Comparing the Cost of Capital in the United States and Japan: A Survey of Methods

by James M. Poterba

Wide U.S. trade deficits in the early 1980s prompted policy analysts in government and industry to search for the sources of declining U.S. competitiveness. Many argued that U S. managers failed to "take the long view," forgoing investment or market development projects with high future yields to maintain their current profits Cultural factors, such as the weak implicit contracts between firms and workers, were often cited as the cause of falling competitiveness, even though these factors have evolved slowly while the U.S trade position declined precipitously in the early 1980s

During the last decade, a small but growing group of academics, policy makers, and businessmen has argued that the differential behavior of U.S. and foreign firms is a rational response to disparities in their economic environments. For example, George Hatsopoulos (1983) claimed that the cost of capital, or the pretax rate of return that firms must earn to generate the returns demanded by shareholders and creditors, was significantly higher in the United States than in Japan He and others have argued that as a result, Japanese managers find it in their firms' best interest to undertake some long-horizon projects that U.S managers would reject

While the cost of capital is simple in concept, it is quite complex in practice It depends on the rates of return demanded by shareholders and bondholders, the tax system confronting corporations, and a variety of auxiliary aspects of firm behavior. Any attempt to estimate the cost of capital must rely on a variety of assumptions about corporate financing and investment practices Moreover, data for firms in different nations are rarely comparable, requiring further assumptions and approximations.

Given the central importance of the cost of capital in corporate investment decisions, it is no surprise that numerous studies have tried to compare the cost of capital facing U.S. firms with that of their international competitors. Given the estimation difficulties, however, it is also no surprise that these studies do not reach identical conclusions Many but not all studies find that the cost of capital has placed U S. firms at a competitive disadvantage relative to firms in other nations

This article surveys the sizable literature comparing the cost of capital in different nations It tries to isolate common conclusions and to highlight the methodological differences of previous investigations The article does not attempt to compute "definitive" estimates of relative capital costs. Rather, it draws on earlier studies and emphasizes the underlying economic and institutional factors that may contribute to cost of capital disparities.

The article illustrates alternative cost of capital methodologies by focusing on the United States and Japan. Most previous studies have confined their analysis to these nations because of a worsening bilateral trade balance in the 1980s and the high visibility of Japanese import penetration in several high-technology U S markets.[1] Limiting the present analysis to the United States

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[1]The principal exceptions are the studies by the U S Department of Commerce (1983) and McCauley and Zimmer (1989) The former considers only the cost of funds and does not report complete cost of capital estimates The latter analyzes capital costs in the United States, Japan, Germany, and the United Kingdom

and Japan makes it unnecessary to discuss the institutional complexities of other nations, while still highlighting measurement issues concerning the cost of capital.

Even when only two nations are compared, relative capital costs can vary through time This article concludes that Japanese firms have enjoyed a cost of capital advantage over their U.S competitors throughout most of the last two decades, although the source of this advantage has shifted At the beginning of the 1980s, for example, low costs of debt combined with debt-equity ratios substantially above those in the United States held down capital costs for Japanese firms The increasing integration of world capital markets during the last decade has limited the differences in borrowing costs, however, and today any cost of capital advantage is due to lower costs of equity rather than to differential borrowing costs

The article is divided into six sections The first provides a brief overview of what the cost of capital is and how it affects managers' project evaluation The analysis demonstrates that long-term projects are particularly affected by higher costs of capital.

The next two sections discuss the cost of funds, the required return that investors demand the firm earn after corporate taxes The second section analyzes the cost of debt, while the third considers the more complicated problem of measuring the required return demanded by shareholders. Both sections present data on historical rates of return in the United States and Japan and briefly explain why required returns might differ across countries

The fourth section discusses debt-equity ratios of firms in the two nations, noting shifting patterns through time and describing the institutions that have historically supported higher leverage in Japan than in the United States The fifth section considers the influence of the corporate tax rate and the system of investment incentives on the cost of capital. Contrary to some prior claims, tax considerations do not appear to be central determinants of capital cost disparities between the United States and Japan. This section also reports the summary measures of capital costs presented in previous investigations

The article's final section notes several policy options that would affect the cost of capital These include changing the taxation of firms and shareholders as well as raising the national saving rate

Table 1

Impact of Discount Rates on Long-Term Investments

Discount Rate	Current Value of $5 Cash Flow, Five Years in the Future	Economically Profitable "Waiting Time" for Hypothetical New Project†
4	$4 09	45 8 years
6	3 70	23 8
8	3 35	14 2
10	3 03	9 2
12	2 74	6 1

Source Author's calculations

†The second column reports the waiting time for a project with an up-front cost of $100,000 and annual profits of $25,000 once it begins yielding returns The estimates in this column answer the question. How long could a firm wait until the profit flows began?

What is the cost of capital?

The cost of capital is the pretax real return that a firm must earn, gross of depreciation, to satisfy the demands of its shareholders and bondholders If new projects do not earn a return at least as great as the cost of capital, the equity market will penalize managers for wasting corporate resources. The cost of capital therefore directly affects the optimal investment policy of corporations As the cost of capital rises, firms will find fewer projects yielding returns high enough to warrant new investment The cost of capital depends upon the required returns investors demand, on the tax treatment of investment, on the depreciation of the investment asset, and on the expected rate of appreciation for the productive asset

To understand the link between the cost of capital, discount rates, and project choice, consider a simple example of a manager confronting a project requiring a onetime payment today that will return five dollars in today's prices five years in the future. How large an up-front payment will a manager be willing to make for this project? This depends on the discount rate that investors (and the manager) apply to the firm's cash flows The first column of Table 1 presents the answer to this question for several different values of the discount rate.[2] When the discount rate is 4 percent per year, the manager is willing to give up $4.09 for each five dollars he will earn in five years With a discount rate of 10 percent, however, the manager will only forgo $3 03 to earn $5 00 in five years

