# Behavioral Theory and Residential Appraisal

*by James R. DeLisle*

During the past decade research into residential real estate appraisal has covered a range of pragmatic issues. Examples of this research include the isolation of the pricing effects of various attributes, methods of adjusting comparable sales for differential financing, and the application of microcomputers.[1] Although such

1. See John B. Corgel and Halbert C. Smith, "The Concept of Estimation of Economic Life in the Residential Appraisal Process: A Summary of Findings," *The Real Estate Appraiser and Analyst*, vol. 4, no. 4 (Winter 1982): 4-11; William F. Cantrell, "Scenic Easements: Evaluation Considerations," *The Real Estate Appraiser and Analyst*, vol. 49, no. 2 (Summer 1983): 61-67; Steven J. Foute, "Appraising and Underwriting the Energy Efficient Home: The Energy Mortgage Evaluation Method," *The Real Estate Appraiser and Analyst*, vol. 48, no. 1 (Spring 1982): 5-11; Benedict J. Frederick, "Effect of a Swimming Pool on Single-family Home Value," *The Appraisal Journal* (July 1981): 376-381; John B. Housel, "UFFI: A Potential Health Hazard in Residential Housing," *The Real Estate Appraiser and Analyst*, vol. 49, no. 2 (Summer 1983): 13-15; Fred E. Case, "Creative Financing Instruments," *The Real Estate Appraiser and Analyst*, vol. 48, no. 1 (Spring 1982): 45-58; James J. McBirney, "Real Estate Financing in an Inflationary Economy," *The Appraisal Journal* (October 1981): 495-508; C. F. Sirmans and Bobby Newsome, "Mortgage-Equity Valuation and Alternative Financing," *The Appraisal Journal* (April 1983): 240-254; Halbert C. Smith and John B. Corgel, "Adjusting for Non-market Financing: A Quick and Easy Method," *The Appraisal Journal* (January 1984): 75-83. For a review of computer applications see "Computer Connection," *The Appraisal Journal*; Lawrence A. Kell, "Selection of a Word Processing System for an Appraiser's Office," *The Real Estate Appraiser and Analyst*, vol. 48, no. 3 (Fall 1982): 32-33; and Scott G. McMullin, "Simple Computer Data Processing for Appraisers," *The Real Estate Appraiser and Analyst*, vol. 49, no.3 (Fall 1983): 31-37.

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research has helped practitioners identify more efficient solutions to appraisal problems and automate the residential appraisal process, it has not led to a unification of appraisal thought. Indeed, the narrow focus of much of the current research has created a fragmented array of techniques for dealing with the various issues and solutions that have been offered.[2] Professional associations have embraced much of this research and attempted to integrate it into textbooks and continuing education courses, but the time required to make such adjustments has created significant transitional problems for practicing appraisers. The absence of a comprehensive model of integrated research efforts helps explain the time lag. The purpose of this article is to fill this void by reviewing the wide range of behavioral research and fitting it into a unified framework. It will focus particular attention on the behavioral concepts that affect the market's search and price-setting processes. In addition to isolating particular types of behavioral research, the discussion will indicate how practitioners can increase the precision, validity, and reliability of individual appraisals by incorporating a behavioral perspective.

## *BACKGROUND*

The pragmatic orientation of most recent residential appraisal research is partially explained by the wide range of external forces that affect both the housing market and the operation of an appraisal business. The market perspective recognition of the potential pricing effects of external causes such as the energy crisis and alternative mortgage instruments has led to a variety of useful appraisal adjustments. From a practitioner's perspective the ability to apply quantitative techniques, computer-based models of the sales comparison approach, and automated business practices by means of microcomputers has triggered the need to reevaluate traditional appraisal practices. While not unacceptable per se, the emphasis on "how-to" research that has led to these contemporary issues has stagnated appraisal theory. Further, the absence of a unified body of thought has widened the array of techniques and treatments from among which individual appraisers must choose. The resulting ambiguity has helped legitimize fledgling appraisal associations and led to the further division of the industry. Similarly, the absence of a fully formal body of thought has helped professionals in other fields intercept business from appraisers. Finally, the absence of a fully integrated model exposes the industry to a range of external pressures in the form of legislative and judicial intervention in the appraisal process.[3]

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2. This point is best illustrated by reviewing the treatments for cash equivalency adjustments proposed by P. Barton DeLacy, "Cash Equivalency in Residential Appraisal," *The Appraisal Journal* (January 1983): 81; Everett Gevedon, "Equivalent Constants for Variable Rate Mortgages," *The Appraisal Journal* (July 1982): 403-409; Joseph B. Lipscomb, "Discount Rates for Cash Equivalent Analysis," *The Appraisal Journal* (January 1981): 23-33; Arthur L. Schwartz, Jr., "Cash Equivalency: Does it Really Adjust to Market?" *The Real Estate Appraiser and Analyst*, vol. 49, no. 3 (Fall 1983): 38-41.

