Residential Appraisal

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and the Lending Process:
A Survey of Issues

Abstract. **This article surveys mainly academic literature for issues concerning the use of appraisals in the residential lending process. The development of appraisal methodologies is reviewed, and the strengths and weaknesses of various appraisal techniques are assessed. Issues relating to the use of neighborhood characteristics in appraisals for lending purposes are also explored. Finally, institutional incentives that give rise to biased and self-serving appraisals and possible solutions to these incentive problems are examined.**

Introduction

Real estate appraisals have long been an important part of the underwriting and lending decision process. The primary role of appraisals in the loan decision process is to provide evidence that the collateral value is sufficient to avoid losses on loans once they are originated. This article surveys mainly academic literature on the use of appraisals in the residential lending process.

This article is organized as follows. The second section examines the role of appraisals in the loan decision-making process. Section three surveys the literature dealing with methodological issues in appraisals. In this section, the evolution of appraisal techniques is discussed, and the strengths and weaknesses of each technique are assessed. Section four examines the issue of whether neighborhood variables should be included in appraisal models. Section five addresses potential agency problems between appraisers and lenders. The last section is the conclusion.

Mortgage Default and Appraised Value

The principal theoretical and empirical support for the use of appraisals in the underwriting process is found in the mortgage default literature. Much of the research on mortgage default has tested the relative importance of negative equity and factors related to the borrower's ability to pay as determinants of mortgage default. Most of this research (von Furstenberg, 1969, 1970; Herzog and Earley, 1970; von Furstenberg and Green, 1974; Jackson and Kaserman, 1980; Campbell and Dietrich, 1983; Foster

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and Van Order, 1984, 1985; Kau, Keenan, Muller and Epperson, 1987; Titman and Torous, 1989; Hendershott and Schultz, 1993; Kau, Keenan and Kim, 1993; and Vandell, Barnes, Hartzell, Kraft and Wendt, 1993) conclude that the dominant cause of mortgage default is negative equity.[1] In other words, the loan-to-value ratio over time has been shown to be the most important factor triggering loan default.[2]

One clear result of the default research pertinent to residential appraisal is that both the point estimate of value (the expected value) and the dispersion (typically the variance) of house prices are important information items for underwriters. An appraisal report, however, normally provides only a point estimate of value. To minimize the risk both of default and of loss in the event of default, a lower initial loan-to-value ratio would be warranted for a given point estimate if house prices are expected to show considerable variability, the more so if the risk of price depreciation is high. While traditional appraisal methodology lacks the ability to provide information about the variability of appraised value estimates, the contemporary grid method has begun to address this problem. This issue is examined in section three.

Another major problem in the underwriting process is that an appraisal provides an estimate of property value as of a specific date (generally a time proximate to the loan origination decision), yet the decision to default is triggered by the value of the property at some future time. What is needed is a way to connect current estimates of value with the possibility of value change over time. Some recent empirical research suggests that one important element of this intertemporal connection is neighborhood characteristics and their effect on the borrower's motivation to default over the expected life of the mortgage. Questions remain, however, concerning whether legitimate grounds exist for including neighborhood variables in models used for loan underwriting purposes. Research on this issue is examined in section four.

In 1986, the House Committee on Government Operations issued a report concluding that faulty and fraudulent appraisals were an important contributor to the losses suffered by the federal government in its deposit insurance and guaranteed home mortgage programs and that they played a crucial role in weakening major financial institutions.[3] The documented and anecdotal evidence that provided the basis for the report indicated that lenders have incentives to demand biased appraisals, that appraisers have incentives to accede to the wishes of lenders and other clients and that effective restraints are needed to prevent such self-serving behavior. Section five surveys agency-related issues.

Evolution of the Appraisal Methodology

The sales comparison (or market) approach is the most frequently used approach for estimating the market value of residential properties (including single- and multi-family residences). Traditionally, the sales comparison approach has utilized the adjustment-grid method, which is the required method for most appraisals of single-family houses for lending purposes.[4]

It is common knowledge that the implementation of the traditional grid method has been regarded as art, not science (see Gau, Lai and Wang, 1992, p. 122). Lipscomb

and Gray (1990, p. 54) suggest that appraisers often rely heavily on their experience and subjective judgment in making adjustments. Colwell, Cannaday and Wu (1983, p. 23) indicate that an appraiser's choice of the weight of each comparable is largely a matter of judgment tempered by experience.

Research aimed at improving the traditional adjustment-grid method is referred to below as first-generation research. In general, the concern of this research is with improving the point estimate of the appraisal value. The variance of the estimator is neglected. Typically, these studies seek to improve both the selection of the elements of comparison (the adjustment variables) and the accuracy of the adjustment estimates (the adjustment coefficients).

In the 1970s, the multiple-regression method, or the hedonic pricing model (as it came to be called), emerged as a useful alternative to the adjustment-grid method for estimating property values.[5] Most appraisal textbooks advocate this method as an essential tool for mass appraisals. For a typical appraisal assignment, however, this method has been criticized because it requires far more observations, i.e., recent sales, than can generally be obtained from the relevant market area (see Colwell, Cannaday and Wu, 1983, p. 20), and it demands difficult decisions as to the correct model specification (such as selection of the correct functional form and the appropriate independent variables).[6] A less commonly mentioned but potentially more serious problem is the high standard error of the estimated (fitted) value obtained from regression models, which is frequently too large to render the appraisal estimate useful for mortgage loan underwriting.[7] Given the typically high initial loan-to-value ratio (usually at least 80%), lenders should want to know, with a high degree of confidence, that the market value of the property is greater than the loan amount.

We refer to research efforts to improve the application of multiple regression to appraisals as second-generation research. Most studies in this category are concerned with making improvements to hedonic pricing theory in general. Relatively few studies aim specifically at improving regression methodology for uses in appraisal.

In the early 1990s, techniques known as the contemporary grid methods evolved to minimize the second moment of the appraisal estimates by combining the traditional adjustment-grid method (using similar properties as comparables) and the regression method (using the regression coefficients as unbiased adjustment coefficients). The objective of these techniques is to minimize the subjectivity associated with the traditional adjustment-grid method. We refer to research on the contemporary grid method as third-generation research.[8]

Traditional Adjustment-Grid Method: First-Generation Research

Colwell, Cannaday and Wu (1983) provide an analytic foundation for the adjustment-grid method. They are also one of the first to suggest using the hedonic price coefficients estimated from a regression equation as the adjustment factors for the adjustment grid.[9] In addition, they raise the interesting possibility that the adjustment-grid method could be superior to the multiple-regression method if an omitted variable

problem exists.[10] This seminal article provides a more scientific approach for the grid method and provides a foundation for both the second-generation and third-generation studies. Their study, however, does not address issues related to the selection and weighting of the comparables, a process that frequently requires an appraiser's subjective judgment.

