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Articles

VALUATION OF PATENT LICENSES

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Table of Contents

***424 Introduction**

The valuation of patents is important in many contexts, including mergers and acquisitions, research and development, corporate taxation, and infringement litigation. However, nowhere is the valuation of patents more important, or more challenging, than in licensing transactions. This paper will consider the problem of valuing patent licenses. The first part of the Article will discuss the two most often used and discussed methods of valuing patent licenses - the industry standard method and the 25 Percent Rule. The Article conveys the strengths and weaknesses of these two methods, and how they are

best utilized. The second part of the Article presents a new method of valuing patent licenses called the "Competitive Advantage Valuation" model, or CAV.[1] The Article will explain the basic steps involved in CAV analysis of a patent license and illustrate the use of CAV through a series of hypothetical licensing transactions.

I. Industry Standard Method

The industry standard method values a patent license by reference to the royalty rates used in past licensing transactions in a given industry. Information on past royalty rates is available from a number of sources, including court decisions on infringement damages and articles in publications such as les Nouvelles, the Journal of the Association of University Technology Managers, the Licensing Economics Review[2], and trade journals. Past royalty rates are a useful guide in negotiating future royalty rates; however, there are some limitations on using prior rates to measure the value of a patent license. Past royalty rates are often compiled for broad industry categories that contain wide ranges. For example, in a recently published table of royalty rates for fifteen different industries, the average difference between the minimum and maximum royalty rates was nearly thirty-one percentage points, and, in two of the fifteen industries, the difference was nearly seventy percentage points.[3]

The considerable difference between the minimum and maximum royalty rates in an industry is attributable to the many factors that affect the value of a license that are not accounted for in the reported royalty rate percentages. Such factors that might affect the value of a particular license include the stage of development of the technology, the additional investment required by the licensee, the strength of the intellectual property protection, the inclusion of cross license or ***425** grant back provisions, the competitive advantage the technology provides the licensee, and the relative bargaining power of the two parties.

The gap between minimum and maximum royalty rates can represent tens of millions of dollars to both parties. The gap can be narrowed only by considering factors - individually and in combination - that bear on a license's value. There are occasional attempts to compile more targeted royalty rates, for example, by subdividing industry groups or distinguishing technologies by their degree of innovation;[4] however, there is no database that systematically correlates royalty rate levels with the multiple variables that determine these levels. The development of such a database would be a daunting task - it would require the collection of large amounts of data and the creation of complex relational tables. It would also require access to confidential data that firms might be unwilling to provide.

Despite these limitations, industry standard royalty rates should always be considered in valuing a patent license. Industry standard royalty rates can be used to set upper and lower royalty rate boundaries, to calculate average and median royalty rates, and to provide baselines for comparing differences between patents and between license terms. However, industry standard royalty rates should never be used in isolation.

II. The 25 Percent Rule

The 25 Percent Rule (Rule) is often claimed to be the most widely used license valuation method. The Rule is a heuristic tenant that suggests the licensee should pay a royalty equivalent to 25% of the expected profit from the product that incorporates the patent being licensed. One writer has suggested four basic reasons for the 25:75 percent split between the licensor and licensee: (1) licensees bear 75% of the cost to commercialize licensed technologies; (2) licensees have technology investment options, in contrast to the fixed investment costs of licensors' technological investments, that give licensees bargaining leverage over licensors; (3) the 25:75 percentage split allows licensees to achieve a threefold return on investment; and (4) the ratio of total research and development (R&D) expenses to profits is often in the range of 25% to 33%, and therefore a 25% royalty approximates the R&D expense a licensee would incur to independently develop the licensed technology.[5]

The great advantages of the 25 Percent Rule are its simplicity and broad acceptance; however, even the most ardent advocates of the 25 Percent Rule acknowledge its limitations. These limitations include not accounting for the different ***426** levels of risk assumed by a licensor and licensee, not separating out the benefit of a licensed technology when it is used in combination with other technology, and, most importantly, not comparing the value of the licensed technology to available alternative technologies. This Article explores these limitations further in order to provide a context for the following discussion of Competitive Advantage Valuation.

Much has been written over the years on the 25 Percent Rule, and many of these writings present divergent interpretations of the Rule. For the purpose of this discussion, I would like to focus on an article written by Goldscheider.[6] The Goldscheider article provides a detailed explanation of the Rule and tests it against empirical data. Although the authors of the Goldscheider article concluded that the 25 Percent Rule is roughly consistent with data compiled on industry royalty rates and operating margins, the discussion of the Rule highlights the challenges in valuing patent licenses.

