CASH BALANCE PLAN CONVERSIONS: EVIDENCE ON EXCISE TAXES AND IMPLICIT CONTRACTS

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November, 2003

Acknowledgments: The authors appreciate the comments and help of two anonymous reviewers, Shingo Goto, Scott Harrington, Dick Ippolito, Eric Powers, Bill Ross, Jack Vanderhei, D.H. Zhang, participants at the 2001 Current Pension Policy Issues Conference at Miami University and at a research seminar at the University of South Carolina, and the research assistance of Scott Brown.

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Abstract:

Firms that wish to switch from a traditional defined benefit pension plan to a defined contribution-type plan have a choice between converting to a cash balance plan or replacing the defined benefit plan with a full-fledged defined contribution plan. According to Ippolito and Thompson's (1999) excise tax avoidance hypothesis, a number of firms have switched to cash balance plans because conversion allows the firm to avoid excise taxes on its excess pension assets. In contrast to existing studies, our evidence supports the excise tax avoidance hypothesis. Cash balance plan conversions also have been criticized for imposing pension losses on older employees. The implicit contract theory of pensions predicts that poorly performing firms would be the ones that would impose losses on employees. However, our evidence indicates that firms converting to cash balance plans typically are not poor performers.

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1. INTRODUCTION

The number of employees enrolled in traditional defined benefit pension plans has declined dramatically in the past two decades relative to enrollment in defined contribution-type plans (see e.g., Ippolito, 1995). An interesting aspect of this transition is the large number of sponsors that converted traditional defined benefit plans into cash balance plans during the latter part of the 1990s. Cash balance plans are similar to defined contribution plans from an employee's perspective -- e.g., cash balance plans have individual employee account balances that are portable. However, cash balance plans operate like defined benefit plans from a sponsor's perspective and are treated as defined benefit plans for regulatory purposes. Ippolito (2002) reports that about 20 percent of defined benefit plans, weighted by participation, have converted to cash balance plans.[1] The objective of this paper is to present evidence on two separate, non-mutually exclusive hypotheses about why firms convert to cash balance plans. One hypothesis relates to the avoidance of excise taxes and the other hypothesis relates to the implicit contract theory of pensions.

Promoters of cash balance plans argue that these plans provide a defined contribution-type plan that is more valuable than a defined benefit plan for most employees, especially younger employees who are likely to switch jobs frequently during their career.[2] If a defined contribution type plan is preferred, the natural question is why not simply terminate the defined benefit plan and adopt a full-fledged defined contribution plan. Ippolito and Thompson (1999) suggest (without providing evidence) that the answer lies in the tax code (also see Ippolito, 2001a and 2001b). Congress imposed an excise tax on reverted excess pension assets in the late 1980s and increased it under some circumstances to 50 percent in 1990. Thus, if a firm terminates an overfunded defined benefit plan in favor of a full-fledged defined

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[1] Bank of America appears to have introduced the first cash balance plan in 1985.
[2] Ippolito (1995) discusses the reasons why a defined contribution-type plan might be preferred to a defined benefit plan.

contribution plan in the 1990s, it will lose a substantial part of the excess assets to excise taxes. If instead the firm converts to a cash balance plan, the firm avoids the excise tax.[3]

The avoidance of the excise tax is not costless, however. First, greater administrative costs are likely to be incurred in managing a cash balance plan than a full-fledged defined contribution plan, because a cash balance plan must meet the regulatory requirements of defined benefit plans (Clark and McDermed, 1990 and Ippolito, 1997). Second, when a firm converts to a cash balance plan, it does not immediately gain access to the excess pension assets. Instead, the excess assets go into the cash balance plan and must be used to fund future retirement benefits. Consequently, when deciding whether to convert to a cash balance plan or switch to a full-fledged defined contribution plan, a firm with an overfunded plan must consider the tradeoff between the excise taxes on the excess pension assets and the cost of restricting the use of those excess assets. The substantial increase in the excise tax in 1990 changed this tradeoff and thereby changed the effect of pension funding on the choice between converting to a cash balance plan versus switching to a full-fledged defined contribution plan. Relative to its effect in the 1980s, additional excess pension assets in the 1990s are hypothesized to have a positive impact on the likelihood of a cash balance plan conversion.

Several other studies have examined the effect of pension funding on the likelihood of a firm converting to a cash balance plan, including Clark, Haley, and Schieber (2001), Coronado and Copeland (2003), and Cowan and Power (2003). Each of these studies compares the funding ratios of plans that converted to cash balance plans to funding ratios of on-going traditional defined benefit plans. They do not find that converters have greater funding ratios. According to the excise tax avoidance hypothesis, however, the comparison group should be plans that were terminated and replaced with a full-fledged defined contribution plan, not on-going defined benefit plans. We therefore compare pension funding of firms that converted to cash balance plans to the funding of firms that terminated a traditional defined

[3] There are other potential benefits of cash balance plan conversions, which are not pursued in this paper. For example, cash balance plans offer employees a defined contribution-type plan, but still provides the funding flexibility of a defined benefit plan to the sponsor. Also, see Clark and Schieber (2001, 2002).

benefit plan and replaced it with a defined contribution plan. Consistent with the excise-tax avoidance hypothesis, our evidence indicates that the relationship between the likelihood of a cash balance plan conversion and excess pension funding increased in the 1990s.

We also present evidence on a separate issue related to cash balance plan conversions. Under a traditional defined benefit plan, benefits generally are backend loaded, i.e., employees accrue a disproportionate amount of their retirement benefits in the latter part of their careers. However, employees typically pay for their pension benefits, through foregone wages, more evenly over their career (Ippolito, 1985). As a consequence, a large part of an employee's pension wealth is in the form of a bond. Part of the value of the bond can be lost if the sponsor stops or reduces benefit accruals late in an employee's career (e.g., by terminating the plan or converting to a cash balance plan).[4] The implicit contract theory of pensions implies that sponsors would impose such losses on employees only when the firm's poor financial circumstances require it (Ippolito and James, 1992).

Determining whether employee losses are associated with cash balance conversions is difficult, as it depends on the specific plan characteristics and transition benefits provided, and we make no attempt to do so here.[5] Instead, we test whether cash balance plan conversions occur in situations where the implicit contract theory of pensions predicts that employee losses would occur, i.e., when firms are performing poorly. Existing evidence on defined benefit plan terminations during the 1980s is generally consistent with the implicit contract theory, i.e., plan terminations were undertaken by poor performers (see e.g., Middelstaedt, 1989, Pontiff, Shliefer, and Weisbach, 1990, and Petersen, 1992). Our evidence on the performance of firms that convert to cash balance plans, however, indicates that cash balance plan converters generally are not poor performers. Thus, if employee losses are occurring when cash balance plan conversions take place, the implicit contract theory is not rich enough to explain these transactions.

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[4] IBM's conversion received special attention in the press because of its impact on employees' pension wealth. IBM subsequently altered their conversion plan to appease many of the employees who expected to be harmed by the original plan (see e.g., Schultz, Auerbach, and Burkins, 1999).

[5] Clark and Schieber (2001) and Johnson and Uccello (2002) provide some evidence on how conversions affect hypothetical employees' pension wealth. Coronado and Copeland (2003) present evidence that projected benefit

An alternative explanation is that conversions do not involve substantial employee losses, because of transition benefits provided to older employees.

The paper proceeds as follows. In section 2, we describe the main features of cash balance plans and how they compare with defined benefit plans. The implications of the excise tax avoidance hypothesis are derived in section 3, along with the methodology used to test the hypothesis. We describe the data and present the empirical results on the excise tax avoidance hypothesis in section 4. Evidence on the performance of firms converting to cash balance plans is presented in section 5. We end with a short summary and our conclusions.

2. OVERVIEW OF CASH BALANCE PLANS

2.1 GENERAL DESCRIPTION

From an employee's perspective, a cash balance plan closely resembles a defined contribution plan with employer contributions and a guaranteed rate of return. Each employee has a hypothetical account balance, which grows based on salary credits and interest credits. Salary credits typically are stated as a percentage of the employee's earnings with the percentage often varying with years of service.[6] Interest is credited at a guaranteed rate that is periodically reset (e.g., the rate might equal the rate on one-year Treasury bills reset every six-months). Prior to retirement, the account balance is portable. At retirement, the participant can take the account balance as a lump sum or as a retirement annuity.

Although each participant has an account balance, the funds are managed like a traditional defined benefit plan. Contributions and investment earnings are not actually allocated to individual accounts; instead, contributions are made to a common trust fund for all participants and benefits are paid from the fund. Participants do not choose how "their" account balance is invested. The plan's trustee

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obligations do not decline on average following conversions, which suggests that conversions do not reduce overall benefit obligations.

invests the assets and the sponsor is liable for any shortfall that might occur. If the return on the plan's assets exceeds the guaranteed interest credit, then the extra investment earnings are used to build up the plan assets and thereby reduce future sponsor contributions. Thus, from the sponsor's perspective, a cash balance plan operates like a traditional defined benefit plan and it is subject to the same regulations as a defined benefit plan.

