Faculty Working Papers

AN ECONOMETRIC APPROACH TO THE FNMA FREE MARKET SYSTEM AUCTION

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March 12, 1980

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Summary

In the last few years, several innovations have appeared in mortgage finance which are designed to improve the flow of funds into mortgage lending. One of these innovations is the FNMA Free System Auction. This paper analyzes this auction by developing a bidding model for use by participating mortgage banking firms. Next, historical frequencies are used to establish the probability of acceptance for any particular bid, given the predicted low accepted bid. It is then shown how the mortgage banking firm can utilize the model, given its individual needs.

Acknowledgment

The authors gratefully acknowledge the support of Cameron-Brown Company on this project.

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INTRODUCTION

In the last few years, several innovations have appeared in mortgage finance which are designed to improve the flow of funds into mortgage lending. Among this group,[1] The Federal National Mortgage Association (FNMA) remains the intermediary which handles the largest share of most mortgage lenders' placements. FNMA is a private corporation, chartered by Congress and owned by stockholders, that provides a national secondary market facility for government-backed (FHA/VA) and conventional mortgages.[2] Through its secondary market operations, FNMA furnishes a source of liquidity for mortgage lenders, the major portion of this support being provided through the Free Market System (FMS) auctions.[3] Through its issuance of forward purchase commitments, the FNMA assures lenders of a permanent investor (at a set yield) for specified periods of time, regardless of changing money market and housing conditions.

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[1]For a discussion of all the placement options available to mortgage lenders, see Sears, Steve, "Mortgage Placement Alternatives" North Carolina Investment Institute Working Papers, UNC (1979).

[2]Sources include: Federal National Mortgage Association, Free Market System Auction, 1977; Federal National Mortgage Association, FHA/VA Home Mortgage Programs and How They Work, 1976; Federal National Mortgage Association. Conventional Program for Home Mortgages, 1976.

[3]Through the FMS auctions, FNMA issues optional forward commitments (four months) for the purchase of single-family mortgage loans from originating lenders. Basically, lenders offer to sell mortgages to FNMA at specified yields. FNMA then evaluates these offers, determines the amount of mortgages it will purchase (i.e., the yields it will accept) and then issues forward commitments to the successful bidders.

Such auctions are conducted on alternate Mondays with participation limited to FNMA-approved lenders(sellers). Bids must be telephoned between the hours of 10:00 a.m. and 3:00 p.m., Washington, D.C. time, on the day of the auctions. Competitive bids submitted by the seller must include, in the yield, 3/8 of 1% servicing fee which will be received by the seller for servicing the mortgage, should the bid be accepted by FNMA. (Cont. page 2)

To evaluate the potential economic significance of the FMS auctions, one must first determine how the placement opportunities provided by the auctions may be used by mortgage lenders. In this endeavor, the clearest case of the entrepreneur among the various mortgage lenders is the non-depository financial intermediary, the mortgage banking firm (MBF). Since its entire operation is oriented to mortgage finance, the MBF provides an excellent example of a mortgage lender attempting to efficiently utilize the FMS auctions. This paper analyzes the operations of this financial intermediary and develops a bid model for use in the FMS auctions.

The Mortgage Banking Firm

The MBF is a non-depository intermediary whose principal activity is the originating and servicing of loans secured either by commercial or residential real estate. The firm operates by taking loan applications (from either developers or individual borrowers), committing funds to these borrowers, closing the loans with funds normally borrowed through bank lines of credit and finally selling a package of loans to permanent investors.[4] The proceeds from sale, in excess of credit advances,

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[3] Simultaneous, but separate, auctions are conducted for conventional and FHA/VA mortgages. A single seller may submit up to five competitive bids in each of the two auctions, subject to certain requirements:

1. The maximum dollar amount for any single bid is $3 million for both auctions. Thus the total amount of the bids submitted cannot exceed $15 million (per auction).
2. The minimum dollar amount for any one bid is $10,000, and only one bid can be for less than $500,000.

