The Gerstner Effect: Managerial Motivations and Earnings Manipulation

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ABSTRACT

Managers manipulate firm earnings in characterizing pension assets to capital markets and alter investment decisions to justify, and capitalize on, these manipulations. We construct a measure of the sensitivity of reported earnings to the assumed long-term rate of return on pension assets. This sensitivity is an important determinant of the rate of return assumption, implying that managers are more aggressive when their assumptions have a greater impact on reported earnings. Managers also increase assumed rates of return as they prepare to acquire other firms and as they exercise large amounts of stock options, further confirming the opportunistic nature of these increases. Decisions about assumed rates of return, in turn, influence asset allocation within pension plans. Instrumental variables results suggest that a 25 basis point opportunistic increase in the assumed rate of return is associated with a 5% increase in equity allocation. Taken together, these results suggest that earnings manipulation arising from managerial motivations influences other managerial investment decisions in important ways.

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1. Introduction

In speculative markets, earnings manipulation can become a powerful tool for managers to inflate their stock prices. Such manipulations and consequent price distortions are also a potential threat to confidence in capital markets. Despite the centrality of earnings manipulation to managerial actions and the functioning of capital markets, the sources, mechanisms and consequences of earnings manipulation remain difficult to investigate given the various alternative explanations for reporting decisions. Investigations of earnings manipulation also promise to illuminate whether managers manipulating earnings and their stock prices are advancing the interests of their shareholders or expropriating those shareholders through these actions.

In this paper, we show how earnings manipulation is accomplished through the simplest of mechanisms, how the propensity to manipulate earnings is linked to managerial incentives (at the firm and individual level), and how firm investment decisions are changed in order to justify, and capitalize on, earnings manipulation. Specifically, we emphasize one particularly powerful and simple way for managers to manipulate earnings – the assumed rate of return on pension assets – and then examine how distorted reporting decisions interact with option exercises, merger activity and asset allocation decisions within pension plans.

The size of defined-benefit pension plans and managers' wide latitude in characterizing them to capital markets make pension accounting a fertile area for earnings manipulation. Firms can improve earnings substantially in the short run by changing the assumed long-term rate of return for the pension assets they manage for their worker-beneficiaries. Capital market observers consider the actions of the CEO of IBM, Louis Gerstner, Jr., to be a paradigmatic example of the use of pension accounting to manipulate earnings.[1]

IBM sponsors a large defined benefit pension plan, with over $57 billion in assets at the end of 2002. Table 1 outlines the operating performance of IBM, the performance of its DB pension plan, and CEO Lou Gerstner's option grants and exercises. Changes in the long-term rate of return (LTROR) that IBM assumes on its DB pension plan assets are of particular interest.

[1] See Maclean (2002).

IBM changed its assumed long-term rate of return three times during this period: a twenty-five basis point reduction in 1995, a twenty-five basis point increase in 1997, and a fifty basis point increase in 2000. As we describe more fully in the sections that follow, IBM's assumed rates of return throughout this period exceeded those used by most firms. The frequent changes are also notable given the long run nature of these assets and assumptions. While IBM reacted to poor *actual* performance in its pension plan in the mid-1990s by reducing the assumed long-term rate of return, the opposite occurred in 2000. In the face of poor equity market returns and declining bond yields during that year, IBM raised its long-term rate of return assumption by fifty basis points. Nearly five percent of IBM's income before tax in 2000 and 2001 resulted from the increase in the assumed long-term rate of return from 9.25% to 10.00%. More generally, IBM's reported pretax income grew at a compound annual growth rate of 6.7% from 1995 to 2001; without these changes, income would have grown at only a 5.6% rate. As Table 1 shows, these critical changes in pension assumptions coincided with deteriorating operating performance and with substantial option exercise activity by Gerstner.

As this example illustrates, pension accounting creates a simple mechanism through which senior managers can opportunistically boost their firms' reported profits. Coronado and Sharpe (2003) present evidence that investors have been unable to 'pierce the veil' of pension finance accounting: earnings associated with changed pension assumptions are capitalized into prices much as operating earnings are.[2] This suggests that managers can boost both reported profits *and* stock prices through the simple mechanism of pension accounting. We investigate the degree to which managers are opportunistic with these assumed returns and evaluate the extent to which choices on assumed returns interact with their own option exercises and with the merger activity of their firms. Finally, we evaluate the extent to which managers alter asset allocation within pension plans to justify these assumed returns.

We start by constructing a measure of the sensitivity of a firm's overall profits to the assumed long-tem rate of return on pension assets. We show that this sensitivity measure is an important determinant of the levels of, and changes in, assumed rates of return. Specifically, a firm whose pension assets are twice as large relative to its operating income as the median firm

[2] In a related vein, Franzoni and Marin (2003) conclude that firms with underfunded plans are overvalued by the market.

in our sample assumes, on average, a long-term rate of return that is approximately ten basis points higher than the median. A firm in the 90th percentile of sensitivity, on average, has an assumed long-term rate of return that is 40 basis points higher than a firm in the 10th percentile. The impact of these measures of pension sensitivity on rate of return assumptions grew significantly over the decade.

We go on to investigate whether these acts of earnings manipulation are linked to investment decisions made by firms and managers. Specifically, if financial markets capitalize higher assumed long-term rates of returns, these financial reporting decisions provide managers with a tool to inflate stock prices when making acquisitions or when exercising options. We show that firms make particularly high return assumptions in periods leading up to the acquisition of other firms. This relationship is particularly strong for firms whose reported income is the most sensitive to pension assumptions. Assumed long-term rates of return at the median firm are between 5 and 30 basis points higher during the period prior to an acquisition. In addition, years in which CEOs choose to exercise options also see higher returns assumptions; a one standard-deviation increase in option exercise, at the median firm, is associated with a 4 basis point increase in the assumed long-term rate of return. As managers prepare for acquisitions and for large exercises, they have an increased incentive to produce higher earnings and stock prices and they appear to increase their assumed rates of return in order to do so. The opportunistic use of pension accounting to inflate reported earnings — the so-called "Gerstner effect" — appears to have been pervasive in the recent period.

We further assess the investment consequences of earnings manipulation by investigating the links to asset allocation within pension plans. Allocations to equity vary considerably across organizational form and across firms, with equity allocations of firm-sponsored pension funds exceeding equity allocations in public and union-sponsored funds. Indeed, the large equity allocation in most firm pension plans remains an outstanding puzzle; our analysis suggests that the interaction of managerial opportunism and pension accounting may help explain part of this phenomenon. Our empirical strategy is to regress equity allocation on the long-term rate of return assumption, using a dummy variable for acquisitions as an instrument for firms' long-term pension asset return assumptions. This strategy aims to address the concern that assumed rates and asset allocation decisions may be correlated for reasons unrelated to managerial motivations.

Because it is unlikely that the variation in equity allocations is independently correlated with firm acquisition activity, instrumenting in this manner provides a robust source of identification. The results from this IV analysis indicate that changed assumed rates lead to changed asset allocation decisions. Specifically, we find that 25 basis point increases in assumed rates are associated with 5% increases in equity allocation.

Earnings manipulation can arise in equilibrium from several sources with distinctive consequences for current shareholders. Several arguments suggest that managers may pursue earnings manipulation for the benefit of current shareholders. In Stein (1988, 1989), myopic managerial actions arise in markets that are rational but imperfectly informed. Managers, averse to even temporarily undervalued equity, inflate reported earnings and the market's conjectured relationship between reported and true earnings holds in equilibrium. Shleifer and Vishny (1990) similarly suggest that costly arbitrage can also lead to a short-term bias in the absence of an agency problem. Bolton, Scheinkman and Xiong (2003) suggest that current shareholders optimally write incentive contracts biasing managers to the short-run in order to capitalize on speculative markets. Shleifer and Vishny's (2003) view of stock-financed mergers is also consistent with current shareholders benefiting from merger activity arising from artificially inflated stock prices.

In contrast, earnings manipulation may be linked to compensation arrangements designed to facilitate rent-seeking by managers. Yermack (1997) and Bertrand and Mullainathan (2001) note that various aspects of compensation arrangements do not correspond purely to incentive purposes, suggesting that managers are extracting rents through incentive compensation. Bebchuk, Fried and Walker (2002) characterize this alternative view of incentive compensation as arising from managerial power and leading to opportunism – such as earnings manipulation – that benefits managers at the expense of shareholders. While posed as a solution to an agency problem, many aspects of compensation arrangements are actually a manifestation of an agency problem.

We conclude by framing our investigation of earnings manipulation within this debate on whether earnings manipulation reflects an agency concern or is beneficial to current shareholders. We show that the managers least constrained by their shareholders — as measured

by an index of corporate governance — appear to be the most aggressive with their rate of return assumptions. This evidence suggests that the managerial opportunism and earnings manipulation investigated here does not benefit current shareholders. We go on to speculate on the magnitude of these effects by returning to the case of Gerstner and IBM. We estimate that between $12 and $76 million of compensation accrued to Gerstner from these changed assumptions alone.

In addition to the literature on the reasons for earnings manipulation, this paper relates to the literatures on incentive compensation and managerial incentives and the asset allocation decisions and reporting of pension plans. As detailed in Hall and Murphy (2003), the growth of incentive compensation is one of the most notable developments in corporate practices through the 1990s. Recently, more attention has been paid to the less beneficial effects of such practices, as in Bebchuk, Fried and Walker (2002), Bergstresser and Philippon's (2003) study of accrual accounting, Erickson, Hanlon and Maydew's (2003) study of accounting fraud, and Desai, Dharmapala and Park's (2003) study of tax avoidance. Our paper examines the link between incentive compensation and a particularly simple mechanism for distorting financial reporting in a broad sample.

Academic work on pension plans has typically focused on whether or not firms incorporate pension plans into their own capital structure and investment decisions (as in Friedman (1983) and Bodie et al. (1985)), how unfunded pension liabilities are priced by the market (see for example Feldstein and Seligman (1981) and Feldstein and Mørck (1983)), and how firms react to the guarantee of pension liabilities provided through the Pension Benefit Guarantee Corporation. Some studies have examined latitude in setting the rate used to discount pension liabilities in accounting regimes where this flexibility was considerable.[3] Several studies have examined asset allocation decisions (eg. Papke (1992)) and their relationship to tax incentives, as in Frank (2002). Amir and Benartzi (1998) examine expected rate of return assumptions and find them weakly related to equity shares and unrelated to future performance of pension fund assets. Gold (2003) conjectures that the puzzle of high equity allocations in defined-benefit pension plans reflects managerial incentives created by accounting rules and our results investigate, and confirm, this conjecture.

[3] Feldstein and Mørck (1983) consider these assumptions in the US before SFAS 87, which placed significant restrictions on discount rates. Obinata (2000) considers Japanese firms.

Section 2 of the paper motivates the analysis that follows by providing an illustrative example of managerial motives with respect to defined benefit plans. Section 3 describes recent patterns on assumed rates and asset allocation and reviews the data employed in the subsequent analysis. Section 4 analyzes the determinants of assumed rates of return with particular emphasis on the role of merger activity and incentive compensation. Section 5 relates decisions on assumed returns on pension assets to equity allocation decisions through and instrumental variables analysis. Section 6 discusses the consequences of these results for the evolving debate on how managerial manipulations reallocate value amongst current shareholders, potential shareholders and managers. Section 7 is the conclusion.

