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Case

# THE YELLOW BRICK COMPANY: AN INSTRUCTIONAL CASE FOR INTEGRATING THE TEACHING OF TAX AND MANAGERIAL ACCOUNTING

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*Abstract:* In recent years, the emphasis in accounting education has shifted from technical instruction to a broader understanding of the role of accounting in decision-making. One outgrowth of this new emphasis has been an integration of the accounting curriculum, whereby courses assimilate and explore the interrelationships among the various accounting subareas as well as with other disciplines. The aim of this instructional case is to help bridge the gap that typically exists between tax and management accounting teaching. Through the evaluation of three mutually exclusive alternatives, students are systematically introduced to the ways that implicit taxes, alternate tax structures, and the treatment of net operating losses (NOLs) can alter the relative profitability and risk of alternative courses of action. The case thereby helps students who do not take courses in taxation to appreciate that taxes are not simply payments to the government after the fact. Rather, they play an important and integral role in managerial decision-making. Copyright © 1996 Elsevier Science Ltd

## THE YELLOW BRICK COMPANY

Shortly after arriving at work, you receive a frantic phone call from Walter Wizard, chief executive officer of the Yellow Brick Company. "I need your help!" Walter cries. "Come to my office at once."

Moments later Walter greet you. Scattered about his usually tidy office are disorganized stacks of financial reports, production analyses, and market projections. Prominently placed on the center of his desk is the latest edition of *The Investor's Alert*, a weekly investment publication.

"Have you seen this?" Walter asks as he points to the publication. Before you have a chance to respond, he continues. "They seem to think

I'm not up to the job of running this company. 'Living in the land of Oz' as they put it. The sad part is they might be right. Our quarterly results are down 30% from last year. Our stock is trading at an all-time low. Stockholders are selling out and new investors are avoiding us. Obviously, we have to change the way that we do things. But the market for yellow bricks is depressed. Foreign competition and declining consumer demand are significantly eroding our profitability. To turn things around, something drastic needs to be done. But I don't know what!"

Pausing briefly, Walter hands you three notebook binders. "Last week I asked our corporate attorney, Clare Crow, production engineer, Tim Mann, and marketing director, Howard LeLyon, to develop proposals to improve our profitability. Clare suggests that we spend $19,000 to hire an outside law firm specializing in governmental regulations to lobby members of Congress for protection from foreign competition. She believes several other firms in our industry might participate in the lobbying effort, making our chance of receiving some form of government relief about 50%. If we get it, our sales would improve substantially. But if we don't, foreign competition will continue to cut into our sales."

"Tim suggests that we extend our product line to include other brick colors, like red and gray. Frankly, I don't know who would want a house built with red bricks, but Tim says that the market for colored bricks has been increasing over the past few years and that most of our customers repaint our yellow bricks now anyway. He is quite certain that there's a 10% chance that a high-quality brick, such as we make, in the right colors would boost sales tremendously. However, there's also a 90% chance that the additional colors will only increase sales modestly. And with either outcome, our variable and committed fixed costs will rise."

"Howard wants to revitalize our marketing effort by bringing it in touch with today's consumers. He thinks our current spokesperson, Molly Munchkin, is antiquated. Howard thinks that if we hire that rock singer and part-time actress, Bea Witch—you know, the one who dyes her hair purple and wears green lipstick—our advertising will appeal to a broader range of customers. If it does, there's a 50% chance our sales will go through the roof. The downside risk, however, is that the new marketing effort will fail to attract new customers but, instead, will make some of our current customers switch to our competitors."

For several minutes Walter is silent as you glance through the binders and study the relevant information (Tables 1–3). Then suddenly he interrupts your thoughts. "Personally, I think they have all done a competent and thorough job assessing the profitability and risk of their proposals. But I still do not feel ready to commit to a course of action. Why don't you take a detailed look at these proposals and give me your opinion?"

