Path Analysis and the Need for an Alternative Approach to the Investigation of Redlining

by Jon R. Crunkelton and Franklin J. Ingram

INTRODUCTION

At the time our national housing goal was articulated over a quarter century ago, an estimated six million Americans were ill-housed. Ironically, after the passage of nearly three decades and the expenditure of billions of dollars of public and private funds to improve housing conditions, the latest estimate of the number of Americans still lacking a decent home and living environment remains at or slightly above that six million level, indicating no absolute improvement.[1] Under such conditions, the prevention of unjustified withholding of mortgage loans from declining neighborhoods is important if progress is to be made. However, it is equally important to prevent the dissipation of scarce capital in home loans that are likely to go into default.

The ways in which the issue of "redlining" has been defined heretofore have been as varied as the viewpoints of the interested parties. For the purposes of this discussion, "redlining" is taken to be the alleged practice by financial institutions of prior designation of certain neighborhoods within an urban real estate market in which mortgage loans will not be made when risk differentials do not justify such action. This definition includes making the terms of such loans so unappealing that housing loans become

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effectively unobtainable. The great difficulty, and the source of most of the contention surrounding the redlining issue, is differentiating between discrimination and sound business judgment in the mortgage lending practices of financial intermediaries.

PURPOSE

The primary purpose of this analysis is to demonstrate in a rigorous manner that the existence of redlining and other forms of mortgage lending discrimination have, as yet, not been satisfactorily established. No attempt is made to model redlining because, as will be indicated, much data collection and study remain to be done before the presence of redlining can be objectively determined. In accomplishing this purpose, a research methodology known as path analysis is employed. Path analysis lends itself to consideration of the complex of interrelationships among variables that are relevant to the urban real estate environment.

BACKGROUND

To carry out the objective of the study, research was conducted to secure data from each institution covered by the Mortgage Disclosure Act with offices in a particular medium-sized, growing, southern SMSA (Standard Metropolitan Statistical Area). The original survey included the four largest savings and loan associations and the four largest commercial banks in that SMSA.

At each institution, a copy of its disclosure statement was requested and voluntarily provided. *Exhibit 1* summarizes the disclosure report forms of the four savings and loan associations and two commercial banks whose

EXHIBIT 1

TEST SMSA FINANCIAL INSTITUTIONS
MORTGAGE LENDING
July 1-Dec. 31, 1976

Area	Population	% Black (PB)	Median Family Income (MFI)	% Sub-Standard Housing Units (PSHU)	Single Family Mortgages: Number	Single Family Mortgages: $ Amount	Single Family Mortgages: Mortgage Loans Per Thousand Population (MLPT)
Central City	113,542	30%	$7,612	3%	184	$ 5,603,000	1.6
Balance of Urban Area	120,326	33	$9,170	5	439	15,341,776	3.6
Urban Sub-Total	233,868	31	$8,542	4	620	20,944,776	2.7
Suburban Sub-Total	89,012	13	$8,756	4	533	16,163,995	6.0
SMSA Totals	322,880	26	$8,617	4	1156	37,108,771	3.6

Note: Columns may not add to totals and sub-totals due to rounding

primary service areas covered both the central city and the suburban ring. *Exhibit 1* also includes census data considered relevant to the analysis.

THE AVAILABLE EVIDENCE

A wide range of redlining studies has been undertaken in recent years by states, communities, and public interest groups. While space limitations do not allow a thorough review of all these efforts, the interested reader is referred to the Urban-Suburban Investment Study Group's recent summary report produced for the Department of Housing and Urban Development.[2] The important point is that included in that report is a critique of the redlining literature in which two researchers in the field, Agelasto and Listokin, conclude that "the (available) studies of redlining commence with an expressed bias against lenders . . . and prejudge the banks to be arbitrary and discriminatory, and search for evidence to prove this view. Other drawbacks . . . are that they are often isolated, have limited analysis, and contain questionable assumptions. . . ."[3]

Agelasto and Listokin also question the assumption of certain studies which contend that a low or reduced volume of loans in a particular neighborhood is evidence of discriminatory lending patterns. Instead, they suggest that a limited volume of loans might be a function of risk factors or demand. Moreover, as Brimmer points out in his review of the redlining debate, there is ample indication of substantially greater risks in central city—as compared with suburban—mortgage lending. Brimmer notes, for example, that a seven-year (1968-1974) study of minority group-owned financial institutions turned up the following facts:

1) Minority-owned associations hold a somewhat larger fraction of their assets in a combination of cash, demand deposits, and investment securities. (In 1974, the figures were 10.3% in minority associations and 9.4% for white-owned associations).
2) The ratio of mortgages to total assets was lower at minority-owned associations—79.9% versus 81.5% for white-owned associations in 1974.
3) Conventional mortgages represented a smaller fraction of total mortgages (88.0%) at minority-owned institutions than at their white counterparts (93.9%) in 1974. In contrast, VA-guaranteed and FHA-insured loans represented 12.0% of total mortgages at minority-owned associations versus 6.1% at those controlled by whites.
4) Foreclosed real estate (reflected in properties owned and in judgment plus loans and contracts to facilitate sale) represented 2.0% of total outstanding mortgages at minority-owned institutions in 1974, compared with 0.5% at white-controlled associations.

