

PART

# One

## Foundations for Patent Valuation and Decision Making

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## CHAPTER 1

# Valuation Basics

**O**ne cannot make an informed decision without valuation. By definition, decisions require choosing between alternative courses of action. Putting aside for a moment what *value* actually means, a reasonable decision maker will seek the alternative that provides the best value. If a firm is considering whether to buy an asset, it will want to determine the asset's value to the firm and compare it with the acquisition cost. If a firm is choosing between business strategies or financing strategies, it will want to pursue the strategy that provides the most value to the firm. The realization that informed decisions require valuation is well understood in many business settings. You would be hard pressed to find a competent corporate finance manager who does not rely on valuation as the primary decision making tool.

Despite its acceptance in other business settings, valuation has been slow to develop as a wide-ranging decision-making tool for patents. In the patent context, valuation analyses tend to be conducted only when absolutely required. If a company is about to license its patent rights to a third party, for example, or needs a damages estimate for an infringement lawsuit, a value obviously must be placed on the patent rights. Consciously valuing the potential patent rights at other times is much less common. In effect, thoughtful valuation efforts are limited to when money is about to change hands on the patent rights or when an asset value needs to be placed on the books for tax planning or accounting purposes. Using valuation to make patent decisions in other circumstances, however, remains the exception rather than the rule. Twenty or thirty years ago, when patents tended to be less critical to firms' success, it may have been permissible for companies to take a cavalier approach to valuing patents and making patent decisions. That is no longer the case. Today's successful manager, scientist, attorney, or governmental official involved with patents is constantly asked to make decisions, and that decision-making process can be significantly improved by understanding and using

valuation analyses. Consider just a few of the common patent-related decisions that firms face on a daily basis:

- Which R&D project should the firm pursue?
- Should the firm obtain a patent?
- In which countries should the firm obtain a patent?
- How broadly should the firm's lawyers draft the patent's claims?
- How should the firm manage its patent portfolio?
- Should the firm sue a possible infringer?
- How should the firm respond to a threat of an infringement suit?
- How should the firm monetize a patent?

For those decision makers who purposefully or inadvertently try to avoid valuation analyses, their avoidance efforts will not be successful. Every decision involves a value judgment (the option chosen is better than the options not chosen), whether the decision maker appreciates it or not. When a company decides to prioritize one research and development (R&D) project over another, for example, the company has valued the winning R&D project higher than the other. When a company decides to settle a patent infringement suit, the company has valued the settlement alternative higher than the litigation alternative. Therefore, the choice is not whether to conduct a valuation analysis. Rather, the choice is whether to employ an intelligent valuation analysis that helps to inform the decision or to employ a sloppy process that ignores such valuable information.

Valuation has traditionally had a limited role in the patent context because it is perceived to be so complex and uncertain that the effort is not worth the information it generates. We could not disagree more with that line of thinking. This book is based on two foundational principles that we hope to prove throughout the text: (1) Reasonable valuation estimates can be generated for patents that significantly improve all aspects of patent decision making, and (2) conducting useful patent valuations is not that difficult. In fact, patent valuation skills can be made generally accessible to most actors in the patent industry and thereby improve decision making throughout the entire patent process.

In this chapter, we

- Explain what is meant by *value*.
- Provide a general overview of the valuation process and what it can accomplish.
- Explain the importance of identifying exactly what is being valued: the invention, the patent rights, or both?

- Examine some common misconceptions about valuation that obscure the ultimate benefits of the exercise.
- Provide an overview of the three fundamental valuation approaches (income, market, and cost).
- Consider limitations on rationality in valuation and decision-making exercises.

## WHAT IS VALUE?

A valuation analysis seeks to determine an asset's value. Most of us have an intuitive appreciation of what is meant by *value*: It refers to the benefits that come from the asset. The unifying benefit patents provide is the cash flow that patent rights help to generate. Why do firms buy, sell, or otherwise make decisions about patent rights? There are many specific reasons, but the overarching rationale that links each patent decision is the firm's desire to generate economic benefits. By their nature, most firms are profit-driven entities. Whether or not mandated by law (e.g., in the case of corporations<sup>1</sup>), the fundamental purpose for most business firms is to generate profits. A firm's decisions to accumulate, use, transfer, enforce, or defend patent rights are therefore driven by the ability for that decision to generate "net" economic benefits—economic benefits that exceed related costs—that enhance the firm's economic position. Thus, a patent valuation analysis is an attempt to measure the net economic benefits that come from a firm's patent-related decisions.