The Goldscheider article states that the 25 Percent Rule comprises three steps: (1) an estimate is made of the licensee's expected operating profits from the product that embodies the licensed patent; (2) these operating profits are divided by the licensee's net sales over the same period of time to calculate the licensee's profit rate; and (3) the licensee's profit rate is then multiplied by 25% to calculate the running royalty rate applied to the licensee's net sales.[7] The article illustrates the 25 Percent Rule as applied to a product patent using a table similar to this one:[8]

*427 25 Percent Rule Illustration - Revenue Side

	No Patent	Revenue Enhancing Patent	25 Percent Rule
Revenues	$100	$110	
Cost of Sales	$40	$40	
Gross Margin	$60	$70	
Operating Expenses	$30	$30	
Operating Profits	$30	$40	($40 x 25%) / $110 = 9. 1%

The authors of the Goldscheider article assert that the 25 Percent Rule running royalty rate should not be applied to the incremental revenue gain from the patent license (in this example $10), but rather to the full amount of revenue generated from the product embodying the licensed patent (in this example $110).[9] The problem with this approach is readily apparent when the calculated running royalty rate (9.1%) is applied to the full product revenue. The royalty payment of $10.01 ($110 x 9.1%) is greater than the licensee's revenue gain of $10 ($110- $100).[10]

The article justifies the application of the royalty rate to full product revenue because the incremental benefit of a licensed patent is often difficult to measure.[11] However, no economically rational firm would enter into a license if the cost of the license exceeds the revenue gain from the license. In practice, no matter how the royalty rate is determined, it can only be applied to the licensee's incremental gain from the license even if this gain cannot be measured precisely.

Another problematic aspect of this example is the calculation of the licensee's increased profits without any adjustment for increased product costs. In the case where the increased revenue is attributable to increased sales volume, the cost of goods sold is likely to rise (unless the additional units could be produced at zero ***428** cost) along with possible operating expenses (at least those expenses such as marketing and sales that vary with sales volume).

A related point should also be noted - the example assumes the entire profit gain is attributable to the licensed patent. Stated differently, the assumption is that none of the licensee's other assets contributed to the increase in profits. To appreciate the importance of this issue, consider the licensee's pre-license profit of $30. A firm is comprised of three classes of assets: tangible assets (for example, land, buildings, and equipment); intangible assets (for example, employee expertise, management skill and customer/supplier relationships); and intellectual property assets. Intellectual property assets include three distinct types of assets: technical intellectual property assets (for example, utility patents and software copyrights); reputation-related intellectual property assets (for example, trademarks and brand names); and operational intellectual property assets (for example, business method patents and proprietary business processes).[12] All of a firm's assets contribute to some degree to a firm's profitability. It would be erroneous to attribute the licensee's $30 pre-license profit solely to one class of asset or solely to one type of intellectual property asset.

Two points should be noted in this regard. The more obvious point is that to the extent the royalty rate is applied to the licensee's full profit (rather than to the incremental gain in profit), the pre-license profit contribution of the licensee's current assets is ignored, including the pre-license contribution of the licensee's other patents. In other words, the licensed patent is paid royalties for the pre-license profit contribution of the licensee's existing assets.

The less obvious point involves the relative profit contribution of different types of assets. There are two dimensions of relative profit contribution. One dimension is the contribution of different types of assets relative to one another. For example, what is the proportional contribution of a firm's tangible assets in comparison to intangible assets, of intangible assets in comparison to intellectual property assets, or of utility patents in comparison to trademarks? Although the proportional contribution of different types of assets might not be subject to precise measurement, the failure to consider proportional contribution will result in highly distorted valuations of patent licenses.

The second dimension of the relative contribution of a firm's assets is the licensed assets' contribution relative to the contribution of comparable assets incorporated in competing products. A firm can deploy its assets more or less effectively than its competitors and can thereby increase or decrease its competitive advantage in relation to its competitors. A firm's overall product market share can be viewed as a composite of the competitive advantages derived from each type of ***429** asset. Therefore, when a firm licenses a patent, it gains competitive advantage in a particular type of asset. However, this gain in competitive advantage does not translate directly into an equal gain in product market share. Rather, the gain in competitive advantage in one asset type is averaged in with the competitive advantages of the other asset types. The gain in product market share is proportionate to the increase in the average competitive advantage for all asset types. Returning to the example, if the licensed patent increases the licensee's profit by $10, it has increased the average competitive advantage for all asset types sufficiently to yield an additional $10 profit. Although it might not be possible to precisely measure the competitive advantage of each type of asset relative to substitute assets, or to precisely translate the gain in competitive advantage into a gain in market share, the failure to consider these factors will result in highly distorted valuations of licensed patents.

Finally, note that the previous example predicts the licensee's post-license profit gain will be $10, but it does not provide a basis for this prediction. The essence of a patent license's value is the post-license profit gain to the licensee. Therefore, the 25 Percent Rule is not actually a method to value a patent license but a means to allocate the value of a patent license between the licensor and licensee once that value has been determined. This is a serious limitation of the Rule because the value of a patent license is essential to the licensor-licensee allocation of value as well as to other important provisions of the license agreement such as best efforts and milestone payment clauses.

