Volume Title: Corporate Capital Structures in the United States

Volume Author/Editor: Benjamin M. Friedman, ed.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-26411-4

Volume URL: http://www.nber.org/books/frie85-1

Publication Date: 1985

Chapter Title: Secular Patterns in the Financing of U.S. Corporations

Chapter Author: Robert A. Taggart, Jr.

Chapter URL: http://www.nber.org/chapters/c11417

Chapter pages in book: (p. 13 - 80)

1 Secular Patterns in the Financing of U.S. Corporations

Robert A. Taggart, Jr.

Developments in the financing of corporations are often traced by looking at financial ratios for the corporate sector as a whole. For many years, in both academic and business publications, patterns in these ratios have been observed, interpreted, and sometimes decried.[1] There is little consensus on what these patterns mean, however, and even some disagreement over what the patterns have been. Some studies, for example, argue that corporate debt ratios have increased sharply over the past two to three decades, and they point to such factors as inflation and the tax system to explain this trend.[2] Other studies assert that the corporate debt-equity mix has exhibited remarkable secular stability.[3]

Several factors have contributed to this lack of consensus. First, financial ratios can be measured in a variety of different units, such as book value versus market value or stocks versus flows. Different measurements are subject to different biases and thus present different pictures of the trends in corporate finance. Second, different time periods have been used to trace the behavior of these ratios. Studies emphasizing increased use of corporate debt, for example, focus generally on the post–World War II period, while those arguing for debt ratio stability typically encompass a longer period overall but do not include the most recent years' experience. Third, attempts to interpret financing trends have been hampered by the lack of a theoretical framework. With few excep-

Robert A. Taggart, Jr., is professor of finance at Boston University and a research associate of the NBER. The author is grateful to the NBER for financial support and to Michael Burda, Leslie Edison, and Wing Woo for research assistance. Helpful comments on earlier drafts were provided by Fischer Black, Benjamin Friedman, John Lintner, Terry Marsh, Robert McDonald, Stewart Myers, William Sahlman, and participants in the Finance Workshops at Harvard University, MIT, McGill University, and the University of Minnesota.

tions, previous studies have discussed these trends without reference to a detailed model.[4] Although this may seem odd in view of corporate capital structure's place among the central theoretical issues in finance, it should be kept in mind that many of the academic studies of aggregate financing trends came before theoretical work had progressed very far.More fundamentally, theoretical work that has been conducted has been largely aimed at the individual firm, and, until very recently, little analysis has been explicitly devoted to the determinants of corporate finance at the aggregate level.[5] Much of existing theoretical work, then, has not made it clear what to look for in attempting to explain secular financing patterns for the corporate sector as a whole.

In view of these difficulties, the purpose of the current study is to broaden existing perspectives on both the measurement and theory of corporate financing trends. One premise of this effort is that stepping back and looking at the longest possible period with different types of data will resolve some of the controversy over what these trends have been. A second premise is that the determinants of these trends can be further illuminated by examining current capital structure theories with the specific aim of drawing out their implications for aggregate financing patterns.

The paper consists of four sections. In section 1.1, the measurement issue is addressed. Observations from a number of previous studies are gathered and updated in order to present the broadest possible view of corporate financing trends from the beginning of this century to the present. Section 1.2 undertakes the first step in interpreting these trends by reviewing available capital structure theory. The major aim of this review is to identify the determinants of aggregate supplies and demands for corporate securities relative to competing securities in the capital market. In section 1.3, a very preliminary test is presented of existing theory's ability to explain the capital structure trends described in section 1.1. This is done by comparing trends in capital structure determinants, as predicted by existing theory, with the capital structure trends themselves. Finally, in section 1.4, some suggestions are offered for improving the ability of capital structure theory to explain the evolution of aggregate corporate financing patterns over time. These suggestions center around providing a fuller description of the role of corporate financing activities in the context of the financial system as a whole.

To preview some of the major conclusions, it is found that there has been an undeniable trend toward greater use of debt financing by corporations in the post–World War II period. Nevertheless, the relative level of corporate debt was unusually low around the time of World War II, and current debt levels are not unprecedented when viewed in the context of the twentieth century as a whole. The tax system, in conjunction with inflation, has probably played an important role in the postwar increases in corporate debt, but these factors appear insufficient to explain the trends over longer periods of time. In particular, it is argued that supplies of competing securities, such as federal government bonds, as well as the secular development of the financial intermediary system, may also be important determinants of long-run corporate financing patterns.

1.1 Measurement of Capital Structure Trends

Attempts to identify the secular trends in corporate financing encounter a variety of measurement problems. Comparable data series often are not available over long periods of time. Accounting conventions are subject to change, and fluctuations in economic conditions, especially the rate of inflation, may destroy the comparability of accounting numbers between periods. Market value numbers may be used in their stead, but these must be estimated with some error, and it is unclear to what extent market values reflect the actual financing decisions of corporations and to what extent they reflect other exogenous factors.

The approach taken here will be to present a variety of different measures of corporate financing trends and then to try to infer the common patterns that emerge. Four different types of data have been used in previous studies of corporate financing, and all four will be presented sequentially in the sections that follow. These include book value, market value, replacement cost, and flow-of-funds data. Each type of measurement has its problems and advantages, and these will be discussed as the data are presented.

Throughout the ensuing discussion, primary attention is devoted to corporations' relative use of debt and equity financing. This has been the focal point of most previous attempts to trace patterns in corporate financing and of capital structure theory as well. Where possible, however, trends in preferred stock, external versus internal equity, and short-term versus long-term debt will also be noted.

1.1.1 Book Value Balance Sheet Data

Perhaps the simplest approach to assessing corporate financing patterns is to examine changes in the composition of the liability side of the corporate balance sheet. This was the approach adopted by Miller (1963), for example, in a study undertaken for the Commission on Money and Credit. The Internal Revenue Service compiles balance sheet data both for U.S. corporations in the aggregate and for U.S. manufacturing corporations, and Miller's study examined these data for the period 1926–56. Using data through 1979, table 1.1 presents a variety of balance sheet ratios from this source, including the ratios of long-term debt and preferred stock to total capital. These data are plotted in figure 1.1.

As Miller pointed out in his study, the ratios of long-term debt to total

Table 1.1 **Selected Book Value Balance Sheet Ratios, All U.S. Corporations and U.S. Manufacturing Corporations**

	All U.S. Corporations			Manufacturing Corporations		
Year	LD/TC (1)	P/TC (2)	D/A (3)	LD/TC (4)	P/TC (5)	D/A (6)
1926	.21	.11	—	.09	.14	—
1927	.22	.11	—	.09	.14	—
1928	.23	.10	—	.10	.13	—
1929	.23	.09	—	.09	.12	—
1930	.24	.09	—	.10	.12	—
1931	.25	.10	—	.10	.13	—
1932	.26	.11	—	.11	.13	—
1933	.26	.11	—	.10	.14	—
1934	.26	.10	—	.10	.14	—
1935	.26	.11	—	.10	.14	—
1936	.26	.10	—	.10	.13	—
1937	.26	.10	.53	.10	.12	.26
1938	.27	.10	.54	.11	.13	.25
1939	.27	.09	.55	.11	.12	.25
1940	.26	.09	.57	.11	.11	.27
1941	.26	.08	.58	.11	.10	.31
1942	.24	.08	.61	.10	.10	.35
1943	.23	.08	.63	.09	.09	.36
1944	.23	.08	.64	.09	.09	.34
1945	.21	.08	.65	.09	.09	.30
1946	.21	.07	.64	.10	.09	.30
1947	.22	.07	.63	.11	.08	.31
1948	.23	.06	.62	.12	.07	.32
1949	.23	.06	.62	.12	.07	.28
1950	.23	.05	.63	.11	.06	.31
1951	.23	.05	.63	.13	.06	.35
1952	.24	.05	.65	.15	.05	.36
1953	.25	.04	.65	.15	.05	.36
1954	.25	.04	.65	.15	.05	.34
1955	.24	.04	.66	.15	.04	.35
1956	.25	.04	.65	.16	.04	.36
1957	.26	.04	.65	.17	—	.38
1958	.26	.03	.65	.17	—	.37
1959	.27	.03	.66	.17	—	.38
1960	.27	.03	.66	.17	.03	.38
1961	.28	.03	.66	.18	.03	.43
1962	—	—	—	—	—	—
1963	.28	—	.68	.17	—	.38
1964	.28	—	.68	.18	—	.39
1965	.28	—	.69	.19	—	.40
1966	.29	.02	.69	.21	.02	.43
1967	.29	—	.69	.21	—	.42
1968	.30	—	.70	.23	—	.45

Table 1.1 (continued)

	All U.S. Corporations			Manufacturing Corporations		
Year	LD/TC (1)	P/TC (2)	D/A (3)	LD/TC (4)	P/TC (5)	D/A (6)
1969	.31	—	.70	.23	—	.45
1970	.32	—	.71	.26	—	.49
1971	.33	—	.72	.27	—	.49
1972	.33	—	.72	.26	—	.49
1973	.34	—	.73	.26	—	.51
1974	.34	—	.74	.27	—	.53
1975	.34	—	.74	.28	—	.52
1976	.34	—	.74	.28	—	.53
1977	.34	—	.74	.27	—	.53
1978	.34	—	.75	.28	—	.54
1979	.33	—	.74	.28	—	.55

Source: Internal Revenue Service, *Statistics of Income*.

Note: LD = long-term bonds and notes; P = preferred stock; TC = total long-term capital = long-term debt + preferred stock + common equity; D = total debt; A = total assets.

long-term capital fluctuate but exhibit virtually no trend through the mid-1950s. The ratios of total debt (including liabilities of all kinds) to total assets show some tendency to rise in the late 1930s and early 1940s but exhibit no trend thereafter until at least the late 1950s.[6] The use of preferred stock, on the other hand, exhibits a steady secular decline through the early 1960s.[7]

Data that were not available to Miller at the time of his study, however, suggest that debt ratios have tended to drift steadily upward since the late 1950s. This may indicate a fundamental change in corporate financial policy, although Miller (1977) has warned that at least some of this apparent trend may be spurious. Liberalized depreciation allowances since the early 1960s, for example, would tend to depress reported equity values and would automatically tend to increase debt ratios. Inflation in the 1960s and 1970s has also caused distortions in book value measures of debt ratios. Such measures do not reflect inflation-induced transfers of value from bondholders to equityholders, for example. By the same token, inflation causes reported asset values to be understated, thus giving a misleading impression of the size of corporate debt relative to assets.[8]

If capital markets are efficient, investors should see through these accounting changes and should also adjust for the effects of inflation. Some of the problems described above may be circumvented, then, by the use of market value balance sheet ratios, and it is to these that we now turn.[9]

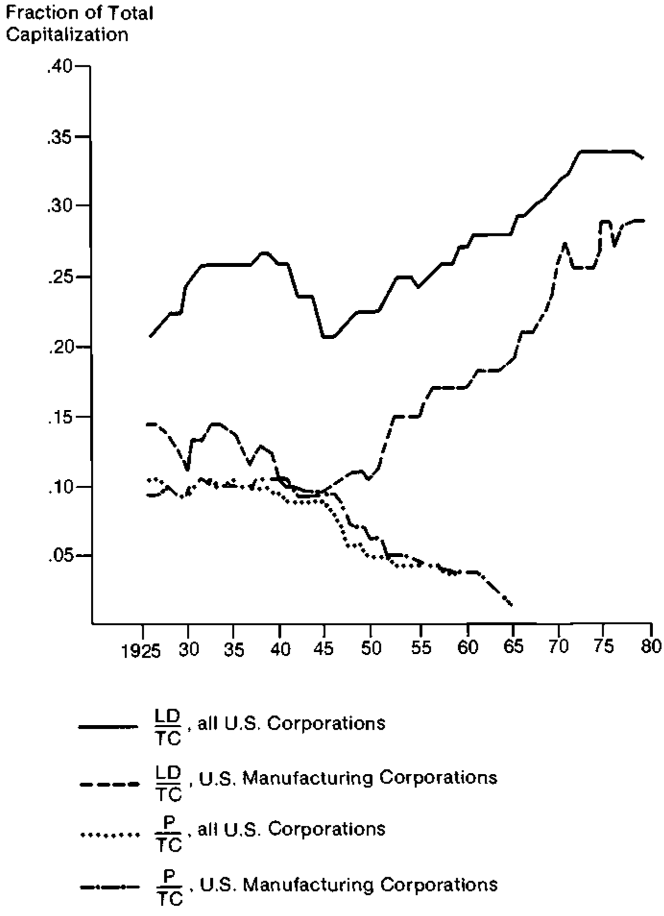

Fig. 1.1 Plot of book value financial ratio data from table 1.1.

1.1.2 Market Value Balance Sheet Data

Since market value data are not available for the nonfinancial corporate sector as a whole, they must be estimated. A variety of estimates using somewhat different techniques are presented in table 1.2. Several of these measures are also plotted in figure 1.2.

The most common approach is to take dividend and interest payments reported by corporations and to capitalize these at appropriate rates to obtain estimates of the market values of equity and debt, respectively. This approach has been followed by Holland and Myers (1979), using the dividend yield on the Standard and Poor's Composite Index and Moody's Baa corporate bond rate as capitalization rates. Their estimates, updated through 1981 are shown in column 1 of table 1.2. Like the accounting numbers in table 1.1, these estimates suggest that there has been a considerable increase in corporate debt ratios since the late 1950s. A major portion of this increase has apparently occurred during the decade of the 1970s. The increase is not nearly as smooth as the accounting numbers suggest, however, as dips occur in the early and late 1960s, and again in the early and late 1970s. Furthermore, although the 1930s and 1940s hardly could be characterized as a normal period, the estimates at least suggest that the debt ratios occurring in the 1970s are by no means unprecedented.

The estimates in columns 2 and 3 of table 1.2 are from von Furstenberg (1977), and they differ in two respects. First, dividend payments for common and preferred stock have been separated and capitalized at different rates. Second, von Furstenberg argued that the weighted average rating of corporate bonds outstanding has tended to be A or slightly better. He thus capitalized interest payments using the A-rated bond yield and also attempted to take into account the maturity composition of corporate debt. His estimates give consistently higher values for corporate debt ratios than those in Holland and Myers (1979), partly because of the lower capitalization rate for corporate debt and partly because the higher dividend yield on preferred stock gives a lower estimate for the combined market value of common and preferred stock. Nevertheless, the two series move in unison, with von Furstenberg's estimates also suggesting a considerable rise in corporate debt ratios since the mid-1950s. The estimates also reveal that the relative value of preferred stock has remained low throughout and has generally tended to decline, with the exception of a modest comeback in the mid-1970s.

A third approach has been followed by Gordon and Malkiel (1981), who use the sample of nonfinancial corporations for which data are reported on the Standard and Poor's COMPUSTAT Tapes. Market values of common equity can be observed directly for these companies. Market values of debt and preferred stock have been estimated using methods similar to von Furstenberg's but with the estimates derived from bond and preferred stock prices sampled at the two-digit industry level. Again, the estimated debt ratios, shown in column 4 of table 1.2, move in parallel with the other two series, with their absolute magnitudes generally falling between the other two. The estimates suggest the same increase in debt ratios, particularly since the late 1950s. Since both the von Furstenberg and the Gordon and Malkiel estimates range over a shorter period than those of Holland and Myers, however, they may give the impression that current debt ratios are higher by historical standards than is really the case.

The last approach to estimating market values, followed by Ciccolo (1982), uses observed market values for all securities for samples of roughly fifty U.S. manufacturing firms. Ciccolo has reported market

Table 1.2 Market Value Balance Sheet Ratios

Year	Holland & Myers	von Furstenberg		Gordon & Malkiel	Ciccolo	
	(1) D/(D+P+E)	(2) D/(D+P+E)	(3) P/(D+P+E)	(4) D/(D+P+E)	(5) D/(D+P+E)	(6) P/(D+P+E)
1926	—	—	—	—	.085	.102
1927	—	—	—	—	—	—
1928	—	—	—	—	—	—
1929	.13	—	—	—	—	—
1930	.18	—	—	—	.057	.097
1931	.25	—	—	—	—	—
1932	.39	—	—	—	—	—
1933	.37	—	—	—	—	—
1934	.32	—	—	—	—	—
1935	.36	—	—	—	.042	.120
1936	.24	—	—	—	—	—
1937	.27	—	—	—	—	—
1938	.41	—	—	—	—	—
1939	.32	—	—	—	—	—
1940	.33	—	—	—	—	—
1941	.38	—	—	—	.069	.155
1942	.44	—	—	—	—	—
1943	.28	—	—	—	—	—
1944	.28	—	—	—	—	—
1945	.25	—	—	—	—	—
1946	.16	—	—	—	—	—
1947	.17	—	—	—	.082	.091
1948	.17	—	—	—	—	—
1949	.23	—	—	—	—	—

1950	.18	—	—	—	—	—
1951	.19	—	—	—	—	—
1952	.21	.29	.04	—	—	—
1953	.21	.30	.04	—	.133	.058
1954	.22	.26	.04	—	—	—
1955	.16	.22	.03	—	—	—
1956	.15	.24	.03	—	—	—
1957	.17	.21	.03	.21	—	—
1958	.17	.25	.03	.17	—	—
1959	.16	.23	.02	.16	.084	.016
1960	.18	.26	.02	.17	—	—
1961	.16	.23	.02	.16	—	—
1962	.21	.27	.02	.18	—	—
1963	.18	.24	.02	.17	—	—
1964	.17	.22	.02	.16	—	—
1965	.17	.22	.02	.16	.080	.018
1966	.22	.28	.02	.19	—	—
1967	.19	.25	.02	.18	—	—
1968	.18	.23	.02	.18	—	—
1969	.22	.27	.02	.21	—	—
1970	.27	.32	.02	.22	—	—
1971	.26	.32	.02	.23	.132	.017
1972	.24	.30	.02	.23	—	—
1973	.31	.35	.02	.28	—	—
1974	.38	.45	.03	.36	—	—
1975	.32	.40	.03	.32	—	—
1976	.32	.38	.03	.29	.230	.150
1977	.34	—	—	.32	—	—
1978	.35	—	—	.33	—	—
1979	.36	—	—	—	—	—
1980	.32	—	—	—	—	—
1981	.28	—	—	—	—	—

Sources: Cited in text.