How do patent rights help the rights holder to generate the net economic benefits that are the source of value? That is a topic we will cover throughout this book. For now, note that there are two choices: Economic benefits can be either direct or indirect.

1. **Direct economic benefits:** Patent rights can create a direct cash flow stream for the rights holder that could not be earned without those rights. For example, holding the patent rights may allow the rights holder to generate extra profits that stem from excluding competitors.
2. **Indirect economic benefits:** Patent rights can also generate indirect economic returns for the rights holder. Namely, the patent rights can (1) save money for the rights holder by reducing or eliminating certain negative costs and (2) indirectly help the rights holder to generate cash flow streams (e.g., a patent can signal R&D strength that helps the patent holder to raise investment capital and build other business lines).

On occasion, patents can also generate noneconomic benefits (see Box 1.1).

**BOX 1.1: INSTRUMENTAL VERSUS INTRINSIC VALUE**

In this book, we will generally focus on instrumental value. Patents have value as instruments of commerce that provide rights holders with certain economic benefits (both direct and indirect). Because patents are typically held by companies and other commercial actors, the instrumental value of patents is the dominant focus for most rights holders.

It should not be forgotten, however, that patents may also have intrinsic value for some rights holders. Many inventors are driven to patent by the possibility of financial gain, but some pursue patents for their intrinsic value. Intrinsic value includes noneconomic rewards such as the prestige, personal achievement, or feeling of accomplishment that comes from having a patent. For such an inventor, a patent can be a symbol of inventiveness or achievement, even if it does not create any real value in commerce. This intrinsic value of patents may help to explain why so many patents are pursued each year that generate no economic returns to the inventor.

Finally, value is a relative concept. The exact same asset will generate very different future economic benefits—and therefore very different values—depending on who possesses it and how it is deployed. Assume that a small start-up company develops a patented pharmaceutical drug that affects blood-flow circulation. This drug can be used as an effective treatment for two different health conditions: (1) It can help to treat pulmonary arterial hypertension (PAH), and (2) it can help to treat male erectile dysfunction (ED). The start-up company has strong research capabilities, but weak marketing and distribution capabilities. If the start-up keeps the patent and tries to market and distribute the drug itself, profits (and therefore the patent's value) would likely be low. If the start-up decides to license the drug's patent rights to a large pharmaceutical company to market and distribute the drug, profits (and therefore the patent's value) would likely be much higher. The same patent rights would have two very different values depending on who holds them. The same can be said for how the patent rights are deployed. Assume that the start-up licenses the drug's patent rights to the large pharmaceutical company, which is deciding how to market the drug. It could market the drug primarily as a PAH treatment or primarily as an ED treatment. To complete the hypothetical example, it turns out that the ED market is much larger than the PAH market and would generate more profits. Again, the same patent rights would have two

different values, but this time deployment (rather than who holds the rights) would be the variable that changes value.

It is this relative nature of value that allows markets to develop. That different parties value an item differently is what encourages the exchanges that are the driving principle of markets. See Chapter 8 for a discussion of markets and their effect on patent valuation.

## THE VALUATION PROCESS

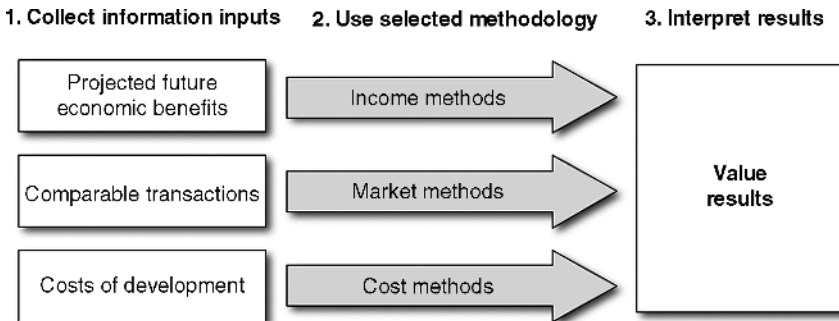
How should value be determined? There are an almost infinite variety of possibilities; some are logical and reasonable, some not. No matter what method is used to measure value, however, the foundation of each valuation assessment is a translation exercise (see Figure 1.1). The valuation process takes a complex, ever-changing, and messy reality and translates it into a simplified, numerical measurement (see Box 1.2) or value result. In the case



