

“Complete” Accrual Taxation

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I. INTRODUCTION

The realization rule has been referred to as the Achilles' heel of the income tax,¹ and for good reason. Under this rule, accrued gains and losses generally are not taken into account for income tax purposes until a disposition occurs.² Thus, the realization rule is responsible for tax deferral, which in turn likely leads to economic inefficiencies and inequities. The realization rule also contributes greatly to the complexity

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1. See William D. Andrews, *The Achilles' Heel of the Comprehensive Income Tax*, in *NEW DIRECTIONS IN FEDERAL TAX POLICY FOR THE 1980S* 278 (Charles E. Walker & Mark A. Bloomfield eds., 1983).

2. See I.R.C. § 1001 (1994). In limited circumstances, gains and losses are recognized prior to dispositions. Section 1256 requires that certain future contracts and options be treated for recognition purposes as sold for their fair market value on the last day of the taxable year (referred to as marking to market). I.R.C. § 1256 (1994). In addition, section 475, which was added by the 1993 Revenue Reconciliation Act, provides mark-to-market treatment for securities dealers. I.R.C. § 475 (1994). Furthermore, although not representing an actual decline in the value of property, depreciation deductions are allowed over the statutory life of depreciable property. See I.R.C. §§ 167, 168 (1994 & West Supp. 1996).

of the federal income tax system by necessitating numerous Internal Revenue Code (Code) provisions that address the many consequences arising from a decision to postpone taxation until a disposition occurs.

An alternative to the realization rule is accrual taxation—the inclusion in the tax base of annual increases and decreases in the value of property, regardless of disposition. Accrual taxation may improve economic efficiency and equity, and certainly would obviate a substantial portion of the Code. Yet, accrual taxation presents serious problems of its own—the difficulty of valuing assets and possible taxpayer illiquidity.³ For these reasons, few have supported such a system.⁴

3. See, e.g., DEPARTMENT OF THE TREASURY, BLUEPRINTS FOR BASIC TAX REFORM 81 (1977) [hereinafter BLUEPRINTS] (referring to valuation and liquidity, along with the burden of annual reporting, as posing insurmountable problems).

Valuation and liquidity are problems raised by accrual taxation, but constitutionality is not. See Noël B. Cunningham & Deborah H. Schenk, *Taxation Without Realization: A "Revolutionary" Approach to Ownership*, 47 TAX L. REV. 725, 741 (1992). Although *Eisner v. Macomber*, 252 U.S. 189 (1920), could be interpreted as constitutionally mandating realization, no cases since *Eisner* support this view. See, e.g., *Murphy v. United States*, 992 F.2d 929 (9th Cir. 1993) (holding that mark-to-market taxation of futures contracts is constitutional). Moreover, the realization rule has been abandoned in a number of circumstances. See, e.g., I.R.C. §§ 475, 1256, 1272 (1994).

4. Among the literature calling for an accrual tax system are David J. Shakow, *Taxation Without Realization: A Proposal For Accrual Taxation*, 134 U. PA. L. REV. 1111 (1986); David Slawson, *Taxing as Ordinary Income the Appreciation of Publicly Held Stock*, 76 YALE L. J. 623 (1967); Victor Thuronyi, *The Taxation of Corporate Income—A Proposal for Reform*, 2 AM. J. TAX POL'Y 109 (1983); *A Proposal for Revision of Capital Gains Tax Provisions of the Federal Internal Revenue Code and Critique of Treasury Proposals in Related Areas: Hearings on the Subject of Tax Reform Before the House Comm. on Ways and Means*, 91st Cong., 1st Sess. (1969) (statement of Martin David and Roger Miller), reprinted in TAX REFORM, 1969 4275 (U.S. Gov't Printing Office, 1969) [hereinafter David & Miller]; John B. Shoven & Paul Taubman, *Saving, Capital Income, and Taxation*, in THE ECONOMICS OF TAXATION 203, 211-13 (Henry J. Aaron & Michael J. Boskin eds., 1980); Mark L. Louie, Note, *Realizing Appreciation Without Sale: Accrual Taxation of Capital Gains on Marketable Securities*, 34 STAN. L. REV. 857 (1982); Carl S. Shoup, *The White Paper: Accrual Accounting for Capital Gains and Losses*, 18 CANADIAN TAX J. 96 (1970) [hereinafter Shoup, *The White Paper*]; CARL SHOUP ET AL., COMMITTEE ON TAXATION OF THE TWENTIETH CENTURY FUND, INC., FACING THE TAX PROBLEM 484-91 (1937). On the other hand, accrual taxation has had more than its share of detractors. See, e.g., BLUEPRINTS, *supra* note 3, at 81 (pointing out the insurmountable problems of valuation, illiquidity, and annual reporting); Special Committee on Simplification, Section of Taxation, American

And the rare proposals made are merely calls for partial accrual taxation.⁵

This Article considers and analyzes "complete" accrual taxation. Actually, like those in prior proposals, the system considered here also excludes certain assets as well as the imputed income on consumer items. However, this accrual system is more complete in that it seeks to value and tax on an annual basis what are likely the most difficult-to-value assets—nonmarketed business interests and collectibles. To value these assets, this Article suggests the use of computer software, in particular, artificial intelligence. Computer technology finally may allow the income tax system to deal with valuation and realize the benefits therefrom.⁶

Part II of this Article sets forth an outline of the complete accrual tax system, which will serve as the focus of further expansion and analysis. Part III engages in a rigorous examination of the benefits resulting from complete accrual taxation, in particular, the extent to which the tax

Bar Association, *Evaluation of the Proposed Model Comprehensive Income Tax*, 32 TAX LAW. 563, 588 [hereinafter ABA, *Evaluation*] (although recognizing the conceptual basis for accrual taxation, agreeing with *Blueprints* that the practical problems involved are too great); Douglas A. Kahn, *Accelerated Depreciation—Tax Expenditure or Proper Allowance for Measuring Net Income?*, 78 MICH. L. REV. 1, 8-9 (noting valuation difficulties and illiquidity, as well as unfairness); Andrews, *supra* note 1, at 280-85 (pointing out impracticality of accrual taxation).

5. See Shakow, *supra* note 4, at 1134-37, 1144, 1153-54, 1157-58 (excluding personal residences, consumer durables (including collectibles) with purchase prices below a certain amount, and effectively excluding nonmarketed business interests); Slawson, *supra* note 4 (limiting the coverage of accrual taxation to publicly traded stock); Thuronyi, *supra* note 4 (concurring); David & Miller, *supra* note 4, at 4218-82 (excluding personal property from accrual taxation); Shoven & Taubman, *supra* note 4, at 212-13 (annually taxing the owners on the imputed accounting income of a closely held business, as opposed to the value of the owners' interests in the business); Louie, *supra* note 4 (limiting accrual taxation to publicly traded securities).

6. This Article does not address the relative merits of an income tax versus a consumption tax and instead *assumes* that income is the proper tax base. For an analysis of the relative merits of income and consumption taxes, see John S. Nolan, *The Merit of an Income Tax Versus a Consumption Tax*, 71 TAX NOTES 805 (1996). It should be noted that consumption tax advocates view the inequities, distortions, and complexities brought on by the realization requirement as an important reason for the desire to abandon the income tax. See, e.g., William D. Andrews, *A Consumption-Type or Cash Flow Personal Income Tax*, 87 HARV. L. REV. 1113, 1115-16, 1139-40 (1974). Consequently, the possibility of implementing an accrual tax system through the use of computer technology may figure prominently in the ongoing debate of whether to replace the income tax with a consumption tax.

system can be made more economically efficient, more equitable, and less complex. Part IV then compares these consequences of complete accrual taxation to the consequences of adopting other alternatives to the realization rule, specifically, retrospective, partial accrual, and expected return taxation. Part V explores in some detail a computerized valuation system for nonmarketed business interests, collectibles, and real estate. Part VI offers a solution to the liquidity problem, which again involves the use of computer technology. Part VII deals with the special considerations involving consumer items. Part VIII addresses the legitimate privacy concerns raised by a federally run computerized valuation system. Part IX concludes the Article.

II. OUTLINE OF THE COMPLETE ACCRUAL TAX SYSTEM

This section provides an outline of the system for achieving complete accrual taxation that will be expanded upon and analyzed throughout the remainder of this Article.

Under the system, the difference in values for a given asset from one year to the next (that is, an estimate of annual appreciation or depreciation) would be included in the asset owner's tax base as income or deductions, as the case may be. An asset would have an adjusted basis equal to its most recent annual value, so that upon a sale or other disposition the difference between the amount received and this latest value would be reported either as income or as a deduction.

All assets⁷ would be subject to accrual taxation, except for consumer durables and collectibles with a purchase price below a certain amount. In addition, the system would not tax the imputed income on consumer items.⁸

By using computerized valuation techniques, the IRS would determine annual asset values for real estate, nonmarketed business interests, and collectibles. The IRS would then send taxpayers annual valuation statements with respect to these assets.

In order to eliminate distortions due to inflation, asset bases would be indexed to reflect inflation. This would be accomplished by having IRS computers increase the previous year's asset value by the inflation factor announced by the federal government. With respect to those assets not subject to the IRS valuation system—for example, publicly traded

7. While the discussion in this Article focuses on valuing assets, the complete accrual tax system would also apply to liabilities, given that their value can change. See Shakow, *supra* note 4, at 1163. See *infra* note 317 for a method of valuing liabilities.

8. See *infra* Part III.B.3. (discussing possible modifications to this feature).

stock—taxpayers would multiply the value of the asset at the end of the previous year by the appropriate inflation factor.⁹

Under the system, a taxpayer owning stock in a C corporation would include in her tax base (i) the value of any amounts received during the year from the corporation, and (ii) the annual change in the value of her stock ownership in the corporation, taking into account any contributions she made during the year.¹⁰ Similarly, taxpayers who own interests in other types of business entities—such as partnerships, S corporations, and limited liability companies—would include in their tax base (i) the value of any amounts received from the entity during the year, and (ii) the annual change in the value of the taxpayers' interest in the entity, taking into account any contributions the taxpayers made during the year.¹¹ This business "net worth" method should be used for taxing owners of sole proprietorships as well.¹² The business net worth method is consistent with the practices for valuing businesses, under which a business is typically valued as a whole rather than on the basis of its separate assets.¹³ Under this approach, business transactions conducted by a partnership, S corporation, limited liability company, or sole proprietorship would indirectly—as opposed to directly—affect the tax liability of its owners, as the income and expenses relating to such transactions would be used in determining the annual net worth of the business.¹⁴

9. Cf. Daniel Halperin & Eugene Steuerle, *Indexing the Tax System for Inflation*, in UNEASY COMPROMISE 347, 360-61 (Henry J. Aaron et al. eds., 1988) (suggesting this method for implementing indexation under an accrual tax system).

10. See Thuronyi, *supra* note 4, at 121; Shoven & Taubman, *supra* note 4, at 211.

11. Germany uses a similar approach to tax partnerships. See Walter D. Schwidetzky, *A Comparison of Partnership Income Taxation in the United States and Germany: A Study in Differences*, 10 AM. U. J. INT'L L. & POL'Y 1331, 1335-36 (1995).

12. Because a sole proprietorship is not a separate legal entity, its assets, liabilities, and bank accounts would need to be designated as belonging to the sole proprietorship for tax purposes to properly value the business. For a recommendation of a similar designation procedure for the assets, etc. of a nonlegal entity, see Fred B. Brown, *Federal Income Taxation of U.S. Branches of Foreign Corporations: Separate Entity or Separate Rules?*, 49 TAX L. REV. 133, 154 (1993).

13. See SHANNON P. PRATT, VALUING A BUSINESS: THE ANALYSIS AND APPRAISAL OF CLOSELY HELD COMPANIES 43 (2d ed. 1989).

14. See *infra* Part V.B.3.a.(iii).

With complete accrual taxation, it would be advisable to repeal the corporate income tax. In this regard, several of the accrual taxation proposals also call for the elimination of the corporate income tax. See e.g., Shakow, *supra* note 4, at 1135; Thuronyi, *supra* note 4, at 109; Shoven & Taubman, *supra* note 4, at 212. The separate tax on

III. THE CASE FOR COMPLETE ACCRUAL TAXATION

A. *A Comprehensive Tax Base Includes Unrealized Appreciation and Depreciation*

It is often acknowledged that an ideal income tax base includes unrealized appreciation and depreciation.¹⁵ The conceptual basis for this view is the widely accepted Haig-Simons definition of income,

C corporations is justified as a surrogate for taxing the shareholders on corporate income. See John K. McNulty, Commentary, *Preserving the Virtues of Subchapter S in an Integrated World*, 47 TAX L. REV. 681, 684-85 (1992). Since with accrual taxation the shareholders would be taxed annually in the change in value of their shares, this rationale for the corporate income tax would no longer apply. Moreover, retaining the corporate income tax would further complicate complete accrual taxation's economic efficiency and equity consequences, given that the effective tax rates on activities conducted through C corporations would exceed the effective tax rates applicable to other business activities. See *infra* Part III.B. For an analysis of the efficiency consequences of corporate integration, see Emil M. Sunley, *Corporate Integration: An Economic Perspective*, 47 TAX L. REV. 621 (1992). However, raising revenue still may be a concern. Thus, while elimination of the corporate income tax may promote economic efficiency and equity, budgetary constraints may stand in the way.

If C corporations continue to be subject to the corporate income tax, the net worth method could be used to tax them as well. That is, a corporation's annual economic income should equal the annual change in value of its net assets, as adjusted for distributions to, and contributions from, shareholders. For publicly traded corporations, the net value of the corporation's assets should nearly equal the aggregate value of the corporation's stock plus a control premium. (The effect of the corporate income tax on the value of shares would seem to cause some deviation between share values, plus a control premium, and net asset values.) For a discussion of control premiums, see *infra* Part V.B.3.a.(iii)(e). Consequently, the change in the aggregate value of a publicly traded corporation's shares could be a basis for determining the corporate income tax. See Joseph Bankman, *A Market-Value Based Corporate Income Tax*, 68 TAX NOTES 1347 (1995), for a similar proposal. Alternately, the corporate income tax base could be determined as under current law, that is, based on the separate transactions of the company, except with the changes brought on by complete accrual taxation. Since the complete accrual taxation system does not separately value and tax accrued gains (or losses) on business intangibles, but instead reaches these amounts by taxing the change in value of the business interests, this alternative method for measuring and taxing corporate income would not reach the accrued income on the corporation's intangibles. For closely held C corporations, either the net worth method—based on the value of the business—or a separate transaction method could be used as a basis for determining the corporate income tax base.

15. See e.g., Shakow, *supra* note 4, at 1114; Slawson, *supra* note 4, at 624; Andrews, *supra* note 6, at 1113-16; Louis Kaplow, *Human Capital Under an Ideal Income Tax*, 80 VA. L. REV. 1477, 1477 n.1 (1994). Indeed, the Treasury Department recognized that including unrealized appreciation and depreciation in the income tax base would be in line with the Haig-Simons definition, but decided against inclusion for administrative reasons. See BLUEPRINTS, *supra* note 3, at 75-81; see also ABA, *Evaluation*, *supra* note 4, at 588 (although recognizing the conceptual basis for accrual taxation, agreeing with BLUEPRINTS that the practical problems are too great).

which provides that income is the sum of consumption plus change in net worth.¹⁶ Haig-Simons taxation requires that all economic income be included in the tax base. Given that unrealized appreciation and depreciation affect a taxpayer's net worth,¹⁷ such appreciation and depreciation should be included as it accrues in a tax base reflecting economic income.¹⁸

Furthermore, unrealized gains should not be viewed as outside the coverage of the income tax merely because the gains have not been reduced to cash. Like cash, unrealized gains can add to a taxpayer's spendable income through a taxpayer's ability to raise cash proceeds by borrowing against appreciated assets.¹⁹ Moreover, taxing unrealized gains is supported by what is perhaps the most prominent justification for the income tax, as opposed to a consumption tax: Intangible benefits which flow from owning wealth, such as prestige benefits, power benefits, and security benefits, should be included in the tax base; an income tax reaches these benefits indirectly by taxing, and taking away, part of any increases to wealth.²⁰ Therefore, based on this theoretical

16. See Robert M. Haig, *The Concept of Income—Economic and Legal Aspects*, in READINGS IN THE ECONOMICS OF TAXATION 54 (Richard A. Musgrave & Carl S. Shoup eds., 1959); HENRY C. SIMONS, PERSONAL INCOME TAXATION 61-62, 206 (1938). This income definition formed the basis for Treasury's 1977 proposal for a comprehensive income tax. See BLUEPRINTS, *supra* note 3, at 22, 53. Notwithstanding, Haig and Simons both thought that accrual taxation would be unworkable on a universal basis. See Cunningham & Schenk, *supra* note 2, at 733.

17. Cf. Cunningham & Schenk, *supra* note 3, at 733 (noting that there is little disagreement that changes in net worth constitute economic income irrespective of the ownership form).

18. See e.g., *id.* at 741 (stating what the realization requirement deals with when asset gains are included in income, not whether unrealized appreciation constitutes economic income); HENRY J. AARON & HARVEY GALPER, ASSESSING TAX REFORM 56 (1985); Thuronyi, *supra* note 4, at 125 (pointing out that the realization of gain does not constitute a meaningful economic event).

One commentator has asserted that the Haig-Simons definition is vague as to the assessment period for taxing accrued gains and losses, and that the theoretically correct method would be to continuously assess and tax such items. See Jeff Strnad, *Periodicity and Accretion Taxation: Norms and Implementation*, 99 YALE L.J. 1817, 1830-31 (1990). It would appear, however, that administrative considerations, as well as the general use of an annual accounting period, favor using an annual assessment period for any accrual of asset appreciation and depreciation. See Reed Shuldiner, *A General Approach to the Taxation of Financial Instruments*, 71 TEX. L. REV. 243, 247 n.6 (1992).

19. AARON & GALPER, *supra* note 18, at 22.

20. See Kaplow, *supra* note 15, at 1504 (stating this justification for the income tax); see also Strnad, *supra* note 18, at 1833-46.

underpinning of the income tax, unrealized gains, even if not currently spendable,²¹ should be included in the income tax base in order to indirectly tax the intangible benefits that flow from such gains.

This view that noncash gains should be included in taxable income is reflected in the current tax law. For example, under the accrual method of accounting,²² income items usually are included whenever a taxpayer has the fixed right to receive the item, irrespective of actual receipt.²³ Similarly, Code section 1272 generally requires holders of original issue discount bonds to include implicit interest over the life of the bonds, without regard to the receipt of actual cash payments.²⁴ Other examples include the mark-to-market accounting treatment for option traders²⁵ and dealers of financial securities,²⁶ as well as the rules requiring that service providers include the fair market value of property received.²⁷ Therefore, in both theory and practice, noncash gains are viewed as proper objects of the income tax.

Notwithstanding the frequent recognition that accrual taxation is theoretically correct, unrealized appreciation and depreciation are not included in the tax base²⁸ due to the perceived administrative difficulties of valuing assets and avoiding taxpayer illiquidity.²⁹ Therefore, if

21. See AARON & GALPER, *supra* note 18, at 24 n.10 (pointing out that a person who accrues rights to future pension payments may not have experienced any increase in current spending ability because it may not be permissible to pledge those rights as security for loans).

22. Generally, C corporations are required to use the accrual method. See I.R.C. § 448 (1994). In addition, taxpayers maintaining inventories must use this method. See Treas. Reg. § 1.446-1(c)(1) (as amended in 1992).

23. See Treas. Reg. § 1.451-1 (as amended in 1978).

24. I.R.C. § 1272.

25. See *id.* § 1256.

26. See *id.* § 475.

27. See *id.* § 83 (1994).

28. It is well documented that the current U.S. tax system fails in several other respects to reach all income as theoretically defined. See, e.g., BLUEPRINTS, *supra* note 3, at 53-95; RICHARD GOODE, THE INDIVIDUAL INCOME TAX 97-144 (rev. ed. 1976).

29. See Cunningham & Schenk, *supra* note 3, at 742 (viewing the realization requirement as essentially a rule of administrative convenience).

Professor Kahn, however, has offered an additional reason for rejecting accrual taxation—that it is unfair to tax unrealized gains because these are merely paper gains, *i.e.*, transitory gains that may ultimately be offset by declines in the assets' values. See Kahn, *supra* note 4, at 8-9. The argument runs that where the gain has been reduced to cash it has been "captured," thus justifying the imposition of a tax. Presumably, Professor Kahn is using fairness (or equity) in the traditional tax policy sense. Horizontal equity is satisfied when taxpayers with equal pretax economic incomes are taxed equally, and vertical equity is satisfied when taxpayers with unequal pretax economic incomes are taxed differently. See *infra* notes 80-81 and accompanying text. Therefore, unless unrealized gains are not viewed as a part of economic income, an objection to accrual taxation on the basis of equity is misplaced. Accordingly, the objection appears to be that unrealized gains do not represent economic income because

these practical problems could be overcome, it would appear that the case for the realization rule would evaporate and accrual taxation should be adopted.³⁰

B. Analyzing the Benefits of Accrual Taxation

The aforementioned administrative problems will not be overcome without incurring costs. Moreover, the Haig-Simons income definition is not a normative goal in itself,³¹ but instead is based on notions of equity³² and economic efficiency.³³ Consequently, as part of a thorough analysis of complete accrual taxation, it is imperative to evaluate its benefits within the general framework of traditional tax policy concerns: Economic efficiency, equity, and Code simplification.

1. Economic Efficiency

The realization rule results in differing effective tax rates³⁴ on capital income, which in turn likely causes economic inefficiencies. On the

these gains may later be offset by declines in the assets' values.

As previously mentioned, however, unrealized gains do represent economic income under the widely accepted Haig-Simons income definition, in that such gains add to one's net worth. Moreover, another flaw in Professor Kahn's argument is that the same objection could be made with respect to the taxation of realized gains. That is, even where the gain is reduced to cash it still may be offset by subsequent losses, unless of course the cash is consumed. For example, assume in year 1 that *A* purchases *X* stock for \$100 and sells it for \$150 on December 31 of the same year. *A* then reinvests the \$150 in *Y* stock, which by December 31 of year 2 has declined to \$90 in value. Despite this subsequent depreciation, *A* would be taxed under current law's realization rule on \$50 of gain on the disposition of *X* stock. So even under current law, a taxpayer may have a realized gain notwithstanding the possibility of subsequent losses which can offset this gain. See Thuronyi, *supra* note 4, at 124-25.

30. Cf. Shakow, *supra* note 4 (generally recommending accrual taxation for those assets that do not pose valuation difficulties); Slawson, *supra* note 4, at 623-26 (proposing accrual taxation for publicly held stock); Louie, *supra* note 4, at 857-58, 865 (recommending accrual taxation of marketable securities).

31. Cf. Kaplow, *supra* note 15, at 1513 (referring to the Haig-Simons standard as a stipulated definition that does not follow directly from views of distributive justice or fundamental moral principles).

32. See Noël B. Cunningham & Deborah H. Schenk, *The Case for a Capital Gains Preference*, 48 TAX L. REV. 319, 366-67 (1993).

33. See Charles R. Hulten & Robert A. Klayman, *Investment Incentives in Theory and Practice*, in UNEASY COMPROMISE, *supra* note 9, at 317, 324 n.6 (pointing out that Haig-Simons definition results in an efficient tax system under some circumstances).

34. See *infra* note 39 for a definition of effective tax rates.

other hand, complete accrual taxation, if practically possible, would achieve greater uniformity in effective tax rates and thus may improve economic efficiency.

a. Realization Rule Results in Differing Effective Tax Rates on Capital Income

Under the realization rule, capital income in the form of asset appreciation is not taxed as it accrues; instead, gains usually are taxed when the asset is disposed of,³⁵ but in some cases even later.³⁶ Moreover, because death is not a realization event and property held by a decedent receives a fair market value basis,³⁷ most gains are effectively exempt from taxation.³⁸ The deferred taxation of asset appreciation increases the asset holder's after-tax rate of return by allowing the investor to hold onto the tax dollars longer and thereby earn additional income on these amounts; consequently, deferral lowers the effective tax rate³⁹ on asset appreciation, with greater reductions in the effective tax rate for longer investment horizons.⁴⁰ For assets held until the holder's death, the effective tax rate is zero.⁴¹

As demonstrated by other commentators, the effective tax rates under the realization rule also depend on the presence of strategic trading—holding appreciated assets while selling depreciated assets.⁴² Investors' ability to deduct their investment losses while deferring the tax on their investment gains improves the after-tax return on investments and therefore results in even further reductions in effective tax rates on capital income.⁴³ The reduction in the effective tax rates due to strategic trading is related to the volatility of the investment, with

35. The realization rule applies to both gains and losses; however, because taxpayers control the timing of realization, taxpayers tend to realize losses as they accrue, subject to limitations (e.g., section 1211's capital loss limitation). I.R.C. § 1211 (1994); see Cunningham & Schenk, *supra* note 32, at 322-23.

36. See, e.g., I.R.C § 1031 (1994) (deferral of gain on like-kind exchanges); *id.* § 351 (deferral of gain on certain transfers to corporations).

37. See I.R.C § 1014 (1994).

38. Cunningham & Schenk, *supra* note 32, at 323 (citing MERVYN A. KING & DON FULLERTON, *THE TAXATION OF INCOME FROM CAPITAL* 221 (1984)).

39. The effective tax rate equals $100(1 - (\text{after-tax rate of return}/\text{pretax rate of return}))$. See Mark P. Gergen, *The Effects of Price Volatility and Strategic Trading Under Realization, Expected Return and Retrospective Taxation*, 49 TAX L. REV. 209, 231 n.77 (1994).

40. See Gergen, *supra* note 39, at 231-36; Cunningham & Schenk, *supra* note 32, at 323.

41. Cunningham & Schenk, *supra* note 32, at 323.

42. See Gergen, *supra* note 39, at 240; Shuldiner, *supra* note 18, at 255-56.

43. The ability to improve the after-tax return through strategic trading is referred to as the "timing option." See, e.g., Shuldiner, *supra* note 18, at 250, 255-57.

greater volatility leading to larger reductions.⁴⁴ The existence and extent of strategic trading depends on transaction costs, with lower transaction costs increasing the likelihood of strategic trading.⁴⁵ Consequently, strategic trading results in the largest reductions to effective tax rates on those investments with high volatility and low transaction costs.⁴⁶

Inflation also affects the effective tax rates on capital income in real dollar terms. Because the current tax system does not formally provide for indexing and therefore includes nominal income in the tax base,⁴⁷ the effective tax rates on real capital income increase with rising inflation rates.⁴⁸ Like the effective tax rates on nominal capital income, those with respect to real capital income decrease with longer investment horizons;⁴⁹ however, with inflation the effective tax rates on real capital income decrease more dramatically for longer investment horizons compared to the effective tax rates on nominal capital income, a phenomenon that increases with rising inflation rates.⁵⁰ Therefore, the disparity in effective tax rates on real capital income for investments of differing investment horizons is greater for increased levels of inflation.

b. *Inefficient Portfolio Management*

As a result of lower or zero effective tax rates for longer holding periods, taxpayers tend not to change investments. The so-called lock-in effect⁵¹ resulting from the realization rule produces economic ineffi-

44. See Gergen, *supra* note 39, at 242.

45. *Id.* at 251-53.

46. *Id.* at 212.

47. Nonetheless, the tax system contains various forms of hidden indexing, *i.e.*, features, such as the realization rule, that lower the effective tax rate on capital income and effectively exempt a large portion of inflationary gains from tax. See Halperin & Steuerle, *supra* note 9, at 353-55.

48. See *id.* at 355.

49. See *id.*

50. Professor Shuldiner demonstrates that under certain assumptions (5% real growth, 5% inflation, and 30% statutory tax rate), the nominal effective tax rates on an asset held for one year and an asset held for 35 years are 30% and 10%, respectively; the real effective tax rates on these assets are 59% and 20%. See Reed Shuldiner, *Indexing the Tax Code*, 48 TAX L. REV. 537, 554 (1993).

51. See Cunningham & Schenk, *supra* note 32, at 344; James W. Wetzler, *Capital Gains and Losses*, in COMPREHENSIVE INCOME TAXATION 115, 135 (Joseph A. Pechman ed., 1977).

ciencies by reducing the portfolio reallocations of investors.⁵² An investor holding an asset may believe that other investments will yield higher returns, or he may want to diversify his risk. Yet, because the effective tax rate on his current investment will be lower the longer he holds it, he may refrain from selling, thus reducing his utility.⁵³ Similarly, a taxpayer otherwise may desire to dispose of an asset and consume the proceeds, but may be unwilling to do so because of the greater tax burden.⁵⁴ As a consequence, the lock-in effect may produce an individual welfare loss.⁵⁵

c. *Inefficient Allocation of Capital*

The realization rule is also likely responsible for an inefficient allocation of capital among different uses. The lock-in effect probably contributes to some capital misallocations, although its effects may not be large. That is, the lock-in effect may discourage some investors from selling assets and investing in venture capital,⁵⁶ as well as restrict the investment options of those who establish highly successful companies.⁵⁷ Yet, these cases probably are not common.⁵⁸

In addition, the varying effective tax rates on different types of capital income caused by the realization rule probably contribute to an inefficient allocation of capital. With no externalities, an efficient allocation of resources exists when all assets of equal risk yield an equal pretax rate of return.⁵⁹ In the absence of an income tax, free-market forces generally would ensure equal pretax rates of return on all equally risky assets. With an income tax, however, the process of arbitrage tends to equalize the after-tax rates of return on investments, thus disrupting the assurance that pretax rates of return will be equal. The imposition of equal effective tax rates on investments should result in equal pretax rates of return and consequently bring about an efficient

52. See George R. Zodrow, *Economic Analyses of Capital Gains Taxation: Realizations, Revenues, Efficiency and Equity*, 48 TAX L. REV. 419, 467 (1993); Wetzler, *supra* note 51, at 140.

53. See Cunningham & Schenk, *supra* note 32, at 345; Zodrow, *supra* note 52, at 467-68; Wetzler, *supra* note 51, at 140.

54. See Cunningham & Schenk, *supra* note 32, at 345.

55. See *id.* at 345 n.101.

56. See *id.* at 345.

57. See Zodrow, *supra* note 52, at 467 n.193.

58. See Cunningham & Schenk, *supra* note 32, at 345; *cf.* Zodrow, *supra* note 52, at 467 (pointing out that the primary effect of lock-in is a reduction in portfolio reallocations).

59. See Hulten & Klayman, *supra* note 33, at 324. Externalities are the failure of the market to account for all the costs or benefits associated with a given activity. *Id.* at 324 n.5. What follows draws heavily on Hulten & Klayman.

allocation of resources, subject to the exceptions noted below. On the other hand, differing effective tax rates generally will lead to unequal pretax rates of return and thus inefficient resource allocation.⁶⁰

The prescription of equal effective tax rates on capital income to ensure efficient resource allocation is, in theory, subject to exceptions. Reducing the effective tax rate on some investments may be justified as a means to overcome factors that prevent the market from functioning perfectly, such as externalities, underemployment of resources, and inadequate economic growth.⁶¹ Moreover, optimal commodity taxation recognizes that since equal tax rates on all inputs and outputs of an economy would produce no revenue, it is necessary to vary tax rates and tolerate some inefficiency.⁶² Accordingly, differing effective tax rates on capital income are needed, in theory, in order to raise revenue while minimizing inefficiency.⁶³ Despite these purported bases for varying the effective tax rates on capital income, the pattern of optimal, nonuniform tax rates is unknown.⁶⁴ Given the lack of a factual basis for varying tax rates, it is frequently contended that the differing effective tax rates on capital income lead to an inefficient allocation of capital resources.⁶⁵ Nonetheless, investment incentives sometimes are advocated as a means of offsetting the above-mentioned natural market inefficiencies.⁶⁶

The realization rule results in effective tax rates on capital income that vary significantly based on the extent to which an asset produces currently taxed income versus accrued gains. Yield assets that produce

60. *Id.*

61. *See id.* at 328-30.

62. *See id.* at 326.

63. *See supra* note 39 and accompanying text for a definition of effective tax rates.

64. *See* AARON & GALPER, *supra* note 18, at 30 n.20; Hulten & Klayman, *supra* note 33, at 318 (pointing out that it would be virtually impossible to obtain the information about the economy and social values to determine optimal tax rates).

65. *See, e.g.,* Cunningham & Schenk, *supra* note 3, at 803-04; Shuldiner, *supra* note 18, at 258; AARON & GALPER, *supra* note 18, at 30 n.20; Charles R. Hulten & Frank C. Wykoff, *The Measurement of Economic Depreciation*, in DEPRECIATION, INFLATION, AND THE TAXATION OF INCOME FROM CAPITAL 82 (Charles R. Hulten ed., 1981); *cf.* Mary Louise Fellows, *A Comprehensive Attack on Deferral*, 88 MICH. L. REV. 722, 727 (1990) (noting the potential misallocation of resources due to deferral).

66. *See* S. REP. NO. 144, 97th Cong., 1st Sess. 12-13 (1981), *reprinted in* 1981 U.S.C.C.A.N. 105, 119-20 (adding Accelerated Cost Recovery System (ACRS) to stimulate capital formation and increase productivity).

currently taxed income, such as variable-rate debt instruments,⁶⁷ do not benefit from deferral to the same extent as growth assets, such as land and certain corporate stock.⁶⁸ Because of the resulting lower tax rates on growth assets compared to yield assets, overinvestment in growth assets is encouraged.⁶⁹

Furthermore, even among growth assets the realization rule results in differing effective tax rates, with such rates varying based on an investment's holding period, volatility, and transaction costs. Effective tax rates are lower for assets with longer time horizons, higher volatility, and lower transaction costs, for which overinvestment is encouraged.⁷⁰

Yet, the question still needs to be addressed whether the nonuniform effective rates produced by the realization rule offset any natural market or tax-induced inefficiencies. The realization rule was not adopted, nor is it justified, as a measure to correct any perceived inefficiencies.⁷¹ However, it is often contended that an income tax discourages risk-taking by reducing the expected return from a risky investment.⁷² Professors Cunningham and Schenk demonstrate, though, that the imposition of a proportional income tax with full loss offsets does not affect the relative attractiveness of a risk-free investment versus a risky one.⁷³ Such a tax system does not currently exist, however, and the loss limitations⁷⁴ under current law probably discourage some risk taking.⁷⁵ Nonetheless, the realization rule is a very poor second-best

67. As demonstrated by Professor Strnad, the effective tax rate on fixed-rate long-term debt instruments also can be significantly below the statutory rate because of investors' ability to exploit price fluctuations by engaging in strategic trading. See Jeff Strnad, *The Taxation of Bonds: The Tax Trading Dimension*, 81 VA. L. REV. 47, 51 (1995).

68. See AARON & GALPER, *supra* note 18, at 56-57 n.9.

69. See Shuldiner, *supra* note 18, at 258 (concluding that such overinvestment leads to an inefficient allocation of resources).

70. See *supra* notes 42-46 and accompanying text.

71. Cf. AARON & GALPER, *supra* note 18, at 57 (noting that deferral does not promote especially meritorious activities); *id.* at 30 (pointing out that few of the unintended distortions resulting from the current tax system can be justified on the basis that they counter natural inefficiencies). Similarly, there is no basis for concluding that the realization rule minimizes inefficiencies under optimal commodity taxation theory. Cf. Hulten & Klayman, *supra* note 33, at 328 (noting the virtually insurmountable practical problem of finding the optimal tax structure of investment incentives).