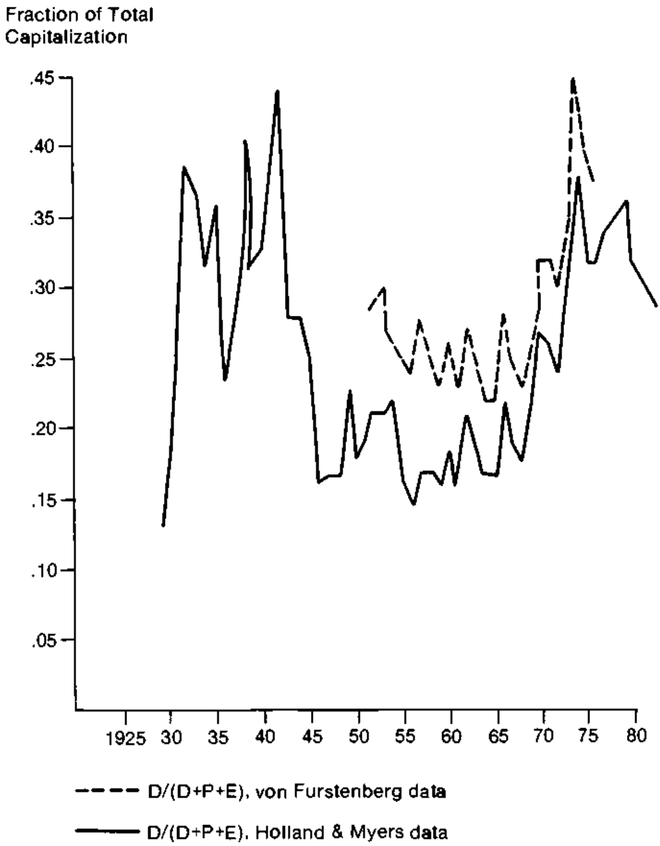

Fig. 1.2 Plot of market value debt ratios from table 1.2.

value balance sheet ratios for the aggregate of his sample firms for selected years, and these are shown in the last two columns of table 1.2. The debt ratios are generally much lower than those in the other series and do not move in parallel with the Holland and Myers estimates for the early years. The fact that the debt ratios are so much lower for all years raises the possibility that the sample may not be representative of the nonfinancial corporate sector as a whole. Nevertheless, Ciccolo's figures reveal the same increase in debt ratios since the 1960s that the other series do. Moreover, the preferred stock figures confirm the secular decline in the importance of preferred stock that appears in the accounting data of table 1.1.

1.1.3 Replacement Cost Data

Another ratio that has been used in previous studies to measure corporate leverage is that of the market value of debt to the replacement value of total assets. Like the market value data, replacement values are subject to substantial estimation error. However, replacement cost asset measures alleviate the overstatement in book value debt ratios during inflationary periods resulting from both the understatement of corporate assets and the overstatement of debt in real terms. Moreover, as we shall see in section 1.2, the replacement value of assets may have some theoretical advantages as a measure of debt capacity.[10] In any case, estimates of the ratio of the market value of debt to the replacement value of assets are available over a long period.

Two series of these ratios are available. One is from von Furstenberg's (1977) study and runs annually from 1952 to 1976, while the other is from Goldsmith's (Goldsmith et al. 1963) study of national balance sheets. Goldsmith's estimates are available for selected years from 1900 to 1945 and annually from 1945 to 1958. The two series are shown in table 1.3 and are plotted in figure 1.3. The figures from Goldsmith et al. suggest that nonfinancial corporations' use of debt financing relative to the replacement value of their assets was markedly lower in the decade following World War II than it had been earlier in the century. The figures from von Furstenberg indicate that corporate debt ratios then rose in the postwar period. Little trend is apparent after the early 1960s, however, suggesting that trends in the book value ratios in figure 1.1 may reflect inflationary distortions.

It can be seen from the years of overlap in the 1950s that there are some discrepancies between the two series. The ratios derived from Goldsmith's data, for example, are consistently somewhat lower than von Furstenberg's.[11] Moreover, Goldsmith's series itself may not give comparable data between prewar and postwar periods. Balance sheets from the prewar period are from Goldsmith (1958) while the annual data from 1945 to 1958 are from Goldsmith et al. (1963). Some changes in sectoral definitions and estimation methods occurred between these two studies, and the only year of overlap, 1945, indicates that these changes may have caused some differences in the debt ratios.

Nevertheless, some tentative conclusions can be drawn. Between 1952 and 1958, Goldsmith's and von Furstenberg's series move quite closely together, and it may be that they would exhibit similar trends throughout the whole period 1900–1978. If so, it appears that even though corporate debt ratios increased substantially in the postwar period, particularly from the mid-1950s to the mid-1960s, the debt ratios of recent years are not unusual by historical standards. Even if it is argued on the basis of the two 1945 estimates that the prewar figures are overstated by a third, the debt ratios of the 1960s and 1970s would still represent a return to roughly the levels that prevailed over the prewar period. The replacement value data, then, provide some further support for the impression gained from market value data that, while debt ratios have increased in recent de-

Table 1.3 Balance Sheet Ratios with Debt and Preferred Stock Measured at Market Value, Assets at Replacement Cost

	Goldsmith	von Furstenberg	
Year	(1) D/A	(2) D/A	(3) P/A
1900	.32	—	—
1912	.42	—	—
1922	.28	—	—
1929	.28	—	—
1933	.35	—	—
1939	.33	—	—
1945	(.15)[a] .10	—	—
1946	.13	—	—
1947	.14	—	—
1948	.14	—	—
1949	.14	—	—
1950	.13	—	—
1951	.14	—	—
1952	.15	.17	.02
1953	.15	.17	.02
1954	.15	.18	.03
1955	.15	.17	.03
1956	.16	.18	.03
1957	.17	.19	.02
1958	.17	.20	.02
1959	—	.19	.02
1960	—	.21	.02
1961	—	.22	.02
1962	—	.23	.02
1963	—	.24	.02
1964	—	.24	.02
1965	—	.25	.02
1966	—	.25	.02
1967	—	.24	.02
1968	—	.23	.02
1969	—	.23	.02
1970	—	.23	.02
1971	—	.24	.02
1972	—	.26	.02
1973	—	.27	.02
1974	—	.25	.02
1975	—	.24	.02
1976	—	.26	.02
1977	—	.27[b]	—
1978	—	.28	—

Sources: Cited in text.

[a]Figure in parentheses is from Goldsmith (1956). Other figure is from Goldsmith et al. (1963).

[b]Gordon and Malkiel (1981) update von Furstenberg's figures, using the same estimation method, through 1978. They do not report figures for preferred stock, however.

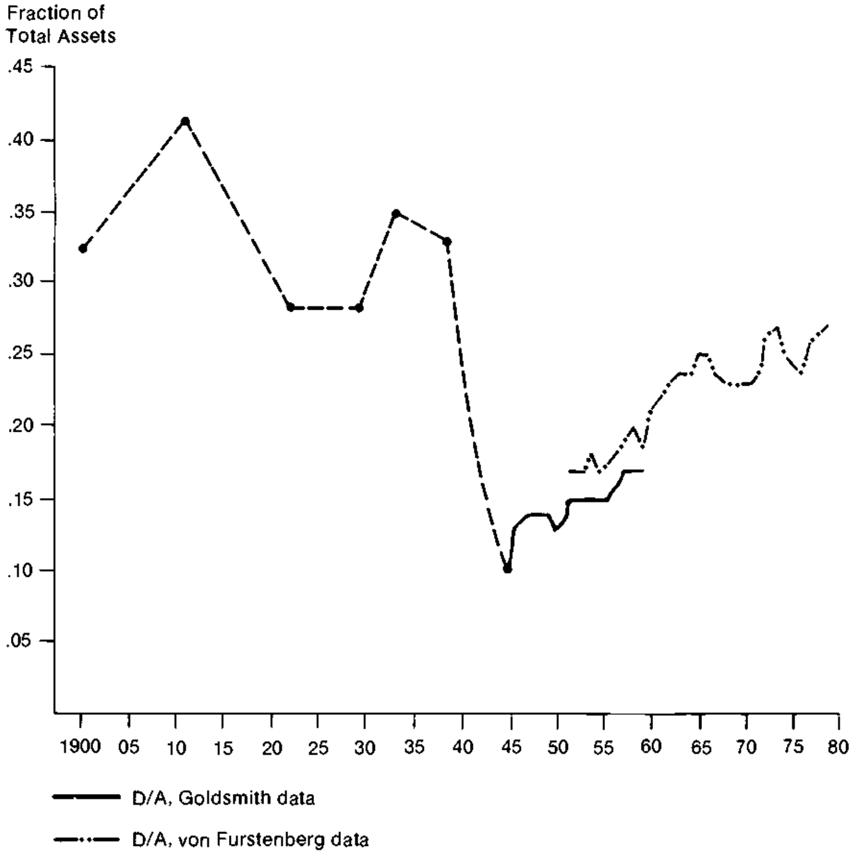

Fig. 1.3 Ratios of market value of debt to replacement cost of assets from table 1.3.

cades, after a relatively flat period in the 1940s and 1950s, they are nevertheless not unusual by prewar standards.

1.1.4 Flow of Funds Data

The final method for measuring corporate financing patterns makes use of flows of funds over periods of time as opposed to stocks at particular dates. While this method does not take into account inflation-induced valuation changes, as market value and replacement value estimates do, it may nevertheless come closest to recording the actual decisions made by corporations. Furthermore, since capital consumption allowances are included as a component of internal equity financing, this method is not subject to Miller's criticisms about understatement of equity financing in the wake of changes in depreciation accounting.[12]

Between Goldsmith's *Study of Saving* data, which run from 1900 to 1945, and the Federal Reserve *Flow of Funds Accounts* which cover the period 1946 to the present, it is possible to put together a fairly lengthy

Table 1.4 **Flow of Funds Data: Proportions of Total Financing Accounted for by Particular Sources of Funds**

Period	Total Debt / Total Sources (1)	Long-Term Debt / Total Sources (2)	Short-Term Liabilities / Total Sources (3)	Internal Funds / Total Sources (4)	New Stock Issues / Total Sources (5)
1901–12	.31	.23	.08	.55	.14
1913–22	.29	.12	.17	.60	.11
1923–29	.26	.22	.04	.55	.19
1930–39	negative	negative	negative	1.14	.19
1940–45	.15	negative	.20	.80	.05
1946–59	.30	.16	.14	.64	.05
1960–69	.36	.18	.18	.62	.02
1970–79	.45	.21	.24	.52	.03

Sources: Goldsmith et al. (1963) and Federal Reserve *Flow of Funds Accounts*.

record of corporate financing flows. The data are shown in table 1.4. Since the emphasis of this paper is on secular patterns in corporate financing, the flows are divided into periods covering roughly a decade each.

The same data have previously been examined by Kuznets (1961), Sametz (1964), and Friedman (1980). Kuznets and Sametz were limited to the period from 1900 through the late 1950s. Both were struck by the sharp decline in the use of stock issues as a financing source, and both argued that internal funds, disregarding the aberrant years of the Depression and World War II, had shown at least a modest upward trend relative to other financing sources. Both authors also pointed out that, although short-term liabilities fluctuated considerably, they generally increased relative to both total financing sources and total debt through the late 1950s. Finally, Sametz emphasized that, despite trends in internal funds and external equity and in short-term and long-term debt, the use of total debt financing relative to total equity financing appeared to have remained roughly constant over long periods of time.

Friedman, confining his attention to the postwar period, pointed out that internal funds first increased relative to total sources in the 1950s and then decreased in the 1960s and 1970s. He also emphasized the continued decline in stock issues, an increased use of debt, and, in the late 1960s and 1970s, an increase in the use of short-term debt.

Looking at the whole period, as shown in the data in table 1.4, the trends discussed by all three authors are evident, and at the same time some longer-run trends come into sharper focus. It is clear, for example, that the use of debt financing has increased in the 1960s and 1970s after recovering in the years following World War II to pre-Depression levels. Use of long-term debt, however, is by no means unusual, even after steady postwar increases, relative to the levels prevailing in the first decade of the century and in the 1920s. The increased use of debt, then, seems largely attributable to an increase in short-term liabilities. It should also be noted that short-term liabilities have shown considerable fluctuations over time, with substantial increases occurring in the 1913–22 period and again during the World War II years. Although it cannot be denied that short-term liabilities have been much higher in the postwar period than in the prewar years, it is not clear if the recent surge represents a temporary phenomenon or the continuation of a trend. In addition, it is likely that inflationary distortions account for some portion of the most recent increases in debt proportions generally.

On the equity side, the greatly diminished use of stock issues appears to be a long-term trend. Stock issues staged a modest comeback in the 1970s, compared with the 1960s, but they remain very low by prewar standards. Furthermore, much of the increase in the 1970s is accounted for by public utility preferred stock issuance (Friedman 1980). Because utilities are required to meet the demand for service, their investment and financing decisions reflect special factors that may not be present in the decisions of other nonfinancial corporations. As has been widely noted, internally generated funds have also declined relative to total sources during the postwar period. The data indicate, however, that the depressed levels of internal funds experienced in the 1970s are not unusually low relative to the levels of the first decade of the century and the 1920s. It might be inferred, instead, that the use of internal funds was unusually high during the period 1930–60 and that the past two decades have witnessed a return to roughly the levels experienced during the pre-Depression era.

1.1.5 Common Trends

Viewing the different measures of corporate financing patterns simultaneously, some common threads appear. First, the use of debt financing has increased considerably in the postwar period. Despite the presence of inflationary distortions in some of the data, this trend emerges regardless of the method of measurement employed. There is considerably more doubt, however, as to whether current debt levels are unusally high relative to those of the prewar period. The accounting-based data of tables 1.1 and 1.4 suggest that they are, but the measures that make some attempt to correct for valuation changes, as shown in tables 1.2 and 1.3, indicate that this may not be true. At the very least, the trend in corporate debt ratios has not been unidirectional. Rather, these ratios appear to have been somewhat low in the 1920s and especially in the years surrounding World War II. Thus, the postwar surge in corporate debt does not appear to be as dramatic when viewed in the light of the whole century's experience as it does when the postwar period is considered in isolation.

Second, some changes have occurred within the debt and equity components of corporate finance. Although it is traceable only in the sources- and uses-of-funds data, there appears to be little doubt that short-term liabilities have increased in importance over time. Again, however, the trend is not unidirectional. Within the equity component, there is no doubt that issues of both preferred and common stock have declined considerably in relative importance. Internally generated equity, on the other hand, is currently low relative to the previous few decades, but whether it is unusually low when a longer-run view is taken is far less clear.

1.2 Implications of Existing Theory for the Determinants of the Aggregate Corporate Capital Structure

Before the trends observed in the preceding section can be interpreted, a theory is needed to predict the causal factors underlying them. Existing capital structure theories are capable of identifying a number of such factors, although this has not been recognized as explicitly as it might be. In this section, the major capital structure theories are reviewed with an eye toward drawing out more explicitly the determinants of aggregate financing trends.

To facilitate this process, some of the theories will be recast in terms of their implications for the aggregate supply and demand for corporate securities. This analysis of aggregate supply and demand is carried out in section 1.2.1, while the determinants of aggregate capital structure trends are discussed in section 1.2.2. In the diagrams accompanying the text, the aggregate amount of corporate debt, B, will be measured along the horizontal axis, and since investment will be held fixed, movements along this axis represent substitutions of corporate debt for equity. On the vertical axis will be measured the certainty-equivalent yields on corporate debt, r, and on corporate equity, r_e.

In keeping with most previous literature, corporate capital structure will be taken to represent the mix of debt and common equity financing. The framework employed is more general than that, however, and could also be used to include preferred stock and a variety of other hybrid financing instruments.

1.2.1 A Brief Review of Existing Capital Structure Theories

Modigliani and Miller's (1958) analysis of corporate capital structure is the logical place to begin, both because it remains the classic paper on the topic and because it is a special case of most subsequent theories. In the context of a "complete" capital market, the Modigliani-Miller theorem implies that the aggregate supply and demand for corporate debt coincide and that both are perfectly elastic, as depicted in figure 1.4. Supply is perfectly elastic because corporations can costlessly transform their financing mixes from all equity to any degree of leverage. Thus they are willing to freely substitute one form of financing for the other as long as

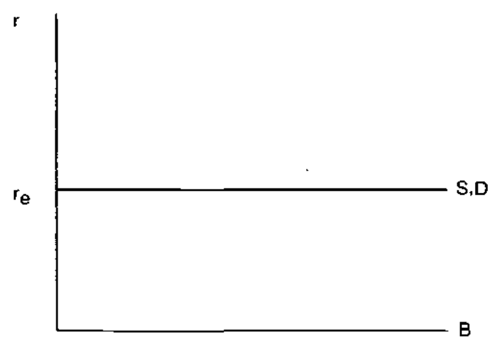

Fig. 1.4 Supply, S, and demand, D, for corporate debt implied by Modigliani and Miller (1958).

both have the same certainty-equivalent cost. But demand is likewise perfectly elastic because households can costlessly perform the same transformations on their own account, and thus they will be unwilling to accept any yield differential between the two securities.[13]

This configuration of supply and demand implies that corporate capital structure is indeterminate not only at the individual firm level but also at the level of the corporate sector as a whole, since corporate and household financial transformation are perfectly substitutable.[14] While this analysis emphasizes the important fact that corporations face competition from other sectors in their financial transformation activities, however, it also does not tell us much about factors that would cause the aggregate corporate financing mix to change over time. As long as equilibrium in the capital market is continuously maintained, such changes are largely random events.

Following Modigliani and Miller's (1963) correction for corporate taxes, a theory that gained considerable support took the trade-off between bankruptcy costs and tax savings from the deductibility of interest to be the primary determinant of corporate capital structure.[15] Under this theory the demand for corporate debt is still perfectly elastic, because investors are willing to substitute debt for equity freely as long as their certainty-equivalent yields are equal.[16] The supply of debt is no longer perfectly elastic, however. Because of the tax deductibility of interest, corporations would be willing to pay a certainty-equivalent yield on the first dollar of debt equal to $(1/1 - t_c)$ times the certainty-equivalent yield on equity, where t_c is the corporate tax rate. As more debt is issued, the probability of bankruptcy increases, and if bankruptcy imposes costs on firms, the premium rate that they are willing to pay to issue debt decreases. Thus the supply curve for corporate debt is downward sloping, as depicted in figure 1.5. Equilibrium is reached when the corporate sector has issued an amount of total debt that drives the certainty-equivalent yields on debt and equity into equality. Furthermore, since bankruptcy costs are firm specific, the optimal capital structure is determinate at the individual firm level as well as at the aggregate level. The aggregate supply curve for corporate debt may be thought of as a horizontal sum of individual firm supply curves, and the optimal capital structure for any firm is determined by the point at which r_e cuts its individual debt supply curve. As will be seen in section 1.2.2, the primary determinants of changing patterns in the aggregate corporate financial structure are changes in corporate tax rates and changing perceptions of bankruptcy costs.

