The Quantification of Economic Obsolescence

By Michael J. Remsha, P.E., ASA, CMI

You can't see it, you can't touch it, and you can't smell it (at least most of the time), so how are appraisers suppose to quantify it? It's called economic obsolescence. No one ever said being an appraiser was easy. It takes years of training, experience, and hard work to be able to investigate an industry, analyze market data, and derive economic obsolescence.

OVERVIEW

Economic obsolescence, also referred to as external obsolescence, is the loss in value resulting from influences external to the property itself. External conditions causing economic obsolescence may be international, national, industry-based, or local in origin. Various external factors affect potential economic returns, thus having a direct impact on the market value of an asset or property.

To determine if economic obsolescence (EO) is present, a review must be made of the economics of the subject property and the industry it competes in, as of a point in time - the appraisal date. This review can be made by examining the earnings history of the subject property and any local or other influences that may affect the economic performance of the subject and its assets. For typical real estate, especially small generic properties, the effects of local market conditions can be very important. Zoning, the local economy, unemployment, and industry factors can affect the value of real estate. Larger real estate properties may not be affected by local economics as significantly, but can be affected by the regional, national, and even the global economy. Major properties that typically include real estate and significant other capital assets, and going concern influences (business values such as tangible and intangible assets and working capital) can be affected by local economic factors, but usually are more significantly affected by industry-wide economic conditions.

Industry economic conditions affect all aspects of a business, and many assets commonly appraised are businesses, not just real estate or machinery and equipment. Typical properties that can be considered in this category include cement plants, steel mills, paper mills, petrochemical and chemical plants, and other processing plants; extractive industries such as oil and gas production or mining; and any other assemblies of assets that compete in a specific industry. Typical data that can be used to review the economics of an industry include annual stockholder reports of companies in the industry, 10K reports to the Securities and Exchange Commission, industry publications discussing product and raw material price changes, investment banking and brokerage reports, and government studies. By using these data, the appraiser can determine if the earnings in the industry, and hence the subject property, have been, are currently, or will be affected by some outside economic influence that will reduce earnings and, therefore, the value of the business and its assets.

Of course, if certain assets in the plant or in the industry are generic such that they could be used by other industries, the EO of the current user may not be appropriate for that specific asset. For example, EO in the buggy whip industry may be significant, but the real estate associated with the buggy whip plant could be used by many different users. Therefore, it would be appropriate to apply the EO penalty to the machinery and equipment used to manufacture buggy whips, but not to the buildings. The appraiser must practice careful analysis.

The first step in quantifying EO is to investigate the existence of economic conditions that may reduce the value of a business and, hence, its assets. Then, after researching any reasons for EO, it must be quantified in an objective manner. EO may exist in any industry or property where the following attributes are found:

- Reduced demand for the company's products.
- Overcapacity in the industry.

- Dislocation of raw material supplies.
- Increasing cost of raw materials, labor, utilities, or transportation, while the selling price of the product remains fixed or increases at a much lower rate.
- Government regulations that require capital expenditures to be made with little or no return on the new investment.
- Environmental considerations that require capital expenditures to be made with little or no return on the new investment.

EO is present when better economic opportunities exist for an investment. The economic principles of supply and demand, and competition drive the loss of value associated with economic obsolescence. Typically EO cannot be reduced by capital investments, but it can change and even decline to zero through changing industry conditions.

Quantification

EO can be quantified using several different methods. Each method will not be applicable in every valuation problem. The appropriate method will depend on the availability of the data available to review and the type of asset being valued. The methods discussed are as follows:

- Market-Derived Approach
- Income Approach
- Utilization Analysis
- Return-on-Capital Analysis
- Equity-to-Book Ratio Analysis
- Gross Margin Analysis
- Government Regulations
- Income Shortfall

Details of the above methods are provided in the following sections.

