ACTUARIAL REPORT 23rd

on the

CANADA PENSION PLAN

as at 31 December 2006

Canada

18 October 2007

The Honourable James M. Flaherty, P.C., M.P.
Minister of Finance
House of Commons
Ottawa, Canada
K1A 0G5

Dear Minister:

In accordance with section 115 of the *Canada Pension Plan*, which provides that an actuarial report shall be prepared every three years for purposes of the contribution rates review by the Minister of Finance and the ministers of the Crown of the provinces, I am pleased to submit the Twenty-Third Actuarial Report on the Canada Pension Plan, prepared as at 31 December 2006.

Yours sincerely,
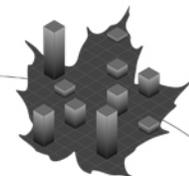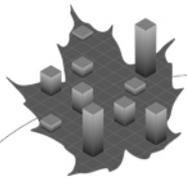
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Chief Actuary

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I. Executive Summary

This is the Twenty-Third Actuarial Report since the inception of the Canada Pension Plan (CPP) in 1966. It presents the financial status of the Plan as at 31 December 2006. The previous triennial report was the Twenty-First Actuarial Report as at 31 December 2003, which was tabled in the House of Commons on 8 December 2004.

The Canada Pension Plan was subject to a series of amendments since the Twenty-First Actuarial Report pursuant to the adoption of Bill C-36. Bill C-36 amends the *Canada Pension Plan* to bring into operation the existing full funding provision for benefit enhancements or new benefits that is set out in section 113.1(4)*d)* of the Act. The effects of these amendments were covered in the Twenty-Second Actuarial Report, which was tabled on 4 December 2006 in the House of Commons. Bill C-36 received Royal Assent on 3 May 2007. According to the legislation, the formal approval of at least two-thirds of the provinces representing two-thirds of the population is required in order for amendments to the CPP to come into force. This is in process and should be completed in due course. The amendments introduced by Bill C-36 are included in the financial projections of this report and are assumed to come into force on 1 January 2008.

Bill C-36 highlights that the Plan is subject to two financing objectives:

Steady-state funding which replaces the original pay-as-you-go financing to build a reserve of assets equivalent over time to about five and a half years of benefit expenditures or about 25 per cent of Plan liabilities.

Incremental full funding which requires that changes to the CPP that increase benefits or add new benefits be fully funded.

Both of these funding principles were introduced to improve fairness and equity across generations. The move to steady-state funding eases some of the contribution burden on future generations. Under full funding, each generation that receives benefit enrichments is more likely to pay for it in full so that its costs are not passed on to future generations.

A. Purpose of the Report

This report has been prepared in compliance with the timing and information requirements of the *Canada Pension Plan*. Section 113.1 of the Act provides that the Minister of Finance and ministers of the Crown of the provinces shall review the state of the CPP once every three years, and may consequently make recommendations to change the benefits or contribution rates, or both. Section 113.1 identifies the factors they consider in their review, including information to be provided by the Chief Actuary.

An important purpose of the report is to inform contributors and beneficiaries of the current and projected financial status of the Plan. It provides information to evaluate its financial sustainability over a long period, assuming the Act remains unchanged. Such information should facilitate a better understanding of the financial status of the Plan and the factors that influence costs, thus contributing to an informed public discussion of issues related to it.
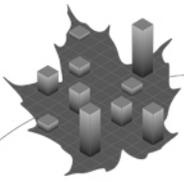
B. Scope of the Report

Section II presents a general overview of the methodology used in preparing the actuarial estimates included in this report, which are based on the key best-estimate assumptions described in Section III. The results are presented in Section IV and include the projections of the income, expenditures and assets of the Plan over the next 75 years. Section V presents the reconciliation of the results with those presented in the Twenty-First report. Section VI deals with the uncertainty of results and presents financial results under two alternative scenarios. Section VI also presents the impact of financial market volatility on the financial status of the Plan and a sensitivity analysis of the key best-estimate assumptions based on stochastic approaches. Section VII presents a general conclusion about the financial status of the Plan, while Section VIII consists of the actuarial opinion.

The various appendices provide supplemental information on the long-term financial sustainability of the Plan, the Plan provisions, a detailed reconciliation of the results with the previous report and a description of the data, assumptions and methods employed.

C. Main Findings

The results of the actuarial projections of the financial status of the Canada Pension Plan presented in this report are generally consistent with the trends revealed in the previous triennial actuarial report.

- The minimum contribution rate, which is the lowest rate sufficient to sustain the Plan with respect to the two financing objectives without further increase, is 9.82% of contributory earnings for years 2010 and thereafter. The minimum contribution rate of 9.82% consists of the steady-state contribution rate of 9.80% to finance the Plan without Bill C-36 and a contribution rate of 0.02% to fully fund the increase in eligibility for disability benefits with respect to long-term contributors generated by the amendments introduced by Bill C-36.

- With the minimum contribution rate of 9.82%, the assets are expected to increase significantly over the next 13 years, with the ratio of assets to the following year's expenditures growing from 4.1 in 2006 to 5.4 by 2019 and to 5.6 by 2050. From 2050 to 2075 the ratio decreases from 5.6 to 5.3.

- With the legislated contribution rate of 9.9%, total assets are expected to grow from $114 billion at the end of 2006 to $235 billion by the end of 2015.

- With the legislated contribution rate of 9.9%, contributions are more than sufficient to cover the expenditures over the period 2007 to 2019. Thereafter, a proportion of investment earnings is required to make up the difference between contributions and expenditures. In 2050, 31% of investment earnings is required to pay for benefits.

- With the legislated contribution rate of 9.9%, the assets are expected to increase significantly over the next 13 years, with the ratio of assets to the following year's expenditures growing from 4.1 in 2006 to 5.5 by 2019 and 6.0 by 2050. From 2050 to 2075 the ratio grows from 6.0 to 6.4.

- The number of contributors is expected to grow from 12.3 million in 2007 to 15.3 million by 2050. Contributions are expected to increase from $33 billion in 2007 to $37 billion in 2010 and $56 billion in 2020.

D. Uncertainty of Results

To measure the sensitivity of the long-term projected financial position of the plan to future changes in the demographic and economic environment, three types of sensitivity tests were performed.

For the first set of sensitivity tests, two demographically based scenarios were developed that portray a generally younger and older population. The economic outlook under both demographic alternatives was also adjusted to reflect the anticipated effects of a modified demographic environment on the main economic variables that affect the Plan. The younger and older population scenarios produced minimum contribution rates of 9.07% and 10.69%, respectively.

The second set of sensitivity tests focus on the impact that equity market shocks and alternate investment portfolios could have on the financial sustainability of the Plan. The change in the minimum contribution rate caused by an equity shock depends on the magnitude of the shock and the proportion of the portfolio invested in equities. Assuming the best-estimate portfolio of the CPP and a nominal equity return of -10% in 2009 and 2010, the assets of the CPP would be reduced by $28 billion by the end of 2010, which is comparable to nine months of contributions paid to the Plan in 2010. As well, the minimum contribution rate would increase by 0.16% to 9.98%.

On the other hand, the impact of an equity market shock, as described above, is much larger when considering a riskier portfolio invested in 80% equity. In this case, the variation of the minimum contribution rate is much higher due to volatility in the equity markets and the rate would increase from 9.59% to 9.81%, an increase of 0.22% (compared to 0.16% under the best-estimate portfolio). As well, the assets of the CPP would be reduced by $35 billion by the end of 2010, which is equivalent to the total contributions paid to the Plan in 2010.

The final set of sensitivity tests focus on varying the key assumptions individually in order to measure the impact on the financial status of the Plan. These tests show that the minimum contribution rate could deviate significantly from its best-estimate of 9.82% if other than best-estimate assumptions were to be realized. For example, if life expectancies at age 65 were to increase by three more years than the best-estimate of this report by 2050, then the minimum contribution rate would increase to 10.20%. Furthermore, if early retirement were to increase at age 60 by another 20 basis points, then the minimum contribution rate would increase to 10.02%, which is above the legislated rate of 9.9%.
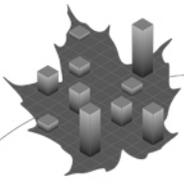
E. Conclusion

The results contained in this report confirm that the legislated contribution rate of 9.9% for years 2010 and thereafter is sufficient to pay future expenditures and to accumulate assets worth $235 billion (i.e. 5.2 times the annual expenditures) in 2015. In 2050, the assets are projected to be $1,432 billion or 6.0 times the annual expenditures.

The minimum contribution rate required to financially sustain the Plan under this report is 9.82% for years 2010 and thereafter. The minimum contribution rate, with respect to the two financing objectives, consists of a steady-state contribution rate of 9.80% to financially sustain the Plan without the amendments introduced by Bill C-36 and a contribution rate of 0.02% to fully fund the increase in benefits resulting from these amendments.

Better-than-anticipated experience, especially regarding investment performance, labour force participation and employment data, over the period 2004 to 2006 has put downward pressure on the minimum contribution rate. On the other hand, a more costly demographic outlook, due to the continuing increases in longevity, combined with an unexpected increase in the number of early retirement benefit uptake, lower inflation expectations and lower rates of return on investments have put upward pressure on the minimum contribution rate. Overall, the minimum contribution rate of 9.82% is slightly higher than was reported in the previous report.

Under the 9.9% legislated contribution rate, the assets are projected to grow rapidly over the next 13 years as contribution revenues are expected to exceed expenditures over that period. Assets will continue to grow until the end of the projection period, but at a slower pace, and the ratio of assets to the following year's expenditures (asset/expenditure ratio) is expected to reach a level of 6.0 by 2050 and 6.4 by 2075. These are indicators that the Plan is financially sustainable over the long term. The pool of assets generated over the projection period provides the Plan with the capacity, through investment earnings, to absorb some, but not all, of the possible unforeseen economic or demographic fluctuations, which otherwise would have to be reflected in the legislated contribution rate. Thus, despite the projected substantial increase in benefits paid as a result of an aging population, the Plan is expected to be able to meet its obligations throughout the projection period.

II. Methodology

The actuarial examination of the Canada Pension Plan involves projections of its revenues and expenditures over a long period of time, so that the future impact of historical and projected trends in demographic and economic factors can be properly assessed. The actuarial estimates in this report are based on the current provisions of the Plan as well as the amendments of Bill C-36, data regarding the starting point for the projections and "best-estimate" assumptions regarding future demographic and economic experience.

The revenues of the Plan include both contributions and investment earnings. The projection of contributions begins with a projection of the working-age population. This requires assumptions regarding demographic factors such as fertility, migration and mortality. Total contributory earnings are derived by applying labour force participation and job creation rates to the projected population and by projecting future employment earnings. This requires assumptions such as wage increases, an earnings distribution and unemployment rates. Contributions to the Plan are obtained by applying the contribution rate to contributory earnings. Investment earnings are projected on the basis of the existing portfolio of assets, projected net cash flows and the assumed rates of return on investments.

Expenditures are made up of the benefits paid out and administrative expenses. Newly emerging benefits are projected by applying demographic assumptions regarding retirement, disability and death to the eligible populations, together with the benefit provisions and the earnings histories of the participants. The projection of total benefits, which includes the continuation of benefits already in payment at the valuation date, requires further assumptions, along with an assumption regarding the rate of increase in prices. Administrative expenses are projected based on historical experience.

The assumptions and results presented in the following sections make it possible to measure the financial status of the Plan in each projection year and to calculate the minimum contribution rate, which consists of two components. The first component is applicable to the Plan excluding the amendments of Bill C-36 and is referred to as the steady-state contribution rate. It is defined as the lowest level contribution rate applicable after the end of the review period, to the nearest 0.001%, that results in the asset/expenditure ratio being the same in the 10th and 60th year following the end of the review period. For this Report, the end of the review period is 2009. Therefore, the steady-state contribution rate is applicable for years 2010 and thereafter and the relevant years for the determination of the steady-state contribution rate are 2019 and 2069. The second component of the minimum contribution rate consists of the full funding rate required to fully fund the amendments of Bill C-36 in respect of disability benefits. Both the steady-state rate and the full funding rate are rounded to the nearest 0.01%.

A wide variety of factors influence both the current and projected financial position of the Plan. Accordingly, the results shown in this report differ from those shown in previous reports. Likewise, future actuarial examinations will reveal results that differ from the projections included in this report.
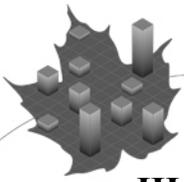
III. Best-Estimate Assumptions

A. Introduction

The information required by statute, which is presented in Section IV, requires making several assumptions regarding future demographic and economic trends. The projections included in this report cover a long period of time (75 years) and the assumptions are determined by putting more emphasis on historical trends than on short-term trends. These assumptions reflect our best judgement and are referred to in this report as the "best-estimate" assumptions. The assumptions were chosen to form a coherent whole, taking into account certain interrelationships among them.

An independent panel of actuaries reviewed the Twenty-First Actuarial Report and released a report in March 2005. The Review Panel concluded that the Twenty-First Actuarial Report on the CPP was competently prepared and that it presented a reasonable set of results. The Review Panel found that the Twenty-First Actuarial Report was prepared in accordance with professional standards and that the assumptions used by the Chief Actuary were in the aggregate within the reasonable range. The Review Panel report made a series of recommendations dealing with data, methodology, assumptions and communication of results. The Government Actuary's Department (GAD) of the United Kingdom provided the opinion that the reviewers were suitably qualified to carry out the review and that the work carried out for the review and the review document adequately addressed the issues set out in the terms of reference. For the Twenty-Third Actuarial Report, the Office of the Chief Actuary (OCA) acted on the review panel's recommendations.

The Chief Actuary held a seminar on the demographic and economic outlook for Canada to obtain opinions from a wide range of individuals with relevant expertise. The seminar was held in March 2006. Four experts in the fields of demography and economics were invited to present their views. Amongst the participants at the seminar were representatives of the OCA, Human Resources and Social Development Canada and the Department of Finance, as well as representatives from provincial and territorial governments. Furthermore, representatives of the OCA attended a seminar held by the Québec Pension Plan (QPP) in September 2006. The various papers presented at both seminars are available from the OCA's website.

Table 1 presents a summary of the most important assumptions used in this report compared with those used in the previous triennial report. The assumptions are described in more detail in Appendix D of this report.
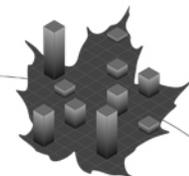
Table 1 Best-Estimate Demographic and Economic Assumptions

Canada	23rd Report (as at 31 December 2006)		21st Report (as at 31 December 2003)	
Total fertility rate	1.6 (2010+)		1.6 (2016+)	
Mortality	2000-02 Life Tables for Canada with future improvements		1995-97 Life Tables for Canada with future improvements	
Canadian life expectancy at birth in 2007 at age 65 in 2007	Males 84.5 years 19.3 years	Females 87.7 years 22.0 years	Males 83.1 years 17.6 years	Females 86.5 years 21.6 years
Net migration rate	0.50% of population to 2015 0.54% of population for 2020+		0.50% of population to 2015 0.54% of population for 2020+	
Participation rate (aged 15-69)	74.2% (2030)		73.4% (2030)	
Employment rate (aged 15-69)	69.9% (2030)		68.6% (2030)	
Unemployment rate	6.3% (2006+)		6.5% (2020+)	
Rate of increase in prices	2.5% (2016+)		2.7% (2015+)	
Real-wage differential	1.3% (2015+)		1.2% (2012+)	
Real rates of return	4.2% (2016+)		4.1% (2011+)	
Retirement rates for cohort at age 60	Males Females	40.0% (2009+) 45.0% (2009+)	Males Females	32.0% (2030+) 38.2% (2030+)
CPP disability incidence rates (per 1,000 eligible)	Males Females	3.1 (2011+) 3.5 (2011+)	Males Females	3.25 (2008+) 3.50 (2008+)

B. Demographic Assumptions

The demographic projections start with the Canada and Québec populations on 1 July 2006, to which are applied fertility, migration and mortality assumptions. The relevant population for the Canada Pension Plan is Canada less Québec and is obtained by subtracting the projected results for Québec from those for Canada. The population projections are essential in determining the future number of CPP contributors and beneficiaries.

1. Fertility

The first cause of the aging of the Canadian population is the large drop in the total fertility rate over the last three decades, relative to the baby boom generation born between the mid-1940s to the mid-1960s. The fertility rate in Canada has dropped rapidly from an average level of about 4.0 per woman in the 1950s to 1.8 in the late 1970s and to 1.6 over the last two decades. The same observations can be made for Québec except that fertility rates were slightly lower.

The decrease occurred as a result of changes in a variety of social, medical and economic factors. It is unlikely that fertility rates will return to historical levels in the absence of significant societal changes. It is assumed that the total fertility rate for Canada will increase slightly from its 2004 level of 1.53 (1.51 in 2005 for Québec) to an ultimate level of 1.60 in 2010 (1.57 for Québec). As a result, the total fertility rate for Canada less Québec is assumed to be 1.61 in 2010 and thereafter.
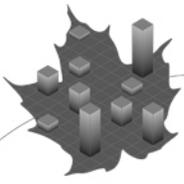
2. Mortality

Another element that has contributed to the aging of the population is the significant reduction in age-specific mortality rates. This can be best measured by the increase in life expectancy at age 65, which directly affects how long retirement benefits will be paid to beneficiaries. Male life expectancy at age 65 increased 28% between 1966 and 2004, rising from 13.8 to 17.7 years. For women, life expectancy at age 65 increased 25%, from 16.8 to 21.0 years over the same period. Although the overall rates of increase in life expectancy since 1966 are similar for males and females, more than half of the increase in life expectancy at age 65 occurred after 1989 for males, while for females, 70% of the increase occurred prior to 1990.

Mortality improvements are expected to continue in the future, but at a slower pace than observed over the last 15 years. The ultimate rates of improvement for years 2029 and thereafter were established by looking at trends in Canadian experience over the last 30 years by age and sex. Rates of improvement for the period 2005 to 2009 are assumed to be those experienced over the last 15 years (1989 to 2004). After 2009, the rates are assumed to gradually reduce to their ultimate levels by year 2029.

3. Net Migration

Net migration (i.e. the excess of immigration over emigration) is unlikely to materially reduce the continued aging of the population unless (1) the level of immigration rises significantly above what has been observed historically and (2) the average age at immigration falls dramatically.

Net migration to Canada was 0.65% of the population in 2006 and has averaged 0.50% of the population over the last 30 years. Based on a continuation of these net migration levels and the expected pressure on the labour market due to the impending retirement of the baby boom generation, an ultimate assumption of 0.54% of the population has been established for years 2020 and beyond. The initial level of 0.50% is kept constant from 2007 until 2015, then increases uniformly to reach an ultimate level of 0.54% for 2020 and thereafter to take into account the effects of the anticipated labour shortage. The ultimate 0.54% assumption remains lower than actual averages observed over the last 20 years. To project the Québec population, a net migration rate of about 0.4% is assumed over the projection period.

4. Population Projections

Table 2 shows the population for three age groups (0-19, 20-64 and 65 and over) throughout the projection period. The ratio of people aged 20-64 to those aged 65 and over is a measure that approximates the number of working-age people to retirees. Because of the aging population, this ratio drops by more than half during the projection period, from 4.8 in 2007 to 2.2 in 2050.
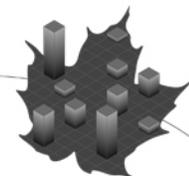
Table 2   Population of Canada less Québec
(thousands)

Year	Total	Age 0-19	Age 20-64	Age 65 and Over	Ratio of 20-64 to 65 and Over
2007	25,209	6,066	15,829	3,314	4.8
2008	25,452	6,048	16,002	3,401	4.7
2009	25,697	6,029	16,176	3,491	4.6
2010	25,946	6,009	16,355	3,582	4.6
2011	26,195	5,996	16,513	3,687	4.5
2012	26,445	5,990	16,619	3,836	4.3
2015	27,193	6,002	16,924	4,266	4.0
2020	28,453	6,147	17,242	5,064	3.4
2025	29,669	6,390	17,284	5,994	2.9
2030	30,762	6,538	17,295	6,929	2.5
2040	32,522	6,580	18,051	7,891	2.3
2050	33,922	6,780	18,614	8,529	2.2
2075	37,189	7,354	20,150	9,685	2.1

C. Economic Assumptions

The main economic assumptions related to the Canada Pension Plan are labour force participation rates, job creation rates, unemployment rates and average employment earnings increases. For benefit and asset projection purposes, assumptions regarding the rate of increase in prices and rates of return on invested assets are also required.

One of the key elements underlying the best-estimate economic assumptions relates to the expected labour shortage due to the aging of the population and the retirement of the baby boom generation between 2010 and 2030. Labour force growth will weaken as the working age population expands at a slower pace. The outlook for the participation rates also points to slower labour force growth. Growing labour shortages, especially after 2010, are assumed to force higher real wage growth. The higher real wages may help keep people in the labour force who might otherwise retire.

1. Labour Force

Employment levels are reflected in the projections through the assumption regarding the proportion of the population, by age and sex, with earnings in a given year. These proportions vary not only with the rate of unemployment, but also reflect trends in increased workforce participation by women, longer periods of formal education among young adults and changing retirement patterns of older workers.

As the population ages it becomes more heavily weighted in age groups where participation is lower and, as a result, the labour force participation rates for Canadians aged 15 and over are
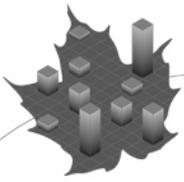
expected to decline from 67.1% in 2007 to 61.6% by 2030. A more useful measure of the working age population is the participation rate of those aged 15 to 69, which is expected to decline from 74.7% in 2007 to 74.2% in 2030. The participation rates of those aged 60 to 69 are gradually increased after 2006. Moreover, the narrowing of the gap between the age-specific participation rates of men and women continues but at a much slower pace than in the past, except for certain age groups.

Recent significant increases were experienced in both younger and older age groups for both males and females. In general, participation rates for females are projected to increase more than for males, primarily for those aged 30 to 49. Overall, the male participation rate of those aged 15 to 69 is expected to decrease from 79.2% in 2007 to 78.3% in 2030, while the female participation rate for the same age group is expected to remain at 70.1% during the same period. Therefore the current gap of 9.1% between males and females is expected to slightly decrease to 8.2%.

The job creation rate in Canada was, on average, 1.8% from 1976 to 2006 based on available employment data; it is assumed that the number of jobs increases by 1.0% in 2007. The job creation rate is, on average, about 0.8% from 2008 to 2010 and 0.4% from 2010 to 2020. For 2020 and thereafter, the job creation rate follows the labour force growth rate and is about 0.3% due to the aging of the population.

The job creation rate is determined on the basis of the short-term economic outlook and the unemployment rate which is set at 6.3% for years 2007 and thereafter. The relative stability of the labour force makes it possible for the unemployment rate to remain at 6.3% throughout the projection period.

2. Price Increases

Price increases, as measured by changes in the Consumer Price Index, tend to fluctuate from year to year. Based on the renewed commitment of the Bank of Canada and the Government to keep inflation between 1% and 3% until 2011, a rate of price increase of 2.0% has been assumed for years 2007 to 2011. Beginning in 2011, the rate is uniformly increased until it reaches an ultimate rate of 2.5% in 2016.

3. Real Wage Increases (Average Annual Earnings)

Wage increases affect the financial balance of the Canada Pension Plan in two ways. In the short term, an increase in the average wage translates into higher contribution income, with little immediate impact on benefits. Over the longer term, higher average wages produce higher benefits. The long-term projected financial status of the Plan is more dependent on the differential between the assumed annual rate of wage increases and price increases (the real-wage differential) than on the level of wage increases.

Many factors have influenced the real rate of increase in average annual wages, including general productivity improvements, the move to a service economy, decreases in the average hours worked and fluctuation in the size of the workforce. Considering these factors, along with historical trends, the expected labour shortage and various long-term economic forecasts, an ultimate real wage differential of 1.3% is assumed for 2015 and thereafter. Combined with

the price increase assumption described above, this results in an assumed annual increase in wages of 3.8% in 2016 and thereafter.

The assumptions with respect to the increase in average annual earnings and job creation rates result in projected average annual real increases in total employment earnings of about 1.7% for the period 2007 to 2020. This decreases to about 1.6% ultimately, reflecting the 1.3% real increase in annual wages and the 0.3% annual growth in the working-age population.

4. Rates of Return on Investments

Real rates of return are the excess of the nominal rates of return over the rates of price increase and are required for the projection of revenues arising from investment earnings. A real rate of return is assumed for each year in the projection period and for each of the main asset categories in which CPP assets are invested. The assumed long-term real rate of return on CPP assets takes into account the assumed asset mix of investments as well as the assumed real rate of return for all categories of CPP assets. The real rates of return on investments are net of investment expenses.

For the period 2007 to 2015, the annual real rates of return are slightly lower than the assumed ultimate real rate of return of 4.2% due to a lower equity risk premium during that period. The ultimate equity risk premium of 2.3% is reached in 2016. The long-term real rate of return on CPP assets of 4.2% is comparable to historical real rates of return for large pension plans.

D. Other Assumptions

This report includes several other assumptions, such as retirement rates and disability incidence rates.

1. Retirement Rates

The sex-distinct retirement rates for any given age between 60 and 70 correspond to the number of emerging retirement beneficiaries divided by the product of the population and the retirement benefit eligibility rates for the given age. The normal retirement age under the Canada Pension Plan is 65. However, since 1987 a person can choose to receive a reduced retirement pension as early as age 60. This provision has lowered the average age at benefit uptake from 65.2 in 1986 to 62.3 in 2006.

Retirement rates at age 60 for cohorts reaching age 60 in 2009 and thereafter are assumed to be 40% and 45% for males and females, respectively and 36% and 30%, respectively at age 65. These rates reflect trends in recent experience.
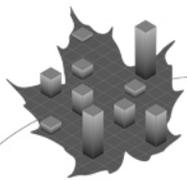
2. Disability Incidence Rates

The sex-distinct disability incidence rates at any given age are the number of new disability beneficiaries divided by the total number of people eligible for the disability benefit. Based on historical Plan experience, the ultimate overall incidence rates for years 2011 and thereafter have been assumed to be 3.1 per thousand eligible for males and 3.5 per thousand eligible for females. The ultimate incidence rates for males is slightly lower than in the previous actuarial report and recognizes that the overall male incidence rate has recently been about 0.4 per thousand lower than the female incidence rate. These rates are further adjusted to account for the effects of Bill C-36.

The assumption recognizes that although incidence rates have been relatively stable since 1997 the current rates lie significantly below the levels experienced in the mid-1970s to early 1990s.

Table 3 summarizes the main economic and investment assumptions over the projection period.

Table 3   Economic and Investment Assumptions

Year	Real Increase Average Annual Earnings	Real Increase Average Weekly Earnings	Price Increase	Labour Force				Real Rate of Return on Investments
				Participation Rate	Job Creation Rate	Unemployment Rate	Labour Force Annual Increase	
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
2007	0.2	0.2	2.0	67.1	1.0	6.3	1.0	3.8
2008	0.4	0.4	2.0	66.9	0.9	6.3	0.9	3.7
2009	0.6	0.6	2.0	66.7	0.8	6.3	0.8	3.6
2010	0.8	0.8	2.0	66.5	0.8	6.3	0.8	3.5
2011	0.9	0.9	2.0	66.3	0.7	6.3	0.7	3.4
2012	1.0	1.0	2.1	66.1	0.6	6.3	0.6	3.5
2013	1.1	1.1	2.2	65.8	0.5	6.3	0.5	3.7
2014	1.2	1.2	2.3	65.6	0.5	6.3	0.5	3.9
2015	1.3	1.3	2.4	65.3	0.4	6.3	0.4	4.2
2016	1.3	1.3	2.5	65.1	0.4	6.3	0.4	4.4
2020	1.3	1.3	2.5	63.9	0.3	6.3	0.3	4.3
2025	1.3	1.3	2.5	62.5	0.3	6.3	0.3	4.2
2030	1.3	1.3	2.5	61.6	0.4	6.3	0.4	4.2
2040	1.3	1.3	2.5	60.3	0.3	6.3	0.3	4.2
2050	1.3	1.3	2.5	59.5	0.1	6.3	0.1	4.2

IV. Results

A. Overview

The results of the actuarial projections of the financial status of the Canada Pension Plan presented in this report are generally consistent with the trends revealed in the previous triennial actuarial report. The key observations and findings are described below.

- With the legislated contribution rate of 9.9%, total assets are expected to grow from $114 billion at the end of 2006 to $235 billion by the end of 2015.

- With the legislated contribution rate of 9.9%, contributions are more than sufficient to cover the expenditures during the period 2007 to 2019. Thereafter, a proportion of investment earnings is required to make up the difference between contributions and expenditures. In 2050, 31% of investment earnings is required to pay for benefits.

- With the legislated contribution rate of 9.9%, investment earnings, which represent 17% of revenues (i.e. contributions and investment earnings) in 2007, will represent 28% of revenues in 2020. In 2050, investment earnings represent 31% of revenues. This clearly illustrates the importance of investment earnings as a source of revenue for the Plan.

- With the legislated contribution rate of 9.9%, the assets are expected to increase significantly over the next 13 years, with the ratio of assets to the following year's expenditures growing from 4.1 in 2006 to 5.5 by 2019 and 6.0 by 2050. From 2050 to 2075 the ratio grows from 6.0 to 6.4.

- The minimum contribution rate, which is the lowest rate sufficient to sustain the Plan without further increase, is 9.82% of contributory earnings for years 2010 and thereafter. The minimum contribution rate of 9.82% consists of the steady-state contribution rate of 9.80% to finance the Plan without Bill C-36 and a contribution rate of 0.02% to fully fund the increase in eligibility for disability benefits with respect to long term contributors generated by the amendments of Bill C-36.

- With the minimum contribution rate of 9.82%, applicable for years 2010 and thereafter, the assets are expected to increase significantly but at a lower level then under the legislated contribution rate. The ratio of assets to the following year's expenditures is projected to grow from 4.1 in 2006 to 5.4 by 2019 and 5.6 by 2050. From 2050 to 2075 the ratio decreases from 5.6 to 5.3. However, using the legislated contribution rate of 9.9%, the ratio increases from 6.0 to 6.4 during the period 2050 to 2075.

- Although the pay-as-you-go rate is expected to increase steadily from 8.4% in 2007 to 11.5% by the end of the projection period due to the retirement of the baby boom generation, the legislated contribution rate of 9.9% remains sufficient to sustain the Plan in the long term. The pay-as-you-go rate is the rate that would need to be paid if there were no assets.
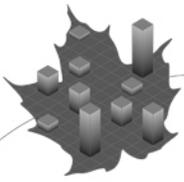
- Demographic changes will have a major impact on the ratio of workers to retirees; the ratio of the number of individuals aged 20 to 64 to those aged 65 and over is expected to fall from about 4.8 in 2007 to 2.2 in 2050.

- The number of contributors is expected to grow from 12.3 million in 2007 to 15.3 million by 2050. Contributions are expected to increase from $33 billion in 2007 to $37 billion in 2010 and $56 billion in 2020.

- By 2050, there will be 9.6 million retirement beneficiaries compared to 3.5 million today (7.1 million by 2025).

- Expenditures are expected to grow rapidly from $28 billion in 2007 to $33 billion in 2010 and $57 billion in 2020.

- For the first time, in 2007, there are more female than male retirement beneficiaries. This trend is expected to continue and, by 2050, there will be approximately 650,000 (or 15%) more female than male retirement beneficiaries.

B. Contributions

Projected contributions are the product of the contribution rate, the number of contributors and the average contributory earnings. The contribution rate is set by law and is 9.9%.

The number of contributors by age and sex is directly linked to the assumed labour force participation rates applied to the projected working-age population and the job creation rates. Hence, the demographic and economic assumptions have a great influence on the expected level of contributions. In this report, the number of CPP contributors is expected to increase continually throughout the projection period from 12.3 million in 2007 to 13.1 million by 2015, after which the increase is limited due to the lower growth in the working age population and labour force.

The growth in contributory earnings, which are derived by subtracting the Year's Basic Exemption (YBE) from pensionable earnings, is linked to the growth in average employment earnings through the assumption regarding annual increases in wages and is affected by the freeze on the YBE since 1998. The projected average contributory earnings in 2007 are $28,636 for men and $23,927 for women.

Contributions are expected to be $32.8 billion in 2007. Since the legislated contribution rate is constant at 9.9% for years 2007 and thereafter, contributions increase at the same rate as the total contributory earnings over the projection period. Table 4 presents the projected components of total contributions.
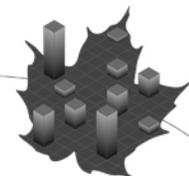
Table 4   Contributions

Year	Contribution Rate	Number of Contributors	Contributory Earnings	Contributions
	(%)	(thousands)	($ million)	($ million)
2007	9.9	12,280	331,200	32,789
2008	9.9	12,409	343,669	34,023
2009	9.9	12,536	356,699	35,313
2010	9.9	12,662	370,305	36,660
2011	9.9	12,781	385,232	38,138
2012	9.9	12,884	400,338	39,634
2015	9.9	13,144	454,172	44,963
2020	9.9	13,480	566,677	56,101
2025	9.9	13,719	700,665	69,366
2030	9.9	14,073	869,269	86,058
2040	9.9	14,812	1,336,186	132,282
2050	9.9	15,297	2,014,667	199,452

C. Expenditures

The projected number of beneficiaries by type of benefit is given in Table 5, while Table 6 presents the same information for males and females separately.

The number of retirement, disability and survivor beneficiaries increases throughout the projection period. In particular, the number of retirement beneficiaries is expected to more than double over the next 25 years due to the aging of the population. For the first time, in 2007, there are 12,000 more female than male retirement beneficiaries. By 2050 female retirement beneficiaries will outnumber male retirement beneficiaries by 650,000 or 15%. Over the same period, the number of disability and survivor beneficiaries is projected to increase but at a much slower pace than retirement beneficiaries.

Table 7 shows the amount of projected expenditures by type while Table 8 shows the same information but in millions of 2007 constant dollars. Projected expenditures in 2007 are $27.7 billion and reach $32.5 billion in 2010. Table 9 shows the projected expenditures by type expressed as a percentage of contributory earnings. They are referred to as the pay-as-you-go rates. The pay-as-you-go rate corresponds to the contribution rate that would need to be paid if there were no assets. Although the pay-as-you-go rate is expected to increase significantly from its current level of 8.4% in 2007 to 11.5% by the end of the projection period, the legislated contribution rate of 9.9% is sufficient to financially sustain the Plan over the projection period.
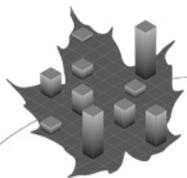
Table 5   Beneficiaries
(thousands)

Year	Retirement*	Disability	Survivor**	Children	Death***
2007	3,533	356	1,074	219	120
2008	3,702	364	1,095	221	124
2009	3,878	372	1,116	222	128
2010	4,055	382	1,136	225	131
2011	4,232	393	1,155	227	135
2012	4,424	401	1,174	228	139
2015	5,006	426	1,230	231	150
2020	6,030	457	1,326	240	171
2025	7,080	468	1,435	252	196
2030	7,913	466	1,562	264	225
2040	8,857	509	1,835	276	287
2050	9,574	539	2,013	274	327

*   The number given for retirement beneficiaries does not take into account that the retirement pension can be shared between spouses.
**   A beneficiary who receives concurrently a retirement and a survivor pension are counted in each category.
*** This is the number of deceased contributors entitled to a death benefit during the given year.