**Table 1. Clare Crow's Proposal**

Strategy: Hire the firm of Ozgood & Nogood to lobby the federal government for protection from foreign competition.

| | |
|---|---|
| **Possible Outcome 1** | |
| Sales volume | 996,000 bricks |
| Probability | 50% |
| Sales revenue (40¢ per brick) | $398,400 |
| Variable cost (15¢ per brick) | (149,400) |
| Contribution margin | 249,000 |
| Discretionary fixed cost | |
| Lobby expenses | (19,000) |
| Other | (20,000) |
| Committed fixed cost | (65,000) |
| Operating income before taxes | $145,000 |
| **Possible Outcome 2** | |
| Sales volume | 476,000 bricks |
| Probability | 50% |
| Sales revenue (40¢ per brick) | $190,400 |
| Variable cost (15¢ per brick) | (71,400) |
| Contribution margin | 119,000 |
| Discretionary fixed cost | |
| Lobby expenses | (19,000) |
| Other | (20,000) |
| Committed fixed cost | (65,000) |
| Operating income before taxes | $15,000 |

**Table 2. Tim Mann's Proposal**

Strategy: Expand the product mix to include other brick colors.

| | |
|---|---|
| **Possible Outcome 1** | |
| Sales volume | 725,000 bricks |
| Probability | 90% |
| Sales revenue (40¢ per brick) | $290,000 |
| Variable cost (20¢ per brick) | (145,000) |
| Contribution margin | 145,000 |
| Discretionary fixed cost | (20,000) |
| Committed fixed cost | |
| Retooling expenses | (10,000) |
| Other | (65,000) |
| Operating income before taxes | $50,000 |
| **Possible Outcome 2** | |
| Sales volume | 1,725,000 bricks |
| Probability | 10% |
| Sales revenue (40¢ per brick) | $690,000 |
| Variable cost (20¢ per brick) | (345,000) |
| Contribution margin | 345,000 |
| Discretionary fixed cost | (20,000) |
| Committed fixed cost | |
| Retooling expenses | (10,000) |
| Other | (65,000) |
| Operating income before taxes | $250,000 |

**Assignment**

1. Prepare an analysis and comparison of the proposals of Clare Crow, Tim Mann and Howard LeLyon to help Walter choose among them. For this part, ignore the effects of income taxes. Which proposal would you recommend? Why?
2. Analyze and compare the proposals based on their after-tax cash flows. Use a flat tax rate of 34%, but ignore the effect of any net operating loss (NOL) carryover. Based on this analysis, which proposal would you recommend? Why?
3. Analyze and compare the proposals based on their after-tax cash flows. Use the progressive tax rates shown below,[1] but ignore the effect of any NOL carryover. Based on this analysis, which proposal would you recommend? Why?

**Progressive Tax Rates for Corporations**

| Taxable Income Over ($) | But Not Over ($) | Tax ($) | Rate (%) | Of Amount Over ($) |
|---|---|---|---|---|
| 0 | 50,000 | | 15 | 0 |
| 50,000 | 75,000 | 7,500 | +25 | 50,000 |
| 75,000 | 100,000 | 13,750 | +34 | 75,000 |
| 100,000 | 335,000 | 22,250 | +39 | 100,000 |
| 335,000 | 10,000,000 | 113,900 | +34 | 335,000 |
| 10,000,000 | 15,000,000 | 3,400,000 | +35 | 10,000,000 |
| 15,000,000 | 18,333,333 | 5,150,000 | +38 | 15,000,000 |
| 18,333,333 | | 6,416,666 | +35 | 18,333,333 |

4. Derive and analyze the after-tax cash flow of Howard LeLyon's proposal when any current year NOL is carried back. In making your evaluation use both a flat tax rate of 34% and progressive tax rates. Assume that the Yellow Brick Company has been in operation for only 1 year and that it had income in this prior year of:
   a. $60,000
   b. $160,000.

**Additional Information**

1. Federal income taxes are not deductible for computing taxable income.
2. Lobbying expenses paid in an attempt to influence federal legislation

[1]The progressive tax rates presented here are those currently in effect for corporations. Although only the first four brackets of the rate structure are required for the case, the entire structure is provided to give students the full picture.

**Table 3. Howard LeLyon's Proposal**

Strategy: Replace the Company's current advertising spokesperson, Molly Munchkin, with controversial rock singer and part-time actress, Bea Witch.

| | |
|---|---|
| **Possible Outcome 1** | |
| Sales volume | 1,460,000 bricks |
| Probability | 50% |
| Sales revenue (40¢ per brick) | $584,000 |
| Variable cost (15¢ per brick) | (219,000) |
| Contribution margin | 365,000 |
| Discretionary fixed cost | |
| Promotional expenses | (50,000) |
| Other | (20,000) |
| Committed fixed cost | (65,000) |
| Operating income before taxes | $230,000 |
| **Possible Outcome 2** | |
| Sales volume | 300,000 bricks |
| Probability | 50% |
| Sales revenue (40¢ per brick) | $120,000 |
| Variable cost (15¢ per brick) | (45,000) |
| Contribution margin | 75,000 |
| Discretionary fixed cost | |
| Promotional expenses | (50,000) |
| Other | (20,000) |
| Committed fixed cost | (65,000) |
| Operating loss before taxes | $(60,000) |

or governmental actions are not deductible for computing taxable income.