The limitations of the 25 Percent Rule demonstrate the problems involved in valuing a patent license. Because of its simplicity, widespread acceptance, and general empirical support, the Rule should always be considered as part of any valuation of a patent license. The Rule can be used in a variety of licensing situations, and it can provide a benchmark to compare the results of other valuation analyses. However, as with industry standard royalty rates, the 25 Percent Rule should never be used in isolation. The inability to precisely measure the factors that determine the value of a patent license should not preclude any attempt to do so. As in many fields of study, perfect knowledge ought not to be the enemy of greater knowledge.

III. Competitive Advantage Valuation

Competitive Advantage Valuation attempts to address the limitations of the Industry Standard Method and the 25 Percent Rule. Most valuation methods have two components. The first component is the valuation model or the association of variables that are assumed to determine an asset's general value. The second component is the valuation inputs or the numeric values substituted for the variables to calculate an asset's actual value. The CAV method approaches these two components differently. The CAV model is built on a highly structured set of variables whereas the CAV inputs allow the user considerable choice in balancing the resources expended and the results obtained in a valuation analysis.

*430 The key variables in the CAV model are the competitive advantage contribution of a licensed patent, the predicted gain in market share attributable to the competitive advantage contribution, the present value of market profits attributable to technical intellectual property, the alternative ways to structure license payments, and the technical, market, and intellectual property risks. The valuation inputs for the CAV model can be obtained from three sources: market research (for example, customer surveys and customer focus groups); management experience (for example, industry bench marks and teams of

technical, business, and legal professionals); and CAV default measures, which are explained later. CAV allows users to combine input sources in any way to control the cost of the information used in the valuation analysis. However, regardless of how the value inputs are obtained, a given set of value inputs will always produce the same valuation result. The user can see how a change in a value input affects the valuation result and what combinations of value inputs are necessary to produce a desired valuation result.

A. Calculation Example Setup & Hypothetical Facts

To help understand CAV and how the calculations are performed for a variety of licensing situations, please consider the following hypothetical facts. Medical Science, Inc. (MedSci) is a leading manufacturer of hip and knee implant devices. A long standing problem with hip and knee implants was life-threatening infection, which occurred in nearly 15% of all procedures. After years of research, MedSci developed a biocompatible polymer drug coating (PDC) for implants which reduces the incidence of infection to less than 0.1%. In addition to reducing infection, PDC has other beneficial properties, including a reduction in both pain and post-operation inflammation as well as the coating itself completely dissolving away from the surface of the implant over time, an important factor in using medically-treated devices in the body. PDC can be applied to implants at a minimal additional production cost. The introduction of PDC was a major technical achievement and a significant factor in MedSci's commanding 40% market share. MedSci's managers know that their four competitors are hard at work developing their own implant coatings. To maintain its market leadership, MedSci has determined that it must introduce an improved implant coating within the next five years.

In order to fund the future research necessary, MedSci's managers have developed a two-prong licensing strategy. First, MedSci will try to license PDC in a non-competing market. MedSci decided that the cardiovascular stent market was the most promising non-competing market. MedSci found that stents presented similar medical problems, the stent market was large and growing, and that MedSci had no intention of entering this specialized field. Second, when MedSci successfully develops an improved implant coating, it will try to license PDC to a competitor firm. MedSci believes that at least one competitor firm will benefit from the PDC implant coating license, and MedSci can still protect its current market share through the introduction of the improved implant coating in the near future.

The following subsections will explain how CAV is used to value a patent license to either non-competitor or competitor firms, how to value exclusive and ***431** non-exclusive licenses, and how to determine the effect of the license on non-licensees.

B. Licensing a Non-Competitor Firm

The valuation of an exclusive patent license to a non-competitor firm involves four basic steps. First, the licensee's gain in technical competitive advantage and predicted market share are calculated. Second, the technical intellectual property percentage of the present value of total market profits is calculated. Third, the value of the patent license is calculated from the predicted market share; the technical intellectual property percentage of the present value of total market profits; and the technical, market, and intellectual property risks associated with the patent license. Fourth, alternative compensation arrangements for the patent license are calculated from the value of the license, the licensor and licensee investments in the license, the forms of license payment, and the licensor's and licensee's weighted average costs of capital. Consider the following hypothetical facts in using these four steps to determine the proper license valuation.