Adjustment Coefficients. A traditional alternative to regression coefficients for deriving the adjustment factors is the paired-sale technique. Although it has been widely used in the appraisal field for some time, a theoretical foundation for the paired-sale technique was not provided until Palmquist (1982). Palmquist demonstrates how a paired-sale technique can be used to measure environmental effects on property values. Grissom, Rudy, Robinson and Wang (1987) and Lipscomb and Gray (1990) offer guidance on how to apply the paired-sale technique in appraisal assignments.

The paired-sale technique, which seems appealing at first glance, is difficult to implement in the real world. In its pure form, this technique requires the recently sold properties (comps) in each pair to be virtually identical in all material respects except for the one element of comparison (or variable) requiring adjustment. Furthermore, the appraiser needs to find such a paired sale for every element that requires adjustment. Since it is nearly impossible to find perfectly matched pairs for all elements of comparison, the appraiser frequently must make prior adjustments in order to equalize comparables within each pair with respect to all other elements of comparison. The sequential-pair technique developed by Grissom et al. (1987) is a method for creating paired sales when all other elements are not identical.[11]

Under circumstances in which an appraiser is able to find such a data set (where every element has at least one paired sale), the multiple-regression technique will yield an identical set of adjustment factors by using the same set of data. In other words, the data constraint is more serious for the paired-sale technique than for the regression method.

Yet another problem is to determine the appropriate adjustment factor when an appraiser finds multiple paired-sales and obtains different adjustment factors from each of the pairs. In such a situation, there are no clear criteria for deciding which pair the appraiser should use. Because the paired-sale technique cannot remove subjectivity from appraisal assignments, it may be an inferior substitute for the regression method even though data constraints may dictate its use.

We do not mean to suggest, however, that the paired-sale technique should be totally rejected. When used with other methodologies, this technique is particularly useful for estimating property appreciation or depreciation rates. However, a sufficient number of paired sales are needed to establish a reliable pattern of price movement. A single observation of the appreciation rate extracted from a randomly selected paired sale could deviate greatly from the true value. When paired sales (particularly in the special case of repeat sales) are used in a regression analysis, it has been suggested that the coefficient of the time variable would be suitable for the establishment of a price index for a geographic area (see Case and Shiller, 1990; Case, Pollakowski and

Wachter, 1991; and Goetzmann, 1992 for a discussion of this technique; see Clapp and Giaccotto, 1992, 1994 for a discussion of alternative methods).

In certain situations, moreover, the paired-sale technique might be the only viable option for appraisers. For example, in the event of limited or very diverse information (a small number of observations or a high variation among the observations), the variance of the point estimate generated from the regression method might be too large to render the estimate meaningful. Under these circumstances and also in cases where several comparables are very similar to the subject property, it is possible that the paired-sale technique may result in more reliable adjustment estimates than can be obtained from a regression model. Research is definitely warranted into the trade-offs between these two methods to provide guidance for determining when each should be selected.

Survey Method. An intuitively appealing technique for determining the adjustment coefficient or the weight of each element (variable) is simply to ask (or survey) individuals about their willingness to pay for certain property characteristics (or attributes). Arandal and Ives (1974) and Brookshire, Ive and Schulze (1976) quantify aesthetic value by using a survey technique (a bidding game). Thayer (1981) and Brookshire, Thayer, Schulze and d'Arge (1982) provide a sound theoretical basis for the survey method, although they also imply that successful application of the survey method critically depends on the existence of an informed populace with market experience regarding the attributes in question.

Kroll and Smith (1988) are probably the first to establish a framework for applying the buyer's response technique to improve the comparable selection and adjustment process in single-family appraisals. Their goal is to achieve more accurate market value estimates by incorporating survey information obtained from recent home purchasers. The survey method, albeit ad hoc in nature at present, could become an important tool for valuing real estate in the future. Given the infrequent trading problem faced in the real estate field, the survey method could be a useful method for incorporating the most recent information into the valuation process. Further research into applications of the survey method to appraisal should be encouraged.

Multiple Regression Method: Second-Generation Research

Although Bruce and Sundell (1977) report that regression analysis was used for appraisals as early as 1924, theoretical justifications for the use of the regression method (hedonic pricing model) for property valuation were advanced at a much later date. The pioneers who applied hedonic price theory to the real estate and urban economics fields are Tiebout (1956), Lancaster (1966), Muth (1966), Oates (1969) and Rosen (1974).[12] Difficulties arise in implementing the theory because it does not specify the estimation method, the functional form and the number or kinds of variables to include, nor does it provide guidance on how to select the sample period or the sample area.

The ordinary least squares (OLS) linear regression is the estimation method most frequently used in academia and the appraisal field. However, it is well known that

the distribution of residuals is typically heteroskedastic (see, for example, Randolph, 1988); and that the residuals are typically spatially correlated (see, for example, Dubin, 1988).[13] In addition, evidence indicates that a non-linear functional form specification is preferred over a linear specification (Halvorsen and Palmquist, 1981; Dubin and Sung, 1990; and Burgess and Harmon, 1991). Multicollinearity can also be a problem. When two or more independent variables are highly correlated, the presence of multicollinearity distorts the interpretation of the relative effects of any independent variable (see Gau and Kohlhepp, 1978, for a survey of this issue).

Other problems encountered in estimating hedonic pricing equations include the delineation of homogeneous submarkets and the selection of an estimation period. Butler (1980) and Bajic (1985) propose that a homogeneous market be used as the sampling area in order to minimize estimation error, but a consensus has yet to evolve on how to define a sufficiently homogeneous market, especially given the need for a large number of observations. Mark (1983) investigates the extent to which the coefficients of a housing equation are stable over time, finding that instability of the coefficients increases with the length of the estimation period. Parsons (1990) and Smith and Huang (1994) indicate that market conditions are important when determining the estimators of hedonic coefficients because variations due to local conditions can be significant.

Indeed, controversies over model specifications and estimation methods have not ceased since the creation of the hedonic pricing model. For the purpose of this article, however, only three issues relevant for the valuation of single-family residences are reviewed. The first two issues involve the selection of variables. The third involves ways to deal with the small-sample problem that is commonly encountered in residential appraisal.

Unlike the capital asset pricing model, but similar to the arbitrage pricing theory, hedonic pricing theory indicates neither the optimal number nor the kinds of variables that should be included in a valuation model (hedonic equation). Furthermore, the problem cannot be resolved empirically. A review of papers that utilize hedonic pricing techniques provides ample evidence that diverse views on correct model specification exist. Atkinson and Crocker (1987) present an interesting statistic on variable selection. They identify a total of 110 distinct variables in a review of fifteen representative hedonic studies. Yet a typical hedonic study includes only about sixteen variables.