The agency theory of Jensen and Meckling (1976) is diagrammatically similar to the tax savings–bankruptcy costs theory, but some of its implications are different. Again, the demand curve for corporate debt is perfectly elastic at the level r_e. Likewise the supply curve has its intercept

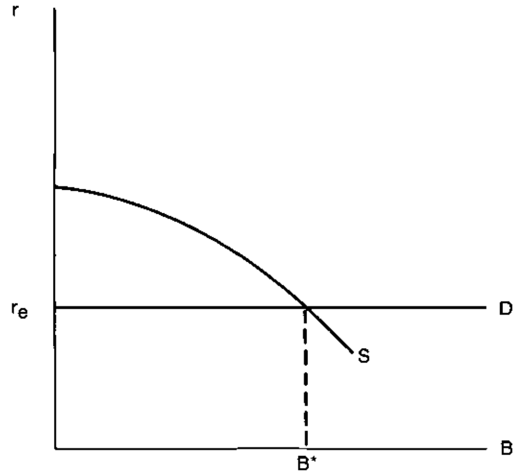

Fig. 1.5 Supply and demand for corporate debt implied by the tax-saving-bankruptcy costs theory.

at a point above r_e, because, starting from all-equity financing, the firm can reduce total agency costs associated with outside financing by substituting a dollar of debt for a dollar of outside equity. Thus the firm would be willing to pay a higher certainty-equivalent yield on debt to reflect this advantage. As more debt is issued, however, its ability to reduce agency costs at the margin declines and eventually turns negative, so the supply curve is downward sloping as depicted in figure 1.6.[17] As with the previous theory, the costs that cause this downward slope are firm specific, so equilibrium determines an optimal capital structure at the individual firm as well as at the aggregate level.

The difference between this theory and the previous one is that in the agency theory, the supply curve's vertical intercept lies above r_e even in the absence of taxes. In the tax savings–bankruptcy costs model, eliminating taxes would shift the intercept of the debt supply curve down to r_e. Under the agency cost theory, by contrast, the possibility of economizing on agency costs makes the firm willing to offer a premium rate on the first dollar of debt, even if it could realize no tax saving. Without specific knowledge of the nature of the agency costs, however, the vertical intercept of the debt supply curve cannot be identified as precisely in figure 1.6 as it can in figure 1.5.

Shifts in the relative agency costs of debt and equity would be the primary determinants under this theory of changing patterns in the aggregate corporate financial structure. In addition, there is an interaction in the agency cost theory between financing and investment. Certain types of assets may be more amenable than others to reducing the agency costs associated with either form of financing. Some types of assets may

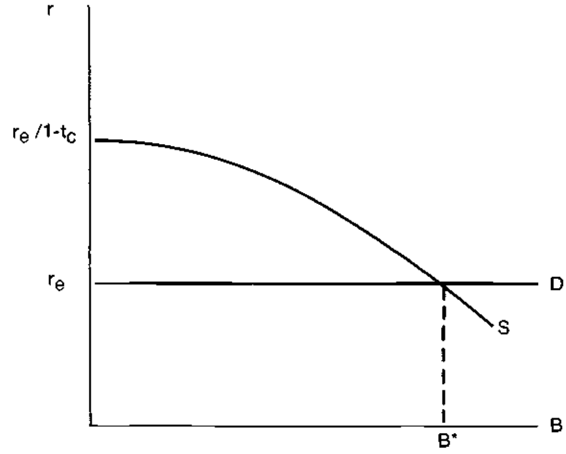

Fig. 1.6 Supply and demand curves for corporate debt implied by the agency cost theory of Jensen and Meckling (1976).

be more suitable for use as collateral, for example, and may facilitate the use of more debt. In the aggregate, then, changes in the characteristics of the corporate sector's capital stock may also influence changes in the aggregate financing mix.

As an aside, it might be mentioned that the Ross (1977) signaling model can be viewed for our purposes as very similar to the agency cost model. Corporate capital structures are determined by a combination of information and managerial incentive problems in the Ross model, and these would lead to a similar downward-sloping debt supply curve. For each firm in Ross's model, there is some amount of debt that maximizes its perceived value, subject to the equilibrium condition that investors' perceptions be correct. Because of the way their incentive compensation scheme is set up, the firm's managers would be willing to pay a premium yield to substitute debt for equity up to this optimal point, but a negative premium beyond that point. The signaling model is thus diagrammatically identical to the agency cost model. As in the agency cost model, asset characteristics would play an important role in secular financing patterns, since firms' optimal capital structures depend on the range of asset qualities across firms and on investors' ability to distinguish among them.

The only theory explicitly aimed at the capital structure of the corporate sector as a whole is Miller's (1977) "debt and taxes" model. Here, the supply curve is horizontal since, apart from tax considerations, corporations can costlessly split their return streams into debt and equity portions. Furthermore, because of the tax deductibility of interest they are willing to pay a premium yield, $r_e/1 - t_c$, to issue debt. Unlike the three theories discussed above, however, personal taxes are considered, and the demand curve is upward sloping, starting from r_e.[18] This is because investors are arrayed in groups subject to successively higher personal tax rates and because tax arbitrage restrictions make it costly for them to mitigate the differing tax consequences of different securities. Thus, since returns on corporate debt are taxed more heavily at the personal level than returns on corporate equity, investors in successively higher tax brackets must be enticed with successively higher yields to buy these bonds. As depicted in figure 1.7, equilibrium occurs when enough bonds have been issued to drive the corporate bond rate up to $r_e/1 - t_c$.

In contrast to the tax savings–bankruptcy costs theory and the agency cost theory, however, corporate capital structure is determinate only at the aggregate level, not at the individual firm level. As in the original Modigliani-Miller model, corporations and households compete with one another to perform financial transformations, but here they do not all compete on equal terms. Corporations that issue debt reap tax savings at the rate t_c per dollar of interest, and thus they have a comparative advantage in borrowing over those investors with personal tax rates lower than t_c. It will thus pay corporations to keep on borrowing until the marginal shareholder is just indifferent between buying levered shares and borrowing on his own account to buy unlevered shares. This will occur when the marginal shareholder's tax rate is just equal to t_c. Nevertheless, this comparative advantage applies to the corporate sector as a whole, but not to any individual firm. One corporation's debt is as good as any other's, and thus, in equilibrium, capital structure is of no consequence at the firm level.

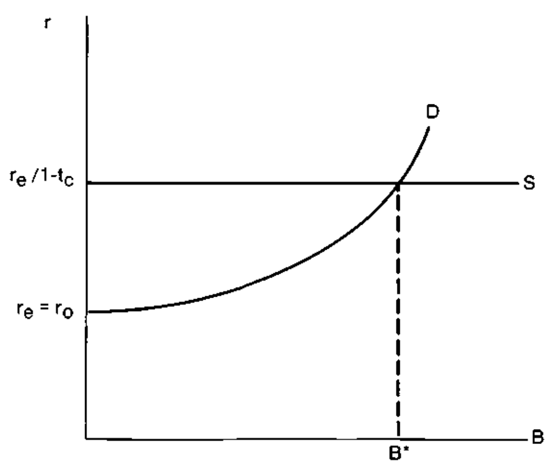

Fig. 1.7 Supply and demand for corporate debt implied by Miller (1977).

Determinants of changes in the aggregate capital structure in Miller's model include corporate and personal tax rates and the relative supplies of taxable and tax-exempt securities. The specific effects of these factors will be brought out in more detail in section 1.2.2.

The four theories reviewed above are primarily distinguished, then, by their implications for the shapes and positions of the aggregate supply and demand curves for corporate debt. A salient characteristic of these theories is that all of them imply perfect elasticity for the demand curve, the supply curve, or both. It should also be noted that the theories are not necessarily mutually exclusive. It is possible to combine corporate taxes with the agency cost model, for example, resulting in a diagram that looks qualitatively similar but has the debt supply curve shifted upward to reflect its tax advantage.[19] Similarly, agency or bankruptcy costs could be grafted onto Miller's model, imparting a downward slope to the debt supply curve.[20]

We now turn to a comparative statics analysis of the effects of various factors, such as tax rates and security supplies, on the equilibrium financial structure in these models. Since there is no equilibrium financial structure in the original Modigliani-Miller model, the discussion will center largely on the other three models.

1.2.2 Determinants of Secular Trends in Corporate Finance

Tax Factors. A prominent factor affecting the equilibrium financial structure in both the tax savings–bankruptcy costs and Miller models is the corporate tax rate. An increase in the corporate tax rate in the tax savings–bankruptcy costs model simply shifts the debt supply curve upward. Investors would still be willing to freely substitute debt for equity securities as long as their certainty-equivalent yields were equal, however, and thus, abstracting from any wealth effects that might change the absolute level of security yields, the demand curve for corporate debt would be unaffected.[21] The net result of the increased corporate tax rate, therefore, would be an increased amount of corporate debt relative to equity.

In the Miller model, the effect of an increase in the corporate tax rate is somewhat less straightforward. Recalling that the certainty-equivalent return on equity in Miller's model is equal to the tax-exempt bond yield, r_0, the equilibrium condition can be written as

$$1 - \frac{r}{r_0}(1 - t_c) = 0 . \qquad (1)$$

This condition can in turn be thought of as an implicit function, $H(B^*, f) = 0$, of the optimal amount of corporate debt, B^*, and a vector of exogenous factors, f, such as tax rates. The effect of an increase in t_c, holding all other factors constant, for example, is found by implicit differentiation to be

$$\text{(2)} \qquad \frac{\partial B^*}{\partial t_c} = -\frac{\partial H/\partial t_c}{\partial H/\partial B} = \frac{\left[\dfrac{r}{r_0} - (1-t_c)\partial\left(\dfrac{r}{r_0}\right)/\partial t_c\right]}{-(1-t_c)\partial\left(\dfrac{r}{r_0}\right)/\partial B}.$$

The denominator is negative, since an increase in B increases the supply of taxable relative to tax-exempt securities and thus increases r relative to r_0. The whole expression will thus be positive, and an increase in corporate tax rates will increase the equilibrium amount of corporate debt, if the numerator is positive. An increase in t_c, holding all security supplies constant, decreases the availability of tax-exempt income from shares, and this will induce high tax bracket investors to bid down r_0 relative to r. The sign of the numerator in (2), therefore, depends on the relative magnitudes of the two terms. It is argued in Appendix A, however, that the net effect of t_c on B^* will be positive unless the adjustment in relative interest rates to t_c, the second term in the numerator, is unreasonably large. This exercise is represented diagrammatically in figure 1.8. The increase in the corporate tax rate from t_c to t_c' shifts the supply curve upward. The effect of t_c on the relative yields, r/r_0, however, also causes the demand curve to rotate upward. Comparing this case with the effect of increased corporate taxes in the tax savings–bankruptcy costs model, the upward shifts of the supply curves are similar. The upward slope of

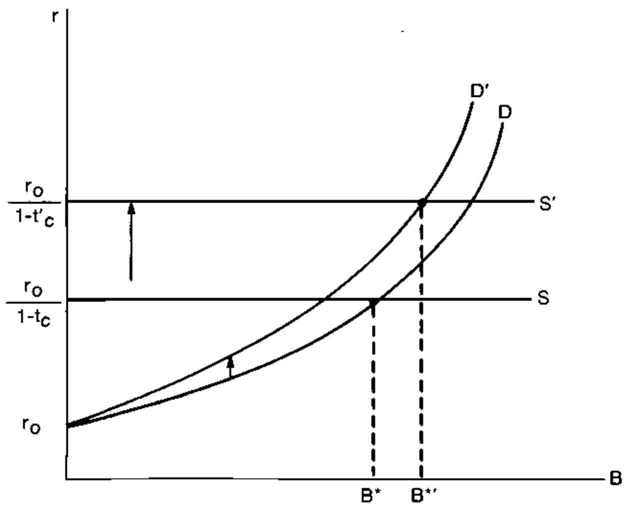

Fig. 1.8 Change in equilibrium quantity of corporate debt caused by an increase in the corporate tax rate.

the demand curve in Miller's model, as well as its upward rotation resulting from the increase in t_c, though, makes the net increase in corporate debt smaller in Miller's model than in the tax savings–bankruptcy costs model.

Another tax factor that can affect equilibrium corporate leverage is the set of personal tax rates, t_p. These rates play no role in either the tax savings–bankruptcy costs or agency costs models, but in Miller's model they are an important determinant of the corporate sector's comparative advantage in borrowing over different segments of the investing public. If an increase in the corporate tax rate is accompanied by an increase in personal tax rates, for example, analysis similar to that carried out in the previous exercise indicates that the resulting change in corporate debt is given by

$$\text{(3)} \qquad \frac{\partial B^*}{\partial t_c} = - \frac{\left[\dfrac{r}{r_0} - (1 - t_c)\left(\dfrac{\partial\left(\dfrac{r}{r_0}\right)}{\partial t_c} + \dfrac{\partial\left(\dfrac{r}{r_0}\right)}{\partial t_p}\dfrac{dt_p}{dt_c}\right)\right]}{-(1 - t_c)\dfrac{\partial\left(\dfrac{r}{r_0}\right)}{\partial B}}.$$

Since increases in t_p increase the value of tax-exempt income to investors, r/r_0 would be expected to increase with t_p and hence any increase in B^* would be smaller than in the previous case where only t_c increased. It is possible, of course, that B^* may even decline.[22]

Diagrammatically, this exercise is similar to that shown in figure 1.8. The only difference is that the demand curve rotates upward by an even greater amount, thus dampening further or even offsetting any upward pressure on corporate debt caused by the upward shift in the supply curve.

The models' predictions about the effects of extreme changes in tax rates can also be examined. If all tax rates are driven to zero, for example, the supply curve in the tax savings–bankruptcy costs model shifts downward until its vertical intercept is at r_e. Since the demand curve is unchanged, this implies that equilibrium corporate leverage goes to zero. In the Miller model, by contrast, elimination of all taxes shifts the supply curve down to r_e ($= r_0$) and flattens out the demand curve at the same level since taxable and tax-exempt securities are now perfect substitutes. This reduces, then, to the original Modigliani-Miller model and equilibrium corporate leverage is indeterminate.

An Aside on Taxes and Preferred Stock. Similar analysis can be applied to different types of securities, such as preferred stock. The supply curve for preferred stock in the Miller model would be horizontal at the level r_e.

That is, preferred stock and common equity receive the same tax treatment at the corporate level, and thus corporations would regard them as perfect substitutes at the same certainty-equivalent yield. If we ignore any inflexibilities from the cumulation of omitted dividends, preferred stocks entails no bankruptcy costs, and thus the supply curve would also be horizontal at r_e in the tax savings–bankruptcy costs model. The demand curve in both models would be horizontal in the absence of taxes. The imposition of personal taxes would make this demand curve slope upward in Miller's model.[23]

If we start from a no-tax situation and then impose both corporate and personal taxes with no tax deductibility of preferred stock dividends, the Miller model offers no prediction of what would happen to the amount of preferred stock outstanding. This amount was indeterminate in the absence of taxes and some preferred stock could still be issued to tax-exempt investors and corporations at a yield of r_e in the presence of taxes. Thus, the model does not predict preferred stock's disappearance or even, necessarily, its decline. The tax savings–bankruptcy costs model does not even have the upward slope in demand and hence it likewise offers no firm prediction about the equilibrium amount of preferred stock when taxes are imposed.

If the Miller model is combined with the agency costs model, a determinate amount of preferred stock could exist, even in the absence of taxes, because of its agency cost-reducing properties. That is, corporations might be willing to pay a premium yield to issue some amount of preferred stock, whereas investors would demand no premium. The supply curve will also slope downward because additional issues of preferred stock would create agency problems of their own, similar to those posed by debt. If taxes are then imposed, the demand curve will bend upward, leaving the supply curve unchanged, and the equilibrium quantity of preferred stock will thus be reduced. This effect is illustrated in figure 1.9.

Inflation. Inflation is often mentioned in popular discussions as a determinant of corporate financing trends. While financial economists would reject the notion that debt financing is advantageous under inflation because it can be repaid in "cheaper dollars," there is, nevertheless, some basis in capital structure theory for an inflation-induced effect on aggregate financing patterns. This effect generally stems from the interaction between inflation and tax factors.

In the tax savings–bankruptcy costs model, for example, an increase in anticipated inflation will increase all interest rates by (approximately) the increase in the expected inflation rate. Looking at figure 1.5, and letting Δi denote the increase in expected inflation, the demand curve for corporate debt will shift upward by Δi. The supply curve, on the other hand,

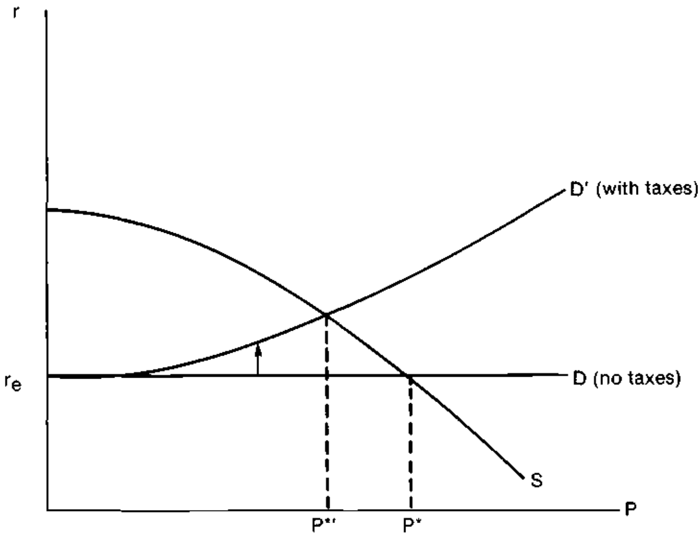

Fig. 1.9 Effect on equilibrium amount of preferred stock from imposing taxes (Miller model with agency costs).

shifts up by $\Delta i/1 - t_c$. Since the supply curve shifts up by more than the demand curve, the equilibrium amount of corporate debt must increase, and this can be interpreted as occurring because inflation increases the real value of the interest tax deduction on debt.

