Estimating Net Realizable Value for Distressed Real Estate

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Abstract. **This paper provides a framework for adjusting distressed real estate properties for liquidating discounts. We estimate the probability of receiving an offer on a property in any particular short interval of time. Our empirical evidence allows us to predict the average rate at which offers will occur in any particular interval of time. Further, it allows us to arrive at an estimate of net realizable value, adjusted for selling expenses.**

Introduction

Any appraiser who has appraised distressed real estate acquired by lenders through foreclosure knows that, while lenders may not want "fire sale" or "liquidation value" appraisals, they do require a value based on a fairly short marketing time interval.[1] This requirement forces an appraiser to estimate the fair market value of a property assuming a short marketing time horizon to arrive at what may be called the property's net realizable value. The difference between market value and net realizable value under these circumstances can be defined as a liquidating discount or the amount the lender is willing to give up in order to sell quickly. Previous research on the relationship between marketing time and selling price suggests that a rational lender or seller will attempt to obtain a higher nominal selling price in order to maintain a constant real price as marketing time increases (e.g., Miller [8]).

Adjusting distressed real estate properties for liquidating discounts raises several questions. First, how should the discounted market value be measured? Measurement errors can occur when the liquidating discount either fails to adjust for the probability of receiving an offer on the property in any particular short interval of time or if the appraiser fails to include an adjustment for the net direct and indirect carrying costs of the property. Either of these omissions may lead to a significant understatement of the liquidating discount necessary to assure that the marginal investor will earn a required rate of return. Second, what costs associated with ownership, development, operation and sale of the property should be included in the discounted value and how should these costs be

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measured? For example, if the sale is unlikely to occur within six months from the date of the appraisal, should part of the discounting process include such seller-paid expenses as the sales commission, concessions and closing costs?

This paper focuses on the appraisal of distressed real estate properties. The intent of the paper is to show how financial analysis can be used to estimate net realizable values of distressed real estate. We begin with a discussion of the relationship between market value and net realizable value. Then we offer a measurement for the probability of receiving an offer to purchase from a potential acquirer over a specified marketing time interval. Finally, we extend this discussion by presenting some empirical evidence on liquidating discounts for distressed residential properties. The estimates are derived from a multiple regression model that uses comparable properties for which all else is held constant except for the decision to liquidate the distressed real estate. From this analysis it is possible, under reasonable assumptions, to estimate the average rate at which purchase offers will occur in any particular interval of time.

Market Value versus Net Realizable Value

Several definitions of "value" appear in the appraisal literature and are used in practice, with the appropriateness of each depending upon the purpose of the appraisal. One important distinction that must be made is between market value and net realizable value. Market value is often defined as the amount that a typical buyer will pay and a typical seller will accept, neither being under any pressure to act.[2] This definition implicitly assumes that the property will be exposed to the market for a reasonable or "normal" marketing time, one long enough to find a purchaser who will buy the property knowing its immediate potential uses.

Estimating market value is the purpose of most valuations. A market value estimate usually reflects the highest price that a property would bring to a seller who is willing, but not compelled, to sell. If the asset in question is owned in fee simple, its market value may actually be defined as the present worth of rights to future benefits arising from ownership. The computed market value is likely to change, at least from year to year, as the factors (e.g., supply and demand conditions, social conditions, environmental factors, and government intervention) influencing value change.

Net Realizable Value Defined

Net realizable value, on the other hand, is the value of the property to a particular investor or enterprise, a value that is based on the amount realized from its sale, adjusted for selling expenses (e.g., *AIREA* [1]). What this value involves, basically, is an estimation of the price at which the property can be sold discounted for projected changes in economic factors or protracted sales. If net realizable value is greater than the present worth to a specific decision maker of the property's anticipated benefits, then the investor would be better off selling rather than continuing to operate the property. Alternatively, if the

present value of future benefits from ownership is greater than net realizable value, the investor would be better off continuing to operate the property rather than selling it.[3]

In estimating net realizable value, most lenders will require that all appraisals be made assuming a cash basis sale; however, if appraisers are uncomfortable with supplying a valuation on a cash basis they can use a "typical terms" valuation under special circumstances. However that may be, the lender's expected period of ownership is usually relatively short, and most lenders require a value based on a marketing time not to exceed this anticipated holding period. The resulting net realizable value appraisals are generally used for multiple purposes, such as for bids at foreclosure sales, for large protective advances, for operating budgets, and for the sale of the property.