Cardiovascular stents are widely used in the treatment of coronary disease, which is caused by the blockage of arteries leading to the heart. A catheter is inserted in the diseased artery and a balloon on the tip of the catheter is used to expand a metal stent that acts as a scaffold to keep the artery open. In approximately 25% of these procedures, the expansion of the stent wounds the artery wall causing inflammation that very often results in new tissue growth around the stent. The proliferation of new tissue around the stent produces a blockage, or restenosis, of the artery necessitating removal of the existing stent and insertion of a new stent. Manufacturers have long sought to develop stent coatings to reduce the incidence of restenosis without much success. The coatings developed to date have only slightly reduced inflammation and new tissue growth and have involved complex application processes that have significantly added to the stent cost. These coatings are also not biodegradable, which is another important property for stents.

MedSci has approached G&G, one of the six cardiovascular stent manufacturers, with a proposal to license the PDC coating.

G&G is very interested in pursuing licensing discussions with MedSci, but it is unsure of the value of the license and is concerned that the PDC coating might not be adaptable to cardiovascular stents. G&G is also concerned that the PDC coating does not have sufficient flexibility and lubricity to be used on an expandable device. The Competitive Advantage Valuation of the proposed MedSci - G&G patent license is determined by the following four steps.

1. Calculation of G&G Gain in Competitive Advantage and Predicted Market Share

To calculate G&G's gain in competitive advantage, a set of competition parameters are set that can be used to compare cardiovascular stents. In this example, assume four competition parameters: (1) anti-inflammation (measured as the percentage of procedures in which there is no inflammation); (2) anti-proliferation ***432** (measured as the percentage of procedures in which there is no tissue growth); (3) biodegradability (measured as the percentage of coating remaining sixty days after the procedure); and (4) price. The following table sets forth the industry average performance on each of these parameters, G&G's current performance on each of these parameters, and G&G's current average competitive advantage:

G&G's Current Competitive Advantage

	Anti-Inflammation	Anti-Proliferation	Bio-degradability	Price
Industry Average Performance	35%	25%	80%	$1,200
G&G Performance	30%	20%	70%	$1,200
G&G Current Competitive Advantage	14%	20%	13%	0%
G&G Average Current Competitive Advantage		=		12%

The next table calculates G&G's post-license competitive advantage if the PDC coating meets projected expectations:

G&G's Post-License Competitive Advantage

	Anti-Inflammation	Anti-Proliferation	Bio-degradability	Price
Industry Average Performance	35%	25%	80%	$1,200
G&G Performance	1%	1%	1%	$1,200
G&G Current Competitive Advantage	97%	96%	99%	0%
G&G Average Current Competitive Advantage			=	73%

Therefore, G&G's post-license competitive advantage gain is sixty-one percentage points (73% to 12%).

The correlation between competitive advantage and market share varies from industry to industry, and the correlation can be determined using statistical analyses of product performance, price, and sales data combined with management experience. The CAV default correlation between competitive advantage and market share assumes a very conservative one-to-one relationship. For example, if the G&G pre-license stent's competitive advantage is 12% greater than the average stent, CAV would predict that the G&G pre-license stent's market share is 12% ***433** greater than the average stent.[13] In this example, the assumption is that there are six firms in the stent market, so the average stent market share would be 16.7% and G&G's pre-license market share would be 18.7% (0.167 x 1.12).[14] G&G's post-license competitive advantage of 73% would give G&G a 28.9% predicted market share (0.167 x 1.73), and therefore a post-license predicted market share gain of 10.2 percentage points (28.9% - 18.7%).[15]

2. Calculation of the Technical Intellectual Property Percentage of the Present Value of Total Market Profits

The apportionment of profits among different classes of assets is accomplished using statistical analyses of financial and

marketing data combined with management experience. The CAV default measures for apportioning profits attributable to different classes of assets come from the balance sheets and income statements. The default measure for the tangible asset percentage (TA%) is calculated by dividing the book value of a firm by its market capitalization value. The default measures for the intangible asset percentage (IA%), intellectual property asset percentage (IPA%), technical intellectual property asset percentage (TIP%), reputation-related intellectual property asset percentage (RIP%), and operational intellectual property asset percentage (OIP%) use four categories of expenses as indicators of these asset percentages.

The company's balance and income statements are used to fill out the values for the CAV calculation. The value for combined sales, general, and administrative expenses (SG&A) is used as an indicator of the intangible asset percentage. The total for research and development expenses (R&D) is used as an indicator of the technical intellectual property percentage. Advertising expense (AD) is used as an indicator of the reputation-related intellectual property percentage. Total investment in new business processes (BP) is used as an indicator of the operational intellectual property asset percentage. These different expense categories are compared to one another to calculate their fractional contribution to profits. The formula for calculating the technical intellectual property percentage contribution to profits is:

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*434 Rather than calculate the percentage contribution for each class of asset for this example, the assumption will be made that the technical intellectual property percentage contribution to profits in the cardiovascular stent market is 20%, a mid-range number for R&D intensive companies.

