of uniform reporting where the financial statement and taxation are based on the same set of accounting numbers. In this context, the current US administration (The White House and The Department of the Treasury 2012) proposes higher book-tax conformity, and the European Commission (2001) considers the IFRS framework as a starting point for the implementation of a common consolidated corporate tax base.

The next section lays out the model and derives the results. Section 3 summarizes the results and concludes.

## 2 The model

Consider a small open economy with a large number of identical firms which live for two periods,  $t = 1, 2$ . In period 1, the representative firm decides whether or not to acquire a risky asset and, in period 2, the asset yields income. There is a continuum of assets, indexed by  $j$ . Each firm is constrained to invest in one unit of asset only. Assets differ in expected income  $1 + \theta(j)$  where  $\theta(j) \in [\theta^-, \theta^+]$ . After acquisition, an asset specific information,  $\varepsilon$ , is revealed which alters the expected income to  $1 + \theta(j) + \varepsilon$ . This (information) shock is idiosyncratic and distributed with zero mean and variance  $\sigma_\varepsilon$ , i.e.  $\varepsilon \sim (0, \sigma_\varepsilon)$ .

The initial asset owners have a uniform reservation asset valuation of unity implying that the asset price in period 1, denoted by  $p_1(j)$ , has to be at least equal to one. Investment is financed by equity raised from investors whose (non-tax) opportunity cost is given by the world market interest rate  $r$ . Finally, we assume that firms and investors are risk-neutral. Firms are assumed to maximize the present expected value of cash flows. This implies that accounting information are only used for tax purposes.

### 2.1 Benchmark case

For benchmarking purposes, we consider investment decisions made in the absence of taxes. With  $E(\varepsilon) = 0$  the expected net present value,  $V_1(j)$ , of investing in asset  $j$  with expected income  $1 + \theta(j)$  is

$$V_1(j) = -p_1(j) + \frac{1 + \theta(j)}{1 + r} \quad (1)$$

Perfect competition implies that expected discounted income equals the asset price. Consequently, the value of all assets are *a priori* zero. Thus, asset prices are given by  $p_1(j) = \frac{1 + \theta(j)}{1 + r}$  and marginal yields by  $\tilde{\theta} = r$ .

We define an accounting principle as investment neutral if asset prices and marginal yields are given as in the benchmark case. An accounting principle is risk-neutral if asset prices and marginal yields do not depend on the degree of risk, as measured by  $\sigma_\varepsilon$ . Note that investment neutrality is a sufficient condition for risk-neutrality, and risk-neutrality is a necessary condition for investment neutrality.

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<sup>5</sup>See Hanlon and Shevlin (2005) for a detailed overview and discussion on the issues surrounding the proposals on book-tax conformity in the US.

## 2.2 Accounting based taxation

Now assume that the tax base is determined according to MM, LCM or HC accounting. When the asset is acquired, the book value under all three accounting principles is  $p_1(j)$ . Similarly, when the asset matures, the book value is  $p_2(j) = 1 + \theta(j) + \tilde{\varepsilon}$  where  $\tilde{\varepsilon}$  denotes the realized shock. The principles differ, though, in how book values change when the shock  $\varepsilon$  occurs. Let  $b_1^\varepsilon$  denote the book value in period 1 just after the shock has been revealed.

We assume that, first, shareholder taxes, i.e. capital gains taxes and dividend taxes, are zero; it is, however, straightforward to show that all results hold if symmetric shareholder taxation is considered.<sup>6</sup> Second, the representative firm's taxable income is assumed to be large enough to fully utilize any tax credits, an assumption that is relaxed in the next subsection. Third, tax credits received in the first period stay within the firm (i.e. are not distributed as dividends) and yield an interest rate of  $r$  which is taxed at the corporate tax rate  $\tau$ ; equivalently, tax debt is financed by debt contracts and the resulting interest payments can be deducted from the corporate tax base. Fourth, the investors' alternative is taxed at a rate of  $m \geq 0$ . Finally, after the asset has matured, all income (and remaining cash in the firm) is distributed to the investor and the firm is (costlessly) dissolved.

