THE CONSUMER SECTOR'S DEMAND FOR ASSETS AND THE SUPPLY OF CORPORATE BONDS AND EQUITIES: AN INTEGRATION OF PORTFOLIO THEORY AND A THEORY OF THE FIRM

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ABSTRACT

THE CONSUMER SECTOR'S DEMAND FOR ASSETS AND THE SUPPLY OF CORPORATE BONDS AND EQUITIES: AN INTEGRATION OF PORTFOLIO THEORY AND A THEORY OF THE FIRM

By

Robert Henry Gentenaar

Within portfolio theory, relative interest rates are assumed to be dependent upon the relative supplies of assets.

Previous investigations have concentrated on the demand for assets, usually ignoring equities and neglecting the study of the supply of these assets.

The purpose of this study is to incorporate the supplies of corporate bonds and equities into a model containing the consumer sector's demand for assets and to measure the effects of a change in the money supply.

The time period included in this study is 1927-72, omitting 1942-49, a total of thirty-eight years. The sources and methods of data accumulation are fully explained in the Appendices.

Demand equations were developed for the following assets held by the consumer sector:

M = Money holdings
(Currency and demand deposits)

Dep = Savings deposits
(Time deposits in commercial banks, savings and loan shares, and mutual savings deposits)

GS = Holdings of state, local and federal obligations

CB = Holdings of corporate bonds

E = Holdings of equities

The demand equations were specified in the following semi-log form:

$$\ln \frac{A}{W} = \alpha_0 + \beta_1 \ln W + \beta_2 \ln Y + \sum_{i=3}^{6} \beta_i r_i$$

where:

A = asset (one of the five)

r_i = rate of return on each of the assets (rate on money assumed to be zero)

W = net worth (total of the five assets plus the value of the consumer sector's holdings of durables and housing minus holdings of mortgages and installment loans)

Y = personal disposable income

The 'best fit' is arrived at for each of the demand equations by means of regression analysis.

Two theories of the firm are analyzed, however the traditional theory is found to be more compatible with portfolio theory. For this reason, the supply equations for corporate bonds and equities are derived using the basic assumptions of the traditional theory.

The final model is composed of eleven equations, which include the five demand equations plus the two supply equations and four identities. The identities include statements on net worth, money supply, deposit supply and corporate bond supply.

These equations were then solved by means of a program incorporating an iterative technique producing simulated values for each of the thirty-eight years.

The money supply was then increased and new simulated values were obtained.

The results indicate a 'good fit' between the simulated and actual values for the various assets and the rate of return on corporate bonds. The 'goodness of fit' for the rates of return on equity and government securities appears as somewhat lower than that of the assets.

An increase in the money supply has a positive, though almost continuously decreasing, effect upon the supplies of corporate bonds and equities and upon the demand for all assets except equities.

There is a large negative effect upon the consumer sector's holdings of equities and a negative effect upon the rate of return on equities, while the other rates of return are affected in the same manner as their assets.

The model indicates that for monetary policy to maintain the same effectiveness, throughout this time period, it must involve an almost continually increasing percentage change in the money supply.

The model further indicates that when the consumer sector increases its demand for money, the rate of return on equity must drop to induce this increase. These changes then lead to an increase in equity financing relative to bond financing and a shift in the consumer sector's portfolio values from equities into the other assets, whose rates of return have risen.

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To Mom and Dad

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INTRODUCTION

Studies of the asset money have slowly evolved over the years into what has become known as portfolio theory. Within portfolio theory, relative interest rates are assumed to be dependent upon the relatjve supplies of assets.

Previous investigations have usually omitted equities from their demand equations and have, in the articles reviewed, totally neglected any study of the supply of assets.

Studies on the subject of equities usually confine themselves to the prediction of changes in the price of equity rather than the movements of the asset equity within the portfolio of the consumer sector.

Many of the previous investigations have preoccupied themselves with the study of only a relatively short and recent time period usually starting with a post World War II date.

This paper has as its basic purpose the investigation of the assets of the consumer sector and the effects upon these assets when there is a change in the money supply. Including supply equations for corporate bonds and equities involved an attempt to integrate a theory of the firm and portfolio theory.

The time period included in this study is 1927-41 and 1950-72, a total of thirty-eight years. Final data for the earlier portion of this period was not always readily available and the process by which the data was accumulated is explained in the Appendices.

A short review of the evolution of portfolio theory is included in Chapter I while Chapter II examines several articles dealing with financial assets other than money.

The purpose of Chapter III is to determine what theory of the firm is appropriate for the development of supply equation for equities and corporate bonds. The first portion of Chapter III is devoted to a review of articles dealing with the determination of the price of equity while the latter portion reviews the differing theories of the valuation of the firm.

Chapter IV is a presentation of the method used in arriving at demand equations while Chapter V is devoted to the derivation of supply equations for equities and corporate bonds.

The demand and supply equations are joined in Chapter VI, and the results of a simulation are presented. The simulation is repeated after an increase in the supply of money and these results are also included within this chapter.

The conclusion as well as recommendations for further study make up the final chapter (Chapter VII).

The appendices explain the sources and methods of the collection of data for the entire time period.

CHAPTER I

DEMAND FOR MONEY

Very few topics have received the attention accorded to the demand for money; however, disputes still linger involving such important issues as the stability, determinants, and even the definition of money. Despite these differences, there exists an apparent consensus of opinion that money is properly examined in the context of a balance sheet.

Accepting this approach to the study of money determines the manner in which the other assets are investigated. Therefore, for this study and possibly for economics in general, the continuing disputes are secondary in importance to this consentient element.

In light of the above statements, a review of the subject of money was deemed necessary prior to an investigation of any other assets and accounts for the structure of this chapter. The remainder of this section will present a short review of the evolution of this approach to the investigation of the demand for money. The first task of this review is to settle on a definition of money.

Hicks

The conception of treating money as an asset in a balance sheet dates back to 1935 when Hicks, purporting to be a novice on the subject of money, suggested simplifying the theory of money by

incorporating marginal utility analysis.

> In value theory, we take a private individual's income and expenditure account: we ask which of the items in that account are under the individual's own control, and then how he will adjust these items in order to reach a more preferred position. On the production side, we make a similar analysis of the profit and loss account of the firm. My suggestion is that monetary theory needs to be based again upon a similar analysis, but this time, not of an income account, but of a capital account, a balance sheet. We have to concentrate on the forces which make assets and liabilities what they are.[1]

Keynes departed from the Quantity Theory by specifying a precautionary and a transaction motive, mainly dependent on income, and a speculative motive, dependent on the interest rate. His emphasis on treating money as an asset and the aggregation of all other assets into bonds, which as Harry Johnson points out is implicit in the use of a single rate of interest, results in an overly simplified version of the balance sheet approach.[2]

Friedman

A leading proponent of the modern quantity theory, Friedman perceives money as ". . . one kind of asset, one way of holding wealth."[3] Viewing the quantity theory as a theory of money, Friedman explains that the determinants of money or any other asset are the

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[1] J. R. Hicks, "A Suggestion for Simplifying the Theory of Money," in Readings in Monetary Theory, ed. Friedrich A. Lutz and Lloyd W. Mintz (New York: The Blakiston Co., 1951), p. 25.

[2] Harry G. Johnson, "Monetary Theory and Policy," American Economic Review 52 (June 1962):345.

[3] Milton Friedman, "The Quantity Theory of Money--A Restatement," reprinted in Readings in Macroeconomics, ed. M. G. Mueller (New York: Rhinehart and Winston, Inc., 1971), p. 147.

total wealth, the price and return of the various assets which are components of this wealth, and the tastes and preferences of the wealth holders.

Based on an investigation of the period 1870-1954, Friedman found income velocity declining over long periods but increasing in the short run. To rationalize this conflicting behavior the concepts of permanent income and permanent price were introduced. This led to the finding of a highly stable secular behavior of income velocity.

Using this information plus the inability to relate interest rates to changes in velocity, Friedman concluded that interest rates had very little effect on the demand for cash.

Friedman disputed the transactions motive and speculative motive (based on the above findings) and concluded that money should be considered as "one of a sequence of assets, on a par with bonds, equities, . . ."[4]

In investigating these relationships, Friedman's definition of money included time deposits. By means of a simple correlation between the logarithm of real cash balances per capita and the logarithm of real income, an income elasticity of money of 1.8 was calculated which implies money may be a luxury good.

Much of the importance of Friedman's articles lies in the definitions of his variables, for the controversy surrounding them greatly influenced the research of many investigators.

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[4]Milton Friedman, "The Demand for Money: Some Theoretical and Empirical Results," The Journal of Political Economy 67 (August 1959):349.

Latané

With money defined as currency plus demand deposits and using GNP as a measure of income, Latané found interest rates were significant determinants of money demand and calculated the income elasticity of money to be approximately unity.[5]

Attempting to explain the discrepancy between Latané's findings and their own, Friedman and Schwartz concede that the income elasticity for time deposits is greater than the income elasticity for currency and demand deposits. In defending the difference in interest elasticities, Friedman and Schwartz found it plausible that the interest elasticity for money narrowly defined should be greater than for the definition including time deposits.

More interesting is the contention by Friedman and Schwartz that neither definition of money can be considered as correct but rather the decision regarding the definition is arbitrary.[6] They explain that the basis for their decision to include time deposits in the definition was largely a matter of convenience, dictated by the data available, in that prior to 1914 time deposits and demand deposits could not be separated.

Ironically, support for this line of reasoning exists in the General Theory, where Keynes considered not only including time deposits but such assets as treasury bills in the definition of money

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[5]Henry Allen Latané, "Cash Balances and the Interest Rate--A Pragmatic Approach," Review of Economics and Statistics 36 (November 1954):460.

[6]Milton Friedman and Anna J. Schwartz, "Money and Business Cycles," Review of Economics and Statistics 45 (Feburary 1963):45.

as a matter of convenience.[7] Duesenberry suggested dispensing with the term money and replacing it with an explanation of whatever assets the author uses.[8]

Other writers, some included later have not been in agreement with this flexible definition of money and have attempted to arrive at 'the' correct definition.

It is apparent, not only from the above articles but also those that follow, that the problem of proper definitions has been a major source of difficulty in the investigation of money. Many of the differing conclusions can and have been attributed to differences in the definitions and as a consequence the measurements of not only money but also such variables as wealth, income, and even interest rates.

Bronfenbrenner and Mayer

To investigate the relationship between money holdings and interest rates for the period 1919-56, Bronfenbrenner and Mayer used currency and demand deposits as the definition of money.[9]

The independent variables chosen include the 4-6 month commercial paper rate, Goldsmith's series on total national wealth in 1929 and deflated private GNP.

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[7]Referred to in a footnote in John Maynard Keynes, The General Theory of Employment, Interest, and Money (New York: Harcourt, Brace and World, Inc., 1964), p. 167.

[8]James S. Duesenberry, "The Portfolio Approach to the Demand for Money and Other Assets," The Review of Economics and Statistics 45 (February 1963):9.

[9]Martin Bronfenbrenner and Thomas Mayer, "Liquidity Functions in the American Economy," Econometrica 28 (October 1960):813-18.

$$\ln M = .1065 - .0928 \ln r - .1158 \ln W + .7217 M_{-1} + .3440 \text{ GNP}$$
$$\qquad (.0032)\ (.0139) \qquad (.0883) \qquad (.0576) \qquad (.0862)$$

$r = .997$ (Parentheses include standard errors)

The interest elasticity was computed to be less than .1 and the negative sign for the coefficient of wealth, though not significant, led them to suspect that money may be an inferior asset.

Meltzer

Contending that the reason for the finding of a negative wealth elasticity was due to an incorrect definition of the wealth variable by Bronfenbrenner and Mayer, Meltzer attempted to arrive at the correct specification for not only wealth but also money.[10] His approach consisted of running log linear regression equations using three definitions of money and four definitions of wealth.

Three of Meltzer's equations, covering the period 1900-49 are reproduced below in Table 1 and as Meltzer indicates, the definition of wealth as either total assets (A) or as net worth (N) gives improved results over the definition used by Bronfenbrenner and Mayer (G).

Both the series on total assets (A) and the series on net worth (N) were constructed from Goldsmith's estimates of total assets (A) for eight bench mark years and his yearly estimates of nominal wealth (G).

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[10]Expressed in a footnote in Allan H. Meltzer, "The Demand for Money: The Evidence from the Time Series," Journal of Political Economy 71 (June 1963):230.

Table 1.--Meltzer's Equations.

Dependent Variable			Correlation
$\ln M_1$	$-.8 \ln r$ (9.1)	$.997 \ln A$ (34.8)	.99
$\ln M_1$	$-1.00 \ln r$ (11.1)	$1.08 \ln N$ (32.9)	.98
$\ln M_1$	$-.50 \ln r$ (5.6)	$-.02 \ln G$ (.65)	.64

It is readily apparent that the results are significantly influenced by the definition of wealth. Meltzer's equations suggest an income elasticity of approximately unity. The same magnitude is suggested for the interest rate elasticity which is considerably higher than that obtained by Bronfenbrenner and Mayer. Part of this discrepancy may be due to the fact that Meltzer used the yield on long term corporate bonds whereas, as previously noted, Bronfenbrenner and Mayer chose the short term rate.

Heller

When using real wealth Meltzer concluded that the addition of real income contributes little information. In contrast, Heller ran the same equations and obtained just the opposite results, i.e., when using real income the addition of real wealth contributes little information.

Using the broader definition of money revealed that income added little information. Based on these results, Heller concluded the constraint used depended on the definition of money with income being the proper constraint for the definition including time deposits.[11]

Many difficulties arise in comparing Heller's results to Meltzer's findings. First Heller used a short term interest rate due to finding long term rates nonsignificant. Second the data used by Heller was quarterly observations for the period 1947-58, which might present problems in deciding on the appropriate interest rate since the Treasury was pegging interest rates up to 1951. Third, the measurement of wealth used by Heller was constructed in a different manner than that of Meltzer.

The above articles by Bronfenbrenner and Mayer, Meltzer, Heller, and Latané differ greatly due in large part to their definitions of variables but they all provide support, in varying degrees, for the theory that the demand for money is inversely related to the interest rate.

These articles followed the procedure used by Keynes in that they assumed there existed a single interest rate.

Using a single interest rate implies that all nonmoney assets are perfect substitutes and of course does not allow for the investigation of the allocation of the nonmoney assets. The fact that investors hold many assets implies that this perfect substitutability does not exist in the real world.

The fact that there are obviously several interest rates led Joan Robinson to the conclusion that every asset should be considered as a potential alternative to every other asset including money.

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[11] H. R. Heller, "The Demand for Money: The Evidence from the Short-Run Data," Quarterly Journal of Economics 79 (May 1965):294.

Prior to any of the above studies, she voiced the opinion that the demand and supply of every asset should be considered.[12]

Tobin

A theory of the capital account is concerned with the proportions of the assets and debts in the portfolios. Monetary theory, therefore, should direct itself, according to Tobin, to the identification of the forms in which nonmonetary proportions of wealth exist, as well as the various independent interest rates, i.e., those not separated by a constant risk differential.

Keynes's model aggregated all nonmonetary assets by assuming the existence of <u>the</u> interest rate. The yields on the nonmonetary assets were not assumed as equal but rather the differences between them were constant. Tobin explains this freed the rate differentials from dependency on the relative supplies of assets and therefore by setting one rate the others are defined. <u>The</u> interest rate was therefore determined by the supply of money relative to the supply of 'bonds' (the aggregate of all nonmonetary assets).

Tobin defined a different model, termed the Cambridge Tradition, which again was composed of two assets. In this model the assets are physical capital and money, with money being the aggregate term.

Tobin, however, faults this model for failing to recognize the function of the yield of capital. He then presents a so-called modern

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[12]Joan Robinson, <u>The Rate of Interest</u> (London: Macmillan, 1952), pp. 5-9.

version of the money-capital model, where the yield on capital is dependent on the relative supplies of the two assets.

Money and government debt are "one and the same" and Tobin describes a trivial extension of this model which includes government securities assuming that the yield differentials among these securities and 'actual' money are constants.[13]

Livingston in reviewing Tobin's capital-money model claims that Tobin should have said money and bonds are perfect complements in that he meant the demand for money and bonds are one and the same.[14]

It is apparent that Livingston misunderstood the relationship among the assets in this model. In aggregating money and bonds Tobin has in fact specified that the differential in their yields is independent of their relative supplies. This in effect means the composition of the asset termed money, which is defined as government debt, is a matter of indifference to the holders and this automatically defines the components of this asset as perfect substitutes. If in fact money and bonds were pefect complements, as suggested, then the doubling of bonds would have to be matched by a doubling of money and the composition would no longer be a matter of indifference, which would mean that their respective yields are not independent of their relative supplies.

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[13]James Tobin, "Monetary Theory: New and Old Looks; Money, Capital, and other Stores of Value," American Economic Review 51 (May 1961):32.

[14]Byron Miles Livingston, "Effects of Real Economic Growth, Inflation and Monetary Forces Upon Stock Market Prices, Analyzed by Means of a Wealth Model" (Ph.D. dissertation, New York University, 1972), p. 10.

Livingston charges that in Tobin's model "one must also account for the change in the supply of bonds, if the government buys bonds from the public."[15]

This again is a misunderstanding of the model apparently stemming from Tobin's discussion concerning the effects of retiring long term debt through taxation.

Tobin's model sees this action as deflationary due to the reduction in the supply of money, which is equivalent to government debt, relative to the supply of capital.

Livingston apparently is trying to separate bonds and money which is contrary to the assumptions of the model. By taxing and then retiring bonds, the holders of bonds and money have in effect reduced their holdings of bonds relative to money but this does not determine the interest yields and therefore is inconsequential. The importance to the model is that the combined holdings of money and bonds have been reduced relative to the existing holdings of capital. Therefore investors will require a higher return on capital, which is the strategic variable in Tobin's model.

The importance of Tobin's work, however, rests not on the formulation of this model but in the recognition that all forms of wealth as well as all independent rates of interest should be identified for a proper investigation of the portfolio of wealth holders. This then identifies an interest rate for every asset that is an imperfect substitute for another asset rather than assuming a two

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[15]Ibid., p. 11.

asset world with just one rate determined by the supply and demand of assets.

The portfolio approach is a theory not only of the demand for money but of each asset which is a component of the portfolio. Rather than having a constant rate differential, the relative rates on the assets depend on the relative supplies and the portfolio approach is therefore concerned with the allocation among the various assets within the portfolio. By measuring the proportion of each asset in the portfolio we then are measuring the demand for that asset.

By increasing the supply of one asset relative to other assets, the rate of interest on that asset has to go up relative to the rates on other assets to entice the wealth owners to accept the increased supply. Therefore the demand for that asset will go up relative to the other assets.

Tobin sets up an accounting framework for the economy where each asset has its own rate of return and every sector has a demand for each asset, which is a function of the various interest rates (one for each asset). Each sector is constrained by its net worth, i.e., the sectors can choose the proportions held of each asset but they cannot choose their net worth.

In conjunction with Brainard, Tobin established a fictitious economy composed of six assets and three sectors.[16] Income is entered in each demand equation to represent the influence of

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[16]William C. Brainard and James Tobin, "Econometric Models: Their Problems and Usefulness; Pitfalls in Financial Model Building," American Economic Review 58 (May 1968):100.

transaction volume on money holdings. The form of the equation for the demand of each asset is:

$$X_j = (a_0 + \sum_{i=1}^{6} a_i r_i + a_7 Y)W$$

where:

X_j = desired asset holding

r_i = interest rate on each asset

Y = income

W = net worth

Summary

The study of money has progressed from the investigation of a two asset economy to a theory that considers the choice of all assets in the portfolio.

The problems of definitions are now compounded for the investigator must now choose several interest rates that are determined to be independent and must define assets in addition to the term money.

Settling on a proper definition of money becomes a process of elimination. Harry Johnson discusses four definitions. Two of them have not been reviewed in this paper. They are liquid assets (M3) and the Gurley and Shaw definition which includes all liabilities of financial institutions (M4).[17]

The term liquid assets appears nebulous and as a result suffers from the lack of a workable definition. Both (M3) and (M4)

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[17] Harry G. Johnson, "Monetary Theory and Policy," American Economic Review 52 (June 1962):351-52.

were eliminated from consideration because they preclude the examination of the allocation of financial assets by the consumer sector. The reasoning behind these definitions is the high degree of substitutability between these assets. Unless the assets are found to be perfect substitutes, and they were never found as such, there is no necessity to expand the definition.[18]

Friedman argued for the inclusion of time deposits (M2) not only because they are close substitutes for currency and demand deposits (M1) but, as noted earlier, due to the available data prior to 1914.

The findings of some of the articles discussed later do not unanimously support the contention that time deposits are strong substitutes for currency and demand deposits. In addition, this line of reasoning leads to the same conclusion as that given for excluding (M3) and (M4). Furthermore, the period examined in this study begins in 1927 which allows for a finer breakdown between these assets.

Based on the above, there appears no compelling reason to expand the definition beyond (M1), which has been the more popular version. The rest of this study when referring to money will, therefore, assume it to be currency plus demand deposits.

The demand equations used in this study were based on the equations derived by Tobin. The assets investigated include the consumer sector's holdings of money, savings deposits, corporate

[18] When the objective is a more stable function, Laidler states that substitutability between the assets is a necessary but not a sufficient condition. David Laidler, "The Definition of Money," reprinted in Monetary Economics Readings on Current Issues, ed. William E. Gibson and George G. Kaufman (New York: McGraw-Hill Book Company, 1971), p. 188.

bonds, equities, and government securities. Definitions for the assets, other than money, are arrived at in the next section. Net worth is calculated as the total of seven assets (the above five plus holdings of durable goods and the valuation of housing) minus the consumer sector's holdings of mortgages and installment loans.

CHAPTER II

DEMAND FOR FINANCIAL ASSETS (EXCLUDING MONEY)

The problems connected with the demand for money are present in the studies concerned with other financial assets. There is disagreement on the forms of the equations, the rates of return to be included, the proper constraints, and the grouping of assets. Needless to say, the results are diverse and the explanations varied.

An important objective of this chapter is the establishment of the proper grouping for the various nonmoney assets and for this purpose we undertake a survey of the literature.

Feige

Investigating the consumer sector's demand for demand deposits, time deposits, and savings and loan shares, Feige utilized three equations.[19] Independent variables included the actual interest returns on the above assets, the actual rate on mutual savings bank deposits, permanent income, per capita advertising expenditures by savings and loan associations, and nine dummy variables. The actual interest returns were computed by dividing the total interest payments by the average balance held during a particular period. The interest

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[19] Edgar L. Feige, The Demand for Liquid Assets: A Temporal Cross Section Analysis (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1964), pp. 21-30.

Table

Table

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return on demand deposits was represented by the total service charges divided by actual balances and was of course negative.

During the period covered, (1949-1959), many savings and loan associations offered nonpecuninary returns in the form of premiums. Since data on the amount of these returns was unavailable, Feige used per capita advertising expenditures as a proxy.

The nine dummy variables were included to account for possible variation in the intercepts for a particular asset among different geographical and financial areas.

Using a pooled time series, cross sectional approach covering the eleven years with 49 observations for each year (one for each state plus the District of Columbia), Feige's results are as follows (Tables 2 and 3).

Table 2.--Rate Elasticities.

	Feige's Results					Lee's Results (Omitting Dummy Variables)				
	η_{xd}	η_{xt}	η_{xs}	η_{xm}	η_{xy}	η_{xd}	η_{xt}	η_{xs}	η_{xm}	η_{xy}
Demand Deposit	.31	-.10	.30	.04	.92	.37	.02	-.31	-.05	1.36
Time Deposit	-.13	.49	-.55	-.28	.69	-.28	.15	-.75	.01	1.24
Savings and Loan Shares	-.10	-.003	.18	-.08	.63	-.22	.12	.66	-.12	1.98

As the tables indicate, all the own rates entered with the expected sign, and time deposits appear as weak substitutes for demand deposits. The remaining elasticities, however, suggest a mixture, some not in keeping with expectations.

Table 3.--Feige's Coefficients.

	Y	r_d	r_t	r_s	r_m	R^2
Demand Deposits	.365 (.08)	535 (48)	-35 (13)	53 (13)	25 (15)	.978
Time Deposits	.122 (.037)	-101 (37)	76 (10)	-44 (10)	-82 (11)	.942
Savings and Loan Shares	.069 (.008)	- 48 (19)	.25 (5.39)	9 (5)	-14 (6)	.968

Notes for Table 3:

r_d = return on demand deposits

Y = permanent income

r_t = return on time deposits

r_s = return on savings and loan shares

r_m = return on mutual savings deposits

Parentheses include standard errors

In equation 1, savings and loan shares appear as complements to demand deposits but equation 3 shows them to be weak substitutes. Equation 2 has savings and loan shares as substitutes for time deposits while in equation 3 they are almost independent of one another. The income elasticity for demand deposits is approximately 1 while that for time deposits is only .69. This together with the finding of weak substitution between demand deposits and time deposits, if accepted, would be contrary to Friedman's explanation of the difference between Latané's and Friedman's own results referred to in the last section.

To explain the finding of complementarity, Feige cites an article by Tobin and Brainard. However, their finding of possible complementary assets is based on the assumption that there is more than one holder of the asset in question, i.e., the consumer sector and the financial sector.[20] Feige logically concludes that the reason for the complementarity is most likely due to an inadequate measure of the household's holdings of demand deposits.

If this logic is correct then as the rate paid on savings and loan shares increases the demand for demand deposits by the consumer sector declines but the holdings of demand deposits by savings and loan associations increase enough to more than offset the decrease in the consumer sector. Since the consumer sector holds the vast majority of savings and loan shares and it seems illogical that the savings and loan associations would convert more than a fraction of incoming deposits into demand deposits the implication of Feige's explanation must be the saving and loan shares and demand deposits are considered as very weak substitutes with a major source of saving and loan shares being time deposits or some other asset.

Equation 2 shows that time deposits are very sensitive to both the rate of interest on savings and loan shares and the rate paid by mutual savings banks. Equation 3, however, implies that the savings and loan shares are not influenced by the rates on time deposits or mutual savings deposits.

The three equations, therefore, estimate the influence of these rates on the three assets but the equations do not explain, with the possible exception of savings and loan shares, the source of these

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[20] James Tobin and William C. Brainard, "Financial Intermediaries and the Effectiveness of Monetary Controls," <u>The American Economic Review</u> 53 (May 1963):393-97.

assets, i.e., what assets in the portfolio are reduced to increase the holdings of time deposits and demand deposits.

One reason for this lack of explanatory power may well be an incomplete listing of the assets of the consumer sector. This explanation may not be the root of the problem, however, as is evident in the review of Feige's study by Tong Hun Lee.

Tong Hun Lee

Omitting the dummy variables and the per capita advertising expenditure by savings and loan associations, Lee obtained the elasticities reproduced in Table 2[21] (to the right of Feige's results). Using the same data as Feige, Lee obtained a higher income elasticity for savings and loan shares than for demand deposits; however, the income elasticity of time deposits was still lower than that of demand deposits. Savings and loan shares are now seen as strong substitutes for demand deposits. Equation 2 shows savings and loan shares strong substitutes for time deposits whereas equation 3 has them as weak complements. Time deposits in equation 1 are almost independent of demand deposits but equation 2 shows them to be fairly strong substitutes.

It would be difficult to arrive at a logical explanation as to why an increase in the rate on time deposits should increase the holdings of saving and loan shares. The purpose of Lee's review is

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[21] Tong Hun Lee, "Substitutability of Non-Bank Intermediary Liabilities for Money: The Empirical Evidence," The Journal of Finance 21 (September 1966):454.

not, however, to explain the findings but rather to demonstrate that the use of excessive dummy variables can produce erratic results.