3. NOLs can be carried back 3 years and forward 15 years to offset the taxable incomes of prior or future years. Tax refunds from NOL carrybacks are computed as the difference between the amount of tax paid in the year(s) to which the NOL is carried back and the amount that would have been paid had the income of the carryback year(s) been reduced by the amount of NOL.[2]

[2]Only those aspects of NOL carrybacks applicable to the case are presented here. If the instructor wishes to give students a fuller coverage on this topic, he/she can add the following: NOLs can be carried back 3 years and forward 15 years to offset the taxable incomes of prior or future years. In computing the carryback of the current year NOL, the NOL is first carried back to offset taxable income in the earliest of the 3 preceding years. If taxable income in this year is insufficient to exhaust the NOL, the remainder is carried to the second preceding year, then to the first preceding year. If the full amount of the NOL still is not used up, then the remainder is carried forward against future taxable income for up to 15 years. The carryback of a NOL is mandatory, unless an election is made to forego the carryback completely. If such an election is made, then the entire NOL must be carried forward. At the end of a 15-year carryforward period, any NOL not offset by taxable income expires and can no longer be carried forward.

## TEACHING NOTE

This case illustrates the complex ways in which several key aspects of the tax law, specifically implicit taxes, progressive rates, and NOL carrybacks, can affect the relative profitability and risk of alternative projects. The importance of these tax features to decision-making is discussed by Scholes and Wolfson (1992). The framework they provide, however, is largely conceptual and targeted at courses with a focus on tax. While this case is based on their framework, it is designed for use with students who have no special background in taxation. Its coverage is also deliberately kept comprehensive to promote an integrative, as opposed to a piecemeal, understanding of the role of taxes in decision-making.

This case is primarily designed for managerial accounting courses. Many students who take such courses are nonaccounting majors who tend not to augment their accounting coursework with a tax course. The case can help these students develop an appreciation for the important, and often complex, role that taxes can play in managerial decision-making. For those students who do go on to take courses in taxation, the case still can be of benefit by strengthening their recognition that tax planning is an integral, rather than compartmentalized, part of management.

The amount of class time needed for the case depends in part on the students' background, and in part on how much open discussion the instructor wishes to allow. Covering all four assignment questions generally requires a carefully-paced 100-minute session or two 50-minute sessions. These time allotments will permit considerable time for in-class discussion. Many of the key points are covered in the first three questions. A time-pressed instructor can cover these questions in a 75-minute session if significant in-class discussion is allowed, and a 50-minute session if a very directive approach is used (e.g., using the case as the basis for a lecture).[3]

The tax concepts illustrated in the case are applicable to both short- and long-term decisions. To keep the focus on the role of taxes, and to do this within a limited amount of class time, requires some simplifications. This teaching note follows our preferred approach of limiting attention to one period and omitting consideration of the time value of money. Instructors who wish to include these factors can easily do so, such as by adding multi-period NOL carrybacks and carryforwards.

The assignment questions progress from simpler concepts to increasingly involved analyses, and we strongly recommend that they be taken in the

[3]Another way to reduce the time requirement of the case is to exclude Clare Crow's proposal. This proposal introduces the concept of implicit taxes, which tends to be relatively easy for students to grasp. However, retaining this proposal does have the advantage of enriching the discussion of the risk–return tradeoffs among alternatives.

order given. We also recommend constructing a table—such as Table 4—on the board to help students keep track of the numbers and to follow the key points. This table can be completed in three stages, each corresponding to one of the first three assignment questions. For each segment of the table, we typically show how the figures are derived for one of the proposals, then simply fill in the corresponding numbers for the other two proposals.

