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Determinants of Investment Behavior

Introduction

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This volume contains the papers presented at a conference sponsored by the Universities-National Bureau Committee for Economic Research on June 10–12, 1965, at the University of Wisconsin, together with much of the discussion of these papers. The purpose of this conference was to bring together the work of people studying the investment decisions of different economic units and to compare the methods employed and the nature of the results obtained. The conference was concerned with theoretical approaches to explaining investment as well as with behavioral relations. Consumer units and business firms were the subjects of study. (The original plans included a session on government investment behavior, but these plans could not be implemented because of the sparse analytical work on the subject.)

The conference was organized into five sessions, which served as the basis for the organization of this volume. The first session, reported in the first part of the book, was designed to explore some of the fundamental questions of consumer and business investment. The result is two papers that are very different, not only in subject matter but also in content. In the first of these papers, Jean Crockett and Irwin Friend take an empirical approach to the analysis of consumer investment behavior. After providing a concise review of the current literature on consumer saving and investment, they proceed to formulate a theory of the determinants of consumer holdings of different tangible as well as financial assets wherein the desired stock of assets depends primarily on the normal or permanent income of the household. Increments to this stock then depend on the difference between the desired stock and the actual stock, with normal income serving as a proxy for desired stock in the empirical tests.

Two sets of cross-section data are used for the empirical tests, carried out by a series of multiple regressions. The tests were designed partly to experiment with ways of separating normal from transitory income effects

and partly to obtain improved estimates of the effect of initial asset holdings on consumer saving and investment by holding tastes constant in various ways. The most noteworthy feature of the results, the authors state, is the tendency for the long-run normal income elasticity of saving or of assets to exceed unity by substantial margins. The results also suggest that initial assets are necessary in explaining saving behavior, as is implied by a lagged adjustment model, though in a number of the regressions the assets effect is very weak.

In commenting on this paper, James Tobin feels that the formulation of the basic hypothesis is too static, that allowance should be made for changes in desired wealth and in its composition. He also questions whether sufficient allowance has been made for the effects of age, inheritances, and unrealized capital gains (though more complete allowances for age effects in the final draft of this paper does not alter the main results), and urges that better ways be sought to hold tastes constant. Tobin and Zvi Griliches feel that the speed-of-adjustment estimates are not too satisfactory, which may well be due to lack of sufficient data.

The second paper at the first session, by Dale Jorgenson, follows a highly theoretical bent in considering the investment behavior of business firms. In presenting a survey of some of the current theories of business investment behavior, it seeks to provide a framework for comparing alternative models of investment behavior. Such a framework is badly needed at this time, Jorgenson argues, as "a basis for evaluating evidence on the determinants of investment behavior." In seeking such a framework, Jorgenson contrasts the neoclassical theory of optimal capital accumulation with the current theory in the literature that business firms maximize utility in a broader sense than just profits. His basic point is that it is indeed possible to derive a demand function for investment goods on the basis of neoclassical assumptions and that the resulting theory provides a framework for the principal econometric models of investment behavior. The alternate theory based on utility maximization, he notes, conflicts with much of the literature on cost and production functions.

Jorgenson uses the neoclassical assumptions in conjunction with the premise that the firm maximizes the utility of a consumption stream subject to a fixed set of production possibilities and to fixed current and future prices, including interest rates. The production plan, which is then independent of the choice of a consumption stream, is selected by maximizing the present value of the firm subject to a production function relating output to flows of labor and of capital services. In addition, capital services as well as replacement are considered to be proportional

to the stock of capital goods. The demand function for investment goods is then obtained as the sum of the rate of change in the flow of capital services and of replacement needs, the latter being proportional to capital stock. By assuming that changes in the rate of interest leave the price of capital services unchanged, the desired demand function is readily obtainable. This demand function has a negative slope with respect to changes in the rate of interest.

In his comments on Jorgenson's paper, Tobin agrees with the usefulness of the neoclassical theory of the firm and with the principle of maximization of the present value of the firm as a basis for a dynamic theory. Tobin feels, however, that the development of this principle "is only barely dynamic" because the "firm can maximize present value simply by maximizing profits at every point in time." Decisions about time paths of profits do not enter the picture. In addition, Tobin questions the continuity of such variables as prices, wages, and the rental cost of capital services, and argues that if these variables are subject to discontinuities, no demand schedule for net investment exists, only one for capital. The investment demand schedule obtained by Jorgenson, Tobin notes, is not the demand schedule considered by previous theorists because other variables are not held constant but are manipulated to compensate for the effect of a change in the interest rate.