Each competitive bid submitted by a seller must be identified by a bid number (i.e., 1,. . .,5). These bid numbers determine the amount of bid fee charged (which ranges from 1/100 of 1% for bid number one to 1/50 of 1% for bids two through five). In addition, for accepted bids, a non-refundable commitment fee of 1/2 of 1% is charged. (Cont. page 3)

along with origination fee, servicing fee, float and warehousing arbitrage, represent income.

In handling loan originations and sales, the MBF can follow one of three general patterns:

1. Origination without commitment--the mortgage loan is originated and held in the MBF's investment portfolio until a final lender can be located. Such a procedure creates two problems for the firm:
   a. A final lender may not be found, in time, to provide funds for repayment of the commercial bank warehousing loan.
   b. Upward shifts in market interest rates between the MBF's commitment to a borrower and the final sale of the loan package may produce a marketing loss upon subsequent sale (i.e., require a discount on final sale).

2. Mandatory commitment--the mortgage loan is originated after all arrangements are settled with a permanent lender or other secondary market source. In this case, the MBF must deliver the loan. This particular origination alternative provides the firm with the necessary protection against the above problems. It insures the firm that funds will be available when needed and it guarantees a floor (and ceiling) on the price to be

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[3] Lenders are also permitted to bid non-competitively in the auctions. In doing so, the lender must again meet certain requirements:
   a. Only one non-competitive bid may be submitted per auction and the seller cannot bid both competitively and non-competitively in the same auction.
   b. The minimum and maximum dollar amounts for the non-competitive bid are $10,000 and $250,000, respectively.
   c. The seller is guaranteed that its bid will be accepted, but it agrees to accept the weighted average yield of all bids accepted by FNMA for that auction (which may be significantly greater than the low accepted bid).

[4] McKinnon, H. Alexander, Miles, Mike, and McLeod, Robert W. "Evaluation Model Can Improve Performance in FNMA Auction." The Mortgage Banker (March, 1978), p. 54.

received for the mortgage loan. On the other hand, such a commitment does not protect the firm from downward shifts in interest rates. Such shifts could result in the firm originating loans at a rate less than the yield promised to the final lender and consequently result in a marketing loss on disposition.

3. Optional commitment--the mortgage loan is still originated after all arrangements are settled with the permanent investor. However, in this instance, final delivery is optional, pending arrangement of a more favorable placement alternative. This method operates in a manner similar to the mandatory commitment, but with the firm now also insulated against downward interest rate shifts during the warehousing period (so long as a new permanent lender can be located).

In assessing the relative merits of these alternatives, one should note that the basic philosophy of the MBF is to attempt to maximize production (or loan origination) because this, in turn, leads to the greatest servicing revenue (which is the largest profit item). Consequently, MBF's seek to obtain prior coverage equal to most of their expectations of mortgage loan demand and maximize production while avoiding the two risks noted above.[5] As a result, these two risks can be said to place constraints on the firm's operations.

Historically, MBF's have handled these constraints through the secondary market private commitment process. However, the extent to which this process can be utilized has greatly diminished via the changing economic conditions of the late 1960's and early 1970's. (i.e., life insurance companies, as well as other private lenders, have been able to locate more attractive investment

[5]This is not to say, however, that MBF's will only originate when covered. At times, a firm will originate in anticipation of finding coverage at a later date. However, the typical firm will incorporate a risk constraint in its decision-making process to limit the amount of its uncovered portfolio.

opportunities.) The MBF has thus been forced to look elsewhere for alternative risk-shifting mechanisms.

One such alternative is the FNMA FMS auction. The auction provides the mortgage banker with the necessary time-risk shifting mechanism that was previously available in the strictly private sector. However, the two commitment alternatives differ in at least one important aspect. Under the private commitment, the MBF was assured of purchase by the permanent lender via commitments negotiated under long standing relationships with specific permanent lenders. In FNMA auctions, the firm must bid for the right to sell its package of loans. Hence, there is less assurance of the availability of funds (at a set price) to meet liquidity needs. Furthermore, if the firm's bid is accpeted at a higher yield than competing mortgage lenders, the MBF will be at a competitive disadvantage in loan origiantion.