2. A motivating example

Firms that sponsor DB pension plans create a liability equal to the present value of all future payments due their employees. Firms fund these liabilities with devoted pension assets, which are supposed to be managed in the fiduciary interest of the employee-beneficiaries. These assets and obligations, however, are also accounted for on the firm's financial statements. While there are explicit rules relating to contribution and funding decisions, such as minimum funding requirements and restrictions designed to prevent substantial overfunding of plans, firms have significant latitude to make assumptions when they characterize these assets and liabilities to the capital markets.[4] We focus on these critical assumptions and their impact on asset allocation in the sections that follow.

Three main calculations must be made in characterizing the annual cost associated with DB plans — a service cost, an interest cost, and an offsetting assumed return on plan assets. The service cost is the present value of benefits earned by the firm's employees during the current period. This cost can be thought of as the change in the value of the firm's promises to its employees that comes from an additional year of employment. Firms also report an interest cost, which is the change in the present discounted value of the pension obligations coming from the approach of these obligations in time. Holding the nominal value of the obligations constant, bringing these obligations a year closer increases their present discounted value. The change in the present discounted value of pension obligations due to changing interest rates would also be

included in interest cost. Industry observers suggest that both service costs and interest costs are not significant areas for managerial discretion.[5]

The final component of the annual cost of DB plans, one that offsets the interest and service costs, is the assumed return on plan assets. It is important to note that this return is not the realized rate of return on plan assets. The use of an assumed rate of return insulates annual earnings from year-to-year fluctuations in the market performance of pension assets. Reconciling the assumed and actual rates of return happens over time with amortization periods stretching as long as 15 years. The discretion that firms enjoy in the recognition of pension-related gains and losses allows for a substantial opportunity to manage earnings. As a simple example, consider a firm with $100 of operating assets, a 4% ($4) return on these operating assets, and $20 of pension assets. If this firm changes the assumed rate of return from 10% to 11%, it can immediately increase net income by 5% (or $0.20). As this example illustrates, the scope for increasing profits in this manner is a function of the size of pension assets relative to operating income.

In addition to the role of pension assets and operating income in determining assumed returns, assumed rates of return may influence asset allocations themselves. Given the absence of rules that dictate rate of return assumptions, extreme assumptions may be easier to justify in a setting where expected returns are more uncertain. In particular, given the uncertainty involved in equity returns, firms with large allocations to equity enjoy greater leeway in estimating expected returns compared to a firm whose investments are entirely in fixed-income securities. In short, higher assumed returns may be more easily rationalized with higher equity allocations.

In order to consider the potential scope of these incentives, Table 2 provides the share of operating income derived from pension assets given different assumed rates and different levels of pension sensitivity. Our measure of pension sensitivity is the ratio of pension assets to firm operating income, and the long-term rate of return is the one reported in the firm's financial

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[4] For a detailed discussion of these accounting rules, see Hawkins (2001) and Zion and Carcache (2002). For a broader discussion of the legal rules surrounding DB plans, see Langbein and Wolk (2000).

[5] See Zion and Carcache (2002). While changed interest rate assumptions can have large consequence, cross sectional variation in these effects is bounded by the rules that liabilities must be valued using rates that are between 90% and 120% of the 30-year Treasury rate. The steep decline in this rate has raised liabilities while asset values of equity-heavy pension funds fell, a situation industry insiders call the "Perfect Storm".

statements. The row entries in the table reflect the distribution of long-term rates of return in the Compustat sample that is the subject of the empirical work that follows; the fifth percentile is 7 percent, while the median is 9 percent and the 95th percentile is 10 percent. The column entries in the table reflect the distribution of pension sensitivity; at the median firm in our sample, pension assets amount to 71.6 percent of firm operating income.

For the firms with small plans, even large changes in the assumed rate of return make small differences in net earnings. For instance, at the 10th percentile of pension sensitivity, at which plan assets amount to 5.8 percent of firm operating income, changing the assumed rate of return from 7 percent to 10 percent would boost reported income by only 2 tenths of a percent. However, at the 50th percentile of pension sensitivity, the same increase in the assumed rate of return would increase reported income by over 2 percent. At the 90th percentile of pension sensitivity, however, reported firm income would be boosted by almost 9 percent. Firms with large pension plans, such as IBM, can significantly change their reported performance by adjusting this assumed long-term rate of return.

3. Data and descriptive statistics

In order to examine the linkages among managerial motivations, these reporting decisions and the asset allocation decision, we compile data from several sources. Firm non-pension income, non-pension assets, pension fund size, pension liability size, and long-term rate of return assumptions for pension assets come from the Compustat dataset for the years 1991-2002. Compustat Executive Compensation provides information on CEO option exercise for a subsample of Compustat firms from 1992-2002. Data on firm acquisitions are taken from the Securities Data Company (SDC) database of mergers and acquisitions and are available for the entire sample period.

Pension fund asset allocation data come from two sources. First, an annual survey conducted by *Pensions and Investments* covers the asset allocation of the largest US pension funds from 1991-2002.[6] Second, firms sponsoring pension plans with more than 100 employees must file a Form 5500 for each plan with the IRS on an annual basis; the full set of these forms

[6] The *Pensions and Investments* survey data begins in 1988 but the years 1988-1990 are not used in this study as the Compustat pension data does not begin until 1991.

are publicly available in electronic form through 1998 and contain asset allocation data. For firms with multiple plans we aggregate the IRS 5500 filings from the plan-year level to firm-year observations. We do not use asset allocation data from a firm's 5500 filings if that pension fund's assets are held in trusts or other opaque investment vehicles; for these observations it is impossible to precisely identify equity allocations. The combination of the Pensions and Investments and IRS 5500 sources provides equity allocation information for approximately 3,200 firm-year observations, and approximately equal numbers of firm-year observations come from each of the two sources.[7]

The analysis that follows uses three different samples; the second and third are subsets of the first. Our primary sample includes all Compustat firms for which pension assets, operating income, and assumed long-term rates of return on pension investments are available.[8] This sample has 19,325 observations on 3,247 defined-benefit plan sponsors during this period. We use this sample to investigate the relationships among pension sensitivity, firm acquisitions, and assumed rates of return on pension assets. The second sample includes the 7,075 firm-year observations from the first sample that can be linked to the Compustat Executive Compensation database. Results on executive option exercises are based on this smaller sample. The third sample includes the 3,200 firm-year observations from the first sample for which we also observe pension fund asset allocations, either from the Pensions and Investments data or from the IRS 5500 filings.

Defined benefit pension plans are quite large in aggregate, and represent a significant part of firms' overall assets. They also represent a large part of the pool of liquid financial assets in the economy. Table 3 describes, for the firms in our sample, the size of these plans over our sample period. The aggregate ratio of pension assets to operating assets peaked at 10.31% in 1997 when these assets totaled $1.156 trillion for 1,630 firms. The mean firm in our sample, in

[7] The initial size of the *P&I* sample is 200 pension sponsors for each year 1988-1996 and 1000 sponsors for 1997-2002. Approximately 45% of the entities in each year of the *P&I* are corporate (as opposed to public, union, or nonprofit) sponsors of DB plans. The requisite data from Compustat (in particular the long-term rate of return) are available for approximately two-thirds of those observations, leaving about 1,700 P&I observations at the firm-year level. The IRS 5500 filings add the remaining 1,500 observations during the period 1990-1998, which is also the period for which the *Pensions & Investments* sample is smaller.

[8] This sample includes only those firms for which the log ratio of pension fund size to firm operating income can be computed.

that year, had $709.4 million in assets in their pension funds. The distribution is highly skewed, however; the median in this year was $77 million and the 95th percentile was $414.6 million.

Pension fund assets (though not liabilities) have retreated with the recent collapse in equity markets; in 2002, the total pension fund assets for the 1,502 firms amounted to $1.094 trillion or 5.7% of the balance sheet assets of the firms in our sample. This reduction in the value of assets in pension plans coincided with an increase in the value of plan liabilities due to falling bond yields over the period. The declining funding status of these pension plans reflects both falling asset values and rising liability values. Figure 1 shows the changing pension funding status for our sample of firms.[9] This figure shows the mean, median, and 25th and 75th percentile funding status among our sample of funds, measured along the left axis.

In 1991 the mean and median funds were both overfunded, as the value of pension assets exceeded the estimated value of pension liabilities. At the 25th percentile fund, the extent of underfunding amounted to over 10 percent of plan liabilities. At the height of the market peak in 1999, the 75th percentile plan was 30 percent overfunded, and the 50th percentile plan was more than 10 percent overfunded. While equity returns had been very high over this period, the impact of these returns on pension plan funding status was somewhat offset by the impact of declining bond yields on the value of pension liabilities. By 2002, several years of poor equity market performance and declining bond yields had harmed the funding status of defined benefit pension plans; in this year, the median and mean pension plans in the sample were almost 25 percent underfunded. This underfunding has become an important public policy issue due to the role that the federally-sponsored Pension Benefit Guarantee Corporation plays in insuring pension plan participants, as well as the cash drains that required contributions represent to firms with underfunded plans.[10]

Asset allocations for the firms in our sample have also shifted over time. Figure 2 plots the allocations to equity among the firms in our sample, as well as additional samples of union-sponsored and public-sponsored pension plans covered in the *Pensions and Investments* annual surveys. Two important patterns stand out. First, the mean allocation to equity in each of the

[9] We use the projected benefit obligation (PBO) as our measure of liabilities and compute funding status as the difference between plan assets and plan liability scaled by plan liabilities.
[10] See Rauh (2003).

three types of pension funds increased fairly dramatically over the period. Among the corporate-sponsored plans in our sample, the mean allocation to equity rises from 35 percent to approximately 65 percent between 1991 and 2000, before retreating in 2001 and 2002. The second notable pattern in this figure is that corporate-sponsored pension plans have increased their equity allocations particularly dramatically relative to union or public plans. Clearly, increased exposure to equities amplified the current funding crisis apparent in Figure 1. Section 5 of this paper explores the relationship between managerial incentives and the shift of pension assets towards equity over the 1990s.

A remarkable feature of pension funds during this period of changing yields and shifting returns has been the roughly constant cross-sectional distribution of long-term rate of return assumptions. Figure 3 documents the median long-term asset rate of return assumptions in our sample of pension funds. The median assumed return is constant at 9 percent until the last period of the sample, when it falls to 8.5 percent. The mean, 25th percentile, and 75th percentiles of the distribution have also been roughly constant through the period. This stable distribution of long-term rate of return assumptions is remarkable because it comes during a period when yields on Treasury securities have been declining; the lowest line on Figure 3 shows the yield on 10-year government bonds over the period. Because firms generally hold a mix of equity and fixed-income securities, this constant median LTROR assumption has implied increasing optimism about contribution to total returns from the equity components of firms' pension plans. The top line on Figure 3 gives the implied assumed expected return on the equity securities held in a pension fund that is 40 percent equity 60 percent bonds and that assumes an aggregate long-term rate of return of 9 percent; at this ratio, the implied expected return on equity, based on bond yields, was approaching 16 percent by 2002.[11] A forward-looking expected return of 16 percent on an equity portfolio is optimistic by most measures. Welch (2001) surveys 510 finance and economics professors and reports that the mean 30-year stock market return forecast in this group is 9.1 percent; responses to this survey are tightly bunched between 8 and 10.5 percent.