**Assignment Question One**

We recommend that the instructor initiate the case analysis by constructing the first three columns of Table 4. These columns simply summarize information provided in Tables 1, 2 and 3. To avoid stifling student participation, we suggest that at this point, the instructor only put up the first two columns of numbers for each alternative, namely, the before-tax cash flows for outcomes 1 and 2 and their probabilities.

With these figures on the board, the students can be asked (by a show of hands) which of the three proposals they would recommend. It is rare for a consensus to emerge at this point, and we recommend allowing time for students to discuss their different conclusions. The more thoroughly the three proposals are evaluated at this initial stage, the stronger the foundation for analyzing the subsequent assignment questions. This discussion also will increase students' appreciation that real world problems often are complex and without unambiguous "right" answers.

Some students will support Tim Mann's product mix proposal because it has the highest potential payoff on the upside ($250,000) while on the downside, its low payoff ($50,000) is not as low as those for the other two alternatives. Invariably, some students will counter that Tim Mann's high payoff only has a 10% probability of occurring, while there is a full 90% probability that the low payoff will be obtained. (If the students fail to consider the outcomes' probabilities, the instructor can nudge them in this direction by asking how sure they feel that Tim Mann's high payoff would be obtained.) During this discussion, the students often will recommend computing the expected value of each proposal's cash flows. It is useful to work out this value for one of the proposals, then fill in this row of Table 4 for all three proposals.

The instructor can close the discussion by noting that choosing among the proposals basically involves trading off their levels of payoffs and their associated probabilities. Thus, while Howard LeLyon's proposal has the highest expected before-tax cash flow, it also is the only proposal with a chance of a loss. Clare Crow's proposal has the second highest expected cash flow, but its highest potential payoff is far less than that under Tim Mann's proposal. On the other hand, there is only a 10% chance that Tim Mann's high outcome will be realized. Hence, none of the proposals

**Table 4. After-Tax Cash Flows and Risk of the Proposals Under Flat and Progressive Tax Rates**

| Proposal (1) | Probability (2) | Before-tax Cash Flow (3) | Nondeductible Expenses (4) | Taxable Income (5) | Flat Rate (34%) Taxes (6) | Flat Rate (34%) After-tax Cash Flow (7) | Progressive Rates Taxes (8) | Progressive Rates After-tax Cash Flow (9) |
|---|---|---|---|---|---|---|---|---|
| **Clare Crow's Lobbying Proposal** | | | | | | | | |
| Outcome 1 | 50% | 145,000 | $19,000 | $164,000 | $55,760 | $89,240 | $47,210 | $97,790 |
| Outcome 2 | 50% | 15,000 | 19,000 | 34,000 | 11,560 | 3,440 | 5,100 | 9,900 |
| Expected value[a] | | 80,000 | | 99,000 | 33,660 | 46,340 | 26,155 | 53,845 |
| Standard deviation[b] | | 65,000 | | | | 42,900 | | 43,945 |
| Risk (coefficient of variation)[c] | | .81 | | | | .93 | | .82 |
| **Tim Mann's Product Mix Proposal** | | | | | | | | |
| Outcome 1 | 90% | 50,000 | | 50,000 | 17,000 | 33,000 | 7,500 | 42,500 |
| Outcome 2 | 10% | 250,000 | | 250,000 | 85,000 | 165,000 | 80,750 | 169,250 |
| Expected value[d] | | 70,000 | | 70,000 | 23,800 | 46,200 | 14,825 | 55,175 |
| Standard deviation[e] | | 60,000 | | | | 39,600 | | 38,025 |
| Risk (coefficient of variation)[f] | | .86 | | | | .86 | | .69 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Howard LeLyon's Marketing Proposal without NOL Carryback** | | | | | | | |
| Outcome 1 | 50% | 230,000 | 230,000 | 78,200 | 151,800 | 72,950 | 157,050 |
| Outcome 2 | 50% | (60,000) | 0 | 0 | (60,000) | 0 | (60,000) |
| Expected value[g] | | 85,000 | 115,000 | 39,100 | 45,900 | 36,475 | 48,525 |
| Standard deviation[h] | | 145,000 | | | 105,900 | | 108,525 |
| Risk (coefficient of variation)[i] | | 1.71 | | | 2.31 | | 2.24 |

[a]($145,000 operating income × 50% probability) + ($15,000 operating income × 50% probability).

[b]Square root of [($145,000 operating income − $80,000 expected income)$^2$ × 50% probability] + [($15,000 operating income − $80,000 expected income)$^2$ × 50% probability].

