Considerations Related to the Valuation of Wireless Spectrum

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In the valuation of wireless communications radio spectrum licenses, the general lack of available transactional market data often precludes an analyst from using the cost approach and may cause uncertainty in applying the market approach and the income approach. This discussion focuses on the characteristics of wireless spectrum licenses and on the generally accepted methods to address and account for the challenges in the valuation process.

Introduction

Wireless communications companies operate within a specific radio frequency bandwidth (i.e., "spectrum") that is regulated by the Federal Communications Commission (FCC). In other words, wireless communications companies need FCC spectrum licenses in order to operate. Accordingly, FCC spectrum licenses are a common intangible asset that is owned by wireless communications companies.

Wireless spectrum licenses are acquired through either (1) the primary market or (2) the secondary market. Transactions in the primary market occur by means of periodic FCC auctions. Transactions in the secondary market occur between private parties. Secondary market transactions are allowed if the parties involved conform to certain FCC restrictions on the spectrum licenses in terms of swapping or reselling.

Spectrum is a finite resource. Current technology limits the useable spectrum available to wireless carriers. Spectrum licenses allow a wireless carrier to utilize a specific portion of spectrum under the terms of the associated license. As a result of the scarce availability of spectrum licenses (as well as other factors), the prices for spectrum licenses can fluctuate significantly.

Because of the limited availability and related price volatility, many transactions—regardless of whether they take place in the primary or secondary market—may not provide meaningful evidence of current market value.

Assessing the value of intangible assets, such as spectrum licenses, is necessary in the assessment of state and local ad valorem property taxes. According to the *Guide to Intangible Asset Valuation*:

> The valuation of intangible assets is often an important aspect of the valuation of a taxpayer corporation that is subject to either the unitary principle or the summation principle of property tax assessment. This is because some jurisdictions tax intangible property at different rates than they tax tangible property. In addition, in some jurisdictions, certain intangible assets are exempt from state and local property taxation.[1]

Additionally, because spectrum licenses have an infinite useful life, licensees generally treat FCC licenses as indefinitely lived intangible assets under the provisions of Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) Topic 820, *Fair Value Measurements and Disclosures*. As indefinitely lived assets, FCC licenses are subject to annual impairment testing for financial reporting purposes governed by FASB ASC 350-30-35, *General Intangibles Other than Goodwill – Subsequent Measurement*.[2]

In this discussion, we will summarize two generally accepted valuation approaches and methods related to the analysis of spectrum licenses:

1. The market approach, and the guideline transaction method

2. The income approach, and the greenfield method (a discounted cash flow analysis)

These two valuation methods are well recognized spectrum license valuation methods.

A Spectrum Primer

To own and operate the radio frequency spectrum in the United States, wireless communications companies must:

1. be authorized by the FCC to operate the wireless network and
2. allow the usage of mobile devices in assigned spectrum segments.

Wireless system operators must comply with the rules and policies governing the use of the spectrum as adopted by the FCC.

Among other things, these rules and policies:

1. regulate wireless carriers' ability to acquire and hold wireless spectrum;
2. impose technical obligations on the operation of wireless carrier networks, including limits on radiofrequency radiation from (a) mobile phones and antennas, and (b) the location, lighting, and construction of antenna towers;
3. impose requirements on the ways in which wireless carriers are allowed to provide service to, and communicate with, their customers;
4. regulate the interconnection among wireless carriers; and
5. impose a variety of fees and charges on the wireless carriers' businesses.[3]

There is approximately 615 megahertz (MHz) of paired wireless spectrum available to wireless carriers in the United States. However, this entire spectrum cannot be utilized until wireless carriers deploy new technology.[4]

Thus, companies planning for the future are sometimes forced to pay for spectrum licenses that have no immediate benefit to their earnings.

According to an analysis done by J.P. Morgan, approximately 135 MHz of spectrum is allocated to 2nd and 3rd generation technologies, with the remainder allocated to 4th generation technology.

Of the 480 MHz allocated to 4th generation technology, they estimate that 100 MHz is not in use yet. This is because wireless carriers lack the network capability to utilize that spectrum.