Market-Derived Approach

Several techniques can be investigated to quantify the effects of EO. A very simple and direct approach is to derive EO from the market by reviewing sales of similar properties. This is especially useful for real estate where similar properties are available in the local or regional market and sufficient information is available on properties that have sold. In this approach, the following steps are applied:

Step 1: Deduct land value from the sale price of the property that sold; the result is the value of only nonland assets. Because EO is an attribute of the cost approach and land is typically valued using the sales comparison approach, the land value is removed from the analysis.

Step 2: Develop the current cost new of nonland assets

Step 3: Calculate all depreciation and obsolescence, except EO, and deduct from the current cost new of nonland assets

Step 4: Deduct the adjusted sale price (Step 1) from the current cost new less depreciation and obsolescence (Step 3)

The result is an indicator of EO based on a market transaction, a sale of a similar property. This approach can be used to calculate EO as a dollar amount, or as a percentage of the cost of reproduction new (CRN), cost of replacement (COR), or even the cost of replacement less physical depreciation (CORLD). See example 1 below.

Several sales should be reviewed in the analysis to develop a market-derived conclusion. Preferably, the sales should be similar in age and location to the subject, and have little or no functional obsolescence (one less item to analyze), if possible. Sometimes this is not possible, but an attempt should be made to locate comparables that have similar economic factors as the subject. Also, if the calculated EO is based on a percentage of CORLD, then the deduction for EO must be taken before the deduction of any dollar amount for functional obsolescence, when applied to the subject property. Percentage deductions must always be deducted first, dollar deductions last.

Income Approach

A common valuation technique used by the financial community is simply to develop the income indicator of value for the property being appraised. The income approach quantifies all forms of depreciation and obsolescence—physical,

Example 1

Sale Price of Similar Property	$1,000,000
Less Value of Land	200,000
Sale Price of Nonland Assets	800,000
Cost Indicator of Value of Property Sold	
COR	1,500,000
Less Physical Depreciation	500,000
CORLD	1,000,000
Less Functional Obsolescence	0
Cost Indicator of Value Before EO	1,000,000
Less Sale Price of Nonland Assets	800,000
Indicated EO	$ 200,000
or as Percent of CORLD	20%

Hence, based on the above, EO is $200,000 or 13% of the COR or 20% of the CORLD. The dollar amount of EO is the same, but the percent will vary depending on how it is measured and how it is to be used.

functional, and economic. However, when quantifying depreciation and obsolescence through use of the income approach, EO cannot be separately delineated in the analysis without relying on the cost approach. A modification of this approach is to develop all aspects of the cost approach, with the exception of EO, as in the market-derived approach previously discussed, then subtract the income indicator of value from the partially completed cost approach; the difference is EO. The primary problem with this approach is that the result is really just one approach to value, the income approach. As a general rule, using this technique, the cost approach to value will always equal the income approach to value. Although EO has been developed, it is totally dependent on the basic assumptions of the income approach. See example 2, which is based on the previous example in the market-derived approach and appears on this page.

Utilization Analysis

Other totally independent procedures are available to quantify the effects of EO. One simple approach is to review the asset's utilization. If the asset is being utilized at less than 100% or whatever is the norm for the industry, then EO exists because demand available in the industry is substantially less than the available supply. Mathematically, this is based on the relationship whereby EO equals actual utilized capacity (demand) divided by maximum capacity (supply) with the result taken to an exponent (scale factor), subtracted from 1. The scale factor is a relationship of cost to capacity, which reflects the concept that as capacity increases, the cost of construction increases at a different rate, typically a slower rate. Typical scale factors are 0.6 to 0.7, based on data published in engineering and construction texts.

The buggy whip industry will be used as an example of this type of calculation. Because of the use of automobiles, demand for buggy whips has been greatly reduced. While the manufacturing supply potential is still in place, the demand is not. Let's say the machinery and equipment at the plant has the capacity (supply) to manufacture 100,000 units per

Example 2

Income Indicator of Value	$1,100,000
Less Value of Land	200,000
Income Indicator the Nonland Assets	900,000
Cost Indicator of Value Before EO	1,000,000
Less Income Indicator of Value of Nonland Assets	900,000
Indicated EO	$ 100,000

Hence, based on the above, EO is $100,000. If the income indicator of value were to change based on a different set of projections or even a different discount rate, the dollar amount of EO also would subsequently change.