Traditionally, a hedonic study requires selection of location, especially neighborhood, variables as well as property-specific variables. When regressions are applied to data gathered from different neighborhoods, dummy variables can be used to capture the effects of the collective characteristics of each neighborhood on value. To appraisers, however, variables related to neighborhood characteristics are not particularly important because the observations (comparables) are generally drawn from the same neighborhood (or very similar neighborhoods). When all comparables are collected from the same neighborhood, the assumption is that neighborhood characteristics are constant across properties in the neighborhood so that they need not be explicitly

included in the estimation of the value of a subject property located in that neighborhood. However, neighborhood characteristics may need to be included in an appraisal if an appraiser desires to project price movements in the future. This topic is addressed more fully in section four. Apart from neighborhood characteristics, another set of neighborhood variables that could affect property values are neighborhood externalities (a topic discussed in the following subsection).

The Impact of Externality Variables. Empirical studies indicate that externalities located within or adjacent to neighborhoods affect property values. The pioneering studies on the impact of externalities on property values apply to neighborhood parks (Kitchen and Hendon, 1967; Hendon, 1971, 1973, 1974; Weicher, Weicher and Zerbst, 1973; Correll, Lillydahl and Singell, 1978; and Vaughan, 1981. The consensus is that parks can exhibit either a positive or a negative effect on the value of properties close to the park. The determination of a positive or negative impact is based on the trade-off between the benefits derived from using and/or viewing the park and the exposure to nuisances (such as noise) associated with proximity to the park. The early studies also report that the relative impact on property value differs among various socioeconomic groups.

Although the methodologies of the earlier studies are not as sophisticated and their data sets not as comprehensive as more recent hedonic studies, the studies provide great insights into the appraisal issue. First, they demonstrate that proximity to certain externalities affects property value. Second, a similar externality can produce different types of impacts on property values. Third, the magnitude of the impact varies with the characteristics of the neighborhood.

Subsequent hedonic studies examine the impact of different externalities on property values. Research on the proximity to industrial properties and refineries (Li and Brown, 1980; and Flower and Ragas, 1994), airport and nuclear power plants (Nelson, 1980, 1981; Webb, 1980; and Gamble and Downing, 1982), public housing or non-residential uses (Grether and Mieszkowski, 1980; Gabriel and Wolch, 1984; Rabiega, Lin and Robinson, 1984; and Farber, 1986), power lines and railways (Poll, 1978; and Colwell, 1990), churches and schools (Jud and Watts, 1981; Jud, 1985; and Do, Wilbur and Short, 1994), earthquake-prone areas, hazardous waste sites and landfills (Michaels and Smith, 1990; Kohlhase, 1991; Reichert, Small and Mohanty, 1992; Smolen, Moore and Conway, 1992; Thayer, Albers and Rahmatian, 1992; and Murdoch, Singh and Thayer, 1993) in general confirm the finding that externalities affect property values. In addition, the consensus is that the magnitude of the impact of an externality on property values is a function (linear or nonlinear) of the distance to and size of the externality (see Sirpal, 1994, for a discussion of the size issue).[14]

Krumm (1980) is the first to examine a micro-level type of external influence, specifically, the appearance of surrounding properties, on the values of adjacent properties. Along a similar vein, Wang, Grissom, Wells and Spellman (1991) examine the impact of rental properties on the value of surrounding residences. Both studies find that the appearance of the surrounding environment, even in the absence of a particular visible externality, affects property values. Wang et al. (1991) also find that

the number of and distance to rental properties surrounding a subject property determine the price impact on the property. Their findings have two important implications. First, the magnitude of the impact is not trivial. They report that the impact of proximity to rental properties could be 2% to 5% of the property selling price. Second, the cost of estimating the impact is likewise nontrivial, involving a detailed and time-consuming data gathering effort.

For the purpose of appraisals, the implications of the externality studies can be mixed. It is not clear whether we should encourage appraisers to quantify those influences when performing an appraisal assignment. On the one hand, the inclusion of externality variables improves the estimation of property price. On the other hand, such improvement is costly. This latter consideration is particularly important given current concern about the costs of purchasing a home, including the costs of appraisals. An empirical investigation of the trade-off between an improvement in efficiency in the underwriting process and an increase in costs of appraisals is encouraged.

Transaction Variables. Another set of variables whose selection has been an issue are transaction variables. These variables are also referred to in the appraisal literature as ''condition of sale'' variables. Empirical studies find that transaction characteristics unrelated to the physical property can affect the sales price of a property. The transaction characteristics examined in the literature include the settlement period (see, for example, Asabere and Huffman, 1993a), taxes (see, for example, Do and Sirmans, 1994), assumption financing (see, for example, Sirmans, Smith and Sirmans, 1983), time on the market (see, for example, Asabere and Huffman, 1993b) and foreclosure or distressed real estate (Forgey, Rutherford and Vanbuskirk, 1994; and Shilling, Benjamin and Sirmans, 1990). Asabere and Huffman (1992) even report that a cash transaction can reduce the price of a property by 13%.[15]

It is common knowledge that the impacts of the above transaction variables on property values vary in each sale. Estimation of the willingness to pay would be difficult. Appraisal textbooks often offer the following suggestion for handling these types of transactions: discard them if a sufficient number of comparables (observations) are available, if not, try to estimate adjustments for these characteristics. But even if appraisers have sufficient comparable data, is it advisable for them to delete such transactions? Further study of the trade-offs between the two strategies is clearly warranted.

The Small-Sample Problem. One of the most serious problems in applying the regression method to valuing real estate is the problem of small samples. We discuss two examples of methodologies that have been developed to address the small-sample problem when applying the regression method to real estate appraisal.

One method, developed by Cronan, Epley and Perry (1986), involves a rank transformation of variables by ranking the comparables from best to worse. While the methodology seems appealing, the statistical properties of the estimator are unclear.[16] In addition, given that the method involves a comparison among all comparables, the result could be extremely sensitive to the sample selected.

It is well known that nonparametric regression estimation requires far less attention to the issue of functional form. Meese and Wallace (1991) use a nonparametric technique (locally weighted regression) that allows flexible estimation of the hedonic's curvature at median attributes and that is less sensitive than the standard regression to the influence of unusual observations.[17] While techniques of this type appear to offer a promising solution to the data limitations confronted by appraisers, further investigation of the statistical properties of the estimators and the reliability of such techniques is needed before they can be adopted by practicing appraisers.

The Real Problem. One of the most serious problems involved with the application of the regression method to appraisals has yet to be adequately addressed in the literature: the large standard error of the regression estimate. The high standard error of estimates reported in most hedonic studies might render the fitted values useless (for example, see the standard errors reported in Vandell, 1991, Tables 2 and 3). Indeed, when the standard error of estimate is normally 10% to 30% of the estimated value of residential properties, we fail to see that the appraisal can contribute very much to the underwriting process.

Intuitively, the problem is easy to understand. When a fitted value is used, all the observations used in the regression receive certain weights in determining the value of the subject property. When comparables differ significantly from each other, the variance of the estimate will certainly increase. The contemporary adjustment-grid method appears to be a better alternative than the regression method precisely because it implicitly places more weight on ''more similar'' comparables.

