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sented at the Conference on Econometric Models of Cyclical Behavior in November 1969. The paper, prepared by Geoffrey H. Moore and myself with the assistance of An-loh Lin, is a simplified, aggregative version of the model. The introduction summarizes the main theoretical ingredients explaining the cyclical process. Twenty-five structural equations are formulated in section 2, including five identities. Statistical estimates of the structural parameters are given in section 3, using quarterly data on the U.S. economy from 1949 to 1967. Some aspects of the errors of the model are analyzed in the last section. Also included is our reply to comments from R. A. Gordon and M. S. Feldstein, which discusses relevant issues and should be treated as a part of this paper.

Additional empirical tests are currently being performed and, depending on the outcome, a revised version of the model may be prepared.

Gregory C. Chow

Determinants of Investment

Collection of McGraw-Hill data relating to capital expenditures of 1967 and 1968 has now been completed. Checking and processing are under way. The body of individual firm data will thus extend for fourteen years, from 1955 through 1968. Further computer analysis and an extensive report along lines indicated previously are in prospect.

A paper on "Investment Anticipations and Realizations: Cross Sections and Time Series of Data of McGraw-Hill Surveys, 1955-66" was completed and presented to the CIRET Conference in Madrid in September 1969. The exchange with Jorgenson and Stephenson and Hall and Jorgenson was continued in "Once More on that 'Neo-Classical Theory of Investment Behavior'" (with M. I. Nadiri), *Review of Economics and Statistics*, May 1970, and "Tax Policy and Investment Behavior: Further Comment," *American Economic Review*, September 1970.

Robert Eisner

6. FINANCIAL INSTITUTIONS AND PROCESSES

Interest Rates

The study of interest rates, undertaken with the aid of grants from the Life Insurance Association of America, is concerned with the behavior, determinants, and effects of interest rates. Publications to date include *The Behavior of Interest Rates: A Progress Report*, by Joseph Conard; *The Cyclical Behavior of the Term Structure of Interest Rates*, by Reuben A. Kessel; *Changes in the Cyclical Behavior of Interest Rates*, by Phillip Cagan; *Yields on Corporate Debt Directly Placed*, by Avery Cohan; *The Seasonal Variation of Interest Rates*, by Stanley Diller; and *Essays on Interest Rates*, Volume I, edited by Jack Guttentag and Phillip Cagan. The study "New Series on Home Mortgage Yields Since 1951," by Jack

Guttentag and Morris Beck, is in press.

In addition, Volume II of "Essays on Interest Rates" is undergoing Board review. It contains (in addition to reprints of the Diller study and parts of the Cagan and Kessel studies mentioned above) the following papers: Jack Guttentag, "Introduction"; Mark Frankena, "The Influence of Call Provisions and Coupon Rate on the Yields of Corporate Bonds"; E. Bruce Fredrikson, "The Geographic Structure of Residential Mortgage Yields"; Avery Cohan, "The Ex Ante Quality of Direct Placements, 1951-61"; Thomas J. Sargent, "Expectations at the Short End of the Yield Curve; An Application of Macaulay's Test."

Phillip Cagan's manuscript on "A Theory of Monetary Effects on Interest Rates" is still

being revised. Royal Shipp, Robert Fisher, and Barbara Oppen report below on their work on income property mortgage characteristics.

Jack M. Guttentag

Interest Rates and Other Characteristics of Income Property Mortgage Loans

This study examines secular and cyclical movements from 1951 to 1968 in interest rates and other terms of mortgage loan commitments on multifamily and nonresidential properties (hereafter called income properties). For the period through mid-1965, data from fifteen large life insurance companies have been collected, under the direction of Jack M. Guttentag with the cooperation of the Life Insurance Association of America. The data from July 1965 through December 1968 were made available by the LIAA, which has been collecting comparable data from the same fifteen companies on a current basis.

In addition to a description and analysis of the data, the study will include a comprehensive statistical appendix showing monthly, quarterly, and annual averages of interest rates and other loan terms, cross classified by location, property type, and other criteria.

