

# Instructor's Solutions Manual

## Taxes and Business Strategy

### **A Planning Approach**

*Fifth Edition*

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## **NOTE TO INSTRUCTORS**

Much care and attention has gone into the preparation of this Solutions Manual. Despite these efforts, some minor errors may have escaped our notice. We would appreciate your apprising us of any errors you encounter. Please email us at [tshevlin@uci.edu](mailto:tshevlin@uci.edu).

We would also appreciate any comments or feedback on your experiences using the book and on suggestions for revising the text.

# Chapter 1

## Introduction to Tax Strategy

### Discussion Questions

1. When facing a business decision in which taxes play a role, a planner employing efficient tax planning considers all of the costs, tax and nontax, that will be incurred by all of the parties to the transaction. In addition to the explicit tax payments that will result from the transaction, the planner considers implicit taxes that parties will pay in the form of lower before-tax rates of return on tax-favored investments as well as any other non-tax costs associated with the transaction such as the costs of restructuring an organization to obtain favorable tax treatment. A planner whose criterion is tax minimization, on the other hand, ignores many of these costs. A tax minimizer considers only explicit tax costs. It is easy to see that such a criterion may not result in desirable business strategies when one considers that zero taxes are paid on unprofitable investments.
2. Social planners should encourage taxpayers to engage in costly tax planning when no alternative means of attaining the same social goals is less costly. For example, consider the social goal of providing low-income housing. A system of tax subsidies to providers of this housing may require some taxpayers to incur costs in considering the explicit taxes, implicit taxes, and nontax costs that would affect them and other parties if they were to build low-income housing. If the next-best alternative means of providing low-income housing is for the government to build it directly, the social costs associated with providing this housing may be higher.
3.
  - a. Implicit taxes arise because before-tax rates of return on tax-favored assets are less than those available on tax-disfavored assets. Examples of tax-favored investments include tax-exempt bonds, business equipment eligible for accelerated depreciation, energy-related investments, research and development, agricultural production, foreign export activities, retirement saving, and entrepreneurial risk-taking activities.
  - b. High tax-bracket taxpayers should undertake these investments rather than paying high explicit taxes on investments with higher before tax rates of return but lower after-tax rates of return. Many of these investors do indeed undertake these investments, but nontax considerations also impede their propensity to do so. Later chapters elaborate on how taxpayers determine whether they are in this clientele.
  - c. The issuer or seller of the tax-favored asset receives the implicit taxes. Issuers benefit because they receive higher prices for the securities they are issuing or alternatively they raise funds at a lower before-tax rate of return. Sellers of tax-favored assets receive the implicit taxes via higher selling prices of the asset.
4.
  - a. This statement is correct since municipal bonds are tax-favored.
  - b. This statement is not correct. For example, suppose (1) your tax rate is 30% and you can invest in municipal bonds that yield 10% or equally risky taxable bonds that yield 16%. You should invest in the

taxables and pay explicit taxes of 4.8% to earn an after-tax return of 11.2% (which exceeds the 10% after-tax return on munis).

c. This statement is correct when the business assets are eligible for favorable tax treatment to owners. This is the case in most countries. When owning is tax-favored, it gives rise to high implicit taxes. Low-tax-rate investors do not value the tax benefits as much as high-tax-rate investors do. The low-tax-rate investors can effectively sell the tax benefits to ownership by renting at reduced rental rates.

d. This statement is not necessarily correct. Suppose that employers' tax rates are going to fall more than employee tax rates. In this case, the tax benefit of deferral to employees may be swamped by the cost of deferral to the employer. By adjusting the level of current compensation, employees can be made to prefer current payment. Nontax considerations may also be important. To the extent employees have a strong preference for current consumption and they cannot borrow funds at favorable interest rates, current compensation may be preferred even when taxes can be saved by deferring compensation. We will analyze this problem more formally in chapter Eight.

5. a. Salary and wages, interest and dividend income, gains on sale of securities (may qualify for favorable capital gains treatment). An individual's income from operating a business is included in gross income after deducting the cost of good sold. All items of income are included in gross income from whatever source unless specifically excluded by the Tax Code.

b. Municipal bond income is excluded from gross income (it is tax exempt).

c. In calculating adjusted gross income, some items are deducted from gross income (called Deductions for AGI). Examples include trade or business expenses such as advertising, depreciation, etc for taxpayers operating a business. For employees, payments by the employer to reimburse the employee for certain expenses such as travel, transportation and entertainment expenses incurred by the employee are deductible. Moving expenses and losses from the sale or exchange of property are also classified as deductions for AGI.

Next the taxpayer deducts the maximum of itemized deductions or the standard deduction and exemptions to arrive at taxable income. Itemized deductions are expenses of a personal nature which the Tax Code allows the taxpayer to deduct. Examples include home mortgage interest, property taxes, state and local income taxes, charitable contributions, and medical expenses above a certain limit. The total of itemized deductions is compared to the standard deduction (determined by the filing status of the taxpayer – single, married filing jointly, married filing separately, head of household, and surviving spouse) allowed by the Tax Code – the standard deduction is a fixed amount used to simplify the preparation of the tax return for taxpayers with relatively low itemized deductions. Finally each taxpayer is entitled to a personal exemption (provided the taxpayer is not eligible to be claimed as a dependent on another taxpayer's return).

d. A credit is a dollar-for-dollar reduction in the taxpayer's tax liability (and thus is worth more than a deduction, because a deduction of \$1 only reduces the tax liability by the taxpayer's marginal tax rate). Examples of tax credits for individuals are the earned income credit, child tax credit, credit for elderly, dependent care credit, general business credit, and foreign tax credit (for individuals with foreign earnings and foreign taxes paid).

(The reader interested in a more technical discussion is referred to any technical tax textbook.)

6. a. Revenue less cost of goods sold from operations, dividend and interest income, royalties, rental income. Similarly to individuals, all items of income are included in gross income from whatever source unless specifically excluded by the Tax Code. Generally appreciation in the value of assets held is not taxable until the gain is realized by sale or exchange of the asset.

b. Tax exempt interest on municipal bonds.

c. All expenses incurred in conducting the trade or business (§ 162). Depreciation of plant and buildings, wages and salaries, interest expense, rental expense, advertising and marketing expenses, research and development expenditures, charitable contributions (within limits), deductions for past tax losses (a net operating loss carryforward deduction), deduction for dividends received from other corporations (the dividend received deduction) and utilities.

d. Research and development credit, foreign tax credits, the alternative minimum tax credit.

7. Effective tax planning requires the tax planner to consider the tax positions of all parties to the transaction. By considering the other party, the tax planner can negotiate better terms-of-trade for his client. That is, having more information about the other parties' position can help the tax planner in either structuring the transaction or in pricing the transaction. For example, in negotiating the purchase price of another business, the buying firm can better determine the purchase price if it knows how much the gain on sale will be to the selling party and whether it will be taxed as ordinary income or capital gains. The total gain to the other party depends not only on the price the business is sold for but the basis (defined here simply as the depreciated cost of the assets sold) that the taxpayer has in the assets. The higher the basis, the lower the taxable gain to the seller and the less the buyer might have to reimburse the seller for taxes. This real-world transaction is discussed in more detail in chapters 13-18 (the mergers and acquisitions chapters).