The constant cross-sectional distribution of long-term rate of return assumptions over this period does not mean that these assumptions have been fixed at the individual firm level. Table

[11] Among the firm-year observations in 2002 for which we observe equity allocation and for which that allocation lies between 0 and 40 percent, 9.0 percent is the median long-term rate of return assumption.

4 documents the pattern of increases and decreases to long-term rate of return assumptions over our sample period. Roughly 30 percent of the firm-year observations over this period see either a decrease or an increase in the long-term rate of return assumed. Increases in the assumed long-term rate of return are more common during the late 1990s, while decreases are more common in the early 1990s and 2001 and 2002. Nonetheless, the fact that increases and decreases are represented in all years is indicative of the latitude that managers have in setting this rate. Even in the difficult market environment of 2000-2002, a significant fraction of firms managed to increase their rate of return assumption.

In order to assess the role of managerial motivation, we begin by emphasizing the aforementioned measure of pension sensitivity — the logarithm of the ratio of pension assets to operating income in a firm year. Such a measure excludes observations with negative operating income; employing the log of the ratio also collapses the influence of outlying observations and brings the distribution of pension sensitivity closer to that of a normally distributed random variable. This measure of pension sensitivity has the advantage of capturing the variation across firm-year observations in the incentive to manipulate the long-term rate of return. Unfortunately, because the numerator of this measure reflects, in part, realized returns to pension assets, it may be linked mechanically to assumed returns. Specifically, firms with abnormally high returns, and thus pension assets, may use these realized returns as a basis for increasing assumed returns. Given that this feedback mechanism need not be a reflection of managerial opportunism, we employ two alternative measures of pension sensitivity that are not susceptible to this bias. Specifically, the second measure of pension sensitivity uses the ratio of the firm's average pension assets, over the 1991-2000 period, to operating income. Annual observations of this measure will not be driven by differences in the return to pension assets across years. The third measure of pension sensitivity is the log of the ratio of pension *liabilities* to firm operating income. Using pension liabilities rather than assets completely removes the impact of pension asset returns on the sensitivity measure, and also addresses potential feedback from the size of the pension fund to the long-term rate of return assumption.

Table 5 describes these variables as well as the others used in the empirical analysis. At the mean, pension assets are $653 million and operating assets are $7302.5; because of the skewness of the size distribution of firms these means are substantially higher than the median

pension assets ($65.5 million) and operating assets ($911.7 million). At the median, pension assets are 71.6 percent of operating income and 8.6 percent of operating assets. The next rows in Table 4 describe our three measures of pension sensitivity. For the first measure of pension sensitivity, the log ratio of pension assets to operating income, the median is –0.334 and the mean is –0.440. The distributions of the other two pension sensitivity measures are roughly similar; the mean of the second measure is –0.446 and the mean of the third is –0.382.

The final rows of Table 5 describe our acquirer indicator, CEO option exercise, and firm equity allocation variables. We classify 23.9 percent of our firm-year observations as "acquirers." These observations report the acquisition of another firm in the subsequent year. Among the 7,075 firm-year observations that we are able to link to Compustat Executive Compensation data, CEO option exercises as a share of firm market value averages 29 basis points. About 32 percent of firm-year observations see CEO option exercise; among these observations, the median option exercise value as a share of the firm's value is 24 basis points.

4. The determinants of assumed returns

The empirical work in this section assesses the relationship between managerial motivations and long-term rate of return assumptions with particular emphasis on this behavior around mergers and large option exercises. Table 6 reports the results of linear regressions of firm-year assumed long-term rates of return on covariates, including pension sensitivity measures and year and industry controls:

$$(1) \quad Assumed\ Rate\ of\ Return_{i,t} = \alpha + \beta * Log\ Pension\ Sensitivity_{i,t} + X'_{i,t}\Gamma + \varepsilon_{i,t}$$

Reported standard errors are corrected for clustering at the firm level. The first column of Table 6 reports the results of an OLS regression of assumed long-term rates of return on the first measure of pension sensitivity, the log ratio of annual pension fund assets to annual firm operating income. With no covariates, the coefficient on the pension sensitivity measure is 0.113. This implies that a movement from the 25th percentile of log pension sensitivity (-1.21) to the 75th percentile (0.40) would be associated with an 18 basis point increase in a firm's reported long-term rate of return. The second column of Table 6 includes a time trend and the interaction of the time trend with pension sensitivity. The results in this column suggest that the impact of

sensitivity on the long-term rate of return assumption increases over the sample: the implied impact of pension sensitivity is 0.072 in the first year of the sample and 0.171 by the end of the sample.

Columns 3 through 6 of Table 6 explore the robustness of the relationship between pension sensitivity and the long-term rate of return assumption to controls for year effects, industry effects, year and industry effects, and year-by-industry effects. Column 6 has the most generous control structure, allowing a separate dummy variable for each of 48 industry groups in each year. The estimated coefficients on our first measure of pension sensitivity are not affected by these additional controls. The point estimate of the coefficient ranges from 0.109 in the specification with year fixed effects to 0.123 in the specification with 48 industry effects.

The final two columns of Table 6 explore the two other measures of pension sensitivity and provides for industry-by-year effects as in column 6. Column 7 uses the average of pension asset size over the period as a numerator in the measure of sensitivity, and provides a coefficient roughly similar to columns 1-6. Finally, column 8 uses the log ratio of pension liability size to firm operating income. The results are not statistically distinguishable from the results using our main sensitivity measure, suggesting that the effect we observe is not merely the result of managers adjusting the long term rate of return to correspond with recent past actual investment returns.

If managerial motivations are important in determining assumed long term rates of return, this relationship should be heightened when managers are most interested in inflating profits and stock prices. Figure 4 presents a preliminary exploration of the relationship between takeover activity and long-term rate of return assumptions, describing the pattern of return assumptions around periods that firms undertake merger. Each point on the figure corresponds to a separate regression (with 2-standard error bands on either side); these regressions fit firm-year long-term rate of return assumptions on dummy variables for calendar year as well as an additional dummy variable capturing takeover activity. Each date on the graph corresponds to a separate regression with a different dummy variable; the date (-5), for instance, corresponds to a regression with a dummy variable set equal to 1 if the firm is not doing a takeover in this year, but will do a takeover in 5 years. The date (0) corresponds to a regression where the dummy variable is equal

to one for all firms that take over other firms in that year. This marks only a preliminary exploration of the data, but the results are revealing. First, controlling only for year effects, firm long-term rate of return assumptions are almost 30 basis points higher during merger years than during other years. Firms that will eventually engage in merger activity appear different from other firms; conditional only on takeover activity in 5 years and none in the current year, long-term rate of return assumptions are almost 15 basis points higher than their unconditional expectation in the complementary group of firms.

Table 7 pursues this line of investigation further, reporting results with different sets of control variables. We use a dummy variable that is set equal to one when the firm makes an acquisition of another publicly-traded firm in the next period. This dummy variable captures potential managerial motivations to inflate reported earnings in order to boost their companies' share prices prior to acquisition activity. In addition, we include the interaction of our acquirer dummy with pension sensitivity. The motivation behind including these variables is to explore long-term rate of return assumption during periods when firms have particularly strong incentives to inflate their earnings, and the interaction identifies the effect at firms where the assumption could have a larger impact on reported income prior to acquisition periods.

Equation 2 gives the estimated empirical model for the analysis in Table 7:

$$(2)\quad \textit{Assumed Rate of Return}_{i,t} = \alpha + \beta * \textit{Log Pensions Sensitivity}_{i,t} + \delta * \textit{Acquiror Dummy}_{i,t} + \lambda * (\textit{Log Pensions Sensitivity}_{i,t} * \textit{Acquiror Dummy}_{i,t}) + X_{i,t}'\Gamma + \varepsilon_{i,t}$$

The results in Table 7 suggest that firms make more aggressive long-term rate of return assumptions in periods prior to acquisitions. The magnitude of this effect is quite strong. Firms that are one period before making an acquisition on average have assumed a long-term rate of return that is around 30 basis points higher than other firms in all of the specifications. In fixed effects specification, this effect is smaller but still statistically significant. A given firm on average has a long term rate of return that is 6 basis points higher in years when it is about to make an acquisition compared to years when it is not. We therefore observe substantial effects of the acquisitions variable on the return assumption both within a given firm over time and across firms with different acquisition plans.

Furthermore, the results support the hypothesis that the tendency to raise the return assumption is stronger for firms where changes in the LTROR assumption have a higher impact on operating income. At firms where the pension sensitivity is higher, the marginal impact of the acquisition dummy is also greater. With the exception of the model with firm fixed effects, the coefficient on the interaction term is between 0.04 and 0.08 and statistically significant in each of the specifications. Taking an estimated coefficient of 0.06 would imply that the marginal impact of the acquisition dummy on the rate of return assumption is 10 basis points higher at the 75th percentile of log pension sensitivity (0.40) than at the 25th percentile (-1.21).

Table 8 pushes further by analyzing whether changes in the rates of return themselves are related to our measures of managerial opportunism. The table reports results of ordered probit regressions, where the dependent variables are categorical variables that reflect changes in assumed long-term rates of return. In the first two columns, the specification of the dependent variable is coarse: (-1) if the firm decreases the long-term rate of return assumption in that year, (0) if it is unchanged, and (1) if the firm increases its rate of return assumption. This ordered probit model is based on a latent regression model of the following form:

$$(3)\quad \Delta Assumed\ Rate\ of\ Return_{i,t} = \alpha + \beta * Log\ Pensions\ Sensitivity_{i,t} + \delta * Acquiror\ Dummy_{i,t} + \lambda * (Log\ Pensions\ Sensitivity_{i,t} * Acquiror\ Dummy_{i,t}) + X'_{i,t}\Gamma + \varepsilon_{i,t}$$

The latent propensity to change the long-term rate of return assumption is unobserved, but we do observe the actual changes:

$$(3')\quad SIGN(Assumed\ ROR_{i,t} - Assumed\ ROR_{i,t-1}) = -1 \quad if \quad \Delta Assumed\ ROR^{*}_{i,t} \le 0$$
$$0 \quad if \quad 0 < \Delta Assumed\ ROR^{*}_{i,t} \le \mu_1$$
$$1 \quad if \quad \mu_1 < \Delta Assumed\ ROR^{*}_{i,t}$$

The results in column 1 suggest that firms are more likely to increase their long-term rate of return assumption in periods where the pension sensitivity is highest; the results in column 2 suggest that firms are likely to increase their long-term rate of return assumptions prior to making acquisitions. In particular, the acquirer coefficients can be translated into marginal effects for the probability of each action (increase, decrease, and no change). Firms are 4.1%

less likely to reduce their long-term rate of return the year before an acquisition; 0.7% more likely to keep it the same; and 3.4% more likely to raise the rate. Columns 3 and 4 of Table 8 use a more nuanced, but still discrete, dependent variable: the variable takes on one of 11 different categories, ranging from large decreases in the assumed long term rate of return to large increases. The results are consistent with those in the first two columns. The standard errors for these results are all corrected with firm-level clustering.