Table 6   Beneficiaries by Sex
(thousands)

Year	Males				Females			
	Retirement*	Disability	Survivor**	Death***	Retirement*	Disability	Survivor**	Death***
2007	1,761	172	169	77	1,773	183	906	44
2008	1,838	175	175	78	1,864	188	920	45
2009	1,918	178	183	80	1,960	194	933	47
2010	2,000	182	189	82	2,056	200	946	49
2011	2,081	187	196	84	2,151	206	959	51
2012	2,170	191	203	85	2,254	210	971	53
2015	2,437	202	224	91	2,569	224	1,006	59
2020	2,909	216	259	101	3,121	242	1,067	70
2025	3,395	220	294	113	3,685	248	1,141	83
2030	3,771	217	326	127	4,142	249	1,236	97
2040	4,157	234	374	158	4,700	274	1,462	129
2050	4,462	247	390	174	5,112	291	1,623	152

*   The number given for retirement beneficiaries does not take into account that the retirement pension can be shared between spouses.
**   A beneficiary who receives concurrently a retirement and a survivor pension are counted in each category.
***This is the number of deceased contributors entitled to a death benefit during the given year.
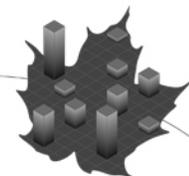
Table 7   Expenditures
($ million)

Year	Retirement	Disability	Survivor	Children	Death	Administrative Expenses	Total
2007	19,460	3,213	3,636	493	269	594	27,665
2008	20,682	3,332	3,738	504	280	614	29,149
2009	22,028	3,470	3,832	517	290	636	30,773
2010	23,449	3,629	3,934	532	301	659	32,504
2011	24,927	3,794	4,035	548	311	684	34,299
2012	26,530	3,943	4,128	562	322	710	36,195
2013	28,266	4,110	4,227	576	334	737	38,249
2014	30,087	4,292	4,332	590	345	767	40,414
2015	32,036	4,486	4,444	607	356	799	42,729
2016	34,126	4,686	4,564	625	368	834	45,202
2017	36,368	4,891	4,691	644	379	869	47,843
2018	38,760	5,098	4,824	665	392	905	50,643
2019	41,303	5,301	4,963	687	405	942	53,601
2020	44,012	5,501	5,109	711	417	981	56,731
2021	46,874	5,703	5,264	735	429	1,021	60,026
2022	49,877	5,899	5,428	761	441	1,062	63,468
2023	53,030	6,097	5,605	788	455	1,105	67,080
2024	56,322	6,300	5,795	817	468	1,149	70,852
2025	59,731	6,497	6,002	848	482	1,196	74,756
2026	63,229	6,690	6,224	879	497	1,245	78,763
2027	66,780	6,886	6,465	910	511	1,296	82,848
2028	70,404	7,082	6,726	940	527	1,350	87,029
2029	74,110	7,297	7,009	973	544	1,406	91,339
2030	77,876	7,542	7,316	1,006	561	1,466	95,767
2031	81,695	7,826	7,644	1,040	576	1,526	100,308
2032	85,550	8,140	7,996	1,074	592	1,590	104,942
2033	89,465	8,473	8,371	1,107	608	1,658	109,682
2034	93,473	8,825	8,772	1,141	624	1,727	114,562
2035	97,600	9,194	9,197	1,175	640	1,800	119,607
2036	101,876	9,576	9,647	1,209	656	1,876	124,840
2037	106,283	9,991	10,118	1,242	672	1,955	130,261
2038	110,828	10,431	10,610	1,276	687	2,038	135,870
2039	115,545	10,902	11,123	1,310	702	2,124	141,707
2040	120,491	11,386	11,656	1,345	716	2,213	147,807
2045	149,484	14,003	14,577	1,516	777	2,708	183,065
2050	187,004	16,692	17,844	1,706	816	3,295	227,357
2055	233,787	19,688	21,426	1,942	833	4,009	281,686
2060	290,578	23,198	25,525	2,236	839	4,896	347,272
2065	357,649	27,867	30,547	2,583	848	6,008	425,502
2070	439,017	34,210	36,932	2,960	868	7,387	521,373
2075	542,254	41,723	44,897	3,364	893	9,054	642,185
2080	673,038	50,086	54,413	3,812	910	11,062	793,321
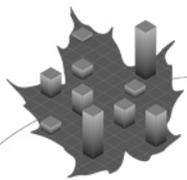
Table 8   Expenditures (millions of 2007 constant dollars)[1]

Year	Retirement	Disability	Survivor	Children	Death	Administrative Expenses	Total
2007	19,460	3,214	3,636	493	269	594	27,665
2008	20,296	3,269	3,668	495	275	603	28,605
2009	21,193	3,338	3,687	498	279	612	29,606
2010	22,118	3,423	3,712	502	284	622	30,659
2011	23,051	3,508	3,731	507	288	633	31,717
2012	24,052	3,575	3,742	510	292	644	32,814
2013	25,103	3,650	3,754	512	297	655	33,969
2014	26,149	3,730	3,765	514	300	667	35,125
2015	27,221	3,811	3,777	516	302	679	36,307
2016	28,322	3,888	3,788	519	305	692	37,515
2017	29,451	3,961	3,799	522	307	704	38,744
2018	30,623	4,027	3,811	525	310	715	40,011
2019	31,836	4,086	3,825	530	312	726	41,316
2020	33,097	4,137	3,842	534	314	738	42,662
2021	34,389	4,184	3,862	540	315	749	44,038
2022	35,700	4,222	3,885	545	316	760	45,428
2023	37,031	4,258	3,914	550	318	772	46,842
2024	38,371	4,292	3,948	557	319	783	48,270
2025	39,701	4,318	3,989	564	320	795	49,687
2026	41,001	4,338	4,036	570	322	807	51,073
2027	42,247	4,356	4,090	576	323	820	52,412
2028	43,453	4,371	4,151	580	325	833	53,714
2029	44,625	4,394	4,220	585	328	847	54,999
2030	45,749	4,431	4,298	591	330	861	56,259
2031	46,822	4,485	4,381	597	330	875	57,490
2032	47,835	4,551	4,470	601	331	889	58,679
2033	48,804	4,622	4,566	604	332	904	59,833
2034	49,747	4,697	4,668	607	332	919	60,971
2035	50,677	4,774	4,775	611	332	935	62,103
2036	51,607	4,851	4,886	612	332	950	63,239
2037	52,526	4,938	5,000	614	332	966	64,376
2038	53,436	5,029	5,116	615	331	983	65,510
2039	54,352	5,128	5,232	616	330	999	66,658
2040	55,296	5,225	5,349	617	329	1,016	67,832
2045	60,634	5,680	5,913	615	315	1,098	74,255
2050	67,043	5,984	6,397	612	293	1,181	81,510
2055	74,080	6,239	6,790	615	264	1,270	89,258
2060	81,381	6,497	7,149	626	235	1,371	97,259
2065	88,532	6,898	7,562	639	210	1,487	105,328
2070	96,052	7,485	8,080	648	190	1,616	114,070
2075	104,859	8,068	8,682	650	173	1,751	124,183
2080	115,033	8,561	9,300	652	156	1,891	135,592

(1) For a given year, the value in 2007 constant dollars is equal to the corresponding value in current dollars divided by the cumulative index of the indexation rates for benefits provided for as of 2007 in the projections.
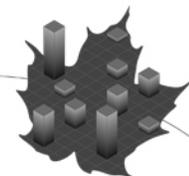
Table 9   Expenditures as Percentage of Contributory Earnings
(pay-as-you-go rates)

Year	Retirement	Disability	Survivor	Children	Death	Administrative Expenses	Total
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
2007	5.88	0.97	1.10	0.15	0.08	0.18	8.35
2008	6.02	0.97	1.09	0.15	0.08	0.18	8.48
2009	6.18	0.97	1.07	0.15	0.08	0.18	8.63
2010	6.33	0.98	1.06	0.14	0.08	0.18	8.78
2011	6.47	0.98	1.05	0.14	0.08	0.18	8.90
2012	6.63	0.98	1.03	0.14	0.08	0.18	9.04
2013	6.78	0.99	1.01	0.14	0.08	0.18	9.18
2014	6.92	0.99	1.00	0.14	0.08	0.18	9.29
2015	7.05	0.99	0.98	0.13	0.08	0.18	9.41
2016	7.19	0.99	0.96	0.13	0.08	0.18	9.52
2017	7.32	0.98	0.94	0.13	0.08	0.17	9.63
2018	7.46	0.98	0.93	0.13	0.08	0.17	9.75
2019	7.61	0.98	0.91	0.13	0.07	0.17	9.88
2020	7.77	0.97	0.90	0.13	0.07	0.17	10.01
2021	7.92	0.96	0.89	0.12	0.07	0.17	10.15
2022	8.08	0.96	0.88	0.12	0.07	0.17	10.28
2023	8.23	0.95	0.87	0.12	0.07	0.17	10.42
2024	8.38	0.94	0.86	0.12	0.07	0.17	10.55
2025	8.52	0.93	0.86	0.12	0.07	0.17	10.67
2026	8.65	0.92	0.85	0.12	0.07	0.17	10.77
2027	8.75	0.90	0.85	0.12	0.07	0.17	10.85
2028	8.84	0.89	0.84	0.12	0.07	0.17	10.92
2029	8.90	0.88	0.84	0.12	0.07	0.17	10.97
2030	8.96	0.87	0.84	0.12	0.06	0.17	11.02
2031	9.01	0.86	0.84	0.11	0.06	0.17	11.06
2032	9.04	0.86	0.84	0.11	0.06	0.17	11.08
2033	9.05	0.86	0.85	0.11	0.06	0.17	11.09
2034	9.06	0.85	0.85	0.11	0.06	0.17	11.10
2035	9.06	0.85	0.85	0.11	0.06	0.17	11.10
2036	9.05	0.85	0.86	0.11	0.06	0.17	11.09
2037	9.05	0.85	0.86	0.11	0.06	0.17	11.09
2038	9.03	0.85	0.86	0.10	0.06	0.17	11.08
2039	9.02	0.85	0.87	0.10	0.05	0.17	11.07
2040	9.02	0.85	0.87	0.10	0.05	0.17	11.06
2045	9.09	0.85	0.89	0.09	0.05	0.16	11.13
2050	9.28	0.83	0.89	0.08	0.04	0.16	11.29
2055	9.49	0.80	0.87	0.08	0.03	0.16	11.43
2060	9.62	0.77	0.84	0.07	0.03	0.16	11.49
2065	9.61	0.75	0.82	0.07	0.02	0.16	11.43
2070	9.57	0.75	0.80	0.06	0.02	0.16	11.36
2075	9.62	0.74	0.80	0.06	0.02	0.16	11.40
2080	9.76	0.73	0.79	0.06	0.01	0.16	11.50
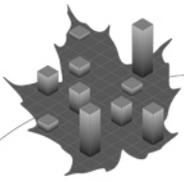
It is interesting to compare the relative change in the distribution of expenditures by type of event over the projection period. Chart 1 presents the distribution of expenditures for 2007 and 2050. The increasing proportion of retirement benefits, which rises from 70% in 2007 to 82% in 2050, clearly shows the impact of the aging population on the benefits paid by the Canada Pension Plan.

Chart 1 Distribution of Expenditures by Type of Event
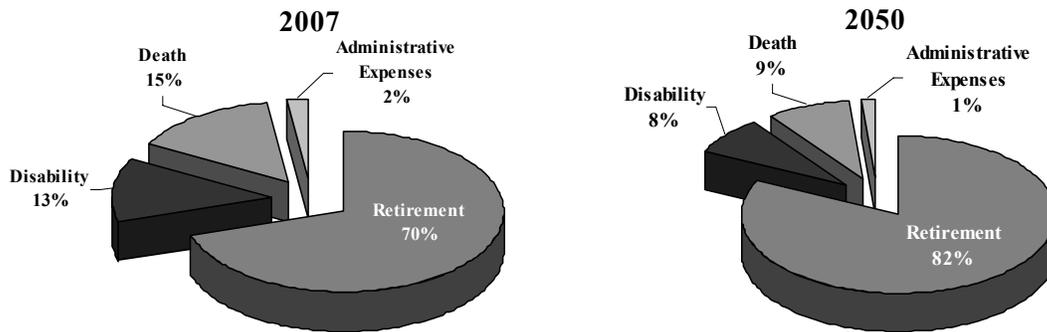
D. Financial Projections with Legislated Contribution Rate

1. Asset Projections at Market Value

Prior to 2001, CPP assets were presented at cost value because they were traditionally limited to short-term investments for the Account component and 20-year non-marketable bonds for the Fund component (i.e. loans to provinces). Since the creation of the CPP Investment Board in 1997, excess cash flows are invested in the capital markets. Those assets, as is the case for private pension plans, are usually valued at market. The market value of assets is $113,581 million as at 31 December 2006.

2. Projected Financial Status

Table 10 presents historical results while Tables 11 and 12 show the projected financial status of the CPP using the legislated contribution rate of 9.9% in current dollars and in 2007 constant dollars, respectively. The projection of assets using the minimum contribution rate of 9.82% for years 2010 and thereafter is discussed in subsection E.
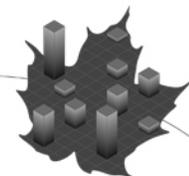
Table 10 Historical Results
($ million)

Year	PayGo Rate*	Contribution Rate	Contributions	Expenditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.**	Yield/ Return**	Asset/ Expenditure Ratio
	(%)	(%)						(%)	
1966	0.05	3.6	531	8	523	2	525	0.7	52.50
1967	0.06	3.6	623	10	613	37	1,175	4.3	48.96
1968	0.13	3.6	686	24	662	79	1,916	5.1	35.48
1969	0.26	3.6	737	54	683	128	2,727	5.6	28.11
1970	0.45	3.6	773	97	676	193	3,596	6.2	24.13
1971	0.66	3.6	816	149	667	260	4,523	6.5	21.33
1972	0.88	3.6	869	212	657	333	5,513	6.8	19.83
1973	1.07	3.6	939	278	661	404	6,578	6.8	16.78
1974	1.17	3.6	1,203	392	811	498	7,887	7.0	14.06
1975	1.42	3.6	1,426	561	865	607	9,359	7.2	11.47
1976	1.80	3.6	1,630	816	814	747	10,920	7.6	10.48
1977	2.05	3.6	1,828	1,042	786	890	12,596	7.8	9.72
1978	2.31	3.6	2,022	1,296	726	1,043	14,365	7.9	9.03
1979	2.47	3.6	2,317	1,590	727	1,236	16,328	8.3	8.31
1980	2.72	3.6	2,604	1,965	639	1,466	18,433	8.7	7.64
1981	2.89	3.6	3,008	2,413	595	1,784	20,812	9.4	7.04
1982	2.91	3.6	3,665	2,958	707	2,160	23,679	10.0	6.58
1983	3.73	3.6	3,474	3,598	(124)	2,494	26,049	10.4	6.22
1984	3.66	3.6	4,118	4,185	(67)	2,829	28,811	10.7	5.97
1985	4.31	3.6	4,032	4,826	(794)	3,113	31,130	10.8	5.66
1986	4.20	3.6	4,721	5,503	(782)	3,395	33,743	10.9	4.73
1987	5.02	3.8	5,393	7,130	(1,737)	3,654	35,660	10.9	4.31
1988	5.41	4.0	6,113	8,272	(2,159)	3,886	37,387	11.0	3.98
1989	5.89	4.2	6,694	9,391	(2,697)	4,162	38,852	11.3	3.72
1990	5.82	4.4	7,889	10,438	(2,549)	4,386	40,689	11.4	3.53
1991	6.31	4.6	8,396	11,518	(3,122)	4,476	42,043	11.2	3.22
1992	7.07	4.8	8,883	13,076	(4,193)	4,497	42,347	11.0	2.97
1993	7.79	5.0	9,166	14,273	(5,107)	4,480	41,720	10.9	2.72
1994	8.33	5.2	9,585	15,362	(5,777)	4,403	40,346	11.0	2.52
1995	7.91	5.4	10,911	15,986	(5,075)	4,412	39,683	11.3	2.37
1996	8.71	5.6	10,757	16,723	(5,966)	4,177	37,894	11.0	2.16
1997	8.67	6.0	12,165	17,570	(5,405)	3,971	36,460	10.8	1.99
1998	8.11	6.4	14,473	18,338	(3,865)	3,938	36,535	10.9	1.94
1999	8.23	7.0	16,052	18,877	(2,825)	764	42,783	1.7	2.17
2000	7.69	7.8	19,977	19,683	294	4,446	47,523	9.9	2.32
2001	7.85	8.6	22,469	20,515	1,954	3,154	52,631	6.2	2.43
2002	8.16	9.4	24,955	21,666	3,289	187	56,107	0.3	2.47
2003	8.19	9.9	27,454	22,716	4,738	6,769	67,614	11.1	2.84
2004	8.29	9.9	28,459	23,833	4,626	6,475	78,715	8.9	3.15
2005	8.37	9.9	29,539	24,976	4,563	11,083	94,361	13.2	3.60
2006	8.37	9.9	31,000	26,213	4,787	14,433	113,581	14.5	4.11

*   The pay-as-you-go rates have been calculated using the historical contributory earnings while the contributions are based on an estimate made by the Department of Finance.

** Results for years 1966 to 1998 are on a cost basis, while results for years 1999 to 2006 are presented on a market value basis. If assets were shown at market value at the end of 1998, total assets would be $44,864 instead of $36,535 million.
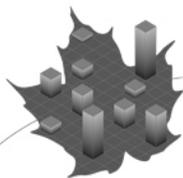
Table 11 Financial Status
($ million)

Year	PayGo Rate (%)	Contribution Rate (%)	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.	Yield (%)	Asset/ Expenditure Ratio
2007	8.35	9.90	331,200	32,789	27,665	5,124	6,785	125,490	5.82	4.31
2008	8.48	9.90	343,669	34,023	29,149	4,874	7,344	137,707	5.72	4.47
2009	8.63	9.90	356,699	35,313	30,773	4,540	7,856	150,104	5.60	4.62
2010	8.78	9.90	370,305	36,660	32,504	4,156	8,351	162,611	5.47	4.74
2011	8.90	9.90	385,232	38,138	34,299	3,839	8,838	175,288	5.36	4.84
2012	9.04	9.90	400,338	39,633	36,195	3,438	9,953	188,680	5.61	4.93
2013	9.18	9.90	416,806	41,264	38,249	3,015	11,269	202,963	5.92	5.02
2014	9.29	9.90	434,853	43,050	40,414	2,636	12,746	218,345	6.23	5.11
2015	9.41	9.90	454,172	44,963	42,729	2,234	14,386	234,965	6.55	5.20
2016	9.52	9.90	474,661	46,991	45,202	1,789	16,360	253,115	6.93	5.29
2017	9.63	9.90	496,827	49,186	47,843	1,343	17,552	272,010	6.91	5.37
2018	9.75	9.90	519,263	51,407	50,643	764	18,774	291,549	6.89	5.44
2019	9.88	9.90	542,573	53,715	53,601	114	20,027	311,689	6.87	5.49
2020	10.01	9.90	566,677	56,101	56,731	(630)	21,300	332,360	6.84	5.54
2021	10.15	9.90	591,647	58,573	60,026	(1,453)	22,607	353,514	6.82	5.57
2022	10.28	9.90	617,378	61,120	63,468	(2,348)	23,928	375,095	6.80	5.59
2023	10.42	9.90	643,966	63,753	67,080	(3,327)	25,281	397,048	6.78	5.60
2024	10.55	9.90	671,707	66,499	70,852	(4,353)	26,651	419,346	6.76	5.61
2025	10.67	9.90	700,665	69,366	74,756	(5,390)	28,031	441,987	6.74	5.61
2026	10.77	9.90	731,095	72,378	78,763	(6,385)	29,447	465,049	6.72	5.61
2027	10.85	9.90	763,246	75,561	82,848	(7,287)	30,968	488,731	6.72	5.62
2028	10.92	9.90	796,795	78,883	87,029	(8,146)	32,524	513,108	6.72	5.62
2029	10.97	9.90	832,253	82,393	91,339	(8,946)	34,128	538,290	6.72	5.62
2030	11.02	9.90	869,269	86,058	95,767	(9,709)	35,789	564,370	6.72	5.63
2031	11.06	9.90	906,667	89,760	100,308	(10,548)	37,507	591,328	6.72	5.63
2032	11.08	9.90	946,759	93,729	104,942	(11,213)	39,292	619,407	6.72	5.65
2033	11.09	9.90	988,698	97,881	109,682	(11,801)	41,138	648,744	6.72	5.66
2034	11.10	9.90	1,032,270	102,195	114,562	(12,367)	43,092	679,469	6.72	5.68
2035	11.10	9.90	1,077,823	106,704	119,607	(12,903)	45,143	711,709	6.72	5.70
2036	11.09	9.90	1,125,460	111,421	124,840	(13,419)	47,296	745,586	6.72	5.72
2037	11.09	9.90	1,174,978	116,323	130,261	(13,938)	49,559	781,207	6.72	5.75
2038	11.08	9.90	1,226,723	121,446	135,870	(14,424)	51,935	818,718	6.72	5.78
2039	11.07	9.90	1,280,560	126,775	141,707	(14,932)	54,439	858,226	6.72	5.81
2040	11.06	9.90	1,336,186	132,282	147,807	(15,525)	57,071	899,772	6.72	5.83
2045	11.13	9.90	1,645,065	162,861	183,065	(20,204)	72,251	1,138,870	6.72	5.96
2050	11.29	9.90	2,014,667	199,452	227,357	(27,905)	90,885	1,431,573	6.72	6.03
2055	11.43	9.90	2,463,571	243,894	281,686	(37,792)	113,256	1,782,723	6.72	6.07
2060	11.49	9.90	3,021,575	299,136	347,272	(48,136)	140,276	2,207,491	6.72	6.10
2065	11.43	9.90	3,723,098	368,587	425,502	(56,915)	174,003	2,739,396	6.72	6.18
2070	11.36	9.90	4,588,166	454,228	521,373	(67,145)	217,219	3,421,353	6.72	6.30
2075	11.40	9.90	5,633,966	557,763	642,185	(84,422)	271,914	4,282,683	6.72	6.39
2080	11.50	9.90	6,896,361	682,740	793,321	(110,581)	339,313	5,342,094	6.72	6.45
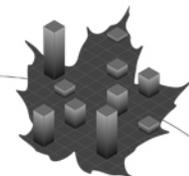
Table 12 Financial Status (millions of 2007 constant dollars)

Year	PayGo Rate	Contribution Rate	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.
	(%)	(%)						
2007	8.35	9.90	331,200	32,789	27,665	5,124	6,785	125,490
2008	8.48	9.90	337,254	33,388	28,605	4,783	7,207	135,137
2009	8.63	9.90	343,178	33,975	29,606	4,368	7,558	144,414
2010	8.78	9.90	349,282	34,579	30,659	3,920	7,877	153,379
2011	8.90	9.90	356,237	35,267	31,717	3,550	8,173	162,095
2012	9.04	9.90	362,947	35,932	32,814	3,117	9,023	171,057
2013	9.18	9.90	370,164	36,646	33,969	2,677	10,008	180,251
2014	9.29	9.90	377,939	37,416	35,125	2,291	11,077	189,768
2015	9.41	9.90	385,917	38,206	36,307	1,898	12,224	199,653
2016	9.52	9.90	393,936	39,000	37,515	1,485	13,578	210,068
2017	9.63	9.90	402,340	39,832	38,744	1,087	14,214	220,279
2018	9.75	9.90	410,253	40,615	40,011	604	14,833	230,343
2019	9.88	9.90	418,214	41,403	41,316	88	15,437	240,249
2020	10.01	9.90	426,140	42,188	42,662	(474)	16,018	249,934
2021	10.15	9.90	434,065	42,972	44,038	(1,066)	16,586	259,358
2022	10.28	9.90	441,896	43,748	45,428	(1,680)	17,127	268,479
2023	10.42	9.90	449,684	44,519	46,842	(2,324)	17,654	277,260
2024	10.55	9.90	457,616	45,304	48,270	(2,966)	18,157	285,689
2025	10.67	9.90	465,701	46,104	49,687	(3,583)	18,631	293,769
2026	10.77	9.90	474,075	46,933	51,073	(4,140)	19,095	301,559
2027	10.85	9.90	482,852	47,802	52,412	(4,610)	19,591	309,185
2028	10.92	9.90	491,781	48,686	53,714	(5,028)	20,074	316,690
2029	10.97	9.90	501,138	49,613	54,999	(5,387)	20,550	324,129
2030	11.02	9.90	510,660	50,555	56,259	(5,704)	21,024	331,544
2031	11.06	9.90	519,639	51,444	57,490	(6,045)	21,496	338,909
2032	11.08	9.90	529,382	52,409	58,679	(6,270)	21,970	346,343
2033	11.09	9.90	539,349	53,396	59,833	(6,438)	22,441	353,899
2034	11.10	9.90	549,383	54,389	60,971	(6,582)	22,934	361,620
2035	11.10	9.90	559,636	55,404	62,103	(6,699)	23,439	369,540
2036	11.09	9.90	570,118	56,442	63,239	(6,798)	23,959	377,687
2037	11.09	9.90	580,685	57,488	64,376	(6,888)	24,493	386,080
2038	11.08	9.90	591,471	58,556	65,510	(6,955)	25,041	394,749
2039	11.07	9.90	602,369	59,635	66,658	(7,024)	25,608	403,705
2040	11.06	9.90	613,205	60,707	67,832	(7,125)	26,191	412,925
2045	11.13	9.90	667,272	66,060	74,255	(8,195)	29,306	461,949
2050	11.29	9.90	722,277	71,505	81,510	(10,004)	32,583	513,232
2055	11.43	9.90	780,632	77,283	89,258	(11,975)	35,887	564,891
2060	11.49	9.90	846,243	83,778	97,259	(13,481)	39,287	618,245
2065	11.43	9.90	921,609	91,239	105,328	(14,089)	43,072	678,105
2070	11.36	9.90	1,003,835	99,380	114,070	(14,690)	47,525	748,550
2075	11.40	9.90	1,089,477	107,858	124,183	(16,325)	52,582	828,170
2080	11.50	9.90	1,178,703	116,692	135,592	(18,900)	57,994	913,053
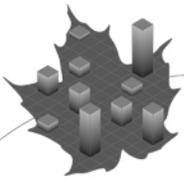
Assets increase significantly over the next 13 years, from $114 billion at the end of 2006 to $312 billion in 2019. Contributions and investment earnings are projected to be 39% higher than expenditures over that period. Thereafter, revenues continue to be higher than expenditures but to a lesser extent. This causes the assets to grow at a much slower pace. The assets reach a level of $1,432 billion by 2050. Table 13 shows in more detail the sources of the revenue required to cover the expenditures.

From Table 13, several conclusions can be drawn.

- The assets grow continuously over the projection period. During the period 2007 to 2019, contributions are more than sufficient to cover expenditures.

- From 2020 onward, some of the investment earnings are required to fund net cash outflows. In 2050, 31% of investment earnings is required to pay for benefits.

- Investment earnings, which represent 17% of revenues (i.e. contributions and investment earnings) in 2007, will represent 27% in 2019. In 2050, investment earnings represent 31% of revenues. This clearly illustrates the importance of investment earnings as a source of revenue for the Plan.

Chart 2 shows the distribution of cash flows by source for the period 1990 to 2025.

Chart 2 Distribution of Cash Flows by Source
(billions of 2007 constant dollars)
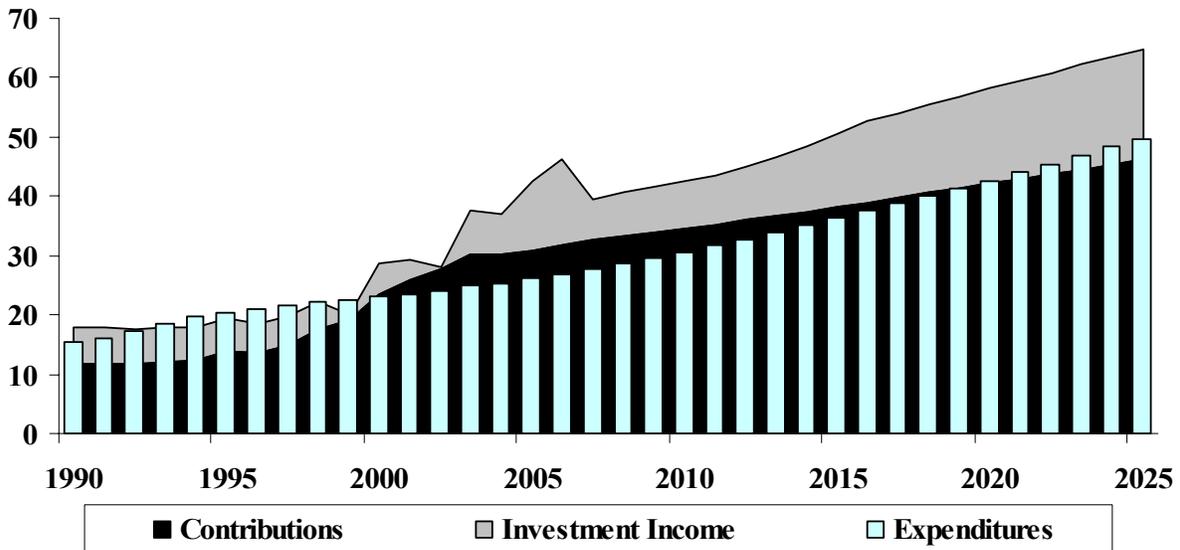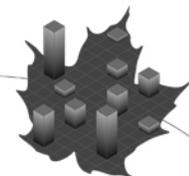
Table 13 Sources of Revenue and Funding of Expenditures
($ billion)

Year	Contributions	Investment Earnings	Total Revenue	Expenditures	Shortfall	Shortfall as % of Investment Earnings	Investment Earnings as % of Revenue
2007	32.8	6.8	39.6	27.7	0.0	0.0	17.1
2008	34.0	7.3	41.4	29.1	0.0	0.0	17.8
2009	35.3	7.9	43.2	30.8	0.0	0.0	18.2
2010	36.7	8.4	45.0	32.5	0.0	0.0	18.6
2011	38.1	8.8	47.0	34.3	0.0	0.0	18.8
2012	39.6	10.0	49.6	36.2	0.0	0.0	20.1
2013	41.3	11.3	52.5	38.2	0.0	0.0	21.5
2014	43.1	12.7	55.8	40.4	0.0	0.0	22.8
2015	45.0	14.4	59.3	42.7	0.0	0.0	24.2
2016	47.0	16.4	63.4	45.2	0.0	0.0	25.8
2017	49.2	17.6	66.7	47.8	0.0	0.0	26.3
2018	51.4	18.8	70.2	50.6	0.0	0.0	26.8
2019	53.7	20.0	73.7	53.6	0.0	0.0	27.2
2020	56.1	21.3	77.4	56.7	0.6	3.0	27.5
2021	58.6	22.6	81.2	60.0	1.5	6.4	27.8
2022	61.1	23.9	85.0	63.5	2.3	9.8	28.1
2023	63.8	25.3	89.0	67.1	3.3	13.2	28.4
2024	66.5	26.7	93.2	70.9	4.4	16.3	28.6
2025	69.4	28.0	97.4	74.8	5.4	19.2	28.8
2026	72.4	29.4	101.8	78.8	6.4	21.7	28.9
2027	75.6	31.0	106.5	82.8	7.3	23.5	29.1
2028	78.9	32.5	111.4	87.0	8.1	25.0	29.2
2029	82.4	34.1	116.5	91.3	8.9	26.2	29.3
2030	86.1	35.8	121.8	95.8	9.7	27.1	29.4
2031	89.8	37.5	127.3	100.3	10.5	28.1	29.5
2032	93.7	39.3	133.0	104.9	11.2	28.5	29.5
2033	97.9	41.1	139.0	109.7	11.8	28.7	29.6
2034	102.2	43.1	145.3	114.6	12.4	28.7	29.7
2035	106.7	45.1	151.8	119.6	12.9	28.6	29.7
2036	111.4	47.3	158.7	124.8	13.4	28.4	29.8
2037	116.3	49.6	165.9	130.3	13.9	28.1	29.9
2038	121.4	51.9	173.4	135.9	14.4	27.8	30.0
2039	126.8	54.4	181.2	141.7	14.9	27.4	30.0
2040	132.3	57.1	189.4	147.8	15.5	27.2	30.1
2045	162.9	72.3	235.1	183.1	20.2	28.0	30.7
2050	199.5	90.9	290.3	227.4	27.9	30.7	31.3
2055	243.9	113.3	357.1	281.7	37.8	33.4	31.7
2060	299.1	140.3	439.4	347.3	48.1	34.3	31.9
2065	368.6	174.0	542.6	425.5	56.9	32.7	32.1
2070	454.2	217.2	671.4	521.4	67.1	30.9	32.4
2075	557.8	271.9	829.7	642.2	84.4	31.0	32.8
2080	682.7	339.3	1,022.1	793.3	110.6	32.6	33.2
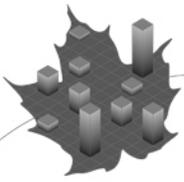
An important measure of the Plan's funding status is defined by the ratio of assets at the end of one year to the expenditures of the next year. As can be seen in Chart 3, under the legislated contribution rate of 9.9%, this ratio is projected to increase over the next two decades, reaching 5.6 by 2025. Thereafter it rises slowly to a value of 6.0 in 2050 and 6.4 by 2075.

Chart 3 Asset/Expenditure Ratio
(9.90% contribution rate)
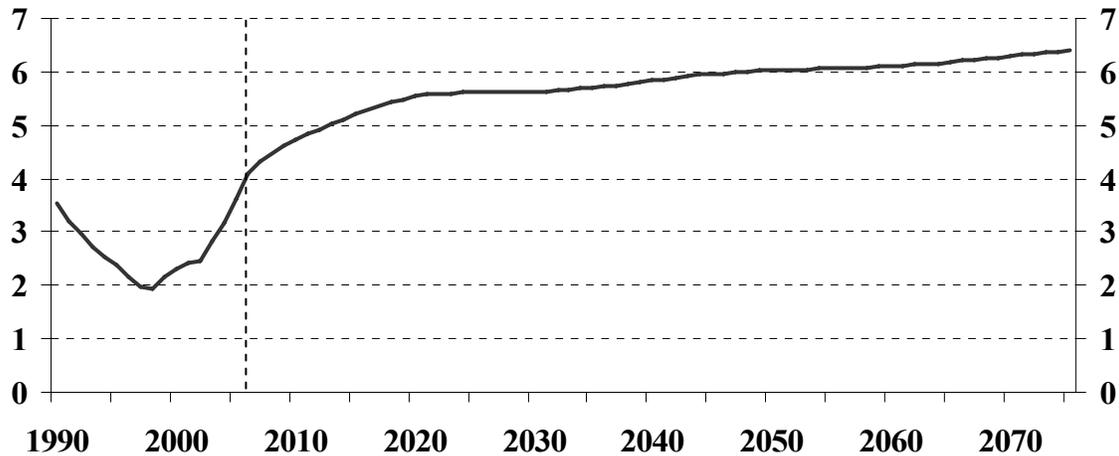
The slowdown in the growth of the ratio from 2015 to 2035 is caused by the retirement of the baby boom generation, which increases the cash outflows of the Plan. The existence of a large pool of assets enables the Plan to absorb the increased outflow and maintain the contribution rate at 9.9% without impairing the financial soundness of the Plan.

E. Financial Projections with Minimum Contribution Rate

The major reform package of the CPP agreed to by the federal and provincial governments in 1997 included significant changes to the Plan's financing and funding provisions.

- The introduction of *steady-state funding* to replace pay-as-you-go financing in order to build a reserve of assets equivalent over time to about five and a half years of benefit expenditures or about 25 per cent of Plan liabilities. Investment earnings on this pool of assets would help pay benefits when the large cohort of baby boomers retires. This refers to subsection 113.1(4)*(c)* of the *Canada Pension Plan*.

- The introduction of *incremental full funding* which requires that changes to the CPP that increase or add new benefits be fully funded, i.e. that their costs be paid as the benefit is earned and that any costs associated with benefits that are paid but have not been earned be amortized and paid for over a defined period of time consistent with common actuarial practice. This refers to subsection 113.1(4)*(d)* of the *Canada Pension Plan*.

> **113.1(4)** *In conducting any review required by this section and in making any recommendations, ministers shall consider…*
>
> **(d)** *that changes to the Act that increase benefits or add new benefits must be accompanied by a permanent increase in the contribution rates to cover the extra costs of the increased or new benefits and by a temporary increase in the contribution rates for a number of years that is consistent with common actuarial practice to fully pay any unfunded liability resulting from the increased or new benefits.*

Both of these funding principles were introduced to improve fairness and equity across generations. The move to steady-state funding eases some of the contribution burden on future generations while under full funding, each generation that receives benefit enrichments is more likely to pay for it in full so that its costs are not passed on to future generations.

Subsection 113.1(4)*(c)* and *(d)* have been part of the Plan since 1997 but up until now there was only a regulation describing how to calculate the rate under the financing objective of subsection 113.1(4)*(c)* (i.e. the steady-state contribution rate). However, as a result of the amendments of Bill C-36 which received royal assent on 3 May 2007, the regulation has been amended to also set out the calculation of the contribution rate that the Ministers must consider under subsection 113.1(4)*(d)* (i.e. the full funding rate). Bill C-36 also requires the Chief Actuary to report these costs in statutory actuarial reports.

Bill C-36 also amends the CPP to relax the current contributory requirements for disability and disabled contributor's child benefits for individuals with twenty-five or more years of contributions such that they would meet the contributory requirements with valid contributions in three of the last six years. Valid contributions in four of the last six years would continue to be required for all other CPP disability benefit applicants. Applicants would still have to meet the existing medical criteria to qualify for the benefits.

The amendments are to come into force in accordance with section 114(2) of the *Canada Pension Plan* (i.e. following formal provincial consent to the change). This is in process and should be completed in due course. For the purpose of this actuarial report and the projections herein, Bill C-36 is assumed to come into force on 1 January 2008. The financial impact of the amendments of Bill C-36 is presented in the 22nd CPP Actuarial Report which was tabled in the House of Commons on 4 December 2006.

1. Steady-State Contribution Rate

Subsection 115(1.1)*(c)*(i), as amended by Bill C-36, describes the financing objective of having a contribution rate in 2010 and thereafter that is no lower than the lowest rate that will result in the ratio of the assets to the following year's expenditures of the Plan remaining generally constant over the foreseeable future. The lowest contribution rate that will meet this objective is referred to as the steady-state contribution rate.

The steady-state contribution rate is defined as the lowest level contribution rate applicable after the end of the review period, to the nearest 0.001%, that results in the projected
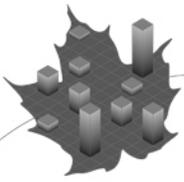
asset/expenditure ratio of the Plan being the same in the 10th and 60th year following the end of the review period. For this report, the end of the review period is 2009. Therefore, the steady-state contribution rate is applicable for years 2010 and thereafter and the relevant years for the determination of the steady-state contribution rate are 2019 and 2069. The resulting steady-state contribution rate is rounded to the nearest 0.01% and is 9.80% for years 2010 and thereafter for this report.

It is important to note that the calculation of the steady-state contribution rate above excludes any amendments that result in an increase in benefit or that add new benefits and that fall under the full funding requirements of subsection 113.1(4)*(d)* of the *Canada Pension Plan.*

2. Full Funding Rate of New or Increased Benefits

Subsection 115(1.1)*(c)*(ii), as amended by Bill C-36, describes the financing objective of determining the contribution rate in respect of any increase or new benefits in accordance with the requirements of subsection 113.1(4)*(d)*. Bill C-36 includes the first amendment to the Plan since 1 January 1998 that requires the application of subsection 113.1(4)*(d)* of the *Canada Pension Plan.*

Temporary Full Funding Rate

Since new disability benefits that will come into pay on or after the effective date of the amendment (1 January 2008) as a result of the amendments of Bill C-36 are based on disabled contributors' Plan participation both before and after the effective date of the amendment, there is a portion of the projected increase in liabilities that relates to Plan participation prior to the effective date. The increase in past liabilities is calculated as the present value as at 1 January 2008 of the projected increase in expenditures relating to Plan participation prior to the effective date and is estimated at $142 million.

The increase in past liabilities will be amortized over fifteen years (2008-2022) with a temporary full funding contribution rate of 0.0032%. This amortization period is consistent with common actuarial practice, as provided in the legislation, and is appropriate in this circumstance since the change does not put the financial sustainability of the plan at risk. The temporary full funding rate is equal to the ratio of the increase in past liabilities to the present value as at 1 January 2008 of contributory earnings over the period 2008 through 2022.

Permanent Full Funding Rate or "Current Service Cost"

The increased liability due to Bill C-36 for disabled contributors' Plan participation on or after 1 January 2008 is estimated to be $2.9 billion and is fully funded with a permanent contribution rate of 0.0196%. This rate is referred to as the *"current service cost"* of the amendment. The current service cost is equal to the ratio of the increase in liabilities due to future participation to the present value of future contributory earnings as at 1 January 2008.

The sum of the permanent and temporary incremental full funding rates for the first fifteen years (2008-2022) is 0.0228% (0.0032% plus 0.0196%) and 0.0196% for years 2023 and thereafter. The rounded incremental full funding rates are 0.02% for years 2008 through
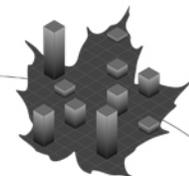
2022 and 0.02% for years 2023 and thereafter. The Office of the Chief Actuary will review the incremental full funding rates on a periodic basis to account for actual experience and any change in assumptions. The total actuarial liability as at 1 January 2008 resulting from Bill C-36 is estimated to be $3,046 million. Table 14 summarizes the results.

