FINANCIAL DERIVATIVES IN CORPORATE TAX AVOIDANCE

By

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To Emily, Nicholas, Mom, and Dad. Mission complete

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The inclusion of financial derivatives in numerous tax shelters suggests tax avoidance is an economically significant, yet previously underexplored, aspect of their use. Accordingly, this study investigates the role of derivatives in corporate tax avoidance. First, the study develops a framework describing why the fundamental, transactional, tax reporting and cognitive features of derivatives are useful for avoiding taxes, and then demonstrates how by using the framework to dissect two derivative-based tax shelters. The discussion reveals that by allowing taxpayers to design transactions that alter the timing, character, and source of gains and losses, derivatives provide opportunities to exploit ambiguity in the tax code with a seemingly low probability of detection by tax authorities. Thus, derivatives are sophisticated tax planning tools that can work in isolation or concomitantly with other tax planning strategies.

Second, the study investigates the extent to which derivatives facilitate tax avoidance and whether this aspect is detectable from recently enhanced financial statement disclosures. The results indicate that new derivative users experience reductions in tax burden following the implementation of a derivatives program. These benefits increase with the magnitude of derivatives employed and do not depend on effective hedging of economic risks. Further analyses reveal firms' *ex ante* preferences for aggressive tax strategies have a positive relation

with the underlying implementation decision. This evidence suggests tax avoidance is both a determinant and outcome of derivative use. However, similar to the opacity of corporate tax shelters, there is no indication of either aspect in footnote disclosures explaining why and how firms use derivatives.

Overall, this study contributes to the extant literature by highlighting tax avoidance as a previously unexplored incentive for derivative use. In doing so, it connects academic literature on an increasingly important tax and accounting issue to that of practitioners and regulators. Additionally, the study provides evidence on why, how, and the extent to which derivatives are used to facilitate corporate tax avoidance.

CHAPTER 1
INTRODUCTION

> "The 900-pound gorilla in all the corporate tax shelter discussion – that practitioners do not want to talk about and the Treasury report mentions only obliquely – is derivatives… Derivatives turbo charge tax shelters." – Sheppard (1999)

The last three decades are witness to massive growth in the market for derivatives, with some estimates of market size currently exceeding $500 trillion and other reports suggesting derivative use by 64% of non-financial companies (Bartram et al. 2009). Apart from their widespread role in managing firm-level risks (Aretz and Bartram 2010), derivatives facilitate the development of sophisticated and potentially lucrative tax avoidance strategies (U.S. Congress Joint Committee on Taxation 2008).[1] Regulatory initiatives addressing ambiguities in derivative taxation (U.S. Congress Joint Committee on Taxation 2008) and the inclusion of derivatives in numerous tax shelters (Wilson 2009) suggests tax avoidance is an economically significant, yet previously unexplored, aspect of their use. Accordingly, this study examines the role of derivatives in corporate tax avoidance.

Through clever and nearly indecipherable financial arrangements, derivatives can produce precise and predictable financial results with known levels of risk and a seemingly low probability of detection by tax authorities (Sheppard 1999). While some studies investigate tax incentives for derivative use, including tax rate progressivity (Graham and Smith 1999) and debt tax shields (Myers 1993, 1984), this literature omits the link between derivatives and tax avoidance. To a large extent, this oversight explains numerous calls for research examining whether and how financial instruments are used to avoid taxes (Hanlon and Heitzman 2010; Shevlin 2007, 1999; Shackelford and Shevlin 2001). Consequently, an examination of the use of

[1] Tax avoidance is defined as reducing the present value of tax payments and increasing the after-tax rate of return to investors (e.g., Hanlon and Heitzman 2010; Rego 2003).

derivatives in tax avoidance is necessary, especially given recent surges in tax shelter activity (e.g., Drucker 2006), regulatory initiatives targeting ambiguities in derivative taxation (U.S. Congress Joint Committee on Taxation 2008), and the role derivatives are alleged to have played in the ongoing global financial crisis (Ryan 2008).

First, this study develops a framework describing *why* the fundamental, transactional, tax reporting and cognitive features of derivatives are useful for avoiding taxes. The fundamental aspects include tax function convexity and the debt tax shield as two basic tax incentives for derivative use. Building on these incentives, the transactional aspects describe the tax treatment of derivative transactions and their ability to strategically alter the timing, character, and source of related gains and losses. Because the efficacy of derivatives as tax planning mechanisms relies on ambiguity in the tax code, the tax reporting aspects consist of the inconsistency, asymmetry, and indeterminacy in current derivative tax rules. Finally, the cognitive aspects consider the difficulties faced by tax authorities in understanding, detecting, and enforcing derivative-based tax avoidance. Overall, the framework reveals that derivatives play a significant role in tax avoidance by offering unique opportunities to design (*ex ante*) transactions that reduce tax burden with a seemingly low probability of detection by tax authorities.

Second, to demonstrate *how* derivatives facilitate tax planning, this study examines two arrangements designated as tax shelters by the Internal Revenue Service (IRS): (1) a "Straddleship" (IRS Notice 2002-50), and (2) certain offsetting foreign currency option contracts (IRS Notice 2003-81). Both arrangements rely heavily on derivatives and cleverly designed organizational structures to accomplish tax reduction objectives. Although intense IRS scrutiny implies these tax shelters may no longer be prevalent, the availability of transaction-level detail provides insight into their design and operation. In both arrangements, the analyses reveal that derivatives reduce users' tax burdens by generating noneconomic losses and offering disparate tax treatment of similar (and sometimes identical) financial positions. As a result, derivatives allow taxpayers to strategically choose the time and character (i.e., ordinary or capital) of loss recognition. Together, the discussion of the framework and tax shelter analysis raise empirical questions concerning the extent to which derivatives reduce tax burden and whether tax avoidance is detectable from recently enhanced financial statement disclosures.

Third, the study examines the first of these empirical questions, the degree to which derivatives promote tax avoidance. This inquiry provides an opportunity to investigate the firm characteristics through which derivatives influence tax burdens and the choice behavior motivating this process. Because derivatives can reduce tax burden and the desire to avoid taxes may lead firms to use derivatives, reducing the present value of taxes may be an impetus for, and/or consequence of, derivative use. Following Demski (2004), the study exploits this potential endogeneity by exploring both the outcomes and determinants of firms' underlying choices. Specifically, the study performs direct tests of the relation between tax burden and derivatives implementation, and then complements the findings with indirect tests investigating why firms make such choices. The benefit of this approach is that it not only alleviates concerns about alternative hypotheses and inferences based on endogenous relationships (Guay 1999), but offers insight into firm-level choices. Each test, along with the relevant findings, is discussed in turn.

Using a sample of new derivative users and a matched-pair control group, I directly test the time-series relation between changes in derivative use and changes in three measures of tax burden. By focusing the analysis on changes, I mitigate the effects of simultaneity between incentives to avoid taxes and *ex ante* tax burden.[2] Relative to the control group, I find that firms

[2] Firms with *ex ante* large tax burdens have an incentive to engage in tax avoidance. However, if firms respond to an exogenous tax increase (e.g., statutory adjustment) by employing derivatives, it is possible to observe no change in

experience a 1.7% and 4.0% reduction in current taxes and cash taxes paid, respectively, in the four years subsequent to derivatives implementation. I do not, however, find a significant change in total tax expense, which suggests derivatives primarily provide tax deferral strategies rather than generate permanent book-tax differences that result in lower book effective tax rates.

Because derivatives are commonly used to manage risks, I consider whether post-implementation tax burden reductions result from effective hedging rather than tax avoidance. Under both financial and tax reporting regulations, speculative and ineffective hedge positions induce income volatility (Zhang 2009; Graham and Smith 1999) and reduce debt capacity (Stulz 1996), which theory suggests leads to higher expected taxes (Stulz 1996; Smith and Stulz 1985). As such, effective hedging may induce tax burden reductions unrelated to tax avoidance. However, using unexpected changes in risk to capture hedge effectiveness (Zhang 2009), I find that tax burden reductions from effective hedging are substantially less than those from speculative and ineffective hedging. Other tests reveal no changes in the variability of income and reductions in debt usage following derivatives implementation. Thus, effective hedging, income volatility, and greater debt capacity are not alternative explanations for the post-implementation tax burden reductions.

As an indirect test of tax avoidance and derivative use, I examine the cross-sectional variation in tax burden changes for new derivative users. Because derivative-based tax strategies likely require additional positions and encourage the operation of more than one derivatives program (Ensminger 2001), I test whether firms experience greater tax burden reductions as the size of initial positions increase. Further, to the extent previous inferences are spurious, observed changes in tax burden will not be correlated with the magnitude of positions or other incentives

tax burden even if derivatives are solely used to avoid taxes. A similar result may occur if firms begin using derivatives and simultaneously substitute away from other tax planning strategies (Guay 1999; Skinner 1996).

to avoid taxes (e.g., sales growth). As expected, I find that total notional principal and fair value of initial derivative positions are inversely related to changes in current tax expense and cash taxes paid.

If derivatives are used to mitigate tax burden, then the underlying implementation decision should be a function of incentives to reduce taxes and preferences for more contentious tax planning techniques. Given that tax aggressive firms are those that move well beyond conventional approaches to avoiding taxes, I predict they are more likely than other firms to begin using derivatives.[3] Additionally, tax aggressive firms may also require larger derivative positions to accomplish their tax avoidance objectives. Using two continuous measures of tax aggressiveness, discretionary book-tax differences (Frank, Lynch, and Rego 2009) and likelihood of tax shelter participation (Wilson 2009), as well as controls for five categories of non-tax incentives to use derivatives, I find firms' preferences for less conservative tax planning techniques (i.e., *ex ante* tax aggressive behavior) increase the likelihood of derivatives implementation. These preferences, however, have no relation with the magnitude of derivatives employed. Tests separating the implementation decision from the quantity decision reveal each choice has different determinants.

The evidence suggests tax avoidance is both an incentive for, and outcome of, derivative use. Although deciphering tax avoidance from financial statement disclosures is incredibly difficult (e.g., McGill and Outslay 2002, 2004), after 2008, SFAS No. 161, *Disclosures about Derivative Instruments and Hedging Activities*, requires firms to explicitly indicate why and how derivatives are used (FASB 2008). As such, the fourth and final step is to determine whether

[3] For purposes of this study, I view tax aggressiveness as claiming a tax benefit with relatively weak facts to sustain the benefits if the company were audited by tax authorities (Mills et al. 2010). This definition includes illegal and contentious tax positions as well as some tax avoidance. Chapter 5 provides a detailed discussion of this definition, and Chapter 7 describes the proxies used to capture this construct.

derivative-based tax avoidance is detectable from these recently enhanced disclosures. Despite a comprehensive evaluation of derivative footnotes, I identify no firms indicating they use derivatives for tax avoidance purposes. While this finding is not at all surprising given the opacity of tax avoidance and tax shelters (Lisowsky 2010; Wilson 2009; Graham and Tucker 2006), it suggests detecting derivative-based tax avoidance from the financial statements will remain a challenge for tax authorities.

This study makes several contributions to the extant literature. First, it contributes to an extensive body of derivatives-related research (see Aretz and Bartram (2010) for a recent review) by providing large-sample evidence of a previously underexplored incentive for derivative use. Although tax avoidance may not be as strong of an incentive as risk management, the study helps identify in which decisions taxes represent a first-order effect and in which decisions taxes have an n^{th}-order effect (Maydew 2001). In addition, evidence that effective hedging has little influence on tax burden also relates to studies investigating the tax consequences of hedging (Graham and Rogers 2002) as well as research on the economic effects of derivative accounting and disclosure (Zhang 2009). Second, the study responds to calls for research on the role of financial instruments in corporate tax avoidance (Hanlon and Heitzman 2010; Shevlin 2007, 1999; Shackelford and Shevlin 2001). Although derivatives comprise only one category of financial instruments, the empirical analysis complements studies examining the tax implications of other instruments (Mills and Newberry 2005). Third, the study contributes to a growing literature on corporate tax avoidance and tax aggressiveness (Hanlon and Heitzman 2010) by investigating the determinants and consequences of derivative-based tax planning. Rather than rely on reduced-form techniques, it explores the behaviors involved by broadening the analysis to include firms' underlying choices (e.g., Demski 2004). Similarly, because the study closely examines the transaction-level details of derivative-based tax planning, it also extends recent research examining tax shelter participants (Lisowsky 2010; Wilson 2009; Graham and Tucker 2006) by providing a mechanical view of tax shelter design and operation. Finally, the study informs the tax law literature (e.g., Shapiro 2006; Schizer 2000) by demonstrating how these aggressive tax planning vehicles exploit the disparity between financial and tax reporting regulations.

CHAPTER 2
A BRIEF BACKGROUND ON DERIVATIVE INSTRUMENTS

Although derivatives can be traced back to Aristotle (Cecchetti 2006), a precise definition remains elusive in practice and theory.[1] From an economic perspective, any security deriving its value from one or more primitive securities could be referred to as a derivative. This definition, however, requires identifying the set of primitive securities in question because the derivatives could, in fact, be the primitive securities (Ryan 2007). A more common approach is to define a derivative as a financial contract or security deriving its value based on its relationship to something else, typically referred to as the *underlying* (e.g., Stulz 2004). The underlying is often another financial instrument (i.e., primitive security) or economic good (i.e., commodity), but can be almost anything. For example, derivatives exist where the value is based on the S&P 500 index, the price of oil and fertilizer, the amount of frost in Florida, and even other derivative instruments.

Derivatives generally fall into three broad categories: (1) options, (2) futures and forwards, and (3) swaps (Ryan 2007; Strong 2005). An option involves the right, but not the obligation, to buy or sell the underlying at a set price within a predefined period of time. The holder of an option pays a premium to the issuer for this right. Options are routinely bought and sold on shares of stock, market indices, foreign currencies, and metals. A futures or forward contract, however, involves an obligatory promise to exchange the underlying at a future date for a specified price.[2] More specifically, futures are standardized exchange-traded contracts settling in cash daily (i.e., marked to market) and guaranteed by an exchange clearinghouse. These

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[1] According to Aristotle, the Greek philosopher Thalus profited immensely from purchasing rights to olive presses in anticipation of a bountiful harvest. See Cecchetti (2006) for other historical examples.

[2] The Securities and Exchange Commission (SEC) regulates options because they are securities. Futures contracts are not securities, but often regulated by the Commodity Futures Trading Commission (CFTC).

contracts commonly trade on both familiar products (e.g., oil, wheat, gold) and more abstract constructs such as weather and utility prices (Strong 2005). Forward contracts are analogous to futures in that exchange is obligatory, but because they are customized contracts (i.e., not standardized), forwards generally are not marketable to third parties.[3] The third category, swaps, involve agreements to exchange a periodic stream of benefits or payments based on some underlying over a predefined period of time. For example, in an interest rate swap, one party pays a fixed interest rate on a sum of money and, from another party, receives a floating rate payment based on the same sum of money. Swaps are a popular means of lowering corporate borrowing costs and a common risk management tool (Artez and Bartram 2010). In many cases, because it is difficult (or impossible) to exchange the underlying with another party (i.e., weather), derivatives often require, or at least permit, that only the net cash value of the instrument change hands at settlement.

Although these three types of derivatives are common in practice, oftentimes they are combined with other financial instruments (or one another) to develop more sophisticated instruments. For example, a *swaption* involves an option to enter into a swap at a future date, while exercising a *futures option* provides the holder with a position in a futures contract. Similarly, many structured finance arrangements consist of debt instruments and embedded options or swaps. As a result, derivatives can be relatively simple to understand and execute (e.g., option) or extraordinarily complicated, such as Enron's over-the-counter energy derivatives. Ultimately, the development of sophisticated derivatives is limited only by the ingenuity of financial engineers who create them.

[3] Unlike futures, forward contracts are not routinely marked to market and instead settle only at termination.

Depending on the possibility of imperfect correlations with the underlying, derivatives can be used to completely offset (perfectly hedge) or partially offset inherent business risks. Because few hedges are perfect, however, failure to hold effective hedge instruments or intentionally speculating in the derivatives market can also increase exposures to risk (Zhang 2009). As such, corporate use of derivatives is frequently motivated by risk management concerns, such as those associated with changes in interest rates, foreign exchange rates, and commodity prices (Bartram, Brown, and Fehle 2009; Bodnar and Wong 2003; Tufano 1996). For example, Southwest Airlines saved $64 million on fuel expenditures during the first quarter of 2004 by using futures contracts to lock in oil prices (Reed 2004). Similarly, Bombardier increased sales 38% by offering a $1,000 rebate on snowmobile purchases in the event of inadequate snowfall and hedging against this risk with weather derivatives (Cecchetti 2006). Additionally, firms can hedge against foreign currency risks by using swaps to effectively fix foreign exchange rates over a period of time. Although empirical evidence generally supports these risk management motives (Aretz and Bartram 2010; Guay 1999), other reports suggest the resulting effects are economically insignificant (Hentschel and Kothari 2001) and that other explanations may be more prevalent. For example, derivative use may also be motivated by industry competition (Tufano 1996), firm characteristics such as debt and dividend policy (Bartram et al. 2010), and income smoothing (Barton 2001; Pincus and Rajgopal 2002).

The financial reporting of derivatives is primarily governed by SFAS 133, *Accounting for Derivative Instruments and Hedging Activities* (FASB 1998), as significantly amended by several subsequent pronouncements.[4] In essence, these rules require that all derivatives be

[4] SFAS 133 is effective for all fiscal years beginning after June 15, 2000. See Ryan (2007) for an excellent discussion of these "exceedingly complex and detailed" derivative accounting standards. Also see ASC 815, *Derivatives and Hedging* , for the post-codification version of SFAS 133.

reported as either assets or liabilities on the balance sheet at fair value with any unrealized gains and losses due to changes in fair value reported on the income statement.[5] Under certain conditions, however, the standards also permit preferential hedge accounting whereby a derivative may be designated as a hedge of the exposure to (1) changes in fair value of a recognized asset or liability, (2) variability in cash flows of a recognized asset or liability or forecasted transaction, or (3) foreign currency risk associated with foreign operations or other foreign-currency denominated transactions. With hedge accounting, changes in fair value of an effective hedge instrument and changes in fair value of the underlying item are included in net income in the same accounting period (i.e., they offset). Alternatively, unrealized gains and losses on derivatives not qualifying for hedge accounting or that result from most types of hedge ineffectiveness are recorded in net income as they occur (i.e., no offset).[6] Thus, only speculative positions and the ineffective portion of hedge instruments directly affect reported (book) earnings.

SFAS 133 also requires disclosure of firms' objectives for using derivatives, whether for hedging or speculating. Although somewhat general, these disclosures typically provide an adequate description of hedging activities (Ryan 2007). However, to further enhance disclosures about derivatives' impact on financial position, the FASB issued SFAS No. 161, *Disclosures about Derivative Instruments and Hedging Activities*, in 2008 (FASB 2008). The new standard requires disclosure of (1) how and why firms use derivatives, (2) how derivatives and related hedged items are accounted for under SFAS 133 and its related interpretations, and (3) how

[5] SFAS 133 defines a derivative as a financial instrument or contract having one or more underlyings, notional amounts, and/or payment provisions requiring little or no initial net investment and permitting net settlement.

[6] Ryan (2007) outlines several sources of hedge ineffectiveness: (1) managers inability to perfectly understand or model their aggregate exposures, (2) aggregation of small imperfections that add up to larger imperfections in hedging aggregate exposures, in part, because SFAS 133 only allows hedges of specific exposures, (3) unfavorable or excessively costly perfect hedges, and (4) credit and other counterparty risks.

derivatives and related items affect financial position, performance, and cash flow. In doing so, firms must indicate which instruments are used to manage risk, provide information about the volume of derivatives activity, and create tabular disclosures detailing the fair value of derivatives and where they are reported on the balance sheet, as well as the amount of derivative gains and losses and where they are reported on the income statement. These disclosure requirements are effective for interim and annual periods beginning after November 15, 2008 and applicable to all entities that issue or hold derivatives.

CHAPTER 3
WHY ARE DERIVATIVES USEFUL FOR AVOIDING TAXES?

Although largely overlooked by prior research, derivatives offer many opportunities to reduce the present value of tax payments. These tax avoidance features are easily organized according to the (1) fundamental, (2) transactional, (3) tax reporting, and (4) cognitive aspects of derivatives. Using this simple framework, this section describes why derivatives are useful for avoiding taxes.[1] Figure 3-1 provides a graphical depiction of the discussion framework that follows.

Fundamental Aspects

A fundamental feature of derivatives is the ability to hedge exposures to economic risks. With perfect capital markets, however, there are no corporate benefits to hedging because investors with equal access to these markets can accomplish similar risk management objectives on personal account (Modigliani and Miller 1958). Thus, market frictions and other imperfections, such as taxes, provide the impetus for why firms may choose to hedge risks. This innermost stratum of the framework broadly describes how tax function convexity and the debt tax shield provide two fundamental incentives for derivative use.

