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Measuring and Reporting Actuarial Obligations of the Canada Pension Plan

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I. Executive Summary

A. Purpose

This is the nineteenth actuarial study to be published by the Office of the Chief Actuary (OCA). All the findings in this study are based on the 27th Actuarial Report on the Canada Pension Plan as at 31 December 2015 (the “27th CPP Actuarial Report”).

This study was undertaken in response to Recommendation #7 made by the independent peer review panel that reviewed the 27th CPP Actuarial Report¹. In particular, the review panel recommended that

“the section of the report dealing with the actuarial balance sheet mention:

- since 2011, the CPP actuarial balance sheets appear in the notes to the Public Accounts of Canada, which reinforces the necessity to present this information in CPP actuarial reports.”

Therefore, this study was undertaken as a follow-up of Actuarial Study No. 10: “Measuring the Financial Sustainability of the Canada Pension Plan”, published in 2012, and Actuarial Study No. 13: “Assessing the Sustainability of the Canada Pension Plan through Actuarial Balance Sheets”, published in 2014. This study updates the information presented in the previous studies on the basis of the 27th CPP Actuarial Report. This current study also discusses social security balance sheet disclosure requirements.

B. Scope

Part 1 of Bill C-26, an *Act to amend the Canada Pension Plan, the Canada Pension Plan Investment Board Act and the Income Tax Act*, amended the CPP legislation in 2016 to include additional benefits and contributions effective 1 January 2019. As such, the additional Canada Pension Plan refers to the portion of benefits introduced by the Bill and all contributions in respect of those portions of benefits. The base Canada Pension Plan refers to the part of the Canada Pension Plan relating to benefits and contributions under the *Canada Pension Plan*, other than those included in the additional CPP. This actuarial study considers only the base CPP. Therefore, for the purpose of this study, references to the CPP or Plan without any qualifier shall mean only the base Plan.

The results contained in this study are based on the “best-estimate” scenario of the 27th CPP Actuarial Report, which was tabled before Parliament on 27 September 2016, with a subsequent revised report published 13 February 2017. The best-estimate scenario consists of long-term projections based on “best-estimate” assumptions. These assumptions reflect the best judgment of the Chief Actuary of the CPP as to future demographic, economic, and financial market conditions that will affect the long-term financial sustainability of the Plan. The projections in this study cover periods of 75 years and longer and place more emphasis on long-term historical trends than on short-term trends.

Section II discusses the history of the Plan and how its financing has evolved from pay-as-you-go to steady-state financing. Section III presents an analysis of the assets and

¹ “Review of the 27th Actuarial Report on the Canada Pension Plan” report by the CPP actuarial review panel and associated documents may be accessed at the following web site: <http://www.osfi-bsif.gc.ca/Eng/oca-bac/jpr-rip/Pages/default.aspx>

obligations of the CPP using different actuarial balance sheet methodologies. Section IV presents a more in-depth analysis of the actuarial balance sheet under the open group methodology. Section V discusses sensitivity analyses based on different demographic, economic and financial market scenarios under the open and closed group approaches. Section VI addresses the reporting of the long-term financial sustainability of the CPP. The conclusion follows in Section VII. Lastly, three appendices provide, respectively, the principles upon which changes made to the Plan in 1997 (the “1997 Amendments”) were based, the references used for this study, and a list of contributors to this study.

C. Main Findings

- The 27th CPP Actuarial Report concludes that under the 9.9% legislated contribution rate, 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.
- The open group methodology is consistent with the partial funding approach of the CPP since it fully takes into account future contributions to the Plan as a source of financing of its future expenditures. As such, it represents the most appropriate methodology to be used if the Plan’s financial sustainability is to be measured by means of its balance sheet.
- Under the open group approach, the best-estimate scenario of the 27th CPP Actuarial Report, and the legislated contribution rate of 9.9%, there is an asset excess (positive difference of assets and obligations) of \$1 billion, and the Plan’s assets represent more than 100% of its obligations as at 31 December 2015.
- Under the closed group without future benefit accruals approach, the Plan’s asset shortfall (negative difference of assets and obligations) is \$886 billion, and the assets represent 24% of the Plan’s obligations as at 31 December 2015. Under the closed group with future benefit accruals, the asset shortfall is \$591 billion and the Plan’s assets represent 67% of its obligations as at 31 December 2015.
- The balance sheets under the closed group with and without future benefit accruals methodologies do not reflect the nature of the partial funding approach of the CPP, whereby future contributions represent a major source of financing of future expenditures. As such, it is inappropriate to reach a conclusion regarding the Plan’s financial sustainability considering only the asset shortfalls determined under the closed group with and without future accruals balance sheets.
- Under an open group, the obligations of the Plan result from and are met to a large extent by the pay-as-you-go component. Under the best-estimate assumptions, the pay-as-you-go component accounts for 88% of the Plan’s total obligations, whereas the funded component only accounts for 12% of the total obligations as at 31 December 2015. Although these relative proportions change over time, the Plan remains financed mostly on a pay-as-you-go basis.
- Sensitivity analysis of the Plan in a changing environment highlights the importance of measuring the assets and obligations in the way that provides meaningful indications of how various risks may impact the financial state of the Plan. Measuring the Plan’s assets and obligations using the open group approach provides information that properly reflects how changes affect the long-term sustainability of the CPP. On the other hand, using the

closed group without future accruals approach may provide incomplete or even misleading information.

