

# THE EARNINGS IMPLICATIONS OF PENSION EXPENSE: A STOCHASTIC ANALYSIS OF TEN CANADIAN COMPANIES

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## ABSTRACT

Recent challenges to the actuarial pension model and a movement to harmonize international accounting standards both suggest that the current Canadian standards for pension accounting, CICA 3461, may see substantial revision during upcoming years. To understand better the implications of these possible accounting changes, this paper presents the results of a stochastic analysis that quantifies how the volatility of pension expense for a sample of ten Canadian companies sponsoring defined benefit plans will be increased by the adoption of immediate recognition accounting. For certain companies this increase is significant and is shown to have a material earnings impact. The implications of this earnings volatility for the future of defined benefit pension plans are also explored.

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“Volatility is a property of markets, not a disease curable by accounting and actuarial methods.”

-Jeremy Gold and Larry Bader, *Pension Financial Economics Webcast Series*

## 1. INTRODUCTION

Recent challenges to the actuarial pension model and a movement to harmonize international accounting standards both suggest that the current Canadian standards for pension accounting, Section 3461 of the Handbook of the Canadian Institute of Chartered Accountants (CICA), may see substantial revision during upcoming years.

### 1.1 History of Pension Accounting in Canada

Under CICA 3460 prior to December 1, 1986, the pension expense that a company recorded for accounting purposes was typically the cash contributions made to the pension fund (and deducted for income tax purposes) that year. Hence, there

was little distinction between pension accounting and funding. Given that actuarial cost methods, assumptions, and disclosures tended to vary between companies, intercompany comparison of pension costs was very difficult.

With the introduction of Statement of Financial Accounting Standards (FAS) Nos. 87 and 88 in the United States, CICA 3460 was amended effective December 1, 1986 to sever the link between pension accounting and funding. The objective was to advance the accrual paradigm while facilitating more relevant intercompany comparisons. The requirement, for example, that the actuarial cost method (for accounting purposes) be the “projected benefit method prorated on services” served to enhance comparability between companies by standardizing pension accounting. However, that key assumptions were to be determined as “management’s best estimate” did leave significant discretion with company management.

Effective January 1, 2000, The Canadian Accounting Standards Board (AcSB) introduced CICA 3461 as a replacement for CICA 3460, making Canadian pension accounting standards more consistent with those of the Financial Accounting Standards Board (FASB) in the United States and the International Accounting Standards Board

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(IASB). Besides introducing new terminology and disclosures, CICA 3461 is noted for introducing market-related discount rates and hence for removing some of the discretion inherent in CICA 3460.

## 1.2 Key Features of CICA 3461

This paper explores two key features of pension expense as calculated under CICA 3461.

### 1.2.1 Capitalization of the Equity Risk Premium

CICA 3461.050a specifies that the liability discount rate be set with reference to “market interest rates at the measurement date on high-quality debt instruments with cash flows that match the timing and amount of expected benefit payments.” In practice, the yield curve of AA-rated bond indices is typically used. CICA 3461.076 also specifies that the expected return on plan assets should be based on “the expected long-term rate of return on plan assets.” This expected rate of return is based on management’s best estimate. So in determining pension expense, CICA 3461 requires management to estimate to what extent the rate of return on pension assets is expected to exceed the interest rate at which the liabilities are discounted. By capitalizing this difference each year rather than recording the actual return on plan assets in the period, CICA 3461 essentially adjusts pension expense, so that the larger the expected return on a given asset base, the smaller the expense incurred in that period.

### 1.2.2 Smoothing and Deferral

CICA 3461 recognizes the long-term nature of defined benefit pension plan liabilities. More specifically, it permits a significant degree of smoothing and deferral of experience. Popularly known as “the 10% corridor rule,” CICA 3461.088 stipulates that actuarial gains and losses should be recognized in pension expense only when they exceed 10% of the greater of (a) the accrued benefit obligation at the beginning of the year, and (b) the fair value, or market-related value, of plan assets at the beginning of the year. When actuarial gains and losses exceed the 10% corridor, the amount of the excess is not immediately recognized in earnings. Rather, such excess is amortized over the average remaining service period of

employees expected to receive benefits under the plan, which ranges typically from 10 to 15 years.

CICA 3461 supports the recognition of experience gains and losses over the long term (delayed recognition) for the reason that they arise from adjustments to long-term measurements. Long-term recognition is consistent with the expectation that short-term deviations represent “noise” and that over the long term, adverse deviations average out with the “true” pension expense remaining relatively stable. Until recently, this perspective has been the dominant view and has been generally unchallenged.

## 1.3 Recent Criticisms of the Current Standard

During the booming equity markets of the 1990s, investors were relatively unconcerned about the significant experience gains unrecognized by CICA 3460 and 3461. For many, if not most, North American companies with defined benefit pension plans, pension expense was an income item that inflated earnings with large unrecognized asset gains accumulating. However, the recent decline in global equities combined with a significant drop in interest rates has changed this circumstance considerably. With pension expense becoming a true expense and unamortized gains becoming unamortized losses, the earnings and balance sheet implications of CICA 3461 have been watched much closer. Out of this increased scrutiny, several groups have raised concerns regarding the current pension accounting standards.