The calculation of the net present value of industry profits is done with the familiar Discount Cash Flow formula.[16] This formula utilizes information on the current year's sales, the projected sales growth, the length of the license, the operating profit margin, and an appropriate present value discount rate. For the purposes of the example, cardiovascular stent sales in 2003 are assumed to have been \$2.5 billion, projected sales growth in the stent market is 40% per year, the period of the proposed license is 5 years, the industry operating profit margin is 35%, and the present discount value rate is 6%. With these assumptions, the net present value of the profits in the cardiovascular stent market for the next five years is \$10.88 billion. The share of the net present value of the profits attributable to the technical intellectual property assets is \$2.18 billion (\$10.88 billion x 0.2).

3. Calculation of the Value of the Patent License

To calculate the value of the patent license to G&G, the value of G&G's post-license gain in market share must be determined first, and then it must be adjusted for technical, market, and intellectual property risks. G&G's post-license gain in market share was calculated at 10.2%. The technical intellectual property asset value of the cardiovascular stent market was determined to be worth \$2.18 billion. Therefore, the value of G&G's post-license gain in market share is \$222.4 million (\$2.18 billion x 0.102).

The adjustment for technical, market, and intellectual property risk is accomplished by analyzing the technical, marketing, and intellectual property data combined with management experience. The CAV default measure for technical risk is based on the possibility that a technology might not ultimately be commercially viable. Typically, the later a technology is in its development cycle, the lower the technical risk because the technology has been refined and tested. The CAV default measure for market risk is based on a firm's vulnerability to competition within a market segment. For a firm already in a market, vulnerability to competition is measured by the firm's market share relative to the average market share.[17] ***435** The CAV default measure for intellectual property risk is based on the potential loss of intellectual property rights (for example, in the case of a patent, the potential that a patent might be found invalid because of a statutory bar, prior art, or prosecution misconduct) and on the potential strength of intellectual property rights (for example, in the case of a patent, the potential that the patent claims can be worked around or that the patentee lacks the financial resources necessary to pursue infringement actions).

For this example, it is assumed that G&G anticipates there is 40% possibility that the PDC coating will not be adaptable to cardiovascular stents, a 16.7% market risk factor, and that there is less than a 10% risk that the five issued and seven pending PDC patents could be found invalid or could be engineered around. The calculated risk-adjusted value of the license would therefore be \$99.68 million:

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4. Calculation of Alternative Compensation Arrangements for the Patent License

CAV provides formulas to calculate the minimum acceptable license payment to the licensor, the maximum acceptable license payment to the licensee, an equal return payment in the form of a single up-front license payment, and an equal return payment in the form of running royalties. In calculating these payments, CAV ignores the fact that the licensor's R&D investment is a fixed cost; the CAV calculation attempts to fairly allocate the value of the license between the licensor and licensee in light of their respective total investments in the license.[18] In this example, it is assumed that MedSci has invested $40 million in R&D for the PDC coating and seeks to recover one-half of this amount, $20 million, from its license with G&G. It is also assumed that G&G will invest $10 million in additional R&D to determine whether the PDC coating can be used with cardiovascular stents. If the PDC coating can be used, it will cost G&G an additional $5M for the new equipment necessary to manufacture PDC-coated stents.

The licensor's minimum acceptable license payment must provide the licensor a rate of return on its investment that is greater than its weighted average cost of capital. The licensor's minimum acceptable license payment is calculated by multiplying the licensor's investment in the license by one plus the licensor's weighted average cost of capital. If MedSci's weighted average cost of capital is assumed to be 15%, MedSci's minimum acceptable license payment is $23 million:

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*436 The licensee's maximum acceptable license payment must provide the licensee with a rate of return on its investment that is greater than its weighted average cost of capital. The licensee's maximum acceptable license payment is calculated by dividing the risk-adjusted license value minus the licensee's investment in the license by one plus the licensee's weighted average cost of capital. If it is assumed that G&G's weighted average cost of capital is 15%, G&G's maximum acceptable license payment is $73.63 million:

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The "equal return payment" is a payment from the licensee to the licensor that provides both parties an equal rate of return on their respective investments in the license. In the case of a single, up-front license payment, in which the licensee bears the entire risk, the equal return payment is calculated by using the full risk-adjusted license value. In this example, the full risk-adjusted license value has already been calculated - it is $99.68 million.[19]

However, in the case of running royalty license payments, the licensor and licensee share the license risk because both parties' respective return depends on the technical, market, and intellectual property risks associated with the license. For running royalties, the CAV calculation allocates the license risk between the licensor and licensee in proportion to their investments in the license. In the example, MedSci and G&G have invested $20 million and $15 million, respectively. Based upon proportions, MedSci bears 57% of the license risk ($20 million / $35 million) and G&G bears 43% of the license risk ($15million / $35 million). Because the risk premium for this license is $122.72 million ($222.40 million - $99.68 million), G&G would bear $52.77 million of this risk ($122.72 million x 0.43). Therefore, the risk-adjusted value of the license to G&G based upon running royalties is $169.63 million ($222.40 million - $52.77 million).

