

Economic Evaluation Techniques

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How to arrive at a reasonable determination of a defined value for your intellectual royalty

There are several methodologies, techniques, and analyses that may be appropriate to the economic analysis and appraisal of intellectual properties. When we consider the fundamental similarities and differences of these several methodologies, they all logically group into the three general categories of valuation analyses. These three general categories of methodologies — or fundamental ways of analyzing the economics of intellectual properties — are often called the cost approach, the market approach (or the sales comparison approach), and the income approach.

Each of the several methodologies has the same objective: to arrive at a reasonable indication of a defined value for the subject intellectual property. Accordingly, methodologies that are premised upon the same fundamental economic principles should be grouped together into overall valuation approaches. The three approaches to intellectual property value, collectively, encompass a broad spectrum of economic theory and of property investment concepts.

INTELLECTUAL PROPERTY VALUATION APPROACHES

The cost approach is based upon the economic principle of substitution. This basic economic principle asserts that an investor will pay no more for an investment than the cost to obtain (i.e. either purchase or construct) an investment of equal utility. For purposes of this economic principle, utility can be measured in many ways, including functionality, desirability, etc. The

availability (and the cost) of substitute investments is directly affected by shifts in the supply and demand functions with regard to the universe of substitute investments. Unlike fungible tangible assets, often there are not reasonable substitutes for many intellectual properties. Accordingly, in the case of intellectual properties with unique qualities, the application of the cost approach may have limitations.

The market (or sales comparison) approach is based upon the related economic principles of competition and equilibrium. These economic principles conclude that, in a free and unrestricted market, supply and demand factors will drive the price of an investment to a point of equilibrium. The principle of substitution also directly influences the market approach. This is because the identification and analysis of equilibrium prices for substitute investments will provide important evidence to the appraiser with regard to the indicated value for the subject investment (i.e. the subject intellectual property).

The income approach is based on the economic principle of anticipation (sometimes also called the principle of expectation). In this approach, the value of the subject investment (i.e. intellectual property) is the present value of the expected economic income to be earned from the ownership of the subject intellectual property. As the name of this economic principle implies, the investor "anticipates" the "expected" economic income to be earned from the investment. This expectation of prospective economic income is converted to a present worth — i.e. the indicated value of the subject intellectual property.

There are numerous alternative definitions of economic income. If

properly analyzed, many different definitions of economic income can be analyzed to provide a reasonable indication of value for the subject intellectual property. This approach requires the appraiser to estimate the investor's required rate of return on the investment generating the prospective economic income. This required rate of return will be a function of many economic variables, including the risk — or the uncertainty — of the expected economic income.

Appraisers and economists typically attempt to analyze intellectual properties using all three of the basic valuation approaches — in order to obtain a multidimensional perspective on the subject intellectual property. The final value estimate conclusion is typically based on a synthesis of the value indications derived from various alternative valuation approaches and methodologies. It is noteworthy to mention that appraisers "estimate" the value of intellectual properties. The marketplace "determines" the value of intellectual properties.

MARKET APPROACH VALUATION METHODS

Typically, appraisers attempt to apply the market (sometimes called sales comparison) approach methods first in the valuation process. This is because "the market" — i.e. the economic environment where arm's-length transactions between unrelated parties occur — is typically the best indicator of the value of an intellectual property. Appraisers will analyze "the market" for both sale transactions and license (rental) transactions that

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may be useful in the analysis of the subject intellectual property.

There are somewhat fewer individual methods to select from within the market approach — as compared to either the cost or income valuation approaches. Nonetheless, the practical application of a market approach methodology is a very complex and rigorous analytical process.

There is a general systematic process — or framework — to the application of market approach methodologies to the valuation of intellectual properties. The basic steps of this systematic process are summarized as follows:

1. Research the appropriate exchange market to obtain information on sale transactions, listings, and offers to purchase or license "guidelines" (i.e. similar) or "comparable" (i.e. identical) intellectual properties that are similar to the subject properties — in terms of characteristics such as intellectual property type, intellectual property use, industry in which the intellectual property functions, date of sale, etc.