72. See Cunningham & Schenk, *supra* note 32, at 340 (noting these claims).

73. See *id.* at 341.

74. See, e.g., I.R.C. §§ 465, 469, 1211 (1994). As Professors Cunningham and Schenk point out, the effect of current law's progressive rates on discouraging risk taking is unclear. See Cunningham & Schenk, *supra* note 32, at 296 n.87. The effect of tax rates under current law may not be significant, given the fact that the rates are far less progressive than they have been historically. Cf. *id.* (noting this fact).

75. See Cunningham & Schenk, *supra* note 32, at 343 (noting that some taxpayers effectively are not subject to loss limitations because they can offset losses on one

solution.⁷⁶ It would be pure coincidence if the variation in effective rates as a result of an investment’s volatility were the appropriate response to offset any unacceptable bias against risk taking.⁷⁷ Indeed, a first-best solution to the effect of the loss limitations on risk taking would be to shift to complete accrual taxation, which should allow for the repeal of the loss limitations.⁷⁸

d. Complete Accrual Taxation May Improve Economic Efficiency

Complete accrual taxation, if practically possible, would include in the tax base unrealized gains and losses as they accrue and would thus bring about greater uniformity in effective tax rates on capital income; consequently, the efficiency of portfolio management and resource allocation may improve.⁷⁹ If, in the future, natural inefficiencies are identified or an optimal tax structure is determined, with accrual taxation it always would be possible to appropriately vary the statutory rates to address these factors.

2. *Equity*

In addition to efficiency, tax theorists usually evaluate income tax rules under two equity norms:⁸⁰ Horizontal equity, which requires that taxpayers with equal economic income be taxed equally, and vertical equity, which requires that taxpayers with greater amounts of economic

transaction against gains on other transactions).

76. *Cf. id.* (similarly characterizing a capital gains preference as a solution).

77. *Cf. Shuldiner, supra* note 50, at 601 n.234 (similarly pointing out that it is very unlikely that the optimal depreciation policy would change as a function of the inflation rate).

78. *See infra* notes 146-47 and accompanying text; Daniel Halperin, Commentary, *A Capital Gains Preference is not EVEN a Second-Best Solution*, 48 TAX L. REV. 381, 383 (1993).

79. Even with complete accrual taxation, effective tax rates on investments in consumer items, such as owner-occupied housing, would differ from the effective tax rates on other investments if the imputed income from consumer items continues to be excluded from the tax base. The efficiency consequences of the failure to tax this imputed income are discussed *infra* Part III.B.3.

80. While equity has been the traditional tax policy standard, it is now supplemented, and maybe even supplanted, by economic efficiency concerns. *See Boris I. Bittker, Equity, Efficiency, and Income Tax Theory: Do Misallocations Drive Out Inequities?*, in THE ECONOMICS OF TAXATION, *supra* note 4, at 19.

income be taxed more heavily.⁸¹ As discussed below, the realization rule appears to violate both standards of equity, whereas accrual taxation may improve upon the equity of the income tax system.

On its face, the differing effective tax rates caused by the realization rule violate horizontal equity; two taxpayers with equal economic income may have unequal tax liabilities because one taxpayer has realized gains while the other has accrued, unrealized gains (and the concomitant benefit of deferral).⁸² In addition, it has been suggested that the realization rule also violates vertical equity; higher income taxpayers are likely to have a greater percentage of their total income coming from capital than lower income taxpayers, and thus the benefit of deferral is not evenly distributed among income classes.⁸³

Although the above assertions may be correct, the analysis is oversimplified as it ignores the process of arbitrage. In response to a tax preference, investors will tend to be drawn to the tax-favored investment, thus in theory driving down the pretax rate of return until the after-tax rates of return for all investments (of equal risk) are equalized.⁸⁴ Thus, with complete arbitrage the tax preferences produced by the realization rule would be capitalized into the cost of the investments, and purchasers of such assets would receive no better than normal after-tax returns.⁸⁵

81. See Bittker, *supra* note 80; MICHAEL J. GRAETZ, FEDERAL INCOME TAXATION: PRINCIPLES AND POLICIES 17 (2d ed. 1988). Vertical equity is the primary justification for progressive tax rates. See *id.* Over the last several years, a debate has ensued over whether horizontal equity is actually different from vertical equity. See, e.g., Paul A. McDaniel & James R. Repetti, *Horizontal and Vertical Equity: The Musgrave/Kaplow Exchange*, 1 FLA. TAX REV. 605 (1993). Specifically, this debate has focused on whether horizontal equity has any normative content apart from vertical equity. See *id.* at 607-09. Yet, as a surrogate for detecting departures from the decisions underlying the tax base and rate structure, see *id.* at 613, there is a difference between horizontal equity and vertical equity if vertical equity only is violated when tax preferences are not evenly distributed among income classes; using equity in this sense, horizontal equity can be violated in situations where vertical equity is not.

82. See AARON & GALPER, *supra* note 18, at 11; Shakow, *supra* note 4, at 1115.

83. See Shuldiner, *supra* note 18, at 261-62 (if the tax benefit is not capitalized by the market, which the author points out may not be the case); Slawson, *supra* note 4, at 624; cf. James Buchanan & Geoffrey Brennan, *Tax Reform Without Tears*, in THE ECONOMICS OF TAXATION, *supra* note 4, at 33 (pointing out that wealthy taxpayers use tax loopholes far more than poor taxpayers).

84. Hulten & Klayman, *supra* note 33, at 331.

85. See Bittker, *supra* note 80, at 22-26. Cf. Gergen, *supra* note 39, at 216 (noting that the equity argument for accrual taxation is dubious because, among other reasons, markets may adjust so that investments which are taxed differently as a result of the realization rule yield similar after-tax returns). Although initially the price of the tax preferred asset will rise, the general equilibrium effects should ultimately result in a lower pretax return on the tax favored assets as supply of this asset increases. See Alan J. Auerbach, *Should Interest Deductions Be Limited?*, in UNEASY COMPROMISE, *supra* note 9, at 195, 201-02 n.9.

Under these circumstances, horizontal and vertical equities are not violated among investors; despite a lower direct tax liability, a recipient of tax-preferred capital income is subject to an additional indirect tax liability through reduced pretax returns.⁸⁶

The preceding analysis, which indicates that tax preferences—such as the deferral benefit provided by the realization rule—do not violate equity, assumes complete arbitrage, that is, that the after-tax return for all investments (of equal risk and for investors in the same tax bracket) are equalized through investor behavior. While the occurrence of some arbitrage seems inevitable, it is unlikely that investor behavior will so adjust to a tax preference as to completely capitalize the cost of the preference.⁸⁷ Some taxpayers, for whatever reason, may not adjust their investment behavior to minimize their tax payments.⁸⁸ Thus, although behavioral adjustments to tax preferences may mitigate horizontal and vertical inequities, such adjustments probably do not eliminate these inequities entirely.⁸⁹

Furthermore, any capitalized tax preference resulting from the realization rule that is reflected in the pretax rate of return of a particular taxpayer's investment most likely will not equal the tax preference actually experienced by that taxpayer. This is because the differing effective tax rates produced by the realization rule, unlike the zero tax rate imposed on state or local bond interest, are greatly dependent on the individual circumstances of a particular investor. Therefore, while the pretax rate of return on a particular asset may reflect some or all of the tax preference experienced by the market as a whole, the effective tax rate imposed on particular taxpayers (within the same marginal tax bracket) who hold that asset may vary significantly⁹⁰ based on an investment's holding period,⁹¹ volatility,⁹² and actual returns.⁹³ An

86. See Bittker, *supra* note 80, at 23; Hulten & Klayman, *supra* note 33, at 331.

87. Cf. Shuldiner, *supra* note 18, at 262 n.70 (noting with respect to the taxation of financial instruments that to the extent that significant market participants are taxed at lower or zero rates, the degree of adjustment is quite uncertain).

88. See Buchanan & Brennan, *supra* note 83, at 36 (implying that some taxpayers cannot adjust easily to take advantage of tax loopholes); Bittker, *supra* note 80, at 27 n.6 (noting the reluctance of some taxpayers to engage in tax-preferred activities).

89. See Buchanan & Brennan, *supra* note 83, at 36.

90. Cf. Shuldiner, *supra* note 18, at 262 (pointing out that inequity as to a particular investor will be eliminated only if the investor is subject to the same effective tax rate that is implicit in the market capitalization).

91. See *supra* notes 42-46 and accompanying text.

example of such a situation is where two taxpayers purchase the same stock on the same date, and one taxpayer sells after one year while the other sells after two years. Whether or not any tax preference is reflected in the stock's rate of return, it is clear that the two taxpayers experience the same pretax rate of return for year one; yet, because one defers realization and the other does not, their effective tax rates on year one's economic income is different, as is their after-tax rate of return. In addition, because of their greater sophistication and more extensive investment portfolios, some investors will achieve greater after-tax returns than others by using strategic trading.⁹⁴ Consequently, notwithstanding the market's ability to capitalize the tax preference, the realization rule offends horizontal equity by causing varying after-tax rates of return on capital.

Additionally, even with complete arbitrage, investment incentives may still violate vertical equity when the preferred assets must be sold to lower marginal rate bracket taxpayers in order to clear the market. In such a case, the tax benefit will be competed away only for the lower marginal rate taxpayers, with higher rate taxpayers benefitting from the investment incentive.⁹⁵

92. *See id.*

93. *See Gergen, supra* note 39, at 231 (pointing out the equity concerns arising because of the dependency of effective rates on investment performance, and noting that this may not be a significant concern if most investors hold portfolios with offsetting returns).

94. *See supra* notes 42-46 and accompanying text. Without an extensive portfolio producing sufficient realized gains, strategic trading should be curbed as a result of the capital loss limitations contained in section 1211. *Cf. Cunningham & Schenk, supra* note 32, at 343 (loss limitations do impact taxpayers without diversified portfolios).

95. Tax-exempt state or local bonds best illustrate this "trickle-up" phenomenon. *See Bittker, supra* note 80, at 26-29. For example, assume that taxable bonds pay interest at 10% and that due to the supply of tax-exempt bonds, it is necessary to sell tax-exempt bonds to taxpayers in the 36% marginal tax bracket. In order to compete with the 10% taxable bonds in attracting 36% taxpayers, tax-exempt bonds (of equal risk) must pay interest at 6.4% (the after-tax return to 36% taxpayers on the taxable bonds). As to the 36% taxpayers, the tax-exempt status of state and local bonds provides no benefit; whether they invest in taxable bonds or tax-exempt bonds, their after-tax return is 6.4%. As to taxpayers in the 39.6% marginal tax market, however, a benefit is conferred by the exclusion; 39.6% taxpayers receive a 6.4% tax-free return on the exempt bonds as opposed to a 6.04% after-tax return on the taxable bonds. Consequently, in this situation vertical equity is violated because 39.6% taxpayers who invest in tax-exempt bonds receive the same after-tax return (6.4%) as 36% taxpayers who invest in either tax-exempt or taxable bonds. (For 39.6% taxpayers choosing between investing in tax-exempt and taxable bonds, horizontal equity also appears violated. Professor Bittker disputes this, arguing that high-bracket taxpayers investing in taxable bonds have only themselves to blame for their lower after-tax yields. *See Bittker, supra* note 80, at 28. While this may be true, their failure to invest in exempt bonds may be due to lack of sophistication. If so, it seems unfair to penalize taxpayers because they have not educated themselves or sought expert advice on the intricacies of tax law.)

This "trickle-up" phenomenon⁹⁶ is due to the fact that where one asset receives a tax preference over another asset, investors in different marginal tax brackets will receive different relative after-tax returns from these two assets.⁹⁷ Specifically, higher bracket investors will receive a greater relative benefit from the income exclusion of the tax-preferred asset than will lower bracket investors.⁹⁸ Because the realization rule results in tax preferences, it likewise may produce a trickling up of tax benefits to high-bracket taxpayers, providing a possible source of vertical inequity.⁹⁹

Although the realization rule does not expressly exclude income from the tax base, its effect in present value terms is equivalent to taxing a portion of unrealized gains as they accrue.¹⁰⁰ This portion is equal to the present value factor for the period that accrued gains are deferred under the realization rule, using a discount rate equal to the taxpayer's after-tax cost of borrowing.¹⁰¹

With this expression of the realization rule as a partial exclusion, the realization rule's trickle-up potential will now be demonstrated. Assume that there are two assets, asset *A*, which is fully taxable, and asset *B*,

96. See *supra* note 95.

97. See Auerbach, *supra* note 85, at 199-207.

98. See *id.*

99. Cf. *id.* at 198-99 (implying that when different assets have different rates of tax deferral, trickling up is possible).

100. Alternatively, the effect of the realization rule can be expressed as taxing the full amount of unrealized gains as they accrue, at tax rates below the statutory rates, that is, the effective tax rate. See *supra* note 39 and accompanying text; see generally Gergen, *supra* note 39. The exclusion equivalent is used here because it is similar to the tax preference provided to tax-exempt bonds, and thus is more conducive to traditional trickle-up analysis.

101. The following example demonstrates this equivalency. Assume in situation *A* that a 28% taxpayer has \$100 of accrued gains for year one that under current law are realized and taxed in year two. This taxpayer would pay \$28 of tax in year two. In situation *B*, assume that the realization rule is replaced by a system that taxes a portion of the accrued gain in year one. Using the expression set forth in the text for determining this portion, with a cost of borrowing of 10% (compounded annually), the tax system hypothesized in situation *B* will tax 93.28% of the accrued gain in year one. With 93.28% of the \$100 of accrued gain, or \$93.28 included and taxed in year one, the 28% taxpayer would pay \$26.12 of tax in year one. In addition, the taxpayer in situation *B* will have lost the value of deferral, and thus has an additional effective tax cost, vis-à-vis the taxpayer in situation *A*, of the after-tax return on \$26.12 for one year, or \$1.88. See Gergen, *supra* note 39, at 218 n.31 (setting forth a formula for the value of deferral). Thus, the taxpayer in situation *B* has a total effective tax liability of \$26.12 plus \$1.88, or \$28.00, the same as the tax liability of the taxpayer in situation *A*.

which is tax preferred; two groups of taxpayers, 28 percent taxpayers and 40 percent taxpayers; and in order to clear the market, asset *B* must be sold to 28 percent taxpayers. Asset *A* provides for a 10 percent rate of return, compounded annually, with all returns in the form of annual interest payments. Asset *B* provides for all of its return in the form of accrued gains, which because of the realization rule is tax deferred for a five-year period. Expressing the realization rule as an exclusion, for 28 percent taxpayers the accrued gain on asset *B* is subject to tax in the year of accrual to the extent of 70.4 percent.¹⁰² With complete arbitrage, the lowest bracket taxpayer to whom asset *B* must be sold in order to clear the market, here 28 percent taxpayers, will receive equal after-tax returns on asset *A* and asset *B*. Under these circumstances, the pretax rate of return on asset *B* would equal 8.97 percent compounded annually.¹⁰³

Given the assumed condition of equal after-tax rates of return to 28 percent taxpayers from asset *A* and asset *B*, a 28 percent taxpayer will receive no benefit from the tax preference accorded asset *B*. A 40 percent taxpayer investing in asset *B*, however, will benefit from the tax preference; specifically, 40 percent taxpayers receive a 6.29 percent after-tax rate of return on asset *B* compared with a 6 percent after-tax rate of return on asset *A*. Stated another way, without the tax preference given to asset *B*, a 28 percent taxpayer and a 40 percent taxpayer would have after-tax rates of return of 7.2 percent and 6 percent, respectively; with the tax preference, their after-tax rates of return would be 7.2 percent and 6.29 percent, and thus no longer separated by the "proper" distance.¹⁰⁴ Although the deviation does not appear large, it may be

102. This percentage is derived from the present value factor for a 5-year period at a discount rate of 7.2% (a 28% taxpayer's after-tax cost of borrowing). Of course, with the realization rule, each year's accrued gain is deferred for different time periods, with appreciation for earlier years being deferred longer. Therefore, the percentage of an investment's unrealized gain that can be viewed as included in the tax base for a given year will increase over time. To simplify the calculations, only one year's accrued gain (and thus one year's inclusion percentage) is being used in this example. The results still should be valid as the specific inclusion percentage generally should not affect whether different marginal rate taxpayers receive different relative after-tax returns from the same two assets, the general principle underlying the trickle-up phenomenon. See Auerbach, *supra* note 85, at 199.

103. With complete arbitrage, the pretax return of a tax-preferred asset would equal $(1-y)/(1-xy)$ times the pre-tax return of the fully taxed asset, with x being the fraction of the favored asset's returns which are included in the tax base, and y being the marginal tax rate bracket of the lowest bracket taxpayers to whom the asset must be sold in order to clear the market. See Auerbach, *supra* note 85, at 199-200. Substituting .704 for x and .28 for y , and the 10% return on asset *A* for the pretax return on the fully taxed asset, yields $(1-.28)$ divided by $(1-(.704)(.28))$ times .10, or .0897.

104. Cf. Bittker, *supra* note 80, at 25 (using this term to describe vertical equity).

significant in that the tax preference increases the after-tax income of a 40 percent taxpayer by approximately 5 percent. Furthermore, if asset *B* needed to be sold to 15 percent taxpayers in order to clear the market, a 40 percent taxpayer would have an after-tax return from asset *B* of 6.62 percent, an approximately 10 percent increase in after-tax income. The results of the example are illustrated in Table 1 (following page). They demonstrate that even with complete arbitrage,¹⁰⁵ the tax preference resulting from the realization rule can violate vertical equity.¹⁰⁶

As the foregoing demonstrates, the realization rule causes horizontal inequities and probably produces vertical inequities as well. Although the realization rule's resulting tax preference may be capitalized into the cost of a preferred asset, complete market adjustment is unlikely. In any event, the after-tax rate of return for a given asset (and taxpayers subject to the same tax rate) will be equal only if these taxpayers are subject to the same effective tax rate, which will not be the case when they have different holding periods. Accordingly, the realization rule will produce a benefit for certain investors, thereby violating horizontal equity; vertical equity may be violated as well if these capital income benefits are, as appears, more widely available to higher-income taxpayers.¹⁰⁷ Additionally, the trickle-up phenomenon may provide another source of vertical inequity by allowing higher-income taxpayers to reap greater benefits from the realization rule than lower-income taxpayers.

105. A fortiori, with incomplete arbitrage and thus a benefit to lower bracket taxpayers stemming from the realization rule (the highly likely situation), the trickle-up effect to high-bracket taxpayers would be even more pronounced.

106. It should be pointed out again that capital income exclusions will produce this trickle-up phenomenon only when the preferred assets must be sold to lower bracket taxpayers in order to clear the market. The need to sell the tax-preferred assets to these taxpayers may be due to a few possible reasons. First, the supply of the preferred assets may exceed the available wealth of the highest bracket taxpayers. In theory, highest bracket taxpayers could borrow funds to invest in the preferred assets, but provisions such as section 163(d), which limit the deduction of investment interest, may restrict such borrowing. See I.R.C. § 163(d) (1994); Auerbach, *supra* note 85, at 207. Another possibility is that some highest bracket taxpayers may simply fail, for whatever reason, to take advantage of tax-preferred investments. Cf. Bittker, *supra* note 80, at 27 n.6.

107. This assumes, however, that income from labor, the income type for which lower bracket taxpayers receive relatively greater amounts, is taxed more heavily than capital income, which may not be the case. See *infra* Part III.B.4.

**COMPLETE ARBITRAGE WITH RESPECT TO
28 PERCENT TAXPAYERS**

	28 PERCENT TAXPAYERS		40 PERCENT TAXPAYERS	
	ASSET A	ASSET B	ASSET A	ASSET B
PRETAX RETURN	10%	8.97%	10%	8.97%
INCLUDABLE RETURN	10%	6.37%*	10%	6.69%**
TAX	2.8%	1.77%	4%	2.68%
AFTER-TAX RETURN	7.2%	7.2%	6%	6.29%
<p>* 8.97 times .704 (which is the present value factor based on a 5-year period using an after-tax borrowing cost of 7.2%, compounded annually).</p> <p>** 8.97 times .746 (which is the present value factor based on a 5-year period using an after-tax borrowing cost of 6%, compounded annually).</p>				

**COMPLETE ARBITRAGE WITH RESPECT TO
15 PERCENT TAXPAYERS**

	15 PERCENT TAXPAYERS		40 PERCENT TAXPAYERS	
	ASSET A	ASSET B	ASSET A	ASSET B
PRETAX RETURN	10%	9.44%	10%	9.44%
INCLUDABLE RETURN	10%	6.28%*	10%	7.04%**
TAX	1.5%	.94%	4%	2.82%
AFTER-TAX RETURN	8.5%	8.5%	6%	6.62%
<p>* 9.44 times .665 (which is the present value factor based on a 5-year period using an after-tax borrowing cost of 8.5%, compounded annually).</p> <p>** 9.44 times .746.</p>				

Complete accrual taxation may significantly restore horizontal and vertical equity. By eliminating deferral and thereby substantially equalizing the effective tax rates on capital income, holders of certain assets will not receive tax benefits. Without preferential tax treatment for certain investments, the above-described equitable distortions would be eradicated.¹⁰⁸

The above discussion has centered on the extent to which mismeasurements of economic income affect tax burdens. This, of course, is merely one aspect of equity, which ultimately rests on concerns for distributive justice.¹⁰⁹ Thus, an arguably more important aspect of equity involves those measures which deal more directly with the issue of wealth redistribution, such as the progressive rate structure and negative tax subsidies. Nonetheless, the equity gains that may result from complete accrual taxation could be significant.¹¹⁰ By achieving a better reflection of economic income, complete accrual taxation would move the tax burdens imposed on taxpayers closer to those dictated by the statutory tax rates. Thus, while not addressing directly the issue of wealth redistribution, complete accrual taxation may better ensure that the redistribution of benefits occurs according to the prescribed statutory rates, rather than such occurrence being made uncertain because of the complexities engendered by tax preferences.

3. *Complications Raised by Imputed Income on Consumer Items*

The imputed income on consumer items, especially owner-occupied housing, substantially complicates both the efficiency and equity issues. Imputed income on consumer items is a form of capital income, and a failure to include it in the base raises a real question as to whether accrual taxation will advance economic efficiency and equity.¹¹¹ It

108. Even with complete accrual taxation, effective tax rates on investments in consumer items, such as owner-occupied housing, would differ from the effective tax rates on other investments, if the imputed income from consumer items continues to be excluded from the tax base. The equity consequences of the failure to tax this imputed income are discussed *infra* Part III.B.3.

109. See Gergen, *supra* note 39, at 216.

110. Cf. Kaplow, *supra* note 15, at 1513 (noting that conventional fairness arguments are often helpful).

111. Cf. John B. Shoven, Comments, in *UNEASY COMPROMISE*, *supra* note 9, at 342, 344 (discussing Hulten & Klayman, *supra* note 33, and pointing out that not taxing the imputed income on owner-occupied housing substantially changes the level playing

may well be that a tax system that achieves greater, although not perfect, uniformity in the taxation of capital income will result in a more efficient allocation of resources, as well as a distribution of the tax burden that is more in line with the statutory rates. But it also may be that a second-best solution—taxing some, but not all capital income—would result in less equity and a less efficient allocation of resources than current law.

Thus, the case for an almost complete accrual tax system hinges on the results of research that would answer several questions.¹¹² First, would economic efficiency and equity be advanced even if imputed income on consumer items were excluded from complete accrual taxation? If so, the enhancement of economic efficiency and equity would support the accrual taxation approach suggested in this Article. An intermediate question is whether taxing the imputed income on only owner-occupied housing would advance fundamental policies or would exclusion of the income from consumer durables seriously undermine gains. If exclusion of all or a portion of imputed income would not actually bring us closer to the ideal, then the case for accrual taxation is substantially weakened.

The solution would be to tax imputed income on consumer items, but this is problematic. This would substantially increase the coverage of accrual taxation, with the attendant administrative difficulties for taxpayers and the IRS. Furthermore, requiring individuals to account for the imputed income on all of their possessions would raise major privacy concerns. A more palatable solution would be to tax only imputed income on owner-occupied housing, the largest single item. This might be accomplished by imputing a rental amount based on the values generated by a federal real property valuation system along with empirical data on rental rates.¹¹³ Owners, of course, would be entitled to depreciation deductions, which should be determinable through annual real property values. They should also be entitled to maintenance expense deductions as well, but this may entail somewhat burdensome record-keeping. However, taxing the imputed income on owner-occupied housing may be very difficult from a political standpoint, given that there is a general lack of understanding of its nature.¹¹⁴ Further-

field concept).

112. Cf. Halperin, *supra* note 78, at 381, 385 (calling for further research on whether a part realization, part accrual system would reduce the complexity and economic distortion of current law).

113. Cf. BLUEPRINTS, *supra* note 3, at 86 (noting this as a method for determining the imputed income on owner-occupied housing). A system for valuing real property is discussed *infra* Part V.B.3.

114. See BLUEPRINTS, *supra* note 3, at 86.

more, taxing only the imputed income from owner-occupied housing but not other consumer items again assumes that taxing less than all capital income advances economic efficiency and equity, which may not be the case.

4. *Economic Efficiency and Equity Gains as Affected by the Taxation of Labor*

An analysis of the economic efficiency and equity gains resulting from complete accrual taxation would be incomplete without considering the taxation of labor. As discussed above, complete accrual taxation may produce economic efficiency and equity gains by generally equalizing the effective tax rates on capital income. By moving such effective tax rates closer toward the statutory rates, accrual taxation would increase capital's share of the tax base. Taxing capital more heavily, however, may result in inefficiencies and inequities of a different kind—by discriminating in favor of labor—if the economic income from labor is taxed more lightly than that from capital.¹¹⁵ Thus, in order to fully evaluate the economic efficiency and equity gains of accrual taxation, the taxation of labor relative to that of capital needs to be addressed.

In two respects, accrual taxation would result in capital being taxed more heavily than labor, unless other measures are also employed. The potentially greater burden on capital income is due to the effects of inflation and the failure to tax human capital. As explained below, to minimize the inefficiencies and inequities that could result from the uneven taxation of capital and labor, complete accrual taxation should be accompanied by a method for indexing capital income for inflation. For the same reason, in connection with adopting complete accrual taxation, serious consideration should be given to developing a method for taxing any changes in wealth due to human capital.

It is familiar that inflation has a greater effect on the taxation of capital than on the taxation of labor. Unlike the situation with labor, a significant portion of the nominal income from capital is due to the amount of inflation that has occurred during the period in which an asset

115. Cf. Kaplow, *supra* note 15, at 1513 (noting that the different tax treatment of investments in human and physical capital may distort investment decisions).

is held.¹¹⁶ Therefore, taxing the full amount of nominal capital income in an inflationary setting would overtax real capital income relative to the taxation of labor income.¹¹⁷

Although the current system does not formally index capital income for inflation, it does provide several hidden forms of inexact indexing, which nearly exclude from income the aggregate inflationary returns to capital.¹¹⁸ Such features include the deferred taxation of unrealized gains, the stepped-up basis for assets held at death, accelerated depreciation, and last-in, first-out (LIFO) inventory accounting.¹¹⁹ However, complete accrual taxation, by taking into account estimated asset value changes on an annual basis, would eliminate these ad hoc forms of indexation and thus discriminate in favor of labor. Therefore, to avoid undertaxing labor (compared to capital) and the inefficiencies and inequities which could result, it is important that complete accrual taxation be accompanied by formal indexation.

With complete accrual taxation and thus the nearly full taxation of physical and financial capital,¹²⁰ concerns of economic efficiency and equity arguably also call for the taxation of human capital¹²¹—the value of a person's anticipated future earnings.¹²² Unlike the effects of inflation on the taxation of capital versus labor, however, there is considerably less certainty among tax scholars regarding the propriety of taxing human capital.

A few commentators have suggested that a tax system purporting to reach all economic income should include in the tax base any changes in the value of human capital.¹²³ Although not dictated by the Haig-

116. See, e.g., Halperin & Steuerle, *supra* note 9, at 348-53; Shuldiner, *supra* note 50, at 588 (pointing out that there is no need to index wages for inflation).

117. See Halperin & Steuerle, *supra* note 9, at 352.

118. See *id.* at 353-56. Nonetheless, for specific assets inflation can have widely varying effects upon the effective tax rate on real capital income. See *id.* at 357.

119. See *id.* at 353-56.

120. See *supra* Part III.B.3.

121. Cf. Kaplow, *supra* note 15, at 1501, 1513 (indicating that human capital should be taxed in a system that subjects physical and financial assets to accrual taxation); Mark Kelman, *Time Preference and Tax Equity*, 35 STAN. L. REV. 649, 651 (1983) (noting the inequity and inefficiency of discriminating in favor of human capital over physical and financial capital). Other commentators proposing the repeal of the realization rule likewise have addressed the taxation of human capital. See Shakow, *supra* note 4, at 1158; Fellows, *supra* note 65, at 780.

122. See Kaplow, *supra* note 15, at 1482-90; Shakow, *supra* note 4, at 1158.

123. See e.g., Kaplow, *supra* note 15; cf. William A. Klein, *Timing in Personal Taxation*, 6 J. LEGAL STUD. 461, 467-69 (1977) (while apparently recognizing that an ideal income tax would include any changes in the value of human capital, rejecting such treatment due to concerns of practicality and personal liberty violations). Other commentators have argued that current law (i) overtaxes labor by not allowing certain educational expenses to be capitalized and deducted, see, e.g., Daniel I. Halperin,

Simons definition of income,¹²⁴ it is claimed that an ideal income tax base should reflect human capital, given that it is the major component of most individuals' wealth.¹²⁵ According to one version of this view, an ideal income tax should include, at birth, the present value of an individual's expected future earnings.¹²⁶

To the extent that human capital provides economic value and therefore wealth to an individual, it should be reflected in a tax base comprised of economic income. Yet, in order to value human capital with a reasonable degree of accuracy, contingencies relating to an individual's actions would have to be reasonably assessed. This would be especially problematic if human capital were to be valued at an individual's birth. For such valuations, one would have to assess the individual's likelihood of completing high school, attending college and graduate school, and becoming employed, among other contingencies; these occurrences are highly dependent on individual idiosyncracies and, thus, are only roughly estimable. There also would be great difficulties in valuing human capital at the time that an individual attends college or professional school. On the other hand, valuations of nonmarketed business interests also involve an assessment of future events—that is, the forecast of future earnings streams and, as will be discussed later, reasonably accurate valuations of these items may be feasible. Thus, it may be possible to formulate some reasonable approach to valuing human capital. In this regard, it has been suggested that human capital may be valued by determining the amount of current borrowing that would be supported by an individual's future labor earnings.¹²⁷ An

Business Deduction for Personal Living Expenses: A Uniform Approach to an Unsolved Problem, 122 U. PA. L. REV. 859, 899-905 (1974), and (ii) may undertax labor by allowing foregone earnings associated with education to be effectively expensed rather than capitalized, *see, e.g.*, Paul B. Stephan III, *Federal Income Taxation and Human Capital*, 70 VA. L. REV. 1357, 1371-72 (1984).

124. *See* Kaplow, *supra* note 15, at 1500 n.52; Alvin Warren, *Would a Consumption Tax Be Fairer than an Income Tax?*, 89 YALE L.J. 1081, 1115 (1980).

125. *See* Kaplow, *supra* note 15, at 1500.

126. *See id.* at 1482-90. To avoid problems of valuation, liquidity, and alleged violations of personal liberty, Professor Kaplow would tax human capital by applying a multiplier to wages when earned—a form of retrospective taxation. *See id.* at 1507-11.

127. *See* William D. Andrews & David F. Bradford, *Savings Incentives in a Hybrid Income Tax*, in *UNEASY COMPROMISE*, *supra* note 9, at 269, 298. Such an approach follows from defining wealth as "the maximum amount of consumption a person could finance in a given period." *Id.* Nonetheless, Professors Andrews and Bradford believe that, as a practical matter, it would be very difficult to value human capital using this

ability-to-borrow approach could serve as a useful guidepost in valuing human capital.

Before proceeding further with the valuation issue, another problem should be pointed out: The taxation of human capital raises concerns over the violation of an individual's personal liberty. Several commentators have argued that taxing human capital violates liberty, in that individuals may be forced to work in order to pay the taxes on their human capital.¹²⁸ There are many instances, however, when the tax law essentially requires individuals to either work or dispose of assets to pay their taxes, for example, when money is earned and consumed without setting aside a portion for taxes or when income is received in the form of property.¹²⁹ Yet, in these situations, taxpayers may have other means than working to raise the needed tax funds—they could be more fiscally responsible in their consumption habits, or they could dispose of the property received. A much more difficult situation to distinguish is when taxes force impoverished people to work more than they otherwise would.¹³⁰ Even here, however, it might be contended that the tax law requires additional work only because the affected individuals have exercised a choice by entering the market.¹³¹

To avoid both valuation difficulties and alleged violations of personal liberty, as well as liquidity problems, Professor Kaplow has put forth for consideration an approach for taxing human capital which employs a form of retrospective taxation.¹³² Under his scheme, wages as earned would be grossed up by a multiplier in order to simulate the results that would have obtained if a tax had been imposed throughout an individual's life on the changes in the present value of earned wages.¹³³

ability-to-borrow standard. *Id.* at 300.

128. See, e.g., Warren, *supra* note 124, at 1114-17; Mark G. Kelman, *Personal Deductions Revisited: Why They Fit Poorly in an "Ideal" Income Tax and Why They Fit Worse in a Far from Ideal World*, 31 STAN. L. REV. 831, 838-44 (1979).

129. Cf. Stephan, *supra* note 123, at 1368 n.14 (pointing out that property and wealth taxes may force taxpayers to either work or sell property in order to pay their taxes).

130. See Kaplow, *supra* note 15, at 1506 n.71.

131. *Id.* at 1506.

132. Retrospective taxation is discussed more fully *infra* Part IV.A.

133. Specifically, wage earnings would be multiplied by

$$\frac{1}{t} - \frac{1-t}{t} \left(\frac{1+ra}{1+r} \right)^i$$

with t referring to the tax rate, i to the time period in which the wages are received, r to the interest rate and ra to the after-tax interest rate. Kaplow, *supra* note 15, at 1508. Professor Kaplow puts forth this approach as a thought experiment and not as a reform proposal. See Louis Kaplow, *On the Divergence Between "Ideal" and Conventional Income-Tax Treatment of Human Capital*, 86 AM. ECON. REV. 347, 349 (1996).

Thus, Professor Kaplow's method assumes that in the year of an individual's birth, the individual accrues wealth equal to the present value of actual future earnings. While this approach generally shows promise, it appears to depart from economic reality by effectively valuing human capital at an individual's birth based on actual future earnings, thus ignoring significant contingencies which exist at that time, and for years to come.¹³⁴ Economic value would be better reflected by taking into account, in connection with a retrospective approach, an individual's ability to borrow against future earnings¹³⁵ during the course of her life. A possible approach would be to use the gross-up mechanism, but adjust it so that changes in the present value of future wages are not effectively taxed until the individual has some presumed ability to borrow against those future wages, for example, upon graduating from college or becoming employed.¹³⁶ A more accurate, yet complex, approach would be to attempt to tailor the multiplier to the various borrowing abilities that individuals possess throughout their lives, possibly through the use of empirical evidence.