Example 3

$$EO = 1 - (\text{Demand} \div \text{Capacity})^{0.7}$$
$$= 1 - (1{,}000/100{,}000)^{0.7}$$
$$= 1 - 0.001^{0.7}$$
$$= 96\%$$

Note: To convert the 96% figure into a dollar amount, it can be multiplied by the CRN, COR, or CORLD. Because percentage deductions are always deducted before dollar deductions, the order of the mathematical calculation is not important; the result will be the same (the associative principle of algebra).

year, but demand is for only 1,000 units per year. The magnitude of EO in the industry and in the assets located at the plant is calculated as follows:

The company that makes the buggy whips has some income from production of the product, but the machinery and equipment is severely underutilized and, hence, exhibits a high level of EO, 96%. The market for buggy whips has been replaced due to a new form of transportation, automobiles.

Some unenlightened practitioners may argue that EO cannot exist if capacity at the subject or in the industry is nearly or fully used. This is not always true. It can only be true if earnings in the industry can support the capital investment at a market-based rate of return. If utilization is at 100%, but the industry (including the subject) is only breaking even or losing money, then EO is strongly indicated. Utilization can be at what is considered the norm in the industry because of economic influences outside the property, such as high consumer demand, but have low levels of profitability because of competition or some other outside influence on the subject property. An example would be any industry competing with foreign companies where raw materials or operating expenses are less when compared with the United States. If a U.S. plant has a maximum capacity of 100,000 units per year and demand for its products is high, the plant's output can still be 100,000 units per year. But because of imports from overseas, the price (i.e., value) received for the products produced may just cover expenses; therefore, earnings are low or negative, and the return on the investments in the business are reduced. The magnitude of EO in the industry based only on utilization (with a blindfold on) is "calculated" to be zero. Of course, this is incorrect.

As can be seen in the example above, the company has low or negative earnings from the manufacture of a product, yet the equipment is utilized at 100%. The plant is likely experiencing financial difficulties because of reduced earnings caused by competition; hence, EO exists and must be quantified using an earnings-related approach. The practitioner can't just plug numbers into formulas to calculate a number and call it EO. Thoughtful, reasoned analysis is required. Several questions must be investigated and answered: Are expected earnings reasonable for the plant? How do plant earnings compare to the industry? How do plant and industry earnings compare to those in other alternative investments?

If a plant is new and "state-of-the-art," it still can exhibit EO. For example, if a plant was built to manufacture a product, and because government regulations change or consumer preferences change, the demand for the product or maybe even the primary raw material disappears, EO for the plant and the industry could suddenly be 100%, and the plant would shut down. This could happen today (2001) in the MTBE (a blendstock used in reformulated gasoline) industry if the U.S. government follows the lead of California and bans the use of MTBE in gasoline in the entire country. The MTBE plants would have the option of shutting down or maybe, if even possible, spending capital to modify the plant to produce another product. EO can be sudden and significant, especially if a government body is involved.

Return-on-Capital Analysis

Another approach to quantifying EO is a return-on-capital (or investment) analysis. In the return-on-capital analysis, the relationship of earnings is compared to the magnitude of investment used to generate those earnings. A simple and direct approach to apply the return-on-capital analysis is to review the relationships of publicly traded companies in the same or a similar line of business as the subject property as of the appraisal date to a benchmark to determine if EO exists and at what level. One method is to investigate the percent earned on total capital (return on capital) for the year prior to the