First, the basic structure of the federal corporate tax system includes a zero tax rate on negative taxable income, moderate progressivity for taxable income under a threshold, and a constant rate thereafter. As a result, corporate tax liabilities are generally a convex function of taxable income (Graham and Smith 1999). For example, Figure 3-2 graphs corporate tax liability conditional on taxable income. The solid line in Panel A depicts expected taxes assuming a basic tax structure ignoring tax credits, loss carryforwards and carrybacks, and the Alternative

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[1] This paper only focuses on the use of derivatives in a tax planning context. Readers interested in other objectives (e.g., risk management) are referred to Aretz and Bartram (2010) and Stulz (2003).

Minimum Tax (AMT), while the dashed line depicts an extended tax structure incorporating these elements.[2] Because of the asymmetric treatment of gains and losses (i.e., zero tax on losses and positive rates on profits), the basic structure reveals substantial convexity when taxable income lies in the progressive region. Further, Panel B of Figure 3-2 zooms in on the most progressive region of the basic tax structure and illustrates how the tax schedule creates multiple convex regions. Similarly, the extended tax structure remains convex even though some features of the tax code, such as loss carrybacks, smooth the tax function (Graham and Smith 1999).

In the case of a convex tax function, Smith and Stulz (1985) demonstrate income volatility leads to higher expected taxes. In particular, they argue if marginal tax rates are an increasing function of pre-tax firm value, then after-tax value is a concave function of pre-tax value. To the extent income volatility creates variability in pre-tax value, larger tax liabilities are expected and the post-tax firm value suffers. Therefore, reducing volatility with derivatives (i.e., through effective hedging) can have the opposite effect. That is, expected tax liabilities decrease and the post-tax firm value increases provided the cost of hedging is not prohibitive.[3]

For example, consider the basic tax structure described above and two equally likely outcomes: low taxable income with no tax liability and high taxable income with a $100 tax liability.[4] Without hedging, the expected tax liability is $50, but if derivatives perfectly eliminate income volatility, the tax bill can theoretically be reduced to zero. This example, however, does not consider complexities in the extended tax structure that may provide tax disincentives to

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[2] Graham and Smith (1999) portray the extended tax structure for a hypothetical firm using the following characteristics: income of $310,500 in years *t*-3 through *t*+18 (excluding year t), investment tax credit of $1.3 million in year *t*, and for AMT purposes add backs of $100,000 and a 20% tax rate. The tax liability is the tax obligation for year *t* income less any tax credits, plus any AMT liabilities, less the present value of the tax benefit associated with carrying back or forward any losses or credits (using a 10% discount rate).

[3] See Smith and Stulz (1985) for a graphical illustration of this argument.

[4] This example is adapted from Graham and Smith (1999).

hedge. Along these lines, Graham and Smith (1999) estimate the tax function for over 80,000 firm-year observations while considering the effects of net operating losses, tax credits, and AMT consequences. They find nearly half are convex, with the remaining tax functions split almost evenly between linear and concave.[5] In addition, Graham and Smith simulate income volatility reductions and discover only one-quarter of firms with convex tax functions experience material tax savings. In some cases, however, the savings exceed 40% of the expected tax liability (roughly $2 million annually) if income volatility were reduced by only 5%. Other evidence suggests gold mining firms hedge in response to tax function convexity (Dionne and Garand 2000), but Graham and Rogers (2002) find no such evidence in a broader cross-sectional sample.

Second, the debt tax shield also provides a fundamental incentive to use derivatives. Stulz (1996), Ross (1997), and Leland (1998) demonstrate that, by reducing the volatility of income and the probability of financial distress, hedging increases debt capacity. As firms add more leverage in response to greater debt capacity, the resulting increase in deductible expenditures (i.e., interest expense) lowers tax liabilities and increases firm value (Graham 2003). Stated differently, by reducing the likelihood of financial distress, firm can increase the optimal debt-to-equity ratio thereby increasing the tax shield of debt (Myers 1984; 1993; Leland 1998). Consistent with this theory, Graham and Rogers (2002) find hedging leads to greater debt usage and provides tax shields equal to 1.1% of firm value, on average. Other studies reach similar conclusions on an international level (e.g., Bartram et al. 2009) suggesting these benefits are not confined to the US tax system.

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[5] Thus, approximately one-half the sample has a tax incentive to hedge while the other half does not.

Taken together, tax convexity and the debt tax shield provide two fundamental incentives for using derivatives to reduce expected tax burden. Although mixed empirical support suggests other incentives also play a role, many of these more practical explanations (i.e., timing of income and losses) also relate to such theoretical incentives. Consequently, the remaining layers of the framework extend or indirectly encompass the fundamental theories of effective hedging.

Transactional Aspects

Tax avoidance involves designing transactions that result in the realization of gains and losses at a specific time, of a specific character, or from a specific source (Scholes et al. 2009). This layer of the framework focuses on why transactions involving one or more derivatives can be strategically engineered to accomplish these basic tenets of tax planning. Because of the complexity of derivatives taxation and the unlimited possibilities with which derivative-based transactions can be designed, the discussion that follows is necessarily general, example intensive, and by no means comprehensive.[6] Table 3-1 broadly depicts the complicated derivative tax system, while Appendix A provides a summary of the relevant tax rules.

The timing of income and loss recognition is a critical component of tax avoidance because current taxes are more costly from a present value perspective than future taxes. As a result, opportunities to defer income to future periods and accelerate losses to the current period are particularly advantageous. The tax code generally limits such strategies by following a "recognition upon realization" doctrine whereby taxable gain or loss is triggered with the disposition of property.[7] However, many derivative instruments are not subject to this standard prescription (Table 3-1) and therefore can provide substantial tax-timing opportunities.

[6] As an example, the Bureau of National Affairs (BNA) U.S. Income Portfolio on the taxation of equity-based derivatives (Portfolio 188-1st) exceeds 160 pages. Readers interested in detailed legal analysis concerning the taxation of financial transactions and instruments, including derivatives, are referred to Keyes (2008).

[7] See, for example, § 1001 of the Internal Revenue Code (IRC) of 1986, as amended.

Constantinides and Scholes (1980) demonstrate how derivatives can be used to defer gains to future periods. Specifically, certain hedging strategies involving call options and commodity futures facilitate the realization of a loss at time t and an equal gain at time $t+1$ (with zero net cash flows at each date), effectively shifting gains from one period to the next. Although "straddle" rules complicate the realistic implementation of such a strategy, numerous exceptions provide similar income shifting opportunities.[8] For example, a straddle that is clearly identified as such upon initiation is not subject to certain loss deferral or carrying cost capitalization requirements (Appendix A).[9] Instead, losses are capitalized into the basis of the offsetting position and recognized upon sale or other disposition. Similarly, straddles comprised of one or more positions in IRC §1256 contracts (i.e., regulated futures) along with non-IRC §1256 contracts can be designated as "mixed straddles" and receive special treatment.[10] For instance, taxpayers may be permitted to elect out of the mark-to-market requirements thereby preventing, or at least minimizing, any mismatch in the timing of gain and loss recognition. As another example, when taxpayers are not required to apply mark-to-market rules, and where the occurrence of property disposition is of major importance, the interaction of derivatives (e.g., equity swaps) with cash market transactions (e.g., cash settled forward contracts) may obscure any indication of whether or not a true property disposition has occurred (Ferguson 1994). In such cases, taxpayers can exploit favorable timing opportunities by choosing one derivative type over another.[11]

[8] For tax purposes, a straddle is an offsetting position (not designated or qualifying as a hedge) against actively traded property substantially reducing the risk of loss. See Table 3-1 and Appendix A for further details.

[9] IRC § 1092(a).

[10] IRC § 1256(d).

[11] See Ferguson (1994) for a detailed analysis of this and other similar examples.

Unlike individuals, corporate taxpayers do not have a rate preference for capital gains. However, the character of gains and losses remains a central tax issue because capital losses reduce taxable income only to the extent of capital gains, and ordinary losses are only deductible against recognized ordinary income.[12] Thus, derivatives can reduce the present value of corporate taxes by modifying the character of current gains to release suspended capital losses. Similarly, by transforming capital losses into ordinary losses, derivatives can also reduce current taxable income. For example, if a regulated futures contract (i.e., exchange traded contract for the future exchange of goods) is held for speculative purposes (i.e., not designated or not qualifying as a hedge), then it is treated as if it were sold at fair market value on the last day of the tax year with any gain or loss classified as capital in character. If, however, the contract is designated as a hedge, then any gain or loss receives ordinary treatment when the underlying hedged item is received, sold, or otherwise disposed.[13] Given that a taxpayer's choice of hedge or speculative designation can directly affect both the timing and character of gain or loss recognition, it is no surprise that the IRS has the authority to designate a derivative transaction as a hedge *ex post*.[14] However, the statutes and regulations defining what constitutes a hedge for tax purposes are qualitative and subject to various interpretations (Schizer 2004, 2000; Ferguson 1994; Scarborough 1994).[15] In reality, a clever tax planner could carefully devise a transaction that intentionally qualifies or fails to qualify for hedge treatment thereby creating opportunities for character-based tax planning.

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[12] IRC § 1211.

[13] IRC § 1256.

[14] To help identify these transactions, the detailed book-tax difference reconciliation filed with the corporate federal tax return (Schedule M-3) includes a special line item for hedging (Donohoe and McGill 2010).

[15] See, for example, Treas. Reg. § 1.221-2(f).

Derivatives can also modify the source of gains and losses. Sourcing is an important determinant of foreign tax credits and pertinent in calculating withholding taxes on payments made to, or received from, foreign entities. For example, in the U.S., foreign entities are generally subject to a 30% withholding tax on dividends received from U.S. sources.[16] However, income received in an equity swap is sourced according to the residence of the recipient.[17] Therefore, if a foreign entity enters into an equity swap with a commercial or investment bank (where the underlying asset is shares of U.S. stock), swap proceeds are deemed income from foreign sources and not subject to U.S. withholding taxes. This arrangement permits a foreign entity to avoid withholding taxes, yet still receive the benefits (e.g., dividends, appreciation) of directly owning the underlying equity shares (Rubinger 2002). Other sourcing matters arise when derivatives are held by entities outside of a U.S. consolidated group. In this case, mismatched gains and losses may be subject to special rules requiring recognition on the U.S. tax return for U.S. shareholders of the foreign entity. For this reason, some taxpayers prefer to place derivatives in U.S. entities to "hedge" against such foreign tax effects.

Tax Reporting Aspects

Tax avoidance opportunities generally involve the exploitation of uncertainty and dissonance in the tax code. In the case of derivatives, the tax reporting system is fragmented, largely incomplete, treats similar instruments and opposing sides to the same transaction differently, and offers few provisions for determining the tax treatment of new or compound transactions. Consequently, the efficacy of derivatives as tax planning mechanisms hinges on the inconsistency, asymmetry, and indeterminacy in the current derivative tax reporting system

[16] IRC §§ 871(a) and 881(a).

[17] Treas. Reg. § 1.863-7(b).

(Weisbach 2005). These characteristics are heavily discussed in the tax law literature (e.g., Shapiro 2006; Schizer 2004, 2000; Ferguson 1994; Scarborough 1994) and frame this layer of the discussion framework.

Inconsistency in derivative taxation has developed over time primarily because the tax law response to financial innovation has always been "reactive and particularized" (Warren 2004, 913). As a result, existing legislation and case law create a "cubbyhole" system whereby tax rules are prescribed for only a few broad categories (Table 3-1) that taxpayers use to classify transactions and determine how to report them on the tax return (Kleinbard 1991).[18] Although ostensibly straightforward, this generic piecemeal approach to taxing sophisticated transactions provides taxpayers with considerable discretion and flexibility.

Specifically, the cubbyhole system permits similar (and sometimes identical) economic positions to be taxed differently depending on transactional form. For example, through the concept of put-call parity (Merton 1973; Stoll 1969), each of the following assets can be restated in terms of the others, so long as competitive markets exist: (1) a share of stock paying no dividend, (2) a risk-free zero coupon bond, (3) a call option to buy a share of stock, and (4) a put option to sell a share of stock. Despite their equivalence, only the second asset (the bond) falls into a specific tax cubbyhole, while any gains and losses on the other assets remain indeterminable until sale or other disposition (Warren 2004). Similarly, a firm can acquire equity interests in another firm with at least five different transactions: (1) directly purchasing shares, (2) engaging in an equity swap, (3) executing an equity-linked note, (4) purchasing a call, selling a put (or entering a forward contract), and (5) buying a prepaid forward on equity. All five of these roughly equivalent transactions achieve similar ownership objectives, yet all are subject to

[18] The cubbyhole system is more formally referred to as "mapping" in the tax law literature. See, for example, Hu (1989) and Powers (1976).

disparate tax treatments. Consequently, the tax law distinction between different derivatives is generally untenable as financial equivalences allow one cubbyhole to be replicated by another.[19]

Additionally, a cubbyhole system places regulators and tax authorities at a distinct disadvantage. For instance, the development of this rules-based approach begins with regulators laying out precisely delineated tax treatment alternatives. However, because derivatives easily replicate similar economic positions, taxpayers are essentially free to choose the alternative that provides an optimal tax outcome. In response, regulators modify rules or create new cubbyholes to circumvent undesirable behavior. Given that this process repeats indefinitely, regulators are always left scrambling to catch up with taxpayers (Warren 2004). That is, regulators consistently suffer from a first-mover disadvantage (e.g., Gibbons 1992).

A second tax reporting issue concerns the asymmetric treatment of opposite sides to the same transaction. Like many other tax provisions, the taxation of derivatives depends on the motive and characteristics of the taxpayer (Table 3-1). Therefore, firms can use derivatives to achieve specific tax reporting objectives without directly affecting the tax treatment for other transacting parties. For example, the fact that one party designates a transaction as a hedge to receive ordinary character treatment does not compel a counterparty to follow suit. This independence provides an additional layer of flexibility and explains, in part, why the Internal Revenue Service (IRS) has authority to modify the categorization of some transactions *ex post*.

A third issue arises because several popular, yet highly sophisticated, derivatives are, in effect, derivatives of other derivatives. As such, the tax treatment of these compound instruments is frequently indeterminable because they do not fit snugly into a specific cubbyhole. In fact, the

[19] These examples demonstrate how the cubbyhole system provides tax avoidance opportunities (*ex ante*) through transaction form choice. Although transaction costs are ignored for simplicity, these and other tradeoffs are part of determining the optimal tax avoidance strategy.

tax code makes no mention of financial instruments created by combining equity instruments with traditional derivatives, debt instruments with embedded derivatives, or derivatives with other derivatives (e.g., swaptions). Moreover, with such complicated transactions, the tax law strongly disfavors separating these instruments into their various derivative subcomponents because numerous "derivations" are possible (U.S. Congress Joint Committee on Taxation 2008). Thus, it comes as no surprise that there are several well-known derivative-based transactions for which the "appropriate" tax treatment remains elusive.

For example, a prepaid forward contract on equity (e.g., mandatory convertible) is similar to a bond investment because the purchaser pays the entirety of the investment at inception and, in return, receives periodic cash flows along with the final payment at maturity. In this case, however, the amount paid to the purchaser at maturity is entirely contingent upon the future value of a share of stock and does not satisfy the criteria traditionally used to define "debt."[20] As a result, the taxpayer is effectively free to choose between two imperfectly defined cubbyholes (debt or forward contract) each with substantially different tax consequences (U.S. Congress Joint Committee on Taxation 2008). A similar situation occurs in the case of deep-in-the-money options, contingent non-periodic payments under notional principal contracts, and a handful of other common transactions.[21]

Cognitive Aspects

Of all the complex financial and tax reporting subjects, practitioners and regulators routinely place derivatives near the top of the list (PricewaterhouseCoopers 2009; U.S. Congress Joint Committee on Taxation 2008; IASB 2008; SEC 1997). Similarly, the financial media has

[20] For example, see IRS Notice 94-47 and 94-48.

[21] See Warren (2004) for additional examples and detailed legal analysis.

described them as being “concocted in unstoppable variation by rocket scientists who rattle on about terms like delta, gamma, rho, theta and vega” (Loomis 1994). Even the television show *60 Minutes* once described derivatives as “too complicated to explain and too important to ignore.”[22] To a large extent, this innate complexity stems from the confusing and constantly evolving terminology, and their ability to endlessly replicate similar economic positions. For example, Koonce et al. (2005) investigate whether varying the labels used to describe derivatives affects investors’ risk assessments even when the underlying economic exposures are held constant. Specifically, they ask investors to evaluate the risk of one of three debt positions with very similar risk exposures, but with different descriptions (e.g., fixed-rate debt, variable-rate debt combined with a swap to produce a net fixed-rate position, and the latter described as a hedge). They find that participants judge the variable-rate debt with a swap as riskier than the other two instruments implying that even knowledgeable investors struggle to unravel the economic implications of fairly common derivatives.

The inherent complexity of derivatives suggests they are not well understood despite their overall significance in the financial markets (Boyle and Boyle 2001). However, because external advice is readily available from specialists, these cognitive aspects provide yet another unique advantage for tax planning. If practitioners and investors struggle to understand derivatives, then considering the intricacies of the Internal Revenue Code, tax authorities will encounter similar problems detecting and contesting derivative-based tax avoidance. In fact, the IRS forms teams of highly specialized tax return examiners and financial experts to police aggressive tax

[22] The program *Derivatives* was originally broadcast on March 5, 1995.

strategies involving derivatives (McConnell 2007; Raghavan 2007).[23] These teams, however, are generally small and specialized (e.g., 6-10 individuals) requiring that they only focus on the most egregious forms of tax avoidance. Consequently, derivatives can be used to carry out any variety of tax planning strategies, while typically remaining 'below the radar.'

Overall, the potential for strategic altering of the character, timing, and source of income or losses coupled with the seemingly low probability of examination by tax authorities strongly indicates *why* derivatives are appealing as tax planning tools. Even though the implementation and recurring management of a derivatives program is potentially quite complicated, professional expertise is readily available from most major accounting and consulting firms. As a result, derivative instruments can play a significant role in corporate tax planning.

[23] In May of 2007, the IRS established a separate division of attorneys to examine new financial products across several industries in an effort to "avoid falling farther and farther behind" as derivative markets evolve (Raghavan 2007).