3. Barry A. Diskin and James R. DeLisle, "The Use of Computer Technology by Members of the Appraisal Profession," *The Appraisal Journal* (April 1985): 186-199.

## *SIGNIFICANCE OF BEHAVIORALISM*

The objective of an appraisal is to predict the most probable price for specified real estate interests. The ultimate price will be the result of action by market participants who may be affected significantly by a wide range of externalities. Researchers have suggested how practitioners can adjust for changes in externalities. While their treatments may have been valid, the timing and significance of these changes have become increasingly difficult to predict, thus rendering them unreliable over time. Without an understanding of consumer behavior appraisers do not have systematic methods for identifying the different impacts of such forces across market segments. To increase the reliability and sensitivity of the residential appraisal process, appraisers must develop greater understanding of what types of externalities affect specific real estate markets and to what extent prices are affected. This point can be clarified by reviewing the behavioral inputs that contribute to the traditional sales comparison approach. Whether an appraiser uses a manual or automated market comparison system, several steps must be performed. They include

1. Compilation of an appraisal database
2. Acceptance of the appraisal assignment and definition of specific problems
3. Quantification of the subject property
4. Search for comparable sales
5. Adjustment of comparable sales to subject equivalencies
6. Consolidation or correlation of the final conclusion to obtain appraised value
7. Report generation

Market-based assumptions for each of the seven stages may improve individual appraisals by reducing the uncertainty around the most probable selling price. Some behavioral inputs are essential.[4] For example, only if the underlying database is expanded to include the variables used by the market in arriving at subjective values will an appraiser be able to analyze the same features as the market. Second, unless the rules of measurement for quantifying variables reflect the market's perceptions, valid adjustments cannot be assured. Third, unless the search for comparables produces a subset of the data that matches the pricing evidence used by the relevant market, an appraiser will have to rely on different evidence of value from that used by the market. Fourth, unless the adjustment process reflects the underlying utility functions of those market participants who ultimately affect the price of the property, precise estimates cannot be obtained. Finally, unless the consolidation of the evidence of value produces the same results as the pricing models of the market, defensible conclusions cannot be generated. This does not suggest that individual residential appraisals will be reversed in court, but that parties who can more efficiently produce appraisals (that is, mass appraisal firms) may intercept appraisal business.

4. Kenneth M. Lusht, "Most Probable Selling Price," *The Appraisal Journal* (July 1983): 346-354.

Although statistical or otherwise automated sales comparison models may help increase the efficiency of each stage of sales comparison analysis, the mere use of such "objective" technologies is not adequate to ensure valid results. Even if such methods enable appraisers to draw valid price inferences for a fixed point in time, the reliability of such techniques over time cannot be assumed. This is especially true with energy efficiency and financing variables that have inconsistent pricing effects across market segments and over time. In proposing greater emphasis on behavioralism in appraisal, it is important to note that behavioralism is not inconsistent with the use of automated appraisal techniques, but can actually help increase the validity of inferential, automated models and processes. For example, by being able to identify the most probable market segment for a particular property and to understand how that market will select and price real estate offerings, appraisers will be able to select and adjust comparables in such a manner that computer-based models will be more reliable than those that rely on purely mathematical or statistical bases.

## *EVOLUTION OF BEHAVIORALISM*

Behavioralism has had a subtle but inconsistent impact on appraisal throughout its evolution. Although it has only been recognized as a formal division of appraisal thought in the last 20 years its roots were laid at the turn of the century when appraisal first emerged as a distinct discipline. Richard M. Hurd provided one of the first formal statements of behavioral thought when he recognized the need to understand and incorporate market behavior in appraisal.[5] Departing from classical economists who relied solely on the income capitalization approach, Hurd stated that the value sought in appraisal was the value in exchange. Where market indicants deviated significantly from values indicated by capitalization incomes, he argued that the sales comparison approach should be employed. This departure from traditional thought triggered numerous arguments over the relative merits of the two approaches. Throughout the early 1900s researchers continued to search for a unified appraisal model. However, Frederick M. Babcock concluded that it would be futile to continue such debates since there was not a single approach but three valid approaches to appraisal: cost, income capitalization, and sales comparison.[6]