The results in columns 5 and 6 of Table 8 use our second of pension sensitivity as the independent variable: the measure used, for each firm-year observation, is the log ratio of the average pension fund size for that firm over the 11 years of the sample to the firm's operating income in that year. In these regressions, the pension sensitivity measure is statistically insignificant. The takeover variable, on the other hand, remains statistically significant. Similarly, the final two columns use the third definition of sensitivity, namely the log ratio of pension liabilities to the firm's operating income in a given year. The sensitivity variable does not predict changes in the long term rate of return in this specification, but firms about to make acquisitions are more likely to raise their rate of return assumptions. The magnitude of the acquirer effect and the marginal effects are roughly constant across the specifications using different measures of sensitivity.[12]

Finally, the most direct measure of managerial motivation is the timing of option exercise. Table 9 and Figure 5 shift to a smaller sample of firms for which we observe executive compensation and option exercise data in addition to data on pension assets and rate of return assumptions. As with our analysis of merger activity, we begin with a graphical depiction of our results in Figure 5. This figure, similar to Figure 4, presents the coefficients from regressions of long-term rate of return on a dummy variable for CEO option exercise as well as calendar year dummy variables. The CEO option exercise dummy variables are set equal to 0 or 1 depending on whether options will be exercised at the appropriate lead or lag. While not as pronounced as

[12] We further considered the possibility that particular types of mergers – stock financed mergers – would be more closely associated with increases in assumed returns. This investigation is clouded by empirical and conceptual difficulties. First, our source on merger data has coarse groupings on the type of financing and manual inspection of the data for one company, IBM, relative to their 10-K's suggests only a crude mapping between the two sources. Second, as Fama and French (2003) point out, equity issuance through mergers is isomorphic with other forms of equity issuance and may be associated with additional monitoring costs further clouding the predicted relationship between merger financing and pension decision-making. The results do not indicate a distinctive pattern of assumed rates of return for stock-financed mergers.

figure 4, the results do suggest a spike in long-term rate of return assumptions around periods of option exercise; at firms where the CEO is exercising options in the current year, long-term rate of return assumptions are 12 basis points higher than at other firms.

Table 9 focuses this analysis, estimating equations that allow us to incorporate different sets of control variables. The linear regression models reported in this table estimate equation 4 below:

$$(4)\quad Assumed\ ROR_{i,t} = \alpha + \beta * Log\ Pensions\ Sensitivity_{i,t} + \delta * \frac{CEO\ Option\ Exercise\ Value}{Firm\ Equity\ Value}_{i,t}$$
$$+ \lambda * (Log\ Pensions\ Sensitivity_{i,t} * \frac{CEO\ Option\ Exercise\ Value}{Firm\ Equity\ Value}_{i,t}) + X'_{i,t}\Gamma + \varepsilon_{i,t}$$

Again, we correct the standard errors in the table for clustering at the firm level. The results suggest that firms make aggressive long-term rate of return assumptions during periods when CEOs are exercising large amounts of stock options. The coefficient estimates range form 0.014 in the specification with firm fixed effects to 0.035 in the specification with industry by year effects. A coefficient estimate of 0.020 would imply that a one-standard deviation increase in exercise (1.780) would be associated with a 3.5 basis point increase in the assumed rate of return on pension assets. Again the marginal effect is larger at firms where pension sensitivity is larger; in the first specification, the coefficient of 0.011 on the interaction term implies that at the 25th percentile of pension sensitivity the marginal effect of CEO option exercise is 0.009. At the 75th percentile of pension sensitivity estimated marginal effect of CEO option exercise is 0.033.

Taken together, the results in Tables 6 through 9 and Figures 4 and 5 suggest that managerial motivations — as measured by the importance of pension earnings to operating earnings, the timing of merger activity and the timing of option exercises — are a critical determinant of the choice of assumed rates of return. That managers capitalize on inflated earnings through increased merger activity and greater exercises further illustrates that other managerial decisions are impacted by the potential manipulation of pension earnings.

5. The determinants of asset allocation decisions

The managerial incentives we have identified may have effects not just on financial reporting and investment decisions by firms and managers but also on asset allocation decisions within pension plans. This section investigates the possibility that managers shift pension assets towards equity in order to justify a higher long-term rate of return assumptions in periods around mergers. To investigate this possibility, we use the merged DB pension equity allocation data described in section 3. Our empirical approach is to fit two stage least squares regressions of equity allocation share on the long-term rate of return, with the long-term rate of return instrumented with a dummy for acquisition activity.

The first two columns of Table 10 show the results of an OLS regression of equity shares on the assumed long-term rate of return. In the first column, for each percentage point higher the long-term rate of return assumption is, the percentage of the pension fund allocated to equity is 6 percentage points higher. The second column adds a full set of industry-by-year controls and this effect becomes 4.5 percentage points. There are a number of potential reasons we might observe a correlation between these two variables. One is that mangers increase the allocation of risky assets in their pension funds to justify increases long-term rates of return, but there are several alternatives. It might be the case that the long-term rate of return assumption responds to shorter term increases in the actual rate of return on pension assets, a variety of excessive extrapolation (see Benartzi and Thaler (2001)). Alternatively, pension plans with higher equity allocations might have higher assumed rates given greater exposure to assets that earn risk premia.

In the third and fourth columns we attempt to address these endogeneity concerns by estimating the relationship between the equity allocation and the long-term rate of return using instrumental variables. We estimate the system of equations below:

$$(5') \quad Equity\ allocation_{i,t} = \alpha_0 + \alpha_1 * Log\ Pension\ Sensitivity_{i,t} + \alpha_2 * Assumed\ ROR_{i,t} + X'_{i,t}\Gamma + \varepsilon_{i,t}$$

$$(5'') \quad Assumed\ ROR_{i,t} = \beta_0 + \beta_1 * Log\ Pension\ Sensitivity_{i,t} + \beta_2 Acquiror\ Dummy_{i,t} + X'_{i,t}\Lambda + v_{i,t}$$

by two-stage least squares. The first stage equation (8") is analogous to specifications in the first through third columns of Table 7, although we are now focusing on the smaller asset allocation

sample. The terms represented by the matrix X are included in the fourth column specification only and represent industry-by-year controls.[13]

The identifying assumption behind this specification is that the merger decision affects equity shares in the pension fund only through its effect on the assumed long-term rate of return. Instrumenting in this manner provides a much larger effect of the long-term rate of return on the equity share. The specification in column 3 suggests that one percentage point difference in the assumed long-term rate of return (such as from 8.00% at the 25th percentile to 9.00% at the 75th percentile) is associated with an increase of 21 percentage points in the equity allocation. The inclusion of industry-year effects only modestly reduces this effect to a 19 percentage point increase in response to a one percentage point increase in assumed returns. While these magnitudes seem large, it useful to remember that most one-time changes in assumed rates are considerably more modest than a one percentage point change. As such, it is useful to scale these effects for modest assumed rate of return changes and view them as associating 25 basis point changes in assumed rates leading to five percentage point changes in equity allocation.

Overall, this evidence suggests that the determination of the risk exposure of pension fund assets is related to managerial incentives for earnings management. From a policy perspective, this increased risk taking increases the value of the insurance provided by the PBGC and thus raises the liability that the federal government faces through its insurance of private pension funds. Furthermore, because solvent firms are required to make contributions to underfunded pension plans, increased risk-taking increases the severity of the effects of a market downturn on a company's financial position. Finally, given that pension funds are supposed to be managed in the interest of the employees, the use of pension assumptions as an earnings management vehicle is rather unsettling if asset allocation decisions are being made in part to justify those assumptions.

6. Managerial Opportunism and Shareholder Interests

Our results on earnings manipulation and pension decision-making illustrate how managerial actions can redistribute value between current shareholders, managers and potential shareholders. If managers are inflating profits and stock prices and then acquiring other firms

[13] Due to the fact that our equity allocation data is compiled from two separate sources which each have different samples over different time periods, we do not move to the full firm-fixed effects specification.

with inflated stock, then current shareholders could benefit from this opportunism as value is redistributed to them from future shareholders. This would be consistent with the view of optimal incentive contracts of Bolton, Scheinkman, and Xiong (2003) and the view of stock-financed mergers in Shleifer and Vishny (2002). If, instead, managers are inflating profits to enable empire-building and self-enrichment through option exercises, then value is likely being transferred from current shareholders toward managers. This view would be consistent with the managerial power view of Bebchuk, Fried and Walker (2002) and others.

We frame our discussion of managerial opportunism and pension decision-making within this debate by investigating the relationship between assumed rates of return and the corporate governance environment of the firm. Specifically, we expect that if current shareholders are the beneficiaries of managerial opportunism in setting pension return assumptions, then high assumptions will be more prevalent in firms where managers are more constrained to behave in the interest of shareholders. Alternatively, if firms where managers are least constrained by shareholder interests indulge in aggressive assumed rates of return, this would be more supportive of the rent-extraction view.

Figure 6 provides evidence that long-term rate of return assumptions on pension assets are substantially higher at firms where current shareholders have weaker control over managers. Firm-year observations are sorted on the basis of the nearest preceding measure of the Gompers, Ishii, and Metrick (2003) corporate governance index. This index aggregates 24 different dummy variables representing mechanisms that firms can employ to insulate managers from shareholders. These include devices like staggered board elections, which impose delays on any contestant seeking to take over board seats. We aggregate observations into categories ranging from 1, those where shareholders have the most control over mangers, to 6, those where managers are the most insulated from shareholders. There is a substantial increase in long-term rates of return as managers become more insulated from current shareholders. At the most democratic firms, assumed long-term rates of return are below 8.5 percent, while at the most dictatorial, they are above 9 percent. While the analysis of Figure 6 is only suggestive, it does indicate that managerial opportunism in pension decision-making does not appear to be guided by shareholder interests.

Finally, it is useful to consider the potential magnitude of these redistributive effects for a specific example. We return to IBM to consider the effects of the inflated stock prices arising from inflated pension earnings. Specifically, we attempt to outline the scale of managerial enrichment during that period due to opportunistic pension decision-making. While this exercise is necessarily speculative, it is useful for scaling the potential redistribution in this instance. The first panel of Table 11 provides information on IBM market values and acquisition activity from 1997 to 2001, the period emphasized in Table 1. This period saw an increase in market value of almost $100 billion as well as robust acquisition activity. IBM made 41 acquisitions during this period valued at over $4 billion. The second panel combines the estimates from Table 1 regarding the effect of the deviations from an assumed rate of return of 9.25% on income with the Coronado and Sharpe (2003) estimates suggesting that pension earnings are capitalized in the same manner as operating earnings. This assumption gives an estimated stock price in the absence of those deviations from the 9.25% long-term rate of return assumption. Finally, Gerstner's option exercise activity is employed to arrive at an estimate of the dollar value garnered by Gerstner that arose from the deviations from the 9.25% rate. This estimate totals more than $12 million for the period.

How reliable is this $12 million estimate? Obviously, it relies on numerous assumptions – several of which may be construed to be conservative or aggressive. The most aggressive assumption is the one borrowed from Coronado and Sharpe (2003) – that markets completely fail to distinguish between pension and operating earnings and capitalize them similarly. Having said that, the estimate may be quite conservative – particularly if one believes that the reduced growth rates (which would have been negative in some years) that would have been apparent without the changed assumptions would have changed the capitalization rate of *all* earnings. If this was the case even to a limited degree, the scope of managerial enrichment resulting from the changed assumptions would be substantially larger. Specifically, the final column considers an alternative scenario where the capitalization rate of *all* earnings is altered by the changed growth

rates noted in introduction.[14] Under these assumptions, this estimate rises to nearly $76 million.[15]

If between $12 million and $76 million went into Gerstner's pocket from these changed assumptions, where did it come from? This discussion of who benefited from this earnings manipulation is necessarily even more conjectural. Given the overall scope of market value gains experienced by IBM shareholders during this period, this amount may be trivial and may have resulted from an optimal compensation arrangement. Indeed, if merger activity financed by stock or employee ownership was enabled by these assumptions, preexisting shareholders may be the beneficiaries of value transfers from these new shareholders.[16] Our reading of their 10-Ks suggest that approximately 25% of the $4 billion of target value was financed through share issuance. Given that over $10 billion of market capitalization by the end of 2001 is calculated to reflect capitalized pension earnings arising from these increases, it does not appear that a substantial fraction was value transfers accomplished through mergers. Finally, it is possible that these rate of return changes and resulting incremental compensation was facilitated to enable exercises of options and transfers of value away from current shareholders and toward management. In this regard, it is useful to note that subsequent to Gerstner's departure, the assumed rate of return was revised downward to 9.5% in 2002 and IBM's market value fell by $70 billion during 2002 to return to 1998 levels.