Therefore, it behooves the firm to have a strategy model for participation in the FMS auctions. A model is needed to estimate the lowest yield that will be accepted by FNMA and then establish a probability of acceptance around the expected low bid. The MBF can then bid "optimally," given its existing portfolio, expected mortgage loan demand, and its willingness to assume the aforementioned risks.

The Proposed Model

The proposed model is designed to achieve three goals:

1) The model provides a better set of determinants than the naive strategy of employing last period's low accepted bid as the firm's best guess for the low bid to be accepted in the upcoming auction. This strategy (which is currently employed by many MBF's)[6] may be effective in a fairly stable market, but becomes less satisfactory in more volatile markets.

2) The model is capable of application in the real world. An MBF can utilize the model as a tool in its decision-making process.

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[6]McKinnon, p. 57.

3) The model is based on theoretical precepts. That is, the determinants of the predicted low accepted bid in the upcoming FMS auctions are logical from an economic theory persepctive.

Theoretical Determinants

Since the variable to be determined (the low accepted bid in the upcoming auction) is expressed in interest rate form, related economic theory can be used to develop a set of suitable determinants. Certainly, the interest rate (or price) of an asset should be a function of the demand for and the supply of the asset in question. Thus, two logical determinants of the upcoming low accepted auction yield should be the demand for and the supply of mortgage funds.[7]

Since markets are typically interrelated, the interest rate on mortgages should be a function of not only its own supply and demand, but also a function of demand-supply conditions in competing markets. Therefore, a third determinant should capture this substitution effect between the secondary mortgage market and competing financial markets.

A fourth determinant, one that has become increasingly important in recent years, is inflation. Since mortgage loans are typically denominated in nominal terms, a lender is interested in changes in the purchasing power of the returned principal. Thus, should FNMA anticipate price increases, it could be expected to incorporate an inflation premium into the low bid which it is willing to accept.

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[7]The authors note the "chicken-egg" problem in the above statement. The direction of causality between yield and supply/demand is probably dual. Thus, a more sophisticated model would be one in which not only the yield, but also supply and demand were determined endogenously.

A final determinant is not one which is clearly grounded in economic theory, but one which involves the influence of FNMA (as a quasi-governmental body) in the mortgage market. Since FNMA was created specifically to aid this capital market sector during "troubled time," it may not act in exactly the same manner as a private enterprise. Some subsidizing from period to period may be anticipated to smooth rate changes, and such behavior is important to the MBF in anticipating the low accepted bid.

Variable Proxies

Concerning suitable proxies for the demand and supply variables, newly placed construction and the difference between M_3 and M_1 (as a measure of time deposits at banks and thrift institutions) were chosen. These seemed to be logical choices due to their aggregate nature and the fact that the auctions are conducted on a national basis.

The substitution variable is represented by the most recent yield on three to five year Government bonds, taken on a bi-weekly basis. (Any large volume medium term maturity would be acceptable given the 8 to 12 year expected life of mortgage loans.) Changes in this yield are also represented in the model to temper the effect that this yield has an explanatory variable. (A fuller explanation follows in footnote 16.)

Concerning the measurement of inflation, proxy choices included the annualized rate of change in the consumer, housing, and wholesale price indexes.[8] (Quite clearly, there is a potential double counting problem

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[8]Data concerning the respective price indexes is provided on a monthly basis by the bureau of Labor Statistics. The monthly levels are coverted into annualized rates of changes by:

$$ARCO_t = \left(\frac{PI_t}{PI_{t-1}} \right)^{12} - 1$$

between the substitution and inflation variables which will be dealt with subsequently.)