Note that if the taxpayer is buying goods and services in a competitive market place and is a price taker (the taxpayer takes the price as given and cannot negotiate a different price) then there is less benefit to the taxpayer knowing the other (selling) party's tax position.

8. After-tax rates of return are not always lower than pretax rates of return. For example, for a tax exempt municipal bond the after-tax rate of return equals the pretax rate of return. Consider also the following counter-example. The taxpayer invests \$1,000 in some activity with the investment being immediately tax deductible. At the end of the year the activity gives rise to a gain of \$800 taxed as a capital gain. The taxpayer faces a tax rate of 39.6% on ordinary income and 20% on capital gains.

The pre-tax rate of return in this simple example is  $(800 - 1,000)/1,000 = -20\%$ .

The after-tax rate of return is  $[800(1-.20) - 1,000(1-.396)]/1,000(1-.396) = (640 - 604)/604 = 5.96\%$ .

9. Tax avoidance is another label for effective tax planning. See the quote in the text attributed to Judge Learned Hand. The courts have upheld taxpayers' rights to arrange their affairs in ways to maximize their after-tax rates of return, provided the arrangements are within the law. Tax evasion denotes activity that is outside the law such as not reporting income that is taxable, or falsely claiming or overstating deductions. Tax evasion represents fraudulent activity and is illegal. Tax evasion is also labeled as deliberate noncompliance. A taxpayer facing a high marginal tax rate who buys a tax-exempt municipal bond and thus faces no explicit taxes is practicing tax avoidance but a taxpayer who buys a taxable corporate bond but omits the interest income on his tax return is practicing tax evasion.

## Exercises

1. Taxpayer A invests in corporate bonds: after-tax rate of return =  $.125(1-.28) = .09$ .  
Taxpayer B invests in tax-exempt municipal bonds: after-tax rate of return =  $.09$ .  
Thus both taxpayers are earning 9% per annum after-tax. Taxpayer B is not paying any explicit taxes but is paying implicit taxes in the form of a lower pre-tax rate of return compared to the 12.5% pretax rate of return on the fully taxable bond.
  - a. The implicit taxes are being paid to the municipality issuing the tax-exempt bond.
  - b. Taxpayer B is paying implicit taxes here at a rate of 28% ( $= [.125-.09]/.125$ ).
2. Price willing to pay for the corporate bond is \$1,000 (the face value). The bond promises a coupon of 6% and the taxpayer requires a pretax rate of return of 6% as well. More formally  
Price = present value of the coupon payments + present value of the face amount  
(Pretax calculation): price =  $.06 \times (1,000) \times PVA + \$1,000 \times PV1$   
where PVA is the present value of a \$1 annuity for 5 years at 6% per annum = 4.212, and  
PV1 = is the present value of a dollar to be received in 5 years at 6% per annum = .747.  
Thus  $.06 \times (1,000) \times 4.212 + 1,000 \times .747 = \$1,000$ .  
(On an after-tax basis): price =  $[.06 \times (1,000)](1-t) \times PVA + \$1,000 \times PV1$   
where the PVA and PV1 factors use an after-tax discount rate  $.06[1-.31] = .0414$   
implying a PVA factor of 4.434 and PV1 of .8164. Thus,  
Price =  $[.06 \times (1,000)](1-.31) \times 4.434 + \$1,000 \times .8164 = \$1,000$ .  
  
Price willing to pay for the municipal bond. Since the taxpayer can earn 4.14% after-tax by investing in the fully taxable bond, he requires this as a minimum rate of return on the muni and thus is willing to pay a maximum of  
Price =  $.06 \times (1,000) \times PVA + \$1,000 \times PV1$   
where PVA and PV1 are based on the after-tax discount rate of 4.14%. Thus  
Price =  $.06 \times (1,000) \times 4.434 + \$1,000 \times .8164 = \$1,082.44$ .  
  
The taxpayer is indifferent between the fully taxable bond at a price of \$1,000 and the tax-exempt municipal bond at a price of \$1,082.44 because at these prices both offer an after-tax rate of return of 4.14%. This example relates to implicit taxes because the taxpayer is willing to pay more for the tax favored treatment of the municipal bond thus lowering its pretax (also equal to after-tax) rate of return. The implicit tax is the difference between the 6% pretax return on the fully taxable bond and the 4.14% pretax rate of return on the muni. The implicit tax rate is 31%  $[(.06 - .0414)/.06]$ .

3.

	<b>Alternative A</b>	<b>Alternative B</b>
Investment	\$20,000	\$18,000
Expected Payoff	$\$21,000 \times .75 = \$15,750$	$\$25,000 \times .80 = \$20,000$
Pretax rate of return	$(\$15,750 - \$20,000) / \$20,000 = -21.25\%$	$(\$20,000 - \$18,000) / \$18,000 = 11.11\%$
After-tax rate of return*		
For taxpayer with 15% rate	-7.35%	11.11%
For taxpayer with 35% rate	21.15%	11.11%

\*Alternative A: after-tax rate of return calculation:

(expected payoff – after-tax cost of investment)/after-tax cost of investment  
 $= (\$15,750 - \$20,000[1-t]) / \$20,000[1-t]$ . The expected payoffs represent tax savings which are tax-exempt.

Alternative B: after-tax rate of return calculation:

(expected after-tax payoff - after-tax cost of investment)/after-tax cost of investment  
 $= (\$20,000[1-t] - \$18,000[1-t]) / \$18,000[1-t] = \$2,000[1-t] / \$18,000[1-t] = \$2,000 / \$18,000 = 11.11\%$ .  
 Since the payoff is ‘taxable’ (cost savings reduce the tax deduction) and the investment is tax deductible at the same tax rate, the after-tax rate of return equals the pre-tax rate of return.

The low-tax bracket taxpayer should invest in alternative B because this maximizes her after-tax rate of return. The high-tax bracket taxpayer should invest in alternative A. And note that alternative A represents tax planning activity and while the pretax rate of return is negative, for the high-tax bracket taxpayer, the after-tax rate of return is positive and higher than alternative B. This example illustrates that tax planning is a tax-favored activity which activity is more valuable for high-tax bracket taxpayers.

4. If receive bonus now: after-tax amount received is  $\$30,000(1-.396) = \$18,120$ . The taxpayer can invest this amount to earn 5% after-tax for the year which will cumulate to  $\$18,120(1.05) = \$19,026$  at the end of next year.

If defer bonus for one year (assumed received at end of the next year, not at the start of the next year): after-tax amount received is  $\$30,000(1-.31) = \$20,700$ .

Thus defer receipt of bonus for one year. However, if the taxpayer can earn 15% after-tax on her investment, then  $\$30,000$  received now will accumulate to  $\$30,000(1-.396)(1.15) = \$20,838$  which now exceeds the amount from the one-year deferral.