Independent of the accounting principle, the expected after-tax value of investing in asset  $j$  is given by

$$V_1(j) = -p_1(j) + \frac{1 + \theta(j) - \tau \Delta_1(j)(1 + r(1 - \tau)) - \tau \Delta_2(j)}{1 + r(1 - m)} \quad (2)$$

where  $\Delta_1(j) \equiv b_1^\varepsilon(j) - p_1(j)$  and  $\Delta_2(j) \equiv 1 + \theta(j) - b_1^\varepsilon(j)$  defining the expected tax bases in period 1 and 2, respectively, as well as

$$\begin{aligned} b_{1,MM}^\varepsilon(j) &= \tilde{p}_1(j) \\ b_{1,HC}^\varepsilon(j) &= p_1(j) \\ b_{1,LCM}^\varepsilon(j) &= \min[p_1(j), \tilde{p}_1(j)] \end{aligned} \quad (3)$$

with  $\tilde{p}_1(j) = \frac{1 + \theta(j) + \tilde{\varepsilon}}{1 + r(\frac{1-m}{1-\tau})}$  denoting the market price after the shock is revealed.<sup>7</sup> To rule out insensible results we make the following assumption:

**Assumption 1** The present value of tax deductions related to purchasing the asset at

<sup>6</sup> Asymmetric shareholder taxation, i.e. the absence of tax refunds in the case of capital losses, however introduces a downward bias in investment that increases in the level of risk. More information is available from the authors upon request.

<sup>7</sup> After the shock is revealed, the asset could be sold to outside investors. Investors bid until the market price satisfies

$$-\tilde{p}_1(j) + \frac{1 + \theta(j) + \tilde{\varepsilon} - \tau(1 + \theta(j) + \tilde{\varepsilon} - \tilde{p}_1(j))}{1 + r(1 - m)} = 0 \quad (4)$$

which implies  $\tilde{p}_1(j) = \frac{1 + \theta(j) + \tilde{\varepsilon}}{1 + r(\frac{1-m}{1-\tau})}$ .

a price of  $p_1(j)$  must not exceed  $p_1(j)$ .

Under MM accounting, the shock  $\varepsilon$  triggers a tax credit if  $\tilde{p}_1(j) < p_1(j)$  and tax payments if  $\tilde{p}_1(j) > p_1(j)$  which corresponds to higher or, respectively, lower tax payments in the second period. The net expected tax payment (or credit) due to  $\tilde{p}_1(j) \neq p_1(j)$  is zero since  $E(\varepsilon) = 0$ . Thus, the introduction of risk does not change investment behavior. Prices are given by  $p_1(j) = \frac{1+\theta(j)}{1+r(\frac{1-m}{1-\tau})}$  and the marginal yield is  $\tilde{\theta} = r\frac{1-m}{1-\tau}$ .

Under HC accounting, revaluations are not reflected in a change in book values, i.e.  $\Delta_1(j) = 0$ . Asset prices in period 1 are given by  $p_1(j) = \frac{1+\theta(j)}{1+r(\frac{1-m}{1-\tau})}$  and the marginal yield by  $\tilde{\theta} = r\left(\frac{1-m}{1-\tau}\right)$ ; thus, outcomes are equivalent to the MM scenario.

Under the LCM principle, unrealized profits due to appreciations do not enter the tax base in contrast to depreciations. Let  $\pi$  denote the probability that the asset price depreciates,  $\tilde{p}_1(j) < p_1(j)$ , and let  $E_\varepsilon^- \equiv E(\varepsilon : \tilde{p}_1(j) < p_1(j))$  be the mean expected shock given that the asset price depreciates. Then, the expected tax credit in period 1 is  $\pi\tau\left(\frac{1+\theta(j)+E_\varepsilon^-}{1+r(\frac{1-m}{1-\tau})} - p_1(j)\right)$  which is compensated by expected additional tax payments in period 2 of the same size. The different timing of tax credits and payments, though, gives rise to a distortion. Competition among investors implies that, for all  $j$ , prices are given by  $p_1(j) = \frac{1+\theta(j)-\tau\pi\Omega^s E_\varepsilon^-}{1+r\frac{1-m}{1-\tau}}$  where  $\Omega^s \equiv \frac{r}{1+r(\frac{1-m}{1-\tau}-\pi\tau)} > 0$  – the superscript  $s$  denoting symmetric tax treatment of gains and losses – and the marginal yield is  $\tilde{\theta} = r\frac{1-m}{1-\tau} + \tau\pi\Omega^s E_\varepsilon^-$ .<sup>8</sup> With  $E_\varepsilon^- < 0$  the accounting based tax system inflates asset prices and increases risky investment.

We summarize these findings in Proposition 1.