These data suggest an important conclusion: minority-owned depositories, which concentrate on inner-city lending and which cannot be accused of practicing racial discrimination, face substantially more risk of loss than do their white counterparts. Consequently, these minority-owned institutions seek to avoid or minimize such risk by a cautious lending posture (reflected in a fairly high liquidity ratio) and by relying much more heavily on mortgages underwritten by the federal government.

The first official recognition of the practice of discriminatory mortgage lending by financial institutions came as recently as 1974 when an Ohio couple successfully sued a Cincinnati savings and loan association under the Civil Rights Act of 1968 for redlining the racially-mixed Avondale section of that city.[5] This case, along with mounting pressure from around the nation, spurred Congress to pass the Mortgage Disclosure Act of 1975 in which all depository institutions that make mortgage loans in SMSAs are required to report their mortgage lending activity by census tracts. As the data generated under this law have not as yet been fully gathered and summarized, the existing evidence is entirely local in nature.

All the studies in the literature possess at least one of the following serious deficiencies:

1) They ignore or assume away the interrelationships among the causal factors.
2) They fail to take demand into account explicitly.
3) They do not give risk factors adequate consideration.

In spite of these shortcomings, most of the studies conclude that urban financial institutions do practice redlining. The result has been a spate of laws and government regulations which are rapidly institutionalizing costly anti-discrimination mechanisms which lend themselves to misinterpretation and fail to generate the data required for a completely unambiguous statistical screening device.

THE CONVENTIONAL WISDOM

A simplistic analysis of the data in *Exhibit 1*, of the type that has become traditional among local government agencies and/or public interest groups, might lead to the conclusion that there is strong evidence to suggest both geographic and racial discrimination on the part of the banks and savings and loan associations studied. The data reveal the following preliminary results on apparent lending discrepancies between the central city area vis-a-vis the suburbs:

1) Residents of census tracts within the central city district received 16% of the mortgage loans made during the period, although 35% of the sample SMSA's population resided in this area.
2) The balance of the urbanized area accounted for 38% of the mortgage loans and 37% of the population.
3) Individuals financing homes in suburban neighborhoods attracted 46% of the mortgages, although only 28% of the population resided in such areas.

With respect to the racial undertones which are an important aspect of the redlining question, the following relationships are revealed by the analysis:

1) Residents of predominantly black neighborhoods received only 3% of the mortgage loans made by the sample SMSA's financial institutions during the period, although 19% of the population lived in these neighborhoods.
2) The correlation coefficient (r) between the percentage of blacks in a neighborhood and the number of mortgage loans was −.33, which implies that there is a statistically significant (at the 99+% confidence level) inverse relationship between minority concentration and mortgage lending.

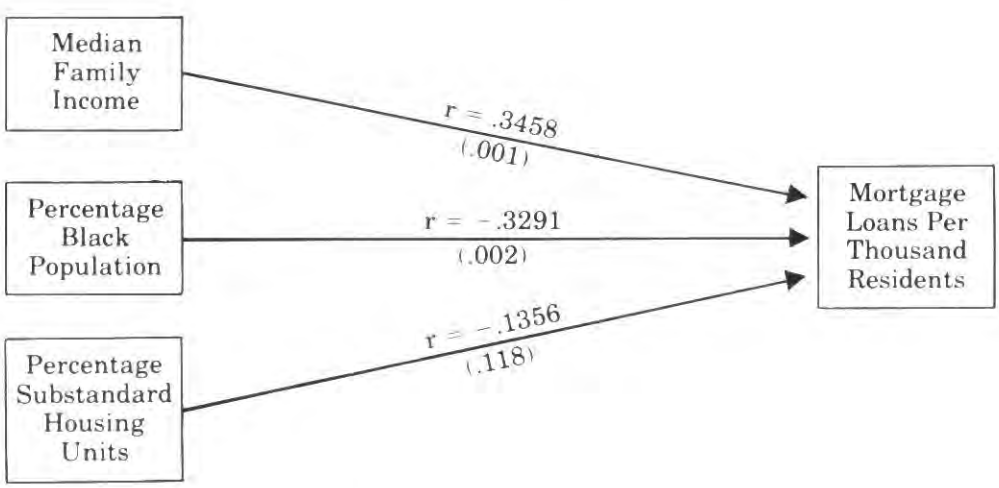
Ignoring the critical interrelationship problem, these factors could be interpreted as an indication of a clear pattern of discrimination in mortgage lending by the area's depositories.