- A main tool used by the CPP stakeholders to assess the long-term financial sustainability of the Plan is the statutory actuarial reports prepared by the OCA. In addition, the long-term financial sustainability of the CPP is discussed in the notes to the CPP consolidated financial statements in the CPP Annual Reports² and the Public Accounts of Canada. The actuarial balance sheets under both open group and closed group approaches are presented in the actuarial and annual reports and in the Public Accounts of Canada, with an emphasis on the results under the open group.

D. Conclusion

Major amendments in 1997 led to the change in financing of the CPP from a pay-as-you-go basis to a form of partial funding called steady-state funding. The 1997 Amendments, and particularly steady-state funding, restored the Plan's financial sustainability for current and future generations. The purpose of steady-state funding was to build a reserve of assets and stabilize the ratio of assets to expenditures over time. According to the 27th CPP Actuarial Report, under the legislated contribution rate of 9.9%, the net cash flows of the Plan, that is, contributions less expenditures, are expected to be positive until 2020 inclusive, resulting in an increase in the Plan's assets and asset/expenditure ratio.

Although a number of indicators may be used to assess the Plan's financial sustainability, the key legislatively prescribed financial measure for evaluating the Plan is the steady-state contribution rate, specifically, its adequacy and stability over time.

Partially funded systems, as well as pay-as-you-go ones, represent social contracts where, in any given year, current contributors allow the use of their contributions to pay current beneficiaries' benefits. As a result, such social contracts create claims for current and past contributors to contributions of future contributors. The proper assessment of the financial sustainability of a social security pay-as-you-go or partially funded system by means of its balance sheet should take into account these claims. The traditional closed group methodologies do not reflect these claims since only current participants are considered. In comparison, the open group approach does account explicitly for these claims by considering the benefits and contributions of both the current and future plan participants.

The CPP is intended to be long-term and enduring in nature, a fact that is reinforced by the federal, provincial, and territorial governments' joint stewardship through the established strong governance and accountability framework of the Plan. Therefore, if the Plan's financial sustainability is to be measured based on its asset excess or shortfall, it should be done so on an open group basis, which reflects the partially funded nature of the Plan, that is, its reliance on both future contributions and invested assets as the means of financing its future expenditures. The inclusion of future contributions and benefits with respect to both current and future contributors in the assessment of the Plan's financial state shows that the Plan is able to meet its financial obligations and is sustainable over the long term.

Future demographic, economic and financial market environments may differ from those assumed under the best-estimate scenario of the 27th CPP Actuarial Report, and as such may

² The Annual Reports on the CPP are produced by Employment and Social Development Canada in collaboration with Finance Canada. The reports are accessible at: <https://www.canada.ca/en/employment-social-development/services/pension/reports.html>

impact the Plan's finances differently. It follows that, regardless of the measure used to assess the Plan's financial state, the unique characteristics of the Plan's long-term obligations and the assets needed to meet those obligations, as well as the relation between them, should all be considered to ensure the long-term financial sustainability of the CPP.

The statutory actuarial reporting and the provision of further relevant and complete information using multiple disclosures in the CPP consolidated financial statements of the CPP Annual Reports and Public Accounts of Canada are aimed at providing all stakeholders with accurate, appropriate, and comprehensive information to enable informed decisions to be made.

II. Historical Background on Financing of the CPP

A. Inception to Pre-1997 CPP Amendments

The Canada Pension Plan came into effect on 1 January 1966 as an earnings-related plan to provide working Canadians with retirement, disability, death, survivor and children benefits. The Plan was established primarily to assist with income replacement upon retirement. Retirement benefits under the Plan are meant to replace approximately 25% of a beneficiary's pre-retirement earnings up to \$54,440 in 2018 (the five-year average of the Year's Maximum Pensionable Earnings (YMPE)).

The Plan covers employees and self-employed persons between the ages of 18 and 70, but excludes those with earnings less than or equal to the Year's Basic Exemption (YBE), members of certain religious groups, persons who qualify under excepted employment and those covered by the Québec Pension Plan (QPP). The QPP came into effect on the same date as the CPP, and the two plans are deemed to be substantially similar.