Example 4

Company	*Five-Year Mean 1990-1995 (%)*	*Current Data (%)*
Algoma Industries	14.7	10.1
Kewaunee Industries	12.6	8.7
Manitowoc Mfg.	11.0	7.1
Menomonee Cos.	10.9	12.1
Okauchee Services	8.3	8.0
Sheboygan Industries	11.1	10.1
Waukesha Mfg.	9.1	6.1
Low	8.3	6.1
High	14.7	12.1
Median	11.0	8.7
Mean	11.1	8.9
Conclude	11.0	9.0

$$\text{Economic Obsolescence} = \frac{11.0 - 9.0}{11.0} = \frac{2.0}{11.0} = 18\%$$

Accordingly, based on the return-on-capital analysis, the economic penalty, or EO, on assets in the sample industry is 18%.

appraisal date to a point in time (one year), or over several years when the percent earned on total capital was higher (i.e., the good old days of more reasonable returns). A convenient publication to utilize in this analysis is Value Line Investment Survey (Value Line). Value Line publishes a significant amount of current and historical financial data on thousands of publicly traded stocks on a continuous basis. One of the components of a Value Line analysis is percent earned on total capital.

Value Line defines percent earned on total capital as "a company's return on its stockholders' equity and long-term debt obligations." As defined in the financial community, the summation of long-term debt and stockholders' equity represents the total invested capital of a business or the business enterprise. When the economics of the industry are good, the return on capital will be high; when poor, low. Hence, a return-on-capital analysis is a meaningful indicator of economic obsolescence.

To develop an example analysis, returns for a typical industry were reviewed based on data published in *Value Line*. Example 4 follows based on *Value Line* type data for a sample industry.

This is a meaningful indicator of EO when the practitioner can identify companies followed by *Value Line* that are in an industry similar to the subject property and have a minimal amount of diversification. For example, if the subject property were an oil refinery, several companies followed by *Value Line* would be considered good comparables because they are primarily oil refintng companies with few other assets in other sectors of the oil and gas industry, or other industries. In other words, the economics of the subject property would be influenced by the same or similar economic factors as the comparable companies.

After finding the comparable companies, the second step is to study the history of the industry to find a period of time when the return on capital was good (i.e., the good old days). For the oil refining industry, this can be identified as the late 1970s, and 1988, the years before supply and demand disruptions and expensive environmental govemment regulations. If the subject property were a single tissue (paper) mill, this approach may not be as meaningful because Value Line does not track any companies that own just tissue mills. All the paper industry companies followed are diversified and, hence, may experience different economic factors than the subject.

The practitioner must study the subject property economics and locate companies to be used as comparables that are as similar as possible to the subject. Of course, no comparable will be perfect. The goal is to locate comparables that are in a similar economic environment.

Equity-to-Book Ratio Analysis

Another method for determining EO present in an industry is to analyze investors' perceptions of investment in that industry using common stock (equity) prices. Indicative of investors' perception of the obsolescence present in the investment is the ratio of price paid for common stock relative to its book value. Book value of the stock relates to the original capital contributed to the firm in exchange for the stock plus retained earnings which have accumulated since the initial investment.

From a legal perspective, stockholders own the firm in which they have invested. From an investor's viewpoint, stock ownership is considered to represent a net ownership position in the firm's assets. At any point in time, if the total value of all assets is considered and all liabilities are deducted, the net amount is representative of the total value of the common stock or the value of the common equity in the firm. Thus, an investor purchasing shares of common stock is making a decision on the value of the total assets.

Book value of common stocks of publicly held companies is calculated with reasonable consistency for most publicly traded companies due to accounting regulations. The regulations involve not only the general methodology used in the calculations, but also regulate the type of data available to investors. Because of the consistency of reporting, the book values are useful as a benchmark for certain types of measurements. However, book values will not specifically represent fair market value of the assets, primarily because they are based on historical costs.

To estimate EO affecting assets in a sample industry, information in Standard & Poor's (S&P) *Analyst's Handbook* was analyzed for a sample industry's stock, on a per-share basis. The information represents indices that are based on stock prices (the annual high and low are reported) and also an index for the industry book value (one number is reported). For baseline comparison purposes, the same information is available on a group of industrial companies known as the S&P 500 (Industrials). The S&P Industrial sector represents the S&P 500 after removing any nonindustrial stock. Comparisons of stock price and book value are possible based on these annual data for the subject industry and also for the benchmark Industrials.