Given that economic efficiency and equity would be further advanced with equal treatment of economic income derived from capital and labor, I recommend that, in connection with accrual taxation for physical and finance capital, serious consideration be given to developing an approach for taxing human capital, possibly along the lines suggested above.¹³⁷

134. Professor Kaplow recognizes that this approach ignores uncertainty and that individuals would be overtaxed or undertaxed, depending on whether they experienced more favorable than average resolutions of uncertainty or less favorable resolutions, respectively. See Kaplow, *supra* note 15, at 1509-09 n.76; see also Kaplow, *supra* note 133, at 349. Cf. Warren, *supra* note 124, at 1116-17 (stating that the present value of future earnings streams does not indicate a power to purchase goods and services).

135. See *supra* note 127 and accompanying text.

136. Such an adjustment to the multiplier could be made by simply measuring the time period in which earnings are received from the year in which the ability to borrow is presumed, instead of from the year of the individual's birth.

137. To bring about more efficient and equitable treatment of those who invest in human capital and those who invest in financial capital, Professor Fellows suggests imposing higher tax rates on service income in connection with her retrospective taxation proposal for capital income. See Fellows, *supra* note 65, at 782.

Even if a retrospective approach substantially similar to that discussed in this Article were used for taxing human capital, several other issues would need to be addressed. For example, what interest rate should be used in discounting wages to present value? Cf. Gergen, *supra* note 39, at 224-26 (addressing a similar issue in connection with applying retrospective taxation to physical and financial capital). What tax rate should be applied to the grossed-up wages? Cf. Fellows, *supra* note 65, at 748 (addressing a

While any means of retrospective taxation would rather imprecisely reflect actual changes in value,¹³⁸ an accrual approach for taxing human capital, even if feasible, may be unacceptable because it appears to impinge on personal liberty. Therefore, the choice may well be either a retrospective method or no taxation of human capital at all. The former should better equalize the taxation of capital and labor and thus seems preferable.¹³⁹

5. *An Accrual System Should Result in Numerous Administrative Benefits*

As Professor Shakow points out, it seems odd to praise accrual taxation for its administrative benefits given the need to value assets on an annual basis.¹⁴⁰ Yet, numerous administrative benefits could result, such as the deletion of many Code sections and improvement of the current valuation process used for federal and state taxation.¹⁴¹ These administrative benefits are addressed below.

a. Many Code Provisions Would Be Rendered Unnecessary

A significant number of Code provisions result in large part from having a realization system, as opposed to an accrual system, for dealing with asset appreciation and depreciation.¹⁴² Most prominently, the capital gains preference and all the accompanying provisions would be unnecessary under an accrual system. The capital gains preference¹⁴³ was originally enacted to alleviate the “bunching” effect—the inclusion

similar issue in connection with applying retrospective taxation to physical and financial capital).

138. See *infra* Part IV.A. In this connection, the problem of strategic trading, which has been found to significantly affect the effective tax rates under the retrospective taxation of physical and financial assets, would not be present with the retrospective taxation of human capital, given that under this method an individual cannot dispose of her human capital at a loss.

139. Cf. Cunningham & Schenk, *supra* note 3, at 747 (concluding in a similar fashion that expected return taxation for split ownership interests in property, although not perfect in measuring income, is preferable to current law).

140. Shakow, *supra* note 4, at 1115.

141. In fact, Professor Bittker doubts that the appraising costs brought on by accrual taxation would equal the current cost of administering the realization rule. See Boris I. Bittker, *Tax Reform and Tax Simplification*, 29 U. MIAMI L. REV. 1, 3 (1974).

142. See *id.*; cf. Shuldiner, *supra* note 18, at 283-84 (referring to several provisions that address the problems created by the realization rule, which could be repealed with the adoption of accrual taxation).

143. I.R.C. §§ 1(h), 1201, 1221-1223 (1994). In addition, the Revenue Reconciliation Act of 1993 added section 1202, which generally allows noncorporate taxpayers to exclude 50% of any gain derived from the disposition of “qualified small business stock” which is held for more than 5 years. *Id.* § 1202.

of several years of appreciation in one year and the resulting high marginal tax rates that would apply to the consequent income.¹⁴⁴ A later, additional justification for the preference was to compensate for the fact that all or a portion of the gain may be due to inflation.¹⁴⁵ Accrual taxation, coupled with the indexing of asset bases to reflect inflation, would allow for the repeal of the special treatment accorded capital gains. With the inclusion of an asset's real appreciation annually, neither bunching nor the inclusion of inflationary gains would occur, thus removing the need for the capital gains preference.

The tax law also accords special treatment to capital losses.¹⁴⁶ The Code limits the amount of capital losses that may be deducted annually in order to prevent taxpayers from effectively choosing the year in which investment losses are reported.¹⁴⁷ Because accrual taxation would eliminate the ability of taxpayers to control the timing of gains and losses, the capital loss limitations could also be repealed.

With the repeal of both the capital gains preference and the capital loss limitations, the entire capital/ordinary distinction effectuated throughout the Code could be eliminated. Thus, all of the provisions that form the mechanics of capital gain and loss determinations,¹⁴⁸ including the vague and difficult-to-apply capital asset definition, could be repealed. Furthermore, the many provisions contained throughout the Code that guard against taxpayer conversion of capital items into ordinary items, or vice versa, could also be deleted. For example, the rules requiring the recapture of certain amounts into ordinary income upon the disposition of depreciable property¹⁴⁹ would no longer be necessary.

Accrual taxation also would obviate nonrecognition rules. The realization and recognition requirements result in the apparent need for nonrecognition when the disposition of an asset more closely resembles a change in the form, as opposed to the substance, of the taxpayer's holdings. In a system that hinges taxation of asset appreciation on the disposition of property, dispositions that merely affect the form of a

144. See Cunningham & Schenk, *supra* note 32, at 328-30.

145. *Id.* at 337.

146. I.R.C. §§ 1211-1212, 1222-1223 (1994).

147. See ABA, *Evaluation*, *supra* note 4, at 591-92.

148. See *supra* note 143; I.R.C. §§ 1211-1212, 1222-1223.

149. See I.R.C. §§ 1245, 1250 (1994 & West Supp. 1996).

taxpayer's holdings are viewed as inappropriate events for levying a tax.¹⁵⁰ Under an accrual system, however, nonrecognition provisions would have no place, as dispositions are irrelevant to the imposition of tax; asset gains and losses would accrue regardless of dispositions. Consequently, it would be possible to repeal the many nonrecognition provisions prevalent throughout the Code, such as the rules applying to like-kind property exchanges,¹⁵¹ corporate¹⁵² and partnership formations,¹⁵³ and corporate reorganizations.¹⁵⁴ Each of these nonrecognition provisions contains complex definitional requirements¹⁵⁵ and rules providing for corollary adjustments.¹⁵⁶

The use of an accrual system would also allow for the repeal of the provisions effectuating the shareholder-level tax on distributions from C corporations. Presently, the Code employs several mechanisms to exact the second level of tax on corporate earnings—rules for determining the dividend consequences of nonliquidating distributions,¹⁵⁷ rules for distinguishing between redemptions warranting distribution as opposed to exchange treatment,¹⁵⁸ rules for determining the taxable consequences of stock dividends,¹⁵⁹ rules denying full exchange treatment to dispositions of certain preferred stock,¹⁶⁰ and rules imposing distribution treatment on certain sales of stock to affiliated corporations.¹⁶¹ Under an accrual system, this tax would be imposed by including in a shareholder's tax base (i) the value of any amounts received during the year from the corporation, and (ii) the annual change in value of the shareholder's stock ownership in the corporation, taking into account any contributions the shareholder made during the year.¹⁶² Consequently, it may be possible to fully repeal the above-mentioned rules, which comprise a major portion of subchapter C.¹⁶³ Similarly,

150. See STEPHEN A. LIND ET AL., CASES AND MATERIALS ON FUNDAMENTALS OF CORPORATE TAXATION 58 (1991).

151. I.R.C. § 1031.

152. *Id.* § 351.

153. *Id.* § 721 (1994).

154. *Id.* §§ 354 (1994 & West Supp. 1996), 361 (1994).

155. See, e.g., *id.* § 368 (1994).

156. See, e.g., *id.* § 358 (1994).

157. *Id.* § 301 (1994).

158. *Id.* § 302 (1994).

159. *Id.* § 305 (1994).

160. *Id.* § 306 (1994).

161. *Id.* § 304 (1994).

162. See Thuronyi, *supra* note 4, at 121; Shoven & Taubman, *supra* note 4, at 211.

163. The repeal of these rules, along with the nonrecognition rules for corporate formations and reorganization, should virtually delete subchapter C. Nonetheless, it may be necessary to retain these shareholder-level tax rules for taxing foreign shareholders, as they are taxed only on dividends, not stock gains. See I.R.C. § 871 (1994). An

it would be possible to repeal other rules governing entity-owner relationships, for example, the pass-through regimes applicable to partnerships and S corporations.

Additionally, the accrual system should be used to attempt to measure the actual decline in value of business and investment assets for purposes of computing depreciation deductions.¹⁶⁴ This aspect of an accrual system would supplant the current morass of depreciation rules, which contain several categories of general rules for determining deductions based on mechanical, somewhat arbitrary methods, coupled with many exceptions.¹⁶⁵ Furthermore, the admittedly often excessive depreciation deductions produced by these rules have aided tax shelter activities, which in turn have prompted Congress to enact such curbing measures as the passive loss rules¹⁶⁶ and the at-risk rules.¹⁶⁷ Consequently, using an accrual system to determine reasonably accurate depreciation deductions should further simplify the Code by allowing for the repeal of these anti-shelter provisions.¹⁶⁸

Another provision ripe for repeal with the adoption of an accrual system would be the installment sale provisions. To alleviate taxpayer liquidity problems where asset sales are done on a deferred payment

alternative may be to include in a foreign shareholder's tax base stock appreciation and depreciation, along with amounts received from the corporation. A collection procedure similar to that used under the Foreign Investors Real Property Act (FIRPTA) could be adopted, with withholdings made from distributions and sales proceeds. See I.R.C. §§ 897, 1445 (1994) (FIRPTA provisions). If that were done, then the application of the accrual system to foreign shareholders' income and loss from stock holdings would be the same as for U.S. shareholders, and the shareholder-level tax rules could be fully repealed. See Thuronyi, *supra* note 4, at 121; Shakow, *supra* note 4, at 1135 n.91.

164. This follows from the lack of a factual basis for varying the effective tax rates on capital income, which includes the income from depreciable property. See *supra* notes 58-78 and accompanying text; see also John P. Steines, *Income Tax Allowances for Cost Recovery*, 40 TAX L. REV. 483, 545-50 (1985) (pointing out that economists and others have questioned the wisdom and effectiveness of using depreciation allowances to stimulate the economy, and concluding that Congress should be reluctant to use depreciation allowances to stimulate the economy, unless doing so has demonstrable merit and a similar end realistically cannot be achieved outside the tax system).

165. See I.R.C. §§ 167, 179, 197, 280F (1994), 168 (1994 & West Supp. 1996).

166. *Id.* § 469.

167. *Id.* § 465.

168. Cf. Gene Steuerle, *Does the Code Reward Concentrated Ownership of Real Estate?*, 62 TAX NOTES 635, 636 (1994) (pointing out that if the taxable income from real estate investments were equal to economic income, Congress could repeal the passive loss rules).

basis, the Code generally allows taxpayers to report a portion of the total gain each year as payments are received, rather than taxing all of an asset's appreciation in the year of the sale.¹⁶⁹ Under an accrual system, taxpayers would not be faced with such liquidity problems in the year of a deferred payment sale, given that only one year's worth of appreciation would be subject to tax for that year; therefore, the installment sale provisions should be unnecessary.¹⁷⁰

Besides the above-mentioned provisions, several other sections of the Code may be eliminated with the adoption of an accrual system. Included among these provisions are the rules disallowing losses on sales of property between related parties,¹⁷¹ rules imputing interest to deferred property sales,¹⁷² the original issue discount rules,¹⁷³ and the special rules applying to controlled foreign corporations.¹⁷⁴ All together, 210 Code sections have been identified as candidates for repeal;¹⁷⁵ adopting an accrual tax system thus could result in a thirty percent reduction in the number of Code sections that currently comprise the federal income tax.

b. Collateral Benefits of a Computerized Valuation System

The development of a computerized valuation system to implement an accrual system may produce several collateral administrative benefits for both federal and state governments, as well as taxpayers, by improving on the valuation process currently in use for federal and state tax purposes. In administering federal income tax laws, valuation issues currently arise in determining deductions for charitable contributions¹⁷⁶ and uninsured casualty losses.¹⁷⁷ Appraisals are even more integral to the administration of the federal estate and gift taxes, given that a key determinant in the base of these taxes is the value of transferred property.¹⁷⁸ As a consequence, in dealing with these areas of taxation,

169. See I.R.C. §§ 453, 453A, 453B (1994).

170. Nonetheless, taxpayers may generally face liquidity problems in light of accrual taxation. These concerns are discussed later. See *infra* Part VI.

171. I.R.C. § 267(a)(1), (d) (1994).

172. *Id.* §§ 483, 1274 (1994).

173. *Id.* §§ 1272, 1273, 1275 (1994).

174. *Id.* §§ 951-962, 964 (1994).

175. A list of these Code sections is set forth in the Appendix.

176. See I.R.C. § 170 (1994); Treas. Reg. § 1.170A-1(c) (as amended in 1990); see, e.g., *Anselmo v. Comm'r*, 757 F.2d 1208 (11th Cir. 1985), *aff'g* 80 T.C. 872 (1983).

177. See I.R.C. § 165(c)(3) (1994); see e.g., *Stein v. Comm'r*, 31 T.C.M. (CCH) 663 (1972), *aff'd in part by unpublished order*, 492 F.2d 1246 (7th Cir. 1974).

178. See I.R.C. §§ 2031, 2512 (1994); Treas. Reg. § 20.2031-1 (as amended in 1965); Treas. Reg. § 20.2031-2 (as amended in 1992); Treas. Reg. § 20.2031-3 (as amended in 1992); Treas. Reg. § 20.2031-4 to -6 (1958); Treas. Reg. § 20.2031-7 (as

the IRS and taxpayers must currently resort to primarily manual appraisals¹⁷⁹ of property. Besides being expensive, manual appraisals appear to be quite subjective, given the extent to which two appraisals of a particular asset can vary.¹⁸⁰ The widely different values produced by manual appraisals no doubt contribute to valuation controversies between the IRS and taxpayers, which result in increased burdens for both the IRS Appeals Office and the courts.¹⁸¹ An automated valuation process based on computer applied, economically sound and objective formulas may result in lower costs and less controversy for the IRS and taxpayers in valuing property for federal tax purposes.¹⁸²

Under state and local tax laws, valuation also currently plays a key role. In administering real property taxes, local governments are required to value real property on a periodic basis.¹⁸³ The traditional approach has been to manually appraise the value of the realty. There has been, however, a recent trend to use computer-assisted mass appraisal processes.¹⁸⁴ In either case, local governments may benefit from the development by the federal government of an automated valuation process. With regard to the states' administration of personal

amended in 1994); Treas. Reg. § 20.2031-7A (1994); Treas. Reg. § 20.2031-8 (as amended in 1974); Treas. Reg. § 20.2031-9 (1958); Treas. Reg. § 25.2512-1 (as amended in 1992); Treas. Reg. § 25.2512-2 (as amended in 1976); Treas. Reg. § 25.2512-3 to -4 (1958); Treas. Reg. § 25.2512-5 (as amended in 1994); Treas. Reg. § 25.2512-5A (1994); Treas. Reg. § 24.2512-6 (as amended in 1974); *see, e.g.*, Russell v. United States, 260 F. Supp. 493 (N.D. Ill. 1966); *Calder v. Comm'r*, 85 T.C. 713 (1985).

179. Manual appraisals are those done by human beings. Computer software packages are available for valuing business enterprises. *See infra* notes 357-59 and accompanying text. This software, however, requires the judgment of the user in many instances. *See infra* note 360 and accompanying text.

180. *See, e.g.*, *Ashkar v. Comm'r*, 61 T.C.M. (CCH) 1657 (1991) (taxpayer's expert valued ancient biblical fragments at between \$300,000 and \$700,000, while IRS's expert valued these items at between \$25,000 and \$30,000).

181. *Cf.* Ralph E. Lerner, *Valuing Works of Art for Tax Purposes*, 28 REAL PROP. PROB. & TR. J. 593, 606 n.73 (1993) (citing to some of the many tax cases dealing with valuation disputes).

182. *Cf.* George Cooper, *Taking Wealth Taxation Seriously: Mortimer Hess Memorial Lecture*, reprinted in 34 RECORD OF THE ASSOCIATION OF THE BAR OF THE CITY OF NEW YORK 24, 35-36 (1979) (asserting that a computer-based, objective formula approach to valuation for purposes of administering an annual wealth tax may well be more accurate, more fair and less costly than the current valuation process).

183. *See, e.g.*, MD. CODE ANN., TAX-PROP., § 8-104(b) (1994) (providing for a 3-year cycle).

184. *See infra* notes 330-47 and accompanying text.

property taxes, even greater benefits may be realized because an automated valuation process should be more accurate—and therefore fairer—than using pricing guides or percentages of original costs, which are sometimes employed to value personal property.¹⁸⁵

Additionally, the development of a computerized valuation system also may aid in administering the transfer pricing rules under Code section 482. In order to ensure that related corporations charge one another fair prices for property and services, section 482 authorizes the IRS to use arm's-length principles to compute prices.¹⁸⁶ This authority is most often exercised regarding transfers between affiliated U.S. and foreign corporations, where there is a risk that inter-company pricing may be used to siphon profits out of the U.S. tax base.¹⁸⁷ In determining arm's-length amounts for the sale or use of property, as well as services, amounts charged by unrelated parties in comparable transactions are the preferred guidepost.¹⁸⁸ Nonetheless, other means include profit-split methods aimed at allocating combined profit among related corporations in a manner that reflects the relative value of each related corporation's contribution to the combined profit.¹⁸⁹ In essence, then, the transfer pricing rules are methods for valuing property and services.¹⁹⁰ And, the valuation processes in the section 482 context are performed by individuals.¹⁹¹ In consequence, transfer pricing determinations are quite costly and controversial.¹⁹² Thus, an automated valuation process also may facilitate the administration of section 482 by providing objective and less costly computer-determined transfer prices.

Finally, the development of a computer-based valuation system may benefit foreign governments in the administration of wealth taxes and as a consequence, possibly may engender the cooperation of foreign governments in such a project. Several European countries impose

185. See, e.g., VA. CODE ANN. § 58.1-3503(B) (Michie Supp. 1996).

186. I.R.C. § 482 (1994).

187. See BORIS I. BITTKER & LAWRENCE LOKKEN, 3 FEDERAL TAXATION OF INCOME, ESTATES AND GIFTS ¶ 79.3 (2d ed. 1991).

188. See Treas. Reg. § 1.482-1 (1994).

189. See Treas. Reg. § 1.482-6 (as amended in 1995).

190. Cf. GORDON V. SMITH & RUSSELL L. PARR, VALUATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS 380 (2d ed. 1994) (discussing the use of the discounted cash flow method, an income-based valuation method, to determine arm's-length royalties for purposes of section 482).

191. To assist in the process, the IRS is in the process of compiling databases containing comparables for use under section 482. See Brown, *supra* note 12, at 171.

192. See generally Stanley I. Langbein, *The Unitary Method and the Myth of Arm's-Length*, 30 TAX NOTES 625 (1986).

annual taxes on the net wealth of individuals.¹⁹³ In valuing interests in closely held businesses for purposes of these taxes, for example, the countries employ differing formulas that on the whole appear to approximate value merely roughly.¹⁹⁴ Therefore, these countries may be interested in participating in an international effort to develop a more accurate, computer-based approach for valuing property on a mass scale.¹⁹⁵

IV. OTHER ALTERNATIVES TO THE REALIZATION RULE WOULD NOT FULLY ACHIEVE GAINS IN ECONOMIC EFFICIENCY, EQUITY AND CODE SIMPLIFICATION

A. Overview

As demonstrated in the previous Part, an accrual tax system may produce gains in the fundamental areas of economic efficiency and equity and would significantly simplify the Code. However, the administrative difficulties of valuation and potential taxpayer illiquidity associated with accrual taxation would likely require a substantial effort to attain feasibility.¹⁹⁶ An obvious question, then, is whether the aforementioned gains could be achieved through alternatives that would avoid the administrative difficulties of complete accrual taxation.

Over the last few decades, commentators have proposed several alternatives to the realization rule, which have seen limited application in the tax law. Specifically, retrospective taxation, partial accrual taxation, and expected return taxation are measures which attempt to respond to the problem of deferral without incurring the administrative

193. See ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, TAXATION OF NET WEALTH, CAPITAL TRANSFERS AND CAPITAL GAINS OF INDIVIDUALS 61-74 (1988) [hereinafter OECD, NET WEALTH]; see also RICHARD W. LINDHOLM, A NEW FEDERAL TAX SYSTEM 180-81 (1984).

194. See OECD, NET WEALTH, *supra* note 193, at 71-73.

195. In this regard, there have been several international efforts sponsored by OECD on the tax issues facing multinational businesses. See, e.g., OECD, COMMITTEE ON FISCAL AFFAIRS, TRANSFER PRICING AND MULTINATIONAL ENTERPRISES: THREE TAXATION ISSUES (1984).

196. In particular, the possibility of a computerized valuation approach is discussed *infra* Part V.

burdens of complete accrual taxation.¹⁹⁷ As this Part will demonstrate, these alternatives would not fully achieve the economic efficiency, equity, and Code simplification gains that could result from using complete accrual taxation.

Under retrospective taxation, the tax event awaits realization, but accrual taxation is approximated by (i) allocating the gain or loss over the term of the investment, (ii) computing the increase or decrease in tax attributable to the allocated gain or loss, respectively, for each of the taxable years covered by the investment's term, and (iii) charging or paying the taxpayer interest for the period of the underpayment or overpayment, as the case may be.¹⁹⁸ Most retrospective taxation proposals,¹⁹⁹ as well as the Code's sole use of it in a provision dealing with Passive Foreign Investment Companies (PFIC),²⁰⁰ allocate gain or loss ratably over the holding period of investment. A recent proposal by Professor Fellows, however, would allocate gain or loss at a compound rate using a constant yield to maturity,²⁰¹ an approach which in other contexts has been recognized as more economically realistic than ratable apportionment.²⁰²

As an illustration of such an application of retrospective taxation, assume that a taxpayer purchases an asset in year one for \$100 and sells it in year three for \$121. The \$21 of gain would be allocated over the

197. Partial accrual taxation and expected return taxation do, however, raise concerns of taxpayer liquidity. See Shakow, *supra* note 4, at 1167; Cunningham & Schenk, *supra* note 3, at 743-46.

198. See Fellows, *supra* note 65, at 737.

199. See, e.g., Shakow, *supra* note 4, at 1122-23; Cynthia Blum, *New Role for the Treasury: Charging Interest on Tax Deferral Loans*, 25 HARV. J. ON LEGIS. 1 (1988).

200. Under section 1291, gains on the disposition of PFIC stock or certain PFIC distributions are allocated on a straight-line basis over the PFIC stock's holding period as ordinary income and taxed at the highest rate for each of these years, with an interest charge imposed for the period between the year to which gain is attributed and the year in which the gain is realized. I.R.C. § 1291 (1994). In addition, the Code uses a feature of retrospective taxation, interest-bearing deferred tax liabilities, in several instances—in connection with certain applications of the installment method for reporting gain, *id.* §§ 453(l)(3), 453A(c); in the throwback rules for foreign trusts, *id.* § 668(a),(c) (1994); in the taxable year rules for S corporations and partnerships, *id.* § 7519 (1994); in connection with the percentage of completion method for certain long-term contracts, *id.* § 460(b)(2); and in the Domestic International Sales Companies (DISC) rules, *id.* § 995(f) (1994).

201. See Fellows, *supra* note 65, at 743; *cf.* Gergen, *supra* note 39, at 223 (allocating gain and loss on a constant yield to maturity basis in analyzing the effect of retrospective taxation on effective tax rates).

202. This recognition prompted Congress to amend the original issue discount rules, I.R.C. § 1272, to use economic accrual, rather than ratable apportionment, in order to allocate interest over the term of a debt instrument. See, e.g., Peter C. Canellos & Edward D. Kleinbard, *The Miracle of Compound Interest: Interest Deferral and Discount After 1982*, 38 TAX. L. REV. 565 (1983).

term of the investment using the investment's implicit rate of return, assuming a constant yield to maturity and annual compounding—which on these facts is ten percent compounded annually.²⁰³ Thus, \$10 of gain would be allocated to year two²⁰⁴ and \$11 of gain would be allocated to year three.²⁰⁵ Assuming that the taxpayer is subject to a forty percent tax rate and that the before-tax interest rate on deferred tax liabilities is ten percent compounded annually, the taxpayer would have (i) \$4 of tax on year one's gain and \$.24 of interest on that tax,²⁰⁶ plus (ii) \$4.40 of tax on year two's gain, for a total time-adjusted tax in the year of the sale of \$8.64.²⁰⁷

Another alternative to the realization rule is partial accrual taxation which, as the term suggests, applies accrual taxation—or synonymously, mark-to-market taxation—only to certain types of assets. Under the Code, mark-to-market taxation is used for futures contracts and options that are traded on exchanges and for foreign currency contracts traded in the interbank market,²⁰⁸ as well as for all noninvestment securities held by dealers.²⁰⁹ In addition, over the years several commentators have advocated using accrual taxation for other types of assets that generally pose minor problems of valuation and liquidity, such as publicly traded securities.²¹⁰ Professor Shakow goes beyond most of these proposals and recommends accrual taxation for publicly traded stock, publicly and privately traded debt-instruments, commercial real estate, and tangible business assets,²¹¹ for assets not subject to accrual

203. More generally, an investment's rate of return under these assumptions would equal

$$\left(\frac{V}{C} \right)^{\frac{1}{n}} - 1$$

with v as the investment's value upon sale, c as the initial cost of the investment, and n as the number of years the investment is held. See Gergen, *supra* note 39, at 222 n.49; Fellows, *supra* note 65, at 742-43.

204. $100 \times .10$.

205. $(100 + 10) \times .10$.

206. $\$4 \times .06$ (the after-tax interest rate to this taxpayer). The after-tax interest rate should be used to adjust the deferred tax liability because this is the advantage that taxpayer receives from deferral. See Fellows, *supra* note 65, at 751; Gergen, *supra* note 39, at 222.

207. See Fellows, *supra* note 65, at 752.

208. See I.R.C. § 1256.

209. *Id.* § 475.

210. See, e.g., Slawson, *supra* note 4.

211. See Shakow, *supra* note 4, at 1126-57. For privately traded debt, Professor Shakow proposes an approximate, mechanical valuation approach whereby value would

taxation, he recommends a form of retrospective taxation using ratable allocation.²¹²

Lastly, expected return taxation attempts to overcome deferral by imputing income over the term of an investment based on the investment's expected return at the outset.²¹³ Unlike the other two alternatives, expected return taxation plays a fairly significant role under current law as it is the method used to tax bonds with original issue discount (OID).²¹⁴ To illustrate its application, assume that a taxpayer pays \$100 for a corporate bond that will pay \$126 in three years, with no annual interest payments. The expected rate of return, or yield to maturity, on this bond is eight percent compounded annually. Under the OID rules, the taxpayer would include interest based on the bond's expected rate of return of eight percent compounded annually; thus, the taxpayer would report interest of \$8.00 for the first year (.08 x \$100), \$8.64 for the second year (.08 x \$108), and \$9.33 for the third year (.08 x \$116.64).²¹⁵ Recent scholarship has recommended extending expected return taxation to some other situations involving deferred returns.²¹⁶

The following sections evaluate three alternative schemes under the policy standards of economic efficiency, equity, and Code simplification. These alternatives use retrospective, partial accrual, and expected return taxation, either alone or in combination. As is demonstrated, each of these alternative schemes is significantly deficient to complete accrual taxation in advancing these fundamental tax policy concerns.

be estimated based on the relationship between the interest rate on the subject debt instrument and a benchmark rate for the year in which the debt instrument was issued. *Id.* at 1130. For tangible business assets, Professor Shakow apparently would use an approach which would approximate economic depreciation. *Id.* at 1157.

212. *Id.* at 1122-23.

213. See Gergen, *supra* note 39, at 218.

214. See I.R.C. §§ 1272-1275. Expected return taxation also is used in recently promulgated regulations dealing with notional principal contracts. See Treas. Reg. § 1.446-3 (as amended in 1994).

215. See I.R.C. § 1272(a). As Professor Gergen indicates, the OID rules do not employ true expected return taxation, in that they ignore credit risk and interest rate risk. Gergen, *supra* note 39, at 219. True expected return taxation, however, is found in proposed regulations on debt instruments with contingent payments, where contingent payments are estimated by using forward prices for the underlying property, or if such prices are not readily available, by determining a reasonable rate of return on the instrument based on comparables. Prop. Treas. Reg. § 1.1275-4(b), 60 Fed. Reg. 13,213 (1995); see also Gergen, *supra* note 39, at 219-21.

216. See, e.g., Cunningham & Schenk, *supra* note 3.

B. Universal Retrospective Taxation

One possible scheme would be to apply retrospective taxation to all assets. As demonstrated below, such an approach has troubling economic efficiency and equity consequences, as well as limited Code simplification benefits.

Equalizing the effective tax rates on capital income generally should promote economic efficiency and equity.²¹⁷ Accordingly, retrospective taxation's capacity for producing economic efficiency and equity gains can be judged by its ability to so equalize effective tax rates.

As noted above, retrospective taxation does not allocate gains and losses to the time periods in which they economically accrue, but instead bases the allocation on the investment's ex post average rate of return. Thus, retrospective taxation, to avoid the difficulties of annual valuations, merely approximates the manner in which gains and losses arise; rather than accruing at a constant rate, there actually may be wide fluctuations in the value of an asset over the term of an investment. As a result, retrospective taxation may significantly overtax or undertax the income of a particular investment, or stated another way, may cause material differences in the effective tax rates on capital income. For example, if a two-year investment produced a high return (in the form of capital appreciation) for the first year followed by a low return for the second year, retrospective taxation would blend the two returns, thus effectively deferring the tax on a portion of the high return and causing undertaxation.²¹⁸ On the other hand, if low returns precede high returns, the blending effect accelerates tax on the low returns, causing overtaxation.²¹⁹ With greater differences between the high and low returns, or in other words, with higher levels of volatility, the degree of undertaxation or overtaxation increases.²²⁰

217. See *supra* Part III.B. Simply for purposes of the analysis in this Part, it is assumed that the failure to tax imputed capital income would not compromise economic efficiency and equity gains.

218. See Gergen, *supra* note 39, at 229.

219. *Id.*

220. *Id.* at 232 n.78.

The under- and overtaxation described above would clearly distort equity.²²¹ Nonetheless, it might be contended that although particular investments are likely to be subject to different effective tax rates depending on the pattern of their returns, the average effective tax rate for all investments should equal the statutory rate because the under- and overtaxation results should cancel each other out.²²² Thus, one might argue that while retrospective taxation would cause inequities where investors cannot diversify their holdings, it should not produce an inefficient allocation of resources or inefficient diversification of investment portfolios.²²³ Professor Gergen, however, has demonstrated that for average investment returns the under- and overtaxation results do not cancel each other out, and that the average effective tax rate for investments with overall positive returns is below the statutory rate.²²⁴ Professor Gergen obtained this result by applying retrospective taxation to the binomial distributed returns of a hypothetical investment, as well as to the actual performance of 500 publicly traded stocks over several investment terms.²²⁵ His findings also indicate that the average effective tax rate decreases for longer investment horizons,²²⁶ as well as for higher levels of volatility.²²⁷ In addition, Professor Gergen's analysis demonstrates that effective tax rates under the retrospective method decrease even further when strategic trading is present,²²⁸ as the investment horizons and volatility increase.²²⁹ Indeed, for assets

221. See Fellows, *supra* note 65, at 745 n.55 (stating that equity appears to be a major concern with retrospective taxation).

222. Professor Fellows appears to take this view and supports it by an application of retrospective taxation to stock data on Standard & Poor's 500 Common Stocks for 1965 to 1984, which she claims produces results that closely approximate accrual taxation. *Id.* at app. 812-13. Actually, Professor Fellow's analysis shows that retrospective taxation overtaxed the returns on these stocks by 12.30%, a result which is probably due to the fact that several years with negative returns occurred in the first half of the sample period. *Id.* at app. 813.

223. See *supra* Part III.B.1. and accompanying text.

224. Gergen, *supra* note 39, at 232.

225. *Id.* at 231-40. In addition, Professor Gergen provides a mathematical explanation for this phenomenon. *Id.* at 232 n.78.

226. Specifically, for the hypothetical investment, effective tax rates ranged from approximately 40% to approximately 39% as the investment horizon increased from two to seven years, with a statutory rate of 40%. For the publicly traded stocks, effective tax rates ranged from approximately 38.5% to 33% as the investment horizon increased from five to fifteen years, with a statutory rate of 40%. See *id.* at 231-36.

227. Specifically, for the hypothetical investment held for five years, effective tax rates ranged from approximately 40% to approximately 24% as the level of volatility increased, with a statutory rate of 40%. For the publicly traded stocks held for five years, effective tax rates ranged from approximately 40% to approximately 37% as the level of volatility increased, with a statutory rate of 40%. See *id.* at 233-39.

228. See *supra* notes 42-46 and accompanying text.

229. See Gergen, *supra* note 39, at 240-43, 245-50.

trading at very low costs, for which strategic trading is most prevalent, the variation in effective tax rates is similar to that under the realization rule.²³⁰

In sum, retrospective taxation appears to present serious concerns of inequity and inefficiency, given its capacity for producing varying effective tax rates on capital income.²³¹ The use of retrospective taxation for publicly traded stock is especially problematic, as for these assets it appears to offer little improvement over the realization rule.²³² Accordingly, a universal application of retrospective taxation would fall considerably short of complete accrual taxation in improving the equity and economic efficiency of the tax system.

Retrospective taxation also would not achieve the Code simplification that could occur with complete accrual taxation. Because strategic trading could be used by investors to lower effective tax rates, it would be necessary to retain the capital loss limitations²³³ in order to place some curb on this form of manipulation.²³⁴ Keeping the capital loss limitations means, of course, retention of the entire capital versus ordinary distinction that complicates the Code. Similarly, the wash sales provision²³⁵ and section 267(a)(1), which disallows losses on sales to related parties, should be kept as additional checks on strategic trading.²³⁶

In addition, unlike complete accrual taxation, retrospective taxation would not allow for the repeal of the provisions effectuating the shareholder-level tax on distributions from C corporations. There would be the continued need for sections 301 and 316 to determine whether a corporate distribution is out of earnings and profits and therefore includable, or not supported by corporate profits and therefore

230. *See id.* at 217, 243, 250.