3. Choice between a Cash Balance and Full-Fledged Defined Contribution Plan

Consider a firm with a defined benefit pension plan that wishes to switch to a defined contribution-type plan.[7] The issue is whether to switch to a full-fledged defined contribution plan or convert to a cash balance plan. Switching to a defined contribution plan is likely to save administrative costs because the firm no longer needs to comply with the regulations related to defined benefit plans or pay for the actuarial valuations of pension liabilities.[8] The same savings in administrative costs would not be expected if the firm converts to a cash balance plan, because a cash balance plan must comply with the same regulations as traditional defined benefit plans (Clark and McDermed, 1990). We expect that the present value of the additional administrative cost associated with a cash balance plan has a fixed cost component and a component that increases with the size of the pension plan as measured by the value of pension liabilities, PL. Consequently, the present value of the additional administrative cost associated with a cash balance plan, denoted g(PL), is posited to be an increasing, concave function of PL ($g' > 0$ and $g'' \leq 0$).

If the defined benefit plan has excess pension assets (pension assets exceed the accumulated benefit obligation) and the firm terminates the plan in favor of a full-fledged defined contribution plan,

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[6] For example, Countrymark Corporation's plan credits the account balance with three percent of salary for employees with less than five years of service, but nine percent of salary for employees with 30 years of service (Littell, 1996).

[7] We do not analyze the reason for the switch to a defined contribution plan. The benefit of switching includes savings in indenture premiums, and the cost includes foregone productivity gains that arise from the incentives of a traditional defined benefit plan (see e.g., Ippolito, 1994, 1995).

[8] Clark and McDermed (1990) and chapter 12 in Ippolito (1997) provide evidence of the differential administrative costs and that the differential costs have increased over time.

the firm pays excise taxes on the excess pension assets. The Tax Reform Act of 1986 levied a ten percent, non-deductible, excise tax on reverted pension assets and in 1988 the rate was increased to 15 percent. In 1990, Congress increased the excise tax to 20 percent of reverted assets, provided that 25 percent of the excess pension assets is used as a cushion for a replacement plan, or that benefits are increased by 25 percent. Otherwise, the excise tax is 50 percent. The important point that we utilize in the empirical analysis is that the excise tax increased substantially in the 1990s.

The firm can avoid the excise tax on the excess assets and still have a defined contribution-type plan by converting the traditional defined benefit plan to a cash balance plan. With a conversion, the excess assets remain within the plan and thus the use of those funds is restricted to the funding of future benefit accruals.[9] In a perfect capital market, this restriction would not be costly because the firm could simply borrow against the excess assets in the cash balance plan if it needed funds for other positive net present value projects. However, due to the costs of raising external capital (see e.g., Myers and Majluf, 1984; and Lee et al., 1996) and the inability to use pension assets explicitly as collateral, restrictions on the use of the excess assets is likely to be costly. We assume that this cost is proportional to the value of excess assets, where θ is the proportionality factor. For example, if $\theta = 0.2$, then the firm would be indifferent between having \$0.80 in cash or \$1 of excess assets in the cash balance plan. In order to derive the main implications, we initially assume that θ is a constant. We then consider the additional implications from allowing θ to vary across firms.

Let τ be the excise tax rate on reverted pension assets. Then, for a firm that wishes to switch to a defined contribution-type plan, the benefits of choosing a cash balance plan versus a full-fledged defined contribution plan equals

$$\tau \, EXFND - \theta \, EXFND - g(PL).$$

[9] The excise tax avoidance explanation for cash balance plans also suggests that cash balance plans would be temporary structures, because once the excess pension assets are exhausted, the plan can be terminated and a defined contribution plan can be established.

In words, the benefit of converting to a cash balance plan equals the savings in excise taxes minus the cost of restricting the use of the excess pension assets, minus the extra administrative cost of a cash balance plan. Dividing by pension liabilities (PL), we find that the benefit of converting to a cash balance plan per dollar of pension liabilities equals:

$$B = \left(\frac{EXFUND}{PL}\right)\tau - \left(\frac{EXFUND}{PL}\right)\theta - \frac{g(PL)}{PL}. \qquad (1)$$

By differentiating B (see Appendix A), we derive predictions about the how the benefits of a cash balance plan conversion vary across firms and under different tax regimes. First, holding other factors constant (including the excess funding ratio), the benefit of a cash balance plan conversion, B, increases as the size of the pension plan, PL, increases. This result is due to the concavity assumption on g( ), which in turn is based on the existence of a greater fixed cost component associated with managing a defined benefit plan than a defined contribution plan. Intuitively, larger plans are more likely to convert to a cash balance plan because they can spread the fixed administrative costs over a greater number of participants.

Second, the effect of an increase in the excess funding ratio (EXFND/PL) on B depends on the relative magnitude of τ and θ. Additional excess funding will decrease B if $\tau < \theta$. However, if $\tau > \theta$, additional excess funding will increase the benefits of a cash balance plan. The increase in the excise tax rates in 1990 implies that additional excess funding increases the benefit of a cash balance plan more in the 1990s than in the 1980s.

Third, an increase in the tax rate on excess pension assets, τ, increases the benefits of a cash balance plan, and this effect is larger the greater is the value of the excess funding ratio. Thus, the benefits of a cash balance plan are greater in the 1990s, especially for firms with greater excess funding. Notice that both the second and third arguments imply a positive interaction effect between excess funding and the 1990s.

These predictions lead us to specify the following function for the unobservable benefits of a cash balance plan relative to a full-fledged defined contribution plan for firm i which decides to switch to a defined contribution-type plan in year t:

$$B_i = \alpha + \beta_1 \, D90s + \beta_2 \left(\frac{EXFUND}{PL} \right)_i + \beta_3 \left[\left(\frac{EXFUND}{PL} \right)_i (D90s) \right] + \beta_4 LOGPL_i + \varepsilon_i, \qquad (2)$$

where D90s equals one if the switch year is in the 1990s, LOGPL is the natural logarithm of pension liabilities, α and the β_i's are parameters to be estimated, and ε_i has a standard logistic distribution. A positive β_4 coefficient would be consistent with larger plans being more likely to convert to a cash balance plan because of the larger fixed administrative costs associated with defined benefit plans. The parameter β_2 determines the impact of excess funding in the 1980s and the parameter β_3 determines the differential effect (relative to the 1980s) of excess funding in the 1990s on the benefit of a cash balance conversion for firms that would like to switch to a defined contribution-type plan. The focus of the analysis is on the coefficient on the interaction variable (β_3); arguments two and three above imply that β_3 is positive. Although we do not observe the benefits of converting (B_i), we can observe whether a firm that switches to a defined contribution-type plan chooses a cash balance plan or a full-fledged defined contribution plan, which allows us to estimate the parameters in (2) using a logistic regression.

Plausibly, the cost associated with restricting assets to the funding of future retirement benefits (θ) varies across firms. For example, holding other factors constant, θ is likely to be lower when the firm is performing well, because the firm is likely to be generating cash from operations and not need the cash in the pension plan. Also, larger firms, because of their better access to capital markets, are likely to have lower values of θ, all else equal. This reasoning provides the motivation for including the average return on assets in the previous three years (MEANROA) and the natural logarithm of corporate assets (LOGASSETS) in some of the specifications.[10] Note, however, that firm performance and firm size could

[10] A strict interpretation of the model also implies that these effects are greater for firms with greater excess funding. We checked for such a non-linearities by including interaction effects with the excess funding variables, but did not find significant coefficients on the interaction variables and the other results remain essentially unchanged.

be capturing other factors as well, and consequently we do not make strong interpretations of the coefficient estimates on these variables.

Ideally, the model would be estimated using plan level data, which unfortunately we do not have.[11] Therefore, we use firm level data. Since firms can sponsor multiple plans, firm level funding measures a particular plan's funding with error. While we expect that the funding of a particular plan would be positively correlated with firm level funding, the measurement error could bias our estimates.[12]

4. EMPIRICAL ANALYSIS

4.1 Cash Balance Converter Sample

Our sample of firms sponsoring cash balance plans is constructed from several sources. Kwasha Lipton consulting group provided a list of 313 organizations with cash balance plans. The May 31, 1999 issue of *Pensions & Investments* lists 326 organizations with cash balance plans, of which 35 are not on the Kwasha Lipton list. Finally, by searching *Compact Disclosure* from 1988-2000 for financial statement disclosures mentioning cash balance plans, we identify 76 firms with cash balance plans, of which 30 are not on either of the other two lists.[13] Thus, this process identified 378 (313 + 35 +30) organizations with cash balance plans. The sample selection process from this point is driven by the need to find financial information on the firm, which limits the sample to public companies, and by the need to

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[11] Identifying cash balance plans is difficult and costly. Disclosures on Forms 5500 did not identify when a plan was a cash balance plan until 1999 and as of July 2002 the complete 1999 Form 5500 data were not yet available. Even with plan level data in 1999, we would need to trace plans back in time using Form 5500s from prior years to identify the plan's funding prior to the cash balance plan conversion.

[12] Another potential concern is that we are analyzing the second stage of a two-stage process. In the first stage, a firm decides whether to switch from their defined benefit plan to a defined contribution-type plan. In the second stage, conditional on a switch, the firm decides whether to use a cash balance plan or a full-fledged defined contribution plan. Since we analyze firms that reach the second stage, the firms in our sample are "selected" because the net benefits associated with switching from a defined benefit plan to a defined contribution-type plan are positive. Even though our hypotheses relate to the group of firms that switched to a defined contribution-type plan and not the general population of firms with defined benefit plans, this selection process could yield inconsistent estimates (Greene, 2000). Because specifying and estimating the first stage would divert attention from our main focus on cash balance plans, we proceed by analyzing the second stage in isolation and leave the selection issue for future research.

find a conversion date, which limits the sample to companies that disclose the year of the conversion in their financial statements filed with the Securities and Exchange Commission.

