I.R.C. Conformity

Many companies are contemplating whether they will be able to use net operating losses that built up during recent years. This article, by Michael Salama of the Walt Disney Co., suggests a new method and means for evaluating utilization of NOLs from a tax perspective in the context of financial statement and cash tax analysis. It highlights areas where Jensen's inequality may appear in modeling, and offers a step-wise approach to building sounder tax models to address uncertainty associated with data inputs.

Monetizing NOLs: Finding the 'Flaw Of Averages' and Producing Useful Forecasts

By Michael H. Salama

I. INTRODUCTION

Three years after the 2008 economic downturn and global banking crisis, many companies are sitting with significant net operating losses (NOLs) in hand. Among the many business challenges they face is the problem of determining how likely it is they will be

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The thoughts and opinions expressed in this article are the author's and not necessarily those of his employer.

able to monetize their NOLs against past, current, and future income.

Are they cash equivalents? Will they be fully absorbed? Should their value be discounted and by how much? The implications of that analysis can have a material financial statement and cash tax needs impact.

Companies often conduct this analysis using single-point estimates for forecasting current-year and future-year income and other inputs. Static data points do not offer a range of potential values and do not allow the user a meaningful way to make a decision regarding degree of likelihood.[1] And, by most accounts in the professional community, the probabilistic modeling techniques found on Wall Street, funds in Connecticut and Silicon Valley, and other bastions of mathematical aptitude and application have not made their way into mainstream Tax Departments and functions that forecast tax attribute utilization.

This is striking since for most non-start-ups one of their largest book expenses and cash needs is for taxes. Imagine a chief financial officer asking the company's Tax Department whether it will be able to use the

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[1] This paper builds on a specific modeling opportunity discussed in Salama, M., ''The Flaw of Averages in U.S. Corporate Income Taxes: An Evaluation from the Taxpayer's Perspective,'' *Virginia Tax Review*, Vol. 30, No. 4 (Spring 2011), pp. 631-661.

$100X of historic tax losses and reduce its tax bills. The CFO might want to know not just how much of the losses the Tax Department thinks the company will utilize, but also over what time period, and how likely those results are. These are important questions and difficult to answer well when one's models are based on static data points.

The Tax Department also will need to strategically consider how it might impact the timing on the use of the losses. Static models are limited in this regard, too.

The static data point approach also fails to take into account non-linearities which cause the expected value to differ from the actual average. This is known as "the flaw of averages." The rule is: "Plans based on average assumptions are wrong on average."[2] Sam Savage, author of *The Flaw of Averages: Why We Underestimate Risk in the Face of Uncertainty*, explains this with a nice analogy: "Consider a drunk staggering down the middle of a busy highway. . . and assume that his average position is the centerline. Then the state of the drunk at his average position is alive, but on average he's dead."[3]

This is an accessible way to explain Jensen's inequality. Jensen's inequality states that for the convex (concave) function F of a random variable X, $F(E(X) \leq E(F(X))$ (or $F(E(X)) \geq E(F(X))$ for concave functions) where E is the expectation operator.[4] While the federal statutory rate is 35 percent, tax attributes may drive a progressive corporate tax effective rate and a non-linear effective tax rate curve. Those attributes may include foreign tax credits subject to limitation, capped research and experimentation tax credits, alternative minimum tax, and the focus of this article, NOLs.[5]

This article explores how one might model NOL utilization beyond the use of static data points. The next section outlines at a high level of abstraction the relevant federal income tax and tax accounting parameters. The following section contains practical suggestions as to how one might approach this modeling opportunity.

