Journal of Accounting, Finance and Economics
Vol. 5. No. 1. September 2015. Pp. 56 – 73

Market Valuation of Pension Plan Information: The Case of Canada

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This paper examines the association between disclosed financial accounting data about defined benefit pension plans (DBPP, hereafter) and firm value while controlling for the effect of managerial discretion in the choice of actuarial assumptions used to calculate pension related numbers. Our study proposes a two-stage generalized least squares methodology to take into account the endogeneity of the choice of actuarial assumptions by management. Our findings suggest that investors value pension plan surplus as asset of the firm and pension plan deficits as liabilities of the firm. They further indicate that managers use their managerial discretion in the choice of actuarial assumptions and investors take into account this discretion, and adjust their valuation accordingly.

Keywords: Defined benefit pension plans; actuarial assumptions; managerial discretion; market value.

1. Introduction

This paper analyses whether pension fund information is reflected in the share prices. Prior research on value relevance of defined benefit pension plans is mostly based on US data and concludes that pension assets and liability are considered as owned by the firm. The recent Canadian study by Wiedman and Wier (2004) find that Canadian pension plan deficits are regarded as liabilities of the firm but surpluses are not viewed as assets of the firm. They claim that this result is due to the Canadian legal environment allowing systematically surplus to plan participants.

Accounting for pension in Canada is similar to the requirement of the Statement of Financial Accounting Standard (SFAS, hereafter) 87 since 2000. Prior that period, Canadian firms had less details in footnotes, particularly with respect to actuarial assumptions and details of the pension expense. With respect to the legal requirements, although they are similar in many aspects, each province has its own regulating body, and pension plans under the federal jurisdiction are supervised by the federal government. Wiedman and Wier (2004) raise a

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potential difference between the Canadian and US environment, which is the court decisions allowing surplus to plan participants. According to them, this might have an impact on the perception of accounting information by market participant depending on the status of the pension plan.

Canadian standard setters only required information similar to SFAS 87 since 2000. Wiedman and Wier (2004) only considered 2 years of data to perform their study which also correspond to a recession period. Our study extends theirs in two ways. First we consider a longer estimation period, and second, we account for the flexibility in calculating pension liability and expense. Section 3460 of the handbook of the Canadian Institute of Chartered Accountants (CICA), similarly to the SFAS 87 in the US, requires the use of actuarial assumptions in the measurement of pension plan information. Our results find that managers opportunistically choose discount rate, compensation growth rate and expected rate of return. Results indicate also that investors take into account this discretion and correct for liberal actuarial assumption choices by management. To our knowledge, our study is the first in Canada that examines the determinants of the actuarial hypothesis. Further, our results, contrary to Wiedman and Wier (2004), do not indicate a zero market reaction for pension plan surplus. We find that Canadian investors appear to view the deficit arising from underfunded plans as a liabilities of the sponsoring firm and the surplus from overfunded plans as an asset of the firm.

We believe our study improves on prior research in three ways. Wiedman and Wier (2004) is the only available Canadian study that focuses on CICA chapter 3461, issued in 2000, with requirement similar to SFAS 87. Unfortunately their study covers only a 2-year recession period. Their results suggest a different valuation depending on the funded status of the regime. We believe a Canadian study over a wider period is necessary to shed light on the Canadian behavior with respect the pension information. Further, our study integrates the impact of accounting assumptions on market value. In this respect we complement Brown's (2006) research. The author examines only two assumptions, the discount rate and compensation growth rate, and they combine these two variables in a composite variable, where each assumption has an equal weighting. However, this approach might bias the results. For example, if a firm chooses a discount rate higher than the benchmark discount rate (a liberal choice) and a compensation growth rate also higher than the benchmark for the industry (a conservative choice), the combination of these two rates can distort the analysis. Indeed, we claim that the impact of the discount rate is far more important that the compensation growth rate. This is why our analysis does not aggregate the different actuarial assumptions in a composite variable. We analyze all of the three assumptions separately. Finally, the last feature of our analysis is that we integrate actuarial choices into our market analysis. Our statistical method takes into account the endogeneity of these decision choices made by management. Brown (2006) doesn't take into account the endogeneity of the decision choice. As actuarial choices are endogenous, the standard OLS model is biased; therefore, we propose the use of a generalized two-stage Generalized Least Square model instead. We first model the actuarial choices and use the predicted value our first model into our market valuation analysis.

The remainder of the paper is organized as follows. Section 2 presents the relevant literature and our hypotheses. Section 3 describes our methodology and sample. Our empirical results are reported in section 4, and section 5 consists of concluding remarks.

2. Relevant Literature and Hypotheses

Relevant research has to be analyzed according to the contemporaneous accounting standards. For example, for the period preceding the release of SFAS 1987, accounting pension expense was equal to the disbursement. Still, prior to SFAS 87, research sought to determine if the unfunded pension obligation represents a debt to the firm and to what extent the market value of the firm reflects the amounts not provisioned. Feldstein and Morck (1983) show that the unfunded liabilities related to pension, estimated at an average interest rate, are valued by the market. Landsman (1986) also found that the obligation (calculated using the actuarial value of benefits that are vested and unvested) and assets of pension plans are recognized by the market as assets and liabilities of the company. Dhaliwal (1986) shows that market's risk perception of unfunded pension liability does not differ from that of other debt of the firm. Similarly, Landsman and Ohlson (1990) examine how off-balance sheet pension surplus or deficit is reflected in the prices of securities for the period between 1979 and 1982. Like Landsman (1986), the results of Landsman and Ohlson suggest that pension assets and obligation are relevant in determining the value of the firm. Feldstein and Seligman (1981) also find that securities prices reflect the unfunded liabilities of pension plans.