FCC Wireless Spectrum Licenses

FCC spectrum licenses for wireless carriers to date are generally delineated into four primary classifications. These classifications are as follows:

1. Cellular
2. 700 MHz
3. Personal communications services (PCS)
4. Advanced wireless services (AWS)

Based on the individual licenses, the following factors vary for each wireless service offered: (1) the specific radio frequency and bandwidth of spectrum, (2) the size of the geographic areas in which the licensee is authorized to operate, and (3) the technical and service rules imposed by the FCC.

The four spectrum classifications noted previously are all based on the portion of the spectrum band offered by the license. The location on the spectrum band and the classification are as follows:

1. The 700 MHz band (both classification and location)
2. The 800 MHz band, traditionally known as cellular spectrum
3. The 1800–1900 MHz band, referred to as PCS spectrum
4. The 1700 MHz and 2100 MHz bands, known as AWS spectrum

The 700 MHz and cellular bands are better at penetrating buildings and travelling long distances (propagation). By comparison, the PCS and AWS bands are able to carry more data per given amount of bandwidth. However, their propagation properties are inferior. Therefore, these bands require more network infrastructure than the lower spectrum bands.

Although spectrum licenses are considered indefinitely lived assets, the FCC issues licenses for only a fixed period, generally 10 years. Therefore, a licensee must periodically seek renewal of its FCC spectrum licenses. Although the FCC has routinely renewed all of the wireless spectrum licenses that have come up for renewal to date, renewal challenges could arise in the future.

If a wireless license was revoked or not renewed upon expiration, the wireless carrier that held the license would not be permitted to provide services on the licensed spectrum in the area covered by that license. In addition, violations of the FCC rules may result in monetary penalties or other sanctions.

The licenses owned by wireless carriers apply to specific markets as designated by the FCC. The markets covered by each license can range from an

individual city, to a metropolitan area, to a multistate region. The FCC uses a variety of "market types" to characterize the geographic region that each license covers.

The following market types are associated with spectrum licenses, ranked by geographic size from smallest to largest:

1. Cellular Market Areas (CMAs) were created from the Metropolitan Statistical Areas defined by the Office of Management and Budget and Rural Service Areas. These were established by the FCC and they do not cross state borders.
2. Basic Trading Areas (BTAs) are based on the Rand McNally *1992 Commercial Atlas & Marketing Guide*.
3. Major Trading Areas (MTAs) are based on the Rand McNally *1992 Commercial Atlas & Marketing Guide*, extended and adjusted by the FCC.
4. Economic Areas (EAs) are based on the areas delineated by the Regional Economic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, extended and adjusted by the FCC.
5. Regional Economic Area Groupings (REAG) were created by the FCC staff and are an aggregation of EAs into 12 regions.

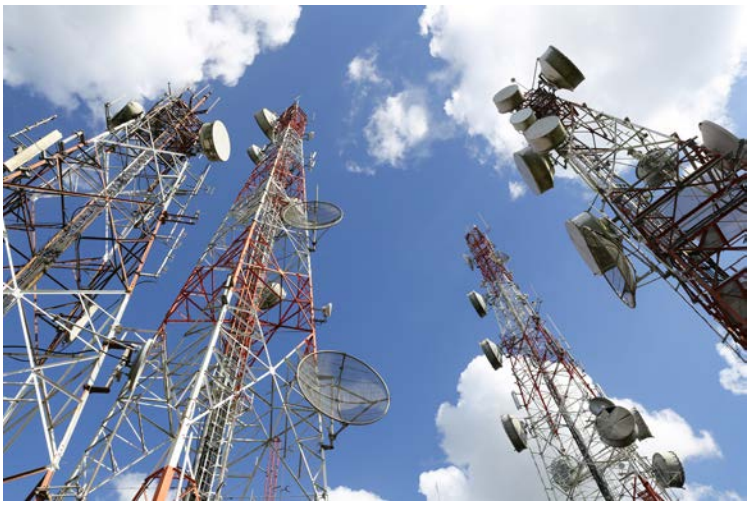
Spectrum Prices

Spectrum prices are generally quoted in terms of the following formula: price paid ÷ (population covered × bandwidth). This measurement covers the two characteristics that are most important in estimating the value of a specific license:

1. The number of people (the population) that the subject license covers
2. The size of the bandwidth offered by the license

All else being equal, the price paid for a license is positively correlated to both the population covered and the size of the bandwidth. For the purpose of this discussion, we refer to these license purchase prices as price/Pop×MHz. Dense urban areas with high populations tend to command the highest price/Pop×MHz bids.