The equal return payment can be calculated on a calculator or with spreadsheet software by using the following equation:

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where ERP is the equal return payment, LEI is the licensee investment in the license, LAV is the risk-adjusted value of the license to the licensee, and LRI is the licensor investment in the license.

*437 In the case of a single, up-front license payment, the equal return payment would be $37.77 million:[20]

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In the case of running royalties, the equal return payment would be $51.23 million:

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With respect to running royalties, the equal return payment is the net present value of the future royalty payments that G&G would have to pay MedSci to yield a total license payment equivalent to the equal return payment. If the net present value of the future royalty payments is $51.23 million, MedSci would have to receive $10.25 million each year for the five-year license ($51.23 million / 5) to obtain a total license payment equal to the equal return payment. The following table details the future annual royalty payments necessary to compensate for the present time-value of the $10.25 million payment made each year of the five-year license.

Royalty Payments Needed to Yield Equal Return Payment ($Millions)

	Present Value of Royalty Payment	Annual Royalty Payment
Year 1	$10.25	$10.87
Year 2	$10.25	$11.52
Year 3	$10.25	$12.21
Year 4	$10.25	$12.94
Year 5	$10.25	$13.72
Total	$51.25	$61.25

Equal Return Payment = $51.25M

Present Value Discount Rate = 6%

Since the annual royalty payments necessary in each year of the license to yield a present value of $51.25 million have been calculated, the running royalty rate percentages necessary to yield the annual royalty payments can be determined. The next table states these annual royalty rate percentages based on the following assumptions: (1) total sales in the cardiovascular stent market in 2003 are $2.5 billion, (2) sales are expected to increase at a rate of 40% per year, (3) G&G cardiovascular stent market share is 28.9%, and (4) the present value discount rate is 6%.

*438 Annual Running Royalty Rates to Yield Royalty Payments ($Millions)

	2004	2005	2006	2007	2008
Total Market Sales	$3,500	$4,900	$6,860	$9,604	$13,446
G&G Sales @ 28. 9% Market Share	$1,012	$1,416	$1,983	$2,776	$3,885
Annual Royalty Payment to Yield ERP	$10. 87	$11.52	$12.21	$12.94	$13.72
Running Royalty Rate	1.1%	0.8%	0.6%	0.5%	0.4%

Note that the equal return payment ($51.23 million) is over 30% of the risk-adjusted value of the license ($169.63 million) while the running royalty rates average less than 1% of net sales. This difference is due to the fact that the equal return payment is calculated on a much smaller base than the running royalty rates. The equal return payment calculation is based on the licensee's incremental gain in profits attributable to technical intellectual property assets, which are discounted for technical, market, and intellectual property risks. The running royalty rate calculation is based on the licensee's net sales, which are attributable to all of the licensee's assets without a discount for technical, market, or intellectual property risk. Note also that the net sales royalty rates, calculated using CAV, approximate the net sales royalty rates calculated using the 25 Percent Rule if the Rule is applied only to the licensee's incremental revenue gain. Recall the 25 Percent Rule example

discussed earlier where the royalty rate was 9.1%, the licensee's incremental revenue gain was $10, and the licensee's post-license revenue was $110. If the royalty rate is applied only to the licensee's incremental revenue gain, the royalty payment would be $0.91 ($10 x 9.1%). A royalty payment of $0.91 is 0.8% of net sales ($0.91/$110) and squarely within the range of net sales royalty rates calculated using CAV.

The following subsections will discuss competitor licenses, non-exclusive licenses, and the effect of licenses on non-licenses. This discussion will focus on the calculations that are unique to these licensing situations.

C. Licensing to a Competitor Firm

Licensing intellectual property to a competitor firm is different than licensing to a non-competitor firm. In a license to a non-competitor firm, the post-license competitive advantages of the licensor and licensee are independent of one another. In a license to a competitor firm, the post-license competitive advantages of the licensor and licensee are interdependent. As explained earlier, CAV calculates the competitive advantage of a given product in reference to the average competitive advantage in the product market. When a licensor with a higher competitive advantage grants a license to a competitor with a lower competitive advantage, the average competitive advantage in the product market increases. The increase in the average competitive advantage results in a proportionate decrease in the licensor's post-license competitive advantage. Likewise, because CAV assumes that the licensor ***439** and licensee products will have the same post-license competitive advantage, the licensee's post-license gain in competitive advantage will be proportionate to the licensor's post-license loss in competitive advantage.