In the same article, using data obtained from Friedman and Schwartz for the years 1934-60 (omitting 1942-45) and the Federal Reserve Bulletin for 1961-64, Lee examines the relationship between the yields of nonbank intermediary liabilities and the demand for money. The stated purpose is to test the Gurley and Shaw and Friedman definitions of money. Gurley and Shaw maintain there is a close substitutability between these liabilities and money. Friedman and Schwartz, however, contend there is a close substitutability between time deposits and demand deposits but not between those assets and the liabilities of nonbank intermediaries.

In an attempt to avoid problems of multicollinearity, two interest rates were selected, a weighted average of the rates on savings and loan shares, i_{sm}, and a weighted average on long term and short term government securities, i_g. Lee then subtracts from each of these average rates the yield on demand deposits, i_d, obtained in the same manner as in Feige's study.

$$\ln \frac{M_1}{P_n} = \underset{(.234)}{-.724} + \underset{(.034)}{1.073} \ln \frac{Y_n}{P_n} - \underset{(.101)}{.091} \ln (i_g - i_d) - \underset{(.079)}{.64} \ln (i_{sm} - i_d)$$

$$R^2 = .985 \qquad D.W. = 1.359$$

where:

M_1 = per capita money stock (narrow definition)

P_n = permanent price

$\frac{Y_n}{P_n}$ = permanent per capita net national product

Parentheses contain standard errors.

Lee concludes there is a close substitutability between non-bank intermediary liabilities and money based on the high interest elasticity (-.64). Using the broader definition (M2) led to the same conclusion. The coefficient of the yields on government securities suggests a low level of substitution; however, the coefficients were not statistically significant on either equation.

Hamburger

The objectives of this study are "1. to test a simple model of household investment behavior (portfolio selection) and 2. to determine the degree of substitution among liquid assets, and between these assets and marketable securities."[22] The data consisted of semi-annual observations covering the period 1952-62. Hamburger's equation is derived as follows:

$$A_i^* = a_{io} + \sum_j a_{ij} r_j + a_{iy} Y + a_{iw} W$$

$$i = T,S,L,B \qquad j = T,S,B,E$$

where:

T = time deposits

S = accounts at other savings institutions

L = life insurance claims

B = marketable bonds (including corporate, state and local, and federal obligations)

E = equities

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[22] Michael J. Hamburger, "Household Demand for Financial Assets," Econometrica 36 (January 1968):97.

W = real wealth measured as financial assets excluding equities (FA), or financial net worth excluding equities

Y = real disposable income

A_i^* = real value of asset i desired by the household sector

Hamburger states that A_i^* is not observable and the adjustment process is explained by the following equations.

$$A_{it} - A_{i,t-1} = \theta_i \, (A_{it}^* - A_{i,t-1}) \quad 0 \leq \theta \leq 1$$

Therefore the original equation becomes

$$A_{it} = \theta_i a_{io} + \sum_j \theta_i a_{ij} r_{jt} + \theta_i a_{iy} Y_t + \theta_i a_{iw} W_t + (1-\theta_i) A_{i,t-1}$$

then $$A_{it} = b_{io} + \sum_j b_{ij} r_{jt} + b_{iy} Y_t + b_{iw} W_t + \lambda_i A_{it-1}$$

where: $$\theta_i = 1-\lambda_i \quad \text{and} \quad a_{ik} = \frac{b_{ik}}{1-\lambda_i}$$

The results from running this last equation are given in Tables 4 and 5.

In both tables, the first equation for each dependent variable is the original estimate while the second equation presents the results when all the nonsignificant variables are omitted.

According to Tables 4 and 5, the yield on equities enters significantly only in the bond equation. Hamburger concludes that the household sector treats equities as poor substitutes for the liabilities of financial intermediaries. Time and savings accounts were found to be very good substitutes. The finding of a positive income coefficient for time and savings accounts is interpreted by

Table 4.--Hamburger's Results (Part 1).

Dependent Variable	Intercept	r_E	r_B	r_T	r_S	Y	NW	FA	Lagged Dependent Variable	$\bar{R}^2$ S*	DW
T	-17.9 (11.3)	.06 (.30)	-1.25 (.46)	5.06 (1.13)	-2.28 (1.47)	.001 (.011)	.124 (.054)		.722 (.173)	.9971 .4696	1.88
T	-18.5 (8.7)		-1.26 (.43)	5.15 (.95)	-2.24 (1.34)		.131 (.039)		.699 (.110)	.9975 .4378	1.91
L	10.7 (2.5)	.01 (.08)	- .09 (.17)	-1.58 (.33)	- .25 (.54)	-.019 (.18)		.070 (.009)	.586 (.068)	.9992 .1376	1.86
L	10.6 (1.5)			-1.73 (.22)		-.021 (.010)		.069 (.006)	.591 (.048)	.9993 .1281	.944
S	-28.9 (5.7)	-.18 (.12)	- .46 (.19)	-1.39 (.44)	3.54 (.82)	.001 (.018)	.108 (.011)		.939 (.049)	.9999 .1672	
S	-27.8 (2.8)		- .46 (.19)	-1.71 (.40)	3.29 (.55)		.100 (.01)		.967 (.015)	.9999 .1734	

Parentheses include standard errors

r_E = Moody's dividend yield on equities

r_B = Moody's A_{aa} rate on long term corporate bonds

r_S = weighted average of rates paid by savings and loans associations and mutual savings banks

r_T = interest paid as a ratio of total time and savings deposits for member banks

$\bar{R}^2$ = R^2 adjusted for degrees of freedom

S* = adjusted standard error of regression

DW = Durbin Watson statistic

Table 5.--Hamburger's Results (Part 2).

Dependent Variable	Inter-cept	R_E	R_B	$R_{T.S}$	Y	NW	Lagged Dependent Variable	$\bar{R}^2$ S*	D.W.
B	-5.8	-2.01	4.88	-6.72	.012	.071	.688	.9871	2.54
	(10.7)	(.52)	(.78)	(1.84)	(.022)	(.048)	(.094)	.7307	
B	-3.2	-2.22	4.88	-6.34		.086	.699	.9877	2.63
	(9.3)	(.34)	(.76)	(1.67)		(.038)	(.09)	.7129	

$R_{T.S}$ = weighted average of yield on time deposits and savings accounts

Other definitions are given in the note to Table 4.

Hamburger as evidence that they are poor substitutes for money; however, income only enters significantly in the equation for life insurance claims. He does suggest other interpretations are possible concerning this finding.

Hamburger's investigation is quite relevant to the present study; however, his measure of the return on equities appears inadequate. The prices on shares of common stock are continuously fluctuating while the dividends paid are slower to change. This means that the yields are most apt to alter due to prices and therefore the investor may well view a change in the dividend yield quite differently than a change in the actual return from equity. In effect then, an insignificant finding for the coefficient of the dividend yield may not signify that the return on equity is insignificant in the demand for the asset.

Another problem exists in the definition of net worth. Admittedly the measurement of the value of common stock holdings is a difficult and at best an imprecise undertaking; however, to omit this value from net worth definitely results in an invalid constraint for the consumer sector. Net worth of the consumer sector could well be fluctuating in a manner far different from the fluctuations in the value used in Hamburger's study.

Chase

In a study of the household sector's demand for saving deposits (defined as time deposits, mutual saving bank deposits, saving and loan shares, credit union deposits, deposits in the

Postal Saving system, and government savings bonds), Chase uses the following equations:

$$(1) \quad S = \alpha Y_p^{\beta_1} r_s^{\beta_2} r_c^{\beta_3} \delta^d$$

$$(2) \quad S = \alpha Y_p^{\beta_1} r_s^{\beta_2} (r_c - r_s)^{\beta_3} \delta^d$$

where:

S = real per capita holdings of savings deposits

Y_p = real per capita permanent income

r_s = average yield on savings deposits

r_c = average yield on corporate A_{aa} rated bonds

d = deposit insurance dummy; 0 before insurance legislation, i.e., before 1934.

The data covers the years 1921-29 obtained from Goldsmith, and 1934-41, 1946-65 from the Federal Reserve's flow of funds accounts.

The regression results are reproduced in Table 6.

In all cases the income elasticity of savings deposits is significant and approximately 1. The coefficient of r_s in equation 2a (.269) shows that a 10 percent increase in both the yields of savings deposits and corporate bonds produces a 2.7 percent increase in per capita real savings deposits. Chase finds this "consistent with the hypothesis that a change in the yield on savings deposits elicits a change in the real quantity people will hold independently

Table 6.--Chase's Results.

Equation Number	Period	Inter-cept	$\ln Y_p$	$\ln r_s$	$\ln r_c$	$\ln(r_c - r_s)$	$\ln \delta$	$\bar{R}^2$	DW
1a	1921-29 1934-41 1946-65	-.361 (.170)	.967 (.0514)	.986 (.140)	-.890 (.148)	---	.193 (.0172)	.986	1.38
2a	1921-29 1934-41 1946-65	-.636 (.136)	.992 (.0476)	.269 (.0488)	---	-.203 (.0328)	.183 (.0164)	.987	1.32
1b	1934-41 1946-65	-.307 (.207)	.996 (.0565)	.794 (.183)	-.665 (.202)	---	---	.976	1.38
2b	1934-41 1946-65	-.525 (.158)	1.02 (.0515)	.258 (.0515)	---	-.149 (.0438)	---	.977	1.41

Parentheses contain standard errors

DW = Durbin Watson statistic

$\bar{R}^2$ = adjusted for degrees of freedom of an induced switch out of marketable securities because it leads to a reduction of money holdings."[23]

He concludes the findings therefore imply that the demand for money is negatively related to savings deposit yields.

Though Chase mentions other possibilities, the above statement appears void of any real meaning due to the omission of other assets such as equities and government securities. Though the statement is correct, the finding is consistent with any number of hypotheses.

What does appear significant in this study is the agreement with Hamburger's findings of strong substitutability between corporate bonds and savings deposits. Problems exist however, in that Chase's study has used the rate on corporate bonds as a proxy for all marketable securities. The present study finds a weak correlation between the return on corporate bonds and equities (r^2 = .057) as opposed to a strong correlation between corporate bonds and savings deposits (r^2 = .86).

This would tend to discredit the use of the proxy used by Chase; however, he does not suggest a formula for calculating the return on equity and given the assumption that his proxy is correct would add credibility to his conclusions.

Kardouche

Attempting to determine the factors that influence savings and loan shares and time deposits, Kardouche employed both time-series and a pooled time-series cross-sectional approach. In the

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[23]Samuel B. Chase, Jr., "Household Demand for Savings Deposits, 1921-1965," The Journal of Finance 24 (September 1969):653.

time series analysis the equations were obtained using quarterly data for the period 1952I-1966IV (Table 7).

Equation 2 is in log linear form and the coefficients show a high wealth elasticity (2.16) and a rather low own rate elasticity (.16), but the most interesting result is the positive elasticity for the yield on common stocks.

Kardouche explains this positive coefficient as implying

> . . . that depositers would shift their savings into time deposits and out of stocks as the yield on the latter rose. Savers therefore appear to avoid high (rising) stock yields. Such behavior can be rationalized by assuming that savers move out of stocks at higher yields to avoid a potential capital loss involved. In fact, a chart of the yield on common stocks and of the relevant price index for common stocks revealed a close inverse relationship of stock yields to stock prices.[24]

Replacing the stock yield variable by a stock price index, Kardouche finds that rising stock prices "induce" shifts from time deposits into stocks and therefore concludes stocks are substitutes for time deposits.

Albeit, this is an imaginative explanation, an even better one appears to be the admission that neither stock yields or a price index is a good measure of the return on equity. The finding of a close inverse relationship between stock yields and stock prices comes directly from the method in which stock yields are calculated. The return on equities should equal the yield plus expected capital gains and it is not clear that the price level or the yield is a good proxy for this return.

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[24]George M. Kardouche, "The Competition for Savings," in Studies in Business Economics No. 107 (New York: National Industrial Conference Board, Inc., 1969), p. 50.

Table 7.--Kardouche's Results.

Equation	Dependent Variable	Intercept	i_t	i_s	i_{mu}	i_{cs}	W	S_1	S_2	S_3	R^2	DW
1	T	-85.4	5.16 (1.47)	-14.84 (5.00)	-1.79 (4.92)	2.62 (5.45)	.66 (21.89)	-3.57 (5.23)	-1.34 (1.96)	-1.61 (2.37)	.998	1.33
2	ln T	-.84	.16 (2.08)	-.20 (1.54)	-.17 (5.35)	.05 (2.00)	2.16 (26.24)	-.04 (4.67)	-.01 (1.47)	-.02 (1.99)	.998	1.08

Equation	Dependent Variable	Intercept	i_t-i_s	i_c-i_s	a_s	W	S_1	S_2	R^2	DW
3	S	-123.22		-6.17 (8.04)	.23 (10.87)	.49 (149.31)	-2.36 (4.74)	-1.48 (2.99)	.998	1.03

Note: Parentheses include t ratios

i_t = time deposit yield

i_s = savings and loan yield

i_c = yield on A_{aa} corporate bonds (Moody's)

i_{mu} = yield on mutual savings deposits

i_{cs} = yield on common stocks (Standard and Poor's)

a_s = value of savings and loan associations advertising expenditures per dollar of saving and loan shares

T = time deposits (current value)

S = saving and loan shares (current value)

W = net financial wealth (excluding equities)

S_i = seasonal dummies

DW = Durbin Watson statistic

Kardouche has implied that increasing the price of stock increases the demand for stock. An explanation that allows for more rationality on the part of stock buyers is that the price of stock goes up due to increased demand and the increased demand can be attributed to an increase in the return to stocks relative to other assets resulting in a reallocation of assets. The increased demand has then caused the increase in price rather than vice versa as Kardouche has concluded.

Correlation does not mean causation and the finding of a negative coefficient for the stock price index in the time deposit equation does not necessarily result in Kardouche's explanation.

The price of stock may be positively correlated to the demand for stock due to its being a measure or proxy for expected capital gains which are a portion of return.

Accepting the price of common stocks as a proxy for the return on common stock and looking at Kardouche's equations one can agree with his conclusion, if not his explanation, that equities appear as substitutes for time deposits. This conflicts with Hamburger's findings as noted earlier.

Equation 3 has the interest rates in terms of differences in an effort to reduce collinearity. Equation 3 is a 'best fit' after trying and eliminating $(i_t - i_s)$. This indicates that time deposits are not considered as substitutes for savings and loan shares which 'conflicts' with the results of the time deposit equation. In other words increasing the rate on savings and loan shares causes a decrease in time deposits but increasing the rate on time deposits does not affect the holdings of saving and loan shares.

Kardouche concludes that corporate bonds are a close substitute for savings and loan shares while time deposit rates are not significant.

Running the time deposit equation in linear form but utilizing two interest rate differentials (i_s-i_t) and (i_b-i_t), where i_b was one of seven different rates (7 equations), Kardouche rated the assets as to their substitutability with time deposits.

1. Savings and Loan Shares
2. Long term Government bonds
3. Long term corporate bonds
4. Common stocks
5. Municipal bonds
6. 3-5 year Government bonds
7. 3-month Treasury bills.

Using the same procedure for the savings and loan equation the interest rate differential used was (i_b-i_s).

1. Corporate bonds
2. Long term Government bonds
3. Municipal bonds
4. Common stocks
5. 3-5 year Government bonds
6. 3-month Treasury bills

Nyerges

Using quarterly time series data (1952-71) and linear regression analysis, Nyerges investigated the demand for savings and loan shares. The equations in their final form included as independent variables: disposable income, the average rate on savings and loan shares, a competitive institutional rate, an average rate on a potentially competitive market instrument and three seasonal dummy variables.[25] Nyerges' equations as well as his elasticity calculations are included in Table 8.

Ranking the various assets on the basis of their relative elasticities (defined in note to Table 8), Nyerges found them to be in the following order of substitutability for savings and loan shares.

1. Mutual savings deposits
2. Time deposits
3. Long term Government bonds
4. Corporate bonds
5. 3-5 year Government bonds
6. 9-12 month Government bills
7. State and local bonds

This conflicts with Kardouche's finding that time deposits are not significant in the savings and loan equation.

Assets 2 through 7 had the same ranking in both the equation using the rate on mutual savings deposits and the equation using the rate on time deposits.

The only surprising element in Nyerge's equations are the extremely high elasticities. They appear out of line with any of the

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[25] Richard Nyerges, "The Demand for Savings and Loan Shares: An Empirical Test of the Static and Dynamic Influence of Interest Rates" (Ph.D. dissertation, MSU, 1974), p. 79.

Table 8.--Nyerges' Equations.

Equation	R^2	Competitive Asset	Market Instrument	Income Elasticity	Own Elasticity	Cross Elasticity MSB	Cross Elasticity TD	Cross Elasticity Market Instrument	Intercept	Income	Own Rate	Institutional Rate	Market Rate	S_1	S_2	S_3
1	.83824	TD	3 month T Bill	2.94	6.51		3.22 (.49)	1.27 (.19)	-7875.4	.055446 (5.74445)	3274.0 (3.7748)	-2152.1 (3.1477)	-754.4 (5.505)	126.20 (.5705)	-859.72 (3.7050)	334.65 (1.3224)
2	.82638	MSB	3 month T Bill	2.26	5.76	4.14 (.72)		1.35 (.23)	-2423.3	.042672 (4.7560)	2897.8 (2.9158)	-2182.0 (2.262)	-793.1 (5.699)	187.45 (.81311)	-819.88 (3.436)	353.43 (1.4201)
3	.83365	TD	9-12 month Govt Bill	2.83	7.48		3.71 (.49)	1.18 (.16)	-8813.5	.053322 (5.4477)	3762.3 (4.3341)	-2484.9 (3.672)	-639.9 (5.106)	200.16 (.89218)	-729.09 (3.073)	411.70 (1.6039)
4	.82062	MSB	9-12 month Govt Bill	2.02	7.13	5.27 (.73)		1.26 (.18)	-3154.2	.038186 (4.2382)	3585.4 (3.5947)	-2776.1 (2.908)	-681.2 (5.298)	265.78 (1.1345)	-673.12 (2.765)	465.87 (1.8673)
5	.84003	TD	3-5 year Govt	3.26	7.84		3.91 (.52)	1.72 (.22)	-8822.0	.061532 (6.3582)	3942.6 (4.6295)	-2616.3 (3.984)	-833.3 (5.369)	226.73 (1.0313)	-761.43 (3.286)	293.30 (1.1629)
6	.83411	MSB	3-5 year Govt	2.46	8.13	6.15 (.76)		1.87 (.23)	-2936.3	.046451 (5.2258)	4087.5 (4.2461)	-3241.4 (3.586)	-906.8 (5.836)	302.64 (1.3426)	-683.6 (2.835)	359.67 (1.4995)
7	.81137	TD	LT Govt (over 5 yrs)	3.44	9.00		4.23 (.47)	2.79 (.31)	-8641.1	.064912 (6.0646)	4525.2 (4.8574)	-2832.0 (3.981)	-1341.5 (4.125)	183.65 (.77017)	-937.8 (3.753)	203.53 (.73602)
8	.80687	MSB	LT Govt (over 5 yrs)	2.68	11.41	8.23 (.72)		3.49 (.30)	-2418.5	.050492 (5.0895)	5735.7 (5.3194)	-4340.4 (4.496)	-1680.5 (5.203)	196.44 (.81385)	-958.3 (3.887)	243.80 (.90827)
9	.80150	TD	State & Local Obligations	3.45	9.87		5.23 (.55)	1.36 (.14)	-10968	.065002 (5.8525)	4964.5 (4.9956)	-3633.0 (5.035)	-744.8 (3.389)	272.76 (1.1052)	-811.00 (3.145)	202.30 (.71484)
10	.82156	MSB	State & Local Obligations	2.62	14.93	12.39 (.83)		2.34 (.16)	-3453.3	.049564 (5.2707)	7507.1 (6.2516)	-6533.1 (6.222)	-1280.0 (5.492)	322.43 (1.3629)	-798.7 (3.337)	193.16 (.76787)
11	.80313	TD	Corporate Bonds	4.52	9.46		5.21 (.55)	2.53 (.27)	-10178	.085312 (6.1525)	4756.9 (4.9007)	-3482.3 (4.874)	-1023.4 (3.387)	173.13 (.7059)	-991.5 (3.812)	105.18 (.36509)
12	.80776	MSB	Corporate Bonds	4.37	14.19	11.78 (.83)		4.15 (.29)	-2748.4	.082480 (6.1734)	7135.0 (5.9981)	-6208.5 (5.921)	-1674.7 (5.158)	123.75 (.50794)	-1055.4 (4.245)	85.05 (.31498)

TD = Time deposits

MSB = Mutual savings bank deposits

Parentheses in elasticity columns contain relative elasticities defined by Nyerges as $\frac{\text{cross elasticity}}{\text{own rate elasticity}}$

S_i = Dummy variables

Institutional rate = rate on competitive assets other studies reviewed. Nyerge explains that the elasticities are calculated at the mean. The formula for calculating the own rate elasticity at the mean would be:

$$\eta_{xr} = \frac{\bar{r}}{\bar{x}} \frac{\partial x}{\partial r}$$

where:

$\bar{x}$ = average holdings of savings and loan shares

$\bar{r}$ = average rate on savings and loan shares

$\frac{\partial x}{\partial r}$ = coefficient in the regression equation

The coefficient of the own rate for the second equation is 2897.8. For the period 1952-71 the average rate on savings and loan deposits was .0369; this is an average of yearly rates obtained from the Savings and Loan Fact book and should be identical to Nyerge's average rate for he used the same data and interpolated to arrive at his quarterly rates. The elasticity calculated by Nyerge's is 5.76. Therefore:

$$2897.8 \left(\frac{\bar{r}}{\bar{x}}\right) = 5.76 \quad \text{or} \quad \frac{\bar{r}}{\bar{x}} = .00199$$

since $\bar{r}$ = .0369, the average holdings ($\bar{x}$) must equal 18.54. The average yearly holdings of savings and loan shares calculated from the Federal Reserve Flow of Funds accounts (1945-72) is 81.319 billion.

There appears to be a large discrepancy. Nyerge used other sources for his average holdings but it does not seem possible to explain this difference.

Using 81.319 billion, $\bar{r}$ = .0369 and Nyerge's coefficient of 2897.8 the elasticity calculated is 1.31 not 5.76.

All own rate elasticities were recalculated and Nyerge's estimates were consistently higher by a factor of approximately 4.4. The same factor was found in the cross elasticity for corporate bonds. Due to the unavailability of Nyerge's data sources, it remains impossible to determine whether or not a mistake was made in the calculations; however, it appears that the relative standings of the substitutes would not be affected since the difference is a constant factor.

Summary

Feige's findings are of little help in the determination of how to group the various assets due to his mixed results. Lee does improve these results by omitting the dummy variables; however, they remain mixed.

Hamburger's study is the most pertinent one for this examination. In that article he concludes that time deposits and savings deposits are almost perfect substitutes. This finding is similar to the conclusion reached by Nyerge. Even though Nyerge's findings are possibly 'tainted' due to the inability to check the calculations of the elasticities, it appears that recalculating with data from the present study would not alter the relative position of the substitutes for savings and loan shares.

Kardouche's results are again mixed and of little aid and Chase assumes that all savings deposits are perfect substitutes.

Therefore, while there is no consensus of opinion, the findings do appear to lean toward a closer substitutability among savings deposits than between savings deposits and other assets.

This study defines as savings deposits the time deposits in commercial banks, saving and loan shares and mutual saving bank deposits. The major reason for this grouping is an attempt to arrive at a manageable number of assets, while hopefully sacrificing as little explanatory power as possible.

Other assets selected include corporate bonds, equities and Government securities. The latter includes both State and local obligations as well as Federal bonds.

In addition to the five demand equations, two supply equations are derived--one for equities and one for corporate bonds. Chapter III is a review of the articles pertaining to this topic.

CHAPTER III

SUPPLY OF EQUITY AND CORPORATE BONDS

To investigate the supply of corporate bonds and equities necessitates an establishment of an objective or criterion for decision making by the firm. Most investigators assume the firm is acting in the best interest of the stockholders, i.e., maximizing the value of the firm to the shareholders. This premise must have as its foundation not only a theory of how the shareholders determine value but also a theory on how this value can be influenced by the firm.

Major disputes exist on the subjects of valuation by shareholders and on the effects of changes in the capital structure of the firm.

The first section of this chapter deals with studies investigating the determinants of equity prices while the second section is a short review on the two opposing theories involving the effect of capital structure in the valuation of the firm.

Equity Price

Dividend Theory--Pure Earnings Theory

The disagreement here focuses on what a shareholder buys when he purchases a share of stock. The dividend theory considers the

price of a share of stock as equivalent to the present value of the expected dividend stream while the pure earnings theorists regard equity values as functions of the earning's stream independent of dividends.

Solomon and Modigliani, and Miller adhere to the latter proposition as evidenced in the following statements. Regarding the valuation of shares Solomon contends "in the long run, the holder of a share of stock is the owner of a stream of earnings from the share, and hence the most pervasive item affecting him in this connection is the impact of policy on future earnings per share.[26]

Modigliani and Miller support this hypothesis declaring the absence of any difference between retained earnings and dividends when it is assumed the management is acting in the best interest of the stockholders.[27]

Gordon

Deciding to test the two theories Gordon initiated a review of past studies. A dearth of published articles confined Gordon's investigation to unpublished work and led to the discovery that these studies had been abandoned due to questionable results.[28]

In testing the theories, Gordon collected data for the years 1951 and 1954 on four different industries. The industries and

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[26] Ezra Solomon, "Measuring a Company's Cost of Capital," in The Management of Corporate Capital, ed. Ezra Solomon (New York: The Free Press, 1959), p. 131.

[27] Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," The American Economic Review, June 1958, p. 266.

[28] M. J. Gordon, "Dividends, Earnings, and Stock Prices," The Review of Economics and Statistics 41 (May 1959):99.

number of corporations included in each industry are chemicals, 32; foods, 52; steel, 34; and machine tools, 46.

Retained earnings were included based on the assumptions that they are the most important cause of growth in dividends and the investor values a stream of dividends rather than solely the current dividend.

The equation used to test the dividend theory was

$$P = \alpha_0 + \alpha_1 D + \alpha_2 (Y-D)$$

where:

P = year end stock price

D = annual dividend

Y = yearly income per share

The results (reproduced in Table 9) of the eight equations lead Gordon to the conclusion that the dividend hypothesis presents a reasonable explanation of stock prices. The explanatory power was high (r^2 = .89-.94) and all but two of the coefficients (machine tools--1951 and chemicals--1954) were found to be significant.

The difference between α_1 and α_2 was found significant except for chemicals--1951. This was interpreted as evidence that investors view retained earnings differently than dividends which conflicts with the earnings hypothesis.

The study suffers due to a small sample size and the question raised by the study is whether current retained earnings are an adequate measure of expected future dividends. If the latter is not the case, the equation does not represent a test of the theories.

Table 9.--Gordon's Equations.

Year	Industry	Intercept	D	Y-D	R^2
1951	Chemicals	-7.0	15.9 (2.7)	16.7 (3.1)	.93
1951	Foods	.1	12.5 (1.1)	5.5 (.9)	.90
1951	Steels	5.5	8.6 (1.5)	2.0 (.6)	.86
1951	Machine tools	2.4	12.8 (1.0)	.8 (.5)	.90
1954	Chemicals	-3.0	30.0 (2.6)	.3 (3.3)	.92
1954	Foods	- .4	15.9 (1.5)	5.6 (1.0)	.91
1954	Steels	8.7	10.4 (1.4)	2.0 (.8)	.94
1954	Machine tools	6.3	9.6 (1.2)	4.1 (.6)	.89

Parentheses include standard errors

Leroy

The stated intention of this article is to empirically test the traditional theory.