However, lending institutions have contended that among the variables considered in this study, family income is the major criterion in mortgage loan evaluation. The correlation between median family income and the number of mortgage loans made in a neighborhood was +.35, which implies that a positive, statistically significant (at 99+% confidence level) relationship does exist between the two factors. Furthermore, investigation of the interdependence between percent substandard housing within a census tract and mortgage loans showed a correlation coefficient of −.14, which indicates a statistically significant (at the 88% confidence level) inverse relationship.

Thus, one might argue that racial discrimination in housing finance exists because of the negative correlation between racial composition and loans extended. But at the same time, lending institutions could just as easily maintain that family income is the primary consideration, rather than race, basing their assertion on the positive correlation between income and mortgage loans. Additionally, a case could be made for the presence of discrimination due to the correlation between the quality of housing stock and mortgage lending volume. All these relationships and the relevant correlation coefficients are depicted in *Exhibit 2*. The problem with these arguments lies in the fact that each ignores or assumes away the influence of demand, risk, and the complex interdependencies among the variables.

The correlation coefficients shown in *Exhibit 2* are an index of the direction and magnitude of a relationship between two ordered sets of variables.

EXHIBIT 2



Note: Numbers within parentheses indicate level of significance and r = correlation coefficient.

However, this relationship consists of both the direct effect of the variable taken as causal and also the indirect effect through other variables. What is needed to rigorously demonstrate the internal weaknesses and methodological problems of the bulk of the studies that claim to prove the existence of redlining is a method of decomposing and isolating linear relationships among a set of variables. Path analysis is such a method.

PATH ANALYSIS

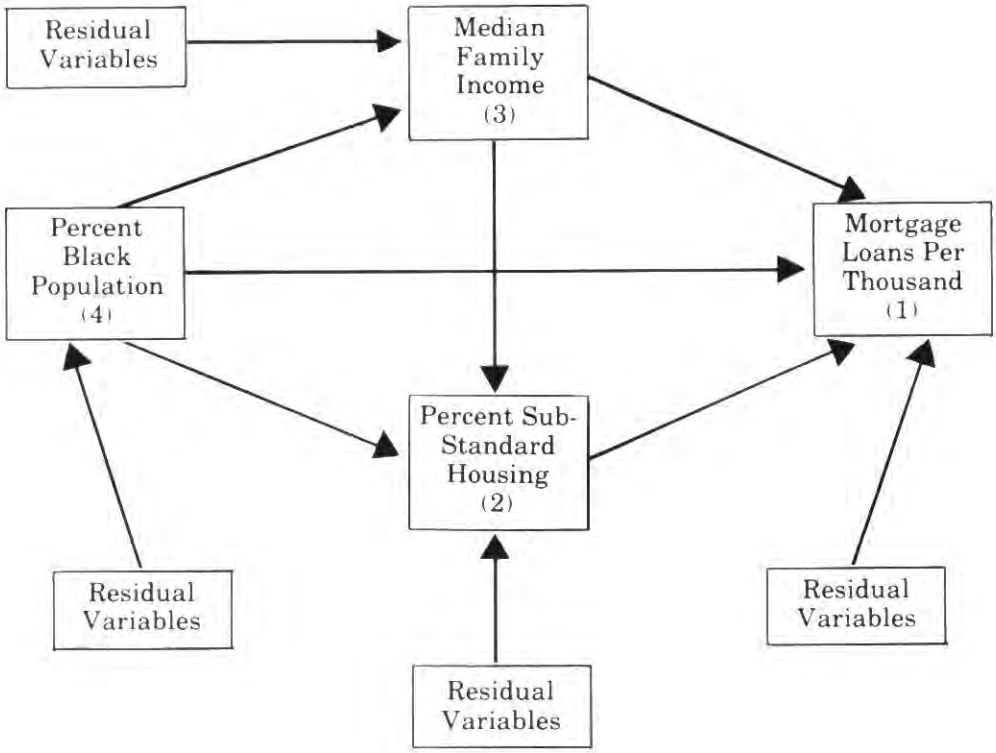
Path analysis is a technique used to study the direct and indirect effects of causal (or independent) variables on variables taken as effects (or dependent variables). This methodology is applied to an explanatory model which has been formulated on the basis of knowledge and theoretical considerations. Path analysis is utilized for testing cause and effect relationships in a formulated theory, rather than in the generation of the theory.[6] The method dichotomizes the correlations between variables into direct and indirect effects. However, path analysis is not a procedure for demonstrating causality; rather, it is a method for tracing out the implications of causal relationships which the analyst is willing to impose upon a system of relationships.[7]