SFAS 87 improves the requirements of information and increased transparency of the accounting for defined benefit plans. Barth (1991) examines various measures of pension assets and pension liabilities disclosed in accordance with SFAS 87 to determine which retirement measures are used in the determination of security prices. The author shows that Vested Benefit Obligation (VBO), Accumulated Benefit Obligation (ABO) as well as Projected Benefit Obligation (PBO) are significantly relevant in the pricing of securities, and that ABO and PBO are significantly more relevant than VBO. Barth (1991) suggests that elements of retirement disclosed in notes to financial statements are more relevant in determining the prices of securities than pension elements disclosed in the balance sheet.

Barth, Beaver and Landsman (1992) examine the informational content of the components of pension expense and find that the coefficients of the components of pension costs that are not permanent, such as amortization of the transitional asset, are not significantly different from zero. The authors also find that the components of pension expense in the income statement have higher loading than other components unrelated to retirement. They concluded that the burden of retirement has a coefficient significantly higher than other components of the income statement. In a subsequent study, Barth et al. (1993) test whether the components of pension expense in the income statement and in the balance sheet transmit the same information, and conclude that they are redundant.

Gopalakrishnan and Sugrue (1993) show the existence of a significant relationship between the market value of firms sponsoring DBPP and pension obligations (PBO). They thus support the findings of Landsman (1986) that the rights of property of the pension fund belong entirely to the firm and investors perceive pension assets and liabilities as assets and liabilities of the firm.

Picconi (2006) shows that prices and profit forecasts do not reflect information on the DBPP at the time of disclosure. Instead, it appears that investors and analysts gradually incorporate this information into prices and forecasts as they observe the effects of changes in pension

benefits on the subsequent quarterly disclosure. This result appears to contradict prior findings of Landsman (1986) and Barth (1991).

In Canada, the adoption in 2000 of the new Section 3461 "Employee Future Benefits" has similar accounting implication than the SFAS 87. Wiedman and Wier (2004) study the effect of applying this new chapter on the value of Canadian firms. The authors do not get the same conclusion as most of the U.S. studies, that assets and pension liabilities are treated as assets and liabilities of firms. Indeed, they find that the average Canadian investors believe the funding deficit is a responsibility of the sponsoring companies while they do not consider the funding surplus as an asset for these companies. They explain this result by the legislative process in Canada that in most cases has found the plan sponsor responsible for the deficit while leaving the plan surplus to participants. However, as we mentioned before, their study is performed on a limited number of firms on a two year period only, corresponding to a recession period.

Other relevant research focused on actuarial choices. Different actuarial assumptions are made for accounting and also for tax purposes. Some research consider specifically on the tax actuarial assumptions and indicate that firms choose assumptions that maximize the tax deductible contribution (Tepper 1981, Asthana 1999). Further, Asthana (1999) argues that firms in a situation of surplus will make more conservative actuarial choices and firms in a situation of deficit will make more aggressive choices.

With respect to accounting actuarial choices, studies find that firms experiencing severe financial distress cease DBPP, while firms with fewer financial difficulties change their actuarial assumptions to reduce their contributions to the scheme and increase their liquidity (Mittelstaedt 1989, Thomas 1989). Similarly, Healy and Palepu (1990) find that firms are likely to change their pension actuarial assumptions to avoid violating a dividend payment covenant. For their part, Blankley and Swanson (1995) studied the choice of assumptions over a period of seven years from 1987 to 1993 and conclude that the overall evidence does not support the contention of widespread abuse of SFAS 87 implied in the business press.

In a subsequent study, Godwin, Goldberg and Duchac (1996) examine the factors that motivate managers to manage pension costs through changes in the discount rate. Their results suggest that managers increase the discount rate to limit the restrictions on dividends, increase profits and reduce debt. Gopalakrishnan and Sugrue (1995) find that debt and the funded status of pension plans significantly determine the choice of actuarial assumptions. Indeed, the authors conclude that firms with a deficit funded status and are highly leveraged are likely to choose a high discount rate and a low compensation growth rate.

Finally, few studies consider the impact of actuarial choice on market value. Brown (2006) examines the association between the disclosure of pension accounting information and the value of the firm. He is particularly interested in the managerial discretion in selecting actuarial assumptions to calculate pension obligations (PBO). The author argues that firms with pension deficits are more likely to choose less conservative actuarial assumptions and, therefore, disclose a lower pension obligation. Brown creates an actuarial choice variable measuring the degree of care managers in the choice of actuarial assumptions relating to the discount rate and rate of compensation increase. He concludes that managers of firms with a funding deficit situation opt for actuarial assumptions that reduce the pension obligations (PBO). The author

also concludes that the market is aware of the choices for the actuarial reduction of pension obligations.