### 1.3.1 Criticisms from the Actuarial Community

The most foundational criticisms of the current standards have arisen through the financial economics critique of actuarial practice. Based on the pioneering work of Samuelson (1963), Black (1980), Tepper (1981), and Bodie (1995), among others, there has been a renewed interest to understand defined benefit pension obligations through the lens of modern financial engineering. Some of this movement’s more recent spokesmen include Jeremy Gold and Lawrence Bader in the United States and Jon Exley in the United Kingdom. These concerns have also received attention in Canada through Malcolm Hamilton’s *National Post* articles. Though most of the financial eco-

conomic criticisms address pension-funding practices, criticisms of accounting standards have also been voiced. Many of these criticisms apply to CICA 3461.

The financial economics perspective observes that the equity risk premium has a risk adjusted present value of zero. Consequently, this perspective is critical of accounting standards such as CICA 3461 that do not adjust the equity risk premium for risk, and hence assign it a nonzero present value. By capitalizing the equity risk premium before it is earned, it is argued that CICA 3461 does not transfer risk properly between generations of shareholders. Instead, it rewards today's shareholders for risks that tomorrow's shareholders have not yet endured.

The financial economics perspective also takes issue with CICA 3461's smoothing and deferral. According to the *law of one price*, a fair trade of a marketed security or portfolio must occur at a market price. It is argued that the smoothing and deferral of CICA 3461 complicates the investment decision both by using market-related (smoothed) asset values as well as by concealing the true underlying volatility, through the 10% corridor rule.

Bader and Gold (2003, p. 1) poignantly summarizes these two criticisms:

*“Contrary to the teachings of financial economics, the actuarial pension model anticipates expected outcomes without reflecting the price of risk. It then camouflages the risky distribution of outcomes by various smoothings and amortizations.”*

### 1.3.2 Criticisms from Accounting Standards Setters

The Enron and WorldCom disasters of recent years have provided accounting bodies with new incentives to improve financial reporting. In this environment, many have questioned whether existing pension accounting standards properly reflect core accounting values such as understandability, relevance, reliability, and comparability (CICA 1000).

*“... we have to move to the point where we don't report a single number.”*<sup>1</sup>

<sup>1</sup> Paul Cherry, chairman of the CICA's AcSB, in support of the current push for a redesigned income statement. See Church (2002).

*... one of the prime examples of bad accounting.*<sup>2</sup>

*You may as well ... divide it by the cube root of the number of miles to the moon and multiply it by your shoe size. It does not mean a thing.*<sup>3</sup>

The current debate surrounding pension accounting reform coincides with a new impetus to upgrade and harmonize accounting standards internationally. The International Accounting Standards Board (IASB), under the leadership of Chairman Sir David Tweedie, is coordinating this convergence project. Tweedie is a proponent of immediate recognition pension accounting modelled after Financial Reporting Standard (FRS) 17 in the United Kingdom. There is a definite possibility that Canada will follow the IASB and adopt immediate recognition pension accounting in upcoming years. This adoption may call for a redesigned income statement in which distinct components of pension expense would flow to income statement line items such as *earnings from operations*, *earnings from financing*, and *earnings from remeasurements*.<sup>4</sup>

### 1.4 Recent Articles and Contributions

Within the accounting community, recent papers on pension accounting have not directly addressed the features of CICA 3461 that I have outlined. Wiedman (2002, 2003) focuses on disclosure and assumption setting. D'Andrea (2003) outlines possible changes being considered. Church (2002, 2003), Corcoran (2003), Daly (2003), and Hamilton (2003) have all introduced the pension accounting crisis to the Canadian public through national newspaper articles. Klumpes (2003) has examined pension accounting in the United Kingdom context. Most of the literature reexamining actuarial practice in light

<sup>2</sup> Robert Herz, chairman of the Financial Accounting Standards Board (FASB), in support of the current push for changes to FAS 87. See Burkholder 2003.

<sup>3</sup> Sir David Tweedie, chairman of the International Accounting Standards Board (IASB), with reference to the arbitrariness with which the amortization period is determined under current pension accounting standards. See Financial Reporting Council 2002. Online at [www.publications.parliament.uk/pa/cm200102/cmselect/cmtreasy/758/2070211.htm](http://www.publications.parliament.uk/pa/cm200102/cmselect/cmtreasy/758/2070211.htm).

<sup>4</sup> Bader (2002) argues for the benefits of using multiple earnings categories in corporate valuations.

of financial economics has focused on pension funding. Ruloff (2003), however, does specifically examine FAS 87 in light of financial economics. His analysis is based on a stochastic model with similarities to the model that I use.

A practical push to quantify the financial impact of CICA 3461 has also come from the financial analyst community. Graham (2002) marks-to-market the defined benefit pension plans of Canada's largest companies so as to estimate the 2002 earnings implications under six deterministic scenarios. Moran and Cohen (2002), Skilbeck and Redlich (2002), and Vasic (2002) have released similar reports providing guidance on how to "un-smooth" reported pension expense. Rosen and Rosen (2002, 2003) have issued multiple reports detailing the pension problems of specific Canadian companies.