2. Verify the information by confirming that the data obtained are factually accurate and that the sale or license exchange transactions reflect arm's-length market considerations. (If the guideline transaction was not at arm's-length market conditions, then adjustments to the transactional data may be necessary.) This verification procedure may also elicit additional information about the current market conditions for the sale or license of the subject intellectual property.

3. Select relevant units of comparison (e.g. income multipliers or dollars per unit — units such as "per drawing," "per customer," "per patent" or — for computer software — "per line of code") and develop a comparative analysis for each unit of comparison.

4. Compare "guideline" intellectual property sale or license transactions with the subject using the elements of comparison and adjust the sale or license price of each guideline transaction appropriately to the subject property — or eliminate the sale or license transaction as a guideline for future con-

sideration.

5. Reconcile the various value indications produced from the analysis of the guideline transactions into a single value indication or a range of values. In an imprecise market — subject to varying economics — a range of values may sometimes be a better conclusion for the subject intellectual property than a single value estimate.

There are 10 basic elements of comparison that should be considered when selecting and analyzing "guideline" sales or license transactions in the market approach valuation of an intellectual property. These basic elements of comparison are:

1. The legal rights of intellectual property ownership that were conveyed in the guideline transaction.

2. The existence of any special financing terms of arrangements (e.g. between the buyer and the seller).

3. Whether the elements of arm's-length sale conditions existed.

4. The economic conditions that existed in the appropriate secondary market at the time of the sale or license transaction.

5. The industry in which the intellectual property was — or will be — used.

6. The physical characteristics of the guideline sale properties — compared to the subject intellectual properties.

7. The functional characteristics of the guideline sale properties — compared to the subject intellectual properties.

8. The technological characteristics of the guideline sale properties — compared to the subject intellectual properties.

9. The economic characteristics of the guideline sale properties — compared to the subject intellectual properties.

10. The inclusion of other (non-intellectual property) assets in the guideline sale transaction. This may include the sale of a bundle — or a portfolio — of assets that could include tangible personal property and/or real estate, as well as intellectual properties.

The reconciliation step is the last phase of a market approach valua-

tion analysis in which two or more value indications have been derived from guideline market data. In the reconciliation step, the appraiser summarizes and reviews the data and analyses that resulted in each of the value indications. These value indications are then resolved into a range of value or into a single value indication or a point estimate. It is important that the appraiser consider the strengths and weaknesses of each guideline value indication derived, examining the reliability and appropriateness of the market data compiled and the analytical techniques applied.

COST APPROACH VALUATION METHODS

The theoretical underpinnings of the various cost approach methods relate to the following basic economic principles:

1. Substitution — affirms that no prudent buyer would pay more for an intellectual property than the total cost to "construct" one of equal desirability and utility.

2. Supply and Demand — shifts in supply and demand cause costs to increase and decrease and cause changes in the need for supply of different types of intellectual properties.

3. Externalities — gains or losses from external factors may accrue to intellectual properties. External conditions may cause a newly "constructed" intellectual property to be worth more or less than its cost.

Types of Cost

Within the cost approach category, there are several groups of related methodologies. Each of these groups of methodologies use a similar definition of the "type" of cost that is relevant to the analysis. The most common "types" of — or definitions of — cost include:

1. Reproduction cost.
2. Replacement cost.

There are subtle, but important, differences in the definitions of these "types" of cost.

Reproduction cost contemplates the construction of an exact replica of the subject intellectual property.

Replacement cost contemplates

the cost to recreate the functionality or utility of the subject intellectual property, but in a form or appearance that may be quite different from the actual asset subject to appraisal.

Functionality is an engineering concept that means the ability of the subject intellectual property to perform the task for which it was designed. Utility is an economics concept that means the ability of the subject intellectual property to provide an equivalent amount of satisfaction.

However, while the replacement intellectual property performs the same task as the subject intellectual property, the replacement asset is often "better" (in some way) than the subject. In that case, the replacement property may yield more satisfaction than the subject property. If this is the case, analysts should be careful to adjust for this factor in the obsolescence estimation of their replacement cost analysis.