Path analysis is used in this study specifically to divide correlations into direct and indirect effects, but the technique is also an important analytical tool for theory testing. Kerlinger and Pedhazur[8] show that path analysis can be used to determine whether or not a pattern of correlations for a set of observations is consistent with a specific theoretical formulation by attempting to use the path coefficients to reproduce the original correlation matrix (R) for all the variables in the system. If a researcher proposes a more parsimonious model he, in effect, deletes some of the paths on the theory that the correlation between the variables is due to the indirect rather than the direct effects. Kerlinger and Pedhazur show that if, after the deletion of these paths, it is possible to reproduce R, or closely approximate it, the pattern of correlations in the data is consistent with the simpler model. For further insight into alternative uses of path analysis, the interested reader is referred to the Kerlinger and Pedhazur text.[9]

However, the objective of this paper is to study the relationships among redlining variables. While partial and semi-partial correlation analysis could also be used for this purpose, path analysis is especially appealing as it lends itself to the use of diagrams, thus facilitating understanding.

To demonstrate how the use of path analysis can divide a correlation into both direct and indirect effects, thereby adding more reality and clarity to the study of redlining, the model outlined in *Exhibit 3* was formulated. Mortgage Loans Per Thousand (MLPT) is hypothesized to be dependent upon the following three variables for which data are available from the decennial census: Median Family Income (MFI), a proxy for default risk; Percentage Black population (PB); Percentage Substandard Housing Units (PSHU), a proxy for neighborhood quality; and other undefined residual variables for which data are not currently accessible.

EXHIBIT 3



The following relationships were also assumed:

1) PB has an inverse, direct effect upon MFI; that is, family income is inversely related to the percentage of blacks in a neighborhood.
2) PB has a postive, direct effect on PSHU.
3) PSHU has an inverse, direct effect on MLPT.

In *Exhibit 3*, the unidirectional arrows are called *paths* and are drawn from the variables taken as causes (independent variables) to those taken as effects (dependent variables). The path from MFI to PSHU indicates that the percent of substandard housing units is likely to be affected by the median family income for a particular census tract. The major dependent variable of interest, MLPT, is hypothesized to be a function of MFI, PB, PSHU, and other unknown residual variables as indicated by the arrows. The variables have been numbered for ease in labeling; for example, MFI is variable 3.

Several important assumptions underlie the application of path analysis as used in this study.[10] The first assumption is that the relationships between the variables in the model are linear, additive, and causal. This means that curvilinear relationships and others are excluded. The second assumption is that the residual variables are not correlated with variables preceding them in the model or among themselves. This implies that all relevant

variables are included in the system. The third assumption is that the model is recursive; i.e., the causal flow is uni-directional. This means that MFI is taken as a cause of PSHU but PSHU has no causal effect on MFI.[11] The fourth assumption is that all of the variables are measured on either the interval or ratio scales.

After setting up the model, the second step in path analysis is the calculation of path coefficients. The developer of path analysis, Sewall Wright,[12] defines a path coefficient as:

> The fraction of the standard deviation of the dependent variable (with the appropriate sign) for which the designated factor is directly responsible, in the sense of the fraction which would be found if this factor varies to the same extent as in the observed data while all others (including the residual factors . . .) are constant.

The path coefficient denoted with the symbol "p" indicates the amount of expected change in the dependent variable as a result of a unit change in the independent variable. It indicates the direct effect of an independent variable upon a dependent variable. Along with the symbol "p," two subscripts are used to identify a particular path. The first subscript indicates the effect or dependent variable while the second indicates the cause or independent variable. Thus, the path indicated by P_{43} indicates the direct effect of variable 3 (PSHU) upon variable 4 (MLPT). There is a path coefficient for each unidirectional arrow indicating this direct effect.

Given the assumptions previously discussed, the solution for the path coefficients is simply the ordinary least squares solution for the standardized regression coefficients (β's). When a dependent variable is hypothesized to be dependent upon only one variable and possibly a residual variable, the path coefficient is equal to the zero-order correlation coefficient. For variables such as variable 1, (MLPT), hypothesized to be directly affected by more than one variable, the path coefficients are equal to the β's calculated by applying the least squares solution to the regression of variable 1 upon variables 2, 3, and 4. Thus:

$$P_{14} = \beta_{14.23}$$

Path coefficients for residual variables associated with a dependent variable are estimated by $\sqrt{1 - R^2}$ where the R^2 (coefficient of determination) is from the regression equation in which all causally prior variables are used as predictors.

There is, however, an important difference between regression analysis and path analysis. In regression analysis, one regression is conducted; i.e., the dependent variable is regressed upon all of the other variables in the model. In path analysis, however, more than one regression may be needed. At each stage, a variable hypothesized as being dependent is regressed upon just the variables upon which it is assumed to be dependent. In the model presented, two regressions were performed. PSHU was regressed upon MFI and PB. Then MLPT was regressed upon MFI, PB, and PSHU.

