

Chapter 1

Valuation Techniques Used to Measure Fair Value of In-Process Research and Development Assets

Introduction

1.01 As indicated in paragraph .04 of the AICPA's Statement on Standards for Valuation Services (SSVS)¹ No. 1, *Valuation of a Business, Business Ownership Interest, Security, or Intangible Asset* (AICPA, *Professional Standards*, VS sec. 100), in the process of estimating value, the *valuation specialist* applies valuation approaches and valuation methods² and uses professional judgment. The use of professional judgment is an essential component of estimating value. Also, it is important for the valuation specialist to consider facts and circumstances specific to the asset being valued.

1.02 Valuation approaches used to measure the *fair value* of an asset may be classified broadly as cost, market, or income.³ FASB ASC 820-10-35-24 states that a "reporting entity shall use valuation techniques that are appropriate in the circumstances and for which sufficient data are available to measure fair value, maximizing the use of relevant observable inputs and minimizing the use of unobservable inputs." Therefore, when valuing an asset, all three approaches should be considered, and the approach or approaches that are appropriate under the circumstances should be selected.

1.03 Each of the three approaches can be used to measure fair value of an asset acquired in a business combination, asset acquisition, or, subsequently, for impairment testing and measurement purposes. As provided in FASB ASC 820-10-35-24B

[i]n some cases, a single valuation technique will be appropriate...In other cases, multiple valuation techniques will be appropriate...If multiple valuation techniques are used to measure fair value, the results (that is, respective indications of fair value) shall be evaluated considering the reasonableness of the range of values indicated by those

¹ Words or terms defined in the glossary are set in italicized type the first time they appear in the body of this guide.

² Financial Accounting Standards Board (FASB) *Accounting Standards Codification* (ASC) 820, *Fair Value Measurement*, refers to valuation approaches and valuation techniques. However, Statement on Standards for Valuation Services (SSVS) No. 1, *Valuation of a Business, Business Ownership Interest, Security, or Intangible Asset* (AICPA, *Professional Standards*, VS sec. 100), refers to valuation approaches and methods (not techniques). SSVS No. 1 (which is discussed in chapter 6, "Valuation of In-Process Research and Development Assets") defines *valuation method* as "within approaches, a specific way to determine value." This definition is consistent with the meaning attributed to valuation techniques in FASB ASC 820. Also, in practice, many valuation techniques are referred to as *methods* (for example, discounted cash flow method, multiperiod excess earnings method, relief from royalty method, Greenfield method, real options method, and so forth.) As a result, this guide uses the terms *technique* and *method* interchangeably to refer to a specific way of determining value within an approach.

³ Note that while the discussion of the various approaches in this guide are focused only on fair value, as defined in FASB ASC 820, of in-process research and development (IPR&D) assets for financial reporting purposes, these approaches can, and frequently are, used for other assets or under other valuation premises or standards (for example, fair market value, liquidation value, investment value, and so forth).

results. A fair value measurement is the point within that range that is most representative of fair value in the circumstances.

1.04 For purposes of measuring the fair value of *in-process research and development (IPR&D) assets*, the *cost approach* is applied only in limited circumstances. For example, the cost approach may be used to value dedicated, single purpose fixed assets used in research and development (R&D) activities, assets that can be substituted effectively through replacement or reproduction, or *IPR&D projects* that are in initial stages of development in which robust *prospective financial information (PFI)* does not exist. The *market approach* is seldom used to value IPR&D assets due to the lack of observable market values for similar assets, except in certain cases in which there may be sufficient observable asset pricing data. In most instances, however, the *income approach* is used to value IPR&D assets.

1.05 The classification of valuation methods and approaches used in this guide reflects the views of the IPR&D Task Force (task force). However, the task force acknowledges that there is some diversity in views in the valuation profession regarding certain characterizations. For instance, although this guide classifies the *relief from royalty method* as a method under the income approach, some practitioners believe that it is a form of the market approach. There are likely other examples of different views on characterizations. However, the task force believes that categorization does not change the substance of the application of these methods or their results. It should be noted that this guide does not intend to definitively determine which method falls within which approach or which method is a subset of another method.

Cost Approach

1.06 As discussed in paragraphs 3D–3E of FASB ASC 820-10-55, the cost approach reflects the amount that would be required currently to replace the service capacity of an asset (often referred to as *current replacement cost*). From the perspective of a *market participant seller*, the price that would be received for the asset is based on the cost to a market participant buyer to acquire or construct a substitute asset of comparable utility, adjusted for obsolescence.