A large number of the 378 organizations with cash balance plans are private companies or not-for profit organizations. We found 222 companies in the *CRSP* database, indicating that their stock was publicly traded at some point.[14] For these companies, we search annual reports, 10Ks, and proxy statements contained in *Lexis-Nexis* for the year in which the cash balance conversion took place. There are 136 companies for which we can identify the conversion year. We then obtain financial information from *Compustat*. In cases where pension disclosures or assets values are missing from *Compustat*, we search financial statements in *Lexis-Nexis* in an attempt to fill in the missing data. This process results in a sample of 123 public firms that converted their traditional defined benefit plan to a cash balance plan for which we have the conversion year, pension data, and asset value. Panel A of Table 1 summarizes the sample selection process for the cash balance converters.

4.2 Defined Benefit Terminator Sample

We construct a sample of firms that terminated a traditional defined benefit plan through an electronic search of annual reports between 1988 and 2000 contained in *Compact Disclosure* using a variety terms, such as: "terminated plan," "terminated pension," "frozen benefit," "curtailed plans". This search results in a list of 599 firms that potentially terminated or froze a defined benefit plan. After reading the disclosures, we eliminate those firms with disclosures that clearly are not related to pension plans. The resulting list consists of 354 firms.

We then manually search annual reports, 10ks, and proxy statements included in *Lexis-Nexis* to (1) confirm that the firm terminated or froze a qualified defined benefit plan, (2) identify the year that the

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[13] Compact disclosure begins in 1987, but neither of our universities had access to the 1987 files. Therefore, we begin searching with the 1988 file.

[14] We search the *CRSP* database because it includes historical names, not just the most recent name, which is what *Compustat* contains. We record the permno from the *CRSP* database. Later in the process, we obtain the gvkey to access *Compustat*.

company froze or terminated the plan, and (3) identify, when possible. the type of replacement plan. We are able to confirm the year that a plan was frozen or terminated in 209 cases. Although 1988 is the first year in which we search annual reports in Compact Disclosure for disclosures of terminations, the disclosures sometimes refer to terminations that occur prior to 1988. We keep these observations in the sample.

There are 43 cases in which the terminated defined benefit plan is replaced by another defined benefit plan. Almost all of these cases are associated with a pension asset reversion (the firm terminated an over-funded plan, reverted the excess assets to the firm, and established a follow-on defined benefit plan with the same characteristics as the terminated plan). Since we are interested in a sample of firms that replaced their defined benefit plan with a defined contribution plan, we eliminate the firms with a defined benefit replacement plan, leaving 166 potential observations. It is interesting to note that 37 of the 43 terminations with a defined benefit replacement plan occurred during the 1980s when the excise tax was relatively low.

We then obtain financial information from *Compustat*. If pension disclosures or asset size are missing from *Compustat*, we try to fill in the missing data by searching annual reports in *Lexis-Nexis*. The resulting sample consists of 132 public companies that either froze benefit accruals or terminated a defined benefit plan for which financial information is available. Eighteen of the firms froze plans, 91 terminated plans, and 23 froze and then subsequently terminated plans. We treat firms that froze plans the same as those that explicitly terminated plans, although we find similar results if we only analyze the 114 cases where the plan was terminated. For the cases in which the firm froze a plan and then subsequently (sometimes years later) terminated the plan, we use the termination year as the event year for all of the results reported in the paper, but we find essentially the same results if we use the freeze year as the event year. Panel B of Table 1 summarizes the sample selection process for the defined benefit plan terminators.

Of the 132 firms that terminated their defined benefit plans, we are able to confirm that 77 firms replaced their terminated plan with a defined contribution plan. We are unable to identify the

replacement plan in the other 55 cases. We first estimate the model using all 132 defined benefit terminators, and then again using the 77 cases with confirmed defined contribution replacement plans.

4.3 Descriptive Statistics

Panel A of Table 2 gives the frequency distribution of event years: conversion year for cash balance converters and termination year for defined benefit terminators. Relatively few cash balance conversions took place in the latter 1980s and early 1990s, but the number of conversions increased in the mid-1990s. The defined benefit terminations, on the other hand, are more evenly distributed throughout the sample period. Panel B of Table 2 gives the frequency distribution for five major industry categories for both cash balance converters and defined benefit terminators. The table indicates that both samples come from a broad range of industries.

Table 3 provides descriptive statistics for the variables used in the empirical analysis. The data are divided into four categories based on the decade of the transaction and whether the transaction was a cash balance plan conversion or a defined benefit termination. Pension liabilities (PL) equals the value of the accumulated benefit obligation in the year prior to the event year, restated in 2000 dollars using the producer price index. The excess funding ratio (EXFUND/PL) equals the ratio of excess pension assets divided by pension liabilities. The numerator of the excess funding ratio equals the maximum of zero and the difference between the value of pension assets and the accumulated benefit obligation in the year prior to the pension change.[15] To measure firm size, we use total firm assets (ASSETS) in the year prior to the

[15] Reported pension liabilities depend on the discount rate assumption used by the firm, which varies across firms.. Therefore, we calculate pension liabilities using a common discount rate for all firms in a given year. For the years 1993-2000, the common discount rate is the average monthly interest rate used to value annuities reported on the PBGC web site. Since the first year in which the PBGC reports the annuity interest rates is 1993, for the prior years we estimate the annuity rate using the PBGC's formula for the interest rates used to calculate insurance premiums and the average spread (80 basis points) of the annuity rate above the interest rate used for premiums. The adjusted pension liability figures are calculated assuming that pension liabilities have a duration of nine years and using the difference between the discount rate assumed by the firm and the PBGC annuity rate. (We also used a seven year duration and the basic results are unchanged.) Since 44 firms did not disclose their assumed discount rates, we replace these missing values with the average values for the assumed discount rates among firms that report the

event year, restated in 2000 dollars using the producer price index. MEANROA is the average return on assets over the three-year period before the event year.

Panel A of Table 3 suggests that cash balance plan converters differ from defined benefit terminators in several respects. For example, firms converting to cash balance plans are on average larger and have greater pension liabilities than firms terminating their defined benefit plans. Also, cash balance plan converters typically have a higher mean return on assets than defined benefit terminators in both the 1980s and 1990s.

Among the transactions in the 1980s, defined benefit terminators typically have a higher excess funding ratio than the cash balance plan converters (e.g., median of 70.8 percent versus 26.1 percent). However, among the transactions in the 1990s, defined benefit terminators have a lower excess funding ratio than the cash balance plan converters (e.g., median of 6.1 percent versus 17.3 percent).[16] These descriptive statistics provide preliminary evidence that the relation between pension funding and the likelihood of a cash balance plan conversion changed in the 1990s, which is when the excise tax became especially burdensome.

Note that the standard deviation of the excess funding ratio for defined benefit terminators is extremely large in the 1980s compared to the ratio for defined benefit terminators in the 1990s and the ratio for cash balance converters during the entire sample period. The high standard deviation is largely due to one observation with excess pension assets equal to 24 times its pension liability. Removing this observation from the sample does not change any of the results reported in the paper.

Panel B of Table 3 gives correlation coefficients between the variables used in the analysis. Not surprising, larger firms tend to have larger pension liabilities; the correlation coefficient between the logarithm of assets (LOGASSETS) and the logarithm of pension liabilities (LOGPL) is 0.69. The

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assumed discount rate for the missing firm's event year. The logistic regression results are not substantively altered when the adjusted pension liability numbers are used in place of the reported numbers.

[16] Consistent with general trends, funding ratios in the 1990s are lower than in the 1980s (see Ippolito, 2001a).

correlation coefficients between the excess funding ratio (EXFUND/PL) and the other variables are relatively small.

4.4 Logistic Regression Analysis

Tables 4 and 5 present the results of estimating logistic regression models for the likelihood of converting to a cash balance plan. The analysis in Table 4 includes all of the defined benefit terminators and the analysis in Table 5 includes only those defined benefit terminators with confirmed defined contribution replacement plans. In each table, columns one presents the results for the basic specification and columns two and three add the variables LOGASSETS and MEANROA to the specification.

In each of the specifications, the coefficient on LOGPL is positive, as predicted, and statistically significant, which suggests that firms with larger pension plans are more likely to convert to a cash balance plan. As columns two and three indicate, the inclusion of the variable LOGASSETS reduces the magnitude of the coefficient on LOGPL, but the coefficient remains significantly different from zero. These results are consistent with fixed administrative costs increasing the likelihood that firms with larger plans will choose a cash balance plan, all else equal (e.g., Clark and McDermed, 1990).

The coefficient on LOGASSETS is positive and statistically significant in each specification, suggesting that larger firms are more likely to convert to cash balance plans, even after controlling for the size of pension liabilities. The positive coefficient is consistent with the notion that larger firms have lower costs of restricting the use of excess pension assets to funding future benefits. However, the variable might also be picking up other effects that are correlated with firm size. The coefficient on MEANROA is positive, which is consistent with more profitable firms having lower costs of restricting the use of excess assets. However, the coefficient on MEANROA is not statistically significant in either table.

We now move to the focus of the analysis -- the coefficients on the excess funding variables. In each specification, the coefficient on EXFUND/PL is negative and statistically significant, and the coefficient on the interaction of EXFUND/PL and D90s is positive and statistically significant. The

positive coefficient on the interaction variable is consistent with the main prediction of the excise tax avoidance hypothesis. That is, additional funding in the 1990s increases the likelihood of a cash balance plan relative to the effect of additional funding in the 1980s.