Calculating Net Realizable Value for Distressed Properties

The first step in calculating net realizable value for distressed real estate properties is to establish the most probable price, given a fairly short expected holding period. This value will equal, by definition, the current market value of the property should the property have a short-lived marketing time (i.e., less than the lender's expected holding period). For properties with protracted marketing times (i.e., harder to sell properties), the market value of the property must be adjusted for the probability of receiving an offer to purchase from a potential acquirer during the lender's expected holding period. This calculation can be done using a Poisson distribution.

The Poisson Process

To illustrate, let X be a random variable with a discrete distribution and suppose that X represents the number of occurrences of an offer on a property in a given month. It is assumed that the number of occurrences at which offers arrive in any two disjoint intervals of time are independent of each other. Moreover, the probability of an offer occurring in any particular period is assumed to be approximately proportional to the length of that interval.[4] Finally, the probability of two or more offers in any particular short interval of time is assumed to be of a smaller order of magnitude than the probability of just one occurrence.

The random variable X in this case has a Poisson distribution with mean λ ($\lambda = 0$). The probability function of X is defined to be

$$f(x/\lambda) = \begin{cases} \dfrac{e^{-\lambda}\lambda^{x}}{x!} & \text{for } x = 0, 1, 2, \ldots \\ 0 & \text{otherwise.} \end{cases} \tag{1}$$

It is known from the properties of the Poisson distribution that the mean $E(X)$ is

$$E(X)=\sum_{x=0}^{\infty} xf(x/\lambda) \tag{2}$$

$$=\lambda \sum_{x=0}^{\infty} \frac{e^{-\lambda}\lambda^{x-1}}{(x-1)!}$$

$$= \lambda,$$

and the variance for the Poisson distribution is

$$\text{var}(X)=E(X^2)-[E(X)]^2 \tag{3}$$

$$=\lambda.$$

The positive constant λ can also be interpreted as the expected number of offers per unit time. To illustrate, suppose that the average rate at which offers on a property will occur is 0.15 per month. To determine the probability that one or more offers will occur in a given six-month period, let λ equal the number of periods the lender expects to hold the property times the probability of an offer per period. That is, assume $\lambda=0.9$ (i.e., 0.15 per month $\times$ 6 months). It can be found from tables of the Poisson distribution that $Pr(X\geq 1)=0.5934$.

The probability that one or more offers will occur in a given marketing period can now be used to determine the expected gross sale proceeds (SP) as

$$SP = Pr(X \geq 1) \times MV \tag{4}$$

where

$Pr(X \geq 1)$ = probability that one or more offers will occur in a given marketing period in the Poisson process, and
MV = estimated market value of the property, assuming the property will be exposed to the market for a reasonable marketing time horizon.

Example

Consider the disposition of a residential condominium project acquired by a lender through foreclosure. Let the probability that one or more offers will occur in a given marketing period equal $Pr(X\geq 1)=0.5934$. Further suppose that the estimated market value of the property is \$650,000. The estimated gross sale proceeds assuming the lender expects to sell the property within six months can therefore be calculated as follows:

$$\begin{aligned} SP &= Pr(X\geq 1)\times MV \\ &= 0.5934 \times \$650{,}000 \\ &= \$385{,}710. \end{aligned}$$

Because the probability of an offer in any particular period is approximately proportional to the length of the marketing interval, as the expected marketing period increases (e.g., say, from six months to one year), the probability $Pr(X \geq 1)$ will increase and, as a consequence, the expected gross selling price will increase.

Adjusting for Net Carrying Costs

The second step in calculating net realizable value is to subtract off net carrying costs. Normally included in these costs are such items as real estate taxes, insurance and maintenance, rent loss during lease-up, operating costs (e.g., operating expenses, reserve requirements, and management fees), and development costs, if any. Excluded in this definition of net carrying costs are expenses such as brokerage fees, legal fees and other costs or concessions associated with the disposition of the property.[5] These costs are excluded because most lenders want to know the expected sales price (i.e., the most probable bid at a foreclosure sale) as opposed to the net sales proceeds, which can be easily computed by deducting the selling expenses associated with the disposition of the property from the expected sales price.

The relationship between the net realizable value and the most probable selling price over the lender's expected holding period may now be written as

$$NRV = SP - (C - R)/(1 + r)^n \tag{5}$$

where

NPV = net realizable value,
SP = expected gross sale proceeds,
C = carrying costs; which equals direct carrying costs, such as those costs associated with ownership, development, operation, and sale of the property,
R = effectve gross income,
r = market discount rate, and
n = expected holding period.

