

Union of Panamerican Valuers Associations
“Valuing Our World: Challenges Facing the Global Market”

Auditability of Valuation: A Professional Solution to World Needs: the Legacy, the Science, the Opportunity

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This paper relates the historical progress of the valuation profession to the currently recognized ‘traditional practices’ – through to the era of automated models, value-compliant appraisals, and non-ethical valuations. Given the repeated and perhaps true inability of traditional valuation practices to prevent abuses, bubbles, and even rampant fraud – questions are raised.

Is there a solution to be found from within the practice of valuation? Does today’s technology provide the potential for objective results? Will the market (for appraisals) embrace a product which gives ‘real’ value estimates? Will governmental or other regulatory processes be required to effectuate an objective model? Is intrinsic value measured by contract sale prices? And finally, are currently accepted ‘market value’ definitions accomplices in the recent global mis-evaluation problem -- or have they simply been ignored or misunderstood?

This paper considers the lack of risk/reliability estimation in the traditional valuation model. What causes the absence of reliability scoring? Is an objective reliability/risk estimate possible -- given today’s data, econometrics, ethical behaviors, and communication capabilities?

Finally, we consider how relevant has been the traditional appraisal under recent fluctuating conditions (which seem to recur in repeating cycles), where the “market value” reflects *more* than the intrinsic utility/welfare equilibrium – due to speculative over-exuberance. Then alternately, in depressed times, it reflects market prices which are below intrinsic long-term value – due to systemic *over-caution*, in spite of political efforts to rejuvenate the purchasing ability of buyers.

Today, the challenge (and the answer) of the valuation profession is to place itself firmly in the seat of scientific endeavor. Impediments to the creation of objective standards continue to be removed and reduced. The profession is impelled to be nimble and take practical immediate advantage of improvements in data, verifiability, modeling, econometric and computer technologies. These practices inevitably must include statistical analysis, graphical investigation and presentation, reliability measures, auditable practices, and a rigorous view of “market” value.

First, we will review the current evolution and context of traditional appraisal practices. Second we will consider the deeper scientific and philosophical basis

of what ‘should be’ the result of an appraisal. We discover the definitional “*market value paradox*.” We continue with an overview of the opportunity under modern data and analytical technology, when complemented with the appropriate technical education for valuers. Finally, we conclude with a summary of a valuation process which is auditable. The combination of auditability, attention to a more rigorous interpretation of market value, and provision of numerical scoring of risk/reliability as an explicit result of a valuation – may revolutionize the profession, as well as significantly better serve the public good.

I. The Legacy: valuation practices and technology

Does current valuation practice meet today’s needs?

To answer this question, a look at the evolution of appraisal practice gives us perspective on the trajectory of the profession, from where it has done well, to where it has failed. The history can also emphasize the elements of the process – from the data, to the model/analysis applied, to the forms of communication. The historical legacy of valuation influences much of our impression of today’s results. We look first at common elements throughout history.

As a part of this historical look, we must also consider the effect (and interpretation) of the common definitions of market value. These definitions have been influenced (or perhaps neglected) by the professional and governmental organizations responsible for setting this all-important concept. The historical impact of ‘market value’ on the economy is perhaps underrated. There are two aspects of this influence:

- The definitions currently favor a microeconomic view of value. However, they can favor a macro- (welfare/utility-economic) concept, alternatively described as ‘intrinsic’ or ‘fundamental’ value.
- Market elements (for valuation services) are also heavily influenced by the realities of *client expectations*, as well as the accepted (but subjective) “*peers’ actions*” criteria which currently set the standard of sufficiency.

The concept of comparing subject characteristics (whether income or amenity) to selling prices of similar properties permeates the evolution. There have been intriguing exceptions, which we will examine later.

Appraisal is always performed to fill an immediate need. Historically, it was performed by someone perceived as having superior knowledge of a specific market – by area, and by property type and characteristics. The evolution of change in appraisal practice is encouraged, as documented in USPAP (Uniform Standards of Professional Appraisal Practice) Standard 1-1(a), regarding “recognized methods and techniques”.¹

¹ *Uniform Standards of Professional Appraisal Practice*. 2010-2011 ed. Washington, D.C.: The Appraisal Foundation, 2009. Print. [Standards Rule 1-1(b), and Standards Rule 1-4, lines 556 -578].

This Standards Rule recognizes that the principle of change continues to affect the manner in which appraisers perform appraisal services. Changes and developments in the real estate field have a substantial impact on the appraisal profession. Important changes in the cost and manner of constructing and marketing commercial, industrial, and residential real estate as well as changes in the legal framework in which real property rights and interests are created, conveyed, and mortgaged have resulted in corresponding changes in appraisal theory and practice. Social change has also had an effect on appraisal theory and practice. To keep abreast of these changes and developments, the appraisal profession is constantly reviewing and revising appraisal methods and techniques and devising new methods and techniques to meet new circumstances

The International Valuation Standards² (IVS) are somewhat more pointed about current objectives and desired outcomes. In the “Objectives and Scope” section three principle objectives are stated. These are summarized as:

- Promote transparency in financial reporting, and promote reliability of valuations performed;
- Benchmark for reliable valuations and meet financial reporting requirements;
- Meet needs of emerging and newly industrialized countries.

The evolution of appraisal practice has followed changes in real estate construction, marketing, planning, law, financial instruments and social change. We are interested in the technological changes which have accelerated dramatically how valuations are performed in the last three decades. These changes can be organized into three sequential categories: 1) Data; 2) Modeling and analytical methods; and, 3) Communication of results. We will examine the first two of these in this paper.

Data affects the quality of results from its comprehensiveness, accuracy, completeness, and timeliness. Data quality, on a technical basis, determines the **modeling and analytical** methods.

Data

In the US and around the world, data has generally improved in availability and quality. But such progress has been varied and spotty. Any improvement can dramatically increase the accuracy and the precision of appraisal results.

Up until the availability of electronic resources, data was only available in hand-written or printed form. The most valuable resource for an appraiser was personal contact. Who you knew was as important as what you knew. Knowing and controlling the information was the key to success in an appraisal practice.

² International Valuation Standards Committee. *International Valuation Standards*. Eighth ed. London: International Valuation Standards Committee, 2007. 8. Print.

On the residential side, MLS (Multiple Listing Service) and cooperative appraiser data publications were only in print form until the early 1970's. Reliance on print form continued generally until the mid-1980's when computers had become financially possible for individual appraisal offices. Even then, the data was searched and downloaded to print form for further analysis into traditional forms requiring three comparable sales. MLS and other residential data continued to increase in quality in all parts of the US.

On the commercial side, print information did not become available in most metropolitan areas until the late 1980's, with electronic delivery not common until around the turn of the century. However, commercial income and expense information quality has varied, perhaps even declined in the past 10-15 years. Non-residential data quality has generally improved as brokers have become less secretive, particularly in lease agreement information.

Public records are of greatly varying quality throughout the USA and the rest of the world. In the US, they tend to be good or excellent in the West. The "non-disclosure" states (the western plains states down to Texas) tend to have low transparency, (with sale prices often concealed), making recorded verification more difficult. Quality of data tends to vary greatly in parts of the eastern states. Metropolitan areas everywhere tend to be better; but rural counties running poor to fair.