Table 14 Incremental Full Funding Rates in Respect of Bill C-36

Present Value of Contributory Earnings (2008-2022)	Increase in Liability due to Participation Prior to Effective Date	Temporary Full Funding Rate (2008-2022)	Present Value of Contributory Earnings (2008+)	Increase in Liability due to Participation on or After the Effective Date	Permanent Full Funding Rate or "Current Service Cost" (2008+)	Permanent and Temporary Cost (2008-2022)
(A)*	(B)**	(C) = (B)/(A)	(D)*	(E)**	(F) = (E)/(D)	(G) = (C) + (F)
($ billion)	($ million)		($ billion)	($ million)		
4,445	142	0.0032%	14,819	2,904	0.0196%	0.0228%

*   As at 1/1/2008 based on the contributory earnings as projected under this report using a discount rate equal to the overall rate of return on CPP assets.
** Present values are taken as at 1/1/2008 for the increase in benefits due to participation prior to the effective date (B) and on or after the effective date (E) using a discount rate equal to the overall rate of return on CPP assets.

3. Minimum Contribution Rate

The minimum contribution rate, which consists of the sum of the Plan's steady-state contribution rate and the full funding rate, will be recalculated in the next triennial actuarial report to be prepared as at 31 December 2009. It may also be recalculated at any other date to reflect the cost impact of any other proposed amendments to the Plan.

The default provisions in subsections 113.1(11.05) to 113.1(11.15) may result in adjustments to the legislated contribution rate and, perhaps, benefits in payment if the federal and provincial governments reach no agreement in response to the actuarial determination of a minimum contribution rate. In respect of the current triennial review, the minimum contribution rate of 9.82% is less than the legislated rate and thus, the default provisions do not apply. Therefore, in the absence of specific action by the federal and provincial governments, the legislated contribution rate will remain at 9.9% for years 2010 and thereafter.

The results presented in Table 15 are based on the best-estimate assumptions but using the minimum contribution rate of 9.82% as opposed to the currently scheduled contribution rate of 9.9% for years 2010 and thereafter. The financial projections under the legislated rate of 9.9% are presented in Table 11.
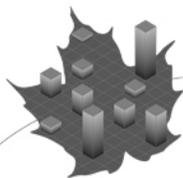
Table 15 Financial Results - Minimum Contribution Rate of 9.82%
($ million)

Year	PayGo Rate	Contribution Rate*	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.	Asset/ Expenditure Ratio
	(%)	(%)							
2007	8.35	9.90	331,200	32,789	27,665	5,124	6,785	125,490	4.31
2008	8.48	9.90	343,669	34,023	29,149	4,874	7,344	137,707	4.47
2009	8.63	9.90	356,699	35,313	30,773	4,540	7,856	150,104	4.62
2010	8.78	9.82	370,305	36,364	32,504	3,860	8,342	162,305	4.73
2011	8.90	9.82	385,232	37,830	34,299	3,531	8,812	174,648	4.83
2012	9.04	9.82	400,338	39,313	36,195	3,118	9,907	187,673	4.91
2013	9.18	9.82	416,806	40,930	38,249	2,681	11,198	201,552	4.99
2014	9.29	9.82	434,853	42,703	40,414	2,289	12,645	216,486	5.07
2015	9.41	9.82	454,172	44,600	42,729	1,871	14,250	232,607	5.15
2016	9.52	9.82	474,661	46,612	45,202	1,410	16,181	250,198	5.23
2017	9.63	9.82	496,827	48,788	47,843	945	17,334	268,478	5.30
2018	9.75	9.82	519,263	50,992	50,643	349	18,514	287,341	5.36
2019	9.88	9.82	542,573	53,281	53,601	(320)	19,720	306,741	5.41
2020	10.01	9.82	566,677	55,648	56,731	(1,083)	20,943	326,601	5.44
2021	10.15	9.82	591,647	58,100	60,026	(1,926)	22,195	346,869	5.47
2022	10.28	9.82	617,378	60,627	63,468	(2,841)	23,456	367,484	5.48
2023	10.42	9.82	643,966	63,237	67,080	(3,843)	24,744	388,386	5.48
2024	10.55	9.82	671,707	65,962	70,852	(4,890)	26,044	409,539	5.48
2025	10.67	9.82	700,665	68,805	74,756	(5,951)	27,347	430,935	5.47
2026	10.77	9.82	731,095	71,794	78,763	(6,969)	28,680	452,646	5.46
2027	10.86	9.82	763,246	74,951	82,848	(7,897)	30,110	474,858	5.46
2028	10.92	9.82	796,795	78,245	87,029	(8,784)	31,565	497,640	5.45
2029	10.98	9.82	832,253	81,727	91,339	(9,612)	33,061	521,089	5.44
2030	11.02	9.82	869,269	85,362	95,767	(10,405)	34,604	545,288	5.44
2031	11.06	9.82	906,667	89,035	100,308	(11,273)	36,195	570,210	5.43
2032	11.08	9.82	946,759	92,972	104,942	(11,970)	37,841	596,081	5.43
2033	11.09	9.82	988,698	97,090	109,682	(12,592)	39,538	623,027	5.44
2034	11.10	9.82	1,032,270	101,369	114,562	(13,193)	41,331	651,165	5.44
2035	11.10	9.82	1,077,823	105,842	119,607	(13,765)	43,206	680,606	5.45
2036	11.09	9.82	1,125,460	110,520	124,840	(14,320)	45,170	711,456	5.46
2041	11.07	9.82	1,393,319	136,824	154,205	(17,381)	56,505	890,022	5.53
2046	11.16	9.82	1,713,336	168,250	191,185	(22,935)	70,610	1,111,705	5.57
2051	11.32	9.82	2,096,660	205,892	237,395	(31,503)	87,418	1,375,070	5.55
2056	11.46	9.82	2,565,032	251,886	293,894	(42,008)	106,975	1,681,283	5.48
2061	11.49	9.82	3,149,528	309,284	361,839	(52,555)	129,921	2,041,285	5.42
2066	11.41	9.82	3,882,217	381,234	443,051	(61,817)	157,921	2,482,065	5.38
2071	11.36	9.82	4,781,993	469,592	543,342	(73,750)	192,809	3,031,101	5.35
2076	11.42	9.82	5,868,112	576,249	669,843	(93,594)	235,102	3,694,485	5.29
2081	11.53	9.82	7,179,708	705,047	827,598	(122,551)	284,279	4,463,447	5.17

*   For years 2010 and thereafter the minimum contribution rate of 9.82% consists of the Plan's steady-state contribution
    rate of 9.80% and a rate of 0.02% to fully fund the amendments of Bill C-36.
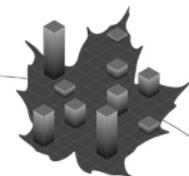
V. Reconciliation with Previous Report

A. Introduction

The results presented in this report differ from those previously projected for a variety of reasons. Differences between the actual experience for 2004 through 2006 and that projected in the Twenty-First Actuarial Report are addressed in subsection B below. Since historical results provide the starting point for the projections shown in this report, these historical differences also have an effect on the projections. The impact of the experience update and other significant factors on the minimum contribution rate are addressed in subsection C. Detailed reconciliations of the projected pay-as-you-go rates and the minimum contribution rate are presented in Appendix C.

B. Financial Status – 2004 to 2006

The major components of change in the CPP assets from 31 December 2003 to 31 December 2006 are summarized in Table 16.

Contributions during the period 2004 to 2006 were about $156 million more than projected. Over that period, contributory earnings were greater due to higher-than-expected levels of employment.

Expenditures during the period were $36 million more than projected, slightly offsetting the positive impact of higher contributions. This represents a deviation from the expected results of less than 0.1%. The difference between actual and projected results is mainly due to an under-projection of retirement and survivor benefits that outweighs an over-projection of other expenditures. The details by type of expenditure appear in Table 17.

Investment earnings were 97% higher than anticipated due to the good performance of financial markets over the period. As a result, assets increased by $46 billion during this period, 53% higher than the projected increase of $30 billion. The resulting assets as at 31 December 2006 are 16% higher than projected.

Table 16 Financial Status - 2004 to 2006
(cost accrual basis, $ million)

	Actual	Expected	Difference	Ratio
Assets at 31 December 2003	67,331	67,614	(283)	1.00
+ Contributions	88,997	88,841	156	1.00
- Expenditures	75,022	74,986	36	1.00
+ Investment Earnings	32,274	16,389	15,885	1.97
Change in Assets	46,249	30,244	16,006	1.53
Assets at 31 December 2006	113,581	97,858	15,723	1.16
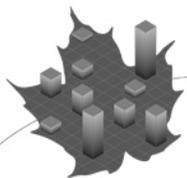
Table 17 Summary of Expenditures - 2004 to 2006

($ million)

	Actual	Expected	Difference	Ratio
Retirement	52,415	52,123	292	1.01
Disability	9,030	9,164	(134)	0.99
Survivors	10,242	10,212	30	1.00
Children	1,430	1,452	(22)	0.98
Death	723	786	(63)	0.92
Administrative Expenses	1,182	1,249	(67)	0.95
Total Expenditures	**75,022**	**74,986**	**36**	**1.00**

C. Changes in the Minimum Contribution Rate

Table 18 presents the main elements of change in the minimum contribution rate since the previous report. The minimum contribution rate is reduced at first due to better investment experience than anticipated during the period 2004-2006. However these investment gains are more than offset by the anticipated increase in the life expectancy at 65 and in the number of contributors asking for their retirement pension at age 60.

Table 18 Reconciliation of Minimum Contribution Rate

	Steady-State Rate	Full Funding Rate	Minimum Rate
21st Report (Unrounded)	9.770	-	9.770
Amendments (Bill C-36)	0.000	0.022	0.022
Changes in Methods	0.040	-	0.040
Experience (2004 to 2006)	(0.134)	-	(0.134)
Changes in Demographic Assumptions	0.140	-	0.140
Changes in Benefit Assumptions	(0.017)	0.001	(0.016)
Changes in Economic Assumptions	0.008	-	0.008
Changes in Investment Assumptions	(0.005)	-	(0.005)
23rd Report (Unrounded)	9.802	0.023	9.825

VI. Uncertainty of Results

A. Introduction

The future income and outgo of the Canada Pension Plan depend on many economic and demographic factors, including the labour force, average earnings, inflation, fertility, mortality, migration, retirement patterns, disability rates and investment returns. The income will depend on how these factors affect the size and composition of the working-age population and the level and distribution of earnings. Similarly, the outgo will depend on how these factors affect the size and composition of the beneficiary population and the general level of benefits.

The projected long-term financial status of the Plan is based on best-estimate assumptions; the objective of this section is to present alternative scenarios. The alternatives presented illustrate the sensitivity of the long-term projected financial position of the Plan to changes in the future economic and demographic outlook.

The scenarios in subsection B portray a generally younger and older population. The scenarios reflect the possible outlooks on each of the principal assumptions, taking into account the interrelationships between these assumptions. For example, one could assume a much lower fertility rate but might also assume that immigration policies would change to partly compensate for the reduction in population growth that would otherwise occur. As another example, one may suggest longer life expectancy at age 65 combined with an increased average age at retirement. The choice of assumptions will always remain subjective to a certain extent and one could always argue that the range of possible projected outcomes presented herein is not realistic. However, we must keep in mind that these alternative scenarios are only presented to provide a reasonable range of possible future outcomes for the cost of the Plan.

Because the projected financial status of the Plan is very sensitive to the assumed demographic outlook, the alternative scenarios presented in subsection B are demographically based. First we look at the younger population alternative where the ratio of retirees to workers would be lower than under the best-estimate assumption. The second scenario has a ratio of retirees to workers that is higher than the best-estimate and can be referred to as the older population scenario. The economic outlook under both demographic alternatives has been adjusted to reflect the anticipated effects of a modified demographic environment on the main economic variables that affect the Plan.

An economic slowdown followed by a partial economic recovery and its impact on the financial status of the Plan is discussed in subsection C. The impact of financial market volatility on the financial status of the Plan is explored in subsection D, while sensitivity tests on individual assumptions based on stochastic modelling techniques are presented in subsection E.
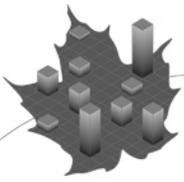
B. Younger and Older Populations

1. Younger Population

Under the younger population scenario, it is assumed that the total fertility rate is 1.80 per woman for Canada and 1.77 for Québec. These are 0.20 higher than the best-estimate assumption. These rates could be attained if the current increasing trend in fertility for those aged 30 and over is extrapolated further in time than has been done under the best-estimate scenario. These levels of fertility remain well under the national population replacement rate of 2.1 and correspond to the levels experienced in the 1970s.

Mortality is assumed to improve at a much slower rate than under the best-estimate scenario and for some age groups, mortality rates are assumed to deteriorate from the current rates. This reflects to a certain degree the slowdown in mortality improvements observed over the last few years and anticipates that improvements may not be sustainable. The result is that life expectancies at age 65 reduce from their projected best-estimate by approximately two years for males and three years for females by 2050. The life expectancies anticipated in this scenario were determined using the stochastic time-series modeling techniques described in subsection E. An upper and lower confidence interval that corresponds to one sigma, or approximately 68%, was projected around the best-estimate life expectancies to determine a reasonable range of values over the 75-year projection period. The lower bound of this confidence interval represents the life expectancy at age 65 under this younger population scenario.

Under a scenario of a younger population, net migration to Canada is assumed to reach a level of 0.64% of the population by the year 2007. This is an 18.5% increase from the best-estimate and corresponds to the level of migration observed during the mid-1990s.

The combination of these younger population assumptions results in a dependency ratio of those aged 65 and over to the working-age population (20-64) of about 0.40 (or 2.5 workers per retiree) in 2050. This is 15% lower than under the best-estimate scenario where the ratio reaches a level of 0.47 (or 2.1 workers per retiree) in 2050.

It is assumed that under a better demographic outlook the anticipated labour shortage would be less severe. As a result, it is assumed that the ultimate unemployment rate would be slightly higher than under the best-estimate, i.e. 6.8% as opposed to 6.3%, and that the labour force participation rates would be somewhat lower, especially for ages 55 and over. With a larger labour force there would be less pressure to work to a later age, and both employers and unions would more easily manage early retirement.

Furthermore, due to the reduced risk of an anticipated labour shortage, there would be less pressure on average wages as the demand for workers would be met more easily. For this reason, the assumed ultimate real wage increase is reduced from 1.3% to 1.0%. Prices are assumed to be lower under such a scenario as the average consumer demand for goods can be met with more ease through a larger labour force. Thus, the ultimate price increase assumption is set at 2.0% as opposed to 2.5%.

Disability incidence rates are reduced under this scenario as slightly better economic conditions prevail. Disability incidence rates are set at 2.85 per thousand for males and 3.25 per thousand for females.

Under this scenario, the ultimate real increase in total employment earnings is 1.7% as opposed to 1.6% under the best-estimate. The lower real-wage increases under the younger population scenario are more than offset by the higher population increases, so there is a larger real increase in total employment earnings.

Finally, capital markets are assumed to perform better under such conditions as individuals are generally better off economically and are willing to take on additional risk. This would, on average, produce a higher return on their investments. For this purpose, the real rate of return on assets is increased by 0.7% to 4.9%.

2. Older Population

Under the older population scenario, it is assumed that the total fertility rate is 1.4 per woman for Canada and 1.37 for Québec. These are 0.20 lower than the best-estimate assumption. These rates are lower than current observed total fertility levels and could be attained if fewer women have multiple births over their lifetime.

Mortality is assumed to improve at a faster rate than under the best-estimate scenario. The result is that life expectancies at age 65 increase from their projected best-estimate levels by approximately two years for both males and females by 2050. Once again, the life expectancies anticipated in this scenario were determined using the stochastic time-series modeling techniques described in subsection E. The upper bound of the one-sigma confidence interval represents the life expectancy at age 65 under this older population scenario.

Under a scenario of an older population, net migration to Canada is assumed to fall to a level of 0.44% of the population by the year 2005. This is 18.5% lower than the best-estimate and corresponds to the level of migration observed during the recession of the early 1980s.

The combination of these older population assumptions results in a dependency ratio of those aged 65 and over to the working-age population (20-64) of about 0.54 (or 1.84 workers per retiree) in 2050. This is 17% higher than under the best-estimate scenario where the dependency ratio reaches a level of 0.47 (or 2.1 workers per retiree) in 2050.

It is assumed that with a poorer demographic outlook the anticipated labour shortage would be more severe. For this purpose, it is assumed that the ultimate unemployment rate would be slightly lower than under the best-estimate, i.e. 5.8% as opposed to 6.3%, and that the labour force participation rates would be somewhat higher, especially for ages 55 and over. With a smaller labour force there would be more pressure to work to a later age and early retirement would be more difficult to manage for both employers and unions.

Furthermore, due to the increased risk of a labour shortage, there would be upward pressure on average wages as the demand for workers would be met with greater difficulty. For this reason, the assumed ultimate real wage increase is raised from 1.3% to 1.6%. Prices are
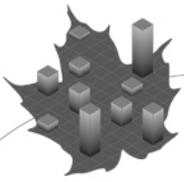
assumed to be higher under such an environment as a reduced labour force cannot meet the consumer demand for goods as economically. Thus, the ultimate price increase assumption is set at 3.0% as opposed to 2.5%.

Disability incidence rates are increased under this alternative as slightly worse economic conditions prevail. Disability incidence rates are set at 3.35 per thousand for males and 3.75 per thousand for females.

Under this scenario, the ultimate real increase in total employment earnings is 1.5% as opposed to 1.6% under the best-estimate. The higher real-wage increases are more than offset by the lower population increases, so there is a smaller real increase in total employment earnings.

Finally, capital markets are assumed to perform worse under such conditions as individuals are generally worse off economically and are less willing to take risk in their portfolios. This would, on average, produce a lower return on their investments. For this purpose, the real rate of return on assets is decreased by 0.7% to 3.5%.

3. Results

Table 19 presents a summary of the assumptions used in this sensitivity analysis. Tables 20 and 21 present the financial results under both the younger and older population scenarios, respectively. Both projections assume the currently scheduled contribution rate of 9.9%. The minimum contribution rates are 9.07% and 10.69% for the younger and older population scenarios, respectively. Chart 4 shows the evolution of the asset/expenditure ratio under the younger, best-estimate and older population scenarios with the legislated contribution rate of 9.9%, while Chart 5 shows the asset/expenditure ratio if the resulting minimum contribution rates are used.

Table 19 Younger and Older Population Sensitivity Test Assumptions

Canada	Younger Population		Best-Estimate		Older Population	
Total fertility rate	1.8		1.6		1.4	
Mortality: Canadian life expectancy at age 65 in 2050	Males Females	19.6 21.4	Males Females	21.9 24.2	Males Females	23.9 26.6
Net migration rate	0.64%		0.54%		0.44%	
Participation rate (aged 15-69) (2030+)	Males Females	77% 67%	Males Females	78% 69%	Males Females	79% 70%
Unemployment rate	6.8%		6.3%		5.8%	
Rate of increase in prices	2.0%		2.5%		3.0%	
Real-wage differential	1.0%		1.3%		1.6%	
Real rates of return	4.9%		4.2%		3.5%	
CPP disability incidence rates (per 1,000 eligible)	Males Females	2.85 3.25	Males Females	3.1 3.5	Males Females	3.35 3.75
Minimum Contribution Rate	**9.07%**		**9.82%**		**10.69%**	

Table 20 Financial Status under Younger Population Scenario
($ billion)

Year	PayGo Rate	Contribution Rate	Contributory Earnings	Contri-butions	Expen-ditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.	Asset/ Expenditure Ratio
	(%)	(%)							
2007	8.35	9.9	331.3	32.8	27.7	5.2	7.5	126.2	4.34
2008	8.46	9.9	344.0	34.1	29.1	4.9	8.2	139.3	4.54
2009	8.60	9.9	357.2	35.4	30.7	4.7	8.8	152.8	4.71
2010	8.74	9.9	371.0	36.7	32.4	4.3	9.5	166.6	4.88
2011	8.85	9.9	386.1	38.2	34.2	4.1	10.2	180.9	5.02
2012	8.97	9.9	401.8	39.8	36.0	3.7	11.3	195.9	5.15
2015	9.31	9.9	453.2	44.9	42.2	2.7	15.8	247.7	5.57
2020	10.00	9.9	545.6	54.0	54.6	(0.5)	23.4	354.9	6.18
2025	10.73	9.9	649.9	64.3	69.7	(5.4)	31.1	477.7	6.54
2030	11.06	9.9	781.1	77.3	86.4	(9.1)	40.5	621.9	6.92
2040	10.73	9.9	1,154.3	114.3	123.9	(9.6)	69.7	1,073.3	8.36
2050	10.56	9.9	1,675.1	165.8	176.9	(11.0)	126.7	1,952.7	10.65
2075	9.88	9.9	4,317.4	427.4	426.5	0.9	637.9	9,853.7	22.23
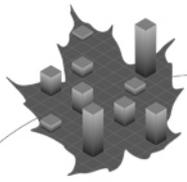
Table 21 Financial Status under Older Population Scenario
($ billion)

Year	PayGo Rate	Contribution Rate	Contributory Earnings	Contri- butions	Expen- ditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.	Asset/ Expenditure Ratio
	(%)	(%)							
2007	8.36	9.9	331.3	32.8	27.7	5.1	6.2	124.9	4.28
2008	8.49	9.9	344.1	34.1	29.2	4.8	6.8	136.5	4.41
2009	8.65	9.9	357.6	35.4	30.9	4.5	7.3	148.3	4.52
2010	8.79	9.9	372.8	36.9	32.8	4.1	7.8	160.2	4.61
2011	8.92	9.9	389.2	38.5	34.7	3.8	8.4	172.4	4.68
2012	9.05	9.9	407.1	40.3	36.8	3.5	9.5	185.4	4.74
2015	9.41	9.9	469.7	46.5	44.2	2.3	13.7	229.8	4.89
2020	9.92	9.9	608.2	60.2	60.3	(0.1)	20.2	324.3	5.05
2025	10.55	9.9	776.5	76.9	81.9	(5.1)	26.5	429.7	4.95
2030	10.97	9.9	989.2	97.9	108.5	(10.6)	33.4	540.7	4.73
2040	11.40	9.9	1,576.8	156.1	179.8	(23.7)	48.4	781.6	4.14
2050	12.07	9.9	2,455.8	243.1	296.4	(53.3)	60.2	962.0	3.09
2075	13.10	9.9	7,332.3	725.9	960.8	(234.9)	-	-	-

Chart 4 Asset/Expenditure Ratio Under Alternative Population Scenarios (9.9%)
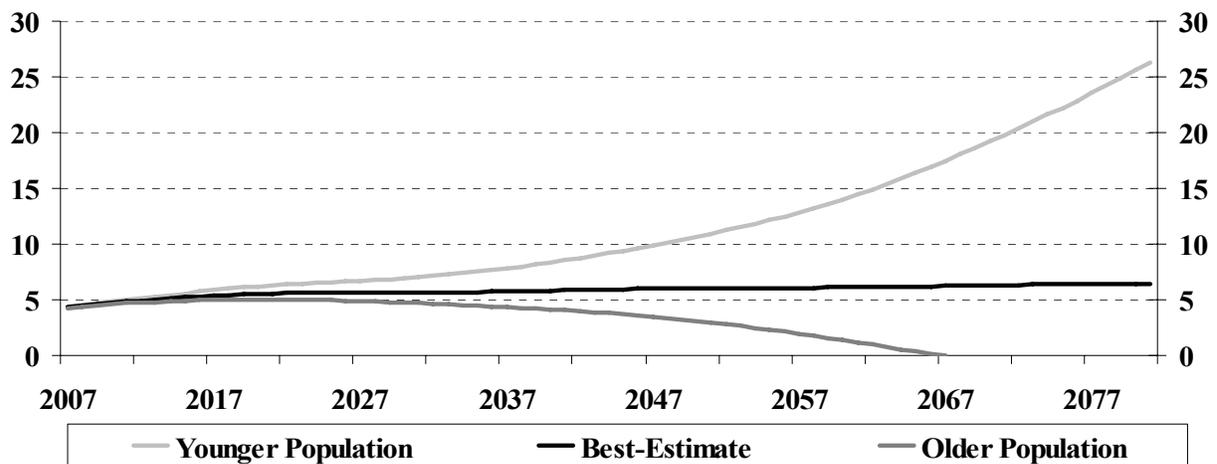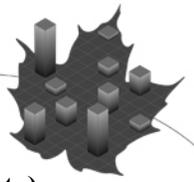
Chart 5 Asset/Expenditure Ratio Under Alternative Population Scenarios (minimum rate)

| Younger Population (9.07%) | Best-Estimate (9.82%) | Older Population (10.69%) |
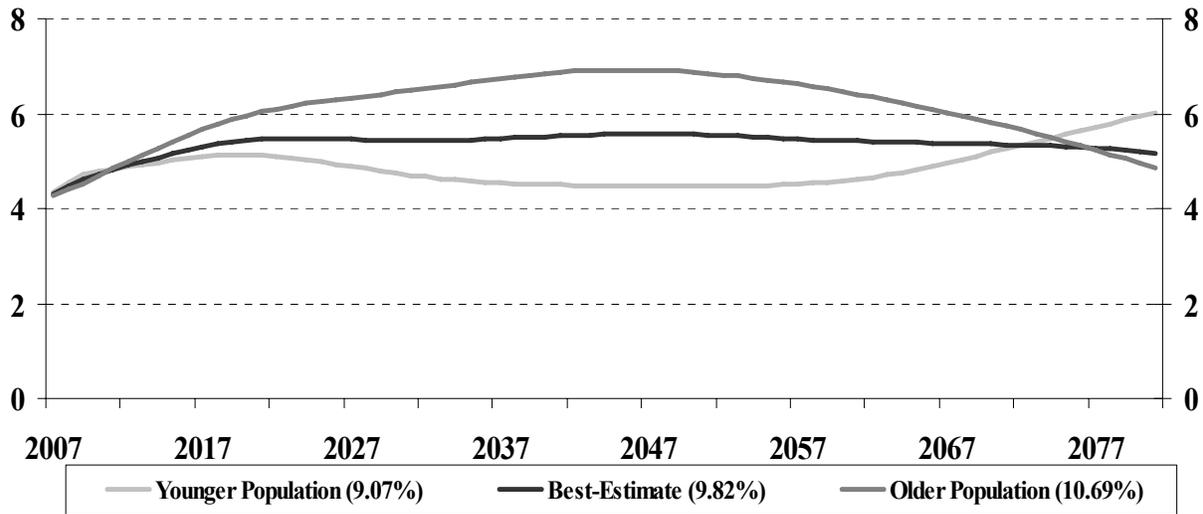
C. Economic Half Cycle

Under the best-estimate scenario, a moderate but sustainable growth in the economy is assumed to persist throughout the projection period. The sensitivity test presented in this subsection assumes an economic slowdown followed by a partial economic recovery. Under this scenario, the total contributory earnings are reduced by 6% in 2009 and are followed by a partial recovery thereafter. The unemployment rate is increased in 2009 and gradually reverts to its best-estimate value over the following ten years. The real increases in average weekly earnings and average annual earnings are reduced for 2009 and then return to their best-estimate values for 2010 and thereafter. Under this scenario, the minimum contribution rate increases to 9.92%.

D. Financial Market Volatility

In 1996, a review was commissioned by the federal and provincial finance ministers to determine the best ways to ensure the long-term financial sustainability of the Plan. It was acknowledged that to ensure the sustainability of the Plan, higher rates of return would be required on the assets and that continuing to invest solely in short-term and fixed income instruments would ultimately require a higher contribution rate and thus was not a viable option.

As a result of the review, the CPP Investment Board was created in 1997 with the objective "to invest its assets with a view of achieving a maximum rate of return, without undue risk of loss, having regard to the factors that may affect the funding of the Canada Pension Plan and the ability of the Canada Pension Plan to meet its financial obligations on any given business day." The purpose of the CPP Investment Board is to meet this mandate by diversifying the assets of the Plan through investments in equities and other asset classes with the aim of achieving higher returns. The role of the CPP Investment Board will become increasingly important as assets are expected to grow rapidly over the next 13 years with contributions to
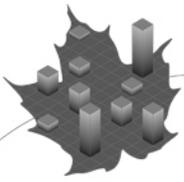
the Plan projected to exceed expenditures over this period. After 2019, it is projected that investment earnings will be required to meet expenditures.

Historically, equities have shown greater volatility than fixed income instruments (bonds), where volatility is a measure of the magnitude of fluctuation in returns. For instance, in the fifty, twenty-five, and ten years ending 2006, the volatility (standard deviation) of Canadian equities (indicated now by the S&P/TSX Total Return Index) was 16.1%, 15.1%, and 16.6%, respectively, as given in the Canadian Institute of Actuaries' *Report on Canadian Economic Statistics 1924 – 2006* (CIA Report). This compares with volatility of long-term federal bonds of 10.4%, 11.4%, and 7.3% over the same periods. Higher volatility of a security's returns implies a greater risk since the range of possible outcomes of returns increases. Hence, equities are viewed as being more risky than bonds. Historically, the higher volatility of equities compared to bonds has also been rewarded with higher returns.

Investors requiring higher returns from their portfolios may seek to invest in equities; however, by doing so, a higher level of risk is undertaken. This describes the key risk-reward relationship, whereby investors seek a higher level of return over the long term, or an equity risk premium, in exchange for assuming a higher level of risk. Nevertheless, over the short term, the potential for higher returns exists along with that for lower returns due to the higher level of volatility. Over the last fifty, twenty-five and ten years ending 2006, the average nominal return of Canadian equities was 9.9%, 10.8% and 10.0%, respectively, and for long-term federal bonds, the average nominal return was 7.6%, 12.2% and 8.5%, respectively, as given in the CIA Report. Although the return on equities was higher, on average, than federal bonds over the last fifty and ten years, equities provided lower returns, on average, than bonds over the last twenty-five years.

Investing in a greater proportion of equities requires assuming a higher level of risk and hence a possibility of realizing a wider range of returns. Conversely, investing in lower risk fixed income instruments will tend to produce lower returns. Further, by accepting lower returns with lower risk, investment objectives may not be achieved. If CPP assets were to be invested solely in long-term federal bonds starting in 2010, a lower return would be realized. Under such a scenario, the lack of equity investments would cause the minimum contribution rate to increase to 10.64%. As such, equity investments and thus, incurrence of higher risk, are necessary for the CPP to maintain the minimum contribution rate below the legislated rate of 9.90%. The following two sections discuss the impact of financial market volatility on the minimum contribution rate by considering alternative scenarios where equity returns other than the best-estimate are assumed to occur over the two-year period, 2009 to 2010.

1. Measuring the Impact of Financial Market Volatility (2009 to 2010)

Under the best-estimate assumptions of this report, it is expected that the Plan will be approximately 25% funded by 2025. To illustrate the possible impact of volatility in equity returns, different rates of return for Canadian and foreign equities are assumed to occur in 2009 and 2010 under various investment portfolios of the CPP.

Two alternative portfolios have been developed to show the potential impact of a riskier (Portfolio I, 80% equity) and less risky (Portfolio II, 30% equity) portfolio in relation to the
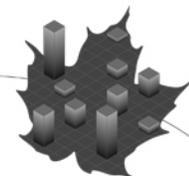
best-estimate portfolio. The resulting minimum contribution rates are given in Table 22. In addition, the probabilities of realizing such returns are given for the best-estimate portfolio. For a return of 0% in 2009 and 2010, the probability in the table is that of achieving 0% or less, on average, over a two-year period. All probabilities are stochastically generated, based on historical equity returns over the last 69 years ending 2006.

Following the various equity returns in 2009 and 2010, it is assumed that the returns revert back to their best-estimate values from 2011 onward. The probabilities in Table 22 indicate that there is a greater likelihood of realizing an average positive return over two consecutive years; however, the likelihood of realizing zero or negative returns still amounts to about 31%.

Table 22 Minimum Rate Under Various Equity Returns and Portfolios (2009 and 2010)

Annual Nominal Equity Returns in 2009 and 2010	Best-Estimate Portfolio		Portfolio I: 80% Equities/ 20% Fixed Income	Portfolio II: 30% Equities/ 70% Fixed Income
	Minimum Rate	Probability of Return[*]	Minimum Rate	Minimum Rate
(%)	(%)	(%)	(%)	(%)
+25	9.61	3	9.26	10.00
+15	9.72	18	9.43	10.04
+5.5	*9.82*	*47*	*9.59*	*10.08*
0	9.88	31	9.67	10.10
-10	9.98	6	9.81	10.14

[*] The probability of achieving the positive equity returns listed in the table (+25%, +15% and +5.5%) over two consecutive years corresponds to the probability that the average return is greater than or equal to the indicated return. Similarly, the probability of equity returns over two consecutive years being -10% is the probability that the average return is -10% or less over the two-year period. For a return of 0%, the probability corresponds to the average return being 0% or less over the period.

Portfolio I, which is riskier, has the greatest proportion of Canadian and foreign equity. As a result, the minimum contribution rate changes the most from its initial value. For instance, with an average return of -10% over two years, the minimum rate under a riskier portfolio increases by 0.22% (9.81% - 9.59%). This compares with increases of 0.16% for the best-estimate portfolio and only 0.06% for a less risky portfolio. Similarly, for average positive returns over two years, the minimum contribution rate decreases to a larger extent under a riskier portfolio compared to the other two portfolios. In comparison, a less risky portfolio has the greatest fixed income content, which results in the minimum contribution rate changing the least from its initial value compared to the other two portfolios. In general, positive returns provide additional room to absorb some of the impact of future adverse experience and also cause the minimum contribution rate to decrease. Conversely, negative returns remove room to offset adverse experience and cause the minimum contribution rate to increase.

Table 23 shows the change in assets resulting from equity returns being different than the best-estimate assumption in each of the years 2009 and 2010. Nominal equity returns of -10%, 0%, and +15% are considered to occur in years 2009 and 2010. Cumulative year-end
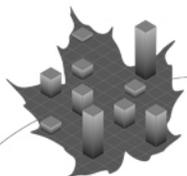
assets and the asset/expenditure ratio are also shown using the 9.9% legislated contribution rate. In all cases, it is assumed that the returns revert back to their best-estimate values from 2011 onward. The best-estimate year-end assets and asset/expenditure ratio are also shown in the table for comparison purposes. As shown in Table 23, cumulative assets would decrease by $28 billion or 17% by the end of 2010 as a result of a -10% equity return in 2009 and 2010 compared to the best-estimate assumption. This loss is equivalent to approximately nine months of contributions to the Plan in 2010. If an equity return of 0% were experienced, then the assets would decrease by $10 billion by the end of 2010. The effect is reversed in the event of a strong positive return of 15% with the assets increasing by $19 billion by the end of 2010. Conversely, under a more risky portfolio (80% equity), nominal equity returns of -10% in 2009 and 2010 will cause the assets to reduce by $35 billion at the end of 2010, rather than $28 billion under the best-estimate portfolio. This is equivalent to the total contributions paid to the Plan in 2010.

Table 23 Financial Status Under Various Equity Returns in 2009 and 2010
(9.9% contribution rate)

	Best-Estimate Equity Returns		Nominal Equity Returns in 2009 and 2010								
			-10%			0%			+15%		
Year	Assets at 31 Dec.	A/E Ratio	Assets at 31 Dec.	Change in Assets	A/E Ratio	Assets at 31 Dec.	Change in Assets	A/E Ratio	Assets at 31 Dec.	Change in Assets	A/E Ratio
	($ billion)		($ billion)	($ billion)		($ billion)	($ billion)		($ billion)	($ billion)	
2007	125	4.3	125	-	4.3	125	-	4.3	125	-	4.3
2008	138	4.5	138	-	4.5	138	-	4.5	138	-	4.5
2009	150	4.6	136	(14)	4.2	145	(5)	4.5	159	9	4.9
2010	163	4.7	134	(28)	3.9	152	(10)	4.4	181	19	5.3
2011	175	4.8	146	(30)	4.0	164	(11)	4.5	195	20	5.4
2015	235	5.2	197	(38)	4.4	221	(14)	4.9	260	25	5.8
2020	332	5.5	280	(53)	4.7	313	(19)	5.2	367	35	6.1
2025	442	5.6	369	(73)	4.7	415	(27)	5.3	490	48	6.2
2030	564	5.6	463	(101)	4.6	527	(37)	5.3	631	67	6.3
2050	1,432	6.0	1,060	(371)	4.5	1,296	(136)	5.5	1,677	245	7.1

As the return on the assets increases, the asset/expenditure ratio also increases as long as the contribution rate of 9.9% remains above the minimum contribution rate. For instance, in the case of an equity return of +15% in years 2009 and 2010 and a return to the best-estimate investment return assumption thereafter, the minimum contribution rate would decrease from 9.82% to 9.72%. Therefore higher returns cause the minimum contribution rate to decrease and provide more room for the assets to absorb some, but not all, of the impact of future adverse experience.

Conversely, negative returns remove room to offset adverse experience. In the case of an equity return of -10% in years 2009 and 2010, the minimum rate would increase above the legislated rate of 9.9% from 9.82% to 9.98%. The loss of investment earnings would reduce the Plan's assets in 2009 and thereafter.

In the best-estimate scenario, contributions are projected to exceed expenditures until 2019 after which time investment earnings will be required to pay a portion of benefits. Starting in

2020 or thereafter, any negative returns will cause the assets to decrease from one year to the next since contributions and investment income will not be sufficient to pay the year's benefits. However, if the Plan were solely invested in less risky fixed income instruments, the minimum contribution rate would have to be increased significantly as contributions and investment earnings would not be sufficient to meet expenditures in the long term. Thus, the CPP Investment Board was created to invest the assets in a diversified portfolio consisting of equities and other asset classes, necessarily incurring risk, with the purpose of earning higher rates of return to help ensure the long-term financial sustainability of the Plan. Investing solely in short-term and low risk fixed income instruments is not considered to be an option since, as described earlier, a higher contribution rate would ultimately be required.

E. Individual Sensitivity Tests

This actuarial report on the Canada Pension Plan is based on the projection of its revenues and expenditures over a long period of time. The information required by statute, which is presented in Section IV of this report, has been derived using best-estimate assumptions regarding future demographic and economic trends. The key best-estimate assumptions, i.e. those for which changes within a reasonable range have the most significant impact on the long-term financial results, are described in Appendix D. Both the length of the projection period and the number of assumptions required ensure that actual future experience will not develop precisely in accordance with the best-estimate assumptions. Individual sensitivity tests have been performed that consist of projections of the CPP financial results using alternative assumptions.

In previous reports, all individual sensitivity tests were based on a deterministic approach. Historical trends and judgment were used to determine an appropriate range of outcomes for each assumption, which were then tested. However, these tests provided no indication of the probability that the actual future experience would be inside or outside the assumed range of these estimates. For the first time, in this report, many of the individual assumption sensitivity tests are determined based on stochastic modeling techniques that estimate the probability distribution of the outcome for each of the assumptions.