With adequate data and assumptions about the average rate at which offers on a property occur, equation (5) can be used in a variety of instances to provide estimates of net realizable value for distressed real estate. The major difficulty in this approach is finding an estimate of λ for use in the calculation of $Pr(X \geq 1)$ in equation (4).

Estimating λ of the Poisson Distribution

Multiple regression analysis provides a technique for estimating λ of the Poisson distribution. A simple way to approach the calculation is to state that the selling price (SP)

that a property should bring in a competitive and open market under all conditions requisite to a fair sale equals market value (MV) plus an error term:

$$SP = MV + \varepsilon. \tag{6}$$

Using equation (4), the selling price of distressed real estate properties can be written.

$$SP = [Pr(X \geq 1)]MV + \varepsilon. \tag{7}$$

The error terms in (6) and (7) can either be positive or negative, depending on supply and demand factors; however, both error terms are assumed to have a normal distribution with mean 0 and variance σ^2. It follows from this assumption that the conditional distribution of SP given MV will be a normal distribution.

The next step is to state that market value is a function of all the expected benefits (services) of the property over time. This flow of services can be broken down into an infinite number of items, including physical attributes (e.g., building or room size, quality of construction, age, condition, architectural style, the number of bedrooms, site size, and any other potential physical amenities) and location characteristics (e.g., desirability of location, neighborhood characteristics, positive and/or negative externalities, police protection, fire protection, the local schools, and other location characteristics). That is,

$$MV = f(Benefits). \tag{8}$$

Assuming a linear functional form between the expected benefits and the sum of all the individual characteristics yields

$$MV = \beta_0 + \sum_{j=1}^{k} \beta_j x_j \tag{9}$$

where

x_j = explanatory variables (e.g., square footage, number of bedrooms, desirability of location, etc.).

Substituting (9) into (6) and (7), and combining equations yields[6]

$$\ln SP = \beta_0 + \sum_{j=1}^{k} \beta_j x_j + \gamma D + \varepsilon \tag{10}$$

where

D = a dummy variable equal to 1 if the property was acquired by a lender through foreclosure and then disposed of as quickly as possible, and

$$\gamma = Pr(X \geq 1) - 1. \tag{11}$$

Equation (10) specifies a multiple regression equation that allows the estimation of $Pr(X \geq 1)$. In fact, the coefficient γ should be negative, indicating that the liquidation of distressed property does result in substantially lower transaction prices. Hypotheses about γ can be tested via standard statistical tests. For example, a small one-sided probability value can lead to the rejection of the null hypothesis that γ is not statistically different from zero. Such a conclusion, however, rests on the correctness of the assumptions of the model, which can be tested by calculating

$$F = \frac{(\textit{Variability in } SP_i \textit{ explained by regression})/(k-1)}{(\textit{Unexplained variability in } SP_i)/(N-k)} \tag{12}$$

where k is the number of parameters estimated and N is the number of observations. Here, if the null hypothesis that the model has no explanatory power is true and the least-squares assumptions are true, then for any reasonable Type I error level a large F-ratio will lead to the rejection of the null hypothesis.[7] This conclusion suggests that if the model assumptions are true, there may indeed be a statistically significant liquidating discount for distressed residential real estate.

As a measure of "goodness to fit," a coefficient of multiple determination—written as R^2—can also be calculated. The R^2 value indicates the proportion of the variability in the sample values of SP_i explained by the multiple regression. The error in predictions made by the regression line is indicated by the residual sum of squares.

Empirical Results

The multiple regression equation in (10) is estimated using a sample of sixty-two residential condominium units sold in Baton Rouge, Louisiana in 1985. Included in the sample are condominium units on the open market and otherwise comparable units liquidated by a local financial institution. The analysis assumes that both types of properties are part of a single cross-section, with a dummy variable to indicate whether the distressed real estate was liquidated or sold on the open market.