231. *See supra* Part III.B.

232. *See Gergen, supra* note 39, at 217.

233. Professor Fellows is of the opinion that with retrospective taxation it would be possible to abandon the capital loss limitation, because this method would eliminate the benefit of tax deferral on gains. Fellows, *supra* note 65, at 802. In light of Professor Gergen's findings regarding the effect of strategic trading on retrospective taxation, Professor Fellows' assessment of the need for the capital loss limitation appears incorrect.

234. *See Gergen, supra* note 39, at 214. Although the capital loss limitation is probably an imperfect check on strategic trading, it is likely not completely ineffective. *See id.* at 213-14.

235. I.R.C. § 1091 (1994).

236. *Id.* § 267(a)(1).

excludable (with a stock basis reduction and possible gain recognition).²³⁷ It also would be necessary to retain section 305 to distinguish between taxable and nontaxable stock distributions. In addition, with dividends fully includable and stock dispositions subject to retrospective taxation, it probably would be necessary to keep sections 302, 304, and 306, which prevent taxpayers from disguising dividends as proceeds from stock dispositions, although the retrospective method's time-adjusted tax may significantly deter this ploy with respect to disposition of appreciated stock. Furthermore, retrospective taxation should not allow for the repeal of rules governing other entity-owner relationships, such as the rules applying to partnerships and S corporations.²³⁸

Retrospective taxation also would not permit the repeal of the installment sales provisions, which generally allow taxpayers to report gain as cash is received on deferred payment sales.²³⁹ Given that retrospective taxation is partially founded on the desire to avoid liquidity problems,²⁴⁰ it would be quite inconsistent to engender such difficulties through the repeal of section 453. In fact, because a taxpayer would owe tax plus an interest charge on the sale of an appreciated asset, an installment sale likely would cause even greater liquidity problems under retrospective taxation than under current law, in the absence of taxpayer relief.²⁴¹

Finally, it is doubtful whether retrospective taxation would lead to the repeal of the nonrecognition provisions.²⁴² A justification often given for nonrecognition provisions is that there should be no tax consequences when a taxpayer changes the form of her holdings, as opposed to the substance, just as there are no such consequences when a taxpayer remains in the same investment.²⁴³ Underlying this policy is a concern

237. Cf. Gergen, *supra* note 39, at 227-28 (employing sections 301 and 316 to determine whether a distribution is treated as a dividend or recovery of capital for purposes of applying the retrospective method to historic stock data); Fellows, *supra* note 65, at 801-05 (not including these provisions among the sections that could be repealed with retrospective taxation).

238. Cf. Fellows, *supra* note 65, at 801-05.

239. See I.R.C. §§ 453, 453A, 453B.

240. See Fellows, *supra* note 65, at 727.

241. Cf. Cunningham & Schenk, *supra* note 3, at 744-45 (noting that even with a cash sale under retrospective taxation, the proceeds may not be sufficient to fund the tax and interest).

242. See, e.g., I.R.C. §§ 1033 (1994 & West Supp. 1996), 1031, 351, 354, 361, 721.

243. See BORIS I. BITTKER & JAMES S. EUSTICE, FEDERAL INCOME TAXATION OF CORPORATIONS AND SHAREHOLDERS ¶ 3.01 (6th ed. 1994). While the common theme among the nonrecognition provisions is that the new and old holdings must bear a degree of similarity, and thus can be rationalized as a change in the form of the investment, nonrecognition sometimes is granted with business readjustments when the change clearly is one of substance: for example, where four individuals each contribute different

that taxpayers would be deterred from readjusting their holdings if such events brought on costly tax consequences.²⁴⁴ That is, without nonrecognition rules, the imposition of tax on a readjustment of one's holdings would eliminate the benefit of further tax deferral under the realization rule and thus deter such actions. It might be contended, then, that since retrospective taxation generally eliminates the benefit of tax deferral, there would be no cost to earlier recognition and thus little need to retain the nonrecognition provisions.²⁴⁵ Yet, as pointed out previously,²⁴⁶ retrospective taxation does not significantly reduce the benefit of deferral for volatile investments with low transaction costs, due to the effect of strategic trading. Perhaps more important is the fact that subjecting a transaction to retrospective taxation may be costly in another sense: The taxpayer will be forced to pay the tax plus an interest charge and thus will have lost what might have been a valuable borrowing source.²⁴⁷ Consequently, in light of the continued costs of earlier recognition with retrospective taxation, the policy to avoid deterring change-in-form-type transactions would appear to support the retention of nonrecognition rules.

Another justification for the nonrecognition provisions is to avoid valuation difficulties.²⁴⁸ With retrospective taxation, there still would be the need to value property received in an exchange, and thus this justification for nonrecognition would be equally applicable.²⁴⁹

assets to a corporation in exchange for its stock. In such cases, nonrecognition has been justified as a means of allowing tax-free treatment for a wide variety of corporate formations or reorganizations. See LIND ET AL., *supra* note 150, at 57-58.

244. See LIND ET AL., *supra* note 150, at 57.

245. See Fellows, *supra* note 65, at 804 (essentially taking this position).

246. See *supra* text accompanying note 230.

247. Professor Fellows recognizes this possibility but concludes that the fact a taxpayer would value such an opportunity suggests that the taxpayer has a low credit rating and thus should not be the beneficiary of delayed tax collection due to the risk of subsequent default. See Fellows, *supra* note 65, at 804. However, there may be reasons other than a low credit rating why a taxpayer values a government borrowing source, such as more favorable borrowing terms or the desire not to go through the expense and inconvenience of finding another lender. In any event, denying nonrecognition likely would not accelerate tax collection from taxpayers with low credit ratings, given that without the benefit of the nonrecognition rules these taxpayers would probably continue to hold onto their original assets.

248. See Marjorie E. Kornhauser, *Section 1031: We Don't Need Another Hero*, 60 S. CAL. L. REV. 397, 407, 409 (1987).

249. Of course, this Article takes the position that valuation difficulties may be sufficiently overcome through the development of a computer-based valuation system.

A third justification for the nonrecognition provisions is that these rules alleviate potential problems of taxpayer illiquidity.²⁵⁰ With retrospective taxation, there would be an even greater concern of taxpayer illiquidity than exists under current law, as upon recognition a taxpayer would owe a time-adjusted tax—that is, tax plus an interest charge.²⁵¹ Professor Fellows has suggested, however, that rather than allow all taxpayers nonrecognition, a more rational approach to relieve taxpayers of liquidity hardships would be for the IRS to grant loans only upon a requisite showing of illiquidity.²⁵² Indeed, this Article recommends such an approach to deal with the liquidity problems posed by accrual taxation.²⁵³ Nonetheless, the availability of IRS loans only to illiquid taxpayers would probably not overcome the deterrent effect that retrospective taxation would have on change-in-form-type transactions, and certainly would not overcome the valuation difficulties caused by taxing these transactions. Consequently, the retention of the nonrecognition rules, rather than individualized illiquidity relief, would advance better the policies underlying nonrecognition.

C. *Partial Accrual Taxation Coupled With Retrospective Taxation*

Another possible scheme would be to combine partial accrual taxation with retrospective taxation. Under such an approach, accrual taxation could be used for easier-to-value items such as publicly traded stock, debt instruments, tangible business assets, and real estate, whereas retrospective taxation—using constant rate allocation—would be used for all other assets.²⁵⁴ As demonstrated below, while this approach would

It would not appear sensible, however, to incur the expense of developing such a system simply to allow for the taxation of property exchanges under the retrospective method. Thus, if retrospective taxation is used, the better approach would be to avoid valuation difficulties through the retention of nonrecognition rules.

Professor Fellows apparently would retain nonrecognition rules only for those situations where the taxpayer receives no boot in the exchange. Professor Fellows is of the opinion that when boot is received, appraisals must be done in any event to determine the amount of recognized gain under the nonrecognition rules; thus for this situation, there is no reason to continue to delay taxation. *See* Fellows, *supra* note 65, at 805. Even when a taxpayer receives boot, however, professional appraisals may not be necessary if it is obvious that the amount of realized gain exceeds the boot. Therefore, Professor Fellows' proposal calling for a limited retention of the nonrecognition rules likely would cause greater valuation difficulties.

250. *See* Kornhauser, *supra* note 248, at 397, 407-08, 410-11.

251. *See supra* text accompanying note 198.

252. *See* Fellows, *supra* note 65, at 805.

253. *See infra* Part VI.

254. Professor Shakow has proposed a similar system, except he would exclude personal residences from accrual taxation and apply retrospective taxation based on ratable allocation. *See* Shakow, *supra* note 4, at 1119.

probably do a better job than universal retrospective taxation with respect to achieving the goals of economic efficiency, equity, and Code simplification, it still would not produce the benefits of complete accrual taxation.

On the one hand, subjecting publicly traded stock to accrual taxation, rather than retrospective taxation, may improve economic efficiency. Whereas retrospective taxation for such assets would likely yield a varying pattern of effective tax rates that is very similar to that produced by the realization rule,²⁵⁵ accrual taxation should ensure that publicly traded stock is taxed at the applicable statutory rate.

Yet, retrospective taxation still would apply to nonpublicly traded business interests, as well as to nonpublicly traded financial products such as hybrid debt instruments, futures, forwards, options, and notional principal contracts, and the resulting effective tax rates on such assets likely would be significantly below the applicable statutory rate. As Professor Gergen's study reveals, effective tax rates under retrospective taxation drop off dramatically for investments with high volatility and low transaction costs,²⁵⁶ which should thus be the case for nonpublicly traded financial products.²⁵⁷ Although the transaction costs associated with some nonpublicly traded business interests²⁵⁸ should substantially repress strategic trading with respect to these assets, volatility alone can significantly reduce effective tax rates.²⁵⁹ Indeed, for publicly traded stocks with higher than average volatility, which are held for five years, the effective tax rate without strategic trading was approximately thirty-seven percent compared to a statutory rate of forty percent.²⁶⁰ Given that nonpublicly traded business interests tend to be more volatile than their publicly traded counterparts,²⁶¹ the effective tax rates on the

255. See *supra* text accompanying note 232.

256. See *supra* text accompanying note 230.

257. Indeed, financial products sometimes are engineered to increase volatility. See Gergen, *supra* note 39, at 211 n.13.

258. See *id.* at 251 (noting that included within transaction costs are sacrifices made in sale prices for assets with thin markets).

259. See *id.* at 234, 239.

260. See *id.* at 239.

261. See JAY E. FISHMAN ET AL., GUIDE TO BUSINESS VALUATIONS § 510.09 (5th ed. 1995); cf. IBBOTSON ASSOCIATES, INC., STOCKS, BONDS, BILLS, AND INFLATION: 1988 YEARBOOK 24 (Katie B. Weigel & Laurence B. Siegel eds., 1988) (pointing out that standard deviation—a common measure of volatility—in total returns on publicly traded common stock was 21.1% from 1926 to 1987, whereas the standard deviation in

former likely would be below this figure. Moreover, the effective tax rates should be even lower for longer investment horizons.²⁶² Consequently, even applying retrospective taxation to only limited categories of assets, such as nonpublicly traded financial products and business interests, may have disturbing economic efficiency consequences, as the resulting pattern of effective tax rates may encourage the long-term holding of volatile assets of this type.²⁶³

Furthermore, a part accrual, part retrospective tax system would not just create a bias for more volatile nonpublicly traded interests over less volatile ones; such a system also would create a tax bias for investing in nonpublicly traded interests in general over publicly traded ones.²⁶⁴ The significant tax discontinuity created by a bifurcated system could in turn lead some companies to avoid publicly traded status.²⁶⁵ Consequently, the economic efficiency benefits that would be realized by equalizing the effective tax rates on publicly traded stock likely would be offset, to an extent, by inefficiencies created as a result of the generally more favorable treatment accorded nonpublicly traded business interests.

total returns on common stock in small publicly traded corporations over this period was 35.9%).

262. See Gergen, *supra* note 39, at 236.

263. It should be pointed out that to an extent interests in pass-through entities—partnerships and S corporations—would be effectively subject to accrual taxation under an accrual-retrospective tax system. Cf. Shakow, *supra* note 4, at 1134-35 (stating that in light of the pass-through rule, his proposed partial accrual tax system would tax the owners of pass-through entities on changes in the values of the entities' assets). This is because application of the pass-through principle would result in the interest holders being taxed on any changes in the values of the entity's assets that are subject to accrual taxation. For example, to the extent that the value of a partnership interest is attributable to commercial real estate held by the partnership, a partner would be subject to accrual taxation as accrued gains and losses on the real estate are passed through to the partner, raising or lowering the partner's basis in her partnership interest, as the case may be. Nonetheless, under this system all intangible assets, including goodwill, would be excluded from accrual taxation; consequently, retrospective taxation would apply to a considerable portion of the value of partnership interests and S corporation stock.

264. Cf. Gergen, *supra* note 39, at 211 n.11 (noting the competitive advantage of options and futures contracts that are traded in over-the-counter markets over their exchange-traded counterparts, which are subject to section 1256's mark-to-market treatment); Fellows, *supra* note 65, at 744 n.55 (noting that a part accrual, part retrospective system could create unplanned advantages for certain investments); Cunningham & Schenk, *supra* note 3, at 749 (noting in general that subjecting some assets to an annual tax on accrued income—based on expected returns—could create a tax preference for those assets not subject to annual accrual, resulting in a possible inefficient allocation of capital).

265. Cf. Gergen, *supra* note 39, at 216 n.27 (pointing out how the fear of section 1256 mark-to-market taxation led Merrill Lynch to develop Stock Market Annual Reset Term Notes, an instrument resistant to section 1256 treatment).

A part accrual, part retrospective taxation system's capacity for improving equity would be similar to its capacity for improving efficiency. The previously mentioned under- and overtaxation caused by retrospective taxation would be avoided for publicly traded stock (as well as for other assets subject to accrual taxation such as commercial real estate and debt instruments), but still would occur for other assets such as nonpublicly traded financial products and business interests.²⁶⁶ Moreover, the different tax treatment accorded asset types through a bifurcated regime could further distort equity.²⁶⁷

An accrual-retrospective taxation approach also would fall considerably short of complete accrual taxation in simplifying the tax laws. Indeed, regarding the number of Code sections that would be eliminated, it appears that this system would offer very little improvement over universal retrospective taxation.²⁶⁸

Because the approach still would involve retrospective taxation, all of the provisions necessitated by this method, which were previously detailed,²⁶⁹ would be required under a part accrual, part retrospective system. Thus, the capital loss limitations²⁷⁰ would need to be retained as a measure to curb strategic trading on assets subject to retrospective taxation, such as nonpublicly traded financial products, nonmarketed business interests, and collectibles.²⁷¹ Retention of the capital loss

266. See *supra* text accompanying notes 218-20.

267. See *supra* Part III.B.2.

268. Furthermore, because this system would involve two different regimes for taxing investments, there may be additional administrative difficulties associated with boundary drawing. Cf. Gergen, *supra* note 39, at 218 (noting the attendant problems of boundary-drawing with his multi-regime approach for taxing investment assets).

269. See *supra* notes 233-41 and accompanying text.

270. I.R.C. § 1211. Similarly, the section 1091 wash sales provision and the section 267 related party loss disallowance rule also should be kept.

271. If all financial products were subject to accrual taxation—which under section 475 currently occurs with respect to financial products held by dealers in a noninvestment capacity—arguably there would be little need for the capital loss limitations, given that the moderate-to-high transaction costs associated with most nonpublicly traded business interests would seem to suppress strategic trading. See Gergen, *supra* note 39, at 217, 253. Professor Gergen's results, however, indicate that even with costly trading (10% of asset value), strategic trading under the retrospective method still could persist at high levels of volatility (returns with standard deviation of 50% or greater). See *id.* at 254. Given that the average volatility rating of stock in small publicly traded corporations is approximately 36%, see *supra* note 261, and that the volatility of nonpublicly traded business interests should be even greater, see FISHMAN ET AL., *supra* note 261, § 510.09, it would appear that strategic trading may occur with respect to such

limitations means, of course, continuation of the entire ordinary versus capital dichotomy that pervades the Code.²⁷² The installment sales provisions²⁷³ also would be needed to alleviate liquidity problems for deferred payment sales of assets subject to retrospective taxation, in particular, nonpublicly traded business interests.²⁷⁴ In addition, because stock in nonpublicly traded corporations would be subject to retrospective taxation, the provisions effectuating the shareholder-level tax on distributions from C corporations would remain necessary²⁷⁵ unless subchapter S were expanded to include all such corporations.²⁷⁶ As with universal retrospective taxation, it also would be necessary to retain the rules governing the taxation of partnerships and S corporations.

Finally, it appears that a part accrual, part retrospective approach would necessitate the retention of most nonrecognition provisions. On the one hand, the like-kind exchange provision²⁷⁷ apparently could be repealed because most assets for which it is used, namely, commercial real estate and tangible business property,²⁷⁸ would be subject to

nonpublicly traded interests under retrospective taxation. Therefore, even if financial products were marked to market, the capital loss limitations would appear to be needed. Furthermore, in proposing his partial accrual, partial retrospective taxation system, Professor Shakow advocated retaining the capital loss limitations for another reason—to prevent taxpayers from bunching losses in years when marginal tax rates are high. *See* Shakow, *supra* note 4, at 1124. Professor Shakow's retrospective method proposal would use the taxpayer's tax rate in the year of a disposition to compute the increase or decrease in tax arising from a gain or loss, as the case may be. Accordingly, loss bunching in high tax rate years is a legitimate concern for Professor Shakow. However, it would be possible to alleviate this problem by subjecting gains and losses under the retrospective method to some average tax rate for the period in which the asset was held. *See* Fellows, *supra* note 65, at 748 (suggesting possible alternative averaging approaches). This would add to the complexity of the retrospective method, though, which is what Professor Shakow wanted to avoid. *See* Shakow, *supra* note 4, at 1123. Consequently, if the retrospective method were applied by using the taxpayer's year-of-disposition tax rate, potential loss bunching would provide another reason to retain the capital loss limitations.

272. *See supra* notes 143 and 146.

273. I.R.C. §§ 453, 453A, 453B.

274. *See supra* text accompanying notes 240-41. As discussed previously, interests in pass-through entities still would have a portion of their value, attributable to goodwill and the like, that would be taxed under the retrospective method. *See supra* text accompanying note 259.

275. *See supra* note 237 and accompanying text.

276. Such an expanded subchapter S applying to corporations with multiple classes of stock and affiliated companies, however, would be more complicated than the current version. *See* Shakow, *supra* note 4, at 1137.

277. I.R.C. § 1031.

278. Under section 1031(a)(2), stocks, securities, debt instruments, and similar interests are ineligible for like-kind treatment. *See* Treas. Reg. § 1.1031(a)-2 (1991). Furthermore, intangibles can receive nonrecognition treatment under section 1031 only if the old and new intangible are similar types of rights (*e.g.*, patent and copyright are

accrual taxation under this system. On the other hand, the policies underlying the nonrecognition rules²⁷⁹ appear to call for the retention of the rules allowing for the tax-free formation of corporations²⁸⁰ and partnerships,²⁸¹ as well as the rules providing tax-free status to certain corporate reorganizations.²⁸² Under the accrual-retrospective tax system, assets often involved in these transactions, such as goodwill, nonpublicly traded stock, and partnership interests, would be subject to retrospective taxation.²⁸³ This means, of course, that in the absence of nonrecognition, the transfer of goodwill to a corporation (pursuant to the incorporation of a going concern) or the exchange of nonpublicly traded stock for other stock (pursuant to a merger) would require the transferor to pay a time-adjusted tax for the year of the transaction. The cost of earlier recognition under the retrospective approach would not be as great as that under current law, where recognition means the loss of further tax deferral; yet, such recognition may be costly in that the taxpayer might have lost a valuable borrowing source.²⁸⁴ Consequently, it would appear that a key policy underlying nonrecognition, that is, to avoid deterring the readjustment of asset holdings, would support the retention of these provisions under a part accrual, part retrospective system. Furthermore, without the availability of nonrecognition provisions, the above-described transactions could present problems of valuation and taxpayer illiquidity, other concerns justifying nonrecognition.²⁸⁵ Accordingly, an accrual-retrospective taxation system apparently would not obviate the corporate and partnership nonrecognition provisions.²⁸⁶

dissimilar) and involve similar underlying property (*e.g.*, novel and song are dissimilar). *See id.* § 1.1031(a)-2(c). In addition, the goodwill of one business is not of a like kind to the goodwill of another business. *See id.* § 1.1031(a)-2(c)(2).

279. *See supra* notes 242-53 and accompanying text.

280. I.R.C. § 351.

281. *Id.* § 721.

282. *Id.* §§ 354-358, 361-362, 367-368 (1994).

283. As mentioned previously, interests in pass-through entities still would have a portion of their value, attributable to goodwill and the like, that would be taxed under the retrospective method. *See supra* note 263.

284. *See supra* note 247 and accompanying text.

285. *See supra* notes 248-53 and accompanying text.

286. Professor Shakow disagrees with this conclusion. *See Shakow, supra* note 4, at 1124. Professor Shakow feels that the protection provided by these rules is not needed to encourage incorporations, partnership formations, or reorganizations, once most assets are subject either to annual accrual taxation or a form of retrospective

Thus, as the foregoing analysis demonstrates, an accrual-retrospective taxation alternative apparently would not offer much in the way of Code simplification. Yet, it certainly would reduce the extent to which Code provisions are utilized. For example, the rules effectuating the shareholder-level tax with respect to corporations no longer would apply to transactions between publicly traded corporations and their shareholders. Similarly, the corporate reorganization rules would not be relevant to mergers and acquisitions involving only publicly traded corporations. Furthermore, the more limited application of the capital loss limitations should produce benefits by eliminating much tax planning.²⁸⁷ Nonetheless, complete accrual taxation would produce even greater simplification benefits by eliminating entirely the need for these provisions.²⁸⁸

D. *Partial Accrual Taxation Coupled With Retrospective and Expected Return Taxation*

A third possibility would be to use expected return taxation, either alone or in combination with the other two methods. However, the application of expected return taxation to certain assets whose returns are very uncertain could lead to substantial under- or overtaxation and thus would have dire equity consequences. This is because, to the extent that actual returns deviate from expected returns, the difference would be recognized as gain or loss, as the case may be, upon the disposition of the investment. Thus, where actual returns are above what was expected, the tax on a portion of returns would be deferred, producing undertaxation. The opposite would occur where actual returns are below

taxation where assets are valued and taxed every five years ("five year valuation rule"). *Id.* at 1124 n.40. Under his proposal, however, the five year valuation rule only would apply to consumer durables and collectibles with purchase prices in excess of \$20,000, assets which rarely would be transferred to corporations or partnerships. *See id.* at 1153-54. For other assets excluded from accrual taxation, Professor Shakow has decided against a periodic valuation rule because of the burdens involved, and opted for retrospective taxation. *See id.* at 1121, 1123. Consequently, Professor Shakow has failed to consider what impact using retrospective taxation would have on the need to retain the corporate and partnership nonrecognition provisions.

For reasons similar to those given with respect to the entity nonrecognition rules, section 1033, which provides tax-free treatment for certain involuntary conversions of property, likewise appears to be deserving of retention. I.R.C. § 1033; *cf.* Shakow, *supra* note 4, at 1124 (apparently favoring retention on the basis that the occurrence of a disaster is not an appropriate time to impose a tax detriment).

287. *Cf.* Gergen, *supra* note 39, at 214 n.19 (pointing out how taxpayers attempt to avoid the capital loss limitations by devising ways to produce risk-free capital gains, and noting that section 1258 was enacted to combat one such device by treating as ordinary income the interest-like returns on certain conversion transactions).

288. Of course, complete accrual taxation would entail additional administrative costs as well—those relating to valuation and liquidity difficulties.

what was expected. Indeed, if an investment's actual returns were negative (say, stock that depreciated in value), the degree of overtaxation would be particularly egregious.²⁸⁹ Given that it is very difficult at the outset of an investment to reasonably predict the actual returns of many types of assets, such as business interests and collectibles, a universal application of expected return taxation would have unacceptable equity consequences.²⁹⁰

Accordingly, the only real option for using expected return taxation is to relegate it to those investments whose returns are reasonably certain,²⁹¹ such as debt instruments, which is generally the case under current law.²⁹² Thus, even if expected return taxation were used in an alternative approach to the realization rule (short of complete accrual taxation), retrospective taxation still would be necessary for difficult-to-value assets, such as closely held corporate stock. And, as discussed above, retrospective taxation, either alone or coupled with partial accrual taxation, falls considerably short of complete accrual taxation in advancing the policies of economic efficiency, equity, and Code simplification.

289. The under- or overtaxation that can arise under expected return taxation may be significantly greater than that under retrospective taxation. This is because with retrospective taxation, income is effectively taxed over the term of an investment based on the investment's average actual rate of return, whereas with expected return taxation, income is taxed over an investment's term—prior to a disposition—based on a rate of return that may bear no semblance to the investment's actual rate of return.

290. See Cunningham & Schenk, *supra* note 3, at 734-35.

Furthermore, an ex ante [valuation] approach is seriously flawed where accurate prediction of the income is impossible. Thus, for example, measuring income by predicting market appreciation or depreciation almost always would understate or overstate income. . . . [W]e do not, however, believe that ex ante valuation must be rejected in all cases. We conclude, that ex ante valuation should be considered where it is extremely likely to correspond to ex post valuation Because our tax system uses income as the determinant of ability to pay, we agree it is generally unwise to use expected value as the measure of income.

Id. (footnote omitted); cf. Michael J. Graetz, *Implementing a Progressive Consumption Tax*, 92 HARV. L. REV. 1575, 1600-01 (1979) (concluding that "horizontal equity must be an ex post concept"); Warren, *supra* note 124, at 1098 ("[F]airness in taxation should depend on outcomes, not expectations."). But see Alan J. Auerbach, *Retrospective Capital Gains Taxation*, 81 AM. ECON. REV. 167, 176-77 (1991) (arguing that an ex post equity objection should not be fatal to a retrospective taxation proposal which ignores actual gain or loss and taxes the amount realized from an investment as if it had appreciated to the final value at the normal rate of return for that period).

291. See Cunningham & Schenk, *supra* note 3, at 734.

292. See *supra* note 214 and accompanying text.

Furthermore, it appears that even limiting expected return taxation to investments with reasonably certain returns, such as OID bonds, can have undesirable economic efficiency and equity consequences. The expected return method is particularly susceptible to strategic trading.²⁹³ Professor Gergen's study indicates that at low and even moderate trading costs (up to five percent), the expected return method results in effective tax rates that are close to those under the realization rule.²⁹⁴ Professor Gergen's, as well as Professor Strnad's, findings raise serious doubts whether the existing OID rules should continue applying to most bonds.²⁹⁵ These findings also indicate that, in devising alternatives to the realization rule, expected return taxation probably should be limited to investments with reasonably certain returns that trade at high or maybe even prohibited costs.²⁹⁶ Consequently, using expected return taxation in a multi-regime alternative to the realization rule would appear to offer little improvement, if any, over the other possible alternatives.²⁹⁷

V. THE VALUATION OF ASSETS UNDER THE COMPLETE ACCRUAL TAX SYSTEM

A. Overview

For publicly traded securities, the determination of annual values should be relatively easy. IRS computers must simply be linked to computers containing market data on such securities.²⁹⁸ The IRS then could publish annual notices which publicly announces these values.

293. See Gergen, *supra* note 39, at 217, 257.

294. See *id.* at 257; *cf.* Strnad, *supra* note 18, at 54, 89, 95, 111, 115 (study indicating that tax trading removes much of the effect of the OID rules; pointing out that successful reform for bond taxation would need to involve more drastic measures such as mark-to-market taxation).

295. See Gergen, *supra* note 39, at 260; Strnad, *supra* note 18, at 54.

296. *Cf.* Gergen, *supra* note 39, at 217, 260-61 (suggesting that assets trading at prohibited costs be taxed under the expected return method; noting that the capital loss limitations, which his study disregarded, may be shown to constrain strategic trading).

297. One situation in which expected return taxation could prove helpful is in taxing the owners of a split interest in real property, for example, a life estate and remainder interest. See Cunningham & Schenk, *supra* note 3, at 737-39. In particular, expected return taxation could be used to tax the remainderman on the increase in the value of her interest over time—until possession occurs. See *id.*

298. For this purpose, the value of the securities on December 31 of each year could be used. See Shakow, *supra* note 4, at 1132. While there might be some concern that some large shareholders could manipulate end-of-the-year prices, the apparently successful use of this approach for futures contracts and options under section 1256 indicates otherwise. See *id.* at 1133. In any event, any value manipulation could be curtailed by using the average closing price for some end-of-the-year period. See *id.*

Alternatively, publicly traded corporations could be required annually to send Forms 1099 to taxpayers and the IRS, reporting the value of the shares.²⁹⁹ For other assets, such as nonpublicly traded interests in business enterprises and collectibles, the task is quite daunting. Indeed, with some exceptions,³⁰⁰ prior accrual taxation proposals have exclud-

299. See Shoven & Taubman, *supra* note 4, at 217.

300. In its proposal, the Twentieth Century Fund suggested that nonmarketed stocks be valued on the basis of percentage changes in book values. See SHOUP ET AL., *supra* note 4, at 477-78. Such book values, however, would not reflect the fair market value of the stock; in particular, any changes in stock value attributable to the company's goodwill would be ignored. Messrs. David and Miller proposed to have appraisers periodically value untraded stock, with values in intervening years based on an index of asset values published by the Treasury Department. To prevent valuation abuses, owners of nonmarketed business interests would be required to publish the valuation with a binding offer to sell the subject interest at a price related to the valuation. See David & Miller, *supra* note 4, at 4287. This approach may be quite burdensome on taxpayers as it would require the cost and difficulty of periodic manual valuations. Moreover, the binding offer procedure does not appear workable, given that it may necessitate intrusive inspections of companies' books. See Shakow, *supra* note 4, at 1134. With regard to collectibles, Professors Shoven and Taubman proposed to base valuations on owner's estimates, with the use of insurance values by the IRS to check the reasonableness of these estimates. If the value at sale or the owner's death is significantly different from the estimates, a penalty would be imposed unless an explanation was provided. See Shoven & Taubman, *supra* note 4, at 213. This approach would necessitate annual manual appraisals, with associated costs and difficulties. In addition, it is unclear how well insurance values would reflect the changing fair market values of collectibles to provide a sufficient check on the process. In his proposal, Professor Shakow suggested that collectibles with purchase prices above a certain dollar amount be valued by taxpayers every five years, subject to IRS challenge, with any difference in values over the five-year periods subject to retrospective taxation (using ratable allocation). See Shakow, *supra* note 4, at 1153-54. Again, the suggested approach would require costly and possibly controversial valuations, albeit every five years. Moreover, using retrospective taxation, even over five-year periods, may significantly distort the reflection of actual changes in values.

Finally, Professors Cunningham and Schenk, in their expected return taxation proposal, suggested that income be annually imputed and taxed on nonmarketed growth stock and art objects, based on the rate of return on Treasury notes. See Cunningham & Schenk, *supra* note 3, at 799-802. They recognized that this would only tax a component of the taxpayer's expected return, but opted for this approach because it would be too speculative to tax the expected market return on an *ex ante* basis. See *id.* at 799. While this approach is administratively easier than a valuation approach, it does raise equitable concerns because the amount of imputed income may be quite different from the taxpayer's actual economic income from the asset. In addition, because the imputation rate used is below the expected market rate, there would be deferred gain for the average

ed nonmarketed business interests and collectibles.³⁰¹

Professor Bittker doubts that the appraising costs brought on by accrual taxation would equal the current cost of administering the realization rule.³⁰² Given the Code provisions necessitated by the realization rule, Professor Bittker may be correct. Yet, manual appraisals³⁰³ are costly,³⁰⁴ as well as inconsistent, and thus subject to controversy.³⁰⁵ Because of the widely varying values resulting from manual appraisals, there is a real question as to whether an accrual system based on such appraisals would result in a more accurate measurement of economic income than alternatives such as retrospective taxation. Consequently, a manual appraisal-based accrual system may not only be administratively difficult, it also may fail to improve the economic efficiency and equity of the tax system beyond that attainable through other alternatives to the realization rule.

Computerized valuation should offer several advantages over manual appraisals. While there would no doubt be significant costs incurred in order to develop a computerized valuation system, once operational, the system should result in substantial cost savings compared to manual appraisals.³⁰⁶ In addition, computers can allow scarce expertise to be more widely available.³⁰⁷ Moreover, unlike a human being, a comput-

investment. Thus to an extent, the distortions resulting from the realization rule would remain under this approach.

301. See Shakow, *supra* note 4, at 1134-37, 1157-58 (effectively excluding nonmarketed business interests); Slawson, *supra* note 4 (limiting the coverage of accrual taxation to publicly traded stock); Thuronyi, *supra* note 4; David & Miller, *supra* note 4, at 4218-82 (excluding personal property from accrual taxation); Shoven & Taubman, *supra* note 4, at 212-13 (annually taxing the owners on the imputed accounting income of a closely held business, as opposed to the value of the owners' interests in the business); Louie, *supra* note 4 (limiting accrual taxation to publicly traded securities); SHOUP ET AL., *supra* note 4, at 490-91 (excluding collectibles).

302. See Bittker, *supra* note 141, at 3.

303. See *supra* note 179.

304. See, e.g., BLUEPRINTS, *supra* note 3, at 81 (referring to the cost of determining asset values annually); Cunningham & Schenk, *supra* note 3, at 743.

305. See *supra* note 181.

306. Computer-assisted mass appraisal (CAMA) techniques used by counties and municipalities to value realty for property tax purposes have produced similar cost savings. See, e.g., William H. Riley & Jan Schreiber, *Statewide Computer-Assisted Mass Appraisal System: A Pilot for Maryland*, 11 PROP. TAX J. 83, 102 (1992) (pointing out that a one-year savings in appraiser salaries resulting from CAMA more than offset the combined hardware and software costs).

307. See Beverly K. Duval & Linda Main, *Microcomputer Applications in the Library—Expert Systems: What is an Expert System?*, 13 LIBR. SOFTWARE REV. 44, 46 (1994); cf. Roger Jambor et al., *The Credit Clearing House Expert System*, in 3 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE 255, 267 (Reid G. Smith & A. Carlisle Scott eds., 1991) (noting how a credit expert system improves quality because its recommendations are based on the experience and expertise of the most senior analysts).

er is completely objective, applying the same rules to each valuation assignment.³⁰⁸ Consequently, computer-generated valuations should be consistent³⁰⁹ and may well have higher overall quality than manually generated valuations.³¹⁰

No matter how sophisticated, a computerized valuation system will not produce perfectly accurate valuations. Indeed, even for humans, absolute accuracy in valuations is impossible.³¹¹ Moreover, a computerized system likely would be unable to take into account certain relevant qualitative information,³¹² and thus may generate less accurate valuations than the most expert human appraiser. Consequently, a computerized valuation system will not perfectly measure the accrual of capital income.

Yet, it is not appropriate to judge a computer system's capacity for measuring income according to the standard of perfectly accurate income measurements. Perfect income measurements are not attainable. Instead, a computer-based accrual system should be compared to other alternatives for measuring and taxing capital income—that is, realization, retrospective, and expected return taxation.