To calculate the equity-to-book ratio for this study, the mean common stock price is divided by the book value per share as published in the *Analyst's Handbook*. The analysis follows in example 5.

The above relationship is indicative of investors' relative valuation of the sample industry assets when compared with general industrial stocks. Owners of general industrial stocks appear willing to pay about 27% more for such stocks than they would pay for stock in the sample industry, based on the equity-to-book-value ratio. By this method,

Example 5

	S&P Indexes Per Share	
	Industrials	*Sample Industry*
Book Value	168	210
Stock Prices		
High	888	821
Low	709	652
Mean	799	737
Stock Price/ Book Value	4.8	3.5

$$\text{Economic Obsolescence} = \frac{4.8 - 3.5}{4.8} = \frac{1.3}{4.8} = 27\%$$

EO of 27% is indicated. To the extent that EO exists in the general industrial companies used in this analysis, the EO conclusion for the sample industry is somewhat understated.

Gross Margin Analysis

Another method that can be used to quantify EO is the study of plant or industry returns by comparing gross (profit) margins over time. The gross margin is simply a plant's revenues less its cost of raw materials. Revenues can be measured by multiplying the number of units produced by the value of those units in the market. The cost of raw materials can be developed in a similar manner. For a plant that is being appraised, information should be available by reviewing the last five to ten years of the plant's financial data. This analysis is typically developed on a unit-of-production basis (dollars per pound of production, or dollars per barrel of throughput [inputs to the plant], for example). If gross margins have been declining or are currently just lower than in the past, EO may be present even if utilization is high. Of course, if EO does exist, then the industry must first be analyzed to find the reasons for the obsolescence. Typical reasons could be an overcapacity of products available that are driving prices down, an increase in the cost of raw materials caused by a shortage in the market, or maybe just "cutthroat" competition. Remember, EO

is commonly caused by supply and demand problems, and competition. If the gross margins are lower than in the past, EO can be measured using the technique on the next page.

Generally EO is considered to be incurable, as typically, investments cannot be made to make it go away. But it can change and even decline to zero if industry economics change. If a competitors' plant suddenly goes out of business, a shortage of products may occur. When demand is constant, and supply goes down, economic theory says that prices will tend to increase. When prices increase for the products produced, revenues will go up for the plant. EO may be reduced or even disappear until a new plant is built to increase supply, or imports arrive from other parts of the country or from foreign countries.

Government Regulations

One cause of EO is government regulations. For much of the 20th century, state and federal governments structured public utilities earnings on the investment in the tangible assets used to serve the public in a monopoly situation. Because the public utilities were allowed to have a monopoly, the government wanted to protect the public by controlling the utilities earnings. This was done through "rate base" regulation. Rate base is the original cost of the assets being used to serve the public less allowed (rate base) depreciation. The public utilities would supply the government body information, which is created using unique utility accounting practices for this purpose. The government would permit a certain allowed return on this investment, the rate base, based on actual costs of debt and a market-based allowed return on equity. If the utility earned the allowed amount, good; if the utility earned less, too bad (poor management?). If the utility earned too much, the excess earnings had to be returned to the rate payers through a rate adjustment. If the utility thought earnings should be higher, they had to file a request (rate case) to have their allowed return increased. If the rate case took too long to come before the review board and equity returns were rising, a level of EO resulted from the regulatory lag (i.e., the allowed rate of return was not permitted to be increased fast enough, and the utility was not being given the opportunity to earn its rate base at current market rates.) This can be measured as follows:

Example 6

Past Gross Margins	$2.00 per unit
Current Gross Margins	$1.00 per unit

$$EO = \frac{\text{Past Gross Margins - Current Gross Margins}}{\text{Past Gross Margins}} = \frac{\$2.00 - \$1.00}{\$2.00} = 50\%$$

Example 7

Allowed return	10%
Current market return	13%

$$EO = \frac{\text{Current market return - Allowed return}}{\text{Current market return}} = \frac{13\% - 10\%}{13\%} = \frac{3\%}{13\%} = 23\%$$

This means, because of regulatory lag (bureaucracy), the utility is not able to earn at market rates, and therefore, the owners of the utility must accept a lower level of earnings. This loss of earnings is a form of EO that reduces the value of the utility's property.