Researchers continued to debate the relative merits of the three distinct, formally recognized approaches, but none of the three emerged as the single, unified approach. Rather, the profession accepted a multistage approach that employed the reconciliation of the three approaches. Although the three approaches have been almost universally accepted, there are substantial variations in their application and relative importance. Despite the inconsistent treatment of the approaches

5. Richard M. Hurd, *Principles of City Land Values* (New York: Real Record Association, 1903).
6. Frederick M. Babcock, *Real Estate Valuation* (New York: McGraw-Hill, 1932).

to value, one consensus has been maintained throughout the evolution of appraisal: appraisals must be objective. The endurance of the commitment to objectivity is attested to by the industry's resistance to pressures brought by the Federal Housing Administration in the 1930s and the Veterans Administration in the 1940s.[7]

The objectivity criterion states that to be valid, appraisals must constitute detached, third-party predictions of probable sale prices. An appraised value should not be biased by the subjective beliefs of the appraiser. Similarly, appraisals should not reflect the speculative values that may result if an owner goes to unusual expense to change the highest and best use of a particular subject property. Rather than using these extremes, appraisers in the past have attempted to achieve objectivity by focusing on the "average" buyer's mentality. While it was an improvement over reliance on subjective criteria, this generalist approach lacks the precision gained by focusing on the most probable buyer for a particular property. Unless such perspectives are adopted appraisals will reflect a normative position, drawing on generalized beliefs rather than on the relevant market's standards.

#### RATCLIFF'S CALL FOR BEHAVIORALISM

In 1963 Richard U. Ratcliff offered a scathing criticism of traditional appraisal thought.[8] Ratcliff's premise was that there was only one approach to appraisal, the sales comparison approach, not three distinct approaches. He called for practitioners to view appraisals as problem-solving and decision-making processes. The transaction price was the beginning of real estate value analysis as well as its end. In order to advance the field Ratcliff called for the application of the scientific method. The development of a body of scientific knowledge and the application of that knowledge were essential to the survival of the discipline. Although he did not elaborate on how the scientific method should be applied beyond these basic premises, the appraisal profession was to rise to the challenge of applying it.

In the mid-1960s, Ratcliff continued his challenges to the appraisal profession.[9] He stated that almost all appraisal problems call for an estimate of the "most probable selling price." Market clearing prices conceivably could vary from what a sophisticated buyer "should" be willing to pay. The real challenge to appraisers is to minimize the zone of uncertainty around the most probable price. Since these prices are set by market participants, Ratcliff argued that appraisal theoreticians would have to integrate a greater understanding of market pricing processes into appraisal theory and practices. In 1972 Ratcliff identified explicitly two distinct schools of appraisal thought.[10] The first school concentrated on the mechanics

7. Frederick M. Babcock, *Federal Housing Administration Underwriting Manual* (Washington. D.C.: Federal Housing Administration, 1934); Veterans Administration, *Lender's Handbook*, Pamphlet 4-3 (Washington, D.C.: U.S. Government Printing Office, 1948).

8. Richard U. Ratcliff, *A Restatement of Appraisal Theory*, Wisconsin Commerce Reports 8, no. 1 (Madison: Wisconsin Commerce Reports, 1963).

9. Richard U. Ratcliff, *Modern Real Estate Valuation, Theory and Application* (Madison, Wis.: Democratic Press, 1965).

10. Richard U. Ratcliff, "*Valuation for Real Estate Decisions* (Santa Cruz: Democratic Press, 1972).

of appraisal, addressing the pragmatic issues surrounding individual appraisal applications. The second school concentrated on theoretical issues, addressing the extension of behavioralism to appraisal. A range of practitioners and theoreticians interested in the continued evolution of the appraisal have called for greater understanding of market behavior.[11] They contend that behavioralism is consistent with the objectivity criterion since accurate predictions of the results of the market's price-setting processes are contingent on an understanding of market dynamics.

## *APPLIED BEHAVIORAL RESEARCH*

### OVERVIEW

Applied behavioral research relevant to appraisal can be organized into macrotheoretical and microtheoretical elements. Macrotheoretical research focuses on comprehensive models that identify the elements and linkages employed in buyer decision-making processes. Microtheoretical research concentrates on individual concepts that fit into the market's overall decision-making processes. Understanding of both may provide insights that appraisers can use in making more accurate applications of the sales comparison approach.

### MACROTHEORETICAL MODELS

The roots of macrotheoretical models of buyer behavior lie in marketing. Developed to provide broad conceptual frameworks into which narrower, empirical research could be fit, macrotheoretical models are significant to appraisers because they provide insights into the behavioral responses of market participants who affect the prices of a particular piece of real estate. Awareness of the processes by which the market forms perceptions of the world which influence their attitudes and responses can also help appraisers predict the interactive effects of changes in a wide range of internal and external phenomena. In addition, an understanding of the broad level of market dynamics can help an appraiser evaluate the composition and level of effective demand for particular types of property.