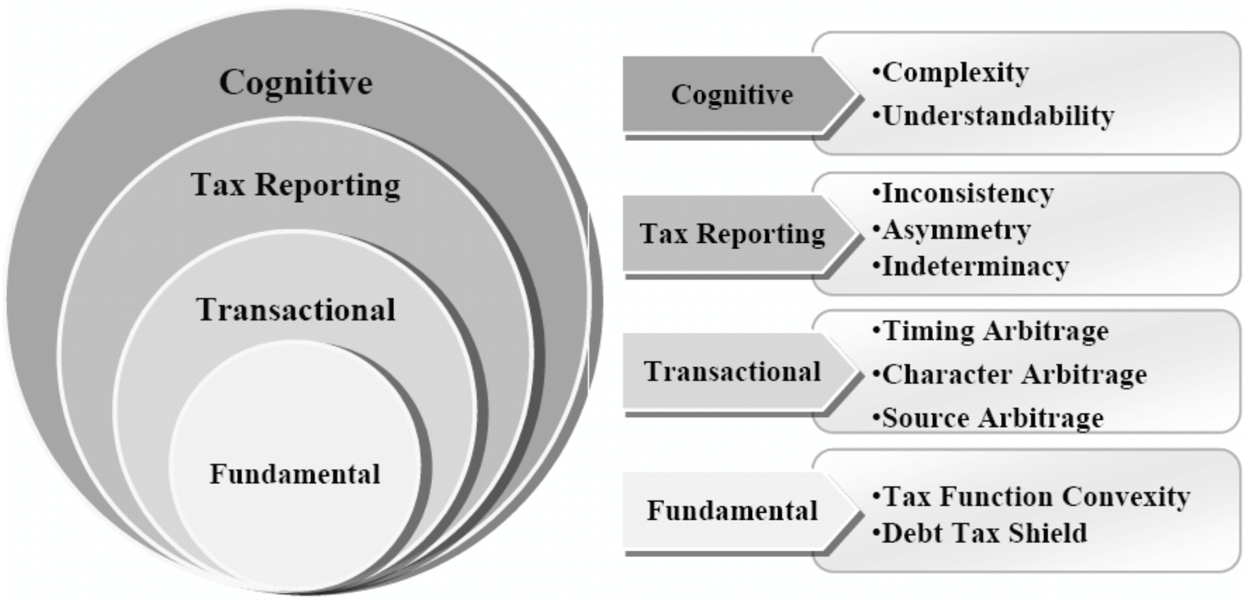

Figure 3-1. Broad aspects of derivative instruments

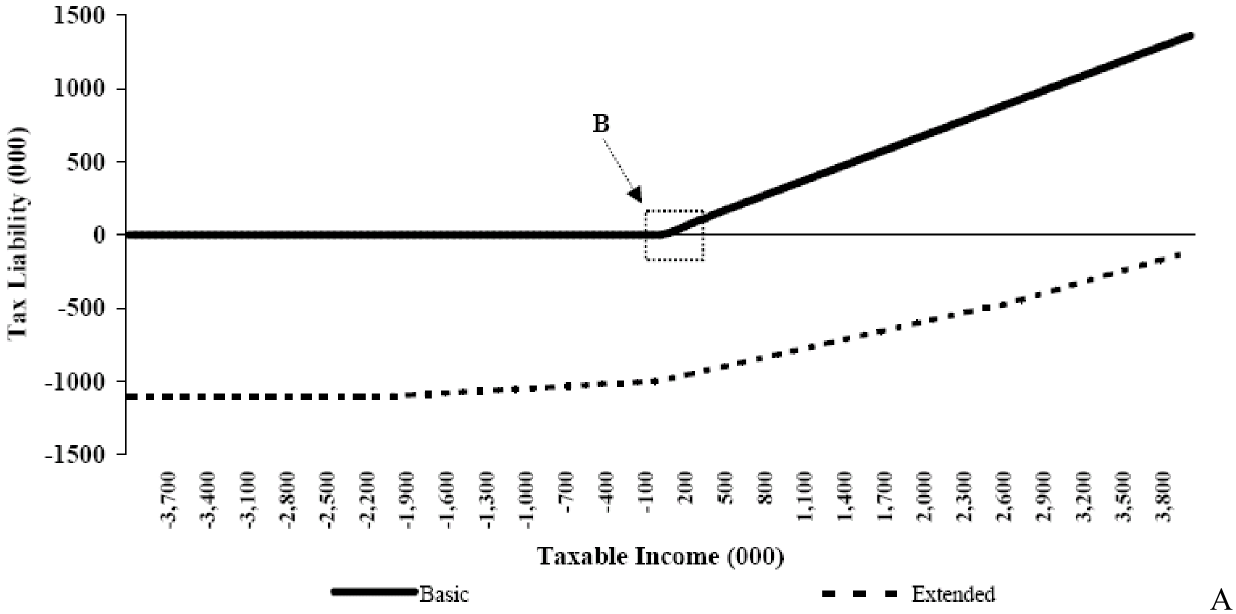

Figure 3-2. Convexity in the basic and extended corporate federal tax functions. This figure plots federal corporate tax liabilities conditional on the level of taxable income. A) Expected tax liabilities assuming a basic tax structure ignoring tax credits, loss carry forwards and carry backs, and AMT (solid line), and an extended tax structure (dashed line) incorporating these elements following Graham and Smith (1999). The extended tax structure is portrayed for a hypothetical firm using the following characteristics: income of $310,500 in years *t*-3 through *t*+18 (excluding year *t*), investment tax credit of $1.3 million in year *t*, and for AMT purposes add backs of $100,000 and a 20% tax rate. The tax liability is the tax obligation for year *t* less any tax credits, plus any AMT liabilities, less the present value of the tax benefit associated with carrying back or forward any losses or credits (using a 10% discount rate). B) A closer view of the most progressive region of the basic tax structure demonstrating how the progressive tax schedule creates multiple convex regions.

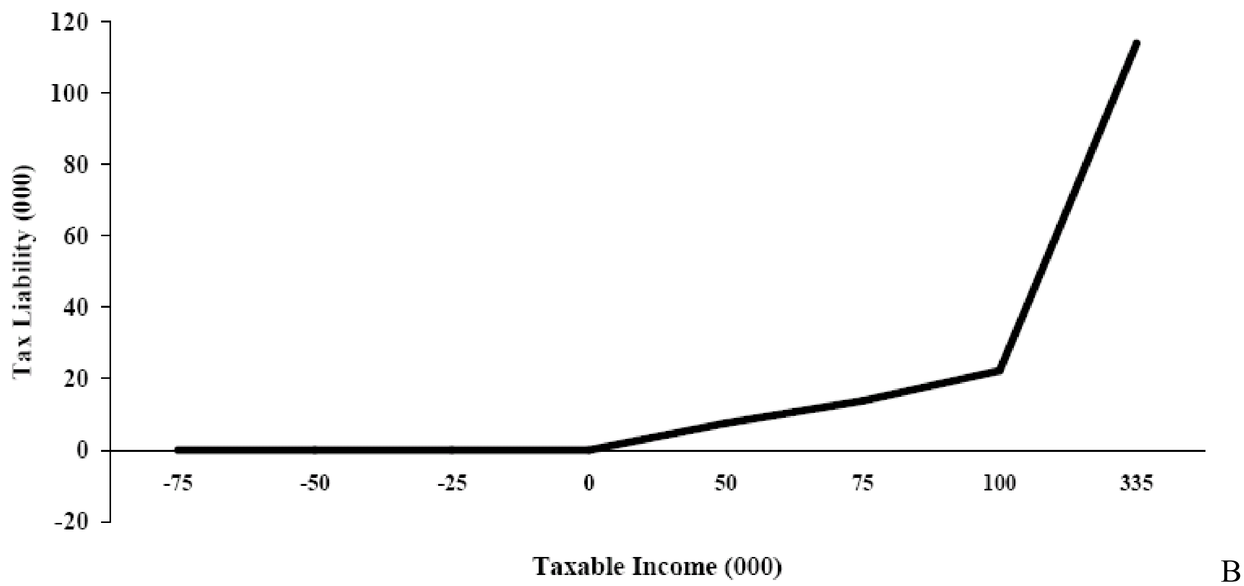

Figure 3-2. Continued

Table 3-1. Federal taxation of derivative transactions

Attribute	Category	Description	Timing	Character	Source
Type	§1234 Options	Exchange-traded and over-the-counter options on debt, equity, commodities and indices.	Deferred until settlement.	Same as underlying, generally capital.	Taxpayer country of incorporation.
	Forwards	Contracts to buy/sell underlying for specified price at specified time settling in cash or physical delivery.	Deferred until settlement.	Same as underlying.	Taxpayer country of incorporation.
	Securities Futures	Exchanged-traded contracts for sale or future delivery of a single security or narrow-based index.	Deferred until settlement or termination.	Same as underlying.	Taxpayer country of incorporation.
	§1256 Contracts	Regulated futures, exchange-traded non-equity options, and some foreign contracts.	Marked-to-market at year-end.	Generally capital.	Taxpayer country of incorporation.
	Notional Principal Contracts	Contracts providing for payment of amounts at specified intervals calculated in reference to a specified index upon a notional principal amount in exchange for consideration or promise to pay similar amounts.	Termination payments on receipt; other payments amortized.	Same as underlying for termination payments; other payments are ordinary.	Taxpayer country of incorporation unless income earned via U.S. branch.
Motive	Hedge	Transactions initiated in the normal course of business to reduce exposures to risks.	Matched with underlying item.	Generally ordinary.	Taxpayer country of incorporation.
	Straddle	Offsetting position (not designated or qualifying as a hedge) against traded property substantially reducing risk of loss.	Loss deferral; interest and carrying costs capitalized.	Same as underlying.	Taxpayer country of incorporation.
	Constructive Sale	Offsetting position for purpose of locking in gains and avoiding taxes.	Immediate gain recognition at FMV.	Same as underlying.	Taxpayer country of incorporation.
Status	Dealer	Taxpayer who regulatory buys, sells, or otherwise offers securities to customers in ordinary course of business.	Marked-to-market at year-end.	Ordinary.	Taxpayer country of incorporation.
Other	Entity Form	Partnerships, trusts, and other pass-through entities are assessed taxes at the ownership level, but consolidated in financial reports.	May depend on entity form.	May depend on entity form.	May depend on entity form.
	Jurisdiction	The tax treatment of derivatives varies across many foreign tax jurisdictions.	May depend on foreign tax jurisdiction.	May depend on foreign tax jurisdiction.	May depend on foreign tax jurisdiction.

CHAPTER 4
HOW ARE DERIVATIVES USED TO AVOID TAXES?

The development of sophisticated financial instruments, such as derivatives, facilitates the design of aggressive tax planning strategies (US Treasury 1999). Of particular regulatory concern in recent years is corporate use of tax shelters. In general, tax shelters are defined as either arrangements to avoid or evade federal income tax without exposure to economic risk or loss (US Treasury 1999), or tax motivated transactions based on literal interpretations of the tax code that are inconsistent with legislative intent (Bankman 1999). Because firms do not normally disclose tax shelter involvement, research opportunities are somewhat scarce leaving much to be learned about their operation.[1] Accordingly, this section provides insight into how derivatives further the design of aggressive tax avoidance strategies by examining two derivative-based arrangements designated as tax shelters by the IRS. Details regarding how the timing, character, and source of related gains and losses are strategically altered follow a summary of each arrangement. Readers interested in detailed legal analyses are referred to the indicated IRS documents.

"Straddleship" (Notice 2002-50 Tax Shelter)

Financial Arrangement

Notice 2002-50 (2002-2 C.B. 98) designates as abusive tax shelters certain arrangements involving straddles, tiered partnerships, transitory partners, and the absence of specific tax elections. These so-called "Notice 2002-50 tax shelters" (hereafter, Straddleships) use a number of precisely arranged transactions to generate deductible noneconomic losses. Although the facts

[1] Recent research includes, for example, Lisowsky (2010), Wilson (2009) and Graham and Tucker (2006).

and circumstances may vary by occurrence, the general structure remains the same (Figure 4-1). Accordingly, the IRS contends any arrangement resembling the following will be contested.[2]

To begin, the promoter of the tax shelter forms a tiered partnership by creating three related pass-through entities that are classified as partnerships for federal tax purposes. First, an entity controlled by the promoter (Promoter1) and an unrelated entity (Accommodating) together form a limited liability company (UpperTier). The initial capital contributions are designed so that Accommodating retains a 99% interest in the entity and has a tax basis equal to the property contributed (e.g., $100). Second, UpperTier contributes property (e.g., $40) in exchange for a 99% interest in a new subsidiary limited liability company (MiddleTier), while a promoter-related entity (Promoter2) acquires the residual interest. Third, MiddleTier contributes property (e.g., $20) to another limited liability company (LowerTier) for 99% of the ownership interest, and Promoter2 typically holds the remaining interest.[3] At no time during the course of the transactions do any of the newly created entities make a tax election to adjust the basis of partnership property upon distribution or transfer of interests (i.e., IRC § 754).[4]

Next, derivatives are employed to generate losses later used to shelter (eliminate) other taxable income. Specifically, in the fourth step, LowerTier acquires a long and short position in foreign currency forward contracts.[5] Together, these two positions qualify as a tax straddle because they substantially offset one another such that the value of one position varies inversely with the value of the other. A short time later, LowerTier closes the gain leg of the straddle (e.g.,

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[2] The following description is adapted from IRS Notice 2002-50.

[3] In some cases, the lower tier is excluded and, with some modifications, the shelter remains largely intact.

[4] An election by the taxpayer under this section of the IRC destroys the operation of the tax shelter.

[5] The operation of this tax shelter is not limited to foreign currency forwards; however, most variants use positions in minor foreign currencies to avoid the application of certain mark to market rules (e.g., IRC § 1256).

$10,000).[6] As the gain leg is closed, the loss leg is simultaneously captured with a replacement position, known as a "switch," reestablishing the straddle and leaving LowerTier with an unrealized loss (e.g., $10,000). The loss remains unrealized and the process repeats until total net unrealized losses approximate the tax loss objectives of the taxpayer. In the interim, gain proceeds for the terminated leg are invested in a deposit account (e.g., CD), which serves as collateral for the unrealized loss position. In doing so, when the loss leg is eventually terminated, the partners will not have to contribute additional property to cover the loss.

In step five, the taxpayer (Taxpayer) becomes more directly involved in the shelter. Following the close of the gain leg, Taxpayer purchases Accommodating's interest in UpperTier for the same price as the initial investment (e.g., $100) causing the partnership's taxable years to close under the technical termination rules.[7] The unrealized gain (e.g., $10,000) is then allocated first to MiddleTier, then to UpperTier, and finally to Accommodating.[8] Thus, MiddleTier's basis in LowerTier, UpperTier's basis in MiddleTier, and Accommodating's basis in UpperTier all increase by the amount of the gain (e.g., increase to $10,020, $10,040, and $10,100, respectively), while Taxpayer's basis in UpperTier remains the same ($100). As a result, Accommodating may claim a tax loss because the amount realized (e.g., $100) is less than its adjusted basis ($10,100), and because no special elections were made, Taxpayer's share of UpperTier's basis in its MiddleTier interest remains the same (e.g., $10,040).

In anticipation of Taxpayer's eventual purchase of UpperTier's interest in MiddleTier, derivatives are employed to increase Taxpayer's basis and amounts at risk. Specifically, in the

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[6] Although the loss leg cannot be recognized prior to the gain leg, taxpayers are not precluded from recognizing the gain before closing the loss position (IRC § 1092). The role of Accommodating is to receive the gain leg so that the taxpayer can be allocated the loss leg of the straddle.

[7] IRC § 708(b)(1)(B).

[8] For simplicity, the numerical examples assume all of the gains and losses are allocated to the 99% partners.

sixth step, MiddleTier and a financial institution (Bank) enter into a structured loan agreement that generally involves three components: (1) a foreign currency loan from Bank to MiddleTier (e.g., $10,000, or the desired loss), (2) simultaneous investment of loan proceeds in an instrument (Instrument) held by Bank, such as deep-in-the-money options, and (3) a costless collar (i.e., pair of options) hedging against the exposure to foreign exchange rates.[9] Although the loan proceeds never leave Bank, Taxpayer's amount at risk increases because the non-managing member of MiddleTier guarantees the loan to the extent of Taxpayer's loss objectives. As a result, the arrangement with Bank increases UpperTier's basis in MiddleTier to a total of the loan, gain, and initial contribution (e.g., $20,040).

In step seven, Taxpayer purchases UpperTier's interest in MiddleTier at cost (e.g., $40) and releases UpperTier from its loan obligations by guaranteeing the loan with Bank. As a result, the taxable years for MiddleTier and LowerTier immediately close under the technical termination rules causing UpperTier to realize a loss on the sale (e.g., $40 from sale and $10,000 of debt relief less adjusted basis of $20,040). This loss, which is allocated to Taxpayer, is not reported on the tax return because Taxpayer and UpperTier are related parties. Instead, after the purchase, Taxpayer's basis in MiddleTier equals the amount paid plus the debt guarantee (e.g., $10,040), while its basis in UpperTier remains the same (e.g., $100).

The eighth step releases the accumulated losses so that they may pass through the tiered partnership structure to Taxpayer. Specifically, LowerTier closes the loss leg of the straddle thereby releasing an ordinary loss that flows first to MiddleTier and then to Taxpayer (e.g., $10,000). Because Taxpayer has sufficient basis and an appropriate amount at risk, the loss may be used to offset other ordinary income. However, if Taxpayer prefers capital character losses,

[9] Loan agreement details concerning cash on deposit restrictions, right of set off, and similar provisions are excluded for brevity. Interested readers are referred to IRS Notice 2002-50.

then step eight is modified. Instead of closing the loss leg of the straddle, MiddleTier sells its interest in LowerTier to another promoter-related entity causing LowerTier's tax year to immediately close under the technical termination rules. Consequently, MiddleTier recognizes a capital loss (e.g., $10,000) equal to the difference between its adjusted basis in LowerTier (e.g., $10,020) and the amount realized (e.g., $20). This loss is ultimately allocated to Taxpayer and used to offset other capital character income. Regardless of character, any recognized losses decrease Taxpayer's basis in MiddleTier.

The final transaction, step nine, effectively terminates the tax shelter. In the year following the recognition of accumulated losses, Taxpayer sells (at cost) its interest in MiddleTier to another promoter-related affiliate (Promoter3) who guarantees the loan with Bank. Taxpayer incurs a gain (e.g., $10,000) equal to the difference between any amounts realized on the sale (e.g., $10,000 debt relief, $40 cash) and its adjusted basis in MiddleTier (e.g., $40). However, this gain is not recognized. Instead, Taxpayer relies on the related-party rules (i.e., IRC § 267(d)) to argue such gains must only be recognized to the extent they exceed any previously disallowed losses. Because an equivalent loss was previously disallowed after UpperTier sold its interest to MiddleTier, no additional gain recognition is necessary. These assertions are typically supported by legal opinions from various tax and legal professionals unrelated to the promoter.

Additional transactions may occur after shelter termination to compensate the promoter for designing and implementing the Straddleship. In many cases, these fees are disguised as payments to venture capital funds or run through various tiered organizational structures. Although details concerning such fee payments are beyond the scope of this study, it is important to emphasize that their deductibility is often a significant part of tax shelter marketing strategies and also routinely challenged by tax authorities. See IRS Notice 2002-50 for further details.

Analysis

Despite the deliberate configuration of numerous entities, purchase of sophisticated investment instruments, and a multifaceted agreement with a financial institution, the decisive tax planning effects of Straddleships occur as a result of step eight. This final transaction before shelter termination allows the taxpayer to strategically determine both the timing and character of manufactured losses. For example, the taxpayer may keep open the loss leg of the straddle for as long as necessary to accumulate sufficient losses or in anticipation of realizing other income. Once the tax conditions are optimal, the taxpayer may choose precisely when to release the losses. Similarly, if the taxpayer prefers capital character losses then, as described, modifying the transaction as a sale of partnership interests accomplishes this objective as well.

Although Straddleships have no obvious sourcing advantage, modifications can also be made to produce foreign losses. For instance, direct investments in derivatives where the underlying is a foreign security or the inclusion of foreign entities (partners) in the ownership structure may enable the taxpayer to diminish other foreign sourced income. Additionally, the success of this tax shelter does not depend on the exclusive use of tax partnerships as other variants employ different organizational structures, including Subchapter S corporations, to accomplish similar objectives.[10] In sum, the Straddleship arrangement provides taxpayers with the ability to strategically modify almost every aspect of effective tax planning. Thus, it is no surprise the IRS considers its use an "abusive and negligent disregard" of the tax system.[11]

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[10] For example, a "Notice 2002-65 tax shelter" uses Subchapter S entities, one or more transitory shareholders, and straddle positions in forward interest rate swaps to generate noneconomic losses.

[11] See the discussion of accuracy-related penalties in IRS Notice 2002-50 (Issue 8).

Offsetting Foreign Currency Option Contracts (Notice 2003-81 Tax Shelter)

Financial Arrangement

In December of 2003, the IRS detected certain abusive arrangements involving the assignment of offsetting foreign currency options to charitable organizations. These "Notice 2003-81" (2003-2 C.B. 1223) tax shelters (hereafter, OFCO) create noneconomic losses by exploiting the IRC's rules for gain and loss recognition on foreign currency contracts. To date, the IRS has identified dozens of entities (both taxable and tax-exempt) participating in these arrangements, and estimates tax avoidance in excess of $1 million per occurrence. Similar to Straddleships, the specific facts and circumstances may vary, but the general arrangement is described as follows (Figure 4-2).

The implementation of an OFCO shelter involves three steps. First, the taxpayer (Taxpayer) enters into an investment management agreement with the tax shelter promoter (Promoter), a registered investment advisor. Promoter creates a trading account with an intermediary (Intermediary) using Taxpayer's initial capital contribution of either 15% of the desired ordinary loss, or 10% of the desired capital loss. Taxpayer agrees to keep the funds in the trading account for at least five years, although early withdrawal is available for a substantial fee. A majority of the initial contribution (e.g., 98%) is then invested in a hedge fund of funds, while the remaining balance is used to establish a foreign currency trading account.

Second, Taxpayer initiates an investment strategy by simultaneously purchasing and selling foreign currency option contracts where only a portion of the underlying currencies are traded through regulated exchanges. For example, Taxpayer purchases two 180-day European-style digital currency options pegged to fluctuations in the exchange rate between the U.S. dollar and the Euro ("major contracts"). Because the positions are denominated in foreign currency and traded through regulated futures contracts, Taxpayer classifies them as "IRC § 1256 contracts"

Concurrently, Taxpayer sells two 180-day European-style digital currency options pegged to fluctuations in the exchange rate between the U.S. dollar and another stated European currency ("minor contracts"). These contracts are not classified under IRC § 1256 as the stated currency does not trade on a qualified exchange. By design, the value of the underlying currencies in these contracts are either officially linked with one another, such as through the European Exchange Rate Mechanism (ERM II), or historically demonstrate a high positive correlation. As a result, the value of the major options is inversely related to the value of the minor options such that any gain in a major foreign currency position will be largely offset by a corresponding, but not necessarily equal, loss in a minor foreign currency position.[12] Further, the initial cash outlay is limited to the net premium among the offsetting positions because the counterparty is the same for all four contracts.