A common market-based methodology to valuing wireless spectrum is to "bucketize" the licenses according to market type and population. For instance, an analyst may look at a historical transaction price for an AWS band license with a BTA market type covering a population of 75,000.



The analyst could then apply the transaction-based price/Pop×MHz to all other AWS band licenses with a BTA market type covering populations of say 50,000 to 100,000. With enough transaction data points, this methodology could then be extrapolated to cover all licenses by (1) band, (2) market type, and (3) population bucket.

Historically, the bands at the lower end of wireless spectrum (700 MHz and cellular) were considered the most valuable. The reason for this is that in order for a wireless carrier to have significant geographical coverage with limited tower infrastructure, they would require spectrum with good propagation characteristics. Any new entrant to the wireless market or a smaller provider looking to expand their coverage footprint would place a premium on the 700 MHz and cellular bands.

More recently though, the high frequency bands (i.e., AWS and PCS) have been commanding prices on par with, or even greater than, the low frequency bands. A primary reason for this development is that the major wireless carriers such as AT&T and Verizon already have nationwide coverage via low frequency band licenses. Their focus now is on better serving the urban areas.

The upward trajectory of consumers wireless data needs is requiring wireless carriers to build increasingly dense urban networks. With multiple wireless towers in urban areas, the carriers can then utilize the high frequency bands to meet the ever-rising customer data requirements, which cannot be met with low frequency bandwidth.

FCC Spectrum Auctions

Periodically, the FCC releases new spectrum in various frequency bands via auctions. For auctions where a significant amount of spectrum is being released, the auctions are highly competitive with

numerous qualified bidders. The auctions tend to stretch over several months with over a hundred bidding cycles completed before the auction is closed.

The auctions offer spectrum licenses for particular bands and the licenses are grouped into a number of individual blocks. These blocks are differentiated by three primary characteristics:

1. The license market type
2. The specific frequency
3. The bandwidth

Within each block, licenses are differentiated based on the geographic region they cover.

There were four significant (i.e., more than $2 billion raised) FCC auctions in the last 11 years. These auctions are summarized below:

- In 2005, the FCC held Auction 58. Auction 58 included spectrum in the PCS band. This auction was comprised of A, C, D, E and F block licenses that covered BTAs and MTAs and offered frequency blocks of 10 MHz, 15 MHz and 30 MHz. In total, the auction raised $2.04 billion.
- In 2006, the FCC held Auction 66. Auction 66 included spectrum in the AWS band. This auction was comprised of A through F block licenses that covered CMAs, EAs, and REAGs, and offered frequency blocks of 10 MHz and 20 MHz. In total, the auction raised $13.7 billion.
- In 2008, the FCC held Auction 73. Auction 73 included spectrum in the 700 MHz band. This auction was comprised of A through E block licenses that covered CMAs, EAs, and REAGs and offered frequency blocks of 6 MHz, 10 MHz, 12 MHz, and 22 MHz. In total, the auction raised $19.0 billion.
- In 2014, the FCC held Auction 97. Auction 97 included spectrum in the AWS band. This auction was comprised of A, B, G, H, I, and J licenses that covered CMAs and EAs and offered frequency blocks of 5 MHz, 10 MHz, and 20 MHz. In total the auction raised $41.3 billion.

There are a couple of important points to note. First, only one of these auctions occurred within the last seven years. Second, the trend in amounts raised by the FCC auctions appears to indicate that spectrum is becoming increasingly valuable. The implication of this trend is that older auctions become more of a reference point as opposed to meaningful pricing data points of current value.

Auction 97 results could serve as a meaningful price point for AWS band licenses and possibly as a reference to other bands. Relative band values, however, are very open to interpretation as the spectrum market continues to evolve in terms of supply and demand.

The scarcity of meaningful FCC auctions, in terms of valuation analysis, is further compounded by the fact that for three of the four primary band classifications, there are limited FCC auction pricing data for at least eight years.