Finally, the government involvement variable chosen was the spread between the current market level of mortgage rates (as represented by the FHLBB new homes series) and the previous auction's weighted average yield of accepted bids). To some extent, movement in this spread captures the "smoothing" intent of FNMA in the low bid acceptance decision.[9]

Variable Measurement Problems

Several problems exist in the proper measurement of the determinants chosen. With practical application as a goal, it is critical that values of the chosen determinants be known prior to the upcoming auction.

This presents problems with several of the variables, particularly demand, supply, and inflation. The crux of the matter is that the latest levels of several of the variables are only known with a considerable lag.[10] Hence, one must either assume that the latest information available is the most relevant; or, generate expectations concerning current (unknown) levels.[11] In this study, both the latest known level as well as the expected (current) level are examined with expectations generated via Box-Jenkins techniques.

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[9]Data sources for variables used in the model include: The Federal Reserve Bulletin, The Federal Home Loan Bank Board Journal, the Bureau of Labor Statistics, and the Federal National Mortgage Association.

[10]The latest levels of variables in these three categories are known to the decision-maker only after a lag of six to eight weeks. An additional problem exists because some of the variable values (particularly demand and supply) are subject to continual revision. The authors, in keeping with their objective of using only known information at the time of auction, avoided utilizing revised or updated information. For, even if today's information is incorrect, it is the information with which the MBF must work that is appropriate in this study.

[11]That is, one could presume that the best estimate the current (unknown) level is the most recent known level (a random walk). Or, one can extrapolate to produce an estimate of the current level.

In addition to the information lag problem, some of the variables are available only in monthly form, creating an additional problem since FNMA auctions are conducted on a bi-weekly basis. For these variables, the authors analyze (again) two different series. One series uses only the monthly figures and results in values being used twice or three times (for those months in which three auctions were held). A second series is created in which interpolated values are used.[12]

Methodology and Organization of the Study

This study was conducted over the period extending from January 1974 - December 1978. The period is marked by a major recession, along with fluctuating mortgage yields which reached then record peaks in late 1978 - early 1979.[13]

The regression is organized in the following manner. First, the period extending from January 1974 - June 1976 (65 auctions) was used for parameter estimation. For each of the two auctions, a regression equation was estimated in the hypothesized format. Results from the theoretical model were compared to a naive model which utilizes only the previous auction's low accepted bid. (Other work has shown this "naive model" to be the most common estimation technique used by practicing mortgage bankers.)[14]

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[12]Although arbitrary, the authors assumed the monthly level to be taken at the midpoint of the month. Interpolated values were then created to fall on the Fridays preceding the auctions. Again, it was necessary that interpolated values be created from known information at the time of the auction.

[13]The authors note certain regulatory changes which were partially implemented over the sample period. (For a background discussion, see the Hunt Commission and FINE studies).

[14]McKinnon Pg. 57.

Secondly, the parameter estimates from the test period were used with observations on the exogenous variables in the second period (July 1976 - December 1978) to produce forecasted values for the low accepted bids, (i.e., the estimates from the first period were tested over the latter period.)

The authors hypothesized that the expanded model would both out-perform the naive verison over both the test and forecast periods and confirm the set of theoretically appealing determinants via good performance over the latter period.

Finally, a probability parameter is employed in order to provide the MBF with the probability that any particular bid will be accepted given the low bid forecast.

Estimation Period-Multiple Regression Model

Lag relationships were used to capture the effects of administrative action (i.e., loan committee decisions on lending rates) and price expectations (inflation). The expected problems of multicollinearity and autocorrelation were examined, with the inflation variable falling out of the equation.[15]

Once the regression equation was specified, an examination of the correlation matrix revealed no major multicollinearity problems. The Durbin-Watson statistic did reveal the presence of first-order autocorrelation. An

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[15]A highly colinear relationship exists between the rate on competing instruments (3 to 5 year governments) and the inflation variable as would be expected on a theoretical basis. According to the Fisher effect, the observed nominal rate, i, has two components:

r = the real rate
p = inflation component, or the percentage change in prices

Hence, since all money market and capital market rates are expressed in nominal terms, the substitution variable includes an inflation compenent. Thus, the authors would argue that a single variable can be used to represent demand/supply conditions in other markets, as well as inflation.

examination of the residuals revealed no significant autocorrelation past first-order. Thus, the autocorrelation was corrected via Cochrane-Orcutt procedures to put the estimators in their final form.