Under perfect certainty the rate of discount for all securities would equal the market rate of interest. In order to account for uncertainty Leroy incorporates expected future dividends and a risk premium defined as the difference between the expected rate of return on stock and the interest yield on bonds. The equation then becomes

$$P_t = \frac{D_t}{1+I+RP} + \frac{D^e_{t+1}}{(1+I+RP)^2} + \ldots$$

where:

I = interest on debt

RP = risk premium

e = expected value

D = dividends

P = share price

t = time

Leroy then assumes the risk premium remains constant and uses current earnings as a proxy for future expected dividends.[29]

The final equation results are

$$P_t = \underset{(4.9825)}{.3832}\, E_t - \underset{(-.2172)}{.0255}\, I_t \qquad R^2 = .26$$

Parentheses include t ratios

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[29] Stephen F. LeRoy, "Explaining Stock Prices," Federal Reserve Bank of Kansas City Monthly Review, March 1972, p. 12.

The results imply that traditional theory is inadequate. The coefficient of the earnings variable is highly significant while the interest coefficient is nonsignificant.

The data consisted of quarterly observations from 1952I to 1971III. The interest rate used was Moody's Aaa bond rate and earnings were measured as net of taxes and depreciation.

Difficulty arises in attempting to determine exactly what is being tested by the above equation.

A constant risk premium implicitly assumes perfect substitution between bonds and stocks. Therefore in setting the rate on bonds, the rate of return of stocks is automatically determined. The rate of return on stocks is therefore independent of the relative supplies of bonds and stocks.

The dividend theory states that the value of any <u>share</u> of stock equals the discounted value of its dividend stream. Neglecting the relative supplies of bonds and stocks and using aggregate levels for income presents problems in interpreting the significance of movements in the earnings variable.

<u>Keran</u>

Keran's method is a variation of the dividend theory. "Conceptually, the price an individual is willing to pay for an equity share is equal to the discount to present value of both expected future dividends and the discount to present value of the expected stock price at the time of sale."[30]

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[30]Michale W. Keran, "Expectations, Money, and the Stock Market," <u>Federal Reserve Bank of St. Louis Review</u>, January 1971, p. 17.

The equation for the average investor as specified by Keran is as follows:

$$SP_t = \frac{(D_e + \Delta SP^e)_{t+1}}{1+R} + \frac{(D_e + \Delta SP^e)_{t+2}}{(1+R)^2} \quad . \; . \; .$$

where:

ΔSP^e = expected change in the stock price in each time period

SP_t = stock price at time t

D^e = expected dividends

R = interest rate

Keran contends "for average investor behavior, one must assume something approaching an infinite time horizon, because the longest time horizon of the individual investor will dominate the time horizon of the average investor."[31]

Before examining the remainder of Keran's study it is necessary to consider the above equation. This approach to valuation would appear to assume the investor is acting irrationally.

He is discounting to present value an earnings stream a portion of which he is not receiving until sale, i.e., ΔSP. Again difficulty arises in determining the basis for this equation. In dividend theory the rate of discount is equivalent to the yield plus capital gains regardless of the date of sale as demonstrated by Lintner.[32]

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[31] Ibid., p. 18.

[32] John Lintner, "Dividends, Earnings, Leverage, Stock Prices and the Supply of Capital to Corporations," The Review of Economics and Statistics 44 (August 1962):248.

$$P_{it} = \sum_{m=0}^{\infty} \frac{D_{i(t+m)}}{\prod_{\tau=0}^{m} (1+r_{t+\tau})}$$

$$= \frac{1}{1+r_t} \left[D_{it} + \sum_{m=1}^{\infty} \frac{D_{i(t+m)}}{\prod_{\tau=1}^{m} (1+r_{t+\tau})} \right]$$

$$\text{but} \quad \sum_{m=1}^{\infty} \frac{D_{i(t+m)}}{\prod_{\tau=1}^{m} (1+r_{t+\tau})} = P_{i(t+1)}$$

$$\therefore \quad P_{it} = \frac{D_{it} + P_{i(t+1)}}{1+r_t}$$

$$r_t = \frac{D_{it}}{P_{it}} + \frac{P_{i(t+1)} - P_{it}}{P_{it}}$$

where:

D = dividend/share

P = price of a share

t = time period

r = rate of discount

Therefore, according to the dividend theory, Keran is double counting. Continuing the review of Keran's study, the following equation is derived based on the assumption that retained earnings are the major factor in expected capital gains.

$$SP_t = \frac{[kE^e + (1-k)E^e]_{t+1}}{(1+R)} + \frac{[kE^e + (1-k)E^e]_{t+2}}{(1+R)^2} \ldots$$

$$\therefore SP_t = \frac{E^e_{t+1}}{1+R} + \frac{E^e_{t+2}}{(1+R)^2} \ldots$$

where:

$$k = \frac{\text{dividends}}{\text{earnings}}$$

$(1-k)$ = expected retained earnings ratio

Keran assumes expected earnings as dependent upon current and past actual earnings which results in equation 1.

$$SP_t = a_0 + a_1 \sum_{i=0}^{1} R_{t-i} + a_2 \sum_{i=0}^{n} w_i E_{t-i}$$

where:

w_i = the weights

n = number of periods used in forming earnings expectations

R = the interest rate, lagged one quarter to capture a lag in investor response

Keran's results are stated in Table 10. His method was to start with equation (1), which was derived as explained earlier, showing stock prices as dependent upon interest rates lagged one quarter and a weighted average of present and past earnings used as a measurement of expected earnings. Equations (2) and (3) were attempts to establish the determinants of interest rates and earnings respectively. Equation (4) then is an expansion of equation (1) by including the determinants of interest rates and corporate earnings.

Conclusions based on equation (4) were: (A) expected earnings and inflation have a significant influence on stock prices and

Table 10.--Keran's Results.

(1) $$SP_t = \underset{(3.08)}{12.33} - \sum_{i=0}^{1} \underset{(4.48)}{16.27}\, R_{t-i} + \sum_{i=0}^{19} \underset{(8.69)}{4.44}\, E_{t-i}$$

$$R^2 = .94 \qquad DW = .74$$

R = corporate bond yield Aaa

E = profits after taxes

Data = quarterly 1956-70

(2) $$\dot{R}_t = \underset{(4.63)}{1.22} - \underset{(3.55)}{.06}\, \dot{M}^*_t + \sum_{i=0}^{16} \underset{(2.11)}{.15}\dot{X}_{t-i} + \sum_{i=0}^{16} \underset{(20.31)}{1.00}\, \dot{P}_{t-i} + \underset{(12.56)}{1.60}\, Z_t$$

$\dot{M}^* = M/P$ M = nominal money stock; P = price index

$\dot{P}^e_t = \left[\sum_{i=0}^{n} Z_i\right] \dot{P}_{t-i}$ = expected rate of change in price

Z_i = weights

real growth = $\left[\sum_{i=0}^{n} u_i\right] \dot{X}_{t-i}$ $\dot{X}$ = change in real GNP

u_1 = weights

Z_t = dummy variable to account for change in the relationship between 1950s and 1960s

Data = quarterly 1955-70

(3) $$E_t = \underset{(19.53)}{63.04} - \underset{(16.50)}{1.12}\, tx_t + \underset{(4.79)}{.013}\, Y_t + \sum_{i=0}^{12} \underset{(13.23)}{1.59}\, \Delta Y_{t-i}$$

$$R^2 = .99 \qquad DW = .98$$

Data = quarterly 1953I to 1970II

tx = corporate tax rate

Y = nominal GNP = demand

Table 10.--Continued.

$$(4)\quad SP_t = \underset{(9.84)}{-30.68} + \sum_{i=0}^{2} \underset{(4.14)}{1.31}\, \dot{M}^{*}_{t-i} - \sum_{i=0}^{7} \underset{(5.67)}{5.37}\, \dot{X}_{t-i} - \sum_{i=0}^{16} \underset{(7.93)}{11.96}\, \dot{P}_{t-i} +$$

$$\sum_{i=0}^{19} \underset{(20.00)}{4.8}\, E^{*}_{t-i} \qquad E^{*} = E/P$$

$R^2 = .98 \qquad DW = 1.71$

Data = quarterly I 1956--II1970

t ratios in parentheses

(B) changes in real money have a small direct effect. Based on further examination Keran concludes that while money plays a small direct role it has large indirect effects.

Hamburger and Kochin argue, however, that the first equation using the bond rate gives poorer results than the equation with the determinants of interest (4), showing money has a direct effect on equity prices.[33]

It appears that the derivation used in arriving at equation (4) may not be logically consistent with the beginning assumptions. Keran specified (equation 3) earnings as dependent upon the tax rate and nominal GNP. Therefore the equation assumes earnings do not depend on the past retention of earnings. Expected earnings are assumed dependent on current and past earnings and therefore also independent of any measure of retained earnings. Retained earnings are not considered a determinant of interest rates. This leads to the conclusion that stock prices are independent of retained earnings; however, it was assumed that retained earnings are a major determinant of expected capital gains. We then are faced with a dilemma in that either the conclusion is reached that retained earnings are not a major factor in determining capital gains and therefore stock prices or we are left with the suggestion that stock prices are independent of capital gains. Either conclusion conflicts with the premise upon which Keran began.[34] This apparent conflict in conjunction with the problems

[33]Michael J. Hamburger and Levis A. Kochin, "Money and Stock Prices: The Channels of Influence," Journal of Finance (May 1972):238.

[34]Keran's exposition remains ambiguous as to how E* is measured in equation 4. If actual values were used the contradiction, as stated

discussed concerning the conflict of the starting equation with the dividend theory necessarily throws suspicion on any conclusions based upon either equation (1) or equation (4).

Lerner and Carlton

These authors demonstrate that, given certain conditions, the dividend theory and earnings theory are equivalent.[35] Starting with the assumption that dividends grow at a rate proportional to their present level, $\frac{dD}{dt} = gD$, they add the premise that the value of the dividend stream decays at a rate proportional to its existing value, $\frac{dV}{dt} = -kV$, where k is the market rate of discount.

Therefore, $D_t = D_o e^{gt}$

$$V_t = V_o e^{-kt}$$

at time o $V_o = 1,\ D_t = D_o$

Then $P_o = \int_o^\infty D_o e^{gt} e^{-kt} dt$ P = Price/share

or $P_o = \frac{D_o}{k-g}$

The corporation is then assumed to have a constant rate of return r and to retain a constant percentage b so that g = br. Therefore, $P_o = \frac{D_o}{k-br}$ or $P = \frac{(1-b)Y_o}{k-rb}$ where Y_o = earnings.

They then show that when the internal rate of return is equal to the rate of discount, $P_o = \frac{Y_o}{k}$ which is the earnings hypothesis.

above, would not affect equation 4. If E* was calculated using equation 3 then equation 4 is affected by the contradiction.

[35]Eugene M. Lerner and Willard T. Carleton, "The Integration of Capital Budgeting and Stock Valuation, American Economic Review, September 1964, pp. 685-87.

Gruber

Deriving a similar formula for the earnings hypothesis, Gruber demonstrates the same results by setting the retention rate equal to zero.

$$P = \frac{Y_0}{k-G_y}$$

where: G_y = rate of growth of earnings

In addition Gruber finds "if the retention rate is greater than zero, this formulation results in double counting of retained earnings. They are counted once at the time they are earned and once again through the increase in future earnings due to their reinvestment."[36]

Sprinkel

Finding that changes in the money supply lead changes in the stock prices which in turn lead business cycles, Sprinkel suggested a theory on why money affects stock prices. Sprinkel, a former student of Friedman, explains that as a result of an increase in money supply people possess more cash than desired and consequently readjust their portfolios raising the prices on assets other than money. Since stocks are one of the other assets, increasing the money supply increases the price of stock.[37]

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[36] Martin J. Gruber, The Determinants of Common Stock Prices (The Pennsylvania State University, 1971), p. 6.

[37] Beryl Wayne Sprinkel, Money and Markets (Homewood, Illinois: Richard D. Irwin, Inc., 1971), pp. 228-41.

Livingston criticizes Sprinkel's explanation, saying correlation does not necessarily indicate cause and effect and suggests that Sprinkel's

> . . . empirical evidence would also support the positions (1) that the money supply affects long-term interest rates on bonds, which in turn affect the equity markets and (2) that the money supply affects short-term rates which affect long-term rates of interest, which affect the equity markets. (3) That the money supply affects rates of interest on long term bonds, which affects business investment, which affects output, which affects corporate profits, which affects equity market prices; (4) that the money supply affects the level of output directly which affects corporate profits, which affect equity prices.[38]

Mascia

The rate of change in the money supply was designated as a leading indicator in 1967 by the National Bureau of Economic Research. Mascia reasoned that changes in this rate should have some influence on equity values if this rate is an important indicator.[39]

Using quarterly data covering the period 1957-67, the following equations were calculated:

$$(1)\quad I.S. = 62.736 + \underset{(4.79)}{3.757}\ (\%\Delta M_t)$$

$$R^2 = .34 \qquad DW = .32$$

$$(2)\quad I.S. = 63.504 + \underset{(4.36)}{3.761}\ (\%\Delta M_{t-1})$$

$$R^2 = .29 \qquad DW = .32$$

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[38] Livingston, Effects of Real Economic Growth, p. 37.

[39] Joseph S. Mascia, "Monetary Change and Equity Values," The Banker's Magazine, Summer 1969, p. 52.

(3) $I.S. = 65.026 + \underset{(3.57)}{3.208} (\%\Delta M_{t-2})$

$R^2 = .19 \quad DW = .26$

where:

Parentheses include t values

I.S. = quarterly average of Standard and Poor's stock index

Period covered 1957-67

$\%\Delta M_t$ = compound annual rate of change, quarterly, in money supply (narrow definition)

$\%\Delta M_{t-1}$ = 1 quarter lag

$\%\Delta M_{t-2}$ = 2 quarter lag

Mascia has in effect attempted an empirical test of Sprinkel's theory. Little support can be found, however, due to the poor results obtained by Mascia.

Homa and Jaffee

The first portion of this study is devoted to developing the theoretical link between the money supply and stock prices.

Referring to the following formula for the value of a share:

$$P = \sum_{t=0}^{\infty} \frac{D_o(1+g_t)^t}{(1+r_t+\rho_t)^t}$$

where:

P = present discounted value of expected dividends

D_o = level of current dividends

g_t = expected growth rate of dividends at time t

r_t = riskless rate

ρ_t = risk premium

Homa and Jaffee contend that a decrease in the supply of money, given the demand for money, raises interest rates reducing investment causing a decrease in sales and therefore a decline in dividends.[40] The money supply influences the riskless rates directly due to the effect on market interest rates. The risk premium varies directly with a decrease in money supply since monetary tightness increases the uncertainty of investor's expectations.

The second part of the study estimates the relationship between the money supply and a stock price index using regression analysis.

$$SP = \underset{(1.11)}{-26.77} + \underset{(4.13)}{.61}\, M + \underset{(3.16)}{3.14}\, G + \underset{(1.46)}{1.46}\, G_{-1} + .87\, u_{-1}$$

$$R^2 = .968 \qquad S_e = 3.70 \qquad DW = 2.14$$

where:

SP = stock price index, Standard and Poor's

M = money supply

G = growth rate in money supply = $\frac{M - M_{t-1}}{M_{t-1}}$

G_{-1} = 1 quarter lag in growth rate

Period 1954-1 to 1969-4

.87 = coefficient of serial correlation

Parentheses include absolute values of T statistics.

Homa and Jaffee began their study with an explanation of how the money supply indirectly affects stock prices. This explanation

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[40]Kenneth E. Homa and Dwight M. Jaffee, "The Supply of Money and Common Stock Prices," The Journal of Finance, December 1971, p. 1047.

suffers from the same defect that Livingston referred to when reviewing Sprinkel's study; i.e., correlation does not mean causation.

The authors appear to have derived an equation more suited to Sprinkel's hypothesis of a direct influence on stock prices. While the results are far better than that obtained by Mascia, the high correlation must be judged in light of the problem of serial correlation.

NOI-NI Approach

Robichek and Myers (RM)

The following is a brief summary of (RM)'s presentation of the traditional theory (NI).[41]

Required capital = constant

B = portion of debt financing

E = portion of equity financing

$V = B + E$ = value of investment

Y = constant income $\quad Y = rV$

r = internal rate of return

$D = Y - iB = KE$

D = Expected Dividend

i = interest rate

K = expected dividend return per dollar of shareholders invested capital

$$KE = Y - iB = rV - iB$$

$$KE = r(B + E) - iB$$

[41] Alexander A. Robichek and Stewart C. Myers, Optimal Financing Decisions (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1965), pp. 29-34.

$$K = r(\frac{B}{E} + 1) - i\frac{B}{E}$$

$$K = r + (r-i)\frac{B}{E}$$

If r is a constant, K increases with B/E, provided $r > i$. If i increases with B/E, K increases at a decreasing rate.

B/E can be taken as a measure of risk and then it becomes possible to construct an indifference curve showing the trade off between risk (B/E) and expected return (K). The indifference curves define the price of a share of stock and the market price can be maximized by moving investors to their highest indifference curves. Under this theory an optimum debt to equity ratio does exist.

The above is a representation of the NI or net income approach. The basis of this approach is that investors capitalize net earnings (after interest) to reach a value for equity. The value of the firm is then found by adding the value of equity to the value of debt. Assuming that at low levels of debt, owners of shares would prefer more risk and more return, the firms by varying their debt to equity ratio can place the owners on higher indifference curves therefore increasing the owners' valuation of the firm. The basis of this argument therefore is that there exists an optimum point of leverage, at which point the firm attains its maximum value.

Modigliani and Miller (MM)

MM assumes that the assets held by a firm yield a profit stream to the owners; the elements of this stream are uncertain but all investors agree on the average value of this stream.[42] The expected return per share is this average value divided by the number of shares.

MM then assign risk classes defined as including all firms with returns proportional to each other. In other words a firm with five times the earnings of another firm in the same class will have stock prices five times as high. This means the price of $1 of expected return is the same for any firm in a certain class.

MM have in effect defined a different type of risk, the risk associated with the profit stream of the firm; for lack of a better term this risk is referred to as a business risk. The investor is now considered as concerned with this business risk rather than the risk produced by leverage or financial risks.

The assumptions involving financial leverage are crucial to the theory. The investor is considered indifferent between corporate and personal leverage and is assumed to be able to borrow at the same rate as corporations. If a firm becomes leveraged, the equity of the investor has become leveraged. This theory contends that the investor can assume this leverage personally, sell his shares and buy into an unleveraged firm in the same risk class. Since $1 of expected return cost the same for all firms in the same risk class, this investor can purchase more expected return while his risks do not increase over that which he experienced with the leveraged firm. Investors employing this method of arbitrage can offset any leverage a firm

[42] Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," The American Economic Review, June 1958, pp. 265-66.

attains and therefore the firm cannot alter its value nor can it alter the price of its shares by means of leverage.

The basis of the whole theory is that investors consider the stream of profit accruing to each share as having a certain risk. As long as this stream of profit and this risk are not affected the value cannot be affected. Since leverage alters neither of these, changing the structure can have no effect on value.

This approach is representative of the NOI hypothesis, the net operating income of the entire corporation. The value of equity is found as a residue since owners capitalize the entire earnings stream of the firm to reach a value for the firm and then subtract the value of bonds to obtain a value for equity.

Durand

Durand attempts a compromise of the two hypotheses stating that it is possible that the total risk remains the same for the corporation regardless of capitalization but the valuation will increase if the same amount of risk is involved but the company has a judicious debt to equity ratio.[43]

This method, however, is based on a super premium paid on the corporation's bonds due to insufficient arbitrage and restricted investors such as banks and insurance companies.

The problems in this approach are many. First, it would be extremely difficult to incorporate these restrictions into a model

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[43] David Durand, "Costs of Debt and Equity Funds for Business: Trends and Problems of Measurement," in Management of Corporate Capital, ed. Ezra Solomon (New York: The Free Press, 1959), p. 101.

and to settle on a measure of a super premium. Second, the super premiums would only apply to a portion of the market. Third, increasing the debt to equity ratio while not affecting the risk of a corporation eliminates the trade off between risk and expected return which is essential to the traditional model. Fourth, allowing capital structure an effect on the income stream would in terms of MM's model affect the risk to the shareholders.

It appears that the author is attempting to come to a compromise between two different definitions of risk without defining one of them. While this model is a compromise of sorts it is not as general as either the MM model or the traditional model due to the restrictive assumption placed on the market place.

Solomon and Vickers

Disagreement with MM over the existence of an optimal debt to equity ratio resulted in Solomon investigating the situation where a firm expands by adding more debt.[44] Assuming that each asset generates operating earnings of the same magnitude and quality as the existing assets, Solomon concluded that due to leverage the marginal cost of debt rises producing an optimum point where it equals the overall cost of capital. He then contends that a firm would be irrational to finance by debt if it could do so at lower cost by using a mixture of debt to equity similar to that in the existing structure.

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[44] Ezra Solomon, "Leverage and the Cost of Capital," The Journal of Finance 18 (May 1963):274.

Accepting this argument produces an optimum point for the financial structure doing away with the major difference between the traditional and the MM hypotheses.

Vickers derives an equation that closely parallels Solomon's argument.[45] Starting with an equation for the overall cost of capital:

$$K_o = K_i B/V + K_e S/V$$

where:

K_o = overall cost of capital = weighted average cost

K_i = average yield on debt

K_e = yield on common stock

B = market value of debt

S = market value of stock

V = market value of the firm

Then,

$$K_o V = K_i B + K_e S$$

Taking the differential $K_o dV + V dK_o = K_i dB + B dK_i + K_e dS + S dK_e$

V and K_o are both assumed constant and a change in the direction of K_e means $dK_e = 0$

$$\therefore 0 = K_i dB + B dK_i - K_e dB$$

$$\text{or } K_e = K_i + B \frac{dK_i}{dB}$$

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[45] Douglas Vickers, "Elasticity of Capital Supply, Monopsonistic Discrimination, and Optimum Capital Structure," The Journal of Finance 22 (March 1967):4. (This derivation also appears in Robichek and Myers, p. 48).

Vickers concludes that the change in direction of the equity capitalization rate occurs when it is equal to the marginal cost of borrowing an occurrence he considers improbable. This differs slightly from Solomon's argument only in that Solomon was considering the situation where debt is added to a constant equity base rather than a substitution of debt for equity as Vickers has examined.

MM's proposition II states that the expected rate of return or yield for any share of stock is a linear function of leverage. If the rate of interest rises with leverage this equation will, according to MM, no longer be linear and the yield may fall beyond a certain debt to equity ratio.

Solomon contends that at the point yield falls investors would have to be risk lovers, capitalizing a more uncertain stream of residual earnings at a lower rate than a less uncertain stream. "The introduction of subjective risk preference as a major determinant of equity prices just for this phase of the leverage argument is hardly admissable unless one is prepared to accept it for other phases of leverage."[46]

Robichek and Myers add that the company would have to be acting irrationally to raise leverage beyond this point causing a decrease in the stockholder's expected return.

Sametz

Reporting on the trend in corporate finance, Sametz found that common stock as a percentage of total external long term

[46] Ezra Solomon, "Leverage and the Cost of Capital," Journal of Finance 18 (May 1963):278.

financing fell from 34 percent in the period (1923-29) to 26 percent in the postwar period (1946-58).[47] The author attributes most of this decrease to an increase in corporate taxes in the postwar period. When including financing by retained earnings, referred to as internal equity financing, Sametz obtains a more dramatic decrease from 14 percent to 5 percent. There also was evidence of a dramatic shift from reliance on long term debt to short term debt.

Sametz concludes that the composition of debt and the composition of equity may change but the overall debt to equity ratio (when including internal equity financing) remained relatively stable.

Schwartz and Aronson

The objective of this study was to investigate the financial structures of several firms in different industries and test the hypothesis that there is a statistically significant difference between 'classes' but not within 'classes.' The 'classes' consisted of railroads, utilities, mining, and industrials, with eight firms being examined in each 'class.'

Data for 1928 was compared to that of 1961 as well as examining the financial structures over time (1923-62). Results indicated support for the above hypothesis which was interpreted as evidence that the various industries had developed optimal debt to equity

[47] Arnold W. Sametz, "Trends in the Volume and Composition of Equity Finance," Journal of Finance 19 (September 1964):461.

ratios, "conditioned by the intensity of their operational risks and by the characteristics of the industry asset structure."[48]

In addition to the above, Schwartz and Aronson found evidence that the financial structures were stable over time which led to the conclusion that the percentage of common stock in the financial structure has remained relatively constant. This finding conflicts with the article by Sametz; however, the authors point out that the discrepancy between the two findings may be due in part to differences in the definition of structural change as well as the selection of time periods.

Baumol and Malkiel

Contending that the introduction of transactions costs eliminates the perfect substitutability between homemade leverage and corporate leverage, Baumol and Malkiel find an optimal debt to equity is possible within the MM model.

If the stockholder desires a higher leverage than that of the corporation he must

> . . . simultaneously purchase stocks and borrow money. Normally he will do this by buying stocks on margin. His brokerage costs will be greater than would otherwise have been the case simply because he must purchase a larger volume of securities than he would if the firm had provided the degree of leverage he desired. In addition, our investor must pay the interest on the loan.[49]

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[48]Eli Schwartz and J. Richard Aronson, "Some Surrogate Evidence in Support of the Concept of Optimal Financial Structure," The Journal of Finance 22 (March 1967):17.

[49]William J. Baumol and Burton G. Malkiel, "The Firms Optimal Debt-Equity Combination and the Cost of Capital," The Quarterly Journal of Economics 81 (November 1967):555.

The interest rate for the investor is seen as higher than that for the corporation due in part to a limited liability for the corporation as opposed to unlimited liability for the individual. Another reason given for the higher interest rate is that the investor is limited by the margin requirement as to the amount he can borrow using his stocks as security. Once this limit is surpassed the applicable interest rate is likely to increase substantially.

Vickers

This study attempts to find the optimum debt to equity ratio by incorporating into the equation for the firm the interdependent problems of production, investment and finance.[50]

The objective function is:

$$\psi = \frac{1}{\rho(\overline{K},D)}[P(Q)f(x,y)-\gamma_1 x-\gamma_2 y-r(\overline{K},D)D] + u[\overline{K}+D-g(Q)-\alpha X-\beta Y]$$

P = selling price of product - function of output

ρ = equity owner's capitalization rate, a function of the constant amount of equity capital measured in book value ($\overline{K}$) and debt capital (D)

V = value of the equity investment = π/ρ

π = profit = $P(Q)f(x,y)-\gamma_1 x-\gamma_2 y-r(\overline{K},D)D$

X,Y = factors of production

Q = $f(x,y)$ = production function

γ_1,γ_2 = factor cost of X,Y respectively

$g(Q)$ = net working capital requirements dependent on production

α,β = money capital requirements of X,Y respectively

u = Lagrangian multiplier, interpreted as the marginal productivity of money capital

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[50] Douglas Vickers, "The Cost of Capital and the Structure of the Firm," The Journal of Finance 25 (March 1970):35.