In the Miller model, by contrast, the inflation premium in interest rates is taxed at the personal level and this has offsetting effects. An increase in expected inflation of Δi, for example, will increase the tax-exempt bond rate demanded by investors by approximately Δi. Investors in taxable securities, however, will demand that nominal rates rise sufficiently to maintain real after-tax yields. This implies that for the marginal investor, whose personal tax rate is t_{pm}, the taxable bond rate must rise by approximately $\Delta i/(1 - t_{pm})$.[24]

The change in equilibrium corporate debt resulting from a change in expected inflation is given by

(4) $$\frac{\partial B^*}{\partial i} = -\frac{-(1-t_c)\partial\left(\frac{r}{r_0}\right)/\partial i}{-(1-t_c)\partial\left(\frac{r}{r_0}\right)/\partial B}.$$

The numerator may, in turn, be expressed as

(5) $$-(1-t_c)\partial\left(\frac{r}{r_0}\right)/\partial i = -(1-t_c)\left(\frac{r_0\frac{\partial r}{\partial i} - r\frac{\partial r_0}{\partial i}}{r_0^2}\right).$$

But, letting $\partial r/\partial i = 1/(1 - t_{pm})$ and $\partial r_0/\partial i = 1$ and recognizing that in equilibrium the marginal investor will be just indifferent between taxable and tax-exempt bonds, this numerator reduces to zero.

Diagrammatically, as shown in figure 1.10, the increase in expected inflation shifts the supply curve for debt upward by $\Delta r_0/(1 - t_c) = \Delta i/(1 - t_c)$. The demand curve, however, shifts upward by different amounts for investors in different tax brackets. At the intercept, which corresponds to the demand for taxable bonds by tax-exempt investors, the demand curve shifts upward by $\Delta r_0 = \Delta i$. At other points, corresponding to the demand for bonds by investors in tax bracket j, the demand curve will shift upward by $\Delta i/(1 - t_{pj})$. In particular, in the initial equilibrium an amount, B^*, of corporate debt had been issued such that the personal tax bracket, t_{pm}, of the marginal bondholder was equal to the corporate tax bracket, t_c. At B^*, then, the increase in expected inflation causes the demand curve to shift upward by $\Delta i/(1 - t_c)$, which is exactly the same amount by which the supply curve shifts upward. The new supply and demand curves, S' and D', must therefore intersect at B^*, and hence equilibrium corporate debt remains unchanged.[25]

This result is altered, however, when Miller's model is combined with the agency cost model. As depicted in figure 1.11, agency costs impart a downward slope to the debt supply curve, and the initial equilibrium occurs at B_a^*. As long as agency costs cause equilibrium debt to be less than it would be if supply were perfectly elastic (that is, as long as B_a^* is less than B^* in fig. 1.10), the personal tax bracket, t_{pm}, of the marginal bondholder at B_a^* will be less than the corporate tax rate.

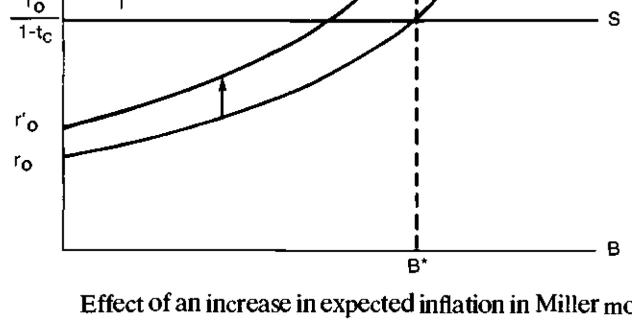

Fig. 1.10 Effect of an increase in expected inflation in Miller model with no agency costs.

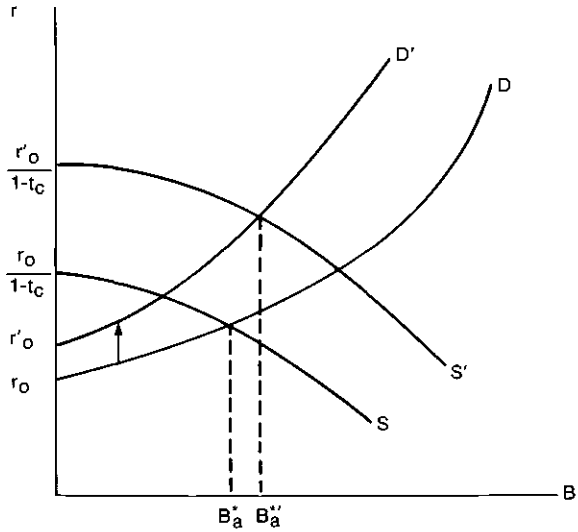

Fig. 1.11 Effect of an increase in expected inflation in Miller model with agency costs.

When an increase in expected inflation occurs, the supply curve in figure 1.11 shifts up by $\Delta i/(1 - t_c)$ assuming that inflation is neutral with respect to the agency cost function. At B_a^*, however, the demand curve shifts up by $\Delta i/(1 - t_{pm}) < \Delta i/(1 - t_c)$, and, given the slopes of the two curves, the new intersection point must occur to the right of B_a^*. Hence, in the presence of agency costs, an increase in expected inflation encourages substitution of debt for equity financing and increases equilibrium corporate leverage.[26] This result emerges, however, not from some "debtor-creditor" hypothesis, as has sometimes been argued, but from inflation's interaction with the tax system and agency costs.[27]

Supplies of Competing Securities. A special feature of Miller's model is its prediction that exogenous changes in the supplies of other securities will induce changes in corporate leverage. An increase in the supply of tax-exempt bonds, B_0, for instance, will result in the following change in corporate debt:

$$\frac{\partial B^*}{\partial B_0} = -\frac{-(1-t_c)\partial\left(\frac{r}{r_0}\right)/\partial B_0}{-(1-t_c)\partial\left(\frac{r}{r_0}\right)/\partial B}. \tag{6}$$

Since an increase in B_0 increases r_0 relative to r, expression (6) will be positive. From a personal tax standpoint, tax-exempt bonds are substitutes for equity in Miller's model, and thus an increase in the supply of tax exempts encourages corporations to shift their financing mix more toward debt. Graphically, the increase in the supply of tax exempts results in a downward rotation of the demand curve for corporate debt. Since there are now more tax-exempt bonds, the marginal investor at any given level of corporate debt will be in a lower personal tax bracket than was previously the case. Hence, the equilibrium amount of corporate debt increases.

An increase in the supply of competing taxable bonds, on the other hand, has the opposite effect on B^*. If the supply of federal government bonds, G, increases, for example, the effect on corporate debt is given by

$$\frac{\partial B^*}{\partial G} = - \frac{-(1-t_c)\,\partial\left(\frac{r}{r_0}\right)/\partial G}{-(1-t_c)\,\partial\left(\frac{r}{r_0}\right)/\partial B}. \tag{7}$$

Since the increase in G must increase r relative to r_0, expression (7) is negative. From a personal tax standpoint, taxable government bonds are a substitute for corporate debt, and an increase in the supply of debt substitutes induces corporations to shift their financing mix more toward equity. Graphically, the demand curve for corporate debt rotates upward, and this results in a decrease in equilibrium corporate debt. It should also be pointed out that an increase in the supply of any other type of taxable debt instrument, such as mortgages, would have the same effect on the corporate financing mix.[28]

In sharp contrast to Miller's model, exogenous changes in security supplies would have no effect on relative yields in any of the other capital structure models. The perfectly elastic demand curves in each of the other models imply that investors are willing to freely substitute one type of security for another in their portfolios, as long as the certainty-equivalent yields on these securities are equal. Any changes in portfolio risk resulting from such substitutions can be offset costlessly because investors can create perfect substitutes for corporate (or any other) securities, either on their own account or through financial intermediaries acting on their behalf. In such an environment, then, changes in relative security supplies will have no effect on relative yields and hence no effect on the optimal corporate financing mix.

In the Modigliani-Miller world, it is true in a general equilibrium sense that an increase in the supply of substitutes for corporate debt might result in a decrease in the amount of corporate debt outstanding. In equilibrium, the supply of some debt security (e.g., personal debt, financial intermediary debt, corporate debt) must fall in order to make room for any increased amount of substitute securities, and the one that falls could just as well be corporate debt as any other. But since it could also just as well be some other security, the Modigliani-Miller model offers no strong prediction of a decline in corporate debt. In the agency costs or tax savings–bankruptcy costs models, moreover, the downward-sloping supply curve determines the equilibrium amount of corporate debt, and if both relative yields and the position of the supply curve are unchanged, corporate debt is unchanged. Hence these models offer a strong prediction that corporate debt will not change in response to competing security supplies.

Miller's model, on the other hand, is the only one of the capital structure models that has an imperfectly elastic demand curve for corporate debt. Because of tax arbitrage restrictions (or at least the costly nature of tax arbitrage), investors are unable to create perfect substitutes for securities with different tax treatment. Such securities are imperfect substitutes, therefore, and the terms on which investors are willing to substitute one type of security for another differ across investors in different tax brackets. In such an environment, changes in the relative supplies of different types of securities will cause changes in relative yields and these will, in turn, induce changes in the corporate financing mix.

Agency Costs and the Characteristics of Corporate Investment. A final determinant of aggregate corporate financing patterns that can be drawn from existing capital structure theories is the costs associated with corporate debt. These include bankruptcy costs or, more generally, agency costs of all kinds. It is clear from figures 1.5 and 1.6, for instance, that increases (decreases) in the magnitude of these costs will tilt the debt supply curve more (less) sharply downward and thus decrease (increase) the equilibrium amount of corporate debt. Moreover, the important aspect of these costs is corporate managers' and investors' perceptions of their magnitude. If the risk of bankruptcy is perceived to increase because it is felt that the economy generally has become less stable, this will induce corporations to reduce their leverage.

It should also be noted that the costs associated with debt create an interaction between financing and investment. Even if the functional relationship among assets, financing sources, and agency costs does not change, a change in asset characteristics can alter the optimal financing mix. If the corporate sector's investment shifts more toward assets that are less risky, that are more easily used as collateral, or that lend themselves more readily to perquisite consumption by owner-managers, the aggregate corporate financing mix will shift away from outside equity and more toward debt. In addition, as suggested by Myers's (1977) analysis, the relationship between future investment opportunities and assets in place will also influence the corporate financing mix. The greater these future opportunities are, the more debt financing will exacerbate the problem of potential underinvestment and hence the less heavily debt will be used.

This influence that asset characteristics and other factors specific to individual firms have on the financing mix is a unique feature of the capital structure models that exhibit downward-sloping debt supply curves. In the Modigliani-Miller and Miller (without agency costs) models, this supply curve is perfectly elastic and hence firms are willing to substitute debt and equity financing indefinitely on the same terms. Asset characteristics are incapable of altering this terms of trade, and no firm is unique in the terms it is willing to offer to substitute one form of financing for another. Hence, firm-specific factors play no role in capital structure determination.

Summary. The results of the comparative statics exercises in this section are summarized in table 1.5. These exercises are intended to accomplish

Table 1.5 **Summary of Effects on Corporate Debt of Various Factors in Different Capital Structure Models**

Effect on Corporate Debt of an Increase in	Model			
	Tax Savings–Bankruptcy Costs	Agency Costs	Miller	Miller with Agency Costs
Corporate tax rate	More debt	Taxes not applicable	Probably more debt	Probably more debt
Corporate & personal tax rates combined	Personal taxes not applicable	Taxes not applicable	Ambiguous	Ambiguous
Inflation	More debt	No effect	No effect	More debt
Supply of tax-exempt bonds	No effect	No effect	More debt	More debt
Supply of noncorporate taxable bonds	No effect	No effect	Less debt	Less debt
Costs associated with corporate debt	Less debt	Less debt	Debt costs not applicable	Less debt
Future investment opportunities relative to assets-in-place	No effect	Less debt	No effect	Less debt

two purposes. First, they are intended to identify those causal factors that capital structure theory suggests might be useful in explaining corporate financing patterns. The left-hand column of table 1.5 provides a list of such factors. Second, table 1.5 lists a set of predictions that can be used to test the different capital structure theories. A finding that changes in expected inflation are systematically associated with changes in corporate financing, for example, would be consistent with the tax savings–bankruptcy costs or Miller-cum–agency costs models, but not with the simple versions of either the Miller or agency costs models. Similarly, the finding of a relationship between noncorporate security supplies and the corporate financing mix would weigh in favor of one of the versions of Miller's model, or perhaps in favor of the Modigliani-Miller model, but against both the tax savings–bankruptcy costs and the agency costs models. It is unfortunate, however, that none of the rows of table 1.5 contain direct sign contradictions. It may be more difficult to distinguish empirically between an effect and the absence of an effect than between effects in opposite directions.

Looking at the results in table 1.5 in general terms, two additional points emerge. The first is that the determinants of corporate financing patterns suggested by existing capital structure theories rest heavily on tax considerations. Apart from tax rates themselves, any effect of inflation depends on its interaction with the tax system, while the effect of noncorporate security supplies rests on the fact that the tax system renders security demands less than perfectly elastic. The only factors entirely unrelated to the tax system, in fact, are agency cost considerations.

The second point is that the extreme assumptions made by most of these models about the elasticity of either demand or supply severely limit the range of factors that might influence corporate financing patterns. As we have seen, if demand is perfectly elastic, supplies of noncorporate securities can have no effect on the corporate financing mix. If supply is perfectly elastic, firm-specific factors can have no effect. The column headed "Miller with Agency Costs," the only model in which neither demand nor supply is perfectly elastic, is the only column in table 1.5 that does not contain several "no effect" entries.

1.3 Interpretation of Capital Structure Trends

The task of this section is to link the theories described in the preceding section with the financing trends observed in section 1.1 in an attempt to interpret these trends. This will be done by comparing the trends in capital structure's determinants, as outlined in table 1.5, with the capital structure trends themselves.

This attempt must be regarded as preliminary, since neither the available data nor the available theory is sufficiently rich to allow very powerful tests. Nevertheless, some distinctions can be made among the abilities of different theories to explain these trends. Furthermore, it is hoped that the empirical regularities discussed here will stimulate further refinement of an aggregate corporate capital structure theory.

1.3.1 Corporate and Personal Tax Rates

As was seen in the preceding section, tax considerations are an important element of capital structure determination in both the tax savings–bankruptcy costs and Miller models. Movements in marginal corporate and personal tax rates from 1913 to the present are shown in table 1.6. Personal tax rates for those investors in the lowest and highest marginal brackets are shown in columns 1 and 2, respectively, while the corporate tax rate is shown in column 3.

The corporate tax rate has moved sharply upward, particularly in the 1940s and early 1950s. This trend is consistent, under either the tax savings–bankruptcy costs or Miller models, with the postwar increase in corporate leverage, although one may well ask why more of the increase in debt did not come earlier when corporate tax rates were rising most steeply. One might also ask why corporate leverage seems to have decreased during at least the first decade of the tax code's existence, at the same time that corporate tax rates increased dramatically in percentage terms, albeit from a small base.

Part of the answer could lie with the parallel increases in personal tax rates, which as we saw in the subsection "Tax Factors" in section 1.2.2 could dampen the leverage effects of corporate taxes. Some additional insight into the relationship between personal and corporate tax rates can be gained if we think in terms of the "clientele" version of Miller's model. In this version, low-tax-bracket investors hold shares in highly leveraged firms while the reverse is true for high-tax-bracket investors. In effect, low-tax-bracket investors prefer to borrow through corporations so as to maximize the tax advantage of debt, while high-tax-bracket investors prefer to borrow on their own account. A very rough measure of the strength of these preferences is what Grier and Strebel (1980) have referred to as the "net debt incentive tax ratio." This ratio, δ, is defined as

$$\delta = 1 - \frac{1 - t_c}{1 - t_{pB}}, \tag{8}$$

where t_c is the corporate tax rate and t_{pB} is the personal tax rate on ordinary income. Columns 4 and 5 of table 1.6 give time series for δ_L, the debt incentive tax ratio for investors in the lowest tax bracket, and δ_H, the ratio for investors in the highest bracket. These ratios measure the value

Table 1.6 **Corporate and Personal Tax Rates and Debt Incentive Tax Ratios**

Year	Lowest Value of t_{pB} (1)	Highest Value t_{pB} (2)	t_c (3)	δ_L (4)	δ_H (5)
1913–15	.010	.070	.010	.00	−.06
1916	.020	.150	.020	.00	−.15
1917	.020	.670	.060	.04	−1.85
1918	.060	.770	.120	.06	−2.83
1919–21	.040	.730	.100	.06	−2.33
1922	.040	.560	.125	.09	−.99
1923	.030	.560	.125	.10	−.99
1924	.015	.460	.125	.11	−.62
1925	.011	.250	.130	.12	−.16
1926–27	.011	.250	.135	.12	−.15
1928	.011	.250	.120	.11	−.15
1929	.004	.240	.110	.11	−.17
1930–31	.011	.250	.120	.11	−.17
1932–35	.040	.630	.138	.10	−1.33
1936–37	.040	.790	.150	.11	−3.05
1938–39	.040	.790	.190	.16	−3.86
1940	.044	.811	.240	.21	−3.02
1941	.100	.810	.310	.23	−2.63
1942–43	.190	.880	.400	.26	−2.47
1944–45	.230	.940	.400	.22	−9.00
1946–47	.190	.865	.380	.23	−3.60
1948–49	.166	.821	.380	.26	−2.47
1950	.174	.910	.420	.30	−5.44
1951	.204	.910	.508	.38	−4.47
1952–53	.222	.920	.520	.38	−5.00
1954–63	.200	.910	.520	.40	−4.33
1964	.160	.770	.500	.41	−1.17
1965–67	.140	.700	.480	.40	−.73
1968	.140	.753	.480	.40	−1.10
1969	.140	.770	.480	.40	−1.26
1970	.140	.718	.480	.40	−.84
1971–78	.140	.700	.480	.40	−.73
1979–	.140	.700	.460	.37	−.80

Source: Pechman (1977).

of the marginal return stream to investors in these tax brackets, when firms in which they hold shares substitute an additional dollar of debt for equity financing.[29]

Ideally, of course, we would like to have a measure of the strength of investor's demand for corporate leverage under different tax rate configurations, and this would necessitate knowing the distribution of wealth, and particularly shareholdings, across the spectrum of true marginal tax rates. Without such knowledge it is perilous to infer too much from the values of δ_L and δ_H.[30] Nevertheless, if it can reasonably be assumed that personal tax rates between the highest and lowest values move in concert and that the underlying wealth distribution does not shift radically over time, movements in δ will give at least a rough idea of the strength of demand for corporate leverage by low-tax-bracket investors and of the aversion to corporate leverage by high-tax-bracket investors. If δ values tend to increase over time for both high- and low-tax-bracket investors, for example, the demand for corporate leverage should also increase. In addition, during times when δ values are small, even for low-tax-bracket investors, one would expect that any tax advantage to corporate debt would be more easily offset by such factors as bankruptcy and agency costs.