II. THE RELEVANT INCOME TAX AND TAX ACCOUNTING RULES

A. Income Tax Framework

NOLs constitute deductions allowed in computing one's taxable income. The NOL totals the amount of net operating loss carryovers and carrybacks to a particular year. And, the NOL deduction is not allowed where the taxpayer does not have trade or business income in that year.[6]

For federal income tax purposes NOLs are typically first carried back two years and then forward 20 years.[7] Yet, taxpayers may elect to waive the carryback period regarding an NOL originating in any particular year.[8] There are a host of additional related rules and special provisions regarding the computation of and manner in which NOLs may be used; and, the amount of the NOL is determined pursuant to the law applicable to the year the loss occurs.[9]

Taxpayers need to be aware of the federal-state differences in this space, too. These have become particularly pronounced with many states facing material budget deficits and seeking new sources of revenue. These federal-state differences might include:

■ the requirement that the entity have nexus with the state and be subject to income tax in the year of the carryover; [10]

■ differences in how federal and state taxable income are computed, including, *e.g.*, a state decoupling from federal bonus depreciation provisions which would otherwise allow for accelerated basis recovery of covered assets;[11]

■ limitations on the amount of loss that might be used based upon level of activity in the state;[12]

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[2] Savage, S., *The Flaw of Averages: Why We Underestimate Risk in the Face of Uncertainty*, John Wiley & Sons Inc., Hoboken, N.J, 2009.

[3] *Id.* at 43.

[4] The four general types of this inequality include those situations where the graph of the formula is: (a) a straight line and the formula's average value is the formula as evaluated at the average input; (b) a convex curve and the formula's average value is more than the formula assessed at the average input; (c) a concave curve and the formula's average value is less than the formula assessed at the average input; and (d) something else where "Jensen's inequality keeps its mouth shut." Id. at 91-92.

[5] Smith, Clifford W., Jr., "Corporate Risk Management: Theory and Practice," *The Journal of Derivatives*, Summer 1995, p. 26.

[6] Internal Revenue Code §172; Regs §1.172-1(a).

[7] I.R.C. §172(b)(1). Note, however, the Worker, Homeownership, and Business Assistance Act of 2009, passed on Nov. 6, 2009, amended I.R.C. §172(b)(1)(H) to extend the carryback period to up to five years for taxpayers incurring losses in tax years ending after Dec. 31, 2007, and beginning before Jan. 1, 2010. The IRS released Rev. Proc. 2009-52, providing guidance on the extended three-, four-, or five-year NOL carryback periods enacted with I.R.C. §172(b)(1)(H).

[8] I.R.C. §172(b)(3).

[9] Regs. §1.172-1(e). The details of those rules, including the loss limitation rules under I.R.C. §382, which apply to certain change-of-ownership transactions, is beyond the scope of this paper.

[10] For example, in Maryland, a corporation that is not subject to income tax in a particular year because of a lack of nexus will not be permitted a deduction to offset Maryland income in a year that it does have nexus. (Md. Regs. §03.04.03.07(A)(5)). Connecticut has a similar rule whereby an NOL carryforward applies only to a corporation that was subject to tax and filed an annual return in the year that the loss was sustained. (Conn. Regs. §12-217-1(a)). Rhode Island maintains a similar regime. (R.I. Gen. Laws §44-11-11(b)).

[11] Although most states will conform to the Internal Revenue Code as of certain or specified dates, many states will decouple from specific provisions. A common example of state decoupling concerns the complete decoupling from the federal bonus depreciation provisions. For example, California, Georgia, New Jersey, and New York among others have completely decoupled from the federal bonus depreciation provisions. Alternatively, Alaska, Colorado, and Delaware among others allow a full first-year of the bonus depreciation deduction, whereas Minnesota requires the taxpayer to add back 80 percent of the federal additional first-year depreciation deduction in the year in which it is claimed. Other examples of state decoupling from federal provisions include §199, federal dividends-received deductions, and income-based taxes. However, other variations in conformity can arise from a lag in the period of time between when a federal law is enacted and when the state conforms, or a limitation on the amount of bonus depreciation that may be allowed.