Contributions to the Plan are based on contributory earnings between the YBE and the YMPE. In 2018, the YBE and YMPE are \$3,500 and \$55,900, respectively, giving a maximum contributory earnings base of \$52,400. The legislated contribution rate is shared equally between an employer and employee, or applied fully to self-employed persons. In 2018, the combined employer-employee contribution rate is 9.9% (4.95% each), giving a maximum contribution of \$5,187.60 (\$2,593.80 each). The YBE has been fixed at \$3,500 since 1997, whereas the YMPE increases each year in line with the percentage increase, as at 30 June of the preceding year, in the 12-month average of the Industrial Aggregate (the measure of average weekly earnings by Statistics Canada). The CPP is progressive in that contributions are based on earnings above the YBE so that lower-income earners pay a lower level of contributions for the same effective benefit protection.

The CPP was initially established as a pay-as-you-go (PayGo) plan with a small reserve and an initial combined employer-employee contribution rate of 3.6%. The CPP (and QPP) became the second tier of Canada's retirement income system, with the first tier being the Old Age Security Program (including the Guaranteed Income Supplement and Allowance) financed from general tax revenues and the third tier comprising employer-sponsored registered retirement plans and personal savings, including individual registered retirement savings plans and tax-free savings accounts. A registered retirement plan is registered with the federal Canada Revenue Agency and thus qualifies for tax sheltering.

At the time of the Plan's inception, demographic and economic conditions were characterized by a younger population owing to 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 of the scheme unattractive and a pay-as-you-go 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. The assets of the Plan were invested primarily in long-term non-marketable securities issued by 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 flows (contributions less expenditures) had turned negative and part of the Plan's investment income was required to meet the shortfall. The

shortfall continued to grow and eventually caused the assets to start decreasing by the mid-1990s. The fall in the level of assets resulted in 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 pay-as-you-go 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 four factors responsible for the increasing Plan costs, namely: lower birth rates and higher life expectancies than expected, lower productivity, benefit enrichments, and increased numbers of Canadians claiming disability benefits for longer periods.

The projected increasing financial burden on workers to financially maintain the Plan led to the federal, provincial, and territorial governments' decision to consult with Canadians in a review of the Plan and to restore its long-term financial sustainability. Following the cross-country consultations held in 1996, the federal, provincial, and territorial governments agreed to amend the Plan based on nine guiding principles (see Appendix A).

The historical financial state of the CPP from its inception to year 2015 is shown in Table 1. The decrease in assets in the mid-1990s is observed in the table. The subsequent increase in the assets starting in the year 1998 resulted from the major changes made to the Plan as agreed to in 1997. These Plan amendments are discussed in the following subsection.

Table 1 Historical Financial State⁽¹⁾

Year	PayGo Rate ⁽²⁾ (%)	Contribution Rate (%)	Contributions (\$million)	Expenditures (\$million)	Net Cash Flow (\$million)	Investment Income ⁽³⁾ (\$million)	Assets at 31 Dec. ⁽⁴⁾ (\$million)	Yield/Return ⁽⁴⁾ (%)	Asset/Expenditure Ratio
1966	0.05	3.60	531	8	523	2	525	0.7	52.50
1970	0.45	3.60	773	97	676	193	3,596	6.2	24.13
1975	1.42	3.60	1,426	561	865	607	9,359	7.2	11.47
1980	2.72	3.60	2,604	1,965	639	1,466	18,433	8.7	7.64
1985	4.31	3.60	4,032	4,826	(794)	3,113	31,130	10.8	5.66
1986	4.20	3.60	4,721	5,503	(782)	3,395	33,743	10.9	4.73
1987	5.02	3.80	5,393	7,130	(1,737)	3,654	35,660	10.9	4.31
1988	5.41	4.00	6,113	8,272	(2,159)	3,886	37,387	11.0	3.98
1989	5.89	4.20	6,694	9,391	(2,697)	4,162	38,852	11.3	3.72
1990	5.82	4.40	7,889	10,438	(2,549)	4,386	40,689	11.4	3.53
1991	6.31	4.60	8,396	11,518	(3,122)	4,476	42,043	11.2	3.22
1992	7.07	4.80	8,883	13,076	(4,193)	4,497	42,347	11.0	2.97
1993	7.79	5.00	9,166	14,273	(5,107)	4,480	41,720	10.9	2.72
1994	8.33	5.20	9,585	15,362	(5,777)	4,403	40,346	11.0	2.52
1995	7.91	5.40	10,911	15,986	(5,075)	4,412	39,683	11.3	2.37
1996	8.71	5.60	10,757	16,723	(5,966)	4,177	37,894	11.0	2.16
1997	8.67	6.00	12,165	17,570	(5,405)	3,971	36,460	10.8	1.99
1998	8.11	6.40	14,473	18,338	(3,865)	3,938	36,535	10.9	1.94
1999	8.23	7.00	16,052	18,877	(2,825)	764	42,783	1.7	2.17
2000	7.69	7.80	19,977	19,683	294	4,446	47,523	9.9	2.32
2001	7.85	8.60	22,469	20,515	1,954	3,154	52,631	6.2	2.43
2002	8.16	9.40	24,955	21,666	3,289	187	56,107	0.3	2.47
2003	8.19	9.90	27,454	22,716	4,738	6,769	67,614	11.1	2.84
2004	8.29	9.90	28,459	23,833	4,626	6,475	78,715	8.9	3.15
2005	8.37	9.90	29,539	24,976	4,563	11,083	94,361	13.2	3.59
2006 ⁽⁵⁾	8.22	9.90	31,000	26,080	4,920	14,300	113,581	14.4	4.10
2007 ⁽⁵⁾	8.15	9.90	33,621	27,691	5,930	3,269	122,780	2.7	4.20
2008 ⁽⁵⁾	8.03	9.90	36,053	29,259	6,794	(18,350)	111,224	(14.2)	3.60
2009 ⁽⁵⁾	8.16	9.90	37,492	30,901	6,591	9,021	126,836	7.6	3.96
2010	8.83	9.90	35,885	32,023	3,862	11,804	142,502	8.9	4.23
2011	8.73	9.90	38,202	33,691	4,511	8,057	155,070	5.4	4.27
2012	8.84	9.90	40,682	36,321	4,361	15,664	175,095	9.7	4.66
2013	8.73	9.90	42,632	37,575	5,057	23,887	204,039	13.2	5.26
2014	8.70	9.90	44,181	38,808	5,373	32,136	241,548	15.2	5.91
2015	8.79	9.90	46,026	40,883	5,143	38,667	285,358	15.6	6.64