The realization rule operates on a "null hypothesis," that is, it presumes that there is no change in a property's value until a disposition occurs.³¹³ Consequently, a computer-based accrual system, which at least attempts to measure accrued capital income based on factors relating to the subject property, should measure income more accurately than current law does.³¹⁴ Retrospective and expected return taxation also are prone to mismeasure capital income: Retrospective taxation

308. See Gene Bylinsky, *Computers that Learn by Doing*, FORTUNE, Sept. 6, 1993, at 96, 102 (referring to a computerized real estate valuation system as the ultimate in objectivity).

309. See Jambor et al., *supra* note 307, at 267 (noting improved consistency with the credit assessments made by the expert system).

310. Whether a computerized valuation system produces more precise valuations than manual appraisals will depend on the extent to which the system can duplicate the expertise of an expert human appraiser.

311. See Frederick M. Babcock, *A Look at Valuation Science*, in A HANDBOOK ON THE APPRAISAL OF PERSONAL PROPERTY 4 (American Society of Appraisers ed., 1989) (pointing out also that valuations are judgments, not measurements).

312. See *infra* text accompanying note 453.

313. See Cunningham & Schenk, *supra* note 3, at 746; Stephen B. Land, *Contingent Payments and the Time Value of Money*, 40 TAX L. REV. 237, 263 (1987).

314. Cf. Cunningham & Schenk, *supra* note 3, at 747 (fashioning a similar argument for their expected return taxation proposal).

effectively accrues income based on average ex post rate of return, and expected return taxation accrues income based on average ex ante rate of return, with an ex post³¹⁵ reconciliation.³¹⁶ On the other hand, a computer-based accrual system may measure capital income more accurately than either retrospective or expected return taxation, given that a computer-based system would base annual valuations, and thus capital income measurements, on the specific facts relating to the particular asset.

In light of the foregoing, this Article puts forth for consideration a computer-based system for valuing real estate, nonpublicly traded business interests, and collectibles.³¹⁷ Such a system would require (i) the development of sophisticated valuation software which could produce sufficiently accurate valuations with minimal human input, and (ii) access to all the necessary data.³¹⁸

315. *See id.* at 736.

316. *See supra* notes 198-215 and accompanying text.

317. In addition to the assets dealt with in this Article, there are other items that would pose valuation difficulties in implementing a complete accrual tax system. Such assets include nonpublicly traded fixed-rate debt instruments and various types of financial products such as forward foreign exchange contracts, interest-rate swaps, currency swaps, and forward rate agreements. Untraded debt could be valued on an annual basis by computing the present value of the sum of the instrument's future payment obligations, using a discount rate based on the known interest rate for debt of comparable risk and maturity. *Cf.* Theodore S. Sims, *Long-Term Debt, the Term Structure of Interest and the Case for Accrual Taxation*, 47 TAX L. REV. 313, 361 (1992) (noting this as a method for approximating the market value of untraded debt). The computerized techniques discussed *infra* Part V.B.3.a.(iii)(c) possibly could be employed to determine an appropriate discount rate in making this computation. The valuation of various types of financial products likely is more complicated and uncertain. Because these financial products are often held by securities dealers, they are currently subject to mark-to-market treatment in the hands of such dealers under section 475. *See* I.R.C. § 475(c)(2) (equity notional principal contracts and derivatives are presumptively noninvestment securities for the dealers of such securities and thus subject to mark-to-market treatment). As a result, taxpayers and the IRS currently are devising valuation methods for such assets. *Cf.* John Turro, *IRS Contracting to Produce Derivatives-Valuation Software*, 66 TAX NOTES 1772 (1995) (reporting that the IRS has contracted with the Energy Department's Los Alamos National Laboratory to develop valuation software for over-the-counter financial derivatives; noting that finance dealers use software programs for their valuations). As issues concerning the valuation of financial products are addressed in IRS audits—section 475 was enacted in 1993—IRS guidance on these matters will no doubt be publicly available in the form of private letter rulings, technical advice memorandum, and possibly, revenue rulings and regulations. Such forthcoming guidance may provide a basis for developing a comprehensive approach for valuing financial products.

318. A few other commentators have recommended using computers to value property for federal tax purposes. Over 15 years ago, Professor Cooper suggested using a computer-based valuation system for implementing an annual wealth tax. *See* Cooper, *supra* note 182, at 35-38. Under his proposal, which admittedly lacked details, computer software containing multiple regression analysis techniques would be employed to value untraded securities and real estate. *See id.* In addition, Professor Shakow, in his accrual

The remainder of this Part examines in some detail the possible implementation of such a valuation system. This analysis does not conclude that a computer-based accrual tax system is beneficial or even feasible, but does demonstrate that it is worthy of further study. Whether a computer-based accrual tax system is worthwhile will depend on its capacity for measuring income significantly more accurately than the other alternatives; the system's capacity for measuring income in turn will depend on the capabilities of emerging computer technology.³¹⁹

taxation proposal, recommended that the federal government develop a computerized valuation system—along the lines of the computer-assisted mass appraisal systems used by local governments—to value commercial real estate. See Shakow, *supra* note 4, at 1148-50.

319. In addition to technical issues, another implementation issue involves the right of taxpayers to appeal value determinations. One concern with applying accrual taxation to difficult-to-value assets, such as nonmarketed business interests, is that the tax system would become bogged down with valuation controversies like those that plague the administration of the estate tax. Cf. Cooper, *supra* note 182, at 34 (noting these concerns with respect to implementing an annual wealth tax). At one extreme, taxpayers could be prohibited from appealing value determinations either to the IRS or the courts. Under such an approach, the value determinations would have the force of a legislative "regulation" or "statute." (For example, Congress would pass a statute providing that the value of property as determined under the system is conclusively presumed to be the property's actual value.) While prohibiting taxpayer appeals on value determinations may appear to be blatantly unfair, to an extent this occurs under current law. The depreciation rules in section 168 can be viewed as rules that provide conclusive, unappealable values for tangible property (of course, most often these rules overstate depreciation). Cf. Cunningham & Schenk, *supra* note 3, at 742 (viewing the depreciation rules as an *ex ante* valuation provision). Similarly, the OID rules prescribe a method for accruing implicit interest income and do not afford the taxpayer the right to demonstrate that a bond's actual value is lower than that indicated by the statutory method. I.R.C. § 1272. Even the realization rule can be characterized as a conclusive valuation provision: Despite the actual decline in the value of property, the realization rule conclusively presumes that no change in value has occurred until there is a realization event.

However, prohibiting taxpayer appeals of value determinations would appear to frustrate a primary purpose for using accrual taxation—to achieve a reasonably accurate measurement of capital income and the attendant economic efficiency and equity gains. Moreover, on a per assessment basis, the valuation disputes that occur with respect to the estate tax should occur much less frequently under accrual taxation. With the estate tax, the full amount of the determined value is subject to tax, whereas with an accrual system only the incremental increase in value would be taxed. In addition, with valuation assessments each year under an accrual tax system, taxpayers might have some degree of assurance that valuation errors in one year may be offset by errors in another year. Cf. Cooper, *supra* note 182, at 35 (noting the same with respect to an annual wealth tax). Consequently, taxpayers should have less of an incentive to appeal valuations under an accrual tax system than they do under the estate tax.

B. Computer-Based Valuation

1. Valuation in General

Before discussing the use of computers to value property, it may be helpful to summarize the general methods used for valuation. Basically, there are three approaches used for valuing assets: Market, income, and cost.³²⁰ For each of these approaches, there are typically several methods used to estimate value.

The market approach estimates value through an analysis of sales of comparable assets.³²¹ For residential real estate and collectibles, for example, a straightforward market-based method is often used—sales of comparable assets are identified and adjustments are made to estimate the value of the subject asset.³²² For business enterprise valuations, market-based methods employing comparable company value multiples are sometimes used; for example, the value of a business may be determined by multiplying the earnings of the business by the price/earnings ratio of comparable companies.³²³

Under the income approach, future ownership benefits from an asset are estimated and then capitalized using factors that reflect the relative risks regarding the realization of those benefits.³²⁴ Two basic methods are used under this approach—discounted future returns and capitalized returns. The discounted future returns methods involve the forecast of an asset's future benefits stream, which then is discounted to present

Nevertheless, with so many taxpayers subject to annual value determinations, there is some concern that allowing unrestricted appeals could overly burden the IRS and the courts. Therefore, a compromise should be reached: Taxpayers should be allowed to appeal value determinations to the IRS and the courts, through the normal deficiency or refund procedures, but they should not prevail unless they demonstrate that the determined value exceeds the property's actual value by more than a certain percentage (say, 20%) of actual value. *Cf. id.* (recommending a similar procedure in connection with an annual wealth tax). This procedure should discourage many taxpayers from appealing, while also allowing for the rectification of significant valuation errors.

320. See FISHMAN ET AL., *supra* note 261, § 215.02; Internal Revenue Service, IRS VALUATION GUIDE FOR INCOME, ESTATE AND GIFT TAXES, 81 Stand. Fed. Tax Rep.(CCH) (Jan. 28, 1994) [hereinafter IRS GUIDE].

321. See FISHMAN ET AL., *supra* note 261, § 215.04; Rev. Rul. 79-24, 1979-1 C.B. 565.

322. See IRS GUIDE, *supra* note 320, at 4-8, 5-1.

323. See FISHMAN ET AL., *supra* note 261, § 215.08; see, e.g., Estate of Oman v. Comm'r, 53 T.C.M. (CCH) 52 (1987).

324. See FISHMAN ET AL., *supra* note 261, § 215.10; IRS GUIDE, *supra* note 320, at 7-14 to 7-18; Rev. Rul. 59-60, 1959-1 C.B. 237.

value using an appropriate discount rate.³²⁵ Under the capitalized returns method, an asset's value is estimated by dividing its current benefits by an appropriate capitalization rate.³²⁶ These income-based methods are often used to value interests in business enterprises³²⁷ and intangibles.³²⁸

The cost approach estimates asset values by first determining the cost of reproducing the asset and then subtracting an allowance for physical deterioration and obsolescence.³²⁹ This approach is usually relegated to such items as land improvements and equipment.³³⁰ However, it is sometimes used for valuing business enterprise interests through the use of the net asset value and liquidation value methods.³³¹

Valuation is by no means an exact science, and a great amount of human judgment currently enters into the process. This is especially true for valuing nonpublicly traded interests in business enterprises.³³² An appraiser must exercise judgment in performing key steps in this process, such as forecasting an earnings stream and selecting a discount rate.³³³

2. Computer-Assisted Mass Appraisal for Real Estate

Traditionally, the valuation process has been performed solely by individuals. In recent years, however, computerized techniques have entered into the valuation process for some types of assets.³³⁴ Perhaps

325. See FISHMAN ET AL., *supra* note 261, § 215.11; IRS GUIDE, *supra* note 320, at 7-16 to 7-17. These methods include the discounted net cash flow method and the discounted future earnings method.

326. See FISHMAN ET AL., *supra* note 261, § 215.10; IRS GUIDE, *supra* note 320, at 7-16; see, e.g., Estate of Little v. Comm'r, 43 T.C.M. (CCH) 319 (1982); Estate of Sels v. Comm'r, 52 T.C.M. (CCH) 731 (1986). These methods include the capitalization of earnings method, the capitalization of net cash flow method, and the capitalization of gross cash flow method.

327. See IRS GUIDE, *supra* note 320, at 1-14.

328. See *id.* at 13-14.

329. See FISHMAN ET AL., *supra* note 261, § 215.05; IRS GUIDE, *supra* note 320, at 1-15.

330. See FISHMAN ET AL., *supra* note 261, § 215.05; IRS GUIDE, *supra* note 320, at 1-15.

331. See FISHMAN ET AL., *supra* note 261, § 215.05; see, e.g., Estate of Gallo v. Comm'r, 50 T.C.M. (CCH) 470 (1985).

332. See FISHMAN ET AL., *supra* note 261, § 215.08.

333. See *id.* §§ 220.05 -26.

334. See, e.g., Steve Hemmerick, *BARRA Demystifies Black-Box Investing*, PENSIONS & INVESTMENTS, Jan. 24, 1994, at 3 (corporate stock); Steve Hemmerick, *Software Looks at Attitude, Investor Psychology Plays Big Role in Computer Model*,

the best illustration of this advancing computerization concerns the valuation of real property for assessing county and municipal property taxes. Over the last twenty-five years, there has been a trend to use computer-assisted mass appraisal (CAMA) techniques to value realty for property tax purposes.³³⁵ An overview of this process may prove useful for the discussion that follows.

For residential real property, CAMA generally involves using computers to generate realty values through a statistical analysis of comparable property sales. Thus, the market approach, which is usually well-suited for valuing residential real property, is often implemented with the help of the vast data processing capabilities of computer technology.³³⁶ Cost savings in the assessment process, among other benefits, have resulted from the use of CAMA.³³⁷

In applying the market approach to residential real property, CAMA systems typically use multiple regression analysis,³³⁸ a process by which a formulary model relating real estate characteristics to value is hypothesized and solved. For example, an oversimplified version of such a formula for a single family house could be value = ($A \times$ number of rooms) + ($B \times$ square feet of land). The computer then would attempt to solve for coefficients A and B by running through this

PENSIONS & INVESTMENTS, May 31, 1993, at 25 (fixed income securities); R. Glazer, *Measuring the Value of Information: The Information-Intensive Organization*, 32 I.B.M. SYS. J. 99 (1993) (information); Scott Brown et al., *Analysis of Mortgage Servicing Portfolios*, J. FIXED INCOME, Dec. 1992, at 60 (mortgage servicing portfolios); Ivy Schmerken, *Mutual Funds Go On-Line to Accurately Cast Their Nets*, WALL STREET COMPUTER REV., May, 1988, at 8 (mutual funds); J. Douglas Timmons, *A Computer-Based Model for Evaluating Convertible Mortgages*, REAL EST. FIN., Spring 1989, at 46 (convertible mortgages).

335. See John F. Ryan, Comments, 9 PROP. TAX. J. 43 (1990) (discussing Morgan B. Gilreath, Jr., *Mass Appraisal with General Purpose Software: Applying the Income Approach*, *id.* at 27). In addition, there is widespread use of computerized appraisal techniques to value real property for investment purposes. See James R. Burbach, *What to Look for in Discounted Cash Flow Software*, 58 APPRAISAL J. 196 (1990). Moreover, banks and insurance companies have been using computer-assisted techniques for valuing real property for purposes of issuing loans and insurance, respectively. See Patrick M. O'Connor, *Computer-Assisted Mortgage Review Assurance*, 8 PROP. TAX J. 3 (1989); Thomas M. Maher, *Home is Where the Heart and Heartaches Are*, NAT'L UNDERWRITER, July 17, 1989, at 9.

336. See David L. Jensen, *Artificial Intelligence in Computer-Assisted Mass Appraisal*, 9 PROP. TAX J. 5 (1990). Market-adjusted cost approaches are also used in the CAMA process to value residential real property. See *id.*; Riley & Schreiber, *supra* note 306, at 93.

337. Riley & Schreiber, *supra* note 306, at 101.

338. Ryan, *supra* note 335.

formula data relating to sales of single-family homes.³³⁹ This formula then could be used to estimate the value of a particular house.³⁴⁰

For commercial real property, most jurisdictions place heavy reliance on the cost approach in using the CAMA process.³⁴¹ This approach starts with replacement cost and then makes adjustments for physical deterioration and obsolescence.³⁴² At least one jurisdiction has begun using the income approach with the cost approach to determine allowances for economic obsolescence.³⁴³ Under this approach,³⁴⁴ computer software first analyzes income and expense reports provided by owners of income-producing property and changes these figures, if necessary, into more typical amounts for the kind of property involved. The software then determines capitalization rates,³⁴⁵ based on the income and expense figures and the actual sales prices of some of these

339. The statistical techniques used to solve formulas of this type are quite sophisticated.

340. Recently, some jurisdictions have been experimenting with integrating geographic information systems (GIS) and CAMA systems in order to improve the accuracy of property value determinations. See, e.g., François Des Rosiers & Marius Thériault, *Integrating Geographic Information Systems to Hedonic Price Modeling: An Application to the Quebec Region*, 11 PROP. TAX J. 29 (1992). GISs are computer software that can render multi-colored maps on computer screens. Niles Curry et al., *Using a Computer-Assisted Mass Appraisal—Geographic Information System (CAMA-GIS) Link to Develop a Multiregional Market Model*, 9 PROP. TAX J. 103 (1990). GISs are capable of superimposing over these images information such as labels and numeric values, which then can be spatially and statistically manipulated. See *id.* As a consequence, GISs are useful for managing and studying spatial data. Rosiers & Thériault, *supra* at 30. By integrating GISs with CAMA systems, valuation systems are better able to take into account the geographical features of real property (e.g., distance from a major highway or population center). See *id.* at 31; Curry et al., *supra* at 104, 114. In addition, private real estate appraisers also are using GISs in their computerized valuation systems. See Bruce R. Weber, *Application of Geographic Information Systems to Real Estate Market Analysis and Appraisal*, 58 APPRAISAL J. 127 (1990). Additional refinements in the CAMA process are being made by adjusting for the time of sales, so that the process can monitor and adjust for time trends. See Robert J. Gloude-mans, *Adjusting for Time in Computer-Assisted Mass Appraisal*, 9 PROP. TAX J. 83 (1990).

341. See Morgan B. Gilreath, Jr., *Mass Appraisal with General Purpose Software: Applying the Income Approach*, 9 PROP. TAX. J. 27, 28 (1990).

342. See *supra* text accompanying notes 329-331.

343. See Gilreath, *supra* note 341, at 27; cf. Owen Connellan, *Discounted Asset Rents—A New Approach to the Cost Approach*, 12 PROP. TAX J. 137 (1993) (projecting a pattern of asset rents, based in part on replacement cost figures, and discounting this rental stream to determine depreciation for use in a cost approach system).

344. See generally Gilreath, *supra* note 341.

345. The project actually determined a capitalization rate, based on net income, and a gross rent multiple, based on gross income. See *id.*

properties. The mean capitalization rates that are computed then are used with each property's income and expense data to generate values for the properties. Finally, appraisers used these income-based values as a guide to adjust the values determined under the cost approach to reflect the economic obsolescence of improvements.³⁴⁶

Despite the use of computers, a great deal of human judgment enters into the CAMA process. For example, in employing regression-based market valuation, mass appraisal or statistical experts have traditionally been needed to pre-screen and clean input data (e.g., eliminate nonrepresentative parcels) and formulate a model that satisfies certain statistical performance criteria.³⁴⁷ However, one project demonstrated that artificial intelligence³⁴⁸ can successfully perform the task of formulating statistically satisfactory models.³⁴⁹ Artificial intelligence was used in this project to direct the repetitive modeling and statistical analysis necessary to producing sufficient regression models.³⁵⁰ This project appears important, not only because of its success in automating the modeling aspect of CAMA, but also because it may lead to other uses of artificial intelligence in the CAMA process³⁵¹ and, possibly, the valuation process in general.

On the whole, then, there have been several recent developments in the CAMA process which may improve the accuracy and automation of this valuation process. Even more important for purposes of implementing complete accrual taxation, the successful use in the CAMA process of highly tuned regression models, the income approach, and artificial intelligence, provides a body of knowledge that should assist in the development of a computerized mass appraisal system for other assets, such as nonmarketed business interests and collectibles.

346. For private appraisers, there are many software packages available for using the income approach to value income-producing real property. See Burbach, *supra* note 335; Kenneth Jay Gain, *Appraising by Probability Analysis*, 58 APPRAISAL J. 119 (1990).

347. See Jensen, *supra* note 336, at 6, 23.

348. Very generally speaking, artificial intelligence is computer software that is capable of performing autonomous decision-making functions. See Frederick Hayes-Roth & Neil Jacobstein, *The State of Knowledge-Based Systems*, COMMUNICATIONS OF THE ACM, Mar. 1994, at 27. See *infra* Part V.B.3.a.(ii) for a more in-depth discussion of artificial intelligence.

349. See Jensen, *supra* note 336, at 5.

350. See *id.* at 10.

351. See *id.* at 23.

3. *Developing a Computer-Based Valuation System for Different Asset Types*

A computer-based valuation process for real estate tax assessments is firmly established, and there have been continual developments which should make this process more accurate and less dependent on humans. To value real estate for purposes of a complete accrual tax system, the federal government could institute a computerized valuation system along the lines of CAMA.³⁵² Since such a federal real property valuation system would essentially be duplicating the CAMA systems of local governments, it may be possible to reduce local government valuation functions, thereby lowering the overall national costs of such a federal project.³⁵³

Unfortunately, for valuing nonmarketed business interests and collectibles, there is no existing computerized mass valuation system that the federal government can simply adopt. Instead, such a system would need to be developed. Set forth below is a detailed examination of possible computerized systems for valuing nonpublicly traded business interests and collectibles.

a. Nonpublicly Traded Interests in Business Enterprises

i. Overview

The income approach is often the best-suited approach for valuing nonpublicly traded business interests, such as corporate stock and partnership interests.³⁵⁴ Accordingly, to computerize the valuation of such business interests, it would be necessary to develop software capable of employing the discounted future returns method, as well as other methods.

To a limited extent, such software already exists. There has been some use of income-based methods in the CAMA process.³⁵⁵ Further-

352. See Shakow, *supra* note 4, at 1148-50; *cf.* Cooper, *supra* note 182, at 37 (recommending this approach for implementing an annual wealth tax).

353. See Shakow, *supra* note 4, at 1150.

354. See *supra* notes 324-28 and accompanying text. Nonetheless, market and cost methods are sometimes used as well. See *supra* text accompanying notes 323 and 331.

355. See *supra* text accompanying notes 343-46.

more, private real estate appraisers often use computer software, utilizing discounted and capitalized earnings stream methods in valuing property for investment purposes.³⁵⁶ Perhaps even more important to the development of software allowing for the mass appraisal of business interests are the several software packages currently available for valuing businesses.³⁵⁷ The user of this software must input data relating to the subject business, along with industry data which is available in add-on databases.³⁵⁸ The software, with the assistance of the user, then generates business values under several different methods, including, of course, income-based methods.³⁵⁹

The problem with the existing software for valuing businesses from a mass appraisal perspective, however, is that its use requires the judgment of experienced appraisers.³⁶⁰ That is, in using this software, an appraiser must still exercise judgment and discretion in carrying out several functions, such as making adjustments to reported income and expenses, determining the values of individual assets, selecting a valuation method, forecasting earnings streams, selecting appropriate discount and capitalization rates, and determining appropriate discounts and premiums. Thus, the use of currently available business valuation software still would involve the costs and subjectivity of manual appraisals. To feasibly value business interests for purposes of complete accrual taxation, it would be necessary to develop valuation software that can perform these functions with little or no human involvement.

The solution could be to use artificial intelligence with conventional business valuation software to supply the necessary decision-making capabilities. In a much more limited context, artificial intelligence has been used successfully in performing statistical modeling functions in the

356. See *supra* note 346. Recently, software implementing the discounted earnings stream method has achieved greater accuracy in forecasting earnings through the use of probability analysis. See *Gain*, *supra* note 346. By employing "Monte Carlo" simulation, this software can generate a range of possible values, each weighted according to their probability of occurrence, based on random combinations of reasonably possible earning streams and holding periods. See *id.* at 124-26. The statistical mean of these weighted possibilities then can be computed to determine the most probable value of the subject property. See *id.*

357. Among the available software are: ValuSource III by ValuSource, Business Valuation by Essential Software, and Value Master by Prima Facie Software, Inc.

358. This description of the available business valuation software is based on the author's review of a particular software package.

359. The software package that was reviewed by the author produces values under 14 different methods.

360. See FISHMAN ET AL., *supra* note 261, § 110.12 (noting that conventional business valuation software still requires the appraiser to exercise professional judgment); Alan Zipp, *Caveat Appraiser*, J. ACCT., Dec. 1994, at 50.

CAMA process.³⁶¹ It may be possible to devise business valuation software employing artificial intelligence that would be capable of valuing business interests on a mass level. An expert in artificial intelligence is of the opinion that at the very least such an endeavor is worthy of a study.³⁶²

The next subsection will describe several types of artificial intelligence that have potential for use in valuing businesses. The subsequent subsection then will explore the use of specific types of artificial intelligence in various stages of the business valuation process.

ii. Artificial Intelligence

In very general terms, artificial intelligence is computer software that is capable of performing autonomous decision-making functions.³⁶³ Artificial intelligence was developed in the mid-1950s and over the years has been used in many applications in science, industry, and business.³⁶⁴ The most widely used type of artificial intelligence is expert systems.³⁶⁵ Over the last few decades, however, other types have emerged, such as neural networks and fuzzy logic.

Expert systems are "computer programs that provide advice and diagnoses for advisory problems ordinarily dealt with by human experts."³⁶⁶ As the term suggests, expert systems allow for an automated application of an expert's knowledge. Expert systems are most effective when used to address those problems that are neither highly structured nor totally unstructured—handling specialized tasks, which otherwise would require an experienced human.³⁶⁷

An expert system consists of two basic components: A knowledge base and an inference engine.³⁶⁸ The knowledge base contains the facts and rules that comprise the expert's knowledge of the problem

361. See *supra* text accompanying notes 348-51.

362. Telephone Interview with Professor Bonnie Webber, Chair, Computer Science Department, University of Pennsylvania (July 7, 1994).

363. See Hayes-Roth & Jacobstein, *supra* note 348.

364. HENRY C. MISHKOFF, UNDERSTANDING ARTIFICIAL INTELLIGENCE 23-50 (1985).

365. See *id.*

366. Kenneth L.K. Yiu & Andy W.K. Kong, *Choosing the Correct Expert System Development Method for Financial Decision-Making*, J. SYS. MGMT., Nov. 1992, at 16.

367. See *id.* at 18-19.

368. See *id.* at 16-17.

domain. The inference engine basically manipulates the facts and rules through inference strategies and controls.³⁶⁹

Expert systems have wide application in the area of financial decision-making. Although it does not appear that expert systems currently are used in the business valuation process, they are being used extensively in several related areas. For example, expert systems are being utilized in financial analysis, granting of credit, commercial loan analysis, prediction of stock market behavior, and risk analysis for new venture capitalization and financing.³⁷⁰

Neural networks are an approach to computing that roughly mimics the brain's ability to recognize and understand patterns, trends, and associations.³⁷¹ But because neural networks can perceive correlations among hundreds of variables, whereas humans usually cannot assimilate more than a few variables at once, neural networks demonstrate a remarkable ability to detect patterns and trends too complex or subtle for humans. Another important trait of neural networks is their capacity for learning.³⁷²

A neural network is essentially a simplified mathematical model of a brain-like system.³⁷³ The most common models use a representation of the neuron as the basic processing unit. Each such unit has several features—an activity level, output value, and bias value—as well as a set of input connections from other units and output connections to other units. A brain-like computing device consists of a large network of

369. See *id.* at 17.

370. See *id.* at 19. Despite its successes, there are two problems with the knowledge encoding process used in most expert systems: First, the knowledge base does not learn from its experience, thus necessitating the complex task of maintaining the knowledge base, and second, the current technologies do not facilitate the modeling of episodic knowledge (different episodes or events and the relationship between them) and commonsense knowledge. Ashish Goel, *The Reality and Future of Expert Systems: A Manager's View of AI Research Issues*, INFO. SYS. MGMT., Winter 1994, at 53, 55, 57. Regarding learning and episodic knowledge, case-based reasoning (CBR) has been modeled in new expert systems to allow them to adapt to new situations and to improve their problem-solving techniques. See *id.* at 57. CBR theory assumes that humans devise knowledge from experience and that knowledge can be better articulated as experience rather than rules. See *id.* Experience is encoded by describing a case to the computer in terms of its major features, a process which continues for new case experiences of the expert system. See *id.* at 57, 60. In addition, commonsense modeling attempts to capture the commonsense knowledge that a human expert may use in problem-solving by developing a very large knowledge base of common sense. See *id.* at 57. Ultimately, expert systems may integrate relevant commonsense knowledge modules with application-specific knowledge captured through CBR. See *id.* at 58-59.

371. See Bylinsky, *supra* note 308, at 96-97.

372. See *id.* at 97.

373. See David E. Rumelhart et al., *The Basic Ideas in Neural Networks*, COMMUNICATIONS OF THE ACM, Mar. 1994, at 87.

these units, each connected to another. The function the network computes is determined by the configuration of connections, which thus is the analog of a program.³⁷⁴

The task of finding a set of connection strengths that allow the network to perform the desired computation—or in other words, learning—is accomplished by a procedure known as the back propagation learning algorithm. In back propagation, connection strengths are determined by running input data through the network and comparing actual output with the desired target. When the actual and target output differs, some of the connections need to be changed, a procedure that can be defined by formulating a function that optimizes the overall performance of the system. Because these learning procedures can be defined, neural network systems are able to adapt to their environments.³⁷⁵ One implication of the learning process, however, is that enough training data must be available to sufficiently constrain the model for the particular problem.³⁷⁶

In the last five years, many commercial applications of neural networks have come into use.³⁷⁷ Although no applications in business valuations have been located, neural networks are being used in closely related areas such as predicting stock prices, valuing residential property, and evaluating corporate loan risk.³⁷⁸

Expert systems and neural networks are each better suited for different situations. On the one hand, if complete and precise rules are obtainable, an expert system would be the better choice.³⁷⁹ In contrast, in situations where reliable rules cannot be obtained, a trainable neural network allows for complex relations to be abstracted directly from training data. Thus, neural networks perform better at such tasks as pattern recognition and predictions, for which rules are difficult to devise. Moreover, the unique capacity of the neural network to design

374. See *id.* at 87-88.

375. See *id.* at 89.

376. See *id.* at 91; Bernard Widrow et al., *Neural Networks: Applications in Industry, Business, and Science*, COMMUNICATIONS OF THE ACM, Mar. 1994, at 93, 104.

377. See Widrow et al., *supra* note 376, at 93.

378. See *id.* at 95; Ramesh Sharda, *Neural Networks for the MS/OR Analyst: An Application Bibliography*, INTERFACES, Mar.-Apr. 1994, at 116, 118-19.

379. See Widrow et al., *supra* note 376, at 104.

itself through the learning process allows it to perform well even when the environment in which it is operating changes over time.³⁸⁰

A third type of artificial intelligence, fuzzy logic, is actually a tool that can be used with expert systems and neural networks. The advantage of fuzzy logic is that it attempts to emulate the human mind's ability to exploit a tolerance for imprecision and uncertainty.³⁸¹ Rather than forcing rules and data into categories, fuzzy logic uses the central concept of graded membership to deal directly with imprecision and uncertainty.³⁸² For example, while conventional computer logic might define "young" as age twenty-five or younger, fuzzy logic might do so by including within the term "young" a broader range of ages at varying degrees.³⁸³ Through this process, fuzzy logic should yield more accurate results.³⁸⁴

Although its use generally has been shunned in the United States, the Japanese have successfully incorporated fuzzy logic in many commercial applications such as washing machines, vacuum cleaners, microwave ovens and subway systems, to name a few.³⁸⁵ Furthermore, while fuzzy logic apparently has yet to be used for valuing businesses, it has been used in related areas such as assessing earthquake damage to buildings,³⁸⁶ evaluating the creditworthiness of corporate borrowers,³⁸⁷ and

380. See *id.*

381. Lotfi A. Zadeh, *Fuzzy Logic, Neural Networks, and Soft Computing*, COMMUNICATIONS OF THE ACM, Mar. 1994, at 77, 78.

382. Joseph F. Coates, *Looking Ahead: Fuzzy Logic Is Clearly in Your Future*, RES. TECH. MGMT., May-June 1994, at 7.

383. See Zadeh, *supra* note 381, at 78.

384. See DANIEL MCNEILL & PAUL FREIBERGER, FUZZY LOGIC 115 (1993) [hereinafter MCNEILL & FRIEBERGER, FUZZY LOGIC]; Cf. Goel, *supra* note 370, at 58 (pointing out that expert systems using fuzzy logic produce results that more closely matches the decision of a human expert). Fuzzy logic, however, has had its detractors, who claim that fuzzy logic presents no advantages over probability theory in dealing with uncertainty. See Daniel McNeill & Paul Freiberger, *The Secret Revolution*, SUCCESS, Sept. 1994, at 72C [hereinafter McNeill & Freiberger, *The Secret Revolution*]; MCNEILL & FREIBERGER, FUZZY LOGIC, *supra* at 175-91. Supporters of fuzzy logic respond by pointing out that probability theory and fuzzy logic each deal with different aspects of uncertainty. *Id.* at 188. Specifically, whereas probability treats dissonance (which of *A*, *B*, *C*, or *D* is it?), fuzzy logic handles nonspecificity and fuzziness (to what extent is it *A*?). See *id.*; cf. Goel, *supra* note 370, at 58 (probability deals with the undecidability regarding the outcome of an event; fuzzy logic deals with the ambiguity inherent in the event itself). Supporters also point to the many application successes of fuzzy logic. See *infra* text accompanying notes 385-89.

385. See MCNEILL & FREIBERGER, FUZZY LOGIC, *supra* note 384, at 159-60; McNeill & Freiberger, *The Secret Revolution*, *supra* note 384, at 88.

386. See MCNEILL & FREIBERGER, FUZZY LOGIC, *supra* note 384, at 219.

387. See Michael F. Wolf et al., *CUBUS—An Assistant for Fundamental Corporate Analysis*, in 3 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE, *supra* note 307, at 271.

analyzing stock portfolios.³⁸⁸ Perhaps even more closely related to business valuations is the use of fuzzy logic in an expert system for predicting the exchange rate of the yen against the dollar, a system currently under development.³⁸⁹

iii. Computerizing the Steps of the Business Valuation Process

Even with the commercially available software for valuing businesses, a human expert's judgment is needed in several critical stages of the valuation process. This subsection examines the following steps in some detail and explores the possibility of using artificial intelligence techniques to supply the necessary judgment for each step: (i) adjusting financial statements, (ii) selecting the valuation approach, (iii) implementing the income approach, (iv) applying asset methods, and (v) determining discounts and premiums.³⁹⁰

a. Adjusting Financial Statements

In valuing a business, an appraiser must first analyze and adjust a company's financial statements, that is, adjust its income statement and balance sheets to better approximate the real economic earning power of the business.³⁹¹ This is especially necessary in valuations of smaller businesses, whose income statements and financial balance sheets may not bear any relationship to economic reality.³⁹² Even for larger businesses, an appraiser must evaluate items and adjust for different accounting practices in order to properly use comparable company

388. See MCNEILL & FREIBERGER, *FUZZY LOGIC*, *supra* note 384, at 215.

389. See *id.* at 248. The system, FOREX, will incorporate the effects of both political and economic events. *Id.*

390. It should be noted that the following discussion does not cover every detail of the business valuation process. Instead, major steps in the process requiring human judgment have been chosen for analysis. Moreover, the analysis does not explore every valuation method. In particular, the discussion omits two methods that have more limited application in valuing businesses: The comparative company approach and the excess earnings method. Nonetheless, an actual implementation of computer-based valuation for businesses may well want to consider such methods for specific applications.