One of the important applications of path analysis is in its ability to determine what part of a correlation between two variables is due to the

direct effect and also an indirect effect. Indirect effects may occur in several ways. For example, when causes are correlated, each cause has a direct effect on the dependent variable as well as on indirect effect through the correlations with the other causes. As an example, PB might have indirect effects upon MLPT through PSHU, through MFI, or through the path MFI and PSHU. The calculation of indirect effects is more complex and is described fully by Turner and Stephens.[13] A short example utilizing variables 1, 2, and 3 will demonstrate how the indirect effects are calculated. All variables are expressed in standard form (z score) and the e's represent residual variables not in the model. These three variables can then be expressed as follows:

$$z_1 = e_1 \qquad (1)$$

$$z_2 = p_{21}z_1 + e_2 \qquad (2)$$

$$z_3 = p_{31}z_1 + p_{32}z_2 + e_3 \qquad (3)$$

The calculation of the two paths leading to variable 3, p_{31} and p_{32}, starts with the calculation of the correlation coefficient for variables 1 and 3, as seen in formula 4 below:

$$r_{13} = \frac{1}{N} \sum z_1 z_3 \qquad (4)$$

Substituting for z_3 and dropping the residual variables for simplification because the covariance between p_3 and z_1 and p_3 and z_2 is zero, the following is obtained:

$$r_{13} = \frac{1}{N} \sum z_1 (p_{31}z_1 + p_{32}z_2)$$

$$= p_{31} \sum \frac{z_1^2}{N} + p_{32} \sum \frac{z_1 z_2}{N}$$

$$\sum \frac{z_1^2}{N} = 1$$

$$\sum \frac{z_1 z_2}{N} = r_{12}$$

$$r_{13} = p_{31} + p_{32}r_{12} \qquad (5)$$

Formula 5 states that the effect of variable 1 upon 3 consists of two parts. p_{31} represents the direct effect and $p_{32}r_{12}$ represents the indirect effect through variable 2.[14]

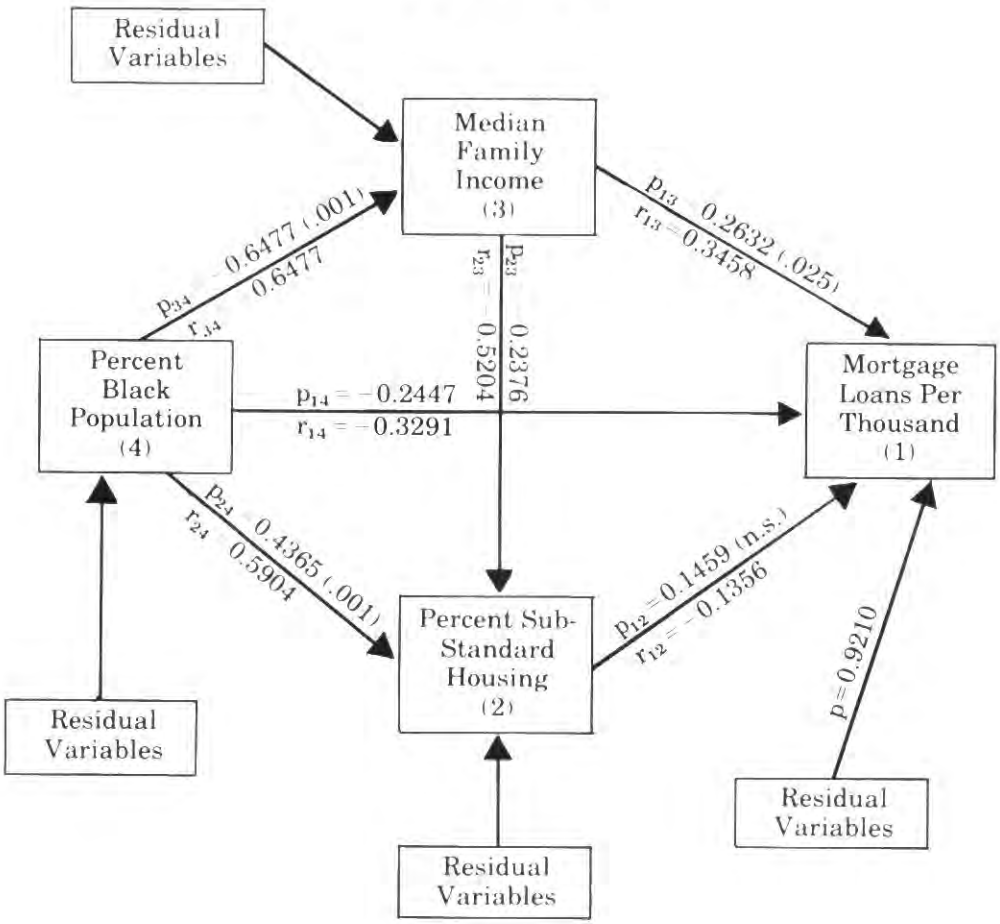
The relationship between two variables can also be decomposed into causal and noncausal or spurious components. This dichotomy is accomplished in a similar manner to the breakdown into direct and indirect effects and is explained more thoroughly in the Statistical Package for the Social Sciences.[15]