The first order optimization conditions are calculated as:

(1) $\frac{\partial\psi}{\partial x} = \frac{1}{\rho}[(P + Q\frac{dP}{dQ})f_x - \gamma_1] - u[g'(Q)f_x + \alpha] = 0$

(2) $\frac{\partial\psi}{\partial Y} = \frac{1}{\rho}[(P + Q\frac{dP}{dQ})f_y - \gamma_2] - u[g'(Q)f_y + \beta] = 0$

(3) $\frac{\partial\psi}{\partial D} = -\frac{1}{\rho}(r + D\frac{\partial r}{\partial D} + V\frac{\partial\rho}{\partial D}) + u = 0$

(4) $\frac{\partial\psi}{\partial u} = \overline{K} + D - g(Q) - \alpha X - \beta Y = 0$

Therefore it is concluded that the optimum level of debt to equity given $\overline{K}$ is at the point where u is equal to the marginal cost of borrowing, i.e., $u = \frac{1}{\rho}(r + D\frac{\partial r}{\partial D} + V\frac{\partial\rho}{\partial D})$ (Equation 3).

The analysis up to this point is straight forward; however, Vickers then proceeds to investigate the situation where the optimum debt is employed with the optimum (variable) equity, a point referred to by Vickers as the optimum optimorum.

The method of analysis employed starts with the conditional optimum point described above and analyzes what happens if additional equity is introduced.

Problems exist in this procedure in that the additional fixed input (equity) necessarily shifts the marginal cost curves of the variable input (debt). This is evident in comparing the marginal cost of borrowing, $u = \frac{1}{\rho}(r + D\frac{\partial r}{\partial D} + V\frac{\partial\rho}{\partial D})$ with the differential of the objective function with respect to K, $u = \frac{1}{\rho}(V\frac{\partial\rho}{\partial K} + D\frac{\partial r}{\partial K})$.

Vickers, however, ignores these marginal effects, and so states, to calculate, $\frac{dV}{dK} = u$, where u is now defined as the marginal value productivity of the additional equity.

The process of calculating the optimum optimorum appears to be based on a rather hazy theoretical conception. First, if the conditional optimum has been attained, this implicitly assumes the investors are on their highest indifference curves concerning the trade off between risk and expected return. In other words the ratio of debt to equity is at an optimum point. Second, if an injection of equity is contemplated at that point, the firm would have to be acting irrationally unless the added equity was expected to benefit the owners. The fact that they are contemplating the increase assumes that the added equity either reduces risks and/or increases expected return. The latter assumption implies that there is an excess of debt relative to equity which conflicts with the premise of the conditional optimum.

The problem arises due to the manner in which the conditional optimum is interpreted. The objective function describes a monopoly and therefore $\frac{dP}{dQ}$ is decreasing as quantity increases meaning marginal revenue is decreasing. Increasing debt while holding equity fixed means debt will be increased as long as there is any benefit while the effects on the marginal cost of equity are being ignored. The investors' valuation is based upon the trade off between risk, partially determined by leverage as indicated by Vickers, and expected return and therefore does not ignore these marginal effects. The firm, if it maximizes value to the owners, therefore does not ignore these marginal effects whereas the objective function as stated does when calculating a conditional optimum.

The investors in reaching the conditional optimum are not given a choice but rather have to decide upon investment by debt or no investment. Therefore the conditional optimum does not specify an optimum debt to equity ratio in the usual sense but rather the maximum value of investment financed by debt given the equity base. This conditional equilibrium therefore defines a situation where debt is employed beyond that which the investors would have accepted had they been given the alternate choice of equity financing.

When considering equity as variable, this conditional optimum, is no longer a point of optimum debt to equity but rather a point of disequilibrium.

In establishment of an optimum optimorum the marginal cost of equity is equated to the marginal cost of borrowing; however the formula for the marginal cost of borrowing describes a conditional optimum point which is therefore a point of disequilibrium.

Based on the above reasoning it appears the method used by Vickers portrays a perpetual disequilibrium in the debt to equity ratio. His mathematical derivations are logically consistent but it seems he has assumed his conclusion as opposed to proving the conclusion. The assumption that debt and equity will be used until their respective marginal costs are equated agrees with the economic theory relating to inputs and for that reason is a very logical conclusion but it is doubtful that the above approach is the manner in which to establish this equality.

Summary

As was shown the earnings hypothesis and the dividend hypothesis, given certain conditions, can be shown to be equivalent. Empirical investigations testing the two hypotheses appear at best inconclusive, i.e., based on the articles reviewed in this study. Since previous articles do not aid in the selection, the selection must be deemed purely a matter of convenience or preference.

The choice between the traditional (NI) model and the (NOI) model as outlined by MM represents a more important and more difficult selection. More important due to the absence of an optimal debt to equity ratio in the MM model, at least based on measurable determinants such as leverage, selecting the MM model would lead to intractable problems in deriving supply curves for debt and equity. Of course the level of difficulty should not determine the choice of a theory but rather the selection should be made on the basis of which of the two theories offers the better explanation and serves the purposes of the investigation.

Several authors including Solomon, Vickers, Baumol and Malkiel have offered compelling criticisms of the MM model; the first two authors assail the logic of the model while the latter two contend the assumption of perfect substitutability between personal and corporate leverage is not realistic. If either of these arguments are accepted, an optimum debt to equity can be obtained and the differences between the models becomes one of semantics.

The two articles that measure the debt to equity ratios arrive at conflicting conclusions and therefore are of little assistance in the selection.

The above arguments, however, could be considered as a sufficient basis for selecting the traditional model and therefore the relationship between leverage and risk.

An additional reason for choosing the traditional model, and perhaps the most important for purposes of this investigation, can be arrived at by comparing the assumptions of the MM model with those of the theory of portfolio choice. If the two models are not consistent then the model used for the demand equations would be inconsistent with the model used in analyzing the supply of bonds and equities.

Following MM, consider a firm in risk class (A) that is leveraged as follows:

B = 4000 B = value of bonds

E = 7000 E = value of equity

An investor that owns 1/100 of the shares in this firm has a \$70 investment. According to MM, the firm has leveraged this investor's equity so he is responsible for \$40 of the debt. To undo this leverage the investor must sell his shares receiving \$70, borrow \$40 and invest \$110 in an unleveraged firm in risk class (A), thereby increasing his return while his risk remains constant. The leverage is the same whether the firm leverages the investor's capital or he does, therefore MM assume the risk remains constant.

However, in duplicating this leverage the investor has altered the allocation within his personal portfolio. From the viewpoint of his personal portfolio, instead of \$70 which represents a portion of his net worth, the investor now has \$110, a larger portion, invested in risk class (A) earning a particular earning stream (B). The introduction of debt into the portfolio also is a reallocation but can be ignored for purposes of this analysis.

For purposes of illustration, assume the investor has another investment in another risk class (C), earning an income (D). This other investment could be any alternate asset which is not a perfect substitute for the shares in the firm in risk class (A). For purposes of comparability, let this alternate asset be represented by the shares in a firm in risk class (C).

By arbitraging, the investor has increased the proportion of his net worth invested in risk class (A) with an earning stream (B), relative to his investment in risk class (C) with an earning stream (D).

According to the theory of portfolio choice when the risks are independent, diversification leads to a smaller portfolio risk. The proportion in which assets are allocated therefore determine the overall risk of the portfolio.

It follows that an unknown proportion of the risk averters will be forced into a higher risk situation. This implies that even if we assume the investor can duplicate the leverage of the firm, the process of bringing the leverage into his own portfolio changes the risk of that portfolio.

Attempting to make this explanation compatible with the MM model, assume that the personal portfolio automatically becomes leveraged when the firm becomes leveraged. Going back to firm (A) the investor's portfolio would automatically show an investment of \$70 equity plus \$40 debt and the value would be considered \$110 - \$40 = \$70. To counteract this leverage, however, the investor only receives \$70 upon sale and must borrow the other \$40 which again alters his portfolio allocation. The act of reversing this leverage requires a change in the total risk of the portfolio even when the definition of net worth is altered to include the leverage created by the firm.

As a consequence, the MM model and the theory of portfolio choice are seen as being inconsistent with one another. A reconciliation between the two could be offered; however, a change in the definition of risk would be required. As provided in the article by Baumol and Malkiel, this would lead to an optimum debt to equity ratio using the MM model.

The above reasoning, in conjunction with the criticisms offered by the reviewed articles offers sufficient and indeed necessary conditions for the elimination of the MM model from consideration. For purposes of this investigation the traditional formulation is seen as the more appropriate approach.

CHAPTER IV

DEMAND EQUATIONS

When an investor purchases a financial asset, he is "buying" the right to receive an expected rate of return or interest. If the asset has a rate of return of 5 percent the investor must pay a price of twenty dollars to receive one dollar of return. The purchase price of a financial asset is then comparable to the reciprocal of the interest rate. When the rate of interest on an asset decreases the price has therefore increased and the demand for that asset should decrease, providing the rates of return on other assets have remained constant. If two goods A and B are substitutes and the price of A goes up relative to price of B, the demand for B goes up relative to the demand for A.

In a portfolio model, each asset in the portfolio is a potential substitute for every other asset. The quantity demanded of a financial asset should, as Tobin explained, vary inversely with the rates of return on other assets and directly with its own rate of return.

A finding of complementarity is possible within the model when more than one sector is a holder of the asset examined, as pointed out by Tobin and Brainard and discussed earlier in conjunction with the review of Feige's study.

The present study employs two sectors: the consumer sector and the corporate sector. The corporate sector is considered as the supplier of corporate bonds and equities and not as a holder of any of the assets examined.

The demand equations of the consumer sector would therefore not be expected to show any signs of complementarity.

The following section pertains to all the demand equations, explaining the form of the equations and the methods employed.

Method

As explained in Chapter I, the demand equations used in this study are patterned after the equations derived by Tobin and Brainard. The actual form of the equation, i.e., linear, log linear, etc., appears from the articles reviewed to be a matter of choice. Hamburger used a linear form, Chase a log linear, and Kardouche used both, while the studies on money relied mainly on a logarithmic form. From the studies on money, it is apparent that the relationship between money and interest rates is not strictly linear.

A relationship that is linear in logarithms closely resembles the expected relationship between money and interest rates. This form is popular not only for the above reason but also because it has the added feature of constant elasticities with the coefficients in the regression equation being estimates of these elasticities.

The inclusion of the logarithm of the interest rate, however, "results in blow-ups of small changes which occurs at low levels of the interest rate."[51]

For this reason, a log-log form was eliminated from consideration. Instead a semi-log form was used with the net worth and income variables in logarithmic form and the rates of return in linear form.

This relationship has a form very similar to the log-log form with the net worth and income elasticities being constant and equal to their respective coefficients. The rate elasticities can then be calculated at their mean with the method of calculation given as follows:

$$\text{If} \quad \ln M = \beta_1 \ln Y + \beta_2 RDep$$

$$\text{Then} \quad M = Y^{\beta_1} e^{\beta_2 RDep}$$

$$\eta_{(M,RDep)} = \frac{\partial M}{\partial RDep} \frac{\overline{RDep}}{M}$$

where:

$\eta_{(M,RDep)}$ = rate elasticity

$\overline{RDep}$ = mean of RDep

$$\frac{\partial M}{\partial RDep} = \beta_2 Y^{\beta_1} e^{\beta_2 RDep}$$

$$\therefore \quad \eta_{(M,RDep)} = \beta_2 Y^{\beta_1} e^{\beta_2 RDep} \left(\frac{\overline{RDep}}{M}\right)$$

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[51] Philip Cagan and Anna J. Schwartz, "Has the Growth of Money Substitutes Hindered Monetary Policy," Journal of Money Credit and Banking 7 (May 1975):141.

$$= \beta_2 Y^{\beta_1} e^{\beta_2 RDep} \left(\frac{\overline{RDep}}{Y^{\beta_1} e^{\beta_2 RDep}} \right)$$

or

$$\eta_{(M,RDep)} = \beta_2 \overline{RDep}$$

The rate elasticity is then equal to the mean rate multiplied by the value of the coefficient obtained in the regression equation.

Tobin's equation was assumed homogeneous of degree 1 in net worth, meaning a doubling of net worth doubles the demand for each asset. While many of the studies on the demand for money tend to confirm this premise, finding a wealth elasticity of approximately unity, there is no evidence that this is true of the other assets, i.e., in those studies reviewed in this paper. Taking into consideration the wide variance of the wealth elasticities found in Chapter II, this assumption must be considered as unduly restrictive and therefore the equations in this study do not retain this assumption.

Time Period

All assets are measured as end of year balances in current values. The sources of the data are explained in the appendixes with the major sources for the years 1927-41 being the works of Goldsmith, while the major source for the period 1950-72 was the Federal Reserve Flow of Funds Accounts 1945-72.

The year 1927 was chosen as the beginning of the period due to a change in some of the methods of data collection by Goldsmith from the earlier years. For example, the interest rates on the separate components of the asset savings deposits were prior to 1927 mainly estimates based on data covering New York and Massachusetts, whereas beginning in 1927 the interest rates are calculated as the ratio of interest paid to deposits.

The years 1942-49 were omitted due to the unavailability of durable goods during the war years (1942-45) and the possible effects this had on the consumer sector during this period and the immediate post-war years 1946-49.

The statistical technique employed is ordinary least squares regression. This method is used for both the demand and supply equations.

The term, consumer sector, as used in this study includes the household sector, personal trusts and nonprofit organizations. The form of data available precludes a higher degree of discrimination.

The variables included in the demand equations are defined below with the year end asset holdings of the consumer sector measured in millions of dollars.

Definition of variables:

M = holdings of demand deposits and currency defined as money

Dep = holdings of savings deposits, defined as time deposits in commercial banks, saving and loan shares, and mutual savings deposits

GS = holdings of state, local and federal obligations. This term is defined as government securities.

CB = holdings of corporate bonds

S = holdings of equities

RDep = weighted average of the interest rates on the components of the asset savings deposits.

CP = rate on 4-6 month commercial paper taken to be the rate of return on government securities.

RB = Moody's Aaa corporate bond rate of interest

RS = rate of return on equity (calculated later)

W = net worth, defined as the sum of the above assets (M, Dep, GS, CB, S) plus the consumer sector's holdings of durables and housing minus mortgages and installment loans

Y = personal disposable income

All assets are measured in current values and the rate of return on money is assumed to be zero.

The remainder of this chapter outlines the procedure used in this investigation in arriving at what can be termed as the "best" or most useful equation. "Best" in this terminology is meant to signify those equations that offer the highest degree of explanatory power while remaining compatible with the theory upon which the equations are formulated.

In the presentation of the equations, in all cases, the parentheses under the coefficients contain the t-ratios.

One problem area present in all equations containing numerous interest rates is the subject of multicollinearity. The presence of a high degree of multicollinearity reduces the efficiency of the estimates of the coefficients.

A matrix is produced below containing the simple correlations among the various rates of return (Table 11).

The elimination of all collinearity among the independent variables is impossible without destroying the purpose of the equations. The "second best" approach is to attempt to minimize suspected problems where possible while remaining "faithful" to the basic purpose. The results derived from the demand equations, as reported

Table 11.--Correlations among Rates of Return.

	RDep	RB	RS	CP
RDep				
RB	.8621			
RS	.0172	.0570		
CP	.7263	.6968	.0093	

in this investigation, must therefore be viewed in light of the above discussion.

The larger the number of interest rate variables included, the greater the probability of a high degree of multicollinearity.

Interest rate variables were frequently omitted from one equation to the next, as stated within this chapter, if they were either not significant at a reasonable probability level, or if their omission would tend to reduce other problems such as multicollinearity.

The resulting equations, therefore, include only those interest rate variables of dominant importance.

Demand for Money

The first equation for the demand for money is of the form:

$$\ln M/W = \alpha_0 + \beta_1 \ln W + \beta_2 \ln Y + \beta_3 RDep + \beta_4 RB + \beta_5 RS + \beta_6 CP$$

This form yielded the following regression results:

$$(1)\ \ln M/W = \underset{(-11.8930)}{-4.865} - \underset{(-4.4505)}{.8355} \ln W + \underset{(6.5148)}{1.1431} \ln Y - \underset{(-7.2210)}{27.8666}\ RDep +$$

$$\underset{(2.3981)}{6.7581}\ RB - \underset{(-3.5993)}{.5594}\ RS - \underset{(-2.0646)}{3.2802}\ CP$$

$$R^2 = .9637 \qquad DW = 1.11$$

Equation (1) has a high degree of explanatory power and all coefficients are statistically significant.

Since the coefficient of W is not significantly different from minus one, equation (1) can be rewritten as:

$$\ln M - \ln W = \alpha_0 - \ln W + \beta_2 \ln Y + \beta_3 RDep + \beta_4 RB + \beta_5 RS + \beta_6 CP$$

$$(2) \quad \therefore \quad \ln M = \alpha_0 + \beta_2 \ln Y + \beta_3 RDep + \beta_4 RB + \beta_5 RS + \beta_6 CP$$

Problems exist, however, in that the coefficient for the rate on corporate bonds is positive. An explanation based on this formulation would indicate that corporate bonds were considered as complements of money. Though this is in conflict with the theoretical basis of the equation, an attempt could be made to explain this positive sign in a manner similar to that employed by Feige.

The simple correlation between the rate on corporate bonds and the rate on government securities is approximately .70. Therefore, an unknown reduction in the degree of multicollinearity can be achieved by the omission of one of these variables.

Based on this discussion, the conclusion was reached to omit the rate on corporate bonds with the results hopefully being a reduction in the degree of multicollinearity.

As a result of this step the money demand equation becomes:

$$\ln M = \alpha_0 + \alpha_1 \ln Y + \alpha_2 RDep + \alpha_3 RS + \alpha_4 CP$$

$$(3) \ \ln M = \underset{(-20.4955)}{-4.5622} + \underset{(69.9418)}{1.3044} \ln Y - \underset{(-7.9498)}{20.4412} \, RDep - \underset{(-5.1941)}{.7533} \, RS - \underset{(-1.5003)}{2.4129} \, CP$$

$$R^2 = .9954 \qquad DW = .99$$

The size of the R^2 indicates that the omission of the rate on corporate bonds did not significantly alter the explanatory power of the equation.

The low level of the Durbin-Watson statistic is an indication of a possible error in the specification of the equation. A plot of the residuals against time revealed a need for a dummy variable with a value of 0 for 1927-33 and 1 for 1934-72.

Inclusion of the dummy variable resulted in:

$$(4)\ \ln M = \underset{(-12.6410)}{-3.9921} + \underset{(43.5146)}{1.2509} \ln Y - \underset{(-7.4650)}{19.1792}\, RDep - \underset{(-.6130)}{.9153}\, CP - \underset{(4.2795)}{.6425}\, RS - \underset{(-2.1464)}{.1288}\, D/M$$

$$R^2 = .9959 \qquad DW = 1.28$$

Omitting the rate on government securities (CP), due to its being statistically insignificant, provides the final equation for the money demand of the consumer sector.

$$(5)\ \ln M = \underset{(-15.0769)}{-3.8822} + \underset{(49.7714)}{1.2424} \ln Y - \underset{(-10.3862)}{20.1952}\, RDep - \underset{(-4.4292)}{.6538}\, RS - \underset{(-2.4572)}{.1397}\, D/M$$

$$R^2 = .9958 \qquad DW = 1.30$$

All the variables now possess the expected sign and all the coefficients are highly significant. The Durbin Watson statistic, while not extremely high, does not exhibit any overwhelming evidence of a problem with serial correlation.

While recognizing the potential influence of multicollinearity, which was discussed earlier in this chapter, equation (5) appears to offer a satisfactory representation of the money demand of consumers. In addition, the equation closely resembles the equations and theory derived in past studies, as reviewed in Chapter I.

Savings Deposits

The methods employed in obtaining the money demand equation are utilized in all the demand equations. To avoid being redundant, reference is made to the discussions in that section whenever they become pertinent.

The first equation again includes all the interest rate variables.

$$(6)\ \ln \frac{Dep}{W} = \underset{(-8.3369)}{-3.3684} - \underset{(-2.2569)}{.4186} \ln W + \underset{(3.1174)}{.5404} \ln Y + \underset{(4.6085)}{17.5719}\ RDep +$$

$$\underset{(.4432)}{1.2372}\ RB - \underset{(-2.2936)}{.3522}\ RS - \underset{(-4.1127)}{6.4561}\ CP$$

$$R^2 = .8687 \qquad DW = .927$$

Equation (6) can be rewritten as:

$$\ln Dep = -3.3684 + .5814 \ln W + .5404 \ln Y + 17.5719\ R\ Dep +$$

$$1.2372\ RB - .3522\ RS - 6.4561\ CP$$

Since .5814 is not significantly different from .5404 the wealth and income elasticities can be constrained equal.

$$(7)\ \ln Dep = \underset{(-15.2296)}{-3.3299} + \underset{(62.5044)}{.5602} \ln W + \underset{(62.5044)}{.5602} \ln Y + \underset{(5.3917)}{17.7800}\ RDep +$$

$$\underset{(.4525)}{1.2434}\ RB - \underset{(-2.3713)}{.3547}\ RS - \underset{(-4.2593)}{6.4866}\ CP$$

$$R^2 = .9964 \qquad DW = .917$$

Omitting the rate on corporate bonds (RB) due to its being both statistically insignificant and positive yielded the following equation:

$$
\begin{aligned}
(8)\ \ln Dep = &\underset{(-15.4361)}{-3.3327} + \underset{(64.5941)}{.5610} \ln W + \underset{(64.5941)}{.5610} \ln Y + \underset{(8.1886)}{18.8366}\, RDep - \\
&\underset{(-2.9625)}{.3865}\, RS - \underset{(-4.3622)}{6.2899}\, CP
\end{aligned}
$$

$R^2 = .9960 \qquad DW = .947$

Again the low levels of the Durbin-Watson statistic indicates a possible error in the specification of the equation. Plotting the residuals against time indicated the need for a dummy variable with a value of 0 for 1927-33 and 1 for 1934-72, which is the same dummy used in the money demand equation. Inclusion of this dummy variable yielded the final form of the demand equation for savings deposits.

$$
\begin{aligned}
(9)\ \ln Dep = &\underset{(-8.0056)}{-2.5255} + \underset{(38.3226)}{.5253} \ln W + \underset{(38.3226)}{.5253} \ln Y + \underset{(8.6887)}{20.3976}\, RDep - \\
&\underset{(-3.0819)}{4.1242}\, CP - \underset{(-2.0386)}{.2748}\, RS - \underset{(-2.8116)}{.1555}\, D/M
\end{aligned}
$$

$R^2 = .9960 \qquad DW = 1.27$

Comparing the form of this equation to those of past studies, as reviewed in Chapter II, there appears to be close agreement with the equations derived by Chase, Hamburger and Nyerges. Feige and Kardouche incorporate advertising expenditures of savings and loan associations into their equations for saving and loan shares. This variable was included as a proxy for the competition between banks and savings and loan associations.

Problems exist in including this proxy. First, the accuracy of these figures as a proxy is unknown. Second, the competition between banks and savings and loans appears to have been concentrated in the postwar years. Third, the nonpecuniary returns most likely affect the composition of the asset savings deposits; however, the effect on other assets in the portfolio appears as a more questionable topic. In fact the Alhadeffs contend that the importance of the increased advertising in causing a change within the composition of this asset has been seriously overrated.[52] Their premise is that the advertising is just a reinforcement of other numerous factors that would have occurred in the absence of the advertising. Therefore inclusion of this factor might lead to signs of high correlations as in the studies by Feige and Kardouche; however, whether or not this implies advertising is a determinant or even a proxy for a determinant is a matter of conjecture.

Another possible candidate for inclusion is the regulation of the maximum rate paid on time deposits. During the 1950s and 1960s this maximum was increased several times.[53] This movement in the maximum makes its effectiveness as a constraint decrease if not vanish. Even assuming the control is effective, this would tend to alter the composition of the asset savings deposits provided the

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[52]Charlotte P. Alhadeff and David A. Alhadeff, "The Struggle for Commercial Bank Savings," The Quarterly Journal of Economics 72 (February 1958):8.

[53]Staff of the Federal Home Loan Bank Board, "Cycles in Mortgage Credit Availability and the 1966 Experience," in Readings in Money, National Income and Stabilization Policy, ed. W. L. Smith and R. L. Teigen (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 438.

components are very good substitutes as contended. Therefore this constraint is a matter of indifference to the study as formulated.

The dummy variable (D/M) included in the savings deposit equation is identical to the insurance deposit dummy used by Chase. SEC regulations were prevalent during the 1930s with a new regulation appearing almost yearly starting in 1933 up to 1940. The basic purpose of these acts was to protect the investors. These acts, of course, changed the consumer's risks in investing.

There are unknown lags among the passing of a legislation, the implementation of the legislation, and the effectiveness of the legislation. The choosing of one act and assuming its effectiveness began in the same year it was passed appears to be an unrealistic approach.

The probable changes induced in the market by the passing of the various financial legislations are allowed for by the dummy variable. It is recognized, however, that this variable is unable to differentiate among the impacts of the various legislations.

Returning to the discussion of equation (9), the variables all possess the correct signs and the Durbin-Watson statistic does not indicate a problem of serial correlation.

Corporate Bonds

The first equation run resulted in:

$$(10)\ \ln \frac{CB}{W} = \underset{(13.3453)}{10.0210} - \underset{(-2.1770)}{.7505 \ln W} - \underset{(1.5544)}{.5008 \ln Y} + \underset{(1.3822)}{9.7948\, RDep} +$$

$$\underset{(10.5887)}{54.9376\, RB} + \underset{(2.8986)}{.8272\, RS} - \underset{(-5.2432)}{15.2968\, CP}$$

$$R^2 = .9852 \qquad DW = 1.11$$

A plot of the residual against time indicated the need for a dummy variable [0 for (1927-41) and 1 for (1950-72)].

$$(11)\ \ln \frac{CB}{W} = \underset{(5.1818)}{5.8289} - \underset{(-2.7715)}{.5024} \ln W - \underset{(-1.9404)}{.3092} \ln Y - \underset{(-.8946)}{3.9743}\ RDep +$$

$$\underset{(13.7010)}{42.2157}\ RB + \underset{(1.0641)}{.1743}\ RS - \underset{(-6.1281)}{10.7434}\ CP - \underset{(-14.4012)}{1.2448}\ Dum$$

$$R^2 = .9951 \qquad DW = 1.61$$

Since -.5024 is not statistically different from -.3092, equation (11) can be rewritten as:

$$\ln CB = \alpha_0 + \alpha_1 \ln Y + (1 + \alpha_1) \ln W + \ldots$$

In addition, the coefficients for RDep and RS are not statistically significant.

Including the above changes, results in the final equation for the demand of corporate bonds:

$$(12)\ \ln CB = \underset{(4.9152)}{3.4399} + \underset{(21.4327)}{.6831} \ln W - \underset{(-9.9440)}{.3169} \ln Y + \underset{(17.7871)}{38.9575}\ RB -$$

$$\underset{(-6.2440)}{8.0333}\ CP - \underset{(-10.1641)}{1.0438}\ Dum$$

$$R^2 = .9834 \qquad DW = 1.51$$

All the variables possess the expected sign and the Durbin-Watson statistic does not indicate the presence of serial correlation.[54]

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[54]The negative coefficient for the income variable is explained by the fact that both income and wealth appear in the equation. As was seen on pages 8 and 9, there is much discussion in the literature on the choice of the proper constraint.