[c]$65,000 standard deviation ÷ $80,000 expected income.

[d]($50,000 operating income × 90% probability) + ($250,000 operating income × 10% probability).

[e]Square root of [($50,000 operating income − $70,000 expected income)$^2$ × 90% probability] + [($250,000 operating income − $70,000 expected income)$^2$ × 10% probability].

[f]$60,000 standard deviation ÷ $70,000 expected income.

[g]($230,000 operating income × 50% probability) + ($ − 60,000 operating loss × 50% probability).

[h]Square root of [($230,000 operating income − $85,000 expected income)$^2$ × 50% probability] + [($ − 60,000 operating loss − $85,000 expected income)$^2$ × 50% probability].

[i]$145,000 standard deviation ÷ $85,000 expected income.

dominates the others in all respects, and choosing any one of them would require foregoing some advantage offered by one of the other alternatives.

By this time, the students will readily accept that it would be helpful to quantify the proposals' risk–return tradeoffs. Yet, they often have difficulty coming up with a measure, and we recommend that the instructor simply take charge of this issue. Our preferred approach is to first ask students if they recall what the standard deviation of a distribution represents. (Students without such prior exposure are rare.) Then we compute this statistic for Clare Crow's proposal, in the process showing how it is based on both the cash flows' magnitude and their probabilities. After that, we fill in this part of Table 4 for all three proposals.

Next, we point out that the three proposals have different expected cash flows and standard deviations, so that the risk–return tradeoff among them is still not clear. Then we suggest that it would be useful to compare the amount of risk that each proposal requires to earn a dollar of expected cash flow. Dividing each proposal's standard deviation by its expected cash flow yields its coefficient of variation, which we also enter into Table 4. We then propose using this coefficient as our measure of project risk.[4]

With the first three columns of Table 4 thus completed, the focus should revert to choosing among the three alternatives. This time, the nature of the tradeoffs is a bit more clearcut. Relative to Tim Mann's proposal, Clare Crow's has both a higher expected cash flow ($80,000 versus $70,000) and a lower coefficient of variation (.81 versus .86). On this basis, the class generally would agree that Clare's proposal is superior. However, choosing between Clare's and Howard LeLyon's proposals still is problematic, as neither dominates the other. While the former has a substantially lower coefficient of variation (.81 versus 1.71), its expected cash flow also is lower. Trying to decide between these two proposals helps to show that while it is useful to derive formal measures of project characteristics — risk–return ratios in the current case — such measures are not replacements for managerial judgment. After a brief discussion, students generally would settle on Clare Crow's proposal as providing the best balance between expected return and risk. However, reaching a consensus is not necessary. Indeed, any remaining disagreement can be

[4]Some instructors may prefer to use other risk measures, such as variance or mean absolute deviation. Others may prefer to stay with the standard deviation, or even just the alternate outcomes and their associated probabilities. We expect that in part, this choice will depend on the course level and student background. The case discussion can easily be modified to accommodate these other measures without reducing its ability to illuminate the tax issues. Our teaching note focuses on the coefficient of variation because we have used it with consistently favorable student reactions.

used to remind students of the complexity and multi-dimensional nature of real world decision-making.

### Assignment Question Two

This question initiates the consideration of tax effects. Use of a constant marginal tax rate is typical of the approach in managerial accounting textbooks; by comparing the answers to questions two and three, students will see that alternate tax structures can produce significantly different project evaluations, such that understanding the applicable tax structure is crucial to effective decision-making. A 34% constant rate is used in the case because this is the effective marginal rate for many large corporations.[5]

Question two calls for completing columns 4–7 of Table 4. Computing the after-tax cash flows for Clare Crow's lobbying proposal introduces the concept of implicit taxes. The instructor can explain that such taxes arise because not all types of income or expenses are treated equally under current tax laws. For the Yellow Brick Company, the expenses of manufacturing and distributing bricks (variable cost, other discretionary fixed cost, and committed fixed cost) are fully deductible and, hence, tax-favored. The cost of lobbying the federal government, on the other hand, is tax-disfavored because it is not deductible.[6] Thus, the $19,000 lobbying expenses under Clare Crow's proposal have to be added back to the before-tax cash flows to arrive at taxable income. Neither of the other two proposals faces this complication, as both involve only tax-deductible expenses. For these proposals, the tax is simply 34% of the before-tax cash flows.