Another form of government-caused EO is rent controls. In certain areas of the United States, rent in apartment buildings is controlled by the local government. The intention is to provide affordable housing for existing tenants. While the market may be changing the market rental rates of apartments in an area (generally increasing with inflation), local government laws sometimes prevent landlords from increasing rental rates. This is a form of regulation that causes EO as seen in a reduction in the value of the property (Example 8).

Again, because of local government controls, EO exists, and the value of the property is reduced.

Consider the position of a potential buyer. If a potential buyer knows that the earnings will be reduced by local government rent controls, will a

Example 8

Current allowed rental rate	$500 per month
Current market rental rate	$1000 per month

$$EO = \frac{\text{Current market rental rate - Current allowed rental rate}}{\text{Current market rental rate}} = \frac{\$2.00 - \$1.00}{\$2.00} = 50\%$$

purchase offer be based on the property's earnings limited by local regulations, or on current market rental rates that do not apply to the property? Of course, the prudent investor will base the offer to purchase on the property's permitted earnings, not on market earnings that do not apply. Rent controls reduce the value of a property because earnings are controlled, reduced. That's economic obsolescence.

Another form of government-regulation-based EO is the lack of return on investments made for pollution control equipment or mandated environmental remediation. The Clean Air Act of 1990 Amendment required many heavy industries to invest in pollution-control-related equipment that did not increase the capacity of the plant or make the plant more profitable. In fact, in many cases, the new equipment actually increased operating expenses through higher labor requirements and more energy consumption, hence reducing earnings. The plants had two choices: to invest in the pollution control equipment, or to shut down. The investment is considered a necessary capital expenditure or a form of curable functional obsolescence, and the resulting reduction on the return on investment, a form of EO. Government regulations constantly require industry to make new investments in their plants. When the required investments do not generate income, EO is the result.

Income Shortfall Analysis

Another indicator of EO is an income shortfall. This approach is similar to the regulatory lag or rent control techniques except that the income shortfall is caused by "the market." For example, suppose the subject property was in an industry that was very competitive. The property being appraised has made large investments to modernize and meet environmental requirements, and essentially to invest in long-term future operations. Because of supply and demand economics, and competition, earnings are not available to support the investment in the plant assets. The plant had the option of investing in the new environmental equipment or shutting down. EO exists because the earnings generated by the plant do not support the level of investment made in the plant. An example of the earnings shortfall method was on the previous page.

Another way to calculate EO caused by an income shortfall is to calculate the differential in earnings. An example follows:

This income shortfall calculation of EO is very similar to the first calculation in which the required and current returns were known. In the example above, the returns are calculated based on the investment in the property and the return received or projected after a new investment is made that provided no additional income. The result is similar:

Example 9

Required Return on Investment	15%
Current Return on Investment	10%

$$EO = \frac{\text{Required Return on Investment - Current Return on Investment}}{\text{Required Return on Investment}} = \frac{15\% - 10\%}{15\%} = \frac{5\%}{15\%} = 33\%$$

EO exists and is significant.

Entrepreneurial Profit

Entrepreneurial profit is the anticipated profit an investor requires to construct and sell a property. It is a reward to the entrepreneur for the inherent risks of investing time and money in the construction of a property.