In Latin America, the topic of data availability can be considered in a broader context of 'transaction *transparency*'. The Jones Lang LaSalle survey³ of transparency includes five categories: performance measurement, market fundamentals, publicly listed vehicles, regulatory and legal environment, and transaction process. The Jones Lang LaSalle report converts these categories into four tiers of transparency.

While the US and Canada fall in the top tier of the four levels, Latin America falls generally into the third tier (Semi-transparent), to include Chile (the highest), followed by Brazil, Mexico, Argentina, and Costa Rica. Tier 4 (Low-Transparency) countries include Panama, Uruguay, Columbia, Peru, Venezuela, and the Dominican Republic. While recent improvements in Latin America have slowed, all countries have improved except for Venezuela, which has declined due to "regulatory and legal changes, including weakened enforceability of contracts."

Overall, where the data is available, electronic transmission, storage, and sharing of the data has continued to increase. Once the data is available, it tends to be shared and easily incorporated into analysis.

The point here: the *quality* of data depends on governmental and regulatory rules, social and industry habits and expectations, and financial institutions' willingness to work with varying levels of risk/reliability.

³ "Real Estate Transparency: Latin America Weak." *Latin Business Chronicle*. Jones Lang LaSalle, 28 June 2010. Web. 16 Aug. 2010. <<http://www.calvin.edu/library/knightcite/index.php>>.

Historically, in the USA, the profession grew up as a ‘cottage’ industry, with local realty brokers being the most knowledgeable about available data. The person with the most information, formal or informal, was the center of ‘wisdom’ and expertise regarding recent sales and trends. In developing countries, (as well as some rural areas of the USA), a similar reliance on a few ‘best comparables’ data points, and the word of a trusted expert remains the *best practice*. Either the data is simply not available, not comprehensive, not accurate, or part of a market with just occasional sales activity.

Thus we see that *data* is the first controlling point in the progression of available analytical methodologies. Where data is poor or sparse, the analysis will generally be limited to a handful of ‘most similar’ comparable sales. Where data is good, other (perhaps superior) analytical methods become possible.

Modeling and Analytical Methods

There are two reasons why the traditional ‘best comparables’ appraisal models may continue to be valid:

1. Some properties are unique, or belong to a market with few sales or difficult comparisons.
2. Quality of data may be poor, and expensive (research effort) to gather.

But there have been problems. We may ask: Is some other valuation method or goal better? We may do well to consider the nature of the appraisal process or valuation model. Can we assume that the ideal model has already been discovered? Intuitively, and through the years the accepted “approaches to value” have proven themselves substantially useful and adaptable to varying situations. Also, world-wide, fundamental principles and practices are similar. Per IVS:

The experience of Valuers and dialogue among nations through the International Valuation Standards Committee (IVSC) have demonstrated that, with few exceptions, there is common worldwide agreement regarding fundamentals that underpin the valuation discipline. Local laws and economic circumstances may, on occasion, require special (and sometimes limited) applications, but fundamentals of valuation methods and techniques are generally similar throughout the world. It is an objective of the International Valuation Standards Committee to avow and promote these fundamentals.⁴

To better understand the relationship between the quality of data and the analytical methodology thus enabled, it is important to understand the two-fold nature of the valuation challenge for an appraiser. Simply put, the two tasks are:

1. Identify the appropriate market segment, (the data frame);
2. Position the subject within that market, (the analytics).

⁴ International Valuation Standards Committee. *International Valuation Standards*. Eighth ed. London: International Valuation Standards Committee, 2007. 21. Print.

Data is important

The greatest errors found, the greatest frauds perpetrated, the easiest way to intentionally bias an appraisal -- is in selecting the market segment.

When data is sparse or of poor quality, the identification of the market segment may be quite subjective. There has been little research and few academic papers written on the topic in anything less than a general way. Macroeconomic studies tend to gather data larger than specific markets and submarkets. While microeconomic theory is well developed by economists, (including rigorous mathematical-statistical support), little of this knowledge has transferred to the *practice* of real property valuation. There are several aspects to the inertia found in this and perhaps any profession or body of knowledge. Wide acceptance of new but superior solutions is often a slow process. Resistance to change is a natural human and cultural phenomenon. However, we can observe some specific aspects of this resistance within the valuation profession. One is the history of data quality – the other is the inherent inertia of our institutions, particularly education. So let us look at some of the obstacles to the implementation of technological methods

The historical lack of comprehensive, quality data is continuing to cause the focus of the profession, and even (real estate and financial) academia -- to be on finding a “few good comps.” Thus the baseline of acceptability is set. This habit substantially continues in various degrees and dimensions today. (I do acknowledge that academic studies commonly rely on multiple regression in related studies).

This existing curriculum has been circumscribed by the traditional model -- slowing growth of the very innovations the earlier-quoted USPAP rule exalts regarding changing proficiency needs. There are several reasons for this resistance, including:

- The **experiential learning** aspect of appraisal has been important, and continues today, particularly in the higher reaches of professional education and more complex property types.
- **Licensing and certification** tends to freeze the body of basic knowledge to the testing requirements to the qualifying education courses.
- The **caretakers of the curricula** tend to be the oldest and wisest practitioners. They also tend to be the most sophisticated appraisers, typically working in non-residential assignments, where the data component has lagged behind the residential data component by perhaps two decades. Also, the data tend to be naturally sparser and diverse, further justifying the ‘best comps’ methodology for data selection.
- The USPAP **‘test’ of acceptability** justifies the traditional methods. These are that which is *expected by clients* and what *peers would do* in the same assignment. Thus an appraiser who would use a technologically superior method (but unfamiliar to peers and clients), would risk the penalty of reviewer questions, and even loss of clientele.

- The newer technology may involve topics scary to many. These include **GIS** (Geographic Information Systems), **graphics, and statistics with econometrics** – particularly scary for the math and computer phobic. More so because the world of econometric analytics has grown rapidly and concurrently. Within this context even the teaching of statistics has changed dramatically to more practical applications. Younger people have grown up with less difficult theory, and simpler applications of statistics, taught by more compassionate teachers than in previous decades.

To sum up regarding data selection and data modeling: the selection of a few comparables (most similar) has been an embedded part of the accepted valuation practice. This practice, while simplifying comparison analysis may be antithetical to good *market* analysis

Truly identifying *all* the data within the competitive or linked market segment has, of course, been difficult or even impossible. It continues to be difficult in many areas. The cost of gathering and enhancing data to statistically useful standards has been prohibitive. But today, in so many areas, this superior market analysis and improved data analysis is enabled, and must be considered.

Having observed some of the obstacles to the technological progress of the profession, we next will clarify the *two* fundamental, but different, analytical tasks of valuation. We look at the need for, and solutions to, the **first of the two tasks of an appraiser**: getting the right data set.

Identify the appropriate market segment.

We now consider the competency as well as the technical ideals of data selection – the challenges of selecting the correct market segment. This will include an examination of some more objective “better practices” given good data, and availability of modern analytical tools. This will lead us to the next section, which reviews the nature of the scientific method and its applicability to valuation.

But first, we will look to what defines competency within two existing standards – International Valuation Standards (IVS), and the Uniform Standards of Appraisal Practice (USPAP). We will examine what they say about data *required* to be considered (as in IVS), or which data *should be* collected, verified and analyzed (as in USPAP). Also, we will take a quick look at a technical note regarding the *upper limit of information* (Fisher information)⁵ and why more information is better than less.