Recently, Hann, Lu and Sabramanyam (2007) examine the effects of managerial discretion on the relevance of pension obligations. Specifically, the authors wonder if the managerial discretion, permitted by U.S. GAAP, in the choice of actuarial assumptions improves or reduces the relevance of pension obligations (PBO). The authors construct a measure of nondiscretionary PBO, based on the median discount rate and compensation growth of the industry. Thus, the difference between the nondiscretionary PBO and PBO disclosed represents the discretionary component of the PBO. The authors examine the relevance of both pension obligations with the market value of firms and find that the discretionary component is incrementally valued by the market in a similar manner to the nondiscretionary component in the incremental price association regressions. Overall, their results suggest that discretion does not impair the value relevance of the PBO; and that the discretionary component is incrementally value-relevant.

Based on prior research, it appears that funded status has an impact on actuarial choices although some of this evidence is related to the provisioning of the plan (Asthana 1999). We think that the same motivation would be valid for accounting actuarial choices; hence we state our first hypothesis:

Hypothesis 1: Underfunded (overfunded) firms tend to select liberal (conservative) actuarial assumptions;

Chapter 3461 requires more disclosure and more information that has a potential impact on lenders, one major users of accounting report. Hence, based on arguments of positive theory that managers want to move away from debt constraints (Beneish et Press, 1993; Healy, 1985; Press et Weintrop, 1990), we state our second hypothesis stated in the alternate form:

Hypothesis 2: High (low) leveraged firms tend to select liberal (conservative) actuarial assumptions;

Larger firms are politically more visible than smaller firms and, consequently, they are more likely to be controlled for their actions by regulators and politicians (Watts and Zimmerman, 1986; Hagerman and Zmijewski, 1979). The empirical evidence from this line of research seems consistent with the argument that large firms choose conservative actuarial choices to avoid visibility costs. Hence, based on the argument of visibility costs, we state our third hypothesis:

Hypothesis 3: Small (big) size firms tend to select liberal (conservative) actuarial assumptions;

Our next hypothesis follows directly from Wiedman and Wier (2004) who find a differential market impact depending on the pension plan funded status. We want to reinvestigate this potential difference over a longer period, and we state the following hypothesis stated in its alternate form:

Hypothesis 4: Market values pension deficit or surplus as if it was owned by the firm;

Finally, our last hypothesis concerns the actuarial choices and their impact on market valuation of pension information. We believe that market participants are able to see through these assumptions and correct their valuation for liberal or conservative choices. We therefore state the following hypothesis in its alternate form:

Hypothesis 5: Market takes into account liberal or conservative actuarial assumptions in valuing pension's information.

3. Methodology and Sample

We will use the following models for our analysis:

Determinants of actuarial choices

$$IR\_M_{it} = \alpha_0 + \alpha_1 PPFSR_{it} + \alpha_2 LEV_{it} + \alpha_3 ROA_{it} + \alpha_4 LIQUID_{it} + \alpha_5 AUDITOR_{it} + \alpha_6 SIZE_{it} + \alpha_7 SGR\_M_{it} + \alpha_8 ERA\_M_{it} + \eta_i + \mu_{it} \quad (1)$$

$$SGR\_M_{it} = \alpha_0 + \alpha_1 PPFSR_{it} + \alpha_2 LEV_{it} + \alpha_3 ROA_{it} + \alpha_4 LIQUID_{it} + \alpha_5 AUDITOR_{it} + \alpha_6 SIZE_{it} + \alpha_7 IR\_M_{it} + \alpha_8 ERA\_M_{it} + \eta_i + \mu_{it} \quad (2)$$

$$ERA\_M_{it} = \alpha_0 + \alpha_1 PPFSR_{it} + \alpha_2 LEV_{it} + \alpha_3 ROA_{it} + \alpha_4 LIQUID_{it} + \alpha_5 AUDITOR_{it} + \alpha_6 SIZE_{it} + \alpha_7 IR\_M_{it} + \alpha_8 SGR\_M_{it} + \eta_i + \mu_{it} \quad (3)$$

Where i is the firm (i=1,…,N); t is the time indicator that is equal to the number of years (t=1,…,T), η_i are the unobserved individual effects; and μ_i is an error term.

Equations (1) to (3) model actuarial choices, as the first step of our two stage least square. To better measure liberal or conservative actuarial choices, we take the difference of the firm's choice and its industry median for each of the actuarial assumptions (IR_M, SGR_M and ERA_M). We identify industry group using the 4 digit SIC code classification of Asthana (1999).

Following Asthana (1999) and Gopalakrishnan and Sugrue (1995), we assume that actuarial choices are a function of fund status ratio (PPFSR), firm's profitability (ROA) and firm's size (SIZE). From positive theory, we also believe proximity to debt constraints plays a role, so we introduce a leverage proxy (LEV). We also think managers select these hypotheses on a portfolio basis, so we introduce in each model the two other actuarial choices as control variables. Table 2 shows the definitions and the measurements of the variables used in the analysis.