1.07 There is some dispute in the valuation profession regarding whether replacement cost is a pretax or an after-tax measure. This issue is beyond the scope of this guide. However, for purposes of valuing the assembled workforce in the comprehensive example (see paragraphs 6.185–.199 and related schedules), it is assumed to be pretax.

1.08 The task force recognizes that the cost approach is widely used for valuing assets in general. However, it is less commonly used to value IPR&D assets because the goal of R&D is generally to develop commercial products (that is, income-producing assets), which are intended to generate profits (that is, the value derived from those assets is expected to exceed costs incurred in developing those assets). Therefore, for assets to be used in R&D activities, including IPR&D projects, there may be little or no relationship between historical cost expended and fair value. For example, a great invention may cost little, in which case, fair value may far exceed cost. Conversely, an R&D project may last for years without producing a commercially viable product, in which case, the cost approach may overstate the fair value of the technology.

1.09 Because many assets used in R&D activities are unique or proprietary and cannot be reproduced or otherwise replaced, the task force believes that the cost approach will generally not be appropriate for valuing such assets as the intangible portion of an IPR&D project. However, the use of a cost approach may be appropriate in limited circumstances, including the valuation of (a) single purpose fixed assets, (b) assets that can be substituted effectively through replacement or reproduction, or (c) specific IPR&D projects in which the stage of development, although substantive, is so early that reliable information about anticipated future benefits does not exist.

Market Approach

1.10 As stated in FASB ASC 820-10-55-3A, the market approach uses prices and other relevant information generated by market transactions involving identical or comparable (that is, similar) assets, liabilities, or a group of assets and liabilities, such as a business.

1.11 The prices in recent transactions of comparable technology may be a reasonable basis for estimating the fair value of an early-stage technology. In such circumstances, the valuation specialist would study the characteristics of the asset and the stage of its development to ensure that the subject and comparable assets are reasonably similar. However, sales prices of comparable IPR&D assets are seldom available because either (a) IPR&D assets typically transfer with the sale of a business, not individually, or (b) when they do transfer individually, they may not be comparable to the subject asset. Therefore, the market approach seldom is used to value IPR&D assets, unless exchanges of individual assets comparable to the subject asset can be observed.

1.12 In some cases, estimates of fair value may be based on the prices of single-technology or single-product companies that are publicly traded. There may also be markets for the purchase of early-stage discoveries from academic institutions or businesses. Markets are evolving for the exchange of intellectual property, and prices from such markets may also be a useful input. These prices may provide indications of fair value for similar early-stage discoveries. Besides market prices for comparable assets, market-derived data can provide inputs to valuing an asset using the income approach (for example, royalty rates derived from licensing arrangements). It should be noted, however, that the terms in these transactions may include an upfront lump-sum payment with certain contingent payments or ongoing royalties based on future success and revenue. Difficulty converting the transaction terms to either a single lump-sum amount or a blended effective royalty rate may be an obstacle in benchmarking the value of the subject asset, in addition to other issues of comparability.

Income Approach

1.13 As stated in FASB ASC 820-10-55-3F, the income approach converts future amounts (for example, cash flows or income and expenses) to a single current (that is, discounted) amount. When the income approach is used, the fair value measurement reflects current market expectations about those future amounts.

1.14 The term *income*, as used when referring to techniques under this approach, implies anticipated future benefits (sometimes referred to as *economic earnings* as opposed to the notion of accounting earnings or net income),

in the form of *net cash flows*. Net cash flows differ from reported net earnings in that net cash flows are net of earnings reinvested to fund asset growth or development and adjusted for noncash expenses, such as depreciation and amortization. The income approach involves two basic steps. The first is development of prospective net cash flows⁴ expected to accrue to an investor resulting from ownership of an asset or collection of assets. The second step involves discounting the prospective cash flow to a present value.

1.15 The income approach generally may be broken down into two methods: (a) single-period capitalization and (b) multiperiod discounted cash flows. The single-period capitalization method is used primarily in the valuation of small businesses, professional practices, certain types of real property, mature companies with steady growth, or stable growth intangible assets that are expected to exist over an indefinite future period. This method is rarely of use in the valuation of assets used in R&D activities because the assumptions of indefinite existence and continuous growth would be inappropriate. A variation of the multiperiod *discounted cash flow method*, the *multiperiod excess earnings method*, is the most commonly used valuation technique under the income approach to value IPR&D assets. It requires forecasting cash flows for a discrete period and discounting those amounts to present value at a rate of return that considers the risk of the cash flows. These methods are conceptually the same in that they both convert prospective net cash flows expected to accrue to an investor resulting from ownership of an asset or collection of assets to a present value. The main distinction between these methods is that the single-period capitalization method is most commonly used to perform an entity-type valuation, whereas the multiperiod discounted cash flows method, due to its greater flexibility, can address, for example, valuation scenarios with nonconstant growth rates and margins, and, thus, can be used to value a much wider range of subject assets, including entities, segments of entities, groups of assets, and individual assets.