Some Auctions Provide Less Meaningful Pricing Evidence than Others

While some auctions are very competitive, others are not. Regardless of whether or not the auctions are competitive, the results still may not represent a good indication of value for similar frequency licenses.

This can be for a number of reasons, but may include the following:

- Capital availability for wireless providers
- FCC regulations for the licenses being auctioned
- Technology required to utilize the licenses
- Restrictions on reselling or swapping

An example of an FCC spectrum auction that was not very competitive, and may not be a good indicator of license market value, was the case of FCC Auction 96.

Auction 96, the most recent PCS auction, closed in February 2014. In Auction 96, the FCC offered one block of EA licenses covering the entire country. The auction produced price/Pop×MHz results that were significantly below Auction 97 results and past PCS band transactions.

A number of factors contributed to the low prices paid for these licenses. These factors included the following:

1. None of the major wireless carriers participated in the auction—DISH Network L.L.C. (Dish) was the only winning bidder in the auction.
2. As a result of the auction, significant expenses were incurred in clearing incumbents from this band and bidders were subject to cost-sharing allocations apportioned on a pro rata basis against the relocation costs attributable to the band.

3. Winning bidders were required to deploy service to at least 40 percent of the population of an EA within four years after the license was granted and 75 percent within 10 years, thus potentially requiring significant infrastructure investment.
4. Dish was forced to relinquish a portion of the bandwidth it won to the FCC to complete the transaction.[6]

This auction produced price/Pop×MHz values that were significantly lower than more recent PCS band license indicators. The analyst may consider the relevant circumstances of the specific FCC auction data, or the secondary market data for that matter, to assess the extent that he or she should rely on that data to estimate market value for spectrum licenses.

Gross Bids versus Net Bids

There are two types of qualified bidders that participate in FCC auctions:

1. Gross bidders
2. Net bidders

Net bidder status is based on either (1) a small business designation or (2) rural carrier status.

Net bidders receive a discount that ranges from 10 to 25 percent off their gross bid amounts to determine what they would owe the FCC if they were to win a license during an auction. Gross bidders do not receive any bidding discounts.

The vast majority of all winning bidders are gross bidders. All major wireless carriers are gross bidders and, as a result, the most likely buyer of spectrum licenses will be a gross bidder.

Additionally, nearly all significant spectrum transactions in the secondary market are between gross bidders. The overall discount provided to net bidders in competitive FCC auctions generally represents less than 10 percent of auction proceeds and often only a few percent.

Net bidders are faced with many constraints imposed on their spectrum licenses by the FCC that are not applicable to gross bidders.

These constraints include the following:

1. If the net bidder does not have wireless infrastructure to utilize the spectrum licenses within a set period of time, they may have to forfeit the spectrum license.
2. There are restrictions on how soon the net bidder can resell their spectrum licenses on the secondary market, primarily to prevent the buyer from simply flipping the license for a profit.

The valuation analyst should understand the difference between using gross bids and net bids when analyzing FCC auction data.

Secondary Market Spectrum Transactions

Analysis of secondary market transaction data comes with its own set of challenges. Companies can acquire spectrum licenses through a variety of transactions in the secondary market. However, the majority of those transactions may not be accompanied by sufficient data to aid in the valuation process.

This lack of available data may result from circumstances such as the following:

1. Company A acquires Company B. The deal includes all of the Company B spectrum licenses, but no spectrum specific values are provided.
2. Company A and Company B both own spectrum licenses. They swap licenses to meet certain geographical or spectrum band needs, but no additional consideration is exchanged.
3. Company A acquires spectrum licenses from Company B. Neither Company A nor Company B chooses to divulge the transaction details.
4. Company A acquires spectrum licenses from Company B. The transaction is a combination of (a) too small, (b) too geographically limited, or (c) too strategic in nature to have meaningful pricing points for general spectrum valuation analysis.

It is important to note that if two companies do swap two different spectrum band licenses, and enough information is provided, the transaction can serve as a reference point to the relative value of those two bands.

During the past three years, based on our research, there were only two secondary market spectrum license transactions that were over $1 billion and covered substantial geography:

1. Announced during the first quarter of 2013, Verizon sold 39 700 MHz B block spectrum licenses to AT&T Inc. (AT&T) in exchange for a payment of $1.9 billion and the

transfer by AT&T to Verizon of AWS (10 MHz) licenses in certain markets in the western United States.