To test our market hypotheses, we use the following model:

$$MV_{it} = \beta_0 + \beta_1 PA_{it} + \beta_2 ASSET_{it} + \beta_3 LIAB_{it} + \beta_4 PPASSET_{it} + \beta_5 PLIAB_{it} + \beta_6 PPFS_{it} + \beta_7 PPSPLUS_{it} + \beta_8 PPSPLUS * PPFS_{it} + \gamma_i + \varepsilon_{it} \quad (4)$$

Where i is the firm (i=1,…, N); t is the time indicator that is equal to the number of years (t=1,…,T), γ_i are the unobserved individual effects; and ε_i is an error term.

Since our data are time-series cross-sectional, we suspect the presence of autocorrelation and heteroscedasticity. Using the Breush-Pagan test and the Modified Wald test, we conclude respectively for the presence of serial correlation within panel and heteroscedasticity across panels in the error series. Therefore, OLS estimates will yield biased and inconsistent estimates of the parameters.

To tackle these econometric issues, the models (1)-(4) are estimated using the Generalized Least Square (GLS) procedure. When computing the standard errors and the variance-covariance estimates, the disturbances are assumed to be heteroskedastic and auto-correlated within panels. In model (4), the variable PA represents the "predicted actuarial assumption" measured using model (1) to (3). Based on prior research (Landsman 1986, Barth et al 1991, Gopalakrishnan and Sugrue 1993, Wiedman and Wier 2004 among others), we posit that firm's market value is function of its assets (ASSET) and liability (LIAB) as well as its pension plan asset and liability (PPASSET and PLIAB).

Our sample is drawn from all Canadian firms with a DBPP and data available in the Compustat annual industrial data base. We use Compustat to identify firms with pension information and gather financial information from Compustat. Our sample covers the 2000–2006 time periods. Data on pension assumptions had to be extracted from financial statements of each sample firm. Table 1 describes the sample. Our final sample comprises 190 firms. Table 2 lists all the variable definitions.

Table 1: Sample Description

Description	Number
Firms identified with a DBPP	231
Firms with a ratio of Plan Asset/Total Assets less than 1%	(29)
Firms with less than 5 million shares	(10)
Firms with missing market data for all 7 years	(2)
Total potential firms	190
Number of potential firm years (190 X 7)	1330

Table 2: Variable definitions and measurements

Variable	Description
Auditor	Categorical variables representing the quality of auditors hired by the firm, it takes the value of 1 if the auditor is a Big-Eight/Big-Six, 0 otherwise
Asset	Firm's total asset at year end divided by the number of shares outstanding.
ERA_M	Expected rate of return on asset actuarial assumption minus the industry group median.
IR_M	Interest rate actuarial assumption minus the industry group median.
Lev	Firm's leverage (Total debt divided by Total asset).
Liab	Firm's total liability.
Liquid	Firm's cash from operating activities divided by the number of shares outstanding.
PPAsset	Pension plan asset (measured at market value).
PPFS	Pension plan funded status (Pension asset-Pension obligation).
PPFSR	Pension plan funded status ratio (Pension asset/Pension obligation)
PPLiab	Pension plan liability (measured at market value).
PPSurplus	Categorical variable equal to 1 if the firm's pension plan is in surplus, and 0 if it is in deficit.
ROA	Return on asset ((Net income/total assets) x 100).
SGR_M	Salary growth actuarial assumption minus the industry group median.
Size	Firm's log of sales.

4. Empirical Results

Descriptive statistics appear on Table 3. We can see that pension fund status (PPFS) is on average negative most of the period (6 years out of 7), ranging from 0.56$ per share in 2000 to -1.22$ per share in 2005. Panel B displays the actuarial assumptions over the entire period. We notice that the interest rate assumption has decreased over the years, on average (maximum rate) from 6.94% (8.1%) in 2000 to 5.19% (6.1%) in 2006. This is consistent with the general movement in interest rate over the sample period. The salary growth assumption has been stable on over the period 2000-2004, and has substantially decreased afterward. Finally, the expected return on plan assets has also decreased over the period, but substantially less than the interest rate, the average (maximum) rate going from 7.8% (10%) in 2000 to 6.91% (9%) in 2006.