7. Conclusion

In a setting of considerable managerial discretion where manipulated earnings are capitalized into stock prices, managers appear to actively exploit this opportunity and alter investment decisions to justify and capitalize on those manipulated earnings. The latitude managers enjoy in pension accounting and the inability of the market to fully distinguish between inflated pension earnings and operating earnings combine to provide managers with a powerful incentive to opportunistically characterize pension assets. Managers facing large

[14] The calculations on the changed capitalization rates require a discount rate and two alternative growth rates. For these purposes, we use a 12% discount rate and the difference in multiples, using a growing perpetuity formula, arising from a growth rate changing from 6.7% to 5.6%. Such a calculation is necessarily conjectural but does provide a useful alternative to the baseline assumption of no changed capitalization effect.

[15] It is useful to frame these figures in the context of Gerstner's overall compensation during the period from 1997 to 2001. Execucomp data indicates that Gerstner received $45 million in cash compensation and $366 in total compensation, including option exercises, during that period.

incentives to manipulate earnings through pension decisions — either because of the sensitivity of firm earnings to changed assumptions, impending merger activity, or large incentive compensation contracts — appear to alter their assumed returns significantly in response to these incentives. The evidence on merger activity and option exercises confirms the role of earnings manipulation but also makes clear that reporting distortions induced by managerial motivations can alter manager and firm investment decisions. Furthermore, rationalizing these higher assumed returns is easier in the context of higher equity allocations and our IV analysis indicates that higher assumed returns are, in fact, associated with higher equity allocations.

Previous studies of managerial opportunism and earnings manipulation have emphasized large indiscretions in small samples, as in Erikson et. al. (2003) on earnings fraud, or on more aggregated measures of misreporting through accrual accounting, as in Bergstresser and Philippon (2003). In this paper, we emphasize a simple, transparent but important reporting decision that in a large sample appears to be used opportunistically. In addition, we show that this opportunism has further effects in enabling merger activity and option exercises and in determining asset allocation within those plans. Given the importance of pension plan assets to firm finances, employee welfare and the broader capital markets, further work on the implications of this opportunism seems warranted.

To the degree that pension earnings are capitalized into market prices, opportunistic use of assumed rates of return may lead to aggregate levels of overvaluation, as suggested by Coronado and Sharpe (2003). Our results on asset allocation add another mechanism by which pension accounting could have contributed to market overvaluation as increased assumed rates also appear to be associated with higher equity allocations. While market participants were capitalizing pension earnings, firms were increasing equity exposures to justify those very pension earnings.

[16] IBM 10-Ks are somewhat unclear on the financing of each transaction making it somewhat problematic to determine the precise degree to which IBM issued shares to finance their acquisitions.

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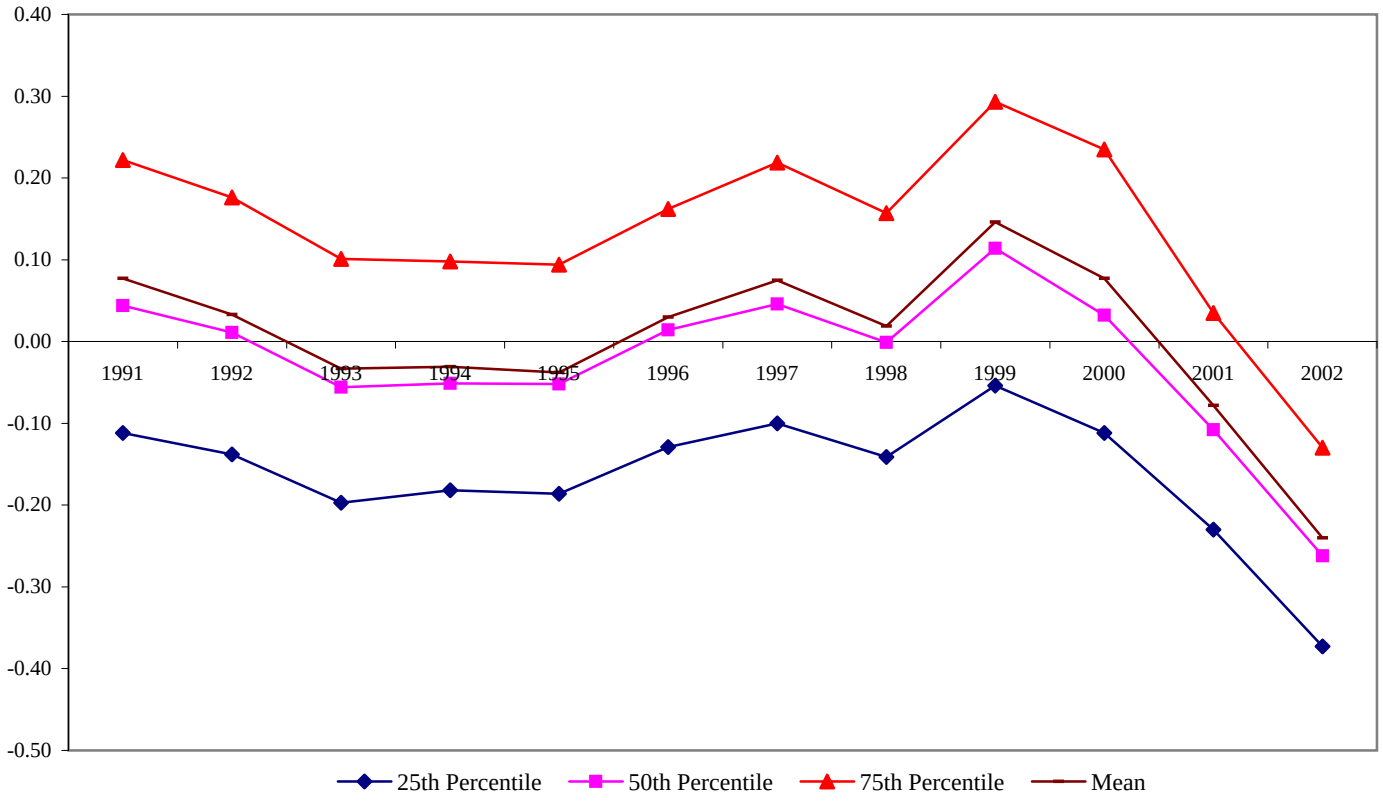
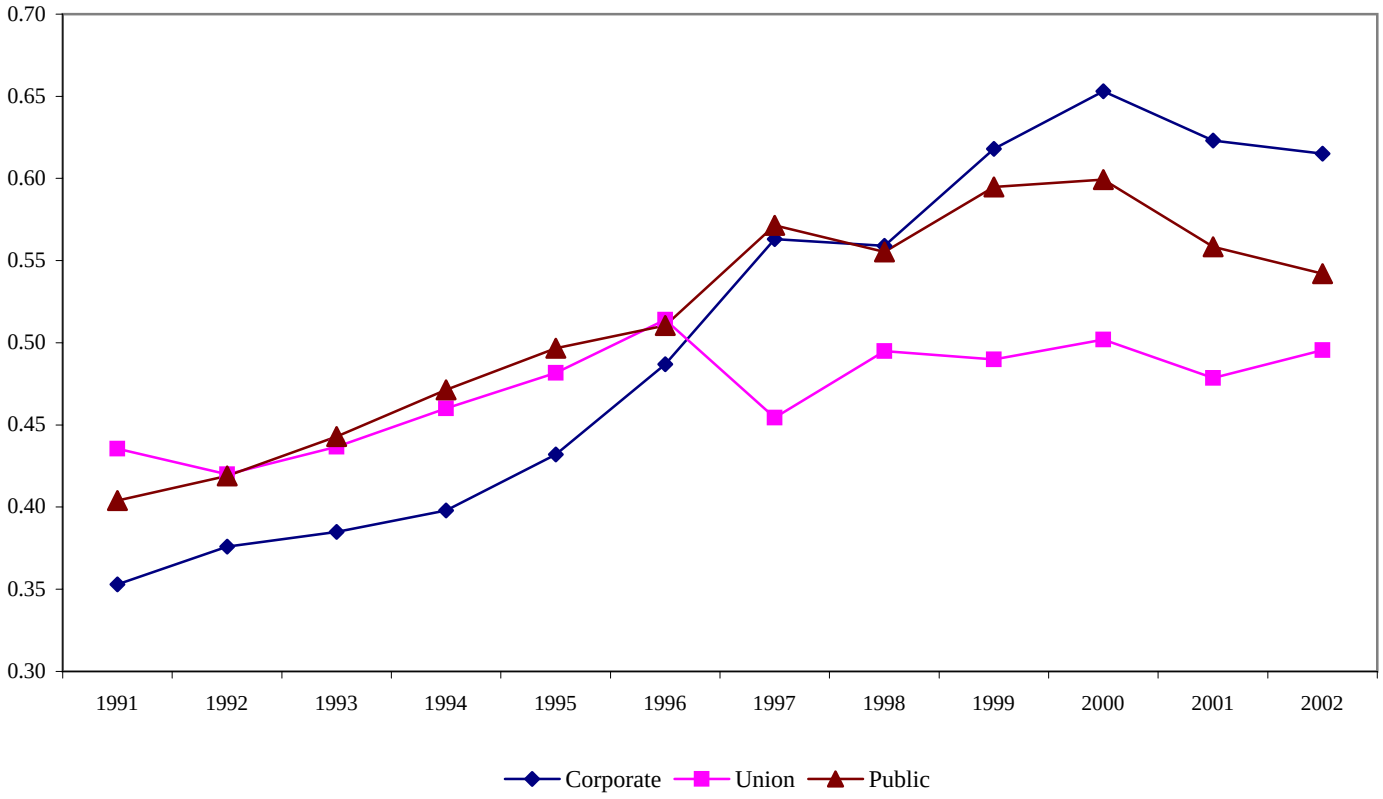
Figure 1: End-of-Year Pension Funding Status 1991-2002