Contemporary Adjustment-Grid Method: Third-Generation Research

The recently developed minimum-variance grid method substantially reduces (if not eliminates) the subjectivity inherent in making adjustments with the traditional grid method. Vandell (1991) is the pioneering work for building the contemporary grid method (see Gau, Lai and Wang, 1994; and Green, 1994 for a discussion of the related issues, and also of the minimum-coefficient-of-variation grid method). In general, the appraisal value derived from using contemporary grid methods has two preferred statistical properties: unbiasedness and minimum variance.

The implementation of the contemporary grid methods involves two steps. First, as suggested by both Colwell, Cannaday and Wu (1983) and Vandell (1991), the coefficients estimated from a hedonic pricing equation are used as the adjustment factors for the adjustment-grid method. The adjustment coefficients obtained in this manner will be unbiased. Second, the selection of comparables and their weights is based on their contribution to the variance of the appraisal value of the subject property. Intuitively speaking, the method assigns more weight to comparables similar to the subject property and, consequently, avoids the high standard error problem associated with the regression method.

It seems fair to say that the minimum-variance grid method developed by Vandell (1991), and the closely related minimum-coefficient-of-variation method developed by

Gau, Lai and Wang (1992), combine the best parts of the adjustment-grid and regression methods. Both methods offer the promise of moving the development of appraisal methodology closer to that of a science. Both methods have been shown to have the important property of reliability: when two appraisers perform the same appraisal assignment by following the same method and using the same set of data, they will obtain the same value estimate. Nonetheless, the distribution properties of the grid estimator of the minimum-variance grid method remain largely unknown. Therefore, similar to the traditional adjustment-grid method, it is not yet possible to construct a confidence interval or to perform hypothesis tests of an estimated property value with the minimum-variance grid method. Lenders and investors, for example, may want to know whether a particular price (say, the offering price) is statistically different from the estimated property value. The inability to perform such analyses has rendered the contemporary adjustment-grid method less valuable than the multiple regression method.

Lai and Wang (1996) recently investigated the statistical properties of the minimum-variance grid estimator. Comparing the statistical properties of the minimum-variance grid estimator and the multiple regression estimator, they found that although both estimators are unbiased, the variance of the prediction error of a minimum-variance grid estimator should be lower than that of a multiple-regression estimator under realistic scenarios (*i.e.*, when the number of comparables is sufficiently large). They also derive a technique to estimate the confidence interval for the minimum-variance grid estimator. With the aid of this technique, the minimum-variance grid method is more complete.

Nonetheless, questions about the use of the contemporary grid methods still remain to be investigated. One question concerns the optimal allocation of the observations between the grid method and the regression method. This is an important issue because observations used in the regression may not also be used as comparables in the grid and only a finite number of suitable observations is available for a market area. An increase in the number of comparables decreases the variance of the grid estimator (Gau, Lai and Wang, 1992, p. 114). On the other hand, an increase in the number of comparables results in a decrease in the number of observations for a regression. This, in turn, increases the estimated variance of the residual and reduces the accuracy of the estimated adjustment coefficients. In view of this trade-off, further research on the optimal allocation of the observations is needed.

Second, future research could also focus on the trade-off between the marginal gain in variance reduction and the marginal cost of increasing the number of comparables in the grid method. This research, by extension, has implications for whether the current policy of using three comparables in the grid method is reasonable. Third, as is true for every new proposed methodology, empirical validation of the contemporary grid methods is required before the techniques can be adopted in day-to-day appraisal practice. Finally, the added costs and time to perform a minimum-variance grid method are nontrivial. Whether the benefit of the reduced variance can justify the

added costs is an empirical question, and a consumer choice. Computer software that can perform the minimum-variance grid method would be one way to lower the cost.

A Side Issue

The valuation of financial assets (stocks and bonds) differs dramatically from the valuation of real estate assets (properties). When developing a valuation technique for financial assets (such as the capital pricing asset model or the arbitrage pricing theory), data availability is rarely the main consideration in the development of the model. The location boundedness, nonhomogeneous production and noncontinuous trading of real estate assets imply that the quantity and quality of available data will generally play an important role in directing the selection of an appropriate valuation method. More sophisticated methods always require more data (observations) than less sophisticated methods. The more sophisticated methods sharpen the value estimate because they utilize more powerful statistical techniques and because additional comparables add information. Research on the trade-off between the benefit of using a more sophisticated methodology and the cost of gathering additional data should be a high priority.[18]

The development of techniques that can remove (or, at least, substantially reduce) subjectivity in the appraisal process will be one of the most important contributions to the real estate field. Otherwise, real estate valuation will always remain an art rather than a science. At the same time, the methodology developed for the valuation of real estate must be somewhat unique because of data constraints. This is why the contemporary grid method holds great promise for real estate appraisal—it offers to reduce subjectivity while accommodating the inherent data constraints present in the appraisal field.

Selection of an appropriate appraisal methodology has public policy implications. As mentioned earlier in connection with issues of variable selection, an important question is whether or not variables related to neighborhood characteristics should be included in appraisals, and particularly in appraisals for mortgage lending purposes. We turn to this issue next.

Neighborhood Variables

To minimize losses from default, lenders must be concerned not only with current estimates of property value but also with projections of future value. Since it is well-recognized that neighborhood characteristics have an important impact on contemporaneous and future home prices, it seems reasonable to assume, following Schill and Wachter (1993), that current and projected neighborhood characteristics are an important element of mortgage risk assessment.[19]

Moreover, evidence that home values in different types of neighborhoods can have different appreciation paths has important implications for the use of mass appraisal techniques as a shortcut method of collateral assessment. Lenders with a heavy loan

exposure in neighborhoods with price paths below the average for the broader sample area can receive inflated indications of price trends affecting their collateral if they relied on such mass appraisals, thereby increasing their collateral risk.

Questions remain, however, about whether neighborhood variables are legitimate indicators of potential adverse influences on future property values, and thereby of the probability of default. Li and Rosenblatt (1995) contend that although a clear relationship no doubt exists between neighborhood characteristics and home prices, little empirical work exists to actually justify the inclusion of neighborhood indicator variables in mortgage lending models.

If current home prices reflect contemporaneous and expected neighborhood characteristics, then current prices are sufficient information on which to base underwriting decisions. The empirical issue here is, how informationally efficient are housing markets? Although it cannot be said that the hypothesis that housing markets are efficient has been rejected, the preponderance of empirical research indicates that housing markets, and real estate markets generally, are not highly efficient (see Case and Shiller, 1989, 1990; Quan and Quigley, 1991; Gatzlaff, 1994; Barkham and Geltner, 1995; and Hendershott and Kane, 1995 for a representative sample; Gatzlaff and Tirtiroglu, 1995, review empirical studies of real estate market efficiency). If housing markets are not informationally efficient, then neighborhood characteristics could be potentially relevant factors in mortgage risk assessment if they can be shown to be significantly related to the movement of house prices.