There are several other "definitions" of cost that are encompassed by the cost approach. Some analysts consider a measure of "cost avoidance" as a cost approach methodology. This methodology quantifies either historical or prospective costs that are avoided (i.e. not incurred) by the asset owner due to the ownership of the subject intellectual property. Some analysts consider "trended historical costs" as an indication of value. In this methodology, actual historical asset development costs are identified and quantified and, then, "trended" to the valuation date by an appropriate inflation-based index factor. All cost approach methodologies typically include a comprehensive and all-inclusive definition of "cost."

It is important to recognize that, the "cost" (whether replacement or reproduction) of an intellectual property includes not only hard costs (e.g. materials) and soft costs (e.g. engineering and design labor and overhead), but also the intellectual property developer's profit (on both the hard- and soft-cost investment) and an entrepreneurial incentive (to economically motivate the development process). And,

the "cost" of an intellectual property should be reduced by all relevant forms of obsolescence including economic obsolescence.

So, while the cost approach is a distinct and different sort of valuation analyses than the income approach, there are necessary economic analyses involved in the cost approach. These economic analyses (that may involve some analysis of income) provide indications both of the appropriate levels of entrepreneurial incentive (if any) and of economic obsolescence (if any).

Cost New

The replacement cost of an intellectual property is the total cost to create, at current prices, an asset having equal utility to the intellectual property subject to appraisal. However, the replacement asset would be created with modern methods and construed according to current standards, state-of-the-art design and layout, and the highest available quality of workmanship. Accordingly, the replacement intellectual property may have greater utility than the subject property.

Reproduction cost is the total cost, at current prices, to construct an exact duplicate or replica of the subject intellectual property. This duplicate would be created using the same materials, standards, design, layout, and quality of workmanship used to create the original intellectual property.

"Replacement cost new" typically establishes the maximum amount that a prudent investor would pay for a tangible asset. To the extent that an intellectual property is less useful than an ideal replacement asset, the value of the subject intellectual property must be adjusted accordingly. The subject intellectual property's replacement cost new is adjusted for losses in economic value due to:

- Physical deterioration.
- Functional obsolescence.
- Technological obsolescence (often considered a specific form of functional obsolescence).
- Economic obsolescence (which is often called external obsolescence).

It is unlikely for an intellectual

property to experience physical deterioration. However, the analyst should consider this concept in a cost approach analysis.

Forms of Obsolescence

Physical deterioration is the reduction in the value of an intellectual property due to physical wear and tear resulting from continued use. As mentioned above, it is unlikely that an intellectual property will experience physical deterioration.

Functional obsolescence is the reduction in the value of an intellectual property due to its inability to perform the function (or yield the periodic utility) for which it was originally designed.

Technological obsolescence is a decrease in the value of an intellectual property due to improvements in technology that make an asset less than the ideal replacement for itself. Technological obsolescence occurs when, due to improvements in design or engineering technology, a new replacement intangible asset produces a greater standardized measure of utility production than the intellectual property being appraised. As previously mentioned, technological obsolescence is often considered a specific form of functional obsolescence. Accordingly, many analysts capture all of the value influences due to both design flaws and changing technology in one category — and call that functional obsolescence.

◀ Economic ▶

Economic obsolescence (or external obsolescence) is a reduction in the value of the subject intellectual property due to the effects, events, or conditions that are external to — and not controlled by — the current use or condition of the intellectual property. The impact of economic obsolescence is typically beyond the control of the intellectual property's owner. For that reason, economic obsolescence is typically considered incurable.

In determining the amounts (if any) of physical deterioration, functional obsolescence, technological obsolescence, and economic obsolescence related to the subject intel-

lectual property, the consideration of the subject property's actual age — and its expected remaining useful life — is essential to the proper application of the cost approach.

Under the cost approach, the typical formula for quantifying an intellectual property's replacement cost is: $\text{Reproduction cost new} - \text{Curable functional and technological obsolescence} = \text{Replacement cost new}$. To estimate the intellectual property value, the following formula is used: $\text{Replacement cost new} - \text{Physical deterioration} - \text{Economic obsolescence} - \text{Incurable functional and technological obsolescence} = \text{Value}$.