Table 3: Panel A - Descriptive Statistics

Variables	Stat	2000	2001	2002	2003	2004	2005	2006
MV	MIN	0.18	0.21	0.14	0.10	0.04	0.05	0.06
	MAX	463.90	140.74	116.15	213.86	162.63	161.47	223.01
	MEAN	19.17	16.74	15.07	18.32	20.53	22.65	24.52
	STD	42.90	20.16	15.50	22.27	20.75	21.75	25.09
PPAsset	MIN	0.00	0.00	0.02	0.00	0.03	0.02	0.01
	MAX	75.74	74.12	67.20	75.06	108.91	208.42	136.58
	MEAN	4.63	4.26	3.70	3.86	4.31	6.08	6.82
	STD	8.72	8.39	7.37	7.85	10.02	19.05	18.72
PPLiab	MIN	0.00	0.00	0.03	0.00	0.03	0.02	0.01
	MAX	70.56	77.06	81.96	90.46	126.18	258.42	148.51
	MEAN	4.28	4.34	4.42	4.47	4.95	7.35	7.55
	STD	8.26	8.72	8.96	9.37	11.68	23.56	20.79
Asset	MIN	1.08	0.97	0.97	0.19	0.12	0.09	0.33
	MAX	2429.84	2469.42	2482.89	2325.98	1969.12	1796.51	1746.49
	MEAN	63.91	63.70	64.27	61.63	61.96	64.66	69.71
	STD	214.25	215.49	215.69	200.59	179.70	173.38	179.64
Liab	MIN	0.52	0.22	0.16	0.08	0.08	0.10	0.22
	MAX	2171.82	2242.43	2231.74	2054.69	1729.14	1607.13	1558.74
	MEAN	51.31	51.92	51.46	48.91	48.51	50.46	53.98
	STD	194.52	198.62	196.54	180.49	161.29	156.95	161.24
PPFS	MIN	-1.83	-6.39	-14.75	-15.40	-17.27	-50	-16.95
	MAX	9.45	7.42	4.02	3.79	2.64	1.97	2.62
	MEAN	0.56	-0.06	-0.66	-0.60	-0.62	-1.22	-0.70
	STD	1.42	1.24	1.96	1.94	1.93	4.57	2.33
Size	MIN	2.09	3.30	2.69	0.37	-1.04	-1.23	-0.80
	MAX	11.18	11.43	10.22	10.28	10.31	10.35	10.49
	MEAN	7.04	7.09	7.06	7.00	7.07	7.12	7.19
	STD	1.79	1.72	1.71	1.79	1.90	1.94	1.86
Lev	MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	80.61	110.13	128.39	118.99	63.63	86.98	121.30
	MEAN	28.00	28.63	27.47	24.95	24.08	24.64	25.11
	STD	16.86	18.10	18.21	16.76	15.26	16.25	17.25
ROA	MIN	-214.76	-120.85	-25.16	-146.46	-100.74	-71.72	-65.40
	MAX	30.04	17.36	20.16	27.82	23.72	70.54	46.37
	MEAN	1.40	0.91	2.53	1.56	2.25	3.84	3.88
	STD	18.98	12.56	6.18	13.71	12.48	11.71	11.76
Liquid	MIN	-3.73	-94.15	-10.35	-12.49	-5.63	-30.81	-6.16
	MAX	21.56	18.71	21.24	32.15	39.79	38.28	63.70
	MEAN	2.24	1.01	1.94	2.22	2.46	2.49	2.97
	STD	2.95	8.05	2.96	4.04	3.98	4.81	5.77

Table 3 (Continued):
Panel B - Descriptive Statistics of Actuarial Assumptions

Year	Statistic	IR	SGR	ERA
2000	MIN	3.50	1.25	4.00
2000	MAX	8.10	7.00	10.00
2000	MEAN	6.94	4.00	7.80
2000	STD	0.53	0.83	0.82
2000	MEDIAN	7.00	4.00	7.96
2001	MIN	3.50	1.25	4.00
2001	MAX	7.50	7.00	10.00
2001	MEAN	6.74	4.00	7.70
2001	STD	0.46	0.74	0.89
2001	MEDIAN	6.75	4.00	7.80
2002	MIN	4.00	2.00	4.00
2002	MAX	7.50	7.00	9.50
2002	MEAN	6.55	3.92	7.47
2002	STD	0.41	0.65	0.75
2002	MEDIAN	6.50	4.00	7.50
2003	MIN	4.00	2.00	4.00
2003	MAX	7.00	7.00	9.00
2003	MEAN	6.18	3.82	7.29
2003	STD	0.41	0.70	0.73
2003	MEDIAN	6.25	4.00	7.38
2004	MIN	3.50	0.60	3.50
2004	MAX	7.00	6.10	9.00
2004	MEAN	5.90	3.69	7.17
2004	STD	0.41	0.66	0.75
2004	MEDIAN	6.00	3.73	7.20
2005	MIN	3.25	0.65	3.50
2005	MAX	6.25	5.00	9.00
2005	MEAN	5.19	3.65	7.02
2005	STD	0.38	0.59	0.77
2005	MEDIAN	5.20	3.50	7.00
2006	MIN	3.00	0.59	3.40
2006	MAX	6.10	5.32	9.00
2006	MEAN	5.19	3.59	6.91
2006	STD	0.39	0.59	0.83
2006	MEDIAN	5.20	3.50	7.00

To specifically test our Hypothesis 4, we add the plan funded status (PPFS), a dummy variable to account for plans that are in surplus (PPSURPLUS), and the interaction among these two variables. If it is true that Canadian market participants evaluate differently plan asset and liability when a pension plan is in deficit or surplus, the coefficients β6, β7, and β8 should be statistically different from zero. Models (1) to (4) are estimated simultaneously using a two-stage GLS procedure. Results appear on Tables 4 to 6. Table 4 displays the correlation among the principal variables. As expected there is a high correlation between pension plan asset and liability (PPASSET and PPLIAB). The correlation between the raw actuarial assumptions is not very high.