Turning to the values of δ in table 1.6, the tax code apparently gave little or no incentive for corporate leverage in the early years of its existence. Until the early 1920s, even investors in the lowest tax brackets had little incentive, purely from a tax standpoint, to hold shares in levered firms, while high-tax-bracket investors often incurred a substantial tax disadvantage from corporate leverage. During the 1920s this tax disadvantage for high-tax-bracket investors grew much smaller, but at the same time the tax advantage for low-bracket investors remained small. It was not until the 1940s, when corporate tax rates rose dramatically, that the δ value grew very much for low-tax-bracket investors. From 1940 to 1954, these δ values for low-tax-bracket investors approximately doubled, whereafter they have remained essentially unchanged to the present. Since top-bracket personal tax rates were very high in the 1940s and 1950s, the δ values for high-bracket investors were also very negative during this period. These δ values have become less negative in the 1960s and 1970s.

Overall, then, it can be inferred that the tax system should have given rise to a demand for corporate leverage on the part of at least a segment of the investing population. This demand should have shown particular growth, moreover, between the 1920s and the early 1950s. In addition, the less negative values of δ_H from the mid-1960s to the present may indicate an atmosphere more conducive to corporate debt in recent years.

Comparing these trends with those discussed in section 1.1, however, it is apparent that tax considerations cannot be the sole determinant of patterns in corporate sector financing. Although the values of δ_L were small immediately following the advent of the income tax system, they roughly doubled in the 1920s, again in the 1930s, and again in the 1940s. Despite the apparent increase in the demand for corporate leverage, however, the tables in section 1.1 indicate that corporate debt usage fell for at least the first two decades following 1913 and that it remained low at least through World War II. The increases in both δ_L and δ_H that have occurred since the 1940s are broadly consistent with increased corporate leverage that has occurred since that period, but the two trends are not closely synchronized.[31] According to tables 1.2 and 1.4, the largest increases in corporate debt financing appear to have occurred during the 1970s, for example, whereas the debt tax incentive ratios have been relatively flat during that time.

1.3.2 Inflation

Another potential explanatory factor is the inflation rate. As discussed in the subsection "Inflation" in section 1.2.2, inflation can enhance the real tax advantage to debt, and thus the interaction between taxes and inflation may produce an explanation of corporate financing patterns that is superior to that of taxes alone.

Some idea of inflation trends can be gained from the yearly percentage changes in the implicit GNP price deflator, shown in table 1.7 for the years 1901 to the present.[32] From these it might be concluded that the relatively high inflation rates of the late 1960s and the 1970s interacted with relatively high debt tax incentive ratios to produce an increase in corporate debt financing during this period (although, as we have seen, inflationary distortions in the data raise some doubts as to just how much debt usage increased in the 1970s). There was also a temporary increase in corporate debt usage coinciding with both the increase in debt tax incentive ratios and the inflationary burst of the immediate post–World War II years.[33] Earlier, however, the years surrounding World War I were also years of relatively high inflation rates coupled with rising debt tax incentive ratios (at least for investors in low tax brackets). The data in section 1.2 indicate, though, that corporate debt financing was lower in that decade than in the one preceding it. Again, therefore, although the interaction between taxes and inflation may have contributed to increased debt usage in recent years, it does not appear to be the sole determinant of corporate financing patterns.

1.3.3 Supplies of Noncorporate Securities

Since the demand for corporate debt is less that perfectly elastic in the Miller model, relative supplies of noncorporate securities can affect corporate financing patterns. Some idea of the relative position of corporate debt in the economy may be gained from table 1.8, which shows the total liabilities of the nonfinancial corporate, federal government, and state and local government sectors as well as the mortgage liabilities of the household sector, all expressed as percentages of total liabilities of the domestic nonfinancial sectors. Data are available from Goldsmith et al. (1963) for selected years from 1900 to 1945 and annually from 1945 to 1958. Annual data are also available from the Federal Reserve *Flow of*

Table 1.7 Yearly Changes in Implicit GNP Price Deflator

Year	% Change in Deflator	Year	% Change in Deflator	Year	% Change in Deflator
1901	−.8	1929		1957	3.4
1902	3.3	1930		1958	1.7
1903	1.2	1931	−2.1	1959	2.4
1904	1.2	1932		1960	1.6
1905	2.4	1933		1961	.9
1906	2.3	1934		1962	1.8
1907	4.1	1935		1963	1.5
1908	−.7	1936	−.8	1964	1.5
1909	3.6	1937		1965	2.2
1910	2.8	1938		1966	3.2
1911	−1.0	1939		1967	3.0
1912	4.1	1940	2.2	1968	4.4
1913	−.7	1941	7.5	1969	5.1
1914	2.0	1942	9.9	1970	5.4
1915	4.6	1943	5.3	1971	5.0
1916	12.1	1944	2.4	1972	4.2
1917	24.2	1945	2.4	1973	5.7
1918	12.5	1946	15.7	1974	8.7
1919	14.1	1947	12.9	1975	9.3
1920	13.9	1948	6.9	1976	5.2
1921	−16.7	1949	−.9	1977	5.8
1922	−8.1	1950	2.1	1978	7.3
1923	2.4	1951	6.6	1979	8.5
1924	−.2	1952	1.4	1980	9.0
1925	1.4	1953	1.6	1981	9.1
1926	−1.5	1954	1.2		
1927	−2.2	1955	2.2		
1928	1.6	1956	3.2		

Source: *Historical Statistics of the United States* and *Economic Report of the President*.

Funds Accounts for the years 1945–78. The series for U.S. government debt and household mortgage debt are intended to reflect supplies of securities that might act as close substitutes for corporate debt in investor's portfolios.[34]

The data suggest that in the post–World War II years, corporate liabilities have been much smaller relative to total liabilities than in the pre-Depression era. There has also been little if any trend in the share of corporate liabilities since the 1950s. While the data in tables 1.2–1.4 indicate that corporate debt financing has increased relative to equity since that time, therefore, corporate debt has still only kept pace with the postwar expansion in liabilities for the economy as a whole. The share of corporate liabilities dropped sharply during the Depression and World War II before recovering somewhat during the years 1945–50. Since that

Table 1.8 **Ratios of Sectoral Liabilities Outstanding to Total Liabilities of Domestic Nonfinancial Sectors**

	Nonfinancial Corporation Liabilities		Federal Government Liabilities		State and Local Government Liabilities		Household Mortgage Liabilities	
Year	Goldsmith (1)	Flow of Funds (2)	Goldsmith (3)	Flow of Funds (4)	Goldsmith (5)	Flow of Funds (6)	Goldsmith (7)	Flow of Funds (8)
1900	.49	—	.04	—	.07	—	.15	—
1912	.54	—	.02	—	.07	—	.12	—
1922	.44	—	.17	—	.07	—	.11	—
1929	.47	—	.09	—	.08	—	.18	—
1933	.45	—	.15	—	.10	—	.17	—
1939	.34	—	.30	—	.10	—	.14	—
1945	.20	.18	.64	.66	.05	.04	.07	.05
1946	.22	.21	.60	.60	.05	.04	.08	.06
1947	.24	.23	.57	.55	.05	.04	.09	.09
1948	.24	.24	.54	.51	.05	.05	.10	.09
1949	.24	.23	.53	.50	.06	.05	.11	.09
1950	.26	.26	.49	.46	.06	.05	.12	.09
1951	.27	.27	.46	.43	.06	.06	.13	.10
1952	.27	.27	.45	.42	.06	.06	.14	.11
1953	.27	.26	.44	.41	.06	.06	.14	.12
1954	.27	.26	.43	.40	.07	.07	.15	.13

1955	.28	.27	.40	.36	.07	.07	.16	.14
1956	.29	.28	.37	.34	.07	.08	.17	.15
1957	.30	.28	.36	.32	.07	.08	.18	.16
1958	.30	.28	.35	.32	.07	.08	.18	.16
1959	—	.28	—	.30	—	.08	—	.17
1960	—	.28	—	.30	—	.08	—	.17
1961	—	.28	—	.29	—	.09	—	.18
1962	—	.28	—	.28	—	.09	—	.19
1963	—	.28	—	.25	—	.09	—	.19
1964	—	.28	—	.24	—	.09	—	.19
1965	—	.29	—	.22	—	.09	—	.20
1966	—	.30	—	.21	—	.09	—	.20
1967	—	.31	—	.21	—	.09	—	.19
1968	—	.32	—	.20	—	.09	—	.19
1969	—	.33	—	.19	—	.09	—	.19
1970	—	.33	—	.18	—	.09	—	.19
1971	—	.33	—	.19	—	.09	—	.19
1972	—	.33	—	.17	—	.09	—	.19
1973	—	.35	—	.16	—	.09	—	.19
1974	—	.33	—	.15	—	.09	—	.20
1975	—	.32	—	.17	—	.09	—	.20
1976	—	.31	—	.18	—	.08	—	.20
1977	—	.31	—	.18	—	.08	—	.21
1978	—	.31	—	.17	—	.08	—	.21
1979	—	.32	—	.16	—	.07	—	.21

Sources: Goldsmith et al. (1963) and Federal Reserve *Flow of Funds Accounts*.

time a modest upward trend seems to have occurred at least through the mid-1970s.

Liabilities of the federal government, by contrast, were quite small at the beginning of the century and remained so until the Depression, even including the increase surrounding World War I. During the Depression and especially during World War II, however, federal government debt mushroomed relative to that of the other sectors of the economy. Thereafter, it declined steadily before reaching an apparent plateau in the 1970s.

On the whole, state and local government and household mortgage liabilities have been smaller than those of the corporate and federal government sectors. State and local government debt has remained relatively small throughout, with little apparent trend. Household mortgage debt hovered around 15% of total liabilities in the pre-Depression era, before falling somewhat by the end of World War II. Since then it has increased to a plateau of about 20%, beginning in the 1960s.

If we focus on the relationship between corporate debt and federal government debt, the prediction that corporate debt responds inversely to supplies of close substitute securities appears to receive some support from the data in table 1.8. A similar relationship has also been noted by Friedman (1982). Particularly in the first half of this century, the share of corporate liabilities has tended to move in the opposite direction from that of federal government liabilities. At the same time that federal government debt was taking its great upward leap during the Depression and World War II, for example, the share of corporate liabilities declined dramatically, as did the share of debt in total corporate financing. Similarly, corporate debt financing has generally increased relative to equity during the postwar years at the same time that the share of federal government liabilities has fallen.

At other points, however, the predictions from Miller's model and the data in table 1.8 do not seem to coincide exactly. Little can be inferred, for example, about the relationship between corporate financing patterns and movements in state and local government liabilities or household mortgage liabilities. If anything, the share of corporate liabilities seems to have moved in the same direction as that of household mortgages.[35] Moreover, corporate leverage, as measured by tables 1.2 and 1.4 at least, shows large increases in the 1970s when the relative supply of government securities is essentially flat.

1.3.4 Perceived Costs Associated with Corporate Debt

A final determinant of corporate financing trends that is suggested by existing capital structure theory is shifts in the perceived magnitude of bankruptcy and agency costs. The greater these costs are perceived to be, the smaller will be the share of debt in total corporate financing. Unfortunately, while the theory's prediction is straightforward, these costs are impossible to measure with any precision.

One factor related to agency costs that can be measured at least roughly is the relationship between corporations' future investment opportunities and their assets in place. As was seen in the subsection "Agency Costs and the Characteristics of Corporate Investment" in section 1.2.2, Myers (1977) has argued that the availability of future investment opportunities exacerbates the moral hazard problem between current bondholders and shareholders and weighs against the use of debt financing for existing assets.

Since future investment opportunities are theoretically reflected in the market value of firms' securities, movements in Tobin's q, or the ratio of the market value of firms' assets to their reproduction cost, provide a rough measure of the changing relationship between these future opportunities and existing assets. It is true that a marginal, rather than an average, q is the best measure of the prospective profitability of a firm's next dollar of investment. But in long-run competitive equilibrium, firms will have adjusted their investment until both marginal and average q values are equal to unity. Changes in average q values provide signals for this adjustment process by indicating changes in the perceived profitability of future investment.[36]

Estimates of q covering the period 1929–80 for U.S. nonfinancial corporations as a whole are shown in table 1.9. The agency cost theory would predict that q and corporate debt usage should move inversely, but comparing the data in table 1.9 with those in tables 1.1–1.3, the evidence in favor of this prediction is somewhat mixed. Through World War II, the market value debt ratios generally moved inversely with the q values in table 1.9.[37] Similarly, the Goldsmith data in table 1.3 suggest that debt ratios rose during the early years of the Depression as q was falling and then fell in the later years of the Depression as q was rising. Both the Holland and Myers and the Goldsmith data indicate sharply lower debt ratios by the end of World War II than had prevailed during the 1930s, however, and it is less clear if this can be explained by any consistent increases in q values around this time. In the postwar years, the early increase in corporate debt is consistent with the depressed q values prevailing during the 1950s. Debt usage should then have fallen in the 1960s, though, when q values soared, but there is no evidence that it did so. Similarly, although increased debt in the early 1970s is consistent with lower q values, debt usage should have continued to rise in the mid-1970s as q values fell further, but it seems instead to have fallen.

This facet of the agency cost theory, then, seems to show a modest degree of explanatory power in interpreting capital structure trends. In fairness to the theory, it should be kept in mind that its predictions have been made at the individual firm level, and aggregation problems may

Table 1.9 Estimates of *q* (Ratio of Market Value of U.S. Nonfinancial Corporations to Replacement Cost of Assets)

Year	Holland & Myers Estimates	Council of Economic Advisers Estimates
1929	1.93	—
1930	1.69	—
1931	1.09	—
1932	.57	—
1933	1.14	—
1934	1.46	—
1935	1.44	—
1936	2.34	—
1937	1.95	—
1938	1.06	—
1939	1.53	—
1940	1.27	—
1941	1.10	—
1942	.89	—
1943	1.19	—
1944	1.19	—
1945	1.31	—
1946	1.44	—
1947	1.00	—
1948	.84	—
1949	.68	—
1950	.76	—
1951	.70	—
1952	.70	—
1953	.70	—
1954	.76	—
1955	.95	.85
1956	.98	.84
1957	.90	.78
1958	.89	.81
1959	1.12	.98
1960	1.08	.95
1961	1.26	1.06
1962	1.21	1.00
1963	1.35	1.10
1964	1.45	1.18
1965	1.52	1.26
1966	1.38	1.13
1967	1.36	1.14
1968	1.35	1.18
1969	1.27	1.06
1970	.94	.87
1971	1.08	.94
1972	1.15	1.02
1973	1.12	.93
1974	1.04	.67

Table 1.9 (continued)

Year	Holland & Myers Estimates	Council of Economic Advisers Estimates
1975	.81	.66
1976	.88	.75
1977	—	.66
1978	—	.61
1979	—	.56
1980	—	.53

Source: Holland and Myers (1979) and *Economic Report of the President.*

weaken its predictive power at the level of the corporate sector as a whole.[38]

Another factor related to agency and bankruptcy costs that can be measured at least roughly is the general stability of business, or "business risk." The less stable are economic conditions, the greater is the overall chance of business failures and the greater will be the weight of bankruptcy costs on corporate financing decisions. Similarly, as the chance of bankruptcy increases, the agency problems associated with debt are exacerbated. As business conditions become less stable, therefore, corporate leverage should fall.

A possible measure of perceived stability is the standard deviation of stock price changes or stock market returns. These measures, derived from monthly changes in the Standard and Poor's Composite Index, are shown in table 1.10 for the years 1890–1981. A crude measure of the standard deviation of returns on total assets, which is perhaps a better indicator of business, as opposed to financial, risk is also shown in column 3 of table 1.10.[39]

On the basis of these figures, it might be plausible to argue that increased tax incentives for corporate debt in the late 1930s and early 1940s were overwhelmed by greater perceived instability in the wake of the Depression. One could similarly make a case, as Gordon and Malkiel (1981) do, that increased instability since 1974 has contributed to a decline, or at least a leveling off, of corporate leverage since that time.

Nevertheless, it is difficult to isolate any general trends in the data in table 1.10. The increased instability surrounding the Depression does not seem to have been inordinately long-lived, for example, relative to the apparent inertia in the recovery of corporate debt ratios. Moreover, the decline in corporate leverage between 1912 and 1929 does not seem to coincide with any general increase in economic instability. Overall, then, the data again appear to grant some explanatory power to agency and bankruptcy cost notions, but these factors do not seem capable of standing alone as determinants of corporate financing trends.