[12] A common limitation against the usage of NOLs is where a state will require that NOL be limited by the taxpayer's apportionment factor in the loss year (*i.e.*, that the NOL is calcu-

- further restrictions on loss use against certain types of income;[13]
- prohibition against carrybacks and/or different periods of use;
- dollar amount limits on the NOL utilization;[14] and
- periods where the NOL use is suspended.[15]

With the ever-changing state landscape, any situation described above will necessitate an analysis for the company's financial statements of the ultimate usage of state NOLs from both a cash-tax and rate perspective.

B. ASC 740's Relevant Considerations

U.S. generally accepted accounting principles (GAAP) requires a reduction in the measurement of deferred tax assets, including NOLs, that are not expected to be realized.[16] Analysis in this space calls for careful consideration of all positive and negative evidence to ascertain whether, based upon the weight of the evidence, a valuation analysis is required.[17]

Future income projections, in and of themselves, are insufficient to achieve the needed level of comfort concerning attribute utilization.

A valuation allowance is recorded where, based upon management's judgment, it is more likely than not (MLTN) (*i.e.*, a probability of more than 50 percent) that some or all of the deferred tax asset (DTA) will not be realized. The MLTN benchmark reflects a special form of the flaw of averages, the flaw of extremes.[18] The valuation allowance reduces the DTA to the amount that is MLTN to be realized.[19]

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lated post-apportionment). *See, e.g.*, Alabama, Ala. Regs. §810-3-335.1-.02; Georgia, Ga. Code. Ann. §48-7-21; and Illinois, Ill. Regs. tit. 86, §1100.2350(a). However, some states like New York and California have adapted their NOL utilization rules even further. California, for example, requires taxpayers to compute the NOL on a post apportionment basis, but further requires the NOL carryforwards be maintained on a separate company basis effectively preventing the offset of one member's loss carryover against the future income of another member. *See* Cal. Rev. & Tax Code §25108.

[13] For example, in New York a corporation with both business income and investment income to which a loss is carried back or forward must apportion the loss between the business and investment income. The amount of loss apportioned to each type of income is determined by multiplying the NOL by a ratio consisting of investment income before deduction of any NOL over entire net income before NOL deductions. (N.Y. Regs. tit. 20, §3-8.8.

[14] A small but growing group of states have limited the use of NOLs to a specific dollar amount. For example, Colorado has capped NOL utilization to $250,000 for years 2011, 2012, and 2013. (Colo. Rev. Stat. §39-22-504.6(a)).

[15] Since 2000, California has adopted outright NOL haircuts, suspended NOL utilization for a period of time, and adjusted the carryback and carryover periods.

[16] Accounting Standards Codification Topic 740-10-30-16.

[17] ASC 740-10-30-17.

[18] Savage, Chapter 17.

[19] ASC 740-10-30-5(e). *See also* PricewaterhouseCoopers LLP, U.S. National Professional Services Group, *Guide to Accounting for Income Taxes (2010)* at §5.1.

One must evaluate past performance as part of the assessment of the likelihood of future profitability. In addition, projections of future income, the future reversals of timing differences, whether there is taxable income in a carryback period (to the extent permitted by law), and tax planning strategies are evaluated to determine if there is enough income to utilize the cumulative NOLs.[20]

While future income projections are a component of this analysis, in and of themselves they are insufficient to achieve the MLTN level of comfort concerning attribute utilization. This is true given the inherently subjective nature of projections. In the tax accounting context future projections of income (and profitability) without more positive evidence generally will not be enough to overcome negative evidence that encompasses a pattern of historic losses in the most recent years. This is even truer where the future-year projections are contingent upon a business turn-around that has not yet been reflected in actual earnings performance.[21] This does not mean that future-year projections are ''skipped'' during the process. They are still an important part of the tax accounting analysis and certainly important from a cash-tax forecasting perspective.