Disscussion of Estimation Period Results

The results for the estimation period are shown in Table I. The model representations are denoted as:

1 = FHA/VA auction, multiple regression

2 = conventional auction, multiple regression

1N = FHA/VA auction, naive model

2N = conventional auction, naive model

and:

X_1 = current yield on three-five year U.S. Government bonds.

X_2 = changes in X_1 over most recent two-week period[16]

X_3 = mortgage supply, as measured by $M_3 - M_1$, lagged two months for the FHA/VA and lagged three months for the conventional. The lag is intended to proxy the period required for lending institutions to translate new information into rates on loan originations.[17]

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[16]Mortgage loan origination is a rather extended process typically requiring 60 to 90 days. Originators usually have some flexibility in adjusting rates during the process but this is usually the function of a loan committee which meets only weekly or bi-weekly. Since the loan origination rate is a major factor in determining secondary market rates, rates in this market adjust to change more slowly than do regularly traded bonds. Hence the need to temper the effect of competing yields with recent changes in those yields.

[17]It takes longer for lending institutions to translate market information into rates on newly origianted conventional loans, relative to FHA/VA loans, because of the inefficiency of the conventional market vis a vis the FHA/VA market. This is not surprising, since in the FHA/VA one finds a highly standardized, very homogenous product. In addition, with the volume of activity in the GNMA security market, additional information is provided which signals any forthcoming changes in market rates. (Cont. page 11)

TABLE I

STATISTICAL RESULTS

MODEL	$\bar{R}^2$	SEE	X^2_{k-1}
1	.9672	.0861	1860.03*
2	.9722	.0794	2210.93*
1N	.9103	.1432	650.60*
2N	.9192	.1362	729.61*

COEFFICIENT RESULTS FOR MULTIPLE REGRESSION MODEL (Estimation Period)

(t values in parentheses)

(beta coefficients in brackets)

MODEL	C	X_1	X_2	X_3	X_4	X_5
1	8.741640	.407374	-1.135230	-.003319	.000021	-.318503
	(7.626660)*	(5.606090)*	(-2.638450)**	(-2.149970)***	(2.290390)***	(-3.63113)**
		[.444686]	[-.077250]	[-.470197]	[.280696]	[-.344998]
2	8.911590	.344091	-920364	-.002794	.000015	-.413311
	(7.472030)*	(5.483970)*	(-2.434920)**	(-1.725780)***	(1.719740)***	(-5.331050)*
		[.375032]	[-.062533]	[-.384545]	[.200190]	[-.433695]

Where:

* = significant at .001
** = significant at .01
*** = significant at .05

X_4 = mortgage demand, as measured by new construction put in place, lagged two months for both auctions. Here the lag represents the timing of permanent -loan- funding relative to actual construction. (i.e., permanent -loan- funding follows actual construction by a period dependent on the particular type of construction. In a single family lending, it follows by an average of 1/2 of the total construction period, usually 90 to 120 days.)

X_5 = spread between the latest known level of mortgage interest rates (as measured by the FHLBB new-homes series) and the previous auction's weighted average yield on accepted bids.[16]

While the formulations do not at first appear ideal due to the flow-stock combinations and the predictions of levels vs. changes, subsequent tests[19] validate these constructs whose results are in the form most recognizable by the MBF.

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[17]Even though the governmentally related loan auctions have done much to enhance the standardization of the conventional loan package, the conventional loan, itself, is highly heterogenous. Underwriting conditions are still a function of the individual lending institution. For this reason, it takes lending institutions longer to assimilate new information and its possible impacts on future loan rates.