- (1) Table 1 corresponds to Table 10 in the 27th CPP Actuarial Report.
- (2) The pay-as-you-go rates have been calculated using historical contributory earnings, while the contributions are based on estimates made by the Department of Finance.
- (3) Investment income includes both realized and unrealized gains and losses.
- (4) Results for years 1966 to 1998 are on a cost basis, while results for years 1999 to 2015 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 million instead of \$36,535 million.
- (5) For the 27th CPP Actuarial Report, historical numbers for years 2006 to 2009 were revised to reflect a change in the methodology used to allocate fiscal year-end accounting adjustments. Since 2010, fiscal year-end adjustments are no longer allocated between two calendar years and are now included in the calendar year in which they are reported.

B. 1997 CPP Amendments

Overview – Restoring the Financial Sustainability of the Plan

The changes to restore the financial sustainability of the CPP were legislated in 1997 and became effective on 1 January 1998. The changes involved a balanced approach to sustain the Plan while ensuring fairness for future generations and between genders. The 1997 changes were based on the principles of increasing the level of funding in order to stabilize the contribution rate, improving intergenerational equity, and securing the financial state of the Plan over the long term. Key changes included short-term steep increases in the contribution rate combined with a freeze on the YBE, a slowing of the future growth of benefits, full funding of any new or improved benefits in the future, and the modification of the investment policy through the creation of the Canada Pension Plan Investment Board (CPPIB). A major change was modifying the financing approach from a pay-as-you-go basis to a hybrid of pay-as-you-go financing and full funding, called “steady-state funding”.

Fuller Funding and Changes to Benefits

The schedule of contribution rates since the changes were implemented is shown in Table 2. The results of the 27th CPP Actuarial Report confirm that the contribution rate of 9.9% for years 2016 and thereafter is sufficient to maintain the long-term financial sustainability of the Plan. The combination of a freeze on the YBE at \$3,500 and the continued increase in the YMPE has led to the contributory earnings base increasing each year, which results in higher Plan contributions and revenue.

Table 2 Schedule of CPP Contribution Rates

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

Prior to the changes, retirement, survivor and disability benefits were based on a formula that indexed wages earned over a working lifetime using a final three-year average of the YMPE. This formula was changed to a five-year average and the eligibility rules for disability benefits were strengthened. These changes resulted in reducing the future growth of benefits by about 10%.

Changes to the Plan’s Financing Provisions

Steady-state funding was introduced to replace pay-as-you-go financing with the purpose of building an asset reserve necessary to stabilize the ratio of assets to expenditures over time. Investment income on this pool of assets help to pay benefits as the large cohort of baby boomers retires. Steady-state funding is described in more detail in the next subsection.

Incremental full funding was introduced in order to require that changes to the CPP that improve or add new benefits be fully funded. That is, the costs of these benefits must be paid as the benefits are earned, and any costs associated with benefits that have already been earned must be amortized and paid for over a defined period of time consistent with common actuarial practice. These additional costs may take the form of temporary and/or permanent

contribution rate increases. The steady-state rate is determined independently of the incremental full funding rate. As such, the Plan is financed on a dual basis – the steady-state rate applies only to the Plan before considering of any new or improved benefits since 1997, whereas the incremental full funding rate applies to new or improved benefits. The sum of the steady-state and incremental rates is the minimum contribution rate (MCR) of the Plan.