The negative estimated coefficient on EXFUND/PL indicates that additional funding in the 1980s lowered the likelihood that firms would convert to a cash balance plan. This result is consistent with the cost of not having access to the excess assets (θ) exceeding the excise tax on the excess assets (τ) in the 1980s. The sum of the coefficients on the excess funding variables is positive and statistically significantly different from zero in most of the specifications, suggesting that excess funding in the 1990s increases the likelihood of a cash balance conversion. The positive sum is consistent with the excise tax (τ) exceeding the cost of not having access to the excess pension assets (θ) in the 1990s.

To illustrate the economic significance of the results, Figure 1 plots the predicted probability of a cash balance conversion versus excess funding for a hypothetical firm with median asset size and median return on assets. Two comparisons are made. The top figure compares the predicted probability in the 1980s to that in the 1990s for a firm with a median value of pension liabilities. The bottom figure compares the predicted probability in the 1990s for a hypothetical firm with a median value of pension liabilities to that of a firm with pension liabilities at the 25th percentile. The predicted probabilities are based on the parameter estimates from column three of Table 5. The figures also include 95 percent confidence intervals around each of the predicted probabilities. The top figure illustrates that pension funding and the tax regime have pronounced effects on the predicted probability. For high levels of excess funding, the predicted probability of a cash balance plan conversion is considerably higher in the 1990s than in the 1980s. For example, for a firm with EXFUND/PL equal to 0.5, the predicted probability of a cash balance plan conversion is 0.80 in the 1990s compared to 0.34 in the 1980s. The bottom figure illustrates that plan size has important effect on the probability of a cash balance plan conversion. Firms with median-sized plans have a much higher predicted probability of a conversion than firms with smaller plans (25th percentile) for all levels of pension funding displayed.

Table 6 presents the estimated derivative of the probability of a cash balance plan conversion with respect to a change in excess funding in the 1980s and in the 1990s for a firm with median values of pension liabilities, total assets, and return on assets using the model from column three of Table 5. Since the derivative is a non-linear function of all of the coefficient estimates, we use the delta method to test whether the derivative is different from zero and whether the derivative in the 1980s equals the derivative in the 1990s (Greene, 2000). The derivative in the 1990s (1980s) is positive (negative) in each case and significantly different from zero at the 5 percent level in most cases. Moreover, we reject that the derivative in the 1990s equals the derivative in the 1980s at the 5 percent level for each reported value of EXFUND/PL the case when this ratio equals one.

To check the robustness of the results to other specifications and variable definitions, we perform several analyses, the detailed results of which we do not report. First, instead of using excess funding (maximum of zero and the difference between pension assets and pension liabilities), we use total funding (difference between pension assets and pension liabilities). The conclusions are unaltered, although the coefficient on the interaction variable is smaller than reported above. Second, since cash balance plan converters tend to be larger than defined benefit terminators, we estimate the model after deleting firms in the top asset size decile. The essential results do not change, implying that the largest firms are not driving the results. Third, we check the impact of influential observations be eliminating the few observations with relatively high absolute values of DFBETA for the coefficients on EXFUND/PL and D90*(EXFUND/PL). This analysis indicates that the conclusions are not due to a few influential observations. Fourth, seven of the defined benefit terminators used an ESOP, at least in part, as the replacement plan. ESOPs are defined contribution plans, but they receive a special treatment under the excise tax law. If a firm uses excess pension assets from a terminated plan to fund an ESOP, the firm does not pay excise tax on the excess assets placed in the ESOP. Eliminating the observations with an ESOP replacement does not change the basic results.

In summary, the analysis supports the conclusion that the effect of additional excess pension assets on the probability of choosing a cash balance plan changed from the 1980s to the 1990s, which is

when the excise tax on excess pension assets more than doubled. The change is consistent with the hypothesis that firms are using cash balance plans at least in part to avoid the excise tax on excess pension assets.

5. Performance of Cash Balance Converters

We now move to a separate issue related to cash balance plan conversions. Firms that have converted to cash balance plans have come under criticism, especially from older employees, because the conversion replaces a benefit formula that typically is heavily backend loaded with a formula that accrues retirement benefits at a more even rate over a worker's career. Unless the cash balance plan benefit formula is adjusted so that the accrual rate increases with service (including pre-existing service), older workers can suffer significant wealth losses from a conversion. Appendix B provides a more detailed comparison of the benefit accrual pattern in a traditional defined benefit plan to that in a cash balance plan.

The implicit contract view of traditional defined benefit plans recognizes that a sponsoring firm has the opportunity to impose losses on employees by changing the benefit accrual pattern late in an employee's career. However, the implicit contract theory implies that a firm would only do so when its financial situation demanded it. Thus, according to the implicit contract theory, employee losses would be associated with poor financial performance (see e.g., Petersen, 1992 and Ippolito and James, 1992).[17] To investigate whether conversions take place when the implicit contract theory of pensions suggests that employees would suffer losses, we examine the performance of firms that convert to cash balance plans.

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[17] Other factors, not examined here, might influence the incentive to impose losses on employees. Since the cost of breaking an implicit contract with unionized employees is likely to be higher than with non-unionized employees, the implicit contract perspective implies that firms with unionized workers would be less likely to impose losses, all else equal. Also, if managers who have developed a reputation with existing employees find it personally costly to break implicit contracts with employees, then firms which have undergone control changes (e.g., following a takeover) are more likely to impose losses (Shleifer and Summers, 1988). Ippolito and James (1992) and Chaplinsky, Niehaus, and Van de Gught (1998) analyze whether firms break implicit pension contracts in leveraged buyout transactions. Middelstaedt (1990), Petersen (1992) and Pontiff, Shleifer, and Weisbach (1990) analyze whether firms break implicit contracts in pension plan reversions. The magnitude of the one-time gain from

It is important to highlight that the following analysis does not compare cash balance plan converters to other defined benefit terminators (as in the previous section). The prediction of the implicit contract theory, as applied to cash balance plan converters, is that cash balance plan converters are poor performers relative to firms that do not terminate their defined benefit plans. Consequently, the comparison group in this analysis consists of firms that retained their defined benefit plans.

5.1 Operating Performance

Table 7 provides information about the operating performance of firms with cash balance plan conversions using the methods suggested by Barber and Lyon (1996). To assess operating performance, we MEANROA, which equals the average of annual operating income before depreciation divided by total assets over the three-year period prior to the conversion.[18] Row one compares MEANROA for firms with cash balance conversions to the median value of MEANROA of other firms with the same two-digit SIC code and with pension disclosures in *Compustat* (indicating that the firm has a defined benefit plan). The data indicate that the operating performance of firms that convert to cash balance plans is not worse than that of firms that retain their defined benefit plans. The mean (median) difference between MEANROA of firms with cash balance plan conversions and the median of other firms in the same industry is 1.13 percent (0.27 percent).

Row 2 of Table 7 compares the operating performance of firms with cash balance plan conversions to the median operating performance of firms that retained their defined benefit plans with the same two-digit SIC code and with total assets between 70 percent and 130 percent of the total assets of the cash balance plan converter. Neither the mean nor median difference in MEANROA is statistically different from zero. This evidence also indicates that cash balance plan converters typically are not poor performers.

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breaking the implicit contract would also influence firms' decisions to impose losses. This amount typically is greater if the plan has a unit-benefit formula and a large proportion of participants are in the middle of their careers.

[18] We also measured operating performance using data for the three-year period before the conversion and the year of the conversion and found similar results.

The operating performance results contrast with the results reported in studies examining the termination of overfunded pension plans during the 1980s. For example, Thomas (1989) finds that firms that terminated overfunded plans and that were not subject to control changes had significantly lower operating performance than non-terminating firms. Petersen (1992) finds that, after controlling for a number of other factors, the likelihood of an overfunded termination is negatively related to the return on assets. Middelstaedt (1989) finds that termination of overfunded plans is associated with financial weakening, as measured by changes in predicted bankruptcy probabilities.[19] Thus, our operating performance results suggest that cash balance plan conversions are motivated by different factors than the wave of overfunded pension terminations during the 1980s.

5.2 Stock Price Performance

The stock price performance reported in Table 8 also indicates that cash balance plan converters are not poor performers. We calculate annualized one-year through three-year buy-and-hold returns prior to the conversion against different portfolios of firms with defined benefit plans.[20] Following Fama and French (1992) and Barber and Lyon (1997), size-matched portfolios consist of all firms with market capitalization in June of each year within 90 percent and 110 percent of the sample firm's market capitalization in June. The size and book-to-market matched portfolio consists of all firms in the size-matched portfolio with book-to-market ratios within 90 percent and 110 percent of the sample firm's book-to-market ratio, where the book-to-market ratio is calculated using the book value of common equity reported on the balance sheet in the prior year divided by the market value of common equity in December of the prior year. Both size- and size and book-to-market matching are performed every year during the comparison period. Regardless of the benchmark or the holding period, we do not find evidence that cash balance plan converters on average have significantly worse performance than the

[19] Recall that we identify firms that terminated their defined benefit plans and replaced them with another defined benefit plan. Although the sample size is small, we find that these firms' operating performance in the three years prior to the termination is on average significantly worse than firms of comparable size in the same industry, which is consistent with the findings of the more complete studies cited in the text.

benchmarks. On the contrary, the cash balance plan converters generally exhibit superior performance relative to other firms with defined benefit plans. For instance, significant at the one-percent level for both a t-test and a sign test, converters' three-year prior conversion mean (median) stock return is 8.5 percent (7.9 percent) higher than the stock performance of firms matched with size and book-to-market ratios.