An intellectual property's deficiencies are considered curable when the prospective economic benefit of enhancing or modifying it exceeds the current cost (in terms of material, labor, and time) to change it. An intellectual property's deficiencies are considered incurable when the current cost of enhancing or modifying it (in terms of material, labor, and time) exceed the expected future economic benefits of improving it.

INCOME APPROACH VALUATION METHODS

There are numerous measures of economic income that may be relevant to the various income approach methodologies. Some of these measures of economic income include:

- Gross or net revenues.
- Gross income (or gross profit).
- Net operating income.
- Net income before tax.
- Net income after tax.
- Operating cash flow.
- Net cash flow.
- Several others (such as incremental income).

Given the different measures of economic income that may be used in the income approach, an essential element in the application of this approach is to ensure that the discount rate or capitalization rate used in the analysis is derived on a basis consistent with the measure of economic income used. There are at least as many income approach valuation methodologies as there are measures of economic income.

However, most of these methodologies may be grouped into several categories of methodologies. These categories have similar conceptual underpinnings and similar practical applications.

Several categories of income approach methods are listed below:

1. Methods that quantify incremental levels of economic income (i.e. the intellectual property owner will enjoy a greater level of economic income by owning the property as compared to not owning the property).

2. Methods that quantify decremental levels of economic costs (i.e. the intellectual property owner will suffer a lower level of economic costs — such as otherwise required investments or operating expenses — by owning the property as compared to not owning the property).

3. Methods that estimate a relief from a hypothetical royalty or rental payment (i.e. the amount of a royalty or rental payment that the intellectual property owner would be willing to buy to a third party in order to obtain the use of — and the rights to — the subject intellectual property).

4. Methods that quantify the difference in the value of overall business enterprise — or similar economic unit — as the result of owning the subject intellectual property (and using it in the business enterprise). As compared to not owning the subject intellectual property (and not using it in the business enterprise).

5. Methods that estimate the value of the subject intellectual property as a residual from the value of an overall business enterprise (or of a similar economic unit), or as a residual from the value of an overall estimation of the total intellectual property of a business enterprise (or of a similar economic unit).

All of the various income approach methodologies may be grouped into the following two other analytical categories:

- Those that rely on direct capitalization.
- Those that rely on yield capitalization.

In a direct capitalization analysis, the analyst estimates the appro-

priate measure of economic income for one period (i.e. one period future to the valuation date) and divides that measure by an appropriate investment rate of return. The appropriate investment rate of return is called the capitalization rate. The capitalization rate may be derived for a perpetuity period of time — or the capitalization rate may be derived for a specified finite period of time, depending on the analyst's expectation of the duration of the economic income stream.

In a yield capitalization analysis, the analyst projects the appropriate measure of economic income for several discrete time periods into the future. This projection of prospective economic income is converted into a present value by the use of a present value discount rate. The present value discount rate is the investor's required rate of return — or yield rate — over the expected term of the economic income projection. The duration of the discrete projection period — and whether or not a residual or terminal value should be considered at the conclusion of the discrete projection period — depends on the analyst's expectation of the duration of the economic income stream.

The result of either a direct capitalization analysis or a yield capitalization analysis will provide an indication of the value of the subject intellectual property, per the income approach.

PURPOSE OF REMAINING LIFE ESTIMATION

The following abbreviated list presents several common reasons to estimate the remaining useful life of an intellectual property:

- Valuation of the property for transaction pricing and/or licensing purposes; an estimate of the intellectual property's remaining life is important regardless of which valuation approach is used.
- Amortization and cost recovery for income tax accounting and/or financial accounting purposes and/or regulatory accounting purposes.
- Cost accounting for capital recovery purposes in normal business

operations, whether as a product expense or as a period expense.

- Percent good studies for financial purposes and for ad valorem property tax assessment purposes.

- Other for miscellaneous management information, financing, and controversy resolution purposes.

PRIORITY OF ESTIMATING REMAINING LIFE FOR EACH VALUATION APPROACH

As explained below, the estimation of the remaining useful life of an intellectual property is an integral part of each of the standard approaches to intellectual property valuation.

Under the income approach to valuation, a lifing analysis may be performed in order to estimate the prospective period for the economic income projection subject to capitalization (whether the direct capitalization or the yield capitalization method is used).