## Tax Planning Problems

1. First note that a firm with accumulated tax losses can carryforward these losses and deduct them against future taxable income. Traditionally, we think of firms with net operating loss carryforwards as facing lower marginal tax rates than a firm currently earning income (discussed in more detail in Chapter Seven).

Plan A: borrow and purchase the plant. Not very tax efficient because will not be deducting the interest on the borrowing at high corporate tax rate nor will the depreciation deductions on the plant be taken at the highest tax rates.

Plan B: issue equity and buy the plant. Issuing equity is tax efficient for low tax firms but buying the plant is not, for reasons given above.

Plan C: leasing is likely the most tax efficient. Once we analyze the tax positions of both low tax-bracket and high tax-bracket taxpayers, we might find low tax-bracket taxpayers better off passing up tax savings and renting. The reason is that low tax-bracket and high tax-bracket businesses will find it desirable to enter into a contract that arranges property rights so that the low tax-bracket businesses effectively sell their tax benefits to high tax-bracket businesses. This is accomplished by reducing the rental rate to the low tax-bracket taxpayer in exchange for the right to take rapid depreciation, for tax purposes, on the equipment.

2. You would like to meet with the CEO so as to obtain information about the CEO's tax position, the rate at which the CEO can earn on her personal investments, and her preferences for current consumption (income) and current savings (deferred income). The CEO's tax position depends not only on the salary from the firm but also any other income arising from her investments outside the firm. By knowing the CEO's tax position, as well as the firm's tax position, you can design a more tax efficient compensation package where efficiency includes the tax position of both parties.

3. If the CEO's actions or available projects from which she can choose are unobservable to the compensation committee (a hidden information problem which is discussed in more detail in chapter 6, but which problem is common in large corporations) then the CEO has to be offered incentives to choose those projects which maximizes the value of the firm (rather than maximizes the utility of the CEO). One solution is to tie part of the CEO's compensation to the payoffs (either accounting earnings or stock price) – this is what bonuses as a function of reported earnings and employee stock options are intended to do.

If the CEO is about to retire and is facing investment decisions that require large current outlays with large future expected payoffs, the firm is said to face an horizon problem: the CEO is looking at short-term results when the firm's shareholders would rather a long-term focus. Again some sort of compensation package (say restricted stock or deferred bonus) that links compensation to the deferred outcomes might be desirable.

Oftentimes the CEO has much wealth (human capital and money) tied to the firm and is thus likely to be more risk averse than shareholders who are likely to hold diversified portfolios. Thus risk averse CEOs might forgo risky but positive net present value projects. Again the compensation package

might include components (such as employee stock options that increase in value as the risk of the firm increases) that encourage increased risk taking by the CEO.

The firm in designing the compensation package thus must not only consider taxes but also what incentives the compensation package might offer the CEO. Oftentimes, the CEO's compensation package is designed with incentive alignment as the first priority and taxes as the second priority. We will discuss this issue in more detail in Chapter Six.

4. Implicit taxes arise because the before-tax investment returns available on tax-favored assets are less than those available on tax-disfavored assets. Taxpayers wishing to obtain the tax-favored treatment offered by the investment bid up the price of the investment lowering the pre-tax rate of return.

Tax clienteles arise because of variation across taxpayers in tax rates. Certain taxpayers are more likely than others to own various kinds of assets or to organize production in particular ways. Taxpayers facing similar marginal tax rates are attracted to the same investments because they offer the highest after-tax rate of return to these taxpayers.

A firm that relies on long-term debt for financing likely faces a high marginal tax rate because the interest payments are tax deductible. Thus issuing debt to fund operations is tax efficient for high tax firms. The owners of distribution facilities (and other buildings and equipment) can deduct the cost of the assets (called depreciation) in calculating taxable income. These tax deductions are most valuable to high tax bracket taxpayers. If the tax depreciation schedule exceeds the rate of economic depreciation then the asset can be labeled as tax-favored and buyers are likely to compete for the asset bidding up the price (leading to the asset bearing implicit taxes). High tax rate taxpayers are the efficient owners of these types of assets. Leasing is often more efficient than buying for low tax bracket taxpayers. Thus if we look at the asset side, we might infer that ABC Corporation faces a low tax rate but when we look at the funding side of the economic balance sheet we might infer that ABC Corporation is a high tax rate corporation. Obviously both inferences cannot be right and thus it is likely that ABC Corporation is in the wrong clientele on one side of the balance sheet: if it is a low tax firm it should not have long-term debt outstanding. If it is a high-tax rate firm, it should not be leasing assets. (This solution focuses on the tax aspects of the problem – as we will learn in later chapters, there might be nontax reasons for the structure of the firm's balance sheet, for example, nontax reasons for leasing.)

## **Chapter 2**

# **Tax Law Fundamentals**

### **Discussion Questions**

1. Appreciation in the price of assets is not taxed until the asset is sold (and income realized). When we apply this rule to investments in corporate stock, stock price appreciation is not taxed until the stock is sold and the gain is realized. This tax treatment encourages investors to buy and hold stock in corporations thus providing equity funds to corporations for their investment needs. However, some large stockholders in an effort to defer the taxation of the gains while at the same time obtaining cash undertake transactions known as “shorting against the box.” This strategy involves the taxpayer borrowing shares of stock equal to the number already owned and then selling the borrowed shares. The taxpayer then sells the borrowed shares thus realizing cash but no taxes are owed because there was no taxable gain on the shares sold. The loan is repaid at a later date by delivering the original appreciated stock. Delivery of the stock also triggers tax on the gain at this later date. The taxpayer has to pay interest on the value of the shares borrowed. It can be argued that this transaction serves no other purpose than to obtain cash today while deferring the taxes on the appreciated securities.

There are numerous other examples but serving no social purpose is a strict standard so one can think of many transactions that are designed to exploit the tax rules that have limited social purposes.

2. a. False. While some tax rules written by Congress are written in the form of very specific restrictions that respond to particular abuses of the tax system that are experienced or anticipated, most tax rules lack the specificity necessary to eliminate ambiguity in the law. Given the enormous range of circumstances in which taxpayers can find themselves, the costs for Congress to pass legislation that is sufficiently comprehensive to cover all situations is greater than the benefits of greater clarity in the tax rules.

b. False. Most tax legislation in the U.S. is initiated in the House. The Constitution (Article 1, Section 7, Clause 1) holds the House responsible for initiating revenue bills (although tax bills could be attached to other bills that originate in the Senate).

c. True. Congress authorizes the Secretary of the Treasury to issue rules and regulations to enforce the Code. The primary purpose of the regulations is to explain and interpret particular sections of the Code. Regulations come in three types: (1) Legislative Regulations where Treasury has been given specific authority to issue a regulation pertaining to a particular section of the Code, (2) Interpretative Regulations that explain the meaning of a particular Code section and commit the Treasury and IRS (but not necessarily the courts) to a particular position, and (3) Procedural Regulations that explain issues such as the information that taxpayers must provide to the IRS and how the IRS is to conduct its affairs. While regulations are considered a direct extension of the lawmaking powers of Congress, revenue rulings are considered an application of the (more limited) administrative power of the IRS and thus have less authority. IRS rulings are also more limited in scope in that they are based on a specific set of facts.

d. True. Revenue Rulings are published as official IRS policy while private letter rulings apply only to the taxpayer requesting the ruling and cannot be cited as precedent in a court of law. Still, private letter rulings are often considered carefully by taxpayers as clues to IRS policy.

e. False. While the courts do not issue regulations per se, court decisions are a source of tax law and the IRS Commissioner is bound by legal precedents.