In the tax centric realm it is common for taxpayers to use average values to project future profitability, *e.g.*, for annual book income based upon expected potential outcomes. The use of average values in this context might not paint a realistic portrait of attribute use. In particular, it could lead to a false positive, *i.e.*, that losses will be utilized when in fact it is unlikely that such will be the case. The flip side to this is that the use of average values for income levels may lead to the faulty conclusion the losses will not be used.

III. SOME REASONED STEPS TO BETTER NOL MODELING

A. The Base-Line Model

The first step in the NOL modeling process typically would include generating a standard Microsoft Excel® spreadsheet reflecting one's taxable income computation for the year, the attributes (including NOLs that exist at the current point), snapshots of prior-year tax posture, and future-year projections of taxable income or loss.

The starting point in the model itself will be book income. This set of numbers typically will be furnished to the Tax Department by a corporate reporting or operations performance and analysis group, or some similar function. In some cases the Tax Department may be provided with a high and low for the book income per year.

In designing the spreadsheet it is important to identify one's inputs, *i.e.*, numbers that describe the system's environment. Where the input's value is uncer-

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[20] ASC 740-10-30-18. *See also* ASC 740-10-30-19, which defines a tax planning strategy as one that: (a) is prudent and reasonable, (b) is an action that the entity ordinarily might not take, but would take to prevent an operating loss from expiring unused, and (c) would result in realization of deferred tax assets.

[21] PricewaterhouseCoopers LLP, §5.1.3.1.

tain, we want to refer the cells in the model that require that input to only one cell and reference the calculations to that cell. For illustration purposes a simple single-year model is shown for XYZ Inc., where the adjustments to compute taxable income include cost of goods sold (COGS), depreciation, software development expenses, and general and administrative (G&A) expenses.

In reality one would want to prepare a comprehensive multi-year model for the current year and perhaps the next four years (and take into account the impact of potential NOL carrybacks, decoupling of federal bonus depreciation, and caps on NOL utilization). One would want to consider the ability to realistically forecast taxable income over a lengthier period, including the entire NOL carryforward period.

Consider the following case illustration in **Figure 1**. The base case illustration reflects the federal income tax profile for XYZ Inc. where, for illustration purposes, no carryback is available.

Figure 1 XYZ Inc.: Federal Base Case Illustration (all amounts in millions)	
Pre-Tax Book Income	$250
COGS	($200)
Depreciation	($10)
Software Development	($10)
G&A	($25)
Pre-NOL TI	$5
NOL Carryover	($5)
Tax	$0

Now consider a situation where the state's rules regarding NOL utilization differ due to a utilization limitation (*i.e.*, an annual cap) of $1 million per year.

Figure 2 shows in Year 1 the creation of a NOL, which arose from a federal/state difference or a timing difference that is subject to carryover. This $5 million NOL creates a DTA that must be tested for realization. Assume for this example that there was sufficient evidence of future taxable income and reversing timing differences such that no valuation allowance is necessary and that the loss cannot be carried back.

Figure 2 XYZ Inc., State NOL Limited to $1 Million per Year – Year 1	
Pre-Tax Book Income	$250
COGS	($210)
Depreciation	($10)
Software Development	($10)
G&A	($25)
Pre-NOL TI	($5)
NOL Carryover	$5

Figure 3 shows that the taxpayer had earnings of $5 million and a corresponding NOL carryover of $5 million which, without any limitation on the use of that tax attribute, would result in no taxes due. However, as a consequence of the $1 million annual cap there is tax due and remaining NOL carryover of $4 million that must again be tested for realization. This reflects a net difference in the amount of NOL utilized for federal vs.

state purposes. Companies will want to be aware of these differences not just from a tax compliance/return preparation perspective but also because they impact forecasting of cash tax needs and potential rate impact. In a more complex model there may likely exist other differences that drive NOL utilization differences, such as state decoupling from bonus depreciation or the domestic production deduction under I.R.C. §199, as discussed above.