Government Securities

As explained earlier, this asset is defined as including state, local, and the federal obligations. The first equation yielded:

$$\text{(13)}\quad \ln \frac{GS}{W} = \underset{(-3.2029)}{-2.7336} - \underset{(-1.3445)}{.5268} \ln W + \underset{(1.8232)}{.6677} \ln Y - \underset{(-2.5476)}{20.5188}\ RDep -$$

$$\underset{(-1.0474)}{6.1768}\ RB - \underset{(-3.5223)}{1.1452}\ RS + \underset{(1.0019)}{3.3223}\ CP$$

$$R^2 = .7687 \qquad DW = .85$$

Equation (13) can be rewritten as:

$$\ln GS = \alpha_0 + \alpha_1 \ln W + \alpha_2 \ln Y + \alpha_3\ RDep + \alpha_4\ RB + \alpha_5\ RS + \alpha_6\ CP$$

Since the coefficients of ln W and ln Y are not statistically different they are constrained to be equal.

A plot of the residuals against time revealed the need for a dummy variable [0 for (1927-37) and 1 for (1938-72)].

One possible explanation for this change in relationship is that U.S. savings bonds guaranteed by the government were not introduced until 1937. Savings bonds are an important part of the consumer sector's holdings.

Furthermore, income taxes become a factor in the post World War II period increasing the attractiveness of the tax free municipals.

$$\text{(14)}\quad \ln GS = \underset{(-5.6679)}{-4.7799} + \underset{(16.2452)}{.6671} \ln W + \underset{(16.2452)}{.6671} \ln Y - \underset{(-3.9070)}{27.4316}\ RDep -$$

$$\underset{(-1.5119)}{8.3562}\ RB + \underset{(1.2537)}{3.5210}\ CP - \underset{(-4.3904)}{1.3714}\ RS - \underset{(-2.4310)}{.3220}\ Dummy$$

$$R^2 = .9814 \qquad DW = 1.23$$

Again, the Durbin-Watson statistic, while not extremely high does not indicate any overwhelming evidence of a problem with serial correlation.

Equities

Established theory maintains that the investor's rate of discount applicable to a share of stock includes a measure of expected capital gains.

Very few of the articles reviewed incorporated a rate of return for equity and measurement appears inconsistent among the articles as well as between the articles and the theory.

This study attempts to calculate the expected rate of return for equity using the following formula:

$$RS = \left(\frac{Div_t}{P_t}\right) \frac{P_t}{P_{t-1}} + \frac{1}{4}\left[\frac{P_{t-1}-P_{t-2}}{P_{t-2}} + \frac{P_{t-2}-P_{t-3}}{P_{t-3}} + \frac{P_{t-3}-P_{t-4}}{P_{t-4}} + \frac{P_{t-4}-P_{t-5}}{P_{t-5}}\right]$$

where:

$\frac{Div_t}{P_t}$ = current dividend yield

P = stock price index

The first term on the right hand side of the equation represents the dividend yield as evaluated at the beginning of the year. The second term in the brackets is an estimate of the expected capital gains. This latter term being approximated by the average capital gains experienced in the previous four years.

There is, of course, no way of measuring the accuracy of this approximation; however, it would appear to be a proxy for the expected rate of return that is more in agreement with established theory than any used in the reviewed articles.

The first equation for the demand for equities yielded:

$$(15)\ \ln \frac{S}{W} = \underset{(-9.9786)}{-5.0399} + \underset{(7.3476)}{1.7036} \ln W - \underset{(-7.2587)}{1.5731} \ln Y + \underset{(1.8751)}{8.9373}\, RDep\ -$$

$$\underset{(-2.4857)}{8.6746}\, RB + \underset{(5.0427)}{.9680}\, RS + \underset{(.4653)}{.9131}\, CP$$

$$R^2 = .8584 \qquad DW = 1.40$$

A plot of the residuals against time revealed the need for a dummy variable [0 for (1927-41) and 1 for (1950-72)]. This dummy variable is identical to the dummy used in the corporate bond equation.

One would expect a change in the relationship, for both equities and corporate bonds, between the pre World War II and post World War II time periods. Price inflation has been a major problem since the beginning of World War II. Common stock, in theory, appreciates in nominal value as a result of inflation, while the prices of outstanding corporate bonds tend to be driven down by inflation [Nominal yields will be driven up].

Therefore, it should be expected that with anticipated inflation, the relative attractiveness of equities and corporate bonds will be altered.

Another suspected reason for the change in relationship is the impact of income taxes.

An individual income tax was first adopted in 1913. For the first thirty years only a small number of high income people were affected. Therefore, individual income taxes did not become a factor until World War II.

Since realized capital gains are subject to preferentially low rates, the consumer sector's demand for equities relative to corporate bonds have, in all probability been altered.

Including this dummy and dropping the variable (CP) resulted in the following equation:

$$
\begin{aligned}
(16)\ \ln S = &\underset{(-10.1585)}{-7.7885} + \underset{(9.4787)}{2.7552} \ln W - \underset{(-7.6985)}{1.3641} \ln Y + \underset{(2.0208)}{7.2428}\ RDep - \\
&\underset{(-4.1710)}{11.7913}\ RB + \underset{(5.9328)}{.8697}\ RS - \underset{(-4.1487)}{.4298}\ Dum
\end{aligned}
$$

$R^2 = .9083 \qquad DW = 1.44$

The coefficient for the rate on savings deposits has remained positive, which dictates the omission of this variable.

$$
\begin{aligned}
(17)\ \ln S = &\underset{(-11.003)}{-8.3123} + \underset{(16.9485)}{2.9256} \ln W - \underset{(-8.8083)}{1.5041} \ln Y - \underset{(-3.7290)}{7.6964}\ RB + \\
&\underset{(6.5000)}{.9552}\ RS - \underset{(-4.3597)}{.4658}\ Dum
\end{aligned}
$$

$R^2 = .9951 \qquad DW = 1.30$

All the variables in the demand equation for equities appear statistically significant and again the Durbin-Watson statistic does not demonstrate overwhelming evidence of the presence of serial correlation.[55]

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[55] Refer to Footnote 54 on page 88 for an explanation of the negative coefficient for the income variable.

Summary

The elasticities obtained from each of the final equations are included in the following table (Table 12). The manner of calculation was explained earlier in this chapter.

Table 12.--Elasticities from Demand Equations.

	η_{RDep}	η_{CP}	η_{RB}	η_{RS}	η_{Y}	η_{W}
Money Demand	-.6462			-.0752	1.2424	
Deposit Demand	.6527	-.1279		-.0316	.5253	.5253
Corporate Bonds		-.2490	1.6752		-.3169	.6831
Government Securities	-.8778	.1092	-.3593	-.1577	.6671	.6671
Equities			-.3309	.1098	-1.5041	2.9256

According to Table 12, the money demand equation indicates savings deposits are a strong substitute for money. This finding is difficult to compare with the studies reviewed due to differences in the grouping of assets. As reported in Chapter II, Feige found a weak substitution between time deposits and demand deposits, Lee found a close substitutability between nonbank intermediary liabilities and money and Hamburger suggested that time deposits and savings accounts may be poor substitutes for money.

The money demand equation further suggests that consumers treat equities as poor substitutes for money, i.e., a 100 percent increase in the rate of return on equities would decrease money demand by 7.5 percent.

The savings deposit equation shows government securities and equities are weak substitutes but savings deposits are quite sensitive to their own rate. The government securities equation, on the other hand, indicates that savings deposits are strong substitutes and corporate bonds are good substitutes while equities enter as weak substitutes.

The corporate bond equation agrees with the government security equation in that government securities are seen as good substitutes. The corporate bond equation indicates the own rate is very potent; a 10 percent increase in the rate on corporate bonds produces a 16.7 percent increase in demand.

Corporate bonds appear as good substitutes for equities in the equity demand equation while the rate of return on equity does not even appear in the corporate bond equation.

Table 12 would appear to indicate that changes in the rate of return on equity do not greatly influence the demand for any of the five assets. According to the equations, it definitely takes a large percentage change in the rate of return on equity to produce a significant change in demand; however, the rate of return on equity is much more volatile than the other rates and large percentage changes are not uncommon.

CHAPTER V

SUPPLY OF EQUITIES AND CORPORATE BONDS

As explained in Chapter III, the traditional view on the relationship between the capital structure and the value of the firm appears as the better approach for purposes of this study.

The investor is therefore facing a trade off between risk and return. The degree of risk is measured by the debt to equity ratio the firm acquires. The firm can in effect set the interest rate on the corporate debt by changing this ratio since the interest rate increases with the proportion of debt. The higher the proportion of debt, the higher the risk experienced by the investor. The investors are assumed to be risk averse and therefore will "accept" a higher risk only if the expected return is increased sufficiently to make the change in the trade off between risk and expected return beneficial to the investors.

A change in this trade off places the investors on a different indifference curve. Any firm acting rationally, i.e., in the best interest of the owners, would not change the ratio of debt to equity in such a way as to place the owners of the firm on a lower indifference curve. The highest indifference curve of the investors represents the point beyond which the increased expected return does not compensate for the increased risk and the investors would therefore value the firm lower.

A change in the debt to equity ratio by changing the risk thereby not only increases the interest rate but also the required rate of return on equity capital and as a result the valuation of the firm by the owners.

If the firm is assumed to be acting rationally, we can then postulate that both the interest rate and the rate of return required by equity holders are increasing functions of the debt to equity ratio within the relevant operating range.

Some studies, notably Solomon (see page 62), and Vickers (pages 67-70), investigate the influence of a change in corporate debt upon the valuation of the firm while holding the equity base constant. This approach does allow for an examination of the effects of leverage; however, they utilize an internal rate of return. This procedure places the investors in a situation where they must rate the trade off between risk and expected return on the basis of either more debt or no investment. As discussed in reviewing Vicker's article (pages 67-70), this approach may lead not to a valuation of the firm based on the optimum amount of leverage but rather to the maximum amount of profitable debt financing. Given this restriction, the firm may well be acting rationally to progress to a point where the marginal cost of additional debt financing is greater than the marginal cost of additional equity financing. The additional expected return may more than compensate for the additional risk; however, it remains unknown whether the investors could be placed on a still higher indifference curve through the use of equity financing. Not giving the investors this choice results in problems of deciding whether investors are on the highest indifference curve. If this is not the case then the optimum debt to equity ratio has not been acquired.

Another approach to this problem is to hold the asset structure of the firm constant and allow for a substitution between debt and equity. Using this approach a reduction in the valuation of total equity is not synonymous with a reduction in the valuation per share due to the presence of a changing number of shares. As envisioned here, a change in the debt to equity ratio changes the risk and has effects on the marginal costs of both debt and equity. Therefore an optimum point would be where the value of the firm can no longer be increased by financing either by debt or equity. This optimum point then represents an optimum amount of equity as well as an optimum number of shares and therefore an optimum value per share. The optimum valuation per share is then consistent with the optimum value of the firm.

This latter method is viewed as a better representation of the traditional approach and therefore is the basis upon which the supply equations for equities and corporate bonds are derived in this study.

In attempting to derive these relationships, the following assumptions were employed.

1. All earnings are paid out as either interest payments on debt or as dividend payments to equity holders.

2. The absence of corporate taxes.

3. The firm experiences constant earnings before interest payments and therefore these constant earnings are unaffected by changing leverage.

4. The interest rate is an increasing function of the leverage.

5. The required rate of return is an increasing function of leverage.

6. The objective is to maximize the value of firm.

Definitions of the terms used in the derivations include:

r = rate of interest on debt = RB in demand equations

k = the rate of discount on equity capital.
For an unlevered firm, k would be equivalent to a riskless rate of return. Therefore, k for a levered firm would equal this riskless rate plus a risk premium produced by the degree of leverage.

$\overline{o}$ = constant earnings before interest

B = market value of bonds

X = number of shares of common stock

P = price per share of common stock

V = B + PX = market value of the firm

$\frac{B}{X}$ = leverage

$$\therefore \quad r = f\left(\frac{B}{X}\right) \text{ and } \frac{\partial r}{\partial B} = \frac{1}{X}f' > 0$$

$$\frac{\partial r}{\partial X} = \frac{-B}{X^2}f' < 0$$

where:
f' is the change in r brought on by a change in leverage

$$k = g\left(\frac{B}{X}\right) \text{ and } \frac{\partial k}{\partial B} = \frac{1}{X} g' > 0$$

$$\frac{\partial k}{\partial X} = \frac{-B}{X^2} g' < 0$$

where:

g' is a measure of the change in k brought on by a change in leverage

Since the assumption was made that all earnings are paid out in either interest payments or dividends, the following equality must exist.

(1) $\bar{o} = kXP + rB$

Solving for P

(2) $P = \dfrac{\bar{o} - rB}{kX}$

At the maximum value of the firm the following conditions must hold:

$$\frac{\partial V}{\partial B} = 0 \quad \text{and} \quad \frac{\partial V}{\partial X} = 0$$

(3) $V = PX + B$

(4) $\dfrac{\partial V}{\partial B} = X \dfrac{\partial P}{\partial B} + 1 = 0$

(5) $\dfrac{\partial P}{\partial B} = \dfrac{kX \left[-r - B \frac{\partial r}{\partial B}\right] - [\bar{o} - rB] X \frac{\partial k}{\partial B}}{[kX]^2}$ from (2)

Substituting (5) into (4) yields:

(6) $\dfrac{\partial V}{\partial B} = \dfrac{-kX \left[r + B \frac{\partial r}{\partial B}\right] - [\bar{o} - rB] X \frac{\partial k}{\partial B}}{k^2 X} + 1 = 0$

Substituting in the values for $\frac{\partial r}{\partial B}$, $\frac{\partial k}{\partial B}$, and $\frac{\bar{o}-rB}{kX}$ given earlier:

(7) $\frac{\partial V}{\partial B} = -[r + \frac{B}{X} f'] - Pg + k = 0$

$\therefore$ (8) $\frac{B}{X} = \frac{k-Pg-r}{f'}$

From (3)

(9) $\frac{\partial V}{\partial X} = X \frac{\partial P}{\partial X} + P = 0$ or $X = {}^{-P}/\frac{\partial P}{\partial X}$

(10) $\frac{\partial P}{\partial X} = \frac{kX [-B \frac{\partial r}{\partial X}] - [\bar{o}-rB] [k+X \frac{\partial k}{\partial X}]}{[kX]^2}$ from (2)

Substituting (10) into (9) yields:

(11) $X = \frac{-Pk^2X^2}{kX(\frac{B^2}{X^2}f') - [\bar{o}-rB]K + [\bar{o}-rB] \frac{B}{X}g'}$

$\therefore$ $1 = \frac{-Pk^2X}{K(\frac{B^2}{X}f') - [\bar{o}-rB]k + [\bar{o}-rB] \frac{B}{X}g'}$

$\therefore$ $k \frac{B^2}{X}f' - [\bar{o}-rB]K + [\bar{o}-rB] \frac{B}{X}g' = -Pk^2X$

$\therefore$ $k \frac{B^2}{X}f' - k\bar{o} + krB + [\bar{o}-rB] \frac{B}{X}g' + Pk^2X = 0$

Substituting (1) into this yields:

$$k \frac{B^2}{X}f' + KrB + PkBg' + Pk^2X = k\bar{o}$$

$\therefore$ $\frac{B^2}{X}f' + rB + PBg' + PkX = \bar{o}$

or $X\ [\frac{B^2}{X^2} f' + r\ \frac{B}{X} + P\ \frac{B}{X} g' + Pk] = \overline{o}$

$\therefore X\ [\frac{B}{X}\ (\frac{B}{X} f' + r + Pg') + Pk] = \overline{o}$

Using the value for $\frac{B}{X}$ from equation (8)

$$X\ [\frac{k-Pg'-r}{f'}\ (k - Pg' - r + r + Pg') + Pk] = \overline{o}$$

or $kX\ [\frac{k-Pg'-r}{f'} + P] = \overline{o}$

$$\therefore X = \frac{\overline{o} f'}{k\ [k-Pg'-r+Pf']} \qquad (12)$$

Equation (12) represents an expression for the optimum number of shares of equity. Substitution of (12) into (8) yields:

$$(13)\ B = \frac{\overline{o}}{k} \frac{(k-Pg'-r)}{(k-Pg'-r+Pf')}$$

Taking the logarithms of both sides of equation (12)

$$(14)\ \ln X - \ln\ [k-Pg'-r+Pf'] = \ln \overline{o} + \ln \frac{f'}{k}$$

Expansion of the second term on the right hand side of equation (14) by means of the MacLaurin formula for functions of two variables yields:

$$h\ (r,P) = \ln \alpha - \frac{1}{\alpha} r + \frac{\beta}{\alpha} P \qquad \text{where } \alpha = k;\ \beta = f' - g'$$

$\therefore$ (15) $\ln X = C + \ln \overline{o} + \frac{1}{\alpha} r - \frac{\beta}{\alpha} P$ where C is a constant.

Equation (15) now is in a form comparable to the demand equations of earlier chapters.

Definition of Variables

X = number of shares of stock (valuation of shares divided by stock price index)

EBT = earnings before taxes

EAT = earnings after taxes

RB = rate of return on corporate bonds

SP = stock price index

The model was expanded to include the effective corporate income tax due to the probable effect changes in this rate would have on the external financing by corporations. Corporations are allowed to deduct interest payments from taxable income and therefore the higher the tax rate the cheaper the use of bond financing, relative to the use of equity financing. A high corporate tax began during World War II and has remained high; however, during the 1950s and 1960s certain tax credits were introduced lowering the effective rate of tax paid by corporations.[56] In the late 1960s a surtax was imposed increasing this tax.

(A) $EAT = EBT - \tau EBT$

where τ = effective tax rate

(B) $\therefore EAT = EBT\ (1-\tau)$

(C) $\therefore \ln EAT = \ln EBT + \ln\ (1-\tau)$

---

[56] Joseph A. Pechman, Federal Tax Policy (New York: W. W. Norton and Co., Inc., 1971), pp. 117-120.

(D) From B $\frac{EAT}{EBT} = 1-\tau$

(E) $\therefore$ $\ln EAT = \ln EBT + \ln \frac{EAT}{EBT}$

The first equation for the supply of stocks yielded:

$$\text{(1)}\ \ln X = \underset{(20.0966)}{8.8503} - \underset{(-3.2489)}{.1596} \ln EBT - \underset{(-2.6333)}{.4985} \ln \frac{EAT}{EBT} + \underset{(5.6372)}{7.3432}\ RB + \underset{(3.4892)}{.0013}\ SP$$

$R^2 = .8608$ DW = .75

A plot of the residuals against time indicated the need for a dummy variable 0 for (1927-33) and 1 for (1934-72). The addition of the dummy variable produced the final equation for the supply of equity. This dummy is identical to the one used in the demand equations for money and savings deposits.

$$\text{(2)}\ \ln X = \underset{(21.9331)}{9.0262} - \underset{(-3.9199)}{.1802} \ln EBT - \underset{(-2.9688)}{.5186} \ln \frac{EAT}{EBT} + \underset{(6.6382)}{8.9091}\ RB +$$

$$\underset{(3.4557)}{.0011}\ SP - \underset{(-2.6132)}{.0857}\ D/M$$

$R^2 = .8853$ DW = 1.13

The equation can be rewritten as:

$\ln X = 9.0262 - .1802 \ln EBT - .5186 \ln EAT + .5186 \ln EBT \ldots$

or

$\ln X = 9.0262 + .3384 \ln EBT - .5186 \ln EAT \ldots$

Written in this manner, the sign of ln EBT is as expected although the sign of ln EAT is not as expected.

The remaining variables, the rate on corporate bonds, and the price of stock have the expected sign. As the rate on bonds rises, the cost of bond financing increases relative to equity financing and as the equation indicates the amount of equity increases. Of course, the increase in the amount of equity supplied due to an increase in the price of equity is as expected.

Supply of Corporate Bonds

The model as defined in this chapter assumes the firm can influence the rate of interest paid on corporate bonds by changing its leverage. The firm in effect is fixing the price of its bonds at a level compatible with the investor's maximum valuation of the equity. In light of the above discussion, it is possible that a given quantity of bonds may be considered optimum at various interest rates, interfering with the interpretation of a supply curve for bonds. Manipulation of the equation for the optimum amount of bonds (13) in the same manner as was done for the equation concerning equity does yield an expression for bonds which is independent of the interest rate.

The model while not allowing for an accurate interpretation of a derived supply curve for bonds does, however, contain assumptions regarding the determinants of the rate of return for corporate bonds. In formulating the model, the rate of return for corporate bonds was assumed to be an increasing function of leverage (B/X). In deriving an equity supply equation, the effective corporate income tax was recognized as a possible influence on the external financing by corporations.

The following equation was based on this discussion and resulted in:

$$RB = .0276 + .0007 \frac{CB}{X} + .2962\ CP + .0423 \ln \frac{EAT}{EBT}$$
$$(15.1439)(7.4545) \quad (5.4492) \quad (7.1070)$$

$$R^2 = .9035 \qquad DW = .65$$

The rate on government securities (CP) represents the riskless rate. The positive coefficient for the variable $\ln \frac{EAT}{EBT}$ indicates that an increase in the effective tax rate results in a decrease in the rate on corporate bonds [$\ln \frac{EAT}{EBT} = \ln (1-\tau)$; $\frac{\partial RB}{\partial \tau} = \frac{-.0423}{1-\tau}$].

This would indicate that an increase in the tax rate leads to more bond financing due to a decrease in the rate on corporate bonds.

A plot of the residuals against time indicates the need for a dummy variable [0 for (1927-67) and 1 for (1968-72)].

The dummy variable in this equation is a proxy for a price expectations effect.

$$RB = .0311 + .0004 \frac{CB}{X} + .2674\ CP + .0353 \ln \frac{EAT}{EBT} + .0127\ Dumb$$
$$(20.3229)(5.2877) \quad (6.4723) \quad (7.5216) \quad (5.1888)$$

$$R^2 = .9469 \qquad DW = 1.10$$

All coefficients have the expected sign and are significant.

Summary

The elasticities for the supply equations are given in Table 13.

Table 13.--Elasticities for Supply Equations.

	$\eta_{\frac{CB}{X}}$	η_{CP}	η_{τ}	η_{SP}	η_{EBT}	η_{RB}
ln X			.0001	.1834	-.1802	.3848
RB	.2419	.1941	.2288			

The equations indicate that a 10 percent increase in the effective tax rate produces a $\frac{1}{1000}$ percent increase in the number of shares supplied and a 2.3 percent decrease in the rate on corporate bonds.

A 10 percent increase in the price of equity yields approximately a 2 percent increase in the supply of shares, while a 10 percent increase in the rate on corporate bonds results in a 3.8 percent increase in the number of shares.

The equation for the rate on corporate bonds indicates an increase of 2.4 percent would result from a 10 percent increase in $\frac{CB}{X}$, while a 1.9 percent increase is produced by a 10 percent increase in the riskless rate (CP).

CHAPTER VI

THE MODEL

The chapters pertaining to portfolio theory led to the following consumer demand equations:

(1) $\ln M^{DC} = -3.88215347 + 1.24244386 \ln Y - 20.19516660\ RDep - .65375116\ RS - .13969467\ D/M$

(2) $\ln Dep^{DC} = -2.52547982 + .52525174 \ln W + .52525174 \ln Y + 20.39762009\ RDep - 4.12420050\ CP - .27484175\ RS - .15552298\ D/M$

(3) $\ln CB^{DC} = 3.43993633 + .68307775 \ln W - .31692225 \ln Y + 38.95753461\ RB - 8.03327367\ CP - 1.04375522\ Dum$

(4) $\ln GS^{DC} = -4.77986824 + .66709168 \ln W + .66709168 \ln Y - 27.43156066\ RDep - 8.35616007\ RB + 3.5209788\ CP - 1.37142766\ RS - .32196928\ Dummy$

(5) $\ln E^{DC} = -8.31229230 + 2.92563327 \ln W - 1.50414603 \ln Y - 7.69642069\ RB + .95521985\ RS - .46582767\ Dum$

The supply equations for corporate bonds and equities obtained from the theory of the firm are:

(6) $\ln E^S = 9.02617808 - .18020110 \ln EB - .51864152 \ln \frac{EA}{B} + 8.90913312\, RB + .00106732\, SP - .08570217\, D/M$

(7) $RB = .03109303 + .00042506 \frac{CB^S}{E^S} + .26738338\, CP + .03525902 \ln \frac{EA}{B} + .01273940\, Dumb$

In addition to the above seven equations, four identities are included to complete the model.

(8) $M^S = M^{DC} + M^{DO}$

(9) $Dep^S = Dep^{DC}$

(10) $CB^S = CB^{DC} + CB^{DO}$

(11) $W = M^{DC} + Dep^{DC} + CB^{DC} + GS^{DC} + E^{DC} + Dur + Hous - Loan - Mort.$

Definition of Variables[57]

Endogenous

(1) RS = rate of return on equity

(2) CP = commercial paper rate used as a proxy for the rate of government securities

(3) CB^{DC} = corporate bonds held by consumers

(4) GS^{DC} = federal, state and local securities held by consumers

(5) E^{DC} = corporate stock held by consumers

(6) E^S = corporate stock supplied by the corporate sector

(7) RB = rate paid on corporate bonds

(8) W = wealth of the consumer sector defined as assets 3 through 5 plus assets 9 through 12 minus assets 13 and 14

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[57]Note: an explanation of the source and/or method of data accumulation is available in the Appendices.

Exogenous

(9) M^{DC} = currency and demand deposits held by consumers

(10) Dep^{DC} = savings deposits held by consumers

(11) Dur = durables held by consumers

(12) Hous = value of housing and related land held by consumers

(13) Mort = value of mortgages owed by consumers

(14) Loan = installment loans of consumers

(15) CB^S = corporate bonds supplied by the corporate sector

(16) Y = personal disposable income

(17) RDep = rate paid on savings deposits = weighted average of the rates paid on mutual savings deposits, saving and loan shares and time deposits

(18) ln EB = logarithm of corporate earnings before taxes

(19) $\ln \frac{EA}{B}$ = logarithm of corporate earnings after taxes divided by corporate earnings before taxes

(20) SP = stock price index

(21) CB^{DO} = corporate bonds held by other than the consumer sector

(22) M^{DO} = currency and demand deposits held by other than the consumer sector

(23) M^S = total money supply

(24) D/M, Dumb, Dum, Dumy = various dummy variables

Solution Procedure

Equation (1) was solved for the rate of return on equities yielding:

$$(1)^1 \; RS = -5.9383 - 1.5296 \ln M^{DC} + 1.9005 \ln Y - 30.8912 \, RDep - .2137 \, D/M$$

Equation (2) was solved for the rate of return on government securities producing:

$(2)^1$ $CP = -.6124 - .2425 \ln Dep^{DC} + .1274 \ln W + .1274 \ln Y +$
$4.9458\ RDep - .0666\ RS - .0377\ D/M$

Equations (8) and (9) then become:

$(8)^1$ $M^{DC} = M^S - M^{DO}$

$(9)^1$ $Dep^{DC} = Dep^S$

The eleven equations using 1^1, 2^1, 8^1, 9^1 were solved by means of the Sim Program[58] which incorporates an iterative technique. The program solves the first equation for the dependent variable and uses this value in solving the second equation. In each step the initial values are replaced by the new calculated values for the dependent variables. When the program has arrived at calculated values for all the dependent variables in the system, these calculated values are compared with the previous values. If the change from the previous value is greater than 1 percent (as specified in this study), the process is repeated. When none of the dependent variables is changed by greater than 1 percent, the model is considered solved.

Results

The results for the expost simulations for the data period [1927-41, 1950-72] are presented in Table 14. For purposes of comparison, the simulated values are listed next to the actual values for each year.

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[58]The Sim Program was developed by Morris Norman.

Table 14.--Simulated and Actual Values.