A possible avenue for further study of the effects of agency costs is the

Table 1.10 **Annualized Standard Deviations of Monthly Stock Market Returns**

Year	S.D. of % Stock Price Changes (1)	S.D. of Total Returns on Stock (2)	S.D. of Returns on Total Assets (3)	Year	S.D. of % Stock Price Changes (1)	S.D. of Total Returns on Stock (2)	S.D. of Returns on Total Assets (3)
1890	9.87	—	—	1930	21.30	26.3	21.6
1891	10.74	—	—	1931	28.02	43.9	32.9
1892	4.26	—	—	1932	61.31	68.0	41.5
1893	15.87	—	—	1933	37.59	56.1	35.3
1894	7.97	—	—	1934	16.45	22.2	15.1
1895	10.32	—	—	1935	15.73	16.3	10.4
1896	13.89	—	—	1936	11.33	14.4	10.9
1897	11.09	—	—	1937	21.93	23.4	17.1
1898	11.40	—	—	1938	24.60	41.2	24.3
1899	12.78	—	—	1939	17.60	29.5	20.1
1900	11.85	—	—	1940	17.46	26.7	17.9
1901	16.04	—	—	1941	12.16	14.3	8.9
1902	7.72	—	—	1942	12.37	14.7	8.2
1903	11.40	—	—	1943	11.78	15.6	11.2
1904	9.39	—	—	1944	7.38	7.9	5.7
1905	8.52	—	—	1945	7.59	13.1	9.8
1906	10.01	—	—	1946	17.29	18.7	15.7
1907	16.28	—	—	1947	11.02	9.6	8.0
1908	10.12	—	—	1948	13.48	19.9	16.5
1909	6.27	—	—	1949	10.15	10.2	7.9
1910	10.15	—	—	1950	11.02	10.8	8.9
1911	9.39	—	—	1951	9.84	12.2	9.9
1912	6.17	—	—	1952	7.34	11.3	8.9

1913	7.55	—	—	1953	8.76	9.4	7.4
1914	13.96	—	—	1954	3.81	13.0	10.1
1915	9.63	—	—	1955	12.06	12.4	10.4
1916	7.79	—	—	1956	10.60	14.8	12.6
1917	10.50	—	—	1957	11.29	12.6	10.5
1918	8.45	—	—	1958	3.74	6.3	5.2
1919	12.78	—	—	1959	8.00	8.0	6.7
1920	15.55	—	—	1960	8.49	13.4	11.0
1921	12.09	—	—	1961	7.21	8.9	7.5
1922	9.63	—	—	1962	17.22	20.1	15.9
1923	10.29	—	—	1963	6.34	9.8	8.0
1924	9.66	—	—	1964	5.47	4.0	3.3
1925	6.44	—	—	1965	6.89	8.5	7.1
1926	10.98	11.7	—	1966	11.05	10.9	8.5
1927	6.86	13.2	—	1967	6.58	12.1	9.8
1928	11.95	17.4	—	1968	10.22	13.0	10.7
1929	31.94	31.0	27.0	1969	10.05	13.0	10.1
1970	15.93	20.3	14.8	1976	10.57	13.7	9.3
1971	11.22	13.7	10.1	1977	4.19	9.6	6.3
1972	6.96	6.6	5.0	1978	12.44	16.6	10.8
1973	10.98	13.9	9.6	1979	8.66	12.8	8.2
1974	17.11	23.9	14.8	1980	25.39	17.5	11.9
1975	15.90	17.9	12.2	1981	18.19	12.3	8.9

Sources: Column 1 = Annualized standard deviations of monthly percentage changes in Standard & Poor's Composite Index. Derived from Standard & Poor's *Trade and Security Statistics, Security Price Index Record.*

Column 2 = Annualized standard deviations of monthly total returns (dividends plus capital gains) on Standard & Poor's Composite Index stocks. From Ibbotson and Sinquefield (1982).

Column 3 = Column 2 multiplied by [1 − (D/D + P + E)] from table 1.2, col. 1.

changing industry composition of the corporate sector. Jensen and Meckling (1976) suggest, for example, that firms in different industries will have different optimal capital structures because they face agency problems of varying magnitudes. As industries rise and fall in relative importance, then, the aggregate corporate capital structure could change even if agency cost functions remain perfectly stable. Interpretation of such trends, however, requires a better understanding of industry effects on capital structure than is currently available from existing theory. Thus this avenue of inquiry will not be pursued further here.

1.3.5 The Ability of Existing Theory to Explain Aggregate Patterns in Corporate Finance

Taking the results of this section as a whole, we can distinguish the relative abilities of existing theories to explain the data. The primary conclusion is that the simplest capital structure models, based on one or two explanatory factors, do not seem fully consistent with the data. To the extent that the analysis in this section has favored any of the models in table 1.5, then, it is the Miller model with agency costs.[40]

Despite the caveats noted in section 1.3.1, for example, this model is broadly consistent with the parallel trends in debt ratios and tax factors, particularly in the post–World War II years. In addition, the model is consistent with the parallel increases in inflation and debt usage of the late 1960s and 1970s. To the extent that the interaction between inflation and the tax system is important, this may explain why, by market value measures at least, much of the postwar increase in debt ratios did not occur until this time, even though corporate tax rates and debt tax incentive ratios increased earlier. Moreover, a relationship between inflation and debt ratios would weigh against the simpler version of the Miller model, since that version predicts no such relationship.

It might be argued that the tax savings–bankruptcy costs model is also consistent with these trends. Several other factors, however, would favor the Miller model with agency costs over the tax savings-bankruptcy costs model. The initial existence and then secular decline of preferred stock financing, for instance, cannot be explained by the latter model, whereas it can by the former. The simple version of the Miller model would also have difficulty explaining this phenomenon. An additional factor favoring the Miller model with agency costs over the tax savings–bankruptcy costs model is the apparent inverse relationship between federal government debt and corporate debt. At the same time, such a relationship would weigh against the pure agency cost model. Finally, to the extent that there is at least some relationship between debt ratios and future investment opportunities, this would tend to favor a capital structure model with an agency cost component.

One potential cloud hangs over the Miller model with agency costs, however, and that is its behavior in the complete absence of taxes. In that case the model simply reverts to the pure agency cost model. It is entirely possible that agency cost considerations alone can account for corporate financing trends prior to the imposition of the U.S. tax code in 1913, or in the years immediately following that when tax considerations may not have been very important. Looking at tables 1.3 and 1.4, though, it is difficult to pinpoint agency cost factors that would explain the decreases in corporate debt usage surrounding that time. As pointed out in section 1.3.4, for example, there is no apparent trend toward greater economic instability during this period. In addition, table 1.8 suggests that the inverse relationship between corporate and federal government debt may have existed even in the early years before tax factors had a very strong limiting influence on the substitutability among different types of securities. The pure agency cost model would be unable to explain such an inverse relationship.

There are some grounds for suspecting, therefore, that even the Miller model with agency costs does not provide an entirely satisfying explanation for the secular patterns in corporate finance. In the next section, some suggestions are offered for augmenting the theory so as to enhance its explanatory power.

1.4 Some Suggestions for an Augmented Theory of the Aggregate Corporate Capital Structure

As was seen in the subsection "Supplies of Competing Securities" of section 1.2.2, the demand curve for corporate debt distinguishes Miller's model from other existing capital structure theories. In all of the competing theories, this demand curve is perfectly elastic.

In general, perfect elasticity on the demand side indicates a well-developed capital market, that is, one in which trading is competitive, transaction costs are low, investors are not subject to trading restrictions, and a full range of securities is available.[41] In such an environment, changes in relative security supplies need not change relative prices because investors can engage in costless portfolio transactions that will completely offset any effects of the change in security supplies. If the corporate sector substitutes debt for equity financing, for example, investors holding equity would then have riskier portfolios on the average because of the increased corporate leverage. This change could be completely offset, however, if investors simply reduced their personal borrowing by an equivalent amount, and thus the increased corporate debt could be absorbed without any change in the relative prices of debt and equity securities.

While the vision of a well-developed capital market that has pervaded modern finance theory has proved to be a highly useful abstraction, it may be more appropriate for analyzing snapshots of equilibrium than for examining longer historical eras. The primary suggestion offered in this section, therefore, is that a better understanding of corporate financing trends over such eras requires a broader understanding of the corporate sector's evolving role in the development of the financial system. Over long periods, economic forces work toward making the capital market more perfect and more complete. Such forces will shape the corporate sector's financing choices, but at the same time corporate financing patterns themselves can serve as a force in the development process.[42]

1.4.1 The Place of the Corporate Sector in the Overall Financial System

Suppose we step back to get a broader perspective on the place of the corporate sector's financial structure in the context of the financial system generally. In order to reconcile the desires of its ultimate wealthholders (households) with the characteristics of its ultimate wealth (tangible assets), the economy develops a financial structure, consisting of nonfinancial corporations, securities markets, and financial institutions. Corporations specialize in holding and managing tangible assets and issue debt and equity claims against them. Financial institutions hold some of these corporate securities and in turn issue their own claims with different liquidity characteristics and patterns of return. Some of these institutions also purchase claims on households, thus affording individuals further financial transformation opportunities on their own account.

What determines the breakdown of these transformation activities among the corporate, financial institution, and household sectors? If the process of transforming asset characteristics were costless, then, as the Modigliani-Miller theorem implies, the allocation of these activities across sectors would be indeterminate. If the process is costly, on the other hand, agents in the various sectors may have access to different transformation technologies, and the scope and allocation of these activities will be determined by the principles of comparative advantage and cost minimization.

If we think of the supply and demand for substitutions of corporate debt for equity, as discussed in conjunction with the diagrams of section 1.2, the shapes and locations of the curves will be determined by the nature of these financial transformation technologies. The supply curve, for example, represents the corporate sector's technology for transforming the returns on its assets from equity claims into debt. If this technology is costless, the supply curve is flat at the level of the certainty-equivalent return on equity, as in the Modigliani-Miller model. If there is a constant corporate tax advantage per dollar of debt, the supply curve is flat at the higher level $R_e/(1 - t_c)$, as in the Miller model. In effect, the corporate sector's transformation technology exhibits constant returns to scale in this case, and thus the equilibrium corporate financing mix is determinate at the sectoral level but not at the individual firm level. Moreover, both the agency costs and tax savings–bankruptcy costs models can be viewed in this light as simply descriptions of the transformation technology on the supply side.

The demand side of the market reflects the competition that corporations face from both financial institutions and households themselves in performing these transformation activities. The more highly developed the financial intermediary system and the broader and less costly the range of transformation opportunities possessed by households on their own account, the less likely it is that corporate debt will possess unique characteristics and the more elastic the demand for this debt will be. In most existing capital structure theories, it is implicit either that investors can costlessly create perfect substitutes for corporate debt on their own account or that financial intermediaries can create such substitutes for them at no cost to the investors. Hence, corporate debt can be substituted for equity without limit at the same terms of trade. It is only in the Miller model that households face a costly transformation technology because of the costs of tax arbitrage activities.[43]

Existing capital structure theories, then, frequently adopt asymmetric views of the relationship between the corporate sector's financial transformation technology and the technologies faced by other sectors in the economy. In both the tax savings–bankruptcy costs and the agency costs models, for example, financial transformation is costly for corporations and the cost varies with the amount of transformation performed. For investors, on the other hand, such transformation activities are costless.

One could argue that any asymmetry in the costs of financial transformation faced by the corporate and household sectors might more plausibly go in the other direction. If there are economies in monitoring one large borrower rather than a number of smaller ones, for instance, or if investors face such restrictions as margin limits, financial transformation might be more costly for households than for the corporate sector. To see how corporate capital structure might be determined under these conditions, we next examine a simple model of such an environment.

1.4.2 A Model of Capital Structure Determination When Transformation Is Less Costly for Corporations Than for Households

To take an extreme case for illustrative purposes, let us suppose that borrowing is prohibitively costly for the household sector but that it entails no costs at all, other than interest, for corporations. In order to highlight the effect of these transformation costs, we will assume away all taxes. We will also ignore, for the time being, the possible existence of financial intermediaries, and we will assume that corporations start out relying exclusively on equity financing.

Initially, then, the only savings vehicle available to individuals is holdings of (risky) corporate shares. They will trade until all individuals place the same marginal valuation on these shares. As shown in Appendix B, these marginal valuations consist of two components: the marginal value of a dollar of certain future income plus an adjustment for risk. Because there is no separate trading in risk-free securities, however, these separate components need not be equal across individuals.

The yield on equity securities, r_e, thus reflects an average of investors' valuations of certain prospects plus an average of their required risk adjustments. But if part of corporations' return streams could be split off and sold separately as riskless securities, these could be sold at a premium price (lower certainty-equivalent yield) to the most risk-averse segment of the investing public.[44]

Corporations might try to profit from this repackaging activity, but competition would eliminate any gains in equilibrium. Since financial transformation has been assumed to be costless for corporations, the supply curve of corporate debt would be perfectly elastic at the level r_e. That is, corporations would be willing to freely substitute debt for equity financing as long as their certainty-equivalent yields were the same. Investors, on the other hand, would demand progressively higher yields to purchase additional increments of debt, since this additional debt would have to be sold to progressively less risk-averse segments of the investing population. Just as in Miller's model, then, restrictions on investors' transformation opportunities cause the demand curve for corporate debt to be upward sloping. As is depicted in figure 1.12, equilibrium is reached in this model when corporations have issued that amount of debt, B^*, that is sufficient to drive the cost of debt, r, into equality with r_e.

As in Miller's model, corporate capital structure is determinate at the aggregate level here, but not at the level of the individual firm. Because of trading restrictions on investors, there is a demand for the corporate sector's transformation services, and firms compete with one another to supply these services. Since all firms compete on equal terms, however, profits from financial transformation are squeezed out, and the most risk-averse investors reap a "bondholders' surplus," just as those investors in the lowest tax brackets do in Miller's model.

In addition, we might suppose that a government suddenly sprang up and issued an amount of government bonds, G, that were perfect substitutes for corporate debt. Since these bonds would tend to drive up the relative yields on corporate bonds above r_e, corporations would start substituting equity for debt and equilibrium corporate leverage would be

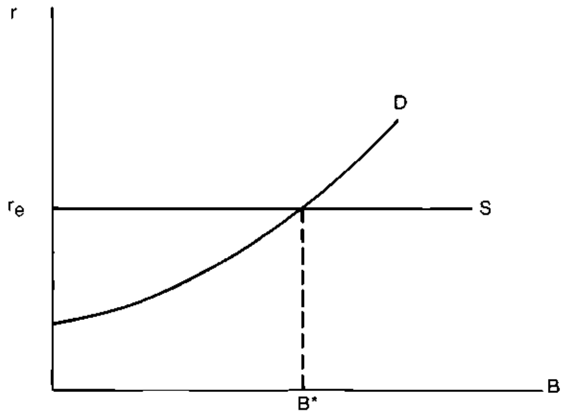

Fig. 1.12 Equilibrium when investors face costly financial transformation but firms do not.

reduced. Costly financial transformation in the household sector, then, is capable of yielding the same kind of substitution relationship between corporate securities and other sectors' securities that occurs in Miller's model. This relationship occurs here, moreover, in the complete absence of taxes.

The transaction costs that impart positive slope to the demand curve in this model are, of course, unrealistically severe. In practice, one would expect firms to face competition in their efforts to overcome transaction costs through financial transformation. Overcoming such costs and helping to satisfy divergent investor demands, in fact, is one of the primary rationales given for the existence of financial intermediaries.

In general, then, not only the corporate sector but also the financial intermediary and household sectors will have access to financial transformation technologies. To the extent that the corporate sector's technology exhibits cost advantages over those of other sectors, the corporate sector will tailor its financing mix to exploit these advantages. Demand curves for corporate securities will be upward sloping in this case because the financial transformations of the corporate sector cannot be duplicated at comparable cost. Exogenous shifts in the supplies of noncorporate securities, moreover, will shift these demand curves and thus cause changes in the equilibrium corporate financing mix.

To the extent that financial intermediaries or investors themselves can transform return streams at relatively low cost, on the other hand, demand curves for corporate securities will be highly elastic. Shifts in relative security supplies, in this case, can be easily accommodated in investors' portfolios, and thus they necessitate no changes in the corporate sector's financing mix. In addition, it might be reasonable to expect that the progression from the first case, in which demand curves for corporate securities are relatively less elastic, to the second case, in which these curves are highly elastic, would bear some relationship to the development of the capital market over time. In less developed periods, when investors face a less plentiful array of financial transformation opportunities, one would expect the intermediation role of corporate finance to be relatively important. As the capital market develops, however, and as investors come to rely less on the corporate sector for financial transformation, this role would be expected to diminish.

1.4.3 Conclusion

The foregoing discussion, of course, need not rule out such factors as tax considerations and the agency costs of corporate finance. The essential point is simply that such costs should be recognized on both sides of the market, particularly if one is interested in interpreting corporate financing patterns over long periods of time.

In general, then, both the demand and supply curves for corporate securities may exhibit less than perfect elasticity. The shape and position of the supply curve for corporate debt will reflect such aspects of the corporate sector's transformation technology as agency costs, the costs of issuing and servicing securities, and corporate taxes. The shape of the demand curve reflects the transformation technology available to investors, either on their own account or through financial intermediaries. In short, it reflects the range of portfolio opportunities open to investors and the costs of switching among them.

In principle, this augmented version of the Miller model with agency costs is capable of offering a richer interpretation of the capital structure trends discussed in section 1.1. The analysis there confirmed previous studies' findings of greater corporate debt financing in the post–World War II period. Nevertheless, the evidence further suggested that corporate reliance on debt financing was unusually low around World War II and that current debt proportions are not entirely out of line with those experienced in the earlier decades of the century.

Since the study has encompassed periods when the current tax system did not exist, tax considerations alone do not explain these overall trends. Instead, the augmented theory described here would suggest the following interpretation: In the early decades of the century, corporations may have played a more substantial intermediary role than has been true in recent decades. Investors' demands for relatively safe, fixed-dollar claims were not met to such a degree in the earlier decades by either the government or financial institutions as has been the case in more recent times. These factors may help account for the relatively high proportion of debt in total corporate financing and for the relatively high proportion of corporate debt in total domestic liabilities in the early part of the century. In the years following the Depression, however, this intermediary role of corporate debt has probably been reduced, both by increased relative supplies of federal government and household mortgage debt and by the increased extent of financial intermediation.[45]

By the present time, the markets both for corporate debt and for corporate stock have become heavily institutionalized, and it would be much more difficult to describe convincingly an overt intermediary role played by these securities. Nevertheless, tax rates and inflation in the postwar years have combined with the declining relative size of federal government debt to stimulate corporate debt financing again. Although corporate debt has never approached its earlier importance relative to total domestic liabilities, corporations' reliance on debt financing relative to equity has returned, by some measures at least, to roughly the proportions experienced in the early part of the century.

The augmented theory of the aggregate corporate capital structure described in this section has several points in its favor. First, it is consistent with the apparent inverse relationship between supplies of federal government and corporate debt, even in the absence of taxes. Second, it is capable of describing the interaction between the corporate sector's financing patterns and the secular development of the capital market and its institutions. The growth of pension funds, for example, would be expected to have alleviated some of the lack of substitutability between debt and equity securities induced by personal tax considerations. Development of these institutions, therefore, may have caused the demand curve for corporate debt to become more highly elastic. Finally, this theory is capable of explaining more corporate financing patterns than just the debt-equity mix. It is widely held, for instance, that recent interest rate volatility has made it increasingly dangerous for financial institutions to intermediate between long-term financial assets and short-term liabilities. This may account in part, then, for the shift in corporate liabilities toward increasingly short maturities.[46]

It is clear that many details still remain to be filled in. In particular, if the costs of financial transformation are an important element in the corporate sector's financing behavior, one would like a better understanding of these costs and of where, specifically, corporations might be expected to possess a comparative advantage over financial institutions and individual investors. In addition, hypotheses should be developed about the ways in which technological and regulatory changes alter these comparative advantages.[47] On the basis of the data examined in this paper, however, further development of an aggregate capital structure theory along the lines suggested here appears to offer some promise for explaining the secular patterns in corporate finance.