In the final step, Taxpayer assigns two of the open foreign currency contracts to a qualified charitable organization (Charity) prior to option exercise. The first contract, a major option, is in a loss position, while the second, a minor option, is in a nearly offsetting gain position at the time of assignment. Taxpayer treats the assignment of the major option (an IRC § 1256 contract) as a termination of the contract immediately recognizing the inherent loss. For the minor option, however, Taxpayer recognizes no gain as the contract is not subject to the mark-to-market rules of IRC § 1256. When the remaining two contracts are closed, their inversely related values essentially offset one another. Therefore, the net effect of the arrangement is immediate recognition of an ordinary loss with no offsetting gain. The loss may also receive capital

[12] To help establish to possibility of real economic losses, Counterparty also makes specific representations to Taxpayer regarding the high likelihood (more than 50%) that the entire investment will be lost.

character treatment through a simple tax election designating the foreign currency contracts as capital assets.[13]

Analysis

The OFCO tax shelter exploits both the wait-and-see approach to option taxation and the mark-to-market rules governing regulated future contracts (Appendix A). Through the investment and subsequent transfer of derivatives subject to mark-to-market accounting, the shelter generates noneconomic losses that Taxpayer can use to offset other income. Taxpayer has the flexibility to determine the exact timing of loss recognition by choosing when to transfer the option contracts to Charity. Additionally, the remaining contracts may be closed at any time provided their values sufficiently offset one another so as to avoid much, if any, gain recognition. Based on the ease of capital asset designation, Taxpayer may also manipulate the character of these recognized losses. In sum, the OFCO is a sophisticated mechanism through which derivatives are used to accomplish straightforward objectives of effective tax planning. This arrangement is presently under serious scrutiny by tax authorities, and disclosure of its use is now required.

Through creative and nearly indecipherable financial arrangements, both the Straddleship and OFCO tax shelters provide users with enormous tax planning opportunities. Further, the direct involvement of sophisticated derivatives and complicated ownership structures help to blur economic substance and, in turn, make them difficult for regulators to detect and subsequently challenge. Thus, it is clear why taxpayers are willing to pay large fees to tax shelter promoters, and also why the Treasury and IRS aggressively police these tactics. Due to intense scrutiny, the

[13] IRC § 988(a)(1)(B) and Treas. Reg. § 1.988-3(b)(4). Taxpayer must attach a verification statement to the filed tax return for a valid capital treatment election.

Straddleship and OFCO have somewhat fallen out of favor. However, as one shelter door closes, others open, essentially guaranteeing the use of other undiscovered arrangements.

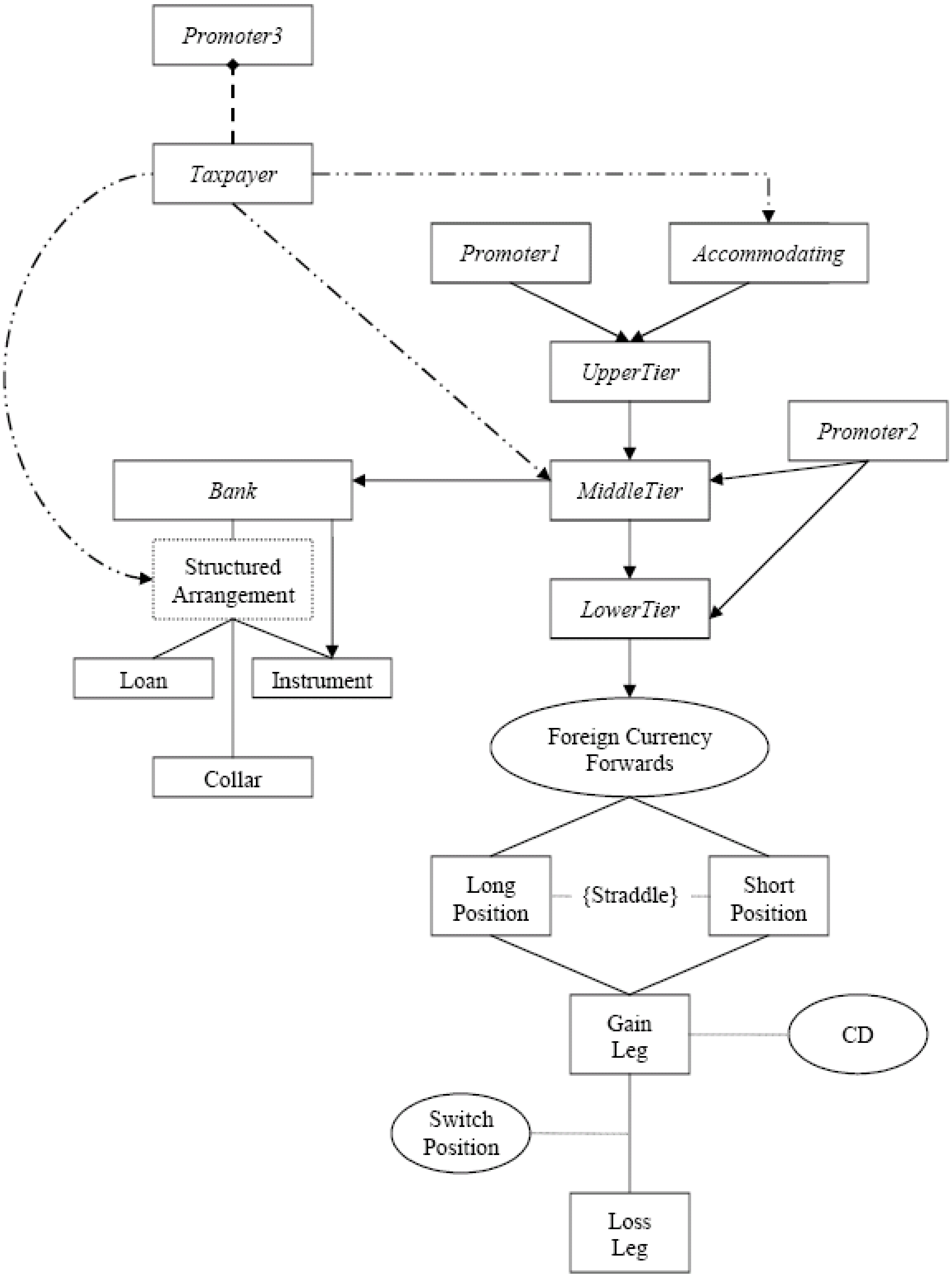

Figure 4-1. Notice 2002-50 tax shelter

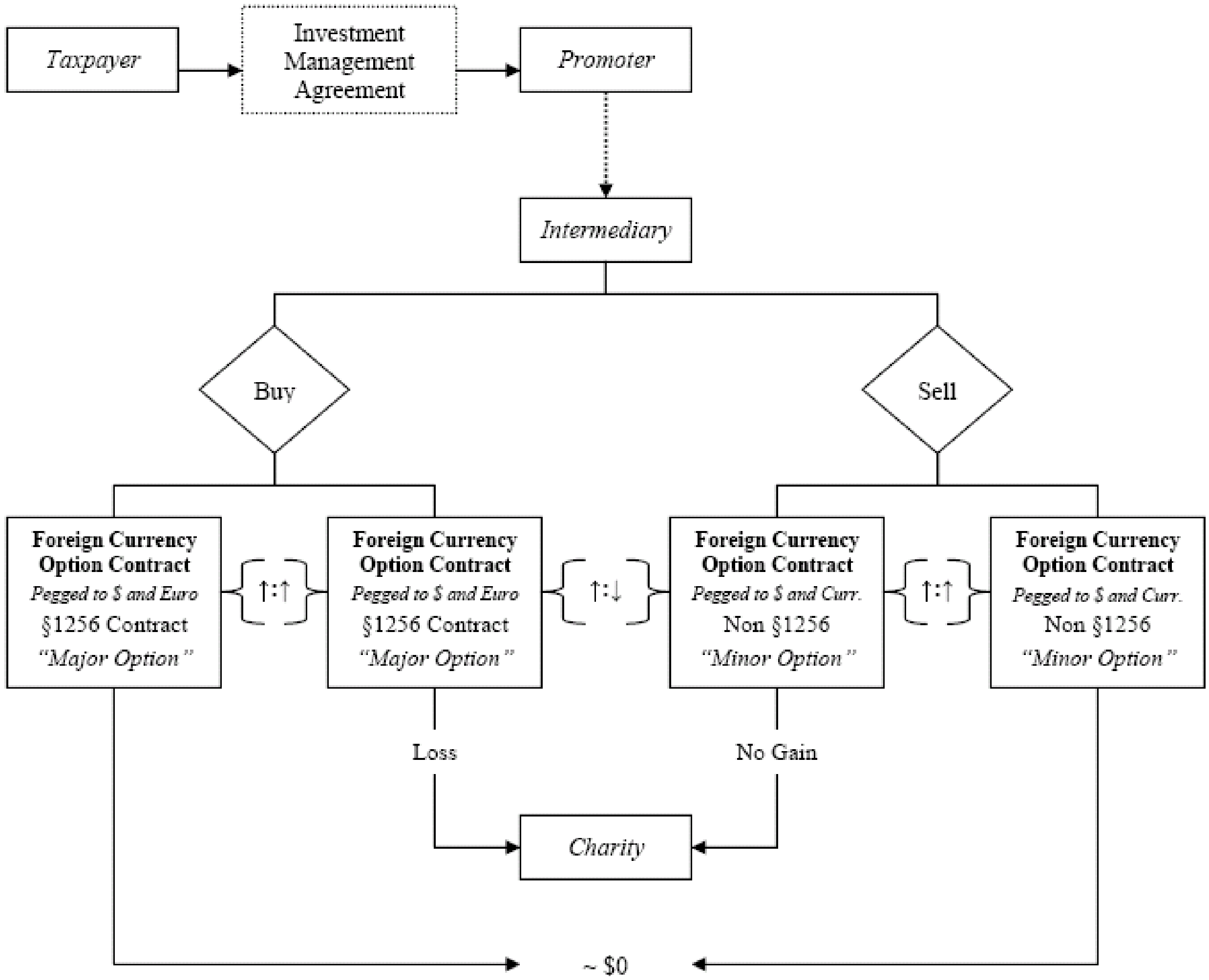

Figure 4-2. Notice 2003-81 tax shelter

CHAPTER 5
HYPOTHESIS DEVELOPMENT

Corporate use of derivatives is frequently motivated by risk management concerns, including those associated with changes in interest rates, foreign exchange rates, and commodity prices (e.g., Bartram et al. 2009; Bodnar and Wong 2003; Tufano 1996). Although empirical evidence generally supports these motives (Bartram et al. 2010; Guay 1999), other research suggests the effects are economically insignificant (Hentschel and Kothari 2001) and that other explanations may be more prevalent. For example, derivative use may be motivated by income smoothing (Pincus and Rajgopal 2002; Barton 2001), industry competition (Tufano 1996), and the consequences of financial distress (Smith and Stulz 1985; Mayers and Smith 1982), underinvestment problems (Froot et al. 1993), and principal-agent conflicts (Mayers and Smith 1987).

Although overlooked by prior research, tax avoidance is another motive for derivative use. As mentioned, derivatives can be employed as sophisticated tax planning tools that work in isolation or concomitantly with firms' other planning strategies. This notion raises empirical questions concerning the extent to which derivatives reduce tax burden and whether tax avoidance is a determinant or consequence of their use.

Derivative Use and Changes in Tax Burden

Derivative use may result in lower expected taxes (Smith and Stulz 1985), increased deductible expenditures (Stulz 1996; Ross 1997; Leland 1998), and in some circumstances, allow firms to alter the timing, character, and source of gains and losses The inherent complexity of derivatives also offers opportunities to exploit ambiguity in the tax code with a seemingly low probability of detection by tax authorities. Given these attractive features, it seems straightforward that derivatives should facilitate tax avoidance, and therefore be associated with smaller tax burdens. However, to the extent tax avoidance motivates derivative use, this relation is more complex because firms with *ex ante* large tax burdens have an incentive to employ derivative-based tax strategies. As a result, even when derivatives are primarily used to avoid taxes, *ex post* tax burdens may be larger, smaller, or indistinguishable from those of non-users. Additionally, because they provide numerous non-tax benefits (e.g., risk management), the presence of derivatives does not necessarily imply these instruments are used to avoid taxes. Consequently, to the extent firms use derivatives for tax avoidance, reductions in tax burden should occur after the implementation a derivatives program. This leads to the first hypothesis:

H_1: Tax burdens decrease subsequent to the implementation of a derivatives program.

Depending on the possibility of imperfect correlations with the underlying, derivatives can be used to completely offset (perfectly hedge) or partially offset inherent business risks. However, because few hedges are perfect, failure to hold effective hedge instruments (ineffective hedging) or intentionally speculating in the derivatives market can also increase exposures to risk (Zhang 2009). Under SFAS 133 derivatives are reported as either assets or liabilities on the balance sheet at fair value with any unrealized gains and losses due to changes in fair value reported on the income statement (FASB 1998). Under certain conditions, however, the standard also permits hedge accounting whereby a derivative may be designated as a hedge of the exposure to (1) changes in fair value of a recognized asset or liability, (2) variability in cash flows of a recognized asset or liability or forecasted transaction, or (3) foreign currency risk associated with foreign operations or other foreign-currency denominated transactions. With hedge accounting, changes in fair value of an effective hedge instrument and the changes in fair value of the underlying item are included in net income in the same accounting period (i.e., they offset one another). Alternatively, unrealized gains and losses on derivatives not qualifying for hedge accounting or that result from most types of hedge ineffectiveness are recorded in net income as they occur (i.e., no offset). Therefore, only speculative positions and the ineffective portion of hedges directly affect reported (book) earnings.

Similarly, a special set of rules apply when a transaction qualifies as a hedge for tax purposes. Although the tax code takes a narrow view of risk management (Yanchisin and Ricks 2006), gains and losses on hedging transactions are generally matched with gains and losses on the underlying such that both are included in taxable income simultaneously. Consequently, speculative and ineffective hedge positions induce short-term volatility in both book (Zhang 2009) and taxable income (Graham and Smith 1999), which is not only less preferable to shareholders and managers (Beatty and Weber 2003; Graham et al. 2005), but also has important tax implications.

As mentioned, *less* volatile income results in lower expected taxes for at least two reasons. First, reductions in volatility increase debt capacity (Stulz 1996), and to the extent increased debt capacity motivates greater debt usage, it also leads to reduced taxes through the deductibility of interest payments (Graham and Rogers 2002). Second, under the present progressive corporate tax system, a firm's tax liability is generally a convex function of its taxable income (Graham 2003). Based on this theory, a firm facing an increasing marginal tax rate can reduce its expected tax liability by reducing the variability of its income (Smith and Stulz 1985). Thus, tax burden reductions following derivatives implementation may result from effective hedging, not tax avoidance.

However, to the extent derivatives are used to avoid taxes, firms may enter into positions that have little or no relation to risk management (Ensminger 2001), potentially increasing exposures to risk. In this case, firms increasing or failing to reduce exposures to economic risks will experience larger reductions in tax burdens than firms effectively hedging their risks. Additionally, the effects of income volatility, and thus effective hedging, on tax burden may be modest. For instance, firms must actually exploit increased debt capacity to garner tax benefits from additional interest deductions. Despite contentions by Ross (1997) and Leland (1998), some firms may instead choose to reduce expected bankruptcy costs and refrain from using additional debt. Further, Graham and Rogers (2002) find no relation between derivative holdings and the shape of the tax function, while other evidence suggests firms holding speculative or ineffective hedge positions use more prudent risk management strategies after the promulgation of SFAS 133 in 1998 (Zhang 2009). Taken together, reductions in tax burden following derivatives implementation are likely associated with speculative and ineffective hedge positions, leading to the second hypothesis:

> **H_2:** Following the implementation of a derivatives program, tax burden reductions from effective hedging are smaller than tax burden reductions from speculative or ineffective hedging.

Cross-Sectional Variation in Tax Burden Changes

Despite similarities in accounting for hedged items, rules governing the financial and tax reporting of derivatives are otherwise diverse. The financial reporting rules follow a fair value approach (i.e., mark to market) whereby the specific accounting treatment depends on whether the derivative qualifies as a hedging instrument, and if so, the reason for holding the instrument (FASB 1998). For federal tax purposes, the timing, character, and source of derivative-related gains and losses varies depending on four attributes: (1) type of instrument, (2) motive for use, (3) status of taxpayer, and (4) organizational form or jurisdiction of taxpayer (Table 3-1). For at least two reasons, the disparity between reporting outcomes suggests firms realize greater reductions in tax burden as the size of their positions increase. First, the divergent rules provide an incentive for firms to separate and independently maintain two derivatives programs

(Ensminger 2001). Operating a program for economic (i.e., risk management) purposes and another for tax planning allows each management team to focus exclusively on identifying and exploiting value-enhancing opportunities. Because many of the "tax inspired" derivatives will be in addition to those initiated for economic purposes, firms with a tax-based derivatives program will use more derivatives overall and, to the extent the strategies are successful, have smaller tax burdens. Second, even if derivatives programs are not separately maintained, transactions entered into for economic purposes do not necessarily provide optimal tax outcomes. For example, derivatives hedging future purchase commitments or locking in prices denominated in foreign currencies generally produce *ordinary* gains and losses and serve to offset gains and losses on the underlying. If, however, a firm wishes to release suspended *capital* losses, then derivatives producing capital character outcomes can be beneficial.

Alternatively, firms may optimally choose position size after considering incremental tradeoffs. If so, it is possible for two firms holding different sized positions to experience similar tax burden reductions. Thus, a monotonic relation between position size and changes in tax burden may not be prevalent. However, the disparities in reporting outcomes suggest, on average, firms require additional positions to accomplish tax reduction objectives, leading to the third hypothesis:

> **H_3:** Firms experience greater reductions in tax burden subsequent to the initiation of a derivatives program as the size of derivative positions increase.

Determinants of Derivative Program Initiation and Magnitude of Initiation

In general, the previous hypotheses predict that derivatives, when used for tax planning, reduce firms' tax burdens. Yet, the question remains as to whether reducing the present value of taxes is an impetus for, and/or a consequence of, derivative use. If firms deliberately use derivatives to reduce tax burdens, then the decision to initiate a derivatives program should be a function of incentives to avoid taxes and preferences for less conservative techniques. While prior literature (e.g., Rego 2003) identifies tax planning incentives (e.g., profitability, foreign operations), many of these also relate to risk management motives (Bartram et al. 2009). Therefore, firms' *ex ante* aggressive tax behavior likely has a more direct link to derivatives initiation.

Tax aggressiveness can be viewed as claiming a tax benefit with relatively weak facts to sustain the benefit if the company were audited by tax authorities (Mills et al. 2010). This definition includes illegal and contentious positions as well as some tax avoidance. More generally, it includes the upper range of the tax avoidance continuum.[1] Therefore, tax aggressive firms are those that move well beyond conservative approaches to tax planning (e.g., tax credits) by including more sophisticated and potentially riskier techniques in their portfolio of tax planning strategies. Because derivatives are complex financial instruments capable of providing sophisticated and oftentimes unconventional tax avoidance opportunities, tax aggressive firms are more likely than other firms to begin using them.

In contrast, tax aggressive firms may be reluctant to employ derivatives given that the associated tax benefits are not necessarily easy to obtain. For instance, character and timing mismatches between a derivative and the underlying can arise if a transaction does not qualify as a hedge for tax purposes. That is, firms may be unable to offset gains and losses because of character differences (i.e., ordinary versus capital), or because special timing rules apply to defer

[1] *Tax avoidance* is the steps taken to reduce explicit taxes per dollar of pre-tax earnings or cash flows. With such a broad view, tax avoidance represents a continuum of tax planning strategies where indisputable ("perfectly legal") strategies lie at one end and extremely contentious or illegal strategies (i.e., some tax shelters) lie at the opposing end. A firm can fall anywhere along the continuum depending on how much avoidance the firm has or how much tax risk is assumed (Hanlon and Heitzman 2010). Although a precise meaning of *tax aggressiveness* is a matter of opinion, the general notion is that aggressiveness determines where along the continuum a firm lies. For example, relatively indisputable tax reduction strategies entail little avoidance and almost no tax risk, while other positions have sufficient avoidance or tax risk to be aggressive. Thus, involvement with illegal or extremely contentious tax positions (i.e., "abusive tax shelters") is a sufficient, but not a necessary, condition for tax aggressiveness.

losses. These differences can destroy the tax advantages of many transactions by introducing substantial tax reporting costs (Keyes 2008). Consequently, tax aggressive firms may find that other tax planning strategies provide similar benefits with less difficulty.