3. Greater specificity in the law can only be achieved at the higher cost of drafting and legislating. Moreover, where it is expensive for the taxing authority to monitor taxpayers' affairs closely (in other words, in the real world) specific rules can provide greater opportunities for taxpayers to structure their affairs in a way that exploits the rules. Greater specificity in the rules would also impose greater burdens on taxpayers and the taxing authority in learning what the relevant rules are. Once learned, however, greater specificity in the rules would give rise to fewer disputes between taxpayers and the tax collectors regarding tax liabilities.

4. Basically see figure 2.1 and the accompanying text.

5. The Tax Code has multiple objectives: to redistribute wealth in the economy, to raise revenue, and to encourage (or discourage) desired economic activities. These multiple objectives naturally give rise to tax rates varying across different economic activities, tax rates varying across different individual taxpaying units, and tax rates varying for a given taxpaying unit over time. These differential tax rates, in turn, provide strong incentives for taxpayers to engage in tax planning. These incentives are the key ingredients that allow the tax system to be used to implement desired social policy.

As an example, one economic activity that is encouraged is savings for retirement which is subsidized by the tax code in several ways (contributions are tax deductible and earnings in the pension fund are tax deferred until withdrawn in retirement). The wealthy are best placed to take advantage of these incentives. However the objective of redistributing wealth and raising revenue results in Congress placing limits on the deductibility of pension contributions both by amount and with phase outs based on adjusted gross income and filing status.

Basically, Congress balances incentives against lost tax revenue and wealth redistribution giving rise to complexity in the code. As incentives are offered, taxpayers aggressively exploit the incentives to avoid taxes and as the tax revenue lost grows, Congress then introduces additional rules to “plug” the loopholes.

Another cause of complexity is that the tax code allows legislators to allocate benefits in return for votes. Specific provisions are included for targeted groups of taxpayers.

Both these causes of complexity (multiple objectives and vote gathering) are unlikely to be correctable. It is unlikely that Congress will forgo using the Tax Code to achieve multiple objectives and to forgo vote gathering via the code.

6. These judicial doctrines discourage taxpayers from structuring their transactions to minimize taxes while not adhering to the social policy goals of the tax law. They allow the taxing authority to examine a transaction to determine if it has any motivation other than tax avoidance. If not, tax-favored treatment is imperiled. Unfortunately, such doctrines may also discourage socially desirable activities due to taxpayer concern over how the doctrine will be applied in practice. On the positive side, the doctrines also serve to discourage those transactions that are structured to appear, falsely, as contributing to the social goals that motivated the granting of tax-favored treatment to certain types of activities.

7. Shifting income is beneficial when a high-tax-rate taxpayer can shift before-tax income to a low-tax-rate taxpayer. One way this could be effected is for the low-tax-rate taxpayer to “sell” the right to reduced taxes to the high-tax-rate individual by setting the terms of trade accordingly. In the case of related parties, the shifting income may be accomplished *without a quid pro quo*.

Shifting income can be costly in that it typically requires a distortion in asset ownership or control; or it can give rise to distorted patterns of cash flows over time. For example, one way to shift income from high-income to low-income taxpayers is for high-income taxpayers to own tax-sheltered assets, like residential property, that are leased to low-income taxpayers. Another example is the formation of a partnership, where low-tax-rate taxpayers are allocated most of the annual income and high-tax-rate taxpayers are allocated most of the appreciation in the value of the partnership (to be realized on sale or liquidation of the partnership). In each example, the parties' incentives can be affected in unfortunate ways.

In family tax planning, one might transfer income-producing assets to a child with the intention that the earnings will pay for the child's education. A risk, however, is that the child may drop out of school and spend the money foolishly. Another way to transfer income to a low-tax-rate family member is by employing them in a family business. To the extent the family member is ill-suited to the job, such a strategy exacts an efficiency cost.

Under the assignment-of-income doctrine, taxpayers must transfer an income-producing asset to a low-tax-rate taxpayer in order to shift taxable income. Costs arise from the high-tax-rate individual not being able to control what the low-tax-rate individual does with the assets. One way to mitigate these costs is to transfer the assets to a trust and have the trustee manage the assets in a pre-specified manner.

8. Related parties whose interests do not conflict can afford (more than unrelated parties can) to enter into agreements that avoid stating explicitly in a contract the full nature of their transactions. Parties with opposing interests, who rely upon the law to enforce their claims, find such arrangements to be relatively unreliable. Tax laws discriminate against related-party contracts because it is easier for the parties to such contracts to engage in sham transactions designed to avoid taxes than is the case for parties contracting at arm's length.

Discriminating against related parties is not always in society's best interests. The costs associated with enforcing and writing arm's-length contracts can be significantly greater than those involving related parties. For example, a family business might be more efficient than a partnership or corporation comprised of unrelated parties because the mutual trust among family members can substitute for the detailed contracts that would have to be written, and the monitoring that would have to be undertaken, to ensure comparable outcomes.

9. Revenue rulings reduce taxpayer uncertainty regarding the tax treatment of particular transactions. Withholding such rulings can discourage taxpayers from entering into transactions that are granted tax-favored treatment. If the taxing authority wishes to maximize tax collections, withholding revenue rulings may be in its best interest even if it were costless to supply the rulings. Whether this is desirable, however, also depends on the social costs and benefits of the transactions that are discouraged.

An additional cost of revenue rulings, of course, is the personnel cost required to do the research needed to provide the ruling. On the benefit side, revenue rulings can enhance the tax authority's ability to enforce the law by warning it of the types of transactions that taxpayers are contemplating entering into. Where the overall social costs to responding to ruling requests exceed the social benefits, charging a fee to the requesting taxpayer can align social and private costs and benefits better than a system in which there is no charge for such requests.

10. A national sales tax system would not eliminate all incentives to shift economic activities in ways that reduce taxes. Taxpayers would still have incentives to shift activities across periods to secure low-income household benefits as well as to exploit changes in sales tax rates across periods. Taxpayers would still have incentives to repackage goods into those that are granted tax exemption (shifting from one type of activity to another). And taxpayers would still have incentives to have consumption shifted from high-income to low-income “pockets” to secure reduced tax rates. The substance-over-form and business purpose doctrines would remain as important as ever in enforcing the tax law.

11. A flat tax system would not eliminate all incentives to shift economic activities in ways that reduce taxes. Taxpayers would still have incentives to shift activities across periods to defer taxation as well as to exploit changes in tax rates across periods. Taxpayers would still have incentives to restructure activities/transactions into those that are granted tax exemption (shifting from one type of activity to another, small businesses using lots of owner supplied debt – interest deductible to the firm but not taxable to the recipient). And taxpayers would still have incentives to shift income from high-income to low-income “pockets” (those family members with low income such that the high standard exemption reduces their tax bill to zero) to secure reduced tax rates. The substance-over-form and business purpose doctrines would remain as important as ever in enforcing the tax law. (The interested reader is referred to an excellent in-depth analysis of tax planning under a flat tax by Michael Cagari, “Flat Taxes and Effective Tax Planning,” in *National Tax Journal*, December 1998, pp. 689-713.)