**FIGURE 1.1** The Foundation of Valuation Assessments Is a Translation Exercise

### BOX 1.2: USING NUMBERS IN VALUATION ANALYSES

Using numbers is one of the most important, but also one of the most inexact, parts of any valuation exercise. Numbers are themselves the result of a translation exercise. They are a simplified representation of some complex reality that a valuator hopes to capture (such as the profits that will flow from the patent next year). This translation of complex reality into a number (or a range of numbers) is a simplification process. Although some information is lost in any simplification process, the objective is to employ simplification methods that retain as much critical information as possible without the burden of superfluous or distracting information. When all the available simplification methods risk significant information loss, the valuator needs to be aware of and consider the risk of lost information when interpreting the results of any valuation analysis.



**FIGURE 1.2** Valuation Analysis Is a Function of Three Basic Variables: (1) Information Inputs, (2) Valuation Methodologies, and (3) Interpretation of the Value Result

of patents, the value result will usually be expressed in terms of money because patent valuation analyses attempt to measure the net economic benefits (direct and indirect) that come from patents.

Conducting a valuation analysis is a function of three basic variables (see Figure 1.2): (1) the information inputs (measurements of the complex and messy reality), (2) the valuation methodology that translates these inputs into a value result, and (3) the interpretation of the ensuing value result. This combination of variables is why most valuation commentators describe valuation as a combination of both art and science. The science part of valuation is the logical and consistent application of reasonable valuation methodologies. The art side, however, tends to be just about everything else. The gathering of information variables and the interpretation of the value result require significant subjective judgments. What information will be collected and what ignored? How will missing information be addressed? How will uncertainty, probable future outcomes, and new information learned in the future be incorporated into the analysis? Finally, what does the value result really mean?

By their very nature, patents can pose particular information input challenges for valuers. Uncertainties about the legal strength of the patent or the underlying technical and commercial viability of the invention make information gathering even more subjective for patents than for many asset classes. These challenges are compounded by the unique nature of patents and the lack of robust patent trading markets. As a result, patent valuation can be more weighted toward the art, rather than the science, side of the spectrum.

## IDENTIFYING THE SUBJECT MATTER OF THE VALUATION

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One of the first steps in any valuation exercise is to identify clearly the item to be valued. For a patent valuation, the valuator must clarify what the term *patent* means in the context of that specific exercise. The problem stems from the multiple meanings that are commonly ascribed to the term, be it for the invention use, the patent rights, or both.

### Invention Use, Patent Rights, or Both?

Sometimes the term *patent* is used to describe the economic use of the patented invention (see Box 1.3). At other times it is used to describe some of or all the intellectual property rights that come with a patent (e.g., it could be used to describe a single claim or embodiment or could focus on the totality of rights associated with the patent). And sometimes it is used to describe both the invention use and the patent rights collectively.

#### **BOX 1.3: USE OF THE PATENTED INVENTION: PATENTED ARTICLE VERSUS PATENTED PROCESS**

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When considering the commercial use of a patented invention, there are two possibilities:

1. A product in the marketplace that results from the patented invention.
2. The use of the patented invention to do something.

Sometimes the product is the subject of the patent (in the words of the U.S. Patent Code, a patented article) so that both possibilities are combined. Sometimes, however, the patent is for a process (a patented process), and the use of that process may result in an unpatented product. For example, suppose that a company has discovered a new way to manufacture chopsticks that lowers its production costs by 30 percent. The ultimate product is not directly patentable because chopsticks were invented thousands of years ago. Instead, the company would be obtaining a patent on its new process to make chopsticks. Although a patent notice marking is not required on nonpatented articles that result from a patented process,<sup>2</sup> the chopsticks produced from the

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patented process could be labeled with a notice of the patented process. For a patented article, a patent notice marking is required so as to give constructive notice of the patent to avert innocent infringement and preserve certain remedies should infringement occur.