Macrotheoretical models are commonly patterned after an input/output structure or the stimulus-organism-response (SOR) paradigm.[12] Regardless of their exact structure such models attempt to establish the links among the key steps in the pricing and acquisition processes. The steps typically included in macrotheoretical models are awareness of need, intention to purchase or sell, specification of evaluative criteria, search for alternatives, selection of an alternative, implementation of that choice, and monitoring and feedback. Satyasseela Brink attempted

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11. Peter F. Korpacz and Richard Marchitelli, "Market Value: A Contemporary Perspective," *The Appraisal Journal* (October 1984): 485-493; Jared Shlaes, "The Market in Market Value," *The Appraisal Journal* (October 1984): 494-518.

12. James Engel, David Kollat, and Roger Blackwell, *Consumer Behavior* (New York: Holt, Rinehart and Winston, 1973).

to extend the general macrotheoretical models of consumer behavior to the housing acquisition process.[13] His empirical tests suggest that the housing acquisition process can be modeled in a meaningful manner. Robin T. N. Flowerdew reported that the housing acquisition process is a special case of the multiattribute decision-making model in which the decision maker is forced to "satisfice" among conflicting objectives.[14]

To test the validity of applying established macrotheoretical models in analysis of housing markets, Edwin J. Doran extended the Howard and Sheth model to the residential product.[15] He concluded that search behavior for the housing product is compatible with a general model of buyer behavior, but it remains ill-defined owing to its complexity and the contingent nature of the relationships among variables. To clarify the significance of behavioral research to real estate, Mildred Ellen Roske provided an exhaustive review of the literature.[16] She concluded that behavioral research focused on several relevant issues: market structure and operation, the impact of societal concerns and values, the nature of fundamental transaction processes, and the development of transaction theory.

The diverse theoretical models explain some of the uncertainty surrounding how appraisers can use purely theoretical research. However, the results of research into such topics can be of use to practitioners. For example, the broad nature of search behavior suggests that the selection and adjustment of comparables should not focus on a narrow band of attributes, but should weigh all aspects of the housing product. Similarly, once beyond a cutoff point for selecting comparables, adjustments based on purely linear measures of attributes may be inappropriate since marginal values may be assigned to them by the most probable buyers. By refining these preliminary findings appraisers may be able to improve the reliability of assumptions made in the appraisal process, especially if they test theoretical results and adjust them to their own markets and appraisal assignments.

### MICROTHEORETICAL NOTIONS

Microtheoretical notions are individual concepts that constitute some broader phenomenon when linked together. Unlike macrotheoretical research addressing the links between these concepts, microtheoretical research isolates each concept. The contribution of such research to the appraisal process can be illustrated by reviewing research on the factors that affect the search processes of buyers and their internal decision making. To suggest how such research can reduce the am-

13. Satyasseela Brink, "A Preliminary Study Towards Developing a Model of Consumer Home Purchase Behavior" (Ph.D. diss., Purdue University, 1975).

14. Robin T. N. Flowerdew, "The Logic of the Decision Process in Residential Choice" (Ph.D. diss., Northwestern University, 1977).

15. Edwin J. Doran, "An Empirical Specification of a Model of Buyer Search Behavior in the Single Family Residence Market" (Ph.D. diss., University of Santa Clara, 1977).

16. Mildred Ellen Deyo Roske, "Analysis and Organization of Human Residential Space Transaction Theory and Research as a Foundation for Education" (Ph.D. diss., University of Oregon, 1975).

biguity surrounding treatments of various situational factors, the contribution of microtheoretical research into decision making is also reviewed.

### SEARCH PROCESSES

The search processes of home buyers have received significant attention from behavioralists. Norman Miller demonstrated that differential transaction costs related to the search for a home affected probable prices.[17] Roy Ira Miller characterized the household as a goal-setting entity which employs a systematic search process including the initiation of search in response to a stimulus, the generating and testing of goals, the selection of information sources to guide the search, and the search itself.[18] His results suggest that the housing search process is affected by migration status (intraurban versus interurban), exigency of move, family size, family composition, and prior tenure. Harry E. Kruekeburg and James Purcell monitored the search processes of households that contacted real estate brokers.[19] Their research revealed that buyers can be grouped on the basis of their firmness of intent to purchase when they first contact a broker. Households that had definitely decided to buy before contacting a broker looked at properties for an average of 94 days compared to 128 days for those undecided at the time of contact.