Additionally, derivatives are seldom easy to understand (e.g., Koonce et al. 2005), especially in a tax planning context. Thus, managers of tax aggressive firms may not extensively employ techniques that they themselves do not fully comprehend. Although support with tax avoidance is readily available from specialists (e.g., McGuire et al. 2010), these services are often costly (Donohoe and Knechel 2011) and may mitigate potential tax savings. Further, regulators' recent laser-like focus on curbing tax avoidance (Donohoe and McGill 2011) suggests derivative-based tax planning may eventually attract considerable scrutiny. In fact, the U.S. Congress Joint Committee on Taxation (2008) is already addressing ambiguities in derivative taxation, while the IRS has hired specialists to assist with enforcement efforts (Raghavan 2008, 2007; McConnell 2007). As a result, tax aggressive firms may limit (or avoid) involvement with derivatives so as not to attract the attention of tax authorities to these and other tax positions.[2]

Despite potential costs, tax aggressive firms, by nature, are unlikely to forgo viable tax planning opportunities, especially as tax departments become increasingly evaluated as profit centers (i.e., ability to reduce taxes) (Robinson et al. 2010; Crocker and Slemrod 2005). Additionally, during tax audit negotiations, the existence of multiple aggressive tax positions may provide flexibility to compromise in one area and retain tax benefits in another (e.g., Javor 2002). Thus, a positive relation between *ex ante* tax aggressiveness and the choice to implement

[2] This suggests less tax aggressive (high tax burden) firms may be more likely to implement a derivatives program. However, the ease of obtaining tax benefits, complexity, and potential future scrutiny from tax authorities also mitigate the likelihood these firms begin using derivatives. Given that additional tax avoidance may be beneficial until firms reach tax exhaustion, and because tax aggressive firms are generally predisposed to implement less conventional tax planning techniques (Lisowsky 2010; Wilson 2009), the hypothesis focuses on these firms.

a derivatives program is expected. Although firms can add derivatives over time, larger positions are likely necessary to fulfill immediate tax avoidance objectives (H_3). Thus, *ex ante* tax aggressiveness is also expected to have a positive relation with the size of derivative positions at initiation.

> **H_{4A}:** Tax aggressive firms are more likely to initiate a derivatives program than other firms.

> **H_{4B}:** Tax aggressive firms initiate derivatives programs with larger derivative positions than other firms.

CHAPTER 6
SAMPLE SELECTION AND DERIVATIVE MEASUREMENT

Data for this study begins with the universe of firms in the Compustat database for the years 2000-2008. Fiscal year 2000 is the first financial reporting year following the implementation of SFAS 133, which became effective after June 15, 2000. I require firms to meet the following criteria: (1) publicly traded, 2) domestically incorporated, (3) non-financial, 4) non-subsidiary, (5) at least three years of consecutive data, and (6) non-missing data necessary to calculate basic descriptive variables.[1] These screens result in 3,858 firms comprising 25,468 firm-year observations.

Following Guay (1999), I identify a subsample of *new* derivative users by manually verifying the implementation of a derivatives program for each firm. Specifically, I obtain information about fiscal year-end derivatives ownership from 10-K forms filed in the SEC's EDGAR database by searching the financial footnotes for a comprehensive listing of keywords relating to derivative use (Appendix B).[2] A firm is considered a *New User* if it did *not* report a derivatives position as of June 2000, but *did* report a position at a fiscal year-end between June 2001 and December 2008.[3] Firms enter the *New User* sample only when derivative use is first observed such that no firm comprises more than one *New User* observation. The resulting sample of *New Users* consists of 526 firms. See Appendix C for examples of *New User*s' derivative disclosures.

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[1] To remove non-corporate firms, I follow Dyreng et al. (2008) and eliminate (1) real estate investment trusts, (2) firm names ending in "-LP" or containing "Trust", and (3) firms with six-digit CUSIPs ending in "Y" or "Z". Financial firms are classified in SIC Codes 60-69.

[2] If Item 8 is "incorporated by reference", I search the incorporated document (where available) or subsequent disclosures to determine derivative use. For 93 observations I am unable to locate the appropriate document or otherwise determine derivative use. I code these observations as *Non-Users*; however, the primary analyses are not sensitive to the omission of these observations.

[3] For instance, a firm reporting a derivatives position at fiscal year-end December 2003, but not at fiscal year-end December 2002 or 2001, is classified as a *New User* in 2003.

For each *New User*, I construct a variable, *NTNL*, reflecting the total notional principal of derivatives held for non-trading purposes. Although notional amounts are generally larger than fair values, they capture the amount exposed to changes in fair value of the underlying and are the basis for determining the amounts exchanged by parties to the derivative (Barton 2001; Allayannis and Ofek 2000; Haushalter 2000; Guay 1999). However, SFAS 133 does not require disclosure of notional amounts (until 2009) and other regulations (e.g., Regulation S-K) hint at disclosure in only limited circumstances.[4] Therefore, I also construct a variable, *FVAL*, reflecting the fair value of derivatives held for non-trading purposes. Prior research finds fair values are highly correlated with notional amounts (i.e., greater than 0.60) indicating they are a coarse, yet reasonable, proxy for the extent of derivative use (Barton 2001).[5]

By classifying firms as *New Users*, I also identify two additional samples consisting of derivative users and non-users. A firm is considered a *User* if it reports an outstanding position in derivatives at the end of both fiscal year *t* and *t*-1, while firms reporting no derivative positions are classified as *Non-Users*. Firms may enter either of these samples more than once.[6] Additionally, a *New User* can be a *Non-User* in an earlier time period if it did not employ derivatives for at least two consecutive years, and can also enter the *User* sample after using derivatives for at least two consecutive years. These samples consist of 12,437 *User* and 12,505 *Non-User* firm-year observations.

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[4] For instance, paragraph 305(a)(1)(i) of Regulation S-K lists "contract" and "principal" amounts as examples of contract terms sufficient to determine future cash flows from market risk sensitive instruments.

[5] To mitigate the possibility of sample misclassification, I re-verify each *New User* while collecting notional and fair value information. Therefore, each *New User* observation has been coded as such no less than twice.

[6] For example, a firm using derivatives between 2003 and 2005 enters the *User* sample twice with each consecutive two-year period constituting a separate observation.

Tables 6-1 through 6-5 present characteristics of the *Non-User*, *User*, and *New User* samples. Table 6-1 illustrates the temporal distribution of observations, while Table 6-2 presents the type of derivative instruments held by *New Users* in each year. Although both tables reveal stable distributions over time for *Non-Users* and *Users*, the largest amount of *New Users* occurs in 2001. This high level of derivative activity likely results from the promulgation of SFAS 133, which made favorable financial reporting changes for derivatives in the previous year.[7] In addition, consistent with prior studies (e.g., Aretz and Bartram 2010), swaps and futures/forwards account for 53% and 36% of the instruments held by *New Users*, respectively.. Table 6-3 reports the industry distribution for each sample. Overall, firms from the manufacturing and service industries comprise the largest portion of the sample observations.

Table 6-4 presents mean and median values of variables used in subsequent analyses along with *t*-statistics for mean test of differences between *New Users* and that of *Non-Users*, *Users*, and a matched-control sample described below. These statistics indicate *Non-Users* and *Users* differ from *New Users* across several dimensions, including profitability (*ROA*) and firm size (*SIZE*). Table 6-5 presents the univariate Pearson correlations between descriptive variables for all observations. Although many correlations are significant, the table does not suggest a problem with multicollinearity as most are less than 0.40.[8] However, some exceptions include the relation between firm size (*SIZE*), analyst following (*ANF*), and institutional ownership (*INST*). Specific details regarding each variable, including calculations and data availability are provided in Appendix D.

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[7] It is also possible the largest amount of *New Users* occur in 2001 because SFAS 133 makes derivative use more transparent. However, repeating the primary analyses after excluding these observations reveals similar results.

[8] Variance Inflation Factors (VIFs) indicate multicollinearity is not an issue in any of the tests that follow.

Table 6-1. Temporal distribution of sample observations

	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Non-Users	1,662	1,647	1,650	1,591	1,492	1,380	1,257	1,058	768	12,505
Users	1,242	1,275	1,425	1,476	1,509	1,477	1,433	1,349	1,251	12,437
New Users	-	117	68	93	67	54	54	47	26	526
Total	2,904	3,039	3,143	3,160	3,068	2,911	2,744	2,457	2,045	25,468

Table 6-2. New derivative users by type of instrument and year

	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Options	-	1	3	2	4	1	2	3	2	18
Swaps	-	84	33	52	26	22	34	34	17	302
Futures/Forwards	-	36	31	41	34	29	17	11	8	207
Other	-	5	6	10	9	5	4	7	1	47
Total	-	126	73	105	73	57	57	55	28	574

Table 6-3. Industry distribution of sample observations

Description	SIC Code	Non-Users Obs.	Non-Users %	Users Obs.	Users %	New Users Obs.	New Users %
Agriculture, Forestry & Mining	1-1499	257	2	771	6	12	2
Construction	1500-1999	170	1	149	1	16	3
Manufacturing	2000-3999	6,154	49	6,449	52	246	47
Transportation & Communication	4000-4999	742	6	1,808	15	43	8
Wholesale	5000-5999	1,791	14	1,297	10	71	13
Business & Personal Services	7000-7999	2,434	19	1,515	12	93	18
Services	8000-8999	957	8	448	4	45	9
Total		12,505		12,437		526	

Table 6-4. Sample statistics and comparison tests

	Non-Users			Users			Matched Control			New Users[‡]	
Variable	Mean	Med.	*t*-stat	Mean	Med.	*t*-stat	Mean	Med.	*t*-stat	Mean	Med.
ABDAC	0.08	0.05	1.68	0.06	0.04	-3.60	0.07	0.05	0.05	0.08	0.04
ANF	4.65	3.00	-1.04	6.48	5.00	5.86	5.28	3.00	0.89	4.92	3.50
CAP	0.45	0.34	-1.73	0.58	0.49	6.37	0.48	0.37	0.17	0.47	0.41
CASH	0.16	0.05	-1.66	0.21	0.18	3.41	0.18	0.14	1.28	0.18	0.12
CONV	-0.11	-0.02	3.16	-0.14	-0.07	-0.09	-0.12	-0.03	1.24	-0.14	-0.04
CYC	214.76	107.05	1.39	132.28	95.78	-1.72	219.51	97.13	0.63	171.93	109.25
CURR	0.15	0.05	-.358	0.16	0.12	-2.36	0.18	0.18	-0.36	0.19	0.13
DELTA	-1.75	0.55	-2.76	-0.30	0.55	0.35	-0.66	0.55	-0.58	-0.46	0.55
DTAX	-0.02	0.01	-3.88	0.02	0.02	0.74	0.01	0.02	-0.47	0.01	0.02
FRGN	0.41	NA	-5.20	0.64	NA	5.30	0.55	NA	0.99	0.52	NA
GAAP	0.22	0.28	-6.01	0.29	0.33	0.78	0.27	0.34	-1.13	0.28	0.34
GROW	0.01	0.07	-6.64	0.02	0.07	-5.07	0.04	0.08	-1.67	0.09	0.09
INST	0.45	0.43	-8.98	0.62	0.68	-8.98	0.53	0.69	1.07	0.57	0.63
INTG	0.12	0.05	-0.85	0.17	0.10	-3.09	0.18	0.09	-1.23	0.20	0.14
INV	0.12	0.06	-0.40	0.12	0.08	-0.89	0.13	0.08	0.44	0.12	0.08
LEV	0.42	0.37	-5.06	0.56	0.56	8.62	0.50	0.49	1.61	0.47	0.45
LOSS	0.39	NA	5.11	0.22	NA	-3.21	0.25	NA	-1.37	0.29	NA
MB	3.90	2.05	1.42	3.30	1.90	0.60	2.38	1.96	-0.64	2.92	2.15
NBM	0.03	NA	-0.17	0.03	NA	0.97	0.04	NA	1.51	0.03	NA
NOL	0.39	NA	1.13	0.41	NA	1.85	0.33	NA	-1.16	0.37	NA
OCF	0.03	0.07	-5.85	0.09	0.09	2.69	0.08	0.09	0.86	0.07	0.08
PPEX	0.05	0.03	-2.78	0.06	0.04	-0.33	0.05	0.04	-0.94	0.06	0.04
RD	0.40	0.01	8.11	0.06	0.00	-2.39	0.09	0.00	-0.74	0.10	0.00
ROA	-0.05	0.03	-4.02	0.02	0.04	2.36	0.01	0.04	1.01	-0.01	0.04
SHLTR	5.97	8.01	-7.39	9.20	9.67	7.18	7.38	8.44	-0.88	7.66	8.78
SIZE	5.09	4.96	-11.75	7.03	6.95	17.86	6.00	5.87	1.59	5.86	5.81
STD	0.66	0.72	8.93	0.45	0.41	-7.56	0.57	0.55	1.51	0.55	0.53

Reported *t*-statistics reflect mean test of differences between the *New User* sample and all others. The matched pair *Non-User* control sample is formed by first limiting potential control firms to *Non-Users* holding no derivative positions during year *t*-1 and *t*, where *t* refers to *New User* year of initiation. Control firms are also limited to those facing *ex ante* interest rate, currency, or commodity price risks (see Graham and Rogers (2002) and Tufano (1998) for details). Firms are then matched on incentives to avoid taxes (*CAP*, *FRGN*, *RD*, *ROA*, *SIZE*, and 2-digit SIC industry membership). [‡]Values for *New Users* are measured prior to derivative use (*t*-1).

Table 6-5. Univariate correlations for full sample

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	*ABDAC*	1.00																
2	*ANF*	-0.04	1.00															
3	*CAP*	-0.07	-0.01	1.00														
4	*CASH*	-0.09	0.00	0.03	1.00													
5	*CONV*	0.09	-0.03	-0.01	-0.14	1.00												
6	*CYC*	0.01	0.01	-0.03	0.01	0.01	1.00											
7	*CURR*	-0.10	0.02	0.01	0.40	-0.26	0.01	1.00										
8	*DELTA*	-0.05	0.04	0.02	0.05	-0.03	0.00	0.05	1.00									
9	*DTAX*	-0.19	0.04	0.03	0.06	-0.03	0.00	0.07	0.06	1.00								
10	*FRGN*	-0.07	0.20	-0.15	0.09	-0.08	0.00	-0.03	0.03	0.07	1.00							
11	*GAAP*	-0.17	0.04	0.10	0.34	-0.73	0.00	0.49	0.08	0.12	0.07	1.00						
12	*GROW*	-0.02	0.03	0.01	0.02	-0.01	0.00	0.01	0.04	0.06	0.03	0.04	1.00					
13	*INST*	-0.10	0.37	-0.15	0.10	-0.07	-0.01	0.13	0.07	0.04	0.24	0.16	0.05	1.00				
14	*INTG*	-0.06	0.10	-0.32	0.03	-0.08	-0.01	0.00	0.01	0.04	0.14	0.06	0.04	0.20	1.00			
15	*LEV*	0.04	0.02	0.21	-0.01	-0.02	-0.02	-0.07	-0.01	-0.06	-0.01	0.00	-0.03	-0.04	0.04	1.00		
16	*LOSS*	0.16	-0.11	-0.10	-0.28	0.11	0.00	-0.28	-0.12	-0.33	-0.07	-0.42	-0.11	-0.18	-0.03	0.05	1.00	
17	*MB*	0.00	0.00	0.00	-0.01	0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	0.00	0.02	0.00	0.01	0.01	1.00
18	*NBM*	0.08	0.01	0.07	-0.07	0.04	0.00	-0.08	-0.01	-0.08	-0.03	-0.12	-0.04	-0.05	0.01	0.49	0.14	-0.05
19	*NOL*	0.04	0.04	-0.10	-0.12	-0.29	0.00	-0.17	-0.01	0.00	0.13	0.00	-0.01	0.02	0.10	0.03	0.16	0.01
20	*OCF*	-0.11	0.17	0.19	0.20	-0.11	-0.02	0.22	0.15	0.35	0.12	0.38	0.09	0.18	0.05	-0.09	-0.47	0.00
21	*PPEX*	0.03	0.07	0.53	-0.01	-0.02	-0.02	0.00	0.02	-0.02	-0.13	0.08	0.04	0.02	-0.22	0.05	-0.08	0.00
22	*RD*	0.04	-0.02	-0.06	-0.06	0.04	0.00	-0.06	-0.02	-0.16	-0.05	-0.09	-0.16	0.00	-0.03	-0.03	0.11	0.00
23	*ROA*	-0.29	0.07	0.06	0.18	-0.10	0.00	0.19	0.15	0.53	0.08	0.27	0.11	0.12	0.02	-0.30	-0.46	0.00
24	*SHLTR*	-0.28	0.21	0.07	0.20	-0.10	0.00	0.19	0.10	0.25	0.15	0.30	0.05	0.27	0.06	-0.10	-0.37	0.00
25	*SIZE*	-0.15	0.49	0.11	0.15	-0.09	-0.02	0.11	0.07	0.10	0.26	0.23	0.04	0.59	0.20	0.24	-0.25	0.00
26	*STD*	0.06	-0.08	-0.35	-0.05	0.06	0.00	-0.01	-0.04	-0.01	0.06	0.00	0.01	-0.13	-0.16	-0.45	0.09	-0.01

Table 6-5. Continued

		18	19	20	21	22	23	24	25
18	*NBM*	1.00							
19	*NOL*	0.04	1.00						
20	*OCF*	-0.11	-0.12	1.00					
21	*PPEX*	0.01	-0.06	0.17	1.00				
22	*RD*	0.02	0.02	-0.16	-0.03	1.00			
23	*ROA*	-0.14	-0.10	0.55	0.03	-0.14	1.00		
24	*SHLTR*	-0.17	-0.23	0.48	0.05	-0.12	0.50	1.00	
25	*SIZE*	0.00	-0.02	0.26	0.06	-0.05	0.18	0.43	1.00
26	*STD*	0.15	0.04	-0.08	-0.16	0.01	-0.05	-0.16	-0.45

CHAPTER 7
RESEARCH DESIGN AND EMPIRICAL RESULTS

Derivative Use and Changes in Tax Burden

Research Design

To test whether firms' tax burdens decrease after implementing a derivatives program (H_1), I examine changes in effective tax rates (ETRs) across multi-year windows surrounding program initiation. An ETR (tax liability over pre-tax profit) offers a direct assessment of tax burden (Callihan 1994). However, because estimates of tax liability are subject to numerous limitations, I employ a portfolio of measures: (1) current ETR (current tax expense per dollar of book income) (*CURR*); (2) cash ETR (cash taxes paid per dollar of book income) developed by Dyreng et al. (2008) (*CASH*); and (3) the financial statement ETR (total tax expense per dollar of book income) (*GAAP*).[1] *CURR* reflects deferral strategies and non-conforming avoidance (Hanlon and Heitzman 2010) such that larger ratios imply a greater need for tax planning (Lasilla et al. 2010). *CASH* captures deferrals and provides a direct measure of firms' cash tax payments (Dyreng et al. 2008), while *GAAP* ignores deferrals but captures the tax rate affecting accounting earnings. Despite relative advantages (and disadvantages), all three ratios capture tax burden with error.[2]

Following Guay (1999), values for *New Users* in Table 6-4 are measured *prior* to derivative use and are therefore less likely to be determined simultaneously with the implementation decision. However, the large between-sample variation in numerous characteristics suggests a direct comparison of tax burdens would be misleading. Further, short

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[1] Following prior research (e.g., Robinson et al. 2010; Rego 2003), I constrain each metric to lie between 0 and 100% to avoid estimation problems and unreasonable values due to small denominators.

[2] Although sample attrition precludes the use of long-run metrics for *New Users*, tax burden changes are computed across multiple years. See Hanlon and Heitzman (2010) for a discussion of these and other ETRs.

time windows raise concerns that tax burden changes may result from sample selection procedures and period-specific economic conditions. To mitigate these possibilities, I create a matched-pair control sample of *Non-Users*, and examine changes in *New Users'* tax burdens relative to changes experienced by control firms. For each *New User*, potential control firms are first limited to those holding no derivatives during the corresponding years *t*-1 and *t*, where *t* refers to the year of initiation. This approach ensures tax burden changes for *New Users* and control firms are calculated over equivalent periods. Because risk management is an important motive for derivative use, I also limit potential control firms to those facing *ex ante* interest rate, currency, or commodity price risks. By focusing only on these firms, the absence of derivatives reflects a choice not to use them, rather than lack of exposure to transferable risks.[3] I then match eligible control firms based on similar incentives to avoid taxes, which results in a matched-pair portfolio of 526 observations.[4] Finally, control-sample adjusted changes are computed by subtracting each *New Users*' change in tax burden from the change experienced by its control sample counterpart.

To examine whether speculative and ineffective hedgers (hereafter, *SPIN*) experience larger reductions in tax burden (relative to effective hedgers) following the implementation of a derivatives program (H_2), I follow a procedure developed by Zhang (2009) to identify these firms. In short, this two-step approach classifies *New Users* as *SPIN* based on the change in a

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[3] See Graham and Rogers (2002) and Tufano (1998) for details. In short, firms are deemed to have *ex ante* foreign currency exposure if they disclose foreign assets, sales, income, currency adjustments, exchange rate effects, income taxes, or deferred taxes in Compustat. *Ex ante* interest rate (commodity) risk is based on the sensitivity of operating income to interest rates (commodity price indices).