Table 4: Correlation Coefficients

This table shows the correlation coefficients for the variables used in our main regression models. The sample period is 2000-2006. The definitions of our variables appear in Table 2. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

VARIABLE	MV	PPASSET	PPLIAB	PPFSR	ASSET	LIAB	ROA	IR_M	SGR_M	ERA_M
MV	1.000									
PPASSET	0.499*	1.000								
PPLIAB	0.520*	0.987*	1.000							
PPFSR	-0.468*	-0.959*	-0.944*	1.000						
ASSET	0.262*	0.320*	0.373*	-0.368*	1.000					
LIAB	0.168*	0.411*	0.333*	-0.394*	0.076*	1.000				
ROA	-0.255*	-0.193*	-0.292*	0.195*	-0.436*	0.290*	1.000			
IR_M	-0.047*	-0.031*	-0.049*	-0.009*	-0.074*	0.123	0.069*	1.000		
SGR_M	0.052*	0.069*	-0.157**	0.152*	-0.034*	-0.044**	0.085*	0.152*	1.000	
ERA_M	0.144*	0.183*	0.091*	-0.293*	0.187*	0.034*	0.198*	0.203*	-0.107*	1.000

Table 5 displays the results of the estimation of models (1) to (3). All models (1) to (3) are statistically significant. The explanatory power of our models, as measured by Wald chi2 test, is highly significant (p- values< 0.000). In model (1) interest rate assumption is positively (0.1487; p<0.000) related to the funded status of the plan, contrary to our expectations. This result is surprising as we believe the impact on the pension status of the interest rate assumption is much greater than the one of the other two assumptions. It appears that the larger the surplus, the higher the interest rate assumption compared to the median. Asthana (1999) find the same result. However, according to our predictions, salary growth rate and the expected rate of return on asset are respectively positively (0.1581; p<0.000) and negatively (-0.2485; p<0.000) related to the plan funded status. This is consistent with our intuition that overfunded firms are more likely to select more conservative actuarial choices. Hence, our results do not fully support our Hypothesis 1. Further, the coefficient on leverage is statistically positive and significant for the interest rate assumption (0.0017; p<0.000) but not statistically significant for salary growth rate and expected rate of return on asset, which provides only partial support for our Hypothesis 2.

According to our predictions, size is significantly negatively related to the interest rate (0.0069; p<0.027) and positively related to the salary growth rate (0.0174; P<0.000) and not significantly related to the expected rate of return on asset. Hence results do not fully support our Hypothesis 3.

Among the other variables, the actuarial assumptions are related to each other. The choice of the discount rate, the salary growth rate, and the expected rate of return on asset are not independent of each other. Our evidence indicates that firms choose a “package” of actuarial assumptions that are favorable to them. Further, Cash Flows from operations is positively

related to interest rate and expected return on asset, and negatively related to salary growth, contrary to our expectations. Our control variable for auditor quality is not significant.

Table 5: Determinants of actuarial choices

This table presents the results of the regressions of our models (1)-(3) estimated with the GLS method, for our Sample of 190 firms over the period 2000-2006. See Table 2 for variable definitions. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Variables	Exp. sign	IR_M	Exp. sign	SGR_M	Exp. sign	ERA_M
CONSTANT		-0.1371***		0.3709***		-0.6622***
		(0.000)		(0.000)		(0.000)
PPFSR	-	0.1487***	+	0.1581***	-	-0.2485***
		(0.000)		(0.000)		(0.000)
LEV	+	0.0017***	-	0.0006	+	0.0001
		(0.000)		(0.160)		(0.845)
SIZE	-	-0.0069**	+	0.0174***	-	0.0980***
		(0.027)		(0.000)		(0.000)
IR_M			-	0.0810***	+	0.3431***
				(0.000)		(0.000)
SGR_M	-	0.0412***			-	-0.0771***
		(0.000)				(0.000)
ERA_M	+	0.1302***	-	-0.0860***		
		(0.000)		(0.000)		
ROA	-	0.0006***	+	0.0021***	-	0.0007
		(0.001)		(0.000)		(0.333)
LIQUID	-	0.0028***	+	-0.0061***	-	0.0046***
		(0.005)		(0.000)		(0.006)
AUDITOR	-	-0.0171	+	0.0887	-	0.1122***
		(0.196)		(0.102)		(0.000)
Wald Chi2		586.95		1791.44		516.60
Wald test		0.000***		0.000***		0.000***
N		913		913		913

Table 6 presents the results of the estimation of the second step of our two-stage model, i.e. the market valuation of the information about pension plans with a control for the pension actuarial assumptions (PA). Panel A displays model (4) including the control for interest rate assumption, Panel B incorporates the control for salary growth assumption, while model (4) with the control for expected rate of return on asset is in Panel C. Panel D incorporates all three actuarial assumptions as control variables.

Panel A, column 1 shows that coefficients on asset (0.7240; p<0.000), liability (-0.7141; p<0.000), pension plan asset (1.8660; p<0.000) and liability (-1.4120; p<0.000) have all the expected sign and are all significantly different from zero. In column 2, we replace pension plan asset and liability with pension plan status (PPFS). As expected the coefficient is positive and significant (0.9263; p<0.000). In column 3 and 4 we add pension plan surplus and the interaction variable. The interaction term of surplus with pension plan funded status (PPSPLUS*PPFS) is positive and significant (1.2578; p<0.000). Given that the coefficient on pension plan status (PPFS) is also positive and significant (0.5036; p<0.010), it appears that investors value positively the increase of pension plan surplus. Our results suggest that

Canadian investors appear to view the deficit arising from underfunded plans as a liability of the sponsoring firm and the surplus from overfunded plans as an asset of the firm.