⁵ The Fisher information is a way of measuring the amount of information that an observable random variable X carries about an unknown parameter θ .

Sir **Ronald Aylmer Fisher** (17 February 1890 – 29 July 1962) was an English statistician, sometimes credited as being the father of modern statistics.

USPAP: the following is taken from the 2010-2011 USPAP, from Standard 1, regarding the development of a real property appraisal. Similar statements are found regarding other property types.

Standards Rule 1-4

556 In developing a real property appraisal, an appraiser must collect, verify, and analyze *all information necessary* for credible assignment results.

558 (a) When a sales comparison approach is necessary for credible assignment results, an appraiser
559 must analyze such comparable sales data as are available to indicate a value conclusion.

560 (b) When a cost approach is necessary for credible assignment results, an appraiser must:

561 (i) develop an opinion of site value by an appropriate appraisal method or technique;

562 (ii) analyze such comparable cost data as are available to estimate the cost new of the
563 improvements (if any); and

564 (iii) analyze such comparable data as are available to estimate the difference between the
565 cost new and the present worth of the improvements (accrued depreciation).

566 (c) When an income approach is necessary for credible assignment results, an appraiser must:

567 (i) analyze such comparable rental data as are available and/or the potential earnings
568 capacity of the property to estimate the gross income potential of the property;

569 (ii) analyze such comparable operating expense data as are available to estimate the
570 operating expenses of the property;

571 (iii) analyze such comparable data as are available to estimate rates of capitalization and/or
572 rates of discount; and

(Emphases added).

Here we acknowledge that the level of validity can vary. We understand that when relevant data is eliminated or truncated, reliability⁶ is reduced, and bias (statistical or personal) is more easily introduced. We also understand that appraiser *credibility*⁷ (worthiness of belief) depends on delivering the level of *precision* sought by the client.⁸ This is identified in the client's *intended use*.

⁶ "Reliability." *The Cambridge Dictionary of Statistics*. 1998. 283. Print. "The extent to which the same measurements of individuals obtained under different conditions yield similar results. [This definition fits the Fisherian, inferential philosophy].

Also:

statistics.com. Statistics.com LLC, 2010. Web. 20 Aug. 2010.

<<http://www.statistics.com/tutoringconsulting/tutoring/>>. "reliability is a measure of precision" [This definition more fits the Bayesian philosophy, and descriptive statistical methods].

⁷ *Uniform Standards of Professional Appraisal Practice*. 2010-2011 ed. Washington, D.C.: The Appraisal Foundation, 2009. Print. [Definition of 'Credible,' Definitions, p. U-3]. The comment to this definition states that the work necessary credible results relates to the intended use.

⁸ As we shall see later, the statistical reliability of a valuation, once the market segment is identified, is determined *solely* by the accuracy of the measurements and categorizations of the data. Since no (random) sample is taken, there is no variability caused by the sampling process. This is perhaps the key concept in our progress toward an 'auditable appraisal'[©] product. Once the measurements are set, and are non-random, statistical reliability of a market segment data set is fixed, and the reliability is 100%. The remaining question is that of validity – whether the right problem and right information has been identified. Issues of outliers and error handling, albeit important, are beyond the scope of this paper. Another definition of reliability is the capability of a procedure to perform without fault.

IVS states that “Sales comparisons or other market comparisons should evolve from market observations.” (Standard 1, Section 1). Also, that “the estimate of Market Value is based on market-derived data.” (Standard 1, Section 5.1.2). Notable in IVS is the similar statement to that found in USPAP. “Valuers ... should consider *all* pertinent market evidence, trends, comparable transactions and other information.” (*Emphases added*).

It has been my experience that many, even those close to the authoring committees, tend to be satisfied that the appraiser has ‘*mentally*’ considered and analyzed the information outside the three or more comparables presented, and that that is satisfactory, (reminiscent of the ‘trust me’ philosophy). While this belief system may be adequate for subjective valuation work, it is not sufficient for scientific, reproducible, auditable appraisal work.

If we see that the use of the *entire* market segment data set is perhaps important, even required for an objective work best practice – then it behooves us to briefly reference a mathematical basis of why more information is better than less.

But before we move forward to Fisher information, we must first distinguish data from information.

Data is a *collection of facts or measurements*.

Information is data which has been *selected, organized, or summarized to be useful* for human decision-making or further analysis.

Clearly, data which does not apply to the problem at hand is not useful, and cannot be information. This forms one boundary for information – it must be useful to be included. But what about the lower bound? Is there an amount of data which is ideal? Is it all the data, part of the data, or just three sales?

‘Fisher information’,⁹ while mathematical in nature, it is simple and intuitive to understand). *It tells us that more information is always better than less*. However, that information has a price. The information must be useful. It must be quality information. It must be accurate. Thus defined, information loses its value as it becomes less accurate and less precise, or the risk of bias increases. We must also recognize that the *cost* of gathering data and improving its quality can be high. The cost of the refining and enhancing¹⁰ information must also be considered in the equation. (Thus, the fee the client pays *does matter* as to the precision and accuracy of the results!)

Lower measurement or categorization validity (and the cost of enhancing it) is a proper reason for discarding data. But the reason must be clear. This then is our *first rule of valuation reliability*. Use as much data as appears to be useful,

⁹ Cover, Thomas M., Joy A Thomas, *Elements of Information Theory*, New York, John Wiley & Sons, Inc.1991, p. 279. Fisher information provides us with the upper limit of the *information* that can be extracted from a given amount of raw data.

¹⁰ Enhancing would include editing, confirming, validating, verifying, and supplementing.

but consider the effect of poor data. If a high level of reliability is desired, then the cost of data enhancement must be considered.

Example: for litigation work, appraisers devote more time to using more data, and verifying, confirming, and validating data to turn it into useful information.

Market Segment Dimensions

The education for appraisal practice has evolved around making adjustments to sale prices, whether for amenity components, or for analyzing income/expense to arrive at net income estimates, or for estimating appropriate yield or income capitalization rates to apply. This body of knowledge is well developed. But there has been little attention paid to the elements or components of objective market identification.

The “Market Delineation Process” is set out in “The Appraisal of Real Estate” as a five-step process.¹¹ It starts with an investigation of the property **type**, then considers property **features** next, the market **area** is considered, then available substitute properties, followed lastly by complementary properties.

The above is a *process*, and perhaps serves that purpose well-enough. It seems to work well with the ‘best comparables’ model. What we need is a data model which recognizes the mathematically multi-dimensional nature of the real property valuation problem. A complete market identification requires five primary dimensions of competitiveness:

- Property type
- Transaction (contract) elements
- Time segment
- Geographic segment
- Characteristics (amenity or income)

This dimensioning may seem similar to the ten “Elements of Comparison”¹² found in “The Sales Comparison Approach” chapter of the Appraisal of Real Estate. But note: most of these, especially financing, motivation, use expenditures, and market conditions adjustments, would normally apply prior to applying income or yield capitalization, as well as within the cost approach, not just to the sales comparison approach. (These adjustments should take place before the application of any of the three approaches, not just sales comparison).