Figure 3 XYZ Inc., State NOL Limited to $1 Million per Year – Year 2	
Pre-Tax Book Income	$250
COGS	($200)
Depreciation	($10)
Software Development	($10)
G&A	($25)
Pre-NOL TI	$5
NOL Utilization	($1)
NOL Carryover	$4

B. Sensitivity Analysis

Conducting sensitivity analysis is old hat in the financial modeling world, but seldom applied with rigor or the right tools in the tax context. One should test the tax-centric model by changing one variable at a time and conducting an initial sensitivity analysis to get a sense of cardinal drivers—for example, what happens if income is more or less, if we slow down depreciation, if we defer income for a year.

Many spreadsheet users do this what-if analysis manually, change by change. However, it is much more efficient and informative to use a sensitivity analysis function like the one in XLSim® to reflect the impact of changing a variable over a range of potential inputs. This function also will enable one to graphically depict the results (a process far superior to manually inputting and charting out the different outputs for each respective input). For example, in this case illustration a sensitivity analysis was run on pre-tax book income, replacing the average projection of $250 million, varying the base-line amount by increments of $1 million, from $200 million to $300 million.
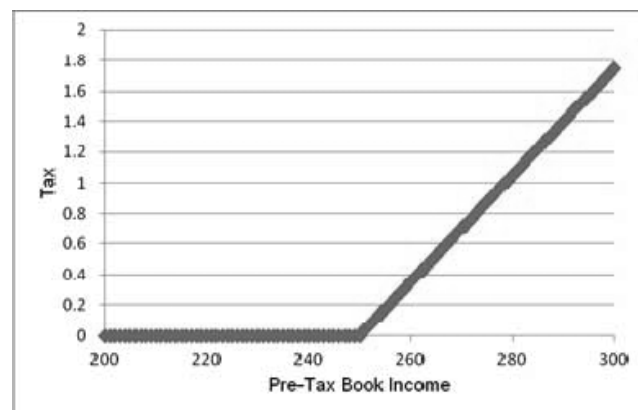
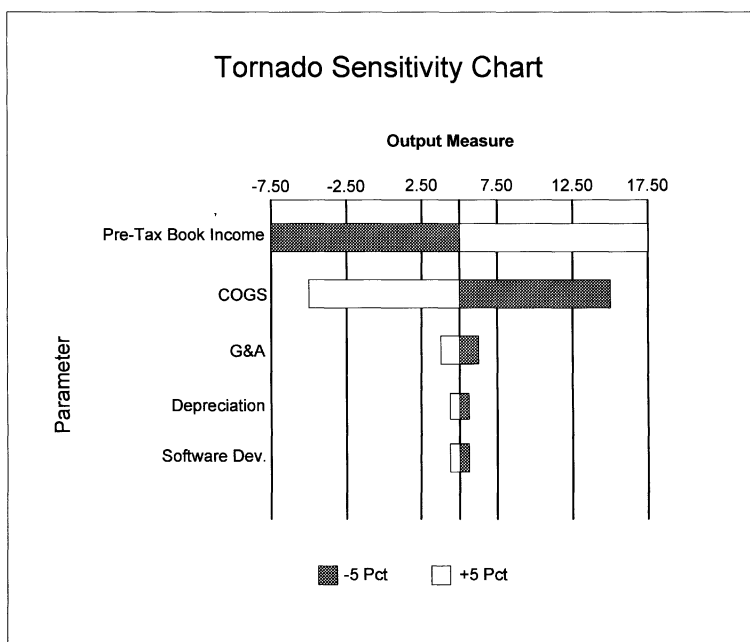The federal base case reflects that at $250 million pre-tax book income there is no tax liability, and an es-

calating liability as book income increases, rising to $1.75 million at $300 million of pre-tax book income. The firm's cash-tax rate is also non-linear and does not track the statutory rate. This simple example can be built upon to improve forecasting and analysis.