And finally given the multiple objectives that Congress uses the Tax Code to pursue (to redistribute wealth in the economy, to raise revenue, and to encourage (or discourage) desired economic activities, as well as being used by individual legislators and the two major political parties to garner political support) we do not believe a flat tax with no itemized deductions is politically feasible in the U.S.

12. To the extent possible defer recognition of much income as possible until next year and accelerate as many deductions as possible to the current period. Deferral of income options: delay payment and receipt of any bonuses until the following tax year (the tax efficiency of this strategy depends on what is happening to the employer's tax rate – if it is also expected to fall, then a careful analysis has to be undertaken – an example of multilateral tax planning.) Do not sell any appreciated assets or securities that give rise to taxable gains until next year. Shift stock portfolio from dividend paying stocks to non-dividend paying stocks to defer income until next period. The taxpayer has to be careful not to run afoul of the constructive receipts doctrine. This doctrine basically prevents taxpayers from turning their backs on income they have already earned and could collect easily. Examples include (1) interest credited on bank accounts where funds are available for withdrawal at any time, and (2) year-end paychecks that can be picked up at the payroll department. The Internal Revenue Service (IRS) has the authority to adjust a taxpayer's method of accounting to ensure that it “clearly reflects income.” Most abuses of accounting methods involve postponing taxable income.

Acceleration of deductions include making an extra mortgage payment at the end of the year qualifying the interest to be deductible in the current period, accelerating any elective medical procedures (provided the sum of the expenditures exceed the lower limit before they become deductible), and increasing to the extent possible any tax deductible personal pension contributions.

## Exercises

1. a. If receive now and invest after-tax proceeds, the taxpayer will accumulate by the end of next period

$$\begin{aligned} & \$100,000(1-t)(1+R(1-t)) \\ & = \$100,000(1-.31)(1+.10(1-.31)) \\ & = \$73,761. \end{aligned}$$

If defer receipt then after-tax will have

$$\$110,000(1-t) = \$75,900.$$

Thus defer receipt for one year.

- b. Equate the two alternatives and solve for R

$$\begin{aligned} & \$100,000(1-t)(1+R(1-t)) = \$110,000(1-t) \\ & 1+R(1-t) = 110,000/100,000 = 1.10 \\ & R = .10/(1-t) = .10/.69 = .1449 \text{ or } 14.49\%. \text{ (check by inserting } R = .1449 \text{ in a).} \end{aligned}$$

- c. If receive now and invest after-tax proceeds, the taxpayer will accumulate by the end of next period

$$\begin{aligned} & \$100,000(1-t_1)(1+R(1-t_2)) \\ & = \$100,000(1-.31)(1+.10(1-.35)) \\ & = \$73,485. \end{aligned}$$

If defer receipt then after-tax will have

$$\$110,000(1-t_2) = \$110,000(1-.35) = \$71,500.$$

Thus take now, do not defer.

- d. Equate the 2 alternatives and solve for  $t_2$

$$\begin{aligned} & \$100,000(1-.31)(1+R(1-t_2)) = \$110,000(1-t_2), \\ & \$69,000(1+.10(1-t_2)) = \$110,000(1-t_2), \\ & 1+.10(1-t_2) = 1.5942(1-t_2), \\ & 1.10 - .10 t_2 = 1.5942 - 1.5942 t_2, \\ & t_2 = .4942/1.4942 = .3307 \text{ or } 33.07\%. \text{ (check by inserting } t_2 = .3307 \text{ in first line).} \end{aligned}$$

2. a. Pretax rate of return,  $R$ , =  $(\$50,000 - \$100,000)/\$100,000 = -50\%$ .

$$\text{b. After-tax rate of return, } r, = \frac{\$50,000(1-.28)}{\$100,000(1-.70)} - 1 = 20\%.$$

(Explain your answer. Do you see any tax planning opportunities?)

3.
  - a. Salary is tax deductible to the business and taxable as ordinary income to the owner-employee.
  - b. Dividends are not tax deductible to the business and taxable as ordinary income to the owner-employee (thus dividends are tax-disfavored relative to salary in this example).
  - c. Fringe benefits are tax deductible to the business and not taxable to the owner-employee (provided part of business wide fringe benefit program). Thus fringe benefits are most tax-favored alternative here (assuming employees value the fringe benefits dollar for dollar with pretax salary).
4. Company A, the high tax company reports zero income while company B reports income of \$1 million and pays tax at a rate of 15% or \$150,000.

The IRS likely will treat these two companies as affiliated entities and tax the two as one combined entity or prorate the \$1 million profit equally across the two companies resulting in a tax bill of  $\$500,000 \times .35 = \$175,000$  for company A and  $\$500,000 \times .15 = \$75,000$  for company B, for a total of \$250,000 tax compared to only \$150,000 under the first arrangement.

5. The IRS agent will argue that the painting was inventory of the gallery business and thus the profit should be taxed as regular income of the gallery (and if organized as a sole proprietorship, the gain will be taxed as ordinary income at the owner's marginal tax rate). The IRS agent likely will argue for application of the substance-over-form doctrine in this case. Capital gains treatment at the individual level requires a holding period of at least 12 months to qualify for the lower long-term capital gains tax rate. Is this satisfied? If not, then either way the gain will be taxed at the taxpayers top marginal tax rate.

- |    |                                  |                                                                                   |
|----|----------------------------------|-----------------------------------------------------------------------------------|
| 6. | a. Tax on gain:                  | $156\text{m} \times (61.00 - 17.62) \times .35 = \$2.368 \text{ billion in tax.}$ |
|    | After-tax gain:                  | $(156\text{m} \times 61.00) \text{ less tax} = \$7.147 \text{ billion.}$          |
|    | b. Dividend income               | $156\text{m} \times 61.00 = \$9.516 \text{ billion}$                              |
|    | Less dividend received deduction | @80% <u>7.613</u>                                                                 |
|    | Taxable income                   | 1.903                                                                             |
|    | Tax @ 35%                        | .666 billion                                                                      |

Thus after-tax gain if treated as a dividend :  $9.516 - .666 = 8.850$   
or tax savings compared to sale treatment  $\$2.368 - \$666 = \$1.702$  billion.

- c. Based on the above numbers the investor corporation has a strong incentive to structure the transaction as a dividend because this treatment saves the investor company \$1.7 billion in tax. There are no tax consequences to the investee company from either treatment. Nontax costs might include Congress and public scrutiny of (and thus political costs for) both companies.