The regrouping above into five categories is for reasons of statistical independence. It enables the highly effective usage of graphical and descriptive

¹¹ Appraisal Institute, *The Appraisal of Real Estate*, 13th ed. (Chicago, Illinois: Appraisal Institute, 2008). p. 50.

¹² *Ibid.* p. 309.

statistics tools. I have found that the use of the five categories is effective and theoretically sound. While it is possible (and important) to further reduce the market delineation algorithm, that is beyond the scope of this paper.

These five dimensions are the determinants of a market segment. Mathematically, they demonstrate low correlation (or co-linearity) as between each other. (In geometric terms, they are substantially perpendicular). This fact is to be used in selecting statistical models for valuation. While the categories are not perfect, their usefulness lies in selecting and analyzing, through effective statistical models, and the concomitant graphical/visual tools of data exploration and visualization.

Property type appears to be the easiest to discern, but in some cases can become a major issue of optimal use (highest and best use). In some cases, a valuation must be done on two or more feasible uses (particularly in a development scenario) – before the optimal maximized present value can be identified. While this dimension's analytical problem appears to be categorical, e.g. residential vs. retail – mathematically it is a case of identifying the maximum of each feasible use, where the first derivative is zero, then reconciling the potential profit with the entrepreneurial risk of each option.

Finally, there are many cases where **substitute property types** may need to be included in the competitive data set. For example, there are cases where condominiums may be a genuine alternative for many buyers for detached residences. Another example may be where rental garage space or even tarp-covered open storage is an alternative to a self-storage facility. Industrial land may commonly find a retail use.

Transaction elements present challenges of quantification. Motivation is not possible to measure directly, so surrogate (stand-in) variables must be found to establish such adjustments. The case for financing adjustments is similar, in that markets seldom respond directly to financial present value. Government subsidized or guaranteed loans can tweak a market by their availability. The property rights conveyed can be a significant market delineator. An example is fee simple vs. leased properties.

Reliable **time** adjustments are actually quite straightforward for most active markets, or where linkages can be shown to economically adjacent markets. But these time-series analysis techniques seem to be known to only a few appraisers who use them on a regular basis. Nevertheless, the market conditions problem is inherently one of extrapolation. Estimated value is always an *ex ante* forecast from the time of the comparable information to the current date of value. Prospective valuations are essentially *ex post* forecasts. Both *ex post* and *ex ante* forecasting can be improved via information *outside* the comparable sale data set. This could include leading indicators both from within the market segment, and from more macroeconomic variables, generally local and regional indicators such as employment level changes, plant closings and openings, and construction permits.

Geographic variables can be divided into three categories. Two of these, **adjacent influences** and **proximate influences** require specific observation. Adjustment may be via GIA (Geographic Information Analysis), and will usually be via matched pair statistical comparison for adjacent influences. Examples would be direct rail access or not, or corner influence or not. Proximate influences may be categorical. An example would be direct beach access, one lot off, two lots off, three lots or more. Alternately, it may be a measure (continuous) variable such as using distance in feet to the beach front, or distance to the central business district. **Market or neighborhood** comparisons are best accomplished via GIA (Geographic Information Analysis), using value on the *z-axis* forming an iso-value topography. Alternately, the same iso-value can be of key variables, such as building area or site area per unit.

Property characteristics can be amenities, when applied similarly to the sales comparison approach. Or, for income properties, net income itself becomes a composite variable which can be directly analyzed (such as in the income approach) – thus the *characteristics* of the income flow are relevant variables.

Physical and amenity characteristics can themselves be multidimensional in nature. This mathematically may create a nested dimensionality problem.

Income characteristics can also be difficult. Rates of return may be responsive to actual risk, or they can respond to perceived risk. In some cases, the amenity and financial desirability can become intermixed, such as in the case of ‘trophy’ properties. Market over-exuberance or pessimism may cause a divergence between the intrinsic investment value and transaction price value. (Will the real market value please stand up!)

Each of the above five major dimensions of market segmentation can themselves be multidimensional, thus creating a mathematical situation of *nested dimensionality*. All this results in the inherent difficulty of market selection. It can be shown that there is no simple linear classifier for such a multidimensional problem. But at least this clarity on what the dimensions are -- opens the topic for further research and development of methodology.

Market Selection Summary

Recent appraiser education attention to market analysis has focused on the analysis of markets for projects to be constructed. There has been little attention to the analysis of existing markets. The low attention has been the result of the subjective method of ‘comparable selection’, necessitated by historically sparse or difficult to confirm data.

We have noted the mathematical and standards arguments, as well as Fisher information for the use of *all available data* relevant to the analysis.

Finally, we have considered the natural dimensionality of the market segment problem for real property. The high mathematical dimensionality of the valuation

problem is one of the main reasons for the inherent scientific ‘difficulty’ of the analysis. The other reason, as we have exposed, is that the appraisal problem is really two problems, iterative in nature: identify the market segment, and; position the subject (multi-dimensionally) within that market data set.

On the other hand, the really good news is that once the market data set is selected, *none* of the variability is due to sampling. It is due *solely* to non-sampling errors -- measurement variance or bias, or misidentification of categorical variables. It is crucially important to understand this fact to avoid the application of non-relevant inferential statistic to the valuation problem.

As we move toward an auditable valuation[®] process and reporting mechanism, we see that the selection of the market segment, (the main data set), is the first step in making the model reproducible. Once the market segment is defined, the statistics are pure mathematics. There is no inferential variability due to sampling. We are dealing with a population or census of all relevant data, not a random sample. The balance of the algorithm is deductive/descriptive in nature, *not* inferential or sample-based.

II. The Science: method and philosophy of valuation

Even as we realize the logical, mathematical, descriptive statistics aspect of appraisal, it is important to consider the judgment and subjective aspects of modeling with the broader scientific method as our *prime directive*.

Science is concerned with deriving general laws from particular experiments. Typically this is not a single experiment, but is a repeatable process which tends to show consistent results. The overall process does involve inference from one successful application to another problem. In the first section, we have set up the deductive nature of the market delineation problem. But the scientific method is inherently an inductive-deductive iteration.

Such is the nature of appraisal. What is learned from a specific set of data for one appraisal is inductively applied to another subject property, another valuation problem. The process inherently involves inspiration, speculation, experience, guesswork, and considering other valuers’ or brokers’ or owners’ opinions.

Scientific Method

We will first look at the general concepts of scientific endeavor, and then consider how the scientific method applies to valuation. We consider the type of available data, the nature of the questions to be (or should be) asked, and the tools and technology available.

The scientific method comprises investigating phenomena, gaining new knowledge, and correcting and integrating prior knowledge. The phenomena

must be observable, measurable, pragmatic, and must be capable of specific principles of analysis – through deductive logic, or inductive probabilistic inferential analysis.

The opinion or conclusion of the investigation must be set out so as to be *refutable* -- capable of being proven wrong.

Scientific researchers must propose hypotheses or explanations, and design experiments or analyses of observable data. The research must be documented that others may follow. The documentation is such that not only can the work be read, understood, and reviewed, but that it can be reproduced. Refutability can only be supported if the steps taken are repeatable.

Other components common to scientific analysis are the process of documenting and archiving data, methodology, and reasoning and conclusions. Such a full disclosure process allows *statistical measures of reliability*.