In his reply Jorgenson distinguishes between whether present and *future* prices or present and *forward* prices are fixed in considering the existence of a demand schedule for investment goods. In the former case, he agrees with Tobin that no demand schedule can exist, but he notes that the latter case does support the existence of a demand schedule and is a point previously overlooked.

The second part of this volume is devoted to the financing of business investment. In the first of the two papers here, Merton Miller and Franco Modigliani develop further their approach for estimating the costs of capital applicable to investment decisions under uncertainty. This leads them to hypothesize that the cost of capital depends primarily on the market capitalization rate for pure equity streams of firms of that type, and not on the financial structure of the firm or on its dividend policy. This approach differs radically from the one usually followed in econometric models which relies upon some standard index of yields on high-grade corporate or government bonds as a measure of the cost of capital. The present approach means that the cost of capital has to be estimated from cross-section regressions between the market value of the firm, on the one hand, and its earnings and rate of growth, on the other. Miller and Modigliani apply such regressions to a cross-section sample of large

electric utilities for the years 1954, 1956, and 1957. From these regressions, estimates of the cost of capital in each year are obtained and compared with capital costs estimated by the more usual approach. They note that in the present study the usual yield measures seriously understate the rise in capital costs that occurred during this period, a rise brought about by the increase in the market's evaluation of the growth potential of that industry.

In the second paper, John Lintner considers the role of financial behavior in investment policy. Like Miller and Modigliani, Lintner assumes that firms seek to act in such a way as to maximize the market value of their equity. Unlike them, however, he assumes that bonds as well as stock are risk assets, and comes to the diametrically opposite conclusion that investment outlays are related inversely to leverage. Also unlike Miller and Modigliani, Lintner places heavy stress on the priority of cash dividend payments in short-run financial investment policy, because of "the extraordinarily high 'information content' of changes in dividend payments in the eyes of shareholders as they form their expectations." Hence, dividend payments are introduced as a constraint on investment.

Lintner tests his model by attempting to explain quarterly capital expenditures of manufacturing companies during 1953–63. The equations, incorporating accelerator, financial, and risk variables, yield highly favorable results by the usual statistical criteria. In particular, Lintner notes that the coefficients of interest rates, their smoothed rate of change and leverage all turned out to be highly and very consistently significant and negatively related to investment.

The comments on these papers raise questions about the theoretical bases of the papers and discuss alternative means of dealing with the same problem. Thus, Irwin Friend suggests "estimating the cost of equity . . . as the sum of a dividend yield plus an estimated growth rate in earnings and dividends, and obtaining the over-all cost of capital as the market-value weighted sum of the costs of equity and senior capital (adjusted for tax effects)." This approach does not require assuming the irrelevance of capital structure, though the difficulty of estimating growth rates still remains. J. Fred Weston questions the validity of many of the basic assumptions in both papers. In the Miller-Modigliani paper, he questions the irrelevance of capital structure, the continuity and independence of investment decisions, and the reliance on an assets variable to measure growth; and in the Lintner paper, he questions the greater role of uncertainty in financing than in capital budgeting, the rise

in the marginal cost of capital with leverage, and other statements which do not seem to have empirical support.

The third part of this volume contains four papers on consumer investment. The first of these, by Richard Muth, deals with housing and focuses on *where* such investment is likely to take place rather than on how much. From this study of the spatial aspects of urban housing, Muth concludes that the urban decentralization that took place up to 1950 "is far from haphazard and only in small part a 'flight from blight.' " The basis for this conclusion is his finding that the "distribution of population between the central city and its suburbs and the total land occupied by an urban area can be explained to a considerable extent, though not solely, by the same forces that affect the spread of population within the central city." Principal among these forces are car registrations per capita, the population of the urbanized area, and median income in the area. Interestingly enough, the changing racial composition of the central city is found to be of relatively small importance in accounting for suburbanization.

The paper by Gordon Sparks deals with a different aspect of residential construction; he develops and tests a model to link such activity with the monetary sector. The model contains a series of equations seeking to measure the effect on housing construction of the flow of funds through financial intermediaries. Accumulation of savings deposits in different types of financial institutions represents one set of equations with one equation for each type of institution. These deposits "together with interest rates and other variables then determine the volume of commitments made by financial institutions to supply residential mortgage funds"; and the resulting supply of funds is shown to affect housing starts and residential construction outlays. Postwar time series regressions provide strong support for this approach, serving to highlight the importance of interest rates, as well as of the ratio of rents to construction costs, in affecting housing starts.