The Side Effect of Neighborhood Variables

The question of whether neighborhood variables should be included in appraisals for loan underwriting purposes takes on added importance in view of public policy concerns with the potential adverse impacts of mortgage screening practices on lending decisions in lower-income and ''protected'' minority neighborhoods.[20] A potentially serious problem is that variables representing neighborhood characteristics are frequently highly correlated with a neighborhood's racial, ethnic and income composition. In addition to creating well-known estimation problems, the high degree of correlation among neighborhood variables can lead to adverse impacts on loan applicants in low-income and ''protected'' minority neighborhoods if they are used for mortgage decision-making purposes. Recently enacted federal legislation has served to highlight trade-offs between comprehensive risk assessment, including consideration of possible effects of neighborhood characteristics on future price volatility, and possible disparate adverse impacts on minority and low-income neighborhoods arising from appraisal reports and underwriting criteria that give weight to certain neighborhood variables.[21]

The release of data mandated by the Home Mortgage Disclosure Act (HMDA) and the results of the Boston Federal Reserve Bank study of mortgage lending practices (Munnell, Browne, McEneaney and Tootell, 1992) served as catalysts for an intense debate over the adverse impacts on loan applicants from minority neighborhoods and the discriminatory effects of various mortgage screening policies and practices,

including appraisals (Bradbury, Case and Dunham, 1989; Gabriel and Rosenthal, 1991; Carr and Megbolugbe, 1993; Berkovec, Canner, Gabriel and Hannan, 1994; Holmes and Horvitz, 1994; and Ferguson and Peters, 1995). These two events have stimulated renewed interest in the role of neighborhood characteristics in residential real estate appraisals, especially those performed for purposes of mortgage loan decision-making. Civil rights and other public policy advocates argue on behalf of a public policy interest in assuring that minority neighborhoods receive an adequate supply of mortgage credit to substantially increase minority home ownership rates and to support a level of real estate transactions and investment sufficient to stabilize home prices and prevent neighborhood disinvestment,[22] even if this means widening the scope of prohibited variables to include neighborhood characteristics highly correlated with minority group status.[23] On the other hand, defenders of conventional lending and underwriting practices argue for a legitimate business interest in considering all variables material to originating sound loans.

Federal legislation prohibits consideration of variables related to borrower demographic characteristics (especially ethnicity, race, religion, sex) for purposes of mortgage loan underwriting. Lenders, and by implication appraisers, bear the burden of proof to justify that any contested variable meets a legitimate business need of the lender.

Rachlis and Yezer (1993) maintain that in order to demonstrate that a neighborhood variable satisfies a legitimate business need, it must be shown to have a significant relation to the initial estimate of property value (*i.e.*, the appraisal estimate at the time of loan origination), to the variance of this initial estimate (''appraisal risk''), to expected price appreciation at the time of loan origination, and to the variance of the appreciation estimate (''appreciation risk''). Beyond this, however, these relationships must be shown to play a significant role in triggering default and determining foreclosure loss. Essentially, the business need test is based on demonstrating a relationship among the particular neighborhood characteristic, the current and expected future collateral (property) value and the risk of default and consequent loan losses.

Unfortunately, little specific guidance is available at present as to which neighborhood variables meet the test of serving a legitimate business need. We can, however, look to the urban economics and urban sociology literature for help in identifying neighborhood effect variables related to sources of mortgage risk. Neighborhood effect variables are, in essence, variables representing neighborhood characteristics that affect all properties in the neighborhood in more or less the same way.[24]

Neighborhood Variables and Neighborhood Changes (*Succession*)

Neighborhood variables that have been shown to have important effects on neighborhood quality (and through their effect on neighborhood quality on the values of homes located in the neighborhood) can be grouped as follows: the characteristics of the population, particularly income, socioeconomic status and racial/ethnic characteristics (Schnare, 1976; Li and Brown, 1980; Galster, 1982, 1990; Bond and

Coulson, 1989; Dubin and Sung, 1990; and Chambers, 1992); the characteristics of the housing stock, especially the age, appearance and upkeep of the housing stock (Muth, 1973; Sweeney, 1974; and Arnott, Davidson and Pines, 1983); and the quality of community and public services, especially local schools and law enforcement (Dubin and Goodman, 1981; Jud and Watts, 1981; and Dubin and Sung, 1990). Interpretations of the effect of variables related to race/ethnicity and socioeconomic status on neighborhood quality are the least clear of the above variables because they may be either direct measures of household preferences and prejudices or proxies for other measures of neighborhood quality, such as the crime rate or the quality of local public schools.

The body of literature dealing with causes of neighborhood succession provides an understanding of key forces of neighborhood change and price movements in neighborhoods over time (Muth, 1973; Sweeney, 1974; McCann, 1975; Brueckner, 1977; Phillips, 1981; and Fogarty, 1982). Traditional theories of neighborhood succession focus on the aging and depreciation of the housing stock, with the rate of depreciation a function of the level of maintenance.

More recent analyses of the process of neighborhood change pay considerable attention to the preferences of households regarding neighborhood demographic composition, especially the neighborhood's racial/ethnic mix, socioeconomic status and income levels and ranges. The analyses attribute the higher rate of house price decline in transitional neighborhoods (relative to more demographically stable neighborhoods), controlling for age of the housing stock, to changing demographics and to the reactions of higher income households, particularly white households, to those changes.

Bond and Coulson (1989) integrate filtering effects based on the age of the housing stock and neighborhood externality effects of population change. Their results show that neighborhood decline is a function of both the age of housing stock and the percentage of higher income households that remain in the neighborhood through time.[25] They demonstrate that once a neighborhood obtains some unspecified percentage of low-income households, the bid price of higher income households for housing units in the neighborhood will fall below that of low income households, and the neighborhood will convert to mainly (if not exclusively) low-income status. The notion of neighborhood racial "tipping" has also received attention as a source of house price instability (Chambers, 1992; and Galster, 1990).[26]

The Challenge

Although empirical evidence on the issue is mixed, a majority of the studies we examined suggest that underwriters and appraisers should not neglect neighborhood characteristics if they are concerned about changes in property value over time and risks to loan quality posed by those changes. Unfortunately, as Schill and Wachter (1993) and Rachlis and Yezer (1993) point out, the choice of which neighborhood variables should be included in valuation models for mortgage loan purposes remains

largely arbitrary. Little theoretical justification exists for why particular variables should be included.

Further research is needed to identify which neighborhood variables have a significant relationship with sources of mortgage risk and to clarify how these variables influence the movement of housing prices over time (neighborhood house price dynamics). In this endeavor, it is meaningful to be able to distinguish between neighborhood variables that have direct effects on neighborhood quality and those that are really proxy effects of other variables. An important challenge, although it will be difficult to accomplish, is to find a way to incorporate significant neighborhood variables in appraisals that will not contribute to discriminatory lending practices. A scientific investigation that takes both social costs and underwriting efficiency into consideration should be encouraged.