### 1.5 My Contribution

I have argued that CICA 3461 may see substantial future revision. The capitalization of the equity risk premium and the smoothing and deferral are features of the current standard that I have identified as having a significant impact on pension expense. Consequently, there is a need to quantify the earnings implications of these current features in relation to the proposed standards in which they are removed. Because Canadian pension plans include significant allocations to Canadian and global equities, it is desirable to capture the full extent and variability of equity returns in the analysis. In addition, the variability in bond yields, although not as volatile as equity returns, has a material impact on the liability measurement that will flow directly into earnings under immediate recognition accounting proposals. A deterministic projection provides only a limited analysis of the magnitude of the impact, and cannot reveal the probable extent of the corporate earnings volatility or the correlation between equity returns and bond yields. Given the reality of dynamic capital markets, a stochastic analysis of likely pension expense outcomes is required. With respect to the published literature, I believe that I am the first to undertake a full stochastic examination of CICA 3461.

This paper seeks to disseminate the results of this examination. The next three sections describe the stochastic model in greater detail. Section 5 summarizes the model's key results. Im-

plications for sponsors of defined benefit plans are then considered in the paper's closing sections.

## 2. MODEL INPUTS

### 2.1 Empirical Inputs

My empirical data was obtained from three sources. *The pension footnotes of companies' annual financial statements* were the primary source of company-specific information. Copies of the 2000, 2001, and 2002 annual financial statements for the sample companies were downloaded from the System for Electronic Document and Analysis and Retrieval (SEDAR). *Pension valuation reports filed with the Office of the Superintendent of Financial Institutions (OSFI)* were used to supplement the relevant financial statement information. Under the Access to Information Act, I requested copies of the most recent actuarial valuation reports of OSFI-regulated defined benefit pension plans. These reports were used to infer demographic details of the plan membership as well as to assess the likelihood and timing of future required cash contributions. Finally, *financial analysts' estimates of future earnings per share* were obtained from [www.globeinvestor.com](http://www.globeinvestor.com) on November 15, 2003.

### 2.2 Selected Companies

Given my need for information beyond the annual financial statements, my list of prospective companies was limited to those that OSFI regulates. Altogether I received approximately 50 reports from OSFI of which the sponsors of the ten largest defined benefit plans were selected as the focus companies for this study.<sup>5</sup> These companies are listed in Table 1.

### 2.3 Capital Market Inputs

Central to this project is the recognition that pension expense is a dynamic function of capital markets developments. Consequently, capital market simulations were used to generate the in-

<sup>5</sup> The one exception was BCE Inc., which had to be excluded because, as Rosen and Rosen (2003) observe, BCE Inc. reports a market-related value as its fair value of plan assets.

puts for the pension expense functions (described in Section 3).

Global CAP:Link is the Towers Perrin Global Capital Market Scenario Generation System.<sup>6</sup> It is a proprietary model that is used in risk analysis for asset-liability management of pension plans and insurance portfolios. It is not designed to predict the direction of short-term market movements but rather is intended to simulate volatility around consensus market forecasts. CAP:Link uses a cascading set of stochastic differential equations to simulate hundreds of alternative i.i.d. year-by-year paths of economic and capital market simulations over a specified time horizon. Given the input assumptions, each path is equally likely and hence, together, the paths approximate the distributions of simulated variables and can be used to provide Monte Carlo estimates of quantities of interest. The model uses mean reversion in the key variables, where relative risk varies by time horizon. These variables include yield curves and inflation rates, as well as returns on a wide variety of asset class categories. Mulvey and Thorlacius (1998) describe the CAP:Link model in greater detail.

CAP:Link is based on market consensus assumptions in effect at the time the model is operated (i.e., government of Canada bond yields, real return bond yields, current dividend yields, etc.). Towers Perrin sets other assumptions in collaboration with academia and capital market experts. The simulations used in this study were based on an equity risk premium assumption of 3% per annum over the normative yield on 10-year Government of Canada bonds. Additionally, interest rates were determined based on targets for normative real yields of 1.7% for 91-day Treasury bills, and 2.8% for 10-year Government of Canada Bonds. Historical correlations and serial correlations are extracted from the previous 180 months of history and are updated monthly throughout the projection period.

The January 2003 Canadian Capital Market Simulations generated the CAP:Link simulations used in this paper. From CAP:Link I obtained 500 sample paths of yearly economic variables that were simulated for 20 years starting in 2003, of

Table 1  
Ten Sample Companies

Air Canada	Bank of Montreal
Canadian National Railway	CIBC
Canadian Pacific Railway	Royal Bank of Canada
TELUS	Scotiabank Capital Trust
TransCanada Pipelines	Toronto-Dominion Bank

which only the 2004 results are used in this paper. Three linear combinations of CAP:Link economic variables are used in my pension expense functions.