**Proposition 1** *Assume that taxation is accounting based. Then, marginal yields are given by*

- (i)  $\tilde{\theta} = r\frac{1-m}{1-\tau}$  under MM,
- (ii)  $\tilde{\theta} = r\frac{1-m}{1-\tau}$  under HC, and
- (iii)  $\tilde{\theta} = r\frac{1-m}{1-\tau} + \tau\pi\Omega^s E_\varepsilon^-$  under LCM accounting.

Thus, both the mark-to-market and the historical cost principle yield risk-neutrality and, if  $m = \tau$ , investment neutrality. In contrast, the LCM principle is neither investment nor risk-neutral. If  $m = \tau$ , there is overinvestment in risky assets under LCM. Considering that the LCM principle is often associated with some notion of conservatism in accounting and investment, the overinvestment result may be surprising.

### 2.3 Corporate tax asymmetries

In practice, tax credits usually do not imply actual tax refunds. Rather, a firm is allowed to use the tax credit to lower tax payments on other income. If there is no other income, losses can be carried forward (at least for a limited number of periods).

<sup>8</sup>The denominator of  $\Omega^s$  being positive follows directly from Assumption 1.

Now, we modify the above model and assume that there is no other taxable income against which book losses in period 1 could be credited. This implies that the loss has to be offset in period 2 where, by assumption, there is sufficient taxable income.<sup>9</sup> The after-tax value of investing in the investment project  $j$  is given by

$$V_1(j) = -p_1(j) - \tau \max\{0, \Delta_1(j)\} + \frac{1 + \theta(j) + \tilde{\varepsilon} - \tau \min\{\Delta_1(j) + \Delta_2(j), \Delta_2(j)\}}{1 + r(1 - m)} \quad (5)$$

with  $\Delta_1(j)$  and  $\Delta_2(j)$  given below equation (2).

Under MM, the firm has to pay taxes if the asset is appreciated, i.e.  $\tilde{p}_1(j) > p_1(j)$ , but cannot use the corresponding tax credits if  $\tilde{p}_1(j) < p_1(j)$ . Asset prices can be shown to equal  $p_1(j) = \frac{1 + \theta(j) + \tau \Omega^{as} \pi E_\varepsilon^-}{1 + r \frac{1-m}{1-\tau}}$  with  $\Omega^{as} \equiv \frac{r}{1 + r \frac{1-m}{1-\tau} - r\tau(1-\pi)} > 0$  – the superscript *as* denoting asymmetric tax treatment of gains and losses – and the marginal yield by  $\tilde{\theta} = r \frac{1-m}{1-\tau} - \tau \pi \Omega^{as} E_\varepsilon^-$ .<sup>10</sup> Note that the distortion has a similar size, though a different sign, as the one under the LCM principle with full loss offsets. Under HC,  $\Delta_1(j) = 0$  and, thus, the results derived in section 2.2 remain unchanged. Under LCM, only depreciations are reflected while appreciations do not alter the tax base. Since there is no taxable income which the losses can be credited against, a loss is carried forward. Thus, in economic terms, the LCM principle yields the same results as the HC principle. These findings are summarized in Proposition 2.

**Proposition 2** *Assume that taxation is accounting based and losses cannot be credited against other taxable income in period 1, but can be carried forward to period 2. Then, marginal yields are given by*

- (i)  $\tilde{\theta} = r \frac{1-m}{1-\tau} - \tau \pi \Omega^{as} E_\varepsilon^-$  under MM,
- (ii)  $\tilde{\theta} = r \frac{1-m}{1-\tau}$  under HC, and
- (iii)  $\tilde{\theta} = r \frac{1-m}{1-\tau}$  under LCM.

Thus, the MM principle is neither investment nor risk-neutral; if  $m = \tau$ , there is underinvestment in risky projects. The HC and LCM principles are economically equivalent. Asset prices and the level of investment are the same as under the HC principle with perfect loss offset. Thus, both rules yield risk-neutrality and, if  $m = \tau$ , investment neutrality.

### 3 Summary

Summing up, the allegedly conservative lower-of-cost-or-market principle acts as a subsidy to risk. If loss offset is imperfect, the MM principle yields underinvestment in risky assets. Only HC valuation is risk-neutral and, potentially, investment neutral in both cases.

<sup>9</sup> Assuming that there may not be sufficient income in period 2 is also possible, however complicates the analysis without yielding new insights. In general, risk-taking is strongly discouraged.

<sup>10</sup> Again,  $\Omega^{as} > 0$  follows from Assumption 1.

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