Until now, we have concentrated on appraisal methodologies. Implicitly, we assume that appraisers will act unbiasedly so that methodology is the only important issue for an unbiased and accurate appraisal estimate. However, this assumption might not hold in the real world. Appraisal error occurs even if an appraiser uses the correct methodology. The issue is whether appraisers have incentives to produce biased appraisals even when applying the best available methodologies.

Agency (Incentive) Issues

An appraisal is a decision-making tool used to facilitate a real estate transaction. In a typical lending situation, an appraiser has a duty to function as a fiduciary by performing as a disinterested third party and rendering an objective and unbiased estimate of value untainted by the influence of personal or business interests. Agency-type problems arise in appraisal when one or more of the parties to the transaction directly seek to influence the outcome of the appraisal or indirectly attempt to bias the outcome of the appraisal through the incentives offered to appraisers.

In this section, we deal with two separate but related issues. The first issue addressed is, what are the significant agency problems in professional appraisal practice? The second issue is, what solutions can effectively deal with these problems?

Does an Agency Problem Exist?

When the compensation of a loan officer is directly related to the amount of the loan the agent generates, the loan officer has an incentive to make sure that the deal is not called off because of a property's low appraised value. At the same time, an appraiser who knows that an appraised value below some amount will kill the deal is concerned about receiving future business from a client with an interest in the deal if the appraisal produces a value estimate that is ''too low.'' In such circumstances, both sides of the table create pressures for an appraiser to provide a high estimate of value.

In other circumstances, however, appraisers may face pressure to provide a low estimate of value. When a lender judges an appraiser based on the number or

percentage of appraisals that lead to bad loans, it will be in the appraiser's best interest to provide a low estimate of value. Lenders under regulatory pressure to make only ''good loans'' may desire appraisals that undervalue collateral to justify lending limitations. Moreover, lenders who engage in discriminatory lending practices may desire appraisals that undervalue collateral to support redlining practices.

In an oversight report issued in 1986[27] and also in a report accompanying the Real Estate Appraisal Reform Act of 1988 (H.R. 3675),[28] the Government Operations Committee of the House of Representatives alleged that faulty and fraudulent appraisals were a significant factor contributing to the banking crisis of the 1980s.[29] The reports were critical of the lack of objectivity and professional integrity on the part of appraisers who acceded to the wishes of clients (lenders, real estate brokers, developers and others who made their living from fees, commissions, salaried bonuses and profits tied to real estate deals) to provide the ''right'' (*i.e.,* the deal-making) estimate of value.

Academic research also provides evidence of agency problems in appraisal, although research that examines agency problems in the appraisal profession is sparse. From a sample of appraisals for loan originations obtained from lenders,[30] Ferguson (1988, p. 25) found that the number of appraisals that provided estimates above the contract sales price was statistically significant. He interpreted the result as evidence that most residential appraisals performed for lenders are not truly appraisals (objective estimates of value) but rather justifications for the requested loan amount. Ferguson also found that 81% of the independent appraisal firms' appraisals were above the contract price in contrast to 63% of staff appraisers' appraisals.[31] Ferguson attributes the difference to the greater pressure faced by independent appraisers to come in ''high'' because many lenders and other potential clients tend not to offer much business to independent appraisers with a reputation for ''tight'' appraisals.[32]

Contrary to the findings of Ferguson, Dotzour (1988) found no evidence of bias in appraisals of the market value of single-family homes performed for corporate relocation firms.[33] The result led him to conclude that appraisers, using current appraisal methods, show no systematic tendency either to overvalue or undervalue single-family owner-occupied houses. Dotzour's method of measuring appraisal error, however, may not have been well suited to detecting appraiser bias in the particular sample he used.[34]

Proposed Solutions to the Problem

Congressional concern over the adverse impact of incompetent and fraudulent appraisals on the U.S. financial system gave rise to the appraisal reform section, Title XI, of FIRREA. Title XI established procedures for the regulation of the appraisal industry, including a requirement for the certification and licensing by all states of appraisers involved in federally-related real estate transactions.

In several Congressional hearings held on the implementation of the appraisal reform provisions of FIRREA, representatives of appraisal organizations argued that a

mandatory state licensing and certification system for real estate appraisers not only improves the level of appraiser competency, but also provides accountability, something that was missing before passage of Title XI. Under the licensing and certification system established by Title XI, an appraiser can lose the right to work in the business if (s)he intentionally high-balls or low-balls an appraisal to give clients the value estimate that they want.[35] Representatives of consumer groups testified that the accountability of state-certified or -licensed appraisers provides a form of consumer protection for homebuyers and borrowers by providing opportunities for redress if consumers believe that their property was not evaluated competently and properly.[36]

A question that needs to be researched is, how effective is the system of state licensing and certification established by FIRREA in ensuring that appraisers provide objective and unbiased estimates of value? We have found no academic research that examines the effectiveness of appraisal license and certification requirements. But research on the licensing of real estate salespersons and brokers may shed some light on this issue.

Implying that complaints against practitioners are an indicator of the quality of professional service, Guntermann and Smith (1988) find that beyond establishing a minimum-threshold prelicensing educational requirement, increasing the stringency of prelicensing educational requirements has no significant effect on the complaint level. On the other hand, complaint levels across the states were found to be significantly inversely related to the intensity of enforcement activities. Guntermann and Smith's results complement the findings of Shilling and Sirmans (1988) that post-licensing educational requirements have little effect on the quality of real estate services. The policy conclusion that can be drawn from these findings is that public resources could be more efficiently allocated by shifting resources from prelicensing and continuing education activities to improving the effectiveness of compliance and enforcement efforts, perhaps by utilizing the credential/designation requirements of high-quality professional associations to meet education and training standards.

In the context of agency theory, compliance and enforcement activity is a type of monitoring activity. Agency theory predicts that agency problems should be reduced as effective monitoring activity is increased, with the trade-off coming in the form of monitoring costs (Jensen and Meckling, 1976). The research of Guntermann and Smith (1988), though limited in scope, provides some confirmation of this prediction. Thus, state licensing and accreditation boards with effective powers and resources to hold appraisers accountable for their activities should have a positive effect on reducing the level of corrupt and faulty appraisal practices. However, the state regulatory apparatus is not a particularly effective way to induce appraisers to perform high-quality work (beyond some minimum level). Enhancement of appraisal quality can probably be better achieved through reliance on the forces of competition in the marketplace, buttressed by the credential/designation requirements and the private rule-making powers of high-quality professional associations, and by the development of effective quality control methods such as that suggested later. Further research into ways in which appraisal associations can enhance the professionalism and ethical behavior of their membership is warranted.