1.16 The following are the most commonly used methods and techniques under the income approach to value IPR&D assets:

- Multiperiod excess earnings
- Relief from royalty⁵
- Decision tree analysis
- "Split" methods (that is, revenue, cash flows, or profit split)

1.17 Other methods and techniques under the income approach that might be used to value IPR&D assets are as follows:

- Monte Carlo analysis

⁴ Typically, net cash flows are considered in the income approach and discounted to present value. However, in certain instances and depending on the unit of account determination, certain cash outflows, such as licensing fees or royalties, may need to be presented as a separate liability or contingency. If this is the case, the estimated future gross cash flows will be discounted to their present value to determine the fair value of the asset versus the liability. See the "Questions and Answers—Recognition of IPR&D Assets Acquired in a Business Combination" section in paragraphs 2.14–.15 for further discussion.

⁵ Although SSVS No. 1 categorizes the relief from royalty method as a method under the market approach, other sources of valuation literature classify it under the income approach. However, the IPR&D Task Force (task force) believes that categorization does not change the substance of the application of this method. See paragraph 1.05 for further discussion.

- Options-based methods
- Manufacturing cost savings
- Incremental revenue or profit (for example, price premium)
- "With and without" analysis
- Greenfield method

1.18 The stream of cash flows from each of these methods is discounted to present value, including, as appropriate, any tax benefits derived from amortizing the intangible asset for tax purposes,⁶ to estimate the fair value of the intangible asset.

1.19 The valuation specialist should apply income-based method(s) or technique(s) that most accurately captures the benefit of owning the IPR&D asset, given the nature of the asset and availability of required inputs.

1.20 *Multiperiod excess earnings method.* In cases when there is an identifiable stream of prospective cash flows for a collection of assets, a multiperiod excess earnings method may provide a reasonable indication of the value of a specific asset. Specifically, under the multiperiod excess earnings method, the estimate of an intangible asset's fair value starts with the PFI associated with a collection of assets, rather than a single asset. *Contributory asset charges*, also referred to as *economic rents*, are then commonly deducted from the net (or after-tax) cash flows for the collection of the associated assets to isolate remaining or "excess earnings" attributable solely to the intangible asset being valued. The contributory asset charge is a deduction for the contribution of supporting assets (for example, net working capital, fixed assets, customer relationships,⁷ trade names, and so on) to the generation of the prospective cash flows. Contributory asset charges should be applied for all assets, including other intangible assets, which would be required by market participants to generate the overall cash flows of the collection of assets. The excess earnings, net of the charges for contributory assets, are ascribed to the asset being valued and discounted to present value. The multiperiod excess earnings method is discussed in detail in chapter 6, "Valuation of In-Process Research and Development Assets."

1.21 *Relief from royalty.* The premise of the relief from royalty method is that ownership of the subject asset *relieves* the owner of the need to license the asset from a third party. Thus, by owning the intangible asset, the owner avoids the royalty payments required to license the asset. The relief from royalty is cash flow savings that are discounted to present value. The present value of the prospective after-tax royalty payments are commonly used to approximate the fair value to the investor of owning the intangible asset. When selecting a royalty rate, one needs to consider whether it is licensor or licensee that is responsible for costs associated with various functions. For instance, when valuing IPR&D assets using the relief from royalty method, it may be appropriate to consider costs to complete, probability of completion, postcompletion

⁶ The need to include the benefits of tax amortization will depend on which tax jurisdiction the intangible asset is located, or would be located, from a market participant perspective. Also, as further discussed in paragraph 6.123, the task force believes that tax amortization benefit should be included regardless of whether the actual transaction is a taxable transaction in which the buyer will receive a step-up in basis for tax purposes.

⁷ The inclusion of customer relationships in the contributory asset charge indicates that a different methodology would need to be used to value customer relationships in order to avoid cross charges. For further discussion regarding cross-charges, see paragraphs 3.5.04–.07 in the Appraisal Foundation document setting forth best practices for *The Identification of Contributory Assets and the Calculation of Economic Rents* (the Appraisal Foundation document).

maintenance R&D costs, and so on. For further discussion, see paragraphs 3.5.03 and 3.6.04 in the Appraisal Foundation document setting forth best practices for *The Identification of Contributory Assets and the Calculation of Economic Rents* (the Appraisal Foundation document).