APPLICATION OF PATH ANALYSIS

Given the proposed model, path analysis was utilized to test whether neighborhood quality and racial composition were factors in determining

lending patterns of the financial institutions analyzed. Based on the analysis of the data, the results are displayed in path diagram form in *Exhibit 4*. This exhibit also shows the correlation coefficients between the

EXHIBIT 4



variables while *Exhibit 5* gives a complete analysis of the relationships between the variables using path analysis.

An examination of the path coefficients in *Exhibit 3* shows the direct effect of the variables upon MLPT. The two variables in the model having the greatest direct effect upon MLPT are Median Family Income with $p_{13} = 0.2632$ and Percentage Black population with $p_{14} = -0.2447$. This means that the direct effects of MFI and PB have about the same impact but in opposite directions. The Percentage of Substandard Housing Units has a statistically insignificant direct effect upon MLPT.

EXHIBIT 5
CAUSAL AND NONCAUSAL EFFECTS

Bivariate Relationship	Total Covariance (correlation coefficient)	Causal Effects			Noncausal Effects
		Direct	Indirect	Total	
PB-MLPT (4 to 1)	−0.3291	−0.2447	−0.0844 (4−3−2−1)=.0224 (4−3−1)=−0.1705 (4−2−1)=0.0637	−0.3291	None
MFI-MLPT (3 to 1)	0.3458	0.2632	0.0347	0.2979	0.1173
PSHU-MLPT (2 to 1)	−0.3156	0.1459	None	0.1459	−0.4615
PB-MFI (4 to 3)	−0.6477	−0.6477	None	−0.6477	None
PB-PSHU (4 to 2)	0.5904	0.4365	0.1538	0.5904	None
MFI-PSHU (3 to 2)	−0.5204	−0.2376	None	−0.2376	−0.2831

A note of caution is needed regarding the inferences made from the path coefficients. The model shows that PB is likely to affect MLPT; however, the variation in the variables in the whole model is associated with only 15% of the variation in MLPT. The path coefficient of 0.0210 from the residual variables to MLPT may indicate that other major variables of importance such as demand, property characteristics, and additional risk factors, are omitted. Thus, analysis of this particular model indicates that MFI and PB are relatively minor factors in the determination of mortgages granted per thousand population, that is, the unknown residual variables account for the levels of the variance in MLPT.

While *Exhibit 4* reveals that the model does not "explain" much of the variation in mortgage lending, *Exhibit 5* offers some important insights in that it shows not only the direct effects, but the indirect effects as well. The interesting point is that if total causal effects are considered, PB and MFI still have about equal, but opposite effects upon MLPT. However, part of the effect of PB is an indirect effect (−.1705) through MFI or the path 4 to 3 to 1. This means that MFI is a moderating variable for the influence of PB upon MLPT. Thus, it can be justifiably argued that the reason blacks are receiving a disproportionately low number of mortgage loans appears to be due not so much to discrimination in lending practices, but to the high inverse correlation between Percentage Blacks and Median Family Income. Likewise, when the impact of income on neighborhood conditions is considered, the influence of PSHU on MLPT becomes negligible. Thus, the apparent discrimination found in many of the available studies is subject to

serious question in the light of this analysis and it appears that attention should be focused on identifying and quantifying the residual variables.

LIMITATIONS OF STUDY

As in any study, several caveats are required regarding the methodology, sample, and the data utilized. The limitations of the method of path analysis lie in the assumptions previously discussed. Another limitation of the method is that a determination of causality is attempted in a descriptive study that can only portray relationships between variables. The information obtained from path analysis does not prove causality, but may be used to draw inferences concerning the relationship between the variables involved. Therefore, the correlation and path coefficients can be used only to infer, and not to establish, a causal relationship. However, measures of the extent to which the change in the level of one variable is associated with a change in the level of another is one basis for inferring causal relationship.

A possible limitation exists in the use of census data from the 1970 population statistics. Data from the financial institutions may be more recently extracted, but this causes only minimal concern, as Hoyt[16] has shown that neighborhods change slowly, particularly in relation to other areas of the same community. While several census tracts in this study showed high growth rates, no significant changes in the variables, such as Percentage Black or Percentage Substandard Housing Units, are believed to have occurred.