Both of these funding objectives were introduced to improve fairness and equity across generations, as well as to improve the long-term financial sustainability of the Plan. The move to steady-state funding eases some of the contribution burden on future generations. Under incremental 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 onto future generations.

New Investment Policy

It was determined by the review of the CPP in 1996 that to ensure the financial sustainability of the Plan, higher rates of return would be required than had been previously thought. Continuing to invest solely in short-term and low risk fixed income instruments was not considered to be an option since it would ultimately require a higher contribution rate. Hence, the CPPIB was created to invest the assets of the Plan in a diversified portfolio with the aim of achieving higher returns without undue risk of loss. All CPP assets were transferred to the CPPIB by April 2007. The role of the CPPIB will become increasingly important as assets are expected to grow rapidly over the next decade with contributions to the Plan projected to exceed expenditures up to and including the year 2020. After 2020, it is projected that an increasing proportion of investment income will be required to meet expenditures. Although net cash flows are projected to be negative after 2020, asset growth is still expected to continue.

Strengthened Stewardship and Accountability

The 1997 Amendments also strengthened stewardship and accountability to Canadians. Specifically, the statutory periodic reviews of the Plan by the federal and provincial finance ministers were increased from once every five years to every three years. Moreover, if a triennial review reveals that major changes are required to be made to the Plan, then Canadians are to be informed in advance of any such changes being made. Self-sustaining provisions were also put in place to safeguard the Plan in the event that the MCR exceeds the legislated contribution rate and no recommendation is made by the federal and provincial Ministers of Finance to either increase the legislated rate or maintain it.

Further to the changes of 1997, the federal, provincial and territorial Finance Ministers took additional steps in 1999 to strengthen the transparency and accountability of actuarial reporting on the CPP. They endorsed regular independent peer reviews of such reports and consultations by the Chief Actuary with experts on the assumptions to be used in the actuarial reports. The most recent independent review of the statutory actuarial report on the CPP confirmed that the methods and assumptions used in the 27th CPP Actuarial Report were reasonable. To ensure the quality of future actuarial reports, the Chief Actuary continues to consult with experts in the fields of long-term demographic and economic projections.

In summary, the 1997 Amendments resulted in the financial sustainability of the Plan being restored and maintained as confirmed in subsequent actuarial reports. The measures

implemented ensure strengthened stewardship, accountability and transparency regarding the Plan and its finances.³

C. Steady-State Funding of the CPP

Steady-state funding is a partial funding approach that is a hybrid of pay-as-you-go financing and full funding, where the level of funding depends on the best-estimate assumptions. Steady-state funding was introduced as part of the 1997 CPP Amendments in order to build a greater reserve of assets and stabilize the ratio of assets to expenditures over time.

The steady-state methodology results in a stable contribution rate over the long term and helps to improve intergenerational equity. When the CPP financing methodology was examined in 1997, intergenerational equity was one of the primary concerns. Maintaining a pure pay-as-you-go approach would have resulted in significant increases in the contribution rate over time to provide the same benefits. On the other hand, moving to a full funding approach would have also created unfairness across generations, as some generations would have been required to pay higher contributions than others to cover both their own past unfunded liability as well as the past unfunded liability of current retirees. Financing of the CPP moved from a pay-as-you-go approach to partial funding in order to build a much larger fund than the one before the amendments. The partial funding approach provides a balance between pay-as-you-go and full funding and contributes to diversifying the financing of Canada's retirement income system. This diversification of financing approaches, in turn, strengthens the system against possible fluctuations in demographic, economic, and financial market conditions.

Steady-state funding involves a steady-state contribution rate that is the lowest rate sufficient to ensure the long-term financial sustainability of the Plan without recourse to further rate increases. This rate is determined separately from any incremental full funding rates of improved or new benefits. Both the steady-state and incremental rates, if applicable, are calculated by the Chief Actuary based on regulations set out in legislation and are part of each actuarial valuation of the Plan that is made public. The steady-state contribution rate ensures the stabilization of the ratio of assets to the following year's expenditures (A/E ratio) over time, before consideration of any full funding of improved or new benefits. Specifically, the *Calculation of Contribution Rates Regulations, 2007* require that the steady-state contribution rate be the lowest rate such that the A/E ratios in the 10th and 60th year following the third year of the most recent review period are the same.

At the time of the 1997 Amendments, the steady-state contribution rate was determined to be 9.9% for the year 2003 and thereafter as shown in the September 1997 (16th) Actuarial Report on the CPP. The contribution rate was thus scheduled to increase incrementally from 5.6% in 1996 to 9.9% in 2003 and to remain at that level thereafter. The legislated rate has remained at 9.9% in accordance with the schedule. In subsequent actuarial reports on the Plan, the steady-state contribution rate and more recent MCR have been determined to be below 9.9%. Under the 27th CPP Actuarial Report, the incremental full funding rate was deemed to be zero and, as such, the MCR equals the steady-state contribution rate of 9.79%. According to the 27th CPP Actuarial Report, under the legislated contribution rate of 9.9%, the Plan's assets are expected to increase significantly, with the A/E ratio projected to remain relatively

³ For further historical background on the 1997 Amendments, the reader may refer to "Fixing the Future: How Canada's Usually Fractious Governments Worked Together to Rescue the Canada Pension Plan" by Bruce Little.

stable at a level of about 6.5 over the period 2016 to the early 2030s and then grow overall thereafter to reach 7.4 by 2090.