A second example illustrates the same point. Consider a stylized project that costs $100,000 today but does not yield returns for several years. There is no uncertainty about the project's cash flows, once the project becomes productive, it yields $25,000 per year (in the prices of the first year) *forever*. Chart 1 sketches the cash flow pattern associated with this stylized project. The second column in Table 1 reports the number of years that a manager will agree to wait before receiving the project's positive cash flows If the discount rate is 4 percent, the project will be profitable even if it takes

[2]Variations in the discount rate affect the cost of capital, although not all disparities across countries or firms in costs of capital are due to differential discount rates

forty-five years before positive cash flows materialize. At a discount rate of 12 percent, however, any delay of more than six years renders the project unprofitable. These calculations illustrate that the discount rate is a particularly critical determinant of the attractiveness of long-term investments.

The cost of capital depends on the discount rate as well as many other considerations affecting the attractiveness of investment projects. It is a function of the returns demanded by bondholders and shareholders, the debt-equity mix used in financing new projects, the corporate tax rate, and the generosity of tax allowances on new investments. Formally, the expression for the cost of capital (c) is

$$(1)\quad c=[r_{eq}(1-\beta)+\beta(1-\tau)r_b+\delta-\pi]^*[(1-ITC-\tau z)/(1-\tau)],$$

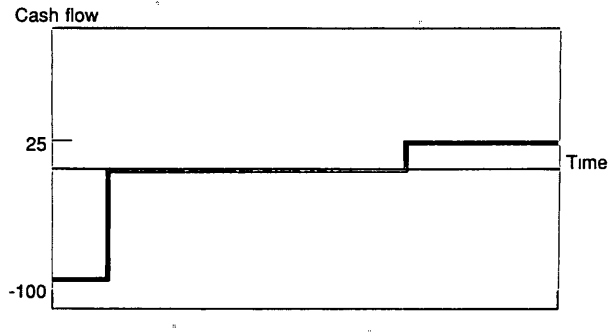
where

- r_{eq} = nominal rate of return demanded by equity holders
- r_b = nominal rate of return demanded by bond holders
- β = debt-to-total capital ratio
- τ = marginal tax rate on corporate earnings
- δ = economic depreciation rate of capital good
- π = expected inflation rate
- ITC = rate of investment tax credit
- z = present discounted value of depreciation allowances on a new investment project.

This expression, though complex, is easy to understand. The first term in brackets is a weighted average of the required returns demanded by equityholders and bondholders, with weights β and (1-β) equal to the share of each type of financing in the firm's capital structure,[3] plus the cost of physical decay on the asset. The nominal cost of debt is multiplied by a $(1-\tau)$ term to reflect the tax deductibility of interest payments Since expected inflation is subtracted from this term, it effectively depends on real debt and equity returns. The second term recognizes that investment incentives and depreciation allowances reduce the cost of purchasing capital goods. Thus, the cost of capital is lower as the investment credit (ITC) or benefits of depreciation allowances (z) are larger. The division by $(1-\tau)$ simply recognizes that profits are taxed, so that the post-tax return that the firm must deliver to its investors is "grossed up" by $1/(1-\tau)$ The next three sections focus on the components of this cost of capital formula

Chart 1

Hypothetical Long-Term Investment Project



The cost of debt

The cost of funds is the rate of return that the firm must promise to its creditors or shareholders when it raises financial capital Most firms use both debt and equity capital This section considers the cost of debt, deferring the more controversial cost of equity until the next section.

The pretax cost of debt is the interest rate that a firm must promise on new corporate borrowings There is no single borrowing rate for the corporate sector; different firms can borrow at significantly different rates, depending on their riskiness. Even a given firm does not borrow at a single interest rate; rather, it faces a spectrum of rates depending on the maturity of its debt issue and the proposed application of funds Most studies ignore these sources of heterogeneity and use indexes of yields on high-grade corporate debt (BAA or better) to measure the cost of debt finance This procedure is justifiable if the structure of risk and maturity premia is stable across countries and time. Such an assumption is not particularly plausible, but an alternative, empirically tractable methodology is difficult to find

Nominal before-tax interest rates are *not* the key determinants of corporate borrowing costs Rather, the cost of funds is affected by the *real, after-tax* cost of debt, defined by

$$(2)\quad r_{AT} = (1-\tau)i - \pi,$$

where π indicates the expected inflation rate Variation in expected inflation rates across countries can lead to significant differences in nominal interest rates, even if real interest rates are similar It is therefore important to

[3]Kester and Leuhrman (1990) emphasize that the marginal debt-equity mix in financing a given project may differ from the average debt-equity mix for the corporate structure They correctly observe that the average debt-equity ratio of a firm or corporate sector may not reflect the appropriate debt-equity weighting on marginal projects

correct nominal interest rates, even if crudely, for inflationary expectations. Equation 2 also emphasizes the link between the statutory tax rate and the after-tax borrowing rate. Since nominal interest payments are tax deductible, an increase in expected inflation that raises nominal interest rates by less than $1/(1-\tau)$ times as much as the inflation shock will reduce the after-tax cost of borrowing

There are at least three different ways to measure expected inflation The first assumes that actual inflation at any moment is a good proxy for what was expected. While obviously erroneous in some situations, this approach is simple and can also be interpreted as the ex post real interest rate paid by firms in a given period A second strategy involves using either survey data or macroeconomic forecasts. While these data are somewhat arbitrary, especially if only one firm's forecast is being used, they are attractive precisely because they are statements of expectations Finally, the most common approach is to compute a weighted average of past inflation rates and to argue that most individuals extrapolate the recent past to the future Like the use of actual inflation rates, this approach will misstate expectations during periods when policy shocks or other factors lead to rapid revisions in inflationary prospects.