Interest Rates. The study of variations in interest rates will include a cross-sectional multiple regression analysis of yield determinants and an examination of cyclical and secular movements in interest rates. To date, only the cross-sectional analysis has been completed. It covers those four quarters for which more information is available than for other periods (1954 III, 1959 IV, 1963 III, and 1965 I). Coefficients of multiple determination (R^2) ranged from .415 to .510 for three of the quarters, when interest rates were relatively stable. In the fourth quarter of 1959, however, when large month-to-month increases in average interest rates were occurring, the R^2 dropped to .238.

Loan and property characteristics that had consistent and highly significant relationships to interest rates in each of the four periods were capitalization rate, property type, geographic location, and lending company. Capitalization rates appear to serve as a proxy variable for a number of risk-determining loan or property characteristics for which survey data were not available (e.g., local market considerations). Loan amount, loan-to-value ratio, and maturity were not consistently related to interest rates.

Nonrate Terms. The nonrate terms covered are loan amount, maturity, loan-to-value ratio, capitalization rates, and per cent constant, which is the annual level payment, including interest and amortization, per \$100 of debt. These average nonrate terms on mortgage commitments of \$100,000 and over trended upward between 1951 and 1968. Accompanying the construction booms that emerged during this period, there was a particularly marked expansion in the total number, the total dollar amount, and the average dollar amount of new commitments approved. Despite a substantial upward trend in interest rates, the per cent constant increased only slightly, because there was a marked lengthening in the average loan maturity. Meanwhile, there was a slight decline in the average debt coverage ratio (net operating income as a multiple of debt service), largely a reflection of increases in the average loan-to-value ratio and in the average capitalization rate.

One of the most striking findings of the study is the lack of strong cyclical variability in most nonrate terms. Nevertheless, average loan maturities and average loan-to-value ratios did tend to increase more slowly during periods of rising interest rates than they did when interest rates were falling. The same behavior is noted in the Guttentag-Beck study of home mortgages.

Royal Shipp
Robert Moore Fisher
Barbara Oppen

A Study of the Gibson Paradox

Over long periods of time, interest rates have been highly correlated with the level of prices, rather than with the rate of change of prices as predicted by classical monetary theory. Irving Fisher's¹ famous explanation of this paradox—called the Gibson paradox—was that the pertinent expected rate of change of prices, π_t , is a distributed lag function of the actual rate of change of prices:

$$(1) \quad \pi_t = \sum_{i=0}^m v_i \Delta p_{t-i} / p_{t-i-1},$$

where p_t is the price level at t and where the v_i 's and m are parameters. Fisher maintained that the distributed lag function (1) is characterized by a long mean lag, and that this explains the Gibson paradox. He implemented his explanation by calculating regressions of the form

$$(2) \quad r_t = \sum_{i=0}^{\hat{m}} w_i \Delta p_{t-i} / p_{t-i-1} + e_t,$$

where \hat{m} and the w_i 's are estimates of parameters, r_t is the nominal interest rate at time t , and e_t is a statistical residual. Fisher estimated (2) using the distributed lag estimator which he had invented. Without exception, he found that \hat{m} was large and that the estimated lag weights w_i were positive, dropping off slowly with increases in i . Thus, expectations seemed to adjust so slowly that the expected rate of inflation typically resembles the level of prices more closely than it does the current rate of inflation.

However, Fisher's work seems to constitute less of an explanation of the Gibson paradox than simply a redefinition for it. For, as Phillip Cagan² has pointed out, the estimated mean lags in (2), which typically range from ten to thirty years, seem implausibly long on the

maintained hypothesis that the w_i 's principally reflect the lag in the formation of expectations. The problem, then, is to explain why the lag is so incredibly long.

As a preface to addressing that main problem, it seems necessary to supplement Cagan's argument, which is the starting point of our work, with a careful statement of the criterion of plausibility. To say that the w_i 's assume an implausible pattern presumably means that they do not resemble the v_i 's, which seem to characterize the way people form expectations in equation 1. To substantiate that claim requires that we have some independent information about the v_i 's. To obtain that information, we invoke John F. Muth's hypothesis³ that the expectations of the market can fruitfully be hypothesized to be the optimal (minimum mean squared error) forecasts of statistical theory. Furthermore, we posit that the actual rate of inflation can be approximated by a mixed autoregressive, moving-average error process. This implies that the v_i 's of the optimal forecasting scheme are members of Jorgenson's⁴ class of rational distributed lag functions. It is possible to calculate the v_i 's from knowledge of the parameters of the mixed autoregressive, moving-average error process in the actual rate of inflation. The v_i 's supply a standard against which we can judge the plausibility of the w_i 's of (2). Preliminary results obtained through this procedure confirm Cagan's doubts about Fisher's results: the estimated v_i 's associated with the optimal forecasting schemes are characterized by very short mean lags, in marked contrast to Fisher's direct estimates of equation 2. Hence it appears very doubtful that long lags in the adjustment of expectations could explain the Gibson paradox, since those lags deviate so radically from the ones implied by optimal forecasting.