Verizon also sold three lower 700 MHz B block spectrum licenses to an investment firm for a payment of $0.2 billion. As a result, Verizon received $0.5 billion of AWS licenses at market value.

Based on the information disclosed, the transaction was valued at approximately $2.6 billion.[7]

The transaction was finalized during the third quarter of 2013.

2. On January 6, 2014, Verizon announced that it had entered into two agreements with T-Mobile with respect to its remaining 700 MHz A block spectrum licenses.

   Under one agreement, Verizon sold certain of these licenses to T-Mobile in exchange for cash consideration of approximately $2.4 billion, and under the second agreement Verizon exchanged the remainder of these licenses for AWS and PCS spectrum licenses.

   The latter agreement represented an exchange of $950 million of AWS and PCS spectrum licenses according to investor material published by T-Mobile.[8]

   Based on the information disclosed, the transaction was valued at approximately $3.3 billion. The transaction was finalized on April 30, 2014.

While both of these transactions are relatively recent and significant in size, the pricing data points are limited to only two out of six existing blocks on the 700 MHz band.

One approach to valuing the rest of the 700 MHz band would be to compare the transaction prices for these blocks to the prices originally paid for these licenses by Verizon in FCC Auction 73. For example, let's suppose that Verizon paid $2.5 billion for A block spectrum licenses in Auction 73. Based on the sale of these licenses to T-Mobile for $3.3 billion, that price would indicate that the licenses had appreciated by 32 percent since the time they were originally purchased.

The 32 percent price premium for the 700 MHz band A block licenses could hypothetically be applied to other 700 MHz licenses sold in Auction 73.

Cellular Band Pricing

Nearly all the cellular band licenses owned by wireless carriers were awarded via comparative hearings and lotteries. The only auctions that did offer cellular band licenses contained limited licenses and few bidders and, therefore, may be considered less relevant in terms of determining market prices. Our research did not identify any secondary market transactions involving cellular spectrum.

The 700 MHz and cellular bands both reside on the low end of the spectrum range utilized by wireless carriers. This 700 MHz band begins at 698 MHz and ends at 793 MHz. The cellular band has two blocks, the first residing at 824-849 MHz and the second at 864-894 MHz. Because the 700 MHz and cellular bands have similar frequencies, they also have similar propagation and capacity characteristics.

It may be appropriate for a valuation analyst to estimate cellular license pricing based on 700 MHz license pricing for the following reasons:

1. The radio frequency proximity of these bands
2. The lack of any meaningful cellular band auction
3. The lack of any cellular band transaction data

A related consideration may be the identification of whether the two bands are comparable in pricing, or if one band carries a premium over the other band.

PCS Band Pricing

There are relatively few PCS band pricing indicators. The last substantial and competitive FCC auction involving PCS band spectrum licenses occurred in 2005. Additionally, there have not been a significant number of quality recent secondary market indicators.

The AWS band resides on the high end of the spectrum utilized by wireless carriers, and effectively straddles the PCS band. On the lower spectrum frequencies, the AWS band begins at 1710 MHz and ends at 1755 MHz. At the higher end of the spectrum, the AWS band begins at 2110 MHz and ends at 2155 MHz. The PCS band resides between these frequencies, and begins at 1850 MHz and ends at 2000 MHz.

Similar to the pricing assumption mentioned above for cellular band licenses, a similar analogy could be made for the PCS band licenses. It may be appropriate to assume PCS license pricing approximates AWS license pricing based on the proximity of the AWS and PCS bands on the spectrum. Determining the degree to which pricing for the two bands is comparable is open to interpretation and will require analyst judgement.

Using the Greenfield Method to Estimate Value

In the process of valuing wireless spectrum licenses, using the market approach may seem to be the preferred methodology. The data used in the market approach may not be comparable to a taxpayer's spectrum license, or the data may be outdated. This may occur because of changes in the competition and marketplace from the:

1. unique characteristics associated with each band of wireless spectrum (e.g., permitted uses, propagation and regional limitations) and
2. infrequent administration of spectrum license auctions and/or resale of spectrum licenses, the data used in the market approach may not be comparable to a taxpayer's spectrum license, or the data may be outdated due to changes in the competition and marketplace.