Three cost of capital studies indicate the varied approaches to measuring the real cost of debt. Hatsopoulos and Brooks (1987), who update and slightly modify Hatsopoulos' (1983) study, use Moody's BAA rate as the pretax interest rate for the United States, but for Japan, they construct their own estimate of long-term borrowing costs using the yield on heavily traded, low-risk Nippon Telephone and Telegraph bonds plus a "risk premium" equal to the yield spread between BAA bonds and Treasury bonds in the United States. This procedure assumes that the risk premium for corporate bonds is identical in the two nations When paired with the assumption that actual inflation rates are reasonable proxies for expected inflation, it yields real after-tax interest rates in Japan that average more than 100 basis points below those in the United States during the 1970s and early 1980s

Bernheim and Shoven (1987, 1989) focus on short-term borrowing costs, since their analysis argues that the capital market equates short-term risk-adjusted returns in the bond and stock markets They explore several different measures of expected inflation and find that for the early 1980s, Japanese real interest rates were between 300 and 600 hundred basis points lower than their U.S. analogues. They also present evidence on long-term rates, finding disparities that, though smaller, again suggest lower Japanese real borrowing costs

McCauley and Zimmer (1989) present the most systematic analysis of borrowing costs. They recognize the mix of long- and short-term borrowing in corporate capital structures and take an average of the interest rates on different maturity debt. They also correct observed interest rates for the presence of compensating balances, that is, requirements that borrowers hold some fraction of a loan in a low-interest account at the lending institution. These requirements effectively raise the cost of borrowing McCauley and Zimmer (1989) follow Hatsopoulos and Brooks in subtracting the actual inflation rate from nominal interest rates when constructing the real after-tax cost of borrowing Their results, for a more recent time period than either of the earlier studies, suggest no apparent differences in real after-tax borrowing costs in the United States and Japan. In part the difference in results is due to capital market integration beginning in the early 1980s.

While different costs of borrowing may have played an important part in historical differences between U S and Japanese capital costs, they are unlikely to be central today Differences in real interest rates across nations are inconsistent with a perfectly functioning world capital market in which investors from a given nation earn the same rate of return regardless of where they invest their funds Academic studies (surveyed, for example, by Mishkin 1984 and Frankel 1990) nevertheless suggest that there are differences in real interest rates between some countries. The size of the U.S. and Japanese markets and the active cross-border arbitrage in fixed income markets make large disparities in these markets unlikely

A firm in either the United States or Japan could, in addition, try to exploit persistent differences in real interest rates by issuing bonds denominated in the other nation's currency and marketing them to foreign investors This equilibrating force was absent in the years before 1980, when the Japanese capital market was relatively closed to outside investors or borrowers Today, however, firms routinely make cross-border transactions of this type. This development reinforces the view that interest rate differences are unlikely to be a central component of the cost of capital differences between Japan and the United States.

The cost of equity

Estimating the cost of equity is the most difficult part of any cost of capital computation. The reason is that there is little evidence on the risk premium that equity investors require to hold stocks rather than less risky bonds. The risk premium is likely to vary through time, making it difficult to use historical data to assess this parameter Consequently, researchers have differed more in their methods of measuring the cost of equity than in

their methods of measuring the cost of debt.

This section considers four approaches to measuring the cost of equity. The first subsection considers estimates that assume that past returns on corporate stock provide a good guide to required returns The next three subsections discuss various measures of expected returns that are based on the ratio of actual earnings to share prices or assets values. A concluding subsection discusses the extent to which differences in equity cost can persist in a world capital market

Estimates using historical data on equity returns

The simplest approach to measuring the required return on equity is to assume that the historical average differential in equity and debt returns indicates the extra return that investors demand for holding risky equity rather than riskless debt.[4] If required returns were constant through time, and if the data sample on equity and debt returns were long enough to measure the average returns precisely, then this procedure would yield reliable results. In practice, however, neither of these conditions is satisfied

It is useful to begin with background information on the equity risk premium computed this way. Table 2 reports the average excess return on equities relative to government bills in the United States and Japan for several different time periods. The findings highlight the sensitivity of these results to the sample period.[5] The sharp rise in the Japanese equity market during the mid-1980s implies that any estimate of ex post returns that includes these years (and does not span a very long period) will show that Japanese investors demand *higher* equity returns than their U S counterparts. The 39 percent decline in the Japanese equity market during calendar 1990 has weakened, but not erased, the apparent differential in required returns

The problems with using relatively short samples of historical returns are more fundamental than sensitivity to a few years of data. To understand the first problem, consider an economy in which institutional changes within a single year reduce by half an equity risk premium that has historically been constant. Share prices will *rise* in response to this news, and ex post measures of the equity risk premium will suggest that it has risen. In this case, however, the actual movement is just the opposite.

The second difficulty with ex post returns is that just as real interest rates appear to fluctuate, there is evidence that required returns vary over the business cycle and through time. Recent research in financial economics (for example, Fama and French 1988) suggests that a considerable share of the variation in equity returns, particularly over long horizons, can be forecast using the dividend-price ratio and related variables Changes in financial markets and practices are also likely to affect the equity risk premium. The rise in the leverage of some U.S. firms during the 1980s, for example, probably raised their equity risk premia relative to what they would have been otherwise, the gradual reduction in the fear of deep and major depressions since the 1930s has probably lowered the relative cost of equity during the postwar period.