Year	CB^{DC} Actual	CB^{DC} Simulation	GS^{DC} Actual	GS^{DC} Simulation	E^{DC} Actual	E^{DC} Simulation	W Actual	W Simulation
1927	19692.635	22048.503	13173.994	23248.595	114233.514	68186.372	302124.632	268522.412
1928	20516.814	23860.986	12581.717	13386.473	155904.668	169396.940	349047.238	367553.193
1929	21078.314	23017.268	12695.463	10636.003	138275.027	155437.655	334547.547	351623.084
1930	21396.872	19418.859	12964.887	9246.496	93433.011	112083.566	281589.105	294491.383
1931	22247.835	16366.634	14853.637	12185.476	46957.584	49711.919	219548.492	213755.043
1932	22026.466	15428.936	16630.606	17535.804	38676.985	40578.758	199326.303	195531.079
1933	21354.121	18638.787	16415.807	15599.591	57125.164	62006.841	215257.464	216592.724
1934	19870.669	16415.807	16831.375	13134.531	54611.513	63576.552	213516.659	215344.394
1935	17925.866	16881.945	16663.900	16797.746	77188.055	72402.782	236286.673	230559.979
1936	16268.728	17658.985	16432.231	20150.815	97246.085	88168.056	266358.254	262367.412
1937	14972.942	15568.423	18106.024	16697.261	64796.055	68528.158	241894.644	244778.904
1938	14779.554	16898.836	17676.653	15351.984	72692.973	73570.543	252364.190	253060.939
1939	13974.646	16983.541	17343.967	19555.268	73203.609	63703.832	258666.456	254377.205
1940	12964.887	14943.026	17257.464	21375.485	64215.507	59934.046	260378.565	262200.104
1941	11203.707	11684.284	19930.370	25488.942	55215.556	54666.152	271858.111	277355.270
1950	5100.021	5591.484	77574.962	78198.051	134054.270	141068.378	652171.940	660307.909
1951	6444.614	5024.092	77110.906	83868.049	152055.369	156373.085	700928.787	710568.228
1952	6260.404	5710.147	78983.954	85391.343	169736.073	164062.052	740762.880	740936.962
1953	6118.058	5808.049	81308.025	79221.262	165049.383	170075.885	755600.734	758321.274
1954	6093.635	6925.739	82125.184	85391.343	226839.954	210449.290	836154.034	823903.443
1955	7672.717	7302.704	88079.932	82867.647	268337.287	267801.148	916889.750	911359.309
1956	7934.693	7669.449	91949.979	81308.025	268874.498	279009.190	957153.201	956365.270
1957	9000.181	8006.428	94183.473	72911.379	241107.941	266998.949	959454.050	962955.213
1958	10229.183	9063.404	91766.263	80740.856	343519.789	362217.450	1094066.556	1100635.839
1959	10229.183	9471.097	100709.962	86249.540	384615.726	406362.135	1182771.896	1189341.592
1960	11025.874	9936.797	104192.976	92226.243	382314.947	368796.397	1205728.306	1179269.443
1961	11271.131	10894.355	104715.246	99707.881	508387.891	497823.064	1365767.643	1349844.554
1962	11158.982	11338.962	103880.866	94183.473	428908.977	412916.222	1330502.352	1305005.887
1963	11170.146	12173.296	108228.499	103053.134	543616.873	548531.507	1504677.253	1505252.575
1964	11813.521	12874.450	114005.275	105979.398	614767.853	644351.717	1638466.320	1661238.210
1965	13399.866	13891.050	118184.235	116657.783	689002.377	720715.682	1785921.763	1816236.364
1966	15184.038	14913.170	129573.038	114462.210	626560.113	632857.147	1802633.116	1793415.257
1967	18977.323	17500.767	128540.589	146532.130	796514.012	765282.251	2090108.765	2075453.884
1968	23789.510	29911.551	133252.353	160974.299	949793.622	845767.688	2376622.086	2306476.062
1969	31132.264	32112.479	154662.407	153891.025	842117.400	746387.365	2384560.624	2288760.877
1970	41192.027	35774.835	146385.671	156529.536	857274.400	797310.924	2542748.186	2487890.730
1971	49513.469	39104.780	132587.754	165214.515	953519.280	1011555.699	2829256.146	2910172.077
1972	54775.594	42958.938	138275.037	183505.515	1126518.840	1318493.032	3198701.780	3426612.654
r^2		.9187		.9429		.9812		.9451
Mean error		-789.149		1042.643		1576.217		1948.006
RMSE		3521.077		12703.451		43695.342		46305.056

Table 14.--Continued.

Year	E^S Actual	E^S Simulation	CB^S Actual	CB^S Simulation	RS Actual	RS Simu-lation	RB Actual	RB Simu-lation	CP Actual	CP Simu-lation
1927	2186.375	2594.113	32577.635	34926.341	.168	-.124	.046	.057	.041	.091
1928	2223.861	2411.490	34194.814	37530.882	.233	.332	.046	.051	.049	.060
1929	2291.587	2328.548	34773.314	36723.327	.245	.492	.047	.051	.059	.060
1930	2477.487	2243.966	36339.872	34364.778	.162	.421	.046	.041	.036	.023
1931	2558.049	2273.328	36889.835	31003.585	.077	.051	.046	.037	.026	.009
1932	2560.608	2373.213	36030.446	29439.281	-.081	-.345	.050	.031	.027	-.008
1933	2649.166	2423.577	34789.121	32070.291	-.204	-.137	.045	.042	.017	.031
1934	2591.520	2423.577	33194.669	29732.842	-.072	.075	.040	.036	.010	.011
1935	2542.746	2401.863	31565.866	30519.319	.007	.082	.036	.036	.008	.011
1936	2397.064	2380.343	30964.728	32361.575	.221	.138	.032	.037	.008	.016
1937	2192.944	2214.983	29685.942	30288.293	.317	.249	.033	.033	.010	.001
1938	2153.824	2330.877	29846.554	31958.810	.131	.074	.032	.034	.008	.003
1939	2069.371	2271.056	29106.646	32113.123	.156	-.028	.030	.036	.006	.010
1940	2061.110	2190.752	28466.887	30440.932	.059	-.020	.028	.033	.006	.007
1941	2067.303	2175.470	27583.707	28069.763	-.030	.044	.028	.031	.005	.025
1950	2221.638	2088.079	35735.021	36223.714	.068	.111	.026	.030	.015	.024
1951	2237.244	2201.733	38931.614	37509.855	.142	.134	.029	.029	.022	.036
1952	2296.175	2237.244	43612.404	43062.108	.175	.116	.030	.032	.023	.035
1953	2287.009	2155.979	46969.058	46656.864	.189	.168	.032	.030	.025	.023
1954	2246.211	2223.861	50449.635	51281.365	.168	.133	.029	.032	.016	.021
1955	2177.647	2214.983	53284.717	53515.967	.190	.209	.031	.032	.022	.021
1956	2094.353	2230.542	56898.693	56636.126	.205	.230	.034	.034	.033	.022
1957	2088.079	2179.825	63214.181	62221.144	.194	.261	.039	.034	.038	.017
1958	2230.542	2337.880	68905.183	67736.513	.186	.241	.038	.036	.025	.019
1959	2312.305	2366.104	71860.183	71106.131	.157	.228	.044	.038	.040	.027
1960	2284.723	2433.291	75308.874	74215.658	.120	.152	.044	.041	.039	.037
1961	2517.446	2565.734	79948.131	79575.057	.111	.156	.044	.042	.030	.040
1962	2375.587	2406.672	84502.982	84685.324	.186	.125	.043	.041	.033	.028
1963	2517.446	2489.905	88418.146	89424.199	.085	.122	.043	.041	.036	.028
1964	2527.536	2530.064	92404.521	93470.159	.107	.154	.044	.041	.040	.025
1965	2620.184	2565.734	97802.866	98291.080	.138	.140	.045	.043	.044	.027
1966	2657.125	2532.596	108020.038	107749.556	.106	.136	.051	.047	.056	.037
1967	2951.297	2782.208	122676.323	121203.161	.109	.031	.055	.053	.051	.056
1968	3200.301	3297.764	135569.510	141680.201	.101	-.013	.062	.068	.059	.069
1969	3278.037	3278.037	147539.264	148522.606	.088	.007	.070	.074	.078	.088
1970	3297.764	3317.610	167304.027	161886.749	.044	.028	.080	.076	.077	.084
1971	3324.252	3301.064	186096.468	175703.397	.067	.050	.074	.073	.051	.068
1972	3367.750	3374.492	198275.594	186445.632	.053	.047	.072	.072	.047	.058
r^2		.8618		.9953		.4583		.8634		.6382
Mean error		.3919		-773.467		-.0028		-.0005		.0006
RMSE		139.592		3520.132		.1081		.0051		.0146

The statistics at the bottom of each column of simulated values show the correlation (r^2) mean error between the actual values and the simulated values and the root mean square error (RMSE).

The statistics indicate a 'good fit' between the simulated values and the actual values for the various assets and the rate of return on corporate bonds (RB). The 'goodness of fit' for the rates of return on equity (RS) and government securities (CP) appears to be much lower than that of the assets.

The actual and simulated values are plotted in Figure 1-7. Analysis of these figures indicate the following capabilities of the model.

Corporate bonds--Figure 1 appears to give an excellent indication of yearly changes in consumers' holdings of this asset, with the major exception being the depression years of 1929-33.

The actual holdings of corporate bonds by the consumer sector increased by 130 percent during the years 1968-72 while the simulated values increased by only 44 percent.

Figure 1, excluding the above mentioned subperiods, demonstates a high degree of accuracy in both the prediction of yearly changes in holdings by consumers and in the magnitude of these holdings.

Figure 4 indicates a high degree of accuracy in the simulation of the supply of corporate bonds.

Government securities--Figure 2 indicates a lower degree of explanation of yearly changes in the holdings of government securities than was found for corporate bonds. The most apparent weakness in

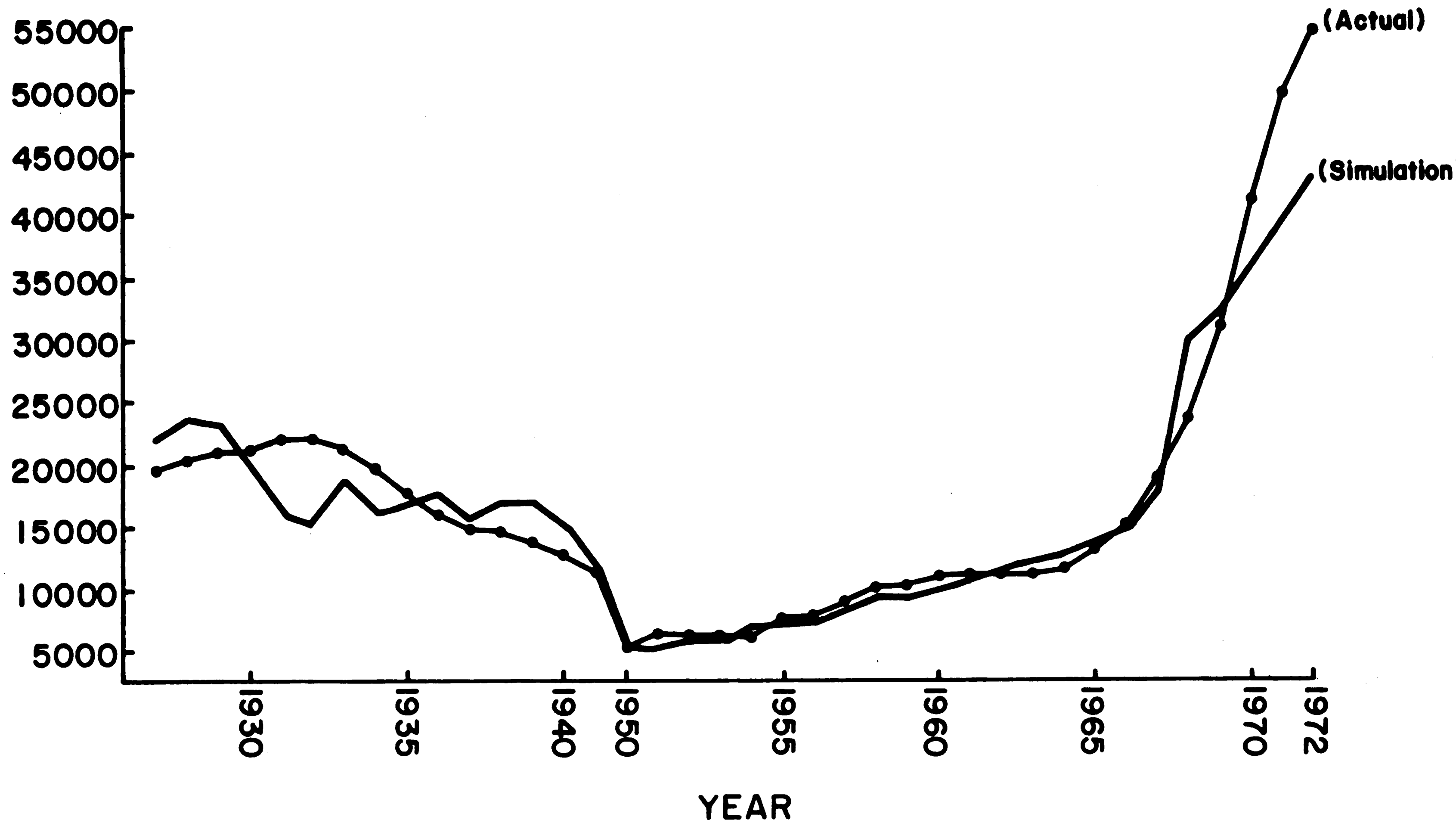

Figure 1. Consumer's Holdings of Corporate Bonds (CB^{DC}) (Millions of dollars).

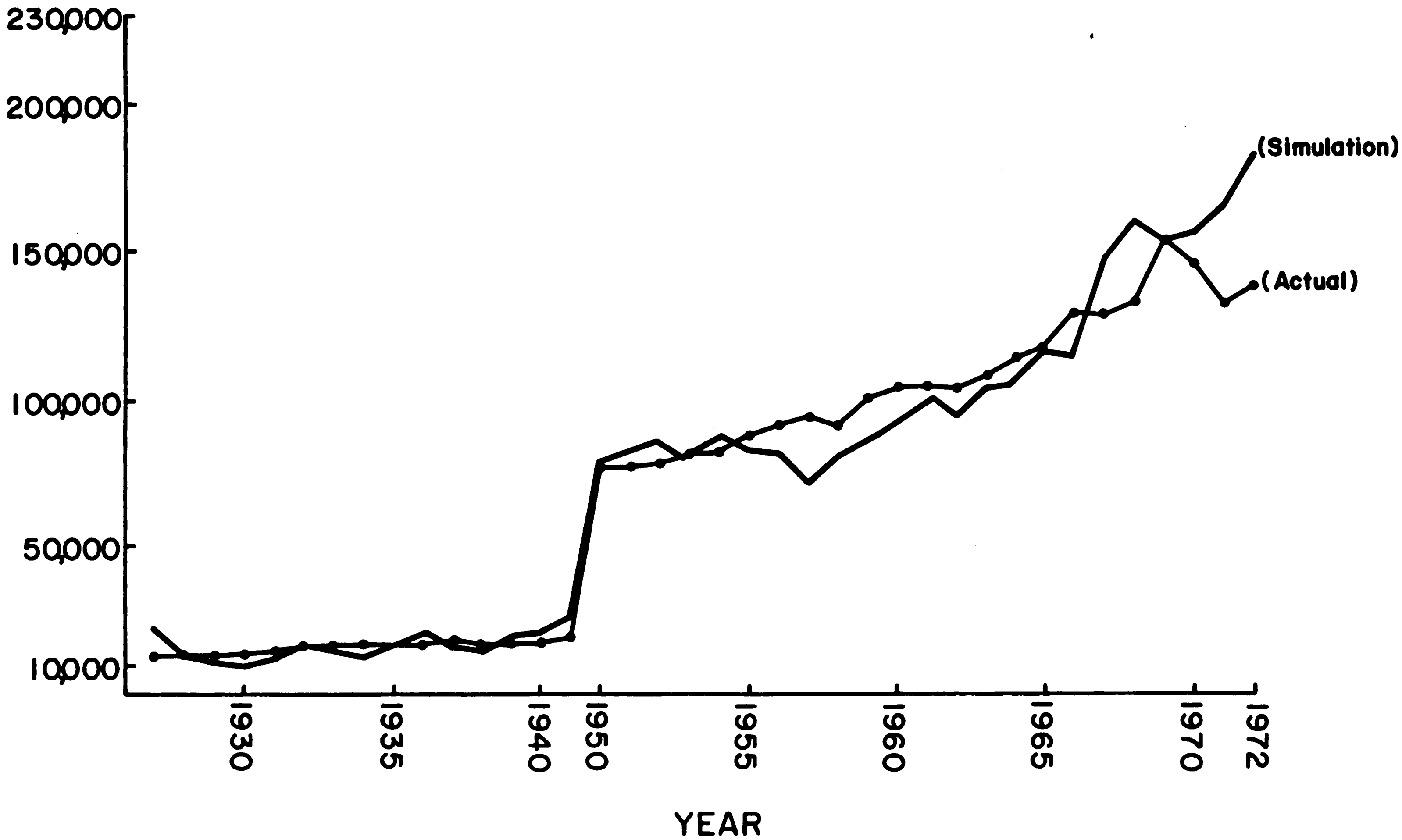

Figure 2. Consumer's Holdings of Government Securities (GS^{DC}) (Millions of dollars).

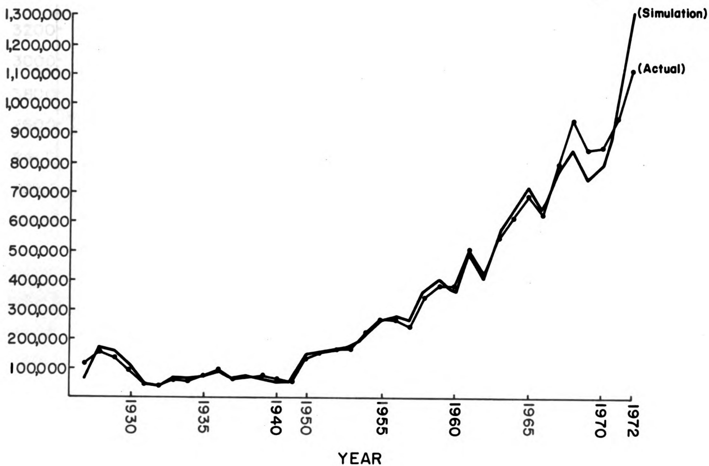

Figure 3. Consumer's Holdings of Equities (E^{DC}) (Millions of dollars).

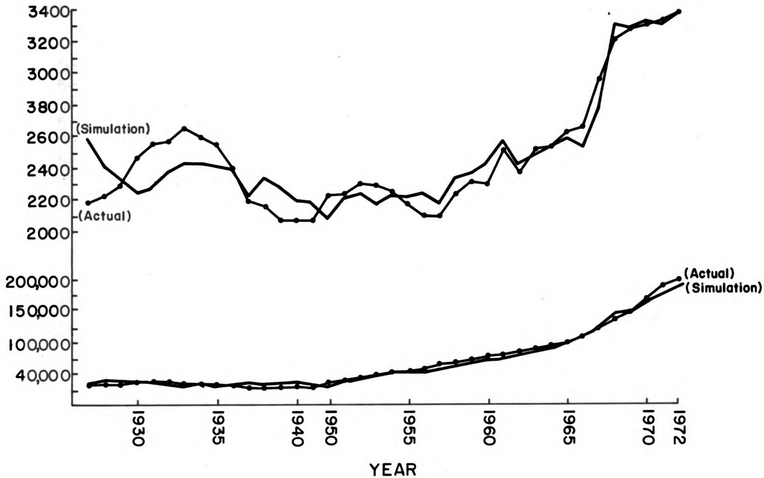

Figure 4. Top Portion [Supply of Equity E^S] (Number of shares).
Bottom Portion [Supply of Corporate Bonds CB^S] (Millions of dollars).

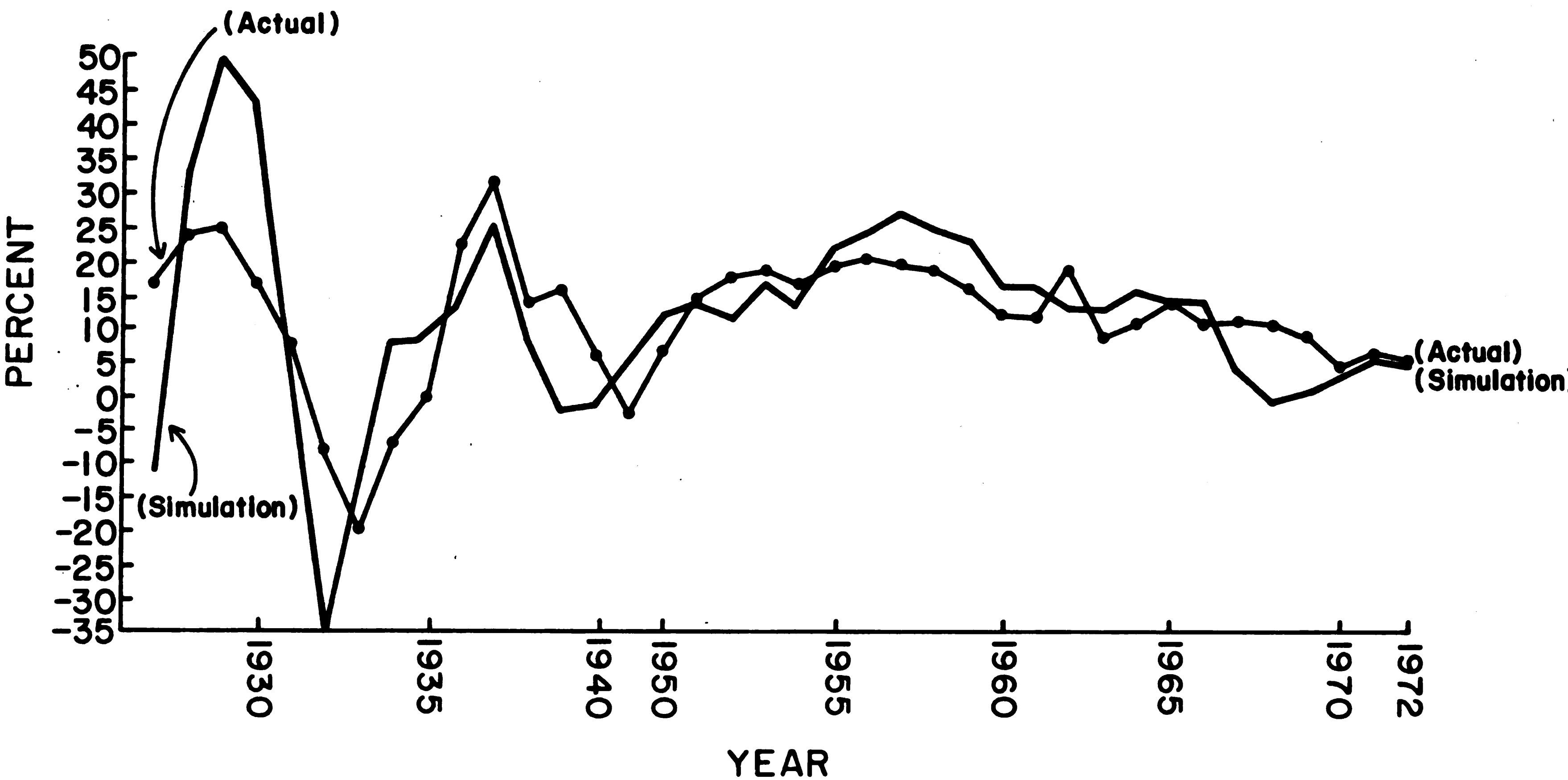

Figure 5. Rate of Return on Equity (RS).

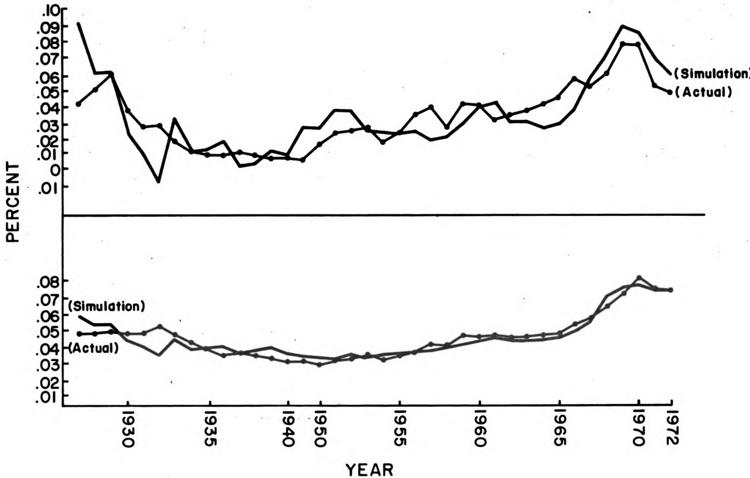

Figure 6. Top Portion [Return on Government Securities (CP)].
Figure 7. Bottom Portion [Return on Corporate Bonds (RB)].

the estimation of the magnitude of consumers' holdings is found in the later years 1956-60, 1966-68, 1971 and 1972.

Equities--Figure 3 provides an excellent picture of the yearly changes in the consumer sector's holdings as well as the magnitude of these holdings.

Figure 4 demonstrates a 'good fit' between the simulated and actual values for the supply of equity with the major exception being the years 1927-35.

Rate of return on equity--Figure 5 indicates that the direction of change in this rate is accurately estimated in 26 of the 38 years but the magnitude of the change tends to be exaggerated between the years 1927-32.

Rate of return on government securities--The difference between the simulated rate and the actual rate is 1 percent or less for 21 of the years. The direction of change is correctly predicted in 21 of the years (Figure 6).

Rate of return on corporate bonds--Figure 7 indicates that the difference between the simulated and actual rate is 1/2 of 1 percent or less for 33 of the years. The direction of change is correctly predicted in 25 of the years.

Increase in the Money Supply

The increase in the money supply in this model is not synonymous with an open market operation but rather represents an immediate increase in wealth such as would occur as a result of a gift, from a source outside the model. Induced changes in the assets are therefore brought about by a wealth effect as well as the substitution effects.

The results of a 10 percent increase in the stock of money are presented in Tables 15 and 16. The first column for each variable in Table 15 contains the simulated value resulting from the increase in the supply of money while the second column for each variable lists the money supply multiplier for each year in the data period.

The money supply multiplier for the assets was calculated by dividing the change in the money supply for each year into the difference between the original solution value (not the actual value), and the solution value obtained with the new money supply data.

The money supply multiplier for the rates of return was found by using the following formula: $\frac{\text{Change in Percent x 100}}{\text{Change in } M^S}$. Since M^S is in millions, this gives the change in basis points per million dollar changes in the money supply.

In the case of the supply of equity, E^S, the money supply multiplier is calculated for both the number of shares (A), and the valuation of shares (B).

Results of an Increase in M^S

Corporate bond holdings--An increase in the supply of money induces consumers to increase their holdings of corporate bonds in every year of the entire period (Table 15). The elasticities (Table 16) indicate that the effect of an increase of money is relatively small being more pronounced in the years 1927-41, than in the years 1950-72 where the elasticities are decreasing over time.

Government securities--As evidenced in both Tables 15 and 16, an increase in the supply of money has a very large positive, though

Table 15.--Valuation of Variables After a 10 Percent Change in Money Supply.