Although the underlying invention use and the patent rights are two distinct value-generating assets, there are times when accurately separating them can be difficult and not worth the bother. In those instances, the valuator may choose to conduct a *combined* invention use plus patent rights valuation. Venture capitalists (VCs) provide a classic example of this combined approach. When evaluating the investment potential for a start-up company, VCs tend not to separate the value of the individual patent rights from the commercial application of the patented invention; rather, they are much more likely to value the profit-generation capacity of the company as a whole. A one-, two-, or three-patent-product start-up will be valued in the aggregate on its ability to generate future profits, and the VC is unlikely to conduct separate valuations for each of the patent-right/invention-use assets that make up the company. The VC combined approach is not unreasonable, but it is not always ideal. Even in the context of a VC investment, failing to distinguish the invention use's value from the patent rights' value can result in both the VC and the start-up missing important information about the start-up's overall value. Consider the following two possibilities:

1. What if the patent is declared invalid or its scope is narrowed?
2. What if the patent rights remain in force, but use of the invention is no longer commercially viable?

Neither of these possibilities is all that uncommon, which means that both the VC and the start-up could benefit from incorporating such possibilities into their decision-making processes. Let us take a look at them one at a time.

**Possibility 1: Invention Use May Have Commercial Value Even If the Patent Rights Do Not** What happens to the value of the VC's investment in the start-up if the patent is declared invalid or its scope is narrowed (such as when one of the patent's claims is invalidated)? It does not mean that the value of the invention covered by such patent rights will be completely

eliminated. The invention use may remain valuable and continue to generate profits. Use of an invention does not require a patent to generate value. Unpatented inventions can be commercialized and generate profits through a variety of traditional commercialization practices and techniques that do not depend upon patent rights. Losing the patent rights will almost certainly decrease the profits, but that does not mean that the profits will decline to zero.

Understanding the stand-alone value for the use of the invention can help to inform both the VC and the start-up. If the stand-alone value for the invention use is substantial, the risk associated with the investment should be lower and could also suggest that the technology company should incorporate a nonexclusive patent licensing strategy into its business plan. If the stand-alone value of the invention use is minimal, the importance of the patent rights is highlighted and allows the parties to concentrate their due diligence on the strength of those rights.

**Possibility 2: Patent Rights May Have Commercial Value Even If the Invention Use Does Not**

It is also possible that the invention use will lose its commercial value during the life of the patent. For example, one of the start-up's competitors may develop an improvement that reduces the commercial viability of the original invention. In that setting, the start-up may lose interest in the prior commercial use of the invention itself. The patent rights in the original invention could remain valuable, however, because to make and sell its improvement the competitor may need to license the start-up's patent.

**Decoupling the Value of the Invention Use from the Value of the Patent Rights**

There is no single method for decoupling the commercial value of the invention use from the value of the associated patent rights. How to decouple will depend on a host of factors, including the valuation technique employed and the track record of the invention and the patent rights. Even if the valuator does not formally decouple the invention's value from the patent rights' value, she should still keep in mind that the value of the patent rights is separate from the value of the invention use. That insight alone can sharpen the valuation effort. Take, for example, the typical VC combined valuation approach discussed above. Box 1.4 demonstrates how simply recognizing the separateness of the invention use's value from the patent rights' value can, with little additional work, help the VC to generate a more useful valuation analysis.

### **BOX 1.4: IMPROVING VC'S COMBINED APPROACH BY RECOGNIZING SEPARATENESS OF INVENTION USE'S VALUE FROM PATENT RIGHTS' VALUE**

Let us assume that a VC is considering investing in a start-up company that sells one primary product. That product is covered by three patents, each of which is held by the start-up. The VC conducts a valuation analysis for the start-up company as a whole and comes up with a valuation range for the company between \$75 million and \$150 million. Some of the positive observations and assumptions that drove the valuation range include:

- A strong track record of the start-up's management team.
- The start-up's strong sales and distribution channels that provide a competitive advantage vis-à-vis competitors.
- The growth of the market for the start-up's product.
- The ability to charge a premium price for the next few years because the market is currently underserved.

On the negative side, the claims for the three patents were drafted broadly and bear significant risk of being invalidated if challenged.

Understanding the separate value for the invention use and the patent rights can help to inform the VC's valuation of the start-up as follows:

- The use of the invention is what is driving the start-up's value, not the value of the patent rights. The ability of the start-up to generate future cash flows is primarily a function of the growing market, the lack of current competitors, and the start-up's ability to beat future competitors through sound business practices.
- Therefore, the weak nature of the patent rights should not detract too much from the start-up's value.

