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Volume Author/Editor: Joseph W. Conard

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Chapter Author: Joseph W. Conard

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3. The Mortgage Market

The study of the mortgage market consists of two major parts. The first consists of cross-section studies, the second of time series. Cross-section analyses are based on data from five sources: the Federal Home Loan Bank Board, the Bureau of the Census, the Federal National Mortgage Association, the Federal Reserve Bank of Chicago,[1] and some large life insurance companies that cooperated in providing new data for our project. For cross-section purposes we drew a 100 per cent sample of residential mortgage loans made by five large life insurance companies in June 1953, together with a similar 100 per cent coverage of all such loans made by six companies in February 1960.

The time series study is based on monthly samples of mortgage loans made by four major life insurance companies during the period January 1951 through December 1963. We are recording about 1,300 observations per month, and so far the evidence indicates that the sample is large enough to provide highly reliable estimates of the yields on all mortgage loans of these companies.

Since the collection of data for the time series is not quite finished, our findings to date are largely from cross-section studies, though we have significant time series insights from one large life insurance company which, for its own purposes, compiles series on both an authorization and disbursement basis.

Yield-Determining Characteristics

Many factors influence the yield on residential mortgages, including location of property, type of lender, size of loan, loan-to-value ratio, maturity, and income of borrower. The relative importance of these factors is difficult to assess because of the high degree of intercorrelation

[1] The Chicago Reserve Bank kindly provided us with punch cards giving data on new mortgages authorized in its District, beginning April 1960, by thirty-six savings and loan associations, twenty-four commercial banks, four mortgage companies, and one life insurance company.

between them and because many of the relations are not linear. For example, a measure of risk such as the loan-to-value ratio might show little effect on yields when it varied from 45 to 50 per cent, yet show large effect when it varied from 90 to 95 per cent. Some factors, particularly those related to risk, bear a highly significant relation to yield in some groups of mortgages and no relationship at all in others.[2] Sometimes even the apparent direction of influence of a given variable on yield can be changed—for example, from positive to negative—by taking account of other variables with which it is correlated. Some variables are related to yield through two channels which are offsetting in their effect.

LOCATION OF PROPERTY

Location of property is one of the most important variables affecting the yield on residential mortgages. Interregional yield differentials are well documented statistically. In addition, we have reason to believe that significant differences exist among individual states within the same region, between metropolitan areas and cities of different size, between cities and suburban and rural areas, and perhaps within different neighborhoods of the same city.

In 1890, the Census Bureau reported that yields on residential mortgages were 3.8 percentage points lower in New England than in the Rocky Mountain states. Since then a substantial portion although not all of the interregional yield differences has been eliminated, owing in good part to improvements in technical facilities for transferring funds from surplus to deficit areas. Today these differentials range generally from 1/4 per cent to 1 per cent, depending on how they are measured. Whether they are continuing to narrow or whether the narrowing process stopped in 1950 or even earlier is not clear. On conventional loans made by the large life insurance companies in our survey, the differences in both June 1953 and February 1960 were about 1/4 per cent. The differentials probably vary cyclically with fluctuations in the general level of rates, however, so that we must await the monthly time series before drawing firm conclusions. In any case, it is clear from Census data that any narrowing that has occurred since 1950 has been small.

[2] Groups are classified by type of lender, type of property (new or existing), and sometimes by characteristics of loan or of borrower (e.g., ratios of loan to asset value, or of borrower's income to loan size).

The causes of regional yield differentials are well known. They stem basically from different rates of economic growth. The more interesting question is why they have not been completely eliminated by the development of the federal underwriting programs and by the yield-leveling influence of loans made by the Federal National Mortgage Association and by private lenders that operate nation-wide, particularly the life insurance companies. Since lenders earn higher yields on mortgages in the deficit regions, why do they not continue to shift their loans to those areas until the differential is eliminated? One reason is a desire to have some sort of geographical diversification in their mortgage portfolios, thereby averaging out risks of a regional nature. The need for diversification is reinforced in some cases by the feeling that higher-yielding mortgages from the faster-growing states may be more risky. In addition, some companies evidently feel that they should make some mortgage loans in areas where they sell insurance.