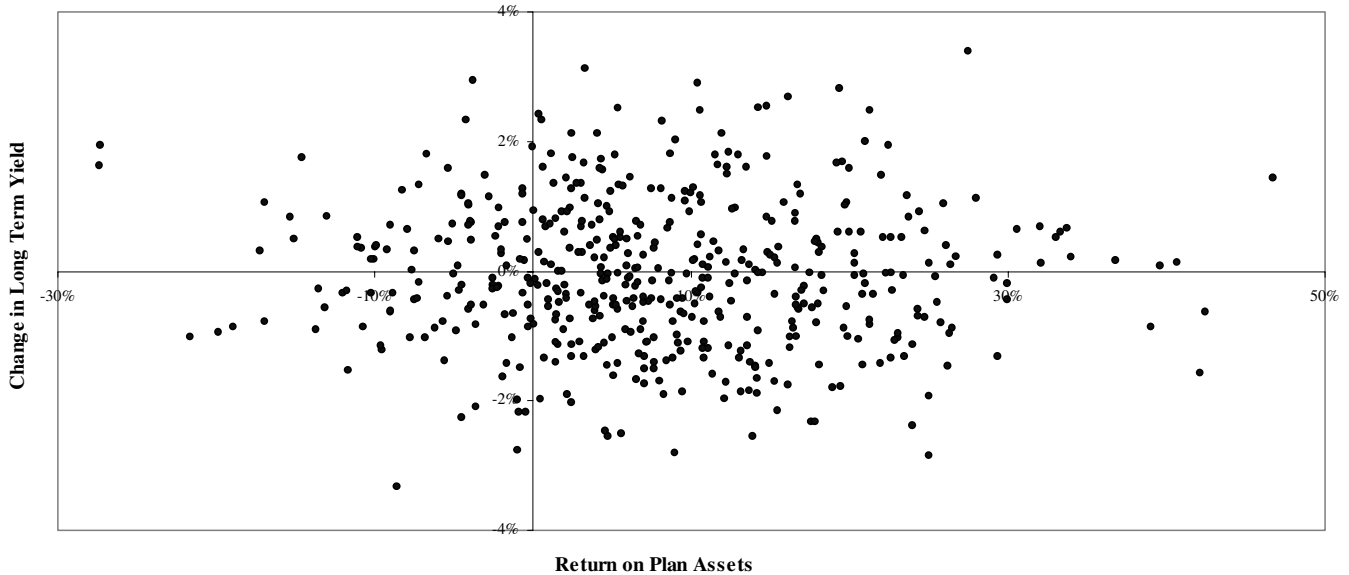
*Long Term Yield* is an economic variable that is generated by CAP:Link. It represents the nominal semiannual yield to maturity on long-term (30-year) Government of Canada bonds. I differenced this variable to generate an annual *Increase in Long Term Yield* (ILY). It is this increase that is an input variable in my pension expense functions.

*Return on Plan Assets (RPA) industry average portfolio* is a quantity that I calculate to mirror the nominal return earned by a 60% equity and 40% fixed income investment portfolio. This return is calculated from CAP:Link as 40% Universe Bonds (Scotia Capital Universe Bond Index), 30% Canadian Equities (S&P/TSX Capped 10% Index), and 30% Global Equities (market-cap weighted Morgan Stanley Capital World Index). At the time of this study, all of the companies that disclosed a defined benefit pension plan asset mix had an equity to fixed income ratio between 70/30 and 50/50, so the industry average portfolio was deemed to best represent current asset allocation practices.

*Return on Plan Assets minimized-risk portfolio* is a quantity that I calculate to mirror the nominal return earned by a 100% fixed income investment portfolio. This return is calculated from CAP:Link as 50% SCM Long Bonds (Scotia Capital Long Term Bond Index) and 50% Real Return Bonds (Scotia Capital Real Return Bond Index). I chose this bond combination because it provided the best duration match for the pension liabilities. The real return component is necessary to match the inflationary nature of defined benefit pension liabilities. Perfect matching is not possible, however, as no asset class is available to match future salary increases.

<sup>6</sup> I extend a special thanks to Towers Perrin for allowing me to use the CAP:Link model.

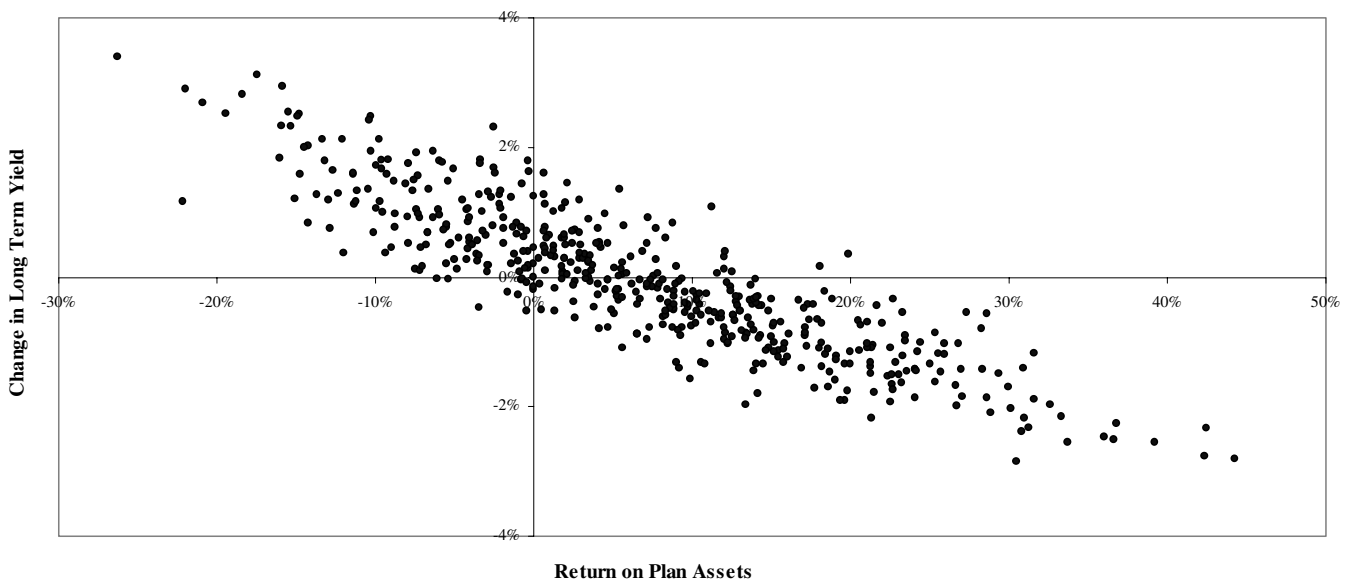
Figure 1  
**2004 Joint Distribution of the Change in Long Term Yield and Return on an Industry Average Portfolio**