Since the federal and state provisions do not conform fully here, one would want to conduct a separate sensitivity analysis for state purposes, particularly where the differences are due to factors other than NOL use limitations, such as depreciation differences. An additional consideration to assess and model is the relationship between the different uncertain numbers. Although they may not have a linear correlation, the relationships should be examined and built into the stochastic model.

Another helpful step in the initial modeling process is to run a Tornado Diagram. This is in essence another sensitivity analysis tool that graphically depicts the relative impact of varying one's inputs over a specific range,

assuming all other items remain constant. The inputs are reflected as horizontal bars with the input having the greatest effect on top, the next highest impact on the next line, and so on. Tornado Diagrams may reveal embedded flaws of averages. This will show up where the input is varied over a symmetric range but the impact on the bar-graph is disproportionate, *i.e.*, one side is shorter than the other.

Tornado Diagrams are particularly useful since they can connect intuition with intellectual rigor, demonstrating which uncertain inputs have the greatest impact on the output. This can be helpful where there is flexibility in the tax rules to change the treatment of particular items to increase NOL utilization. One would want a real sense of how much of an impact this would have. Following the same one-year example, a Tornado Diagram was prepared for the federal base case varying the parameters in 5 percent increments in either direction.

Tornado Sensitivity Chart

Output Measure

	-7.50	-2.50	2.50	7.50	12.50	17.50

Parameter:
- Pre-Tax Book Income
- COGS
- G&A
- Depreciation
- Software Dev.

■ -5 Pct   □ +5 Pct

The graph comports with intuition, at least for this example, that variability in pre-tax book income will be the greatest driver of tax liability; and, it suggests greater focus on a company's concentration on this element, as opposed to merely using/receiving a number as a data input from another group. One will need to take into account relationships between items, such as sales and COGS.

In some cases items the company can control or at least have input into will manifest a greater impact. For example, in December 2010 Congress enacted a fresh round of bonus depreciation rules, with certain new assets qualifying for 100 percent additional first-year depreciation deductions in 2011 and certain new assets qualifying for 50 percent additional first-year deprecia-

tion deductions in 2012.[22] In particular, those with NOLs might consider whether they may want elect to claim 50 percent bonus depreciation instead of 100 percent bonus depreciation or elect out of bonus depreciation.[23] How one takes this into account may greatly influence one's loss utilization position.

C. Going to Monte Carlo

Once one has determined which inputs are key drivers of the result, it is helpful to replace the uncertain

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[22] Section 2022(a), Small Business Jobs Act of 2010, Pub. L. No. 111-240 (Sept. 27, 2010) and Sections 401(a) and (b) of the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, Pub. L. No. 111-312 (Dec. 17, 2010).
[23] Rev. Proc. 2011-26, 2011-16 I.R.B. 664 (3/29/11) provides further IRS administrative guidance on this topic.

number, which was previously represented by one data point—typically an average value—with a range of values and assess the impact on the model of changing the uncertain number over that range of possibilities. Monte Carlo simulation, a term often bandied about in certain circles but not as frequently defined, is the process of running thousands of trials through the model and compiling the output metrics in graph and table format for analysis. Rather than compiling those results in a log or a spreadsheet a new technological advance—DIST standard distribution strings–allows one to accumulate thousands of Monte Carlo simulation trials into a single data element.

There are many advantages of using distribution strings, including the ability to create repeatable results that may be audited, and they are also additive allowing simulations to be consolidated. Here, we want to run trials of the model to see the impact on the outputs, taxable income and NOL utilization, of selecting those uncertain input points at random. When we look to creating our models, sometimes the distribution for a key input may represent historical data points. In the case of NOL analysis, the distribution for book income might be, for example, the past 10 years of book income. This technique is known a boot-strapping and may be used in the absence of more refined distribution. A word of caution, though—boot-strapping is not effective if there is not a reasonable belief the prior year data is a sound predictor of future years.