[18]These proxies were chosen to represent the variables in the regression model of this ability to satisy four conditions:

(a) The figure must be avail ble at the time of the auction (i.e., revised figures were not used since the practicing MBF would not have had the revised figures at the time it was making the bid decision.

(b) The proxy should be highly correlated with the dependent variable.

(c) The proxy should not be highly correlated with the remaining explanatory variables so as to minimize the problem of multicollinearity.

(d) The proxy should be a logical choice, given the categories of variables to be used in the model. (Cont. on page 13).

TABLE II**

MODEL	SEE	MEAN ABSOLUTE ERROR	CORRELATION COEFFICIENT BETWEEN ACTUAL LOW BID AND FORECASTED LOW BID
1	.083720	.066980	.9918*
2	.069051	.054360	.9958*
1N	.096981	.071248	
2N	.082413	.061614	

Where:

* = Significant at the .001 level

** = for correct interpretation of the above results, the reader should note that the endogenous variables were measured in percentage (i.e., 9.82) form, not decimal (i.e., .0982) form. In addition, the first three auctions of 1979 were included to see if the models were capable of "picking up" the then record 11% yields.

As can be seen from Table I, the multiple regression provides a significant improvenment over the naive model in terms of adjusted R^2, as well as SEE (Standard Error of the Estimate).[20]

All coefficients are significant and possess the hypothesized signs.[21]

Variable	Hypothesized Sign
Competing yields and inflation (X_1)	+
Changes in X_1, (X_2)	- (tempering influence)
Supply (X_3)	-
Demand (X_4)	+
Government (X_5)	-

A variable that needs perhaps some explanation is X_5. The negative sign implies that as the spread between market levels of mortgage yields and the yield that FNMA is willing to accept widens, FNMA is providing a subsidizing element to the market. Hence one would expect the accepted yield in the upcoming auction to be lower.

In some sense, the informational content in the lagged variables in the regression model parallels the information available in the naive model. Both the naive model and the lagged variables incorporate information known at the most recent auction. The full set of determinants in the expanded model are more pleasing, however, as they incorporate reasonable institutional lags (the periodicity of loan committee meetings, new home construction times, etc.) as well as new information (since the most recent auction).

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[18] As to the choice of interpolated versus actual data, it is believed that interpolation (however calculated) of any of the explanatory variables would be arbitrary, at best; and might produce some unjustified trending in the series. In addition, tests employing Box-Jenkins techinques were unsuccessful, largely because of the complexity involved in forecasting some of the variables. Furthermore, it is shown in the final model that lag relationships exist (conforming to real world observations) which make expectational forecasts are unnecessary.

[19] In a subsequent test, the model was analyzed in terms of changes, rather than levels. Although statistically significant, the predictive power of the change model was found to be considerably less than the level form. For the estimation period, the adjusted R^2 figures for the FHA/VA and conventional equations are .5668 and .6123, respectively, and all variables have their hypothesized signs.

Forecast Period Results

Table II presents the results using the estimation period parameters and observations on the pre-determined variables for the second period to produce a set of predicted accepted low yields. In addition the standard error of estimates and mean absolute errors for the naive models are included to demonstrate the superiority of the expanded model in the forecast (test) period, as well as the estimation period.

As can be seen, the corrleations between the actual and the predicted are quite high. In addition, the forecasted values for the regression model are within approximately 6 basis points on average, across the 68 auction forecast period. The last fitted value is over 30 months away from the initial estimation period and only those inputs which are known by the MBF prior to each auction are used as determinants in the model.

Model Refinements

One of the benefits of regression analysis is that it allows one to attach a probability, in the way of a confidence interval, to the forecasted value. The MBF can develop a confidence interval about the forecasted low yield and thus attach a probability to a certain low bid being accepted.

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[20] Although not obvious, each regression would resemble:

$$Y = C + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5 (X_5 - X_{6\ t-1}) + E$$

if the previous low bid were used this would not be a fair comparison. for the expanded model would include the naive model ($Y_t = Y_{t-1}$), and in such a case, the expanded model would surely win.