Belief and intent

It is important to note that prior beliefs can alter observations, as well as color methodology and conclusions. It is the essence of the scientific method to acknowledge the human role of the investigator realistically. The potential for bias may arise from unspoken assumptions, from purposeful carelessness, (or subconscious motive), and use or misuse of an analytical model. Bias may also simply appear in the conclusion even as the sequence does not follow. Finally, it is important to note the role of *abduction*¹³ (aka, the educated initial guess), as well as induction and deduction. Sometimes the role of serendipity or just observing one anecdotal piece of information can greatly influence the path to breakthroughs and a modified hypothesis.

We are forced to conclude that the scientific method requires compliance with the key requirements of procedures, as well as *competence, integrity, and communication*. The scientific method requires not only critical thinking – but also background, imagination, and creativity. Darn.

Philosophy of Valuation

We see that the intent and results of the scientific method depend on some personal qualities. There is the additional factor of structural limitations. *What* science studies is also influenced.

These limitations can take the form of political/social influences. They can depend on the technological tools available. Later, we consider how these two factors influence the past regarding valuation, and set up the future. The

¹³ **Abduction** is a type of logical inference described by Charles Sanders Peirce as "guessing". The term defines the process of arriving at an explanatory hypothesis. This can be considered the result of appraisal 'experience' as a necessary component of professional competence. Abduction is actually the starting point of the *market – subject – optimal use* iterative loop.

capability and direction of scientific endeavor then falls into a context. That context is the philosophy of that discipline.

In addition to its reason for being, the philosophy of any discipline is concerned with its assumptions, foundations, methodologies, and implications. While on a daily basis, the philosophy of valuation may be of little or no interest to an appraiser – what we are considering here is the larger picture.

Given the great impact valuation can have on society, our *context, assumptions, standards, and practices are of great importance*. We will consider how financial and social needs, given new technological capabilities, may compel some new performance results.

There is little relevant literature on the philosophy of valuation. Awareness of philosophical differences arises as the historical and political influences in different countries affect international banking, legal, and financial needs. Some of these differences have been confronted and to some success resolved in the IVS (International Valuation Standards).

One major point of this paper is the *results of* some fundamental assumptions and accepted practices of appraisal may in fact be not as fully beneficial to the needs of society as they might.

So what are some of these basic questions which surround the assumptions, foundations, methodologies, and resulting implications of the valuation discipline?

Assumptions of valuation

We will do well to review the nature and types of assumptions. Hadley's classic, but simple definition was: "Price is a fact and value is an estimate of what the price should be."¹⁴

Assumptions (that which is taken to be true), are found in every valuation report. They typically can be reduced to these categories:

- **Integrity assumptions** have to do with the appraiser's independence, impartiality, and objectivity. While the standard appraiser *certifications* (required under USPAP) are not normally considered assumptions, they really are just that: assumptions. They have to do with truth, impartiality, personal interest, bias, financial contingency, standards compliance, personal responsibility, and assistance. A recipient of an appraisal so certified, also makes the assumption (or not) that they are true. (In other words, we assume that the appraiser's claim of being truthful is true).
- **Factual assumptions** have to do with the actuality of data or information. In USPAP¹⁵ they take three forms:

¹⁴ Hadley, A. T. *The Encyclopedia of Social Reform*. Ed. William D. Bliss. 1897. 1365. University of Virginia Library. Web. 11 Sept. 2010. <<http://www.calvin.edu/library/knightcite/index.php>>.

¹⁵ *Uniform Standards of Professional Appraisal Practice*. 2010-2011 ed. Washington, D.C.: The Appraisal Foundation, 2009. Print. p. U-28.

- Typical or normal assumptions found in virtually every report;
- Extraordinary assumptions – facts which *may* not be true;
- Hypothetical conditions – assumptions which *cannot* be true;

However, these three types of conditions fall under a broader set of conditions, characterized under scope of work issues. These prior, assignment-specific conditions identify the problem to be solved. Under USPAP, in addition to the above factual assumptions, they characterize the implied (as well as expressed) assumptions of why, how and for whom the process is to proceed (and their implications). These conditions include: client and other intended users; intended use; type and definition of value; effective date; and the subject and relevant characteristics.

While these other five elements can often be considered as factual, there can be decisions involved (which require deeper assumptions), and themselves can be ‘assumptional’ in nature. In particular, we will examine the nature of the most common definitions of *market value* as they relate to the deeper philosophical assumptions of valuation.

These factual assumptions seldom if ever are explicitly considered in individual assignments, yet go to the core of how and why appraisals are performed, their usefulness to clients, and larger results on society and the economy. They go to the essence of the philosophy of valuation.

- **Modeling assumptions** take place during the performance of analysis, or during the setting of the scope of work in an interview with the client. In the analytic process, the valuer must make abductive decisions. Such preliminary abductive decisions may then be validated or changed as the result of data analysis.

In traditional ‘three approaches’ methodology, this modeling decision may be as between the three approaches, or within an approach, such as modeling on yield capitalization or income capitalization.

In the more modern ‘data analytic’ econometric methods, modeling decisions are similarly made, but tend to be more specific in terms of the tool being applied. These include:

- setting boundaries of the overall data frame;
- market segmentation according to the five dimensions of market characterization discussed earlier;
- preliminary (or neighborhood) data description and analysis;
- setting a precision goal, reflecting the client’s needs and budget;
- providing exception handling, usually in the form of data outliers;
- curve fitting;
- exploring alternative priors, where Bayesian analysis is applied.

Most modeling decisions made within an analysis are clear cut. Similarly qualified professionals would make the same decision with little ambiguity. Other decisions themselves have some ambiguity, but the probability of economically significant impact is small, or the effect itself is small, and not significant from the final conclusions.

The last type of assumption is the most elusive and may be deceptive.

- **Definitional assumptions** have to do with communication. If we desire scientific rather than 'artful' results, we must have precise communication. Words are critical. Misunderstandings, equivocations, and even blindness to what is said – can have grave consequences. Like economic depression.

For us, the most important of these definitions is what is meant by *market value*. While this may seem like something obvious, or an intellectual exercise, it can in fact, have great impact. In our next sections on data analysis and auditable valuations[©] it is the possible disconnect between the application of market value in non-typical market conditions that becomes a foundational issue. Where we are going here is a path toward a solution to 'market value' in unusual times. What are the possible definitions of market value? Does our interpretation and definition of value have only a minor impact – or is it possible that it is near the root of our problems?

It is helpful here to look in a historical context, at the common explanations and definitions of market value. The time in history we will place ourselves is in the 1930's, in the US – the 'great depression' and again in the decade around 2010. Here we find similar challenges to what is 'market value.' We find similar needs other than the accepted belief that "market price is market value." As we shall see, everything is relative.

Market Value

In USPAP discussion of market value appears in two places. First, it is in the definitions section, near the front of the publication cited.

MARKET VALUE: a type of value, stated as an opinion, that **presumes the transfer of a property** (i.e., a right of ownership or a bundle of such rights), as of a certain date, under specific conditions set forth in the definition of the term identified by the appraiser as applicable in an appraisal. [**Emphasis added**].