391. See SHANNON P. PRATT ET AL., *VALUING SMALL BUSINESSES AND PROFESSIONAL PRACTICES* 72 (2d ed. 1993).

392. See PRATT, *supra* note 13, at 265-68; PRATT ET AL., *supra* note 391, at 69-106.

factors (such as discount rates) in assessing value.³⁹³ In general, there are three categories of income statement adjustments: Adjustments for accounting differences, adjustments for nonrecurring events and discontinued items, and adjustments for certain discretionary items.³⁹⁴

In several areas, companies exercise discretion in accounting for items in preparing their income statements. As examples, consider a company choosing (i) whether to capitalize or expense various costs, and (ii) what timing treatment to accord items such as contract work and transactions calling for future services or products.³⁹⁵ It would not appear to be feasible for a computer system to analyze a company's transactions and provide for sound uniform accounting treatment.³⁹⁶ Instead, businesses should be required to use a uniform accounting treatment in preparing income statements for IRS valuations purposes.³⁹⁷ Specifically, businesses should prepare their income statements on the basis of the accrual method of accounting as provided under the Code and regulations.³⁹⁸ This approach would impose the accrual method on some businesses that currently are permitted to use the cash method of accounting. However, the suggested change should not affect a substantial portion of businesses. Under current law, all businesses dealing with merchandise are required to use the accrual method.³⁹⁹ Additionally, C corporations, and partnerships with a C corporation as a partner, generally must use the accrual method—although there are exceptions for entities with average annual gross receipts not in excess

393. See PRATT, *supra* note 13, at 266.

394. See *id.* at 267.

395. See *id.* at 277-78.

396. Because an accounting treatment may lend itself to an expression of rules, it may be possible to develop an expert system to perform this task. For example, assuming all contract work is to be accounted for under the conceptually preferable percentage-of-completion method, it might be feasible to express this treatment in rules which could be added to the knowledge base of an expert system. To the extent these rules are imprecise, a fuzzy logic-based inference mechanism could be used to produce results that would possibly more closely match an expert appraiser's decisions. See Goel, *supra* note 370, at 58. Yet, given the variety of situations in which many different accounting rules would need to be applied, it is not at all clear that such an expert system is feasible. Moreover, even if an expert system could be developed, such an approach would require that the valuation system have access to the details of all business transactions. Much of this data may not be electronically recorded by businesses to be network accessible. See *infra* Part V.B.3.c. Even if it were, the federal government's holding of such detailed information may raise privacy concerns. See *infra* Part VIII.

397. It should be noted that in light of the net worth approach to taxing businesses, traditional business tax returns may no longer be required. See *supra* notes 10-14 and accompanying text.

398. See I.R.C. §§ 446, 451, 461 (1994), and the regulations thereunder.

399. See Treas. Reg. § 1.471-11 (as amended in 1993); Treas. Reg. § 1.446-1(c)(2) (as amended in 1995).

of \$5,000,000 and for C corporations that perform personal services and generally have employee-owned stock.⁴⁰⁰ Most of the businesses currently permitted to use the cash method should be able to deal with the additional complexity the accrual method entails. Moreover, to the extent that forcing the accrual method on businesses causes liquidity problems for their owners, tax payments could be deferred through the installment plan procedure.⁴⁰¹ Due to the added complexity, however, consideration should be given to allowing small service providers to use the cash method in preparing their income statements.

Some changes, however, should be made to the current tax accounting rules for certain items in order to better reflect economic income and provide for more uniform treatment. First, depreciation rules for tangible personal property should be revised to approximate actual declines in value.⁴⁰² Second, the LIFO method of inventory accounting⁴⁰³ should be eliminated, and instead all business should be required to use the first-in, first-out (FIFO)⁴⁰⁴ method, with an inflation adjustment for inventories.⁴⁰⁵ Third, all businesses should be allowed to use the

400. I.R.C. § 448.

401. See *infra* Part VI.

402. See *supra* note 164 and accompanying text. A system for approximating the value of depreciable property is discussed *infra* Part V.B.3.a.(iv).

403. I.R.C. § 472 (1994).

404. *Id.* § 471 (1994).

405. Under current tax—and financial accounting—rules, taxpayers generally have a choice of using either LIFO or FIFO. See I.R.C. § 472(a). As a consequence, an appraiser may need to adjust the financial statements when the subject company and comparable companies use different inventory methods. See PRATT, *supra* note 13, at 269-70. Placing all businesses on an inflation-adjusted FIFO method thus would obviate this adjustment. Moreover, since the purpose of LIFO is to defer, and thus lower, the tax on inflationary gains, LIFO can be eliminated in a system providing for inflation-adjusted FIFO. Cf. Halperin & Steuerle, *supra* note 9, at 356 (referring to LIFO as a form of ad hoc indexing). In this regard, the Treasury Department has recommended that LIFO be repealed and replaced with an inflation-adjusted FIFO method. DEPARTMENT OF THE TREASURY, PRESIDENT'S TAX PROPOSALS TO THE CONGRESS FOR FAIRNESS, GROWTH, AND SIMPLICITY 174-78 (CCH 1985); 2 DEPARTMENT OF THE TREASURY, TAX REFORM FOR FAIRNESS, SIMPLICITY, AND ECONOMIC GROWTH: THE TREASURY DEPARTMENT REPORT TO THE PRESIDENT 189-92 (1984) [hereinafter TAX REFORM FOR FAIRNESS]; cf. Shuldiner, *supra* note 50, at 613-17 (pointing out that LIFO provides only a partial solution to the problem of inflation). Using an inflation-adjusted FIFO method should not be unduly burdensome for businesses and the IRS, especially in a tax system in which other assets are subject to indexation. Cf. *id.* at 617 (noting that it is unclear whether indexing inventories would pose greater administrative burdens than does LIFO, given the complexity of LIFO).

reserve method in deducting bad debts pertaining to accounts receivables.⁴⁰⁶

Another difficulty in measuring the true economic income of a business results from the presence of nonrecurring items or items relating to discontinued operations. Examples of nonrecurring items include gains or losses from the disposition of a segment of a business and proceeds from the settlement of lawsuits.⁴⁰⁷ A computer valuation system would need the capacity to detect such items so as not to distort a company's future earning power. Possibly, an expert system could be developed that would detect typical types of nonrecurring items. One such approach would be to have the IRS promulgate regulations specifying typical nonrecurring items. In preparing their income statements, businesses should then record any of the specified items in a designated section of the income statement, so such items can be easily detected by an expert system. Once nonrecurring items are detected, it may not be appropriate to ignore them completely, given that there may be some possibility of their recurrence.⁴⁰⁸ Accordingly, based on the extent that such items have materialized in the past, the system should take them into account, possibly through the use of fuzzy logic.⁴⁰⁹ With respect to discontinued operations, a procedure could be established whereby the business would notify the IRS of this fact; given that such operations have ceased, however, any items arising therefrom should be removed from the income statement.⁴¹⁰ An alternative way to deal with both types of extraordinary items would be to train neural networks to forecast future returns with such items taken into account (assuming

406. Under the reserve method, businesses use the historical experience of the particular business or industry to estimate and deduct the percentage of accounts receivable that will become uncollectible. See Treas. Reg. § 1.166-4(b) (as amended in 1986); cf. PRATT ET AL., *supra* note 391, at 72-73 (noting that historical experience can be used to adjust receivables). Under current tax law, taxpayers generally cannot use the reserve method. Savings and loans and some banks, however, are permitted to use this method, and accrual-basis service providers generally are not required to accrue any portion of amounts to be received which, based on experience, will not be collected. See I.R.C. §§ 448(d)(5), 585, 593 (1994); Temp. Treas. Reg. § 1.448-2T (as amended in 1988). Moreover, for financial accounting purposes, businesses use a variety of conventions in accounting for uncollectible receivables. See PRATT, *supra* note 13, at 268. Given the differing practices employed, an appraiser may need to adjust the allowances for bad debts in order to better reflect economic income and provide for a more uniform basis for comparing companies. See *id.* Requiring all business to use a reserve method based on experience should obviate this adjustment.

407. See PRATT, *supra* note 13, at 282.

408. See *id.*

409. As noted previously, fuzzy logic can deal with ambiguity or undecidability inherent in an event. See text accompanying notes 381-84; see also Goel, *supra* note 370, at 58.

410. See PRATT, *supra* note 13, at 282.

that the discounted future returns method is used for valuation). The viability of using neural networks to forecast future returns will be discussed later.⁴¹¹

A third category of potential adjustments involves discretionary items such as owner compensation.⁴¹² In closely held companies, the compensation paid to owners may bear little relationship to the value of the services actually rendered by the owners.⁴¹³ This, of course, is also a concern under current tax law, as shareholders of closely held C corporations sometimes attempt to avoid the double tax on corporate earnings by disguising what are in effect dividends as deductible compensation.⁴¹⁴ It would appear to be difficult for a computer system to analyze and adjust owners' compensation.⁴¹⁵ Therefore, as under current law owner compensation would need to be monitored through the IRS audit process.⁴¹⁶

411. See *infra* notes 446-56 and accompanying text.

412. See PRATT ET AL., *supra* note 391, at 92.

413. See *id.*

414. See BITTKER & EUSTICE, *supra* note 243, ¶ 8.05[3].

415. One possible approach would be to develop an expert system capable of analyzing owners' compensation and comparing it to average levels of compensation for the particular type of business and occupation involved. In this connection, there are several sources that provide comparative compensation data. See PRATT ET AL., *supra* note 391, at 93. It is unclear, however, whether such an analysis lends itself to an expression of rules. That is, it may not be possible to articulate in rule form the evaluation and weighing of various comparability factors. Another possibility would be to train a neural network with examples of expert behavior concerning the evaluation of reasonable compensation. Cf. Widrow et al., *supra* note 376, at 104 (suggesting such a use of a neural net where rules are not obtainable). Such a neural net, supplied with comparative compensation data, then would be used to assess and adjust owner compensation. Yet, in order for either an expert system or a neural network to perform this task, the system would need access to the details of the owner's job duties, which would appear to be difficult to achieve.

416. It should be pointed out that the distorting effect of excessive compensation on the valuation process may be less substantial than would at first appear. This is because decreases in the value of business interests resulting from excessive compensation should be substantially offset by the increases in the value of the owners' human capital caused by such compensation if accrual taxation is coupled with a method of taxing human capital. And, even without human capital taxation, an owner's additional tax liability on the excessive portion of the compensation should offset, to an extent, the reduction in tax liability on the devalued business interest. Nevertheless, assuming that accrual taxation does not lead to elimination of the corporate income tax, excessive compensation would lower the separate tax liability of C corporations. However, since publicly held corporations rarely engage in the practice of disguised dividends, see BITTKER & EUSTICE, *supra* note 243, ¶ 8.05[1], the abusive effect of excessive compensation, as under current law, should be limited to businesses operated through

Unfortunately, excessive compensation is just one way in which closely held organizations disguise profit remittances to their owners. Other devices include interest payments on purported debt held by owners, excessive rent on property held by owners, loans to owners, and having the business pay the personal expenses of its owners.⁴¹⁷ Developing expert systems or neural networks to deal with this variety of tax avoidance techniques does not seem feasible; the situations appear to be too varied for any completely automated approach. Thus, the detection of these abuses would have to be left to the audit process, as is the case under current law.

In addition to income statements, an appraiser must also adjust the balance sheets of a business, as these statements likewise may not reflect the economic value of a business.⁴¹⁸ This is because assets generally will be booked at their cost (less some depreciation figure, if depreciable), which may not bear any relation to their fair market value. Common types of assets that would require adjustment include depreciable tangible personal property, inventory, accounts receivable, and real estate.⁴¹⁹ The use of economic depreciation for tangible personal property, inflation-adjusted FIFO for inventory, and the experience method for estimating uncollectible receivables should reasonably reflect the fair market value of these assets. In addition, a federally run computerized system for valuing real property, along the lines of CAMA, should provide for reasonable values of real estate.⁴²⁰

closely held C corporations, for which audits may be an acceptable solution.

To make audits less time-consuming and expert-dependent, thereby increasing their coverage, it may be possible to develop an expert system to assist IRS personnel in examining owner compensation issues. The IRS employs a similar type of expert system to monitor actuarial certifications prepared in connection with qualified pension plans. See S. Meltzer & D. Sriram, *ReValuator—An Expert System Approach to Actuarial Valuations*, in 2 *INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE* 39-40 (Alain Rappaport & Reid Smith eds., 1991). Called ReValuator, this expert system consults with a nonexpert user regarding the reasonableness of actuarial assumptions used by the taxpayer's actuary in determining the pension plan contributions; in doing so, the expert system provides guidelines to the user, and it is left to the user to accept or change the actuarial assumptions used in the taxpayer's pension plan. See *id.* at 41-42. Consequently, an expert system along the lines of ReValuator, while not totally automated, could result in increased audits and thus reduce concerns over excessive compensation.

417. See BITTKER & EUSTICE, *supra* note 243, ¶ 8.05[8]. As with excessive compensation, the abusive effect of most of these techniques should be limited to closely held C corporations both under current law and with accrual taxation (absent the repeal of the corporate income tax). However, because disguising as business expenses the personal expenses of owners will not, unless detected, result in an inclusion to the owners, this device also lowers the tax liability of owners of S corporations, partnerships, and sole proprietorships.

418. See PRATT, *supra* note 13, at 267.

419. See PRATT ET AL., *supra* note 391, at 72-82.

420. See *supra* text accompanying notes 352-353.

The last major category of balance sheet assets that may need adjustment is intangible assets. Despite the fact that intangible assets clearly contribute to the value of the business enterprise, they are usually omitted from the adjusted balance sheet.⁴²¹ To the extent that a business's intangibles have true economic value, that value should be reflected in the earnings.⁴²² Nonetheless, a leasehold interest is a type of intangible that readily can be valued apart from the income of the business and may be adjusted in normalizing the balance sheet. Adjustment should be made when a business owns a leasehold interest calling for rent that is below fair market value. In such a case, the leasehold interest has value to the business equal to the sum total of the present values of the difference for each rental period between current fair market value rent and the leasehold rent.⁴²³ It should be possible to develop an expert system to implement this approach,⁴²⁴ provided the system has access to the market rent for the subject realty. The development of a federal real property valuation system⁴²⁵ should facilitate the importation of market rent information.⁴²⁶

421. See PRATT ET AL., *supra* note 391, at 83; *cf.* PRATT, *supra* note 13, at 277 (noting that in comparing companies with different accounting practices for intangible assets, the simplest way to adjust for intangibles is to eliminate them from the balance sheet); IRVING L. BLACKMAN, VALUING THE PRIVATELY-HELD BUSINESS 208-09 (rev. ed. 1992) (only including tangible assets in applying the adjusted book value method). The reason that this is done is as follows. Intangibles typically are valued using income-based methods, with the income stream associated with an intangible often derived from the income of the entire business. See SMITH & PARR, *supra* note 190, at 260-62, 278-83. Asset values, as reflected in a normalized balance sheet, are used in the business valuation process to (i) assist in the determination of forecasted earnings streams, growth rates and discount rates, see PRATT, *supra* note 13, at 290, (ii) employ methods for valuing a business independent of income, typically for those situations where either there will be no future income or it cannot be estimated properly, see IRS GUIDE, *supra* note 320, at 7-15, or (iii) implement a combined asset and income approach to valuation that determines the value of intangibles based on the residual income of the business—the excess earnings method, see PRATT ET AL., *supra* note 391, at 211-28. Therefore, in light of the purposes for which asset values are used, it is normally not productive to include income-dependent intangible assets in the balance sheet.

422. See PRATT, *supra* note 13, at 277.

423. See *id.* at 275-76.

424. This is because the leasehold adjustment is expressible in rules. See *supra* text accompanying note 379.

425. See *supra* notes 352-53 and accompanying text.

426. If the leasehold rent exceeds the fair market value rent, the same approach should be used to determine the value of the resulting liability represented by the leasehold interest. *Cf.* PRATT, *supra* note 13, at 275-76 (noting that the balance sheet should be adjusted to show a liability in this situation).

In addition to assets, liabilities shown on the balance sheet are sometimes adjusted.⁴²⁷ Adjustments should be made when the interest rate provided under the terms of the loan differs from the current market interest rate for loans of that type. This adjustment is determined by computing the present value of the stream of payments called for under the loan, using a discount rate equal to the market interest rate.⁴²⁸ An expert system should be able to implement this approach,⁴²⁹ provided the system has access to market interest rates.⁴³⁰

b. Selecting the Valuation Approach

The next step in the process calls for an appraiser to select a valuation approach. For most businesses, income approaches yield the most accurate results;⁴³¹ however, asset approaches take on a more prominent role for some situations, such as the valuation of holding companies and businesses contemplating liquidation.⁴³²

The valuation system possibly could implement the selection process through the use of an expert system. Specifically, the valuation approach could be selected based on the business's income and balance sheet statements. For example, if the income statements show earnings for the current year and a sufficient number of past years, and the balance sheets show a substantial percentage of operating assets—that is, assets other than real estate or securities—the system would select an income approach to valuation. Of course, “sufficient” and “substantial” would need to be more precisely defined.⁴³³ In contrast, if the data revealed no or minimal earnings (relative to past years) for the current year, an asset liquidation value approach may be appropriate. In such a case, the system should notify IRS personnel that additional investigation is necessary.⁴³⁴ Where an operating company shows current earnings, but has not existed for a sufficient (which would need to be specified) number of years to use an income approach, valuation should be based on the fair market value of the assets. Finally, if a business shows insubstantial operating assets, either an asset approach, combined

427. See PRATT ET AL., *supra* note 391, at 83.

428. See *id.*

429. See *supra* text accompanying note 379.

430. The issue of data access is discussed *infra* Part V.B.3.c.

431. See PRATT, *supra* note 13, at 43.

432. See *id.*

433. In this regard, the system possibly could employ fuzzy logic. See *supra* text accompanying notes 381-84.

434. A business still could be a going concern even though it has minimal current earnings.

asset and income approach,⁴³⁵ or further investigation by IRS personnel would be required, depending on the percentage of operating assets. While some human input would be needed in the selection process, the majority of businesses should show current earnings, a significant earnings history, and substantial operating assets—thus calling for an automatic selection of the income approach.⁴³⁶

c. Implementing the Income Approach

Given the primary role of the income approach in the valuation of businesses, the ability of the valuation system to produce reasonably accurate business values will depend greatly on how well it implements the basic income methods—the discounted future returns method and the capitalization of returns method.

i. Discounted Future Returns Method

Under the discounted future returns method, an appraiser first forecasts a future cash flow or earnings stream and then discounts the stream to present value, using an appropriate discount rate. Although this method generally is recognized as the theoretically correct approach for valuing most businesses,⁴³⁷ many business valuations are based on the capitalization of earnings method, which relies more heavily on historic rather than future data, because of the difficulty in forecasting future returns.⁴³⁸ To make reasonable forecasts, an appraiser must analyze data concerning the particular business and industry. A key part of this analysis is detecting and evaluating trends in the company's business and financial data⁴³⁹—that is, any improvement or deterioration in various ratios measuring aspects such as liquidity, activity, solvency, and profitability.⁴⁴⁰ In addition, it is also advisable for the appraiser to visit the business and glean information from discussions with company

435. Cf. PRATT, *supra* note 13, at 44 (noting that for hybrid companies—combinations of operating and holding companies—it may be appropriate to value the company in two parts).

436. Cf. *id.* at 40 (noting that the income approach most often is used to value businesses).

437. See *id.* at 35.

438. See *id.* at 87.

439. See *id.* at 290.

440. See *id.* at 290-305.

personnel⁴⁴¹ about issues such as competition,⁴⁴² government regulation,⁴⁴³ supplier relationships,⁴⁴⁴ key employees, and product life cycles,⁴⁴⁵ just to name some.

A computerized approach to valuing businesses probably cannot duplicate an expert appraiser's ability to integrate the above-mentioned qualitative factors in the valuation process. This, however, does not necessarily mean that a computer-based accrual tax system is not beneficial; taxing holders of business interests based on less than ideal valuations still could be an improvement over the other possible alternatives—that is, realization, retrospective, and expected return taxation. Furthermore, as to one critical aspect of forecasting returns, which is trend analysis, neural networks actually may offer an improvement over a human appraiser. As noted earlier, neural networks have shown a remarkable ability to detect patterns and trends too subtle or complex for humans.⁴⁴⁶ Investors are capitalizing on neural networks' capacity to analyze a virtually unlimited number of events quickly in order to predict stock prices.⁴⁴⁷

Two leading experts on neural networks believe that neural networks have the potential to forecast the future returns of a business.⁴⁴⁸ Specifically, it may be possible to train a neural network to predict future returns based on current (and historical) business and financial data concerning the particular company and industry.⁴⁴⁹ Whether a neural network can be trained to forecast returns could be determined by using data concerning the subject business for one set of years as input and using the returns of the business for a later set of years as the target output.⁴⁵⁰ Alternatively, a neural network may be trained by using the

441. See *id.* at 156.

442. See PRATT ET AL., *supra* note 391, at 128.

443. See *id.* at 129.

444. See *id.* at 132.

445. See *id.* at 137.

446. See *supra* text accompanying notes 371-72.

447. See Marlene Givant Star, *New AI Contender Looms*, PENSIONS & INVESTMENTS, Oct. 17, 1994, at 48.

448. Telephone Interview with Dr. Bernard Widrow, Professor of Electrical Engineering, Stanford University (Aug. 3, 1995); Telephone Interview with Dr. Soumitra Dutta, Professor, School of Business, Paris, France (July 28, 1995). It should be noted that neither Dr. Widrow nor Dr. Dutta is an expert on business valuation, nor is either currently working on such an application. Dr. Widrow's and Dr. Dutta's opinions primarily are based on a general description of the valuation process as provided by the author.

449. Telephone Interview with Dr. Widrow, *supra* note 448; Telephone Interview with Dr. Dutta, *supra* note 448.

450. Telephone Interview with Dr. Widrow, *supra* note 448; Telephone Interview with Dr. Dutta, *supra* note 448.

data of a subject business as input and using a human expert's forecast of the business's future returns as the target output.⁴⁵¹ It should be pointed out, however, that because the business and financial information concerning a particular company only indirectly would reflect relevant, qualitative information⁴⁵²—such as changes in competition, government regulation, and product life cycles—a neural network may have difficulties in making reasonable forecasts.⁴⁵³ Yet, as both experts stated, the ability of a neural network to reasonably predict future returns can be determined only by actually performing tests.⁴⁵⁴ If business and financial information alone does yield poor results, it may be possible to incorporate some qualitative factors.⁴⁵⁵ In addition, given the imprecise nature of forecasted returns, fuzzy logic could be used in the process by "fuzzifying" either the outputs or inputs, or both, to achieve possibly more accurate results.⁴⁵⁶

451. See Delvin D. Hawley et al., *Artificial Neural Systems: A New Tool for Financial Decision-Making*, in NEURAL NETWORKS IN FINANCE AND INVESTING 27, 40 (Robert R. Trippi & Efraim Turban eds., 1993) (suggesting that it should be possible to train a neural network to estimate the value of a company by inputting business and financial information concerning the company and using a target output consisting of the value as estimated by a human expert); Telephone Interview with Dr. Widrow, *supra* note 448; cf. Widrow et al., *supra* note 376, at 104 (pointing out that a neural net can be trained with examples of expert behavior).

452. See *supra* text accompanying notes 441-45.

453. Telephone Interview with Dr. Dutta, *supra* note 448.

454. Telephone Interview with Dr. Widrow, *supra* note 448; Telephone Interview with Dr. Dutta, *supra* note 448.

455. For example, the effect of new competition possibly could be incorporated to a degree through data on the recent establishment of similar businesses in the same geographic region. In addition, it may be possible to use product information available in brochures or catalogs. While the incorporation of qualitative data may seem daunting, similar efforts are under way to allow a foreign exchange trading expert system access to political and economic events. See *supra* note 389 and accompanying text.

456. Cf. Zadeh, *supra* note 381, at 78 (noting that it is frequently advantageous to employ neural networks and fuzzy logic in combination). Dr. Dutta, however, feels that such neural networks should be tested first without employing fuzzy logic. Telephone Interview with Dr. Dutta, *supra* note 448.

Another alternative may be to use expert systems in the forecasting process. An expert system has been successfully employed to assist traders in predicting foreign exchange currency prices. See Elizabeth Byrnes et al., *TARA: An Intelligent Assistant for Foreign Traders*, in 1 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE 71 (Herbert Schorr & Alain Rappaport eds., 1989). This expert system has a sophisticated knowledge base of technical trading rules that allows it to employ trend analysis on information charts and provide buy and sell recommendations. See *id.* at 74-75. The system, however, does not have rules regarding business, economic, and political events that affect the market, and thus a human trader adds the requisite perspective to the

The second step of the discounted future returns method, determining an appropriate discount rate, also poses difficulties. In general terms, the discount rate should equal the expected rate of return on investments of comparable risk.⁴⁵⁷ More methodical ways of determining discount rates have been developed. For example, under the capital asset pricing model, the discount rate on an asset is equal to the risk-free rate of return plus a risk premium, with the risk premium being a function of the volatility of the particular asset's price over a given time period relative to the volatility of the whole market over the same period.⁴⁵⁸ The model, however, assumes that investors hold common stocks in fully diversified portfolios, and thus it only takes into account what is referred to as systematic risk—the uncertainty of future returns on the particular investment which is due to the sensitivity of those returns to movements in the returns for the whole market.⁴⁵⁹ Therefore, applying the capital asset pricing model to closely held businesses requires modification for what is known as unsystematic risk—that is, risk that is specific to the particular company and industry, but not to the whole market.⁴⁶⁰ Furthermore, the systematic risk of a closely held company under this model cannot be measured directly but only by reference to comparable publicly traded companies, given that there almost certainly will not be an historic price series for the closely held business.⁴⁶¹

The practice used most often for smaller, closely held businesses is what is referred to as the “build-up” model: Start with the risk-free rate available in the market, add the common stock equity risk premium and the small stock equity risk premium, and adjust for the specific risk of

system's analysis. *See id.* at 76. As noted earlier, currently under development is an expert system for foreign exchange trading that will incorporate the effect of political and economic events through the use of fuzzy logic. *See supra* text accompanying note 389. The existence of these systems indicates that it might be possible to develop an expert system to forecast the future returns of a business. It should be noted, however, that unlike predicting foreign exchange prices, business valuation apparently has not advanced to the point of prescribing fairly definite rules for returns forecasting. *Cf. FISHMAN ET AL., supra* note 261, §§ 525.04 -.32 (examining many factors).

457. *See PRATT, supra* note 13, at 74.

458. *See id.* at 46.

459. *See id.* at 47.

460. *See id.* at 76.

461. *See id.* Another method for determining discount rates, the Schilt model, similarly starts with a risk-free rate of return and adds to this a risk premium. James H. Schilt, *A Rational Approach to Capitalization Rules For Discounting the Future Income Stream of a Closely Held Company*, THE FINANCIAL PLANNER, Jan. 1982, at 56. Under this model, the specific risk premium for a given company is based on qualitative factors concerning the business, with guideline risk premiums specified for several different situations, for example, a 26%-30% risk premium for small businesses of a personal service nature. *See id.* at 58.

the subject company.⁴⁶² Based on historical studies of equity risk premiums, data is available on the common stock and small stock equity risk premiums.⁴⁶³ Nevertheless, under the build-up model an appraiser still must analyze the subject business's risk factors to determine whether the risk premium should be greater than, less than, or equal to the publicly traded small stock premium.⁴⁶⁴

Consequently, to determine an appropriate discount rate, an appraiser must compare the risk factors of the subject company to those of other companies, in particular, to the risk factors of the average small publicly traded corporation, if the build-up model is used.⁴⁶⁵ In assessing the risk of a company, two general classes of risk are evaluated: Business risk and financial risk.⁴⁶⁶ A computerized valuation system would need the capacity similarly to engage in a comparative risk analysis of the subject company in order to determine an appropriate discount rate. One possible approach would be to develop an expert system to perform this analysis. Expert systems have been used extensively in a related application—assessing the credit risk of corporate borrowers.⁴⁶⁷ For this application, the systems assess the credit risk of a business by analyzing the company's business and financial data,⁴⁶⁸ using

462. See PRATT, *supra* note 13, at 77, 204; FISHMAN ET AL., *supra* note 261, § 510.01.

463. See PRATT, *supra* note 13, at 198-206 (referring to data published by Ibbotson Associates).

464. See *id.* at 77, 204; PRATT ET AL., *supra* note 391, at 201-02. A similar analysis of the subject company's risk factors also would be necessary under the capital asset pricing model and the Schilt model.

465. See PRATT, *supra* note 13, at 299-300.

466. See *id.* at 298-99. Basically, business risk can be measured by calculating either (i) the coefficient of variation of earnings (standard deviation of operating earnings over mean of operating earnings), or (ii) the degree of operating leverage (percentage change in operating earnings over percentage change in sales). See *id.* at 299-300. Financial risk also can be measured in two basic ways: (i) by calculating the degree of financial leverage (percentage change in income to equity holders over percentage change in operating income), or (ii) by calculating various balance sheet leverage ratios, such as total debt to assets, long-term debt to total capital, debt to equity, and fixed assets to equity). See *id.* at 300-02.

467. See *e.g.*, Jambor et al., *supra* note 307; Wolf et al., *supra* note 387; Michael A. Hutson, *Analyst: An Advisor for Financial Analysis of Automobile Dealerships*, in 1 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE, *supra* note 456, at 27; Peter E. Hart, *Syntel: An Architecture for Financial Applications*, in 1 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE, *supra* note 456, at 63.

468. See Jambor et al., *supra* note 307, at 28; Wolf et al., *supra* note 387, at 277-79; Huston, *supra* note 467, at 28; Hart, *supra* note 467, at 643.

fixed⁴⁶⁹ or company-specific⁴⁷⁰ norms. While credit assessment expert systems allow for user input in the assessment process, they also are capable of producing autonomous credit assessments.⁴⁷¹ Nonetheless, based on reported applications it does not appear that these systems determine an interest rate as a result of the credit assessment. Therefore, although these systems could serve as an important building block, the computerized valuation system would require an expert system that is both able to evaluate a business's comparable risk and to determine a required rate of return based on this evaluation.

A more promising approach may be to use neural networks to determine appropriate discount rates. Neural networks can extract rules from input and output data and thus do not require a specific set of rules in order to function.⁴⁷² In a related application, neural networks have been trained to predict bond ratings.⁴⁷³ Training was accomplished with various financial and business data concerning a company as input and with the rating placed on the company's bonds by Standard & Poor's⁴⁷⁴ and Moody's⁴⁷⁵ as the target output. During the testing phase, these neural networks performed very well in predicting the actual bond ratings, with correct classification usually around eighty percent.⁴⁷⁶

A leading expert in neural networks is of the opinion that neural networks possibly could be trained to determine discount rates.⁴⁷⁷ Training could occur by using the financial and business data of a publicly traded company as input and using the public company's known rate of return as the target output.⁴⁷⁸ Through repeated training, a

469. See Jambor et al., *supra* note 307, at 261-63.

470. See Wolf et al., *supra* note 387, at 273, 282 (using a dynamic pattern approach that determines norms based on a company's specific situation).

471. See Jambor et al., *supra* note 307, at 265 (pointing out that approximately 89% of the cases were handled automatically by the expert system without any human involvement); Wolf et al., *supra* note 387, at 282 (noting that the system produces credit assessment without requiring any user intervention but does allow for flexible interaction with users); Hart, *supra* note 467, at 69 (indicating that credit assessments generated by the expert system agree with those of senior credit officers).

472. See *supra* text accompanying notes 379-80.

473. Soumitra Dutta & Shashi Shekhar, *Bond Rating: A Non-Conservative Application of Neural Networks*, in NEURAL NETWORKS IN FINANCE AND INVESTING, *supra* note 451, at 257; Alvin J. Surkan & J. Clay Singleton, *Neural Networks for Bond Rating Improved by Multiple Hidden Layers*, in NEURAL NETWORKS IN FINANCE AND INVESTING, *supra* note 451, at 275.

474. See Dutta & Shekhar, *supra* note 473.

475. See Surkan & Singleton, *supra* note 473.

476. See Dutta & Shekhar, *supra* note 473, at 269; Surkan & Singleton, *supra* note 473, at 283.

477. Telephone Interview with Dr. Widrow, *supra* note 448.

478. *Id.*

neural network may be able to reasonably determine the required rate of return of a closely held business based on the company's business and financial data. Alternatively, a neural net may be trained by applying the data of a closely held business as the input and using as the target output a human expert's determination of the appropriate discount rate.⁴⁷⁹ Whether a neural network is trainable for this function can be determined only through experimentation.⁴⁸⁰

ii. Capitalized Returns Method

The other basic income method for valuing a business is the capitalized returns method. Under this method, the value of a business is determined by dividing the historic returns (either earnings or cash flow)⁴⁸¹ for some representative time period by an appropriate capitalization rate.⁴⁸² The capitalization rate is usually determined by subtracting a company's expected growth rate from its discount rate.⁴⁸³ The capitalized returns method is conceptually related to the discounted future returns method in that both methods value a business based on anticipated returns and an appropriate discount rate. Under the capitalized returns method, however, future returns are assumed to equal current or historical returns, adjusted for a constant growth factor.⁴⁸⁴ Consequently, the capitalized returns method is not appropriate if earnings are not expected to grow at a constant rate, for example, when

479. See *id.*; Hawley et al., *supra* note 451, at 40 (suggesting that it should be possible to train a neural network to estimate the value of a company by inputting business and financial information concerning the company and using a target output consisting of the value as estimated by a human expert); cf. Widrow et al., *supra* note 376, at 104 (pointing out that a neural net can be trained with examples of expert behavior).

480. Another option would be to use multiple regression analysis to derive a formulary relationship between a company's data and the company's rate of return. There have been several attempts to use regression analysis to predict bond ratings. See Dutta & Shekhar, *supra* note 473, at 262-63. However, in two studies neural networks performed substantially better than regression in predicting bond ratings. See *id.* at 271-72; Surkan & Singleton, *supra* note 473, at 284-86. Consequently, based on the results in predicting bond ratings, multiple regression analysis appears to be a weaker option than neural networks for determining discount rates.

481. See PRATT ET AL., *supra* note 391, at 198, 200. There are various types of earnings or cash flow bases that can be used. See *id.* at 200.

482. See *id.* at 198.

483. See FISHMAN ET AL., *supra* note 261, § 505.05.

484. See *id.* § 515.25.

a company introduces a new product or is in a cyclical industry.⁴⁸⁵ Accordingly, the capitalized returns method can be viewed as an application of the discounted future returns concept for those situations where stable business growth is anticipated.