Appendix A

The Net Effect of an Increase in Corporate Tax Rates on Equilibrium Corporate Debt

The numerator of expression (2) in the text can only be less than or equal to zero if

$$\text{(A1)} \qquad \partial\left(\frac{r}{r_0}\right)/\partial t_c \geq \frac{r/r_0}{1 - t_c}.$$

Note, however, that if X represents the annual, certainty-equivalent, pretax operating cash flow for the corporate sector as a whole, then the aggregate market value, S, of corporate equity is given by

$$\text{(A2)} \qquad S = \frac{(X - rB)(1 - t_c)}{r_0} = \left(\frac{X}{r} - B\right)\frac{r}{r_0}(1 - t_c).$$

Discounting in expression (A2) is done at the tax-exempt rate since in Miller's model corporate equity is tax exempt by assumption.

If we then increase t_c and abstract from any changes in the absolute level of security yields, the resulting change in the aggregate value of corporate equity is given by

$$\text{(A3)} \qquad \Delta S = -\left(\frac{X}{r} - B\right)\frac{r}{r_0}\Delta t_c + \left(\frac{X}{r} - B\right)(1 - t_c)\left(\partial\left(\frac{r}{r_0}\right)/\partial t_c\right)\Delta t_c.$$

If condition (A1) holds, however, ΔS must be nonnegative. Therefore, if an increase in t_c fails to increase the equilibrium amount of corporate debt, it will also fail to reduce the aggregate market value of corporate equity. It seems unlikely, though, that an increase in corporate taxes would increase the value of corporate equity. Thus, as long as the change in relative yields is small enough that the value of equity declines, an increase in the corporate tax rate will also increase equilibrium corporate leverage in the Miller model.

Appendix B

Investors' Valuation of Corporate Stock When No Riskless Asset Is Traded

Individuals, i, have initial endowments of cash, y_1^i, as well as initial fractional shareholdings, $\bar{\alpha}^i$, in the aggregate market value of corporate equity, V. There is no second-period endowment, so individuals must make a consumption-saving decision that maximizes the expected utility, $E^i(U^i)$, of first- and second-period consumption, C_1^i and C_2^i. As noted in the text, the only available savings vehicle is holdings of corporate shares.

Firms in the aggregate are assumed to be subject to the same uncertainty, and thus the shares of one firm are viewed as perfect substitutes for those of any other firm. We will ignore distinctions among firms, then, and simply think of the corporate sector in the aggregate. The aggregate net income of firms in the second period is $\tilde{\Theta}\bar{X}$, where $\tilde{\Theta}$ is a random variable. In general, individuals may differ in their views of the distribution of $\tilde{\Theta}$ and their subjective probability density functions will be denoted by $f^i(\tilde{\Theta})$.

A representative individual's consumption-saving problem is

$$\text{(B1)} \qquad \max_{\alpha^i} \int U^i(C_1^i,\ \tilde{C}_2^i) f^i(\Theta) d\Theta ,$$

where

$$\text{(B2)} \qquad C_1^i = Y_1^i + (\bar{\alpha}^i - \alpha^i)V,$$

and

$$\text{(B3)} \qquad \tilde{C}_2^i = \alpha^i \tilde{\Theta} \bar{X}.$$

The first-order condition is

$$\text{(B4)} \qquad \frac{\partial U^i}{\partial \alpha^i} = \bar{X} E^i(\tilde{U}_2^i\ \tilde{\Theta}) - V E^i(\tilde{U}_1^i) = 0 ,$$

where

$$E^i(U_2^i \tilde{\Theta}) = \int \tilde{\Theta}(\partial U^i / \partial C_2^i) f^i(\tilde{\Theta}) d\Theta ,$$

and

$$E^i(U_1^i) = (\partial U^i / \partial C_1^i) f^i(\tilde{\Theta}) d\Theta .$$

Using the fact that $\text{cov}(\tilde{A}\tilde{B}) = E(\tilde{A}\tilde{B}) - E(\tilde{A})E(\tilde{B})$, where $\tilde{A}$ and $\tilde{B}$ are any two random variables, (B4) may be written as

$$\text{(B5)} \qquad V = \bar{X}\left(\frac{E^i(\tilde{U}_2^i)\ E^i(\tilde{\Theta})}{E^i(\tilde{U}_1^i)} + \frac{\text{cov}\,(\tilde{U}_2^i \theta)}{E^i(\tilde{U}_1^i)}\right).$$

That is, each individual buys or sells shares until his personal valuation of corporate equity is exactly equal to the market's valuation, V.

As indicated by the right-hand side of (B5), however, the individual's personal valuation has two components, which need not be equal separately for all individuals. If we assume away differences in expectations for the moment and let $E^i(\tilde{\Theta}) = 1$ for all individuals, the first component, $E(U_2^i)/E(U_1^i)$, can be thought of as a personal discount factor for certain prospects, and the second component can be thought of as a personal risk-adjustment factor. From (B5), those investors with higher certainty discount factors (that is, those who place a higher value on certain future consumption) must have correspondingly larger (i.e., more negative) risk-adjustment factors.

If we aggregate by summing (B5), weighted by individual shareholdings, over all individuals, the result is

$$\text{(B6)} \qquad \sum_i \alpha^i V = V = \bar{X}\left(\sum_i \alpha^i \frac{E(U_2^i)}{E(U_1^i)} + \sum_i \alpha^i \frac{\operatorname{cov}(U_2^i \tilde{\Theta})}{E(U_1^i)}\right)$$

and the cost of equity financing to the corporate sector may be expressed as

$$\text{(B7)} \qquad \frac{\bar{X}}{V} = \frac{1}{\sum_i \alpha^i \frac{E(U_2^i)}{E(U_1^i)} + \sum_i \alpha^i \frac{\operatorname{cov}(U_2^i \tilde{\Theta})}{E(U_1^i)}}.$$

That is, the cost of equity is determined by weighted averages of investors' certainty discount factors and risk-adjustment factors. Furthermore, since the second term in the denominator of (B6) can be thought of as the overall market risk–adjustment factor, the market certainty–equivalent cost of equity, r_e, is given by

$$\text{(B8)} \qquad r_e = \frac{1}{\sum_i \alpha^i \frac{E(U_2^i)}{E(U_1^i)}}.$$

If firms were now to begin substituting some risk-free debt financing for equity, those investors with the highest certainty discount factors (that is, those placing the highest personal value on this debt) would be the first to buy it. Since these investors would have higher-than-average certainty discount factors relative to the market as a whole, (B8) indicates that they would be willing to accept a yield lower than r_e on at least an initial increment of risk-free corporate debt.

Notes

1. Academic studies of aggregate corporate financing patterns include Goldsmith (1958, 1963), Lintner (1960), Kuznets (1961), Miller (1963), Sametz (1964), Friedman (1980), and Gordon and Malkiel (1981). Business journalists have also surveyed trends in aggregate financial ratios, particularly in conjunction with the "capital shortage" discussions that were popular in the mid-1970s. See, for example, *Business Week* (1974).

2. Examples include Friedman (1980) and Gordon and Malkiel (1981). Discussions in the business press have also tended to emphasize deterioration in corporation balance sheets. *Business Week* (1974) is a good example.

3. Studies emphasizing stability in debt-equity proportions include Lintner (1960), Miller (1963), and Sametz (1964). Updated versions of these arguments also appear in Miller (1977) and Sametz and Keenan (1981).

4. Among the exceptions are Miller (1977) and Gordon and Malkiel (1981).

5. Miller's (1977) paper was perhaps the first to provide a theory explicitly aimed at the aggregate corporate capital structure.

6. The total-debt-to-total-assets ratio was not examined by Miller.

7. After 1961, the IRS generally stopped reporting separate figures for preferred stock.

8. Distortions in the opposite direction can also occur, however. For example, book-value debt ratios may be understated by the omission of such "off-balance-sheet" financing sources as leases and unfunded pension liabilities. The use of these sources is believed to have grown tremendously in the 1960s and 1970s. One indication of the possible magnitude of this understatement is given in Gordon and Malkiel (1981). They calculate the ratio of debt to debt plus equity for the aggregate of firms included on the Compustat tape. Since 1973 the data on the tape include lease and pension liabilities. The ratios with and without these liabilities are as follows:

	Debt Ratio without Leases and Pensions	Debt Ratio including Leases and Pensions
1973	.367	.497
1974	.381	.511
1975	.374	.499
1976	.362	.485
1977	.358	.473
1978	.358	.462

9. See Modigliani and Cohn (1979), however, for an argument that the market does not properly adjust for inflation in determining equity values. By their argument, market-value debt ratios would be substantially overstated in recent years.

10. Myers (1977), for example, has argued that a firm's capacity to issue debt is closely related to its assets-in-place. The total market value of assets, on the other hand, reflects not only assets-in-place, but also future investment opportunities, and Myers points out that firms may not find it advantageous to borrow against these opportunities. Thus the replacement value of assets, which reflects only assets-in-place, may be a better measure of debt capacity. However, assets-in-place will be overstated to the extent that replacement value figures include assets that firms would not be willing to replace.

11. One problem is that von Furstenberg's measure of debt is different from Goldsmith's. In von Furstenberg, non-interest-bearing liabilities have been netted out against the asset side of the balance sheet, while interest-bearing financial assets have been netted out against the liability side in computing this ratio. To make the figures as closely comparable as possible, the same procedure has been used in calculating debt ratios from Goldsmith's data. Nevertheless, the detail in Goldsmith's data is not the same as that in the *Flow of Funds Accounts*, from which von Furstenberg worked, and thus we would not expect the ratios to be identical.

12. To the extent that some investment expenditures, such as research and development, are expensed immediately, however, the extent of equity financing may still be understated somewhat. There are also other problems inherent in Flow of Funds data. Von Furstenberg and Malkiel (1977) discuss the distortions resulting from failure to recognize the reduction in the real value of previously outstanding debt caused by inflation. In addition, the *Flow of Funds Accounts* published by the Federal Reserve System lump preferred stock financing together with common equity financing.

13. It could be argued that this interpretation of Modigliani-Miller is excessively literal

and that we should view it as an equilibrium tendency rather than as a law that holds instant by instant. Brealey and Myers (1981), for example, conclude their chap. 17 with an equilibrium tendency version of the Modigliani-Miller argument. Nevertheless, the more stringent version depicted in figure 2.4 is representative, I believe, of the way the Modigliani-Miller argument is usually interpreted in formal finance theory. It is certainly the version that is consistent with a complete market model. See Litzenberger and Sosin (1977) for a discussion of related points.

14. The financial institution sector is introduced in Stiglitz's (1974) generalization of Modigliani-Miller. Even if financial transformation were costly for households on their own account, their demand for corporate debt would still be perfectly elastic if financial intermediaries could costlessly perform these services.

15. Examples of this theory may be found in Robichek and Myers (1966), Kraus and Litzenberger (1973), and Kim (1978).

16. Implicitly, there are no personal taxes, or at least corporate debt and equity securities are subject to identical tax treatment at the personal level. When the model is discussed in the analysis that follows, it will be assumed that there are no personal taxes.

17. Certainty-equivalent returns on debt here are net of those agency costs (such as monitoring expenses) borne directly by bondholders. The downward slope in the debt supply curve reflects increases in both these agency costs (which are passed back to firms' owner-managers) and in those (such as bonding expenses or opportunities forgone) borne directly by the owner-managers. See Jensen and Meckling (1976) for further discussion.

18. In the simplest version of Miller's model, equity is assumed to be free from personal taxation. Thus r_e, the certainty-equivalent return on equity, is the same as the certainty–equivalent return, r_0, on tax-exempt bonds.

19. An example of such a model is Myers (1977), in which debt is subject to an agency cost but equity is not. In the absence of taxes, the supply curve for debt would slope downward starting from r_e, and in equilibrium no debt would be issued. When corporate taxes are introduced, however, the supply curve shifts upward and there is a positive equilibrium quantity of debt.

20. See, for instance, DeAngelo and Masulis (1980) or Barnea et al. (1981). The models of Gordon and Malkiel (1981) and Modigliani (1982) can also be interpreted in this vein. It is a semantic nicety, in fact, whether such models are classified as "Miller models with agency costs" or tax savings–bankruptcy costs models adjusted for personal taxes. For simplicity, the former label will be applied in the ensuing discussion.

21. All of the comparative statics exercises in this section are of the partial equilibrium variety in that they concentrate on changes in r relative to r_e but do not consider changes in the absolute level of security yields induced by changes in aggregate wealth.

22. It is easily verified that an increase in t_p alone reduces B^*.

23. As in Miller's model, the presence of tax-exempt investors would lead to an initial horizontal segment (at the rate r_e) in the demand curve for preferred stock. In addition, because of the 85% intercorporate dividend exclusion, corporate investors would demand the same certainty-equivalent return on preferred stock that they would on dividend-paying common stock. Corporate demand for preferred stock, then, would further extend the horizontal segment of the demand curve. Eventually, however, additional preferred stock would have to be purchased by taxable investors, and this would impart an upward slope to the demand curve.

24. This effect is discussed by Modigliani (1982), who labels it "Super Fisher's Law."

25. McDonald (1983) has derived a similar result by somewhat different means.

26. The Gordon-Malkiel (1981) model, which combines tax considerations with bankruptcy costs, reaches a similar conclusion. This finding is also consistent with Modigliani's (1982) analysis.

27. A further interaction between inflation and the tax system has been pointed out by DeAngelo and Masulis (1980). They argue that such items as depreciation provide substi-

tute tax shelters and thus limit the firm's ability to benefit from the tax deductibility of interest. Since an increase in inflation reduces the real value of depreciation and other tax shields, however, the firm is then encouraged to substitute debt for equity financing in order to further shelter its real income.

28. Results similar to those in both of these exercises have been derived independently by McDonald (1983).

29. See Kim et al. (1979) and Taggart (1980) for discussions of how investors in different tax brackets sort themselves into clienteles with respect to their preferences for corporate leverage. At Miller's equilibrium, the marginal investor will have $t_{pB} = t_c$ and $\delta = 0$. Furthermore, this investor will be just indifferent between holding taxable and tax-exempt bonds, so for him $r(1 - t_{pB}) = r_0$. In equilibrium, then, $\delta = 1 - (1 - t_c)/(1 - t_{pB}) = 1 - r(1 - t_c)/r(1 - t_{pB}) = 1 - r(1 - t_c)/r_0 = 0$, and thus expression (8) is consistent with expression (1).

30. In 1973, for example, investors who paid taxes at marginal rates greater than the statutory corporate rate accounted for just 3.57% of the economy's taxable income (Pechman 1977, App. B). If taxable income is at all related to wealth (another treacherous assumption), this may suggest that the aversion to corporate leverage on the part of high-tax-bracket investors was not very important. The presence of tax-exempt investors could also add to the demand for corporate leverage.

31. The upward trend in corporate tax rates is also broadly consistent with the secular decline in preferred stock financing, at least in terms of the Miller model with agency costs, as was seen in the subsection "An Aside on Taxes and Preferred Stock" in section 1.2.2.

32. In principle, expected rates of inflation would be preferred. Over long periods, one might expect at least a rough correspondence between expected and realized inflation rates. Another potential measurement problem stems from the possibility that higher inflation rates may be associated with greater uncertainty about relative price changes. To the extent that this is in turn associated with increased business risk, there may be an offsetting influence on corporate debt usage.

33. This increase in debt financing is particularly apparent if one examines yearly Flow of Funds data. In 1946 and 1947, for example, the years of greatest inflation around that period, total debt accounted for 52% and 49%, respectively, of total sources of funds for the corporate sector. In large part this increased debt financing was accounted for by heavy reliance on short-term liabilities, which made up 33% and 29%, respectively, of total sources.

34. The supply of government debt might reasonably be viewed as exogenous to the system. Observed amounts of household mortgages, on the other hand, will presumably be more affected by prevailing capital market yields.

35. To the extent that tax considerations and their interaction with inflation have affected corporate liabilities and household mortgages in the same direction, this may not be surprising.

36. See Holland and Myers (1979) for a good discussion of the pitfalls in interpreting measured q values.

37. Use of the same data for q and for the financing ratios may entail some spurious correlation, however.

38. Williamson (1981) has had some success in using this theory to explain observed capital structures of individual firms.

39. Column 3 of table 1.10 is derived by multiplying the standard deviation of stock returns by one minus the market-debt-to-value ratio. This is a good measure of business risk or the standard deviation of unlevered asset returns if (i) debt is risk-free, (ii) preferred stock is negligible in magnitude, and (iii) leverage has no effect on overall firm value. All three assumptions are questionable here, and thus the measure is very rough. See Hamada (1972) for a discussion of the problem of measuring business risk.

40. It would be tautological, of course, to say that the model with the most explanatory

variables has the greatest explanatory power. What is being asserted here is that there are economically significant trends that the simpler models are incapable of explaining.

41. The widely used "complete" market model would be one in which these conditions are satisfied. Weaker conditions than market completeness (the "spanning" assumption, for example) would also be sufficient to generate perfectly elastic demands for securities if corporate financing choices were confined to traditional debt and equity securities.

42. A considerable literature exists, tracing this process of capital market development with particular emphasis on the role of financial institutions. See, for example, Davis and North (1971), Silber (1975), and James (1978).

43. See Barnea et al. (1981) for further elaboration on the role of tax arbitrage restrictions in making this demand curve imperfectly elastic.

44. Differences in investor expectations could play a similar role. Firms could try to gain by selling riskless securities to the most pessimistic segment of investors.

45. In the immediate post-Depression years, investors probably also became increasingly skeptical about the safety of corporate debt.

46. Ultimately, this involves a shift in the bearing of interest rate risk from shareholders and other owners of financial institutions and from liability insurance agencies to the shareholders of nonfinancial corporations. A more complete explanation would detail the mechanism by which such a shift might take place. In particular, the stance of financial institution regulators might be an important factor.

47. See Greenbaum and Haywood (1971) for a discussion of the role of technology and regulation in circumscribing the intermediate possibilities open to financial institutions.

References

Barnea, Amir; Haugen, Robert A.; and Senbet, Lemma W. 1981. An equilibrium analysis of debt financing under costly tax arbitrage and agency problems. *Journal of Finance* 36:568–81.

Brealey, Richard, and Myers, Stewart. 1981. *Principles of corporate finance*. New York: McGraw-Hill.

Business Week. 1974. The debt economy. Special Issue. October 12.