From Panel B, focusing on pension plan funded status (PPFS), we notice that the coefficient is statistically different from zero in column 2 (0.7647; $p<0.000$) and 3 (0.8616; $p<0.000$). In addition, the interaction term of surplus with pension plan funded status (PPSPLUS*PPFS) is positive and significant in column 4 (0.7495; $p<0.028$). Given that the coefficient on (PPFS) is also positive and significant (0.7238; $p<0.050$), the result suggests that investors value positively the increase of pension plan surplus.

Panel C discloses results that are qualitatively similar to Panel A. The results show that investors consider pension plan surplus and pension plan deficits as assets and liabilities of the firm.

From panel D, pension plan funded status (PPFS) is positive and significantly different from zero. Colum 4 confirms results of Panel A, B and C that investors react positively to pension plan funded status. It follows that investors value positively the firm when surplus increases. This result is contrary to Wiedman and Wier (2004) and supports our Hypothesis 4 that investors value pension plan surplus as asset of the firm and pension plan deficits as liabilities of the firm. These findings support the financial perspectives theory put forward by Klumps (2001) which suggests that the surplus (or deficit) of the pension fund is part of the property of the firm that sponsors the pension plan and should be recorded in the employer's balance sheet.

From panel A, we clearly see that the interest rate assumption is negatively and significantly related to market value in columns 1 to 4 (from -5.9579 to -4.7618; $p<0.000$). This is consistent with investors lowering market estimate because of an aggressive actuarial assumption that has the consequence of increasing pension plan funding status.

Panel B shows that the coefficient on the salary growth assumption is positive and significant in columns 1 to 4 (from 4.9963 to 10.8683; $p<0.000$), indicating that market adjusts correctly for conservative assumption. In other words, the higher the salary growth rate compared to the median, the more conservative is the assumption. The result suggests that investors revalue upwards the market value of the firm when the difference between the salary growth rate and the median industry rate increases.

Panel C discloses results that are qualitatively similar to Panel A. First, the coefficient of the expected rate of return on asset is negative and significant, indicating that market adjusts correctly for liberal assumption. This result indicates that investors lower the market value of the firms when the difference between the expected rate of return and the median industry rate increases. Note that a higher expected rate of return reduces pension expense and therefore increases the earnings for the year.

Table 6: Market Valuation of Pension Information

This table presents the results of the regressions of our model 4 estimated with the two-stage GLS method, for our Sample of 190 firms over the period 2000-2006. See Table 2 for variable definitions. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Panel A - IR_M

Dependent Variable : MV

	(1)	(2)	(3)	(4)
Constant	8.4748***	9.4904***	9.2160***	8.6216***
	(0.000)	(0.000)	(0.000)	(0.000)
Predicted IR_M	-5.9579***	-4.7618***	-5.7592***	-5.5562***
	(0.000)	(0.000)	(0.000)	(0.065)
ASSET	0.7240***	0.7398***	0.7612***	0.7432***
	(0.000)	(0.000)	(0.000)	(0.000)
LIAB	-0.7141***	-0.7242***	-0.7482***	-0.7295***
	(0.000)	(0.000)	(0.000)	(0.000)
PPASSET	1.8660***			
	(0.000)			
PPLIAB	-1.4120***			
	(0.000)			
PPFS		0.9263***	0.9239***	0.5036***
		(0.000)	(0.000)	(0.000)
PPSPLUS			0.3157	-0.6727**
			(0.282)	(0.012)
PPSPLUS*PPFS				1.2578***
				(0.000)
Wald Chi2	2536.79	759.55	761.57	389.11
	0.000***	0.000***	0.000***	0.000***
N	913	913	913	913

Panel B - SGR

Dependent Variable : MV

	(A)	(B)	(C)	(D)
Constant	7.5607***	8.6521***	8.9015***	8.0641***
	(0.000)	(0.000)	(0.000)	(0.000)
Predicted SGR_M	4.9963***	7.1217***	9.5732***	10.8683***
	(0.000)	(0.001)	(0.001)	(0.000)
ASSET	0.7039***	0.7736***	0.7634***	0.8240***
	(0.000)	(0.000)	(0.000)	(0.000)
LIAB	-0.6895***	-0.7588***	-0.7466***	-0.8154***
	(0.000)	(0.000)	(0.000)	(0.000)
PPASSET	1.7444***			
	(0.000)			
PPLIAB	-1.3073***			
	(0.000)			
PPFS		0.7647***	0.8616***	0.7238**
		(0.000)	(0.000)	(0.050)
PPSPLUS			-0.5731	-1.3890***
			(0.144)	(0.001)
PPSPLUS*PPFS				0.7495**
				(0.028)
Wald Chi2	1396.67	733.58	748.98	717.41
	0.000***	0.000***	0.000***	0.000***
N	913	913	913	913

Table 6 (Continued):