In light of the foregoing, it does not appear useful to computerize the capitalized returns method. If neural networks are able to adequately forecast future returns,⁴⁸⁶ they should be able to do so when a company's business and financial factors indicate stable growth. If neural networks are unable to adequately forecast future returns when earnings are not expected to grow at a constant rate, accrual taxation for nonmarketed business interests may not be feasible, given that manual appraisals would be required for the unstable growth situations.

d. Applying Asset Methods

As noted earlier, in some situations asset methods are preferred over income methods in valuing a business.⁴⁸⁷ One situation involves the valuation of a holding company—that is, a company whose assets consist mainly of real estate or securities, or both.⁴⁸⁸ To value a holding company, an appraiser would value separately the company's individual assets and liabilities.⁴⁸⁹ The computer system should be able to reasonably approximate this approach by accessing the adjusted balance sheet asset and liability values.⁴⁹⁰ As a result of the prescribed accounting treatment and adjustment process,⁴⁹¹ the balance sheet should reasonably reflect the fair market value of the items included.⁴⁹²

The asset method is also appropriate in the valuation of a start-up business.⁴⁹³ Because of a nonexistent or limited earnings history, it can be highly speculative to use income methods for a start-up business. The computer system could value a start-up business by using the adjusted balance sheet values whenever a company lacks a requisite earnings history (which would need to be specified). This approach, however, would ignore the value of any goodwill, and it could very well

485. See *id.* § 525.02.

486. See *supra* text accompanying notes 446-56.

487. See *supra* text accompanying note 432.

488. See PRATT, *supra* note 13, at 43; FISHMAN ET AL., *supra* note 261, §§ 705.02 - .06.

489. See FISHMAN ET AL., *supra* note 261, §§ 710.02 -.04.

490. See *supra* Part V.B.3.a.(iii)(a).

491. See *id.*

492. If the subject company holds nonmarketed stock or other nonmarketed business interests, the fair market value of these interests would be determined by applying the business valuation software to the underlying businesses.

493. See FISHMAN ET AL., *supra* note 261, § 705.07.

be that a fairly new company with some earnings history has accumulated substantial goodwill. Ignoring the value of goodwill for tax purposes until a company has a requisite earnings history could significantly distort the reflection of the enterprise's actual change in value. To reduce this timing distortion, in the year in which a business has attained a sufficient earnings history to apply the discounted future returns method, the tax system could apply retrospective taxation to allocate any increase in value, which presumably is due to goodwill, over the business's prior taxable years and determine a time-adjusted tax for the interest holders on these amounts.⁴⁹⁴ Because this retrospective taxation feature is capable of being expressed in rules, an expert system should be able to implement it.⁴⁹⁵

An asset method also is appropriate when a company ceases to be a going concern and either is in liquidation⁴⁹⁶ or is likely to be in liquidation.⁴⁹⁷ In these situations, an appraiser would apply the liquidation value method⁴⁹⁸ and value assets on the basis of their forced or orderly liquidation value,⁴⁹⁹ which may be substantially less than their replacement cost.⁵⁰⁰ Consequently, the adjusted balance sheet would not reflect the liquidation value of assets, and further adjustment would be required to implement this method. Specifically, estimates of the liquidation value of assets would need to be obtained from equipment appraisers, wholesalers, and auctioneers.⁵⁰¹

It would appear to be very difficult for the computer system to assign liquidation values to balance sheet items. Such values would probably not be readily obtainable, and moreover, the system would need detailed information on specific assets (type, age, etc.) in order to adjust values. Taxpayers could be required to supply liquidation values, but this would

494. See *supra* notes 198-207 and accompanying text for a more complete discussion of retrospective taxation.

495. See *supra* text accompanying note 379.

496. See FISHMAN ET AL., *supra* note 261, § 705.07.

497. See PRATT, *supra* note 13, at 106.

498. See FISHMAN ET AL., *supra* note 261, § 705.06.

499. Forced liquidation value is the amount that would be realized from selling the asset as quickly as possible, for example, at an auction. Orderly liquidation value is the amount that would be realized from selling the asset over a reasonable period, typically several months. Usually, orderly liquidation value is used, unless the company is unlikely to hold the assets for a reasonable period. See *id.* § 705.13.

500. See PRATT ET AL., *supra* note 391, at 82.

501. See *id.*

be burdensome for them and for the IRS in verifying the accuracy of these values. A better approach would be to value business interests on the basis of adjusted balance sheet values for the first year that the liquidation value method is called for and subsequent years until liquidation occurs. Upon the liquidation of the business interests, retrospective taxation then would be applied to any loss recognized by the interest holders (which presumably would be due to the previous failure to account for liquidation values) starting from the first year in which the liquidation value method was appropriate; thus, the tax system would employ retrospective taxation to the loss over the period between the first "liquidation value" year and the liquidation year, and determine a time-adjusted refund on these amounts. This approach avoids the difficulty of assigning liquidation values to specific assets, while also minimizing the resulting timing distortions from failing to adjust for value decreases as they occur. An expert system should be able to implement this retrospective taxation feature, given that it should be expressible in rules.⁵⁰²

e. Determining Discounts and Premiums

In valuing a business interest, an appraiser also must determine discounts for lack of marketability, as well as minority discounts or control premiums.⁵⁰³ Several of the business valuation methods determine values based on factors relating to publicly traded corporations; in particular, discount rates are usually derived from the rates of return on publicly traded stock.⁵⁰⁴ Interests in closely held businesses, however, are not as marketable as publicly traded stock. Since, with all other things being equal, a readily marketable interest is worth more than an interest which is not so marketable, the difference must be taken into account as a discount when valuing closely held business interests based on publicly traded stock data.⁵⁰⁵

Over the years, many empirical studies have been performed on measuring the discount for lack of marketability for closely held business interests.⁵⁰⁶ The range of discounts as indicated by these studies is

502. See *supra* text accompanying note 379.

503. See PRATT, *supra* note 13, at 239, 388.

504. See *supra* notes 457-65 and accompanying text.

505. See PRATT, *supra* note 13, at 240.

506. See PRATT, *supra* note 13, at 240-57; FISHMAN ET AL., *supra* note 261, §§ 815.26 -31. These studies have involved restricted public company stock transactions, private transactions prior to public offerings, and flotation costs of public stock offerings.

fairly wide.⁵⁰⁷ Nevertheless, in general the empirical data suggests that the discount for lack of marketability should average between thirty-five percent and fifty percent.⁵⁰⁸

The valuation system simply could apply a marketability discount by using a fixed discount percentage (derived from the above-mentioned range of discounts) for all closely held business interests. Such an approach, however, would ignore differences in the marketability of particular interests which may be due to factors such as restrictions on transfers, extent of dividends or partnership payouts, and evidence of a market.⁵⁰⁹ Thus, a fixed percentage approach, even if supported by the general range of empirical data, may result in unacceptable valuations.

A better approach, if feasible, would be to use the power of neural networks to determine discounts from data relating to the particular businesses. In order to train neural networks for this task, the IRS would need to obtain data on discounts, as well as the business factors possibly affecting such discounts. Such a study may be difficult, in that it may require a detailed look at qualitative factors relating to a particular business—factors such as restrictions on transfers and evidence of a market. Similarly, the use of neural networks to evaluate the discount relating to a particular business interest would require that the IRS have access to this type of information for each business.⁵¹⁰

If using neural networks to determine marketability discounts proves to be unfeasible, another option could be to use a fixed percentage discount based on the empirical data, unless the taxpayer submits to the IRS evidence of special circumstances that warrant a greater discount—circumstances such as restrictions on transfers, or no history of dividends or partnership payouts.⁵¹¹ If a taxpayer does inform the IRS

507. See FISHMAN ET AL., *supra* note 261, § 815.32.

508. See *id.*; PRATT, *supra* note 13, at 532. In recent years, it appears that the courts in estate tax cases have allowed larger discounts for lack of marketability than they have in previous years, which probably is due in part to the availability of empirical data. See FISHMAN ET AL., *supra* note 261, § 815.34 (listing three Tax Court cases in which the discounts were approximately 35%).

509. See FISHMAN ET AL., *supra* note 261, § 815.25; *cf.* PRATT, *supra* note 13, at 262 (determination should be made based on careful examination of the circumstances of each case).

510. In this regard, neural networks have demonstrated the capacity for making determinations based on qualitative data. See *infra* text accompanying note 549.

511. *Cf.* FISHMAN ET AL., *supra* note 261, § 815.35 (evidence suggests that marketability discount should average between 35% and 50%, absent special circum-

of special factors, IRS personnel then would determine an appropriate discount based on this evidence.⁵¹² Whether this approach would be unduly burdensome for the IRS and for taxpayers likely would depend on the extent to which the selected fixed percentage provides a reasonable marketability discount for taxpayers.

Besides discounting the value of business interests for lack of marketability, an appraiser also may need to make adjustments for minority discounts and control premiums.⁵¹³ These adjustments are necessary to reflect the fact that minority interests usually are worth considerably less than a proportionate share of the entity's total value.⁵¹⁴ If a minority interest is being valued on the basis of publicly traded stock data, however, a minority discount is not appropriate because minority interests are being compared with minority interests—the publicly traded stock.⁵¹⁵ On the other hand, a control premium is appropriate when valuing a controlling interest on the basis of data relating to publicly traded corporations.⁵¹⁶

Consequently, in applying the discounted future returns method to controlling interests, the valuation system would need to determine control premiums. As with marketability discounts, empirical data also has been gathered with respect to control premiums.⁵¹⁷ This data indicates that the average control premium is approximately forty percent.⁵¹⁸ However, studies suggest that using average control premiums derived from aggregate data may not reasonably estimate the

stances).

512. A taxpayer always will have the right to appeal value determinations; however, under the suggested appeal procedure, a taxpayer should not prevail unless she demonstrates that the IRS valuation overstates the actual value by more than a certain percentage of the actual value. *See supra* note 319. In light of the inexactitude of using a fixed percentage for marketability discounts, the suggested standard to prevail on appeals should not apply to these marketability discount determinations.

513. *See PRATT, supra* note 13, at 118-19.

514. *See FISHMAN ET AL., supra* note 261, § 815.04.

515. *See PRATT, supra* note 13, at 118-19 (pointing out that because discount rates used in employing the discounted future returns method usually are derived from the return data of publicly traded stock, a minority discount is not appropriate in this situation); *see also FISHMAN ET AL., supra* note 261, §§ 815.21 -22.

516. *See PRATT, supra* note 13, at 119; *FISHMAN ET AL., supra* note 261, §§ 815.21 -22.

517. *See FISHMAN ET AL., supra* note 261, § 815.16; *PRATT, supra* note 13, at 398-400. The data is based on the prices paid for controlling interests in public companies. *See FISHMAN ET AL., supra* note 261, § 815.16.

518. *See FISHMAN ET AL., supra* note 261, § 815.16. Control premium data is also available by industry. *See generally MERGER AND ACQUISITIONS SOURCEBOOK* (Carl Shrager & David Jurek eds., 1992).

control premium for a particular company, given that the factors which affect control differ among companies.⁵¹⁹

In light of the foregoing, the options discussed above with respect to determining marketability discounts seem equally applicable to the determination of control premiums. Thus, while in theory neural networks might offer the most accurate determination, their feasibility is questionable. Therefore, the best alternative may be the use of a fixed percentage control premium based on empirical data, with taxpayers provided the right to submit evidence which demonstrates the propriety of a lower premium.⁵²⁰

iv. Approximating Economic Depreciation for Tangible Personal Property

A system for approximating the actual decline in value of tangible personal property would need to be developed for preparing the income statements and balance sheets that would be used in the business valuation process.⁵²¹ Unlike the treatment accorded other assets, there is under current federal income tax law an attempt, of sorts, to value depreciable property annually. However, the depreciation methods provided under section 168 are based in part on policy objectives such as investment promotion and administrative convenience, and thus they are not strictly geared towards approximating actual depreciation in

519. See Walt Shubert & Les Barenbaum, *Control Premiums and the Value of the Closely-Held Firm*, 1 J. SMALL BUS. FIN. 155-59 (1991). Factors affecting control include the extent to which the owners are able to exercise certain prerogatives of control, as well as the ownership structure of the company. See *id.*

520. An additional complication that may arise in determining the value of a particular interest in an enterprise relates to determining an owner's proportionate interest. Although the proportionate value is typically a straightforward computation, complications occasionally may arise because of the special rights of different shareholders or partners. See PRATT ET AL., *supra* note 391, at 531. One potentially difficult situation for a valuation system is dealing with special allocations of partnership income and expense. Germany, which taxes partnerships on a net worth method, generally does not permit special allocations, see Schwidetzky, *supra* note 11, at 1344-45, perhaps because of the attendant valuation difficulties. Accordingly, if an accrual tax system is adopted, serious consideration should be given to either prohibiting or limiting special partnership allocations. In this regard, commentators have recommended limiting special partnership allocations in order to curb abuse. See, e.g., Curtis J. Berger, *W(h)ither Partnership Taxation?*, 47 TAX L. REV. 105, 131-34, 139-43 (1991).

521. See *supra* text accompanying notes 162 and 402.

value.⁵²² In order to estimate the value of business interests better, the tax system should attempt to measure the actual decline in value of tangible personal property—or what is referred to as economic depreciation.

Several studies have indicated that economic depreciation is capable of being measured.⁵²³ In particular, Hulten and Wykoff analyzed data on the sales prices of used assets and concluded that geometric (or declining balance) depreciation reasonably approximated economic depreciation for each asset class sampled (ranging from construction equipment to machine tools to buildings).⁵²⁴ Used market prices alone, however, do not reflect the average value of a particular asset type of a certain age. This is because average sales prices of used assets only indicate the value of those assets that survived a given length of time (known as censored sample bias).⁵²⁵ Accordingly, Hulten and Wykoff corrected for censored sample bias by multiplying each sales price by an estimate of survival probability, which was derived from estimates of retirement distribution.⁵²⁶ In addition, because the amount of data samples was insufficient to completely fill out age-price profiles for a reasonable number of asset ages, estimates were made econometrically by using a flexible regression model.⁵²⁷

Building on the Hulten-Wykoff approach, the Treasury Department conducted empirical studies which similarly showed a geometric pattern of constant-dollar depreciation.⁵²⁸ Based on these studies, in 1984 the

522. See S. REP. NO. 144, 97th Cong., 1st Sess. 12-13 (1981), *reprinted in* 1981 U.S.C.C.A.N. 105, 119-20 (ACRS was enacted in order to stimulate capital formation); See also STEPHEN G. UTZ, *TAX POLICY: AN INTRODUCTION AND SURVEY OF THE PRINCIPAL DEBATES* 131 (1993) (noting administrative and economic policy reasons for having tax depreciation deviate from economic depreciation). The accelerated rates of depreciation provided under current law also serve to counteract the effect of inflation on measuring real capital income in a system that does not index asset basis for inflation. See Halperin & Steuerle, *supra* note 9, at 354-55. At one time, however, Congress apparently believed that depreciation deductions approximated the decline in the value of an asset. See, e.g., S. REP. NO. 1622, 83rd Cong., 2d Sess. 25-29 (1954).

523. See Hulten & Wykoff, *supra* note 65, at 106-12.

524. See *id.* at 93, 112. As Hulten and Wykoff indicate, many studies obtained the result that economic depreciation is more accelerated than straight line, and a sufficient number of studies established that geometric depreciation is a reasonable approximation. See *id.* at 112.

525. See *id.* at 91.

526. See *id.* at 91-92. The seminal statistical study of average service lives of industrial property was performed in the 1920s, 1930s, and 1940s by the Iowa Research Station (now known as Iowa State University), producing what are known as the Iowa Survivor Curves. See Charles E. Jerominski, *The Use and Abuse of Iowa Curves when Quantifying Appraisal Depreciation*, in *VALUATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS* 391, 393 (1989).

527. See Hulten & Wykoff, *supra* note 65, at 92-93.

528. See *TAX REFORM FOR FAIRNESS*, *supra* note 405, at 160-62.

Treasury proposed the Real Cost Recovery System (RCRS), which grouped assets among seven classes, with the assets in each class having approximately the same observed geometric rate of economic depreciation.⁵²⁹ Under the proposal, annual depreciation deductions would be computed by multiplying the inflation-adjusted unrecovered cost of an asset by the geometric rate assigned to that asset's class.⁵³⁰ Despite the empirical support for RCRS, the Treasury proposal has not been adopted into law.⁵³¹

Under the Hulten-Wyckoff-Treasury approach, obtaining data on used asset prices and retirement distributions is critical in order to accurately estimate economic depreciation.⁵³² Indeed, Hulten and Wyckoff emphasized that their estimates of depreciation were not definitive and that more data would be needed on asset retirement distributions and used asset prices.⁵³³ Similarly, the RCRS proposal contemplated that the Treasury would continue to conduct empirical studies of economic depreciation by establishing permanent research facilities in order to measure more precisely economic depreciation for specific asset types and to obtain evidence of changing depreciation rates due to such factors as changing market conditions or technological obsolescence.⁵³⁴

In order to reasonably estimate the value of tangible personal property for purposes of valuing business interests, the Treasury Department once again should attempt to measure economic depreciation. Accordingly, studies should be conducted to gather data on used asset prices and asset retirements. Computer technology should facilitate this process through

529. *See id.*

530. *See id.* at 157.

531. In the Tax Reform Act of 1986, Congress did modify the then-existing Accelerated Cost Recovery System—in enacting MACRS—but not in accord with the RCRS proposal. *See* I.R.C § 168.

532. *See* Hulten & Wyckoff, *supra* note 65, at 92, 96; TAX REFORM FOR FAIRNESS, *supra* note 405, at 160.

533. *See* Hulten & Wyckoff, *supra* note 65, at 96.

534. *See* TAX REFORM FOR FAIRNESS, *supra* note 405, at 160; *cf.* Hulten & Wyckoff, *supra* note 65, at 98 (referring to earlier studies which concluded that because asset prices are dependent on taxes, interest rates, and other variables subject to change over time, there is no reason to assume that the depreciation rate remains constant over time; finding, however, no statistical evidence that parameters changed significantly over time and concluding that this instability issue did not appear to present a major problem for their analysis).

its networking and data processing capabilities.⁵³⁵ Based on the results of these empirical studies, the Treasury should promulgate regulations specifying the depreciation rate for specific asset types; businesses then would use these rates along with the inflation-adjusted unrecovered cost of assets to estimate depreciation deductions and the value of tangible personal property in preparing their income statements and balance sheets, respectively.⁵³⁶ In line with the RCRS proposal, the empirical studies should continue on an ongoing basis in order to observe any changing economic depreciation rates as a result of changing conditions; the depreciation regulations should be revised periodically to take into account any changes in the observed rate of economic depreciation.⁵³⁷

b. Collectibles

Collectibles (works of art, antiques, etc.) are valued by using the comparable sales approach.⁵³⁸ Thus, as in the case of residential real property, it theoretically may be possible to develop computer software that would employ either neural networks or multiple regression analysis to value collectibles. Some very difficult problems in implementing this approach would need to be overcome, however.

On one hand, critical factors used in valuing collectibles require the visual inspection and judgment of an expert appraiser. A human appraiser must exercise judgment in order to determine an object's

535. In this regard, expert systems are being used to automatically provide an analysis of the large volume of sales data collected by point-of-sale scanners. See Tej Anand & Gary Kahn, *Making Sense of Gigabytes: A System for Knowledge-Based Market Analysis*, in 4 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE 57 (A. Carlisle Scott & Phillip Klahr eds., 1992).

536. Cf. Shakow, *supra* note 4, at 1157 (apparently suggesting that his proposed partial accrual tax system use a depreciation system that approximates economic depreciation).

537. It should be pointed out that while the above approach should reasonably estimate the depreciation and value of tangible personal property, it will not accurately measure these attributes with respect to a particular asset. This is because the sample data will be derived from many assets operated by various firms, and among firms there are variations in use, operating conditions, maintenance practices and retirement practices. See Jerominski, *supra* note 526, at 404; see also Shoven & Taubman, *supra* note 4, at 209 (noting that a 1962 Treasury study found wide variations in useful lives within prescribed asset classes, which suggests that actual depreciation for a particular asset type varies among firms). Consequently, an accurate determination of economic depreciation and asset values would require that, to some extent, the individual circumstances of particular assets be taken into account. See Jerominski, *supra* note 526, at 404, 409. While an accurate valuation of assets, absent manual appraisals, does not seem attainable, perhaps better estimates of asset values for particular firms eventually could be achieved through more refined empirical studies for particular industries and firm sizes.

538. See Lerner, *supra* note 181, at 593-94; IRS GUIDE, *supra* note 320, at 5-1.

artistic quality, authenticity, condition, uniqueness, and rarity,⁵³⁹ as well as its medium and the artist's relative standing in the profession.⁵⁴⁰ On the other hand, other comparability data relating to collectibles is quantitative in nature and thus could be available for computerized techniques without the need for substantial human involvement. For art objects, such data includes the size of the object, the date of creation, the cost, the date of acquisition, fairly current sales of other works by the same artist, the prices quoted in dealer's catalogs of works of the artist or other artists of comparable stature, the current economic state of the art market, and a record of exhibitions at which the particular art object had been displayed.⁵⁴¹

In light of the foregoing, the following approach is suggested. Upon acquiring a collectible, a taxpayer would be required to obtain an appraisal for qualitative attributes—such as artistic quality, authenticity, condition, uniqueness, and the medium of the object—and to forward this information to the IRS. This qualitative data would then be used along with quantitative data to produce computer-generated values on an annual basis. If feasible, this approach would allow for annual valuations of collectibles with only a one-time manual appraisal of the piece for each owner.

Of course, many difficulties with this approach would have to be addressed. First, some rating scale in evaluating qualitative factors would need to be developed. For example, the quality of the piece, relative to other works by the same or comparable artists, could be expressed as excellent, good, poor, etc. Standards would have to be set to ensure that appraisers attach similar meaning to these terms. The taxpayer should be able to use a private appraisal of the collectible, but this appraisal would be subject to IRS challenge. A taxpayer also should be given the option of having the IRS appraise the piece. In this regard, the IRS currently allows taxpayers to seek advanced valuations of certain art for purposes of determining income, estate, or gift tax liability.⁵⁴²

In addition, the qualitative ratings assigned to a collectible would have to be represented in a manner a computer can understand. One approach would be to give each type of rating a fixed numerical value, for

539. See Lerner, *supra* note 181, at 615.

540. See Rev. Proc. 66-49, 1966-2 C.B. 1257.

541. See *id.*

542. See Rev. Proc. 96-15, 1996-3 I.R.B. 41.

example, excellent is assigned a four, good a three. A possibly more accurate approach would be to use fuzzy logic⁵⁴³ to represent the ratings. In general, the advantage of using overlapping fuzzy sets, rather than intervals, to represent linguistic values (such as excellent) is that this representation mimics the manner in which humans interpret linguistic values and results in a gradual rather than abrupt transition from one linguistic value to a contiguous linguistic value, thus “resulting in continuity and robustness.”⁵⁴⁴

Valuation software, of course, would also need to be developed. Given their success in valuing residential real estate, in theory neural networks may be able to value collectibles.⁵⁴⁵ Indeed, a leading expert in neural networks believes that it may be possible for neural networks to estimate the value of some collectibles, such as art objects and gems.⁵⁴⁶ Nonetheless, in general, collectibles are considerably more unique than residential real property,⁵⁴⁷ and thus it is uncertain whether neural networks can perform this task. In addition to being more unique, collectibles are appraised differently from real estate in that there appears to be heavier reliance on subjective factors like artistic quality and authenticity.⁵⁴⁸ Yet, in one study, neural networks predicted stock price performances solely on the basis of qualitative data gleaned from company letters to shareholders.⁵⁴⁹

A neural network possibly could be trained by using quantitative and qualitative data relating to a collectible with a known sales price as input

543. See *supra* notes 381-84 and accompanying text.

544. Zadeh, *supra* note 381, at 78.

545. Cf. Bylinsky, *supra* note 308, at 100-02 (pointing out that neural networks value real estate more precisely than human assessors because the nets can compare much more data and analyze the variables in many different ways).

546. Telephone Interview with Dr. Widrow, *supra* note 448.

547. Cf. Rev. Proc. 66-49, 1966-2 C.B. 1257 (indicating that art objects are unique whereas real properties are not); Lerner, *supra* note 181, at 595 (noting how Treas. Reg. § 20.2031-1(b) of the estate tax regulations contemplates a retail market that may not exist for unique works of art).

548. Compare Corinne L. Richardson, *Legal Guidelines for Appraisals Used to Substantiate Charitable Contribution Income Tax Deduction*, in A HANDBOOK ON THE APPRAISAL OF PERSONAL PROPERTY, *supra* note 311, at 31, 42-43 (comparability factors for art work include rarity, artistic quality, and authenticity) with APPRAISAL INSTITUTE, THE APPRAISAL OF REAL ESTATE 382-83 (10th ed. 1992) (among the comparability factors for real estate are location and physical characteristics, which includes building size, quality of construction, functional utility, architectural style, building materials, age, condition, site size, attractiveness, amenities, and on site environmental conditions).

549. Youngohc Yoon & George Swales, *Predicting Stock Price Performance: A Neural Network Approach*, in NEURAL NETWORKS IN FINANCE AND INVESTING, *supra* note 451, at 329, 333-39 (the frequency and percentage of each letter devoted to certain themes was used as input data).

and using that sales price as the target output.⁵⁵⁰ Alternatively, the target output could be the value as determined by an expert appraisal.⁵⁵¹ In either case, for purposes of training and using neural networks, comparability standards would have to be established. For example, in valuing art a possible approach would be to use data relating to works by artists of the same school or period as the artist of the subject piece.⁵⁵²

As an alternative to neural networks, the valuation software could employ multiple regression analysis to relate comparability factors to the value of a collectible. Studies have found that neural networks outperform multiple regression analysis in predicting bond ratings⁵⁵³ and stock prices.⁵⁵⁴ These findings indicate that for problem domains lacking a well-defined model or theory, neural networks perform better than regression analysis.⁵⁵⁵ Similarly, for valuing collectibles, which also appears to lack well-defined rules, neural networks may be the stronger approach.⁵⁵⁶

550. Telephone Interview with Dr. Widrow, *supra* note 448. Art Quest is an existing art sales computer database, to which IRS National Office personnel have access. See IRS GUIDE, *supra* note 320, at 5-7. This could provide a source of quantitative data for training and using neural networks to value art.

551. Telephone Interview with Dr. Widrow, *supra* note 448.

552. *Cf.* Farber v. Comm'r, 33 T.C.M. (CCH) 673, 675 (1974), *aff'd mem.*, 535 F.2d 1241 (2d Cir. 1975) (court used this standard to determine comparable sales). In connection with setting comparability standards, the appropriate market for estimating the value of certain collectibles would need to be determined. As an illustration, it has been held that the market for loose, unset gems is comprised of jewelry manufacturers and jewelry stores, rather than consumers. See, e.g., Anselmo v. Comm'r, 80 T.C. 872 (1983), *aff'd*, 757 F.2d 1208, 1214 (11th Cir. 1985). For works of art, there is an issue whether auctions—which are usually, but not always, considered to establish wholesale prices—should be considered along with galleries in establishing market prices. Compare Lightman v. Comm'r, 50 T.C.M. (CCH) 266, 269 (1985) (auction prices are evidence of value) with Biagiotti v. Comm'r, 52 T.C.M. (CCH) 588, 593 (1986) (auction prices are not evidence of value). For a discussion of the difficulties in using auction sales as evidence of value, see Pamela J. Lajeunesse, *Tax Incentives for Support of the Arts: In Defense of the Charitable Deduction*, 85 DICK. L. REV. 663, 673-674 (1981).

553. See Dutta & Shekhar, *supra* note 473, at 271-72; Surkan & Singleton, *supra* note 473, at 285.

554. See Yoon & Swales, *supra* note 549, at 338-39.

555. See Dutta & Shekhar, *supra* note 473, at 272; *cf.* Surkan & Singleton, *supra* note 473, at 285 (results suggest that neural networks may be the more powerful classification technique).

556. Although multiple regression analysis is the valuation technique used in the CAMA process, see *supra* text accompanying note 338, there are some indications that it eventually may be replaced by neural networks. See Richard A. Borst, *Artificial*

c. *Accessing Relevant Data*

In order to generate annual valuations for nonmarketed business interests and collectibles, the IRS would need access to relevant data concerning these assets.⁵⁵⁷ Accessing relevant data may not be troublesome in light of computer networking capabilities.

To value nonmarketed business interests, the IRS would need from businesses information such as past and current income statements, past and current balance sheets, details concerning liabilities and leases, inventory and equipment lists,⁵⁵⁸ particular real estate and investment asset holdings records, and identification of the ownership interests of shareholders and partners.⁵⁵⁹ In addition, except for the shareholder data, the same information would be needed from publicly traded corporations in order for the IRS to have access to industry and comparability data. Much of this data is already required under current law. All businesses, of course, must currently file tax returns detailing income and expense information, and most businesses (with the exception of sole proprietorships)⁵⁶⁰ must include balance sheet

Neural Networks: The Next Modeling/Calibration Technology for the Assessment Community, 10 PROP. TAX J. 69 (1991). Likewise, some investment firms are now using neural networks in place of regression analysis to pick stocks. See Star, *supra* note 447.

557. The IRS should be able to access the necessary data for valuing real property through the means currently used by local governments in the CAMA process. Thus, sales data and parcel sizes should be available from public land records, and information concerning structures and improvements should be obtainable through field reviews. Cf. Riley & Schrieber, *supra* note 306, at 96-98, 102 (discussing the entry of data into the CAMA system).

558. Inventory and equipment lists may not be necessary. In valuing a business, an appraiser needs access to these lists, as adjustments may be required because of the inventory accounting and depreciation methods used by the business. See *supra* notes 402-05 and accompanying text. Under the suggested accrual tax system, however, businesses would be required to use inflation-adjusted FIFO and economic depreciation in preparing their income statements and balance sheets; consequently, adjustments with respect to inventory and equipment should not be necessary, at least during the valuation process. (Adjustments may be required, however, upon audits.) On the other hand, such detailed information concerning inventory and equipment may be necessary to enable neural networks to reasonably forecast future returns and determine discount rates. See *supra* notes 448-56 and 472-80 and accompanying text.

559. See PRATT, *supra* note 13, at 130. As noted earlier, if neural networks are unable to produce reasonably accurate forecasts of future returns based solely on quantitative data, consideration should be given to incorporating some qualitative factors into the process. In this regard, perhaps businesses could be required to send general product information—as is available through catalogues or brochures—as well as lists of competitors. See *supra* note 455 and accompanying text.

560. See IRS Form 1040 and Schedule C.

information.⁵⁶¹ Details concerning particular assets and liabilities, however, would appear to be necessary under a complete accrual tax system.⁵⁶²

Accordingly, it may be possible for the IRS to gain access to the relevant information simply through the traditional return filing process. Obtaining data through paper returns, however, would be quite inefficient and possibly unfeasible.⁵⁶³ Paper return filing requires that data be entered into IRS computers either manually or through image processing.⁵⁶⁴ Given that under a complete accrual tax system the IRS would need to send out valuation statements within a reasonable amount of time after business information is received,⁵⁶⁵ it may be very difficult to enter the data in a timely fashion even through imaging processing techniques. A much more efficient approach would be to have the information filed electronically.

In any event, although there have been problems with the current electronic filing program,⁵⁶⁶ it appears inevitable that electronic filing will replace paper filing. The electronic filing program is the corner-

561. See IRS Form 1065 and Schedule L (partnerships); IRS Form 1120 and Schedule L (C corporations); IRS Form 1120S and Schedule L (S corporations).

562. *But cf. supra* note 558 and accompanying text.

563. *Cf. Rita L. Zeidner, IRS Calls on Private Sector to Open Info Highway for Home Filing*, 60 TAX NOTES 1672 (1993) (pointing out how the IRS cannot continue to process increasing volumes of paper returns).

564. *Cf. IRS' Tax Systems Modernization—Progress and Prospects: Hearings Before the House Subcomm. on Commerce, Consumer, and Monetary Affairs of the House Comm. on Government Operations*, 102d Cong., 2d Sess. 264-68 (1992) [hereinafter Peterson Statement] (statement of Shirley D. Peterson, Commissioner, Internal Revenue Service) (noting manual entry of data under current practices; referring to future use of imaging processing techniques). Recently, the IRS has had problems with its new image processing system, SCRIPS. See George Guttman, *IRS's SCRIPS Imaging System: More Glitch than Glamour*, 69 TAX NOTES 1173 (1995).

565. A possible procedure could be for taxpayers to transmit data shortly after the close of their taxable years and for the IRS to send valuation statements a few months thereafter.

566. See Rev. Proc. 94-63, 1994-40 I.R.B. 7 (providing measures to combat electronic filing fraud, including requiring users to submit fingerprints and authorize credit checks); *IRS Commissioner Announces Steps to be Taken to Combat Filing Fraud*, DAILY TAX REP., July 20, 1994, at G-5, G-6 (noting problems of electronic filing fraud and browsing by IRS personnel through taxpayer files; stating that IRS Commissioner Richardson announced steps to combat fraud, including a program to check the suitability of individuals applying to participate in the electronic filing program).

stone of the IRS's tax systems modernization project.⁵⁶⁷ In fact, the IRS is in the process of planning a network that would electronically link taxpayers from their homes to the IRS.⁵⁶⁸ As planned, this network could be used by the IRS to electronically send to taxpayers such information as forms, letters, publications, and rulings, and to electronically receive from taxpayers such information as tax returns, payments, and wage statements, among other items.⁵⁶⁹ The IRS also

567. See George Guttman, *IRS's Electronic Filing Game Plan for 1996: Too Little, Too Late?*, 67 TAX NOTES 877 (1995) [hereinafter Guttman, *IRS's Game Plan*] (statement of IRS officials to that effect); see generally Peterson Statement, *supra* note 564; INTERNAL REVENUE SERVICE, *TAX SYSTEMS MODERNIZATION* (1991). The IRS's tax systems modernization project also has had problems. Specifically, claims have been made that the project may fail because the IRS lacks the necessary technical expertise and experience. See George Guttman, *IRS Modernization Plans Have Major Problems, Research Group Says*, 70 TAX NOTES 485 (1996) [hereinafter Guttman, *IRS Modernization Plans*]; see also *IRS Admits Its \$4 Billion Modernizing is a Failure*, BALTIMORE SUN, Jan. 31, 1997 (IRS official Mr. Gross is quoted as saying that developed systems "do not work in the real world"); Ryan J. Donmoyer, *Restructuring Panel may Recommend a Board of Directors for the IRS*, 74 TAX NOTES 717 (1997) (statement by Senator Kerrey that news services misinterpreted Gross' comments). Moreover, the IRS's current problems with its tax systems modernization project may well cast serious doubts on the feasibility of implementing a computer-based accrual tax system. Yet, modernization is necessary, and the project simply cannot be abandoned. See Gene Steuerle, *TSM: An Impossible, but Necessary, Task*, 71 TAX NOTES 131 (1996). To improve its effort, the IRS probably will need to acquire more technical management expertise. See Guttman, *IRS Modernization Plans*, *supra*; cf. Steuerle, *supra* (noting the difficulty that the IRS has in recruiting technical talent, due to federal wage scales); David Cay Johnston, *Leaders of I.R.S. Panel Urge Sweeping Overhaul of Agency*, N.Y. TIMES, Feb. 1, 1997 (quoting IRS official Mr. Gross as saying that IRS lacked the "intellectual capital" to modernize; pointing out that federal wage scales make it difficult to hire the necessary talent to manage the project). Thus, to implement its tax systems modernization project, as well as a computer-based accrual tax system, the IRS would appear to need special salary authorization in order to hire the necessary talent. Cf. *Administration Proposes Overhaul of Troubled IRS*, BALTIMORE SUN, Mar. 18, 1997, at 3A (reporting that under a recently announced Treasury plan, IRS would have increased flexibility to hire outside computer personnel and to pay them more).