A direct and potentially powerful method of dealing with the agency issues would be to develop a methodology to examine the consistency of appraisal reports. Such a methodology would permit financial institutions to monitor appraiser activity to reduce agency-related problems and to improve the quality of their performance and would allow the regulators of financial institutions to monitor the appraisal policies and practices of the financial institutions under their jurisdiction.[37] While it is impossible to know whether an appraiser deliberately under- or overestimates value in a particular appraisal report, it is possible to draw an inference when all the reports performed by a particular appraiser are examined together. For example, when an appraiser submits twenty appraisal reports performed in a similar area within a short period of time, it would be possible for a bank or a bank regulator to examine whether the appraiser used the same or sufficiently similar comparables or identical and very similar adjustments for particular elements of comparison (for example, the appreciation rate for an adjustment for a time-of-sale adjustment) for all appraisal assignments on similar properties within that area. Research into the development of such a monitoring tool should be encouraged and supported.

Conclusion

This article surveys the academic literature that focuses on several important issues concerning the use of appraisals in the residential lending process. We analyze the strengths and weaknesses of several appraisal techniques, discuss whether an analysis of neighborhood effects should be included as part of an appraisal assignment, and address potential agency problems arising between appraisers and lenders.

To reiterate the important issues, we suggest three areas for future research. First, broadly speaking, research is encouraged on methodologies that can substantially reduce, if not eliminate, subjectivity from the appraisal process and improve the accuracy of an appraisal estimate while accommodating the data constraints frequently encountered in this field. More particularly, the recently developed minimum-variance grid method offers two important statistical properties (unbiasednesss and minimum variance), but the method has not yet been verified empirically. Therefore, research that aims to improve the theoretical foundation or to provide empirical tests of this method is highly encouraged. It is, of course, possible that the techniques employed by the minimum-variance grid method might not be the best tools to achieve unbiasedness and minimum variance in appraisals. Nonetheless, the direction pointed out by Vandell (1991) is important to the appraisal field.

Second, a scientific investigation of whether neighborhood variables should be included in real estate appraisals is also warranted. On one hand, Federal anti-discrimination laws prohibit the use of certain neighborhood characteristics (such as the percentage of minority) in the underwriting process. On the other hand, failure to include all relevant neighborhood variables in the valuation process could result in a higher variance of the appraisal estimate and an increase in default and loan losses. A difficult task is to find a way to include the neighborhood analysis in an appraisal that will not lead to systematic adverse impacts on the ability of certain minority or low-income loan applicants to qualify for a loan.

Finally, it is well known that agency issues are particularly severe in the appraisal industry. If the appraisal industry is concerned about its long-run viability, even survival, this is the issue that it has to address quickly. We recommend the development of techniques that can check the consistency as well as the accuracy of appraisal values reported by appraisers. We also recommend research into ways in which private appraisal organizations can be more effectively utilized in the regulatory scheme of things to enhance the professionalism and ethical behavior of appraisers.

The appraisal industry has been under increasing scrutiny after the massive failure of the savings and loan industry, and it is under pressure from financial institutions and regulatory agencies to demonstrate that appraisals are a valuable tool in the loan decision process. It is time for the industry to actively support the development of more rigorous appraisal methodologies and to ensure the adoption and application of more demanding standards of professional appraisal practice. Furthermore, the development of advanced appraisal methodologies needs to proceed with consideration given to the cost-benefit trade-offs associated with the data requirements of more sophisticated techniques.

Notes

[1]See Herzog and Earley (1970), Morton (1975), Sandor and Sosin (1975), Vandell and Thibodeau (1985) and Quercia and Stegman (1992) for an explanation of why empirical research has generally failed to find a significant influence of the mortgage payment-to-income ratio on default.

[2]Yezer, Phillips and Trost (1994), however, contend that single-equation models of mortgage default may overestimate the importance of the loan-to-value relationship as a determinant of default because of simultaneous equation bias due in part to failure to consider borrower selection of mortgage terms.

[3]*Impact of Appraisal Problems on Real Estate Lending, Mortgage Insurance, and Investment in the Secondary Market*, House Committee on Government Operations, 99th Congress, 2nd session, H.R. 99–891, September 26, 1986, pp. 4–6.

[4]See Colwell, Cannaday and Wu. (1983, p. 12).

[5]The regression method, however, was introduced to the field at a much earlier date. Bruce and Sundell (1977) report that regression analysis was used for rural appraising around 1924. They also report that multiple regression was used to assess forest land in New Hampshire in 1935.

[6]See Atkinson and Crocker (1987) for a discussion of this issue.

[7]Using Vandell (1991, Tables 2 and 3) as an example, the standard deviation of the prediction error of the mean multiple regression estimator is $79,828 while the mean comparable price is approximately $200,000.

[8]A new methodology, neural networks, appears to be receiving increasing acceptance within the appraisal profession. (We thank an anonymous referee for pointing to this new development.) However, since this method has not been fully addressed in the real estate academic literature, we elect not to include this method in our discussion of the newly developed appraisal methodologies. (For a reference on this methodology, see Worzala, Lenk and Silva, 1995).

[9]An alternative method, the nearest neighbors appraisal technique developed by Isakson (1986), also uses the regression method. The primary advantage of the nearest neighbors technique is that it avoids the traditional piecemeal adjustments on elements by capturing all the subject-comparable differences in a single measure.

[10]The intuition behind this argument is simple. In the presence of spatially correlated errors, the omitted variable could vary over space. The use of a grid method could minimize such variation by using all nearby comparables (less spatial variation). Kang and Reichert (1991) provide some empirical evidence to support this argument.

[11]Grissom et al. (1987) propose that when an appraiser finds an adjustment factor for a particular element, the appraiser should apply this adjustment immediately to all comparables. This process provides an appraiser with a greater chance of obtaining more paired sales for comparison.

[12]Tiebout (1956) is the first to suggest that an individual household evaluates and migrates around communities in a metropolitan area searching for the location that provides each household with its preferred mix of local public services. Given this ideal, Rosen (1974) provides a rigorous theoretical basis for the construction of a price-characteristics equation (or estimation of the willingness-to-pay function).

[13]In the presence of heteroskedastic and spatially correlated residuals, the generalized least squares method should be used for estimating the regression equation.

[14]Indeed, proximity variables deserve more attention than they have received. Asabere (1990) even finds that the type of street (such as a cul-de-sac) affects property values.

[15]This result seems counterintuitive. Given the amount of earnest money (normally less than 5% of the selling price), a reduction of 13% of selling price seems excessive.

[16]This is similar to the problem with the methodology developed by Grissom, Rudy, Robinson and Wang (1987). They propose a methodology that will improve the degrees-of-freedom of a regression by combining independent variables. However, the statistical property of their estimate is unclear.

[17]Pace (1993) also shows that the kernel nonparametric regression estimator outperforms the standard OLS estimator across variable transformations.