1.22 A relief from royalty method is often appropriate for certain types of intangible assets. For instance, trademarks and trade names, patents, and *developed product technology* are examples of intangible assets that frequently are licensed in exchange for a royalty payment. A critical element of this method is the development of a royalty rate that is comparable to ownership of the specific asset (for example, a rate that equates to worldwide, exclusive rights to use that asset in perpetuity in any manner desired). Therefore, if a properly supportable royalty rate that corresponds to the rights and responsibilities represented by the asset being licensed cannot be obtained due to the nature of the asset, then the relief from royalty method should not be used, and other, more appropriate methodologies should be considered instead.

1.23 Generally, the relief from royalty method is applied in situations in which

- the importance of the intangible asset to a business or product is similar to that of a comparable, licensed asset (for example, pharmaceutical compounds that are licensed).
- the intangible asset can be reasonably separated from other assets, and it is practical and possible to license it separately.
- the rights of ownership can be compared to the rights under a license (for example, similar geographic market coverage, duration, exclusivity, limitation, technology, and type of customer).
- royalty rates can be observed, including rates for agreements that confirm comparable economic rights for similar intellectual property.

1.24 Typically, the best source of royalty rate information would be other licensing agreements for comparable technologies made by one of the companies in a transaction. When such information is not available, it may be appropriate to use industry average rates or other broad benchmarks with reasonable justification. Royalty rates would also need to consider the qualitative drivers of comparability. Truly comparable rates may be difficult to find for most IPR&D assets and, therefore, simulated or adjusted royalty rates taking into consideration qualitative value drivers of the subject intangible asset could be used. The relief from royalty method is discussed in detail in chapter 6.

1.25 *Decision tree analysis.* Decision tree analysis is an income-based method that explicitly captures the expected benefits, costs, and probabilities of contingent outcomes at future decision points, or nodes. In general, these nodes are points at which a major investment decision will be made, such as whether a pharmaceutical company will proceed to a phase III clinical trial. At that point, management can decide whether to make an additional investment based on the benefits and costs expected from that point forward. If the expected present value of the asset at that time is less than the required investment, then the investment is avoided. This is the key difference between decision tree analysis and the previously discussed methods—the ability to analyze future values, change course, and potentially avoid future investment costs that are not expected to produce an adequate return. In contrast, other income approach-based methods often assume that such contingencies are resolved

favorably and that future development costs are incurred. Methods such as the multiperiod excess earnings, relief from royalty, and other income-based methods may attempt to account for the risk of failure in the estimation of the risk-adjusted *discount rate*. Decision tree analysis is particularly applicable to the valuation of assets subject to risks that are not correlated with the market, such as the risk that a particular technology will succeed or fail. Risks that are correlated with external markets can be estimated discretely when a decision tree analysis is employed. In summary, the decision tree analysis provides the valuation specialist an ability to analyze costs, risks, and contingent outcomes at various stages.

1.26 An example of a decision tree analysis appears in chapter 6 of this guide. In this example, the market risks are modeled using two potential outcomes—a high market potential and a low market potential. It is important to note that this method will capture the aggregate value of an investment opportunity, including the values of primary and contributory assets. The adjustments required to isolate from the assemblage of assets the values of specific assets (for example, a specific IPR&D asset) are discussed in the example in chapter 6.

1.27 *"Split" methods*. Splitting revenues, cash flows, or profits among assets, or collections of assets, can be a useful technique for isolating cash flows and avoiding double counting when measuring fair value. Such methods may be used to fully isolate the cash flows of a particular asset (for example, a relief from royalty method could be characterized as a form of a profit-split technique) or in combination with other methods (such as multiperiod excess earning) to reduce reliance on the calculation of contributory asset charges as a necessary adjustment to avoid double counting. It should be noted that splitting of revenues, cash flows, or profits would need to be based on a reasonable set of assumptions (for example, profitability of various functions represented) as opposed to being arbitrary. For further discussion, please refer to paragraph 3.5.06 in the Appraisal Foundation document.