The principal difference in valuing a patent licensed to a competitor versus a patent licensed to a non-competitor lies in the comparative loss of competitive advantage. In the case of technology licensed to a competitor, the licensor's potential loss of market share resulting from its loss in competitive advantage must be added to the licensor's investment in the licensed technology. The licensor's potential loss of market share due to a license to a competitor can be determined using analyses of market data and management experience. The CAV default measure for determining the licensor's potential loss of market share assumes that the licensee's gain in market share reduces the market share of all firms in the market equally.[21]

The licensor's post-license market share is calculated by the following formula:

LR:Post:MS = LR:Pre:MS - ((LR:Pre:MS - LE:Pre:MS) / TF),
where LR:Post:MS is the licensor's post-license market share, LR:Pre:MS is the licensor's pre-license market share, LE:Pre:MS is the licensee's pre-license market share, and TF is the total number of firms in the market.

To illustrate the use of this formula, consider an example from the hip and knee implant market. The previous example stipulated that MedSci had a 40% market share and that there were five firms competing in this market. The following table stipulates the market shares for firms in the hip and knee implant market based upon that example:

Hip and Knee Implant Market Shares

Firm	Market Share
Firm #1	5%
Firm #2	10%
Firm #3	20%
Firm #4	25%
MedSci	40%

Total	100%

*440 If MedSci grants an exclusive license to Firm #1 based upon these stipulations, MedSci's predicted post-license market share would be 33%:

40% - ((40% - 5%) / 5) = 33%
MedSci would suffer a seven percentage point market share loss (40% to 33%). MedSci would have to be compensated for this loss through the license payments. The compensatory license amount for the loss can be calculated by multiplying the technical intellectual property percentage present value of the total hip and knee implant market revenue over the period of the license by the loss of market share, and then multiplying the resulting product by MedSci's operating profit margin. For example, if it is assumed that the technical intellectual property percentage present value of the total hip and knee implant market revenue over a five year license term is $4 billion and that MedSci has a 25% operating profit margin, MedSci would have to receive $70 million in license payments to compensate for the market share loss:

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Firm #1's gain in market share from the license is twenty-eight percentage points (33% to 5%). If it is assumed that Firm #1 also has a 25% operating profit margin, the value of the license to Firm #1 (before technical, market and intellectual property risk adjustments) is $280 million:

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If it is assumed that the risk-adjusted value of the license to Firm #1 is $200 million, that MedSci will seek to recover $10 million of its R&D investment in PDC, and that Firm #1 must spend $5 million on new equipment to utilize the PDC coating technology, the equal return payment would be $124 million:

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D. Non-Exclusive Licenses and Non-Licensees

Non-exclusive licenses can be valued in a similar manner to the method used to evaluate exclusive licenses. A difference to consider in valuing non-exclusive licenses is that the licensees' market share gains are summed to calculate each licensee's post-license market share. A non-exclusive licensee's predicted post-license market share is calculated by the following formula:

NX:LE:Post:MS = LR:Pre:MS - (NXLE:Tot:MS / TF),
where NX:LE:Post:MS is a non-exclusive licensee's predicted post-license market share, LR:Pre:MS is a licensor's pre-license market share, NXLE:Tot:MS is the total predicted market share gain for the non-exclusive licensees, and TF is the total number of firms in the market.

Using the hip and knee implant market again as an example, if MedSci with a 40% market share granted non-exclusive licenses to Firm #2 with a 10% market share and to Firm #3 with a 20% market share, the total predicted market share gain ***441** would be fifty percentage points (40% minus 10% plus 40% minus 20%) and Firm #2 and Firm #3 would each have predicted post-license market shares of 30%.

40% - (50% / 5) = 30%
The value of an exclusive license compared to a non-exclusive license to a licensee can also be calculated. In the example, if Firm #3 was granted an exclusive license, its predicted post-license market share would be 36%.

40% - ((40% - 20%) / 5) = 36%
The six percentage point difference between an exclusive license and a non-exclusive license to Firm #3 therefore can not only be valued but also taken into account in the license negotiations.

The effect of licenses on non-licensees can be calculated in a similar manner. In the case of non-exclusive licenses, a non-licensee's predicted post-license market share can be calculated by the following formula:

NN:LE:Post:MS = NN:LE:Pre:MS - (NXLE:Tot:MS / TF),
where NN:LE:Post:MS is a non-licensee's post-license market share, NN:LE:Pre:MS is a non-licensee's pre-license market share, NXLE:Tot:MS is the total predicted market share gain for the non-exclusive licensees, and TF is the total number of firms in the market.[22]

In the hip and knee implant market example, if MedSci granted non-exclusive licenses to both Firm #2 and Firm #3, Firm #4, which had a pre-license market share of 25%, would have a predicted post-license market share of 15%:

25% - (50% / 5) = 15%.