The dependent variable used in the empirical analysis is the natural logarithm of the selling price for each condominium unit. Use of this specification is based on the assumption that the percentage contribution of the structural and neighborhood characteristics remains constant across property types. The dependent variable is then regressed on the various principal covariates of selling price, including living area (in thousands of square feet), number of bedrooms, location dummy variables, amenities, and so on.[8]

Exhibit 1 contains summary statistics for some of the variables used in the regression analysis. Several features of the data should be pointed out. First, the relative price per square foot of the distressed condominium units appears to indicate that these properties are priced at a discount. For example, the average price per square foot of the distressed properties is $59.29, while the average price per square foot of the comparable properties is $66.28, a difference of roughly $7 per square foot. Added to this comparison, however, should be another feature, finance incentives. The large finance incentives associated with distressed properties suggest that these properties are harder to market. In order to

Exhibit 1
Summary Statistics for the Sample of Distressed Residential Properties and Comparable Properties*

Variable	Mean	Median	Standard Deviation	Coefficient of Variation
Price Per Square Foot				
Distressed Real Estate	$59.29	$58.08	2.99	5.04
Comparable Properties	$66.28	$65.37	5.07	7.65
Living Area (square feet):				
Distressed Real Estate	900	900	1600	12.91
Comparable Properties	1137	1255	194	17.14
Finance Incentives:				
Distressed Real Estate	$7300	$7638	654	8.96
Comparable Properties	$2060	$2716	1410	68.31

*Both the sample of distressed real estate and comparable properties are residential condominium units. See text for a further description of sample.
Source: Calculated by authors

measure these financing differences, a variable needs to be employed in the multiple regression to represent the total present value of financing and closing costs paid by the seller for the buyer.

The empirical model requires the assumption that the distressed condominium units are in similar physical condition to the other residential condominiums that were sold by their owners. To the extent that foreclosed properties often have not been properly maintained for many months prior to the disposal by the lender, this assumption is likely violated. This bias is minimal in our sample since all of the distressed residential condominium units were acquired by the lender through foreclosure soon after construction was completed. In addition, before marketing the distressed condominium units, the lender thoroughly rehabilitated any units deemed in disrepair.

Exhibit 2 reports least-squares coefficient estimates for equation (10). The equation fits well and most of the variables behave as expected. The overall fit, as measured by R^2, is 0.98. Since we are not too concerned with the various structural and neighborhood characteristics or with location preferences within a condominium development, not much needs to be said about these coefficients. The coefficient for liquidating discounts reported in Exhibit 2, however, should be examined in conjunction with the relationship between net realizable value and market value. Note also that this estimate is obtained holding financing incentives constant. As shown in Exhibit 2, financing incentives affect the value of distressed real estate by raising the property's market value.

The regression analysis indicates that the discount on distressed real estate is roughly 24% of market value. The size of this discount is not surprising since the market value of these properties must be adjusted for the probability of receiving an offer to purchase during the expected marketing period as well as for the net carrying costs of the property.

The t-statistic of the liquidating dummy variable is -6.34 (or -0.24 divided by a standard error of 0.0379). The t-statistic of -6.34 indicates that this coefficient is

Exhibit 2
Estimates of Discounts on Distressed Real Estate Claimed in Default by a Financial Institution*

Variable*	Coefficient	*t*-statistic
Living area (in thousand sq. ft)	0.42	5.80
Dummy variable for location near swimming pool	−0.01	−0.44
Dummy variable for vaulted ceiling	0.03	2.07
Number of bedrooms	0.12	3.44
Dummy variable for location in front of complex	0.02	1.20
Distance to parking lot	0.01	1.40
Distance to services (mailroom and trash disposal area)	−0.02	−1.02
Distance to Louisiana State University	0.01	0.33
Density	−0.02	−1.67
Time trend variable	−0.001	−0.52
Present value of seller financing and closing cost benefits	0.01	1.99
Liquidated REO property	−0.24	−6.36
Intercept term	10.54	195.56
$\bar{R}^2$	0.98	

*Dependent variable is the logarithm of the selling price of the two groups of properties represented in Exhibit 1.
Source: Estimated by authors. See text for more discussion of sample.

approximately six sampling standard deviations below zero. The probability of getting a *t*-value of −6.34 or greater, with 49 degrees of freedom, is 0.001. Since this probability value of 0.001 is less than the standard 0.05 Type I error level, the null hypothesis is rejected. Thus, the decision to liquidate distressed real estate appears to have a negative, statistically significant, effect on transaction prices.

These results are consistent with the hypothesis that sellers obtain a higher (lower) selling price from longer (shorter) marketing periods. Several studies have examined the relationship between marketing time and selling price. Some examples are those of Kang and Gardner [6], Miller [8], and Miller and Sklarz [9]. The results of these and other similar studies are mixed: some find selling price increases as marketing time increases, while others find a negative and insigificant relationship. Kang and Gardner [6] find that the relationship between marketing time and selling price depends upon conditions in the housing market at a particular time. Their results suggest that sellers who can wait longer in periods of high interest rates may be able to obtain higher prices.