A third drawback to using historical data to calibrate required returns is the imprecision of the resulting estimates. During the last sixty years, the return on U.S equities has exceeded that on Treasury bills by 7 5 percentage points per year Given the significant annual variation in equity returns—the standard deviation of returns on the U.S. market is approximately 20 percent per year—the standard deviation of the *mean* return

[4]Bernheim and Shoven (1989) present some estimates based on this approach Baldwin (1986) and Kester and Leuhrman (1990) also implicitly take this approach

[5]Baldwin (1986) was among the first to bring equity returns data to bear on calibrating the required return, she concluded that, if anything, the risk premium was higher in Japan than in the United States Kester and Luehrman (1990) perform a more sophisticated set of tests, asking whether the market pricing of particular categories of risk differs in the United States and Japan They find no evidence of such differences, but their tests are restricted to only four years of data (1982-86)

Table 2

Excess Returns on Equities Relative to Bills: United States and Japan, 1926–1990

	U S Excess Return (In Percent)		Japanese Excess Return (In Percent)	
Sample Period	Mean	Standard Deviation	Mean	Standard Deviation
1926–89	7 5	20 0	—	—
1960–89	3 2	15 1	7 2	16 6
1960–79	1 5	14 3	3 8	16 9
1980–89	6 5	16 5	14 0	15 9

Source Author's calculations, based on Ibbotson Associates (1990), and Morgan Stanley–Capital International Data

estimated for the period since 1926 is approximately 2.5 percentage points. To specify a range with a 95 percent chance of including the actual mean differential, one would therefore need to admit possibilities from 2 5 to 12.5 percentage points. With such a range, convincing conclusions about the cost of equity are very difficult

For Japan, the data problem is even more severe Most analysts focus on returns in the Japanese equity market during the period since 1960 because the markets before the Second World War and in the early postwar years bore little resemblance to the sophisticated market of today. With only thirty years of data, however, the 95 percent confidence band for returns on the Japanese equity market ranges from 1.2 percent to 13 2 percent per year.

Estimates based on price-earning ratios

A second (and probably the most common) approach to measuring required equity returns relies on market-based measures of prospective equity returns. McCauley and Zimmer (1989a), Bernheim and Shoven (1989), and Ando and Auerbach (1988a, 1988b, 1990) all use some variant of this approach in studying cost of capital disparities. They use the earnings-price ratio, possibly corrected for international differences in accounting or other features, to measure investors' required returns.

Before considering the merits and difficulties of this approach, it is useful to summarize the trends through time in price-earnings ratios for the United States and Japan. These data are shown in Table 3 and Chart 2, without any adjustments The rapid rise in Japanese share prices during the mid-1980s made the price-earnings ratio in Japan much higher than that in the United States. This is the basis for many findings that Japanese firms faced lower required returns on equity during this period.

There are both theoretical and empirical difficulties in using price-earnings ratios or, more accurately, their reciprocal (earnings-price ratios) to describe required returns. One theoretical objection is that rather strong assumptions are needed if the earnings-price ratio is to equal the current required return. For example, if required equity returns change through time, then the earnings-price ratio equals an average of current and future required returns, minus the expected growth rate of earnings. Today's required return is equal to the earnings-price ratio only if the required return is constant through time, or if by chance future variations offset each other and lead the average to equal the current value A second difficulty is that observed earnings-price ratios reflect the stock market's expectation of future corporate growth A low earnings-price ratio could therefore be the result of optimistic growth expectations rather than low costs of equity finance. In any

Table 3

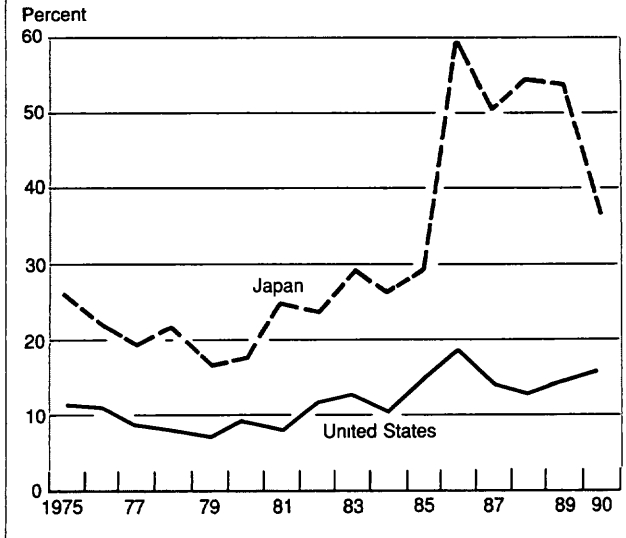
Price-Earnings Ratios for the United States and Japan, 1975–1990

Year	United States	Japan
1975	11 8	25 2
1976	11 2	22 0
1977	9 1	19 3
1978	8 2	21 5
1979	7 5	16 6
1980	9 6	17 9
1981	8 2	24 9
1982	11 9	23 7
1983	12.6	29 4
1984	10 4	26 3
1985	15 4	29 4
1986	18 7	58 6
1987	14 1	50 4
1988	12 9	54 3
1989	14 8	53 7
1990	15 9	36 6

Source French and Poterba (1991a, Table 6) U S price-earnings ratios are taken from Standard & Poor's 500 index of actively traded stocks, Japanese ratios are from the Nomura Research Institute's 350 index of actively traded stocks

Chart 2

Price-Earnings Ratios for the United States and Japan



Source Kenneth R. French and James M Poterba, "Were Japanese Stock Prices Too High?" Journal of Financial Economics, forthcoming.

case, the resulting earnings-price ratio must be corrected for expected growth differentials to compare required returns across countries

A more practical objection to measuring equity returns with earnings-price ratios is that these ratios cannot be compared internationally because of accounting factors. Most studies relying on earnings-price information make some corrections to numbers reported by corporations; the United States–Japan comparison illustrates the type of corrections needed.