1.28 *Monte Carlo analysis*. The Monte Carlo technique can be used in the application of income-based methods previously discussed. The term *Monte Carlo* refers to computer-generated simulations of numerous PFI scenarios. This type of analysis is consistent with the present value techniques described in paragraphs 4–20 of FASB ASC 820-10-55. The Monte Carlo technique can be used for estimating the fair value of IPR&D assets. Also, many assumptions can be simulated using this technique and incorporated into other valuation methods. The details of the Monte Carlo technique are beyond the scope of this guide.⁸

⁸ The nature of Monte Carlo analysis theoretically would lend itself well to the valuation of IPR&D assets. However, the task force observes that, as of the writing of this guide, this methodology was not commonly used in practice to value IPR&D assets. The task force has observed, however, the use of this methodology in the valuation of contingent consideration under FASB ASC 805, *Business Combinations*. For information on the Monte Carlo and other numerical simulation and scenario analysis techniques, readers may refer to the following publication: Johnathan Mun, *Modeling Risk: Applying Monte Carlo Risk Simulation, Strategic Real Options, Stochastic Forecasting, and Portfolio Optimization* (Hoboken, New Jersey: John Wiley & Sons, Inc., 2010). Less technical discussions scenario valuation approaches can be found in the following two publications: Francis Clauss, *Corporate Financial Analysis with Microsoft Excel* (McGraw-Hill Companies, 2010) and Tim Koller, Marc Goedhart, and David Wessels, *Valuation: Measuring and Managing the Value of Companies* (Hoboken, New Jersey: John Wiley & Sons, Inc., 2010). Furthermore, Richard Razgaitis' book *Dealmaking Using Real Options and Monte Carlo Analysis* (Hoboken, New Jersey: John Wiley & Sons, Inc., 2003) is also a useful reference for Monte Carlo and real options techniques.

1.29 *Options-based methods.* Like decision tree analysis, options-based methods (commonly referred to as *real options* and *real options analysis*) are income approach-based techniques that capture explicitly the expected benefits, costs, and probabilities of contingent outcomes at future decision points. Again, like decision tree analysis, a real options analysis considers the stages at which an investment decision will be made.

1.30 Real options analysis differs from decision tree analysis in one key respect: "Market" risks are addressed inside the model using option pricing concepts. The details of options-based methods are beyond the scope of this guide.⁹

1.31 *Manufacturing cost savings.*¹⁰ An intangible asset may afford its owner a cost savings (that is, a reduced or eliminated cash outflow) over the best alternative to the asset. These cost savings represent the value of ownership of the intangible asset. The present value of the cost savings is fair value of the intangible asset, provided the cost savings would be available to market participants if they owned the intangible asset.

1.32 *Incremental revenue or profit.* An intangible asset may allow for premium pricing (that is, higher cash generation) if it provides utility beyond that of competitive products or services. The premium price is a measure of the benefit derived from ownership of the intangible asset. The present value of incremental cash flows resulting from premium pricing is the fair value of the asset, provided that market participants would also be able to take advantage of premium pricing if they owned the intangible asset.

1.33 *"With and without" analysis.* Fair value of some assets may best be measured in a general sense by calculating the difference between a scenario that reflects the benefits of the asset being in place versus a scenario of not having the asset in place. There are a number of specific forms of this technique.

1.34 *Greenfield method.* This direct value method lends itself to valuing key assets in certain industries (such as broadcast, wireless, and cable industries), as discussed in FASB ASC 805-20-S99-3. Conceptually, the Greenfield method and multiperiod excess earnings method accomplish the same objective. The Greenfield method is not commonly used to value IPR&D assets.

⁹ The task force cannot point to any specific examples of using real options analysis for the valuation of IPR&D assets in financial reporting, even though the nature of this methodology also theoretically would lend itself well to the valuation of IPR&D assets. For information on the real options method, readers may refer to the following publications: AICPA Guide *Valuation of Privately-Held-Company Equity Securities Issued as Compensation* (see appendix G, "Real Options"); Thomas E. Copeland and Vladimir Antikarov, *Real Options, Revised Edition: A Practitioner's Guide* (London, UK: Texere, 2003); Martha Amram and Nalin Kulatilaka, *Real Options: Managing Strategic Investment in an Uncertain World* (Boston: Harvard University Press, 1999); Johnathan Mun, *Real Options Analysis: Tools and Techniques for Valuing Strategic Investments and Decisions* (Hoboken, New Jersey: John Wiley & Sons, Inc., 2002); and Timothy Luehrman, *Investment Opportunities as Real Options: Getting Started on the Numbers* (*Harvard Business Review*, July 1998).

¹⁰ Manufacturing costs savings is a part of the broader cost savings method. However, the task force believes that research and development activities would be mainly focused on applying technology to saving costs in the manufacturing process.