The *F*-statistic in Exhibit 2 is calculated as:

$$F_{12,49} = \frac{2.50/12}{0.05/49}$$

$$= 104.17.$$

With 12 and 49 degrees of freedom, the probability of getting an F-value of 204.17 or more is 0.0001. Thus, at a standard 0.05 Type I error level, the null hypothesis that the model has no explanatory power can be rejected.

Extracting λ from the Empirical Findings

The estimate of the average liquidating discount in Exhibit 2 may be seen to represent the amount, adjusted for selling expenses, which financial institutions are willing to give up in order to sell in a hurry. It follows from (11) that

$$Pr(X \geq 1) = 1 + \gamma. \tag{13}$$

Letting $\gamma = -0.24$ yields

$$Pr(X \geq 1) = 0.76.$$

From tables of the Poisson distribution it can easily be determined that λ is between 0.16 and 0.25 per month.

The estimate of λ can be used in a variety of contexts. It, for example, may be used to value hard-to-liquidate assets like commercial or industrial properties; however, its most direct application in this case is to appraisals of distressed residential condominiums. Knowing λ and given an expected holding period, the appraiser can estimate net realizable value using equation (5), after adjusting for selling expenses.

Summary and Conclusions

The cash price that might reasonably be anticipated in a current sale under all conditions requisite to a fair sale is likely to overstate the net realizable value of distressed real estate properties acquired by lenders through foreclosure. There are two reasons for this: First, most lenders expect to sell all properties within a fairly short time interval after acquisition. Thus, for properties with protracted marketing times, lenders will almost certainly have to lower their price (i.e., offer a discount) in order to sell the property quickly. Second, net realizable value requires appraisers to make adjustments for costs associated with ownership, development, operation and sale of the property. These costs will normally include such items as construction cost, rent loss during lease-up, operating expenses, reserve requirements, insurance and maintenance, and other costs. Ignoring these carrying costs distorts net realizable value.

A conceptual basis for estimating value for distressed real estate properties involves making some judgments about potential payoffs over the anticipated marketing period and multiplying the resulting probability that one or more offers will occur times the estimated market value of the property, adjusting for selling expenses. The Poisson distribution can serve as an appropriate probability in this case. The Poisson distribution assumes that the

number of offers in any fixed interval of time is approximately proportional to the length of that interval. Also, it assumes that the number of offers in any two disjoint intervals of time must be independent of each other and the probability of two or more offers must be of a smaller order of magnitude than the probability of just one occurrence.

Notes

[1]The FDIC, for example, believes in an intensive marketing program and normally expects to sell a property within six months of acquisition. These expectations exert considerable downward pressures on the price FDIC is willing to accept on its real estate properties.

[2]Alternatively, market value is defined in Boyce [2, p. 160] as "the most probable price in terms of money which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller, each acting prudently, knowledgeably and assuming the price is not affected by undue stimulus."

[3]An important decision facing the real estate investor is that of continuing to operate versus sale. Alternatively, the investor could either sell the investment outright or on an installment basis, or exchange the property for like-kind property. These latter options complicate the reversion decisions that the real estate investor must make. See, for example, the discussion in Jaffe and Sirmans [5].

[4]This assumption appears fairly reasonable up to a point. Beyond some optimal marketing period, however, the probability of an offer occurring may actually decrease and the price that the property will sell for may decline. Certainly there is anecdotal evidence in the market for single-family dwellings that is consistent with this observation.

[5]A case could be made for including sales concessions and closing costs paid by the seller in the definition of carrying costs when these expenses exceed some normal level, say, 3% to 7% of the gross sales price.

[6]Equation (10) is also written in semilog form. The advantage of the semilog functional form is that it yields the percentage change in sales price that results from a one-unit increase in a particular characteristic (see, for example, Butler [3]).

[7]A Type I error in this context refers to the rejection of a "true" hypothesis. There is also something which is called a Type II error which relates to the acceptance of a false hypothesis. The level of significance provides the probability of rejecting a true hypothesis or committing a Type I error. For a more complete discussion, see DeGroot [4].

[8]For a good overview of multiple regression models for estimating house prices, see King [7].

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