Comment: Forming an opinion of market value is the purpose of many real property appraisal assignments, particularly when the client's intended use includes more than one intended user. The conditions included in market value definitions establish market perspectives for development of the opinion. These conditions may vary from definition to definition but generally fall into three categories:

1. the relationship, knowledge, and motivation of the parties (i.e., seller and buyer);
2. the terms of sale (e.g., cash, cash equivalent, or other terms); and
3. the conditions of sale (e.g., exposure in a competitive market for a reasonable time prior to sale).

The second appearance, in Advisory Opinion 22, is where the common definition currently required for all US federally-insured transactions is provided (This is not an actual part of USPAP, but is only advisory in nature).

Market value means the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

1. buyer and seller are typically motivated;
2. both parties are well informed or well advised and acting in what they consider their own best interests;
3. a reasonable time is allowed for exposure in the open market;
4. payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and
5. the price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

These two references provide a basis for discussing the fundamental issue of market value. The question we now work toward is: Is the appraisal profession providing the value truly *most useful* for long term social benefit given the loan security purpose?

In the definition of market value above, consider specifically the conditions:

1. buyer and seller each acting *prudently* and *knowledgeably*;
2. assuming the price is not affected by *undue stimulus*;
3. *typically motivated*;
4. *well informed* or well advised
5. *cash or comparable terms*;
6. normal consideration *unaffected by special or creative financing*

Without grinding on each of the above emphasized words, we note that in the first decade of the 2000's, we found similar conditions of over-exuberance on the part of both buyers and lenders. While this paper refers to the residential market, most of this discussion can be easily translated to the investment/commercial real property markets. We can note that many, if not most purchases of homes during the exuberant years had two motivational components: 1) a dwelling to provide shelter, and; 2) a speculative venture. Some buyers were purely speculators, having no intention of personally using the asset as a home. Any net rent income (if any) seldom was competitive to other investment instruments.

Our recent understanding is that buyers were ***neither prudent nor knowledgeable*** about speculative investments. They were subject to significantly *undue stimulus* of easy financing with little personal risk or investment. They were *not typically motivated* as a home buyer (for the property use, not for speculation). They were *neither well informed nor knowledgeable about basic economics, (wherein some fundamental or intrinsic value must finally support the "transaction price" value)*. The terms were *far from normal cash or cash equivalent terms* – the nature of the speculation required little or no cash. Finally and most tellingly, the sales were *greatly affected by special and massively*

creative financing. **Six of six requirements of this ‘market value’ definition are *not* met.**

Given that these several and specific conditions of market value were *not* true, is it still reasonable to consider a *transaction* price to reflect “market value.”? If six out of six requirements of market value are violated, should we perhaps be considering an alternative? Do prevailing market prices reflect the “normal consideration” under the conditions *required* to provide a market value. I submit that this value is something else. I suggest we call it a “market price,” or “most probable market price.”

But the problem may be even worse. It may be that the most common definition is *internally* inconsistent. (It cannot be both based on transactions, *and* meet the six fundamental conditions!) If there are *no* transactions meeting the six market value conditions, then it is *impossible* to estimate this value based on the presumption of a transfer of a property. At best, we would have to base our comparisons on *hypothetical* comparable sales.

In any case, it may be difficult to get out of the prevailing mental frame. Either the accepted definition(s) of market value are wrong, or misinterpreted.

The sad economic circumstances of the first decade of 2000 in the US frame a series of questions. Were the values given properties exaggerated? Were the appraised values, the ‘market’ values *correct*? Were they the *useful* values? Were they dangerous, misleading, biased, and independent of client pressures? Or were they simply a cultural tide and group blindness that could not be turned back?

Whether or not we believe this was a ‘group dysfunction mania’ or any other such label, let us know that something went wrong. We will first consider the reality, then what might have been done differently. Finally, in the last section, we will consider the opportunity for the valuation profession.

Market price or market value?

Here is what we know so far:

- Market *value* requires the “normal or typical premise”¹⁶;
- Market *price* reflects the transaction agreement;
- *Most probable market price* may not be normal or typical;
- *Most probable market price* may not be market value, as defined.

If we concede that six of six conditions of market value were not met in many markets in the US in the first decade of the 2000’s – then we must seek

¹⁶ *Uniform Standards of Professional Appraisal Practice*. 2010-2011 ed. Washington, D.C.: The Appraisal Foundation, 2009. Print. p. U-3 (Definitions). This general description of market value definitions summarizes the commonality conditions in three categories: 1) the relationship, knowledge, and motivation of the parties; 2) the terms of sale; and 3) the conditions of sale.

reconciliation of the question: **What would a market value then look like if it met the six conditions?**

IVS sums up this argument nicely and surprisingly on point:

Where normal market conditions are disrupted or suspended, or where supply and demand imbalances lead to market prices that do not meet the Market Value definition, the Valuer may face a **difficult valuation problem**.¹⁷ (Emphasis added).

Recall: Hadley's simple definition was: "Price is a fact and value is an estimate of what the price *should* be."

We are left with the question: If market price is not market value, what *should* the market value be? Where or how would we gain indicators of value which *do* meet the six conditions (where no such sales exist)?

Under USPAP, as noted above, market value **presumes the transfer of a property**. This appears to *compel* the use of actual comparable sales, which have *transferred* at an actual contract price. The same concept continues in the performance standards, such as SR 1-4, where *only* "comparable sales data" are noted as being required to "indicate a value conclusion."

This is our problem of logic: **the 'market value' paradox**

- Market value conditions must reflect:
 1. Prudent/knowledgeable participants
 2. No undue stimulus, such as easy financing
 3. Typical home-buyer motivation
 4. Buyers well informed, knowledgeable about the speculative risk
 5. Normal cash or cash equivalent terms
 6. No special or creative financing.
- Only market *prices* are to be used.
- Market prices do *not* reflect market value as defined.
- There are no sales abiding of the six conditions.

This is the **market value paradox**.

Is it possibly responsible for repeated market economic failures and major disequilibria? Is it possible that resolving this paradox might help us avoid future property and financing economic failures?

I believe the answer is yes. It is the duty of a profession to lead into a solution, not to follow or perpetuate a problem.

¹⁷ International Valuation Standards Committee. *International Valuation Standards*. Eighth ed. London: International Valuation Standards Committee, 2007. 31. Print.

If it is true, so long as the logical paradox remains, *an analytical value solution is not possible*. So long as the logical paradox remains, the profession must continue to equivocate on every appraisal report transmitted.

And what is the impact of 'market price' valuation in the exaggerated real estate price swings we have seen? The cycles are amplified rather than dampened.

In an upswing, the real (but lower), intrinsic value is ignored as long as possible, aggravating and exaggerating the market cycle upswing.

Then when the economy is down, desperately hoping to rise from the ashes, the newly found market (lender) exhibits *exaggerated restraint*. Now the market stays in a condition below the intrinsic long-run value, exaggerating the market cycle downswing.

Are we forever constrained to deliver a value which may not reflect real value? Yes we are – if we are constrained by the definition that *market prices* are the only reflection of 'market value.' There are **no** comparables for intrinsic value.

Is there an option? What can we do to escape the market value paradox?

We find hint of an opening in another place. The IVS.

