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REPORT

Using Discount Rates to Adjust Transfer Prices Under Long-Term Agreements for Differences in Risk

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Under the arm's-length standard, transfer prices between related parties should be based, whenever possible, on the actual prices paid, or the actual profits earned, by third parties dealing with one another under comparable circumstances. In real life, ''exact'' comparables—third-party prices that can be applied to related-party transactions with no adjustments for differences—are rare. Accordingly, transfer pricing guidelines generally allow the use of ''inexact'' comparables if the impact on the transfer price of differences between the related-party dealings and the comparable arm's-length dealings (transfer pricing differences) can be quantified with reasonable precision.[1]

This article will examine the impact on transfer prices of contractual provisions that shift risks from one party to another. Under the U.S. transfer pricing regulations (and Organization for Economic Cooperation and Development Guidelines), related parties generally are not required to use exactly the same pricing formula—and thus to provide for exactly the same allocation of risks—as unrelated parties have applied, or arguably would have applied, under comparable conditions.[2] Notwithstanding differences in contractual terms, an otherwise comparable arm's-length transaction can still be used to test whether the result under a related-party agreement achieved an arm's-length result. The reliability of that test depends on whether a reliable adjustment can be made for the difference in the transfer pricing formula and the consequent difference in the allocation of risks.

Set forth below is a method for making such an adjustment for differences in contractual terms that result in different allocations of risk. Contractual terms are fixed before the actual results from the risks are known. Accordingly, the only way to determine the impact of those terms on prices or pricing formulas is to evaluate the parties' expectations at the time the contractual terms were fixed. Of necessity, any adjustment for differences in contractual provisions that allocate risk

[1] This article addresses adjustments for risks to transfer prices determined under a specific long-term agreement between unrelated parties. A companion article will address adjustments for risk to the profit level indicators under the comparable profits or transactional net margin method.

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[2] Of course, in exceptional cases, contractual terms between related parties may be disregarded. See Regs. §1.482-1(d)(3)(ii). This question of when contractual terms should be disregarded is legal, not economic, and not addressed in this article. Rather, this article assesses the economic impact of contractual terms that satisfy the relevant legal requirements.

 ISSN 1063-2069

must be based on projected, not actual, results. The reliability of any method of adjusting for risk, including the method described below, depends on the reliability of information about parties' projections.

Two different applications of the same general method are outlined. The first and simpler application involves adjusting a running royalty rate under an intangible license agreement for an initial, lump-sum payment. Following a description of how the general method would apply in that simpler case is a closer examination of the critical concept of a risk-adjusted discount rate.

In a second, more complicated situation, the transfer pricing difference pertains to the formula for calculating the compensation of one party by the other (specifically, a distributor with a fixed gross profit margin versus one guaranteed recovery of its operating expense plus a fixed operating margin). Finally, the article explains the clear distinction between the effect of shifting risk from one party to another and the effect of transferring intangible property or other sources of income.

Adjusting for Up-Front Payments

This section discusses how to adjust transfer prices or related-party profits for up-front costs when the consequent economic benefit is, under the terms of a long-term contract, contingent on future sales or other uncertain amounts. A simple example would be an intangible license agreement under which the licensee agrees to pay both a specified lump-sum amount upon the signing the agreement and a ''running'' royalty based on the licensee's net sales of the products that embody the licensed intangible (licensed product). Given the article's focus on up-front costs, it is assumed that but for the up-front payment, the running royalty rate applied to the related-party license agreement would have been equal to the rate under the comparable arm's-length agreement.

The author's experience is that unrelated companies negotiating long-term agreements usually develop, and sometimes exchange, projections of net cash flows resulting from sales of the licensed product. Many companies apply a risk-adjusted discount rate to calculate the present value of the projected cash flows under a proposed license agreement. Within a company, the sponsors of a proposed agreement often summarize the results of these discounted cash flow analyses in presentations aimed at securing top management's approval to sign the proposed agreement. Accordingly, using a present-value formula like that described below offers a reasonable and sometimes feasible way of evaluating the impact of an up-front payment on projected benefits contingent on uncertain future events.