The main purpose of this study is to provide

¹ Irving Fisher, *The Theory of Interest*, New York, 1930, pp. 399-451.

² Phillip Cagan, *Determinants and Effects of Changes in the Stock of Money, 1875-1960*, New York, NBER, 1965, pp. 252-259.

³ John F. Muth, "Rational Expectations and the Theory of Price Movements," *Econometrica*, July 1961, pp. 315-335.

⁴ Dale W. Jorgenson, "Rational Distributed Lag Functions," *Econometrica*, January 1966, pp. 135-149.

an alternative explanation of the Gibson paradox. With a dynamic macroeconomic model, an attempt is made to determine under what conditions direct estimation of equation 2 is likely to enable one to obtain good estimates of the v_i 's of (1). It turns out that, unless the interest elasticity of the demand for money is very small, direct estimation of (2) can be expected to produce very poor estimates of the v_i 's. Moreover, for plausible values of the parameters of the model, the mean lag characterizing the estimated w_i 's of equation 2 will be very much longer than the mean lag of the v_i 's. The mean lag in (2) depends on many of the parameters of the model, not only the v_i 's of (1). Hence, the long lags obtained by Fisher contain some important general implications about the values of those parameters. In addition, the results of our study help explain why the lags characterizing estimates of equation 2 are so much shorter for the post-World War II period.⁵

Thomas J. Sargent

Institutional Investors and the Stock Market

At the request of the Securities and Exchange Commission, the National Bureau is preparing a background report for the Commission's study of institutional investors and the stock market. This report is slated to be included in one form or another in the Commission's own report to the Congress.

In the preparation of this report, the staff, in cooperation with the Flow-of-Funds Section of the Federal Reserve Board, is revising the national balance sheet for the United States (see R. W. Goldsmith, R. E. Lipsey, and M. Mendelson, *Studies in the National Balance Sheet of the United States*, 1963) for the years 1952 through 1958 and extending it through 1968. The staff of the study is also making

some additions to the Federal Reserve Board's flow-of-funds statistics, including, in particular, (1) separation of personal trust funds and nonprofit organizations from the household sector and (2) a rough subdivision of the flow-of-funds accounts for the more narrowly defined household sector and for nonfinancial corporations into about half a dozen subsectors. The sectoring will be by wealth in the case of households and by industry in the case of nonfinancial corporations.

The report, to be submitted to the Securities and Exchange Commission by June 15, 1970, is expected to consist of five chapters and a number of statistical appendixes. The chapters are to deal with:

1. Basic considerations.
2. Institutional investors and the stock market before 1952.
3. The position of institutional investors and corporate stock in the national balance sheet and the flow-of-funds accounts, 1952-68.
4. The determinants of the supply of corporate stock, 1952-68.
5. The demand for corporate stock by financial institutions and households, 1952-68.

The project is under my general direction. Most of the statistical work is being done or supervised by Helen Tice. Reports on specific features of the national balance sheet or of the flow-of-funds accounts are being contributed by Grace Milgram (land); John McGowan, Mahlon Straszheim and Peter Eilbott (supply of, demand for and value of corporate stock); John Bossons (subsectors of the household sector); Ralph Nelson (nonprofit organizations); and Leo Troy (labor unions), described below.

Raymond W. Goldsmith

Unions as Financial Institutions

My project deals with the finances of local, intermediate, national, and international unions in the United States. Special attention will be paid to certain items in the unions' accounts. Among the asset items are: investments in

⁵ William P. Yohe and Denis S. Karnosky, "Interest Rates and Price Level Changes, 1952-69," Federal Reserve Bank of St. Louis *Review*, December 1969.

mortgages, U.S. Treasury securities, and equities. Among receipts and disbursements are: dues, interest, dividends, payments to officers and employees, and the purchase of investments.