The research into buyer search processes has several implications for residential appraisers. With the selection of comparables appraisers should first separate markets into segments and then adjust the selection of comparables to echo differences in search behavior. Since interurban search patterns are typically narrower than intraurban patterns, shorter time periods and closer geographic areas may be more appropriate when selecting comparables for houses that appeal to the interurban market. Similarly, Kruekeburg's results indicate that the type of listing or brokerage relationship may be significant to appraisers in specifying and adjusting comparables. The results also suggest that if an appraiser can isolate the motivations of the probable buyers, he or she may be able to select comparables with matching time frames.

Research into internal factors influencing housing choice has focused on two issues: family structure and husband-wife decision making. Kenneth Lee Bernhardt attempted to establish an additive model of husband-wife influence based on the nature of their interactions during each major phase of the decision-making process.[20] Each of the spouses dominated certain intermediate stages while the final decision generally represented a joint effort. The net influence of each spouse

17. Norman G. Miller, "The Influence of Market Transaction Phenomena on Residential Property Values" (Ph.D. diss., Ohio State University, 1977).
18. Roy Ira Miller, "Simulating an Urban Housing Market: Learning From an Aborted Attempt" (Ph.D. diss., University of Wisconsin, 1978).
19. Harry E. Kruekeberg and James Purcell, "Factors Associated with the Home-Buying Decision-Making Process," Bureau of Business Research, Indiana State University (September 1974).
20. Kenneth Lee Bernhardt, "Husband-Wife Influence in the Purchase Decision Process for Housing" (Ph.D. diss., University of Michigan, 1974).

varied according to household income, relative age, and education. Gary M. Munsinger, Jerry Webster, and R. W. Hansen reported that the occurrence of joint decision making in the housing acquisition process was correlated with a congruence of spouses' perception of their relative roles.[21] Donald Hempel and Subhash Jain concluded that role structure influenced certain intermediate decision stages such as housing search, and that role congruence was associated with a shorter duration of search.[22]

The insights into the decision making of buyers provided by such behavioral research reveal that a range of internal factors may have a significant impact on search patterns and prices. To capture such effects appraisers should first profile the most probable buyer for a particular property. Based on this, adjustments can reflect differential search and decision processes. Such efforts may result in a better targeting of comparables as well as the generation of more valid adjustments.

Situational factors consist of the externalities which may have an impact on the search, selection, or pricing decisions of households. The potential contribution that behavioral research into situational factors can make to appraisal is illustrated by financing effects and operating period effects. Studies of financing effects have dominated residential appraisal research over the past decade. This attention has been a direct response to the need for guidelines that practitioners can use to adjust for such externalities. For example, Ken Garcia noted in 1972 that appraisers must first adjust noncash sales into their "cash equivalents" before they are used in appraisals.[23] Donald R. Epley and William Burns investigated the impact of borrowing costs on market prices.[24] They chastised appraisers for ignoring the impact of specific financial arrangements between the seller and purchaser (for example, negotiations for allocating settlement costs, terms of second mortgages and purchase money mortgages). Such oversights might well lead to misspecifications of final transaction prices.

In the 1980s research into the differential effects of financing on residential prices has dramatically increased as a result of a practitioner's need to deal with the explosion in new types of financing arrangements. One line of this research has consisted almost entirely of articles explaining the mechanics of particular types of financing.[25] Other research has addressed how appraisers should adjust com-

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21. Gary M. Munsinger, Jerry Webster, and R. W. Hansen, "Joint Home Purchasing Decisions by Husbands and Wives," *Journal of Consumer Research* (March 1976): 57-67.

22. Donald Hempel and Subhash Jain, "House Buying Behavior: An Empirical Study in Cross-Cultural Buyer Behavior," *AREUEA Journal* (Winter 1978): 2-21.

23. Ken Garcia, "Sales Price and Cash Equivalents," *The Appraisal Journal* (January 1972): 107.

24. Donald R. Eply and William Burns, "The Correct Use of Confidence Intervals and Regression Analysis in Determining the Value of Residential Homes," *AREUEA Journal* (Spring 1978): 70-85.