These probability distributions are used to quantify a range of possible outcomes for each of the selected assumptions. The fluctuation in each variable is projected by using standard time-series modeling, a method designed to make inferences based on historical data. Generally, each variable is modeled by an equation that captures a relationship between current and prior years' values of the assumption and introduces year-by-year random variation, consistent with the variation observed in the historical period. For some assumptions, the equations additionally reflect inter-relationships with other assumptions. Parameters for the equations are estimated using historical data for periods that range between 37 years and 79 years, depending on the data available. Each time-series equation is designed such that, in the absence of random variation, the value of the variable is equal to the value assumed under the best-estimate assumption.

For each assumption, a minimum of 1,000 outcomes are generated for each year in the projection period. Next, a 95% confidence interval is calculated for each assumption to determine with 95% probability, the range of possible outcomes. The upper and lower values
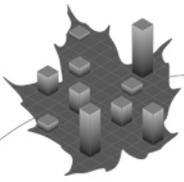
of this 95% confidence interval are used as the low-cost and high-cost assumptions for these individual sensitivity tests. These stochastically-generated values represent the range of the average outcome for the indicated variable over the entire 75-year projection period. Although the yearly outcome of each variable will fluctuate, it is the average outcome over the projection period that will determine the financial sustainability of the Plan. If a shorter projection period were to be considered, such as ten years, one could expect the average 95% confidence interval to be wider since the outcomes will not have had enough time to stabilize.

The results should be interpreted with caution and a full understanding of the inherent limitations of stochastic time-series modeling. Results are very sensitive to equation specifications, degrees of interdependence among variables and the historical periods used for the estimates. For some variables, using the variations exhibited in a relatively recent historical period may not provide a realistic representation of the potential variation for the future. In addition, results would differ if random variations had been applied to additional variables other than those mentioned above (such as labour force participation rates and retirement rates). Furthermore, additional variability could result from incorporating statistical approaches that would more fully model change in the long-range central tendencies of the variables. The historical period available for most variables is relatively homogeneous and does not reflect substantial shifts. The time-series modeling reflects what occurred in the historical period. As a result, the variation indicated in this section should be viewed as the minimum plausible variation for the future. Structural shifts, as predicted by many experts and as seen in prior centuries, are not reflected in the current models. Rather, the projection models or time series are adjusted to reflect our best judgments over a long period.

The sensitivity tests were performed by varying the key assumptions individually in a manner consistent with the results of the stochastic analysis and by keeping the remaining assumptions at their best-estimate levels. Each of these sensitivity tests was categorized as either a low-cost scenario or a high-cost scenario. In the low-cost scenarios, the alternative assumptions have the effect of reducing the minimum contribution rate. Conversely, assumptions in the high-cost scenarios increase the minimum contribution rate.

The alternative assumptions selected are intended to cover a 95% confidence interval and represent a wide range of potential long-term experience. However, each individual result cannot simply be combined because a change in any one particular assumption may have an impact on other assumptions to various degrees. The younger and older population scenarios described earlier in subsection B present a more realistic picture of the possible range for the future financial status of the Plan than does simply combining the individual tests presented in this section.

Over the long term, economic cycles have little impact on pay-as-you-go contribution rates as long as, on average, the ultimate assumptions are realized. Their impact on the minimum contribution rate depends primarily on the assumed pattern of rates of return on investments and real wages. Nevertheless, a separate deterministic test dealing with an economic half cycle is presented in addition to the nine individual tests. For this purpose, a short-term economic slowdown cycle has been prepared to show the impact it would have on the long-term pay-as-you-go-rates and on the minimum contribution rate. This test was described above in subsection C. Another test dealing with the financial market volatility as presented
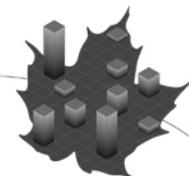
above in subsection D is also shown. In this test, an equity return of -10% is assumed to occur in 2009 and 2010.

Table 24 below summarises the alternative assumptions used in the individual sensitivity tests. It is followed by a brief discussion of each assumption and the impact its variation has on the results.

Table 24 Individual Sensitivity Test Assumptions

	Canada	Low-Cost		Best-Estimate		High-Cost	
1	Total fertility rate	2.1		1.6		1.1	
2	Mortality: Canadian life expectancy at age 65 in 2050	Males	17.8	Males	21.9	Males	25.1
		Females	18.6	Females	24.2	Females	27.9
3	Net migration rate	0.59%		0.54%		0.48%	
4	Participation rate (aged 15-69)*	81% (2030)		74% (2030)		71% (2030)	
	Unemployment rate*	4.3%		6.3%		8.3%	
5	Rate of increase in prices	3.4%		2.5%		1.3%	
6	Real-wage differential	1.9%		1.3%		0.5%	
7	Real rates of return	5.7%		4.2%		2.7%	
8	Retirement rates for cohort at age 60*	Males	20%	Males	40%	Males	60%
		Females	25%	Females	45%	Females	65%
9	CPP disability incidence rates (per 1,000 eligible)	Males	2.45	Males	3.1	Males	3.75
		Females	3.05	Females	3.5	Females	3.95

*   For this test a deterministic instead of a stochastic approach was used to derive the high- and low-cost estimates.

1. Fertility Rate

The best-estimate assumption is that the total fertility rate for Canada will increase slightly from its 2005 level of 1.53 to an ultimate level of 1.60 in 2010. Based on fertility experience of the last 65 years (1941 to 2005), a stochastic approach was used to generate the low- and high-cost scenarios over the 75-year projection period. It was projected that the average total fertility rate throughout the 75-year projection period will be in the range 1.1 to 2.1 with 95% probability. Instead, if a 10-year projection period is considered, then the average total fertility rate will be in the range 0.9 to 2.3.

The low-cost assumption has the fertility rate increasing to an ultimate level of 2.1 in 2010, which is equivalent to the national population replacement rate. Under this scenario, the population grows to a level in 2050 that is 17.3% higher than under the best-estimate assumption. In addition, a higher ultimate fertility rate leads to a younger population. Under this scenario, the dependency ratio of those aged 65 and over to the working-age population (20-64) is 0.41 (or approximately 2.4 workers per retiree) in 2050 compared to a dependency ratio of 0.47 (or approximately 2.1 workers per retiree) under the best-estimate assumptions.

The high-cost assumption has the fertility rate decreasing to an ultimate level of 1.1 in 2010. Under this scenario, the population grows much more slowly, to a level in 2050 that is 15.4%
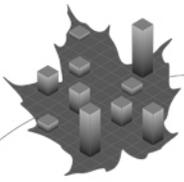
lower than under the best-estimate assumption. A lower ultimate fertility rate leads to an older population. In this scenario, the dependency ratio increases from the best-estimate value of 0.47 (or 2.1 workers per retiree) in 2050 to 0.54 (or 1.9 workers per retiree).

2. Mortality Rates

Mortality improvements are expected to continue in the future. The best-estimate ultimate rates of mortality improvement were established based on trends in Canadian experience over the last 30 years by age and sex. For the first five years of projection (2005 to 2009) rates of mortality improvement are assumed to correspond to the experience over the last 15 years (1989-2004). These rates are then graded down to their ultimate values by 2029.

Based on the mortality experience by age and sex of the last 79 years (1926 to 2004), a stochastic approach was used to generate the low- and high-cost scenarios over the 75-year projection period. It was projected that, on average, the life expectancy of a male age 65 in 2050 will be in the range 17.8 years to 25.1 years with 95% probability. For a female age 65 in 2050, life expectancy is projected to be in the range 18.6 years to 27.9 years.

For the low-cost scenario, mortality is assumed to improve less rapidly in order to obtain the lower targeted life expectancies in 2050. Under this scenario, the population grows to a level in 2050 that is 5.4% lower than under the best-estimate assumption.

For the high-cost scenario, mortality is assumed to improve more rapidly, especially at the older ages, in order to obtain the higher targeted life expectancies in 2050. Under this scenario, the population grows to a level in 2050 that is 1.9% higher than under the best-estimate assumption. Table 25 presents the life expectancies that would result in 2050 from the different rates of improvement.

Table 25 Life Expectancy in 2050 Under Alternative Assumptions
(Canada)

		Low-Cost	Best-Estimate	High-Cost
At Birth	Males	77.9	87.4	91.3
	Females	78.0	90.2	94.6
At Age 65	Males	17.8	21.9	25.1
	Females	18.6	24.2	27.9

*   Life expectancies shown are calculated taking into consideration future improvements in mortality.

3. Net Migration Rate

An ultimate best-estimate assumption of 0.54% of the population has been established for 2020 and thereafter. This level is reached in two steps; first a level of 0.50% is kept constant from 2004 until 2015, then the ultimate level of 0.54% is gradually reached in 2020. This is consistent with experience over the last 30 years.

Based on the net migration experience of the last 48 years (1959 to 2006), a stochastic approach was used to generate the low- and high-cost scenarios over the 75-year projection
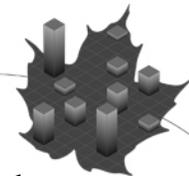
period. It is projected that the average net migration throughout the entire projection period will be in the range 0.48% to 0.59% of the population with 95% probability. Instead, if a 10-year projection period is considered, then average net migration will be in the range 0.30% to 0.69% of the population.

The low-cost assumption has net migration reaching a level of 0.59% of the population in 2007 and remaining constant thereafter. Under this scenario, the population grows to a level in 2050 that is 3.6% higher than under the best-estimate assumption. As well, the dependency ratio of those aged 65 and over to the working-age population (20-64) is 0.46 (or approximately 2.2 workers per retiree) in 2050 compared to a dependency ratio of 0.47 (or approximately 2.1 workers per retiree) under the best-estimate assumptions. The dependency ratio improves only slightly compared to the best-estimate since the impact of a higher net migration rate depends on the age distribution of the immigrants and emigrants. If both groups, those above ages 65 and those ages 20-64, are affected similarly by net migration, then one would expect very little change in the dependency ratio.

The high-cost assumption has net migration reaching a level of 0.48% of the population in 2007 and remaining constant thereafter. Under this scenario, the population grows more slowly, to a level in 2050 that is 2.8% lower than under the best-estimate assumption. As well, the dependency ratio is 0.48 (or approximately 2.1 workers per retiree). There is very little difference in the dependency ratio compared to the best-estimate.

4. Unemployment Rate - Participation Rates

Employment levels are reflected in the actuarial projection model through the assumptions made regarding the level of labour force participation and job creation rates by year, age and sex. These rates vary not only with the rate of unemployment, but also reflect trends in increased workforce participation by women, longer periods of formal education among young adults and trends in retirement patterns of older workers. The ultimate level of unemployment assumed to apply in 2007 and thereafter is 6.3%.

A deterministic model (instead of a stochastic model) was used to generate the low and high-cost scenarios for these assumptions since a stochastic model would not accurately reflect the assumed future trends in labour force participation and unemployment. The future labour shortage caused by the retirement of the baby-boom generation is unlike any labour situation experienced in the past and thus, the historical data does not reflect any substantial shifts like the one being projected. Therefore, it was decided to use judgment in determining the low and high-cost assumptions for participation rates and unemployment.

For the low-cost scenario, the job creation rates are assumed to increase more rapidly, which results in an unemployment rate of 4.3% in 2007 and thereafter. For the high-cost scenario, the job creation rates are assumed to increase more slowly, resulting in an unemployment rate of 8.3% in 2007 and thereafter.

Participation rates are used to estimate the active population. The best-estimate scenario divides the projection period into two periods, i.e. 2007 to 2015 and 2015 to 2030. During the period 2007 to 2015, the assumed increase in labour force participation rates for those aged 50
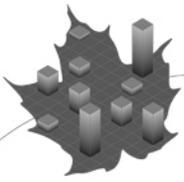
and over will not be sufficient to counteract the decrease in the overall participation rate due to the demographic shift. For this reason, participation rates for people under the age of 55, especially for those aged 20 to 40, were increased somewhat. Thus, the labour force participation rate for ages 15-69 decreases slightly from approximately 74.8% in 2006 to 73.7% in 2015.

From 2015 to 2030, baby boomers born between 1955 and 1965 will be reaching the ages of 60 to 75, while the first generation of boomers (1945 to 1955) will have already retired, thus creating downward pressure on the overall participation rate. It was thus assumed that those reaching ages 55 to 64 during this period will participate more because of the increased employment opportunities due to the expected labour shortage. As well, it is assumed that participation rates for those below age 55 will increase. Thus, the labour force participation rate for ages 15-69 is projected to increase slightly to 74.2% in 2030.

For the low-cost scenario, male participation rates are assumed to reach their highest historical level by 2030 and females are assumed over the same period to reach the level of males. This results in an overall participation rate of 81% for those aged 15 to 69 in 2030.

For the high-cost scenario, male and female participation rates are assumed to remain constant at their 2006 levels. This results in an overall participation rate of 71% for those aged 15 to 69 in 2030.

5. Price Increases

An ultimate annual rate of price increase of 2.5% has been assumed for the best-estimate projections. The rate of price increase is assumed at 2.0% from 2007 to 2011 and is then assumed to increase uniformly to its ultimate level of 2.5% in 2016.

Based on the overall inflation rate experience of the last 69 years (1938 to 2006), a stochastic approach was used to generate the low- and high-cost scenarios over the 75-year projection period. It was projected that the average annual rate of price increase during the 75-year projection period will be in the range 1.3% to 3.4% with 95% probability. Instead, if a 10-year projection period is considered, then the average annual rate of price increase will be in the range -1.0% to 5.2%.

For the low-cost scenario, the annual rate of price increase is assumed to rise to an ultimate level of 3.4% in 2016. This level of inflation is comparable to the average over the last 25 years. Although a higher rate of increase in prices results in higher CPP expenditures, it also results in higher contributory earnings. This is because the same real-wage differential is added to a higher base of inflation, producing a higher nominal rate of wage increase.

For the high-cost scenario, the annual rate of price increase is assumed to be 1.3% for years 2007 and thereafter. This level of inflation is comparable to that of the early 1960s and the mid-to-late 1990s.

6. Real-Wage Differential

Wage increases affect the financial balance of the CPP in two ways. In the short-term, an increase in the average wage translates into higher contribution income with little immediate impact on benefits. Over the longer term, higher average wages produce higher benefits. The long-term projected financial position of the CPP is more dependent on the differential between the assumed annual rates of wage increase and price increase (the real-wage differential) than on the absolute level of assumed wage increases.

An ultimate real-wage differential of 1.3% has been assumed in years 2015 and thereafter for the best-estimate projections. Combined with the best-estimate price increase assumption of 2.5%, it results in assumed nominal annual increases in wages of 3.8% in 2016 and thereafter. During the initial years of the projection period, the real-wage differential is assumed to increase gradually from 2007 to its ultimate level.

Based on the overall real-wage experience of the last 64 years (1943 to 2006), a stochastic approach was used to generate the low- and high-cost scenarios over the 75-year projection period. It was projected that the average real wage differential throughout the 75-year projection period will be in the range 0.5% to 1.9% with 95% probability. Instead, if a 10-year projection period is considered, then the average real wage differential will be in the range -1.4% to 3.1%.

For the low-cost scenario, the assumed real-wage differential increases to an ultimate level of 1.9% in 2015. For the high-cost scenario, the assumed real-wage differential increases to an ultimate level of 0.5% in 2009.

7. Rate of Return on Investments

In accordance with the new policy of investing the assets in a diversified portfolio, the ultimate real rate of return on investments is projected to be 4.2% under the best-estimate assumptions.

Using the assumed asset mix of this report and based on the overall rate of return experience of the last 69 years (1938 to 2006), a stochastic approach was used to generate the low- and high-cost scenarios over the 75-year projection period. It was projected that the average annual real rate of return during the 75-year projection period will be in the range 2.7% to 5.7% with 95% probability. Instead, if a 10-year projection period is considered, then the average annual real rate of return will be in the range -10.5% to 7.9%.

For the low-cost scenario, the real rate of return on investments is assumed to be 5.7%. For the high-cost scenario, the real rate of return on investments is assumed to be 2.7%.

The real rates of return have no effect on the pay-as-you-go rates, since they affect neither benefits nor contributory earnings. However, real rates of return have an impact on the minimum contribution rate. Beginning in 2020 when net cash flows of the Plan are projected to turn negative, a portion of investment earnings will be required to pay Plan benefits. Sufficient real rates of return are required to produce investment earnings large enough to cover the necessary portion of Plan benefits while still increasing the assets of the Plan.
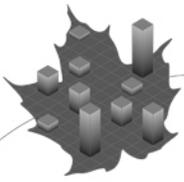
8. Retirement Rates

Retirement rates are used to determine the distribution of retirement ages of new retirement beneficiaries. The best-estimate scenario is based on recent experience. For cohorts reaching age 60 in 2009 and thereafter, it is assumed that the retirement rate at age 60 will be 40% for males and 45% for females. The assumed retirement rates for age 65 are 36% and 30% for males and females, respectively.

For the low-cost scenario, retirement rates were modified so that the retirement rate at age 65 would be 20 percentage points higher. The proportion of persons in the age range 60 to 64 contributing to the Plan is therefore increased. For the high-cost scenario, retirement rates were modified so that the retirement rate at age 60 would be 20 percentage points higher. Thus, the proportion of persons age 60 and above contributing to the Plan is decreased.

9. Disability Rates

The best-estimate projections assume that disability incidence rates will remain at levels comparable to what has been experienced in recent years. The aggregate ultimate rate of incidence for years 2011 and later is 3.1 new disabilities per year among 1,000 eligible workers for males and 3.5 per thousand for females, on average.

Based on the overall disability incidence rate experience of the last 37 years (1970 to 2006), a stochastic approach was used to generate the low- and high-cost scenarios over the 75-year projection period. It was projected that the average annual disability incidence rate for males during the 75-year projection period will be in the range 2.45 to 3.75 per 1,000 eligible workers with 95% probability. For females, the range of disability incidence rates is 3.05 to 3.95 per 1,000 eligible workers.

For the low-cost scenario, disability incidence rates are assumed to reach ultimate levels in 2011 of 2.45 per thousand for males and 3.05 per thousand for females. This male incidence rate is slightly lower than the average rate experienced under the CPP in the last ten years, while the female rate is equal to the average rate experienced over the last ten years.

For the high-cost scenario, disability incidence rates are assumed to reach ultimate levels in 2011 of 3.75 per thousand for males and 3.95 per thousand for females. These rates are slightly lower than the high levels experienced in the early 1990s.

Disability continuance rates assumed for future years, under all scenarios, have been based on the average experience during the period 1997 to 2006.

10. Results

Under each scenario, contribution rates were projected to follow the current schedule through 2009 and a new minimum contribution rate was determined for years 2010 and thereafter. Table 26 summarizes the pay-as-you-go contribution rates and the minimum contribution rate under each of the scenarios. In addition, the table presents the first year that benefits exceed contributions.

Under some of the sensitivity tests, the ultimate pay-as-you-go rates do not stabilize. In such cases, while the minimum contribution rates shown in Table 26 would be adequate through 2075, they could still result in significant increases or decreases in the ratio of assets to expenditures in the later years of the projection period.

Table 26 Sensitivity of Minimum Contribution Rate
(percentages)

	Assumption	Scenario	Minimum Contribution Rate	First Year Benefits Exceed Contributions	Pay-As-You-Go Rates		
					2025	2050	2075
		Best-Estimate	9.82	2019	10.67	11.29	11.40
1	Fertility Rate	Low Cost	9.25	2014	10.63	9.98	9.11
		High Cost	10.45	2024	10.71	13.00	15.10
2	Mortality Rates	Low Cost	9.16	2014	10.40	10.24	9.74
		High Cost	10.20	2021	10.87	11.88	12.21
3	Migration Rate	Low Cost	9.70	2019	10.50	11.08	11.19
		High Cost	9.92	2020	10.76	11.53	11.66
4	Unemployment and Participation Rates	Low Cost	9.41	2021	9.91	10.83	11.41
		High Cost	10.08	2019	11.13	11.57	11.39
5	Price Increases	Low Cost	9.66	2018	10.49	11.02	11.19
		High Cost	10.13	2020	11.01	11.73	11.76
6	Real-Wage Differential	Low Cost	9.34	2017	10.01	10.20	10.28
		High Cost	10.41	2020	11.57	12.80	13.00
7	Real Rate of Return on Investments	Low Cost	9.02	2012	10.67	11.29	11.40
		High Cost	10.72	2026	10.67	11.29	11.40
8	Retirement Rates	Low Cost	9.66	2021	10.34	11.22	11.39
		High Cost	10.02	2016	11.03	11.39	11.46
9	Disability Rates	Low Cost	9.68	2019	10.51	11.13	11.25
		High Cost	9.98	2019	10.83	11.44	11.55
Economic and Investment Shocks							
10	Economic Half Cycle*		9.92	2017	10.79	11.25	11.40
11	Financial Market Volatility*		9.98	2020	10.67	11.29	11.40

*   As described under subsections C and D.
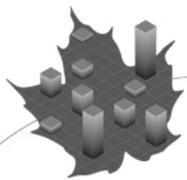
Table 27 summarizes the first year that benefits exceed contributions and the projected impact on the ratio of the assets to the following year's expenditures under each of the alternative sets of assumptions if the currently scheduled contribution rate of 9.9% continues to apply in years 2010 and thereafter.

Table 27 Sensitivity of Funding Levels
(9.9% ultimate contribution rate)

	Assumption	Scenario	First Year Benefits Exceed Contributions	Asset/Expenditure Ratio		
				2025	2050	2075
		Best-Estimate	2020	5.61	6.03	6.39
1	Fertility Rate	Low Cost	2020	5.60	7.61	14.04
		High Cost	2020	5.62	4.42	*
2	Mortality Rates	Low Cost	2021	5.96	9.23	17.35
		High Cost	2019	5.37	4.38	1.69
3	Migration Rate	Low Cost	2021	5.77	6.70	7.96
		High Cost	2019	5.56	5.56	5.08
4	Unemployment and Participation Rates	Low Cost	2025	6.43	8.95	11.62
		High Cost	2017	5.16	4.29	3.06
5	Price Increases	Low Cost	2020	5.76	6.96	8.62
		High Cost	2018	5.26	4.36	2.39
6	Real-Wage Differential	Low Cost	2024	5.99	7.30	11.66
		High Cost	2017	5.11	2.86	**
7	Real Rate of Return on Investments	Low Cost	2020	7.16	12.77	26.77
		High Cost	2020	4.31	2.19	***
8	Retirement Rates	Low Cost	2023	6.48	7.57	9.16
		High Cost	2015	4.74	4.35	3.25
9	Disability Rates	Low Cost	2021	5.93	6.99	8.50
		High Cost	2019	5.30	5.10	4.34
Economic and Investments Shocks						
10	Economic Half Cycle****		2017	5.03	5.07	4.70
11	Financial Market Volatility****		2020	4.68	4.47	3.57

*   Assets depleted by 2069.
**   Assets depleted by 2066.
***   Assets depleted by 2068.
**** As described under subsections C and D.

VII. Conclusion

The results contained in this report confirm that the legislated contribution rate of 9.9% is sufficient to pay for future expenditures and to accumulate assets of $235 billion (5.2 times the annual expenditures) in 2015. In 2050, the assets are projected to be $1,432 billion or 6.0 times the annual expenditures.

The minimum contribution rate determined under the best-estimate assumptions of this report is 9.82%. Better than anticipated economic experience, especially investment performance, labour force participation and employment data, over the period 2004 to 2006 have put downward pressure on the minimum contribution rate. On the other hand, a more costly demographic outlook due to the continuing increases in longevity, combined with an unexpected increase in the number of early retirement benefit uptake, lower inflation expectations and lower anticipated rates of return on investments have put upward pressure on the minimum contribution rate. These factors do not completely offset each other, resulting in a projected minimum contribution rate of 9.82%.

To measure the sensitivity of the long-term projected financial position of the Plan to changes in the future economic and demographic outlook, two demographically based scenarios that portray a generally younger and older population were developed. The younger and older population scenarios produced minimum rates of 9.07% and 10.69%, respectively. Sensitivity tests on key assumptions and an analysis of the impact of financial market volatility show that the minimum rate could deviate significantly from its best-estimate value of 9.82% if other than best-estimate assumptions were to be realized. For example, if rates of return on equities were -10% in both 2009 and 2010, the minimum contribution rate would increase to 9.98%.

Under the legislated contribution rate of 9.9%, the assets are projected to grow rapidly over the next 13 years as contributions are expected to exceed expenditures over that period. The asset/expenditure ratio will grow from 4.1 in 2006 to 5.5 in 2019 and remain somewhat stable as the baby boom generation retires between 2015 and 2030. The retirement of the baby boomers will create upward pressure on the Plan outflows as part of the investment income will be required to pay benefits since contributions will not be sufficient to cover benefits. However, assets are projected to continue to grow until the end of the projection period, but at a slower pace. The asset/expenditure ratio is expected to reach a level of 6.0 by 2050 and 6.4 by 2075. These are indicators that the Plan is sustainable over the long term.

The pool of assets generated during the projection period provides the Plan with the capacity, through investment earnings, to absorb some, but not all, of the possible unforeseen economic and demographic fluctuations which otherwise would have to be reflected in the legislated contribution rate. Thus, despite the substantial increase in benefits paid as a result of an aging population, the Plan is expected to be able to meet its obligations throughout the projection period. The projected financial status of the Canada Pension Plan presented in this report is based on the assumed demographic and economic outlook over the long term. Therefore, it remains important to review the Plan's long-term financial status on a regular basis by producing periodic actuarial reports. For this purpose, as required by the *Canada Pension Plan*, the next such review will be as at 31 December 2009.
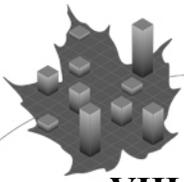
VIII. Actuarial Opinion

In our opinion, considering that this Twenty-Third Actuarial Report was prepared pursuant to the *Canada Pension Plan*:

- the data on which this report is based are sufficient and reliable;

- the methodology employed is appropriate and consistent with sound actuarial principles; and

- the assumptions used are, in aggregate, reasonable and appropriate.

Based on the results of this valuation, we thereby certify that the minimum contribution rate to finance the Canada Pension Plan without further increase is 9.82% for years 2010 and thereafter.

This report has been prepared, and our opinions given, in accordance with the general standards of practice of the Canadian Institute of Actuaries and the Guidelines of Actuarial Practice for social security programs of the International Actuarial Association.

_____
Jean-Claude Ménard, F.S.A., F.C.I.A.
Chief Actuary

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Michel Montambeault, F.S.A., F.C.I.A.
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Senior Actuary

Ottawa, Canada
18 October 2007

Appendix A – Financing the Canada Pension Plan

A. Historical Background

The retirement system in Canada has been designed as a three-tier system. First, the Old Age Security (OAS) Program provides for a minimum floor based on residence in Canada. Second, the CPP/QPP cover most individuals with employment earnings. Finally, individuals may be covered by registered private pension plans (RPP) and can purchase individual registered retirement savings plans (RRSP) to complete their retirement needs.

Each tier is financed using a different approach; OAS is financed through general tax revenues on a pay-as-you-go basis, the CPP is partially funded (projected 25%) based on contributions on employment earnings and RPPs and RRSPs are fully funded. To properly assess the long-term financial status of the CPP, one must consider the whole retirement pension system in Canada rather than the CPP in isolation. This variety in funding methods enables the system to be steered towards more or less funding by putting emphasis on the different tiers depending on the demographic and economic conditions.

The CPP was initially established as a pay-as-you-go plan with a small reserve worth about two years of benefits. At the time of the Plan's inception, demographic and economic conditions were characterized by a younger population (higher fertility rates and lower life expectancies), rapid growth in wages and labour force participation and low rates of return on investments. These conditions made prefunding the scheme unattractive and a PayGo scheme more appropriate. Growth in total earnings of the workforce and thus contributions were sufficient to cover growing expenditures without requiring large increases in the contribution rate. Assets of the Plan were invested primarily in long-term non-marketable securities of the provincial governments at lower than market rates, thus providing the provinces with a relatively inexpensive source of capital to develop needed infrastructure.

However, changing conditions over time, including lower birth rates, increased life expectancies and higher market returns led to increasing Plan costs and made fuller funding more attractive and appropriate. By the mid-1980s, the net cash flow (contributions less expenditures) had turned negative and part of the Plan's investment earnings were required to meet the shortfall. The shortfall continued to grow, which eventually caused the assets to start to fall by the mid-1990s. The decline in the level of assets in turn led to a portion of the reserve being required to cover expenditures.

In the December 1993 (15th) Actuarial Report on the CPP, the Chief Actuary projected that the PayGo contribution rate (expenditures as a percentage of contributory earnings) would increase to 14.2% by 2030. It was further projected that if changes were not made to the Plan, the reserve fund would be exhausted by 2015. The Chief Actuary identified five factors responsible for the increasing costs of the Plan, namely: lower birth and higher life expectancies than expected, lower productivity, benefit enrichments and increased numbers of Canadians claiming disability benefits for longer periods.
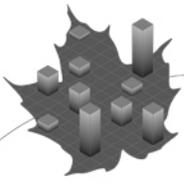
In response to this, amendments were made in 1998 to gradually increase the level of CPP funding by increasing contribution rates over the short term, reducing the growth of benefits over the long term and investing cash flows in the private markets through the CPP Investment Board to achieve higher rates of return. The changes also included that stakeholders shall consider the full funding of any future new or increased benefits provided under the Plan. The reform package agreed to by the federal and provincial governments in 1997 thus included significant changes to the Plan's financing and funding provisions.

- The introduction of *steady-state funding* to replace pay-as-you-go financing to build a reserve of assets (equivalent over time to about five and a half years of benefit expenditures or about 25 per cent of Plan liabilities). Investment earnings on this pool of assets would help to pay benefits when the large cohort of baby boomers retires.

- The introduction of *incremental full funding* that requires that changes to the CPP that increase or add new benefits be *fully funded*, i.e. that their costs be paid as the benefit is earned and that any costs associated with benefits that are paid but that have not been earned be amortized and paid for over a defined period of time consistent with common actuarial practice. This refers to section 113.1(4)*(d)* of the *Canada Pension Plan*.

    113.1(4) *In conducting any review required by this section and in making any recommendations, ministers shall consider…*

    (d) that changes to the Act that increase benefits or add new benefits must be accompanied by a permanent increase in the contribution rates to cover the extra costs of the increased or new benefits and by a temporary increase in the contribution rates for a number of years that is consistent with common actuarial practice to fully pay any unfunded liability resulting from the increased or new benefits.

Both of these funding objectives were introduced to improve fairness and equity across generations. The move to steady-state funding eases some of the contribution burden on future generations and under full funding, each generation that will receive benefit enrichments is more likely to pay for it in full so that its costs are not passed on to future generations.

Under these new funding objectives it is projected that the level of funding for the CPP will grow from its current level of about 15% in 2006 to a level of about 25% over the next 20 years. The objective of the changes was to improve the financial long-term sustainability of the Plan. This will be accomplished if the degree of funding and the contribution rate remain relatively stable, which implies a long-term growth rate of assets at least equal to the long-term growth rate of liabilities.

B. Actuarial Liability and Current Service Cost

1. Actuarial Liability

The Canada Pension Plan is a defined benefit pension plan, i.e. in exchange for contributions, a worker and his or her dependants become eligible for a range of benefits, the amounts of which are based on his or her participation and earnings history. In this sense, the CPP is similar to a defined benefit pension plan that might be established by an employer for its employees.

However, the CPP differs from a typical employer sponsored pension plan in that it is only partially funded. CPP assets are expected to reach a level of about five and a half years of expenditures over the next 20 years, which represents about a 25% funding level under the best-estimate assumptions of this report. From its inception, the CPP was never intended to be a fully funded plan, as it is only one of the three components of the retirement pension scheme in Canada. As mentioned earlier, the three pillars of the retirement system are complementary as their funding approaches differ, provide better flexibility and shorten the time required to adjust to changing demographic and economic circumstances. These changing conditions might make it more or less costly to prefund retirement liabilities.

The actuarial liability of the Plan is estimated using the projected unit credit actuarial cost method. The projected unit credit method is the method most widely used for the actuarial valuation of registered pension plans. Under this method, the benefits that will be paid in respect of CPP participation on or before the valuation date must first be projected. This projection is based on the best-estimate assumptions described in Appendix D with the following exceptions:

- no new entrants to the workforce are included; and

- current Plan participants who are not receiving benefits at the valuation date are assumed to have no contributory earnings beyond that date. Their projected benefits are calculated by assuming they will have no pensionable earnings from the valuation date up to the year of benefit uptake. The YMPE is projected because pre-valuation date pensionable earnings are still indexed to the year of benefit uptake.

Next, the resulting projected expenditures are discounted using the projected rate of return on overall CPP assets to determine their present value. This is the actuarial liability. The actuarial position of the Plan as at 31 December 2006 is presented in Table 28. To obtain the unfunded liability of the Plan, the Plan's assets are deducted from the actuarial liability at the valuation date.
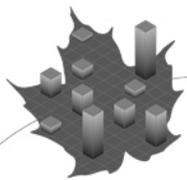
Table 28 Balance Sheet as at 31 December 2006

	Amount	As a % of Liability
	($ billion)	
Actuarial liability	733.5	100
Assets	113.6	15
Unfunded liability	619.9	85

If the Plan was fully funded, the asset/expenditure ratio would be about 26.5 instead of 4.1 as at 31 December 2006. This ratio will vary in future years, in accordance with demographic and economic experience and any changes in assumptions. With the changes introduced in 1998, the Plan has been moving away from pay-as-you-go financing (with a small contingency reserve) towards fuller funding. Therefore, the funding of the Plan is expected to increase from its current level of 15% in 2006 to a level of about 25% by 2025, thus reducing the relative size of the Plan's unfunded liability. The unfunded liability at a point in time is one indicator of the financial health of the CPP, but a better perspective is to look at the projected funding level of the Plan and the projected growth rates of its assets and liabilities.

Chart 6 presents the evolution of the funding level while Chart 7 presents the projected growth rates of assets and liabilities. Up to 1985, the Plan was accumulating assets more rapidly than its liabilities were growing, resulting in an asset worth about six times annual benefits by the end of 1985. However, from 1985 until the last part of the 1990s, assets started to grow less rapidly than liabilities in response to changing demographic and economic conditions. Because of this, the asset/expenditure ratio fell from about six in 1985 to about two by the end of 2000. More importantly, during the period from 1993 to 1998, the asset growth rate was negative because some assets, in addition to all contributions and investment earnings, were being used to pay benefits. The CPP amendments, which became effective on 1 January 1998, reversed this trend.

Chart 7 shows that assets are growing more quickly than liabilities in the short- to medium-term and will thereafter always grow at a rate somewhat higher. This will result in the assets growing to a stable level of between five and six years of benefits from its current level of four over the next few decades. This clearly indicates that the 1998 amendments have put the CPP on a better financial footing over the foreseeable future as the growth in assets significantly outpaces the growth in liabilities over the next 20 years. During that period the baby boom generation will have retired and, as a result of the baby bust, fewer young Canadians will replace them in the workforce. Once the Plan has reached the higher funding level of about 25%, the long-term asset growth rate thereafter must be at least equal to the liability growth rate to ensure long-term financial sustainability. As shown in Chart 7, the asset and liability growth rates will stabilize at about 5% over the long term, making the Plan financially sustainable.
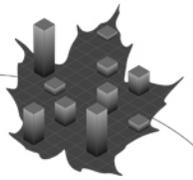
Chart 6 Evolution of Funding Ratio
(9.9% contribution rate for 2010+)
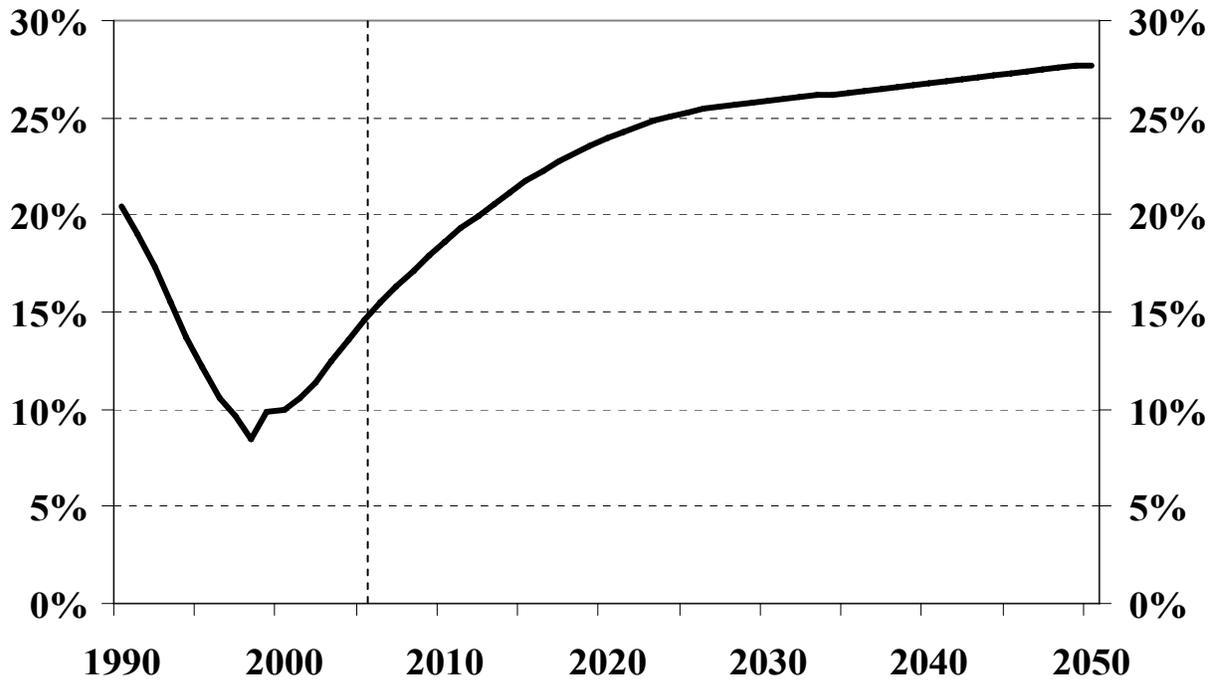
Chart 7 Annual Growth Rates of Assets and Liabilities
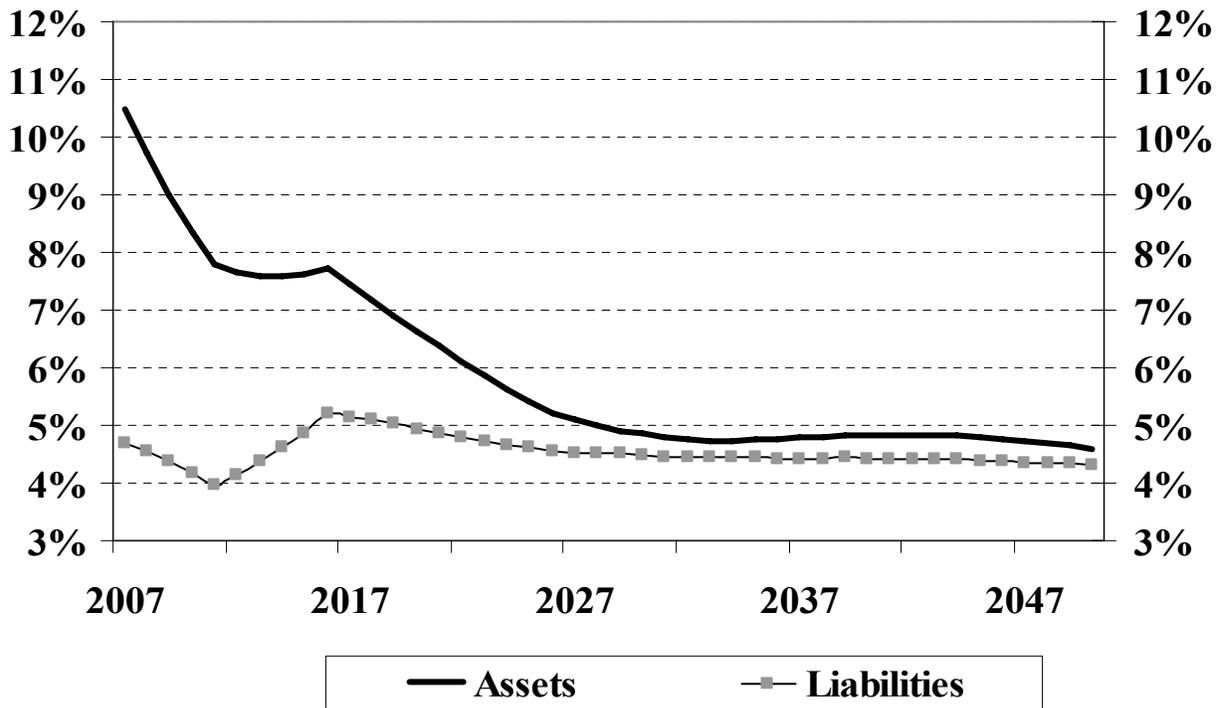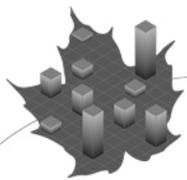
2. Current Service Cost

The current service cost represents the value of future benefits earned in a year. The current service cost for the Plan for 2007 was calculated as $19.4 billion or 5.9% of projected 2007 contributory earnings. It includes the current service cost of 0.02% in respect of Bill C-36.