The summary of data must be regarded, at best, as only suggestive of the actual mortgage lending patterns because of the following:

1) Some lending institutions reported by zip code, rather than census tract, and the two classifications are not perfectly resolvable.
2) The time period (the last half of 1976) may be too limited to allow a clear pattern to develop.
3) Not all the lending activities of the institutions appear because several are affiliated with mortgage banking houses who handle most of their FHA and VA loans.

Nevertheless, it is the considered opinion of the analysts that the data fairly reflect the lending patterns of the community's depository institutions.

CONCLUSION

The key conclusion of this preliminary analysis is that there is no conclusive evidence of discrimination in mortgage lending by urban financial institutions. To understand the mortgage lending patterns of our major lending institutions, an approach is required that concentrates on identifying and isolating the influence of the residual variables discussed in this study. Such a methodology would also provide a tool for assessing the extent of all types of discrimination in institutional lending and therefore

serve as a useful aid in determining how well an institution is serving the credit needs of its community as required in the Community Reinvestment Act of 1977.

REFERENCES

1. A. E. Warner, *The Role of the Farmer's Home Administration in the Residential Mortgage Market* (Chicago: U.S. League of Savings Associations), p. 33.
2. Urban-Suburban Investment Study Group, *Redlining and Disinvestment as a Discriminatory Practice in Residential Mortgage Loans* (Washington: USGPO, 1977).
3. *Ibid.*
4. A. F. Brimmer, *Risk vs. Discrimination in the Expansion of Urban Lending* (Chicago: U.S. League of Savings Associations, 1977).
5. "The Law Closes in on Mortgage Discrimination," *Business Week* (March 22, 1976), pp. 143-144.
6. Fred N. Kerlinger and Elazar J. Pedhazur, *Multiple Regression in Behaviorial Research* (New York: Holt, Rinehart, and Winston, Inc., 1973).
7. *Statistical Package for the Social Sciences*, rev. 2d ed. (New York: McGraw-Hill Book Company, 1975), pp. 383-397.
8. Kerlinger and Pedhazur, *op. cit.*
9. *Ibid.*
10. *Ibid.*
11. M. E. Turner and C. D. Stevens, "The Regression Analysis of Casual Paths," *Biometrics* 15 (1959), p. 236.
12. Wright Sewall, "The Method of Path Coefficients," *Annals of Mathematical Statistics* 5 (1934), pp. 161-215.
13. Turner and Stevens, *op. cit.*
14. Kerlinger and Pedhazur, *op. cit.*
15. *Statistical Package.*
16. New York State Banking Department, *Mortgage Financing and Housing Markets in New York State: A Preliminary Report* (Albany: 1977).

BIBLIOGRAPHY

Black, H., et al. *Discrimination in Mortgage Lending*. Unpublished paper, 1977.

Boyle, R. P. "Path Analysis and Ordinal Data." *American Journal of Sociology*, 1970, pp. 461-480.

Breger, G. E. "The Concept and Causes of Urban Blight." *Land Economics*, November, 1967, pp. 369-376.

Brimmer, A. F. *Risk vs. Discrimination in the Expansion of Urban Lending*. Chicago: U.S. League of Savings Associations, 1977.

Business Week, ed. "A Scare Eases City Mortgages," April 24, 1976, pp. 36-37.

Business Week, ed. "The Law Closes in on Mortgage Discrimination," March 22, 1976, pp. 143-144.

Business Week, ed. "Spurring S & L Loans for the Inner City," April 24, 1977, pp. 86-88.

Center for New Corporate Priorities, ed. *Where the Money Is: Mortgage Lending in Los Angeles County*, 1975.

D. C. Public Interest Research Group, ed. *Lending Practices in Washington, D.C., 1972-1974*, 1975.

Department of Saving and Loan, State of California, *Fair Lending Report No. 1 Vol. 1*, San Francisco: 1977.

Devine, R. J., et al. *Where the Lenders Look First*. New York: National Urban League, 1973.

Federal Savings and Loan Council of Illinois, ed. *Mortgage Lending Practices in Chicago*, 1976.

FHLBB Journal, ed. "Office of Housing and Urban Affairs, Annual Report," *FHLBB Journal* (April 1977), pp. 45-48.

FHLBB Journal, ed. "Perry Sees Greater Emphasis on Urban Low Income Lending," *FHLBB Journal* (March 1977), pp. 2-6.

Governor's Task Force, ed. *Interim Report of the Governor's Task Force on Redlining*. Michigan: 1976.

Grigsby, W. *Housing Markets and Public Policy*. Philadelphia: University of Pennsylvania Press, 1963.

Hertzog, J. P. and Earley, James S. *Home Mortgage Delinquency and Foreclosure*. New York: National Bureau of Economic Research, 1971.