25. Fred E. Case, "Creative Financing Instruments," *The Real Estate Appraiser and Analyst*, vol 48, no.1 (Spring 1982): 45-58; Arthur L. Schwartz, Jr., "Cash Equivalency: Does it Really Adjust to Market?" *The Real Estate Appraiser and Analyst*, vol. 49, no. 3 (Fall 1983): 38-41; C. E. Danek, "Creative or Favorable Financing and its Effects on Value" *The Real Estate Appraiser and Analyst*, vol. 49, no. 2 (Summer 1983): 31-33; Roger P. Sindt and Donald Nielson, "A Conceptual Analysis of Financial Impacts of the 1982 Supreme Court Decision on Due-on-Sale Clauses," *The Appraisal Journal* (January 1984): 60-74; G. Stacy Sirmans, C. F. Sirmans, and Stanley D. Smith, "Adjusting Comparable Sales for Assumption Financing," *The Appraisal Journal* (January 1984): 84-91.

parable sales to arrive at a cash equivalency basis.[26] The attention financing effects have received and the fragmented array of solutions offered underscore the importance of developing a formalized, integrated, behaviorally based body of appraisal thought. Despite the plethora of articles on the topic researchers have failed to note the differential effects that financing has across market segments. Thus, while researchers have been able to identify quantitative treatments for particular types of financing, they have oversimplified the process; across-the-board adjustments cannot be made. For example, if a subject property appeals to a market of migrating retirees who tend to cash out, financing will not affect probable bid prices. However, if the probable buyers for the adjacent property are dual-income households operating on tight budgets, financing may have significant impacts. Although tax-exempt bond programs may tend to inflate prices, the market may not have the time to evaluate and internalize them in pricing decisions. To counter such confounding effects appraisers must be able to draw on behavioral research to identify the "most probable" buyer, establish the importance of financing to that class of buyers, identify the "most probable" financing for the subject property and the comparables, and then make appropriate adjustments to comparable sales.

The second major issue examined by behavioralists addressed the impact of operating costs on housing selection and pricing. Research into property tax burdens, public services, and energy efficiency illustrate this line of research. The influence of property taxes on housing prices has been investigated by numerous authors.[27] In most cases researchers have reported that where there is an overlap of taxation districts within an urban market and differential tax rates across tax boundaries, property tax levels have a negative influence on prices. The effect of public services on property values has received even greater attention in the literature than the impact of property taxes.[28] Although no consensus on the magnitude of such influences has been reached, most authors report a positive correlation between the level of public services and the prices that housing commands in an urban area. Nonna Noto observed the interactive effects of property tax burdens and levels of public services on prices.[29] His research reveals the negative capitalization of the property tax into selling prices and the positive correlation

26. John B. Corgel and Paul R. Goebel, "Financing Adjustments Via Cash Equivalency: Evidence on Accuracy," *The Real Estate Appraiser and Analyst*, vol. 49, no. 1 (Spring 1983): 55-61; James A. Graaskamp and Timothy Warner, "Cash Equivalent Value of Real Property," *The Real Estate Appraiser and Analyst*, vol. 49, no. 3 (Fall 1983): 43-48; Sirmans, Sirmans, and Smith, "Adjusting Comparable Sales for Assumption Financing."

27. Courtney A. Haff, "Critical Variables in Land Tax Assessment for Housing: An Application of Factor Analysis" (Ph.D. diss., New York University, 1976); Albert M. Teplin, "Fiscal Incentives to Residential Location: Baltimore City and Baltimore County" (Ph.D. diss., John Hopkins University, 1975).

28. Konstantinos C. Koutsoulos, "The Impact of Mass Transit on Denver's Residential Property Values" (Ph.D. diss., University of Colorado, 1975); Foh-stang Tang, "Detection and Estimation of Transportation Impact with Models of Suburban Residential Property Sales Prices" (Ph.D. diss., University of Pennsylvania, 1975).

29. Nonna A. Noto, "The Effect of the Local Public Sector on Residential Property Values in San Mateo County, California" (Ph.D. diss., Stanford University, 1976).

of quality of schools and prices. However, his conclusions also suggest that municipal expenditures and other measures of public services cannot be used as reliable predictive variables.

The pricing impact of energy efficiency provides an additional example of how purely pragmatic, quantitative research may depart from the objectivity criterion on which appraisal is based. In the past several years a variety of methods have been suggested for adjusting the pricing effects of energy efficiency, ranging from ignoring the attribute altogether to including it as one of the limited number of variables in regression models.[30] Some researchers have even coined their own treatments of energy adjustments such as the "energy mortgage value" method.[31] Although each of these methods may be rationalized on some purely quantitative grounds such as net present values, they cannot be accepted as valid. In particular, researchers have failed to determine if the market assigns quantitative values, or if there are different effects of energy costs across market segments.[32] Thus, while some treatments may be appropriate for the average buyer, they may not be suitable for certain income or age segments. For example, for low-income households with severely constrained purchasing power, housing costs due to higher-than-normal energy efficiency ratings may not be recovered by sellers. Ironically, rather than increasing values, comparables that have high efficiency ratings but otherwise appeal to such a market may need negligible, if not negative, adjustments. Similarly, households at the upper end of the income spectrum may prefer—and be able to afford—building designs and special features that are not energy efficient. In such cases adjustments that might be assigned for relative levels of efficiency would clearly be inappropriate.