## **VALUATION MISCONCEPTIONS**

There is a danger in any book on valuation that the early introduction and discussion of mathematical concepts and techniques can obscure the subjective nature of valuation analysis. As a consequence, it is probably useful at

the beginning to dispel a number of misconceptions that can interfere with valuation analysis and its ability to improve decision making.<sup>3</sup>

### **Misconception 1: Valuation Analysis Can Only Be Conducted by Experts**

Although an expert valuation appraisal is beneficial or even indispensable at times, total abdication of the exercise to an outside expert is unwise. Expert assistance can be critical to a robust valuation analysis, but overreliance on experts diminishes the merit of the exercise. Valuation exercises are highly dependent on the quality of the inputs that feed the particular valuation methodology. More often than not, these inputs do not come from the expert valuator, but instead come from the actor who needs the valuation to guide a particular decision. A user who understands the limits and implications of the inputs used to feed her chosen valuation method will be better suited than others to interpret and employ the resulting valuation effectively.

The reason this particular valuation misconception persists stems from a misunderstanding of the valuation process, a failure to appreciate the benefits of hands-on involvement in the exercise, and reluctance by many to operate in areas where they are afraid they do not have sufficient training or expertise. One objective of this book is to demystify the valuation process. As the reader will see, most techniques are within the understanding of anyone with a willingness to learn and an open mind. Perhaps it is the unsettling realization that the valuation process is not an exact science that drives many to the authority of an expert who provides a feeling of reassurance in the face of this uncertainty. Rather than fear the uncertainty, it is more sensible to participate in the art of the process and develop an understanding of the strengths and weaknesses of the resulting value. Likewise, an understanding of the science part of valuation—such as which valuation models work best in which situations or what is required to apply a certain model to the available inputs correctly—gives the ultimate user a greater appreciation of the limits of the value result and a healthy skepticism regarding its relationship to some definitive truth.

### **Misconception 2: The Output from the Valuation Analysis—the Value Result—Is More Important Than the Valuation Process**

The valuation process involves using valuation methods to translate the complex and messy reality surrounding the item to be valued into a usable and comparable value result. When most people think of valuation, they think of the number that comes out of the translation process; they think of

the value result. That is unfortunate because it both overstates the power of the translation process and underappreciates the insightful knowledge that comes from performing the translation process. The translation process does not generate a perfect representation of the item being valued. The quality of that translation process will be dependent on the wisdom of the valuation method chosen, the quality of the input data, and the ability of the translator to interpret the results of the valuation exercise. In short, the quality of the value result is entirely dependent on the quality of the process that generated the result.

It is also important to remember that valuation is a uniquely context-sensitive undertaking, and a valuation calculated in one set of circumstances and at a certain point in time is unlikely to be appropriate for a different set of circumstances at another point in time. Without an appreciation for both the process and the context of that particular valuation, the value result is likely to be misunderstood.

### **Misconception 3: The More Quantitative and Mathematical the Approach, the More Accurate the Value Result**

Quantitative models and consistent application of mathematics provide powerful valuation tools. When considering how to improve valuation analysis, the focus is frequently on increasing the sophistication of the valuation methodology with more quantitative and mathematical approaches. Increasing that sophistication can be beneficial, but the benefits will be lost if the inputs feeding the methodology are overly inaccurate. Some of the common information inputs can be measured and definitively obtained from the real world, but most of the inputs—particularly for the income methods (see Chapters 6 and 7)—come from the art side of the ledger and involve considerable subjective interpretation. What will the market be for the patented product in 10 years? How much pricing power will the patent provide to its holder? How easy (or how difficult) will it be for competitors to invent around the patent? This type of information—which is critical to running an income-based valuation analysis—has a subjective element that frequently overwhelms the ability to develop a precise numerical representation. Unless the accuracy of the inputs is also addressed, increasing the sophistication of the methodology to translate those inputs into a value result will not substantially improve the fidelity of that result. One can think of it as an example of the *garbage in, garbage out* principle. The quality of the value result is no greater than the quality of the inputs, no matter how sophisticated the quantitative manipulation.

**Misconception 4: A Valuation Analysis Must Generate a Precise Result to Be Beneficial**

The misconception that a valuation analysis must generate a precise result to be beneficial is one of the more difficult misconceptions to overcome because it seems so counterintuitive. The reality is that consumers of valuation analysis can easily become overly fixated on the precision of the valuation analysis. Valuation, however, is an inherently inexact undertaking. First, valuation analysis is by nature a relative exercise that does not lead to a single, absolutely correct determination of an asset's value. The value of an asset is not a fixed inherent property, but instead is dependent on the circumstances surrounding the asset. Who owns the asset and what usage that owner intends for the asset, for example, will significantly affect the asset's value. Second, the very function of valuation analysis will always involve a high level of imprecision. Valuation analysis is fundamentally about predicting the future. In other words, the value of a commercial asset, including a patent, stems from its ability to generate positive economic benefits (e.g., profits) in the future. Valuing commercial assets therefore requires predicting the extent of those future economic benefits, and predicting the future will always entail a substantial amount of error.