568. See Rita L. Zeidner, *Requiring Preparers to File Electronically is Still an Option*, 62 TAX NOTES 1107 (1994); see also Zeidner, *supra* note 563.

569. See Zeidner, *supra* note 568. The IRS is hoping that the private sector will use its resources to build this communications superhighway. See *id.* In particular, the IRS envisions that taxpayers with a computer and a modem could access the IRS through value added networks (VANs). See Guttman, *IRS's Game Plan*, *supra* note 567; Ryan J. Donmoyer & Sheryl Stratton, *Electronic Filing Highlights Otherwise Quiet CAG Meeting*, 67 TAX NOTES 1131 (1995). For security reasons, the IRS is wary of allowing taxpayers direct access to its computer systems, and thus the VANs would act as a buffer. See Guttman, *IRS's Game Plan*, *supra* note 567. The IRS also is in the process of implementing Cyberfile, a system that would allow taxpayers to transmit their returns electronically directly to the IRS, by using personal computers and modems, sending the information over the Internet. Problems with development and security, however, have forced the IRS to delay testing, at least until the 1997 filing season. See Constance Spheris, *Cyberfile a Costly Mess, GAO Tells Senate Panel*, 71 TAX NOTES 29 (1996).

is devising ways to encourage businesses to file electronically.⁵⁷⁰ The planned electronic filing networks should provide the means to access business and financial data under a complete accrual tax system.⁵⁷¹

These taxpayer-IRS networks also should allow the IRS to access data regarding sales of collectibles.⁵⁷² Sales data collected by galleries, dealers, auction houses, and the like, could be transmitted via the networks to the IRS for entry into databases.⁵⁷³ Similarly, the IRS could use these networks to obtain data on used equipment prices, which would be needed to measure economic depreciation.⁵⁷⁴

VI. TAXPAYER LIQUIDITY CONCERNS

In addition to the valuation problem, another traditionally cited obstacle to accrual taxation implementation is potential taxpayer illiquidity.⁵⁷⁵ That is, imposing taxation without relating it to a sale raises the possibility that a taxpayer may have insufficient liquid assets to pay the tax liability.⁵⁷⁶ Over the years, two alternative solutions to the liquidity problem have been offered: (i) impose the tax upon realization, but with an interest charge for the period of deferral (interest-

570. See Donmoyer & Stratton, *supra* note 569, at 1132.

571. Like the current electronic filing procedures, the information could be transmitted by businesses to the IRS in specified formats to allow for IRS processing. Since, in the near future, almost all businesses will use computers to record and process business data, it should not be burdensome for businesses to assemble the needed data in the prescribed formats and transmit such to the IRS. Cf. Thomas A. Stewart, *Welcome to the Revolution*, FORTUNE, Dec. 13, 1993, at 66, 68-70 (pointing out that virtually all large businesses are computerized to a degree and many medium and small businesses use computers to record and process business data; noting a definite trend in the business community to electronically record business and financial information).

572. See *supra* Part V.B.3.b. discussing the need for such data in the annual valuation of certain collectibles.

573. In this regard, expert systems have been used in connection with point-of-sale scanners to analyze the large volume of data collected. See *supra* note 535.

574. See *supra* Part V.B.3.a.(iv).

575. See BLUEPRINTS, *supra* note 3, at 81.

576. It should be noted that taxpayer liquidity is not always viewed as an overriding concern under the tax law. Under section 1272, taxpayers are taxed on imputed interest income irrespective of cash receipts. I.R.C. § 1272. Similarly, section 83 generally taxes individuals on the receipt of property in connection with the performance of services. I.R.C. § 83. Nonetheless, complete accrual taxation certainly raises greater liquidity concerns than these limited situations where noncash income is taxed.

bearing deferred tax liabilities),⁵⁷⁷ or (ii) allow particular taxpayers to pay the tax in installments, with interest, based on demonstrated illiquidity (individual installment agreements).⁵⁷⁸ As explained below, the latter solution appears preferable.

Interest-bearing deferred tax liability measures are justified on the basis that deferring taxation until a sale occurs makes it more likely that the taxpayer will have the cash to pay the tax liability.⁵⁷⁹ However, these measures actually can create their own liquidity problems⁵⁸⁰—that is, because of the interest charged, the amount received on the disposition of an asset may not be sufficient to fund the total time-adjusted tax liability.⁵⁸¹ Another problem with an interest-bearing deferred tax liability measure is that it effectively forces the government to lend amounts to taxpayers and thus does not allow for any credit control.⁵⁸²

Moreover, the relief provided by an interest-bearing deferred tax liability measure is too broad—taxpayers who have no liquidity difficulties nonetheless would receive deferred tax treatment.⁵⁸³

577. See, e.g., Blum, *supra* note 199; Louie, *supra* note 4, at 872 n.65. As noted earlier, interest-bearing deferred tax liability schemes are used in a few instances under current tax law. See *supra* note 200.

578. See Thuronyi, *supra* note 4, at 128 (in advocating an accrual method for publicly traded stock, recommending, to the extent needed, a more lenient allowance of installment agreements for paying taxes); cf. Shakow, *supra* note 4, at 1176 (suggesting that taxpayers pay at least a certain percentage of income, aside from accrued gains, as a tax on those gains; for individuals with tax liabilities on accrued gains above that percentage of income, allow for interest-bearing deferred tax liabilities if illiquidity is demonstrated).

579. See Cunningham & Schenk, *supra* note 3, at 744.

580. See *id.* at 744-45; Shakow, *supra* note 4, at 1169-70.

581. See Cunningham & Schenk, *supra* note 3, at 744-45 (offering an example demonstrating this); Shakow, *supra* note 4, at 1169-70. An example of such a situation would be where all of the gain on an asset accrued in the first few years of the taxpayer's holding period, with the asset's value continuing stable for the remainder of a long holding period. In this case, the tax on these early accrued gains, plus accrued interest, could easily exceed the amount realized on the disposition.

582. See Shakow, *supra* note 4, at 1169.

583. Cf. Fellows, *supra* note 65, at 805 (contending that rather than retaining nonrecognition rules to provide liquidity relief, a more rational approach would allow taxpayers to defer their tax only upon a showing of liquidity hardship); Thuronyi, *supra* note 4, at 128 (pointing out that accrual taxation should not be rejected simply because some taxpayers will have liquidity problems). In addition, the relief provided by interest-bearing deferred tax liabilities is too narrow. Some taxpayers may continue to have liquidity problems even after a sale. See text accompanying notes 580-81. Professor Rosenberg refers to measures of this type, in particular the realization rule, as an indication of a substituted referent problem—using the taxpayer's realization of gain to measure his possession of cash. See Joshua D. Rosenberg, *Tax Avoidance and Income Measurement*, 87 MICH. L. REV. 365, 459 (1988). As Professor Rosenberg points out, simply because a taxpayer may receive cash on a sale does not necessarily mean that a taxpayer who sells property will have more cash than a taxpayer who refrains from

Taxpayers who have accrued gains on publicly traded securities should not face a liquidity hardship with the tax on these gains, as they can always dispose of these assets at the market price and with low transaction costs. There is no real difference between imposing taxes that effectively force a sale of an asset and imposing taxes that effectively prevent an investment in an asset, provided that there is a ready market for the asset and, thus, no economic loss is occasioned by the forced sale.⁵⁸⁴ The liquidity problem may even be exaggerated for taxpayers who have accrued gains on their personal residences. Taxpayers adapt their liquidity practices to fund their real estate taxes.⁵⁸⁵ Although property tax rates are substantially lower than income tax rates, property taxes apply to the assessed value of a residence, while the accrual income tax would only apply to the annual increase in the residence's value, adjusted for inflation. Moreover, estate tax studies indicate that taxpayers are able to place themselves in a more

selling. *See id.*

Professor Shakow extensively analyzed consumer financial asset data and concluded that only 1% to 2% of the population would suffer liquidity problems under his partial accrual taxation proposal. *See* Shakow, *supra* note 4, at 1172-74. The analysis assumes that the only individuals who potentially could suffer liquidity problems are those whose liquid assets comprise less than 5% of their total assets. *See id.* at 1170-74. The analysis, however, relates only to liquidity problems of individuals and does not deal with the potential liquidity problems of corporations. Presumably, Professor Shakow omits such an analysis based on his apparent recommendation to eliminate the corporate income tax. *See id.* at 1136. Yet, eliminating the corporate income tax is not a necessary ingredient of an accrual tax system, and thus these results do not fully describe the liquidity difficulties taxpayers may face under accrual taxation. Perhaps more importantly, Professor Shakow's liquidity analysis was based on the assumption that certain items such as personal residences would be excluded from accrual taxation, which would not be the case under complete accrual taxation. In analyzing the data, Professor Shakow did not disregard interests in closely held businesses, presumably because his proposal effectively applies accrual taxation to tangible assets held by pass-through entities. However, the data was based on a survey; it is probable that the value of closely held businesses recorded in this survey included only the book value of such companies, thus ignoring goodwill and other intangibles. Thus, in addition to excluding personal residences, the likelihood that the fair market value of closely held businesses was not fully reflected in the data is another reason why Professor Shakow's results underestimate the percentage of taxpayers facing liquidity problems under a complete accrual tax system.

584. *See* Slawson, *supra* note 4, at 646-47; *cf.* Shakow, *supra* note 4, at 1170-71 (including traded securities within liquid assets in his liquidity analysis); Shoup, *The White Paper*, *supra* note 4, at 99 (noting that there is nothing wrong with forcing taxpayers to sell stock to pay tax).

585. *See* Shoup, *The White Paper*, *supra* note 4, at 99.

liquid position when confronted with tax liabilities.⁵⁸⁶ Therefore, it would appear that an interest-bearing deferred tax liability measure is an overly broad solution to the liquidity problem.

Nonetheless, an interest-bearing deferred tax liability system seems to be the simpler of the two solutions: All taxpayers would defer their tax liabilities on accrued gains without necessitating individual determinations of taxpayer illiquidity. However, the use of interest-bearing deferred tax liabilities would compromise some of the Code simplification benefits that otherwise would be realized with complete accrual taxation. The rationale for using interest-bearing deferred tax liabilities—to avoid liquidity problems—would almost certainly require the retention of the nonrecognition provisions, which are founded in part on the desire to avoid liquidity difficulties.⁵⁸⁷ Consequently, the many nonrecognition provisions⁵⁸⁸ contained throughout the Code, along with the tax planning these provisions engender, apparently would remain in an accrual system employing interest-bearing deferred tax liabilities. Similarly, the installment sales provisions,⁵⁸⁹ which are based exclusively on preventing liquidity problems, would no doubt be retained in such a system.

An individual installment agreement procedure, unlike an interest-bearing deferred tax liability measure, would respond directly to taxpayer liquidity difficulties and avoid compromising Code simplification benefits. But, would individualized liquidity relief be a source of great administrative difficulties? Actually, under current law the IRS does administer a procedure whereby taxpayers are permitted to enter into installment agreements for paying their tax liabilities.⁵⁹⁰ Nonetheless, with an accrual tax system, the number of taxpayers needing installment agreement relief would no doubt increase.

586. See Shakow, *supra* note 4, at 1175 (referring to an Iowa Law Review study that indicated that an average of 25% of deceased farmers' gross estates consisted of liquid assets, whereas for living farmers the comparable figure was 9.5%). In addition, some taxpayers who have significant appreciation in the value of illiquid assets may be able to borrow funds to pay their tax liability. See *id.* at 1174.

587. See *supra* text accompanying note 250. Another justification for nonrecognition provisions, to avoid deterring change-in-form-type transactions, would also support their retention in a system employing interest-bearing deferred tax liabilities; in the absence of nonrecognition provisions, a taxpayer may well be deterred from engaging in such transactions, given that by doing so she may be losing a valuable source of borrowing. See *supra* text accompanying notes 244-47.

588. See *supra* notes 151-54 and accompanying text.

589. See *supra* note 169.

590. Section 6159 authorizes the IRS to enter into these agreements to facilitate the collection of taxes. I.R.C. § 6159 (1994).

Consequently, modifications to the existing installment agreement procedure would be necessary. Under current law, the IRS has discretion in deciding whether to enter into an agreement.⁵⁹¹ In light of this discretion, there are probably variations among IRS districts in the extent to which installment agreements are allowed.⁵⁹² Because of the greater overall need for installment agreements under an accrual tax system, the procedure should be standardized. To this end, some formula (or formulas) for measuring liquidity should be prescribed. For example, a taxpayer could be permitted to enter into an agreement if her liquid net assets are less than a certain percentage of her total net assets.⁵⁹³ Alternatively, or in conjunction with this test, the taxpayer's net cash flow could be used to measure liquidity.⁵⁹⁴ A taxpayer's credit history also may need to be considered.⁵⁹⁵ In addition, the liquidity test probably should take into account the financial condition of a business entity in which the taxpayer has a controlling interest, given that the excess liquid assets of the business could provide the taxpayer a source of tax-paying funds.⁵⁹⁶

In addition to being standardized, the installment agreement procedure also should be automated. It should be possible to develop an expert system that would evaluate the liquidity and credit status of a taxpayer according to prescribed tests in order to determine the taxpayer's

591. *See id.*; Treas. Reg. § 301.6159-1 (1994); [2 Admin.] Internal Revenue Manual (CCH) ¶ 5331.1 (Apr. 4, 1994) (noting that IRS personnel must consider an installment agreement if such will facilitate the collection of taxes; pointing out that the taxpayer has no absolute right to an installment agreement). In doing so, the IRS generally will engage in a financial analysis of the taxpayer's situation. *See* [2 Admin.] Internal Revenue Manual (CCH) ¶ 5331.4 (Dec. 11, 1994).

592. *Cf.* MICHAEL I. SALTZMAN, IRS PRACTICE AND PROCEDURE ¶ 15.03[1][a] n.3 (1991) (noting variations among districts in the acceptances of offers in compromise).

593. Professor Shakow used a similar standard in gauging liquidity in his analysis of consumer financial information. *See* Shakow, *supra* note 4, at 1170-72. In this regard, section 6166(a) contains a liquidity test for purposes of allowing taxpayers to defer a portion of the estate tax, with deferral allowed if a substantial portion of the estate is an interest in a closely held business. I.R.C. § 6166(a) (1994).

594. Maryland uses a cash flow standard for determining the amount of income tax that a partnership must withhold with respect to its nonresident partners. *See* Maryland Form 510 (Distributable Cash Flow Limitation Worksheet).

595. *See supra* text accompanying note 582.

596. *Cf.* Shakow, *supra* note 4, at 1173 (considering a controlling shareholder's access to the corporation's liquid assets in analyzing liquidity). In addition, taxpayers entering into agreements should have their financial condition periodically monitored, so that agreements may be modified based on changing conditions. *See* [2 Admin.] Internal Revenue Manual (CCH) ¶ 5331.1(16) (Apr. 4, 1994).

eligibility for an installment agreement. Expert systems are being used in the private sector to evaluate the creditworthiness of borrowers,⁵⁹⁷ and it should be feasible to employ these systems to analyze liquidity as well.⁵⁹⁸ The IRS also could use expert systems (or neural networks)⁵⁹⁹ to properly tailor the installment-agreement interest rate to the circumstances of the particular taxpayer.⁶⁰⁰ Taxpayers seeking installment agreement relief could send financial information to the IRS using taxpayer-IRS networks⁶⁰¹ and authorize banks and securities brokers to transmit relevant information. Furthermore, as is done currently, IRS computer systems could monitor taxpayer compliance with the terms of the agreements.⁶⁰²

VII. CONSUMER ITEMS

Subjecting consumer items to accrual taxation involves special considerations that need to be addressed. Three categories of consumer items—personal residences, consumer durables, and collectibles—are examined in this Part.

597. See *supra* text accompanying note 467; see also James Dzierzanowski et al., *The Credit Assistant: The Second Leg in the Knowledge Highway for American Express*, in 4 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE, *supra* note 535, at 127; Steve Hottiger & Dieter Wenger, *MOCCA: A Set of Instruments to Support Mortgage Credit Granting*, in 4 INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE, *supra* note 535, at 135; Hayes-Roth & Jacobstein, *supra* note 348, at 31-32.

598. Indeed, the financial analyses carried out by these expert systems in evaluating creditworthiness would appear to be easily adaptable to examining liquidity. See, e.g., Jambor et al., *supra* note 307, at 260 (analysis of financial statements); Wolf et al., *supra* note 387, at 276 (analysis of liquid current assets).

599. See *supra* notes 467-80 and accompanying text for the possible use of expert systems or neural networks to determine appropriate discount rates in valuing businesses.

600. One of the difficulties in administering deferred tax liability measures is setting the interest rate. See Gergen, *supra* note 224, at 224; Cunningham & Schenk, *supra* note 3, at 745; Shakow, *supra* note 4, at 1169. In theory, the taxpayer's cost of borrowing should be used. See Gergen, *supra* note 39, at 225-26; cf. Cunningham & Schenk, *supra* note 3, at 745 (suggesting that either the taxpayer's borrowing rate or after-tax investment return rate is theoretically correct); Shakow, *supra* note 4, at 1169 (implying that the interest rate should, in theory, be tailored for each borrower). Nonetheless, administrative costs of determining individualized rates suggest the need for uniform rates in connection with deferred tax liability measures. See Gergen, *supra* note 39, at 225-26; Cunningham & Schenk, *supra* note 3, at 745. The use of expert systems or neural networks in the administration of installment agreements, however, could allow for automated determinations of individualized interest rates.

601. See *supra* notes 568-74 and accompanying text.

602. The IRS currently uses a computerized system, the Integrated Data Retrieval System, to monitor taxpayer compliance with installment agreements. See [2 Admin.] Internal Revenue Manual (CCH) ¶ 5332 (Dec. 11, 1992).

A. Personal Residences

Applying accrual taxation to personal residences involves additional valuation difficulties because it would be necessary to distinguish between the two general types of depreciation that occur with respect to these assets: Depreciation due to physical deterioration, and depreciation due to changes in market conditions.⁶⁰³

Currently, the Code does not allow a deduction for either type of depreciation.⁶⁰⁴ The current treatment, however, does not conform to the Haig-Simons ideal.⁶⁰⁵ While both types of depreciation should be deductible under a pure application of the Haig-Simons income definition, the disallowance of deductions for physical deterioration is justified by the fact that the imputed income derived from the consumption of personal residences is exempt from taxation.⁶⁰⁶ The same cannot be said, however, with respect to depreciation due to changes in market conditions, given that gains on personal residences reflecting market changes are included in the tax base. Consequently, it has been asserted that the Code should allow deductions for losses on personal assets due to market changes.⁶⁰⁷

An accrual tax system applying to personal residences could continue to ignore both types of depreciation. However, because of the greater inequities that would occur with accrual taxation than occur with the realization rule, such treatment would appear to be unwise. With the realization rule, a taxpayer is losing only a deduction for the net market loss (if any) that occurs over the holding period of a personal residence. Conversely, with an accrual tax system, a taxpayer would be losing deductions for all annual decreases in value that are attributable to market changes, because all annual increases in value would be taxed. Moreover, because of the distinct possibility that assets may be overvalued for particular years, corrective adjustments in the form of market depreciation deductions should be available for subsequent

603. See Richard A. Epstein, *The Consumption and Loss of Personal Property Under the Internal Revenue Code*, 23 STAN. L. REV. 454, 458, 471 (1971).

604. See I.R.C. §§ 165(c), 262 (1994).

605. See Epstein, *supra* note 603, at 458-59.

606. *Id.*

607. *Id.* at 471-72.

years.⁶⁰⁸ Thus, in applying accrual taxation to personal residences, depreciation due to market fluctuations should be separately estimated and allowed as a deduction.

The deductible depreciation due to market changes possibly could be estimated by measuring the amount of depreciation that results from physical deterioration and subtracting this amount from any decline in the value of a personal residence, as indicated by the federal real property valuation system.⁶⁰⁹ Perhaps, values generated by the real property valuation system could be used to estimate physical deterioration depreciation by comparing the values (for the same year) of comparable houses of different ages situated in similar markets. Based on this empirical data, it may be possible to estimate rates of physical deterioration depreciation for different types of houses, which the IRS would then use to separate out declines in value that are due to market changes.

B. Consumer Durables

The application of accrual taxation to consumer durables would appear to have little tax effect and, thus, is not worth the administrative costs involved. Since most consumer durables depreciate in value,⁶¹⁰ only rarely would there be accrued gains. Yet, if consumer durables were subject to accrual taxation, it would be necessary to value them each year in order to determine whether such gains exist. Moreover, in light of the inequity of including market gains but not allowing a deduction for market losses,⁶¹¹ it would probably be necessary to distinguish between depreciation due to market conditions and depreciation due to physical deterioration with respect to consumer durables. Given the relatively nominal market gain and market loss that is likely to occur, subjecting consumer durables to accrual taxation is not worth the attendant administrative difficulties.⁶¹²

608. See Shakow, *supra* note 4, at 1143.

609. See *supra* text accompanying notes 252-53.

610. See Cunningham & Schenk, *supra* note 3, at 800 n.309.

611. See *supra* text accompanying note 608.

612. Applying accrual taxation to consumer durables also would require a taxpayer to annually report any accrued market gains and losses. This would be another source of administrative costs, as well as possible privacy concerns. See *infra* Part VIII for a discussion of the privacy concerns raised by complete accrual taxation.

It should be noted that, while the accrued gain on consumer items appears nominal, the imputed income may not be. Cf. Cunningham & Schenk, *supra* note 3, at 800 (pointing out that consumer durables do not involve expected appreciation but do involve imputed income). Consequently, there may be significant economic efficiency and equity consequences if imputed income is not subject to accrual taxation. See *supra* Part

C. Collectibles

Subjecting collectibles to accrual taxation involves the administrative costs of a one-time manual appraisal.⁶¹³ Collectibles, however, generally should be subject to accrual taxation. Unlike consumer durables, they tend to appreciate in value; therefore, excluding all collectibles in a system where investment assets are subject to accrual taxation could distort investment decisions.⁶¹⁴ Nonetheless, given the appraisal costs, it is not sensible to subject lower value collectibles to accrual taxation.⁶¹⁵ Instead of simply choosing an arbitrary cutoff, perhaps a study could be done to determine a rational dollar amount for excluding collectibles. The reason for applying accrual taxation generally to collectibles, but not to consumer durables, relates to the greater likelihood of gain on collectibles; thus, a study could possibly estimate a purchase price amount for collectibles at which the likelihood of appreciation drops off significantly.

Because collectibles are often held with a mixed investment and consumption motive,⁶¹⁶ deductible market depreciation should be distinguished from nondeductible physical deterioration depreciation as is recommended with personal residences. Unlike personal residences, however, physical deterioration depreciation may be very difficult to measure on a comparative basis,⁶¹⁷ given the uniqueness of collectibles. As an alternative, accrued losses could be deductible up to the amount of previously accrued gains;⁶¹⁸ such an approach can be justified as a means of correcting for presumed valuation errors.

III.B.3.

613. See *supra* text accompanying note 542.

614. See Cunningham & Schenk, *supra* note 3, at 804.

615. Cf. Treas. Reg. § 1.170A-13(b),(c) (as amended in 1995) (excluding property below a \$5,000 claimed value from the qualified appraisal requirement, which applies with respect to charitable contribution deductions).

616. See Cunningham & Schenk, *supra* note 3, at 801. Occasionally, collectibles are viewed as being held with the requisite profit motive to warrant a loss deduction upon disposition. See *Tyler v. Comm'r*, 6 T.C.M. (CCH) 275 (1947).

617. See *supra* text accompanying note 609.

618. See Shakow, *supra* note 4, at 1154.

VIII. TAXPAYER PRIVACY CONCERNS

The amount of taxpayer information that needs to be collected and stored in computer databases by the IRS in order to generate property valuations raises another concern—the privacy of taxpayer information. Importantly, however, the suggested valuation system would not appear to require significantly more taxpayer information than is already mandated under current law or that is publicly available.

With respect to business information, the only additional information that likely would be needed under the valuation system are balance sheet data concerning sole proprietorships,⁶¹⁹ terms regarding leases and liabilities,⁶²⁰ and, possibly, lists of inventory and equipment.⁶²¹ Although the IRS currently does not collect real estate value information, it does have property tax information from individual returns, from which it could derive assessed values by obtaining local property tax rates;⁶²² moreover, land records and local property assessments are (to a degree) publicly available.⁶²³ To implement the collectible valuation system, the IRS would need access to more information than it currently has regarding taxpayer-held art objects, and the like.⁶²⁴ Nonetheless, in light of the fact that collectibles comprise a very small percentage of

619. *See supra* text accompanying note 560.

620. While providing the terms of leases and liabilities would allow the IRS to adjust these items to their fair market value, there are other alternatives. Taxpayers could be supplied present value formulas, as well as market interest rate and rent information to make the calculations themselves, or this adjustment simply could be omitted at the cost of some accuracy in the valuations.

621. *See supra* note 558 and accompanying text. Regarding equipment (and other depreciable tangible personal property), taxpayers currently are required to report annual depreciation on a per item basis. *See* IRS Form 4562.

In addition, it may be necessary to incorporate some qualitative data into the valuation process. However, provided this information is limited to knowledge that is publicly available, as is suggested, the government's access to such information should not raise privacy concerns. *See supra* note 455 and accompanying text.

622. *See* Shakow, *supra* note 4, at 1151.

623. *See id.* In light of this available information, Professor Shakow concluded that his proposed federal real property valuation system did not raise major privacy concerns. *See id.*

624. *See supra* text accompanying note 542. Under current law, the IRS sometimes requires taxpayers to submit IRS appraisal information regarding collectibles. Under Treas. Reg. § 1.170A-13(b)(3) and IRS Form 8283, taxpayers making charitable contributions of property (other than money or publicly traded securities) with a claimed value in excess of \$500 must attach to their returns a description of the donated property, as well as other information concerning the property. In addition, if the donated property has a claimed value in excess of \$5,000, taxpayers are required to include with their tax returns an appraisal summary of the donated property (summarizing an appraisal made by a "qualified appraiser"). *See* Treas. Reg. § 1.170A-13(c); Form 8283.

total assets,⁶²⁵ the relative amount of information collected through the appraisal procedure does not appear significant, especially with lower value collectibles excluded from the process.⁶²⁶ Finally, although not required under the accrual tax system, there likely would be a greater number of taxpayers seeking installment payment relief, and thus more taxpayers disclosing financial information under this procedure.⁶²⁷ Yet, such information would be voluntarily disclosed, and moreover, the number of affected taxpayers may not be substantial in light of factors mentioned earlier.⁶²⁸

It is also important to note that the additional taxpayer information needed to implement accrual taxation does not appear to add appreciably to the taxpayer data collected and maintained by the IRS under current law. Through the return filing process, the IRS currently maintains taxpayer records relating to income, expenses, business assets, and asset dispositions.⁶²⁹ In addition, the IRS has information concerning the property holdings of decedents with taxable estates, for whom estate tax returns are required to be filed. With the ongoing IRS tax systems

625. Based on government data concerning consumer durables, Professor Shakow concluded that collectibles constitute no more than 1% of all assets held by individuals. See Shakow, *supra* note 4, at 1151-52. The relatively small percentage of collectibles raises the question whether the tax system should even bother subjecting these assets to accrual taxation. Collectibles, though, are often held partly for investment purposes, and thus, excluding them entirely from accrual taxation could have undesirable economic efficiency consequences. See Cunningham & Schenk, *supra* note 3, at 801; Shakow, *supra* note 4, at 1152. Moreover, there may be equity concerns as well. See *supra* Part III.B.2. Perhaps even more important, because art objects are typically held by wealthy individuals, excluding such assets from a general accrual taxation system would create the appearance of inequity. See Shakow, *supra* note 4, at 1153. Other commentators similarly have noted the importance of perceptual equity. See Cunningham & Schenk, *supra* note 32, at 368; James W. Wetzler, *The Role of Fairness in State Tax Policy*, 47 RECORD OF THE ASS'N OF THE BAR OF THE CITY OF NEW YORK 38, 39 (1992); Charles E. McLure, Jr., Comments, *in* DO TAXES MATTER? 332, 333 (Joel Slemrod ed. 1990) (commenting on Henry J. Aaron, *Lessons for Tax Reform*, *in* DO TAXES MATTER?, *id.* at 321).

626. See *supra* text accompanying note 615.

627. See *supra* text accompanying note 601.

628. See *supra* notes 583-86 and accompanying text.

629. Additionally, in enforcing the section 482 transfer pricing rules, the IRS has begun using its summons authority under section 7602 to attempt to compel third parties to provide detailed financial information on specific transactions, even though the third party has no transactional nexus with the taxpayer in the IRS dispute. See *IRS Asked to State if Firms Under Legal Obligation to Provide Third-Party Data*, DAILY TAX REP., Aug. 29, 1994, at G-4.

modernization project,⁶³⁰ much of this information is, or will be, stored in computer databases. Moreover, state and local governments keep records concerning the ownership and value of real and personal property. More generally, at last count in 1982, the federal government maintained more than 3.5 billion personal files on individuals.⁶³¹

630. See *supra* text accompanying note 567.

631. See DAVID F. LINOWES, *PRIVACY IN AMERICA: IS YOUR PRIVATE LIFE IN THE PUBLIC EYE?* 81, 82 (1989) (pointing out that three-quarters of those 3.5 billion files are held by five government departments: Treasury, Health and Human Services, Education, Defense, and Commerce).

Requiring taxpayers to submit the additional information needed under the valuation system almost certainly would not violate the U.S. Constitution. Indeed, it is not even clear if the constitutional right to privacy applies to the disclosure of personal information. See *J.P. v. DeSanti*, 653 F.2d 1080, 1087-91 (6th Cir. 1981). In *Whalen v. Roe*, 429 U.S. 589 (1977), the Supreme Court upheld a New York statute that called for the state health department to record, in a centralized computer file, the names and addresses of all persons who obtained certain prescription drugs. In doing so, the Supreme Court apparently left open the issue of whether the constitutional right to privacy applied to the state-compelled disclosure of personal information. Because New York's statutory scheme contained sufficient safeguards against unwarranted disclosure of private information, the Supreme Court apparently felt that it did not need to address the right to privacy issue. See *id.* at 605-06. Several subsequent court of appeals cases, however, have recognized the applicability of the constitutional right to privacy to disclosure requirements and have analyzed financial disclosure provisions under an intermediate scrutiny test: The "disclosure is designed to further a substantial government interest and 'does not land very wide of any reasonable mark in making its classifications.'" *Bertoldi v. Wachtler*, 952 F.2d 656, 659 (2d Cir. 1991) (quoting *Igneri v. Moore*, 898 F.2d 870, 873 (2d Cir. 1990)); see also *Barry v. City of New York*, 712 F.2d 1554, 1559-60 (2d Cir. 1983); *Plante v. Gonzalez*, 575 F.2d 1119, 1134-35 (5th Cir. 1978). All of these court of appeals cases involved financial disclosure provisions applying to government officials or employees for the purpose of deterring corruption or conflicts of interest, and with one exception, the provisions at issue allowed for public inspection of the disclosed financial information. See *Igneri v. Moore*, 898 F.2d 870 (2d Cir. 1990); *Barry*, 712 F.2d at 1557-58 (city law gave covered individuals the right to request a limitation on public inspection); *Plante*, 575 F.2d at 1122. Consequently, it is not at all clear that the intermediate scrutiny standard would apply to a federal tax provision requiring the disclosure of financial information for the purposes of determining the covered individual's tax liability, especially if the information at issue is rather insignificant when compared to the information required under the rest of the statutory scheme.

Nonetheless, even assuming that both the intermediate scrutiny standard and the *Whalen* "sufficient safeguard" standard would apply to the information needed under the valuation system, see *Barry*, 712 F.2d at 1560-61 (court tested the disclosure law under both standards), the required disclosure should be held as constitutional. First, a provision requiring such information should be viewed as furthering a substantial government purpose, in that it allows for the collection of revenue. Second, sufficient safeguards to prevent unwarranted disclosures would appear to exist. Section 6103 generally prevents the disclosure of taxpayer information to the public, and pursuant to section 7213, the unauthorized disclosure of such information is a felony. I.R.C. §§ 6103, 7213 (1994); cf. *Whalen*, 429 U.S. at 594-95 (similar statutory safeguards were present). In addition, the IRS is working on security measures in connection with its tax systems modernization project, which should provide the necessary "technical" security. See Peterson Statement, *supra* note 564, at 253; *Whalen*, 429 U.S. at 594 (technical

IX. CONCLUSION

Whether it is sensible to adopt a complete accrual tax system ultimately hinges on the resolution of several broad issues: Is complete accrual taxation beneficial? Is complete accrual taxation feasible? And, if complete accrual taxation is beneficial and feasible, do its benefits warrant the costs of implementation?

Regarding benefits, complete accrual taxation would obviate a significant portion of the Code. In addition, by bringing about more uniform effective tax rates on capital income, complete accrual taxation has the potential to improve the economic efficiency and equity of the tax system. Yet, if the imputed income on consumer items continues to be untaxed, the economic efficiency and equity consequences of complete accrual taxation are uncertain; further research would be needed to determine whether a *nearly* complete accrual tax system indeed would result in a more efficient and equitable tax system than exists under current law.

The feasibility of complete accrual taxation depends on the ability of emerging intelligent computer systems—that is, neural networks, expert systems, and fuzzy logic—to produce sufficiently accurate valuations. A great deal of additional work is needed in this area, including studies to determine whether neural networks would reasonably forecast the future returns of a business using primarily quantitative data. If a computer-based complete accrual tax system is to be implemented, the IRS, of course, would need to hire the necessary technical personnel in order to avoid the problems that have plagued the current tax systems

security also referred to).

With a planned expansion of electronic filing, coupled with the general conversion from paper to electronic storage, the IRS is aware that new avenues exist for the invasion of taxpayer privacy. See *IRS Working to Protect Taxpayer Privacy in Implementation of Modernization Plan*, DAILY TAX REP., Apr. 25, 1994, at G-6 [hereinafter *IRS Working to Protect*]. As a consequence, the IRS is in the process of studying the issue, see Zeidner, *supra* note 568, at 1107, and is planning to use such security features as cryptography—the use of code to write and decipher messages, *IRS Working to Protect, supra* at G-7. In this connection, the IRS is considering digital signature standards. See *id.* In addition to the technological aspects of the privacy issue, the IRS also is emphasizing employee education on privacy matters, which includes the development of a set of basic privacy principles. See *CAG to Examine Commercial Return Preparers, Privacy Issues in Projects*, DAILY TAX REP., June 17, 1994, at G-3.

modernization effort.⁶³² Refinements in the methods employed to value property also may be necessary.

The goal of this Article is not to resolve the broad issues outlined above, but instead to demonstrate that complete accrual taxation is potentially beneficial and feasible, and that further research should be done to address these issues. Much of the remaining work should be left to those who are expert in the fields of economics, artificial intelligence, and valuation. While this research may be difficult and costly, the potential benefits of complete accrual taxation warrant the endeavor.

632. *See supra* note 567.

APPENDIX

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