[18]This issue is particularly important given the issue of the average cost of appraisals relative to the average cost of defaults that came to the fore during the controversy over what is known as the de minimus threshold adopted in regulations enacted to implement the appraisal provisions of Title XI of the Financial Institutions Reform, Recovery and Enforcement Act of 1989 (P. L. No. 101–73, 103 Stat. Section 511 (1989), Codified in 12 U.S.C., Sections 3310, 3331-3351). For an examination of both sides of this controversy, see *Implementation of Appraisal Reform Sections of FIRREA*, hearing before the Subcommittee on General Oversight and Investigations, of the Committee on Banking, Finance and Urban Affairs, House of Representatives, 102 Congress, 2nd Session, September 16, 1992, Serial No. 102–143; and *Real Estate Appraisals*, hearing before the Subcommittee on General Oversight, Investigations and the Resolution of Failed Financial Institutions, of the House Committee on Banking, Finance and Urban Affairs, 103rd Congress, 2nd session, March 1, 1994, Serial No. 103–121.

[19]For a general description of the important role of locational variables, including neighborhood variables, in determining real estate values see DiPasquale and Wheaton (1996, Chap. 2).

[20]The term ''protected'' minority groups refers to those groups protected by anti-discrimination laws and regulations.

[21]The Comment to Standards Rule 1-3(a) of the Uniform Standards of Professional Appraisal Practice, 1993 edition, contains the following statement: ''In considering neighborhood trends, an appraiser must avoid stereotyped or biased assumptions relating to race, age, color, religion, gender or national origin, or an assumption that racial, ethnic, or religious homogeneity is necessary to maximize value in a neighborhood.'' Appraisal Standards Board of the Appraisal Foundation, *The Uniform Standards of Professional Appraisal Practice*, 1993 edition, p. 11. This statement, however, does not provide definitive guidance as to how an appraiser should consider neighborhood effects in an appraisal. This statement was obviously framed to follow the rules promulgated by financial institution regulatory agencies to implement federal legislation.

[22]Lang and Nakamura (1993) suggest a reciprocal relationship between neighborhood characteristics and mortgage lending decisions. They contend that government policies that induce lenders to increase the flow of funds to low-income and minority neighborhoods generate positive informational externalities for these neighborhoods. Such induced increased lending, by increasing property sales, will increase the amount and quality of information available for use in appraisals, thereby decreasing subsequent uncertainty over house prices, which then increases the willingness of lenders to make mortgage loans. By improving the informational efficiency of the local real estate market, such policies, they claim, can help stabilize home prices and prevent neighborhood disinvestment and decline.

[23]Schill and Wachter (1994) provide evidence that governmental policies inducing increased mortgage lending in minority neighborhoods may have unintended undesirable consequences. Their research results suggest that the Community Reinvestment Act of 1977 (P. L. No. 95–128, Section 802, 91 Stat. 1147 (1977), codified at 12 U.S.C. Sections 2901-05 (1988)) may inadvertently contribute to the concentration of low-income and minority households in low-income and minority neighborhoods.

[24]If we visualize all the variables that have material effect on the value of individual homes, such as square footage, lot size, number of bathrooms, etc., as being organized in a matrix, neighborhood effects would enter the matrix in effect like a scalar, moving the prices of all properties in the neighborhood up or down (which is strictly true when neighborhood variables are uncorrelated with other variables).

[25]They contend that higher income households generate positive externalities that benefit all households in the community, such as maintenance of a good exterior appearance (curb appeal) of their properties.

[26]Chambers (1992) demonstrates that the rate of racial/ethnic transition in a neighborhood is an important neighborhood effect. Galster (1990) finds that the rate of white flight from neighborhoods in metropolitan areas increases with racial transition beyond some low percentage but that no particular percentage of blacks results in a neighborhood's ''tipping'' to predominantly black occupancy. Galster also notes some limited success for affirmative marketing policies established by a few communities to slow white flight and to re-establish population stability and, by, inference house price stability.

[27]This report cited government statistics indicating that more than 800, or 25% of the approximately 3,200 federally insured savings and loan associations have significant appraisal deficiencies, from 10% to as much as 40% of the VA's loan guarantee program loss for FY1985, and 10% to 15% of the $1.3 billion in losses suffered by private mortgage insurers in 1984–1985 could be attributed to faulty and fraudulent appraisals. *Impact of Appraisal Problems on Real Estate Lending, Mortgage Insurance, and Investment in the Secondary Market*, House Committee on Government Operations, 99th Congress, 2nd Session, H. R. 99–101, pp. 4–6.

[28]*Real Estate Appraisal Reform Act of 1988*. Report together with dissenting views (to accompany H.R. 3675). House of Representatives, 100th Congress, 2nd Session, H. R. 100–1001, Part 1, September 28, 1988.

[29]''What the subcommittee found in the real estate loan portfolios of virtually every failed S&L and in many of the commercial banks studied, was that faulty and abusive appraisal were systematically used by corrupt or incompetent management to overvalue collateral and make speculative or even fraudulent real estate loans look secure.'' *Real Estate Appraisal Reform Act of 1988*, p. 21.

[30]The appraisals in his sample were all performed by appraisers who were aware of the contract price.

[31]The findings by Ferguson provide evidence (albeit inconclusive) to refute assertions such as those put forth by Congressman Matthew G. Martinez, who argued that if an appraisal ''is done in-house by an institution that hires and pays that appraiser,'' there are bound to be influences over that person's decision, ''whether that person is certified or not.'' The best way to keep

everyone honest is to require independent appraisals, that is, appraisals performed by appraisers that are independent of the institutions that request the appraisal. From *Implementation of Title XI, the Appraisal Reform Amendments of the Financial Institutions Reform, Recovery and Enforcement Act of 1989 (FIRREA)*, Hearing before the Commerce, Consumer, and Monetary Affairs Subcommittee of the House Committee on Government Operations, 101 Congress, 2nd Session, May 17, 1990, pp. 38–39.

[32]"Only when loan officers are seeking reasons not to make loans are such appraisers in demand."

[33]An important difference between these two studies is that appraisers in the Ferguson study were aware of the contract price before they performed appraisals, whereas appraisers in the Dotzour study they did not have earlier knowledge of the contract price.

[34]The relocation corporation generally uses the appraisal report to set the selling price of the house. If the property is appraised under its true market value, it will probably be sold at or close to the appraised value. If it is over-valued, the sales price will be lower than the appraised value, which can cast disfavor on the appraiser. Since it is costly for relocation companies to hold properties for too long, they have an incentive to set the price of the property somewhat below its true market value to produce a more rapid sale. For these reasons, an incentive exists for the appraiser to come in with estimates of value that are lower than true market value.

[35]From the testimony of Patricia J. Marshall, president of the Appraisal Institute, *Implementation of Appraisal Reform Sections of FIRREA*, pp. 23–24, 34; and the testimony of Robert L. Hughes, Jr., president, National Society of Real Estate Appraisers. *Real Estate Appraisals*, pp. 29–34, 151–67.

[36]Testimony of Chris Lewis, director of Banking and Housing Policy, Consumer Federation of America, *Real Estate Appraisals*, pp. 42–45, 206–13.

[37]Agency problems exist at two levels: the individual appraiser level and the institutional level.

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