Selected financial totals for the union movement as a whole are expected to become part of the flow-of-funds accounts of the Federal Reserve Board, as part of the project reported on above by Raymond W. Goldsmith.

Detailed data will be available for the years 1962-68, and estimates of the main items will be prepared for the period 1948-61. Detailed information is supplied by tapes of the U.S. Department of Labor. The tapes have been edited to add organizations omitted from the Department's records and to identify all reporting unions.

Preliminary results show that total union assets climbed from about \$1.8 billion at the end of 1962 to over \$2.1 billion at the end of 1966. By far the largest component of union assets was cash on hand and in banks, about 28 per cent of the total in 1962 and one-third in 1966.

Leo Troy

Performance of Banking Markets

The two projects described below are studies of the relation between the structure of banking markets and the performance of the banking industry. The American Bankers Association has provided financial support for the study and has also assisted in securing the cooperation of banks in the provision of data.

Performance of Banking Markets in the Provision of Services to Business

The purpose of this study is to determine whether the prices paid by businesses for bank services are related to such characteristics of the structure of banking markets as the concentration of control over bank deposits and the degree of branching restrictions. The model

of bank pricing developed here implies that, because of regulatory constraints and long-run profit-maximizing criteria, banks attempt to maximize profits on the entire package of services supplied to a customer, rather than on each service separately. Observed prices of particular services provided by banks are, therefore, influenced by the composition of the package of services purchased by individual customers. Banks are compensated in three distinct ways: through interest on loans, through deposit balances, and, to a minor extent, through fees. To estimate the parameters of the relationship between price and market structure, data which describe the entire bank-customer relationship are required, rather than interest rates on loans, which have been used in all previous attempts at empirical estimation of this relationship.

Data on the total relationship between banks and their business customers were compiled from a questionnaire. The banks were requested to supply data for individual business customers on the package of services provided and the remuneration received.

The parameters of the bank pricing model, augmented by the inclusion of variables to represent demand and size variations between markets and the two structure variables, have been estimated for the two main bank prices: interest rates and deposit balances. The general findings indicate that loan rates are positively associated with both concentration and the degree of branching restriction; that is, interest rates on loans are higher as market concentration is greater and/or as branching restrictions tighten. However, the parameter estimates imply very small absolute differences in interest rates even for major differences in market concentration and branching restrictions. The parameter estimates of the regressions on deposit balances imply no association between the size of these balances and either concentration or branching restrictions.

Our conclusion is, therefore, that market structure affects the price paid for the package of services provided business but the magnitude of the impact is extremely small.

A manuscript of the complete report has

been reviewed by a staff reading committee and is being revised in the light of criticisms received. A manuscript of an Occasional Paper which presents a major portion of the empirical work has been submitted for review by a staff reading committee.

Donald P. Jacobs

Banking Structure and Performance in Consumer Credit Markets

The initial tabulations of data collected on the performance of commercial banks in their consumer lending activities revealed measurable differences in various indexes of performance (such as finance charges, services, and lending policies) among banks operating under different types of banking laws. Most recent work has been devoted to developing an over-all index of performance that combines the individual indexes. Preliminary tests have not produced very strong evidence of significant differences in these over-all measures by type of banking law.

Related work on the price elasticity of demand for personal loans at commercial banks suggests a considerable amount of price competition among banks and between banks and other types of lenders. There is also evidence that bank charges and lending policies are significantly influenced by nonbank competition in these markets. This, in turn, suggests that some of the differences in performance that might be expected to develop under different types of banking structures may be offset by other stronger forces in local markets. Some tests of this hypothesis are being developed.

Paul F. Smith

Behavior of the Commercial Banking Industry, 1965-67: A Microeconomic Study

At present, much of the information concerning the operation of the commercial banking

system is rather fragmentary, and most of the quantitative analysis tends to be highly aggregative. Yet one of the very clear lessons gained from recent experience is that the impact of monetary policy is not necessarily distributed evenly throughout the banking system. For example, it is apparent that the use of alternative policy instruments can significantly alter the distribution of reserves among the individual banks in the system. Interest rate ceilings, in particular, seem to have a major impact on the allocation of funds. These distributional aspects take on added importance because of the fact that the different types of banks are likely to respond quite differently to any given set of financial conditions. Thus, in order to predict the banking system's response to monetary policy, it is necessary to provide estimates of two distinct effects: first, the impact on the distribution of available funds and, second, the response by individual banks to the change in financial conditions.