Turning to specifics, the objective is to translate an initial, up-front payment into an appropriate adjustment to a running royalty rate. As noted, two critical inputs are required: reliable information about the parties' projections of net sales of the licensed product over the term of the license agreement, and an appropriate discount rate to apply in calculating the present value of a running royalty based on those net sales. When both critical inputs are available, the present value of the projected net cash flow of one party or the other can be calculated, and a determination can be made whether the transfer price has been properly adjusted to reflect the difference in contractual terms.

In this first example, the adjustment to the running royalty rate to reflect the initial lump-sum payment would be:

$r_L = L / PV_d(S_1 \ldots S_T)$

where:

r_L = Adjustment to the running royalty rate for lump sum payment

L = Initial lump-sum payment

$PV_d(S_1 \ldots S_T)$ = Sum of the present values (based on a risk-adjusted discount rate, *d*, and as of the date of the lump-sum payment) of net sales of the licensed product in each period during the term of the license agreement.

Attachment 1, which appears after the text of this article, illustrates these calculations.

- Lines 1-5 of Attachment 1 show projected sales of the licensed product, a 5 percent running royalty, an up-front license payment, and thus the licensor's projected total consideration.
- Lines 6-8 indicate that the present value of total payments to the licensor equals 5.6 percent of the present value of the licensees' net sales. Since the effective royalty rate, 5.6 percent, exceeds the running royalty rate, 5.0 percent, the difference, 0.6 percent, represents the adjustment for the up-front payment.
- Finally, lines 9-10 confirm that a running royalty at a 5.6 percent rate would yield royalties with the same present value to the licensor as the up-front payment plus a running royalty at a 5 percent rate (*i.e.*, line 10 equals line 5).

Given all the assumptions, it is reasonable to conclude that in this case 0.6 percent (*i.e.*, 5.6 percent minus 5 percent) reflects an arm's-length adjustment to the running royalty rate for eliminating the up-front payment.

Risk-Adjusted Discount Rates

In some cases, a transfer pricing analyst might know and choose to rely on the risk-adjusted discount rate actually applied by one or both of the parties to an arm's-length agreement. In other cases, the discount rate applied by those parties may be either unknown or not offer a reliable indication of the risk of the projected cash flow. Accordingly, a brief discussion of estimating risk-adjusted discount rates seems worthwhile.

If the future value of a cash flow was known with certainty (*e.g.*, an amount fixed in a binding contract), one would discount that fixed amount at a risk-free rate in order to adjust for the time value of money.[3] When a future cash flow is risky, the appropriate discount rate equals that risk-free rate plus a risk premium that increases in proportion to the risk of that cash flow.

Accordingly, it is important to understand what exactly is meant by ''risk'' and how the risk of a future payment would generally be measured.[4] Using basic concepts of probability theory, risk generally is measured by the ''standard deviation'' of the possible values of a random variable around its ''expected'' value. The

[3] Assuming the company could incur debt now and repay that amount when it receives the risk-free payment, the risk-free discount rate would be the company's interest cost of debt with the same maturity as the risk-free obligation.

[4] In actual cases the measurement of risk depends on the specific facts and circumstances. This short article describes the measurement of risk in very general terms.

  TMTR ISSN 1063-2069

expected value, or mean value, of a random variable (*e.g.*, net sales of the licensed product in the first year under the license agreement) is the probability-weighted average of all its possible values. To illustrate, if first-year sales had a 90 percent probability of equaling $100 and a 10 percent probability of equaling $200, the ''expected'' value of net sales would be $110.[5]

The standard deviation of a random variable is the square root of its ''variance.'' The variance, in turn, is the probability-weighted average of the squared values of the deviations of the possible values around the expected value. Table 1 below illustrates the calculation of mean and standard deviation based on the example given above and indicates that the standard deviation of net sales in the first year is $30.

In evaluating risk of one cash flow in comparison to another cash flow, what matters is relative risk—that is, the standard deviation expressed as a percentage of the expected value.[6] In this case, the ratio of the standard deviation, $30, to the mean value, $110, equals 27.3 percent—see line 9 of Table 1. This critical ratio is generally called the ''coefficient of variation.''

The risk premium that is reflected in the risk-adjusted discount rate increases in direct proportion to the risk of the cash flow as measured by its coefficient of variation. That is, if the coefficient of variation of one cash flow is twice that of a second cash flow, then the appropriate risk premium reflected in the discount rate for the first cash flow is twice that of the second.