Other things being equal, the current service cost is expected to reduce to 5.7% by 2030 as the rate of return is expected to increase over that period. For 2030 and thereafter, the current service cost is expected to reduce somewhat until the end of the projection period as the average benefit factor for future male cohorts is expected to decline. The difference between the legislated contribution rate of 9.9% and the current service cost is used to significantly increase the funding level of the Plan from 15% at the end of 2006 to about 25% by 2025. Again, these results confirm that the current financial status of the Plan is projected to improve significantly over the next 50 years.

Table 29 presents the evolution of the actuarial liabilities, current service cost and funding level under the 9.9% legislated contribution rate while Table 30 present the actuarial liability, unfunded liability and normal cost of the Plan as at 31 December 2006 under various real rates of return assumptions.

Table 29 Liabilities, Current Service Cost and Funding Ratio – 9.9% Contribution Rate

Year	PayGo Rate	Contri- butions	Expen- ditures	Net Cash Flow	Invest- ment Earnings	Assets at 31 Dec.	Rate of return	A/E Ratio	Current Service Cost	Liabilities at 31 Dec.	Funding Ratio
	(%)	($ billion)	($ billion)	($ billion)	($ billion)	($ billion)	(%)		(% of cont. earn)	($ billion)	(%)
2007	8.35	32.8	27.7	5.1	6.8	125.5	5.82	4.31	5.86	768.0	16.3
2008	8.48	34.0	29.1	4.9	7.3	137.7	5.72	4.47	5.85	802.9	17.2
2009	8.63	35.3	30.8	4.5	7.9	150.1	5.60	4.62	5.86	837.9	17.9
2010	8.78	36.7	32.5	4.2	8.4	162.6	5.47	4.74	5.84	872.8	18.6
2011	8.90	38.1	34.3	3.8	8.8	175.3	5.36	4.84	5.81	907.6	19.3
2012	9.04	39.6	36.2	3.4	10.0	188.7	5.61	4.93	5.76	945.3	20.0
2015	9.41	45.0	42.7	2.2	14.4	235.0	6.55	5.20	5.61	1,082.6	21.7
2020	10.01	56.1	56.7	(0.6)	21.3	332.4	6.84	5.54	5.59	1,386.9	24.0
2025	10.67	69.4	74.8	(5.4)	28.0	442.0	6.74	5.61	5.61	1,747.6	25.3
2030	11.02	86.1	95.8	(9.7)	35.8	564.4	6.72	5.63	5.65	2,179.5	25.9
2040	11.06	132.3	147.8	(15.5)	57.1	899.8	6.72	5.83	5.54	3,363.8	26.7
2050	11.29	199.5	227.4	(27.9)	90.9	1,431.6	6.72	6.03	5.41	5,162.0	27.7
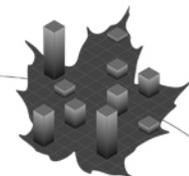
Table 30 Balance Sheet as at 31 December 2006 with Various Rates of Return

Average	100% GC LT Bond Portfolio	Best-Estimate Portfolio	100% Equity Portfolio
Expected Real Return over 75-year Period (%)	2.8	4.2	4.9
Assets ($B)	113.6	113.6	113.6
Liability ($B)	919.8	733.5	675.9
Unfunded Liability ($B)	806.2	619.9	562.3
Funded Ratio (%)	12.3	15.5	16.8
Current Service Cost in 2007 (%)	8.6	5.9	5.0
Minimum Contribution Rate (%)	10.64	9.82	9.42

C. Reconciliation of Changes in Unfunded Liability

The major factors that account for the changes in the unfunded liability from the amount shown in the Twenty-First Actuarial Report are identified in Table 31.

Table 31 Reconciliation of Unfunded Liability with Previous Report
($ billion)

21st Report Unfunded Liability as at 31 December 2003	**516.3**
Update Valuation Date to 31 December 2006:	
Interest	109.4
Contributions less current service cost	(39.9)
Subtotal: Update Valuation Date	**585.8**
Methodology and Experience Update	**(2.3)**
Changes in Key Assumptions	
Fertility	0.1
Migration	(0.4)
Mortality	10.9
Retirement	4.4
Disability	(0.6)
Employment	0.1
Real-wage differential	(3.4)
Price increases	1.2
Real rate of return on investments	38.8
Asset mix	(9.7)
Others	(5.1)
Subtotal: Assumption Changes	**36.3**
Amendments	
Bill C-36	0.1
Court decision (same-sex pre-1998)	0.0
Subtotal: Amendments	**0.1**
23rd Report Unfunded Liability as at 31 December 2006	**619.9**
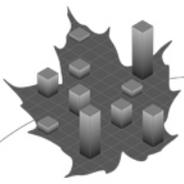
D. Internal Rates of Return

The internal rate of return is, with respect to a group of CPP participants born in a given year (i.e. a cohort), the unique interest rate resulting from the equality of:

- the present value of past and future contributions paid or expected to be paid by and in respect of that cohort, and

- the present value of past and future benefits earned or expected to be earned by that cohort.

Accordingly, actual internal rates of return cannot be determined until the last member of the cohort has died. However, they can be estimated based on the historical and projected experience of the cohort. Internal rates of return have been calculated on the basis of the best-estimate assumptions and using the legislated contribution rate of 9.9% for 2010 and thereafter.

The results presented in Table 32 are net rates in the sense that the administrative expenses associated with the cohort are not included in the value of the benefits. They are shown on two bases, as both nominal and real internal rates of return. To determine the real internal rates of return, both contributions and benefits were first adjusted to remove the impact of price increases.

Table 32 Internal Rates of Return by Cohort
(annual percentages)

Birth Year	Nominal	Real
1940	10.4	6.2
1950	7.2	4.1
1960	5.6	3.0
1970	4.9	2.4
1980	4.8	2.2
1990	4.7	2.2
2000	4.7	2.2

The higher internal rates of return of the earlier cohorts mean that they are expected to receive better value from the CPP than those who follow. The differences provide an indication of the degree of intergenerational transfer present in the Plan. However, the fact that all of the rates in the table are greater than zero shows that each cohort is expected to realize a positive return from its investment in the CPP.
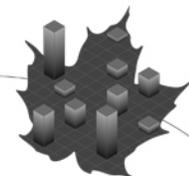
E. Actuarial Balance

In this section, another financial measure called the "actuarial balance" is discussed. It is used to compare the long term financial status of the CPP and the Old Age Security and Disability Program (OASDI) in the United States. The actuarial balance is essentially the difference between annual income and expenditures expressed as a percentage of contributory earnings, summarized over the 75-year projection period. An actuarial balance of zero for any period indicates that the estimated cost for the period is met, on average, with remaining assets at the end of the period equal the following year's expenditures. A negative actuarial balance indicates that, over the period, the present value of income to the program plus the existing assets falls short of the present value of the expenditures of the program plus the assets worth one year's expenditures by the end of the period.

Table 33 compares the actuarial balance between the CPP and OASDI programs over periods ranging from 25 to 75 years. We can observe that the CPP's actuarial balances are always positive while they are negative for the OASDI over the 50 and 75 years periods. This indicates that the CPP is in a better long term financial position than the OASDI.

Table 33 Actuarial Balances Comparison
(as % of present value of contributing earnings in period)

Period		Assets[1] (A)	Income[2] (I)	Expenditures (E)	Actuarial Balance[3] (A)+(I)-(E)
		(%)	(%)	(%)	(%)
CPP:	**2007-2031**	1.92	9.90	10.05	1.78
	2007-2056	1.23	9.90	10.37	0.76
	2007-2081	1.02	9.90	10.50	0.42
OASDI[4]:	**2007-2031**	1.73	12.97	14.13	0.57
	2007-2056	1.01	13.09	15.33	(1.23)
	2007-2081	0.79	13.13	15.87	(1.95)

(1) Based on assets of $113.6 billion at the end of 2006. (2) Using legislated contribution rate of 9.9%. (3) Annual adjustment to the contribution rate that would reduce the Plan's assets to one year of expenditures at the end of each period. (4) From 2007 SSA Trustees Report page 57, Table IV-B4.

Table 34 shows the actuarial balances of the CPP over the 75-year projection period under the alternative population scenarios presented in Section VI of the report. Table 34 reveals that the CPP's actuarial balance becomes negative under the older population scenario. This is consistent with the fact that under an older population scenario the minimum contribution rate of 10.69% is higher than the legislated rate of 9.9%.

Table 34 Actuarial Balances with Alternative Assumptions (CPP 2007-2081)
(as % of present value of contributing earnings in period)

Scenario	Assets (A)	Income (I)	Expenditures (E)	Actuarial Balance (A)+(I)-(E)
	(%)	(%)	(%)	(%)
Younger Population	1.19	9.90	10.04	1.04
Best-Estimate	1.02	9.90	10.50	0.42
Older Population	0.85	9.90	11.05	(0.30)
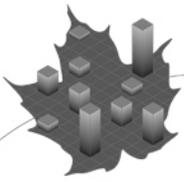
Appendix B – Summary of Plan Provisions

I.   Introduction

The Canada Pension Plan (CPP) came into force on 1 January 1966. Since that time, it has been amended several times, the most recent occasion as a result of Bill C-36 which received Royal Assent on 3 May 2007. The details of the cost impact of Bill C-36 can be found in the 22nd Actuarial Report supplementing the 21st Actuarial Report on the Canada Pension Plan as at 31 December 2003.

II.   Participation

The CPP includes virtually all members of the labour force in Canada, including both employees and self-employed persons between the ages of 18 and 70 with employment earnings, other than those covered by the Québec Pension Plan (QPP). The main exceptions are persons with annual earnings lower than $3,500 (the Year's Basic Exemption, defined below), members of certain religious groups and other persons who qualify under excepted employment. It should be noted that the CPP covers all members of the Canadian Forces and the Royal Canadian Mounted Police, including those residing in the province of Québec. The persons to whom a CPP retirement or disability pension is payable are not required to contribute.

III.   Definitions

A.   Year's Maximum Pensionable Earnings (YMPE)

The YMPE for a calendar year is the limit to which employment earnings are subject to contributions for purposes of the Plan. The YMPE increases each year to the extent warranted by the percentage increase, as at 30 June of the preceding year, in the 12-month average of the Industrial Aggregate (the measure of the Average Weekly Earnings by Statistics Canada). If the amount so calculated is not a multiple of $100, the next lower multiple of $100 is used (although the exact amount forms the basis for the following year's calculation). Under no circumstances is the YMPE allowed to decrease from one year to the next. The YMPE is set at $43,700 in 2007.

B.   Year's Basic Exemption (YBE)

The YBE for a calendar year is the minimum employment earnings necessary to participate in the Plan. As well, contributions are waived on earnings up to the YBE. Prior to 1998, the YBE was calculated as 10% of the YMPE and rounded, if necessary, to the next lower multiple of $100. For each year after 1997 the YBE is $3,500.

C.   Contributory Period

The contributory period is the number of months from attainment of age 18 or from 1 January 1966, if later, to the earliest of the month in which the contributor dies, the month before the one in which the retirement pension commences and the month before the one in which the contributor reaches 70 years of age, less the number of months during which the contributor received a CPP or QPP disability benefit (including the three-month waiting period), or during which the contributor had at least one eligible child under seven years of age and had earnings for that year lower than the YBE.

D.   Pension Index

The Pension Index for a given calendar year is equal to the Consumer Price Index averaged over the 12-month period ending with October of the preceding year; however, the Pension Index of a given year may not be less than the previous year's Pension Index.

IV.   Contribution Rates

Contributions are required during the contributory period in respect of the contributory earnings of each contributor. From 1966 to 1986, the annual rate of contribution applicable to contributory earnings was 1.8% for employees (and the same amount for their employers) and 3.6% in respect of self-employed earnings. This combined employer-employee contribution rate of 3.6% was subject to an annual increase of 0.2% for 1987 to 1996, attaining 5.6% in the last year of this period.

Table 35 shows that the combined contribution rates for 1997 to 2003 increased in steps to reach a combined employer-employee contribution rate of 9.9% by 2003, with no subsequent increases scheduled thereafter.

Table 35 Schedule of Contribution Rates

Year	Contribution Rate
	(%)
1997	6.0
1998	6.4
1999	7.0
2000	7.8
2001	8.6
2002	9.4
2003+	9.9

The legislation gives the federal and provincial ministers of finance the authority to make changes in contribution rates through regulation, in connection with a triennial review. However, year-over-year contribution rate increases cannot exceed 0.2%; beyond that, legislation is required.

If a triennial actuarial report projects a minimum contribution rate in excess of the scheduled rate and the Ministers cannot agree upon appropriate changes, the regulation concerning the calculation of default contribution rates would apply. The contribution rate would then be increased in stages and a temporary freeze on inflation adjustments to benefits in payment would apply.
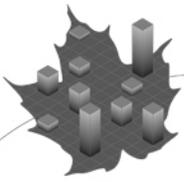
V.   Retirement Pension

A.   Eligibility Requirements

A person aged 60 or over becomes eligible for a retirement pension upon application, provided contributions have been made during at least one calendar year. For a retirement pension to become payable before age 65, an applicant must have wholly or substantially ceased to be engaged in paid employment or self-employment. A person may not contribute to the CPP after a retirement pension becomes payable or, in any event, after age 70.

B.   Amount of Pension

The initial amount of monthly retirement pension payable to a contributor is based on his or her entire history of pensionable earnings during the contributory period. The retirement pension is equal to 25% of the average of the YMPE for the year of his or her retirement and the four previous years, referred to as the Maximum Pensionable Earnings Average (MPEA), adjusted to take into account the contributor's pensionable earnings. For this purpose, the contributor's pensionable earnings for any given month are indexed by the ratio of the MPEA for the year of retirement to the YMPE for the year to which the given month belongs.

Some periods with low pensionable earnings may be excluded from the calculation of benefits by reason of pensions commencing after age 65, disability, child-rearing for a child less than seven years of age and the 15% dropout provisions.

The maximum monthly retirement pension in 2007 is $863.75.

C.   Adjustment for Early or Postponed Retirement

The retirement pension is subject to an actuarial adjustment that depends on the contributor's age at commencement of the retirement pension. The retirement pension is permanently adjusted downwards or upwards by 0.5% for each month between age 65 and the age when the pension commences or, if earlier, age 70.

VI.   Disability Benefit

A.   Eligibility Requirements

A person is considered disabled if he or she is determined to be suffering from a severe and prolonged mental or physical disability. A disability is considered severe if by reason of it the person is regularly incapable of pursuing any substantially gainful occupation; a disability is considered prolonged if it is likely to be long-continuing and of indefinite duration or likely to result in death.

A person who becomes disabled prior to age 65 and is not receiving a CPP retirement pension is eligible for a disability benefit provided that contributions have been made, at the time of disablement, for at least four of the previous six calendar years, counting only years included wholly or partly in the contributory period. With the introduction of Bill C-36, contributors with 25 or more years of contributions to the Plan will can meet the eligibility requirement with contributions in three of the last six years. Contributions must be on earnings that are not less than 10% of the YMPE rounded, if necessary, to the next lower multiple of $100.

B. Amount of Pension

The amount of monthly benefit payable is the sum of a flat-rate portion ($405.96 in 2007) depending only on the year in which the benefit is payable and an earnings-related portion equal, when it commences, to 75% of the retirement pension that would be payable at the onset of disability if the contributory period ended on that date and no actuarial adjustment applied.

The automatic conversion at age 65 of a disability benefit into a retirement pension is based on the pensionable earnings at the time of disablement and price indexed to age 65. In other words, the indexing from disablement to age 65, which determines the initial rate of the retirement pension, is in line with increases in prices rather than wages. The maximum monthly disability benefit in 2007 is $1,053.77.

VII. Survivor Benefit

A. Eligibility Requirements

A legal spouse, a separated legal spouse not cohabiting with a common-law partner or a common-law partner of a deceased contributor, is eligible for a survivor benefit if the following conditions are met as at the date of the contributor's death.

- The deceased contributor must have made contributions during the lesser of ten calendar years, or one-third of the number of years included wholly or partly in his or her contributory period, but not for less than three years.

- If the surviving spouse is the separated legal spouse of the deceased contributor, there must be no cohabiting common-law partner at the time of death. If the surviving spouse is the common-law partner of the deceased contributor, they must have cohabited for not less than one year immediately before the death of the contributor. If the common-law partner is of the same-sex as the deceased contributor, the death must have occurred on or after 17 April 1985.

- The surviving spouse or common-law partner must have dependent children, be disabled or be at least 35 years of age. A surviving spouse or common-law partner with dependent children means a surviving spouse who wholly or substantially supports a child of the deceased contributor where the child is under age 18, aged 18 or over but under age 25 and attending school full-time, or aged 18 or over and disabled, having been disabled without interruption since attaining age 18 or the time of the contributor's death, whichever occurred later.

B. Amount of Pension

The amount of the monthly survivor benefit depends on the age of the survivor at the date of the contributor's death, the survivor's disability status and the presence of dependent children. If a surviving spouse or common-law partner is receiving a retirement pension or a disability benefit, the monthly amount of the surviving spouse's benefit may be reduced. The following five cases are relevant:
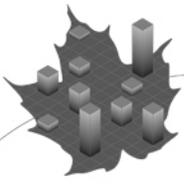
1. **New Survivor Age 45 to 65**

The amount of monthly benefit payable until the surviving spouse or common-law partner attains age 65 is composed of two portions: a flat-rate benefit depending only on the year in which the survivor benefit is payable ($158.39 in 2007), and an earnings-related benefit depending initially only on the contributor's record of pensionable earnings as at the date of death. The initial earnings-related portion is equal to 37.5% of the retirement pension that would have been payable to the deceased contributor if the contributory period ended at the time of death with no actuarial adjustment.

2. **New Survivor Under Age 45**

An eligible spouse or common-law partner, without dependent child(ren) and not disabled, who becomes widowed before age 35 is not entitled to a survivor's benefit but may be entitled at a later date if she or he becomes disabled (see 4) or attains age 65 (see 5). If such a survivor is between 35 and 45 years of age, she or he is entitled to a benefit amount calculated as described in 1 above but reduced (until the earlier of disablement or attainment of age 65) by 1/120 of such an amount for each month that the new survivor's age is less than 45.

3. **New Survivor Under Age 45 with Dependent Child(ren)**

An eligible spouse or common-law partner who becomes widowed prior to age 45 and with dependent child(ren) is entitled to a survivor benefit calculated as in 1 above. Under certain circumstances, the survivor benefit is reduced or even discontinued when the survivor no longer has his/her last dependent child(ren). If the survivor is then under age 45 and not disabled, she or he is considered to be a new survivor entitled only to the benefit in accordance with 2 above.

4. **Disabled Survivor Under Age 65**

An eligible surviving spouse or common-law partner under age 65 is entitled to a survivor benefit calculated as in 1 above whenever she or he is disabled. If the disabled surviving spouse or common-law partner recovers from disability before age 45, the survivor benefit is discontinued or reduced to what it would be for a new survivor in accordance with 2 above.

5. **Survivor Age 65 or Over**

At age 65, or upon becoming widowed at a later age, an eligible surviving spouse or common-law partner is entitled to a monthly benefit equal to 60% of the retirement pension of the deceased contributor with no actuarial adjustment.

VIII. **Death Benefit**

A lump sum benefit is payable to the estate of a deceased contributor if the eligibility rules for survivor benefits are met. The amount of the death benefit is equal to six times the monthly amount of retirement pension accrued or payable in the year of death, adjusted to exclude any actuarial adjustments, subject to a maximum of $2,500.

IX. **Child Benefits**

Each child under age 18 and each full-time student aged 18 to 25 who is dependent on a contributor eligible for a CPP disability benefit or was dependent on a deceased contributor satisfying the contribution requirement for a survivor benefit is entitled to a flat-rate monthly

benefit ($204.68 in 2007). Furthermore, where applicable, a child may receive more than one child benefit simultaneously.

X.   Inflation Adjustments

All monthly benefits payable are increased in accordance with inflation each year. Benefits are multiplied on 1 January of each calendar year by the ratio of the Pension Index applicable for that calendar year to the Pension Index for the preceding year.

XI. Credit-Splitting

Pensionable earnings may be split between divorced or separated couples (legal or common-law partners) for each year the couple lived together. Pensionable earnings are used to establish eligibility for CPP benefits and to calculate the amount of benefits. Contributors may obtain a credit split even if they have remarried. However, pensionable earnings cannot be split for any month in which the earnings allocated to each spouse would be less than 1/12 of the YBE.

XII. Pension Sharing

Couples (legal or common-law partners) in an ongoing relationship may voluntarily (at the request of one of them) share their CPP retirement pensions in proportion to the number of years during which they cohabited. This applies provided both spouses have reached the minimum age requirement to receive a retirement pension. Sharing is possible even if only one of the spouses has participated in the Plan. Pension sharing ceases upon separation, divorce, or death.
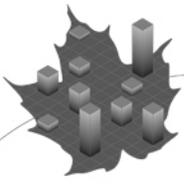
Appendix C – Detailed Reconciliations with Previous Report

The results presented in this report differ from those previously projected for a variety of reasons. Differences between the actual experience from 2004 through 2006 and that projected in the Twenty-First Actuarial Report for the same period were addressed in Section V of the report. Since historical results provide the starting point for the projections shown in this report, these historical differences also have an effect on the projections. The impact of the experience update and other factors that have significantly changed the projected results are addressed in this section.

The pay-as-you-go rate, which is the ratio of expenditures to contributory earnings in a given year, is an important measure of the cost of the CPP and corresponds to the contribution rate that would need to be paid if there were no assets. One way of understanding the differences between the best-estimate projections in this report and those presented in the Twenty-First Actuarial Report is to look at the effects of various factors on the pay-as-you-go rates. The most significant effects are identified in the reconciliation presented in Table 36 and the discussion below.

The methodology described in Appendix D reflects a number of improvements from that used in previous reports. These refinements had the effect of increasing the projected pay-as-you-go rates.

The experience update had the effect of reducing the pay-as-you-go rates in the short-term mainly due to a better than anticipated economic environment (especially labour force participation).

Changes made to the key assumptions since the previous report were outlined in Table 3. The effects of these changes are summarized below.

- The year in which the ultimate fertility rate is reached is earlier than in the previous report and this decrease the long-term pay-as-you-go rates because the higher growth in total contributory earnings outweighs the ultimate increase in expenditures.

- The assumed level of net migration is the same as in the previous report and results in no change in the pay-as-you-go-rates over the projection period.

- The higher mortality improvement rates at ages 65 and over assumed for this report significantly increase the pay-as-you-go rates because beneficiaries are expected to receive their monthly benefits over longer periods of time.

- The higher projected number of individuals opting for the retirement benefit at age 60 increases the pay-as-you-go rates over the projection period.

- The decrease to the male disability incidence rates assumption has reduced the pay-as-you-go rates over the projection period.

- The higher labour force participation rates assumed at older ages decrease the pay-as-you-go rates, although the effect declines with time as the higher participation translates into higher benefit entitlements.

- The change in the real-wage assumption increases the pay-as-you-go rates in the short term due to somewhat lower expectations over that period as compared to the previous report. On the other hand, the pay-as-you-go rates decrease in the long term due to the higher ultimate real wage assumption.

- The lower assumed inflation rate has the effect of increasing the pay-as-you-go rates. This counterintuitive result is caused by the fact that under a lower inflation assumption, the benefits are fully affected, while the contributory earnings (between YBE and YMPE) are partially affected since the YBE is frozen at $3,500 over the entire projection period. The latter effect outweighs the expected decrease in pay-as-you-go rates due to lower benefits paid.

Some other less significant assumptions, which are described in Appendix D, were also changed. For example, the proportion of contributors married or in a common law relationship at time of death used in the projection of survivor benefits and the experience adjustment factors applied in the projection of retirement, disability and survivor benefits were revised to reflect more recent experience. Overall, the changes in these other assumptions had the effect of decreasing the projected pay-as-you-go rates over the long term. The amendments of Bill C-36 have the impact of slightly increasing the long term pay-as-you-go rates.

Factors that lead to changes in the pay-as-you-go rates do not always have comparable effects on the minimum contribution rate. Furthermore, while the assumed rates of return on investments and asset mix have no effect on pay-as-you-go rates, they may have a significant impact on the minimum contribution rate. The ultimate asset mix, which is more risky than in the previous report, causes the minimum contribution rate to decrease by 0.043%. The equity risk premium is assumed to be lower in the first ten years of the projection before reaching its ultimate rate in 2016. The resulting real rate of return on CPP assets is thus lower for the first ten years and has the effect of increasing the minimum contribution rate of 0.038%. A reconciliation of the change in the minimum contribution rate from 9.77% as presented in the Twenty-First Report to the minimum rate of 9.82% determined for this report is provided in Table 37.

The change in the funding target years from 2016 and 2066 to 2019 and 2069 has an impact on the steady-state contribution as the asset/expenditure ratio in 2019 is somewhat higher than that in 2016; this results in a higher funding target which requires an increase of 0.012% in the minimum contribution rate.
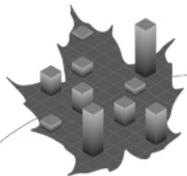
Table 36 Reconciliation of Changes in Pay-As-You-Go Rates
(% of contributory earnings)

	2007	2025	2050	2075
21st Report	**8.51**	**10.42**	**11.29**	**11.32**
I. 22nd Report (Bill C-36)	**0.00**	**0.02**	**0.02**	**0.02**
II. Improvements in Methodology	**0.03**	**0.04**	**0.02**	**0.03**
III. Experience Update (2004-2006)				
Demographic	(0.04)	(0.06)	0.07	0.07
Economic	(0.13)	(0.02)	(0.02)	(0.06)
Benefits	(0.01)	0.01	0.01	(0.01)
Subtotal:	**(0.18)**	**(0.07)**	**0.06**	**0.01**
IV. Changes in Assumptions				
Fertility	0.00	0.00	(0.05)	(0.01)
Net migration	0.00	0.00	0.00	(0.01)
Mortality	0.00	0.11	0.25	0.35
Retirement	0.01	0.17	(0.05)	(0.08)
Disability	0.00	(0.02)	(0.01)	(0.01)
Employment	(0.04)	0.00	(0.10)	(0.05)
Real-wage differential	0.00	(0.02)	(0.18)	(0.19)
Price increases	0.00	0.06	0.07	0.05
Other assumptions	0.02	(0.04)	(0.05)	(0.03)
Subtotal:	**(0.01)**	**0.26**	**(0.11)**	**0.01**
Total of I to IV	**(0.16)**	**0.25**	**0.00**	**0.08**
23rd Report	**8.35**	**10.67**	**11.29**	**11.40**

Table 37 Reconciliation of Changes in Minimum Contribution Rate
(% of contributory earnings)

	Steady-State Rate	Full Funding Rate	Total Minimum Rate
21st Report - After Rounding	**9.800**	**0.000**	**9.800**
21st Report - Before Rounding	**9.770**	**0.000**	**9.770**
I. 22nd Report (Bill C-36)	**9.770**	**0.022**	**9.792**
II. Improvements in Methodology	**0.028**	**0.000**	**0.028**
III. Experience Update (2004-2006)			
Demographic	(0.004)	0.000	(0.004)
Economic	(0.036)	0.000	(0.036)
Benefits	0.000	0.000	0.000
Investments	(0.094)	0.000	(0.094)
Subtotal:	**(0.134)**	**0.000**	**(0.134)**
IV. Changes in Assumptions			
Fertility	(0.019)	0.000	(0.019)
Migration	0.000	0.000	0.000
Mortality	0.159	0.000	0.159
Retirement	0.054	0.000	0.054
Disability	(0.016)	0.001	(0.015)
Employment	(0.033)	0.000	(0.033)
Real-wage differential	(0.031)	0.000	(0.031)
Price increases	0.050	0.000	0.050
Asset mix	(0.043)	0.000	(0.043)
Real rate of return	0.038	0.000	0.038
Other assumptions	(0.033)	0.000	(0.033)
Subtotal:	**0.126**	**0.001**	**0.127**
V. Others (Change in funding target from 2016-2066 to 2019-2069)	**0.012**	**0.000**	**0.012**
Total of I to V	**0.032**	**0.023**	**0.055**
23rd Report - Before Rounding	**9.802**	**0.023**	**9.825**
23rd Report - After Rounding	**9.800**	**0.020**	**9.820**
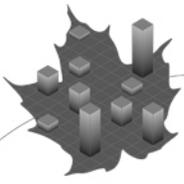
Appendix D – Assumptions and Methods

I. Introduction

This section describes the assumptions and methods that underlie the financial projections in Section IV of this report.

Future cash flows are projected over a long period of time, i.e. 75 years, and depend on assumptions such as fertility, mortality, migration, labour force, job creation, unemployment rates, inflation, employment earnings and investment returns. These assumptions form the basis for the projections of future income and expenditures of the Plan. Over the years, the cumulative difference between the revenues from contributions and investment earnings and the expenditures of the Plan generates the accumulated assets. The ratio of the end-of-year assets to the following year's expenditures is then calculated and used to determine the steady-state contribution rate, which is the lowest contribution rate that, in the long term, would generally stabilize the ratio of assets to expenditures.

Although the economic and demographic assumptions have been developed using the best available information, the resulting estimates should be interpreted with caution. These estimates are not intended to be predictions but rather projections of the future financial status of the CPP.

II. Demographic Projections

Both the historical and projected populations of Canada less Québec are required for the calculation of future CPP contributions and benefits of the relevant cohorts of contributors and beneficiaries.

The populations of Canada and Québec as at 1 July 2006 are used as a starting point. The populations are then projected by age and sex from one year to the next by adding births and net migrants and subtracting deaths. Applying the fertility, mortality and migration assumptions to the starting population develops the annual numbers of births, deaths and net migrants. The population of Canada less Québec is then obtained by subtracting the projected population of Québec from the projected population of Canada.

The population covered by the CPP pertains to Canada less Québec, but includes all members of the Canadian Forces (CF) and the Royal Canadian Mounted Police (RCMP). Consequently, the approach used above to determine the CPP population does not make an explicit allowance for the members of the CF or RCMP residing in Québec or outside Canada. However, provision for this group was made implicitly through the development of the number of people with earnings and the proportion of contributors as described in Section III of this Appendix.

A. Initial Population as at 1 July 2006

The starting point for the demographic projections is the most recent Statistics Canada population estimates as at 1 July 2006 for Canada and Québec, by age and sex. The estimates are based on the 2001 census and are adjusted for the census undercount. They are adjusted to ungroup ages 90 and over into individual ages based on the observed distribution of Old Age Security Program beneficiaries by age for ages 90 and over.

B.   Fertility Rates

The fertility rate for a given age and year is the average number of live births per female of that age during that year. The total fertility rate for a year is the average number of children that would be born to a woman in her lifetime if she experienced the age-specific fertility rates observed in, or assumed for, that year.

Total fertility rates have declined significantly over the last 50 years, from a high of about 4.0 in the late 1950s for both Canada and Québec to recent lows of about 1.5 in the late 1990s. The total fertility rate increased briefly during the early 1990s to reach levels of about 1.70 and 1.65 for Canada and Québec, respectively. Although the total fertility rate averaged about 1.60 for Canada over the last two decades, it currently stands at 1.53 for Canada in 2004 and 1.51 for Québec in 2005. These variations in the total fertility rate have resulted from changes in many factors, including social attitudes and economic conditions.

In this report, it was assumed that the total fertility rate from 2010 onward would be 1.60 for Canada and 1.57 for Québec. These assumed ultimate rates reflect historical trends in fertility by age group over the last 30 years. They are slightly higher than the most recently observed rates. A small increase in total fertility rates is expected over the medium-term horizon because of continued trends in women having their first child at a later age due to increased labour force participation, later marriages and longer stays in the education system. Moderate economic growth is assumed over the projection period and this could help families plan for additional children.

Finally, in accordance with the experience over the last 25 years, the assumed ratio of male to female newborns was slightly lower at 1.054 compared to 1.056 assumed in the 21st CPP report. This is due to lower male to female newborns ratio for years 2002 to 2005. Table 38 and Chart 8 below show the historical and projected age-specific and total fertility rates.

Table 38 Total Fertility Rates
(Canada)

Year	\multicolumn{7}{c}{Annual Fertility Rates by Age Group (per 1,000 women)}	Total Fertility Rate Per Woman
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
2007	11.8	47.5	97.3	103.5	44.4	7.7	0.3	1.56
2008	11.2	46.5	97.1	106.1	45.6	8.0	0.3	1.57
2009	10.7	45.5	97.2	108.9	46.8	8.2	0.3	1.59
2010+	10.2	44.5	97.2	111.7	47.8	8.3	0.3	1.60
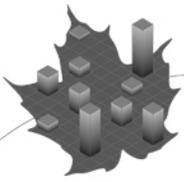
Chart 8   Historical and Assumed Total Fertility Rates
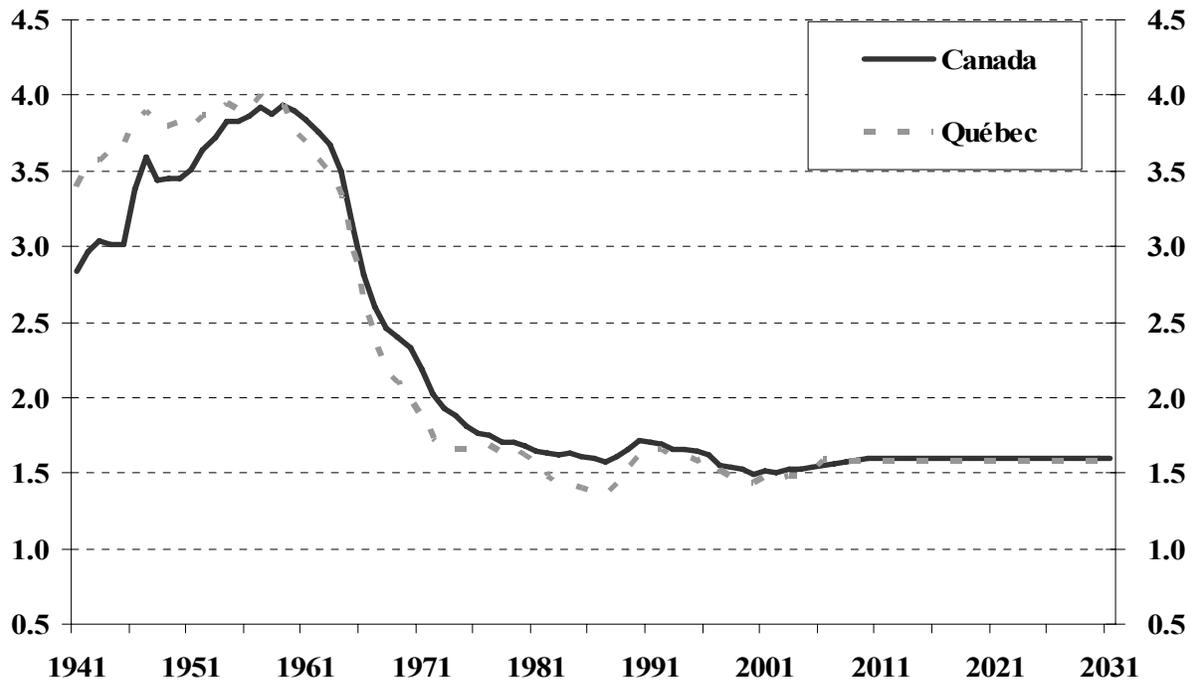
C.   Mortality

The starting point for mortality rate projections for this report is the mortality rates from the Statistics Canada publication "Life Tables, Canada, provinces and territories, 2000-2002". According to these tables, life expectancies at birth for males and females in Canada were 76.9 and 82.0 years, respectively.

To reflect anticipated sustained improvements in life expectancy, the 2000 to 2002 Canada and Québec mortality rates were projected to 2004 using the actual improvements in mortality experienced between 2001 and 2004. This approach produced life expectancies at birth of 77.8 years for males and 82.6 for females in 2004. The life expectancies at age 65 are 17.7 years and 21.0 years for males and females, respectively. This compares well with figures published by Statistics Canada for 2004. Mortality rates thus obtained for 2004 were then projected to the end of the projection period using the following annual rates of mortality improvement.