7. Shorting against the box involves borrowing stock and selling it (this is the short part of the strategy). If the taxpayer shorts stock that he already owns this is shorting against the box. That is, the taxpayer instead of selling the shares he already owns, borrows shares in the same company from another investor and sells the borrowed shares. The tax consequences here are that the short sale defers the recognition of the \$9 million gain (and hence the \$1.8 million capital gains tax) until the position is closed



out by the taxpayer delivering the shares he originally owned to the lender of the shares. In the meantime, the taxpayer has use of the short sale proceeds of \$10 million (in most transactions of this type, about 95% of the proceeds are made available to the short seller) while paying margin interest of between 1 to 3% of the proceeds received. Thus basically the strategy allows the taxpayer to lock in gains, receive the cash, and defer the payment of taxes. As noted in the text, Congress curtailed this activity in 1997 via the constructive sale rule (discussed in some detail later in Chapter 18).

## Tax Planning Problems

1. We assume the taxpayer is an individual (the rules differ for corporations and are discussed later in the text). Capital losses can only be used to offset capital gains. \$3,000 of any excess capital losses in a given year (capital losses less capital gains) can be deducted against ordinary income, with the remainder being carried forward indefinitely to be offset against future capital gains or deducted at a rate of \$3,000 per year.

The taxpayer needs, if possible, to generate capital gains to use up the capital losses. Part-time employment generates ordinary income and thus offers no benefit insofar as allowing increased use of the capital losses. Buying and renovating the house and then selling might generate capital gains if the taxpayer treats the property as investment property. (The rules with respect to short-term and long-term gains and losses and the netting of the gains and losses are complex and beyond the scope of this text and problem – thus we ignore discussion of the holding period in this problem).

2. Taxpayer A has salary of \$50,000 which is subject to taxation. Taxpayer B, even though a carpenter by trade, is not taxed on the value of her services on the house. Goods and services produced for the taxpayer's own consumption are not included as part of the taxpayer's gross income and are therefore not taxed. This is known as in-kind income. Since tax code changes introduced in 1997, if taxpayer A lives in the house for at least two of the five years before selling it, then if married (single) she can exclude \$500,000 (\$250,000) of any gain (selling price less tax basis) from taxable income. Thus the value of the taxpayer's services in renovating the house escapes taxation even though the renovation increased the value of the house. Note that the exclusion of the gain can only be taken once every two years and the taxpayer has to be careful not to be treated as engaging in a business of renovating and selling houses where any gain would then be treated as ordinary income. The taxpayer by living in the house for at least two years likely avoids being treated as a business.

3. The loan to the corporation generates interest deductions for the corporation and assuming the new corporation generates sufficient income to use the deductions the interest deductions then generate an immediate tax benefit. However, the interest income is also taxable to the lender – the owner taxpayer in this case. If the corporation and the taxpayer face the same tax rates, then the net tax is zero. If the corporation faces a lower tax rate (because for example, it is a new corporation with start-up losses) then there is a net tax payment to the tax authorities.

Dividends are not tax deductible to the corporation and are taxed as ordinary income to the recipient. Presumably the corporation will not pay dividends to avoid this unfavorable tax position. Any increase in value of the firm (more specifically, in the value of the equity) is deferred until the taxpayer sells the shares and then any gain is taxed at favorable capital gains rates.

Thus the taxpayer has to consider the tax rate of the corporation and herself when evaluating the amount of debt to put in the corporation. Non-dividend equity is probably a better alternative and to the extent the taxpayer needs income, the firm can pay compensation (deductible to the firm and taxable to the recipient) which offers more flexibility in the timing and amount of payments relative to debt.

4. Since the interest on the borrowed funds can only be deducted against other investment income, purchase of non-dividend paying stock generates no annual investment income and thus the interest is not tax deductible. The interest is deductible against any gain arising from the later sale of the stock. Whether this is a good strategy depends on the annual appreciation in the stock price. Note also that any gain would be treated as a capital gain (provided the stock is held long enough to satisfy the required holding periods) taxed at a lower rate. Thus the interest deduction under this strategy is both deferred and effectively deducted at lower capital gains tax rates instead of being deducted at ordinary rates against other investment income in the period incurred if the taxpayer were to invest in investment income generating assets.

(Note that if the loan was secured against the taxpayer's residence then the interest might qualify for deduction as home mortgage interest deduction – which is deductible up to certain limits).

5. a. Shortening the carryback period will likely result in more losses being carried forward reducing the expected present value of the tax savings from the losses. Lengthening the carryforward offsets the probability that the increased losses now being carried forward would expire unused under the old 15 year carryforward period.

b. In 1997 the firm can carryback losses three years. If there is no change in plans the \$250,000 loss gives rise to a refund of \$87,500 ( $250,000 \times .35$ ) with expected taxes in 1998 of \$175,000 ( $500,000 \times .35$ ). If defer \$50,000 of income from 1997 to 1998 this increases the 1997 loss by \$50,000 to \$300,000 which all can be carried back to obtain a refund of \$105,000 ( $300,000 \times .35$ ). Expected taxes in 1998 are \$192,500 ( $550,000 \times .35$ ). That is, the refund increases by 17,500 ( $50,000 \times .35$ ) in 1997 but taxes increase by a similar amount in 1998. Thus the firm gains the use of \$17,500 for one year which at an after-tax earnings rate of 6% can be invested to earn \$1,050.

Note that there is no incremental advantage to increasing the firm's loss in 1997 arising from the reduction in the carryback period. The gain above arises from the standard tax planning rule of, all else equal, defer paying taxes (because the money saved on taxes can be reinvested to earn additional income).

c. Carryback results in additional tax savings of  $.45 \times \$50,000 = \$22,500$  (compared to \$17,500 in b when the tax rate in the carryback period was 35%). Assuming the tax rate in 1998 is 35% the additional \$50,000 income in 1998 gives rise to an additional tax of \$17,500 (same as part b). Thus the tax savings here are an additional refund of \$5,000 without an incremental increase in future taxes. The \$5,000 can also be calculated as  $\$50,000 \times (.45 - .35)$ . Note also the \$5,000 can also be reinvested in 1997 to earn additional income. Thus when tax rates are expected to decline in the future and the firm has losses in the current period which can be carried back, then it is tax advantageous to increase the magnitude of the losses by deferring income or accelerating deductions (ignoring any nontax costs associated with these strategies).

d. Carryforward a loss when the tax rate in the future is expected to be greater than the tax rate of the carryback period. Note also that carrying forward a loss delays the refund and thus the foregone earnings on the refund. It can be shown carryforward is optimal if

$$t_b(1+r)^s < t_f$$

where  $t_b$  is the tax rate during the carryback period,  $t_f$  is the tax rate during the carryforward period when the loss is eventually deducted,  $r$  is the firm's after-tax earnings rate, and  $s$  is the number of periods before the loss will be used up in the carryforward period.

To illustrate, suppose  $t_b = .30$ ,  $t_f = .40$ , and  $r = .05$ . With a one-year carryforward, ( $s=1$ ) then the left hand side of the above equation equals  $.30(1.05) = .315$  which is less than  $.40$ . That is, if the firm carries back a dollar of losses, it obtains a refund of 30 cents which it can invest at 5% for one period accumulating to 31.5 cents at the end of the next period. If the loss is carried forward to obtain a refund next period the firm has 40 cents. Carryforward is preferred. If  $s = 5$  years, then carryback with reinvestment of the refund accumulates to  $.30(1.05)^5 = 38.3$  cents, still less than the 40 cents from the refund. A carryforward period of 6 years equates the two alternatives. Waiting any longer than 6 years to use up the loss carryforward is not tax favored because immediate carryback and reinvestment accumulates to more than 40 cents.