[4] Specifically, firms are matched according to capital asset intensity (*CAP*), foreign operations (*FRGN*), research and development intensity (*RD*), profitability (*ROA*), firm size (*SIZE*), and industry (2-digit SIC codes). If more than one *Non-User* matches on all parameters, then mean values for these firms are used as the control values.

given risk exposure after program initiation.[5] The first step estimates the exposure to interest rate, foreign exchange rate, and commodity price risks before and after initiation. Following prior research (Zhang 2009; Wong 2000; Guay 1999), these risks are defined as follows:

> INTEREST RATE EXPOSURE. The absolute value of the estimated coefficient from a regression of firms' monthly stock returns on the monthly percentage change in LIBOR.
>
> FOREIGN CURRENCY EXCHANGE RATE RISK EXPOSURE. The absolute value of the estimated coefficient from a regression of firms' monthly stock returns on the monthly percentage change in the Federal Reserve Board trade-weighted US dollar index.
>
> COMMODITY PRICE RISK EXPOSURE. The absolute value of the estimated coefficient from a regression of firms' monthly stock returns on the monthly percentage change in a given commodity price.

Using data from the pre-initiation period, I estimate three regressions quantifying how firms' risk exposures are affected by industry and firm characteristics before derivative use. I then calculate the expected risk exposures for each firm in the post-initiation period using estimated coefficients from the pre-initiation period and explanatory variables measured after initiation. Using these results, firms are designated as *SPIN* (*EH*) if a risk exposure in the post-initiation period is larger (smaller) than expected. Overall, 179 *New Users* are classified as *SPIN* with the remaining 347 as *EH*.[6]

Empirical Results

Tables 7-1 through 7-4 report results for tests of H_1 and H_2. Table 7-1 presents percentage means of each tax burden metric for *New Users* and the matched control sample for the seven-

[5] See Zhang (2009) for complete details regarding this procedure.

[6] The primary results are not sensitive to *SPIN* designations based upon firms having more than one risk exposure larger than expected in the post-initiation period or to classifications based a 1% de minimis threshold.

year window (*t*-3 to *t*+3) relative to the year (*t*) of derivative implementation.[7] Although decreases in ETRs occur for *New Users* in the immediate pre/post initiation window (*t*-1 to *t*), these trends do not persist for *CASH* and *GAAP* in subsequent periods. This result is not surprising, however, given that tax planning strategies may result in both immediate and delayed realizations of tax benefits (e.g., Scholes et al. 2009).[8] As such, the tests that follow consider post-initiation periods longer than one year.

Table 7-2 reports results for tests of mean changes in tax burden for *New Users* and *New Users* adjusted for mean changes in the matched control sample, where changes are measured across the indicated periods.[9] The first set of tests compare tax burdens immediately preceding derivatives initiation (*t*-1) to those at initiation and three years thereafter (*t* to *t*+3). The results indicate *New Users* experience significant reductions in tax burden following derivatives implementation. Specifically, changes in current taxes (*CURR*), cash taxes paid (*CASH*), and total income tax expense (*GAAP*) are negative. With the exception of *GAAP*, control sample adjusted tax burdens reveal similar results. Because derivatives implementation may be costly or generate benefits with a lag (e.g., Artez and Bartram 2010), the second set of tests consider year *t* as a transition period and evaluate changes between pre-initiation (*t*-1) and the three years subsequent to initiation (*t*+1 to *t*+3). These results indicate negative changes in *CURR* and *CASH* for *New Users* and *New Users* adjusted for changes in the control sample, but reveal no reduction

[7] Widening this window to include other years requires adequate *New User* observations. Relative years beyond those reported result in sample sizes of less than 100 and substantially larger (and widely varying) standard deviations. The results that follow are not affected by the choice to report a seven-year window.

[8] For example, deferral strategies can immediately reduce cash taxes paid, while *New Users* may experience a learning curve associated with derivatives, especially if they are employed to maximize after-tax rate of returns.

[9] The reliability of the *t*-statistics associated with *New User* changes is questionable given the potential bias in the standard errors. Because the measured changes are likely correlated across firms, the standard errors used to calculate the *t*-statistics are likely to be too small. However, bias in the control-sample adjusted standard errors is likely to be less severe (Guay 1999). Additionally, tests of median changes in tax burdens reveal similar results.

in *GAAP*. Finding no change in *GAAP* suggests derivatives primarily provide tax deferrals rather than create permanent book-tax differences that result in lower book effective tax rates. Overall, consistent with H_1, the negative changes in Table 7-2 indicate tax burdens decrease after derivatives implementation. As a percentage of *New Users'* previous tax burdens (adjusted for control sample changes), these reductions represent a 1.7% and 4.0% decrease in current tax expense and cash taxes paid, respectively.

Table 7-3 presents percentage means of *New Users*' tax burdens, where *New Users* are classified as either speculative/ineffective (*SPIN*) or effective hedgers (*EH*). Similar to Table 7-1, tax burdens for both *SPIN* and *EH* decrease immediately following derivatives implementation, but later revert in *CASH* and *GAAP*. Thus, to examine whether *SPIN* experience larger reductions in tax burden relative to *EH* (H_2), changes are measured across the same periods as those above. Table 7-4 reports results for tests of mean changes in tax burden among *SPIN* and *EH* classifications.[10] For both periods the results indicate tax burden reductions for *SPIN* are significantly larger than those for *EH*. Specifically, differences between mean changes in tax burden for each group are negative and significant for all three ETRs. Consistent with H_2, these results suggest effective hedging is not alternative explanation for the results in Table 7-2.

Another possibility is the tax burden reductions in Table 7-2 (H_1) are the result of lower income volatility (Graham 1999) and/or increased debt capacity (Stulz 1996) due to derivative use. To consider these explanations, I examine changes in volatility and debt usage across the same periods as those in Tables 7-2 and 7-4. For the period *t*-1 versus *t* to *t*+3, I find no significant change in return on assets, incidences of losses, pretax income, or the standard

[10] Tests of median changes in tax burdens reveal similar results.

deviation of pretax income.[11] Additionally, I find a decrease in long-term debt (*dltt*) (-0.02; $p<0.02$) and long-term debt issuances (*dltis*) (-0.04; $p<0.04$), and no significant change in total, current, or convertible debt usage.[12] Finding no change in the variability of income and only reductions in long-term debt strongly mitigates the likelihood that post-implementation tax burden reductions (H_1) are explained by these alternative theories. However, it is still possible that tax burdens decrease because firms increase their use of (unobservable) off-balance-sheet financing following the implementation of derivatives.

Cross-Sectional Variation in Tax Burden Changes

Research Design

To examine whether *New Users* experience larger reductions in tax burden as the size of derivative positions increase (H_3), I estimate the following model using ordinary least squares for *New Users* disclosing the magnitude (*MAG*) of their positions – i.e., notional principal (*NTNL*) or fair value (*FVAL*):[13]

$$\begin{aligned}\Delta ETR_{it} = {} & \varphi_0 + \varphi_1(\Delta RD_{it}) + \varphi_2(CAP_{it}) + \varphi_3(INTG_{it}) + \varphi_4(\Delta INV_{it}) + \varphi_5(\Delta LEV_{it}) + \\ & \varphi_6(FRGN_{it}) + \varphi_7(GROW_{it}) + \varphi_8(\Delta ROA_{it}) + \varphi_9(LOSS_{it}) + \varphi_{10}(SIZE_{it}) + \\ & \varphi_{11}(MAG_{it}) + \sum \omega_k(IND) + \varepsilon_{it}.\end{aligned} \tag{7-1}$$

[11] Changes in return on assets (0.01; $p<0.21$), pretax income (pi) to total assets (at) (0.01; $p<0.14$), standard deviation of pretax income (0.09; $p<0.29$), and the percentage of loss observations (-0.02; $p<0.23$) are insignificant. All tests are one-tailed assuming unequal variances. Results are similar for the period t-1 versus t+1 to t+3.

[12] Changes in total (tl/at) (-0.02; $p<0.29$), current (lct/at) (-0.01; $p<0.30$), and convertible debt (dcvt/at) (0.01; $p<0.15$) are insignificant. All tests are one-tailed assuming unequal variances. Results are similar for the period t-1 versus t+1 to t+3.

[13] Due to variation in individual derivative instruments, notional principal and fair value capture the effects of derivative use on firms' tax burdens with error (Smith 1995). If this error component is correlated with other variables, then inferences from these tests may be spurious. However, Guay (1999) notes that without a model specifying how firms choose features of individual securities it is difficult control for this potential problem.

The dependent variable, *ΔETR*, is the change in *New Users'* tax burden (*ΔCURR*, *ΔCASH*, and *ΔGAAP*) relative to the year (*t*) of initiation across the period *t*-1 versus *t* to *t*+3.[14] Other than *MAG*, variables in Equation (7-1) capture incentives to avoid taxes and thus relate to changes in tax burden. For instance, divergent financial and tax reporting rules governing the deductibility of research and development expenses (*ΔRD*), depreciation (*CAP*), and intangibles (*INTG*) are associated with tax avoidance (Donohoe and McGill 2011; Mills et al. 1998). Firms may also substitute inventory for capital expenditures (*ΔINV*) and take advantage of the debt tax shield (*ΔLEV*), while those with foreign operations (*FRGN*) typically have more opportunities to avoid taxes than firms operating only domestically (Rego 2003). Additionally, sales growth (*GROW*), profitability (*ΔROA* and *LOSS*), and firm size (*SIZE*) reflect other general characteristics associated with changes in tax burden (Robinson et al. 2010). Consistent with H_3, I expect a negative coefficient for *MAG* as it implies decreasing tax burdens as the magnitude of derivatives increase.

Empirical Results

Tables 7-5 and 7-6 present results for tests of cross-sectional variation in *New Users*' tax burden changes. Specifically, Tables 7-5 and 7-6 report the results of estimating Equation (7-1) on *New Users* disclosing notional principal (*NTNL*) and fair value (*FVAL*) of initial derivative positions, respectively. For changes in *CURR*, the coefficients for *NTNL* and *FVAL* are negative and significant implying the larger the initial magnitude of positions, the greater the decline in current tax expense. Additionally, coefficients for control variables are consistent with tax avoidance. For example, greater capital asset intensity (*CAP*) is indicative of greater depreciation expense – a deferred item. Likewise, positive sales growth (*GROW*) may result in a higher tax

[14] Considering year *t* as a transition period and calculating tax burden changes between pre-initiation (*t*-1) and the three years after initiation (*t*+1 to *t*+3) reveals similar results.

burden by increasing taxable income, while a negative relation with changes in *LEV* suggests the associated interest expense reduces current taxes. *NTNL* and *FVAL* are also negatively related with changes in *CASH* (p<0.10), but have no association with changes in book effective tax rates (*GAAP*).[15]

Overall, consistent with H_3, the evidence in Tables 7-5 and 7-6 indicates the magnitude of *New Users*' initial derivative positions are inversely related to changes in current tax expense and cash taxes paid. As before, these results imply derivative-based tax planning offers substantial tax deferral opportunities. Further, if the inferences drawn for H_1 and H_2 are spurious, then neither the magnitude of derivative positions nor proxies for tax planning incentives would be correlated with observed changes in tax burdens. Therefore, the results of H_3 not only add credibility to the previous conclusions, but also mitigate concerns about the potential correlation between incentives to use derivatives and the amount firms choose to employ (e.g., Guay 1999).

Determinants of Derivative Program Initiation and Magnitude of Initiation

Research Design

To test whether tax aggressive firms are more likely to initiate a derivatives program (H_{4A}), I estimate the following logistic regression model on a pooled sample of *New Users* and *Non-Users*:

$$\ln\left(\frac{P_{\text{initiation}}}{1-P_{\text{initiation}}}\right) = \beta_0 + \beta X + \mu, \tag{7-2}$$

where $\ln\left(\frac{P_{\text{initiation}}}{1-P_{\text{initiation}}}\right)$ is the probability a firm initiates a derivatives program (i.e., a *New User*), and

[15] I also estimate Equation (7-1) using probit regression, where the dependent variable is an indicator equal to 1 for negative tax burden changes. The results of these analyses are similar to those reported above. That is, the larger the magnitude of initial derivative positions, the higher the probability of a negative change in *CURR* and *CASH*.

$$\beta X = \beta_1(CONV_{it}) + \beta_2(LEV_{it}) + \beta_3(ROA_{it}) + \beta_4(NOL_{it}) + \beta_5(NBM_{it}) + \beta_6(MB_{it}) + \beta_7(RD_{it}) + \beta_8(PPEX_{it}) + \beta_9(DELTA_{it}) + \beta_{10}(ANF_{it}) + \beta_{11}(ABDAC_{it}) + \beta_{12}(CYC_{it}) + \beta_{13}(STD_{it}) + \beta_{14}(INST_{it}) + \beta_{15}(FRGN_{it}) + \beta_{16}(OCF_{it}) + \beta_{17}(SIZE_{it}) + \beta_{18}(TA_{it}^{D,S}) + \sum \omega_k(IND) + \sum \tau_t(YR).$$

I use two continuous measures to proxy for firm-level tax aggressiveness ($TA^{D,S}$): (1) *DTAX*, an estimate of discretionary permanent book-tax differences developed by Frank et al. (2009),[16] and (2) *SHLTR*, an estimate of the probability a firm is engaged in tax shelter activity developed by Wilson (2009).[17] Consistent with H_{4A}, I expect a positive association between $TA^{D,S}$ and the choice to initiate. The remaining variables capture diverse incentives for derivatives implementation, including: (1) tax function convexity, (2) financial distress, (3) conflicts of interest, (4) managerial risk aversion, and (5) income smoothing. Each variable is described in turn.

If the function mapping taxable income into tax liabilities is convex, then reducing income volatility by hedging may result in lower expected taxes (Smith and Stulz 1985). As such, the difference between firms' marginal and average tax rates (*CONV*) is expected to have a positive association with derivatives initiation (Barton 2001). Similarly, by reducing the variance of firm value, derivatives may mitigate expected costs of financial distress (Smith and Stulz 1985). Thus, I include leverage (*LEV*) to measure expected costs of distress (Haushalter 2000; Dolde 1995), return on assets (*ROA*) to capture firm profitability where less profitable firms have a higher

[16] Permanent book-tax differences arise from fundamental differences in the scope of activities considered to be income or expense items under the financial and tax reporting systems (Mills and Plesko 2003). Building on the discretionary accruals literature, Frank et al. (2009) develop an estimate of discretionary permanent differences by regressing permanent differences on nondiscretionary items unrelated to tax planning, but known to cause permanent differences. As such, their metric reflects permanent differences likely resulting from tax planning transactions under management control. See Appendix D for more details.

[17] Firms' tax shelter scores are based on the model of tax sheltering in Wilson (2009). He estimates the parameters for his model based on a sample of identified tax shelter participants, where the model includes variables predicted to be associated with tax shelter activity. The metric attempts to identify active tax shelter participants and, as a result, likely captures the most tax aggressive firms. See Appendix D for more details.

probability of entering distress, net operating loss carry forwards (*NOL*) to indicate past distress, and an indicator of negative book-to-market ratios (*NBM*) to capture extreme financial distress. Because incentives to use derivatives are greater for firms facing higher costs of distress, a negative relation with implementation is expected for *ROA* and a positive association for these other variables.[18]

Conflicts of interest between fixed and residual claimholders are related to firms' investment opportunity set. By using derivatives, firms can redistribute cash flow from states in which it exceeds obligations to states with insufficient cash flow. In doing so, derivatives can reduce the incentive to underinvest by increasing the number of future states in which equity holders are the residual claimholders (Berkman and Bradbury 1996; Bessembinder 1991). Therefore, firms with valuable growth options are more likely to begin using derivatives as they are more apt to be affected by underinvestment problems. Alternatively, Froot et al. (1993) demonstrate it is not the existence of growth options per se that is a determinant of derivative use, but the risk of not being able to convert growth options into assets in place. As such, I include proxies for both the value of a firm's growth options (*MB* and *RD*) and the ability to convert growth options into assets in place (*PPEX*).

Income volatility can be costly for managers if their compensation is tied to corporate income or cash flows (Smith and Stulz 1985; Stulz 1984). Thus, if management wealth is a concave function of firm value, then it is optimal for managers to hedge firm value. However, managers are better off without hedging if options and bonus plans make compensation a convex function of firm value. *DELTA* considers managerial incentives to alter firm risk as it reflects the partial derivative of the dividend-adjusted Black-Scholes value of the CEO's stock and option

[18] It is important to note that derivatives may also increase debt capacity. For example, Graham and Rogers (2002) find that firms use derivatives to mitigate expected distress costs and that derivative use leads to greater leverage.

portfolio with respect to firms' stock price, multiplied by 1% (Core and Guay 1999). This variable is expected to have a positive relation with derivatives implementation because it captures whether managers have exposures to idiosyncratic risks that can be reduced with derivatives.

Managers are under increasing pressure to report smooth earnings (Barton 2001). For example, firms with heavy analyst following may avoid reporting earnings surprises (Johnson 1999), while less volatile earnings and cash flows can prevent underinvestment by reducing financing costs (Minton and Schrand 1999; Géczy et al. 1997). Additionally, Barton (2001) finds managers use derivatives and discretionary accruals simultaneously to smooth earnings. Thus, I include number of analysts (*ANF*) and discretionary accruals (*ABDAC*) to control for these smoothing incentives and expect positive associations with derivatives program implementation.

Other firm characteristics may also explain the implementation decision. For instance, firms with long cash conversion cycles (*CYC*) may benefit from derivatives because their cash flows are exposed to price fluctuations for extended periods (Barton 2001). Likewise, firms with short debt maturities (*STD*) may benefit from interest rate swaps (Visvanathan 1998). Additionally, managers have an incentive to hedge away performance uncertainty so the market can more precisely infer their talent (Breeden and Viswanathan 1998; Demarzo and Duffie 1991). As such, if firms owned primarily by institutional investors (*INST*) face less information asymmetry, then they should rely less on derivatives (Barton 2001). Finally, characteristics such as foreign operations (*FRGN*), liquidity constraints (*OCF*), and firm size (*SIZE*) are also known to influence a firm's choice to use derivatives (Aretz and Bartram 2010).

To examine whether tax aggressive firms have larger derivative positions at initiation (H_{4B}), I use two methods of analysis. First, I replace the dependent variable in Equation (7-2) with *MAG* and estimate the model using Tobit regression on the pooled sample of *New Users* and *Non-Users*.[19] Second, I use a variant of the Tobit model proposed by Cragg (1971) to accommodate the possibility the initiation of a derivatives program depends on two decisions, each with different determinants. The Cragg model applies when the probability of a nonlimit outcome (e.g., the decision to begin using derivatives) is determined separately from the level of the nonlimit outcome (e.g., the amount of derivatives to employ). This approach combines a binomial probit (the decision equation) with a conditional (truncated) regression model (the equation for nonzero outcomes). Specifically, in the first stage, using the pooled sample of *New Users* and *Non-Users*, I estimate Equation (7-2) using binomial probit regression. Then, in the second stage, using only *New Users*, I estimate a truncated model (*MAG*>0) that includes a selectivity correction variable (*IMR*) from the first stage. Overall, a positive coefficient for $TA^{D,S}$ is expected in both the Tobit and Cragg specifications.

Empirical Results

Table 7-7 reports the results of estimating Equation (7-2) on a pooled sample of 526 *New User* and 10,843 *Non-User* observations with available data, where the dependent variable (*INIT*) is an indicator set equal to 1 if the firm is a *New User* and 0 if a *Non-User*.[20] Following Guay (1999), I measure *New Users'* incentives (independent variables) prior to derivative use in order to mitigate concerns about simultaneous decisions. Specifically, Panel A presents results where *New Users* incentives are measured in the year prior to initiation (*t*-1), whereas Panel B reports results where incentives are averaged over the three years preceding initiation (*t*-3 to *t*-1). In both

[19] *MAG* is left-censored as it has a value of zero for *Non-Users*.

[20] I use the Hausman test in each regression that follows to examine whether the extra orthogonality conditions imposed by a random effects estimator is more appropriate than a fixed effects estimator. The null hypothesis that the random effects estimator is consistent is rejected in all cases suggesting the fixed effects estimator is preferred. Additionally, VIFs (all <4) for each regression indicate multicollinearity is not a major concern (Kutner et al. 2004).

panels, coefficients for *DTAX* and *SHLTR* are positive and significant, while coefficients for the other independent variables are consistent with prior research. Overall, consistent with H_{4A}, these results strongly suggest the decision to implement a derivatives program is a function of firms' *ex ante* preferences for less conservative tax planning techniques.