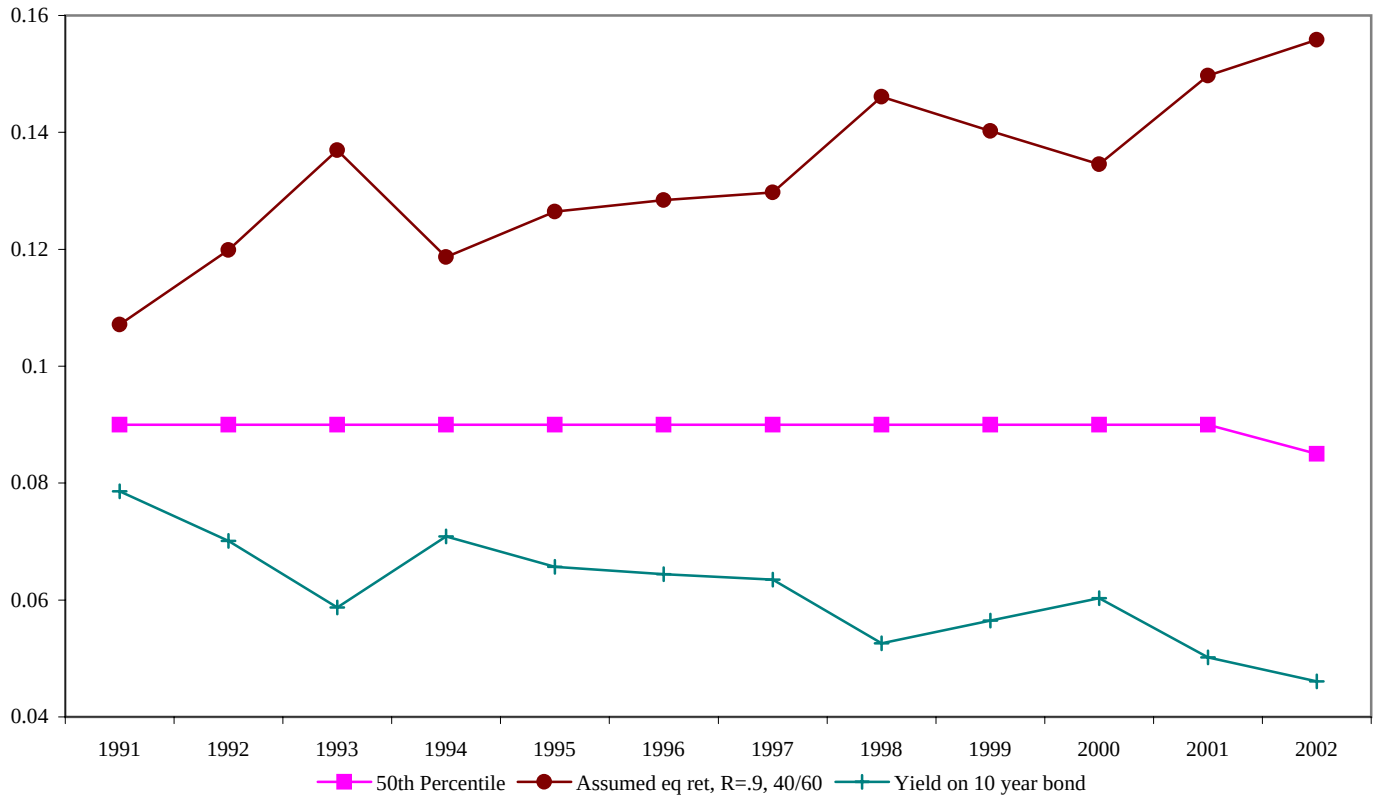
Note. Funding status is the ratio of the difference of Pension Assets and Pension Projected Benefit Obligation to Pension Projected Benefit Obligation. The sample is firms in Compustat that report LTROR, pension asset size, and positive operating income

Figure 2: Mean Share of Pension Fund Assets Invested in Equity



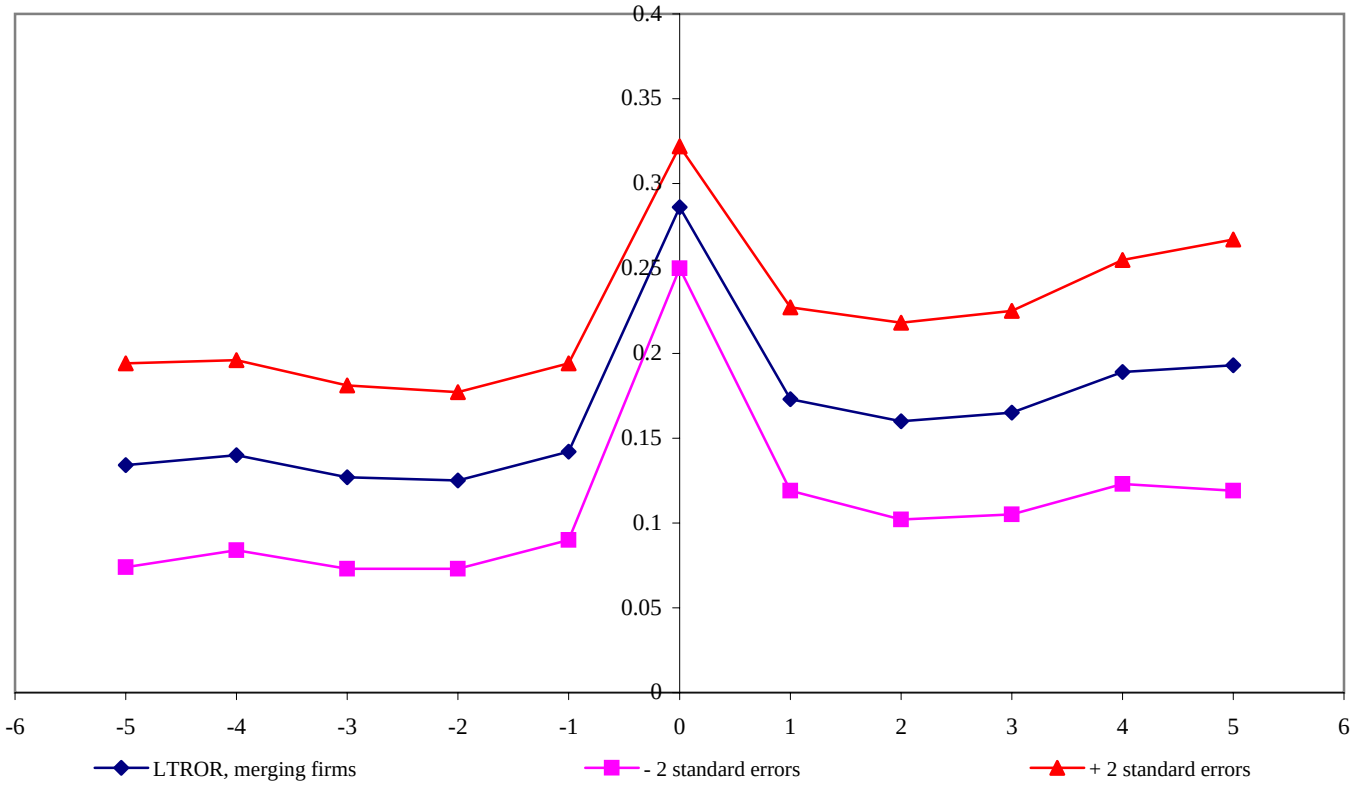
Note. Corporate data from Pensions and Investments and IRS 5500 filings. Union and public data from Pensions and Investments. Equity includes domestic, international, and own-company equity; excludes investments in private equity.

Figure 3: The Distribution of Long Term Rate of Return Assumptions



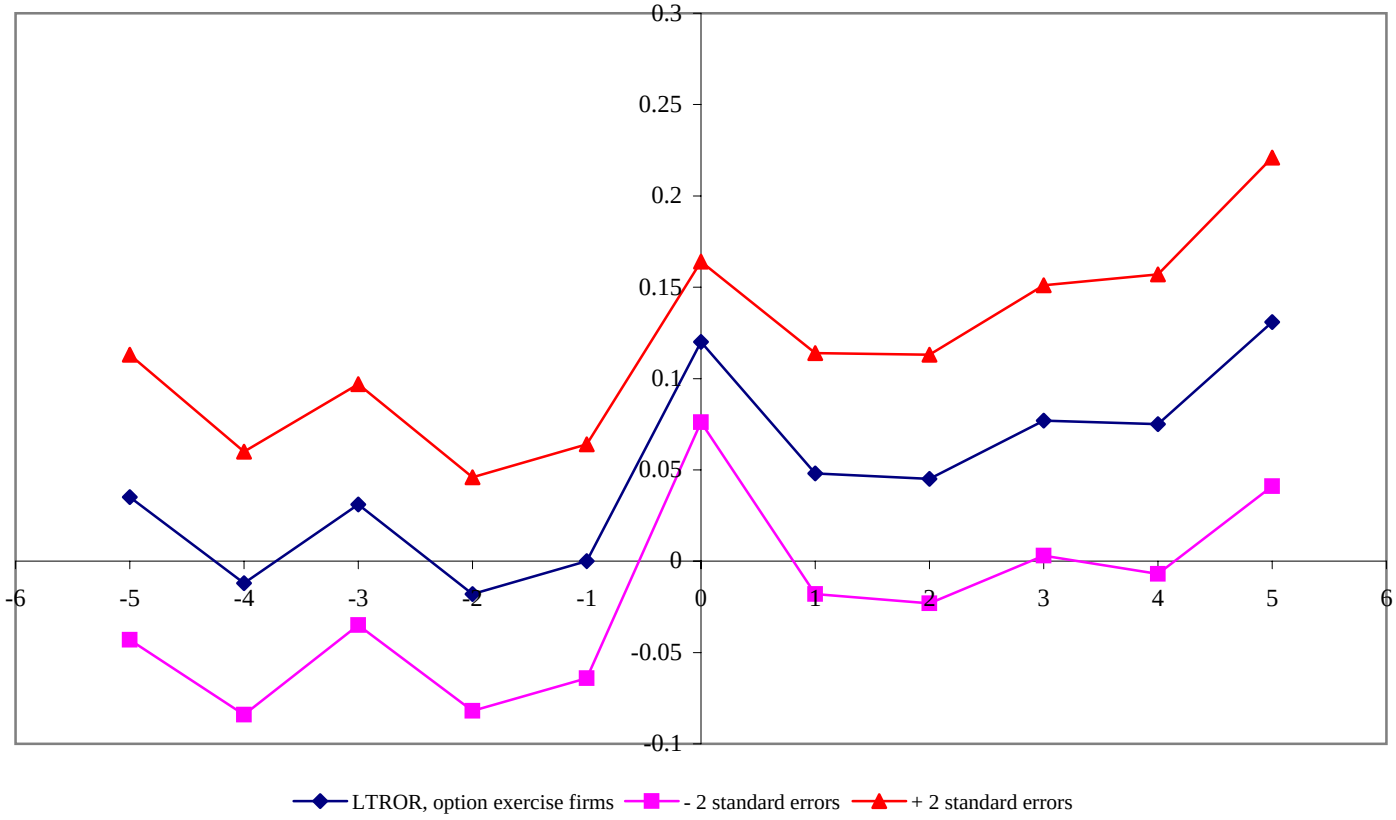
Note. Median long-term rate of return assumption from Compustat. Yield on 10-year bond from Federal Reserve. Implied return on equity is the expected return on a portfolio of 40% equity and 60% bonds.