## *A FORMALIZATION OF THE BEHAVIORAL MODEL*

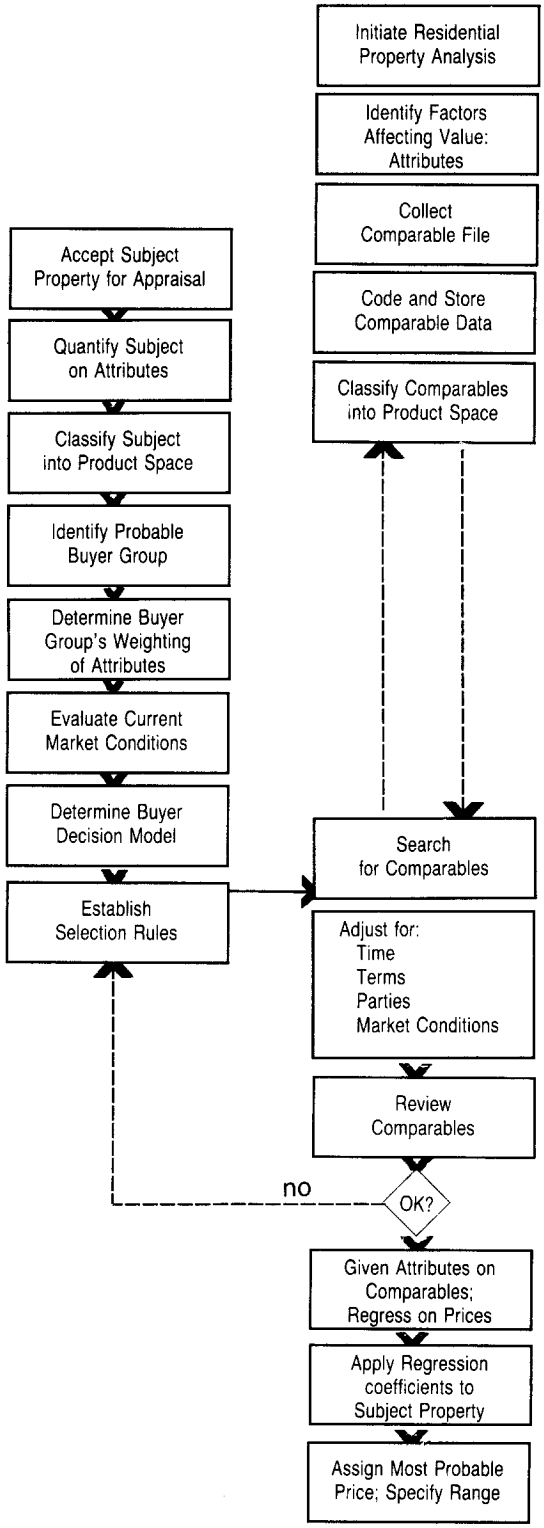
This review of macrotheoretical and microtheoretical research is meant to provide a status report on the "school of behavioralism" and to suggest how such behavioral research may improve the appraisal process. In recognition of the marginal profits on individual residential appraisal assignments, however, it is obvious that behavioral research will have to be put into better operation before it can make a direct contribution to practitioners. Despite this caveat the pragmatic and behavioral schools of appraisal thought noted by Ratcliff can and should be in-

30. John B. Corgel and Halbert C. Smith, "The Concept and Estimation of Economic Life in the Residential Appraisal Process: A Summary of Findings," *The Real Estate Appraiser and Analyst*, vol. 48, no. 4 (Winter 1982): 4-11; Thomas A. Dorsey, "Appraisers as Energy Experts," *The Real Estate Appraiser and Analyst*, vol. 48, no. 3 (Fall 1982): 40-49; Steven J. Foute, "Appraising and Underwriting the Energy Efficient Home: The Energy Mortgage Valuation Method," *The Real Estate Appraiser and Analyst*, vol. 48, no. 1 (Spring 1982): 5-11; Thomas B. Ricker, "The Solar Economics ABCs," *The Real Estate Appraiser and Analyst*, vol. 48, no. 4 (Winter 1982): 12-17; Charles H. Wurtzebach and Steven Cassin, "Multiple Regression Analysis: A Valuable Tool for Mass-land Appraisal," *The Appraisal Journal* (April 1983): 213-234.