The determinants of consumer investment in selected durables is the subject of the paper by Marvin Snowbarger and Daniel Suits. Their study applies a computer interaction search program developed by Sonquist and Morgan to cross-section reinterview data from the 1960–62 Surveys of Consumer Finances and attempts to identify the principal variables affecting the purchase of a television set, refrigerator, washer, furniture, and automobile, with multiple-car ownership as a separate facet. Among other things, the empirical results show that, for each of the products studied, "expressed intentions to buy are the first criterion for identifying eventual buyers," even though less than half of the intenders actually

carried out their purchase plans. Debt position and income were also important discriminators, but attitudinal variables were not. There was no evidence of complementarity or substitutability of durable purchases. Multiple-car ownership was affected by number and age of children and by wife's work status as well as by income. The authors note that a number of interaction effects were uncovered in this study that might not have been obtained by the more usual multivariate methods.

The paper by Roger Miller and Harold Watts is concerned with the financial investment of consumers. Entirely theoretical, it presents a model designed to explain the dynamics of consumer choice of financial assets. The model contains two parts: one is concerned with the household's long-range decisions about such basic variables as time allocation, income, and the value of the portfolio; the other is a short-run suboptimizing model on the explanation of changes in the portfolio. Both parts of the model assume that the household seeks to maximize expected utility over its lifetime, and assign a major role to the subjective probability beliefs of the household. The measurement and incorporation of such probabilities within a general framework should serve as a key, it is felt, to explaining many different aspects of household financial behavior.

A number of technical points on the formulation of the models and the interpretation of data are clarified in the discussion of these papers, some of which are worthy of note. Louis Winnick comments on Muth's paper that the subject of housing investment requires the study of more than population movements and that results pertaining to consumption of housing may be different for households and in per capita terms. Vernon Lippitt notes that the computer interaction search program used by Snowbarger and Suits does not deal fully with interaction effects and is best regarded as a prior step to multiple regression or to analysis of variance. James Morgan finds that many more stocks than just the financial portfolio are involved in household decision-making and should be incorporated in the Miller-Watts model, along with means of allowing for learning and changes in tastes by the household over time.

The fourth part of this book contains two papers on the factors that affect investment behavior. In the first of these, Locke Anderson attempts to throw further light on the controversy about the relative importance of the acceleration principle and the profits principle in investment. From the results of multiple regressions fitted to annual time series in the postwar period, he concludes that "both capacity utilization and financial variables belong together in an adequate explanation of investment." Thus, his results support the findings of others that these two theories

of investment behavior tend to complement rather than compete with each other.

Phoebus Dhrymes and Mordecai Kurz have undertaken a more extensive investigation of investment behavior, in which they focus on the extent to which the firm's investment, dividend payments, and use of external finance are interrelated. The analysis is based on the simultaneous estimation of the parameters of a three-equation model applied to data for 181 industrial and commercial firms year by year over the period 1951–60. Among their principal findings is a significant degree of interdependence between investment and dividend payments and between use of external finances and investment. They also find, as did Locke Anderson, that both the accelerator and the profits versions of investment theory are relevant to explaining investment behavior. In addition, their findings suggest that the influence of profits on investment is more complex than has previously been supposed, so that the effect of this variable may have been underestimated in past, mostly single-equation, studies.

Of major methodological interest is the finding of Dhrymes and Kurz that the single-equation approach tends to obscure the true relationships and that even limited information estimation is not fully satisfactory. A particularly striking example is the consistently positive relationship obtained by single-equation methods between investment and dividend payments, a relationship which turned out to be strongly negative once full information estimation was applied to a system of simultaneous equations.

The discussion of these papers revolves primarily around the specification of the models and the interpretation of the empirical results, particularly of the Dhrymes-Kurz model. R. W. Resek relates both of these papers to those of Miller-Modigliani and of Lintner, noting that both appear to adopt the view that the cost of funds is related to financial structure. Henry Latané, as well as Resek, questions the general omission of lagged variables in the two papers, though Dhrymes and Kurz argue that the results are perhaps more meaningful in their present form because of estimation difficulties when such variables are introduced. The instability of the same regression coefficients among years is highlighted by William Vickrey as a major reason for considering the Dhrymes-Kurz results to be inconclusive, to which the authors reply that for some of the key coefficients this instability is more apparent than real.

The last part of this volume provides new evidence on the relation of anticipations to investment behavior. The first of the two papers in this part, by Reynold Sachs and A. G. Hart, focuses on the effectiveness of

capital appropriations in explaining investment outlays of large durable goods manufacturing firms. The study is based on capital appropriations and expenditures of 627 of the largest manufacturing corporations in the United States. On the basis of a number of multiple regressions involving capital appropriations, expenditures, and related variables over time, capital appropriations are found to embody much information relevant to the explanation of capital expenditures which is not contained in the usual *ex post* economic variables. In particular, an eclectic model incorporating both capital appropriations and financial and accelerator variables provides a much better explanation of fluctuations in capital expenditures than either a model based on accelerator variables, or on purely financial variables, or an autoregressive model.