The inherent imprecision of valuation analysis does not mean the exercise is useless, but it does mean that decision makers need to learn how to use and interpret valuation analysis thoughtfully. In Chapters 3 and 4, we discuss in detail the decision-making improvements that can come from imprecise, but still useful, valuation analysis.

**Misconception 5: There Is a Magic Bullet Method for Determining the Value of a Patent**

Consumers of valuation services may be led to believe that there is a single, best method for determining the value of a patent. Perhaps this misconception is an expected consequence when there are so many valuation consultants who have a specific valuation methodology to sell. Perhaps it is the product of an overemphasis on the science side of valuation, with its mathematical formulas and calculations, and an underappreciation of the art side of valuation, where future projections, risk assessments, and substantial uncertainty exist. One thing that will be abundantly clear to readers of this book, however, is that there are a variety of methods for valuing a patent. Each method has its advantages and limitations, and there is no single, magic bullet valuation method.

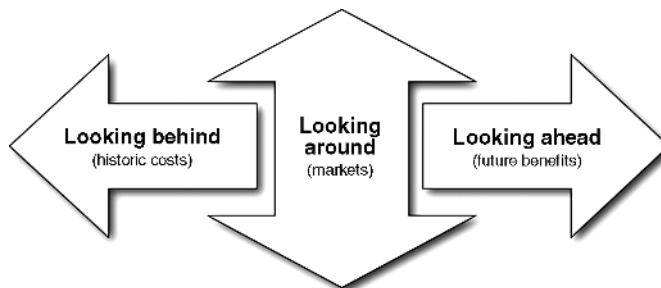
## **THE THREE BASIC VALUATION METHODOLOGIES**

The three basic valuation methodologies are income methods, market methods, and cost methods. Sometimes different names are used or some new valuation methodology is claimed, but all valuation methodologies can be traced back to these three fundamental approaches to valuation analysis. What differentiates the three methodologies is the source of information inputs each uses to generate a valuation result (see Figure 1.3). Income methods seek to measure directly the future economic benefits that will flow from a given asset. Income methods are forward-looking exercises in that the valuator *looks ahead* and uses projections of future benefits as the data for the model. Market methods seek to determine the value of an asset by reference to how other buyers and sellers have valued the same or similar assets. With a market method, the valuator *looks around* and uses contemporaneous market transactions as the data for the model. Finally, cost methods seek to determine value by using some measurable cost for the asset as a proxy for value. Cost methods are backward-looking exercises in that the valuator *looks behind* and uses historical costs as the data for the model.

The following brief overview of the basic methods (see Table 1.1) is meant to provide readers with a cursory understanding of the economic foundation for each approach. Each method is also the subject of a later chapter (or in the case of the income methods, chapters) that will provide a detailed explanation of the method, its strengths and weaknesses, and how to use the method to value a patent.

### **Income Methods**

Income methods attempt to measure the net economic benefits that will come from the asset being valued. The most common form of income



**FIGURE 1.3** The Three Valuation Methods Use Three Different Types of Information Inputs

**TABLE 1.1** Overview of the Three Methods

	Income Methods	Market Methods	Cost Methods
Focus of the approach	Measure the future economic benefits that will flow from a given asset	Consider how other buyers and sellers have valued the same or similar assets	Use some measurable cost for the asset as a proxy for value
Common examples of the method	Discounted future economic benefits (or discounted cash flow) analysis Real options analysis	Competitive exchange methods <ul style="list-style-type: none"> <li>■ Auctions</li> <li>■ Less formal competitive exchanges</li> </ul> Comparable transactions <ul style="list-style-type: none"> <li>■ Valuation ratios</li> <li>■ Industry royalty rates</li> </ul> Other methods <ul style="list-style-type: none"> <li>■ Shadow pricing</li> <li>■ Surrogate valuation measures</li> <li>■ Stated preference methods</li> </ul>	Cost of development Cost of reasonable alternative

