The Use Of The Capital Asset Pricing Model For Valuing Licensing Portfolios

BY TIMOTHY J. GOSSETT*

Introduction

In publicly traded companies the capital asset pricing model can be used in conjunction with historical financial returns from intellectual property licensing portfolios to provide useful information for evaluating the quality of past licensing activity and aid in determining future licensing decisions.

Background

Licensing organizations are constantly making decisions on what licensing opportunities to pursue and how to value those opportunities. Among the methods that are often employed is the estimation of the value of the opportunity using the income valuation method. The income valuation method uses estimations of future cash flows along with a discount rate appropriate for the type of asset that is being valued. This begs the questions: What discount rate should be used? What has been the historical licensing discount rate and is it commensurate with the company's financing structure? In many cases, large intellectual property licensing organizations have a considerable amount of historical data concerning the financial performance of past licenses. This data can be analyzed and used to determine if the licensing organization has made sound investment decisions in the past and how to improve those investment decisions in the future.

Weighted Average Cost of Capital

Even though license agreements are considered intangible assets, capital budgeting techniques still apply to royalty producing licenses. The decision to enter into a licensing agreement, and the value the license will bring to the organization over its lifetime, is a function of the company's cost of capital for investments of corresponding financial risk. A good starting point for determining the cost of capital for licensing activity is to determine the weighted average cost of capital (WACC) for the firm as a whole. The WACC for a firm represents the overall required return on capital associated with an investment that corresponds with an average financial risk for that company. In general, the WACC is the sum of the weighted individual components making up the capitalization structure of the company:

$$WACC = \frac{E}{E+D} r_e + \frac{D}{E+D} r_d (1 - T_c)$$

(See List 1.)

For example, consider the hypothetical XYZ Technology company. Based on their capitalization structure, this company would have a weighted average cost of capital of 6.3% as shown in Table 1. Therefore, *on average*, any financial decision at XYZ Technology based on a discounted cash flow model could use the WACC as an accurate representation of the discount rate for the project.

List 1. Equation List

D = *Estimated market value of the firm's debt*

$$= \text{Present Value (I Annuity, } r_d, M) + \frac{B}{(1 + r_d)^M}$$

I = *Yearly Interest Expense of Debt*

B = *Book Value of Debt*

M = *Average Maturity of Outstanding Debt*

E = *Market Value of Firm's Equity*

= *Number of outstanding shares x Price per share*

r_d = *Expected return of debt (estimated from yield-to-maturity of outstanding bonds and bond ratings)*

r_e = *Expected return on equity (geometric average return of the company's stock)*

T_c = *Marginal corporate tax rate (Interest paid on a firm's borrowing can be deducted from the taxable income reducing the required return on debt by $(1-T_c)$)*

*Tim Gossett is a Licensing Specialist for the Boeing Management Company, a wholly owned subsidiary of The Boeing Company. He holds a B.S. in electrical engineering from Southern Illinois University – Edwardsville and a M.B.A./M.I.M. from Washington University in St. Louis.

Capital Asset Pricing Model

Once the WACC has been calculated for a company it can be used in conjunction with the capital asset pricing model (CAPM) to determine the corresponding market accepted risk associated with its value. The capital asset pricing model describes the security market line in which all efficient security investments must lie in a competitive market. The security market line can be conveniently identified by obtaining points for the expected return of a risk free rate r_f and the expected equity market return r_m as shown in Figure 1. (The current rate of return for a long-term U.S. Treasury Bond can be used to estimate the risk free rate and the geometric average of returns for the S&P 500 Index can be used to estimate the required equity market return.) The advantage of calculating the company's WACC is that it serves as a good benchmark for developing a discount rate for licensing activity. In general, licensing mangers tend to have a good intuition for determining relative financial risks when analyzing a licensing opportunity but they may not have a good feel for absolute values. Determining the corporate WACC serves as a good benchmark to which the discount rate for licensing should be reasonably close.