Consolidation of subsidiary earnings. Until the mid-1980s, Japanese firms usually reported parent company earnings, excluding the profits of wholly and partly owned subsidiaries. Since more than half of the shares on the Tokyo Stock Exchange are owned by other traded corporations (see French and Poterba 1991a), omission of the retained earnings from partly owned firms can substantially affect reported earnings. This generates a downward bias in the earnings-price ratio as a measure of required returns, since the stock market will recognize the value of intercorporate equity holdings but earnings will not reflect the relevant cash flow. This problem can be corrected by inflating earnings (the approach in McCauley and Zimmer 1989a) or by removing the value of intercorporate holdings from the estimate of share value (French and Poterba 1991a).

Depreciation. In Japan, firms use the same depreciation lifetimes in computing tax and accounting earnings In the United States, accounting depreciation is typically slower than that for tax purposes. The same project, if accounted for by a Japanese and an American firm, would therefore show different earnings flows in the two nations. The estimated return in Japan would be lower in the early years of the project, when Japanese depreciation would exceed that in the United States, and higher in later years, when the Japanese firm would have fully depreciated the asset These accounting disparities need to be corrected in making any comparison of earnings-price ratios across countries Ando and Auerbach (1990) and McCauley and Zimmer (1989a) convert depreciation for both Japan and the United States to an economic replacement-cost basis; French and Poterba (1991a) try to restate Japanese depreciation on U.S. accounting principles

Inflationary effects on earnings. Inflation has many distorting effects on corporate earnings. It interacts with nominal accounting conventions to make reported accounting earnings a relatively poor proxy for economic profits If nations have different inflation rates, or even the same inflation rate but different investment histories, then reported accounting earnings will be differentially biased.

Ando and Auerbach (1988a, 1988b, 1990) and McCauley and Zimmer (1989a) try to correct accounting earnings for inflationary errors. This involves restating depreciation allowances in terms of asset replacement cost rather than historical cost, subtracting spurious profits on goods in inventory sold at nominal prices that exceed the nominal acquisition price by much more than the real sales price exceeds the real purchase cost, and estimating real rather than nominal interest outlays. The relative importance and net effect of these corrections on U.S and Japanese accounting earnings vary through time The inflation rate in Japan was higher than that in the United States during the 1970s, but lower in the mid-1980s. In the 1970s, however, the greater leverage of Japanese firms made the inflationary misstatement due to nominal interest rates more important than that in the United States

Other factors must be considered in correcting earnings-price ratios across nations, such as the treatment of reserve accounts in Japan and the disparate procedures for funding retirement plans in different countries. The factors discussed above, however, are the most important ones

After correcting earnings-price ratios for the various considerations noted above, the ratios for Japan still appear lower than those for the United States Lower earnings-price ratios in one country do not *necessarily* signal lower required returns, since the disparity could be due to differential growth expectations One crude way to assess the importance of the latter effect relies on estimates of long-term real GNP growth published by macroeconomic forecasting firms These show average Japanese long-term growth rates of approximately 4 percent per year, compared with values of approximately 2.5 percent per year for the United States Even if discount rates were identical, one would therefore expect lower earnings-price ratios in Japan than in the United States. This is not a large enough growth disparity, however, to account for the differences in earnings-price ratios, nor are there any striking changes in the expected growth rate in the mid-1980s when the Japanese market soared [6] This evidence consequently points toward lower required equity returns in Japan than in the United States, particularly in the late 1980s

Estimates of required returns based on market earnings-price ratios can change substantially in relatively short time spans. This has occurred during the last year with the sharp decline in the value of the Japanese stock market. The earnings-price ratio in Japan has risen by more than one-third since December 1989, indicating a possible rise in required returns.

[6]This discussion draws on French and Poterba (1991a), which also presents data on macroeconomic forecasts

Estimates based on historical profit rates

A third approach to measuring required returns, one which is related to the earnings-price calculations, involves measuring the rate of return on corporate assets—the profit rate. Rather than scale accounting earnings by a market-based measure of asset values such as the total value of outstanding equity, this approach divides by an estimate of the replacement value of the firm's capital stock It suffers from all the difficulties of international comparisons that are associated with earnings-price ratios, with the additional difficulty that data on the replacement value of assets are not readily available and, when available, are often estimated in different ways for different nations. Nevertheless, computing the ex post profit rate can provide some evidence on the level of required returns.

Sustainable growth analysis

A fourth approach to estimating the cost of equity, used by Hatsopoulos (1983) and Hatsopoulos and Brooks (1987), involves estimating the sustainable growth rate for dividends that could be achieved by reinvesting current earnings without altering debt policy By adding the sustainable growth rate to the current dividend yield, this approach provides another estimate of the required return on equities. Since this method is ultimately based on historical rates of return, not surprisingly it suggests that the cost of equity in Japan is lower than that in the United States

Can the costs of equity differ?

This survey of previous work suggests that several different methodologies point to a similar conclusion: the cost of equity has been lower in Japan than in the United States for most of the last two decades [7] Just as it was appropriate to ask if international differences in real interest rates could persist over long periods, one can ask whether arbitrage by investors and firms can eliminate disparities in expected equity returns. There are at least three reasons to suspect that differential equity returns *can* persist.