*Source:* This table was inspired by a figure on the traditional valuation methods produced by Heinz Goddar and Ulrich Moser, “Traditional Valuation Methods: Cost, Market and Income Approach” in *The Economic Valuation of Patents: Methods and Applications*, eds. Federico Munari and Raffaele Oriani (2011), 111.

method involves projecting the asset’s future net economic benefits—which will usually be expressed in terms of free cash flow or net profits—and then adding up the various benefits. Because these benefits will be received over time, a discount needs to be applied to take into account, among other things, the time value of money and the risk that actual benefits will be less than anticipated. The most common form of income method is referred to as a discounted cash flow (DCF) analysis, a term used because the analysis focuses on the future free cash flow that is projected for the valued asset. In this book, however, we do not use the DCF nomenclature, but instead refer to the standard discount method as a discounted future economic benefits (DFEB) analysis. We believe that DFEB analysis is more descriptive of the overall valuation approach that a

valuator should take because free cash flow is not the only relevant measurement of future net economic benefits. Whether one uses the term DFEB or DCF, this income method tries to determine how much a firm should pay today for net economic benefits it may receive in the future. The DFEB method is the subject of Chapter 6.

One limitation of traditional net present value calculations using the DFEB method is their failure to capture future flexibility and choices. Patents provide their holders with the option to make informed choices in the future. Having those options can be extremely valuable and can also be difficult to incorporate into a standard, linear DFEB analysis. There have been a few attempts to incorporate the value of future flexibility into patent valuation analysis. The approach that has garnered the most attention has been the *real options* approach, but it is not the only viable one. Incorporating the value of future decision opportunities into a patent valuation analysis will be the subject of Chapter 7.

### Market Methods

As a valuation tool, market methods seek to determine the value of an asset by using the wisdom and experience of self-interested buyers and sellers. The self-interested buyers and sellers can employ any number of valuation techniques to determine the value of a given transaction. The market then helps to aggregate the findings of these individual determinations. There are two core market methods for valuing assets:

1. **Competitive exchange:** The market of potential buyers is identified and encouraged to compete for the purchase of the asset, which helps to identify who ascribes the highest value to the asset. In effect, the seller polls the market to determine what buyers are currently willing to pay for the asset being valued.
2. **Comparable transactions:** The value of an asset is determined by looking at the range of prices paid in past or current transactions for similar assets. The value stems from the premise that a reasonable buyer “would not pay more for property than it would cost to purchase a comparable substitute.”<sup>4</sup> Furthermore, if the comparable transaction took place in the past, it is assumed that the information derived from that past transaction remains relevant for the transaction under review.

In addition to these two core methods a number of derivative market techniques for valuing assets can be employed. Market methods are the subject of Chapter 8.

## Cost Methods

Cost methods can be boiled down to this simple statement: The cost of an asset tells you something useful about its value. Despite their simplicity (or more likely because of their simplicity), cost methods tend to be the most widely criticized of the three types of valuation methods. Cost methods do not appear to make any effort to measure an asset's future net economic benefits, which makes them an easy target for criticism. When used for valuing patent rights, there are two primary cost methods:

1. **Cost of development:** A patent should be worth at least the amount it cost to develop the patented technology and obtain (and maintain) the patent rights.
2. **Cost of reasonable alternatives:** An economically rational technology acquirer will not pay more for a patent than the cost of a reasonable alternative technology.

There is a tendency to lump both of these cost methods together and criticize their validity as useful valuation tools. Such criticisms, however, are overbroad and can be misguided. The cost of reasonable alternatives method, for example, can be a surprisingly useful valuation tool. Cost methods are the subject of Chapter 9.

## Interrelationship of the Three Basic Methods

Although the three basic methods are typically discussed as three wholly distinct valuation approaches, they are not, in fact, completely independent of one another. Business valuation experts Shannon Pratt, Robert Reilly, and Robert Schweins provide the following explanation of the interrelationship of the three basic methods in the context of valuing a business:

*The income approach requires some kind of a rate of return at which to discount or capitalize the income. The forces of the market drive these rates. All comparative valuation approaches relate some market value observation to either some measure of a property's ability to produce income or to some measure of the condition of its assets. The [cost] approach uses depreciation and obsolescence factors that are based, to a certain extent, on some measure of market values of assets.<sup>5</sup>*

The same interrelationship applies when using the three basic methods to value patents.