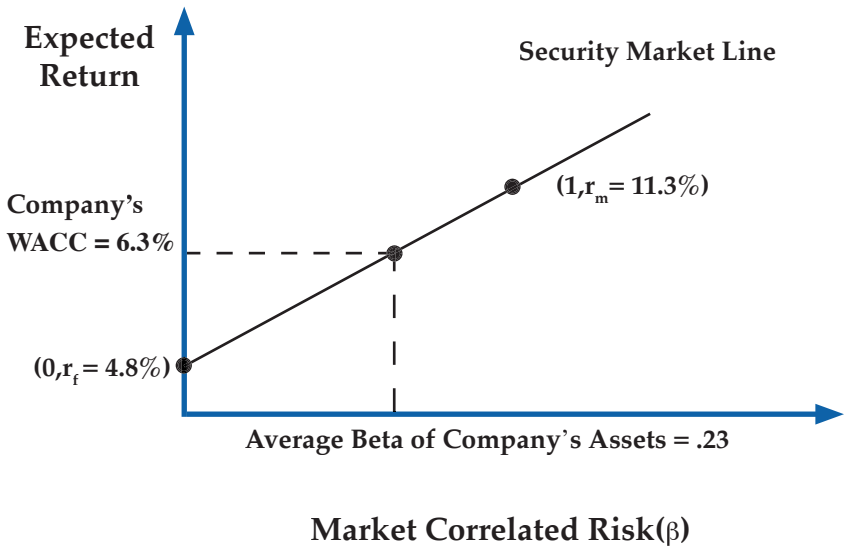
Licensing Discount Rate

To develop a discount rate solely for licensing activity it is necessary to examine historical financial returns from past licensing activity. To continue with the hypothetical company XYZ Technology, consider the following returns of XYZ Technology's licensing portfolio compared to returns from the S&P 500 in Table 2. An expected return on all licensing activity can be obtained by fitting an appropriate probability distribution to the historical financial returns for all past license returns as shown in Figure 2. This distribution begins to reveal what the risk (probability) versus the expected return will be for a typical licensing opportunity for the company. However, by measuring the raw returns from the licensing portfolios one is taking

Table 1. XYZ Technology's Financials

Company XYZ	
Market Capitalization	E = $955 M
Expected Return on Equity (r_e) = Stock (Equity) Beta Applied to SML	r_e = Security Market Line ($\beta_{XYZstock}$ = .6) = 8.7%
Corporate Tax Rate	T_c = 35%
Return on Long Term Treasury Bills	r_f = 4.8%
Estimated Market Value of Debt	D = $1.86 B
Book Value of Outstanding Debt	B = $1.22 B
Interest Expense	I = $250 M
Average Maturity of Outstanding Debt	M = 5.1 Years
Expected Return on Debt (r_d)	r_d = 7.7%
Geometric Average of S&P 500 returns	r_m = 11.3%
Corporate WACC	**6.3%**

Figure 1. XYZ Technology's Corporate WACC



into account all of the risks associated with licensing activity when he should be concerned only with the market or systematic risks. Even though the financial returns from a license agreement will be subject to unique risks specific to the opportunity, contribution-to-the-firm risks and market risks, only the market risks are relevant within the CAPM model. The unique project risks are irrelevant because these risks can be diversified away by the company undertaking many types of licensing agreements. The contribution-to-the-firm risks are irrelevant because given a large number of investment opportunities, an investor has the opportunity to diversify away contribution-to-the-firm risks by investing in a number of different companies. Therefore, in a competitive market, investors will only compensate investments based on the market risk that cannot be diversified away. The motivations of a competitive market made up of such investors ultimately form the security market line thereby establishing the relationship between the required rate of return and the systematic risk associated with any investment.

To obtain the degree of market risk associated within the variance of historic license returns, the license returns must be correlated with equity market returns for an equivalent time period. By fitting a line through a regression of the licensing portfolio returns, against equity market returns the amount of systematic risk can be determined as shown in Figure 3. The slope of this line represents the beta of the licensing portfolio and in this case $\beta = 1.44$. This line represents only the market risk of the overall risks of the licensing portfolio. The scatter of points represents the non-systematic risk. The R^2 value represents the portion of the total variance in the license's financial returns that can be explained by market movement and in this case it is 27.8%. Furthermore, noise in the licensing returns will tend to obfuscate the true licensing beta so a confidence internal may be established in order to define a certainty range. By using the standard error for the regression we can establish that the licensing discount rate for XYZ Technology's licensing activity is 14.2% ± 5.5% with a confidence range of 95% as show in Figure 4. (The true licensing beta will exist in the interval $\beta \pm 2 \times$ Standard Error (SE) = $1.44 \pm 2 \times .42 = 1.44 \pm .84$) At first it would seem that a discount

Figure 2. XYZ Technology's Licensing Returns with Fitted Probability Distribution