A second part of the explanation of the continued regional yield differential is that lending at a distance may be more costly. This probably would not be the case if a perfect market existed for the services of specialists who keep properties under surveillance and collect interest and amortization payments. However, this market is demonstrably imperfect, though it has become increasingly competitive over the long run; this is one aspect of the improvement in technical facilities noted above.

A third part of the explanation, which Guttentag is beginning to unravel, is that because of various types of market imperfections some local submarkets are more or less shielded from the full force of the leveling influence of the national lenders. Apparently reflecting these imperfections, regional yield differentials are much wider for local lenders than for national lenders. They appear also to be wider on loans secured by existing properties than on those secured by new properties, where the influence of national lenders is mainly directed. Regional yield differentials are also higher on loans secured by properties of relatively low value. It is plausible that value serves as proxy for many influences associated with the degree of market segmentation. Very old properties, for example, are of lower average value than new properties and are generally shunned by national lenders.

Little is yet known about the other causes of locational yield differentials. Among the factors that Guttentag believes worth investigating are state laws regarding foreclosures; taxes and other penalties on out-of-state lenders, and taxes and restrictions on state institutions lending out-of-state; and the influence of financial structure (the number and type of financial institutions in different areas). The latter has important implications for public policy with regard to such matters as branching and mergers.

TYPE OF LENDER

Guttentag has recently prepared a progress report describing a number of yield-determining characteristics. Part of what follows is quoted from that report.

It is well known that mortgage yields differ by type of lender. Table 2 shows that on conventional loans differences between the highest- and lowest-rate lenders (savings and loan associations and insurance companies) exceed ½ per cent.

The most obvious hypothesis explaining these rate differences is that the lenders deal in different markets. To begin with, these lenders are represented quite unevenly in different geographic areas. However, similar yield differences exist within given metropolitan areas. In some places the inter-lender differences are larger than those shown in Table 2, notably on the West Coast, and sometimes they are smaller, as in the case of New York City.

The different lender groups also concentrate their activities in different segments of the risk spectrum. Table 2 shows significant differences in maturities, loan-value ratios, and property values among the different major lending groups.

Our studies indicate, however, that yield differences persist even after allowance for identifiable differences in characteristics of loan and borrower. This conclusion follows from regression analysis covering savings and loan associations, commercial banks, and mortgage companies in Chicago. Savings and loan associations show the highest yield, commercial banks the lowest, and mortgage companies are in between.

It may be, of course, that these lender differentials are explained by statistical inadequacies, including factors possibly affecting yield that we were unable to measure, such as the age of the borrower or the prepayment provision of the mortgage. Fortunately, the differences between associations and banks have been verified by a shopping study carried out in Chicago by Allen S. Jung of the University of Chicago.[3] Jung held everything else constant in a way that we never can do statistically. For every lender being solicited for a loan, he described the prospective borrower and the particulars of the transaction in a standardized manner.

[3] "Terms on Conventional Mortgage Loans on Existing Houses," *Journal of Finance*, September 1962, pp. 432–443.

TABLE 2

Characteristics of Conventional First Mortgage Loans, Originated by Major Lender Groups, for Purchase of Previously Occupied Properties, January-March 1963

Lender Group	Effective Interest Rate[a] (per cent)	Contract Rate (per cent)	Loan-to-Value Ratio (per cent)	Value of Property (dollars)	Term (years)
Savings and loan associations	6.29	6.15	73.5	16,500	19.6
Commercial banks	5.95	5.91	61.3	17,000	13.6
Mortgage companies	5.86	5.76	69.8	27,400	22.6
Mutual savings banks	5.65	5.63	66.8	19,300	20.7
Life insurance companies	5.62	5.60	68.1	27,400	24.1

Source: Federal Home Loan Bank Board.

[a]Contract rate adjusted to take account of fees and charges received by lenders, assuming prepayment of principal after a period equal to half the face maturity.