For 2005 to 2009, the annual rates of mortality improvement, varying by age and sex, were set equal to the average annual improvement rates experienced in Canada over the period 1989 to 2004. Improvement rates for years 2010 to 2028 were obtained by linear interpolation between:

- the improvement rates of year 2009, and

- the fixed improvement rates described below in respect of the period 2029 and thereafter.
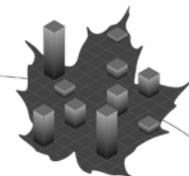
For years 2029 and thereafter, the ultimate annual rates of mortality improvement vary by age only and not sex or calendar year. These ultimate rates are derived from an analysis of trends in Canadian experience over the period 1974 to 2004. The ultimate improvement rates for females are derived by using the ratio of the average annual improvement rates for females over the period 1989 to 2004 (1.27%) to the average annual rates for the period 1974 to 1989 (1.86%). The data derived from the last thirty years shows a clear deceleration of the female improvement rates in Canada. Based on that information, the ultimate improvement rate of 0.7% has been set for females below age 85. Male ultimate improvement rates are then set equal to those for females at all ages. Male improvement rates are thus assumed to continue to exceed female rates over the next 25 years. For ages over 85, the ultimate improvement rates have been reduced between 0.6% and 0.4% to reflect past experience for those ages. Table 39 shows the initial (2005 to 2009), intermediate (2010-2028) and ultimate (2029+) assumed annual mortality improvement rates.

Table 39 Annual Mortality Improvement Rates for Canada

	Males			Females		
Age	2005-2009	2010-2028	2029+	2005-2009	2010-2028	2029+
	%	%	%	%	%	%
0	2.3	1.5	0.7	1.8	1.2	0.7
1-14	3.7	2.2	0.7	3.8	2.3	0.7
15-44	2.8	1.7	0.7	1.6	1.1	0.7
45-64	2.0	1.4	0.7	1.4	1.0	0.7
65-84	2.0	1.4	0.7	1.2	0.9	0.7
85-89	0.8	0.7	0.6	0.5	0.6	0.6
90-94	0.5	0.4	0.4	0.3	0.3	0.4
95+	0.0	0.2	0.4	0.0	0.2	0.4

The projected mortality rates in Table 40 indicate a continuous decrease of mortality rates over the long term. For example, the mortality rate at age 65 for males is expected to be reduced from 13.5 per thousand in 2007 to 6.8 per thousand by 2075. The gap in mortality rates between males and females is also expected to decrease over the projection period.

For 2007 to 2075, Canadian life expectancy at birth (with assumed future mortality improvements) is projected to grow from 84.5 to 88.8 years for males and from 87.7 to 91.5 years for females. A narrowing of the gap between male and female life expectancies has been observed over the last 20 to 25 years in Canada. The yearly increase in life expectancies in the early years of the projection reflects the significant increase observed over the last 25 years. Thereafter, there is a projected slowdown in the increase in life expectancies consistent with the low rate of improvement in mortality assumed for years 2029 and thereafter.

Chart 9 shows the changes in life expectancy at age 65 since the Plan inception in 1966 to the end of the projection period. Table 41 shows the resulting Canadian life expectancies at various ages for the specified calendar years, assuming that the mortality rates of each such year will remain unchanged thereafter (without future improvements). Table 42 is similar to Table 41, the only difference being that it takes into account the assumed mortality improvement after the specified calendar year (with future improvements). Given the
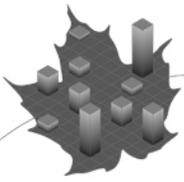
continuing trend to increased longevity, Table 42 is considered to be more realistic than Table 41.

Table 40 Mortality Rates for Canada
(annual deaths per 1,000 people)

Age	Males				Females			
	2007	2025	2050	2075	2007	2025	2050	2075
0	5.09	3.76	3.14	2.63	4.26	3.33	2.79	2.34
10	0.08	0.05	0.04	0.04	0.08	0.05	0.04	0.03
20	0.71	0.49	0.41	0.35	0.31	0.25	0.21	0.18
30	0.75	0.50	0.41	0.35	0.35	0.27	0.23	0.19
40	1.35	1.02	0.85	0.71	0.85	0.71	0.59	0.50
50	3.21	2.48	2.08	1.74	2.11	1.70	1.43	1.20
60	8.66	6.41	5.35	4.49	5.42	4.44	3.72	3.12
65	13.46	9.75	8.14	6.83	8.42	6.95	5.82	4.88
70	21.65	15.82	13.20	11.08	13.49	11.17	9.36	7.85
75	35.56	26.74	22.33	18.74	22.29	18.46	15.46	12.97
80	59.17	46.56	38.94	32.67	38.49	32.42	27.16	22.79
85	98.15	83.49	71.02	60.49	71.25	63.04	53.69	45.72
90	155.79	141.72	128.13	115.91	121.91	114.07	103.21	93.37
100	353.25	343.76	311.36	281.68	295.71	287.76	260.64	235.79

Chart 9 Trend in Life Expectancy at Age 65
(Canada)

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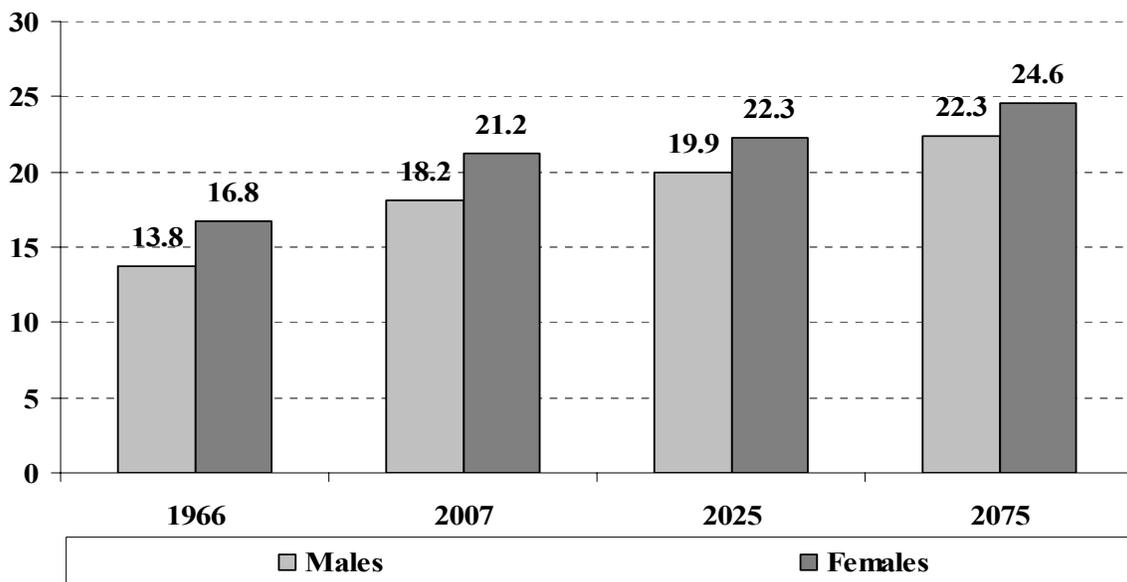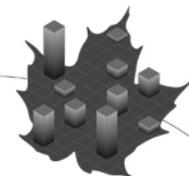
Table 41 Life Expectancies for Canada, without improvements after the year shown*

Age	Males				Females			
	2007	**2025**	**2050**	**2075**	**2007**	**2025**	**2050**	**2075**
0	78.5	81.3	83.0	84.6	82.9	84.5	86.1	87.5
10	69.0	71.6	73.3	74.8	73.4	74.9	76.4	77.8
20	59.2	61.8	63.4	64.9	63.5	65.0	66.5	67.8
30	49.6	52.1	53.7	55.2	53.7	55.1	56.6	58.0
40	40.0	42.4	43.9	45.4	43.9	45.4	46.8	48.1
50	30.7	33.0	34.4	35.8	34.5	35.8	37.1	38.4
60	22.1	24.1	25.4	26.7	25.4	26.6	27.9	29.1
65	18.2	19.9	21.1	22.3	21.2	22.3	23.4	24.6
70	14.5	16.0	17.1	18.2	17.2	18.1	19.2	20.3
75	11.2	12.4	13.3	14.3	13.5	14.2	15.2	16.1
80	8.4	9.2	10.0	10.8	10.1	10.7	11.5	12.3
85	6.1	6.5	7.1	7.7	7.3	7.6	8.2	8.9
90	4.3	4.6	4.9	5.3	5.2	5.3	5.8	6.2
100	2.1	2.1	2.4	2.6	2.5	2.5	2.8	3.1

* These are calendar year life expectancies based on the mortality rates of the given attained year.

Table 42 Life Expectancies for Canada, with improvements**

Age	Males				Females			
	2007	**2025**	**2050**	**2075**	**2007**	**2025**	**2050**	**2075**
0	84.5	85.8	87.4	88.8	87.7	88.8	90.2	91.5
10	74.3	75.5	77.1	78.6	77.5	78.6	80.0	81.3
20	63.8	65.1	66.6	68.1	67.1	68.1	69.5	70.9
30	53.5	54.7	56.3	57.7	56.6	57.7	59.1	60.5
40	43.2	44.4	45.9	47.4	46.3	47.4	48.8	50.1
50	33.2	34.4	35.9	37.3	36.2	37.3	38.6	39.9
60	23.7	25.0	26.3	27.6	26.6	27.6	28.9	30.1
65	19.3	20.6	21.9	23.1	22.0	23.0	24.2	25.4
70	15.3	16.5	17.6	18.7	17.8	18.7	19.8	20.8
75	11.7	12.7	13.7	14.7	13.8	14.6	15.6	16.5
80	8.6	9.4	10.2	11.0	10.3	10.9	11.7	12.6
85	6.2	6.6	7.2	7.8	7.4	7.8	8.4	9.0
90	4.3	4.6	5.0	5.4	5.2	5.4	5.8	6.3
100	2.1	2.1	2.4	2.6	2.5	2.5	2.8	3.1

** These are cohort life expectancies that take into account future improvements in mortality and therefore differ from calendar year life expectancies, which are based on the mortality rates of the given attained year.
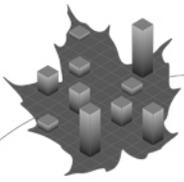
D.   Migration

Immigration and emigration are generally recognized to be volatile parameters of future population growth since they are subject to a variety of demographic, economic, social and political factors. During the period from 1972 to 2006, annual immigration to Canada varied from 84,000 to 267,000, annual emigration from Canada is estimated to have fluctuated between 36,000 and 84,000 and the annual numbers of returning Canadians have fluctuated between 14,000 and 39,000. Chart 10 below shows the net migration experience of the last half-century.

For 2007 to 2015, net migration rate is assumed at a level of 0.50% of the population, which is the average experienced over the last 30 years. For 2015 to 2020, the ratio is gradually increased from 0.50% to 0.54% to take into account the expected labour shortage and then remains at that level thereafter. The ultimate level of 0.54% remains lower than the actual average over the last 20 years.

For the purpose of projecting the population of Québec, historical percentages of the Canadian migration components were attributed to Québec. In addition, based on historical data, it was assumed that Québec would experience net interprovincial emigration of 8,200 in 2006, decreasing to 5,000 for 2015 and thereafter. These assumptions result in an average ultimate net migration rate of approximately 0.4% for Québec. The distributions of immigrants, emigrants and returning Canadians by age and sex used for the demographic projections were taken from Statistics Canada data averaged over the period 2001 to 2005.

Chart 10 Net Migration as % of Population
(Canada)
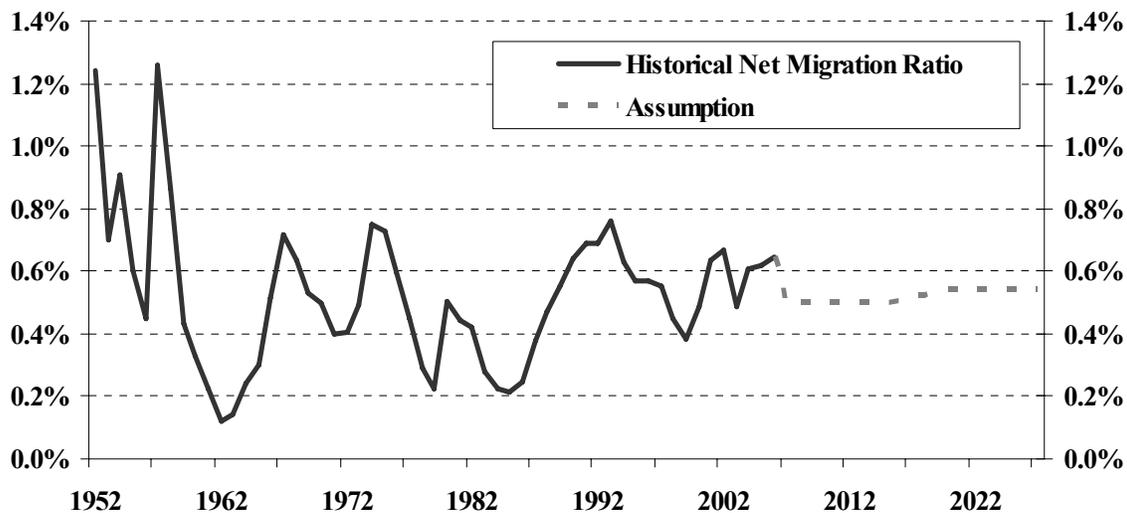
E.   Projected Population and its Characteristics

Chart 11 shows the evolution of the Canada less Québec population age distribution since the inception of the Plan. One can easily observe that the triangular shape of the 1970s is becoming more rectangular, thus leading to an older population on average. The effects of the baby boom and baby bust can be seen. The chart also reveals that the number of people aged 85 and over is expected to increase dramatically over the next 50 years.
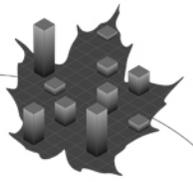
Chart 11 Population Distribution of Canada less Québec
(thousands)
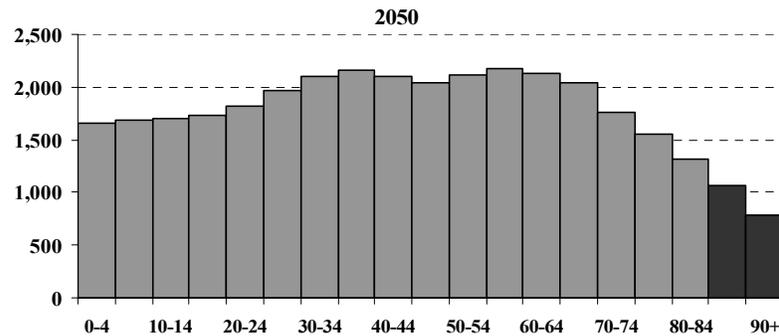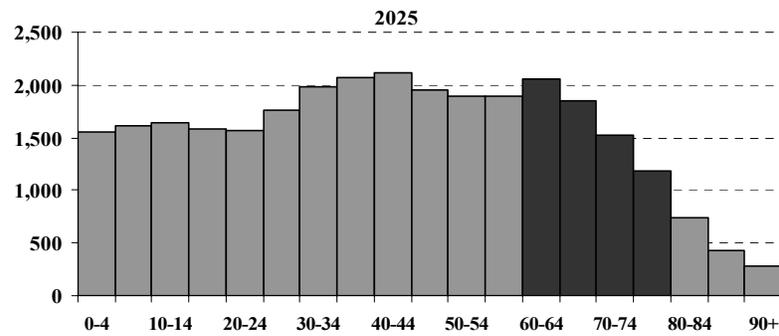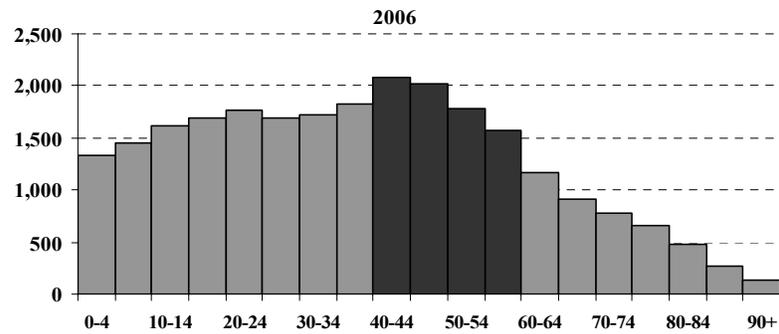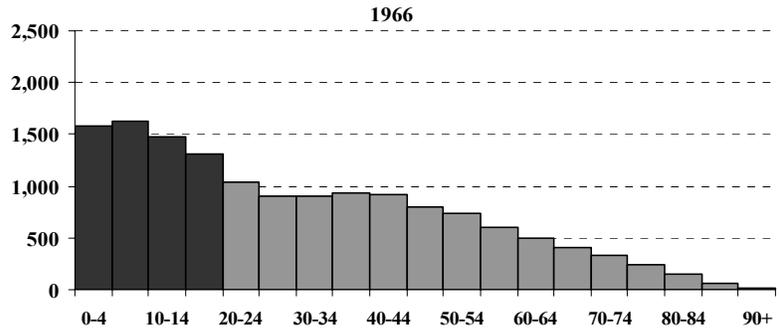
1966

2006

2025

2050

■ Baby Boomers
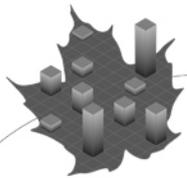
The population of Canada as at 1 July 2006 is 32.6 million while the population of Canada less Québec is 25.0 million. Tables 43 and 44 present the projected population of Canada and Canada less Québec as at 1 July for selected years. Chart 12 shows the evolution of the total population for Canada less Québec and of those aged 20 to 64 from 1975 to 2075. Table 45 shows the variations in the relative size of various age groups throughout the projection period. The proportion of people aged 65 and over is expected to almost double from 13.1% to 26.0% over the projection period. The number of people aged 65 and over as a proportion of people aged 20 to 64 more than doubles over the same period, from 20.9% to 48.1%. This proportion significantly affects the ratio of benefits to contributions under the CPP.

Table 46 shows the components of population growth, namely the projected number of births plus net migrants less the expected deaths for 2007 to 2075. Chart 13 presents these figures graphically for the next 50 years. Over the period 2006 to 2020, the population of Canada less Québec is projected to grow at about 0.9% per year. The annual growth slows to about 0.7% between 2020 and 2040 and to 0.4% thereafter. The population of Canada less Québec is expected to reach 37.2 million by 2075.

Table 43 Population of Canada by Age
(thousands)

Year	0-17	18-69	70+	0-19	20-64	65+	Total
2007	6,919	22,840	3,146	7,777	20,707	4,420	32,904
2008	6,874	23,107	3,209	7,756	20,892	4,540	33,189
2009	6,836	23,365	3,275	7,731	21,081	4,665	33,477
2010	6,809	23,613	3,344	7,697	21,276	4,794	33,767
2011	6,795	23,839	3,423	7,670	21,448	4,939	34,058
2012	6,789	24,051	3,509	7,651	21,562	5,135	34,348
2015	6,808	24,586	3,819	7,643	21,870	5,701	35,213
2020	7,044	25,004	4,607	7,804	22,110	6,741	36,655
2025	7,284	25,226	5,510	8,078	22,005	7,937	38,021
2030	7,351	25,338	6,527	8,206	21,913	9,097	39,215
2040	7,306	25,851	7,888	8,192	22,701	10,152	41,045
2050	7,528	26,616	8,276	8,394	23,184	10,842	42,420
2075	8,022	28,249	9,433	8,968	24,727	12,009	45,704
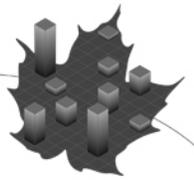
Table 44 Population of Canada less Québec by Age
(thousands)

Year	0-17	18-69	70+		0-19	20-64	65+	Total
2007	5,391	17,448	2,370		6,066	15,829	3,314	25,209
2008	5,359	17,676	2,417		6,048	16,002	3,401	25,452
2009	5,336	17,896	2,465		6,029	16,176	3,491	25,697
2010	5,322	18,108	2,515		6,009	16,355	3,582	25,946
2011	5,318	18,306	2,571		5,996	16,513	3,687	26,195
2012	5,319	18,495	2,632		5,990	16,619	3,836	26,445
2015	5,345	18,994	2,853		6,002	16,924	4,266	27,193
2020	5,544	19,459	3,450		6,147	17,242	5,064	28,453
2025	5,768	19,754	4,147		6,390	17,284	5,994	29,669
2030	5,859	19,962	4,941		6,538	17,295	6,929	30,762
2040	5,869	20,557	6,096		6,580	18,051	7,891	32,522
2050	6,078	21,355	6,488		6,780	18,614	8,529	33,922
2075	6,577	23,001	7,610		7,354	20,150	9,685	37,189

Chart 12 Population of Canada less Québec
(millions)
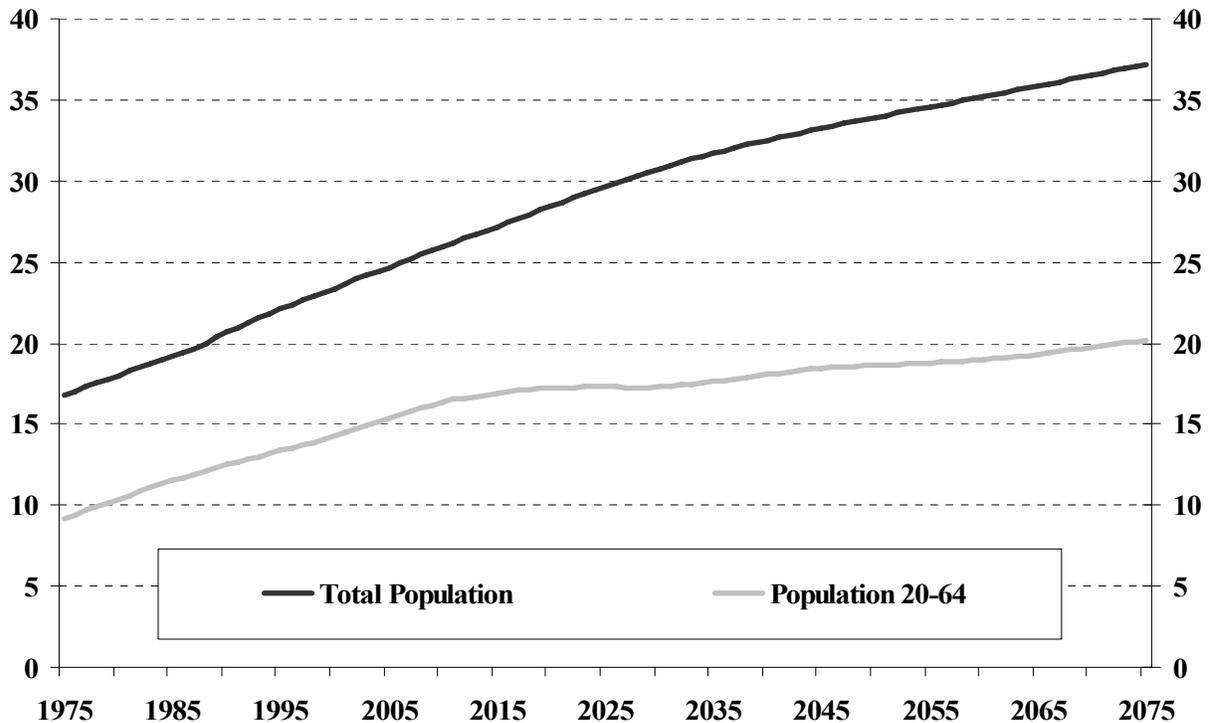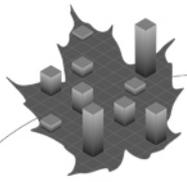
Table 45 Analysis of Population of Canada less Québec

Year	% of Total Population			% of Total Population			Age 65 + as % of Age 20-64
	Ages 0-17	Ages 18-69	Ages 70+	Ages 0-19	Ages 20-64	Ages 65+	
2007	21.4	69.2	9.4	24.1	62.8	13.1	20.9
2008	21.1	69.5	9.5	23.8	62.9	13.4	21.3
2009	20.8	69.6	9.6	23.5	63.0	13.6	21.6
2010	20.5	69.8	9.7	23.2	63.0	13.8	21.9
2011	20.3	69.9	9.8	22.9	63.0	14.1	22.3
2012	20.1	69.9	10.0	22.6	62.8	14.5	23.1
2015	19.7	69.9	10.5	22.1	62.2	15.7	25.2
2020	19.5	68.4	12.1	21.6	60.6	17.8	29.4
2025	19.4	66.6	14.0	21.5	58.3	20.2	34.7
2030	19.0	64.9	16.1	21.3	56.2	22.5	40.1
2040	18.0	63.2	18.7	20.2	55.5	24.3	43.7
2050	17.9	63.0	19.1	20.0	54.9	25.1	45.8
2075	17.7	61.9	20.5	19.8	54.2	26.0	48.1

Chart 13 Components of Population Growth for Canada less Québec
(thousands)
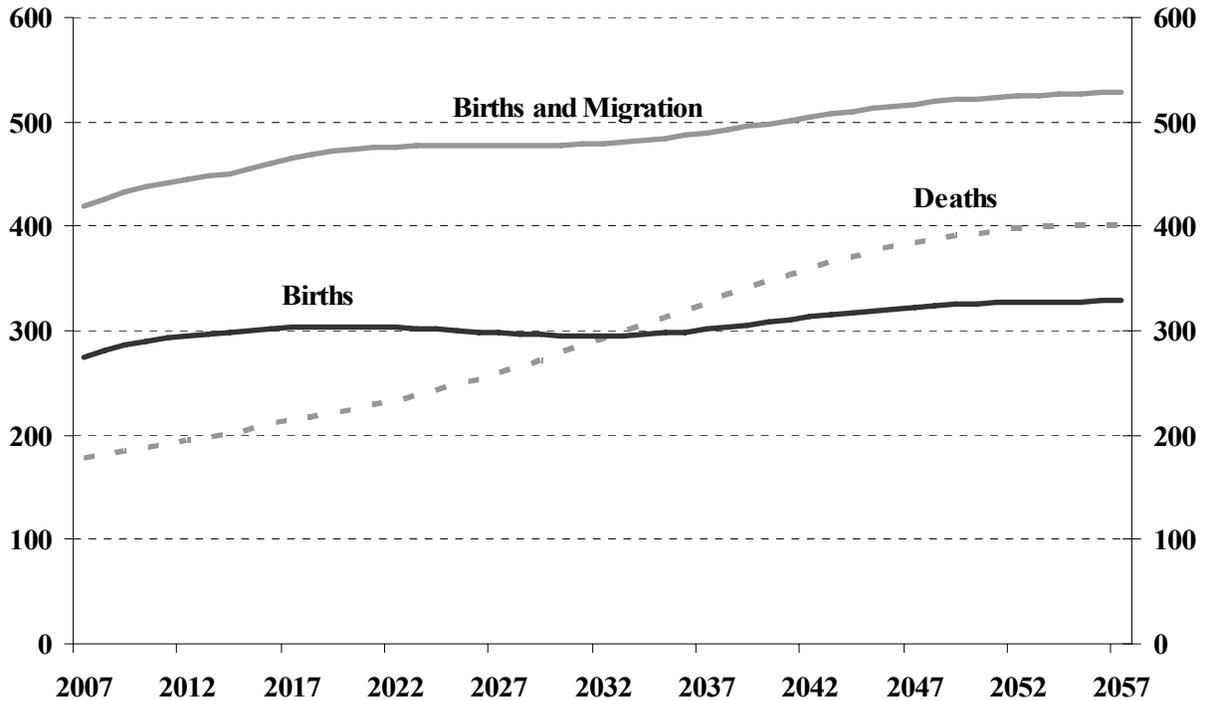
Table 46 Births, Net Migrants and Deaths for Canada less Québec
(thousands)

Year	Population 1st July	Births	Net Migrants	Deaths	Change in Population	Annual Percentage Change		
						20-64	65+	Total
						(%)	(%)	(%)
2007	25,209	275	145	178	242	1.1	2.6	1.0
2008	25,452	281	146	181	245	1.1	2.6	1.0
2009	25,697	286	147	184	249	1.1	2.6	1.0
2010	25,946	290	148	188	250	1.0	2.9	1.0
2011	26,195	292	149	191	250	0.6	4.1	1.0
2012	26,445	295	150	195	250	0.6	3.8	0.9
2015	27,193	301	155	205	250	0.5	3.4	0.9
2020	28,453	303	171	224	250	0.1	3.5	0.9
2025	29,669	300	177	247	230	(0.1)	3.3	0.8
2030	30,762	295	182	277	201	0.3	2.0	0.7
2040	32,522	308	191	347	152	0.5	0.8	0.5
2050	33,922	326	197	393	130	0.2	0.8	0.4
2075	37,189	347	211	424	134	0.3	0.5	0.4

III. Economic Projections

The list of assumptions required to project the various economic indices, benefit expenditures and contributions is quite extensive. The following sections cover the more important assumptions.

The economic outlook rests on the assumed evolution of the labour market, that is, labour force participation, employment, unemployment rates, inflation and the increase in average employment earnings. Rates of return on CPP assets reflect the financial markets and form part of the investment assumptions described in Section IV. All of these factors must be considered together and form part of an overall economic perspective.

A.   Economic Perspective

The future revenues and expenditures of the CPP depend on many demographic and economic factors. It is important to define the individual economic assumptions in the context of a long-term overall economic perspective. For this report, a moderate but sustainable growth in the economy is assumed to persist throughout the projection period.

The actuarial examination of the CPP involves the projection of its revenues and expenditures over a long period of time. Our best judgement regarding future economic trends was used but does not take into account all of the social or technological changes that may occur over the projection period. There will always be a certain degree of uncertainty.
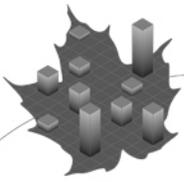
The projected aging of the population combined with the retirement of the baby boom generation over the next few decades will certainly create significant social and economic changes. It is possible that the evolution of the working-age population, especially the active population, will be quite different than what has been historically observed.

B.   Annual Increase in Prices (Inflation Rate)

The inflation rate assumption is needed to determine the Pension Index (PI) for any given calendar year. It is also used in the determination of the annual nominal increase in average employment earnings, the Year's Maximum Pensionable Earnings (YMPE) and the nominal rates of return on investments.

Price increases, as measured by changes in the Consumer Price Index (CPI), tend to fluctuate from year to year. Over the last 50 years, the trend was generally upward through the early 1980s and downward since then. For example, the average annual increase in the CPI for the 50, 20 and 10-year periods ending in 2006 were 4.1%, 2.6% and 2.1%, respectively. Going forward, the Bank of Canada has reaffirmed its objective of keeping the inflation rate within a target range of 1% to 3% until the end of 2011.

For 2007 to 2011, it is assumed that the Bank of Canada will maintain its inflation target policy, so the assumption was set at 2.0%. This corresponds to the average forecast from various economists and falls in the middle of the Bank of Canada target range. On the other hand, the ultimate assumption for price increases for 2016 and thereafter has been set at 2.5%. This is higher than has been experienced over the last decade and is in the upper range of the current Bank of Canada target range. The main reasons for the choice of an ultimate assumption of 2.5% are as follows:

- The Bank of Canada's long-term monetary policy is known only until the end of 2011. Compared to the 75-year projection period of the CPP, the monetary policy of the Bank of Canada could be viewed as short-term.

- The expected upward pressure on real wages due to the labour shortage may create upward pressure on prices.

- There is uncertainty about future energy costs.

- In Canada, the longest consecutive periods in the 20th century with an inflation rate of about 2% are the 1900s, 1920s, 1930s, mid-1950s to mid-1960s, and from 1992 to 2006.

Finally, for years 2012 to 2016 the inflation rate assumption is assumed to increase gradually from 2.0% to 2.5% by increments of 0.1% each year.

C.   Labour Market

Chart 14 shows the main components of the labour market that are used to determine the number of earners and contributors by age, sex and calendar year.

Chart 14 Components of the Labour Market

```
                        ┌──────────────────────┐
                        │  Total Population     │
                        └──────────────────────┘
                                  │
          ┌───────────────────────┴────────────────────────┐
┌───────────────────────────────┐         ┌──────────────────────────┐
│ Population aged 15 and over    │         │ Population aged 0 to 14  │
└───────────────────────────────┘         └──────────────────────────┘
          │
    ┌─────┴──────────────────┐
┌──────────────────┐   ┌───────────────────────┐
│ Active Population*│   │ Inactive Population*  │
└──────────────────┘   └───────────────────────┘
    │
 ┌──┴───────┐
┌──────────┐ ┌─────────────┐
│ Employed │ │ Unemployed  │
└──────────┘ └─────────────┘
```

* An active person is one who is employed or is looking for employment (unemployed). A person is said to be inactive in all other cases.
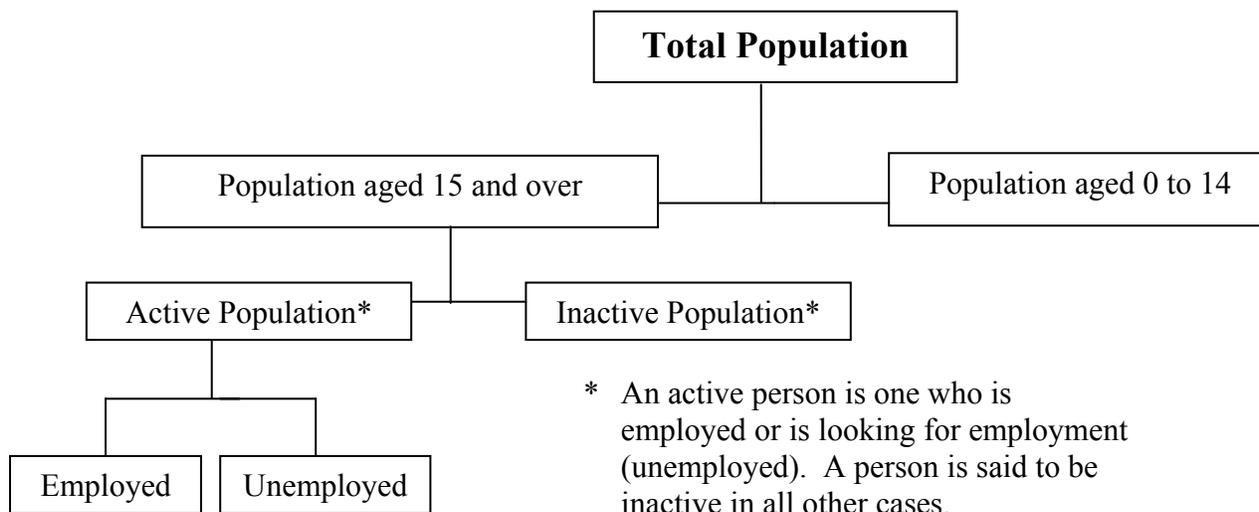
The number of earners is defined as the number of persons who had earnings during a given calendar year. The earners become contributors if they have earnings during the year at least equal to the Year's Basic Exemption (YBE) and they are between ages 18 and 70. The proportion of earners and contributors assumptions (described in subsections C-3 and F below) rely on the projected active population included in this report.

1.   Active Population

The overall labour force participation rates in Canada (the active population expressed as a proportion of the population aged 15 and over) from 1976 to 2006 clearly show a narrowing of the gap between male and female rates. The increase in the participation rates of females aged 15 to 69 has been significant over recent years. For males, the increase in participation rates has been significant for the younger and older age groups, that is, for those aged 15 to 24 and those aged 50 to 69.

In 1976, overall male participation was 77.7% compared to only 45.7% for females, which is a gap of 32%. This gap has narrowed to 10.4% in 2006 with male and female participation at 72.5% and 62.1%, respectively. It is assumed that females will continue to narrow the gap in participation rates but at a slower pace, with the gap gradually reducing to about 8.5% by 2030 and further reducing to about 8.2% by the end of the projection period. Tables 47 to 49 show the projected active population and labour force participation rates for Canada. Over the near term, it is assumed that females aged 50 and over will continue to increase their overall labour force participation compared to previous cohorts.
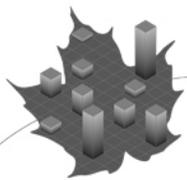
Table 47 Active Population (Canada, ages 15 and over)

Year	Population[1]			Active Population			Average Employed		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
	(thousands)			(thousands)			(thousands)		
2007	13,045	13,458	26,503	9,437	8,337	17,774	8,818	7,836	16,654
2008	13,200	13,609	26,809	9,521	8,409	17,930	8,897	7,904	16,800
2009	13,351	13,755	27,105	9,603	8,478	18,081	8,974	7,968	16,942
2010	13,500	13,899	27,399	9,685	8,545	18,230	9,050	8,031	17,081
2011	13,645	14,039	27,684	9,760	8,607	18,366	9,120	8,089	17,209
2012	13,781	14,170	27,951	9,820	8,655	18,475	9,177	8,134	17,311
2015	14,154	14,529	28,683	9,965	8,769	18,734	9,313	8,241	17,554
2020	14,716	15,068	29,785	10,130	8,913	19,043	9,467	8,376	17,843
2025	15,292	15,619	30,911	10,265	9,060	19,325	9,592	8,516	18,108
2030	15,842	16,162	32,004	10,439	9,278	19,718	9,753	8,723	18,475
2040	16,702	17,065	33,767	10,768	9,584	20,352	10,060	9,010	19,070
2050	17,223	17,622	34,844	10,977	9,764	20,741	10,255	9,180	19,435

[1] Adjusted to the basis used by Statistics Canada in their labour force survey.

Table 48 Labour Force Participation Rates (Canada, ages 15 and over)

Year	Labour Force Participation Rate			Employment Rate			Unemployment Rate		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
	(%)			(%)			(%)		
2007	72.3	62.0	67.1	67.6	58.2	62.8	6.6	6.0	6.3
2008	72.1	61.8	66.9	67.4	58.1	62.7	6.6	6.0	6.3
2009	71.9	61.6	66.7	67.2	57.9	62.5	6.6	6.0	6.3
2010	71.7	61.5	66.5	67.0	57.8	62.3	6.6	6.0	6.3
2011	71.5	61.3	66.3	66.8	57.6	62.2	6.6	6.0	6.3
2012	71.3	61.1	66.1	66.6	57.4	61.9	6.5	6.0	6.3
2015	70.4	60.4	65.3	65.8	56.7	61.2	6.5	6.0	6.3
2020	68.8	59.2	63.9	64.3	55.6	59.9	6.5	6.0	6.3
2025	67.1	58.0	62.5	62.7	54.5	58.6	6.6	6.0	6.3
2030	65.9	57.4	61.6	61.6	54.0	57.7	6.6	6.0	6.3
2040	64.5	56.2	60.3	60.2	52.8	56.5	6.6	6.0	6.3
2050	63.7	55.4	59.5	59.5	52.1	55.8	6.6	6.0	6.3
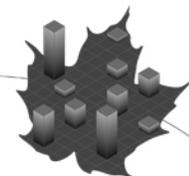
Table 49 Labour Force Participation Rates by Age Group (Canada)

Age Group	Males 2007	Males 2015	Males 2030	Females 2007	Females 2015	Females 2030
	(%)	(%)	(%)	(%)	(%)	(%)
15-19	52.4	53.0	55.0	55.2	56.0	57.0
20-24	80.1	81.0	83.0	77.2	78.0	81.0
25-29	90.2	91.0	93.0	81.9	82.0	85.0
30-34	92.7	93.0	94.0	80.6	81.0	84.0
35-39	93.1	93.0	94.0	81.7	83.0	86.0
40-44	92.3	93.0	94.0	83.0	84.0	87.0
45-49	90.9	92.0	94.0	82.7	84.0	87.0
50-54	87.9	89.0	91.0	78.3	80.0	83.0
55-59	76.2	77.0	79.0	62.4	64.0	66.0
60-64	53.4	54.0	56.0	37.3	39.0	41.0
65-69	23.4	24.0	25.0	12.7	13.0	14.0
70 and Over	6.8	7.0	8.0	2.3	3.0	5.0
15-69	79.2	78.3	78.3	70.1	69.0	70.1
15 and Over	**72.3**	**70.4**	**65.9**	**62.0**	**60.4**	**57.4**

The aging of the population exerts downward pressure on the overall labour force participation rate in Canada. The overall participation rate from Table 48 would fall from 67.1% in 2007 to 56.8% compared to 59.5% in 2050 if the 2006 participation rates by age and sex were to apply throughout the projection period. This can be explained by the projected increase in the proportion of people aged 55 to 69 outweighing the recent increase in participation in this age group, as well as the increase in the proportion of people aged 70 and over. A reduction in the overall participation rates is inevitable under these circumstances. To recognize this particular demographic trend, the projection period for purposes of projecting the participation rates has been divided into two periods: 2007 to 2015, and 2015 to 2030.