[21] Running the regression over the entire period the signs are unchanged.

This greatly aids the MBF for two reasons. First of all, as previously mentioned, the firm faces two time-related risk problems. Coverage for its portfolio position is important; and therefore, it seeks to have its bid accpeted by the FNMA. Still, to remain competitive in the loan origiantion market place, it seeks to obtain the coverage at the lowest possible yield.

Since the MBF can submit up to five bids in each of the two auctions, the probability parameter enables it to submit some bids with a very high probability of acceptance (relatively unattractive yield), and some bids at a very low probability of acceptance (but a corresponding very attractive yield). Thus, it does not have to submit all bids at the same yield but can obtain coverage (with a high probability of acceptance) for a given amount and take a chance on another amount of very profitable coverage.

Seventy-five percent, 90%, 95%, and 99% confidence intervals about each of the forecasts were generated, based on the assumption of normal distributions. In every instance, the true value of the low accepted bid fell within the constructed interval, confirming the reliability fo the model as a forecasting tool, but questioning the normality assumption. With this in mind, probabilities based upon historical occurrences were created (see Table III).[22] Although these probabilities do not conform to the assumptions of regression analysis, they do seem more appropriate for the working world of the MBF. In other words, the confidence interval multipliers shown in Table III should be used rather than the normal distribution multipliers (which are much larger). Hence,

[22]The historical probabilities listed in Table III were generated by empirically analyzing the forecasts (68 in all) and determining what set of multipliers, when adjusted by the forecast error, would produce the indicated acceptance probability. In other words, in 34 cases (50%), if the MBF had taken the low bid predicted by the model and adjusted this bid by (.05) X (forecast error), the "new" adjusted bid would have been accpeted. Similar interpretations can be given for higher levels of probability of acceptance.

TABLE III

HISTORICAL CONFIDENCE INTERVAL MULTIPLIERS*

Probability of Acceptance	Historic-Actual FNMA FHA/VA	Historic-Actual FNMA Conventional
.95	.344	.411
.90	.290	.264
.85	.248	.231
.80	.214	.190
.75	.186	.169
.70	.162	.148
.65	.128	.127
.60	.093	.105
.55	.071	.087
.50	.050	.071

*For correct interpretation of the table, the numbers presented should be multiplied times the standard error of the forecast, with the resulting product being added to the forecast. This adjusted forecast has the indicated probability of acceptance. For example, if the FHA model developed in this paper forecasts a bid of 10.000%, with a standard error of .084, for the upcoming auction, the MBF should bid 10.29 to be 95% confident of its bid being accepted (10.000 + .344 x .084 = 10.029).

taking the SEE's shown in Table II as representative of the error in forecasting, the 95% confidence limits for an FHA/VA bid would be the forecast low accepted bid $\pm$ .029 (.344 x .084). Similarly, the 95% confidence for a conventional bid would be the forecast low accepted bid $\pm$ .028 (.411 x .069). These small basis point ranges demonstrate the usefulness of these models to the MBF. An examination of the auctions over the past 5 years shows this spread to compare quite favorably with the typical spread between low and average accepted bids.[23]

CONCLUSION

This bid model for FNMA FMS auction is reliable, useful and theoretically appealing. The agrument is not that a method has been devised to exploit an inefficient market (the efficiency question has been studiously avoided); rather, that the FNMA FMS auction can be understood through econometric analysis. Such an analysis produces results which are useful to the MBF in light of its particular objectives in the auction.

Obviously, this is only one placement device available to the MBF. Further research is needed to develop strategies for other placement devices. Ideally, a model is needed which would incroporate all of the alternative placement devices available to the MBF.

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[23]For example, the average spread between the low and average accepted bids for the nost recent five year period in the FHA/VA auction was 4.3 basis points. Since the MBF is interested in the upside (having its bid accepted) an adjustment of + .029 basis points compares quite favorably with auction results, especially considering the high probability of acceptance (95%).