Table 3 shows the projected financial state of the CPP using the legislated contribution rate of 9.9%.

The nature of steady-state funding of the CPP results in high reliance of the Plan on future contributions as a source of revenues. Chart 1 shows that while the importance of the investment income as a source of revenues increases over time in line with the overall growth in the CPP assets, contributions are projected to remain the main source of revenues for the Plan. According to the projections of the 27th CPP Actuarial Report, contributions are expected to represent about 65% of total CPP revenues over the long term.

Chart 1 Investment Income and Contributions as Percentage of Total CPP Revenues (9.9% contribution rate)

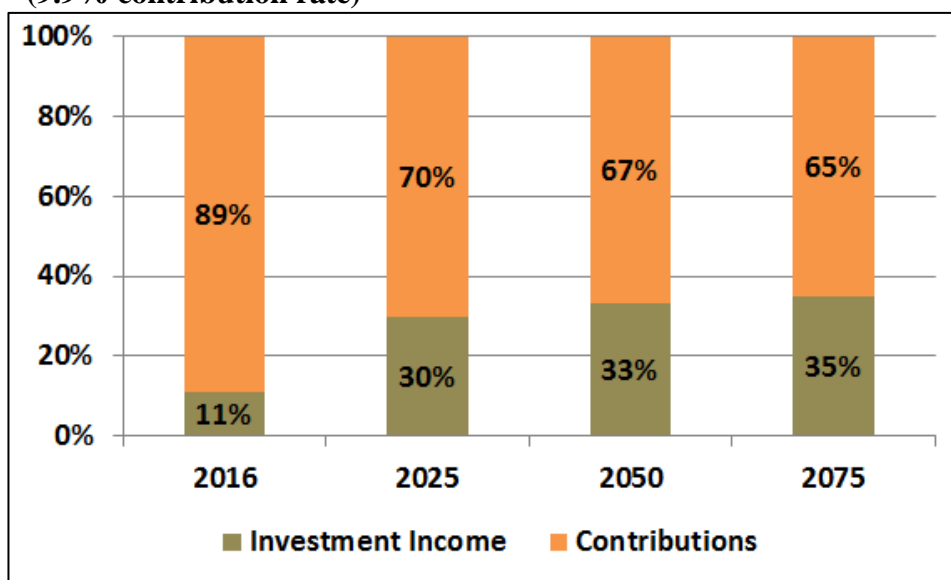


Table 3 Projected Financial State⁽¹⁾

Year	PayGo Rate	Contribution Rate	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Income ⁽²⁾	Assets at 31 Dec.	Return ⁽³⁾	Asset/Expenditure Ratio
	(%)	(%)	(\$million)	(\$million)	(\$million)	(\$million)	(\$million)	(\$million)	(%)	
2016	9.13	9.90	469,849	46,515	42,877	3,638	5,835	294,831	2.00	6.53
2017	9.30	9.90	485,068	48,022	45,129	2,893	15,110	312,834	5.02	6.56
2018	9.45	9.90	504,277	49,923	47,673	2,250	15,638	330,723	4.90	6.55
2019	9.61	9.90	524,960	51,971	50,457	1,514	17,069	349,306	5.07	6.54
2020	9.79	9.90	545,491	54,004	53,416	588	19,093	368,986	5.38	6.53
2021	9.95	9.90	567,494	56,182	56,493	(311)	20,412	389,087	5.45	6.52
2022	10.11	9.90	590,033	58,413	59,644	(1,231)	21,842	409,699	5.54	6.51
2023	10.25	9.90	614,202	60,806	62,927	(2,121)	23,097	430,675	5.57	6.49
2024	10.38	9.90	638,920	63,253	66,340	(3,087)	25,298	452,886	5.81	6.48
2025	10.52	9.90	664,010	65,737	69,851	(4,114)	27,605	476,377	6.03	6.49
2026	10.65	9.90	689,518	68,262	73,432	(5,170)	29,014	500,221	6.03	6.49
2027	10.76	9.90	715,971	70,881	77,055	(6,174)	30,439	524,485	6.03	6.50
2028	10.85	9.90	743,765	73,633	80,735	(7,102)	31,883	549,266	6.03	6.50
2029	10.93	9.90	772,832	76,510	84,501	(7,991)	33,363	574,639	6.03	6.51
2030	11.00	9.90	803,264	79,523	88,331	(8,808)	34,886	600,717	6.03	6.51
2031	11.04	9.90	834,862	82,651	92,210	(9,559)	36,447	627,605	6.03	6.53
2032	11.07	9.90	868,555	85,987	96,111	(10,124)	38,063	655,544	6.03	6.55
2033	11.07	9.90	903,980	89,494	100,054	(10,560)	39,746	684,730	6.02	6.58
2034	11.07	9.90	940,350	93,095	104,093	(10,998)	41,492	715,224	6.02	6.61
2035	11.06	9.90	978,913	96,912	108,249	(11,337)	43,322	747,209	6.02	6.64
2036	11.07	9.90	1,016,680	100,651	112,528	(11,877)	45,241	780,573	6.02	6.68
2037	11.06	9.90	1,056,703	104,614	116,923	(12,309)	47,246	815,510	6.02	6.72
2038	11.05	9.90	1,098,605	108,762	121,421	(12,659)	49,357	852,207	6.01	6.76
2039	11.03	9.90	1,142,737	113,131	126,064	(12,933)	51,588	890,862	6.01	6.81
2040	11.02	9.90	1,187,616	117,574	130,885	(13,311)	53,929	931,480	6.01	6.85
2041	11.01	9.90	1,233,988	122,165	135,911	(13,746)	56,391	974,124	6.02	6.90
2042	11.01	9.90	1,282,122	126,930	141,134	(14,204)	58,990	1,018,910	6.02	6.95
2043	11.00	9.90	1,332,514	131,919	146,576	(14,657)	61,723	1,065,976	6.02	7.00
2044	11.01	9.90	1,383,565	136,973	152,264	(15,291)	64,569	1,115,254	6.02	7.05