Ciccolo, John C., Jr. 1982. Changing balance sheet relationships in the U.S. manufacturing sector, 1926–77. In *The changing roles of debt and equity in financing U.S. capital formation*, ed. Benjamin M. Friedman. Chicago: University of Chicago Press.

Davis, Lance E., and North, Douglas C. 1971. *Institutional change and American economic growth*. Cambridge: Cambridge University Press.

DeAngelo, Harry, and Masulis, Ronald W. 1980. Optimal capital structure under corporate and personal taxation. *Journal of Financial Economics* 8:3–29.

Friedman, Benjamin M. 1980. Postwar changes in the American financial markets. In *The American economy in transition*, ed. M. Feldstein. Chicago: University of Chicago Press.

———. 1982. Debt and economic activity in the United States. In *The changing roles of debt and equity in financing U.S. capital formation*, ed. Benjamin M. Friedman. Chicago: University of Chicago Press.

Goldsmith, Raymond W. 1956. *A study of saving in the United States*. 3 vols. Princeton: Princeton University Press.

———. 1958. *Financial intermediaries in the American economy since 1900*. Princeton: Princeton University Press.

Goldsmith, Raymond W.; Lipsey, Richard E.; and Mendelson, Morris. 1963. *Studies in the national balance sheet of the United States*. 2 vols. Princeton: Princeton University Press.

Gordon, Roger H., and Malkiel, Burton G. 1981. Corporation finance. In *How taxes affect economic behavior*, ed. H. J. Aaron and J. A. Pechman. Washington, D.C.: Brookings Institution.

Greenbaum, Stuart E., and Haywood, Charles F. 1971. Secular change in the financial services industry. *Journal of Money, Credit and Banking* 3:571–89.

Grier, Paul, and Strebel, Paul. 1980. The empirical relationship between taxation and capital structure. *Financial Review* 15:45–57.

Hamada, Robert R. 1972. The effect of the firm's capital structure on the systematic risk of common stocks. *Journal of Finance* 27:435–52.

Holland, Daniel M., and Myers, Stewart C. 1979. Trends in corporate profitability and capital costs. In *The nation's capital needs: three studies*, ed. R. Lindsay. New York: Committee for Economic Development.

Hai Hong. 1977. Inflation and the market value of the firm: theory and tests. *Journal of Finance* 32:1031–48.

Ibbotson, Roger G., and Sinquefield, Rex A. 1982. *Stocks, bonds, bills and inflation: the past and the future*. 1982 ed. Charlottesville, Va.: Financial Analysts' Research Federation.

James, John A. 1978. *Money and capital markets in postbellum America*. Princeton: Princeton University Press.

Jensen, Michael C., and Meckling, William H. 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3:305–60.

Kim, E. Han. 1978. A mean-variance theory of optimal capital structure and corporate debt capacity. *Journal of Finance* 33:45–63.

Kim, E. Han; Lewellen, Wilbur G.; and McConnell, John J. 1979. Financial leverage clienteles: theory and evidence. *Journal of Financial Economics* 7:83–109.

Kraus, Alan, and Litzenberger, Robert. 1973. A state-preference model of optimal financial leverage. *Journal of Finance* 28:911–23.

Kuznets, Simon. 1961. *Capital in the American economy: its formation and financing*. Princeton: Princeton University Press.

Lintner, John V. 1960. The Financing of Corporations. In E. S. Mason, ed., *The Corporation in Modern Society*. Cambridge, MA: Harvard University Press.

Litzenberger, Robert H., and Sosin, Howard B. 1977. The theory of

recapitalizations and the evidence of dual purpose funds. *Journal of Finance* 32:1433–65.
McDonald, Robert. 1983. Government debt and private leverage: an extension of the Miller theorem. *Journal of Public Economics* 22: 303–25.
Miller, Merton H. 1963. The corporation income tax and corporate financial policies. In *Stabilization Policies*, by Commission on Money and Credit. Englewood Cliffs, N.J.: Prentice-Hall.
———. 1977. Debt and taxes. *Journal of Finance* 32:261–75.
Modigliani, Franco. 1982. Debt, dividend policy, taxes, inflation, and market valuation. *Journal of Finance* 37:255–73.
Modigliani, Franco, and Cohn, Richard A. 1979. Inflation, rational valuation, and the market. *Financial Analysts Journal* 35:24–44.
Modigliani, Franco, and Miller, Merton H. 1958. The cost of capital, corporation finance, and the theory of investment. *American Economic Review* 48:261–97.
———. 1963. Corporate income taxes and the cost of capital—a correction. *American Economic Review* 53:433–43.
Myers, Stewart C. 1977. Determinants of corporate borrowing. *Journal of Financial Economics* 5:147–75.
Pechman, Joseph A. 1977. *Federal tax policy*. 3d ed. Washington, D.C.: Brookings Institution.
Robichek, Alexander A., and Myers, Stewart C. 1966. Problems in the theory of optimal capital structure. *Journal of Financial and Quantitative Analysis* 1:1–35.
Ross, Stephen A. 1977. The determination of financial structure: the incentive—signalling approach. *Bell Journal of Economics* 8:23–40.
Sametz, Arnold W. 1964. Trends in the volume and composition of equity finance. *Journal of Finance* 19:450–69.
Sametz, Arnold W., and Keenan, W. Michael. 1981. Business investment demand. In *Financial institutions and markets* by M. E. Polakoff, T. A. Durkin, et al. 2d ed. Boston: Houghton Mifflin.
Senbet, Lemma W., and Taggart, Jr., Robert A. 1984. Capital structure equilibrium under market imperfections and incompleteness. *Journal of Finance* 39:93–103.
Silber, William B., ed. 1975. *Financial innovation*. Lexington, Mass.: D. C. Heath.
Stiglitz, Joseph E. 1974. On the irrelevance of corporate financial policy. *American Economic Review* 64:851–66.
Taggart, Jr., Robert A. 1980. Taxes and corporate capital structure in an incomplete market. *Journal of Finance* 35:645–59.
Von Furstenberg, George M. 1977. Corporate investment: does market valuation matter in the aggregate? *Brookings Papers on Economic Activity* 2:347–97.

Von Furstenberg, George M., and Malkiel, Burton G. 1977. Financial analysis in an inflationary environment. *Journal of Finance* 32:575–88.
Williamson, Scott H. 1981. The moral hazard theory of corporate financial structure: empirical tests. Ph.D. thesis, Massachusetts Institute of Technology.

Comment John Lintner

The first section of this paper provides a very useful overview and synthesis of the evidence regarding the secular patterns in the relative use of debt and equity financing by corporations developed in the classic studies of Goldsmith, von Furstenberg, Holland and Myers, and others. These earlier studies have used book or market or replacement cost valuations to measure the relative stocks of debt and equity securities, or have turned to flow-of-funds data. Each of these individual series measures a different aspect of the underlying reality and raises its own problems of possible bias and measurement error. Taggart's convenient tables also remind us that the levels of corporate leverage reported in different studies using the same concepts for overlapping dates frequently differ substantially. The issues raised by these observations would have required much further detailed investigation if the author had intended to develop econometric tests of the adequacy of any (or of any combination) of our models to explain the year-to-year levels and fluctuations in corporate leverage. But Taggart's objectives in this paper are more broad-brush and qualitative. His focus is on using the available evidence simply to identify the broader trends and stronger tides in the relative use of corporate debt and equity over the eight decades for which estimates are available—the trends and tides which theory should be able to explain in terms of a comparative static analysis.

In spite of the imperfections and differences in the various separate series, Taggart is able to show that there is often, if not always, substantial agreement regarding the general stability or the relative increase or decrease in the use of corporate leverage over various intervals of five or ten years or more.[1] The agreement among all the series in showing a massive increase in the relative use of debt over the last fifteen or twenty years is simply the most dramatic and best known of the instances of common broad movements (or stability) he points out. Taggart also adds useful perspective on this recent experience by observing that equally high levels of leverage measured in market values (or relative to the

Until his death, John Lintner was George Gund Professor of Economics and Business Administration at Harvard University.

replacement cost of assets) were common in the 1930s, and that Goldsmith's data show even higher levels early in this century when inflation was mild and there were no income taxes. While readers familiar with the underlying literature may not be especially surprised at any of the conclusions, this survey and summary of the available evidence will serve to sharpen our perspectives on what the longer-term patterns in the financing of corporate assets and investments have been.

The rest of the paper summarizes, reinterprets, tests, and finally extends the existing body of corporate financial theory in an effort to understand and explain the various stabilities and secular movements in the relative use of debt financing identified in the first section. Of the many models of corporate capital structure which have been developed in recent years, only Miller's "debt and taxes" and its successors directly provide a determinate equilibrium for the aggregate capital structure of the corporate sector as a whole. Optimal debt-to-equity ratios in the original Modigliani-Miller models were of course indeterminate at both the firm and the corporate sector levels. The numerous other theories have all concentrated on deriving the optimal mix of financing for individual firms under different sets of conditions in a partial equilibrium setting. For expositional convenience, along with the original Miller macro model, Taggart groups the rich set of micro models which have been developed in recent years into three generic types: the union of tax savings and bankruptcy cost theories, agency cost theories, and Miller's model combined with agency costs. Taggart then handles the aggregation problems involved in deriving the implications of these various micro theories for the equilibrium values of sector-wide totals of debt and equity financing by recasting the theories in terms of supply and demand curves expressed as functions of what are described as certainty-equivalent rates of return.

On careful examination, however, this description of the functions as certainty equivalents is inappropriate and potentially misleading. In the presence of a riskless asset, the marginal certainty-equivalent rate of return on all risk assets is equal to the riskless rate.[2] In particular, this is true for all outstanding issues of debt and equity securities, regardless of their relative volumes for each firm or for the corporate sector as a whole. Rather than certainty equivalents, Taggart's supply and demand functions are denominated in terms of required expected rates of return throughout. They are simply normalized relative to the rate of return required on outstanding equity in the limiting case of an all-equity capitalization, or alternatively normalized on the rate which borrowers would just be willing to pay (or lenders would just be willing to accept) on the first dollar of debt issued, as the case may be. Each generic theory specifies the all-equity intercept of either the supply or demand function as its primary benchmark. It then derives the intercept of the other function relative to this point by allowing for the initial impact of the factors, such as taxes or agency or bankruptcy costs, which are being analyzed. Once the two intercepts have been located, the shapes, slopes, and derivatives of both the supply and demand functions as more debt is added under the specified conditions are inferred and the sector-wide equilibrium at their point of intersection or equality is determined. At each stage, all measurements are in terms of expected rates of return rather than certainty equivalents.

When properly described and understood in this way, Taggart's recasting of the major micro theories brings out interesting and useful comparisons between them both in his text and in his summary diagrams. It also handles the aggregation problem in a very convenient way,[3] and it facilitates the derivation of the predictions of each theory regarding the qualitative comparative static effects on aggregate debt-to-equity ratios of changes in various contextual factors.

The predictions of each of Taggart's generic model types for the broad effects on corporate financial ratios of changes in corporate and personal tax rates, in inflation, in the costs associated with corporate debt, in the supplies of tax-exempt or of noncorporate taxable bonds, and in growth opportunities relative to assets in place are derived in the second section and conveniently summarized in table 1.5. The simpler types of models focus on only one or two of these determining factors and ignore the others, but, as would be expected, whenever any two models include a common determining factor, they are in complete agreement regarding the impact of a change in that factor. While the separate discussions of the location and shapes of the sectoral supply and demand functions in each model are instructive and nicely set the stage for Taggart's own "augmented theory" in the final section of the paper, these generic models are seen to be quite compatible and complementary.

The third section examines the ability of existing theory to explain the secular movements in corporate capital structures, drawing on many decades of annual data on corporate and personal tax rates, "net debt incentive tax ratios," inflation rates, Tobin's q values, yearly standard deviations of monthly stock market returns, and the relative supplies of corporate and noncorporate securities. Taggart carefully and informatively compares the fluctuations in each series with the observed secular trends in corporate financial patterns. Not surprisingly, he finds that secular fluctuations in corporate debt-to-equity ratios are not adequately explained by any of these factors. Each factor is associated with debt ratios in the way theory predicts over parts of the record, but in each case the expected association is not found during other periods. But however convenient and constructive this one-on-one analysis may be, this part of the paper generally has the character of an examination of the time-series residuals in a series of simple regressions. The important interactions of tax rates and inflation are recognized, but the other causal factors are considered separately. Further research to explain these secular trends will have to move on to examine the net effects of each of the causal factors while appropriately taking into account the simultaneous effects of others. In addition, there are important interactions between these other factors which will have to be analyzed and allowed for—notably those between different risk and agency costs and tax rates.

Even though Taggart did not explicitly carry through this further analysis, he must have done so implicitly and judgmentally, for he clearly believes that all of the factors listed in his table 1.5 are important, though partial, determinants of corporate debt-to-equity ratios. This is the basis for his further conclusion that the Miller model combined with agency costs explains the broad fluctuations in these financial ratios more adequately than any of the three other generic models considered. The original Miller or agency cost models, and even the popular tax savings and bankruptcy cost models, all leave out various factors which appear to be empirically significant, while the Miller-cum–agency cost model in effect is treated as the union of all the elements in the others.

But Taggart regards even this inclusive model as not fully adequate to explain the historical record. He observes that the demand function for corporate debt will become more elastic as capital markets become more fully developed and competitive and as transactions costs and trading restrictions are reduced. Similarly, the position and curvature of this demand function over time will reflect changes in the structure of the set of financial intermediaries and financial instruments available to investors in the economy. He shows that variations in all these major aspects of the broader institutional context of corporate financial decisions, as well as exogenous changes in the relative supplies of noncorporate securities, will affect the equilibrium debt-to-equity ratios for the corporate sector, other things equal, even in the complete absence of taxes and agency and bankruptcy costs. When the latter factors are reintroduced, the resulting augmented version of the Miller-cum–agency costs model helps to explain several important but otherwise rather puzzling features of the historical trends in corporate capital structures, which are discussed in the final section.

As I studied the paper, I was somewhat surprised that Taggart did not explicitly identify and develop some additional determinants of corporate debt-to-equity ratios. Some of these are implicitly suggested in his text, while others are not. In particular, Taggart properly recognizes that the absence of complete markets and the presence of agency and bankruptcy costs make investment and financing decisions interdependent. The optimal debt ratio for any ongoing firm similarly depends on the unsystematic (as well as the systematic) risks of its assets in place.[4] To at least a rough approximation, these risks will depend on the industries within which the firm operates, and it is well known that there are clear and remarkably persistent patterns in the relative use of debt financing by firms in different industries. All this clearly suggests that a considerable part of the variation in aggregate corporate debt-to-equity ratios may have reflected shifts in the relative volumes of total financing required by different industries—due for instance to shifts in the relative growth in demands for their output—rather than to shifts in economy-wide factors such as tax rates or inflation. During a period when the total capitalization of such heavily levered industries as hotels and electric utilities increases relative to that of such industries as soft drink manufacturers or industrial chemicals, the overall corporate debt-to-equity ratio will rise even if nothing else is happening.

Similarly, just as the distribution of income and the pattern of progression in personal tax rates affect the elasticity of the demand for corporate debt in the original Miller model, it is clear from Taggart's analysis that shifts in the distribution of wealth as well as of income among individual investors will shift this demand curve in his augmented model. While the available data on the distributions of income and wealth are rather rough, they may help explain debt usage over time by way of various clientele effects. The data on nondebt corporate tax shields are much more solid, and the direction of their net effect is quite clear. The depressing impact on equilibrium debt ratios of the veritable explosion in these other tax shields over the last decade or so clearly needs to be allowed for in assessing the true explanatory power of other factors. The excess profits taxes imposed during World War II and the Korean War should also be mentioned and taken into account. Finally, it should be observed that Taggart generally discusses the adequacy of each explanatory factor by comparing the contemporaneous movements in corporate debt-to-equity ratios and the series in question. It is becoming increasingly clear that corporations have *target* (equilibrium) debt-to-equity ratios, just as they have target dividend payout ratios, and that as conditions change they progressively but partially adjust their immediate position toward the equilibrium value.[5] This suggests that in future work, even that intended to explain only the secular trends and broader movements in debt ratios, it would be advisable to allow for appropriate lags between the explanatory series and the debt ratios being investigated.

These various observations, however, are in the nature of suggestions for further refinements and extensions in future research on these issues, building on what is already a very broad-ranging, insightful, and commendable piece of work. In particular, Taggart's review and augmentation of our received theory has been very constructive and useful, and the paper as a whole has considerably enriched our understanding of the major trends in corporate financing over the last century.

Notes

1. The major exceptions are of course found in comparisons between series based on book values with those based on either market values or replacement costs.

2. This property is explicitly derived in Lintner (1969, p. 356) and shown to hold when investors have differing (as well as common) probability assessments. When there is no riskless asset (as when inflation is uncertain), the marginal certainty-equivalent real rates of return on all assets in every investor's portfolio again have a common value equal to the shadow value of his wealth constraint—i.e., his marginal real certainty-equivalent of ending wealth (pp. 373–77). This is of course true even when short-selling constraints are effective (pp. 389 ff.). Alternatively, when the objective function is expressed as the utility of a stream of consumption, the marginal certainty-equivalent real rate of return is the ratio of the utility of an added dollar of certain future real consumption to that of a dollar of current consumption. In both formulations, the marginal certainty-equivalent return in the absence of a riskless asset will vary from investor to investor (even when probability assessments are homogeneous), and the market value will involve weighted averages across investors.

3. The lateral summation of rising, horizontal or falling micro supply or demand functions will produce macro functions with qualitatively the same characteristic. Similarly, the displacement of any aggregated function will be qualitatively the same as that of its component micro functions in response to the change of any common factor such as tax rates or inflation.

4. This position is advanced, and some of its further implications are developed, in Lintner (1982), esp. pp. 135–40.

5. The speed of adjustment of debt-to-equity ratios may of course be different than that for dividends. This combined model was originally proposed in Lintner (1967).

References

Lintner, John. 1967. Corporation finance: risk and investment. In *Determinants of investment behavior*, ed. Robert Ferber. New York: National Bureau of Economic Research.

———. 1969. The aggregation of investor's diverse judgments and preferences in purely competitive securities markets. *Journal of Financial and Quantitative Analysis* (December), pp. 347–400.

———. 1982. Some new perspectives on tests of CAPM and other capital asset pricing models and issues of market efficiency. In *Economic activity and finance*, ed. Marshall E. Blume et al. Cambridge, Mass.: Ballinger.