Table 7-8 reports the results of estimating Equation (7-2) using Tobit regression and *MAG* as the dependent variable. Specifically, Panel A (B) of Table 7-8 reports coefficient estimates for the pooled sample of 440 (456) *New Users* disclosing *NTNL* (*FVAL*) and 10,843 *Non-User* firm-year observations holding no derivatives. As before, *New Users'* incentives are measured prior to derivative use (*t*-1).[21] Although many of the independent variables are consistent with previous tests, coefficients for *DTAX* and *SHLTR* are insignificant in both panels. This finding implies that while *ex ante* aggressive tax behavior influences the decision to initiate a derivatives program (H_{4A}), it does not affect the magnitude of the positions (i.e., inconsistent with H_{4B}).[22]

Finally, Tables 7-9 and 7-10 present results for determinants of the magnitude of derivatives implementation by *New Users* (H_{4B}) after separating the initiation decision from the quantity decision. Specifically, Table 7-9 and Table 7-10 report coefficient estimates and *z*-statistics for the Cragg (1971) specification of Equation (7-2), where the truncated models include total notional principal (*NTNL*) and fair value (*FVAL*) of derivatives at initiation,

[21] Averaging incentives over the three years preceding initiation (*t*-3 to *t*-1) reveals similar results.

[22] Derivatives considerable financial and tax reporting implications suggests the presence of auditor-provided tax services may influence the implementation and/or magnitude decisions, especially in the case of aggressive tax behavior (e.g., Donohoe and Knechel 2011). To investigate this possibility, I include an indicator variable (*APTS*) in Equation (7-2) to capture observations where the firm's auditor provides tax services (e.g., compliance, consulting, etc.) during the fiscal year. *APTS* is set equal to 1 if fees paid for tax services are greater than zero (0 otherwise). Because disclosure of tax fees paid to external auditors was voluntary prior to 2003, I estimate Equation (7-2) using a subset of observations from 2003 to 2008. The coefficients for *APTS* are insignificant in both cases (p<0.13, 0.18) suggesting auditor-provided tax services influences neither the initiation nor magnitude decision. Results are similar using a $10,000 tax fee de minimus expenditure threshold.

respectively. Consistent with the previous analyses, both tables reveal positive and significant coefficients for *DTAX* and *SHLTR* in the first stage (i.e., initiation), but insignificant coefficients in the second stage (i.e., magnitude). Further, comparing coefficients for control variables among the first and second stage results suggests different determinants influence each decision. For example, tax function convexity (*CONV*) and the market-to-book ratio (*MB*) are only positive and significant in the second stage implying that once firms make the decision to employ derivatives, higher expected taxes and the level of growth options help explain the extent of use. Conversely, an incentive to smooth reported earnings (*ABDAC*) is important in making both decisions. Nevertheless, separating derivatives implementation into two separate decisions allows for inferences consistent with the earlier analyses. In summary, the analyses reported in this section collectively suggest tax avoidance is an incentive to employ derivatives and an outcome of their use.

Table 7-1. Mean tax burden (%) relative to derivative program initiation – New Users

	CURR		*CASH*		*GAAP*		
t	New Users	Control	New Users	Control	New Users	Control	*N*
-3	16.54	17.39	23.65	26.18	27.49	25.21	318
-2	16.68	15.81	25.30	27.55	28.25	25.09	399
-1	18.66	18.81	27.47	25.07	28.98	27.92	526
0	18.16	18.78	24.99	28.78	27.19	23.99	526
1	16.54	18.25	24.50	27.43	27.68	27.16	480
2	15.94	18.42	26.00	26.77	27.99	27.71	402
3	14.92	18.24	27.57	28.89	27.30	25.89	331

Table 7-2. Changes in tax burden (%) around derivative program initiation – New Users

	Period t-1 vs. t to t+3				Period t-1 vs. t+1 to t+3			
	Unadjusted		Ctrl. Adjusted		Unadjusted		Ctrl. Adjusted	
	Mean	t-stat	Mean	t-stat	Mean	t-stat	Mean	t-stat
CURR	-2.08	-2.11	-1.72	-1.97	-2.76	-2.79	-2.26	-2.60
CASH	-1.80	-1.39	-3.99	-4.58	-1.60	-1.28	-3.32	-3.81
GAAP	-1.42	-1.44	0.25	0.03	-1.30	-1.21	-0.38	-0.04

Table 7-3. Mean tax burden (%) relative to derivative program initiation – *SPIN* vs. *EH*

	CURR		*CASH*		*GAAP*		N	
t	*SPIN*	*EH*	*SPIN*	*EH*	*SPIN*	*EH*	*SPIN*	*EH*
-3	15.58	18.23	23.15	24.14	29.93	26.11	121	197
-2	15.88	17.94	25.14	25.38	28.46	28.12	150	249
-1	18.18	19.41	28.91	26.65	31.31	27.78	179	347
0	17.50	19.42	23.67	26.00	28.25	26.64	179	347
1	16.26	17.15	24.41	24.54	28.61	27.37	159	321
2	15.32	17.13	24.11	26.96	27.92	28.10	126	276
3	13.28	18.76	27.39	27.67	28.87	26.63	99	232

Table 7-4. Mean changes in tax burden (%) around derivative program initiation – *SPIN vs. EH*

	Period *t*-1 vs. *t* to *t*+3				Period *t*-1 vs. *t*+1 to *t*+3			
	SPIN	*EH*	Diff.	*t*-stat	*SPIN*	*EH*	Diff.	*t*-stat
CURR	-2.36	-1.26	-1.10	-1.28	-3.07	-1.91	-1.16	-1.39
CASH	-4.28	-0.49	-3.78	-4.33	-3.83	-0.43	-3.40	-3.89
GAAP	-2.92	-0.60	-2.32	-2.66	-2.86	-0.37	-2.49	-2.86

Table 7-5. New Users disclosing notional principal (*NTNL*) of initial derivatives positions

		ΔCURR		*ΔCASH*		*ΔGAAP*	
	Exp.	Coeff.	*t*-stat	Coeff.	*t*-stat	Coeff.	*t*-stat
Constant	+/-	-0.08	-1.64	-0.02	-0.33	0.03	0.65
ΔRD	-	0.02	0.69	0.02	0.07	0.02	0.58
CAP	-	-0.06	2.06	-0.08	-1.63	0.00	0.05
INTG	-	0.02	0.29	-0.01	-0.17	-0.05	-0.96
ΔINV	-	-0.16	-0.62	0.26	0.70	0.00	0.00
ΔLEV	-	-0.09	-2.18	0.07	1.09	-0.11	-2.51
FRGN	-	0.34	0.85	-0.45	-0.81	-0.38	-0.93
GROW	+	0.10	2.97	0.00	-0.02	0.12	3.36
ΔROA	+/-	0.03	0.78	-0.33	-1.91	0.05	1.26
LOSS	-	-0.02	-1.08	-0.05	-1.22	-0.04	-1.75
SIZE	+/-	0.01	0.69	0.02	1.37	0.00	-0.58
NTNL	H_3	-0.10	-2.22	-0.09	-1.69	0.02	0.33
Industry		Yes		Yes		Yes	
Obs.		440		440		440	
Adj. R^2		0.07		0.06		0.07	
Overall F		2.91		1.77		2.70	

Changes are measured relative to the year (*t*) of derivative initiation across the period *t*-1 versus *t* to *t*+3. Industry fixed-effects are based on 2-digit SIC codes, and reported *t*-statistics are based on robust standard errors (White 1980).

Table 7-6. New Users disclosing fair value (*FVAL*) of initial derivatives positions

		ΔCURR		*ΔCASH*		*ΔGAAP*	
	Exp.	Coeff.	*t*-stat	Coeff.	*t*-stat	Coeff.	*t*-stat
Constant	+/-	-0.06	-1.33	0.00	-0.07	0.04	0.78
ΔRD	-	0.02	0.67	0.06	0.18	0.02	0.56
CAP	-	-0.06	2.14	-0.08	-1.80	0.01	0.19
INTG	-	0.01	0.12	-0.02	-0.25	-0.05	-0.91
ΔINV	-	-0.11	-0.43	0.31	0.85	0.01	0.05
ΔLEV	-	-0.07	-1.75	0.08	1.24	-0.10	-2.32
FRGN	-	0.36	0.90	-0.42	-0.78	-0.38	-0.95
GROW	+	0.10	3.01	0.00	0.05	0.11	3.35
ΔROA	+/-	0.03	0.77	-0.35	-2.02	0.05	1.19
LOSS	-	-0.02	-1.06	-0.05	-1.25	-0.04	-1.76
SIZE	+/-	0.00	0.25	0.01	1.18	-0.01	-0.82
FVAL	H_3	-0.16	-3.24	-0.10	-1.66	0.03	0.49
Industry		Yes		Yes		Yes	
Obs.		456		456		456	
Adj. R^2		0.07		0.06		0.06	
Overall F		3.16		1.66		2.61	

Changes are measured relative to the year (*t*) of derivative initiation across the period *t*-1 versus *t* to *t*+3. Industry fixed-effects are based on 2-digit SIC codes, and reported *t*-statistics are based on robust standard errors (White 1980).

Table 7-7. Determinants of derivative program initiation

		Panel A New User Incentives (*t*-1)				Panel B New User Incentives (*t*-3 to *t*-1)			
		DTAX		*SHLTR*		*DTAX*		*SHLTR*	
	Exp.	Coeff.	*z*-stat	Coeff.	*z*-stat	Coeff.	*z*-stat	Coeff.	*z*-stat
CONV	+	0.29	1.39	0.35	1.66	0.38	1.79	0.48	2.29
LEV	+	0.19	0.91	-0.07	-0.34	0.24	1.11	-0.03	-0.17
ROA	-	-0.18	-0.79	0.06	0.20	-0.21	-0.79	0.18	0.62
NOL	+	0.09	0.90	0.03	0.28	0.07	0.73	-0.01	-0.10
NBM	+	0.18	0.58	0.21	0.66	0.21	0.67	0.17	0.56
MB	+	0.00	-0.32	0.00	-0.25	0.00	0.55	0.00	0.69
RD	+	0.27	2.16	0.28	2.17	0.00	0.09	0.00	0.02
PPEX	+	2.44	3.16	2.19	2.82	2.34	2.99	2.14	2.77
DELTA	+	0.02	1.47	0.02	1.36	0.00	0.05	0.00	-0.01
ANF	+	0.02	1.77	0.03	1.94	0.02	1.48	0.02	1.68
ABDAC	+	1.71	2.83	1.73	2.84	1.83	3.04	1.31	2.48
CYC	+	0.00	-0.48	0.00	-0.50	0.00	-0.86	0.00	-0.92
STD	+	0.85	4.45	0.95	4.98	0.69	3.57	0.80	4.20
INST	-	0.26	1.49	0.26	1.46	-0.16	-0.88	-0.08	-0.43
FRGN	+	0.36	3.47	0.38	3.64	0.40	3.90	0.43	4.14
OCF	+	0.01	0.01	0.57	1.33	0.56	1.32	0.94	2.24
SIZE	+	0.19	5.25	0.23	6.23	0.18	4.91	0.23	6.37
DTAX	H_{4A}	0.55	1.97	-	-	0.62	2.42	-	-
SHLTR	H_{4A}	-	-	0.03	5.81	-	-	0.03	6.03
Industry		Yes		Yes		Yes		Yes	
Year		Yes		Yes		Yes		Yes	
Obs.		11,369		11,369		11,369		11,369	
Pseudo R^2		0.06		0.06		0.05		0.05	
LR χ^2		236.90		258.11		193.16		217.92	

Each panel reports the results of estimating Equation (7-2) using logistic regression on a pooled sample of 526 *New User* and 10,843 *Non User* observations, where the dependent variable (*INIT*) is an indicator variable set equal to 1 if the firm is a *New User* and 0 if a *Non User*. *New Users'* incentives to initiate a derivatives program (independent variables) are measured prior to derivative use as indicated. Industry fixed-effects are based on 2-digit SIC codes and reported *z*-statistics are based on robust standard errors.

Table 7-8. Determinants of the magnitude of derivative program initiation

		Panel A				Panel B			
		New User Incentives (*t*-1)				New User Incentives (*t*-1)			
		Magnitude: *NTNL*				Magnitude: *FVAL*			
	Exp.	Coeff.	*t*-stat	Coeff.	*t*-stat	Coeff.	*t*-stat	Coeff.	*t*-stat
Constant	+/-	-1.77	-11.96	-1.75	-11.72	-1.51	-12.41	-1.49	-12.17
CONV	+	0.04	0.53	0.16	0.19	0.03	0.48	0.01	0.15
LEV	+	0.11	1.39	0.14	1.68	0.11	1.82	0.14	2.14
ROA	-	-0.06	-0.62	-0.04	-0.40	0.03	0.36	0.06	0.58
NOL	+	0.06	1.51	0.08	1.98	0.05	1.44	0.06	1.88
NBM	+	0.00	0.00	0.03	0.23	0.00	-0.04	0.02	0.16
MB	+	0.00	0.27	0.00	-0.28	0.00	-0.26	0.00	-0.25
RD	+	0.09	2.13	0.09	2.15	0.07	2.07	0.07	2.03
PPEX	+	0.96	3.29	0.95	3.22	0.84	3.54	0.84	3.53
DELTA	+	0.02	1.93	0.02	1.98	0.00	1.34	0.00	1.32
ANF	+	0.01	1.70	0.01	1.61	0.01	1.61	0.01	1.51
ABDAC	+	0.39	2.03	0.41	2.14	0.28	1.78	0.32	2.02
CYC	+	-0.01	-0.43	-0.01	-0.43	0.00	-0.43	0.00	0.43
STD	+	0.30	4.14	0.29	3.97	0.23	3.76	0.22	3.58
INST	-	0.05	0.71	0.02	0.31	0.04	0.75	0.02	0.35
FRGN	+	0.13	3.46	0.13	3.36	0.10	3.11	0.09	3.02
OCF	+	0.00	-0.01	-0.03	-0.16	-0.02	-0.14	-0.05	-0.35
SIZE	+	0.05	3.72	0.04	2.89	0.04	3.76	0.04	2.98
DTAX	H_{4B}	0.15	1.65	-	-	0.09	1.06	-	-
SHLTR	H_{4B}	-	-	0.01	0.24	-	-	0.00	1.02
Industry		Yes		Yes		Yes		Yes	
Year		Yes		Yes		Yes		Yes	
Obs.		11,283		11,283		11,299		11,299	
Pseudo R^2		0.05		0.05		0.05		0.05	
LR χ^2		179.74		174.17		168.81		164.63	

Each panel reports the results of estimating Equation (7-2) using Tobit regression on a pooled sample of 440 and 459 *New Users* disclosing the notional principal (*NTNL*) and fair value (*FVAL*) of derivatives at initiation at initiation, respectively, and 10,483 firm-year observations holding no derivatives. *New Users'* incentives to initiate a derivatives program (independent variables) are measured prior to derivative use (*t*-1). Industry fixed-effects are based on 2-digit SIC codes and reported *t*-statistics are based on robust standard errors.

Table 7-9. Determinants of the magnitude of derivative program initiation – Separating the decision to initiate from the extent of initiation using notional principal

		Probit		Truncated		Probit		Truncated	
		INIT		*NTNL*>0		*INIT*		*NTNL*>0	
	Exp.	Coeff.	*z*-stat	Coeff.	*z*-stat	Coeff.	*z*-stat	Coeff.	*z*-stat
Constant	+/-	-2.32	-14.47	-2.22	-0.99	-2.27	-14.15	44.99	0.67
CONV	+	0.12	1.26	2.76	0.51	0.15	1.48	6.78	2.22
LEV	+	0.05	0.52	6.10	1.27	-0.05	-0.52	10.65	3.76
ROA	-	-0.07	-0.62	7.65	0.77	0.06	0.47	8.87	1.77
NOL	+	0.05	1.18	2.45	1.08	0.02	0.48	0.54	0.45
NBM	+	0.15	1.03	16.58	1.64	0.16	1.13	3.72	1.34
MB	+	0.00	-0.30	0.41	2.18	0.00	-0.22	0.21	3.11
RD	+	0.12	2.46	4.29	1.41	0.13	2.55	0.80	0.69
PPEX	+	1.14	3.19	23.29	0.99	1.05	2.92	3.12	0.30
DELTA	+	0.01	1.63	0.87	0.47	0.01	1.54	-0.56	-0.82
ANF	+	0.01	1.68	0.60	1.13	0.01	1.80	0.06	0.27
ABDAC	+	0.60	2.48	25.73	1.84	0.55	2.50	23.24	2.49
CYC	+	-0.01	-0.49	0.01	0.00	0.01	-0.49	0.00	1.35
STD	+	0.41	4.66	11.50	1.00	0.44	5.02	4.43	1.17
INST	-	0.09	1.14	5.16	1.18	0.10	1.17	2.37	1.01
FRGN	+	0.20	4.48	3.57	0.80	0.21	4.72	2.06	1.22
OCF	+	-0.03	-0.18	-10.38	-1.23	0.16	0.82	-7.03	-1.44
SIZE	+	0.09	5.29	2.73	1.62	0.11	6.12	2.67	2.83
IMR	+/-	-	-	27.37	0.97	-	-	-68.47	-0.82
DTAX	H_4	0.23	2.01	-2.06	-0.25	-	-	-	-
SHLTR	H_4	-	-	-	-	0.01	4.99	0.08	0.40
Industry		Yes		Yes		Yes		Yes	
Year		Yes		Yes		Yes		Yes	
Obs.		11,369		440		11,369		440	
Pseudo R^2		0.06		NA		0.06		NA	
LR χ^2		246.15		39.54		262.59		65.61	

The table reports the results of estimating a variant of the Tobit model (Cragg 1971), where the truncated model includes notional principal of derivatives initiation. *New Users'* incentives to initiate are measured prior to derivative use (*t*-1). Industry fixed-effects are based on 2-digit SIC codes, and reported *z*-statistics are based on robust standard errors

Table 7-10. Determinants of the magnitude of derivative program initiation – Separating the decision to initiate from the extent of initiation using fair value

		Probit *INIT*		Truncated *FVAL*>0		Probit *INIT*		Truncated *FVAL*>0	
	Exp.	Coeff.	*z*-stat	Coeff.	*z*-stat	Coeff.	*z*-stat	Coeff.	*z*-stat
Constant	+/-	-2.32	-14.47	-62.10	-0.74	-2.27	-14.15	18.17	0.70
CONV	+	0.12	1.26	5.53	2.21	0.15	1.48	3.48	3.36
LEV	+	0.05	0.52	9.32	4.29	-0.05	-0.52	4.78	4.81
ROA	-	-0.07	-0.62	5.96	1.03	0.06	0.47	0.99	0.63
NOL	+	0.05	1.18	2.57	2.36	0.02	0.48	0.80	1.77
NBM	+	0.15	1.03	4.57	1.86	0.16	1.13	1.00	0.92
MB	+	0.00	-0.30	0.17	3.85	0.00	-0.22	0.08	4.04
RD	+	0.12	2.46	2.15	1.26	0.13	2.55	0.46	0.71
PPEX	+	1.14	3.19	5.81	0.55	1.05	2.92	-0.72	-0.19
DELTA	+	0.01	1.63	0.37	2.00	0.01	1.54	0.22	1.33
ANF	+	0.01	1.68	0.03	0.15	0.01	1.80	0.11	1.36
ABDAC	+	0.60	2.48	15.87	2.83	0.55	2.50	9.11	3.45
CYC	+	0.01	-0.49	-0.01	0.59	-0.01	-0.49	-0.01	-0.90
STD	+	0.41	4.66	2.38	0.66	0.44	5.02	2.91	2.13
INST	-	0.09	1.14	2.01	0.83	0.10	1.17	0.36	-0.40
FRGN	+	0.20	4.48	2.86	1.78	0.21	4.72	1.97	3.19
OCF	+	-0.03	-0.18	-1.79	-0.35	0.16	0.82	0.99	0.59
SIZE	+	0.09	5.29	2.08	2.44	0.11	6.12	0.95	2.79
IMR	+/-	-	-	62.37	0.60	-	-	-31.35	-0.97
DTAX	H_4	0.23	2.01	-1.84	-0.49	-	-	-	-
SHLTR	H_4	-	-	-	-	0.01	4.99	-0.01	-0.15
Industry		Yes		Yes		Yes		Yes	
Year		Yes		Yes		Yes		Yes	
Obs.		11,369		456		11,369		456	
Pseudo R^2		0.06		NA		0.06		NA	
LR χ^2		246.15		129.18		262.59		255.27	

The table reports the results of estimating a variant of the Tobit model (Cragg 1971), where the truncated model includes fair value of derivatives initiation. *New Users'* incentives to initiate are measured prior to derivative use (*t*-1). Industry fixed-effects are based on 2-digit SIC codes, and reported *z*-statistics are based on robust standard errors.

CHAPTER 8
DETECTING DERIVATIVE-BASED TAX AVOIDANCE FROM FINANCIAL DISCLOSURES

It is well-known that deciphering tax avoidance from the financial statements is incredibly difficult. Problems commonly arise due to lack of available information about taxable income and taxes paid on current earnings (McGill and Outslay 2002, 2004; Hanlon 2003), as well as from the discretion and aggregation with which tax positions can be disclosed (Blouin et al. 2010). Although similar criticisms apply to derivative disclosures (Ryan 2007), recent changes by SFAS 161 (FASB 2008) require a description of (1) how and why firms use derivatives, (2) how derivatives and related hedged items are accounted for under SFAS 133 and its related interpretations, and (3) how derivatives and related items affect financial position, performance, and cash flows.[1] These improvements, along with the evidence in Chapter 7, raise the question of whether a link between tax avoidance and derivatives is detectable from the enhanced disclosures.