Heilbrun, J. *Urban Economics and Public Policy*. New York: Columbia University Press, 1971.
HUD Reports, ed. *Compendium of Reports Resulting from HUD Research and Technology Funding*. Washington: USPO, 1972.
HUD Statistical Yearbooks, ed.
Jaffee, B. L. "Whatever Happened to Urban Renewal?" *Business Horizons*. February 1977, pp. 81-91.
Jones, B. *Bethune-Jones Newsletter*, February 15, 1977, pp. 3-5.
Kain, J. F. and Quigley, John M. "Housing Market Discrimination, Homeownership and Savings Behavior." *American Economic Review*. March 1972, pp. 264-276.
Kerlinger, Fred N. and Pedhazur, Elazar J. *Multiple Regression in Behavioral Research*. New York: Holt, Rinehart and Winston, Inc., 1973.
Kristoff, F. "Federal Housing Policies: Subsidized Production, Filtration and Objectives, Part II." *Land Economics*. May 1973, pp. 171-179.
Kristoff, F. *Urban Housing Needs Through the 1980's: An Analysis and Projection*. New York: National Commission on Urban Problems, 1968.
Lowry, I. S. "Housing Assistance for Low Income Families: A Fresh Approach." *Papers Submitted to the Subcommittee on Housing*. 1971, pp. 489-524.
Lusht, K. "Study Relates Mortgage Delinquency to Borrower Traits." *The Mortgage Banker*. March 1977, pp. 42-48.
Lyons, M. "Techniques for Using Ordinal Measures in Regression and Path Analysis." *Sociological Methodology 1971*. Edited by H. L. Costner. San Francisco: Jossey-Bass, 1971.
Mortgage Banker's Association, ed. *The Mortgage Banker*. April 1977, pp. 41-45.
Muth, R. F. *Cities and Housing*, Chaps. 2 and 4. Chicago: University of Chicago Press, 1969.
Musgrave, R. A. *The Theory of Public Finance*. New York: McGraw-Hill, 1959.
New York State Banking Department. *Mortgage Financing and Housing Markets in New York State: A Preliminary Report*. Albany: 1977.
Olsen, E. O. "A Competitive Theory of the Housing Market." *American Economic Review*. September 1969, pp. 612-622.
President of the United States. *Annual Report on National Housing Goals*. 1972.
President's Committee on Urban Housing, ed. *A Decent Home*. Washington: USGPO, 1968.
Rapkin, C., et al. *Housing Market Analysis*. Washington: USGPO, 1953.
Reid, M. G. *Housing and Income*. Chicago: University of Chicago Press, 1962.
Rothenberg, J. *Economic Evaluation of Urban Renewal*. Washington: Brookings Institution, 1967.
Schussheim, M. J. "National Goals and Local Practices, Joining Means and Ends in Housing." *Paper Submitted to the Subcommittee on Housing*. Washington: USGPO, 1971.
Statistical Package for the Social Sciences, 2nd ed. New York: McGraw-Hill Book Company, 1975, pp. 383-397.
Sternlieb, G. "Abandonment and Rehabilitation." *Papers Submitted to the Subcommittee on Housing*. Washington: USGPO, 1971.
Turner, M. E. and Stevens, C. D. "The Regression Analysis of Causal Paths." *Biometrics 15*, 1959, pp. 236-25.
U.S. Bureau of the Census. *Census of Housing*, 1950-60-70.
U.S. Bureau of the Census. *Annual Survey of Housing*.
U.S. League of Savings Associations, ed. *Savings and Loan News*. August 1976.
U.S. League of Savings Associations, ed. *Savings and Loan Factbooks*.
Urban-Suburban Investment Study Group. *Redlining and Disinvestment as a Discriminatory Practice in Residential Mortgage Loans*. Washington: USGPO, 1977.
von Furstenberg, G. M. "Default Risk on FHA Insured Mortgages as a Function of the Terms of Financing." *Journal of Finance*. June 1969, pp. 459-477.
von Furstenberg, G. M., et al. *Patterns in Racial Discrimination*, Vol. I. Boston: Lexington Books, 1974.
Warner, A. E. *The Role of the Farmer's Home Administration in the Residential Mortgage Market*. Chicago: U.S. League of Savings Associations, 1977, p. 33.
Werner, F. E., et al. *Redlining and Disinvestment: Causes, Consequences, and Proposed Remedies*. Chicago: National Clearinghouse for Legal Services, 1976.
Weimer, A., Hoyt, H., and Bloom, G. *Real Estate*, 5th ed., chap. 14. New York: The Ronald Press, 1966.
Wright, Sewall. "The Method of Path Coefficients." *Annals of Mathematical Statistics 5*. 1934, pp. 161-215.