As a result of the difficulty in finding comparable and recent market data, analysts may rely on the income approach to estimate a value for spectrum licenses. Using the income approach to value spectrum licenses is challenging. This is because the income stream associated with the spectrum licenses needs to be isolated, excluding any going-concern value from the existing business or any other asset. In order to estimate this value, one method commonly used is the greenfield method (GFM)—a similar method to the discounted cash flow (DCF) model.

The GFM is based on the value of a hypothetical start-up company. The start-up company is assumed to begin operations on the valuation date, with no revenue or assets to speak of, and is burdened with developing an undeveloped or "greenfield" business.

In order to isolate the value associated with the individual asset (i.e., the set of spectrum licenses), the analyst assumes that the start-up company does not own the subject spectrum licenses, but rather, the start-up company must apply for, and obtain, the spectrum licenses on the valuation date (i.e., time zero).

Starting the valuation with these base assumptions, and projecting the operations of the start-up company going forward, removes any going-concern and goodwill value that may typically be accounted for in other generally accepted valuation methods.

Under the GFM, there are a number of assumptions made that reflect the expectations of a true start-up wireless operator. These assumptions are made with the underlying intent to develop an

operation comparable to the one in which the subject asset is currently utilized. These assumptions account for the initial start-up costs and losses required to purchase, build, or lease the assets needed to operate and build an operation similar to the current subject asset's operation.

Essentially, over the forecast period, the balance sheet of the wireless start-up is augmented with capital expenditures and normal periodic expenses to produce a larger balance sheet with a full complement of assets.

The remaining cash flow resulting from the start-up company's operations, after the operating expenses and capital charges are accounted for and deducted, are presumed to be derived from the one asset that existed at time zero of the analysis. The indicated value of the single asset is derived when the remaining cash flow is discounted back to time zero.

One of the primary assumptions associated with the greenfield method is that the start-up company is owned by a larger parent company that provides several competitive advantages. These competitive advantages include the following:

- Readily available capital and financing for the start-up's endeavors
- A lower cost structure with regards to capital expenditures
- A limited learning curve

The patronage and tutelage of the parent company provide key competitive advantages that account for the rudimentary issues a new start-up would likely encounter if they were to enter the market unassisted. Typically, a new start-up would run into funding and capital issues, as the capital intensity required to build a wireless network is comparatively high to other industries, and the likelihood of a start-up with no revenue receiving this level of funding is unlikely.

Additionally, due to the association with the larger parent company, the management team is assumed to have significant industry experience and sufficient knowledge of the industry, allowing them to quickly and effectively develop the company.

Application of the GFM involves a top-down analysis, meaning the initial assumptions and forecast period begin with broad-based assumptions and, over the course of the projection period, the assumptions are refined to a more granular level of detail.

The following list details the assumptions that likely need to be addressed in the application of the GFM:

- What are the total projected revenues in the market?
- How much market share is available to the owner of the license and what is the expected user-acquisition rate?
- What is the duration and cost of building out an operating wireless infrastructure?
- What are the personnel and operating requirements to create a comparable operating entity?

The starting point for a GFM analysis is the forecasting of total market revenue and expected market share. Over the projection period, cash flow is forecast assuming the existing competitive situation continues within each market. Certain market factors and trends that can influence the current state of the industry, which should be considered in the projection period, are the following:

- The level of direct and substitute competition on a regional and national basis
- The likelihood of another spectrum license auction or sale occurring
- Potential changes in consumer demographics and tastes
- Macroeconomic conditions
- Legal or regulatory factors

The examples included above are not all-inclusive, and in the application of the GFM, the analyst should consider any relevant events and circumstances that may significantly affect the inputs used to estimate the value of the licenses.

During the initial years of operation, revenue is expected to be minimal due to a relatively small market share. Additionally, initial cash flow would likely be negative due to the high required capital outlays associated with starting a new operation. Over the projection period, revenue would increase on par with the customer base until operating cash flow reaches a normalized level.

The normalization and stabilization of revenue and cash flow should be based on what is realistically possible in the current operating conditions of the market, and not necessarily consistent with what the actual license-holding company is able to currently generate.