Year	CB^{DC}	Multiplier	GS^{DC}	Multiplier	E^{DC}	Multiplier	W	Multiplier
1927	23248.595	.435	39815.040	6.005	45661.008	- 8.166	266502.032	- .732
1928	25539.971	.604	26688.819	4.789	101214.773	-24.514	317148.319	-18.123
1929	24661.534	.599	21461.159	3.942	92041.975	-23.088	303439.221	-17.548
1930	20826.885	.549	18939.406	3.782	65643.903	-18.121	261757.233	-12.773
1931	17343.967	.429	22225.599	4.404	31761.178	- 7.873	209110.760	- 2.037
1932	16333.933	.428	31132.264	6.427	26423.261	- 6.691	198011.587	1.172
1933	19692.635	.513	27119.275	5.605	41027.588	-10.207	210248.931	- 3.087
1934	17413.482	.416	23860.986	4.471	40741.398	- 9.517	206604.727	- 3.643
1935	17836.461	.341	29495.707	4.535	47524.469	- 8.886	222204.334	- 2.984
1936	18620.157	.300	34509.848	4.483	59041.744	- 9.093	251750.727	- 3.314
1937	16366.634	.261	27722.510	3.611	46910.650	- 7.081	238076.879	- 2.195
1938	17783.032	.269	26003.853	3.238	49662.232	- 7.267	243982.941	- 2.759
1939	17836.461	.228	32435.215	3.446	43695.482	- 5.354	251832.790	- .681
1940	15724.889	.179	36206.719	3.396	40457.204	- 4.459	262700.149	.114
1941	12246.556	.112	41606.014	3.214	37949.060	- 3.333	282334.050	.993
1950	5796.445	.017	119730.660	3.480	102847.234	- 3.203	675763.791	1.295
1951	5208.254	.015	128540.589	3.533	114005.275	- 3.351	725636.716	1.192
1952	5913.540	.016	130875.269	3.467	119610.989	- 3.388	755302.243	1.095
1953	6002.912	.015	121297.320	3.174	124243.670	- 3.457	767912.665	.723
1954	7158.101	.017	130875.269	3.322	153583.550	- 4.154	826376.562	.181
1955	7540.170	.017	127516.366	3.193	194852.862	- 5.216	897309.016	- 1.005
1956	7918.840	.018	124492.406	3.049	203821.522	- 5.309	938779.836	- 1.242
1957	8250.260	.017	112195.706	2.790	194463.546	- 5.151	944039.786	- 1.343
1958	9330.091	.018	124616.961	2.997	263287.008	- 6.758	1060464.168	- 2.744
1959	9749.780	.019	131531.284	3.065	298045.071	- 7.333	1141257.780	- 3.255
1960	10208.745	.018	139246.358	3.162	272665.214	- 6.465	1145146.288	- 2.295
1961	11203.707	.020	151145.768	3.328	366957.017	- 8.467	1286017.469	- 4.130
1962	11626.009	.018	142628.696	3.057	304674.722	- 6.831	1261402.145	- 2.752
1963	12481.465	.019	155437.655	3.199	405955.976	- 8.706	1431782.748	- 4.486
1964	13187.174	.018	159372.578	3.100	477825.079	- 9.670	1565625.274	- 5.552
1965	14200.039	.017	173164.969	3.131	539824.842	-10.023	1710390.142	- 5.865
1966	15214.436	.016	169058.485	2.955	476393.751	- 8.469	1710299.146	- 4.499
1967	17836.461	.017	213629.824	3.378	581868.642	- 9.234	1978959.307	- 4.858
1968	30485.304	.027	232349.969	3.325	647581.543	- 9.234	2201355.528	- 4.898
1969	32728.450	.028	223462.747	3.130	568638.394	- 7.997	2203280.190	- 3.846
1970	36388.206	.026	225708.585	2.956	610479.504	- 7.983	2394578.063	- 3.987
1971	39695.773	.024	236806.824	2.883	778403.262	- 9.389	2774532.395	- 5.462
1972	43521.050	.021	262498.330	2.944	1017643.278	-11.214	3231635.397	- 7.268

Table 15.--Continued.

Year	E^S (Number of Shares)	Multipler A Number	Multipler B Valuation	CB^S	Multiplier	RS	Multiplier	RB	Multiplier	CP	Multiplier
1927	2746.273	.055	3.878	36143.034	.441	-.493	-1.338	.064	.025	.116	.091
1928	2594.113	.066	6.152	39209.180	.603	-.141	-1.701	.059	.029	.092	.115
1929	2507.396	.065	5.309	38366.166	.598	.011	-1.752	.059	.029	.092	.117
1930	2421.155	.069	4.024	35762.339	.545	-.070	-1.916	.050	.035	.056	.129
1931	2423.577	.066	2.010	31990.371	.433	-.360	-1.803	.044	.031	.036	.118
1932	2522.485	.071	1.792	30337.334	.424	-.738	-1.858	.038	.033	.018	.123
1933	2570.871	.072	2.752	33118.161	.510	-.516	-1.844	.049	.034	.056	.122
1934	2583.757	.067	2.437	30733.019	.417	-.334	-1.705	.043	.029	.038	.113
1935	2550.386	.053	2.753	31484.518	.345	-.304	-1.379	.043	.025	.036	.089
1936	2519.964	.044	2.859	33315.882	.298	-.230	-1.149	.044	.022	.041	.078
1937	2337.880	.040	1.735	31074.705	.258	-.099	-1.140	.039	.020	.024	.075
1938	2465.130	.041	1.971	32847.955	.270	-.287	-1.097	.041	.021	.027	.073
1939	2394.668	.033	1.601	32966.259	.228	-.374	- .926	.042	.016	.033	.062
1940	2314.618	.028	1.200	31219.428	.178	-.381	- .827	.039	.014	.031	.055
1941	2289.297	.023	.815	28631.007	.112	-.291	- .668	.037	.012	.047	.044
1950	2182.006	.008	.641	36428.996	.017	-.180	- .244	.035	.004	.043	.016
1951	2300.772	.008	.720	37694.389	.015	-.157	- .230	.034	.004	.055	.015
1952	2337.880	.008	.753	43264.812	.015	-.176	- .223	.036	.003	.055	.015
1953	2250.708	.007	.687	46852.809	.015	-.122	- .219	.034	.003	.042	.014
1954	2321.572	.007	.947	51511.058	.017	-.158	- .213	.037	.004	.041	.015
1955	2312.305	.007	1.126	53755.363	.017	-.084	- .210	.037	.004	.040	.014
1956	2326.220	.007	1.134	56879.197	.017	-.060	- .205	.038	.003	.041	.013
1957	2273.328	.007	.997	62462.048	.017	-.033	- .209	.039	.004	.037	.014
1958	2440.602	.007	1.411	68009.052	.019	-.054	- .202	.040	.003	.039	.014
1959	2467.597	.007	1.483	71377.507	.018	-.059	- .194	.042	.003	.047	.014
1960	2532.596	.007	1.447	74490.159	.018	-.128	- .188	.045	.003	.056	.013
1961	2673.116	.007	1.818	79876.873	.020	-.127	- .183	.046	.003	.059	.012
1962	2504.890	.006	1.471	84971.428	.018	-.157	- .178	.046	.003	.047	.012
1963	2591.520	.006	1.722	89724.333	.018	-.157	- .170	.046	.003	.047	.012
1964	2633.318	.006	1.878	93778.691	.018	-.123	- .161	.046	.003	.043	.010
1965	2665.108	.006	1.877	98602.892	.017	-.128	- .149	.047	.002	.045	.010
1966	2628.057	.005	1.578	108046.582	.016	-.128	- .143	.051	.002	.055	.010
1967	2884.192	.005	1.801	121532.440	.017	-.224	- .128	.057	.002	.073	.009
1968	3415.230	.005	2.103	142259.945	.027	-.262	- .116	.072	.002	.086	.008
1969	3394.800	.005	1.756	149123.778	.027	-.247	- .114	.078	.002	.105	.008
1970	3432.349	.005	1.657	162484.994	.026	-.220	- .106	.080	.002	.101	.007
1971	3415.230	.005	1.715	176266.352	.023	-.194	- .098	.077	.002	.084	.006
1972	3487.708	.004	1.834	187022.250	.021	-.195	- .090	.076	.001	.074	.006

Table 16.--Elasticities.

Year	CB^{DC}	GS^{DC}	E^{DC}	W	E^S	CB^S
1927	.544	7.126	-3.303	- .075	.587	.348
1928	.704	9.937	-4.025	-1.371	.757	.447
1929	.714	10.178	-4.079	-1.370	.768	.447
1930	.725	10.483	-4.143	-1.112	.790	.407
1931	.597	8.239	-3.611	- .217	.661	.318
1932	.587	7.754	-3.488	.127	.629	.305
1933	.565	7.385	-3.383	- .293	.608	.327
1934	.608	8.167	-3.592	- .406	.661	.336
1935	.565	7.559	-3.436	- .362	.618	.316
1936	.544	7.126	-3.303	- .405	.587	.295
1937	.513	6.603	-3.155	- .274	.555	.260
1938	.523	6.938	-3.250	- .359	.576	.278
1939	.502	6.586	-3.141	- .100	.544	.266
1940	.523	6.938	-3.250	.019	.565	.256
1941	.481	6.323	-3.058	.180	.523	.200
1950	.367	5.311	-2.709	.234	.450	.057
1951	.367	5.327	-2.709	.212	.450	.049
1952	.356	5.327	-2.709	.194	.450	.047
1953	.336	5.311	-2.695	.126	.439	.042
1954	.336	5.327	-2.702	.030	.439	.045
1955	.325	5.388	-2.724	- .154	.439	.045
1956	.325	5.311	-2.695	- .184	.429	.043
1957	.305	5.388	-2.717	- .196	.429	.039
1958	.294	5.434	-2.731	- .365	.439	.040

Table 16.--Continued.

Year	CB^{DC}	GS^{DC}	E^{DC}	W	E^{S}	CB^{S}
1959	.294	5.250	-2.666	- .404	.429	.038
1960	.274	5.098	-2.607	- .289	.408	.037
1961	.284	5.159	-2.629	- .473	.419	.038
1962	.253	5.144	-2.621	- .334	.408	.034
1963	.253	5.083	-2.599	- .488	.408	.034
1964	.243	5.038	-2.584	- .576	.408	.033
1965	.222	4.844	-2.510	- .583	.387	.032
1966	.202	4.770	-2.472	- .463	.377	.028
1967	.192	4.579	-2.397	- .465	.367	.027
1968	.192	4.434	-2.343	- .456	.356	.041
1969	.192	4.521	-2.381	- .373	.356	.040
1970	.171	4.420	-2.343	- .375	.346	.037
1971	.151	4.333	-2.305	- .466	.346	.032
1972	.131	4.305	-2.282	- .569	.336	.031

almost steadily decreasing, effect upon the consumer sector's holdings of this asset.

Equity--The tables indicate a large negative effect upon the holdings of equities. If 1928-30 are ignored the elasticities for the years 1927-41 are approximately constant and all are larger than those for 1950-72 which again appear relatively constant. This would indicate that the effects of an increase in the money supply have a large and relatively predictable effect upon the equity holdings of consumers.

Wealth--The effects upon wealth appear mixed, being negative through 1939 (except for 1932), positive from 1940-54 and negative from 1955-72. The period 1940-54 contains the smallest money supply multipliers for equity holdings (Table 15), which indicates that the reduction in the value of equity holdings by the consumer sector is greater than the combined increases in the other assets, except for the years 1940-54.

Equity supply and corporate bond supply--Both of these variables respond positively to the increase in the money supply in ever year of the data period. Table 16 indicates that the percentage increase in both the equity supply and the corporate bond supply brought about by a 10 percent increase in the supply of money has decreased throughout most of the data period.

For each of the variables, the effect is larger in the first portion of the period (1927-41) than in the latter portion (1950-72).

Table 16 implies that for the years 1927-41, the percentage increase brought about by the increase in the money supply is approximately twice as large for equity supply than it is for corporate bond supply. During 1950-72 this difference is apparently enlarged in that the percentage effect on equity supply is now roughly 10-12 times that on the corporate bond supply.

Rate of return on equity--Increasing the money supply decreases the rate of return on equity. Table 15 shows the magnitude of this effect is larger for the years 1927-41 and is steadily decreasing in absolute value for the years 1950-72.

Rate of return on corporate bonds--Table 15 indicates a positive but quite small and almost continuously decreasing effect upon this rate brought about by an increase in the money supply.

Rate of return on government securities--Increasing the money supply has a small and steadily decreasing positive effect upon the rate of return on government securities (CP).

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

The manner in which the model has been specified dictates that the entire increase in the supply of money will be added to the holdings of the consumer sector.

The rate of return on money has been assumed to be zero being exogenously fixed at that level.

> When the supply of any asset is increased, the structure of rates of return, on this and other assets, must change in a way that induces the public to hold the new supply. When the assets' own rate can rise, a large part of the necessary adjustment can occur in this way. But if the rate is fixed, the whole adjustment must take place through reductions in other rates or increases in prices of other assets.[59]

As evidenced in the last chapter, the only rate of return that was reduced when the supply of money was increased was the rate on equities. In fact, every asset and every rate in the model except for equities and the rate on equities, increased when the money supply was increased.

According to this model, the consumer sector adjusted its portfolios in favor of government securities, money, and corporate bonds at the expense of their equity holdings.

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[59] James Tobin, "A General Equilibrium Approach to Monetary Theory," Journal of Money, Credit and Banking (1969):26.

An increase in money stock results in an increase in money holdings. The consumers can be induced to hold this additional money only through reduction in other rates. The only rate in the money demand function is the rate on equity; therefore this rate must be reduced.

An increase in the money supply increases all assets except equities in each of the years. The effect of the change in money, however, is diminishing through time. This would indicate that monetary policy, in order to have the same magnitude of effect on the consumer sector, would have to consist of almost continuously increasing percentage changes in the money supply.

The consumers then invest in those assets whose rates of return have gone up relative to equities (corporate bonds and government securities). The increase in consumer holdings of government securities is much greater than that of corporate bonds which coincides with the changes induced in the rates of return of these assets.

Since the rate of return on corporate bonds has risen relative to the rate of return on equity, equity financing has become 'cheaper' relative to bond financing resulting in a larger increase in equity financing.

Two of the major hypotheses concerning the channels of influence by which changes in the supply of money affect the stock market are that money exerts an indirect influence via changes in interest rates, or that changes in the supply of money possess a direct influence by means of changing expenditures.

Keran (see pages 46-53 of this paper), is an advocate of the indirect hypothesis suggesting that changes in the money supply influence the stock market through its effects upon corporate earnings and the long term bond rate. Another article advocating this hypothesis is authored by Homa and Jaffee and the following is a paraphrase of their explanation of the channel of influence.

Given the demand for money, an increase in the supply of money reduces interest rates and increases interest sensitive expenditures such as capital investments. The increase in expenditures causes an increase in the firm's sales increasing earnings and therefore dividends. Increasing the supply of money directly reduces the riskless interest rate component of the investor's discount rate and leads to a reduction in the risk premium.[60]

The advocates of the direct approach include Sprinkel and Mascia (see pages 54-56 of this paper). Sprinkel explains the influence of an increase in the money supply as stemming from the imbalance created between the desired and actual amounts of money held, resulting in a rearrangement of portfolios and thus in an increase in price of all assets including equities.[61]

In this study the increase in the money supply becomes an increase in the holdings of money by the consumer sector and therefore represents a reduction in the holdings of equity in every year of the data period.

An attempt has been made to integrate the theory of the firm with portfolio theory with the objective being the observation of the

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[60] Kenneth E. Homa and Dwight M. Jaffee, "Money and Common Stock Prices," The Journal of Finance (December 1971):1046-47. This is a paraphrase of their statements.

[61] Beryl Wayne Sprinkel, Money and Markets (Homewood, Illinois: Richard D. Irwin, Inc., 1971), pp. 232-33.

effects of a change in the money supply upon the holdings of assets by the consumer sector and upon the supplies of corporate bonds and equities.

No matter which hypothesis one adheres to this paper points out the importance of the assumptions concerning the formulation and changes in the demand function for money. If money is assumed to have an indirect influence then the rate of return on equity appears in this model as a key variable. The consumers are induced to hold the increase in money by means of the reduction in the rate of return on equity.

A pertinent question would then be, is the rate of return on equity an important variable in the demand function for money? Support for the inclusion and importance of the rate of return on equity in the demand function for money is found in the following statement by Hamburger.

> When currency plus demand deposits and the liabilities of financial intermediaries are viewed relative to other assets, they are both equally effective substitutes for bonds, whereas the latter are relatively poor substitutes for equities
>
> Second, interest rates appear to be the most important determinants of the short run movements in household money balances. The two interest rates used here--the yield on financial assets and the yield on equities--explain nearly one-half of the variance in the relative quarterly first differences in real money balances.
>
> Third, marketable financial assets do not appear to be much closer substitutes for money (narrowly defined) than equities. On the margin equal percentage increases in the yields on these assets will set off similar shifts from money to equities.[62]

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[62]Michael J. Hamburger, "The Demand for Money by Households, Money Substitutes, and Monetary Policy," Journal of Political Economy 75 (December 1966):621.

This paper further demonstrates that changes in the supply of money effect the relative supplies of corporate bonds and equities which tends to, in the case of equity, reinforce the reduction in the rate of return on equity.

Recommendations for Further Study

The intention of this paper was to incorporate the supply side in the investigation of adjustments in consumers' portfolios induced by changes in the supply of money. One area of weakness in the reviewed literature is the lack of interest in the supply of assets. Since relative interest rates on all imperfect substitutes are viewed as being dependent upon the relative supplies of these assets, it appears that much more investigation of the supply of assets is needed.

Another major weakness of the reviewed articles, including the present study, is the lack of a definitive treatment of expectational variables (such as the rate of return on equity).

There is a great deal of interest in the ability to predict changes in the stock market and some of the articles reviewed dealt with this complex problem. However, until we can explain past behavior, exercises such as prediction appear premature. There appears to be a need for a great deal of study in the areas of both the demand and the supply of assets before much faith can be placed on predictions made that stem from relationships that are not fully understood.

APPENDICES

APPENDIX A

MONEY

APPENDIX A

MONEY

(Currency plus Demand Deposits)

Appendix A (and the following appendices) explain the methods of data collection utilized in the study.

All data is in current year end values expressed in millions of dollars unless otherwise specified.

Data for the period 1950-72, with the exception of equities, durables, and housing was taken directly from the Federal Reserve Flow of Funds Accounts 1945-1972.

Data for the earlier period, 1927-41, was extracted mainly from the works of Raymond Goldsmith et al., i.e., A Study of Saving in the United States, Vol. 1; Studies in the National Balance Sheet of the United States, Vol. 2; and The National Wealth of the United States in the Postwar Period. For this period, year end levels of consumers' assets were as a rule not available except for certain bench mark years; however the procedures utilized in arriving at these bench mark levels are either evident from the tables or are explained in the footnotes.[63]

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[63]Raymond W. Goldsmith, Dorothy S. Brady, and Horst Mendershausan, A Study of Saving in the United States (Princeton, New Jersey: Princeton University Press, 1956), pp. 42-101; and Raymond W.

The procedures used in accumulating data on each asset for the period 1927-41 are explained in the following tables.

Table A-1.--Money (Currency plus Demand Deposits).

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

Location: Table L3 column 5, p. 382 plus Table L5 column 7, p. 385 minus Table U-1 column 1, p. 853

Table A-2.--Savings Deposits (Time Deposits plus Credit Union Deposits, Mutual Savings Bank Deposits, and Saving and Loan Shares).

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

Asset: Time Deposits
Location: Table L6 column 6, p. 386

Asset: Credit Union Deposits
Location: Table L40 column 2, plus column 4, p. 427

Asset: Saving and Loan Shares
Location: Table J5 column 2, p. 441 minus Table L41 column 3, p. 429 plus Table J6 column 1, p. 443

Asset: Mutual Savings Bank Deposits
Location: Table L28 column 2, p. 413.

Goldsmith, Robert E. Lipsey, and Morris Mendelson, Studies in the National Balance Sheet of the United States, Vol. 2 (Princeton, New Jersey: Princeton University Press, 1963), pp. 72-85.

APPENDIX B

GOVERNMENT SECURITIES

APPENDIX B

GOVERNMENT SECURITIES

(Federal, State, and Local Securities)

Federal government securities held by the consumer sector equal gross federal debt minus (holdings of the banking system, state and local governments, financial intermediaries other than banks, government corporations and agencies, nonfinancial corporations, and foreigners).[64]

Table B-1.--Gross Federal Debt.

Reference: A Study of Saving in the United States, Vol. 1

Location: 1927-28, Table F7 column 1, p. 985
1929-32, Table F19 column 1, p. 1017
1933-41, Table F19 column 1, p. 1017 plus Table F20 column 1, p. 1019.

Holdings of federal securities by the banking system equal holdings by the Federal Reserve plus (holdings of operating and closed commercial banks, mutual savings banks and postal savings).[65]

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[64] Goldsmith, Lipsey, and Mendelson, pp. 72-85.

[65] Goldsmith, Brady, and Mendershausen, p. 94

Table B-2.--Holdings of Federal Securities by Banking System.

Years: 1927-41

Reference: Banking and Monetary Statistics

Asset: Federal Securities held by Federal Reserve

Location: p. 343

Reference: A Study of Saving in the United States, Vol. 1

1. Asset: Federal Securities held by operating commercial banks
   Location: Table V74 column 3, p. 577

2. Asset: Federal Securities held by closed commercial banks
   Location: Table V76 column 3, p. 579

3. Asset: Federal Securities held by Mutual Savings Banks
   Location: Table L29 column 7, p. 415.

4. Asset: Federal Securities in Postal Savings
   Location: Table L43 column 3, p. 431.

Table B-3.--Holdings of State and Local Governments.

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

1. Asset: Holdings of state governments
   Location: Table G17 column 5, p. 1071 (Fiscal year data averaged to give year end data)

2. Asset: Holdings of local government
   Location: Table G8 column 5, p. 1057.

Holdings of financial intermediaries other than banks include holdings of operating and closed savings and loan associations plus holdings of (credit unions, joint stock land banks, insurance companies, government trusts, life insurance departments of savings banks, pensions, and investment companies).[66]

Table B-4.--Holdings of Financial Intermediaries Other than Banks.

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

1. Federal Securities held by: Operating and closed saving and loan associations
   Location: Table J2 column 7, p. 436 plus Table V48 column 21, p. 536

2. Federal Securities held by: Credit unions
   Location: Table L41 column 8, p. 429.

3. Federal Securities held by: Joint stock land banks
   Location: Table V77 column 3, p. 580

4. Federal Securities held by: Insurance companies
   Location: Table I6 column 1, p. 456 plus Table I10 column 7, p. 462 plus Table V56 column 6, p. 555 plus Table I14 column 5, p. 467.

5. Federal Securities held by: Government trusts
   Location: 1927-28, Table F9 column 3, p. 989
   1929-36, Table F23 column 3 plus column 6, p. 1026
   1937-41, Table F23 column 3 plus column 6, p. 1026 plus Table D6 column 2, p. 705

6. Federal Securities held by: Life insurance departments of savings banks
   Location: Table V54 column 6, p. 551

7. Federal Securities held by: Investment companies
   Location: Table V62 column 3, p. 563 plus Table V72 column 6, p. 573 plus Table V60 column 3, p. 559 plus Table V48 column 11 plus column 12, p. 536

8. Federal Securities held by: Government corporations and credit agencies
   Location: 1927-28, Table F-7 column 2, p. 985
   1929-41, Table F19 column 2, p. 1017

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[66]Goldsmith, Brady, and Mendershausen, p. 96.

Table B-4.--Continued.

9. Federal Securities held by: Nonfinancial Corporations
   Location: Cumulative total of (first difference) Table V73 column 2, p. 575 minus sum of columns 9-13 Table V48, p. 535.

10. Federal Securities held by: Foreigners
    Location: Table K6 Line 18 gives bench mark years. Remaining years interpolated.

Reference: Financial Intermediaries in the American Economy Since 1900

Federal Securities held by: Pensions

Location: Table A10 Line 8, p. 371, gives the percentage of total assets invested in federal securities for the years 1922, 1929, 1933, 1939, and 1945. Using total assets obtained from A Study of Saving in the United States, Vol. 1, Table I16 column 1, p. 469, and interpolating for remaining years.

Consumers' holdings of state and local securities equal gross debt minus holdings of (nonfinancial corporations, banking system, government corporations and agencies, financial intermediaries other than banks, and state and local trust funds).[67]

Table B-5.--Gross Debt (State and Local).

Reference: A Study of Saving in the United States, Vol. 1

Location: 1927-41, Table G21 column 1 plus column 2, p. 1077

[67]Goldsmith, Lipsey, and Mendelson, pp. 72-85.

Table B-6.--Holdings of State and Local Securities by Nonfinancial Corporations, Banking Systems, Government Corporations, and Credit Agencies.

Reference: A Study of Saving in the United States, Vol. 1

Years: 1927-41

1. State and local securities held by: Nonfinancial corporations
   Location: Table V73 column 3, p. 575

2. State and local securities held by: Banking system
   Location: Table V74 column 4, p. 577 plus Table V76 column 3, p. 579 plus Table L29 column 8, p. 415

3. State and local securities held by: Government corporations and credit agencies
   Location: Table F14 column 4, p. 998

Holdings of financial intermediaries other than banks equal holdings of operating savings and loan associations plus (insurance companies, life insurance departments of savings banks, and face amount investment companies).

Table B-7.--Holdings of State and Local Securities by Financial Intermediaries Other than Banks.

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

1. State and local securities held by: Operating savings and loan associations
   Location: Table J2 column 6 minus column 7, p. 436

2. State and local securities held by: Insurance companies
   Location: Table I6 column 2, p. 456 plus Table I10 column 8, p. 462 plus Table V55 column 7, p. 553 plus Table V56 column 7, p. 555 plus Table I14 column 6, p. 467.

3. State and local securities held by: Life insurance departments of savings bank
   Location: Table V54 colunn 7, p. 551

Table B-7.--Continued.

4. State and local securities held by: Face amount investment companies
   Location: Table V72 column 7, p. 573.

Holdings of state and local government equal holdings of state and state own securities, local holdings, and state and local trust funds.

Table B-8.--Holdings of State and Local Government Securities by State and Local Governments.

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

1. Holdings of: State and state own securities
   Location: Table G17 column 4 plus column 3, p. 1071 (average of fiscal year data to obtain year end estimates)

2. Holdings of: Local governments
   Location: Table G8 column 4 plus column 3, p. 1057

Years: 1927-41

Reference: Financial Intermediaries in the American Economy Since 1900

Holdings of state and local trust funds

Location: Table All line 10b, p. 373 shows that 90 percent of total assets were in state and local securities up to 1933, when the percentage fell to 85 percent. The percentages for years 1939 and 1945 were computed by taking the amounts on Line 9 Table All as a percentage of total assets. Total assets were obtained from A Study of Saving in the United States, Vol. 1, Table G19 column 6 plus column 11, p. 1073. Intervening years were then found by interpolation.

APPENDIX C

CORPORATE BONDS

APPENDIX C

CORPORATE BONDS

Consumers' holdings of corporate bonds equal gross bonds outstanding minus (holdings of banking system, financial intermediaries other than banks and foreigners).[68]

Table C-1.--Gross Corporate Bonds Outstanding.