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[5]Sometimes students become so interested in the tax structure that they request a bit more discussion on the topic. The instructor can explain that despite the progressive nature of the current tax structure, many corporations are subject to a 34% tax rate because their taxable income is between $335,001 and $10,000,000. Additionally, corporations with taxable income between $75,001 and $100,000 are subject to a 34% marginal tax rate, with a 5% surtax imposed on taxable income between $100,001 and $335,000. The effect of this surtax is to create a 39% marginal tax rate "bubble" that levels off to a flat 34% on taxable income between $335,001 and $10,000,000. For taxable income in excess of $10,000,000, the marginal tax rate is 35%, with an additional 3% surtax imposed on income between $15,000,001 and $18,333,333.

[6]If the instructor wishes to provide a fuller treatment of implicit taxes, he/she can point out that under the current tax structure, expenses of lobbying local governmental units are deductible without limitation and that in-house lobbying expenses which do not exceed $2,000 per year are deductible under a *de minimis* exception. Another interesting aspect of the tax laws in this area is that business gifts are deductible to a maximum of $25 per gift for each recipient, and expenses for meals and entertainment for business purposes are deductible to the extent of 50% of their cost.

With columns 4–7 completed, the focus can shift back to comparing the alternatives. This time, Howard LeLyon's proposal can be dismissed relatively quickly, as it has both the lowest expected after-tax cash flow and by far the highest risk. However, the choice between Clare Crow's and Tim Mann's proposals is now less obvious. While the former has a slightly higher expected after-tax cash flow ($46,340 versus $46,200), it also has a slightly higher coefficient of variation (.93 versus .86).

Comparing the proposals before and after tax (columns 3 and 7) is useful for showing how taxes affect project outcomes. The instructor can first focus on Clare Crow's and Tim Mann's proposals. He/she can note that whereas Clare's proposal had a $10,000 higher expected before-tax cash flow ($80,000 versus $70,000), its superiority on an after-tax basis was not $6,600 [ = $10,000 × (1 − .34], but only $140 ($46,340 versus $46,200). This narrowing of the gap was due to Clare's proposed lobbying expenses not being deductible for tax purposes, thus subjecting the company to an additional (implicit) tax of $6,460 (= $19,000 × .34).

Another issue to raise with the students is why there is an increased risk for Clare Crow's proposal (from .81 to .93). The reason is that because lobbying expenses are not tax deductible, the Yellow Brick Company has to bear all of the risk associated with it, rather than shifting 34% to the federal government as it can with deductible expenses. Hence, an implicit tax under a flat tax rate can substantially reduce a project's after-tax profitability while simultaneously increasing its risk.

The increased risk for Howard LeLyon's proposal (from 1.71 to 2.31) can be similarly explained. Since question two had assumed than NOL cannot be carried back or forward, the $60,000 potential loss under this proposal does not produce any tax relief. Thus, the Yellow Brick Company has to bear the entire risk of this outcome rather than to pass 34% of it on to the government.

### Assignment Question Three

Computing taxes under progressive rates (columns 8 and 9 of Table 4) is more involved than for flat tax rates. We recommend going through the detailed calculations for at least one of the proposals. With columns 8 and 9 filled in for all three proposals, the discussion can first focus on comparing the alternatives under a single tax structure, then extend to a cross-comparison with the other structures.

Under progressive tax rates, Tim Mann's proposal begins to dominate the other two alternatives. It has both the highest expected after-tax cash flow ($55,175) and the lowest risk (.69). Clare Crow's proposal is second best on both dimensions; Howard LeLyon's proposal is last.

At this point, it is useful to address why the picture changes so much between the flat and progressive rate structures. Attention can first be

focused on Tim Mann's proposal. With some prompting, if necessary, students will recognize that under progressive tax rates, lower levels of income are tax-favored relative to higher levels. Thus, the $50,000 outcome under Tim's proposal is taxed at a far lower rate than 34%. While the $250,000 outcome is subject to a 39% marginal tax rate, its first $75,000 still is taxed at lower than a 34% rate. When the two after-tax outcomes are weighted by their respective probabilities, the effective overall tax rate is only 21.2% (= $14,825/$70,000).