This research project is studying the above aspects of banking operations during the period 1965 through 1967—a period marked by some very sharp changes in monetary policy and by some pronounced responses within the banking system. In order to analyze bank behavior on a disaggregated basis, the study employs call-report data for each of the nearly 14,000 commercial banks in the country. This information shows the composition of the banks' portfolios at the end of June and December for the years 1965, 1966, and 1967. For those dates, about 150 pieces of portfolio information are provided for each bank. Although some of the breakdowns are not as complete as might be desirable, the data provide considerably more detailed information than that now available even on an aggregate basis.

The content of the study can be divided into two major components: (1) descriptive analysis and (2) regression analysis of bank portfolio behavior patterns. Because of the enormous quantity of data involved, both components of the research have thus far been confined to intensive exploratory analysis, using only a portion of the available data. For example, the

descriptive analysis compares just two types of banks: the very small banks and the large banks with numerous branches. Similarly, the regression analysis is restricted to the relatively small group of banks with deposits in excess of \$500 million. The results of the exploratory analysis have proven most useful, and the analysis is now being extended to encompass the entire body of data.

David T. Kresge

Other Studies

Benoit Mandelbrot is investigating the influence of rational anticipation on the variability of prices in competitive markets. This study follows the lines of his earlier work, which indicated that, as anticipation of the variables that

influence price is improved, and therefore price is made increasingly "rational," the variability of prices is increased.

Richard Selden is revising his study "Financial Intermediaries and the Effectiveness of Monetary Policy: The Case of Finance Companies" preparatory to staff review, and Robert Shay is planning the final summary report on the Consumer Credit Study.

The program of studies on the quality of credit in booms and depressions is also nearing its final stages. The report on *Home Mortgage Delinquency and Foreclosures*, by James Earley and John Herzog, has been published. George Hempel's manuscript on "The Postwar Quality of State and Local Debt" and Edgar Fiedler's "Statistical Compendium on Credit Quality" have been submitted to the Board of Directors.

7. STUDIES IN INDUSTRIAL ORGANIZATION

Economics of Health

Since the last *Annual Report*, the following papers have appeared:

Richard Auster, Irving Leveson, Deborah Sarachek, "The Production of Health, An Exploratory Study," *The Journal of Human Resources*, Fall 1969.

Victor R. Fuchs, "Can The Traditional Practice of Medicine Survive?", *Archives of Internal Medicine*, January 1970.

Victor R. Fuchs, Elizabeth Rand, Bonnie Garrett, "Health Manpower Gap Reexamined," *New England Journal of Medicine*, February 5, 1970.

K. K. Ro, "Patient Characteristics, Hospital Characteristics and Hospital Use," *Medical Care*, July-August 1969.

A paper by Victor R. Fuchs, Elizabeth Rand, and Bonnie Garrett, "The Distribution of Earnings in Health and Other Industries," has been accepted for publication by *The Journal of Human Resources*.

A volume entitled "Essays in the Economics of Health and Medical Care" is now in preparation. It will incorporate most of the work completed during the past few years.

The advisory committee for the program is

chaired by Dr. George James, Dean of the Mount Sinai School of Medicine, and includes the following members: Gary S. Becker, Columbia University and NBER; James Brindle, Health Insurance Plan of Greater New York; Norton Brown, M.D.; Eveline Burns, New York University Graduate School of Social Work; Philip E. Enterline, University of Pittsburgh; Marion B. Folsom; Eli Ginzberg, Columbia University; William Gorham, Urban Institute; David Lyall, M.D.; Melvin Reder, Stanford University; Peter Rogatz, M.D., State University of New York.

The program is supported by grants from the Commonwealth Fund and the National Center for Health Services Research and Development. Reports concerning individual studies follow.

An Econometric Analysis of Spatial Variations in Mortality Rates by Race and Sex

The primary objective of the study is to measure the effects of income, schooling, and other