The International Valuation Standards do agree that the "*market value*" concept and definition are fundamental to all valuation practice. However, IVS softens the requirement that only comparable properties be used.¹⁸

Market valuations are generally based on information regarding comparable properties. The Valuation Process requires a Valuer to conduct adequate and relevant research, to perform competent analyses, and to draw informed and supportable judgments. In this process, **Valuers do not accept data without question but should consider all pertinent market evidence, trends, comparable transactions, and other information. Where market data are limited, or essentially non-existent** (as for example with certain specialized properties), [or over-exuberant times?] **the Valuer must make proper disclosure of the situation and must state whether the estimate is in any way limited by the inadequacy of data.** All valuations require exercise of a Valuer's judgment, but reports should disclose whether the Valuer bases the *Market Value* estimate on market evidence, or whether the estimate is more heavily based upon the Valuer's judgment because of the nature of the property and lack of comparable market data. [Emphasis added].

It goes on:

Because changing conditions are characteristic of markets, Valuers must consider whether available data reflect and meet the criteria for *Market Value*.

Periods of rapid changes in market condition are typified by rapidly changing prices, a condition commonly referred to as *disequilibrium*. A period of disequilibrium may continue over a period of years and can constitute the current and expected future market condition.

It appears that under our interpretation of USPAP, and more so under IVS, intrinsic/fundamental market value should be reported, where market prices do not reflect the required elements of 'market value.'

¹⁸ International Valuation Standards Committee. *International Valuation Standards*. Eighth ed. London: International Valuation Standards Committee, 2007. 80-81. Print.

It can be argued that appraisers not only can, but should have considered these non-normal and non-typical market conditions. It does not matter that the conditions were very difficult. It does not matter that “everybody was doing it.” It may not even matter that USPAP specifically justifies such behavior via the subjective, permissive test of “*expectations of parties who are regularly intended users*” and “*what an appraiser’s peers’ actions would be.*”

So what might the solution be? Is there a value which would have exposed the gross deviation from the accepted definition of “market value”? How could we derive this different value? (We can call it the “economic value”).

The historical clue

We find some of the answer in a historical parallel from the 1930’s. This was a time of great parallel in real estate finance and property values. Another answer is the economist’s view on utility and personal welfare. First we will review the historical solution.

The Home Owners’ Loan Corporation (HOLC) began in 1933 during a housing and mortgage finance collapse. The HOLC was a government intervention designed to rescue borrowers while increasing the liquidity of mortgages. Does this sound familiar? The fundamental idea was that HOLC would acquire defaulted residential mortgages from lenders in return for bonds. Then the mortgages would be refinanced on more favorable and sustainable terms.

While the HOLC’s investment in any mortgage was limited to 80 percent of the appraised value of the property, the theory of ‘**appraised value**’ was different. They developed a theory of value using a combination of estimated market price, replacement cost of the house, and capitalization of the rental value. Thus the effective loan worked out to be greater than 80 percent. Both the cost and the rent capitalization indicators reflected other consumer goods, or at least provided alternative indicators of value other than transaction prices. (Today we would call this *economic obsolescence*, if we actually considered the aberrant market conditions).¹⁹

The microeconomist’s approach

Another viewpoint is that of the economist. The field of welfare economics can be considered to be focused on the optimal allocation of resources and goods based on utility or individual welfare. This relates to the study of income distribution and how it affects the common good. It compares real property utility against other consumer goods.

¹⁹ Ignoring the long-term economic disequilibrium does would not excuse the estimation of economic obsolescence, then adjusting market prices to economic value. Were we to provide a fundamental value alongside the market-price value, the ‘adjustment’ could be classified as form of ‘reverse’ economic obsolescence. This is all just a matter of perspective. It is a matter of value definition.

If we expand our list of data inputs to include, as IVS suggests: “all pertinent market evidence, trends, comparable transactions, and other information,”²⁰ then we may include *other economic indicators*. We affirm that the market value of a home, which provides shelter and other utility, **can be compared to other goods and services**. Not just to other homes.

Clearly, the overall price index has been more stable than home prices in the period 2006 to 2011. We can ask which economic indicators measure the overall value of goods and services. We can apply these as inputs to the basic real property value function.

Is it possible to provide a value which meets all of the conditions of market value as defined, when no market and no transactions meet those conditions? I contend it is possible, and the *destined future* of the profession. In the stock market this is called a ‘fundamental’ analysis. The analyst identifies the difference between the technical transaction price, and what the fundamental value ought to be, having removed non-rational market beliefs, behaviors, conditions, and assumptions.

What would it take to provide an intrinsic value or fundamental value alongside the “market price” estimate? Would it help if we could provide a reproducible product, capable of being replicated from the same stable database the original appraiser utilized? Would it help if we had a measure of the reliability of the result, based on the quality of the data, the appropriateness of the model used, and rigorous exception handling? Would it be possible to now incorporate the other indicators, including macroeconomic indexes? The answer is yes. We now have the technology to do this. All that is needed is the education and understanding of the modern tools and their proper use.

While the *market value paradox* may require a re-definition of market value, the profession can proceed to provide an alternative solution immediately.

III. The Opportunity: societal need and financial payoff

The language of Econometrics is statistics. If we have properly identified our market segment, then let us be clear, we have *all* the competitive sale data. We have the entire relevant population data set. We do *not* have a random sample. We do not want one. Frequentist sample statistics do not apply. All we are doing is describing and estimating/forecasting from the population data set.

We do not need nor want to use any inferential statistical tools because there is no *sampling* variability or error. There is none. If there is any error, it can only come from measurement or categorization error. But we need not deal with these independent variables as stochastic (having a distribution). We can (as a practical matter) deal with them as non-random. For example – a house is 1316

²⁰ International Valuation Standards Committee. *International Valuation Standards*. Eighth ed. London: International Valuation Standards Committee, 2007. 80-81. Print.

square feet (even though measurements may vary from appraiser to appraiser. These two concepts greatly simplify value analytics.

So let us review what is statistics and what is data analysis, and how they can lead us to auditable valuations. ©

What questions *should* be asked? What *should* be the value? Is “most probable” inherently a statistical definition? What is the “most probable selling price” given the truth of the six market-value conditions? How can we apply data analysis to arrive at an economic value?

Data analysis

Data analysis is a process:

1. Raw data is selected (our market segment selection);
2. The data is ordered and organized so that useful information can be extracted (usually tables and graphs)
3. A model is selected, tested, and used for an indication or conclusion;
4. The parameters of the model are applied to the subject property.
5. Finally, the estimate or opinion is communicated to the client, along with supporting information and other non-value incidental factual, informational, and opinion reporting. Again, the use of tables, graphs, maps, pictures, and words are properly combined to communicate the auditable path taken by the appraiser. The raw data is included in the report, or at a minimum, the identification of the stable data base, as well as the exact parameters of the data set is selected.

The solution difference between market price and intrinsic value is the use of other, non-property market variables, which compare the utility of housing to the utility of other consumer goods, including the value of leisure time.

Statistics

Statistics is a science pertaining to collection, analysis, interpretation, and presentation of data that it may become useful information and knowledge. Statistics can encompass *experimental* procedure, where the system is manipulated with before and after measurements taken. Another procedure is *observational* in that there is no real possibility of manipulating the data to provide alternative views. Such a procedure is called “*empirical*.”

Empirical is what valuers do. We deal with observational data.