Both Clare Crow's and Howard LeLyon's proposals also benefit from the progressive tax rates. However, the former is handicapped by the nondeductibility of its lobbying expenses, while the latter gets no relief for its loss. Thus, their expected benefits from progressive taxes are far less than that for Tim Mann's proposal.

Another effect of progressive tax rates is a reduction in all three proposals' risk measures. This reduction can be explained as follows. Under progressive tax rates, the government provides a greater subsidy (via lower marginal tax rates) to lower income outcomes. In the current case, when this disproportionate subsidy is weighted by the outcome probabilities, the net effect is a greater percentage decline in standard deviation than in expected after-tax cash flow.

It should be apparent that the case can be concluded after question three and still have provided students with a rich learning experience. For instructors who select this option, we strongly recommend closing the session with a well-organized summary. The points to stress include the need to consider explicitly both project profitability and risk, the danger of assuming that projects would have the same relative rankings based on before-tax and after-flat-tax cash flows, and most important, the complex effects that the tax structure (i.e., flat versus progressive tax rates) and tax rules (e.g., implicit taxes and NOL deductibility) can have on both project profitability and risk.

### Assignment Question Four

This question shows how the ability to carryback a NOL can further change relative project rankings. In particular, when the income of the carryback year is large enough to fully absorb the NOL, the NOL's adverse effects are eliminated under a flat tax rate, while under progressive tax rates the extent of tax relief depends on the level of income in the carryback year.[7]

[7]The case does not provide an example of a NOL carryback when income in the carryback year is insufficient to absorb the entire NOL. This is a deliberate choice to keep the example from expanding into a multi-period one, with attendant additional complexities.

The tax computations required by question four are more complex than those for the other three questions, and time should be allowed to explain each step. Also, adding question four to the picture greatly expands the number of possible comparisons. We have found that a visual aid like Table 5 can greatly improve students' ability to follow the discussion. (The top part of this table also can be useful for instructors who stop with question three.)

Table 6 shows how we generally structure the income tax computations with a NOL carryback. Consider the 34% flat tax case in column 3. The tax calculation involves first determining the amount of tax originally paid in the year to which the NOL will be carried back. When taxable income in this carryback year is \$160,000, the original tax is \$54,400 (= \$160,000 × .34). The second calculation is the amount of tax that would have been paid after the \$160,000 has been offset by the \$60,000 loss carryback. This amount is \$34,000 (= \$160,000 − \$60,000) × .34). The \$20,400 difference between the originally paid and adjusted tax amounts (\$54,400 versus \$34,000) is the amount of tax refund due to the NOL carryback. In column 3, this amount is multiplied by 50% because that is the probability of sustaining a \$60,000 loss and, hence, the carryback occurring. The final calculation involves adding the \$10,200 expected tax refund (= \$20,400 tax refund × 50% probability) to the current year's \$45,900 expected after-tax cash flow before the NOL carryback (Table 4,

**Table 5. Summary of the Proposals' Cash Flows and Risk**

| Proposal (1) | Before-tax (2) | Flat Rate (34%) (3) | Progressive Rates (4) |
|---|---|---|---|
| **Clare Crow's Lobbying Proposal** | | | |
| Expected cash flow | \$80,000 | \$46,340 | \$53,845 |
| Risk (coefficient of variation) | .81 | .93 | .82 |
| **Tim Mann's Product Mix Proposal** | | | |
| Expected cash flow | 70,000 | 46,200 | 55,175 |
| Risk (coefficient of variation) | .86 | .86 | .69 |
| **Howard LeLyon's Marketing Proposal without NOL carryback** | | | |
| Expected cash flow | 85,000 | 45,900 | 48,525 |
| Risk (coefficient of variation) | 1.71 | 2.31 | 2.24 |
| **Howard LeLyon's Marketing Proposal with NOL carryback** | | | |
| \$60,000 income in the prior year | | | |
| Expected cash flow | | 56,100 | 53,525 |
| Risk (coefficient of variation) | | 1.71 | 1.93 |
| \$160,000 income in the prior year | | | |
| Expected cash flow | | 56,100 | 60,225 |
| Risk (coefficient of variation) | | 1.71 | 1.61 |