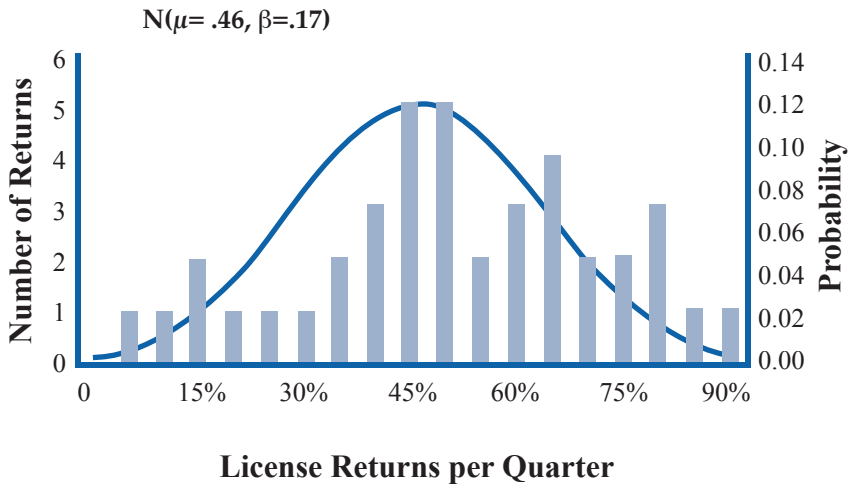


Table 2. XYZ Technology's Licensing and S&P 500 Returns

		License Portfolio Returns (%)	S&P 500 Returns (%)
Year 1	Q1	41.3	1.3
	Q2	3.0	-2.8
	Q3	17.0	-6.1
	Q4	34.3	3.0
Year 2	Q1	57.9	14.6
	Q2	42.0	-1.7
	Q3	64.0	8.5
	Q4	43.4	1.6
Year 3	Q1	9.5	-0.9
	Q2	79.3	5.8
	Q3	12.0	2.4
	Q4	61.7	4.3
Year 4	Q1	75.0	-0.1
	Q2	54.3	2.8
	Q3	40.0	1.5
	Q4	88.0	13.7
Year 5	Q1	78.7	8.9
	Q2	64.0	9.9
	Q3	48.0	9.1
	Q4	60.0	5.0
Year 6	Q1	21.0	9.5
	Q2	11.1	0.3
	Q3	62.8	19.0
	Q4	48.8	0.1
Year 7	Q1	71.4	14.0
	Q2	54.3	8.5
	Q3	43.4	1.7
	Q4	70.0	-7.7
Year 8	Q1	45.6	1.5
	Q2	46.6	0.9
	Q3	36.4	-2.2
	Q4	46.0	-9.0
Year 9	Q1	78.0	16.9
	Q2	27.0	-22.1
	Q3	38.0	4.3
	Q4	34.8	-2.6
Year 10	Q1	45.0	-0.7
	Q2	58.0	1.3
	Q3	67.1	1.8
	Q4	21.0	9.5

rate of 14.2% would be dramatically too low when compared to the mean return of 46% for the raw licensing returns. However, keeping in mind that the linear regression conveys only the systematic risks involved in licensing activity and that it accounts for only 27.8% of the total return value, 27.8% of the 47% raw licensing returns equates to 13.1% of the licensing returns coming from systematic risk. This is well within the range of the licensing discount rate that was developed.

CAPM in practice

Although establishing a discount rate for licensing activity will not result in precise values it is important to establish the best estimate that will allow for appropriate adaptation. Had the licensing managers been using the overall corporate discount rate, 6.3%, they would have been using a discount rate that was too low. In effect, the licensing managers would be more apt to value licensing opportunities at a greater value than they actually were worth, thereby destroying value for the firm. By choosing an arbitrarily high discount rate, say 25%, simply because licensing activity was considered "risky" at XYZ technology, the licensing managers would be valuing licensing opportunities too conservatively. This would result in passing over opportunities to create value or misreporting the value the licensing organization was actually creating for the rest of the company.

Even though using CAPM analysis does not result in precise values it does serve to establish a framework and range in which further analysis can take place. To report accurately the financial health of a licensing organization, rigor must eventually be incorporated into the licensing accounting and capital budgeting process. By constantly reviewing the risk-return relationship within the realm of the CAPM model a licensing organization will eventually converge on an accurate discount rate for licensing activity.

Figure 3. Regression of XYZ Technology's Licensing Returns and S&P 500

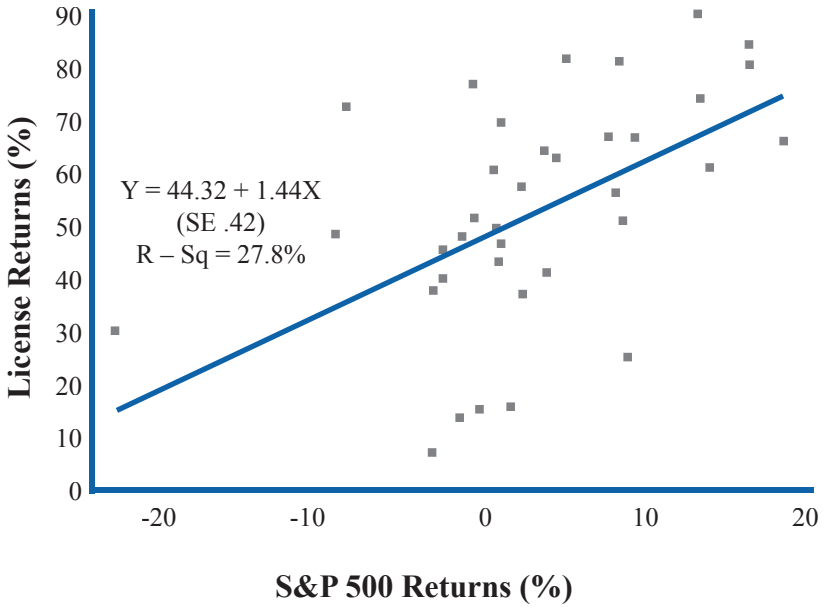


Figure 4. XYZ Technology's Licensing Discount Rate