Figure 4: Long-Term Rate of Return Assumption Around Mergers, All Firms



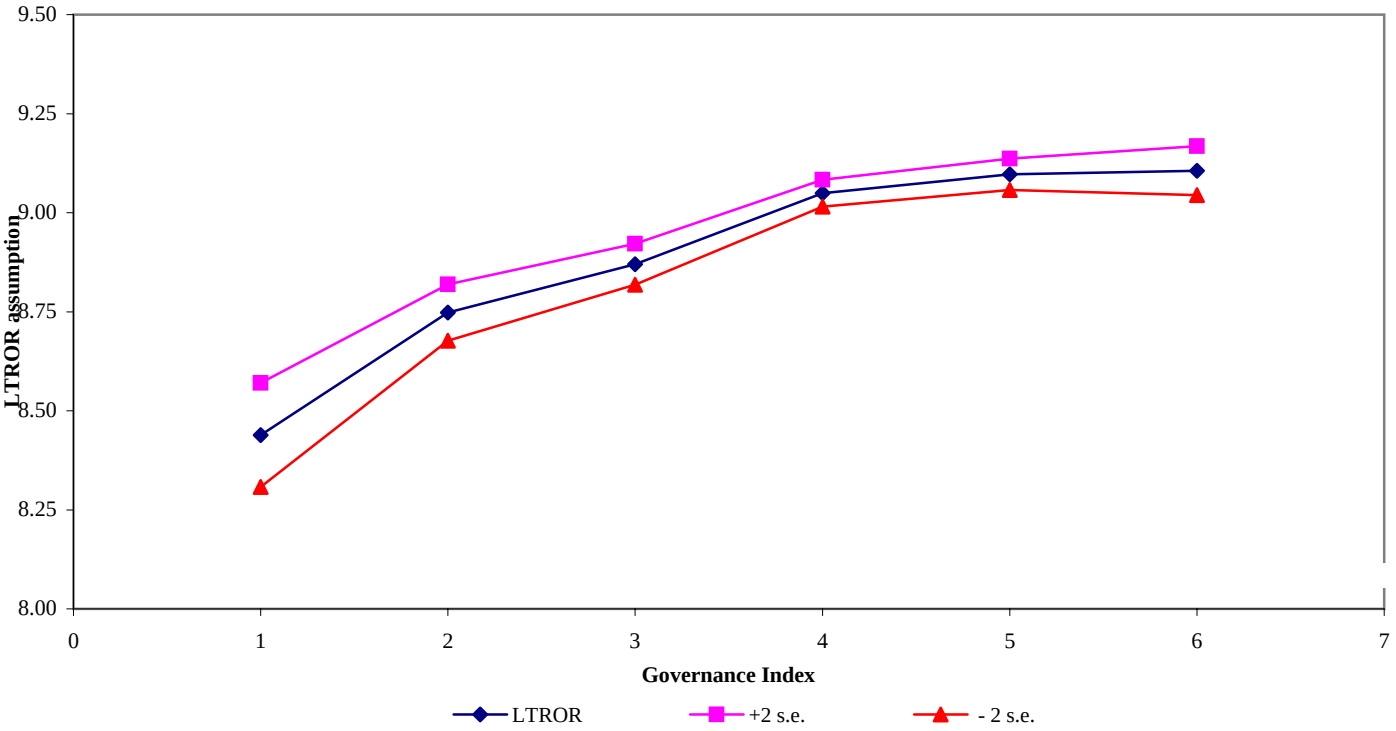
Note. Figure shows long-term rate of return assumptions reported by firms in periods around mergers. This averages are regression-adjusted for calendar-year effects. The estimate for period 0 is the average assumption for firms reporting acquisitions of another firm in that year. The estimate for period 1 is the average assumption for firms reporting acquisition of another firm in previous year, but not current year. The estimate for period -1 is the average LTROR assumption for firms reporting acquisitions of another firm in next year, but not current year. Long-term rate of return assumption data from Compustat.

Figure 5: Long-Term Rate of Return Assumptions around CEO option exercise, All Firms



Note. Figure shows long-term rate of return assumptions reported by firms in periods around CEO option exercise. These averages are regression-adjusted for calendar year effects. At period 0 is average assumption for firms whose CEOs report option exercise in that year. At period 1 is average assumption for firms whose CEOs exercise options in previous year, but not current year. At period -1 is average LTROR assumption for firms whose CEOs exercise options in next year, but not current year. Long-term rate of return assumption data from Compustat.

Figure 6: Rate of Return Assumptions by Quality of Corporate Governance



Note. Figure shows long-term rate of return assumptions plotted against a corporate governance index based on Gompers, Ishii and Metrick (2003). The best governed firms (group 1) scored 1-5 on the G-I-M index, group 2 scored 6-7, group 3 scored 8-9, group 4 scored 10-11, group 5 scored 12-13, and the words governed firms (group 6) scored 14 or above. Long-term rate of return assumption data from Compustat.

Table 1: Pension Decision Making at IBM, 1993-2001

	IBM Corporate Performance		*IBM Pension Plan Reporting and Impact on IBM Corporate Reporting*			*Gerstner Option Activity*	
Year	Revenue Annual Growth Rate	Income Before Taxes Annual Growth Rate	IBM's Assumed Return on DB Assets	IBM's Actual Return on DB Assets	Share of Income Before Taxes Resulting from Deviation from 9.25%	Stock Options Granted to Gerstner (000)	Stock Options Exercised by Gerstner (000)
1993	-2.80%	na	9.50%	na		500	0
1994	2.13%	na	9.50%	-1.16%		225	0
1995	12.31%	51.56%	9.25%	20.54%		100	3
1996	5.57%	9.91%	9.25%	15.54%		300	51
1997	3.37%	5.12%	9.50%	18.07%	1.53%	2200	101
1998	4.02%	0.14%	9.50%	13.62%	1.66%	0	301
1999	7.20%	30.06%	9.50%	15.38%	1.42%	0	803
2000	0.97%	-1.90%	10.00%	-3.06%	4.77%	650	703
2001	-2.86%	-5.04%	10.00%	5.39%	4.75%	0	1253

Note: The three panels of the table provide descriptive data on the performance of IBM, IBM's worldwide pension plans, and option activity by IBM's CEO Louis Gerstner, Jr. All data on IBM corporate performance and pension plan accounting are calculated from data from 10-K filings, and data on option activity are taken from the Compustat Executive Compensation database. Reported earnings are affected by the rate of return assumption because assumed returns on pension plan assets can be deducted from costs, with differences between assumed and actual returns amortized over long periods. The "Share of Income Before Taxes Resulting from Deviation from 9.25%" is the product of the difference between annual assumed rates and 9.25% and worldwide pension assets, divided by annual income before taxes.

Table 2: The Contribution of Assumed Pension Asset Returns to Operating Income, by Rate of Return Assumptions and Pension Sensitivities.

Pension sensitivity		percentile	5th	10th	25th	Mean	50th	75th	90th	95th
		level	0.013	0.058	0.112	0.299	0.716	1.494	3.042	5.150
		log	-4.370	-2.847	-2.193	-1.209	-0.334	0.401	1.113	1.639
Long-term rate of return assumption (LTROR)	percentile	return								
	5th	7.00	0.089	0.406	0.781	2.090	5.013	10.458	21.294	36.050
	10th	7.50	0.095	0.435	0.837	2.240	5.372	11.205	22.815	38.625
	25th	8.00	0.101	0.464	0.893	2.389	5.730	11.952	24.336	41.200
	Mean	8.61	0.109	0.499	0.961	2.571	6.166	12.863	26.192	44.342
	50th	9.00	0.114	0.522	1.004	2.687	6.446	13.446	27.378	46.350
	75th	9.40	0.119	0.545	1.049	2.807	6.732	14.044	28.595	48.410
	90th	10.00	0.127	0.580	1.116	2.986	7.162	14.940	30.420	51.500
	95th	10.00	0.127	0.580	1.116	2.986	7.162	14.940	30.420	51.500

Note: The table provides the share of operating income attributable to assumed returns on pension assets, by pension sensitivity and assumed long term rate of return assumptions. Pension sensitivity is the ratio of pension assets to operating income. The distribution provided across columns corresponds to the sample used in the analysis. The long term rate of return assumption is the assumed rate of return on pension assets in corporate financial reports and the distribution provided along the rows corresponds to the sample used in the analysis. Reported earnings are affected by the rate of return assumption because assumed returns on pension plan assets can be deducted from costs, with differences between assumed and actual returns amortized over long periods.

Table 3: The Magnitude of Pension Assets, 1991-2002

Year	Sample Count	Balance Sheet Assets of Firms in (2) ($bn)	Pension Assets of Firms in (2) ($bn)	DB Pension Assets / Total Assets	DB Pension Assets ($m)			
					Mean	25th Percentile	Median	75th Percentile
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1991	1645	7,061.80	735.1	10.41%	446.9	10.2	46.5	210.1
1992	1725	7,723.50	764.9	9.90%	443.4	10.7	46.7	211.4
1993	1755	8,770.60	879.2	10.02%	501.0	10.9	50.4	236.3
1994	1779	9,798.70	830.6	8.48%	466.9	10.6	48.7	218.5
1995	1741	10,189.70	962.7	9.45%	552.9	11.6	53.5	247.9
1996	1704	10,603.20	1,034.30	9.75%	607.0	13.3	63.1	283.4
1997	1630	11,214.60	1,156.20	10.31%	709.4	16.6	76.6	331.8
1998	1589	12,492.80	1,276.60	10.22%	803.4	17.4	86.0	414.6
1999	1544	14,319.00	1,404.40	9.81%	909.6	19.7	101.1	454.0
2000	1453	14,739.10	1,413.50	9.59%	972.8	20.0	100	482.3
2001	1258	14,957.50	1,067.50	7.14%	848.6	21.5	94.9	443.5
2002	1502	19,249.60	1,093.60	5.68%	728.1	14.9	68.2	333.6

Note: The table characterizes the magnitude of firm operating and pension assets for firms in Compustat that report long term rates of return, pension asset size, and positive operating income. The data are from Compustat.

Table 4: Changes in Long-Term Rate of Return Assumptions (1992-2002)

Year (1)	Mean Change (2)	Number of Increases (3)	Number No Change (4)	Number of Decreases (5)	Total Count (6)
1992	-0.05	90	1288	198	1576
1993	-0.15	87	1161	358	1606
1994	-0.05	136	1257	257	1650
1995	0.06	186	1277	140	1603
1996	-0.04	172	1288	128	1588
1997	0.02	172	1239	112	1523
1998	-0.03	150	1101	159	1410
1999	0.02	157	1079	140	1376
2000	0.04	177	1049	107	1333
2001	-0.03	98	948	152	1198
2002	-0.31	42	591	508	1141

Note: The table provides the mean change in the long term rate of return and the number of increases, non-changes and decreases for the sample of firms from Compustat that report pension asset size, positive operating income, and assumed long term rates of return in the current and previous year.

Table 5: Summary Statistics

Variable	Mean	Median	Standard Deviation	Observations
Pension Assets ($m)	653.0	65.5	2631.2	19,325
Operating Assets (Book Value, $m)	7302.5	911.7	32577.9	19,325
Pension Assets / Operating Income	4.460	0.716	226.8	19,325
Pension Assets / Operating Assets	0.142	0.086	0.255	19,324
Pension Liabilities ($m)	621.3	67.0	2353.2	19,325
Log Ratio of Annual Pension Assets to Operating Income	-0.440	-0.334	1.398	19,325
Log Ratio of Average Pension Assets to Operating Income	-0.446	-0.375	1.357	19,325
Log Ratio of Annual Pension Liabilities to Operating Income	-0.382	-0.322	1.289	19,263
Assumed long-term rate of return (%)	8.746	9.000	1.115	19,325
Change in long-term rate of return (%)	-0.044	0.000	0.703	16,004
Acquirer Indicator	0.239	0.000	0.426	19,325
CEO option exercise/Equity market value (%)	0.296	0.000	1.780	7,075
Equity Allocation	0.498	0.575	0.247	3,202

Note: All data on operating performance, pension assets, and pension assumptions are drawn from Compustat for the sample of firms that report long term rates of return, pension asset size, and positive operating income. Acquisitions data are drawn from the Securities Data Company (SDC) database of mergers and acquisitions. CEO option data are drawn from the Compustat Executive Compensation database. Equity allocation data are drawn from both the *Pensions and Investments* Survey and IRS 5500 filings. The equity allocation sample excludes firms with assets in opaque trusts.