A number of possible explanations of lender differentials suggest themselves. Some bank loans, perhaps enough to affect the aggregate results, may have a tie-in character wherein banks view the borrower (or a firm in which the borrower holds a position of influence) as a possible customer for other services. Of course, some bank borrowers are already customers. Second, banks are not in the mortgage market continuously, and when they come in they may find it necessary to offer attractive rates in order to draw customers from the established lenders in this field.

In addition to yield differences between types of lenders, there are differences within any given type. In the case of both savings and loan associations and commercial banks, yields tend to be inversely related to the size of lender (after taking account of other yield-determining factors), but the tendency is not uniform. In the case of associations, those in the smallest of nine asset-size classifications obtain the highest rates, but the lowest rates are found among lenders of intermediate size. Among banks, the highest rates are found among smaller-size groups and the lowest in the largest-size group, but the very smallest lenders have rates in the intermediate range. Among the factors that may account for these yield differences by size of lender are differences in lending cost and in location within the area.

Even among the large insurance companies there seem to be some systematic differences in yields on similar mortgages made by different companies, but our analysis of this has not gone far enough to justify any generalizations regarding the nature or causes of these differences.

SIZE OF LOAN

Guttentag views the loan size as a double-edged variable. On the one hand, loan size is related to cost per dollar of loan. Since a larger loan may cost no more in the aggregate to put on the books, this may justify a lower yield. A net cost of only $200 to put a $10,000 loan on the books is the equivalent of about 1/4 per cent in yield; for a $5,000 loan, it is about 1/2 per cent. On the other hand, loan size affects borrower risk. A larger loan with given level of customer income, for example, implies reduced income coverage of debt service, and this works toward higher rates.

In most but not all of Guttentag's regressions, loan size is inversely related to yield, after maturity, loan-to-value ratio, and borrower's income are held constant,[4] suggesting that the cost effect dominates. When the regressions are limited to mortgages having relatively low

[4] The terms "regression equation" and "b-coefficient" will appear frequently in the following analysis. Their meaning can be simply explained. If we suppose that yields vary with the size of loan and by appropriate statistical analysis of observed data we derive the statement "yield (per cent) = 6.00 − .02 × size of loan," we have written a "regression equation." Note that this would make it possible to determine (within a margin of error) the yield of a mortgage if we knew only the size of loan. If we used only one explanatory variable, as in this case, we should expect the margin of error to be very great. By adding more explanatory variables, such as monthly mortgage payment, our equation will presumably improve our estimate of what the yield would be, and can also indicate more precisely what the effect of loan size is when the other variables are taken into account. The statistical analysis alone, however, cannot tell us whether the loan size "causes" the

income-loan ratios, however, where borrower risk presumably is high, the relation is positive, implying that in these cases the addition of further borrower risk associated with a large loan more than offsets the effect of its lower cost. Continuing again with Guttentag's report:

Yet it is not at all clear that cost explains the entire negative component of the relation between loan size and yield. Studies of rate structure on other instruments, including Avery Cohan's study of direct placements, also show a very pronounced negative relationship between loan size and rate. The cost factor must be of negligible importance on direct placements because of their large size, and the presumption is that large placements carry lower rates because of their correlation with size of borrower; larger borrowers may generally have a stronger credit position, a stronger bargaining position, or both. It is interesting, however, that Cohan found the size of a direct placement to have a significant negative influence on yield even when two measures of firm size were included in the regression (total capitalization and earnings before interest and taxes). A sophisticated mortgage lender to whom I posed this problem remarked that "large loans carry stature," which is a remark worth pondering.

LOAN-VALUE RATIO

The observed differences among yields on mortgage loans are explained in large measure by differences in risk. One important risk variable is the size of loan relative to property value. Guttentag found that:

Higher loan-to-value ratios generally are associated with higher yields, whether other variables are taken account of or not. The general relation is illustrated in Table 3, drawn from the FHLBB survey, which is a simple classification that does not take into account intercorrelation between the loan-to-value ratio and other yield-determining variables.

On a priori grounds we would not expect the relation of the loan-to-value ratio to yield to be linear. One might even expect that there would be critical levels above which variability would make a considerable difference and be-

yield to be about what the equation asserts, or whether factors not included in the regression but associated with both yield and size produce the result.