Panel C - ERA_M				
Dependent Variable : MV				
	(A)	**(B)**	**(C)**	**(D)**
Constant	7.7760***	10.5250***	9.5448***	8.5726***
	(0.000)	(0.000)	(0.000)	(0.000)
Predicted ERA_M	-9.9118***	-10.0185***	-11.8665***	-10.3289***
	(0.000)	(0.000)	(0.001)	(0.000)
ASSET	0.8351***	0.8540***	0.8684***	0.8498***
	(0.000)	(0.000)	(0.000)	(0.000)
LIAB	-0.8441***	-0.8593***	-0.8745***	-0.8549***
	(0.000)	(0.000)	(0.000)	(0.000)
PPASSET	2.9035***			
	(0.000)			
PPLIAB	-2.2853***			
	(0.004)			
PPFS		1.4973***	1.3022***	0.8904***
		(0.000)	(0.001)	(0.000)
PPSPLUS			0.4190***	-0.1784
			(0.010)	(0.431)
PPSPLUS*PPFS				1.4649**
				(0.014)
Wald Chi2	3985.38	2099	4388.95	2120.04
	0.000***	0.000***	0.000***	0.000***
N	913	913	913	913

Panel D - IR_M, SGR_M, ERA_M				
Dependent Variable : MV				
	(A)	**(B)**	**(C)**	**(D)**
Constant	7.3475***	7.6106***	8.5184***	8.6363***
	(0.000)	(0.000)	(0.000)	(0.000)
Predicted IR_M	-	-	-12.3648***	-7.1034***
	12.1077***	12.1952***	(0.000)	(0.000)
	(0.000)	(0.000)		
Predicted SGR_M	3.3111***	3.6318***	3.5439***	3.0863
	(0.000)	(0.000)	(0.000)	(0.577)
Predicted ERA_M	-8.3685***	-2.3359***	-3.8225***	-1.6069***
	(0.000)	(0.000)	(0.000)	(0.000)
ASSET	0.6389***	0.7802***	0.7807***	0.7415***
	(0.000)	(0.000)	(0.000)	(0.000)
LIAB	-0.6257***	-0.7779***	-0.7763***	-0.7370***
	(0.000)	(0.000)	(0.000)	(0.000)
PPASSET	1.2465***			
	(0.000)			
PPLIAB	-0.8858***			
	(0.004)			
PPFS		0.7308***	1.1254***	0.4331***
		(0.000)	(0.001)	(0.000)
PPSPLUS			2.6066***	-0.9024***
			(0.214)	(0.000)
PPSPLUS*PPFS				1.5774***
				(0.000)
Wald Chi2	1643.08	8455.97	9328.13	8135.20
	0.000***	0.000***	0.000***	0.000***
N	913	913	913	913

To measure the impact of all three actuarial assumptions, we estimate model (4) with the 3 assumptions. The results are displayed in Panel D. We can see that the coefficient on all three actuarial assumptions have the expected sign, are statistically significant, and are consistent with market participants correcting appropriately for aggressive actuarial assumptions. This result supports our Hypothesis 5.

In sum, our findings support Hypothesis 4 and suggest that investors value pension plan surplus as asset of the firm and pension plan deficits as liabilities of the firm. They further indicate that investors take into account the impact of the actuarial assumption, and correct their valuation for liberal or conservative choices. This result supports our Hypothesis 5.

Robustness Checks

We have performed a number validation tests. First, we have performed our analysis excluding observations that are beyond three standard deviations from the mean. Results are qualitatively similar to those presented in Tables 4 to 6.

Secondly, we have estimated our model 4 using OLS instead of our two-stage least GLS procedure. Results are different and show weaker coefficients on actuarial assumptions, and therefore provide mixed support for our Hypothesis 4.

Finally, we have estimated model (4) by multiplying interest rate assumption and salary growth assumption by the pension plan liability (PPLIAB) and the expected return on asset by pension plan asset (PPASSET). We have transformed the variable to control for their impact depending on the size of the pension plan. The unreported results are qualitatively similar to those presented in Tables 4 to 6.

5. Conclusion

This paper examines the association between disclosed financial accounting data about define benefit pension plans and firm value while controlling for the effect of managerial discretion in the choice of actuarial assumptions to calculate pension information. We extend the study of Wiedman and Wier (2004) which is the only study available in the Canadian context. Unfortunately their study covers only a 2-year recession period. Their results suggest a different valuation depending on the funded status of the regime. Further, we complement Brown's (2006) research by integrating the impact of accounting assumptions on market value. Finally, our statistical method takes into account the endogeneity of these decision choices made by management. Our findings suggest that investors value pension plan surplus as assets of the firm and pension plan deficits as liabilities of the firm. They further indicate that managers opportunistically choose discount rate, compensation growth rate and expected rate of return, and investors take into account the impact of the actuarial assumptions, and adjust their valuation accordingly.

Although the results of this study help explain investor perceptions numbers and pension actuarial assumptions disclosed in the statements and notes to financial statements, extensive future research on DBPP are needed to better explain the potential impact of regulation on pension actuarial choice in the Canadian context. Indeed, in Canada, the regulation of DBPP is particularly complex, each province has its own laws and regulations that may be different from

one province to another. It would be interesting to examine in further research, the determinants of actuarial choices and market perception of pension accounting information according to whether the pension scheme is under federal or provincial jurisdiction. Moreover, it would more appropriate to tackle the endogeneity problem of the choice of actuarial assumptions using the Generalized Method of Moments (GMM) statistical procedure.

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