Individuals of the baby boom generation who were born between 1945 and 1955 and are presently active will be aged 55 to 65 within this decade. This highly active cohort will continue to put upward pressure on the participation rate for the age group 55 to 64. It is projected that by 2015 the labour force participation rate of this age group (55 to 64) will increase slightly from its current level. During the period 2007 to 2015, a balance between gains in participation rates and productivity increases through the increase in average employment earnings of workers will likely result. Nonetheless, the assumed increase in labour force participation rates for those aged 50 and over is not sufficient to counteract the decrease in the overall participation rate due to the demographic shift. For this reason, participation rates for people under the age of 55, especially for those aged 20 to 40, were increased somewhat. This results in labour force participation rates for those aged 15 to 69 of 78.3% and 69.0% for males and females, respectively in 2015.
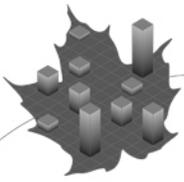
From 2015 to 2030, the baby boomers born between 1955 and 1965, who are more numerous than the previous baby boomers, will be reaching the ages of 60 to 75. The first generation of boomers (1945 to 1955) will have already retired and will have created downward pressure on the overall participation rate. It was thus assumed that those aged 55 to 64 during this period would be participating more because of increased employment opportunities due to the expected labour shortage. This change in work patterns might be expected since this generation of workers is more adaptable, flexible and better educated to prolong their work life. Since the early 1990s, young individuals under the age of 35 have entered the labour force later mainly due to longer schooling. For this reason, we might expect a later exit from the labour force. It was thus assumed that participation rates for those less than age 55 would increase. Again, as for the previous period, we expect a balance between gains in participation and productivity. This results in labour force participation rates for those aged 15 to 69 of 78.3% and 70.1% for males and females, respectively in 2030.

For 2031 and thereafter, the participation rates are kept constant. This, combined with a slow growth in the working age population, results in a low rate of growth of approximately 0.3% for the active population.

2. Employment

In Canada, the annual average job creation rate has been about 1.8% since 1976. However, this rate has varied, having averaged 1.9% from 1976 to 1991 but only 1.7% from 1992 to 2006. It is assumed that the job creation rate will be 1.0% in 2007, based on the most recent experience and various economic forecasts. Thereafter, the job creation rate is assumed to be above 0.8% until 2010 and then decrease gradually to average 0.3% over the long term as the increase in the active population reduces the pressure on the unemployment rate. Tables 47 and 50 show the projected number of employed persons for Canada.

Table 50 Employment of Population (Canada, ages 18 to 69)

Year	Population Males	Population Females	Average Employed Males	Average Employed Females	Employment Rate Males	Employment Rate Females
	(thousands)		(thousands)		(%)	
2007	11,430	11,410	8,503	7,554	74.4	66.2
2008	11,563	11,543	8,578	7,618	74.2	66.0
2009	11,693	11,672	8,653	7,681	74.0	65.8
2010	11,817	11,796	8,729	7,745	73.9	65.7
2011	11,930	11,909	8,799	7,803	73.8	65.5
2012	12,036	12,014	8,856	7,850	73.6	65.3
2015	12,304	12,282	8,994	7,960	73.1	64.8
2020	12,516	12,488	9,127	8,084	72.9	64.7
2025	12,638	12,589	9,194	8,175	72.8	64.9
2030	12,707	12,631	9,293	8,323	73.1	65.9
2040	12,965	12,886	9,548	8,572	73.6	66.5
2050	13,333	13,283	9,736	8,739	73.0	65.8
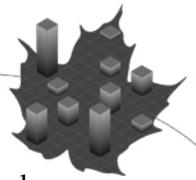
If the job creation rate remained constant at its current level throughout the projection period, it would result in the elimination of unemployment in the context of the projected demographic situation. The unemployment rate is not expected to fall below the natural rate of unemployment without creating inflationary pressures. In this report, it is assumed that the unemployment rate will be 6.3% for 2007 and thereafter.

Chart 15 shows that the number of employed who are age 15 and over increases from about 11.0 million in 1980 to 19.4 million by 2050. At the start of the projection period in 2007, employment is set to reach 16.7 million. As annual employment growth is projected to decline gradually to about 0.2%, the average annual increase in employment from 2007 to 2050 reduces to 0.4%. The number of unemployed who are age 15 and over increases from approximately 0.9 million in 1980 to 1.3 million in 2050.

The labour force or the active population (that is, total employed and unemployed populations) thus increases from 11.9 million in 1980 to 17.8 million in 2007 and then to 20.7 million in 2050, which gives an average annual increase of 0.4% from 2007 to 2050. Correspondingly, the inactive population (those not in the labour force) aged 15 and over increases from 6.6 million in 1980 to 8.7 million in 2007 and then to 14.1 million in 2050, which gives an average annual increase of 1.1% from 2007 to 2050.

The combined impact of a decrease in the labour force participation rate and a gradual increase in the population aged 15 and over leads to an overall moderate increase in the labour force. The labour force grows at a slower rate than the population and the overall participation rate decreases because of the aging of the population, as shown in Chart 15.

Chart 15 Distribution of the Canadian Population Aged 15 and Over
(millions)
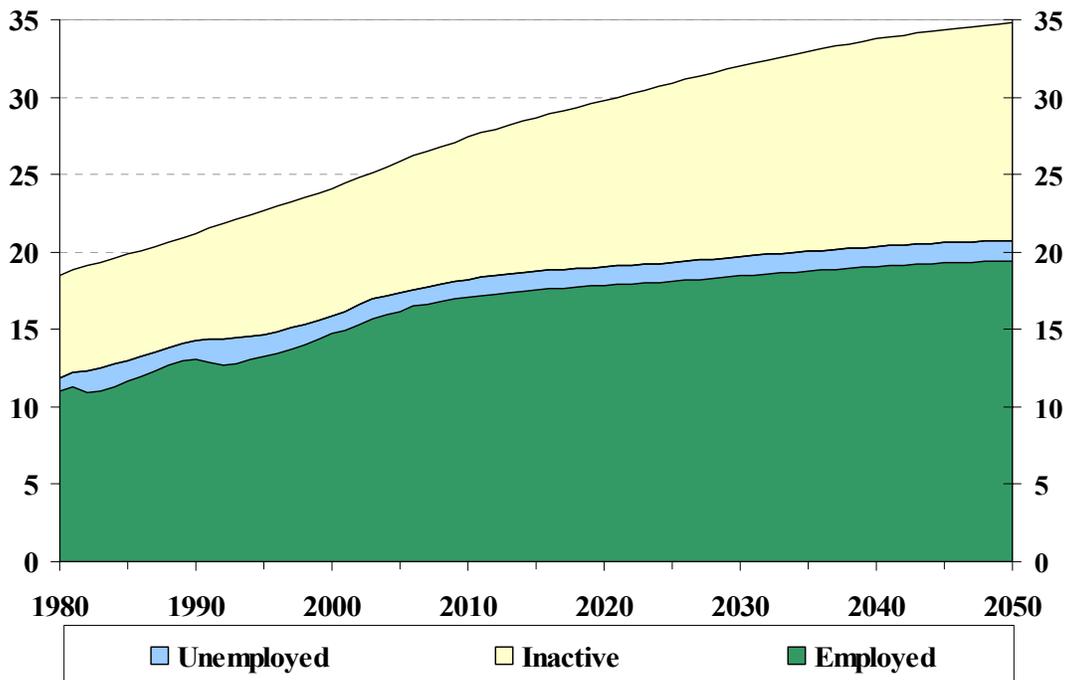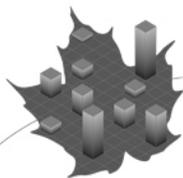
The relevant population for the Canada Pension Plan is Canada less Québec and is obtained by subtracting the projected results for Québec from those for Canada. Tables 51 and 52 show the active population, average employed and labour force rates for Canada less Québec.

Table 51 Active Population (Canada less Québec, ages 15 and over)

Year	Population[1]			Active Population			Average Employed		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
	(thousands)			(thousands)			(thousands)		
2007	9,945	10,257	20,202	7,241	6,424	13,665	6,810	6,062	12,872
2008	10,072	10,384	20,457	7,316	6,491	13,807	6,878	6,124	13,002
2009	10,198	10,509	20,706	7,391	6,556	13,947	6,946	6,184	13,130
2010	10,324	10,632	20,956	7,465	6,620	14,085	7,014	6,243	13,257
2011	10,446	10,753	21,199	7,534	6,680	14,213	7,077	6,297	13,374
2012	10,561	10,867	21,429	7,590	6,728	14,318	7,128	6,341	13,469
2015	10,884	11,189	22,073	7,735	6,852	14,587	7,258	6,454	13,712
2020	11,374	11,676	23,050	7,913	7,017	14,931	7,416	6,603	14,019
2025	11,873	12,168	24,041	8,060	7,170	15,230	7,551	6,748	14,299
2030	12,364	12,665	25,028	8,232	7,372	15,604	7,711	6,939	14,650
2040	13,172	13,523	26,695	8,570	7,686	16,256	8,026	7,235	15,261
2050	13,710	14,108	27,819	8,813	7,894	16,706	8,253	7,430	15,682

[1] Adjusted to the basis used by Statistics Canada in their labour force survey.

Table 52 Labour Force Participation Rates (Canada less Québec)

Age Group	Males			Females		
	2007	**2015**	**2030**	**2007**	**2015**	**2030**
	(%)	(%)	(%)	(%)	(%)	(%)
15-19	52.4	53.0	55.0	56.3	56.8	57.5
20-24	79.7	80.7	83.0	76.8	77.4	80.7
25-29	90.2	91.0	93.0	81.4	81.5	84.7
30-34	92.9	93.0	94.0	80.3	80.4	83.7
35-39	93.5	93.0	94.0	81.2	82.7	85.7
40-44	92.3	93.0	94.0	83.1	84.0	87.0
45-49	90.8	92.0	94.0	82.4	84.0	87.0
50-54	88.1	89.3	91.0	78.9	80.6	83.6
55-59	77.7	78.6	80.1	64.3	65.9	67.6
60-64	55.9	55.9	57.4	40.4	41.9	42.9
65-69	24.9	25.3	25.9	13.3	13.3	14.0
70 and Over	7.5	7.6	8.6	2.6	3.3	5.3
15-69	79.7	78.8	78.7	70.7	69.7	70.5
15 and Over	**72.8**	**71.1**	**66.6**	**62.6**	**61.2**	**58.2**
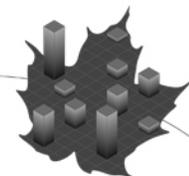
3. Number of Earners

The number of earners for any given year, namely anyone who had employment earnings during the year, is always more than the employed population and sometimes even close to the labour force because it includes all individuals who had earnings at any time during the year. The projected number of earners is obtained by a regression based on a highly correlated historical relationship between the number of employed persons and the number of earners over the period 1976 to 2004. Table 53 shows the average number of employed persons and the proportion of the population with earnings for Canada less Québec.

Table 53 Employment of Population (Canada less Québec, ages 18 to 69)

Year	Population		Average Employed		Employment Rate		Proportion with Earnings (Earners)	
	Males	Females	Males	Females	Males	Females	Males	Females
	(thousands)		(thousands)		(%)		(%)	
2007	8,724	8,724	6,558	5,835	75.2	66.9	79.6	72.7
2008	8,837	8,839	6,624	5,895	75.0	66.7	79.4	72.4
2009	8,946	8,950	6,691	5,955	74.8	66.5	79.2	72.2
2010	9,051	9,058	6,759	6,014	74.7	66.4	79.0	71.9
2011	9,149	9,157	6,821	6,069	74.6	66.3	78.8	71.7
2012	9,242	9,253	6,872	6,114	74.4	66.1	78.6	71.4
2015	9,488	9,506	7,002	6,227	73.8	65.5	77.7	70.6
2020	9,715	9,743	7,143	6,368	73.5	65.4	77.2	70.3
2025	9,865	9,889	7,233	6,477	73.3	65.5	76.7	70.3
2030	9,976	9,986	7,340	6,619	73.6	66.3	76.8	71.1
2040	10,273	10,284	7,608	6,878	74.1	66.9	77.6	71.7
2050	10,662	10,693	7,825	7,069	73.4	66.1	76.8	70.7

D. Rate of Increase in Average Annual Earnings

The assumed increase in average annual earnings (AAE) is used to project the earnings of CPP contributors while the assumed increase in Average Weekly Earnings (AWE) is used to project the increase in the YMPE from one year to the next.

The real-wage differential, as measured by the difference between the increase in the AWE and the CPI, has fluctuated significantly from year to year. The 10-year average real-wage differential was 0.6% for the period ending in 1996 while it was zero for the period ending in 2006. The average annual real-wage differential averaged 1.1% for the last 50-year period ending in 2006. Many factors influence real wage increases including general productivity, labour demand, the move to a service economy and decreases in the average number of hours worked. More specifically, labour demand has significant impact on real-wage increases. Real wages are subject to downward pressure as the demand for workers decreases. On the other hand, one could expect upward pressure on wages if the size of the labour force fails to keep up with a growing economy.
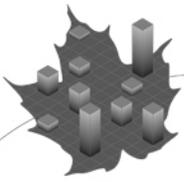
The YMPE is increased according to the AWE while the CPP average earnings are increased according to historical data of the AAE. The difference between real increases in the AWE and the AAE has been relatively small over the periods from 1966 to 2005; that is, an absolute difference of approximately 0.05% per year. For several years in the 1990s this difference was more pronounced; however, the real increase in AAE and AWE are once again converging towards each other. Considering these factors along with the long-term relationship between the two, the real increase in AAE is assumed to be the same as for the AWE for years 2007 and thereafter. The real increase in both the AWE and AAE take into account the expected upward pressure on real wages due to the expected labour shortage. The assumption is based on the expected labour shortage beginning this decade, which will be moderated by higher participation rates at older ages and productivity gains. The real increase for both AWE and AAE is assumed to gradually increase from 0.2% in 2007 to 1.3% by 2015. Table 54 below shows the assumptions regarding the annual increases in prices, AAE and AWE.

Table 54 Inflation, Real AAE and AWE Increases

Year	Price Increases	Real Average Annual Earnings (AAE)	Real Average Weekly Earnings (AWE)
	(%)	(%)	(%)
2007	2.0	0.2	0.2
2008	2.0	0.4	0.4
2009	2.0	0.6	0.6
2010	2.0	0.8	0.8
2011	2.0	0.9	0.9
2012	2.1	1.0	1.0
2013	2.2	1.1	1.1
2014	2.3	1.2	1.2
2015	2.4	1.3	1.3
2016+	2.5	1.3	1.3
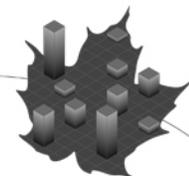
E. Average Annual Earnings, Pensionable Earnings and Total Earnings

Average annual earnings are projected by taking into account the structural demographic changes and the narrowing of the gap between average female and male employment earnings. The ratio of female to male average employment earnings stood at about 48% in 1966 and was 71% in 2006. This ratio is projected to increase to 84% by 2050. Table 55 shows the projected average annual earnings by age group and sex for selected years.

Table 55 Average Annual Earnings

Age Group	Males			Females		
	2007	**2025**	**2050**	**2007**	**2025**	**2050**
	($)	($)	($)	($)	($)	($)
20-24	20,226	36,177	90,968	15,532	29,418	76,940
25-29	34,685	61,657	153,828	26,957	51,720	135,701
30-34	44,151	77,450	192,563	31,427	61,106	162,127
35-39	48,708	85,623	212,913	34,418	66,906	177,622
40-44	51,657	90,732	225,989	36,673	70,884	187,825
45-49	53,773	94,561	235,620	38,118	73,646	195,234
50-54	53,924	95,167	236,909	38,527	73,876	196,045
55-59	48,636	85,508	212,606	34,082	65,848	175,311
60-64	43,532	75,988	188,527	29,115	57,650	154,459
65-69	23,365	40,365	99,769	14,819	29,906	80,680
All Ages	**43,095**	**76,621**	**189,420**	**30,790**	**60,001**	**158,198**

Total earnings are the product of average earnings and the number of earners. Table 56 shows projected average earnings, the number of earners for each sex and the resulting total earnings and its annual percentage increase. The ultimate annual increase in total earnings is set to reach about 4.1%. This nominal increase is comprised of an ultimate inflation rate of 2.5%, real wage growth of 1.3% and population growth for the age group 18 to 69 of 0.3%.

Average pensionable earnings are computed by removing from average annual earnings (1) the earnings of those earning less than the YBE and (2) the portion of earnings in excess of the YMPE. Since earnings statistics are aggregate (by age, sex and calendar year) as opposed to individual, such removal is made using the distribution of earners and earnings. The average pensionable earnings by age, sex and calendar year used in the calculation of the average contributory earnings correspond to the average portion of individual employment earnings below the YMPE for a cohort of earners earning more than the YBE. For 2007, the YMPE and YBE are respectively $43,700 and $3,500. The YMPE is increased annually based on the average industrial aggregate wage in Canada as published by Statistics Canada. Table 57 shows the projected average pensionable earnings by age and sex for selected years.
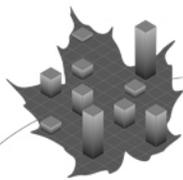
Table 56 Total Earnings
(Canada less Québec, ages 18 to 69)

Year	Average Annual Earnings		Earners		Total Earnings	Annual Increase in Total Earnings
	Males	Females	Males	Females		
	($)	($)	(thousands)	(thousands)	($ million)	(%)
2007	43,095	30,790	6,946	6,343	494,635	3.3
2008	44,006	31,658	7,015	6,401	511,375	3.4
2009	45,026	32,612	7,084	6,458	529,604	3.6
2010	46,168	33,651	7,153	6,516	549,480	3.8
2011	47,389	34,752	7,214	6,568	570,098	3.8
2012	48,742	35,957	7,260	6,609	591,503	3.8
2015	53,689	40,253	7,374	6,714	666,164	4.2
2020	64,094	49,185	7,499	6,845	817,353	4.1
2025	76,621	60,001	7,562	6,953	996,570	4.0
2030	91,679	73,090	7,661	7,104	1,221,587	4.2
2040	131,599	107,734	7,976	7,375	1,844,225	4.2
2050	189,420	158,198	8,188	7,555	2,746,149	4.0

Table 57 Average Pensionable Earnings
(Canada less Québec)

Age Group	Males			Females		
	2007	2025	2050	2007	2025	2050
	($)	($)	($)	($)	($)	($)
20-24	21,131	36,475	88,933	17,280	30,857	77,258
25-29	30,431	53,537	132,131	26,323	47,631	119,626
30-34	33,838	59,646	148,068	28,319	51,556	130,079
35-39	34,992	61,881	154,084	29,609	54,048	136,687
40-44	35,684	63,198	157,727	30,624	55,953	141,813
45-49	36,032	63,893	159,611	31,304	57,259	145,317
50-54	35,801	63,450	158,218	31,403	57,138	144,614
55-59	33,760	59,280	146,182	29,371	53,305	133,766
60-64	32,042	55,518	133,534	27,362	49,590	122,018
65-69	23,001	36,844	82,039	19,078	32,129	73,610
All Ages	**32,136**	**56,830**	**139,677**	**27,427**	**50,001**	**125,146**

Chart 16 shows the evolution of the ratio of average pensionable earnings for males and females as a percentage of the YMPE. The ratio reduces in time for males mainly due to the freeze on the YBE, which has the effect of increasing the number of earners with low earnings. For females, the YBE effect is more than offset by the greater increase in their average pensionable earnings.

Chart 16 Ratio of Average Pensionable Earnings to Maximum
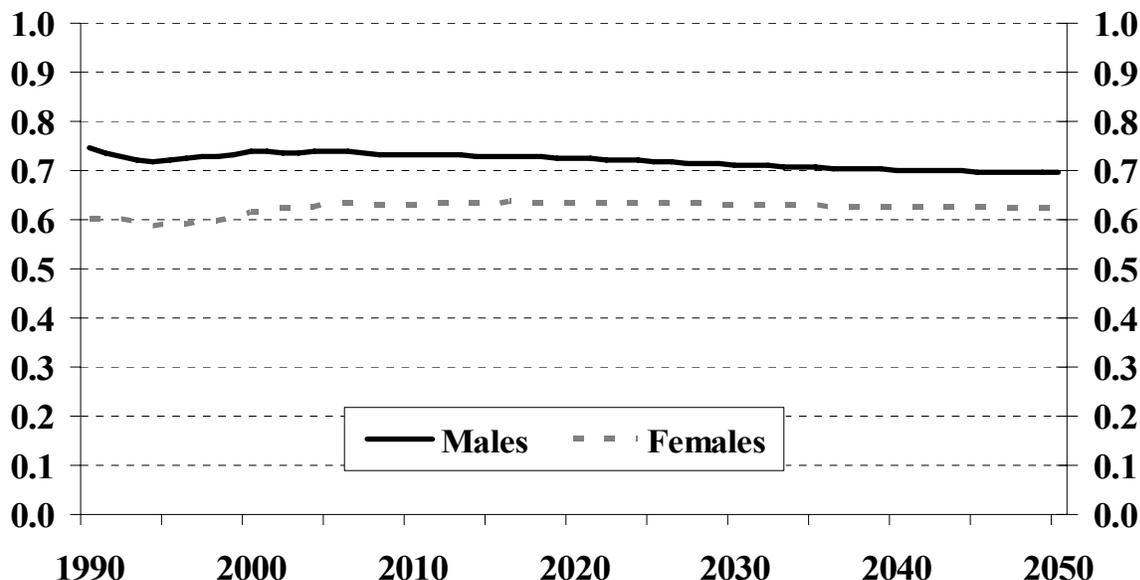
F. Contributions

Contributions are determined by multiplying the number of contributors by the product of the average contributory earnings and the contribution rate.

1. Proportion of Contributors

In respect of a given calendar year, one of the conditions to be a contributor is to have employment earnings exceeding the YBE. Accordingly, a proportion of contributors is determined by multiplying the proportion of earners by the complement of the proportion of earners earning less than the YBE. This fraction was determined for each age, sex and calendar year by expressing the YBE as a percentage of average employment earnings and using the distribution of earners and their earnings. These distributions were obtained from earnings statistics and are assumed to remain fixed at their adjusted 2005 distribution. Table 58 presents the proportion of contributors by selected age groups and years for males and females, respectively.
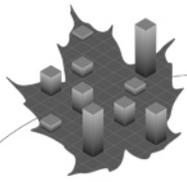
Table 58 Proportion of Contributors by Age Group

Age Group	Males			Females		
	2007	2025	2050	2007	2025	2050
	(%)	(%)	(%)	(%)	(%)	(%)
20-24	76.5	81.0	84.2	73.3	80.9	84.4
25-29	83.8	86.3	90.2	74.9	78.9	81.7
30-34	84.5	86.0	87.8	73.7	76.9	79.8
35-39	86.7	88.7	89.5	75.5	80.3	82.7
40-44	84.6	86.4	87.8	77.6	81.6	84.4
45-49	84.6	87.5	88.6	77.2	81.4	83.6
50-54	81.5	83.9	85.5	72.9	77.1	79.5
55-59	71.7	75.1	77.0	59.4	63.9	66.4
60-64	42.1	41.6	44.3	32.2	34.7	37.3
65-69	4.6	5.5	6.3	3.9	6.2	7.3
All Ages	**74.5**	**72.6**	**74.4**	**66.3**	**66.3**	**68.8**

2.   Average Contributory Earnings

Average contributory earnings were computed for each age, sex and year by subtracting the YBE from the average pensionable earnings as computed above (Table 57). Table 59 shows the resulting average contributory earnings by age group and sex for selected years.

Table 59 Average Contributory Earnings

Age Group	Males			Females		
	2007	2025	2050	2007	2025	2050
	($)	($)	($)	($)	($)	($)
20-24	17,631	32,975	85,433	13,780	27,357	73,758
25-29	26,931	50,037	128,631	22,823	44,131	116,126
30-34	30,338	56,146	144,568	24,819	48,056	126,579
35-39	31,492	58,381	150,584	26,109	50,548	133,187
40-44	32,184	59,698	154,227	27,124	52,453	138,313
45-49	32,532	60,393	156,111	27,804	53,759	141,817
50-54	32,301	59,950	154,718	27,903	53,638	141,114
55-59	30,260	55,780	142,682	25,871	49,805	130,266
60-64	28,542	52,018	130,034	23,862	46,090	118,518
65-69	19,501	33,344	78,539	15,578	28,629	70,110
All Ages	**28,636**	**53,330**	**136,177**	**23,927**	**46,501**	**121,646**

3. Total Contributory Earnings

Contributory earnings for each given age, sex and year are calculated as the product of the proportion of contributors, the average contributory earnings computed as above and the corresponding population. Total contributory earnings for each year were obtained by summing contributory earnings computed for each age and sex for that year.

Total contributory earnings are then adjusted to take into account the non-refundable portion of employer contributions arising generally in respect of (1) employees with multiple employers during a given year, (2) employees earning less than the YBE during a given year and (3) employees who work only part of the year and do not have full access to the YBE. The records of earnings, the annual report on contributors published by Human Resources and Social Development Canada and the information from the Canada Revenue Agency (CRA) on CPP contribution refunds were used to calculate the adjustment. The adjustment is about 2.1% in 2004 and gradually reduces to 2.0% over the projection period to take into account the freeze on the YBE at $3,500 and the portion of the adjustment related to those earners earning less than the YBE.

Annual contributions are obtained as the product of the adjusted contributory earnings and the contribution rate. The contribution rate is set by law at 9.9% for years 2003 and thereafter. Table 60 presents the components of total adjusted contributory earnings and the YMPE. The higher annual increase in total contributory earnings for 2007 is due to the YMPE increase in 2007, i.e. from $42,100 in 2006 to $43,700 in 2007.

Table 60 Total Adjusted Contributory Earnings

Year	Average Contributory Earnings Males	Females	YMPE	Contributors Males	Females	Total Adjusted Contributory Earnings	Annual Increase in Total Contributory Earnings
	($)	($)	($)	(thousands)	(thousands)	($ million)	(%)
2007	28,636	23,927	43,700	6,498	5,782	331,200	4.6
2008	29,370	24,613	44,800	6,563	5,846	343,669	3.8
2009	30,135	25,337	45,900	6,628	5,909	356,699	3.8
2010	30,931	26,096	47,000	6,691	5,970	370,305	3.8
2011	31,841	26,941	48,300	6,751	6,029	385,232	4.0
2012	32,785	27,827	49,600	6,801	6,082	400,338	3.9
2015	36,345	31,089	54,600	6,926	6,218	454,172	4.4
2020	44,049	38,058	65,600	7,077	6,403	566,677	4.4
2025	53,330	46,501	79,100	7,164	6,555	700,665	4.3
2030	64,311	56,516	95,300	7,310	6,763	869,269	4.4
2040	93,529	83,008	138,400	7,689	7,123	1,336,186	4.3
2050	136,177	121,646	201,000	7,934	7,364	2,014,667	4.1
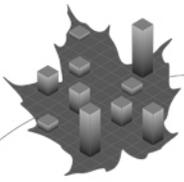
IV. Investment Assumptions

A. Investment Strategy

The CPP Investment Board invests funds according to its own investment policies, which take into account the needs of contributors and beneficiaries, as well as financial market constraints. The investments have been grouped into three broad categories: equity, fixed income securities and inflation-sensitive assets. Equities consist of Canadian, U.S. and foreign equities. Fixed income securities consist of bonds, which are usually a mix of federal, provincial, corporate and real return bonds. Inflation-sensitive assets include such categories as real estate and infrastructure.

As at 31 December 2006, the asset mix of the CPP Investment Board consisted of 67% equity, 23% fixed income securities and 10% inflation-sensitive assets. The CPPIB has an approved Reference Portfolio which consists of 65% equity (40% foreign equity, 25% Canadian equity) and 35% debt (10% Canadian real return bonds, 25% Canadian nominal bonds). The purpose of this Reference Portfolio is to evaluate the performance of the CPPIB Investment Portfolio and hold the CPPIB accountable for its active management decisions. The CPPIB uses the Reference Portfolio as a risk-return benchmark to evaluate, select, implement and manage its performance enhancing investment strategies. This Reference Portfolio was used in the determination of the short-term asset mix of the CPP.

A transition from the CPP portfolio as at 31 December 2006 to a new asset mix is expected to occur from 2007 to 2009. In 2010, the asset mix consists of 60% equity, 30% fixed income and 10% inflation-sensitive assets. The 60% equity component consists of 20% Canadian equity and 40% U.S. and foreign equity. The 30% invested in fixed income securities is composed of 29.5% bonds, including marketable and non-marketable bonds, and 0.5% short-term investments, such as cash. This asset mix is maintained until 2015.

As the CPP matures and plan members age and become more risk adverse, it is assumed that the CPP Investment Board will increase their investments in fixed income securities. For this reason, the ultimate assumed asset mix of the CPP Investment Board is 50% equity, 40% fixed income and 10% inflation-sensitive assets. It is assumed that the 50% invested in equity is composed of 15% Canadian equity and 35% U.S. and foreign equity. The 40% invested in fixed income securities is composed of 39.5% bonds, including marketable and non-marketable bonds, and 0.5% short-term investments. The ultimate asset mix is achieved in 2025.

When deriving the assumed asset mix of the CPP, consideration was given to the asset mix policy of other major Canadian pension plans. Table 61 shows the assumed asset mix at the end of the year throughout the projection period.
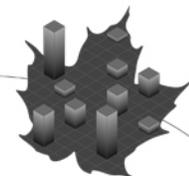
Table 61 Asset Mix

Year	Canadian Equity	U.S. and Foreign Equity	Marketable Bonds	Non-Marketable Bonds	Real Estate & Infrastructure	Short Term
	(%)	(%)	(%)	(%)	(%)	(%)
2007	25.0	40.0	9.1	18.4	7.0	0.5
2008	25.0	40.0	11.8	15.7	7.0	0.5
2009	22.5	40.0	14.8	13.7	8.5	0.5
2010	20.0	40.0	17.6	11.9	10.0	0.5
2011	20.0	40.0	18.9	10.6	10.0	0.5
2012	20.0	40.0	20.1	9.4	10.0	0.5
2015	20.0	40.0	22.4	7.1	10.0	0.5
2020	17.5	37.5	30.2	4.3	10.0	0.5
2025	15.0	35.0	37.7	1.8	10.0	0.5
2030	15.0	35.0	38.3	1.2	10.0	0.5
2035	15.0	35.0	39.2	0.3	10.0	0.5
2040+	15.0	35.0	39.5	0.0	10.0	0.5

B.   Investment Earnings

In general, investment earnings are the product of the market value of a specific asset component and the projected nominal rate of return (which is obtained by adding the applicable projected real rate of return as described in subsection C below to the projected inflation rate) of that component.

The investment earnings of the CPP Investment Board are based on the assumed real rate of return applicable to each type of asset, projected inflation and the projected asset mix. The investment earnings are also adjusted downward to recognize investment expenses. Based on the experience of the CPP Investment Board, the investment expenses are assumed to reduce the gross rate of return by 0.02% for 2007 and thereafter.

C.   Real Rates of Return

Real rates of return are required for the projection of revenue arising from investment earnings. They are assumed for each year in the projection period and for each of the main asset categories in which CPP assets are invested. All of the real rates of return described in this subsection are net of investment expenses.

1.   Real Rate of Return on CPP Account (Operating Balance)

Historically, the CPP Account was comprised of an Operating Balance and short-term investments. The Operating Balance was maintained at a level to meet the anticipated benefit payments and administrative charges from the Account for the next three-month period. These funds were not invested in provincial securities or equities but earned interest on the average daily balance of the reserve.
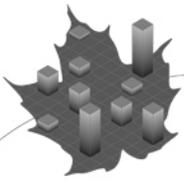
Beginning in September 2004, the CPP Account held by the federal Department of Finance was transferred to the CPP Investment Board at a rate of 1/12th per month and was completed in August 2005. As such, the balance in the CPP Account is now minimal and the Account only serves as a flow through account and remains invested only in short-term securities. It is assumed to earn a real rate of return of 1.0% for 2007 and thereafter.

2. Rollover Rate and Real Rate of Return on CPP Fund (Loans to Provinces)

The CPP Fund at the end of 2006 was composed of bonds with various terms to maturity (not less than 5 years) consisting of loans made to the provinces. The provinces are allowed to rollover, at maturity, any bonds that were purchased prior to the CPP amendments (which came into effect on 1 January 1998) for term of at least five years and a total period not exceeding 30 years. During the eight-year period from 1999 to 2006, 57% of provincial bonds available for rollover had been rolled over. The rollover proportion increases to 62% when considering the three year period from 2004 to 2006. Using this rollover experience, it is assumed that the rollover rate would be approximately 64% for years 2007 and thereafter.

Beginning in May 2004, the CPP Fund held by the federal Department of Finance started to be transferred to the CPP Investment Board at a rate of 1/36th per month. The full transfer was completed by the end of April 2007.

The applicable interest rate on rollover bonds is set at the market rate for provincial bonds issued by the given province. On the basis of the average long-, medium- and short-term experience of the spread between the annual yield on federal and provincial long-term investments, the current outlook of the economy and data on rollovers since 1999, a spread over the federal yield was determined for each province. The ultimate real federal yield is set at 2.8%. The weighted average spread for all provinces is approximately 40 basis points. Therefore, an ultimate yield of approximately 3.2% for provincial rollover bonds was assumed for 2016 and thereafter. For the period from 2008 to 2015, the assumed yields for provincial rollover bonds were derived by interpolation between the assumed 2007 real rate of 2.7% and the ultimate real rate of 3.2% for 2016.

The real rate of return of this non-marketable bond portfolio is calculated by taking into consideration any coupon payments made throughout the year, as well as the change in the market value of the portfolio due to changes in the assumed interest rates.

3. Real Rate of Return on Assets under the Management of the CPP Investment Board

As discussed earlier, CPP Investment Board assets are invested in three broad categories of investments: equity, fixed income securities and inflation-sensitive assets. The projected real rates of return for these three asset classes have been determined by taking into consideration various economic forecasts.

In determining the annual real rates of return for each asset category, consideration was given to the current economic environment, its future outlook, as well as history. The future outlook is based on the fact that over the long term, real interest rates are expected to remain relatively low since their recent higher level was consequential to growing inflation pressure that would not be sustained in the future. The projected real rates of return for different types of investments also reflect that projections are over a 75-year time horizon and thus, should be generally consistent with the long-term averages of real rates of return.

Equity

Most CPP Investment Board assets are currently invested in equity, specifically in Canadian, U.S. and foreign stock indexed funds. In the derivation of the real rates of return for these equity investments, consideration was given to the long-term real rates of return of the S&P/TSX, S&P 500 and MSCI World (excluding U.S.) stock indices.

Since the last actuarial valuation, equity returns have outperformed their historical average returns. It is anticipated that such returns will not be sustainable in the current economic environment. Thus, equity returns in the short-term are moderated by decreasing the equity risk premium. The equity risk premium is assumed to be lower in the first ten years of the projection before reaching its ultimate rate of 2.3%.

Real rates of return for equity investments are projected to be 3.5% for 2007 until 2011. Beginning in 2012, real equity returns will increase annually until an ultimate real rate of return of 5.1% is reached in 2016. In comparison, the 35-year historical average real rate of return of the S&P/TSX total return index ending 31 December 2006 is 6.2% compared to 6.9% for the S&P 500. When considering the 50-year period ending 31 December 2006, the historical average is 5.8% for the S&P/TSX and 6.8% for the S&P 500.

Fixed Income Securities

The CPP Investment Board currently has very few investments in fixed income assets due to the dominance of this type of investment in the CPP Fund. It is expected that fixed income assets will represent an important portion of the CPP Investment Board investments in the future. The assumed asset mix in 2010 is 60% equities, 30% fixed income securities, such as bonds and 10% inflation-sensitive assets. In 2025, it is assumed that an asset mix of 50% equity, 40% fixed income securities and 10% inflation-sensitive assets will be achieved. The percentage of fixed income securities held is assumed to increase through time in order to attain more stability in the investment income which will be required to pay benefits. This may be achieved by implementing a lower risk investment strategy.

As the CPP Fund components mature over the next 30 years, it is assumed that the proceeds will be invested in fixed income investments, such as bonds, and that this marketable bond portfolio will consist of federal, provincial, corporate and real return bonds. It is assumed that when the CPP Investment Board begins purchasing marketable bonds, the proportion already invested in the CPP Fund and the desired bond mix will be taken into consideration.

Over the next few years, it is assumed that a greater proportion of corporate bonds, compared to the other bond types, will be purchased due to the transfer of the CPP Fund to the CPP Investment Board. As the bonds in the CPP Fund mature, it is assumed that the CPPIB will purchase a variety of federal, provincial, corporate and real return bonds in proportions consistent with their investment strategy. Lastly, it is also assumed that the ultimate marketable bond mix (when the non-marketable bond portfolio matures) will be 20% federal, 40% provincial, 30% corporate and 10% real return.