First, structural factors may lead to fundamental differences in the riskiness of U S and Japanese firms. Intercorporate share ownership in Japan and the significant role of banks in corporate finance affect firm behavior and may cushion investors from particularly adverse outcomes at a given firm.[8] This would suggest that even if the price of a particular type of security market risk were equated in Japan and the United States, the "real riskiness" of the Japanese corporate sector would be lower and therefore would command a lower total risk premium

Second, the rapid increase in Japanese land prices during the 1980s may (until recently) have provided a ready source of collateral for Japanese corporate borrowing.[9] The value of land holdings for Japan's nonfinancial corporate enterprises rose from ¥256 3 trillion at the end of 1985 to ¥478 2 trillion at the end of 1988—an appreciation of between $1.5 trillion and $2 trillion, depending on which exchange rate is used [10] This sharp rise in collateral value may have lowered equity costs in recent years; it would not provide an explanation for any lower equity costs in the 1970s and early 1980s.

Finally, it is possible that the strong assumptions of integrated world capital markets are inappropriate. Japanese investors are less well informed about U S than about Japanese equities and may therefore prefer holding domestic shares, even if the expected return on U S equities is somewhat higher (see French and Poterba 1991b) As for the arbitrage by corporate suppliers of equity, U S firms may face constraints on their ability to issue equity in Japanese markets Japanese investors may convey low-cost capital to Japanese firms but not to U.S. firms traded in Tokyo (whose shares are primarily traded and priced in New York).

One explanation of the difference in equity costs that does *not* appear to explain the U S -Japanese case is high turnover in the U.S. stock market. Table 4 shows the turnover rates on the New York and Tokyo stock exchanges during the years 1985-89. Turnover rates in Tokyo exceed those in New York in some years When one recalls that the Tokyo market includes very substantial blocks of cross-held shares that trade infrequently, the implied turnover rate for the "in play" shares is significantly higher than that in New York

Weighting the costs of debt and equity: corporate leverage rates

The results in the last two sections suggest that the cost of debt may have been lower in Japan than in the

[7]The earlier discussion suggested that because of the limited data span, it is probably not possible to reject the hypothesis of similar required equity returns in the two nations The test being applied in such cases, however, has extremely low power to detect deviations because there is so little data

[8]Hoshi, Kashyap, and Scharfstein (1990) provide evidence of the resilience of investment and sales at "keiretsu" firms during

Footnote 8 continued
economic downturns, suggesting that financial practices affect real behavior

[9]Kashyap, Scharfstein, and Weil (1990) provide some evidence that Japanese firms with greater land holdings have exhibited higher investment rates during recent years This evidence is consistent with, although not definitive support for, the collateral explanation

[10]Economic Planning Agency, *Annual Report on National Accounts, 1990* (Tokyo Economic Planning Agency)

United States until the early 1980s. The cost of equity has been lower for most of the last two decades but particularly in the late 1980s The net effect on the cost of capital depends on the relative weights placed on debt and equity in the two nations These debt-equity ratios have not remained fixed over time but have changed significantly during the last two decades.

There are several measures of the debt-equity ratio of a firm or corporate sector. Although managers usually focus on the ratio of book debt to the book value of equity, this measure fails to capture the significant swings in the relative prices of debt and equity securities. The more natural measure is therefore the market value of debt divided by the market value of equity. Table 5 and Chart 3 show the recent history of an imperfect measure of debt-equity ratios for nonfinancial firms: the ratio of the book value of long- and short-term debt to the market value of corporate equity

The central conclusion to be derived from Table 5 is that Japanese debt-equity ratios were significantly higher than their U S. counterparts in the early 1980s, but that they have declined while U.S. leverage has remained stable or, if anything, increased.[11] In 1985, the Japanese debt-equity ratio was 1.3 to 1, compared with .67 to 1 in the United States By March 1989, rising Japanese share prices had reduced the ratio of book debt to market equity to .55 in Japan, while the corresponding figure for the United States was still approximately 67.

The convergence of U.S. and Japanese leverage was due to two factors First, U.S. nonfinancial corporations repurchased nearly $100 billion in equities *each year* between 1985 and 1990 Chart 4 shows the net secu-

[11]Ando and Auerbach (1988b) report estimates of the book debt-to-market equity ratio for the period since 1970, and their data suggest relatively little variation in either nation during the years before 1985

Table 4

Turnover Rates for U.S. and Japanese Equity Markets

(In Percent)

Year	New York Stock Exchange	Tokyo Stock Exchange
1980	36	50
1981	33	50
1982	42	35
1983	51	44
1984	49	43
1985	54	48
1986	64	75
1987	73	96
1988	55	98
1989	52	73

Sources Column 1 data are drawn from the *New York Stock Exchange Fact Book*, column 2 data are from the *Tokyo Stock Exchange Fact Book*

Table 5

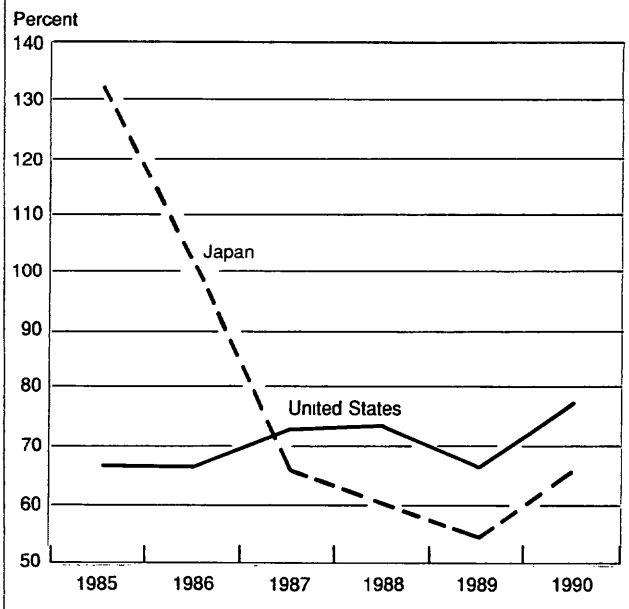
Debt-Equity Ratios (x100) for U.S. and Japanese Nonfinancial Corporations