Entrepreneurial profit must be market based; it's not automatic. The market will not automatically reward an entrepreneur for hard work and risky investments. Most likely, this type of profit will exist in generic industrial, commercial, and residual properties in an expanding market where demand is

Example 10

Current Investment	$1,000,000
Current Income	$ 100,000
Calculated Return	Current Income / Current Investment = 10%
Projected Investment	$1,500,000
Projected Income	$ 100,000
Projected Return	Projected Income / Projected Investment = 7%

Economic Obsolescence = (10% - 7%) / 10% = 30%

greater than supply. It will not exist in unique or special-purpose properties that are built by users and are not for sale in the general marketplace. Of course, if EO exists, entrepreneurial profit is negative. Both cannot exist at the same time (i.e. both cannot be positive).

The lack of new construction is generally an indicator that EO may exist. However, EO can exist in the presence of new construction. Sometimes, a large corporation will replace an old (functionally) obsolete plant with a new, modern, state-of-the-art plant to reduce operating costs and create a stronger presence in the industry. While EO still exists in the industry, which reduces the earnings of the company, the reduced operating expenses resulting from a new plant will make it a stronger participant in the industry and potentially even help to drive out the competition. This may reduce and even eliminate some of the competition and, also, reduce or eliminate EO.

Summary

Economic obsolescence is present when better economic opportunities exist for an investment. When a government entity steps in and attempts to control the market through regulations, economic obsolescence is created externally to reduce the value of assets. The loss of value associated with economic obsolescence also is caused by the economic principles of supply and demand, and competition. Economic obsolescence typically cannot be reduced by capital investments, but it can change, and even decline to zero through changing industry conditions.

An enlightened appraiser will investigate the existence of economic obsolescence and quantify it based on market indicators. Ideally, more than one indicator will be utilized and correlated to conclude its magnitude.

This article discusses several procedures that can be used to quantify the effects of economic obsolescence. These procedures will not apply to every property or industry, and other more appropriate indicators may apply. The appraiser must study the subject property and its industry, as appropriate, to determine if economic obsolescence exists, and if it does, how to measure it. Careful analysis and study are required.

You can't see it, you can't touch it and you can't smell it, but you can measure it using the proper valuation tools of an appraiser. It's in the market, and if an informed appraiser is alert, it will be heard. When the market speaks, appraisers listen.

Michael J. Remsha, is a vice president with American Appraisal Associates, Inc. in Milwaukee, Wisconsin. In this capacity, he provides direction and technical support on the valuation of special-purpose and personal property. He has been a full-time appraiser since 1977. Mr. Remsha is an Accredited Senior Appraiser (ASA) of the American Society of Appraisers. Mr. Remsha is certified in Wisconsin as a Professional Engineer (PE), licensed as a Certified General Appraiser in several states, and is a Certified Member of the Institute (CMI) in the Institute for Professionals in Taxation.

REFERENCES

Hartman, Donald and Michael Shapiro. 1983. Depreciation: Incurable Functional Obsolescence and Sequence of Deductions, The Appraisal Journal, July.

Hinshaw, Andrew. 1963. Functional and Economic Obsolescence of Industrial Installations, Technical Valuation, American Society of Appraisers, February 9.

Iannacito, Alan. 1998. Economic Obsolescence, The M & E Appraiser, January/April, Volume 5, Number 1.

Kinnard, William, and Gail Beron. 1984. Quantification and Measurement of Economic Obsolescence. Paper presented at the Real Estate Valuation Symposium, November 14. Institute of Property Taxation

Landretti, Greg. 1986. Annual Economic Adjustments and the Special Purpose Industrial Property, Assessment Digest, International Association of Assessing Officers, September/ October, Volume 8. Number 5.

Miles, Les. 1993. Economic Obsolescence, The M/TV Journal, American Society of Appraisers, Fall, Volume 10, Number 2.

Reilly, Robert. 1988. The Identification and Quantification of Economic Obsolescence, Business Valuation Review, American Society of Appraisers, June.

Skogstad, Tor. 1983. Estimating Economic Obsolescence of Operating Industrial Plants, Assessment Digest, November/December.

Thatcher, Lionel, and Richard Dubielzig. 1967. Obsolescence in Railroad Ad Valorem Tax Assessments, Wisconsin Commerce Reports, The University of Wisconsin, May, Volume VIII, No. 2.