From the 500 sample paths provided by CAP: Link I have approximations for the joint distribution of the increase in the long-term yield and each of the two return on plan assets quantities. The simulated distributions for 2004 are shown

in Figures 1 and 2. Though pension expense is also a function of other variables, the increase in the long-term yield (which drives the liability discount rate) and the return on plan assets are the two most significant random quantities that de-

Figure 2  
**2004 Joint Distribution of the Change in Long Term Yield and Return on a Minimized-Risk Portfolio**



termine pension expense. Consequently, these joint distributions form the foundation of my model. Without them, the distribution of pension expense must be estimated deterministically, through a sequence of best estimates. With these joint distributions, however, the distribution of pension expense can be estimated through the stochastic process. This provides a much fuller picture of the magnitude of pension financial risks.

### 3. MODEL FUNCTIONS

The variables defined in the previous section are used as inputs for the three pension expense functions. Together these functions quantify the earnings implications of a change in pension accounting standards.

For a given company and asset mix, I define *current pension expense* (CPE) as a real-valued function of ILY and RPA:

$$\text{CPE}_{\text{Company, Asset Mix}}:(\text{ILY, RPA}) \rightarrow \text{EPS.}$$

CPE represents pension expense as it is currently calculated under CICA 3461. Consequently, CPE reflects the capitalization of the equity risk premium as well as the smoothing and deferral that are characteristic of the current Canadian standards.

For a given company and asset mix, I define *equity risk premium reversal* (RPR) as a real-valued function of ILY and RPA:

$$\text{RPR}_{\text{Company, Asset Mix}}:(\text{ILY, RPA}) \rightarrow \text{EPS.}$$

RPR calculates the same pension expense as CPE, with one exception. Where CPE sets the current year's expected return on plan assets assumption equal to the prior year's assumption, RPR sets the current year's expected return on plan assets assumption equal to the current year's liability discount rate. Consequently, RPR reverses the capitalization of the equity risk premium that characterizes CICA 3461. The smoothing and deferral characteristic of CICA 3461 are preserved by RPR.

For a given company and asset mix, I define *smoothing and deferral reversal* (SDR) as a real-valued function of ILY and RPA:

$$\text{SDR}_{\text{Company, Asset Mix}}:(\text{ILY, RPA}) \rightarrow \text{EPS.}$$

SDR is similar to CPE except that all current experience gains and losses are recognized in full during the year in which they occur.<sup>7</sup> This means that SDR does not defer new experience gains and losses (through the 10% corridor rule) but rather recognizes them immediately.<sup>8</sup> This also means that SDR calculates expense based on the actual return of the market value of assets, rather than the expected return on the market-related value of assets. Hence SDR can be seen as an extension of RPR, since its final output does not depend on the expected return on plan asset assumption.

### 4. MODEL OUTPUTS

Rather than reporting pension expense in millions of dollars, each pension expense function expresses pension expense impact in terms of the percentage increase or decrease that a company's pension expense has on its projected earnings per share. This impact is calculated as:

Earnings per Share Impact =

$$\frac{(\text{Total Pension Expense}) \times (1 - \text{Effective Tax Rate})}{(\text{EPS Estimate}) \times (\text{Number of Outstanding Shares})}$$

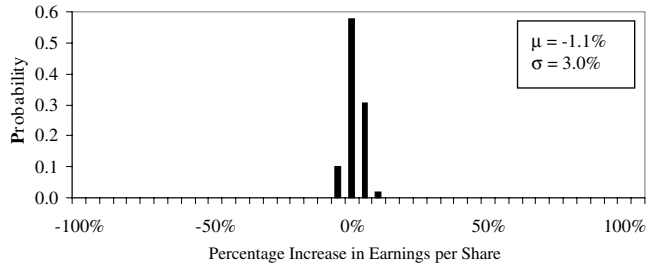
Earnings per share impact of negative five percent, for example, means that pension expense will cause a five percent decrease to a company's earnings per share. Pension expense can be negative and in this case is called pension income. An earnings per share impact of positive five percent, for example, indicates that a company's earnings per share will increase by five percent due to pension income.

An earnings per share impact is not without flaws. One obvious problem is that when a company has a low (or even negative) EPS estimate, the EPS estimate will show significant geometric

<sup>7</sup> By experience gains and losses I mean gains and losses due to unexpected investment experience and gains and losses arising from changes in the liability discount rate. I did not model other types of actuarial gains and losses (such as mortality gains and losses) in the pension expense functions.

<sup>8</sup> Anticipating that a transition to immediate recognition accounting will be handled similarly to the transition from CICA 3460 to CICA 3461 with companies amortizing a transition obligation in accordance with CICA 3461.167, I designed the SDR function to amortize all existing unrecognized experience gains and losses over the average remaining service period of the employee group.