Year	United States	Japan
1985	66 9	132 7
1986	66 6	100 7
1987	73 0	65 9
1988	73 7	60 1
1989	66 5	54 8
1990	77.1	65 8

Source U S data are drawn from the Board of Governors of the Federal Reserve System, *Balance Sheets of the U S Economy*, 1990 edition Japanese data are from *Daiwa Analysts Guide*, 1989 edition Estimates show the ratio of the book value of corporate long- and short-term liabilities to the market value of corporate equity

Chart 3

Debt/Market Equity Ratios for U.S. and Japan Corporations



Sources Board of Governors of the Federal Reserve System, Balance Sheets of the U S Economy, 1990, Daiwa Analysts Guide, 1990

Notes: Chart shows ratios of the book value of corporate long- and short-term liabilities to the market value of corporate equity Japanese data are from end-March. U.S data for 1985-89 are from end-year; for 1990, from end-September

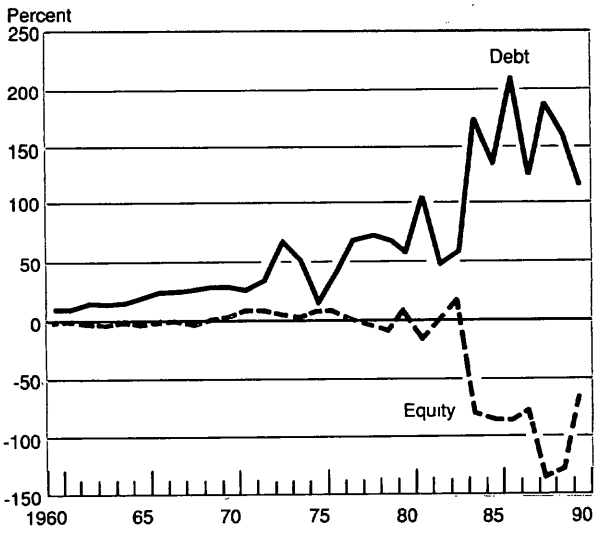
rity issues during this period, with large equity purchases, both direct repurchases and takeover acquisitions, matching substantial debt issues in recent years. Only rising equity values prevented the debt-equity ratio from rising sharply during this period. Second, the rapid increase in Japanese share values during the 1980s was not matched by escalating debt values or debt issue Consequently, the debt-equity ratio of Japanese firms on a market value basis declined during the period.

Taxation and summary measures of the cost of capital

The least controversial part of most cost of capital studies is the treatment of tax incentives for new capital investment There is broad consensus both on the approach to analyzing tax considerations and on the underlying tax code provisions that are important Different studies have reached different conclusions, however, regarding the net effect of tax provisions on the relative costs of capital, primarily because of *different auxiliary assumptions* This section sketches the relevant tax parameters—the statutory corporate tax rate and the net tax-induced reduction in the price of capital goods—then notes their values through time and explains how they affect the cost of capital. It concludes by presenting complete estimates of the cost of capital from several different studies.

Chart 4

Net Equity and Debt Issues by U.S. Nonfinancial Corporations



Source Federal Reserve Board, Flow of Funds Accounts

Note 1990 data are first three quarters' flows at annual rate

Tax parameters

The statutory tax rate affects the pretax returns that firms must earn, other things equal, to satisfy their owners. The magnitude of this effect depends on the fraction of the corporation's profits that are subject to corporate tax, that is, on the relative importance of debt and equity finance.

The generosity of tax depreciation schedules, including the availability of investment credits, is another key aspect of the tax code To provide a unifying framework for comparing different depreciation schedules, most economic analyses focus on the present discounted value of tax depreciation benefits, given by

$$(3)\quad ITC + \tau z = ITC + \Sigma\ \tau_{t+k} * d_{t+k}/(1+\rho)^k,$$

where τ_{t+k} is the tax rate prevailing k years after the investment is made, d_{t+k} is the value of depreciation allowances (per dollar of initial investment) that the firm is allowed to claim, and ρ is the nominal discount rate applied by investors to cash flows with the risk characteristics of depreciation benefits The value of investment allowances thus depends on the rate at which the future tax savings are discounted, as well as the statutory corporate rate. Higher tax rates make a given set of deductions more valuable.

The net effect of raising the corporate tax rate thus depends on the time path of depreciation allowances and the discount rate applied to these tax benefits. If these depreciation benefits were worth one dollar ($z = 1$ and $ITC = 0$), then changes in the corporate tax rate would have *no effect* on the cost of capital: the after-tax cost of a one-dollar project would be reduced, just as the after-tax return from the project would fall. Only when the value of depreciation allowances falls below one dollar does raising the corporate tax rate increase the cost of capital.

The tax parameters in both the United States and Japan have shifted significantly during the last decade Table 6 presents the values of each tax component for the beginning and end of the decade The first column shows the statutory corporate tax rate in each nation, with the U.S. rate falling from 50 percent, including federal as well as state taxes, at the beginning of the 1980s to 38 percent at the decade's end. By comparison, Japanese corporate tax rates are higher: the net tax rate was 53 percent in 1980 and remained at 50 percent at the decade's end.