## **LIMITATIONS ON RATIONALITY IN VALUATION AND DECISION-MAKING EXERCISES**

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One more concept needs to be taken into account when considering valuation basics. In the past few decades, a revolution in cognitive science has changed our perceptions of how people act in economic circumstances. Described under various titles such as behavioral economics, neuroeconomics, or cognitive economics, the new research on the human thought process recognizes that people are often not the rational, utility-maximizing economic decision makers that classic economics once postulated.<sup>6</sup>

Most of the models discussed in this book assume a rational decision maker, and that rationality becomes part of the model. Recent research into real-world decision makers and the human mind reveals that humans are often not rational, but are subject to a variety of biases that arise from perception or context.<sup>7</sup> One of the best known biases that affects valuation decisions is risk aversion.<sup>8</sup> Risk aversion is a well-recognized trait in humans that demonstrates a systematic preference to avoid the uncertainty of a potentially larger reward in favor of a more certain one. When asked whether they would prefer \$1 million guaranteed or a 75 percent chance to win \$1.4 million, most people prefer the former choice even though the probability weighted value of the latter is greater (it is worth \$1,050,000). Fortunately, there are a number of techniques for incorporating a person's degree of risk aversion into the valuation analysis, and we will cover one of those techniques, decision trees, in Chapter 4.

Another human bias that has been shown to affect patent decisions is the endowment effect, the name given to the observed phenomenon that individuals tend to value an item that they possess more than a comparable item that they do not possess, but wish to acquire. The endowment effect was first observed by researchers through a series of "willingness to accept" versus "willingness to pay" experiments.<sup>9</sup> In those experiments, subjects were demanding much more to give up something they already owned in comparison to how much they would pay to acquire the same item. This effect can cause distortions when a market price is being negotiated between the patent owner and a potential patent licensee or buyer.

As our understanding of human bias and irrationality increases so has our ability to incorporate these rationality deviations into our decision-making models.

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## NOTES

1. See e.g., *Dodge v. Ford Motor Co.*, 170 N.W. 668 (Mich. 1919).
2. *Wine Railway Appliance Co. v. Enterprise R. Equipment Co.*, 297 U.S. 387 (1936) (cited with approval in *Bandag, Inc. v. Gerrard Tire Co., Inc.*, 704 F.2d 1578 (Fed. Cir. 1983)).
3. We are admirers of Prof. Aswath Damodaran's work on investment valuation. In his book *Damodaran on Valuation*, Damodaran starts with a number of myths about valuing financial investments. See Aswath Damodaran, *Damodaran on Valuation: Security Analysis for Investment and Corporate Finance*, 2–4. Similar approaches have been used by other valuation authors. We have borrowed that approach for this section on valuation misconceptions.
4. Gordon V. Smith and Russell L. Parr, *Intellectual Property: Valuation, Exploitation, and Infringement Damages* (2005), 169.

5. Shannon Pratt, Robert Reilly, and Robert Schweihs, *Valuing a Business: The Analysis and Appraisal of Closely Held Companies*, 4th ed. (2000), 46.
6. The beginning of the revolution can perhaps be traced to Herbert Simon's 1955 groundbreaking paper (for which he won the 1978 Nobel Prize in economics) that introduced the concepts of bounded rationality and satisficing as an alternative to maximizing. See Herbert Simon, "A Behavioral Model of Rational Choice," *Quarterly Journal of Economics* 69 (February 1955): 99.
7. For an entertaining (and growing) list of cognitive biases, the reader is invited to examine (and perhaps contribute) [http://en.wikipedia.org/wiki/List\\_of\\_cognitive\\_biases](http://en.wikipedia.org/wiki/List_of_cognitive_biases).
8. Paradoxically, research indicates that although people may tend to avoid risks, once they have experienced a loss they may adopt risk-seeking behavior so as to eliminate the loss. Amos Tversky and Daniel Kahneman, "The Framing of Decisions and Psychology of Choice," *Science* 211 (1981): 453.
9. See e.g., Daniel Kahneman, Jack Knetsch, and Richard Thaler, "Experimental Tests of the Endowment Effect and the Coase Theorem," *The Journal of Political Economy* 98 (December 1984): 1325; and Jack Knetsch and J. A. Sinden, "Willingness to Pay and Compensation Demanded: Experimental Evidence of an Unexpected Disparity in Measures of Value," *The Quarterly Journal of Economics* 99 (1984): 508.

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