Figure 3  
**2004 Impact of Pension Expense on EPS  
 for Current Pension Expense:  
 Industry Average Portfolio**



dependence on pension expense even if the magnitude of pension expense's increase or decrease is small in arithmetic terms. This was a problem with Air Canada's EPS estimates. Nonetheless, given its wide use in the investment community, I deemed it to be the most meaningful measure of the financial statement impact of pension expense.

Earnings per share impact can also be criticized for aggregating the impact of immediate recognition accounting into a single number. As discussed in Section 1.3, immediate recognition pension accounting will likely be introduced through a redesigned income statement in which pension expense components flow into several income statement line items. Anticipating this reality, I designed my model to output earnings per share impact as the sum of three separate components.<sup>9</sup> However, to improve the readability of this paper, I have presented the results with single earnings per share impact numbers.

## 5. RESULTS

The results are summarized in six frequency histograms. Each histogram describes the aggregate impact per share that pension expense has on 2004 earnings for both asset mixes under each of

<sup>9</sup> The first component was an operating component representing the impact of the current service cost and the amortization of prior service costs. The second component was a financing component representing the difference between the interest cost and the expected/actual return on assets. The final component was a remeasurement component representing the recognition of asset and liability losses (gains) and transition obligation amortizations.

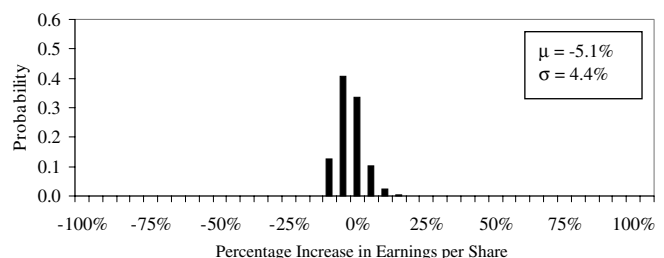
the three pension expense functions. Each histogram is generated by the application of its pension expense function to the 500 CAP:Link market scenario simulations. The histogram bandwidths are five percent in all cases. For a given histogram,  $\mu$  denotes its mean and  $\sigma$  denotes its standard deviation. These distributions are presented on an aggregate basis, with the exclusion of Air Canada.<sup>10</sup> The corporate earnings implications of pension expense vary considerably between companies and so aggregate results should be taken as only suggestive of what the impact might be for a given company.

### 5.1 Industry Average Portfolio

Figures 3 to 5 summarize the pension expense impacts of investing in the industry average portfolio. The industry average portfolio is a 60% equity and 40% fixed income portfolio that approximates the asset allocation strategies currently employed by the companies in this study, as well as the strategies of most defined benefit plan sponsors.

Figure 3 describes the aggregate earnings per share impact of pension expense under the current CICA 3461 standard. According to Figure 3, for the companies in this study CICA 3461 pension expense decreases EPS by roughly one percent on an expected value basis. In addition, the

Figure 4  
**2004 Impact of Pension Expense on EPS for  
 Equity Risk Premium Reversal: Industry  
 Average Portfolio**



<sup>10</sup> Air Canada's low earnings estimates and large unrecognized losses combine to give it a pension expense earnings impact that is significantly larger than that of the other companies. Consequently, the aggregate pension expense distributions have been calculated as an equally weighted average of the distributions of the other nine companies.

Figure 5

**2004 Impact of Pension Expense on EPS for Smoothing and Deferral Reversal: Industry Average Portfolio**

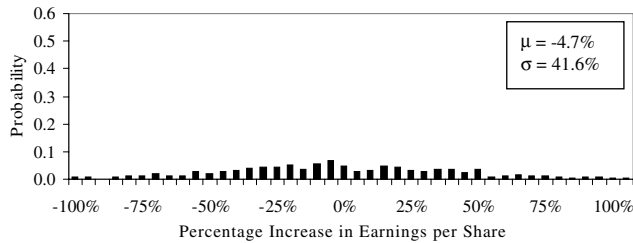
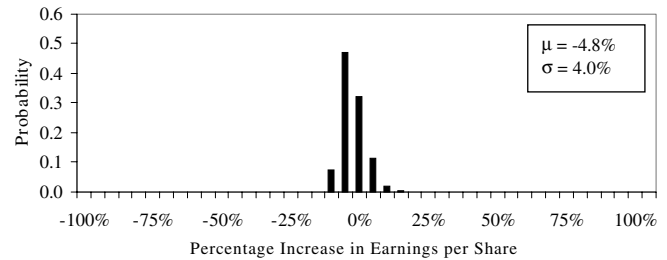


Figure 7

**2004 Impact of Pension Expense on EPS for Equity Risk Premium Reversal: Minimized-Risk Portfolio**



standard deviation of the impact of CICA 3461 pension expense on EPS is three percent.

Figure 4 describes the aggregate earnings per share impact of pension expense under the risk premium reversal function. Note that this distribution has an expected earnings impact that is several percentage points lower than the earnings per share impact of CICA 3461 (Figure 3). This shows that the capitalization of the equity risk premium under CICA 3461 inflates earnings per share.

Figure 5 describes the aggregate earnings per share impact of pension expense under the smoothing and deferral reversal function. Though the earnings per share impact in Figure 5 is increased on average by the application of an actual rate of return (as opposed to an expected rate of return at the liability discount rate) the earnings per share impact is also decreased by the amortization of accumulated prior unrecognized losses. The net result is that the distribution in Figure 5 has an expected earnings impact that is

comparable to the expected earnings impact of the distribution in Figure 4. More significant in Figure 5 is that the standard deviation of its distribution is 10 to 15 times larger than the standard deviations of the distributions in Figures 3 and 4. This quantifies the variability of pension financial risk that is not reflected by CICA 3461.