Note that in the example above the last term is "$-.02 \times$ size of loan." This clearly indicates that when loan size rises, yield falls. The number "$-.02$" in this case is sometimes called the "b-coefficient" or the "regression coefficient" for loan size. Thus a negative regression coefficient means that changes in the variable involved will cause mortgage yields to move in the opposite direction, and conversely with positive regression coefficients. (The numbers in this example have no significance at all; they are purely illustrative.)

TABLE 3

Effective Interest Rate on Conventional First Mortgages by Loan-to-Value Ratio, January-March 1963

(per cent)

Loan-to-Value Ratio	Home Purchase, New	Home Purchase Previously Occupied	Construction
Under 55.0	5.74	6.03	5.98
55.1-60.0	5.78	6.10	6.02
60.1-65.0	5.84	6.06	6.07
65.1-70.0	5.88	6.11	6.14
70.1-75.0	5.83	6.09	6.10
75.1-80.0	6.13	6.27	6.34
Above 80.0	6.24	6.25	6.26

Source: Federal Home Loan Bank Board.

low which it would make little difference. The data in Table 3 do indeed suggest that 75 per cent is such a critical level. It is worth noting in this connection that on conventional mortgages legal maximum loan-value ratios for life insurance companies and mutual savings banks exceed 75 per cent in only a few states.

Because of intercorrelation between the loan-to-value ratio and other mortgage characteristics, and because of the wide coverage of lenders and areas in these data, however, this critical ratio of 75 per cent could be largely illusory. One would expect that the critical level would vary for different groups, depending on the general level of other risk variables. Multiple regression analysis of the Chicago data, where the loan-to-value ratio is analyzed in terms of seven separate groups, broadly confirms this. On conventional loans made by savings and loan associations secured by existing houses, there were significant yield differences between the 30–40 per cent loan-to-value group and below-30 per cent group. In the case of loans on new houses by associations, the loan-to-value ratio does not become important until the 50 per cent level. In the case of mortgage companies, it does not become important until the 70 per cent level, and is not very important even then. On FHA and VA mortgages, where loan-to-value ratios generally ranged much higher, the regression coefficients were often statistically significant, though not quantitatively large.

The loan-to-value ratio is closely related to term to maturity, which will be discussed next.

TERM TO MATURITY

Crude yield curves for mortgages often appear to be negatively sloped, a fact of special interest because bond yield curves have been predominantly of positive slope for the past thirty-five years.[5] To understand the meaning of this frequent negative slope in mortgage yield curves, or even to verify its existence, is a complex task. Indeed, the influence of term to maturity on yield is one of the most difficult to unravel for many reasons. First, maturity affects yield in a variety of ways, some of these even being in opposite directions, hence tending to cancel each other out. Second, maturity is sometimes correlated with other loan or borrower characteristics that influence yield, and hence influence the relationship of yield and maturity. Third, the association between maturity and yield is often nonlinear and difficult to identify. Fourth, the relation between maturity and yield may reflect the preferences of lenders for long or short loans, and attitudes are often difficult to ascertain with confidence and always difficult to measure. Each of these features of maturity analysis requires further discussion.

Maturity is related to risk through two channels which happen to be offsetting in their effect. Guttentag distinguishes borrower risk from property risk. Borrower risk refers to the possibility that the borrower will be unable to service the loan. Property risk refers to the possibility that the value of the underlying property will, sometime over its life, fall below the outstanding loan balance, thus encouraging default and increasing loss to the lender if default occurs. A longer maturity reduces the borrower's monthly mortgage payment, thus raising the income coverage and reducing the borrower risk.[6] How-

[5] A yield curve is one that relates yield to term to maturity, measuring yield on the vertical axis and maturity on the horizontal. If long-term securities yield the highest returns, this curve will slope upward to the right, which is called a positive slope. Conversely, if long-term yields are lower than short yields the curve slopes downward to the right and is said to be negatively sloped.