Years: 1927-41

Reference: Statistical Measures of Corporate Bond Financing Since 1900

Location: p. 21. Added to these figures from A Study of Saving in the United States, Vol. 1, Table V26 column 3, p. 507 plus Table R41 column 1, p. 635 plus Table V26 column 1, p. 507.[69]

Table C-2.--Holdings of Corporate Bonds by Banking System.

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

Location: Table V74 column 5, p. 577 plus Table L30 column 5, p. 417 plus a percentage of column 4 Table V76, p. 579. The percentage is obtained from Table V50 column 15, p. 543.

[68]Goldsmith, Brady, and Mendershausen, p. 65.

[69]For explanation of calculation of corporate bonds outstanding, see Raymond W. Goldsmith, A Study of Saving in the Unites States, Vol. 2 (Princeton, New Jersey: Princeton University Press, 1955), p. 304.

Holdings of financial intermediaries other than banks equal holdings of (life insurance companies, other insurance companies, insurance departments of savings banks, investment companies, credit unions, and pensions).

Table C-3.--Holdings of Corporate Bonds by Financial Intermediaries Other than Banks.

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 1

1. Holdings of corporate bonds by: Life insurance companies
   Location: Table I6 column 3, p. 456.

2. Holdings of corporate bonds by: Insurance departments of savings banks
   Location: Table V54 column 8, p. 551

3. Holding of corporate bonds by: Insurance companies
   Location: Table I10 column 10, p. 462 plus Table I14 column 7, p. 467 plus Table V55 column 8, p. 553 plus Table V56 column 8, p. 555

4. Holdings of corporate bonds by: Investment companies
   Location: Table V60 column 4, p. 559 plus Table V62 column 4, p. 563 plus Table V69 column 3, p. 571.

5. Holdings of corporate bonds by: Credit unions
   Location: Table L41 column 9, p. 429

6. Holdings of corporate bonds by: Foreigners
   Location: Table K6, p. 1089 gives data for 1922, 1933, and 1939. Total outstanding bonds for 1945 obtained from The Share of Financial Intermediaries in the National Wealth and National Assets 1900-1949, Occasional Paper 42. From these figures subtract individual holdings and holdings of financial intermediaries--line II14, p. 62 and line II14, p. 93 in A Study of Savings in the United States, Vol. 3. Remaining years found by interpolation.[70]

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[70]Goldsmith, Brady, and Mendershausen, p. 65. This same type procedure is used to arrive at individual's holdings.

Table C-3.--Continued.

Holdings of corporate bonds by: Pensions

Years: 1927-41

Reference: Financial Intermediaries in the American Economy Since 1900

Location: Table A10 line 5, p. 371 gives corporate bonds as percent of total assets for 1922, 1929, 1933, 1939, and 1945. Total assets of pension funds obtained from A Study of Saving in the United States, Vol. 1, Table I16 column 1, p. 469. Remaining years found by interpolation.

APPENDIX D

HOUSING

APPENDIX D

HOUSING

In this study the asset housing is defined as the valuation of 1-4 family nonfarm house and land.

Table D-1.--Housing.

Years: 1927-41

Reference: A Study of Saving in the United States, Vol. 3

Location: Table W1, p. 14, 1.15 percent of column 4[71]

Years: 1950-58

Reference: The National Wealth of the United States in the Postwar Period

Location: 1.15 percent of column 8 Table B10, p. 233

The data was extended to cover the period 1959-72 since no comparable figures were found in the literature for this period. The method employed, explained in the following tables, was based upon the figures obtained by Goldsmith for 1950-58 and the explanations given of the procedures utilized in arriving at these figures.[72]

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[71]Valuation of underlying land estimated to be 15 percent of structure value. See Raymond W. Goldsmith, The National Wealth of the United States in the Postwar Period (Princeton, New Jersey: Princeton University Press, 1962), p. 235.

[72]Ibid., pp. 226-35.

Table D-2.--Housing Expenditures (Part 1).

Year	Total Housing Nonfarm Expenditures	1-4 Family	Additions and Alterations	Including Farm	Column 2 ÷ Column 5
1959	19233	18181	4468		
1960	16422	15524	4680		
1961	16188	15303	5139		
1962	18638	17619	5344		
1963	20064	18966	4438		
1964	20612	19485	4438		
1965	20351	19238	4438		
1966	17964	16981	4585	19352	.9283
1967	17885	16907	4938	18985	.9406
1968	22423	21196	5018	24030	.9331
1969	23689	22393	5453	25941	.9132
1970	21914	20715	5940	24272	.9029
1971	32478	30701	6377	35066	
1972	41567	39293	6951	44879	
Average					.9262

Notes to Table D-2:

Column	Reference
2 (Except 1971, 1972)	Construction Review
2 for 1971, 1972	Calculated by multiplying the average of column 6 (.9262) by the column 5 figures for 1971, 1972.
3	Column 2 figures multipled by .9453 (obtained in Table D-3).
4	Construction Review
5	Construction Review

Table D-3.--Housing Expenditures (Part 2).

Year	Total Expenditure	1-4 Family	Column 3÷ Column 2
1946	3300	3150	.9545
1947	5450	5124	.9402
1948	7500	6900	.9200
1949	7257	6426	.8855
1950	11525	10666	.9255
1951	9849	9370	.9514
1952	9870	9440	.9564
1953	10555	10049	.9521
1954	12070	11579	.9593
1955	14990	14487	.9664
1956	13535	12980	.9590
1957	12615	12098	.9590
1958	13405	12855	.9590
Average			.9453

Notes to Table D-3:

Column	Reference
2,3	<u>The National Wealth of the United States in the Postwar Period</u>. Starting in 1959, the column 2 series includes farm dwellings. To obtain nonfarm 1-4 family units, the average figure of column 4 (.9453) was multiplied by column 2 figures for 1959-72 to obtain column 3 figures in Table D-2.
4	Column 3 divided by column 2.

Table D-4.--Expenditures on Private Nonfarm 1-4 Family Units.

Year	New Units	Settlement Cost	Additions and Alterations	Total of 1-3	Adjusted Expenditures (x 1.1180679)
1959	18181	273	4334	22788	25479
1960	15524	233	4540	20297	22693
1961	15303	230	4985	20518	22941
1962	17619	264	5184	23067	25790
1963	18966	284	4305	23555	26336
1964	19485	292	4305	24082	26925
1965	19238	289	4305	23832	26646
1966	16981	255	4447	21683	24243
1967	16907	254	4790	21951	24543
1968	21196	318	4867	26381	29496
1969	22393	336	5289	28018	31326
1970	20715	311	5762	26788	29951
1971	30701	461	6186	37348	41758
1972	39293	589	6742	46624	52129

Notes to Table D-4:

Column	Reference
2	Column 3 of Table D-2
3	.015 of Column 2[73]
4	.97 of additions and alterations from Table D-2[74]
5	Total of columns 2, 3, and 4
6	Column 5 times 1.1180679 (This figure calculated in Table D-5).

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[73]Ibid., p. 226. See Note 3.

[74]Ibid., p. 226. See Note 4.

Table D-5.--Housing Expenditures (Part 3).

Year	New Unit	Settlement Cost	Additions and Alterations	Total	Expenditure	Column 5 ÷ Column 6
1946	3150	47	1268	4465	4860	.9187
1947	5124	77	1998	7199	7461	.9649
1948	6900	104	2393	9397	10718	.8767
1949	6426	96	2134	8656	9635	.8984
1950	10666	160	2328	13154	13430	.9794
1951	9370	141	2415	11926	13955	.8546
1952	9440	142	2703	12285	14224	.8637
1953	10049	151	2866	13066	15435	.8465
1954	11579	174	2923	14676	16147	.9089
1955	14487	217	3275	17979	20242	.8882
1956	12980	195	3584	16759	19532	.8580
1957	12098	181	3786	16065	18519	.8675
1958	12855	193	3743	16791	18629	.9013

Notes to Table D-5:

Reference: <u>The National Wealth of the United States in the Postwar Period</u>.

Column	Source
2	Reference, Table B2 column 1, p. 226.
3	Reference, Table B2 column 3, p. 226.
4	Reference, Table B2 column 4, p. 226
5	Sum of columns 2, 3, and 4.
6	Reference, Table B5 column 1, p. 229.
7	Column 5 divided by column 6. The average is .8944, reciprocal 1.1180679. This latter figure was used to calculate column 6 of Table D-4.

Table D-6.--Depreciation.

Year	Expenditure	Depreciation	Net Investment	Stock (K)	Depreciation as Percent of (K-1)
1945				174237	
1946	6311	4450	1861	176098	.02554
1947	8006	4539	3467	179565	.02578
1948	10227	4651	5576	185141	.02590
1949	9437	4779	4658	189799	.02581
1950	12471	4918	7553	197352	.02591
1951	12030	5073	6957	204309	.02571
1952	11938	5218	6720	211029	.02554
1953	12732	5366	7366	218395	.02543
1954	13340	5526	7814	226209	.02530
1955	16337	5710	10627	236836	.02524
1956	15095	5907	9188	246024	.02494
1957	14052	6091	7961	253985	.02476
1958	14007	6286	7721	261706	.02475

Notes to Table D-6:

Reference: The National Wealth of the United States in the Postwar Period.

Column	Source
2	Reference, Table B5 column 2, p. 229.
3	Reference, Table B5 column 4, p. 229.
4	Reference, Table B5 column 7, p. 229.
5	Reference, Table B10 column 5, p. 233.
6	Column 3 divided by previous year's column 6. The average being .02543.

Table D-7.--Valuation of Housing.

Year	Adjusted Expenditure	Annual Average Boeckh Index 47-49=100	Expenditure in 47-49 Prices	Depreciation	Net Investment	Stock 47-49=100	Year End Boeckh Index 47-49=100	Stock in Current Prices
1958						261706		
1959	25479	137.4	18544	6655	11889	273595	139.4	381391
1960	22693	139.7	16244	6950	9294	282889	139.1	393499
1961	22941	140.1	16375	7185	9190	292079	140.8	411247
1962	25790	142.5	18098	7412	10686	302765	143.5	434468
1963	26336	145.5	18100	7674	10426	313191	147.6	462270
1964	26925	149.6	17998	7926	10072	323263	151.4	489420
1965	26646	154.4	17258	8168	9090	332353	157.4	523124
1966	24243	161.1	15048	8381	6667	339020	164.3	557010
1967	24543	170.7	14378	8529	5849	344869	175.9	606625
1968	29496	183.3	16092	8653	7439	352308	190.6	671499
1969	31326	198.4	15789	8811	6978	359286	202.7	728273
1970	29951	208.9	14337	8968	5369	364655	215.6	786196
1971	41758	226.7	18420	9076	9344	373999	238.1	890492
1972	52129	248.8	20952	9272	11680	385679	255.5	985410

Notes to Table D-7:

Column	Source.
2	Column 6 from Table D-4.
3	From Construction Review and Survey of Current Business.
4	Column 2 divided by column 3.
5	.02543 times preceding year's figure in column 7 (.02543 is average yearly depreciation for 1946-58 calculated in column 6 Table D-6).
6	Column 4 minus column 5.
7	1958 figure from The National Wealth of the United States in the Postwar Period, Table B10 column 5, p. 233 (1959-72 calculated by adding each year's net investment [column 5] to previous year's stock.
8	Same source as column 3.
9	Column 7 times column 8

APPENDIX E

DURABLES

APPENDIX E

DURABLES

Table E-1.--Durables.

Years:	1927-41
Reference:	A Study of Saving in the United States, Vol. 3
Location:	Table W-1 column 12, p. 14
Years:	1950-58
Reference:	The National Wealth of the United States in the Postwar Period
Location:	Table A38 column 2, p. 183

The data was extended to cover the period 1959-72, employing methods similar to those procedures utilized by Goldsmith for the years 1950-58.[75]

[75]Ibid., pp. 241-307.

Table E-2.--Durables Constant 47-49 Prices.

Year	Expenditures Nonfarm	Expenditures Farm	Depreciation Nonfarm	Depreciation Farm	Net Investment Nonfarm	Net Investment Farm	Stock Nonfarm	Stock Farm
1945							51026	6501
1946	16468	2193	10159	1299	6309	894	57335	7395
1947	19305	2428	11245	1419	8060	1009	65395	8404
1948	19745	2706	12507	1585	7238	1121	72633	9525
1949	21217	2592	13823	1745	7394	847	80027	10372
1950	26912	3007	15530	1938	11382	1069	91410	11441
1951	23763	2765	17082	2138	6681	627	98090	12068
1952	23743	2270	18171	2202	5572	68	103662	12136
1953	26468	2713	19370	2294	7098	419	110760	12555
1954	27308	2302	20741	2364	6567	-58	117327	12497
1955	34046	2426	22557	2422	11489	4	128816	12501
1956	32775	2272	24414	2467	8367	-195	137177	12306
1957	33127	2251	26096	2468	7031	-217	144208	12089
1958	30671	2388	27206	2477	3465	-89	147673	12000

Notes to Table E-2:

Years: 1945-58

Reference: <u>The National Wealth of the United States in the Postwar Period</u>

Column	Source
2	Reference, column 2 Table B32, p. 253 plus column 1 Table B19, p. 241.
3	Reference, column 1 Table B72, p. 294 plus column 2 Table B66, p. 289.
4	Reference, column 4 Table B32, p. 253 plus column 1 Table B21, p. 243.
5	Reference, column 1 Table B74, p. 296 plus column 4 Table B66, p. 289.
6	Column 2 minus column 4.
7	Column 3 minus column 5.
8	Reference, column 2 Table B37, p. 261 plus column 1 Table B35, p. 259.
9	Reference, column 1 minus column 3 Table B85, p. 306 plus column 5 Table B82, p. 303.

Table E-3.--Depreciation of Durables.

Year	Expenditure	Depreciation	Net Investment	Stock (K)	Depreciation as Percent of (K-1)
1945				57527	
1946	18661	11458	7203	64730	19.92
1947	21733	12664	9069	73799	19.56
1948	22451	14092	8359	82158	19.10
1949	23809	15568	8241	90399	18.95
1950	29919	17468	12451	102851	19.32
1951	26528	19220	7308	110158	18.69
1952	26013	20373	5640	115798	18.49
1953	29181	21664	7517	123315	18.71
1954	29611	23102	6509	129824	18.73
1955	36472	24979	11493	141317	19.24
1956	35047	26881	8166	149483	19.02
1957	35378	28564	6814	156297	19.11
1958	33059	29683	3376	159673	18.99

Notes to Table E-3:

Column	Source
2	Table E-2, column 2 plus 3
3	Table E-2, column 4 plus column 5
4	Table E-2, column 6 plus column 7
5	Table E-2, column 8 plus column 9
6	Column 3 divided by column 5 of the previous year

Table E-4.--Durables in Constant 1958 Dollars.

Year	Expenditure	Depreciation	Net Investment	Stock (K)
1958	37.9			178.75
1959	43.7	34.07	9.63	188.38
1960	44.9	35.91	8.99	197.37
1961	43.9	37.62	6.28	203.65
1962	49.2	38.82	10.38	214.03
1963	53.7	40.79	12.91	226.94
1964	59.0	43.25	15.75	242.69
1965	66.6	46.26	20.34	263.03
1966	71.7	50.13	21.57	284.60
1967	72.9	54.24	18.66	303.26
1968	81.3	57.80	23.50	326.76
1969	85.6	62.28	23.32	350.08
1970	83.8	66.73	17.07	367.15
1971	92.5	69.98	22.52	389.67
1972	104.9	74.27	30.63	420.30

Notes to Table E-4:

Column	Source
2	Survey of Current Business
3	.1906 (average of column 6 Table E-3) times previous year in column 5.
4	Column 2 minus column 3
5	The first figure (178.75) obtained from The National Wealth of the United States in the Postwar Period, Table A38 column 1, p. 183. Remaining years are cumulative using net investment.

Table E-5.--Valuation of Durables.

Year	Stock 1958 Prices	Current Price	1958 Price	Column 3÷ Column 4	Stock in Current Prices
1958	178.75				178.75
1959	188.38	170.8	170.3	1.0029359	188.93
1960	197.37	169.7	170.3	.9964768	196.67
1961	203.65	169.8	170.3	.9970640	203.05
1962	214.03	168.5	170.3	.9894304	211.77
1963	226.94	172.1	170.3	1.0105695	229.34
1964	242.69	172.8	170.3	1.0146799	246.25
1965	263.03	171.1	170.3	1.0046975	264.27
1966	284.60	172.3	170.3	1.0117439	287.94
1967	303.26	177.3	170.3	1.0411039	315.73
1968	326.76	181.7	170.3	1.0669406	348.63
1969	350.08	189.9	170.3	1.1150910	390.37
1970	367.15	200.9	170.3	1.1796829	433.12
1971	389.67	204.2	170.3	1.1990604	467.24
1972	420.30	209.7	170.3	1.2313564	517.54

Notes to Table E-5:

Column	Source
2	Table E-4 column 5
3,4	Figures for 1959-62 from Goldsmith's price index found in Table 39 column 9, p. 171 in _Studies in the National Balance Sheet of the United States_, Vol. I. Data for 1963-72 found by multiplying the price index obtained from _Survey of Current Business_ (1957-59=100) by 1.6712 (the average factor between that price index and the price index used by Goldsmith)
5	Column 3 divided by column 4
6	Column 2 times column 5

APPENDIX F

EQUITIES

APPENDIX F

EQUITIES

Years	Method
1950-68	Institutional Investors and Corporate Stock--A Background Study, pp. 305 and 306 adding foundations, colleges, universities, and personal trusts to make figures comparable to earlier data.
1927-41	The net change in the number of shares of common stock held by individuals located in A Study of Saving in the United States, Vol. 1, Table V-10 column 3, p. 483.
	Stock prices obtained from Studies in the National Balance Sheet of the United States, Vol. 1, Table 39 column 10, p. 170.

The method employed in this study for deriving estimates of the valuation of common stock held by the consumer sector for the years 1927-41 and 1969-72 is based upon the process utilized by Goldsmith et al. in obtaining these estimates for 1946-58.[76]

Estimates of these values for the years 1922, 1929, 1933, 1939, and 1945 were calculated by Goldsmith et al.[77]

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[76] Raymond W. Goldsmith, Robert E. Lipsey, and Morris Mendelson, Studies in the National Balance Sheet, Vol. 2 (Princeton, New Jersey: Princeton University Press, 1963), pp. 316-17.

[77] Ibid., pp. 72-85.

The calculation of the estimates is explained in Tables F-1 through F-3. The formula

$$S_{t-n} = BM_t \prod_{i=0}^{n-1} \left(\frac{I}{E}\right)_{t-i} - \sum_{\gamma=0}^{n-1} \tau NI_{t-\gamma} \left(\frac{E}{A}\right)_{t-\gamma} \prod_{i=\gamma}^{n-1} \left(\frac{I}{E}\right)_{t-i}$$

was then utilized to compute the factor τ which was then used to adjust the yearly net changes in order to arrive at the values Goldsmith et al. obtained for the above mentioned bench mark years where:

BM_t = bench mark value at year t

$\frac{I}{E}$ = beginning of year price divided by end of year price

NI = net change in number of shares held by the consumer sector

$\frac{E}{A}$ = end of year price divided by average price

S_{t-n} = market value of shares held by consumer sector at n years prior to bench mark year of t

Table F-1.--Valuation of Equity 1927-45.

Year	NI	Adjusted NI	End of Year Price÷Initial Price	End of Year Price÷ Average Price	New Issues At End of Year Price	Initial at End of Year Price	Total Value At End of Year Price
1927	1797	1612	1.27	1.12	1805.44	112444	114250
1928	2941	2639	1.33	1.14	3008.46	151952	154961
1929	4174	3745	.87	.93	3482.85	134816	138299
1930	889	-5773	.71	.83	-4791.59	98192	93401
1931	356	-2312	.52	.69	-1595.28	48568	46973
1932	52	- 338	.83	.91	- 307.58	38988	38680
1933	166	-1078	1.51	1.20	-1293.60	58407	57113
1934	282	361	.95	.97	350.17	54258	54608
1935	-231	- 296	1.42	1.17	- 346.32	77543	77197
1936	- 40	- 51	1.26	1.12	- 57.12	97268	97211
1937	628	803	.66	.79	634.37	64159	64793
1938	79	101	1.12	1.06	107.06	72569	72676
1939	433	554	1.00	1.00	544.00	72676	73230
1940	381	525	.87	.93	488.25	63710	64198
1941	530	731	.85	.92	672.52	54568	55241
1942	115	159	1.08	1.04	165.36	59660	59826
1943	285	393	1.20	1.09	428.37	71791	72219
1944	327	451	1.14	1.07	482.57	82330	82812
1945	942	1298	1.33	1.14	1479.72	110140	111620

Notes to Table F-1:

Column	Source
2	_A Study of Saving in the United States_, Vol. 1, Table V10 column 3, p. 483.
3	Derived by use of the formula given earlier.
4,5	Calculated from the price index given in _Studies in The National Balance Sheet of the United States_, Vol. 1, Table 39 column 10, p. 171.
6	Column 3 times column 5.
7	Column 8 minus column 6.
8	Starting with 1945 figure obtained from _Studies in the National Balance Sheet of the United States_, Vol. 2, Table I line 16 plus line 17, p. 42. Subtract column 6 and divide by column 4 to obtain column 8 of preceding year.

Table F-2.--Valuation of Equity 1969-72.

Year	NI	End of Year ÷ Initial	Average Price	End of Year ÷ Average Price	New Issue at End of Year	Initial at End of Year Price	Total	Total Excluding Intercor-porate
1968							1243550	1045000
1969	8396	.87	359.2	.93	7808.3	1081889	1089697	915345
1970	8630	1.01	336.2	1.01	8716.3	1100594	1109310	931820
1971	12961	1.10	355.6	1.05	13609.1	1220241	1233850	1036434
1972	13061	1.17	403.8	1.08	14105.9	1443605	1457711	1224477

Notes to Table F-2:

Column	Source
2	Federal Reserve Bulletin
3,4,5	Calculated from stock price index. Source of stock price index for these years is explained later.
6	Column 2 multiplied by column 5
7	Preceding column 8 figures multiplied by column 3
8	Column 6 plus column 7
9	.84 multiplied by column 8 figure (.84 is the average of column 4 in Table F-3).

Table F-3.--Valuation of Consumer Sector's Holdings (in Billions).

Year	Total Value of Stock for All Domestic Corporations	Value of all Stock of Domestic Corp. Excluding Intercorp. Hold.	Column 3÷ Column 2	Individual Holdings (Millions)	Column 5÷ Column 3
1952	225.4	180.8	.80	169742	.94
1953	219.7	177.3	.81	165041	.93
1954	298.0	246.4	.83	226888	.92
1955	352.3	290.3	.82	268425	.92
1956	351.4	291.0	.83	268825	.92
1957	313.5	262.4	.84	241194	.92
1958	448.7	372.4	.83	343504	.92
1959	499.1	417.7	.84	384707	.92
1960	494.8	416.6	.84	382476	.92
1961	658.8	553.4	.84	508294	.92
1962	564.2	470.5	.83	428769	.91
1963	698.3	595.0	.85	543399	.91
1964	792.2	673.4	.85	614706	.91
1965	893.5	757.7	.85	689120	.91
1966	811.2	689.5	.85	626304	.91
1967	1034.8	879.6	.85	796556	.91
1968	1229.4	1045.0	.85	949489	.91
			Avg .84		Avg .92

Notes to Table F-3:

Reference: Institutional Investors and Corporate Stock--A Background Study.

Column	Source
2	Reference, p. 413
3	Reference, p. 413
4	Column 3 divided by column 2
5	Reference, pp. 305-6
6	Column 5 divided by column 3 (The average is .92).

Notes to Table F-3 (continued):

Column 5 indicates that the consumer sector held 92 percent of all outstanding stock (excluding intercorporate holdings). Taking 92 percent of the values in column 9 of Table F-2 produces the values used for this study.

APPENDIX G

INSTALLMENT LOANS

APPENDIX G

INSTALLMENT LOANS

Table G-1.--Installment Loans.

Reference:	Household Capital Formation and Financing 1897-1962
Years:	1927-41
Location:	pp. 127-30, column 7

APPENDIX H

MORTGAGE LOANS

APPENDIX H

MORTGAGE LOANS

Table H-1.--Mortgage Loans.

Reference: Studies in the National Balance Sheet of the United States, Vol. 2

Years: 1927-41

Location: Table IV b11c-5 column 3, p. 292
and Table IV b11c-6 column 3, p. 293

APPENDIX I

RATES OF RETURN

APPENDIX I

RATES OF RETURN

Table I-1.--Rates of Return.

Rates of Return on	Years	Reference
Time Deposits	1927-41	A Study of Saving in the United States, Vol. 1, Table L23 column 2, p. 407
Time Deposits	1950-72	Savings and Loan Fact Book
Saving and Loan Shares	1927-72	Savings and Loan Fact Book
Mutual Savings Deposits	1927-41	Savings and Loan Fact Book
Mutual Savings Deposits	1950-72	National Fact Book Mutual Savings Banking
Corporate Bonds (Moody's Aaa)	1927-41	Banking and Monetary Statistics
Corporate Bonds (Moody's Aaa)	1950-72	Economic Report of the President
Commercial Paper rate	1927-34	Historical Statistics of the United States
Commercial Paper rate	1935-38	Federal Reserve Bulletin
Commercial Paper rate	1939-72	Economic Report of the President
Stock Price	1927-62	Studies in the National Balance Sheet of the United States, Vol. 1, Table 39 column 10, pp. 170-71.

Table I-1.--Continued.

Rates of Return on	Years	Reference
Stock Price	1963-72	Obtained by averaging the December-January stock prices for 1955-72 found in Survey of Current Business to arrive at year end levels. These figures were multiplied by 3.6846 which was the average factor between these stock prices and those found in the previously cited reference for the years 1955-62.

APPENDIX J

SUPPLY OF EQUITY

APPENDIX J

SUPPLY OF EQUITY

Table J-1.--Supply of Equity.

1927-41 1969-72	Obtained in the same manner as equity holdings of consumers using net issues in place of the change in holdings of individuals.
1950-68	*Institutional Investors and Corporate Stock--A Background Study*, p. 413.

APPENDIX K

CORPORATE EARNINGS AND TAXES

APPENDIX K

CORPORATE EARNINGS AND TAXES

Earnings before taxes plus the capital consumption allowance divided into total taxes gives the effective tax rate. The preceding is the manner in which Joseph Pechman calculated the effective tax rate and is the method used in this study.[78]

Table K-1.--Corporate Earnings and Taxes.

Asset: earnings before taxes, corporate taxes (total), and capital consumption allowance

Years: 1929-41

Reference: National Income Supplement to Survey of Current Business

Years: 1950-72

Reference: Survey of Current Business

Asset: Corporate taxes

Years: 1927, 1928

Reference: Federal Finances 1923-1932, p. 77.

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[78]Joseph A. Pechman, Federal Tax Policy (Washington, D.C.: The Brookings Institute, 1971), pp. 117-18.

Note to Table K-1:

Pechman estimates the corporate tax rate for 1927, 1928 at approximately 1 percent greater than that for 1929.[79] The earnings before taxes for 1927-28 were obtained by multiplying the total taxes paid by the reciprocal of the tax rate (1929 rate plus 1 percent).

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[79] Ibid., pp. 115, 307.

APPENDIX L

PERSONAL DISPOSABLE INCOME

APPENDIX L

PERSONAL DISPOSABLE INCOME

Table L-1.--Personal Disposable Income.

Reference:	A Study of Saving in the United States, Vol. 3.
Years:	1927-41
Location:	Table N-1 column 4, p. 427.

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