31. Steven J. Foute, "Appraising and Underwriting the Energy Efficient Home," 5-11.

32. James R. DeLisle, "Residential Appraisal: A Behavioral Approach to Energy Efficiency," *The Appraisal Journal* (January 1984): 41-47.

FIGURE 1
Market Comparison
(According to Ratcliff Weighted Simple Linear Regression)



tegrated with appraisal practice since purely mathematical and statistical techniques are inadequate to validate appraisals. If appraisal is to emerge with a unified, fully formalized body of thought, the integration with behavioralism is essential. To begin this process it is useful to review an integrated framework upon which such efforts can be built.

Figure 1 presents a graphic abstraction of the sales comparison approach. The sales comparison approach can be organized into three stages: the pre-appraisal stage, the appraisal stage, and the post-appraisal stage. In the pre-appraisal stage the appraiser must create a database sufficient to support ongoing appraisals. Four intermediate steps should be taken to ensure that the database can support behaviorally based appraisals. First, the appraiser should conduct exploratory research to identify the housing attributes which the market uses in its selection or pricing decisions. Second, the appraiser should explore the local housing market and develop a comprehensive classification model encompassing the major types of market offerings. This clustering process should attempt to identify product groups which—although not similar in a traditional sense—may be considered as alternatives by the most probable buyers. Since market segmentation is critical to behaviorally based appraisals, residential databases should be expanded to include socioeconomic and demographic data. Finally, the appraiser should establish some systematic method for matching the subject property to the class of properties to which the market will assign them. This goal can be furthered by noting data on the characteristics of sellers, and if available, profiling actual buyers and feeding such data back into the database.

The first step in the actual appraisal stage of a particular assignment is the specification of the magnitudes of attributes that a subject property possesses. While this task is also required in a more traditional sales comparison analysis, there is a philosophical difference in a behavioral approach. In nonbehavioral applications attributes can be selected on an ad hoc basis or through some statistical technique such as stepwise regression.[33] Furthermore, questions about rules of measurement can be based on purely quantitative measures such as square footage, heating and cooling systems, and lot size. In a behavioral model, however, both the selection of attributes and their units of measurement must be market-based. Appraisers should consider various physical and psychological factors that may affect the perception of product attributes by the most probable buyers of the particular property.

Once the subject property is quantified the property must be assigned to the correct subset of market offerings. Although this matching process might appear similar to that of the traditional approach, there are significant philosophical differences between the two. In most traditional models a database is stratified by minimiz-

33. James R. DeLisle, "Toward a Formal Statement of Residential Real Estate Appraisal Theory: A Behavioral Approach" (Ph.D. diss., University of Wisconsin, Madison, 1981).

ing the physical differences among properties.[34] In a behavioral model, however, the subject property should be grouped with other properties for which market participants perceive a similar use, not with the most homogeneous subset. To do this the appraiser must specify search rules that will yield comparables competitive in the eyes of the most probable buyers. Once the correct comparables are selected, the traditional adjustment process can be conducted. Once again, rather than relying on purely statistical or ad hoc procedures, the behavioral model should attempt to apply adjustments drawn from the uses sought by the most probable buyers.

The output from the appraisal stage of the behavioral model is similar to that of the traditional model in that some dollar estimate of value must be generated. In the behavioral application—as in contemporary appraisal—a point estimate must be accompanied by an explicitly stated range of possible prices.

As in traditional models the post-appraisal stage includes the reporting of the conclusion to the database. Socioeconomic variables of buyers should also be reported to validate the segmentation portion of the analysis. Through a process of continuous monitoring, deviations from predicted prices in subsequent transfers of a property should be noted. Where such deviations are significant or suggest a change in market processes or probable buyers, exploratory research should be conducted to modify measurement, specification of comparables, or adjustment processes.

## *CONCLUSIONS*

The objectives of this article have been to review behavioral appraisal research and provide a unified model into which research efforts can be integrated. The discussion began with a statement of the objectivity criterion and noted how this goal can better be satisfied by the integrated use of behavioral concepts. After a brief review of the evaluation of behavioralism, several examples of contemporary behavioral research were summarized and their operational implications noted. The selected behavioral research was divided into macrotheoretical and microtheoretical elements. Based on this foundation an abstraction of the sales comparison approach was presented to indicate how behavioralism can be synthesized into actual sales comparison analysis. This model can also be used to guide future behavioral research efforts. In the meantime practitioners can use the framework as a screening model to filter out new techniques, refine current processes, and build better databases.

34. Arnold Tchira, "Comparable Sales Selection—A Computer Approach," *The Appraisal Journal* (January 1976): 86-98.