[5] See line 3 of Table 1 below.

[6] Note that whenever one amount (*e.g.*, a running royalty) is a fixed percentage of another amount (*e.g.*, the licensee's net sales), the relative risk of one of those amounts is identical to that of the other amount. Consequently, the risk-adjusted discount rate that would be applied to one would equal the discount rate to be applied to the other.

Table 1: Mean, Standard Deviation, and Coefficient of Variation

		Outcome			
#	*Variable*	*Low*	*High*	*Total*	*Explanation*
		<a>	<b>	<c>	
1	Probability	90%	10%	100%	Assumed value
2	Value	$100	$200		Assumed value
3	Weight Value	$90	$20	$110	#1 x #2
4	Expected Value	$110	$110		#3 <c>
5	Deviation from Expected	-$10	$90		#2 - #4
6	Squared Deviation	100	8,100		Square of #5
7	Weighted Sq. Dev.	90	810	900	#1 x #6
8	Standard Deviation			$30	Square Root of #7
9	Coefficient of Variation			27.3%	#8 / #3

The question, then, is how can an estimate of the coefficient of variation be translated into an estimate of the appropriate risk premium to reflect a risk-adjusted discount rate? One way is to begin with the risk and risk premium that are reflected in a company's overall cost of capital, which is the discount rate, or hurdle rate, that a company would apply to a typical investment. A company's overall cost of capital is usually calculated as a weighted average of the company's cost of debt and the opportunity cost of its equity capital (*i.e.*, investors' expected rate of return on equity investments of comparable risk).

There are various ways of estimating the opportunity cost of equity capital.[7] Assuming a company would apply its own cost of debt (c_d) to a risk-free investment, the risk premium (r_p) inherent in its overall cost of capital would equal (1) the ratio of the company's equity to its total capital (w_e) multiplied by (2) the excess of its cost of equity (c_e) over its the cost of debt:[8]

$$r_p = w_e (c_e - c_d)$$

If the cash flow at issue had risk that was comparable to the risk of the typical investment made by the company, the appropriate risk-adjusted discount rate would be the company's overall cost of capital. In cases where the cash flow at issue is substantially more or less risky than the typical investment, an adjustment to the typical risk premium should be made to reflect the relative risk. That is, if the risk of the cash flow at issue is a fraction (x) of the risk of the typical investment, the discount rate (d) applied to the cash flow at issue would be:

$$d = c_d + (x\ r_p)$$

In actual applications, determining a company's overall cost of capital and evaluating the relative risk of a particular cash flow may be complex and/or controversial. To put these issues in perspective, it should be noted that determining a cost of capital and adjusting that cost for specific risks are often required to assess

[7] A comprehensive review of the alternatives is provided in Ibbotson Associates, *Stocks, Bonds, Bills and Inflation, Valuation Edition, 2003 Yearbook*, Chicago, Illinois, 2003.

[8] That is to say, the formula for the overall cost of capital (c_a) is:

$$c_a = [(1 - w_e)\ c_d] + [w_e\ c_e]$$

The right-hand side of this formula can be rewritten as:

$$c_a = c_d + [w_e\ (c_e - c_d)]$$

The risk premium inherent in a company's overall cost of capital is the last term in this equation.

the fair market value of a business or evaluate the merits of a new investment opportunity.

Differences in the Compensation Formula

A second potential application of this method arises when a related-party agreement provides for a different formula for calculating a party's compensation than an otherwise comparable third-party agreement. For example, a third-party agreement might provide that an unrelated distributor of a product will earn a gross profit margin that is a fixed percentage (*e.g.*, 50 percent) of its net sales of the product at issue. By contrast, a related-party agreement might provide that an affiliated distributor will be reimbursed for all its costs (including its own sales and distribution costs) plus operating income equal to a fixed percentage of sales. To highlight the issue of adjusting for contractual differences, again assume that as a legal matter, the contractual terms of the related party agreement are properly reflected in the transfer prices, and that but for the difference in the compensation formula, an available third-party distribution agreement would be an exact comparable.

A compensation formula that fixes a distributor's gross profit margin is likely to differ from compensation that guarantees a fixed operating margin in two respects.