**5.2 Minimized-Risk Portfolio**

Figures 6 to 8 portray the pension expense impacts of investing in the minimized-risk portfolio. The minimized-risk portfolio is a fixed income portfolio made up of 50% long bonds and 50% real return bonds. This asset mix mirrors the asset mix that a company could employ if it desired to duration match its liabilities.

Figure 6 again describes the aggregate earnings per share impact of pension expense under the current CICA 3461 standard, except now with the minimized-risk asset mix. Note that the expected value of the pension expense earnings impact is roughly three percent lower with the

Figure 6

**2004 Impact of Pension Expense on EPS for Current Pension Expense: Minimized-Risk Portfolio**

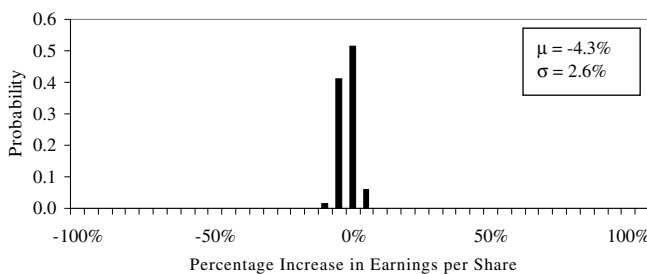
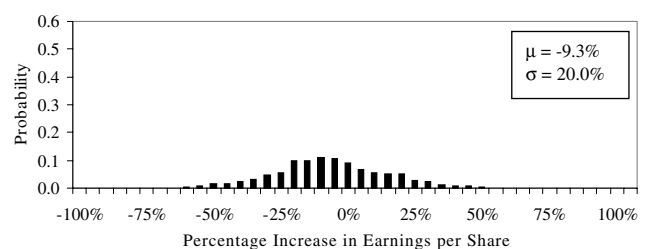


Figure 8

**2004 Impact of Pension Expense on EPS for Smoothing and Deferral Reversal: Minimized-Risk Portfolio**



minimized-risk portfolio. The upshot with this asset mix is that the standard deviation of the earnings impact is reduced geometrically by roughly fifteen percent.<sup>11</sup>

Figure 7 describes the aggregate earnings per share impact of pension expense under the risk premium reversal function and the minimized-risk asset mix. As was the case when moving to Figure 4 with the industry average portfolio, when the difference between the expected return on assets assumption and the liability discount rate is not capitalized, earnings per share is decreased. Compared to the distribution in Figure 4, the distribution in Figure 7 has roughly the same expected earnings impact and a standard deviation of earnings impact that is reduced geometrically by roughly ten percent.

Figure 8 describes the aggregate earnings per share impact of pension expense under the smoothing and deferral reversal function and the minimized-risk asset mix. Note that the standard deviation of the distribution in Figure 8 is only in the order of five times larger than the standard deviation of the distributions in Figures 3 and 4.<sup>12</sup> Consequently, the standard deviation of the distribution in Figure 8 is roughly half that of the standard deviation of the distribution in Figure 5. In comparison, the standard deviation of the distribution in Figure 6 is only slightly smaller than the standard deviation of the distribution in Figure 3. Hence the relative increase in true earnings volatility (from asset-liability mismatching) that accompanies an equity (versus fixed-income) investment strategy is not reflected under CICA 3461.

<sup>11</sup> The volatility ratios under the two asset mixes depend significantly on the methodology used in reducing the expected return on assets (ERA) assumption for the minimized-risk portfolio. I used the equation  $ERA_n = ERA_{n-1} - (ERA_{n-1} - LDR_{n-1}) \times 60\%$ , to estimate the one-time change in management's ERA assumption when the asset mix is changed from a 60/40 to a fixed-income only portfolio. The use of the 60% factor was chosen to reflect the "stickiness" of the ERA assumption, since it was deemed unlikely that management would adopt an ERA assumption as low as the liability discount rate (LDR).

<sup>12</sup> The "minimized-risk" portfolio remains significantly volatile, as evidenced by Figure 8. This residual volatility reflects the imperfect duration matching associated with all such investment portfolios. A more carefully selected duration matching portfolio will reduce volatility further, but in practice the choice of asset combinations is not sufficiently robust to allow complete elimination of asset-liability mismatch.

## 6. IMPLICATIONS FOR DEFINED BENEFIT PLAN SPONSORS

It is entirely possible that the Canadian Accounting Standards Board will adopt immediate recognition-based pension accounting within the next few years. As my results indicate, such a move will significantly increase the earnings volatility of those companies that sponsor defined benefit pension plans. Companies will have several options in responding to this increased earnings volatility.

### 6.1 Maintaining the Status Quo

Despite the increased earnings volatility associated with the adoption of immediate recognition pension accounting, some companies may elect to maintain the status quo. As Table 2 illustrates, the adoption of immediate recognition pension accounting will not impact all companies in the same way.

Irrespective of capital market developments, for the companies in the lower half of this table, reported pension expense has a relatively small impact on annual earnings. The adoption of immediate recognition pension accounting does not significantly change this reality. So maintaining the status quo may be an appropriate option for these companies.