2045	11.01	9.90	1,436,430	142,207	158,220	(16,013)	67,547	1,166,788	6.02	7.09
2050	11.17	9.90	1,722,602	170,538	192,433	(21,895)	84,405	1,457,678	6.02	7.28
2055	11.46	9.90	2,052,424	203,190	235,278	(32,088)	104,335	1,799,883	6.02	7.35
2060	11.74	9.90	2,442,454	241,803	286,634	(44,831)	127,089	2,189,836	6.02	7.35
2065	11.80	9.90	2,926,409	289,714	345,401	(55,687)	153,538	2,644,967	6.02	7.38
2070	11.78	9.90	3,524,950	348,970	415,068	(66,098)	185,553	3,197,264	6.02	7.42
2075	11.78	9.90	4,241,948	419,953	499,669	(79,716)	224,534	3,869,318	6.02	7.46
2080	11.83	9.90	5,092,133	504,121	602,316	(98,195)	271,520	4,678,391	6.02	7.48
2085	11.94	9.90	6,091,572	603,066	727,360	(124,294)	327,105	5,633,298	6.02	7.46
2090	12.07	9.90	7,276,562	720,380	878,046	(157,666)	391,621	6,739,676	6.02	7.39

(1) Table 3 corresponds to Table 11 in the 27th CPP Actuarial Report.

(2) Investment income includes both realized and unrealized gains and losses.

(3) Returns are net of all investment expenses.

III. Analysis of Assets and Obligations of the CPP

This section presents an analysis and comparison of the assets and obligations, i.e. an actuarial balance sheet⁴, of the Plan under different closed and open group methodologies. Two measures of the Plan's financial state are analyzed for each methodology: the difference between the Plan's assets and its obligations (this difference is termed "asset excess", if positive, or "asset shortfall", if negative) and the total Plan's assets as a percentage of its obligations. Both measures provide an indication of the extent to which the Plan's obligations are covered by its assets.

A. General Methodology

A closed group includes only current participants of a plan, with no new entrants permitted. In comparison, an open group is one that includes all current and future participants of a plan. Two types of closed groups are discussed in this section: a closed group without future benefit accruals for the group's members, and a closed group with future accruals for its members.

The methodology to determine the steady-state and incremental contribution rates of the Plan, as prescribed by the *Calculation of Contribution Rates Regulations, 2007*, are based on the open group approach. Prior to the 25th CPP Actuarial Report, the Plan's obligations measured under the closed group without future benefits accruals methodology was historically presented in the CPP actuarial reports as supplementary information. Following the publication by the Office of the Chief Actuary (OCA) of Actuarial Study No. 8: "Technical Aspects of the Financing of the Canada Pension Plan" in 2010, the Plan's actuarial balance sheet based on an open group methodology was also included in the 25th CPP Actuarial Report. Further, following the publication of Actuarial Studies No. 10 and 13, the 26th and 27th CPP Actuarial Reports have both put more emphasis on the actuarial balance sheet on an open group basis, while including information on CPP assets and obligations on the closed group without future benefit accruals methodology as a footnote in the report.