Uncertain numbers also change over time, and so it makes sense to incorporate a process which is often described as a ''random walk'' into our tax modeling. A basic random walk constitutes a sequence of uncertain numbers where x(t) varies from x(t-1) by including an uncertain shock ε(t), for example x(t) = x(t-1) + ε(t). There, x(0) is a known number and ε(t) is an uncertain number that is independent of x(0). One might model pre-tax income based on the prior-year income level with a shock value based on annual growth rates. The manner in which this random walk is constructed will involve some degree of subjectivity and may rely upon a variety of private and public data sources. Tax departments generally will lack the experience or expertise to conduct this analysis and will require the assistance of those with sufficient expertise to fashion a well-designed stochastic model.

In this case, for illustration purposes, assume after analysis it is concluded that a triangular distribution function was determined to constitute a reasonable approach for modeling the shock value for income growth, with the most likely rate at 5 percent, least likely at -4 percent, and high at 8 percent (whereas the company may have historically used those percentages in a static model to drive three single-point estimates of outcomes). Monte Carlo simulation using this distribution at 1,000 trials would inform the stakeholders that for federal purposes there is a 25 percent likelihood of using all of the NOLs, and a 50 percent likelihood there will be $800,000 or more of NOLs unused after this year, assuming no other variability to inputs and no NOL carryback potential.

However, this would reflect an overly simplistic approach and would include an embedded anomaly, *i.e.*, that a triangular distribution might arise for pre-tax in-

come. Rather, various macro economic factors should cause the distribution to resemble something more log normal in shape.[24] Refinements to this random walk, and modeling of other inputs, over a multi-year period may paint a very useful NOL utilization portrait for cash tax and income statement forecasting.

IV. CONCLUSION

Application of modern modeling techniques to the tax context, particularly in the area of NOL utilization, can have a meaningful effect on one's risk management, tax accounting, and cash-tax management. Employing Monte Carlo simulation will inform judgment and may reveal flaws of averages, beyond those merely embedded in the technical tax accounting rules, which might be addressed.

It is unclear why to date the literature and common practice have not previously sought to place this approach into federal and state income tax modeling—another high-stakes area in terms of cash needs and income statement impact. The challenges in this space most certainly include data integrity, complexity in understanding key drivers, generating a flexible model, and navigating through the corporate and professional culture shift that might be necessary in some organizations to make this a reality. Many resist the use of Monte Carlo simulation on the basis the modeling is only as good as the data inputs and that it is just easier to use an average value. Savage has a nice way of addressing this:

> [w]hat's the last thing you do before you climb on a ladder to paint the side of your house? You shake the ladder. Well shaking a ladder is actually a Monte Carlo Simulation. You are bombarding something with random physical forces and you're monitoring the output. The problem is, of course, that the distribution of forces when you shake a ladder is not the same as when you climb it. So, I am interested in how many people . . . are now going to stop shaking ladders because I told them they've been using the wrong the distribution all their lives.[25]

Given the complexity of the tax rules in the NOL utilization area and the uncertainty regarding realizing those assets it is prudent to consider shaking the proverbial ladder in forecasting their cash tax and income statement impacts. This is not to suggest the model should supplant other items that influence one's judgment; but, well constructed stochastic models certainly can serve as a useful tool in informing judgment.

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[24] For ready historical and forecast data to fuel models, http://vectoreconomics.com can provides a platform that retrieves macroeconomic forecast data from Moody's Analytics which allows users to select from dozens of macroeconomic factors like gross domestic product, oil prices, house values, interest rate, labor rate, vehicle sale, and others. Additionally Morningstar provides forecast scenarios generated by their experts that are ready to incorporate into your own models.

[25] *See* 10/6/11 Morningstar article, ''Dr Savage: Monte Carlo Modelling in Everyday Life,'' text and video of interview available at http://www.morningstar.it/it/news/article.aspx?articleid=98368&categoryid=13.