6. a. A taxpayer engaged in a trade or business can deduct the business losses against other income such as salary. Congress believes hobbies are pursued as a pleasure activity for personal enjoyment without a profit motive. Congress wishes to distinguish between the two because it does not want to allow tax deductions for taxpayers' expenditures on their recreation or hobby activities. Further, some taxpayers might aggressively exploit the rules to reduce their tax bills by running their "businesses" at losses so as to shelter their other income.

b. Rules that you might consider:

Is the activity engaged in for profit or is it purely a recreational activity? But how does one determine this motive? Number of loss years versus number of profit years?

Are records kept in a business like manner?

How much time does the taxpayer spend on the activity?

Are other taxpayers' actively engaged in this type of activity as a business?

Do other taxpayers report taxable income in this business?

c. If they have kept records and the wife is actively involved in the activity under the above rules the activity would probably be treated as a business because the taxpayers spent \$25,000 on kennels and purchased multiple breeding females.

d. See Treasury Regulation § 183-2(b).

Difficult call. IRS would likely initially classify as hobby and then taxpayer might appeal. Does not help that the couple are dog lovers (recreational overtones) and the taxpayer is a CEO of a corporation (likely looking for tax shelter).

e. Expenditure on kennel is expenditure on an asset expected to contribute benefits for a number of years. Thus will be depreciated over a number of years rather than deducted in year of expenditure.

Vet fees probably deductible in year of expenditure.

Cost of breeding females – capital expenditure thus will be amortized over the expected breeding lives of the dogs.

Food and sundry supplies – probably deductible in year of expenditure.

## Solutions to Chapter 3

### Returns on Alternative Savings Vehicles

#### Discussion Questions

1. Alternative savings vehicles are distinguished by (1) whether deposits into the savings accounts give rise to an immediate tax deduction, (2) the frequency with which investment earnings are taxed, and (3) the rate at which the investment earnings are taxed.

2. First, as indicated in Table 3.1, the insurance contracts are indeed tax-exempt. Moreover, in the absence of transaction costs, they accrue interest at the before-tax rate of return available on fully-taxable bonds. While municipal bonds are also exempt from explicit taxes, they are taxed implicitly in that they are priced to yield a pretax return below that on fully-taxable bonds. Thus, tax-exempt bonds are not perfect substitutes for these insurance savings vehicles.

This begs the question of how tax-exempt bonds and life insurance contracts can co-exist. That is, why would anyone invest in tax-exempt bonds bearing implicit tax when life insurance contracts are available? We take up this issue in later chapters, but by way of preview, the answer relates to market frictions (that is, transaction costs) and certain tax rule restrictions. Note that the anomaly of the co-existence of tax-exempt bonds and life insurance contracts is no different in substance from the anomaly surrounding the presence of *other* dominated savings vehicles discussed in Chapter Three.

3. An SPDA provides greater after-tax rates of return than a money market account because the investment earnings in an SPDA compound at the before-tax rate of return  $R$ , rather than at the after-tax rate of return,  $R(1 - t)$ . Consider the following example:

$$R = 10\%, t = 30\%, n = 10 \text{ years}$$

SPDA accumulated return for each dollar,  $I$ , invested is

$$\$I(1+R)^n - t[\$I(1+R)^n - \$I]$$

where the first term is the pretax accumulation and the second term is the tax due on the earnings. This equation can be simplified to

$$\begin{aligned} & \$I(1+R)^n - t\$I(1+R)^n + t\$I \\ &= \$I(1+R)^n (1-t) + t\$I \\ &= (1 + .10)^{10}(1-.30) + .30 \\ &= \$2.116 \end{aligned}$$

This implies an annualized after-tax rate of return,  $r_{SPDA}$ :

$$\begin{aligned} (1 + r_{SPDA})^{10} &= 2.116 \\ r_{SPDA} &= (2.116)^{1/10} - 1 = .078 \end{aligned}$$

More generally,  $r_{SPDA}$  solves

$$\begin{aligned} (1 + r_{SPDA})^n &= (1 + R)^n (1-t) + t \\ r_{SPDA} &= [(1 + R)^n (1-t) + t]^{1/n} - 1 \end{aligned}$$

Money market account accumulated return for each dollar, I, invested

$$\begin{aligned} & (1 + R[1-t])^n \\ &= (1 + .10[1 - .30])^{10} \\ &= \$1.967 \end{aligned}$$

The money market annualized after-tax rate of return,  $r_{mm}$ :

$$\begin{aligned} (1 + r_{mm})^{10} &= 1.967 \\ r_{mm} &= (1.967)^{1/10} - 1 = .07 \end{aligned}$$

More generally,  $r_{mm}$  solves

$$\begin{aligned} (1 + r_{mm})^n &= (1 + R[1 - t])^n \\ r_{mm} &= R(1 - t) \end{aligned}$$

Because taxes are not deferred, the length of the holding period does not affect the after-tax rate of return on money market accounts. The investment grows at the after-tax rate. We can see this immediately from the accumulation formula in Table 3.1 for the money market account: its  $n$ 'th root,  $1 + R(1 - t)$ , does not depend on  $n$ . In contrast, the  $n$ 'th root of the accumulation formula for the SPDA *does* depend on  $n$ . Moreover, it *increases* with  $n$ . To see this, note that the “ $t$ ” term in the accumulation factor becomes inconsequential as  $n$  increases (the fact that the original dollar is not taxed is unimportant) and thus the  $n$ 'th root approximates  $(1+R)$  times the  $n$ 'th root of  $(1 - t)$ . But the  $n$ 'th root of  $(1 - t)$  increases with  $n$  (in the limit, it converges to 1). For instance, for  $n=100$ :

$$\begin{aligned} r_{SPDA} &= [(1 + R)^n (1 - t) + t]^{1/n} - 1 \\ &= [(1 + .10)^{100} (1 - .30) + .30]^{1/100} - 1 \\ &= 9.61\% \end{aligned}$$

And for  $n = 1,000$ ,  $r_{SPDA} = 9.96\%$ .

The advantage of the SPDA contract over the money market account grows with the level of interest rates. Note, for example, that at an interest rate,  $R$ , of 0%, SPDAs and money market accounts have equal after-tax accumulations. For  $R = 10\%$ ,  $t = 30\%$ , and  $n = 10$  years, we showed above that SPDAs accumulate to \$2.116 after-tax for each dollar invested, while money markets accounts accumulate to \$1.967. That is, the SPDA accumulation is 7.6% greater than the money market accumulation. For  $R = 20\%$ ,  $t = 30\%$ , and  $n = 10$  years, SPDAs accumulate to \$4.634 per dollar invested, versus \$3.707 for the money market account. Here, the SPDA accumulation is 22.3% greater than the money market accumulation.