IV. Conclusion

Patent license valuation is ultimately a prediction of the amount that a reasonable licensee will pay for the patent in a future arm's length exchange. No valuation method is definitive, and all valuation methods involve considerable uncertainty and subjectivity. As compared to other valuation methods, however, CAV features four important advantages. First, CAV incorporates all of the variables that determine the value of a patent license. Second, CAV associates these variables in a logical, commonsense fashion. Third, CAV is scalable in terms of the information required and the valuation result. Finally, CAV can be used in many licensing contexts. These advantages, therefore, commend the use of CAV whenever a patent license is being valued.

Footnotes

[a1]   Professor of Law, Director, Technology Transfer Research Center, Syracuse University. Work on this article was supported by a Summer Research Grant from Syracuse University College of Law.

[1]   A patent is pending on the Competitive Advantage Valuation Method and a trademark is registered on the name "Competitive Advantage Valuation." See Method for Valuing Intellectual Property, U.S. Patent Application No. 09/726,227 (Filed Nov. 30, 2000). For further information, please contact the Office of Technology Transfer, 113 Bowne Hall, Syracuse University, Syracuse, NY 13244.

[2]   Note, this review is published by AUS Consultants.

[3]   See Robert Goldscheider et al., Use of the 25 Per Cent Rule in Valuing IP, les Nouvelles, Dec. 2002, at 128.

[4]   See Richard Razgaitis, Early-Stage Technologies: Valuation and Pricing 57 (1999) (citing George Corey & Edward Kahn, Biomedical Royalty Rates: Some Approaches, Genetic Eng'g News, July-Aug. 1991, at 4); see also Stephen A. Degnan & Corwin Horton, A Survey of Licensed Royalties, les Nouvelles, June 1997, at 91.

[5]   Razgaitis, supra note 4, at 99-101.

[6]   Goldscheider et al., supra note 3.

[7]   Id. at 124.

[8]   Id. at 125.

[9]   Id. at 126.

[10]   The same problem arises if the 25 Percent Rule is applied to the total profit rather than to the incremental gain in profit. If the licensee paid 25% of its total profit, the license payment would be $10 (25% x $40), which would equal the licensee's total gain in profit of $10 ($40- $30).

[11]   Goldscheider et al., supra note 3, at 126.

[12]   See Gordon Smith & Russell Parr, Valuation of Intellectual Property and Intangible Assets 55-73 (3d ed. 2000).

[13]   All of the CAV default values can be calculated in terms of a numeric range, and all of the CAV percentage default measures can be altered to conform to management experience and judgment.

[14]   The CAV default correlation between competitive advantage and market share compresses product market shares as the number of products in the market increases. To compensate for this compression effect, the products' competitive advantages are multiplied by a factor equal to one plus the number of products in the market divided by ten. This was not done in the hypothetical in order to simplify the discussion.

[15]   Note that the example assumes the licensee will use all of the competitive advantage gained from the license to increase its market share while holding its price constant. The licensee, of course, can also use the competitive advantage gained to increase its price and profit margin. If the licensee elects to charge a price premium above the average product price, this will lower the licensee's average competitive advantage and predicted market share. However, the lower market share might be more than offset by the higher profit margin. The balance between market share and price will depend on the elasticity of demand in the product market.

[16] $NPV = R / (1 + r)^n$ where NPV is the net present value of a future return of a given amount, R is the amount of the future return, r is the risk factor associated with the future return, and n is the number of years until the return is realized. See Razgaitis, supra note 4, at 121-29.

[17]   The CAV default formula for calculating the competitive vulnerability of a firm already in a market is $1 - (AvMktSh^2 / FrmMktSh)$, where AvMktSh is the average market share in the market and FrmMktSh is the market share of the firm for which the market risk is being calculated. The CAV default formula for calculating the competitive vulnerability of a new entrant into a market is $1 - (3 \times AvMktSh)$.

[18]   In practice, the licensor's ability to recover its R&D costs depends upon the bargaining leverage of each party.

[19]   See Section III.B.3.

[20]   MedSci and G&G would both realize an 89% return on their investments in the license. MedSci's return on investment would be calculated as ($37.77M - $20M) / $20M = 89%. G&G's return on investment would be ($99.68M - ($15M + $37.77M)) / ($15M + $37.77M) = 89%.

[21]   The assumption that the firm's post-license reduction in market share is equal simplifies the calculations. In fact, a given firm's post-license reduction in market share is proportionate to its pre-license market share, the higher a firm's pre-license market share the lower the firm's post-license reduction in market share. In most instances, the difference between calculating equal market share reductions (or average market share reductions) for all firms and calculating proportionate market share reductions for

individual firms is within a few percentage points.

[22] A non-licensee's post-license market share in the case of an exclusive license can be calculated using the predicted market share gain of the exclusive licensee.