Because of the high selling effort involved in launching a new product, the ratio of a distributor's sales and marketing expense to its net sales is likely to be substantially higher early in the product's life cycle than in its waning years. Consequently, if the cumulative (undiscounted) operating margin over the life of the product was the same under both agreements, the distributor with the fixed operating margin would enjoy a substantial time-value-of-money benefit in comparison to the distributor with a fixed gross profit margin. If the two agreements are to yield the same net present value for the distributor, the rate of the fixed operating margin will be less than the cumulative operating margin of the distributor with a fixed gross profit margin.

Second, because the operating income of the distributor with a fixed gross profit margin will likely be more variable than the operating income of the distributor with a fixed operating margin, a higher discount rate reflecting the greater risk should apply in the former case than in the latter case.

Following is a description, in words and mathematical symbols, of how the general method would apply to such a case. A spreadsheet table at the end of the article illustrates these calculations.

$S_1 \ldots S_T$ represents net sales projected over the life of the third-party distribution agreement.

g represents the fixed rate of gross profit under that third-party agreement.

$gS_1 \ldots gS_T$ represents the gross profit projected over the life of the related party agreement.

$C_1 \ldots C_T$ represents the third-party distributor's operating expense projected over the life of the distribution agreement.

$[gS_1 - C_1] \ldots [gS_T - C_T]$ represents the operating income projected over the life of the third-party agreement.

d represents the risk-adjusted discount rate that is appropriate given the risks of the projected operating income, $[gS_1 - C_1] \ldots [gS_T - C_T]$

$PV_d\ ([gS_1 - C_1] \ldots [gS_T - C_T])$ represents the present value of the projected operating income, $[gS_1 - C_1] \ldots [gS_T - C_T]$, when discounted at the rate, d.

m represents a fixed operating income margin to apply to the distributor's sales under the related-party agreement, as opposed to the fixed gross profit margin provided by the third-party agreement.

$mS_1 \ldots mS_T$ represents the operating income projected over the life of the related-party agreement, given the fixed operating margin, m.

d_L represents the lower discount rate that would properly be applied (given the lower relative risk) to the projected operating income, $mS_1 \ldots mS_T$.

$PV_{dL}\ (mS_1 \ldots mS_T)$ represents the present value of the projected operating income, $mS_1 \ldots mS_T$, when discounted at the lower rate, d_L.

Under these assumptions, an arm's-length operating margin, m, would be such that the present value of the distributor's projected operating income would be the same given a fixed operating margin, m, as it would have been given a fixed gross profit margin, g:

$PV_{dL}\ (mS_1 \ldots mS_T) = PV_d\ ([gS_1 - C_1] \ldots [gS_T - C_T])$

The fixed margin percentage, m, which achieves this result can be calculated by factoring the m term from the left-hand side of the above formula and then rewriting the formula as:

$m = PV_d\ ([gS_1 - C_1] \ldots [gS_T - C_T]) \ / \ PV_{dL}\ (S_1 \ldots S_T)$

Attachment 2 illustrates these calculations.

■ Lines 1-4 show the independent distributor's projected income and expense amounts assuming a 50 percent gross profit margin.

■ Line 5 indicates that the distributor's cumulative projected operating income over the life of the product would equal 12.8 percent of its cumulative projected net sales.

■ Line 6 shows that the net present value of the distributor's projected operating income discounted at a 12 percent discount rate. The 12 percent discount rate is assumed to be the appropriate risk-adjusted discount rate for operating income when the gross margin is fixed.

■ Line 9 indicates that the present value of operating income represents 7.4 percent of the present value of net sales when both present values reflect a 12 percent discount rate.

■ Lines 10 and 11 show that if the distributor were guaranteed reimbursement of its operating expense plus an operating margin equal to 7.4 percent of net sales, the net present value of its operating income if discounted at the 12 percent rate would be the same as the net present value of operating income when the gross margin is fixed at 50 percent (*i.e.*, line 11 is equal to line 6).

■ Lines 12-14 show the effect on the operating margin of reducing the discount rate from 12 percent to 10 percent to reflect the lower risk of operating income that results from a fixed operating margin. As indicated, the operating margin would be reduced from 7.4 percent (line 9) to 6.7 percent (line 14).

■ Lines 15-16 confirm the intended result. That is, when the distributor's operating margin is fixed at 6.7 percent, the net present value of its projected operating income based on the 10 percent discount rate shown on line 16 equals the net present value of projected operating income based on a fixed gross margin and dis-

   ISSN 1063-2069

counted at the higher 12 percent rate, which is shown on line 6.