4. An investment that is taxed each period at capital gains rates, Vehicle III, is preferred to an SPDA contract, Vehicle II, when capital gains tax rate is low relative to the tax rate on ordinary income, or the holding period,  $n$ , is small. The advantage of the SPDA is that the investor defers taxes, and the longer the holding period, the more pronounced this advantage. The advantage of Vehicle III is that the tax rate is smaller each period and the advantage increases with the smaller the capital gains tax rate  $t_{cg}$ . Consider the previous example with  $t_{cg} = t$  and  $n = 10$ :

With  $t_{cg} = t$ , all of the income is taxed at the rate  $t$  each period. Thus Vehicle III is equivalent to Vehicle I and the previous analysis (see solution to discussion question 3) applies. For  $n > 1$ , we know that vehicle II will be preferred to Vehicle III if  $t_{cg} = t$ . Consider the return to Vehicle III if  $t_{cg} = .10$  of  $t$ .

$$R = 10\%, t = 30\%, n = 10, t_{cg} = (.10 \text{ of } t) = .03.$$

Recall that the SPDA accumulated return (from the solution to question 3) is \$2.116 in this case, and the annualized rate of return is 7.8%. Now consider Vehicle III.

$$\begin{aligned} & (1 + R[1 - t_{cg}])^n \\ &= (1 + .10[1 - .03])^{10} \\ &= \$2.524 \end{aligned}$$

The vehicle III annualized after-tax rate of return,  $r_{III}$ :

$$\begin{aligned} (1 + r_{III})^{10} &= 2.524 \\ r_{III} &= (2.524)^{1/10} - 1 = .097 \end{aligned}$$

More generally,  $r_{III}$  solves

$$\begin{aligned} (1 + r_{III})^n &= (1 + R[1 - t_{cg}])^n \\ r_{III} &= R(1 - t_{cg}) \end{aligned}$$

The after-tax return on Vehicle IV, on the other hand, is always greater than an SPDA's return except when  $t_{cg} = t$ . In this special case, capital gains are taxed as ordinary income and the vehicles are identical.

5. Since deposits into a pension fund, Vehicle VI, are tax deductible, a one dollar investment in the fund is equivalent to  $(1 - t)$  dollars invested by the taxpayer and  $t$  dollars invested by the government in the form of a tax refund for the dollar invested in the pension plan. When the dollar has grown at the before-tax rate  $R$  for  $n$  periods, the proceeds  $(1 + R)^n$  are taxed fully at rate  $t$ . Hence the after-tax proceeds from the  $(1 - t)$  dollars of after-tax investment by the individual are  $(1 + R)^n(1 - t)$ . This yields an after-tax accumulation per dollar invested of  $(1 + R)^n$ . This is the same after-tax accumulation as that on the savings portion of a life insurance policy, vehicle V, for which deposits are not tax deductible but earnings are exempt from taxes.

In comparing any two savings vehicles, one must compare the after-tax accumulation from the same number of after-tax dollars invested. This means that more dollars must be invested in those savings vehicles that give rise to immediate tax deductions than in savings vehicles that do not give rise to immediate tax deductions. More specifically,  $[1/(1-t)]$  dollars must be invested in a savings vehicle that yields immediate tax deductions for each dollar invested in a savings vehicle that yields no tax deductions.

6. Taxpayers may choose to save through a money market account to maintain liquidity. While it is virtually costless to withdraw funds from a money market account, there are typically penalties for early withdrawal of pension or insurance funds, and pension funds can not be used as collateral for a loan or else the tax exempt feature of the pension trust will be lost. Insurance contracts, as the name suggests, include an insurance component. Some investors may not value this insurance as highly as it costs to purchase it.

7. If tax rates are decreasing over time, pension accounts dominate tax-exempt savings accounts. If tax rates are increasing, however, tax-exempt savings accounts dominate. If pension contributions yield tax deductions at rate  $t_o$  and the pension accumulation is taxed  $n$  years later at rate  $t_n$ , each after-tax dollar invested in the pension fund yields an after-tax accumulation in  $n$  years of

$$(1 + R)^n(1 - t_n)/(1 - t_o)$$

If  $t_n < t_o$ , this is greater than the accumulation of  $(1 + R)^n$  from a tax-exempt savings account, and if  $t_n > t_o$ , it is less.

8. The main attraction of SPDAs and pension accounts over money market accounts is that taxes on earnings are not paid until the accounts are liquidated at some date in the future. If tax rates are rising, then the taxes paid upon liquidation will be high relative to those paid each period on the earnings from a money market account. When tax rates are falling, the taxes paid on liquidation will be lower than the average rates of tax paid on the earnings from money market accounts. Rising tax rates therefore make SPDAs and pension accounts less attractive while falling tax rates make them more attractive.

9. Contributing \$I every year is an annuity contribution. Instead of using the future value (FV) of a single dollar accumulation ( $FV = [1 + R]^n$ ), we would substitute the future value of an ordinary annuity ( $FVA = [(1 + R)^n - 1]/R$  (or look up the FVA value from present value tables). Thus, equation (3.6) becomes (where contributing the maximum to both accounts each year)

$$\begin{aligned} \text{Roth Accumulation - Deductible IRA/SPDA Accumulation} \\ &= \$2,000(FVA) - \{ \$2,000(FVA)(1 - t_n) + \$2,000t_t[(FVA)(1 - t_n) + t_n] \} \\ &= \$2,000(FVA)t_n - \$2,000t_t[(FVA)(1 - t_n) + t_n] \end{aligned} \quad (3.6')$$

Note that the amount put into the SPDA each period  $t$ ,  $\$2,000t_t$ , depends on the taxpayer's tax rate in period  $t$ , thus we subscript it with  $t$ . The Roth IRA is preferred if (3.6') is positive.

10. This election might not make sense if the taxpayer expects his tax rate to increase in the next three years. The taxpayer has to compare the tax paid today with the present value of the tax to be paid over the 4 years. Whichever present value is lower is the favored alternative. More formally, let  $V$  denote the gain on rollover, and  $t_1, t_2, t_3, t_4$  denote the taxpayer's tax rate in periods, 1, 2, 3, and 4, respectively. The taxpayer can invest at an after-tax rate of  $r$ . We assume the taxpayer is making the decision at the end of the first period, period 1. Thus include entire amount of gain,  $V$ , in the current period if

$$Vt_1 < [(V/4)t_1] + [(V/4)t_2]/(1+r) + [(V/4)t_3]/(1+r)^2 + [(V/4)t_4]/(1+r)^3$$

## Exercises

1.
  - a. Money market fund (SV I):  $\$1,000(1 + .08(1 - .25))^{20} = \$3,207.14$ .  
Land investment (SV II):  $\$1,000(1 + .07)^{20}(1 - .25) + .25(1,000) = \$3,152.26$ .
  - b. Money market fund:  $r_{mm} = (3,207.14/1000)^{1/20} - 1 = .06$  (also  $r = R(1 - t) = .08(1 - .25) = .06$ .)  
Land investment  $r = (3,152.26/1000)^{1/20} - 1 = .0591$ .