[6] Over a longer period, of course, more things can happen to affect borrower risk, but it is not clear a priori in which direction the effect would run. The difference in *actual* life between short and long maturity mortgages is due largely to the higher assumption rate on long maturity mortgages; i.e., long maturity mortgages are less often paid off when homes are sold, the purchaser assuming the seller's mortgage obligation rather than taking out a new mortgage. Whether assumptions increase or decrease mortgage risk is problematical.

ever, a mortgage of longer maturity implies a smaller accumulated repayment of principal after any given period, and therefore a smaller margin between outstanding debt and property value, which raises property risk.[7] It follows that if we were to consider the risk factor only, a priori reasoning suggests several possible yield curves. First, if borrower risk predominates, we might expect a negatively sloped yield curve, reflecting the lower risk of longer maturities.[8] Second, if property risk predominates, we might expect a positive slope, reflecting the higher risk on longer loans. A third possibility is that the yield curve might be U-shaped, reflecting first the predominant influence of declining borrower risk and then rising as increasing property risk assumes the ascendency.

Guttentag's first step was to disentangle the maturity from the loan-to-value ratio, with which it is highly correlated. He did this by calculating average yields for several maturity groups cross-classified by loan-to-value ratio, and by constructing multiple regression equations describing mortgage yield as a function of term to maturity and loan-to-value ratio. The coefficient of the term to maturity in these equations indicates the slope of the curve when the other variable (loan-to-value ratio) is held constant.

In almost all cases these procedures resulted in negative sloping yield curves or U-shaped curves that were negative on balance. The negative slope was more pronounced in the case of loans on existing houses than on new houses.

Next Guttentag tested the hypothesis that the influence of property risk, if it could be disentangled from borrower risk, would be to give the yield curve a positive slope. To do this, he added to the regression other independent variables which appear likely to be related to borrower risk. Four combinations of such variables were tried: borrower income and loan size, the ratio of income to loan size, income and the monthly mortgage payment, and the ratio of income to mortgage payment. If these variables could pick up the borrower risk component of the maturity, then the maturity would

[7] A complication not considered here is that borrower risk may also be affected by the accumulated equity; i.e., borrowers may be more inclined to default if their equity is small.

[8] As noted later, however, the analytical foundations of a negatively sloped curve are less than firm.

only carry property risk; and since property risk increases as maturities lengthen, the yield curve should tilt upward.

Although these tests have not been completed, the results so far indicate that the inclusion of these variables has little effect on the yield curve. Their inclusion in regression equations does sometimes reduce the extent of negative slope, as expected, but the shifts are invariably small and in no case is the result an unambiguously positively sloping curve.

Guttentag hypothesized that the reason for this might be that the relation between maturity and property risk was nonlinear. In other words, changes in property risk from changes in maturity might be very small if the general level of property risk was small to begin with because of low loan-to-value ratios. Where this is the case, one would not expect much, if any, positive slope in the yield curve even though the borrower-risk component of the maturity was completely eliminated. To test this possibility Guttentag ran separate regressions, covering savings and loan associations only, for loans in four loan-to-value groups on existing houses and two loan-to-value groups in the case of new houses. This provided some but not very strong support for the property-risk hypothesis. Thus, on existing houses the negative slope was significantly steeper for the lowest loan-to-value group (less than 60 per cent) than for the highest (75 per cent and over), while the slopes of the other two groups were in between. But the slope remained slightly negative even on the highest loan-to-value group. This was true both before and after the inclusion of other variables designed to absorb the effects of borrower risk. In the case of loans on new houses, furthermore, slopes were not significantly different as between the two loan-to-value groups (above 75 per cent, and 75 per cent and below); in both cases the yield curve was U-shaped and perhaps slightly negative on balance. Thus, even on high loan-to-value mortgages, Guttentag has not succeeded in finding positively sloped yield curves, and the most that can be said is that on these mortgages the property-risk component of the maturity may result in a somewhat less pronounced negative slope.

What is responsible for the negative slope? At the outset it was suggested that the borrower-risk component of the maturity could generate a negative slope. Yet the evidence indicated to Guttentag that this is not the answer. If the negative slope reflected borrower risk, the inclusion in regression equations of variables that are related to borrower risk, such as the income-to-loan ratio, should eliminate a good part if not all of the negative slope; as indicated above, this is not the case.