Because the net present values applying the appropriate risk-adjusted discount rates are the same, one may conclude that the method illustrated in Attachment 2 offers a reasonable method of adjusting for the difference in risk resulting from the difference between a fixed gross profit margin and a fixed operating margin.

Shifting Risk Versus Shifting Attribution of Intangible Assets

Before concluding, it is important to explain the clear distinction that exists between adjusting for contractual terms that shift *risk* from one party to the other from terms that shift the income attributable to *intangible property*. While some contractual terms may seek to shift intangible income as well as risk, the adjustments described in this article are strictly limited to the impact of shifting risk. The clear differentiation between risk and intangible income is reflected in the discount rate, which properly includes a risk premium, but not an intangible income premium. If a distributor dealing at arm's length owned significant intangibles, the income attributable to its intangibles would be manifest in the high present value of its projected cash flow. Because the method of adjusting for shifting risk would preserve that high present value, the income attributable to intangibles would not be affected by the adjustment for risk.

More generally, has something of value been transferred when contractual terms are changed and risks are thereby shifted from one party to another? In answering this broader question, one may analogize the transfer pricing adjustments described above to an interest-basis swap agreement. Suppose a company incurred long-term debt and agreed to pay monthly interest at floating rate equal to 30-day LIBOR plus a fixed premium (*e.g.*, 50 basis points). To hedge the risk that 30-day LIBOR might increase unexpectedly, the company also entered a swap agreement with a bank under which the company received a monthly amount equal to its floating interest-rate payment, but paid an amount equal to a *fixed* percentage of the notional principal amount provided in the swap agreement. Assuming the fixed interest rate in the swap agreement reflected current long-term interest rates, the company would have no gain or loss at the time it enters into the swap agreement. But over the term of the swap agreement, LIBOR will fluctuate and so too will the payments received by the company under its swap agreement. As a result, the company would have an actual profit or an actual loss on the swap agreement (when considered separately from its floating-rate debt). But if the terms of the swap agreement reflected market values at the time of the swap agreement was made, the actual profit or loss would accrue after the start of the agreement and reflect unanticipated changes in economic conditions.

By analogy, the licensor analyzed in Attachment 1 could be viewed as swapping a fixed up-front payment for a running royalty that had the same market value *at the time it entered into the license agreement*. Similarly, the distributor analyzed in Attachment 2 could be viewed as retaining 6.7 percent of its 50 percent gross profit margin and swapping the remaining 43.3 percent for the guaranteed reimbursement of its actual operating expense. Because both sides of the swap have the same economic value at the outset, the distributor has no profit or loss *at the time it enters into the new agreement*. But under any long-term agreement, actual results will presumably differ from the initially projected results. Accordingly, the parties to those agreements will likely experience *unexpected* gains or losses during the life of the agreement.

Conclusion

Any adjustment for differences in contractual provisions that allocate risk must be based on projected, not actual results. Accordingly, the reliability of any method of adjusting for risk depends on the reliability of information about parties' projections at the time an agreement is negotiated. This analysis focused on the projections that unrelated parties usually make and often exchange in the process of negotiating comparable, long-term agreements.[9]

The underlying premise is that the appropriate adjustment to a transfer price to reflect differences in risk is that which preserves the present value of the projected net cash flow of the parties. The discount rate to be applied in calculating the present value of a projected net cash flow equals a risk-free discount rate plus a premium that increases in proportion to the risk of the net cash flow. Risk is generally indicated by the ratio of the standard deviation of the cash flow to its expected value. That ratio is referred to as the coefficient of variation.

This article described two specific applications of this general method of adjusting for risk:

- For a long-term intangible license agreement, the impact of an up-front payment to the licensor on the running royalty rate, and
- For a long-term distribution agreement, assessing the impact of determining the distributor's gross profits based on (1) a fixed gross profit margin, or (2) reimbursement of the distributor's actual operating expense plus a fixed operating income margin.

The method described calculates the impact on transfer prices or profit margins from shifting risks and does not incorporate, explicitly or implicitly, any transfer of intangible property or other sources of income at the time the contractual terms are fixed.