An eclectic model also serves to explain fluctuations in capital appropriations much better than any of the other three types of models. Hence, Sachs and Hart conclude that both capital expenditures and capital appropriations are influenced partly by financial variables and partly by accelerator variables, but that, even when such variables are incorporated into a function seeking to explain variations in capital expenditures, appropriations variables continue to make a net contribution. Further investigation of the nature of capital appropriations suggests that "plans formulated as of the end of the third quarter before the expenditure may be taken as fairly firm, but that reactions to surprises of later dates are appreciable and significant."

In his paper, Michael Lovell explores the value of anticipations data in explaining fluctuations in the other principal component of investment, namely, inventories. Utilizing recently compiled data of the Office of Business Economics, Lovell explores once more the impact on inventory investment of errors made by firms in forecasting their sales volume and comes up with some rather surprising results. First, he finds that short-run sales forecasts of manufacturers are considerably more accurate than was indicated by earlier studies. Nevertheless (or perhaps because of this fact), "only a marginal improvement could be obtained by using observations on sales anticipations in a model describing the generation of finished goods inventories. . . ." Thus, information on anticipated sales volume does not turn out to be very useful in explaining variations in inventory investment.

A second surprising result is that "evidence suggests that production plans and schedules for the delivery of raw materials are sufficiently flexible to permit considerable adjustment within the quarter to what errors are made in forecasting sales volume." As Lovell notes, this finding may undermine one of the basic assumptions underlying the theory

of the inventory cycle, namely, that businessmen do not immediately adapt their production plans to a change in sales. On the contrary, Lovell finds that inventory plans are subject to quick and substantial modification within a period of two to three months. If this is true, a drastic modification of inventory theory would seem to be indicated.

The discussion of this paper centers on the validity of the foregoing inferences. Robert Eisner suggests that the absence of the buffer stock mechanism may be due to the fact that the new sales anticipations data are released late enough to be closely equivalent to actual sales and do not truly reflect anticipations. Millard Hastay notes that the buffer stock theory is plausible primarily for stocks of finished goods whereas some of Lovell's results pertain to inventories of all types of goods. The contrary results for finished inventories Hastay ascribes to failure to separate inventory reactions to *ex post* stock disequilibrium from reactions to *ex ante* stock disequilibrium. In his rejoinder, however, Lovell raises doubt about the value of these explanations.

Both Hastay and Eisner raise some questions about the analytical approach in the Sachs-Hart paper—the significance of results obtained from a large-scale screening process and the means of utilizing such results in further research. In addition, Victor Zarnowitz suggests that the accelerator-type variable used in the analysis is in reality another form of anticipatory variable, which may explain why this variable makes little net contribution to equations already containing capital appropriations; and James Morgan urges study of the possible effect of the accounting and tax year on investment decisions.

To summarize, the papers that were presented at this conference and that are contained in this volume seem to have contributed to our knowledge of investment behavior in at least two ways. They have provided additional fuel for some of the principal controversies on investment behavior, and they have provided new information on the subject, some of a rather surprising nature. In the former category are the questions of whether an investment demand function can be derived from neoclassical theory and whether the cost of capital to the firm is indeed independent of its financial structure. The new findings include empirical evidence or interrelationships among investment expenditures, dividend payments, and the use of external financing by business firms, and on the determinants of consumer investment in both financial and nonfinancial assets. Not the least of the empirical findings is the apparent failure of the buffer stock theory of inventory investment to be supported by new, presumably more accurate, data. If this evidence is

borne out after further scrutiny, a new theory of inventory accumulation will be needed.

Other implications for theory are contained in the papers in this book. This is apparent most directly in Jorgenson's work supporting the neoclassical theory of investment and the Miller-Watts report presenting a general model of household investment in financial assets. Such implications are also apparent, however, in many of the empirical papers, besides the study by Lovell on inventory investment. Two further examples are the finding in the Crockett-Friend paper that the income elasticity of net worth is greater than unity and the significance ascribed to interest rates in the paper by Sparks. The interested reader will undoubtedly find many other examples.

The members of the planning committee for the conference were Robert Ferber (chairman), Irwin Friend, Dale W. Jorgenson, Edwin Kuh, Harold Watts, and Victor Zarnowitz. The volume was edited by Marie-Christine MacAndrew and the charts were drawn by H. Irving Forman.