The next step in the GFM analysis is the forecasting and modeling of the costs associated with the build-out of a wireless network infrastructure. The analyst should account for the costs associated with building, leasing, or acquiring the necessary tangible assets. The projections for tangible asset expenditures should include the expected costs for towers, transmission lines, transceivers, switches, antennae, buildings and improvements, and various other capital assets.

In addition to the required tangible asset expenditures, the appraiser should also consider the expected time required to construct or acquire these assets. Based on the expected timelines and implementation requirements of the capital expenditures and tangible assets, it is likely that the capital outlays for the wireless network would be the greatest nearer the beginning of the projection period and would decrease over time. It is also common to project different phases of capital expenditure investments based on the company's expected growth and financial performance.

The final step in the GFM analysis is the estimation and projection of the operating expenses that will be incurred during the build-out period. The start-up company will have increasing personnel and advertising needs associated with the acquisition of subscribers and the retention of a customer base.

Additionally, there will be other operating expenses incurred by the company that should be accounted for in the projections. These expenses can include, but are not limited to, salaries, utilities, legal and professional fees, and regulatory fees and permits. These expenses should be expected to increase throughout the build-out phase, as the company begins and expands its operations.

Once the assumptions and likely expectations have been incorporated in the model, the final step in the GFM is to estimate an appropriate discount rate. As discussed previously, the value of the company's spectrum license is estimated as the net present value of future cash flow discounted at an appropriate required rate of return.

Complications arise in the estimation of an appropriate discount rate. This is because the discount rate for the spectrum license is likely to be materially different from that of the subject taxpayer's company. The discount rate estimated for the GFM should encompass and account for the start-up

related risk, as well as the risk associated with the spectrum license being the sole asset.

An in-depth analysis discussing the estimation of an appropriate discount rate is beyond the scope of this discussion. However, based on the aforementioned assumptions, the discount rate associated with this intangible asset is likely to be much higher than the discount rate for the subject taxpayer company.

Summary of the Greenfield Method

Overall, the application of the GFM is a complicated process. Although the method is fundamentally based on a generally accepted economic principle (i.e., the value of an asset is equal to the present value of its future cash flow), the application of this approach requires a prediction of future cash flows, which are difficult to accurately assess.

While the DCF model relies primarily on assumptions that company management may have readily available, such as the company's required rate of return and financial projections, the assumptions used in the GFM are typically not readily available or specifically analyzed by management.

Because of those limitations, identifying reasonable and reliable data for the GFM may require significant market research and analysis. Furthermore, the inherent sensitivity of the GFM, and its value conclusion, to these assumptions leads to increased subjectivity in the final determination of the subject asset's value.

Despite the limitations of the GFM, if conducted appropriately, the method yields a theoretically sound valuation of the isolated spectrum licenses. Based on this information, the application of the GFM is most appropriate when the analyst is knowledgeable about the industry and can reliably estimate future costs and benefits.

Conclusion

As identified throughout this discussion, valuations of wireless spectrum licenses are performed for a number of different reasons, such as providing useful data with regards to primary and secondary market transactions, as well as for the annual assessment of intangible asset impairment and for ad valorem property tax purposes.

The valuation of wireless spectrum licenses presents analysts with a complex and challenging set of practical and theoretical valuation issues. It is important that the analyst be aware of, and recognize, the challenges associated with the related issues in the valuation process.

There is no single method for valuing spectrum licenses. The four previously discussed bands of wireless spectrum—cellular, 700 MHz, PCS and AWS—all have unique characteristics. These unique characteristics may affect the appropriate valuation method, the interpretation of available data, and the processes and assumptions used to value each license.

Additionally, the infrequent sale of wireless spectrum in both the primary and secondary markets results in additional data analyses and interpretation challenges.

This discussion summarized two generally accepted valuation approaches and methods related to the analysis of wireless spectrum licenses:

1. The market approach, and the guideline transaction method
2. The income approach, and the greenfield method

It is important to note that the use of these methods, and the value indications provided by each, can vary significantly. Due to the complexity surrounding wireless spectrum licenses valuations, reliance on a single method or single transaction can yield unreliable conclusions of value.

It is generally accepted for the analyst to utilize multiple valuation methods, and to consider the value indications concluded by each in order to provide an estimate for the final value conclusion.

Notes:

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