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[9] This does not imply that no other reliable sources are available, but only that reliable information about projections may be available in some cases, but not in others.

ATTACHMENT 1: ANALYSIS OF PROJECTED RESULTS UNDER HYPOTHETICAL THIRD-PARTY LICENSE AGREEMENT

		Net Present Value*	Year 0	1	2	3	4	5	6	7	8	9	10	Explanation
	Projected Results for Third-Party License													
1	Net Sales			$20	$50	$80	$100	$100	$100	$100	$90	$80	$70	Assumed Value
2	Running Royalty @ 5%			$1.0	$2.5	$4.0	$5.0	$5.0	$5.0	$5.0	$4.5	$4.0	$3.5	5% of Line 1
3	Up-Front Payment		$5.0											Assumed Value
4	Total Payment to Licensor		$5.0	$1.0	$2.5	$4.0	$5.0	$5.0	$5.0	$5.0	$4.5	$4.0	$3.5	Line 2 + Line 3
5	NPV of Total Payment @ 10%**	$26.7												NPV @ 10% of Line 4
	Effective Royalty Rate													
6	NPV Target for Total Payment	$26.7												Line 5
7	NPV of Net Sales @ 10%**	$477.0												NPV @ 10% of Line 1
8	Effective Royalty Rate	5.6%												Line 6 / Line 7
9	Running Royalty at Effective Royalty Rate			$1.1	$2.8	$4.5	$5.6	$5.6	$5.6	$5.6	$5.0	$4.5	$3.9	Line 8 x Line 1
10	NPV of Total Payment @ 10%**	$26.7												NPV @ 10% of Line 9

* NPV is calculated as of the date of the up-front payment.

** 10% is assumed to be the appropriate risk-adjusted discount rate to reflect risk of total payment that equals a fixed percentage of net sales.

12-22-04

TMTR ISSN 1063-2069

ATTACHMENT 2: ANALYSIS OF PROJECTED RESULTS UNDER HYPOTHETICAL THIRD-PARTY DISTRIBUTION AGREEMENT

		Net Present Values	Year 1	2	3	4	5	6	7	8	9	10	Total	Explanation
	Projected Results for Independent Distributor													
1	Net Sales		$20	$50	$80	$100	$100	$100	$100	$90	$80	$70	$790	Assumed Value
2	Gross Profit @ 50%		$10	$25	$40	$50	$50	$50	$50	$45	$40	$35	$395	50% of Line 1
3	Operating Expense		$45	$36	$36	$27	$27	$27	$27	$27	$27	$15	$294	Assumed Value
4	Operating Income		-$35	-$11	$4	$23	$23	$23	$23	$18	$13	$20	$101	Line 3 - Line 4
5	Cumulative Operating Margin-%												12.8%	Line 4 / Line 1
6	NPV of Operating Income @ 12%*	$31												NPV @ 12% of Line 4
	Fixed Operating Margin w/ No Further Risk Adjustment													
7	NPV Target for Operating Income	$31												Line 6
8	NPV of Net Sales @ 12%*	$419												NPV @ 12% of Line 1
9	Fixed Operating Margin w/ No Risk Adjustment	7.4%												Line 7 / Line 8
	Proof of Equivalency of Net Present Values													
10	Operating Income @ 7.4% Operating Margin		$1	$4	$6	$7	$7	$7	$7	$7	$6	$5	$58	Line 9 x Line 1
11	NPV of Operating Income @ 12%*	$31												NPV @ 12% of Line 10
	Fixed Operating Margin w/ Further Risk Adjustment													
12	NPV Target for Operating Income	$31												Line 6
13	NPV of Net Sales @ 10%**	$461												NPV @ 10% of Line 1
14	Operating Margin with Further Risk Adjustment	6.7%												Line 12 / Line 13
	Proof of Equivalency of Net Present Values													
15	Operating Income @ 6.7% Operating Margin		$1	$3	$5	$7	$7	$7	$7	$6	$5	$5	$53	Line 14 x Line 1
16	NPV of Operating Income @ 10%**	$31												NPV @ 10% of Line 15

* 12% is assumed to be the appropriate risk-adjusted discount rate to reflect risk of operating income shown on Line 4.

** 10% is assumed to be the appropriate risk-adjusted discount rate to reflect lower risk when operating income is a fixed percentage of net sales.