To address this question I collect 2,501 derivative disclosures from the financial footnotes (Item 8) of 1,334 known users' 10-K forms for fiscal-years ending after November 15, 2008, the effective date of SFAS 161.[2] Using text string matching software, I search these disclosures for a general, but comprehensive, set of keywords relating to tax avoidance.[3] In addition, I manually review 125 (5%) randomly selected disclosures for evidence of tax avoidance activities. Consistent with the general concealment of tax planning strategies, I find no mention of tax avoidance in firms' explanations of why and how they employ derivatives.

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[1] These disclosure requirements are applicable to all entities that issue or hold derivative instruments.

[2] Known derivative users are those firms in the *User* and *New User* samples as of fiscal year 2008. Based on availability, the sample window includes derivative disclosures filed before August 1, 2010.

[3] Keywords include variants of the following: *after-tax*, *compliance*, *defer*, *delay*, *effective tax*, *foreign tax*, *haven*, *internal revenue*, *shelter*, *tax*, *tax burden*, *tax payment*, *tax plan*, *tax liability*, *tax-exempt*, *tax expense*.

Instead, nearly all disclosures indicate derivatives are used to offset exposures to foreign exchange and interest rate risks. Consequently, these new disclosures offer little assistance to tax authorities should they attempt to detect derivative-based tax avoidance from the financial statements.

CHAPTER 9
CONCLUDING REMARKS

Although corporate use of derivatives is frequently motivated by risk management, regulatory initiatives addressing ambiguities in derivative taxation (U.S. Congress Joint Committee on Taxation 2008) and the inclusion of derivatives in numerous tax shelters (Wilson 2009) suggests tax avoidance is an economically significant aspect of their use. Accordingly, this study examines the role of derivatives in corporate tax avoidance. First, the study develops a framework describing why the fundamental, transactional, tax reporting and cognitive features of derivatives are useful for avoiding taxes, and then demonstrates how by using the framework to dissect two derivative-based tax shelters. The framework reveals that by allowing taxpayers to design transactions that alter the timing, character, and source of gains and losses, derivatives provide opportunities to exploit ambiguity in the tax code with a seemingly low probability of detection by tax authorities. Thus, derivatives are sophisticated tax planning tools that can work in isolation or concomitantly with other tax planning strategies.

Second, the study investigates the extent to which derivatives facilitate tax avoidance and whether this aspect is detectable from recently enhanced financial statement disclosures. The analyses indicate that new derivative users experience reductions in tax burden following the implementation of a derivatives program. These benefits increase with the magnitude of derivatives employed and do not depend on effective hedging of economic risks. Further analyses reveal firms' *ex ante* preferences for aggressive tax strategies have a positive relation with the underlying implementation decision. This evidence suggests tax avoidance is both a determinant and outcome of derivative use. However, similar to the opacity of corporate tax shelters, there is no indication of either aspect in footnote disclosures explaining why and how firms use derivatives.

Overall, the study provides both conceptual and large-sample empirical evidence concerning the extent to which derivatives facilitate corporate tax avoidance. Therefore, this study has two important implications for future policy decisions. First, as the tax-writing communities attempt to repair the inconsistency, asymmetry, and indeterminacy in the current tax reporting system for derivatives (Weisbach 2005), it is important they remain cognizant of how a piecemeal response to financial innovation leads to further discretion and flexibility. As shown, tax aggressive firms have a penchant for using derivatives and are likely to use such shortcomings to their full advantage. Second, finding no evidence of derivative-based tax planning in financial statement disclosures raises the question of whether tax authorities have adequate information to detect such behavior. Although the Schedule M-3 (Donohoe and McGill 2011) includes a line-item for "hedging transactions", this category is likely too broad to be useful for detecting tax positions that involve sophisticated derivatives and complicated ownership structures. Thus, regulators might consider more detailed disclosure requirements within the Schedule M-3 or the new Schedule UTP.

Additionally, even though this study examines only one category of financial instruments, tax avoidance may be an overlooked aspect of other instruments as well. For example, several of the tax shelter cases studied by Wilson (2009) and Graham and Tucker (2006) involve special leasing transactions, while evidence in Dickinson et al. (2011) suggests investors believe variable interest entity consolidation standards will limit managerial opportunism through the use of tax shelters. Therefore, research investigating whether and how firms use these (and other) instruments for tax avoidance and the interaction of corporate governance (Desai and Dharmapala 2006) may also be worthwhile. Finally, attempts at disentangling both the financial and tax reporting effects of financial instruments will also likely make important contributions to the literature (Mills and Newberry 2005). Such endeavors may even be further enhanced by researchers with access to confidential corporate tax return data.

Despite attempts to ensure the robustness of the results, this study is not without limitations. Although I carefully review firms' financial reports and cross-validating samples, problems may arise with the identification of new derivative users. Moreover, the confidential nature of tax return filings requires the use of imperfect tax burden and aggressiveness proxies estimated from financial statement data. Although the approach taken in this study is generally accepted in the extant literature, some research suggests financial statements do not convey sufficient information to adequately estimate key aspects of firms' tax attributes (Plesko 2007). As a result, further refinements in this area would enhance the validity of the results. For example, researchers with access to corporate tax return data might consider whether tax filings offer insight into tax avoidance with various financial instruments, including derivatives.

APPENDIX A
FEDERAL TAXATION OF DERIVATIVE TRANSACTIONS

For federal tax purposes, the timing, character, and source of derivative-related gains and losses generally depend on four attributes: (1) type of instrument, (2) motive for use, (3) status of taxpayer, and (4) organizational form and/or jurisdiction of taxpayer. Table 3-1 broadly depicts this complicated tax system and outlines the discussion that follows.

The first attribute, type of instrument, is perhaps the most important because there is no general definition of a derivative in the tax code. Instead, derivatives are classified into categories based on specific features of the instrument, many of which are subject to different tax rules. Specifically, with most exchange-traded equity options (IRC § 1234 options), gains and losses are generally recognized on a "wait-and-see" approach where the purchaser initially capitalizes the contract premium (no deduction), the writer records no income, and both parties wait and see what transpires upon sale, expiration, or exercise.[1] If an option is later sold, the contract premium is factored into gain or loss computation at the time of sale. If an option is allowed to lapse, the purchaser (writer) recognizes the contract premium as a loss (gain) at the expiration date. Similarly, option exercise with cash settlement results in gain or loss recognition at the time of exercise. In the case of physical settlement (i.e., the underlying is sold and delivered), however, the contract premium is combined with the sale transaction. That is, the seller recognizes a gain or loss at the time of sale equal to the difference between amounts realized and the tax basis in the underlying, while the purchaser treats the contract price as the new tax basis and only recognizes gain or loss upon future sale, exchange, or disposition of the underlying. Despite these timing differences, gains and losses recognized by option holders

[1] This approach originates from case law (e.g., *Virginia Iron Coal & Co. v. Commissioner*, 37 B.T.A. 195 (1938)) and is also reflected in numerous administrative rulings (e.g., Rev. Rul. 78-182, 1978-1 C.B. 265). In most cases, the taxation of options is governed by IRC § 1234.

generally have the same character (i.e., ordinary or capital) as the underlying.[2] For option writers, however, gains and losses receive capital character treatment unless the option is granted in the ordinary course of business. Finally, option-related gains and losses are typically sourced according to the taxpayer's country of incorporation.[3]

Similar to basic options, *forward* and *securities futures* contracts generally have no tax consequences until settlement, expiration, or assignment.[4] If the contract is sold or cash settled, the recipient recognizes a gain and the payor recognizes a corresponding loss at the time of sale or payment. In the case of physical settlement, the party delivering the underlying recognizes gain or loss based on the difference between the amount realized and the basis in the underlying, while the buyer treats the contract price as the tax basis and defers gain or loss until subsequent sale, exchange, or disposition of the property.[5] The character of these gains and losses largely depends on how the contract is settled. If a forward contract is sold, the gain or loss receives capital character treatment provided the contract is a capital asset in the hands of the seller.[6] If the contract is cash settled, the gain or loss is capital in character only if the underlying is a capital asset.[7] Thus, contracts with a debt, equity, or commodity-based underlying normally receive capital character treatment, while foreign currency contracts generally produce ordinary gains and losses. Alternatively, because *regulated futures* contracts are standardized and trade on

[2] In other words, the same character as if the purchaser acquired the property without using an option. For example, an option to purchase an investment in publicly traded equity securities receives capital character treatment. See IRC § 1234(a) and (c).

[3] IRC § 865(a).

[4] For these purposes, a securities futures contract is an exchange-traded contract for the sale or future delivery of a single security or narrow-based security index.

[5] The tax treatment remains relatively unchanged in the event a forward contract requires payment at the time of contract execution. See IRC § 1001, Rev. Rul. 2003-7, and 2003-1 C.B. 363 for further details.

[6] The treatment applies without regard to the character of the underlying property. See IRC § 1221.

[7] IRC § 1234A.

public exchanges (so-called IRC § 1256 contracts), they are often marked-to-market resulting in annual recognition of a capital gain or loss.[8] Despite the timing and character differences, gains and losses on both futures *and* forward contracts are typically sourced according to the taxpayer's country of incorporation.[9]

Many swap contracts (e.g., equity, interest rate, foreign currency, etc.) are classified as notional principal contracts for tax purposes whereby contracting parties classify payments as either periodic, non-periodic or termination and then follow specific recognition rules.[10] In particular, taxpayers recognize the ratable portion of periodic and non-periodic payments in the year of receipt, and termination payments when the contract is extinguished, assigned, or otherwise terminated. Periodic and non-periodic payments are generally treated as ordinary income and expense items, while termination payments receive capital character treatment if the contract is a capital asset in the hands of the taxpayer.[11] Similar to options and forward contracts, payments with respect to swaps are generally sourced by reference to the taxpayer's country of incorporation, with an exception for income earned through a U.S. branch, which is considered U.S. sourced income.[12]

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[8] See IRC § 1256. In some cases, such as with foreign currency contracts and other ordinary property, the gain or loss receives ordinary treatment.

[9] IRC § 865(a).

[10] The regulations under IRC § 446 address the taxation of notional principal contracts, which are defined as "financial contracts providing for the payment of amounts by one party to another at specified intervals calculated by reference to a specified index upon a notional principal amount in exchange for a specified consideration or a promise to pay similar amounts." These regulations specifically mention "equity swaps, equity index swaps, and similar arrangements" as examples of notional principle contracts, and explicitly exclude futures, forwards, and options. See Shapiro (2006) for further details.

[11] The ordinary income and expense treatment of any payment other than a termination payment is consistent with the view that these payments are not made with respect to a sale or exchange of a capital asset. See Prop. Reg. § 1.1234A-1 and IRC § 1234A for further details.

[12] Treas. Reg. § 1.863-7.

In some cases, a taxpayer's motive for using derivatives (the second attribute) may result in deviation from the general tax rules described above. Specifically, the long-standing corporate use of derivatives as a safeguard against economic risks has resulted in a separate set of rules that apply when a transaction qualifies as a hedge for tax purposes. These rules define a hedge as a transaction entered into in the normal course of business primarily to reduce interest rate, currency, or commodity price risks.[13] Because the underlying in a hedge typically produces ordinary income or expense (e.g., interest income), gains and losses on these transactions also receive ordinary character treatment. Further, the gain or loss on a hedging transaction is often matched with the gain or loss on the underlying such that both are included in ordinary income simultaneously (i.e., they offset), a potentially attractive feature.[14] However, the most difficult issue concerning these rules is whether a transaction qualifies for hedge treatment. For instance, the hedging regulations take a very narrow view of risk management and generally only treat a transaction as a hedge if, in fact, it reduces risks (Yanchisin and Ricks 2006). As such, a subjective facts and circumstances tests determines whether a transaction *intends* to manage risks. Firms must also designate a transaction as a hedge on the day of initiation and identify the underlying within the subsequent 35 days. Failure to meet any of these conditions requires the tax treatment to be determined without regard to the hedging rules. Consequently, any gain or loss may be capital in character and/or receive unmatched timing treatment (i.e., not offset).

A transaction attempting to reduce economic risks, but failing to qualify as a hedge for tax purposes, may be a straddle. That is, an offsetting position with respect to actively traded property, including most stock, substantially diminishing a taxpayer's risk of loss. The tax

[13] See IRC § 1221(a) and Treas. Reg. § 1.1221-2.

[14] IRC § 1502 permits favorable hedge treatment in the case of tax consolidated groups that qualify for and have elected to be included in the U.S. federal consolidated return. That is, one member of a tax consolidated group may enter into a hedging transaction with a third party to hedge against economic risks of another member.

treatment of straddle transactions serves to prevent the use of tax-motivated offsetting transactions to defer income or alter the character of recognized gains and losses. For example, taxpayers are prohibited from converting ordinary income into capital gains with offsetting transactions if substantially all the taxpayer's expected return is attributable to the time value of the net investment. Generally, if a straddle is identified, then a loss realized on any position in the straddle is deferred (i.e., not deducted), and interest and other carrying costs normally deducted are capitalized. In some cases, however, taxpayers can make an election to match the timing and/or character of the offsetting positions.[15] Other rules apply, however, when a taxpayer enters into an offsetting position (e.g., short sale, future, forward, or option) for the purpose of locking in gains and the avoidance of taxes.[16] In these circumstances, constructive sale rules require recognition of a gain (but not a loss) calculated as if the position were sold or otherwise terminated at fair market value. This rule applies to built-in gains associated with a financial position in a partnership, debt, or equity instrument provided it is not a short-term transaction or required to be marked-to-market.

A third attribute, taxpayer status, considers the taxpayer's normal business operations. Specifically, firms qualifying as *securities dealers* are required to mark all derivatives to market at the end of each year for tax purposes without regard for the rules described earlier.[17] In doing so, any gain or loss associated with the firm's activities as a dealer receives ordinary character treatment. Dealer status is generally mandatory provided the taxpayer regularly purchases, sells, or otherwise offers securities to its customers in the ordinary course of business. As such, banks

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[15] For example, see IRC §§ 1092(a), 1256(d), and 1092(b)(2).

[16] This rule was added to the tax code in 1997 to prevent certain forms of income shifting. See IRC § 1259 for additional details.

[17] IRC § 475(c)(1).

and other finance organizations (e.g., mortgage banks) routinely qualify as securities dealers. Firms not designated as dealers follow the general rules.

The final attribute determining the tax treatment of derivatives concerns the organizational form and/or jurisdiction of the taxpayer. Although controlled pass-through entities (e.g., partnerships and trusts) are typically consolidated for financial reporting purposes, taxes are assessed at the ownership level. Therefore, derivatives held by pass-through entities may be taxed differently than if they were held by a corporate entity. As a result, capital loss limitations and income sourcing rules imposed at the pass-through level can alter the character and source of gains and losses flowing through to the corporate owner. Moreover, a mismatch in the timing and/or character of gains and losses can occur when derivatives are held by an affiliate foreign entity for the purpose of hedging the economic risks of an entity in a different jurisdiction. Because tax rules vary across jurisdictions, such arrangements may preclude the otherwise offsetting effect of hedge transactions and therefore affect the calculation of U.S. earnings and profits (E&P) for the foreign entity. In doing so, any future dividends or distributions from the foreign entity may be subject to different tax treatment or, in some cases, limit the amount of foreign tax credits.

APPENDIX B
DERIVATIVE KEYWORDS

"call option"
"call*"
"cash flow hedge"
"collar*"
"commodity"
"currency" with "exchange" with "contract*"
"currency" with "exchange" with "forward*"
"currency" with "exchange" with "future*"
"currency" with "exchange" with "option*"
"derivative*"
"effective portion"
"fair value hedge"
"fixed" with "rate" with "lock*"
"foreign" with "currency" with "forward*"
"foreign" with "currency" with "future*"
"foreign" with "currency" with "option*"
"foreign" with "exchange" with "contract*"
"foreign" with "exchange" with "forward*"
"foreign" with "exchange" with "option*"
"forward"
"forward" with "contract*"
"forward" with "treasury" with "lock*"
"futures"
"futures" with "contract*"
"hedge*"
"hedging"
"ineffective portion"
"interest" with "rate" with "cap*"
"interest" with "rate" with "option*"
"interest" with "rate" with collar*"
"notional amount"
"notional*"
"option contract"
"option*"
"put option"
"put*"
"rate" with "swap*"
"risk management"
"swap*"

APPENDIX C
EXAMPLES OF DERIVATIVE DISCLOSURES FROM FORM 10-K

New users. In fiscal year 2000, Abbot Laboratories (ABT) states:

> "Abbot does not currently use derivative financial instruments, such as interest rate swaps, to manage its exposures to changes in interest rates for its debt instruments and investment securities."

However, after beginning to use derivatives in the following year, the firm indicates that:

> "In 2001, Abbot entered into interest rate hedge contracts $2.45 billion to manage its exposure to changes in the fair value of $2.45 billion of fixed-rate debt due in July 2004 and 2006."

As another example, American Biltrate, Inc. (ABL) states in fiscal year 2005 that

> "Under its current policies, the Company does not use derivative financial instruments, derivative commodity instruments or other financial instruments to manage its exposure to changes in interest rates, foreign currency exchange rates, commodity prices or equity prices and does not hold any instruments for trading purposes."

In fiscal year 2006, the firm began using derivatives to manage interest rate risk and writes:

> "During 2006, the Company entered into two interest rate swap agreements to manage the Company's exposure to fluctuations in interest rates on its term loan and portions of its revolver borrowings."

In each example, the firm is coded as a new user only in the first year of derivative use, and as a non-user in the year prior to derivative use.

Non users. In fiscal year 2002, Dress Barn, Inc. (DBRN) states: "The Company holds no options or other derivative instruments." Likewise, Servidyne, Inc. (SERV) discloses: "At April 30, 2002, and 2001, the Company had no derivative instruments." In each of these cases, the firm is coded as a non-user.

APPENDIX D
VARIABLE MEASUREMENT

Table D-1. Variable measurement

Variable	Calculation (Compustat items in parentheses)
ABDAC	Absolute value of residuals from modified-Jones model (Equation 8 in Dechow et al. 1995).
ANF	Log [number of analysts]
CAP	Gross property, plant, and equipment (ppegt) / total assets (at)
CASH	Cash tax paid (txpd) / [pretax income (pi) – special items (spi)]
CONV	Marginal tax rate (Graham and Mills 2008) – tax expense (txt) / pretax income (pi)
CYC	No. of days inventory [360 / (cost of goods (cogs) / avg. inventory (invt))] + no of days receivables [360 / (cost of goods (cogs) / avg. receivables (rect))] – no. of days payables [accounts payable (ap) / cost of doods (cogs)] * 360
CURR	Current tax expense (txfed) / [pretax income (pi) – special items (spi)] if txfed is missing, current tax expense = txt-txfo-txs-txdi-txo.
DELTA	See Core and Guay (2002).
DTAX	Residuals from Equation (1) in Frank et al. (2009).
⊿ETR	Change in either *CASH*, *CURR*, or *GAAP*.
FRGN	Indicator =1 if foreign income/loss (pifo) $\neq$ 0; 0 otherwise.
FVAL	Reported fair value of all derivative positions (hand collected) / total assets (at).
GAAP	Total tax expense (txt) / [pretax income (pi) – special items (spi)]
GROW	Sales (sale) – lagged sales (sale) / sale (sale)
IMR	Calculated from first-stage of Cragg (1971) model.
INST	Portion of shares held by institutions from 13-f filings.
INTG	Intangible assets (intan) / total assets (at)
INV	Total inventory (invt) / total assets (at)
LEV	Total liabilities (lt) / total assets (at)
LOSS	Indicator =1 if income before extraordinary items (ib) <0; 0 otherwise.
MAG	Either *NTNL* or *FVAL*.
MB	Price (prcc_c)*common shares (csho) / stockholders' equity (seq)
NBM	Indicator =1 if [stockholders' equity (seq) / price (prcc_c) * cmn. shares (csho)] <0.
NOL	Indicator =1 if net operating loss carry forward (tlcf) $\neq$ 0; 0 otherwise.
NTNL	Reported notional principal of all derivative positions (hand collected) / total assets (at)
OCF	Operating cash flow (oancf) / total assets (at)
PPEX	Cash expenditures on PP&E (capx) / total assets (at)
RD	R&D expense (xrd) / total sales (sale)
ROA	Net income (ib) / total assets (at)
SHLTR	Score using estimated coefficients for Equation (1) in Wilson (2009).
SIZE	Log [total assets (at)]
STD	[Total liabilities (lt) – long-term debt (dltt)] / total liabilities (lt)
$TA^{D,S}$	Either *DTAX* or *SHLTR*.
VEGA	See Core and Guay (2002).

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