### 6.2 Reducing the Equity Content of Pension Assets

For companies such as Air Canada, TELUS, Canadian Pacific Railway, and Canadian National Railway, maintaining the status quo may not be

Table 2  
Standard Deviation of 2004 Pension Expense Impact (as percent of EPS)

Company	CICA 3461	Immediate Recognition
Air Canada	128.6%	1945.4%
TELUS	7.4%	103.0%
Canadian Pacific Railway	8.6%	97.9%
Canadian National Railway	4.6%	77.7%
Bank of Montreal	1.4%	15.9%
CIBC	1.1%	13.0%
Royal Bank of Canada	0.9%	11.4%
Scotiabank Capital Trust	0.9%	11.3%
TransCanada Pipelines	0.7%	8.6%
Toronto-Dominion Bank	0.4%	5.3%

feasible. These companies may decide that, under immediate recognition accounting, the sensitivity of earnings per share to pension expense is too high. Reducing the equity ratio of pension assets is one available option. The 2004 consequences, under immediate recognition, of moving from an industry average portfolio to a minimized-risk portfolio are described in Table 3.

As Table 3 indicates, moving to a minimized-risk portfolio cuts the standard deviation of pension expense impact in half. A more carefully selected duration matching portfolio will reduce volatility even further. The trade-off, in either case, is that the equity risk premium is forgone; so on an expected value basis a larger pension expense is expected under the minimized-risk portfolio.

This fixed-income approach has received increased attention in recent times, for reasons quite apart from accounting. In 2002, The Boots Company made waves in the credit world by moving its £2.4 billion Boots pension fund from equities to fixed-income securities. Ralfe, Speed, and Palin (2004) and Gold and Hudson (2003), among other proponents of financial economics, have challenged the wisdom of funding pension obligations with equities. Miller and Modigliani (1958) showed that in perfect capital markets without taxes and bankruptcy costs, firm value is independent of capital structure. As a result, much of this discussion now centers on second-order reasons why a fixed-income investment approach may increase shareholder value. At the very least, a movement to fixed income investments for volatility reduction is neither unwarranted nor unprecedented.

### 6.3 Modifying Defined Benefit Plan Design

Modifying the design of a company's defined benefit plan is a final step that could be taken in reducing the earnings volatility of immediate recognition pension accounting. This approach could be taken in conjunction with or as an alternative to reducing the equity ratio of pension assets.

Such an approach could include modifying pension benefits so that automatic cost of living adjustments are eliminated. Benefits that include interest rate guarantees and other embedded op-

Table 3  
Impact of Asset Mix on the Distribution of Pension Expense

Company	Industry Average Portfolio		Minimized-Risk Portfolio	
	$\mu_{2004}$	$\sigma_{2004}$	$\mu_{2004}$	$\sigma_{2004}$
Air Canada	-404%	1945%	-560%	1001%
TELUS	-6%	103%	-15%	51%
CPR	-24%	98%	-33%	46%
CNR	2%	78%	-6%	36%

tions could also be redesigned. Given that equities are a poor long-term match for inflation-linked liabilities (Smith 1998), the objective is to reduce volatility by limiting the liabilities' sensitivity to inflation.

A more drastic approach could include restructuring pension benefits so that investment risk is transferred from employer to employee. Switching from defined benefit to defined contribution plans is one way that this can be done. Closing the defined benefit plan to new hires is another form of this option. Though drastic, this form of restructuring might be the only satisfactory way for some companies to respond to the earnings volatility associated with immediate recognition pension accounting.

Of course, for some companies, abandoning the defined benefit pension plan may not be a viable option. Particularly for companies with older work forces and significant intellectual property, a defined benefit pension plan is an essential component of total compensation. Not only can it be used in attracting new employees, but it can also be used in retaining them, or even in encouraging them to retire early. Despite its potential for volatility reduction, abandoning a defined benefit pension plan should not be undertaken without first considering the broader human resources implications.

## 7. CONCLUSION

For a sample of ten Canadian companies, I have developed three pension expense functions that together illustrate the impact of impending changes to CICA 3461. These functions map a distribution of capital market scenarios to a distribution of pension expense earnings impacts, and in so doing facilitate stochastic analysis. I

show that under an industry average portfolio, CICA 3461's capitalization of the equity risk premium increases earnings per share. Under this same asset mix, I show that CICA 3461's smoothing and deferral mechanisms decrease the standard deviation of reported earnings impact by ten to fifteen times. This shows that the adoption of immediate recognition accounting standards will materially impact the future distribution of corporate earnings. For this reason, I discuss the benefits of moving out of equities and modifying defined benefit plan design as means of coping with the possible earnings volatility.

The question of whether such changes are warranted is a topic of on-going discussion within accounting bodies. Though the political and human resource implications of this debate are far-reaching, my simulated distributions quantify the actual earnings implications at stake. Based on these distributions, I contend that the CICA 3461 standards lack transparency. The mechanics of the 10% corridor rule, in my opinion, do not adequately describe the true earnings volatility associated with running defined benefit pension plans. Moving to an immediate recognition accounting standard will not create new volatility, but will rather report the existing volatility that the current standards leave unrecognized. With Gold and Bader (2002, 2003), I assert that volatility is a property of financial markets and not a disease that accounting should remedy. Any future standards that recognize this should, in my opinion, be welcomed as a step forward.

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