5.3 Debt Ratings

Another benchmark for assessing a firm's financial condition is its debt rating. We therefore compare the S&P Long-Term Credit Rating as reported in *Compustat* (data number 280) of cash balance plan converters in the year of the conversion to the medium debt rating of comparable firms. Debt ratings are assigned numerical scores as follows: AAA = 21, AA+ = 20, AA=19, …,CC=2, C=1. Only 84 of the cash balance plan converters have a debt rating reported in the conversion year in *Compustat*. As displayed in Table 9, the median debt rating of cash balance plan converters is 14, which corresponds to a BBB+ rating.

We compare the debt ratings of the cash balance plan converters to the median debt rating of other firms with the same two-digit SIC code and to other firms with the same two-digit SIC code and with assets between 70 percent and 130 percent of the value of the cash balance plan converter's assets in the year of the conversion. The results are reported in Table 9. The mean (median) difference between the debt rating of the cash balance plan converters and the median of other firms in the same industry is -0.05 (0.00), which is not significantly different from zero. The mean (median) difference between the cash balance converters and the median of other firms within plus or minus 30 percent of the assets of the converter and in the same industry is -0.55 (-1.00), which also is not significantly different from zero.

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[20] A cash balance converter is excluded from in the stock performance analysis if it has shorter than (1) six months return data in one year prior to conversion, (2) twelve month return data in two years prior to conversion, or (3) twenty-four months in three years prior to conversion.

To summarize, the operating performance, stock price performance, and debt rating evidence indicate that firms that undertake cash balance plan conversions generally are not poor performers. This finding is contrary to what the implicit contract theory of pensions would predict if the firms undertaking conversions were imposing losses on employees. Since we do not identify whether employee losses actually take place, our conclusions are necessarily limited. If cash balance plan conversions are imposing losses on employees, then the implicit contract theory of pensions is not rich enough to explain the conversions. Another possibility is that employees typically do not suffer large losses from conversions, because of the transition benefits provided to older employees.

6. Summary and Implications

Despite the growing importance of cash balance pension plans in the private retirement system in the U.S., we have little evidence on the characteristics of firms that are using these hybrid plans. The main purpose of this paper is to fill this gap and thereby further our understanding of why a large number of firms converted their defined benefit plans to cash balance plans, particularly in the 1990s. Our evidence indicates that part of the reason firms converted their defined benefit plans into cash balance plans as opposed to switching to full-fledged defined contribution plans in the 1990s was to avoid excise taxes on excess pension assets.[21]

During the 1980s, a firm could terminate its defined benefit plan and switch to a full-fledged defined contribution plan and still gain access to the majority of its excess pension assets. The substantial increase in the excise tax on excess assets from terminated plans in 1990, however, increased the cost of terminating an overfunded defined benefit plan and switching to a full-fledged defined contribution plan. Consistent with Ippolito and Thompson's (1999) conjecture, our evidence

[21] Of course, the avoidance of excise taxes is not the sole reason for cash balance plans as there are many organizations that converted to cash balance plans that were not subject to excise taxes. For example, some firms converted prior to the imposition of the excise tax or when the excise tax was relatively small and some firms converted even though they had little or no excess assets to shield from excise taxes.

suggests that the increased excise tax has led many firms that wanted a defined contribution-type plan to convert the defined benefit plan to a cash balance plan. By converting, the firm avoids the excise tax and therefore can use all of its excess assets, albeit at the cost of restricting the use of those excess assets to fund future pension benefits.

Congress passed the excise tax law to discourage pension asset reversions (terminating a defined benefit plan, taking the excess assets, and creating an identical replacement defined benefit plan), because reversions removed the assets backing pension liabilities and potentially imposed wealth losses on employees. However, Ippolito (2001a) demonstrates that excise taxes have increased a sponsor's cost of contributing to a defined benefit plan and thereby led to a significant decline in the funding of defined benefit plans during the 1990s. Our results suggest that many firms are using cash balance plans as a way to switch to a defined contribution-type plan while avoiding the excise taxes. Thus, the excise tax does not seem to be effective in achieving its presumed intent, i.e., protecting traditional defined benefit pension benefits.

Because cash balance plan conversions have been criticized for imposing pension wealth losses on older employees, we also examine whether conversions are taking place when firms are performing poorly, which is when the implicit contract theory of pensions suggests that wealth losses would take place. However, we do not find that cash balance plan converters are poor performers. This evidence suggests that if cash balance plan conversions are imposing wealth losses, they are not doing so in situations that are consistent with the implicit contract theory of pensions. Another possibility is that cash balance plan conversion are not typically imposing large wealth losses on employees.

References

Barber, Brad and John Lyon, 1996, Detecting Abnormal Operating Performance: The Empirical Power and Specification of Test Statistics, Journal of Financial Economics 41, 359-399.

Barber, Brad and John Lyon, 1997, Detecting Long-run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics, Journal of Financial Economics 43, 341-372.

Chaplinsky, Susan, Greg Niehaus, and Linda Van de Gught, 1998, Employee Buyouts: Causes, Structure, and Consequences, Journal of Financial Economics 48, 283-332.

Clark, Robert L. and Ann A. McDermed, 1990, The Choice of Pension Plans in a Changing Regulatory Environment, Washington D.C.: The AEI Press.

Clark, Robert L., John J. Haley, and Sylvester J. Schieber, 2001, Adopting Hybrid Pension Plans: Financial and Communication Issues, Benefits Quarterly First Quarter, 7-17.

Clark, Robert L. and Sylvester J. Schieber, 2001, The Emergence of Hybrid Pensions and Their Implications for Retirement Income Security in the Twenty-First Century, working paper, North Carolina State University.

Clark, Robert L. and Sylvester J. Schieber, 2002, An Empirical Analysis of the Transition to Hybrid Pension Plans in the United States, in William Gale, John Shoven, and Mark Warshawsky (eds.) Public Policies and Private Pensions. Washington: The Brookings Institute.

Coronado, Julia Lynn and Phillip C. Copeland, 2003, Cash Balance Pension Plan Conversions and the New Economy, working paper, Federal Reserve Board, October.

Cowan, Arnold R. and Mark L. Power, 2003, Determinants of Firms that Convert to Cash Balance Pension Plans, working paper, Iowa State University, August.

Fama and French, 1992, The Cross Section of Expected Stock Returns, Journal of Finance 47, 427-466.

Greene, William H., 2000, Econometric Analysis. 4rd edition, Upper Saddle River, NJ.: Prentice-Hall.

Ippolito, Richard, 1985, The Labor Contract and True Economic Pension Liabilities, American Economic Review 75, December, 1031-1043.

Ippolito, Richard and William James, 1992, LBOs, Reversions and Implicit Contracts, Journal of Finance 47, 139-167.

Ippolito, Richard, 1994, Pensions and the Indenture Premia, Journal of Human Resources 29, Summer, 795-812.

Ippoloto, Richard, 1995, Explaining the Growth of Defined Contribution Plans, Industrial Relations 34, 1-20.

Ippolito, Richard, 1997, Pension Plans and Employee Performance: Evidence, Analysis, and Policy, Chicago, IL: University of Chicago Press.

Ippolito, Richard and John W. Thompson, 1999, The Survival Rate of Defined Benefit Plans, 1987-1995, Industrial Relations 39, 228-245.

Ippolito, Richard, 2001a, Reversion Taxes, Contingent Benefits and the Decline in Pension Funding, Journal of Law and Economics 44, 199-232.

Ippolito, Richard, 2001b, Issues Surrounding Cash Balance Plans, Benefits Quarterly 3rd Quarter, 30-45.

Ippolito, Richard, 2002, The Reversion Tax's Perverse Result, Regulation 25, Spring.

Johnson, Richard W. and Cori E. Uccello, 2002, Cash Balance Plans and the Distribution of Pension Wealth, working paper, The Urban Institute, July.

Lee, Inmoo, Scott Lochhead, Jay Ritter and Quanshui Zhao, 1996, The Costs of Raising Capital, Journal of Financial Research XIX, No. 1, 59-74.

Littell, David A., 1996, Cash Balance: The Defined-Benefit Hybrid, Journal of the American Society of CLU & ChFC , September, 15-18.

Mittelstaedt, H. Fred, 1989, An Empirical Analysis of the Factors Underlying the Decision to Remove Excess Assets from Overfunded Pension Plans, Journal of Accounting and Economics 11, 399-418.

Myers, Stewart C. and Nicolas Majluf, 1984, Corporate Financing and Investment Decisions when Firms have Information that Investors Do Not Have, Journal of Financial Economics 13, 187-221.

Petersen, Mitchell, 1992, Pension Reversions and Worker-Stockholder Wealth Transfers, Quarterly Journal of Economics 107, 1033-1056

Pontiff, Jeffrey, Andrei Shleifer, and Michael Weisbach, 1990, Reversions of Excess Pension Assets after Takeovers, RAND Journal of Economics 21, 600-613.

Schultz, Ellen E., Jon G. Auerbach, and Glenn Burkins, 1999, Controversy Besetting New Pension Plan Rises with IBM's Retreat: Cash Balance System's Effect on Older Workers Stirs IRS, Congress, EEOC, Wall Street Journal, September 20.

Shleifer, Andrei and Lawrence Summers, 1988, Breach of Trust in Hostile Takeover, in Auerbach, A. (ed) Corporate Takeovers: Causes and Consequences. University of Chicago Press, Chicago.