**Table 6. Effects of NOL Carryback on Howard LeLyon's Proposal**

| Tax Structure (1) | Income Available for NOL Carryback: $60,000 (2) | | Income Available for NOL Carryback: $160,000 (3) | |
|---|---|---|---|---|
| **Flat Tax Rate of 34%** | | | | |
| Tax on available income | | | | |
| Before NOL carryback | $20,400 | | $54,400 | |
| After NOL carryback | 0 | | 34,000 | |
| Tax refund from carryback | $20,400 | | $20,400 | |
| Expected value (50% probability) | | $10,200 | | $10,200 |
| Expected after-tax cash flow | | | | |
| Before NOL carryover | | 45,900 | | 45,900 |
| After NOL carryover | | $56,100 | | $56,100 |
| Standard deviation | | 95,700 | | 95,700 |
| Risk (coefficient of variation) | | 1.71 | | 1.71 |
| **Progressive Tax Rates** | | | | |
| Tax on available income | | | | |
| Before NOL carryback | $10,000 | | $45,650 | |
| After NOL carryback | 0 | | 22,250 | |
| Tax refund from carryback | $10,000 | | $23,400 | |
| Expected value (50% probability) | | $5,000 | | $11,700 |
| Expected after-tax cash flow | | | | |
| Before NOL carryover | | 48,525 | | 48,525 |
| After NOL carryover | | $53,525 | | $60,225 |
| Standard deviation | | 103,525 | | 96,825 |
| Risk (coefficient of variation) | | 1.93 | | 1.61 |

column 7). The resulting total of $56,100 is the amount of expected after-tax cash flow after carryback of the NOL. The computations under progressive tax rates are similar, except that instead of using a constant 34% marginal rate, the tax refunds are based on the applicable marginal tax rates. Also, the current year expected after-tax cash flow is $48,525 instead of $45,900 (column 9 of Table 4).

Returning to Table 5, first consider the case of flat taxes. Column 3 of this table shows that the NOL carryback produces the same expected after-tax cash flows and risk measures for both levels—$60,000 and $160,000—of prior year income. These identical results are due to both prior year tax assessments and current year tax refunds being based on a constant 34% rate, irrespective of the income level. The expected after-tax cash flows of $56,100 are simply the difference between the expected before-tax cash flow and a tax of 34% [$85,000 expected before-tax cash flow − ($85,000 × 34% tax rate)]. Compared with the before-tax case, the NOL carryback under flat taxes also does not change the proposal's risk, as the government's share of all outcomes—both positive and negative—

is constant. Thus, in the presence of a NOL carryback, the only effect of a flat tax rate is to reduce expected cash flow by 34%.

It is worth noting that with the NOL carryback, the expected after-tax cash flow for Howard LeLyon's proposal now far surpasses those for Clare Crow's and Tim Mann's proposals. Whether this excess is large enough to compensate for its substantially higher risk can be a matter of debate. Regardless, this comparison still shows quite clearly how a specific tax provision—NOL carrybacks—can significantly influence the relative evaluation of alternatives.

In contrast, column 4 of Table 5 shows that under progressive taxes, the effects of a NOL carryback depend on the level of income in the carryback year. When this income is $60,000, a NOL carryback of the same amount provides a smaller tax refund than under flat taxes while increasing the proposal's risk to 1.93. The outcome is that Howard LeLyon's proposal still would be dominated by those of Clare Crow and Tim Mann.

When income in the prior year is $160,000, however, the expected after-tax cash flow of LeLyon's proposal experiences a more substantial increase to $60,225, while its risk decreases to 1.61. Now its expected after-tax cash flow is much higher than those of Clare Crow's and Tim Mann's proposals. Student opinions will differ on whether the excess is sufficient for accepting this proposal's higher risk. Again, the key is not to reach consensus. Rather, it is to recognize the complex way that tax structure, NOL carryback, and the prior year income interact to change the projects' risk and return characteristics.

## CONCLUSION

Given the many tax effects illustrated by the case, it is important to provide an organized summary of the key points. We have found Table 5 to be very useful for this purpose. The points to reiterate include the need to consider both project profitability and risk in decision making, the complex ways in which tax structure (i.e., flat versus progressive tax rates), tax rules (e.g., implicit taxes and NOL deductibility), the company's current and past financial performance, and the nature of its available alternatives can interact to affect the relative desirability of each alternative, and the critical role of *ex ante* tax planning in managerial decision making.

## REFERENCE

Scholes, M. S., & Wolfson, M. A. (1992) *Taxes and Business Strategy*, Englewood Cliffs, New Jersey: Prentice Hall.