As discussed earlier, the ultimate yield on long-term federal bonds is 2.8%. The spread over the federal bond yield is assumed to be 40 basis points for provincial bonds and 100 basis points for corporate bonds. Real return bonds, on the other hand, yield less than long-term federal bonds since the real return is guaranteed and will not vary with inflation. Thus, the yield on real return bonds is assumed to be -40 basis points. The real rate of return for the
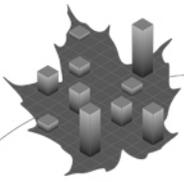
marketable bond portfolio is calculated for each year using the proportion invested in each bond type and the bond yield. An ultimate real rate of return of 3.2% is assumed for the bond portfolio.

Inflation-Sensitive Assets

Inflation-sensitive assets such as real estate and infrastructure are considered to be a hybrid of debt and equity, usually in equal proportions. If these assets are considered to be an equal split between debt and equity then the assumed risk premium should be 50% of that assumed for pure equity. Thus, the assumed real return for inflation-sensitive assets is 2.9% in the short-term and 3.95% in the long-term. The Russell Canadian Property Index has an average real rate of return of 6.2% over the last 30 years.

Table 62 summarizes the assumed real rates of return by asset type throughout the projection period.

Table 62 Real Rate of Return by Asset Type

Year	Canadian Equity	U.S. and Foreign Equity	Marketable Bonds	Non-Marketable Bonds	Real Estate & Infrastructure	Short Term
	(%)	(%)	(%)	(%)	(%)	(%)
2007	3.5	3.5	3.2	5.5	2.9	1.0
2008	3.5	3.5	3.1	5.2	2.9	1.0
2009	3.5	3.5	3.0	4.9	2.9	1.0
2010	3.5	3.5	2.9	4.5	2.9	1.0
2011	3.5	3.5	2.9	3.9	2.9	1.0
2012	3.8	3.8	2.9	3.4	3.1	1.0
2015	4.7	4.7	3.2	3.3	3.7	1.0
2020	5.1	5.1	3.3	3.2	4.0	1.0
2025	5.1	5.1	3.2	2.9	4.0	1.0
2030	5.1	5.1	3.2	2.8	4.0	1.0
2035	5.1	5.1	3.2	2.8	4.0	1.0
2040+	5.1	5.1	3.2	-	4.0	1.0

D. Rates of Return Calculation

Rates of return on the CPP Investment Board fixed income securities take into account the coupons and market value fluctuations due to changes in the assumed interest rates. For the CPP Investment Board equities, the rates of return include dividends from the equities, market value fluctuations and variations in currency exchange for non-Canadian equities. No distinction is made between realized and unrealized capital gains. These rates of return are described above in subsection C.

E. Overall Rate of Return

The assumed rate of return on total assets was derived as the weighted average rate of return on all types of assets, using the market value of the assets as weights. The resulting rates are shown in Table 63.

Table 63 Rates of Return on CPP Assets

Year	Nominal	Real
	(%)	(%)
2007	5.8	3.8
2008	5.7	3.7
2009	5.6	3.6
2010	5.5	3.5
2011	5.4	3.4
2012	5.6	3.5
2015	6.5	4.1
2020	6.8	4.3
2025	6.7	4.2
2030+	6.7	4.2
2007-2016	5.9	3.8
2007-2081	6.6	4.2
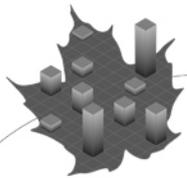
V. Benefit Expenditures

The actuarial approach used for projecting future benefits paid is based on macro-simulation, which means that the projections rely on grouped data. The amount of benefit expenditures is determined by taking into account the administrative agreement between the Canada Pension Plan and the Québec Pension Plan for beneficiaries who contributed to both plans.

The average initial annual retirement pension of all persons born in a given calendar year, split by sex, is obtained by summing over the contributory period of this cohort, the annual products of the proportion of contributors and the average pensionable earnings deemed to apply to the given cohort and dividing this sum by the number of years included in the contributory period.

All benefit projections are made using 1966 as the starting point instead of the beginning (2007) of the statutory valuation period. This is done for the following reasons:

- The valuation methodology can be validated for the pre-valuation years (1966 to 2006) by comparing the projected values (contributions, benefits, beneficiaries, etc.) for these years with actual results.

- The projection of those benefits already in pay as at the valuation date (31 December 2006) is fully integrated with that of benefits emerging after that date, thus ensuring full consistency of the various valuation processes.

The estimated number of beneficiaries and average pensions payable as at 31 December 2006 is shown in Table 64.

Table 64 Pensions Payable as at 31 December 2006

Benefit Type	Number of Beneficiaries		Average Monthly Benefit	
	Males	**Females**	**Males**	**Females**
	(in thousands)		$	$
Retirement	1,653	1,658	592	352
Survivor				
- Aged less than 65	49	187	297	360
- Aged 65 and over	83	633	110	317
Disability	149	157	819	720

Benefit Type	Number of Beneficiaries	Average Monthly Benefit
	Males and Females	**Males and Females**
	(in thousands)	$
Orphans	81	200
Disabled Contributor's Child	91	200

A. **Adjustments to Pensionable Earnings and Proportion of Contributors**

The effect of credit-splitting of unadjusted pensionable earnings between spouses in the event of marital union breakdown is accounted for by adjusting the projected proportion of contributors and average pensionable earnings of the respective spouses.

The average pensionable earnings are also adjusted to take into account retirement pensions emerging prior to age 65. These pensions have the effect of reducing the amount of contributions that would otherwise have been made to the CPP. Such effect is already taken into account in the average pensionable earnings described earlier for contributory earnings purposes (see Table 57). For benefit computation purposes, however, such effect must be removed in respect of contributors not yet retired at a given age before 65. The resulting adjusted proportion of contributors and average pensionable earnings for benefit computation purposes appear in Tables 65 and 66, respectively.

Table 65 Proportion of Contributors (adjusted for benefit purposes)

Age Group	Males			Females		
	2007	**2025**	**2050**	**2007**	**2025**	**2050**
	(%)	(%)	(%)	(%)	(%)	(%)
20-24	77.7	82.1	85.2	76.5	82.7	85.8
25-29	85.9	88.2	91.6	80.4	83.6	86.3
30-34	87.0	88.4	90.0	79.6	82.2	84.5
35-39	89.0	90.8	91.6	80.8	84.6	86.5
40-44	87.1	88.8	90.0	81.7	85.0	87.3
45-49	86.7	89.3	90.3	80.7	84.3	86.2
50-54	83.3	85.6	87.0	76.0	79.8	81.9
55-59	73.2	76.6	78.4	62.4	66.7	69.0
60-64	43.1	42.7	45.5	33.9	36.2	38.9
65-69	4.6	5.5	6.3	3.9	6.2	7.3
All Ages	**76.3**	**74.2**	**75.8**	**69.9**	**69.1**	**71.4**
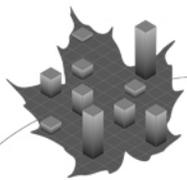
Table 66 Average Pensionable Earnings (adjusted for benefit purposes)

	Males			Females		
Age Group	**2007**	**2025**	**2050**	**2007**	**2025**	**2050**
	($)	($)	($)	($)	($)	($)
20-24	20,593	35,759	87,502	16,920	30,474	76,489
25-29	28,886	51,200	127,254	25,465	46,282	116,732
30-34	31,644	56,217	140,509	27,485	50,125	126,966
35-39	32,877	58,742	147,070	28,870	52,932	134,199
40-44	33,789	60,332	151,480	29,943	54,850	139,453
45-49	34,457	61,594	154,535	30,652	56,249	143,027
50-54	34,431	61,378	153,615	30,700	56,033	142,104
55-59	32,505	57,325	141,782	28,561	51,954	130,622
60-64	33,394	58,117	139,024	28,741	51,905	127,246
65-69	26,100	40,472	89,994	21,280	34,698	79,414
All Ages	**30,731**	**54,815**	**135,337**	**26,835**	**49,145**	**123,281**

B. Benefit Eligibility Rates

As mentioned in Appendix B (Plan Provisions), the eligibility for benefits varies according to the type of benefit involved. Benefit eligibility rates are used in the valuation process for the computation of historical retirement rate proportions, disability incidence rates and benefits of all types.

Benefit eligibility rates for retirement, disability and survivor benefits are computed using regression formulae that were developed to closely reproduce historical eligibility rates as observed from the CPP records of earnings data for the period 1966 to 2005. The projected eligibility rates take into account the applicable eligibility rules for each type of benefit, the proportion of contributors and the length of the contributory period for existing and future cohorts of earners.

The disability and survivor benefit eligibility rates developed above must be adjusted for purposes of computing the earnings-related portion of these two types of benefits. Since eligibility rules for disability and survivor benefits are more stringent than for retirement pensions, contributors eligible for either a disability or survivor benefit have, on average, fewer years of zero earnings than contributors solely eligible for a retirement pension. Table 67 shows the resulting eligibility rates for the various benefit types by sex for selected years.

Table 67 Benefit Eligibility Rates by Type of Benefit

	Retirement Benefit Eligibility Rate at Age 65		Death Benefit Eligibility Rate at Age 65	
Year	Males	Females	Males	Females
2007	1.06	0.95	0.96	0.56
2008	1.07	0.97	0.96	0.57
2009	1.07	0.98	0.96	0.58
2010	1.07	0.99	0.97	0.59
2011	1.07	0.99	0.97	0.61
2012	1.07	1.01	0.97	0.62
2015	1.07	1.00	0.98	0.65
2020	1.04	1.00	0.98	0.69
2025	1.02	0.99	0.97	0.72
2030	1.00	0.98	0.96	0.73
2040	1.00	0.99	0.95	0.74
2050	1.00	1.00	0.94	0.75
	Death Benefit Eligibility Rate at Ages 20-64		Disability Benefit Eligibility Rate at Ages 20-64	
Year	Males	Females	Males	Females
2007	0.78	0.71	0.79	0.68
2008	0.78	0.72	0.80	0.69
2009	0.79	0.72	0.80	0.69
2010	0.79	0.72	0.80	0.69
2011	0.78	0.72	0.80	0.69
2012	0.78	0.72	0.80	0.69
2015	0.79	0.73	0.81	0.70
2020	0.80	0.75	0.81	0.72
2025	0.80	0.76	0.82	0.73
2030	0.81	0.77	0.83	0.75
2040	0.82	0.79	0.84	0.76
2050	0.83	0.79	0.84	0.77
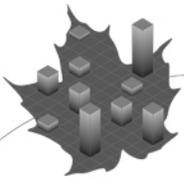
C.   Average Earnings-Related Benefit Factor

The average earnings-related benefit factor is designed to produce, when multiplied by the eligible population and the Pension Index of a given calendar year successively for each sex and all relevant ages, the total emerging annual earnings-related benefit expenditure for that year.

The gross (i.e. before taking into account the dropout provisions and earnings index) average earnings-related benefit factor is determined by sex and calendar year for each attained age from 18 to 70 as the product of the retirement benefit proportion (25%) and the ratio of:

- the sum over all years in the elapsed contributory period (i.e. from age 18 to the attained age) of the ratio in each year of:
  - ➢ the product of the proportion of contributors and the average pensionable earnings (both components adjusted for benefit computation purposes),
  - ➢ to the YMPE

- to the number of years in the elapsed contributory period at the attained age.

The earnings-to-YMPE ratios that have to be dropped from the numerator of the gross benefit factor described above, in respect of an individual, are the lowest ratios for a number of years equal to the sum of the child-rearing period, disability period and 15% of the residual contributory period. However, since the general approach is based on macro-simulation (aggregate), there is no explicit way of determining the lowest ratios for each individual that would have to be dropped from the numerator to take into account the dropout provisions. Consequently, a formula was developed to help determine the lowest earnings ratios that can be dropped. The formula is based on the length of the contributory period, the basic dropout percentage, the child-rearing period expressed as a percentage of the elapsed contributory period and the average proportion of contributors over the elapsed contributory period.

The average period that must be dropped from the contributory period (i.e. the denominator of the gross benefit factor described above) is computed as the sum of the three periods determined in respect of the disability, child-rearing and 15% dropout provisions.

The average earnings-related benefit factor is finally determined by multiplying the gross factor above, adjusted for the dropout provisions, by the earnings index, which takes into account the wage indexation provision underlying the calculation of the initial benefit rate when it emerges.

Table 68 shows the resulting projected average retirement earnings-related benefit factor at age 60 and 65 by sex and year of birth for various cohorts of contributors. The average benefit factor for males at age 65 is about 10 percentage points lower than at age 60 due to the longer contributory period and the historical higher earnings profile of those who take an early benefit at age 60. For females, the difference between age 60 and 65 is less pronounced. The benefit factors for males are expected to decrease over time because of the lower participation and pensionable earnings (as a proportion of the YMPE) of younger contributors in the early years of their contributory period. For females, this decline is offset by the expected higher earnings of future female cohorts. As a result, the gap between the male and female average benefit factors is expected to decrease over time.
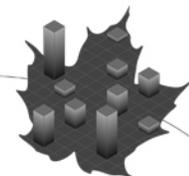
Table 68 Average Retirement Benefit Factor as Percentage of Maximum

| | Average Retirement Benefit Factor (%) | | | |
| | Males | | Females | |
Year of Birth	Age 60	Age 65	Age 60	Age 65
1947	83	72	56	55
1948	80	70	55	53
1949	80	70	56	54
1950	79	69	56	55
1951	78	69	56	55
1952	78	68	57	55
1955	77	67	57	55
1960	74	64	57	53
1965	71	61	56	52
1970	70	60	56	52
1980	72	61	59	54
1990	72	61	60	54
2000+	72	61	60	55

D. Retirement Expenditures

For each cohort of contributors reaching a given retirement age from 60 to 70 in each of the calendar years from 1967 to 2081, an average retirement benefit factor was computed by age, sex and calendar year of emergence of the pension, as the product of:

- the assumed proportion of contributors electing to opt for their retirement benefit;
- the actuarial adjustment factor in connection with the flexible retirement age provision; and
- the average earnings-related benefit factor.

The assumed proportions, by age, sex and calendar year, of contributors electing to start receiving the retirement pension at a given age were determined by taking into account the future assumed work patterns of earners aged 60 and over and the corresponding CPP experience for 1996 to 2006. These proportions correspond to the ratio of the number of emerging retirement beneficiaries to the product of the population and the retirement benefit eligibility rate.

A small proportion of contributors elect to start receiving their retirement pension after age 65. For each year after 2006, the retirement election rates for ages 61 to 64 and 66 to 69 were determined by using the observed averages over the last five years. For males, the rate at age 60 is assumed to increase from its 2006 level of 37% to 40% for years 2009 and thereafter.
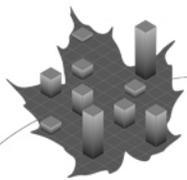
For females this rate is assumed to increase from 43.5% in 2006 to 45% in 2009 and thereafter.

The rate at age 70 is based on historical experience and is set to reach 1% for males and 1.2% for females by 2015. The rate at age 65 is then derived such that the sum of the retirement rates for each cohort is 100%. With this approach, it is implicitly assumed that all eligible contributors will have applied for their retirement pension by age 70. Table 69 shows the projected retirement rates by age for males and females, respectively.

Table 69 Retirement Rates

Age	Male Cohort Aged 60 in		Female Cohort Aged 60 in	
	2007	2009+	2007	2009+
	(%)	(%)	(%)	(%)
60	38.0	40.0	44.0	45.0
61	6.0	6.0	6.5	6.5
62	5.5	5.5	5.5	5.5
63	4.5	4.5	4.5	4.5
64	4.5	4.5	5.0	5.0
65	38.0	36.0	31.4	30.4
66	1.0	1.0	0.7	0.7
67	0.6	0.6	0.4	0.4
68	0.5	0.5	0.4	0.4
69	0.4	0.4	0.4	0.4
70	1.0	1.0	1.2	1.2
Total	**100.0**	**100.0**	**100.0**	**100.0**

The retirement pension expenditure for each year following the year of benefit uptake for a given age, sex and cohort was computed as the product of:

- the population of retirement beneficiaries at emergence;

- the relevant annualized average rate of retirement pension payable during the year of emergence (described above);

- the probability of survival from the emergence age to the attained age; and

- the Pension Index, which recognizes the annual CPI increase to a pension each 1 January after its emergence.

The mortality rates vary by calendar year, sex, age and level of emerging pension. The mortality rates were developed based on the 1966 to 2006 CPP retirement beneficiaries'
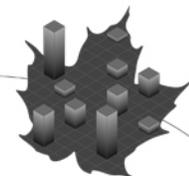
mortality experience. The resulting mortality rates and life expectancies appear in Tables 70 and 71 below.

Table 70 Mortality Rates of Retirement Beneficiaries
(annual deaths per 1,000)

Age	Males				Females			
	2007	2025	2050	2075	2007	2025	2050	2075
60	7.1	5.3	4.4	3.7	3.9	3.2	2.7	2.3
65	13.4	9.8	8.2	6.9	8.3	6.9	5.8	4.8
70	22.1	16.3	13.6	11.5	13.3	11.2	9.3	7.8
75	36.4	27.5	23.0	19.4	22.3	18.6	15.6	13.0
80	60.7	47.6	40.1	33.7	39.0	33.2	27.7	23.3
85	102.3	86.8	74.0	63.1	71.4	63.5	54.0	45.9
90	164.9	148.4	134.2	121.7	128.0	119.0	107.7	97.6
100	374.8	364.8	330.5	298.8	313.0	304.6	275.9	249.7

Table 71 Life Expectancies of Retirement Beneficiaries (with improvements)

Age	Males				Females			
	2007	2025	2050	2075	2007	2025	2050	2075
60	23.6	24.8	26.1	27.4	26.5	27.5	28.8	30.0
65	19.1	20.3	21.6	22.8	21.9	22.8	24.0	25.1
70	15.0	16.2	17.3	18.4	17.6	18.5	19.5	20.6
75	11.4	12.5	13.4	14.4	13.6	14.4	15.4	16.3
80	8.4	9.2	9.9	10.7	10.1	10.7	11.5	12.3
85	5.9	6.4	7.0	7.6	7.1	7.5	8.2	8.8
90	4.1	4.4	4.8	5.2	4.9	5.1	5.6	6.0
100	2.0	2.0	2.3	2.5	2.4	2.5	2.7	3.0

The amounts of all retirement pensions payable during any given past or future calendar year were obtained by simply summing the annual expenditure applicable for the given calendar year as described above, in respect of all age and sex cohorts having emerged in the given and each of the previous calendar years.

Based on comparisons between actual results and projections for 1966 to 2006, experience adjustment factors at emergence were applied to all future emerging retirement pensions calculated using the methodology described above and are shown in Table 72. Table 73 shows the projected number of new retirement beneficiaries along with their projected average monthly retirement benefit by sex and year.
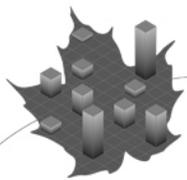
Table 72 Retirement Benefit Experience Adjustment Factors

	Age at Emergence		
	60-65	**66 and Over**	**All Ages**
Males	1.01	0.50	0.99
Females	0.97	0.43	0.95

Table 73 New Retirement Pensions

Year	Number of Beneficiaries			Average Monthly Pension		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**
				($)	($)	($)
2007	135,910	134,024	269,933	553.89	369.33	462.25
2008	144,365	140,570	284,935	563.83	383.94	475.08
2009	149,520	146,828	296,348	573.58	398.96	487.06
2010	152,204	149,589	301,793	582.57	409.83	496.95
2011	154,062	151,364	305,426	595.64	423.45	510.31
2012	163,562	160,585	324,147	617.03	444.29	531.45
2015	171,186	172,188	343,374	648.14	483.56	565.61
2020	191,300	192,201	383,501	752.09	580.08	665.88
2025	200,823	201,154	401,976	874.57	692.94	783.68
2030	190,388	191,373	381,760	1,026.11	834.42	930.02
2040	189,580	193,171	382,751	1,487.63	1,237.36	1,361.32
2050	213,470	217,392	430,862	2,171.05	1,829.78	1,998.86

E. Disability Expenditures

The general approach used to estimate disability pensions is to compute the initial value of benefits emerging by age and sex each year starting in 1970 as the product of:

- the actual or assumed disability incidence rate;
- the probability of being eligible for disability benefits;
- the annual amount of benefit; and
- the corresponding population.

The initial value of the earnings-related benefit by age and sex is equal to 75% of the average retirement earnings-related benefit factor adjusted upward to reflect the fact that eligibility rules are more stringent than for disability than for retirement. These emerging benefits are then projected by age and sex to each future year until termination (due to recovery, death or attainment of age 65) using the disability termination rates for the appropriate duration and the Pension Index. Historical and projected disability incidence rates are summarized in Chart 17 and Table 74.
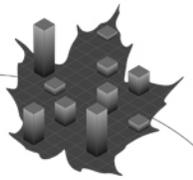
Chart 17 Disability Incidence Rates
(per 1,000 eligible)
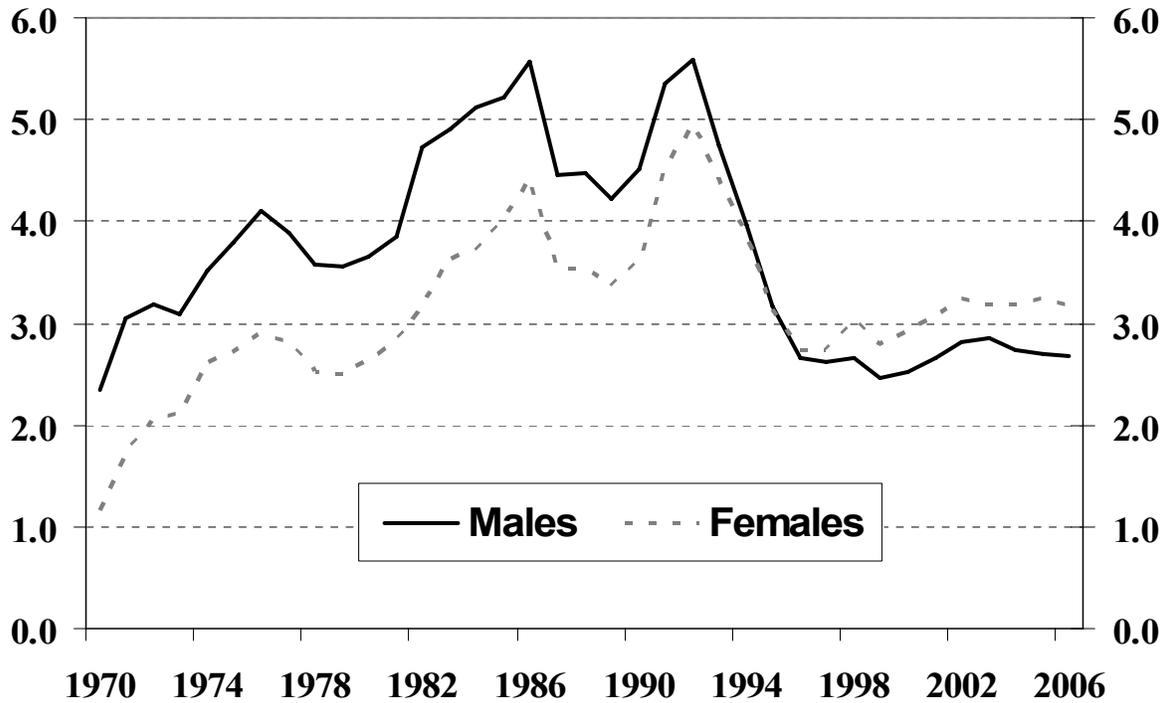
Table 74 Ultimate Disability Incidence Rates
(per 1,000 eligible)

Age	Males	Females
25	0.4	0.4
30	0.7	0.8
35	1.0	1.5
40	1.6	2.4
45	2.3	3.1
50	3.6	4.6
55	6.8	7.6
60	11.0	10.3
61	11.6	10.5
62	12.2	10.6
63	12.7	10.6
64	13.6	9.2
All Ages	**3.1**	**3.5**
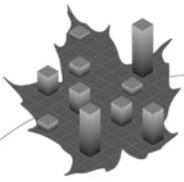
It can be seen from Chart 17 that the incidence of CPP disability (i.e. the number of new cases as a proportion of the eligible population) gradually increased from 1980 to the early 1990s. The annual rate of change in incidence rates was particularly acute between 1989 and 1992. Disability incidence rates declined rapidly between 1992 and 2000 and have remained relatively stable over recent years at levels that are generally lower than historical levels prior to the mid-1990s. Factors that have strongly influenced the decline are related to administrative changes put in place in the mid-1990s. The following factors contributed to the reduction in disability incidence rates:

- beginning in 1994, the CPP administration initiated a range of measures designed to effectively manage the growing pressure on the disability program;
- in September 1995, the guidelines for the determination of disabilities were revised to put the emphasis back on the medical basis and to de-emphasize the use of socio-economic factors. The guidelines are used at all levels in the determination process, thus greatly increasing consistency in decision-making;
- implementation of more stringent eligibility rules since 1998;
- increased reassessments of the disability status;
- expansion of vocational rehabilitation services; and
- implementation of a formal quality assurance program.

After considering the above factors and the fact that the overall female incidence rate has been higher than males over the recent past, the aggregate (all ages combined using the 2006 population for weights) ultimate incidence rate for 2011 and thereafter is taken to be 3.1 and 3.5 per thousand eligible for males and females, respectively. These aggregate ultimate incidence rates recognize recent experience and are somewhat higher than the 2006 averages of 2.8 and 3.2 per thousand eligible for males and females, respectively. The ultimate aggregate rates are then distributed by age in accordance with the 2006 actual experience for each sex. For years 2007 to 2011, male and female rates by age are assumed to increase gradually from their 2006 levels towards their assumed aggregate ultimate levels. The incidence rates for ages 43 and over are further adjusted to account for Bill C-36.

Disability termination rates presented in Tables 75 and 76 are deemed to apply by age, sex and duration on an attained calendar year basis. The graduated average 1997 to 2006 experience is assumed to apply for 2007. For 2008 and subsequent calendar years, the 1997 to 2006 rates are projected by age at onset and duration since disablement based on trends in recovery and mortality improvement rates for the period 1997 to 2006.

Table 75 Disability Termination Rates in 2007
(per 1,000 people)

Age	Males						Females					
	1st Year	2nd Year	3rd Year	4th Year	5th Year	6+ Year	1st Year	2nd Year	3rd Year	4th Year	5th Year	6+ Year
30	68	73	72	67	60	28	49	53	58	53	47	26
40	66	59	47	34	35	23	47	55	39	31	25	17
50	99	80	53	38	33	25	64	73	42	31	22	15
60	100	77	53	41	41	0	65	66	40	34	32	0

Table 76 Disability Termination Rates in 2030
(per 1,000 people)

Age	Males						Females					
	1st Year	2nd Year	3rd Year	4th Year	5th Year	6+ Year	1st Year	2nd Year	3rd Year	4th Year	5th Year	6+ Year
30	62	68	69	64	58	26	44	49	56	53	46	24
40	59	54	44	32	33	21	41	51	38	31	24	16
50	88	74	50	35	31	22	56	68	40	29	21	14
60	89	70	49	38	37	0	56	61	38	32	31	0

Based on comparisons of actual results and projections for 1966 to 2006, experience adjustment factors were applied to all future emerging disability pensions calculated using the methodology described above. These factors appear in Table 77 below.

Table 78 shows the projected number of new disability beneficiaries along with their projected average disability benefit by sex and year.

Table 77 Disability Benefit Experience Adjustment Factors

	Number	Average Benefit
Males	1.00	0.98
Females	1.00	0.91
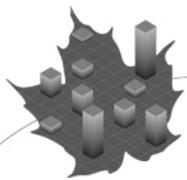
Table 78 New Disability Pensions

	Number of Beneficiaries			Average Monthly Pension			% of Maximum	
Year	Males	Females	Total	Males	Females	Total	Males	Females
				($)	($)	($)	(%)	(%)
2007	17,598	17,876	35,474	853.07	757.44	804.88	81.0	71.9
2008	19,079	19,046	38,125	869.31	774.87	822.13	80.7	72.0
2009	19,971	19,758	39,729	886.24	793.19	839.97	80.4	72.0
2010	20,991	20,504	41,495	904.88	812.56	859.26	80.2	72.0
2011	21,961	21,228	43,189	924.12	832.55	879.11	79.9	72.0
2012	22,369	21,652	44,022	942.82	852.19	898.24	79.6	72.0
2015	23,495	22,848	46,344	1,008.45	919.04	964.37	78.8	71.9
2020	24,613	24,006	48,619	1,156.62	1,065.82	1,111.79	77.5	71.4
2025	24,656	24,407	49,063	1,344.04	1,248.98	1,296.75	76.4	71.0
2030	24,808	25,052	49,860	1,573.07	1,470.55	1,521.56	75.8	70.9
2040	26,637	26,995	53,631	2,176.45	2,047.69	2,111.64	75.2	70.8
2050	27,502	27,906	55,408	3,009.94	2,842.80	2,925.76	74.3	70.2

F.   Survivor Expenditures

Starting in 1968, the number of male and female contributor deaths, taken from the demographic projections for each individual aged 18 and over, was multiplied by the survivor eligibility rates and the proportion of contributors married or in a common-law partnership at death to produce the number of survivor benefits emerging by age, sex and calendar year.

The assumed proportion of contributors married or in a common-law relationship at the time of death was determined from benefit statistics as at 31 December 2006. For each age and sex, the actual proportions for years 2003 to 2005 were smoothed with slight adjustments. On the basis of the trends shown over the period 1990 to 2005, the proportions assumed for the projection period were extrapolated from 2005 to 2007 and kept constant thereafter. These proportions account for benefits extended to same sex couples. Values are shown in Table 79.

For the purposes of the survivor pensions, the number of spousal deaths by sex and calendar year was categorized by the age of the surviving spouse using the age distributions of spouses, and each resulting number was multiplied by:

- the initial benefit amount;
- the probability of the deceased spouse or common-law partner being eligible for a survivor benefit;
- the appropriate factor taking into account the reductions of survivor pensions in respect of survivors emerging under age 45 without dependent children and not disabled; and
- if applicable, the appropriate factor taking into account the limits applying to combined survivor-disability pensions and/or to combined survivor-retirement pensions.

The initial value of the earnings-related benefit is equal to 37.5% or 60% of the average retirement earnings-related benefit factor depending on whether the surviving spouse is under or over age 65. It is further adjusted upward to account for the fact that eligibility rules are more stringent for survivor benefits than for retirement benefits.

All survivor pensions emerging by year, as well as by the age and sex of the surviving spouse, are then projected to each subsequent year by incorporating assumed mortality rates, adjusted using results of an actuarial study of the mortality of CPP survivors to reflect the higher mortality of widows and widowers as compared to that of the general population, and making allowance for the Pension Index. Benefits projected for 2008 were adjusted to incorporate an anticipated one time lump sum payment of about five million dollars related to retroactive payments to same-sex survivors whose partner died prior to 1998.

Based on comparisons of actual results and projections for 1966 to 2006, experience adjustment factors were applied to survivor pensions calculated using the methodology described above. Survivor experience adjustment factors reflect both methodology and assumption adjustments. The adjustment factors for the number of survivors are set at their current five-year average while the factors for the average earnings-related benefit correspond to the initial 2006 factor but trended for five years to 2011. The adjustment factors appear in Table 80. Table 81 below shows the projected number and average monthly survivor pension by sex for selected years.

Table 79 Proportion of Contributors Married or in Common-Law Relationship at Death

Age	Males	Females
	(%)	(%)
20	2	3
30	37	37
40	61	60
50	65	67
60	68	63
70	72	49
80	67	27
90	48	7

Table 80 Survivor Benefit Experience Adjustment Factors

	Initial		Ultimate	
	Number	Average Benefit	Number	Average Benefit
Widows	1.01	1.00	1.01	0.95
Widowers	0.96	0.85	0.96	0.77
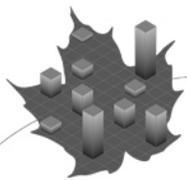
Table 81 New Survivor Pensions

| | Number of Beneficiaries | | | Average Monthly Pension | |
Year	Under 65	65 and Over	Total	Under 65	65 and Over
				($)	($)
2007	23,090	42,140	65,229	345.73	273.81
2008	23,216	43,379	66,595	349.16	274.88
2009	23,512	44,664	68,175	353.33	275.87
2010	23,606	45,790	69,396	359.94	279.63
2011	23,732	46,964	70,696	367.16	283.25
2012	23,858	48,181	72,039	374.42	286.18
2015	24,324	52,108	76,432	400.04	297.49
2020	24,710	59,807	84,517	457.95	330.27
2025	24,714	69,281	93,995	529.84	381.39
2030	24,479	80,454	104,932	613.67	451.43
2040	23,951	99,366	123,317	840.22	641.14
2050	23,649	105,905	129,554	1,159.54	897.22

G. Death Expenditures

The amount of lump sum death benefits payable each year starting in 1968 was determined by age and sex as the product of:

- the number of deaths, derived by sex for individuals age 18 and over, consistent with the population data and projections;

- 50% of the average annual retirement earnings-related benefit factor (the lump sum death benefit is equivalent to six months of retirement pension) reduced, using the maximum retirement pension and the assumed distribution of average retirement pensions, to allow for the provision limiting the death benefit to 10% of the YMPE for the year of death prior to 1998 and to $2,500 thereafter; and

- the proportion of the deceased contributor's earnings eligible for survivor benefits.

Based on the comparison of actual results and projections for 1966 to 2006, experience adjustment factors were derived. To account for the maximum death benefit, which is set at $2,500 for 1998 and thereafter, adjustment factors for average benefits are set at their current level but are gradually increased to one for years 2020 and 2030 and thereafter for males and females, respectively. Tables 82 and 83 below show the experience adjustment factors and the projected number of death benefits by sex for selected years.

Table 82 Death Benefit Experience Adjustment Factors

	Initial		Ultimate	
	Number	Average Benefit	Number	Average Benefit
Males	0.97	0.94	0.96	1.00
Females	1.03	0.88	1.01	1.00

Table 83 Number of Death Benefits

Year	Males	Females	Total
2007	76,869	43,577	120,445
2008	78,482	45,479	123,961
2009	80,320	47,421	127,740
2010	82,101	49,335	131,436
2011	83,761	51,304	135,066
2012	85,493	53,194	138,686
2015	91,092	59,343	150,436
2020	101,147	70,194	171,341
2025	112,997	82,568	195,566
2030	127,474	97,060	224,535
2040	157,643	129,263	286,905
2050	174,405	152,355	326,759

H.   Children's Expenditures

The numbers of disabled contributor's child and orphan benefits emerging each year starting in 1970 and 1968, respectively were determined using the assumed fertility rates to correspond to the number of children of emerging beneficiaries of disability and/or survivor pensions. The resulting number of emerging children by age, sex and calendar year were thereafter projected from one year to the next, incorporating the following reasons for termination of benefits:

- attainment of age 25 by the child;
- ceasing full-time attendance at school while over age 18; and
- regarding disabled contributor's child benefits only, termination (recovery, death or attainment of age 65) of the parent's disability benefits.

Total eligible child benefits were then obtained for any given calendar year as the product of (1) the aggregate number of child beneficiaries who emerged before and during the year and survived to the applicable year and (2) the applicable annualized amount of the child flat-rate benefit obtained by adjusting the 2007 rate in accordance with the Pension Index.
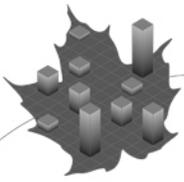
Based on historical data for 1966 to 2006, the assumption for the number of children under age 18 is adjusted by a factor of about 0.85 for both disabled contributors' children and orphans. The assumption for the number of children aged 18 and over attending school is adjusted by a factor of about 0.65 for both disabled contributors' children and orphans. Table 84 shows the projected number of new eligible-child benefits by type and year.

Table 84 New Children Benefits

Year	Disabled Contributor's Child	Orphans	Total
2007	14,059	9,391	23,450
2008	14,880	9,397	24,277
2009	15,470	9,462	24,932
2010	15,972	9,468	25,440
2011	16,466	9,422	25,888
2012	16,607	9,296	25,903
2015	17,283	9,216	26,499
2020	18,304	9,096	27,400
2025	19,519	9,195	28,714
2030	20,625	9,374	29,999
2040	21,572	9,286	30,857
2050	21,817	8,781	30,598

I.   Administrative Expenses

The administrative expenses of the CPP have historically arisen from different sources including Human Resources and Social Development Canada, Canada Revenue Agency, Public Works and Government Services Canada, the Office of the Superintendent of Financial Institutions, the Department of Finance and the CPP Investment Board. In calendar year 2006, administrative expenses including the CPP Investment Board amounted to about $514 million.

In prior reports, all expenses of the CPPIB, including investment and administrative expenses were accounted for as part of investment expenses. In this report, these expenses have been separated. Investment expenses only include external investment management fees, while the administrative (or operating) expenses of the CPPIB are included in the CPP administrative expenses.

Based on recent experience, the annual administrative expenses (excluding CPPIB) were on average about 0.093% of total annual employment earnings in 2006. By including the administrative expenses of the CPPIB and taking into consideration the expected growth in these expenses in the coming years, the projected administrative expenses of the CPP in terms of total annual employment earnings are projected to be 0.12% for 2007 and thereafter.
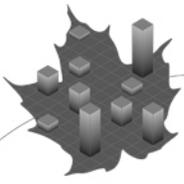
VI.   Assets

The total assets of the CPP at the end of any given year throughout the projection period are simply determined by adding together the total assets at the end of the previous year, projected investment earnings and contribution revenues and then subtracting the projected benefits and administrative expenses of the given year.

The actual value of the CPP assets on a market value accrual basis as at 31 December 2006 was $113,581 million. This is the sum of the CPP Account ($110 million), the CPP Fund ($2,522 million) and the CPPIB Invested Assets ($108,246 million) for a total of $110,878 million before being adjusted by the receivables minus liabilities. The CPP Fund consists of non-marketable provincial bonds pursuant to loans made to provinces. The assets of the CPP Investment Board consist of fixed income securities such as bonds, equity including Canadian, U.S. and foreign equity, as well as inflation-sensitive assets such as real estate and infrastructure. Table 85 reconciles the assets as at 31 December 2006.

Table 85 Assets as at 31 December 2006
($ million)

Assets – Market Value as at 31 December 2006	**110,878**
Plus: Receivables	
Contributions	2,720
Accrued Interest on the Fund	43
Benefits	39
Amount Due from QPP	33
Minus: Liabilities	
Accounts Payable	132
Assets – Market Value as at 31 December 2006	**113,581**

Appendix E – Acknowledgements

Human Resources and Social Development Canada provided statistics on the Canada Pension Plan beneficiaries, contributors and assets.

The CPP Investment Board provided data on the Canada Pension Plan assets.

The Bank of Canada provided data on inflation.

Statistics Canada provided information on Canadian demographic and economic variables.

The Canada Revenue Agency provided information on Canada Pension Plan contributors.

The co-operation and able assistance received from the above-mentioned data providers deserve to be acknowledged.

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