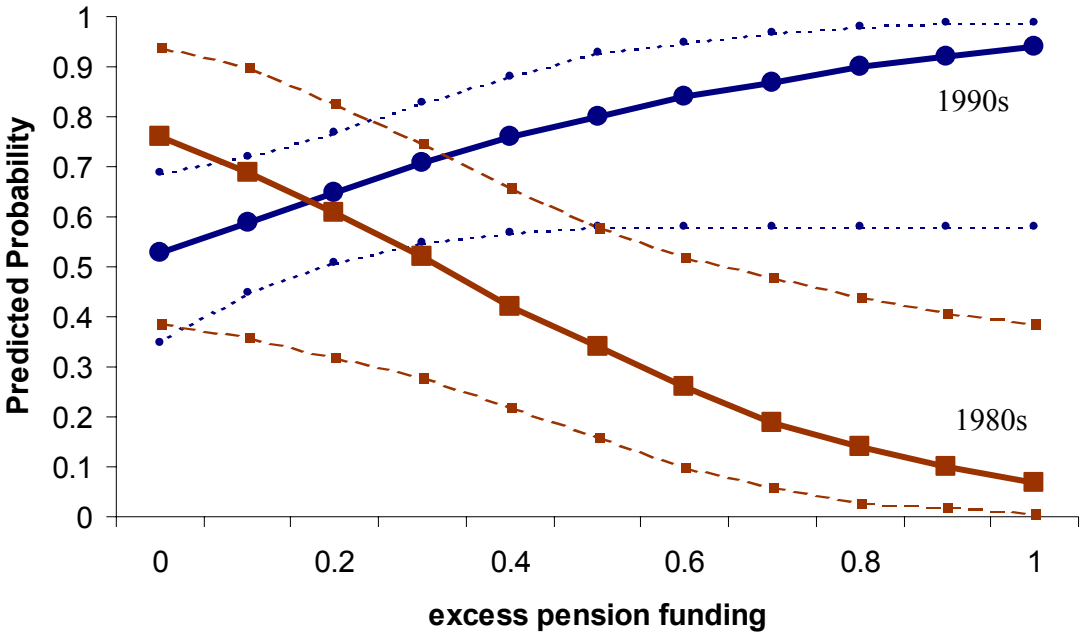
Thomas, Jacob, 1989, Why Do Firms Terminate Their Overfunded Pension Plans?, Journal of Accounting and Economics 11, 361-298.

Van De Ven, Wynand P.M.M. and Bernard M.S. Van Praag, 1981, The Demand for Deductibles in Private Health Insurance: A Probit Model with Sample Selection, Journal of Econometrics 17, 229-252.

Figure 1

Predicted probability of a conversion to a cash balance plan as function of excess pension funding defined as excess pension assets divided by the accumulated benefit obligation (ABO)

. Predicted probabilities are based on the coefficient estimates from column 3 of Table 5 for a firm with median value of assets ($827 million) and median value of MEANROA (10.4%). The top figure compares the 1990s (circle markers) to the 1980s (square markers) and is based on a firm with median value of pension liabilities ($30 million). The bottom figure compares a firm with median value of pension liabilities (circle markers) to one with pension liabilities equal to the 25th percentile (square markers) in the 1990s. The heavy solid lines are the predicted probabilities and the light dashed lines give the 95 percent confidence interval.



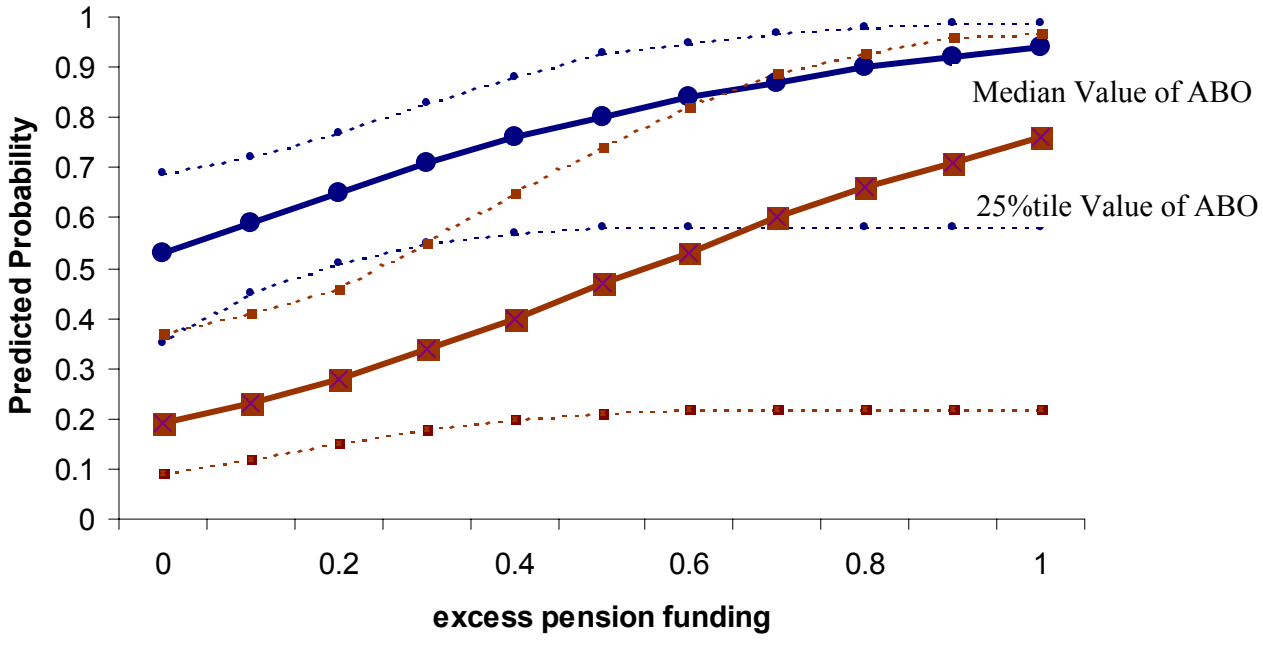


Table 1

Sample selection process for cash balance converters (Panel A)
and defined benefit terminators (Panel B)

Panel A – Cash Balance Converter Sample	Number of Firms
Initial list of firms with cash balance plans (from Kwasha Lipton, Pensions and Investments, and Compact Disclosure search)	378
Delete firms that are not public companies	156
	222
Delete firms without a confirmed conversation year	86
	136
Delete firms without pension data	13
Final Sample	123

Panel B – Defined Benefit Terminator Sample	Number of Firms
Compact disclosure search for terminations or plan freezes	611
Delete firms for which disclosures are not related to pension plans	257
	354
Delete firms without a confirmed termination or freeze year	145
	209
Delete firms with defined benefit replacement plan	43
	166
Delete firms without pension data	34
Final Sample	132
Number with confirmed defined contribution replacement plan	77

Table 2

Frequency distribution by event year (Panel A) and two-digit SIC code (Panel B)

Panel A: Year in which sample firms converted to cash balance plan or terminated defined benefit plans

Year	Firms Converting to Cash Balance Plans	Firms Terminating Defined Benefit Plans
1985	0	1
1986	0	2
1987	4	10
1988	7	17
1989	7	9
1990	3	7
1991	2	10
1992	4	9
1993	4	8
1994	5	5
1995	11	11
1996	18	13
1997	21	16
1998	18	7
1999	15	4
2000	4	3
Total	123	132

Panel B: Two-digit SIC codes for sample firms

2-digit SIC code	Description	Firms Converting to Cash Balance Plans	Firms Terminating Defined Benefit Plans
10-19	Mining & Construction	3	6
20-39	Manufacturing	44	52
40-49	Transportation & Public Utilities	20	10
50-59	Wholesale & Retail Trade	12	19
60-69	Finance, Insurance & Real Estate	36	40
70-89	Services	8	5
	Total	123	132

Table 3

Descriptive statistics for cash balance plan converters and defined benefit plan terminators

ASSETS equal the firm's total assets in the year prior to the pension change; EXFUND equals the maximum of zero and the value of pension assets minus the accumulated benefit obligation; PL equals the accumulated benefit obligation; MEANROA equals the average of return on assets during the three years prior to the event year. The level variables, assets and pension liabilities, are converted to 2000 dollars using the producer price index.

PANEL A

		Cash Balance Converters		Defined Benefit Terminators		p-value of t-test (rank sum test) for difference in means between CB Conv & DB Term	
		1980s	1990s	1980s	1990s	1980s	1990s
	N	18	104	39	93		
ASSETS ($ million)	Mean	12,574.0	29,143.6	4001.5	1,059.0	0.25	0.01
	Median	2,335.1	3,817.1	220.5	222.3	(0.01)	(0.01)
	Stdev	29,097.6	84,903.1	13,744.9	2,880.1		
PL ($ million)	Mean	173.1	1,494.2	75.3	85.0	0.11	0.01
	Median	37.8	199.4	10.1	5.8	(0.01)	(0.01)
	Stdev	216.4	4,774.4	197.2	404.4		
EXFUND/PL (%)	Mean	40.9	27.2	157.9	18.8	0.08	0.08
	Median	28.2	17.0	70.8	6.1	(0.04)	(0.01)
	Stdev	34.1	40.8	397.2	26.9		
MEANROA (%)[#]	Mean	14.5	11.5	10.1	8.8	0.09	0.02
	Median	15.8	11.2	8.0	9.6	(0.01)	(0.04)
	Stdev	6.2	8.6	11.3	8.7		

Panel B

	Correlation Coefficient (p-value) [based on entire sample]		
	LOGPL	**EXFUND/PL**	**MEANROA**
LOGASSETS	0.69 (0.01)	-0.01 (0.90)	0.09 (0.18)
LOGPL		0.10 (0.11)	0.21 (0.01)
EXFUND/PL			-0.08 (0.25)

[#] There are fewer observations for MEANROA than the other variables due to missing data.