A distinguishing feature of the empirical method is that the analyst must provide a higher degree of intuitive or experiential ability. This is the place of the abductive process – the initial judgment of the solution path and the model to be used. This abductive competence includes the choice of the data frame, initial choice of model(s), and preliminary data analysis using graphs and tables, leading to statistical methods.

Statistics is a tool providing us with numerical information, capable of objective mathematical manipulation to give us a defined result. More importantly, it gives us a measure of reliability or *precision* of that result (and more).

Statistics is the key tool to the use of the scientific method. As we proceed to the final section we will see how the proper use of statistics can provide us with an auditable work product.

1930 to 2030

We now have considered the legacy of appraisal services, historically constrained by data quality and availability. We recognize that in some areas and some countries where tractability and transparency of real estate transactions are still low, these methods may not be fully possible. But even in those cases, the result of statistical thinking, and the best auditable practices possible, results will always be superior to traditionally more subjective methods.

We have listed several elements of the valuation process from the level of fundamentals. We examined the importance of intended use, assumptions, and limiting conditions on the nature of the appraisal assignment. We have looked at the critical role of data quality and completeness. We touched upon the importance and interplay of model selection by the analyst. All this we reviewed in the context of the all-important observance (or lack thereof) of the common definitions of market value – the market value paradox.

The historical development of the appraisal process continues to influence the accepted practices and realities of the service. We reviewed the enabling data and analytical technology. We clarified the nature of the appraisal problem and the relation to the government regulations and professional standards. We have considered the context of the scientific method and the deeper issues of the philosophy of valuation, with particular attention to assumptions and the stated conditions of market value.

In the next section, we consider what the next step may be, given a more scientific approach to the valuation process, utilizing econometric statistical techniques under the properly interpreted definitions of the appraisal problem.

Taken together we see a future potential of technological capability meeting the real needs of society for a more stable real estate market.

IV. Auditability: The need and the possibility

Auditable work product is the promise for the reputational resurrection of the valuation profession. While the appraisal process and the experience of knowledgeable appraisers is an essential element, the profession has failed to keep up with modern technologies.

It is the natural outcome of the enabling systems and technology presented earlier in this paper. Advances in analytic methods, statistics, graphics, risk quantification and GIS (Geographic Information Systems), as well as educational potential – now enable superior analytics in the field of appraisal and asset analytics. Auditable valuations[©] significantly reduce the subjectivity in appraisal work. They are best implemented by those with strong experience and education in traditional appraisal methods.

Auditable appraisals[©] pose a significant opportunity for the profession, but present challenges for the inertia of the group culture. This section concludes with the tremendous potential, not only for appraisal, but for real estate finance.

Combined with a rigorous interpretation of definitions of market value, the real property valuation profession can provide a significant tool to prevent future economic turmoil, while enhancing the efficiency of financial markets related to investment portfolios, security agreements, and balancing derivatives.

The Auditable Appraisal

What are the important components for Auditable Appraisal[©]?

- Data set completeness, at least to include key model variables.
- Documentation of data selection, including outlier/exception handling.
- Clarity of model selection.
- Explicit integration of prior knowledge and current-market information.
- Leaving an audit trail throughout.
- Sensitivity-analysis interpretation of results, when appropriate.

While a traditional valuation can be *reviewed* with the reviewer forming an opinion as to the quality of the work, it does not include the act of reproducing or replicating the original analysis. (Although a reviewer can also act as an appraiser, providing his/her own opinion of value alongside his/her criticism of the original appraisal). Contrarily, an auditable valuation[©] can be reproduced, thus audited. This is the essence of the scientific method.

We will look at the advantages of the auditable service, and review the technology and procedures necessary to produce this service.

The general advantages are enormous.

- It combines the best aspects of qualitative and quantitative methods.
- Both equilibrium and game-theoretic economic aspects are accommodated.
- It explicitly clarifies objective and subjective aspects.
- The cost trade-off of objective/subjective aspects is explicit.
- A reliability measure is enabled.
- It is reproducible, therefore auditable.

- The clarity of the product actually reduces the need for audit or review.
- Trend analysis is explicit, through subject-market price indexing (a subset model of the auditable process).

A second, more specific advantage is that the numerical reliability score can be applied by clients to their own risk algorithm. This includes lenders and portfolio investors and that of derivative products. The implications are enormous. This is particularly so as the precision and accuracy of the initial product is so improved. The overall tractability of appraisal results is significantly enabled.

Portfolio evaluation, asset management, and analysis are hugely enhanced. What used to be a subjective assumption as to reliability of each individual property value can now be substantially objective and numerical. Regulation of appraisal licensees becomes much simpler, as a much more objective standard becomes available. Appraiser performance is significantly enhanced.

The third major advantage of an auditable product is that the market price value is quantitatively defined in terms of precision. This enables the addition of variables necessary to arrive at an estimate of the intrinsic-fundamental-economic value we suggested.

These additional variables can include national/international economic indexes and appropriate leading indicators. They can include variables more specific in terms of housing, as it may relate to the value of other consumer goods. Finally, they can include regional and neighborhood variables, down to specific information about local employment, its income demographic, and even specific plant openings, closings, major contracts, as well as construction and permit activity, even down to specific market participants.

Recall that the intrinsic value is corollary with *fundamental analysis* in financial instrument analyses. This is not a radical notion.

A “Tobin’s Q Ratio” for housing may become just as viable for real property as for companies listed on the stock market. Intrinsic value is fundamental value. It may be a better decision measure than the ‘market price’ comparison method. It may represent the true market value.

I believe auditable valuation is the natural result of the evolution of valuation to suit the needs of the public. It should be a ‘best practice’ of the valuation profession. In addition, a believable fundamental (intrinsic) value is needed. This can be done.

Technology and procedures

What are the specific process technologies needed for appraisers to produce an auditable product, capable of providing *fundamental* market value as well as the “most probable market price”?

The technologies necessary are computer skills, to include obtaining useful information over the internet. Implicit in the use of these information and process technologies, is the necessary training and experience for their use.

These include:

- Critical thinking and problem solving;
- Statistics, including preliminary data analysis and model selection;
- Graphics integral to the statistical methods;
- Geographic Information Analytics (GIA), to explicitly measure the locational dimension of value;
- Risk quantification;
- Vocabulary and definitional knowledge to integrate modern analytic methods with traditional appraisal terminology, to resolve apparent and real conflicts of meaning and subsequent equivocation issues.

Procedures include:

- Clear delineation of market segment, via the “five dimensions” construct;
- Quantification of key subject characteristics, suitable for data analysis;
- Data selection, exception handling, and procedural audit trail;
- Clarity and explanation of model selection;
- Explicit presentation of abduction, and Bayesian-prior integration;
- Deeper precision as to appraisal assumptions, including market value;
- Sensitivity-analysis, where model or market circumstances require client awareness (as a defined uncertainty issue).

While some of societies’ challenges here may be met by governmental intervention – it appears there is some real potential for the valuation profession to provide powerful and useful tools. These will of necessity require some real change in the culture. However, I believe that these organizational and cultural issues will follow the successful application of the technology.

In conclusion it appears that a reconsideration of some of the fundamental philosophy of valuation is needed.

A specific answer is two-fold:

1. Add the fundamental (intrinsic) market value to every report possible, in addition to the current ‘most-probable market price.’
2. Perform valuations such that they are auditable, as well as reviewable.