Table 6: The Relationship Between Assumed Long Term Rates of Return and Pension Sensitivities

	Dependent Variable: Assumed Long-Term Rate of Return on Pension Assets							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Ratio of Annual Pension Assets to Annual Operating Income	0.113	0.072	0.109	0.123	0.119	0.117		
	(0.013)**	(0.017)**	(0.013)**	(0.015)**	(0.015)**	(0.015)**		
Log Ratio of Average Pension Assets to Annual Operating Income							0.114	
							(0.015)**	
Log Ratio of Annual Pension Liabilities to Annual Operating Income								0.109
								(0.015)**
Time Trend		-0.043						
		(0.004)**						
Time Trend Interacted with Log Ratio		0.009						
		(0.003)**						
Industry Fixed Effects?	N	N	N	Y	Y	N	N	N
Year Effects?	N	N	Y	N	Y	N	N	N
Industry*Year Effects?	N	N	N	N	N	Y	Y	Y
Observations	19,325	19,325	19,325	19,325	19,325	19,325	19,325	19,325
R-Squared	0.02	0.03	0.04	0.06	0.07	0.10	0.09	0.09
Firms	3,247	3,247	3,247	3,247	3,247	3,247	3,247	3,247

Note: The dependent variable in these regressions is the assumed rate of return on pension assets. Standard errors, reported in parentheses are corrected for firm-level clustering. The sample includes firms in Compustat which report an assumed long-term rate of return on pension plan assets, pension plan asset size, and positive operating income. Data are from Compustat.

Table 7: Assumed Long Term Rates of Return, Sensitivity Measures, and Acquiror Indicators

	Dependent Variable: Assumed Long-Term Rate of Return on Pension Assets					
	(1)	(2)	(3)	(4)	(5)	(6)
Log Ratio of Annual Pension Assets to Annual Operating Income	0.108	0.110	0.107			0.010
	(0.015)**	(0.016)**	(0.016)**			(0.009)
Log Ratio of Average Pension Assets to Annual Operating Income				0.108		
				(0.0160)**		
Log Ratio of Annual Pension Liabilities to Annual Operating Income					0.098	
					(0.016)**	
Acquirer Indicator (Lagged)	0.331	0.317	0.314	0.300	0.322	0.057
	(0.028)**	(0.029)**	(0.030)**	(0.030)**	(0.031)**	(0.014)**
Acquirer Indicator (Lagged) Interacted with Log Sensitivity	0.042	0.057	0.062	0.039	0.076	0.013
	(0.022)	(0.022)**	(0.022)**	(0.023)	(0.024)**	(0.010)
Industry Effects?	N	Y	N	N	N	N
Year Effects?	N	Y	N	N	N	N
Industry*Year Effects?	N	N	Y	Y	Y	N
Firm Effects?	N	N	N	N	N	Y
Observations	19,325	19,325	19,325	19,325	19,325	19,325
R-Squared	0.03	0.07	0.11	0.09	0.10	0.03
Firms	3,247	3,247	3,247	3,247	3,247	3,247

Note: The dependent variable in these regressions is the assumed rate of return on pension assets. Standard errors, reported in parentheses are corrected for firm-level clustering. The sample includes firms in Compustat which report an assumed long-term rate of return on pension plan assets, pension plan asset size, and positive operating income. Financial and pension data are from Compustat; acquisitions data are from the Securities Data Company (SDC) database.

Table 8: Changes in Assumed Long Term Rate of Return, Sensitivity, and Acquisition Indicators

	Dependent variable: categorical variable for change in long-term rate of return assumption							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Ratio of Annual Pension Assets to Annual Operating Income	0.018 (0.007)*	0.016 (0.008)*	0.019 (0.007)**	0.018 (0.008)*				
Log Ratio of Average Pension Assets to Annual Operating Income					0.009 (0.007)	0.012 (0.008)		
Log Ratio of Annual Pension Liabilities to Annual Operating Income							-0.011 (0.008)	-0.015 (0.009)
Acquirer Indicator (Lagged)		0.192 (0.025)**		0.189 (0.024)**		0.180 (0.025)**		0.195 (0.025)**
Acquirer Indicator (Lagged) Interacted with Log Sensitivity		0.021 (0.018)		0.016 (0.017)		-0.001 (0.018)		0.037 (0.019)
Acquiror Indicator (Lagged) Marginal Effects								
Probability of Decrease		-4.1%		—		-3.8%		-4.1%
Probability of No Chg		0.7%		—		0.7%		0.7%
Probability of Increase		3.4%		—		3.1%		3.4%
Dependent Variable								
Coarse (3 categories)	Y	Y	N	N	Y	Y	Y	Y
Fine (11 categories)	N	N	Y	Y	N	N	N	N
Observations	16,004	16,004	16,004	16,004	16,004	16,004	16,004	16,004

Note. The model estimated is an ordered probit. In regressions with coarse dependent variable, the dependent variable takes one of three values: -1 for decrease in rate of return assumption, 0 for no change, and 1 for increase. In regressions with the fine dependent variable, the space of changes in the long-term rate of return assumption is divided into eleven bins. Financial data are from Compustat; acquisitions data are from the Securities Data Company (SDC) database. The sample includes firms in Compustat which report pension plan asset size, and positive operating income, and assumed long-term rate of return in the current and previous period. Standard errors, reported in parentheses, are corrected for firm-level clustering.

Table 9: Assumed long term rates of return, sensitivity measures, and CEO option exercise

	Dependent Variable: Assumed Long-Term Rate of Return on Pension Assets					
	(1)	(2)	(3)	(4)	(5)	(6)
Log Ratio of Annual Pension Assets to Annual Operating Income	0.134	0.152	0.154			0.058
	(0.019)**	(0.021)**	(0.021)**			(0.022)**
Log Ratio of Average Pension Assets to Annual Operating Income				0.165		
				(0.024)**		
Log Ratio of Annual Pension Liabilities to Annual Operating Income					0.162	
					(0.024)**	
CEO option exercise as share of firm equity market	0.025	0.028	0.028	0.035	0.033	0.014
	(0.010)**	(0.009)**	(0.011)**	(0.013)**	(0.012)**	(0.004)**
CEO option exercise share interacted with log sensitivity	0.011	0.012	0.013	0.018	0.025	0.005
	(0.006)*	(0.006)**	(0.006)**	(0.008)**	(0.011)**	(0.003)*
Industry Effects?	N	Y	N	N	N	N
Year Effects?	N	Y	N	N	N	N
Industry*Year Effects?	N	N	Y	Y	Y	N
Firm Effects?	N	N	N	N	N	Y
Observations	7,075	7,075	7,075	7,075	7,075	7,075
R-Squared	0.04	0.12	0.15	0.14	0.15	0.75
Firms	1,075	1,075	1,075	1,075	1,075	1,075

Note: The dependent variable is the assumed rate of return on pension assets. Data are from Compustat and Compustat Executive Compensation. The sample includes firms in Compustat which report assumed long-term rate of return on pension plan assets, report pension plan asset size, have positive operating income, and have data on executive compensation. Standard errors, reported in parentheses, are corrected for firm-level clustering.

Table 10: Equity allocation and assumed long-term rates of return

	Dependent Variable: Equity Allocation Share			
	Ordinary Least Squares		Instrumental Variables	
	(1)	(2)	(3)	(4)
Assumed long-term rate of return	0.0599	0.0449	0.2079	0.1875
on pension assets	(0.0085)**	(0.0089)**	(0.0439)**	(0.0567)**
Log ratio of annual pension assets	0.0393	0.0343	0.0217	0.0197
to annual operating income	(0.0065)**	(0.0070)**	(0.0084)**	(0.0095)*
Industry*Year Effects	N	Y	N	Y
LTROR Instrumented	N	N	Y	Y
Observations	3202	3202	3202	3202
R-Squared	0.11	0.40		

Note: This table presents the results of OLS and IV estimation of models for the pension fund's equity allocation share. Asset allocation compiled from Pensions and Investments annual reports and IRS 5500 filings. Firms with assets in opaque trusts are excluded from the sample. The first two columns report the results of linear regressions of equity allocation shares on LTROR and pension sensitivity. The second two columns use a lagged acquirer indicator as an instrumental variable for the long-term rate of return assumption.

Table 11: Managerial Compensation and Pension Decision Making at IBM, 1997-2002

	IBM Performance					*IBM Pension Plan Reporting and Impact on IBM Share Price*			*Gerstner Option Activity*		
Year	Number of Shares Outstanding (000,000)	Share Price ($)	IBM Market Value ($000,000)	Number of Acquisitions	Value of Acquisitions ($000,000)	Share of Income Before Taxes Resulting from Deviation from 9.25%	Share Price in Absence of Deviations from 9.25% ($)	Share Price in Absence of Deviations from 9.25% and Lower Capitalization ($)	Stock Options Exercised by Gerstner (000)	Compensation Derived from Deviations from 9.25% ($000)	Compensation Derived from Deviations from 9.25% and Higher Capitalization ($000)
1997	958.091	104.625	100,240	4	*250*	1.53%	103.029	84.441	101	162	2,045
1998	915.097	184.375	168,721	9	828	1.66%	181.312	148.601	301	923	10,782
1999	1,784.216	107.875	192,472	17	1,551	1.42%	106.341	87.156	803	1,232	16,641
2000	1,742.900	85.000	148,147	9	511	4.77%	80.942	66.339	703	2,854	13,122
2001	1,723.194	120.960	208,438	2	1,082	4.75%	115.210	94.424	1,253	7,206	33,253
			Totals	41	4,222					12,377	75,843
2002	1,722.367	77.500	133,483								

Note: The three panels of the table provide descriptive data on the performance of IBM, the contributions of deviations in pension rates of return to IBM earnings and stock prices, and option activity by IBM's CEO Louis Gerstner, Jr. All data on IBM corporate performance and pension plan accounting are calculated from data from 10-K filings amd from Compustat. The "Share of Income Before Taxes Resulting from Deviation from 9.25%" is the product of the difference between annual assumed rates and 9.25% and worldwide pension assets divided by annual income before taxes. "Share Price in Absence of Deviations from 9.25%" assumes that pension earnings are capitalized in the same manner as operating earnings, with reported pretax income growing at a compound annual rate of 6.7%. "Share Price in Absence of Deviations from 9.25% and Lower Capitalization" assumes that the market capitalizes earnings growth at a rate of only 5.6%, which would have been the growth rate of pretax income without the changes in rate of return assumptions. Data on option activity are taken from Compustat Executive Compensation database. "Compensation Derived from Deviations from 9.25%" is the difference in share prices under the 9.25% assumption and the actual share price times the number of option exercises. "Compensation Derived from Deviations from 9.25% and Higher Capitalization" is the difference in share prices under the 9.25% assumption with lower capitalization and the actual share price times the number of option exercises.