Under the cost approach to valuation, a lifing analysis may be performed in order to estimate the amounts of obsolescence, if any, that should be deducted from the measures of reproduction, replacement, creation, or recreation cost of the subject intellectual property.

Under the market, or sales comparison, approach to valuation, a lifing analysis may be performed in order to select or to reject and/or to adjust either the "comparable" or the "guideline" intellectual property sale and/or license transaction data so that the adjusted transactional data are more comparative to the subject intellectual property.

EFFECT OF REMAINING LIFE ESTIMATION ON EACH VALUATION APPROACH

The analysis of the remaining useful life of an intellectual property will typically have a direct and predictable effect on the value of that intellectual property. The expected valuation effects of the results of the remaining useful life estimation are summarized:

Valuation Expected Effect on Intellectual Property Value

1. Income (a) Normally, a longer remain-

Approach ing life results in a higher indicated value.

(b) the value is particularly sensitive to remaining life analysis when the remaining life is less than 10 years.

(c) The value is not very sensitive to remaining life analysis when the remaining life is greater than 20 years.

2. Cost Approach

(a) Normally, a longer remaining life results in a higher indicated value.

(b) Normally, a shorter remaining life results in a lower indicated value.

3. Market or Sales Comparison Approach

(a) The market should indicate a normal level of acceptance for the remaining life of the subject intellectual property.

(b) If the subject's remaining life is different from the remaining life of the intellectual properties in the guideline transactions, then adjustments are required in the market-derived valuation multiples.

(c) If the subject's remaining life is substantially different from the remaining life of the intellectual properties in the guideline transactions, this may indicate a lack of marketability (i.e. a lack of normal market acceptance of the remaining life) of the subject intellectual property.

VARIOUS MEANS OR DETERMINANTS TO ESTIMATE REMAINING LIFE

The following list presents the most common "determinants," or factors that directly influence the expected remaining useful life of most intellectual properties. This list also presents several illustrative examples of typical intellectual properties that are most commonly influenced by the indicated life "determinant."

1. Legal Determinants

- Patents
- Copyrights
- Franchises

2. Contractual Determinants

- Contracts
- Licenses
- Permits

3. Functional Determinants

- Computer software
- Patented or unpatented technology
- Trade secrets

4. Technological Determinants

- Proprietary technology
- Technical documentation

- Technological know-how
- Formulas

5. Economic Determinants

- Proprietary technology
- Trademarks and trade names
- Trade secrets

6. Analytical Determinants

- Customer relationships
- Trade secrets
- Copyrights
- Distribution networks

Each of these categories of remaining life determinants should be considered in the estimation of the remaining life of the subject intellectual property. Typically, for valuation purposes, the determinant that indicates the shortest remaining life is the determinant that deserves primary consideration in the estimation of the remaining life of the subject intellectual property.

INTELLECTUAL PROPERTY VALUATION SYNTHESIS AND CONCLUSION

Typically, an appraisal is performed to answer a specific question about an intellectual property. To answer this question, the analyst follows the valuation process summarized above. When more than one valuation approach is used, each approach usually results in a different value indication for the subject intellectual property. Even within the same valuation approach, there are often different indications of value. For example, there may be several values indicated for the same intellectual property by the different income approach methodologies.

The intellectual property valuation synthesis is the analysis of alternative indicated valuation conclusions in order to arrive at a final value estimate for the subject intellectual property.

The intellectual property final value estimate, should generally be a number from within the final range of values indicated by the application of the three valuation approaches. The final value estimate may be one of the numbers indicated by one of the three valuation approaches, or it may be based on the valuation approach relied on most heavily, or it may be based on another number within the

indicated range of values.

Generally, it is not appropriate simply to average the indicated values of the various valuation approaches in order to arrive at a final value estimate. A simple arithmetic

mean implies that all of the valuation approaches have equal validity and equal weight; this is usually not the case in the typical intellectual property valuation. The final value opinion with regard to the

subject intellectual property should be derived from the analyst's reasoning and judgment of all of the relevant factors and from the impartial weighing of all of the available market evidence.