Table 4

Logistic regression analysis of the probability that a firm converts to a cash balance plan relative to the probability that a firm terminates a defined benefit plan

EXFUND/PL equals the maximum of zero and the value of pension assets minus the accumulated benefit obligation of the firm's pension plans in the year prior to the pension change divided by the accumulated benefit obligation. LOGPL equals the natural logarithm of the accumulated benefit obligation in the year prior to the pension change. LOGASSETS is the natural logarithm of total assets in the year of the pension change. The level variables, pension liabilities and assets, are converted to 2000 dollars using the producer price index. D90s equals one if the pension change occurred during the 1990s and zero otherwise. MEANROA is the average return on assets in the 3 years prior to the event year. Coefficient estimates with p-values in parentheses are reported in the table.

Analysis includes defined benefit terminators for which the replacement plan could not be confirmed.

	(1)	(2)	(3)
Intercept	-2.67 (0.01)	-5.48 (0.01)	-5.36 (0.01)
D90s	-0.70 (0.29)	-0.54 (0.43)	-1.19 (0.14)
EXFUND/PL	-2.17 (0.05)	-2.24 (0.08)	-3.38 (0.02)
D90s x (EXFUND/PL)	3.38 (0.01)	3.34 (0.02)	4.55 (0.01)
LOGPL	0.88 (0.01)	0.65 (0.01)	0.80 (0.01)
LOGASSETS		0.52 (0.01)	0.47 (0.01)
MEANROA			3.57 (0.15)
Pseudo-R^2	0.36	0.40	0.42
p-value for chi-square test of H_0: sum of the coefficients on the EXFUND/PL variables =0	0.05	0.11	0.13
Obs.with CB=1	123	123	117
Obs. with CB=0	132	132	123

Table 5

Logistic regression analysis of the probability that a firm converts to a cash balance plan relative to the probability that a firm terminates a defined benefit plan and replaces it with a full-fledged defined contribution plan

EXFUND/PL equals the maximum of zero and the value of pension assets minus the accumulated benefit obligation of the firm's pension plans in the year prior to the pension change divided by the accumulated benefit obligation. LOGPL equals the natural logarithm of the accumulated benefit obligation in the year prior to the pension change. LOGASSETS is the natural logarithm of total assets in the year of the pension change. The level variables, pension liabilities and assets, are converted to 2000 dollars using the producer price index. D90s equals one if the pension change occurred during the 1990s and zero otherwise. MEANROA is the average return on assets in the 3 years prior to the event year. Coefficient estimates with p-values in parentheses are reported in the table.

Analysis includes only those defined benefit terminators for which a defined contribution replacement plan could be confirmed.

	(1)	(2)	(3)
Intercept	-2.58 (0.01)	-5.31 (0.01)	-5.78 (0.01)
D90s	-1.25 (0.12)	-1.39 (0.11)	-1.12 (0.21)
EXFUND/PL	-3.41 (0.01)	-3.65 (0.02)	-3.72 (0.02)
D90s x (EXFUND/PL)	5.61 (0.01)	6.31 (0.01)	6.34 (0.01)
LOGPL	1.20 (0.01)	0.94 (0.01)	0.93 (0.01)
LOGASSETS		0.54 (0.01)	0.50 (0.01)
MEANROA			4.15 (0.18)
Pseudo-R^2	0.41	0.43	0.44
p-value for chi-square test of H_0: sum of the coefficients on the EXFUND/PL variables =0	0.07	0.05	0.06
Obs.with CB=1	123	123	117
Obs. with CB=0	77	77	76

Table 6

Derivatives of probability of cash balance plan conversion with respect to a change in EXFUND

Derivatives are for a hypothetical firm with assets equal to the median ($827 million), MEANROA equal to the median (10.4%), and pension liabilities equal to the median for the sample ($30 million) using the logistic regression model reported in column 3 of Table 5. EXFUND is the maximum of zero and the difference between pension assets and the accumulated benefit obligation. P-values for test of whether the derivative equals zero and whether the derivatives are equal are calculated using the delta method (see Greene, 2000).

	Derivative of Predicted Probability of Cash Balance Plan Conversion w.r.t. EXFUND/PL (p-value for test that derivative = 0 in parentheses)		p-value for test of equality of the derivatives
EXFUND/PL	1980s	1990s	
0.0	-0.66 (0.01)	0.66 (0.07)	0.01
0.1	-0.78 (0.01)	0.64 (0.07)	0.01
0.2	-0.88 (0.01)	0.60 (0.06)	0.01
0.3	-0.93 (0.02)	0.54 (0.03)	0.01
0.4	-0.91 (0.02)	0.48 (0.01)	0.01
0.5	-0.84 (0.02)	0.42 (0.01)	0.01
0.6	-0.73 (0.01)	0.35 (0.01)	0.01
0.7	-0.60 (0.01)	0.29 (0.01)	0.01
0.8	-0.47 (0.01)	0.24 (0.01)	0.01
0.9	-0.35 (0.02)	0.19 (0.02)	0.04
1.0	-0.26 (0.07)	0.15 (0.08)	0.11

Table 7

Operating performance of firms that converted to cash balance plans compared to other firms with defined benefit plans in the same two-digit SIC and to other firms with defined benefit plans of comparable size in the same two-digit SIC code. Operating performance (MEANROA) is the average return on assets over a three-year period prior to the conversion. Return on assets is defined as operating income before depreciation divided by total assets.

	Observations.	Median	Mean
Difference between MEANROA of firms with cash balance plan conversions and the median value for MEANROA of firms with the same two-digit SIC code and defined benefit plans	119	1.12%*	3.28%*
Difference between MEANROA of firms with cash balance plan conversions and the median value for MEANROA of firms with the same two-digit SIC code, defined benefit plans, and with assets between 70% and 130% of total assets for the firm with the cash balance plan conversion #	115	0.01%	0.02%

Firms without a match are excluded.

* indicates significance at the 1% level using a t-test for the mean and sign test for the median.

Table 8

Stock price performance of firms that converted to cash balance plans

Stock price performance is measured using the annualized pre-conversion buy-and-hold returns over one-year, two-year and three-year periods using two benchmarks: (1) a size-matched portfolio and (2) a size and book-to-market matched portfolio. Size-matched portfolios consist of all firms with defined benefit plans and with market capitalization at the end of each year within 90 percent and 110 percent of the sample firm's market capitalization. Size and book-to-market matched portfolios consist of all firms in the size-matched portfolio with book-to-market ratios at the year-end within 90 percent and 110 percent of the sample firm's book-to-market ratio at year-end. A sample firm is not included if its one-year, two-year and three-year prior-conversion return history has fewer than six months, twelve months, and twenty-four months.

	Number of observations Mean Median		
	Years Relative to the year of Conversion		
Difference between firms with cash balance plan conversions and	1 year	2 years	3 years
Size-matched portfolios	117 6.7%** 6.7%**	115 5.8%** 7.8%**	111 6.0%** 7.9%**
Book-to-market matched portfolios	117 5.7%** 6.8%**	108 7.8%** 7.8%**	97 8.5%** 7.9%**

** indicates significantly different from zero at the 1% level using a t-test for the mean and sign test for the median.

Table 9

Debt ratings of firms that converted to cash balance plans

Debt ratings are assigned numerical scores as follows: AAA=21, AA+=20, AA=19, AA-=18, BBB+=17, BBB=16, …CC=2, C=1. Mean and median values in the first row are for the cash balance plan converter sample. Means and medians in rows two and three are the differences between the cash balance plan converters' debt ratings and the median of the benchmark group.

				p-value for	
Sample	N	Mean	Median	t-test	Sign test
Cash Balance Converters	84	14.1	14.50		
Difference in debt rating between cash balance converters and the median of other firms in the same two-digit SIC code	84	0.05	0.00	0.04	0.13
Difference in debt rating between cash balance converters and the median of other firms in the same two-digit SIC code and with assets + or – 30% of the cash balance plan converters' assets	78	-0.55	-1.00	0.11	0.15

Appendix A

The benefit per dollar of pension liabilities equals

$$B = \left(\frac{EXFUND}{PL}\right)\tau - \left(\frac{EXFUND}{PL}\right)\theta - \frac{g(PL)}{PL}. \qquad (1)$$

The partial derivatives of B are

$$\frac{\partial B}{\partial(\frac{EXFUND}{PL})} = \tau - \theta \quad .$$

$$\frac{\partial B}{\partial(PL)} = \frac{-1}{PL}\left[g'(PL) - g(PL)/PL\right] \geq 0, \text{because g is weakly concave.}$$

$$\frac{\partial B}{\partial \tau} = \frac{EXFND}{PL} \geq 0.$$

If we further assume that $\theta = \theta(MEANROA, LOGASSETS)$, then

$$\frac{\partial B}{\partial MEANROA} = -\theta_1(\,)\frac{EXFND}{PL} \geq 0, \quad \text{if } \theta_1 \leq 0;$$

$$\frac{\partial B}{\partial LOGASSETS} = -\theta_2(\,)\frac{EXFND}{PL} \geq 0 \quad \text{if } \theta_2 \leq 0,$$

where θ_i is the partial derivative of θ with respect to the i^{th} argument.