As a further test of the possibility that the negative slope reflects borrower risk, Guttentag ran separate regressions for several groups of mortgages classified by income-to-loan ratio. The logic of the test was as follows. If negative slope reflects borrower risk, then the slope should be greatest when borrower risk is high, because variations in maturity would then have a significant effect on this risk; the slope should thus be greatest for mortgages with low income-to-loan ratios. But the negative slope should largely disappear when high income-to-loan ratios make borrower risk so low that changes in it associated with changes in maturity have little effect. In the existing-house category he ran separate regressions for three income/loan-size groups in each of two loan-to-value classes (those below 60 per cent and those over 75 per cent). Similarly, on new houses, he ran regressions on two income/loan-size groups in each of the two loan-to-value classes (above and below 75 per cent). In general, the differences in slopes between the different income/loan-size groups were not statistically significant, as they should have been if borrower risk tended to produce negatively sloped yield curves.

The argument that the negative slope of mortgage yield curves reflects borrower risk must assume that people want to be forced to save and will pay a premium to be so forced. Despite the evidence that this kind of psychology exists in some contexts, neither Guttentag nor I find the argument persuasive in this situation.

Again the question arises, what does explain the negative slope if it is not borrower risk?

It should be pointed out that the negative slope here discussed cannot be explained by the fact that longer-maturity mortgages are, on the average, also larger loans, and that for this reason the cost of making the transaction is lower per dollar of loan. The reason this explanation must be ruled out is that many of the regressions used in deriving our yield curves hold size of loan constant.

One possible explanation of the negative slope of the yield curve is that the relevant factor is the age of existing properties, on which no statistical data are available. Lenders may limit the maturity on those old properties which also carry high property risk, thus causing short maturities to be associated with greater risk and hence to provide greater yields. (On new houses, it will be remembered, it is not clear whether the negative slope of the curve was statistically significant.)

Another possible explanation of the negatively sloped yield curve is that many buyers of mortgages, especially life insurance companies, prefer long investments to short. Such a preference could reflect the desire to minimize frequency of reinvestment, and also a preference for income security, without concern over prematurity fluctuation of capital values. Evidence in support of this explanation was found in the fact that the yield curves of FHA mortgages, which carry small risk, revealed no slope at all for commercial banks but a negative slope for mortgage companies. Commercial banks would be expected to have some concern over prematurity price fluctuations, but mortgage companies sell largely to life insurance companies.

On the other hand, evidence against this hypothesis is seen in the fact that even for mortgage companies the negative slope is concentrated entirely in the existing-house category, raising the possibility that here also the age of property may be the relevant factor. Lender preferences, furthermore, may not be as important a determinant of term structure in mortgages as in bonds. Residential mortgages today seldom have maturities of less than eight to ten years, and this is already beyond the point where yield curves covering bonds show the steepest slope. The majority of mortgages, furthermore, are paid in full before maturity, so that face maturity is a much less reliable guide to actual life than in the case of bonds.

Borrower's Income. Guttentag's analysis of the influence of borrower's income has not progressed far, and results to date have not been very satisfactory. It would be expected that on loans of given characteristics (maturity, loan-to-value ratio and loan amount), borrowers with high income would pay a lower rate because of lower borrower risk. In fact, the b-coefficient for income in regression equations, including the three variables indicated above, is sometimes positive and sometimes negative. When mortgages are segregated by income-loan ratio, regressions covering low income-to-loan mortgages show the expected negative coefficient, while the high income-loan groups show positive coefficients. We suspect that the income variable may be associated with some factor not yet identified by Guttentag, which bears a positive relation to yield.

Other Observations

The cyclical timing of mortgage rates, as compared with that of other security yields, looks interesting, and we hope it may shed further light on the determinants of interest rates generally. On the basis of very incomplete data, it appears that the well-known tendency of mortgage rates to lag behind bonds is appreciably reduced by the use of authorization dates instead of disbursement dates, but it is not entirely eliminated. The amplitude of the yield series for all residential mortgages authorized by life insurance companies (conventional, FHA, and VA) appears to be somewhat less than that of government obligations and high-grade corporate bonds, but not much different from that of low-grade corporates and the series on FHA mortgages published by that agency.