The second column in Table 6 shows the depreciation benefits accruing to a firm that invests in general indus-

Table 6

Tax Parameters in Cost of Capital Calculations

Parameter	Japan		United States	
	1980	1988	1980	1988
Statutory corporate tax rate	526	499	495	380
Present value of tax reduction for new investment				
Autos	465	473	534	333
Industrial plant	250	355	166	142

Source Bernheim and Shoven (1989, Table 5)

trial equipment, as well as industrial plant, in the two nations. Although the tax lifetimes in the two nations are similar, the tax benefits for the two examples of projects given here are greater in Japan The reason is that in the late 1980s the discount rate applied to the cash flows is lower, and the statutory tax rate to which the deductions apply, higher, in Japan The net effect of U S tax policies during the 1980s was to lower depreciation benefits by extending lifetimes, phasing out the investment tax credit, and reducing the statutory marginal tax rate. Consequently, these changes brought about an increase in the cost of capital.

Most studies of capital costs have argued that tax provisions in Japan are similar to those in the United States and that therefore relatively little of the cost of capital differential can be attributed to tax considerations. Bernheim and Shoven (1989) point out, however, that similar tax provisions operating in different economic environments can yield different tax incentives.

Summary costs of capital

Relatively few studies have made complete estimates of the cost of capital, although many have examined its components Table 7 presents three sets of estimates from studies using different methodologies to assess U S and Japanese capital costs. The table shows the estimated capital cost in 1980 for each study, as well as the estimate for the most recent year available

The studies compute somewhat different capital costs; Hatsopoulos and Brooks estimate an average cost of all capital services, McCauley and Zimmer the cost of capital for a plant investment with a twenty-year lifetime, and Bernheim and Shoven the cost of capital for an industrial plant. In addition, the strategies for estimating the cost of equity vary; Hatsopoulos and Brooks use the sustainable growth method, while Bernheim-Shoven and McCauley-Zimmer use estimates based on adjusted earnings-price ratios.

Despite these differences in approach, all of the studies conclude that the cost of capital is significantly higher in the United States than in Japan. The precise magnitudes differ, with Hatsopoulos and Brooks finding the largest differential (10 percentage points) in 1980, compared with only 2 7 percentage points in McCauley and Zimmer's study. In more recent years, the results suggest a cost of capital differential of approximately 5 percentage points between the two nations

Table 7

Estimated Costs of Capital for the United States and Japan

Study	Year	United States (Percent)	Japan (Percent)
Hatsopoulos-Brooks			
	1980	14 1	4 0
	1985	9 7	3 8
McCauley-Zimmer			
	1980	11 5	8 8
	1988	11 2	7 2
Bernheim-Shoven			
	1980	18 7	11 0
	1988	11 1	4 1

Source Hatsopoulos-Brooks values are estimated by the author from Figure 9 of Hatsopoulos-Brooks (1987) and correspond to the cost of fixed asset services (before depreciation) McCauley-Zimmer estimates are drawn from Table 2 of McCauley-Zimmer (1989b) and correspond to the cost of a twenty-year plant Bernheim-Shoven estimates are drawn from Table 6 of Bernheim-Shoven (1989)

Conclusion and possible policy levers

Many different factors bear on a nation's cost of capital This survey of previous work comparing the cost of capital in the United States and Japan suggests that differential costs of equity are the single most important explanation of apparent cost of capital differences. Many institutional and economic differences between the two nations may contribute to this disparity—in particular, Japan's higher saving rate, less burdensome taxation of equity returns, and greater flexibility in spreading corporate risk

Because the cost of capital depends on many parameters, a wide range of policies can be used to affect it Several possibilities are indicated below

Changing investment incentives is probably the most direct way for policy makers to affect capital costs An investment tax credit, for example, reduces the cost of capital and can be targeted to affect only some classes of assets While much of the discussion leading up to the Tax Reform Act of 1986 stressed the need for a "level playing field," treating all assets equally for tax purposes, some have argued that particular asset classes should be subsidized because of their high social returns [12] This is the basis for the research and development tax credit, as well as subsidies to low-income housing The major disadvantage of more general investment incentives is their significant revenue cost To remedy this problem, policy makers might consider more revenue-efficient subsidies, such as "incremental" investment tax credits on a firm's investment above some history-based target.

The *tax treatment of investors* is a second obvious source of policy leverage on the cost of capital. The analysis above treated the pretax returns demanded by debt and equity investors as fixed. These returns may vary, however, with the tax treatment accorded to different securities The lower pretax required return on tax-exempt debt in contrast to taxable bonds rather clearly demonstrates that investor-level taxes affect required returns In this regard, a change in the tax treatment of dividends—for example, by reducing shareholder taxes with an integration system—would reduce capital costs. Similarly, a capital gains tax reduction would lower the pretax return demanded on equities A particularly cost-effective form of capital gains reduction, from the standpoint of reducing the cost of capital, would follow the Japanese experience and apply very low tax rates to capital gains on corporate equities while taxing gains on other assets at relatively high rates [13]

Raising national saving is a third strategy for reducing the cost of capital. Higher national saving would expand the supply of saving relative to demand, lower required returns on both debt and equity, and ultimately reduce capital costs While the direction of this effect is clear, the magnitude of the cost of capital reduction from a given saving increase is again controversial With partially integrated world capital markets, part of any increase in domestic saving will flow abroad, thereby blunting the effects on domestic required returns Although historical evidence suggests a rather strong association between domestic saving and domestic investment rates, international capital markets have become much better integrated during the last decade, and the leakage effects are therefore probably larger today than in the past

[12]DeLong and Summers (1990) suggest that equipment investment yields particularly high social returns and therefore warrants subsidy beyond other classes of capital goods They present international evidence showing that nations that encourage equipment investment by keeping the relative price of equipment low grow more rapidly than nations with higher equipment prices

[13]The net effect of capital gains tax reduction on capital costs is controversial While few doubt that lower tax rates would lower capital costs, there is less agreement on the size of the effect Since many gains on corporate stock are realized long after they accrue, or never face tax because of basis step-up at death, the effective capital gains tax rate is significantly lower than the statutory rate

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