Appendix B

Benefit Accruals Patterns In Traditional Defined Benefit versus Cash Balance Plans

An important difference between a traditional defined benefit plan and a cash balance plan (and the source of much of the controversy surrounding cash balance plans) is the pattern of benefit accruals over an employee's service with a given employer. With traditional defined benefit plans, benefits are backend loaded – i.e., a large percentage of total benefits are accrued at the end of an employee's career. In contrast, cash balance plans typically have a more even accrual pattern.[22]

To illustrate the different accrual patterns, Figure A1 compares a hypothetical defined benefit plan to a hypothetical cash balance plan (with a constant salary crediting rate) with respect to the present value of accrued benefits. This comparison is made under the constraint that the present value of accrued benefits at retirement for an employee with 30 years of service is identical under the two plans. In the early years of service, employees accrue a relatively low pension benefit under a traditional defined benefit plan compared to a cash balance plan. Accrued benefits then grow at a higher rate under the traditional defined benefit plan so that at the end of 30 years of service, the two plans provide the same level of benefits.

The effect of a conversion from a defined benefit plan to a cash balance plan on the value of an existing participant's retirement benefits depends on his/her years of service to date and his/her expectations regarding additional service. To illustrate, suppose that a sponsor converts the defined benefit plan depicted in Figure B1 to the cash balance plan, also depicted in Figure B1. In this case, the benefit formulas are set so that a newly hired employee who knows for certain that he/she will remain with the firm for 30 years would be indifferent between the two plans.

Existing participants, however, are unlikely to be indifferent. Suppose that the sponsor sets the initial account balance under the new cash balance plan equal to the present value of accrued benefits

under the old defined benefit plan at the time of conversion. In other words, each employee's account balance begins with exactly the same amount (in present value terms) that the employee had accrued under the traditional defined benefit plan. Following conversion, the account balance grows according to the cash balance plan formula. Figure B2 illustrates the effect of conversion on an employee with 20 years of service (dashed line) and an employee with 6 years of service (dotted line). For the employee with 20 years of service, the conversion results in a lower present value of benefits than would have occurred if the employee stayed with the firm under the traditional defined benefit plan. This illustrates one way that cash balance plan conversions can cause losses to older employees.[23,24]

On the other hand, younger employees who do not expect to be with the firm for many years are likely to prefer a conversion to a cash balance plan, because it gives them a higher expected benefit. The dotted line in Figure B2 illustrates this result for the case of a conversion after an employee's sixth year of service. Provided the worker plans to leave the firm before 25 years of service, he/she is better off with the conversion. Thus, converting to a cash balance plan could have a favorable impact on some groups of employees while hurting other groups.

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[22] If a cash balance plan increases the salary credit with years of service, the cash balance plan could have a benefit accrual pattern that more closely matches a traditional defined benefit plan.

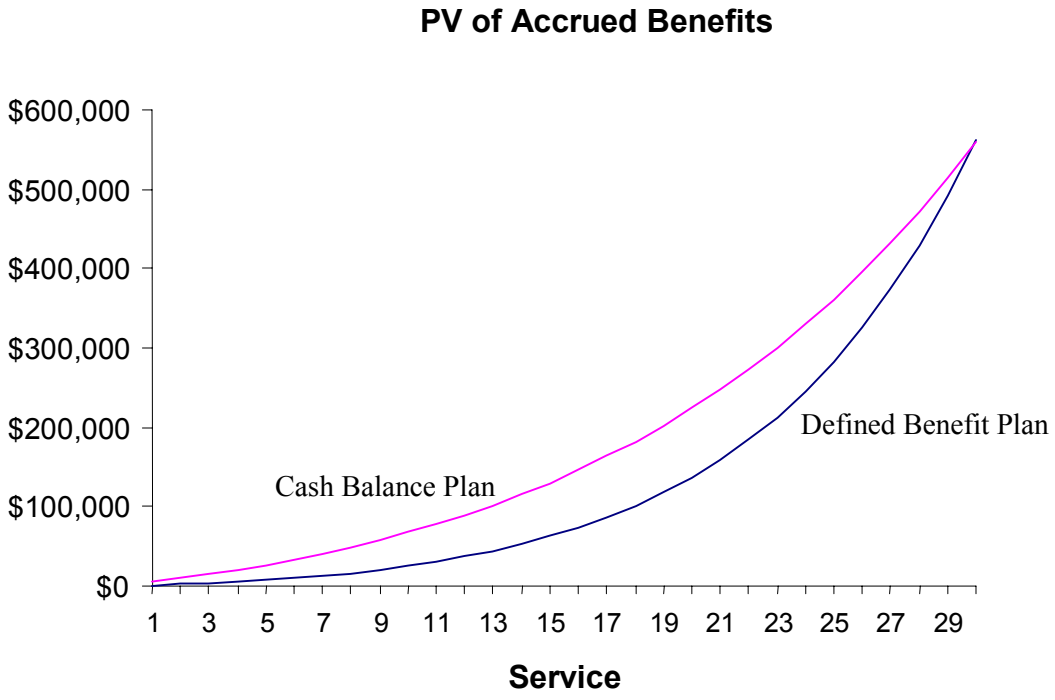
[23] The disadvantage to older employees of converting to a cash balance plan can be offset by either grandfathering their benefits under the old plan or by setting salary credits higher for older employees.

[24] In contrast to the previous analysis, under some conversions, the account balance initially is set lower than the present value of accrued benefits under the old defined benefit plan, which might seem to violate ERISA's requirement that plan changes not reduce benefits that employees have already accrued. To conform to ERISA, in cases where the initial account balance is set lower than the accrued benefits, an exiting employee is entitled to benefits equal to the maximum of the present value of the accrued benefits under the old defined benefit plan or the account balance under the new cash balance plan. Consequently, for a period of time following the conversion, an employee's benefits are frozen at the level of accrued benefits at the time of conversion. This effect of cash balance plan conversions sometimes is referred to as a plateau effect.

Figure B1

Comparison of Defined Benefit and Cash Balance Plans
With respect to the Present Value of Accrued Benefits

Parameters are chosen so that the present value of accrued benefits is the same under both plans
for an employee with 30 years of experience.



Assumptions:
Initial salary =$40,000
Salary growth rate = 4.0%
Interest rate = 6.35%

Defined benefit plan:

β = generosity parameter = 0.015, t = years of service, S_t = salary in year t, A = Cost of retirement annuity = $10 (lump sum of $10 converts to $1 of annual income for life), years to retirement = T - t

Annual benefit formula = 0.015 (final salary) (years of service)

Present value of accrued benefit at t = $(\beta\ A\ S_{t-1}\ t) / (1+r)^{T-t}$

Cash balance plan:

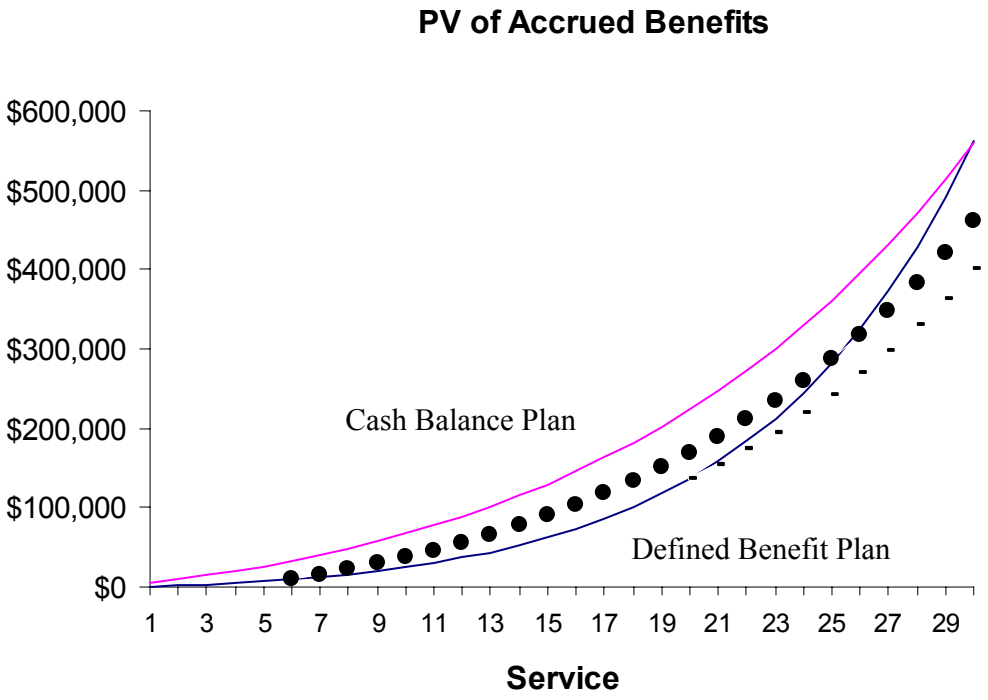
c = salary crediting rate = 10%
r =Interest crediting rate = 6.35%
PV_t^{CB} = present value of accrued benefit at t = $PV_{t-1}^{CB}(1+r) + c\ S_t$; where $PV_0 = 0$.

Figure B2

Effect of a Conversion to a Cash Balance Plan on the Present Value of Accrued Benefits

Parameters are chosen so that the present value of accrued benefits is the same under both plans for an employee with 30 years of experience.

•••• Conversion after 6 years of service
----- Conversion after 20 years of service



See Figure B1 for assumptions.