The choice of the methodology used to produce a social security pension system's actuarial balance sheet is mainly determined by the system's financing approach. This is supported by professional actuarial standards of practice. The Canadian Institute of Actuaries Standards of Practice – Practice-Specific Standards for Social Security Programs stipulate that in choosing a method to assess the financial state of social security program:

"The actuary would use a valuation methodology that is consistent with the financing method used for the social security program. Two methods are available:

- An open group methodology, under which contributions and benefits of both current and future participants are considered, is most appropriate for pay-as-you-go and partially funded social security programs and may also be used for social security programs that are meant to be fully funded; and
- A closed group methodology, under which only current participants are considered, with or without their assumed future benefit accruals and contributions, is only appropriate for a fully funded social security program that is meant to be fully funded."

For fully funded systems, i.e. systems which are expected to have invested assets sufficient to pay for all accrued-to-date benefits of current participants at any given date, the accrued

⁴ In this study, the terms "balance sheet" and "actuarial balance sheet" are used interchangeably.

obligations are assumed to be funded in advance. Therefore, balance sheets determined under a closed group without future accruals are appropriate for such plans.

The balance sheets under a closed group with future accruals correspond to the situation when, for example, a social security system is closed to new entrants. In such situations, independently of its financing methodology, the system would rely on the existing invested assets and future contributions of current participants to pay for their current and future benefits.

Finally, ongoing pay-as-you-go and partially funded systems that cover simultaneously multiple current and future generations represent social contracts where, in any given year, current contributors allow the use of their contributions to pay current beneficiaries' benefits. As a result, such social contracts create a claim for current and past contributors to contributions of future contributors. The proper assessment of the financial sustainability of a social security pay-as-you-go or partially funded system by means of its balance sheet should take these claims into account. The traditional closed group methodologies do not reflect these claims since only current participants are considered. In comparison, the open group approach accounts explicitly for these claims by considering the benefits and contributions of both current and future plan participants.

Closed group and open group methodologies for the CPP are discussed in this section. For all balance sheets discussed in this section, it is assumed that future contributions are determined using the legislated contribution rate of 9.9%. It is also assumed that the assets of the Plan are invested in the best-estimate portfolio of the 27th CPP Actuarial Report, which is invested ultimately as 55% in equities, 20% in fixed income securities, and 25% in real assets, such as real estate and infrastructure. The ultimate annual real and nominal returns on this portfolio are assumed to be 4.0% and 6.0%, respectively. The nominal and real rates of return for each projection year are shown in Table 4.

Table 4 Annual Rates of Return on CPP Assets⁽¹⁾

Year	Nominal	Real
	(%)	(%)
2016	2.0	0.4
2017	5.0	3.0
2018	4.9	2.9
2019	5.1	3.1
2020	5.4	3.4
2025+	6.0	4.0
Average over:		
2016-2020	4.5	2.6
2016-2025	5.1	3.1
2016-2090	5.9	3.9
2016-2165	6.0	4.0

(1) Table 4 is based on Table 61 in the 27th CPP Actuarial Report.

For the purpose of determining the actuarial assets and obligations of the Plan, the future cash flows are discounted using the assumed nominal rate of return on the CPP assets. The question of the discount rate to be used in order to determine the actuarial assets and obligations generates considerable debate in actuarial as well as financial and statistical reporting communities. Possible types of discount rates considered include the rate of return on assets, rates linked to the yield of a basket of government bonds (e.g. under the European System of National and Regional accounts - ESA 2010), and the rate of growth in the Gross Domestic

Product (e.g. as used in the United Kingdom to calculate unfunded public service pension contribution rates). This study considers the use of an alternative discount rate that corresponds to the growth in the financing base of the CPP. Since the CPP, being a partially funded plan, is financed by future contributions and investment income, such discount rate would be a mix of the assumed nominal rate of return on the CPP assets and the growth in the contributory base. This study addresses the use of such an alternative discount rate under an open group approach in Section V and shows that it results in the same asset excess/shortfall as determined by using the assumed nominal rate of return on the CPP assets.

Another important element of the methodology used to determine the components of the CPP balance sheets is the length of the projection period. In this study the cash flows are projected over an extended time period of 150 years. Subsection E provides the rationale for this choice.

B. Closed Group without Future Accruals

For this approach, no new entrants to the Plan are permitted, and current plan participants who are not receiving benefits at the valuation date are assumed to make no further contributions beyond that date, and hence accrue no further benefits.

To determine the actuarial obligations under the closed group approach, the benefits that will be paid in respect of CPP participation up to and including the valuation date must first be projected. For beneficiaries in pay, expenditures are projected using the best-estimate assumptions of the 27th CPP Actuarial Report with benefits increased annually in line with inflation as provided under the current Plan. For contributors, the projection is also based on the best-estimate assumptions of the Plan with the following exceptions:

- No new entrants to the Plan are included; and
- Current Plan participants who are not receiving benefits at the valuation date are assumed to make no further contributions 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 take-up. In accordance with the Plan's provisions, the YMPE is still projected to the year of benefit take-up, and the pre-valuation date pensionable earnings are still wage-indexed to the year of benefit take-up using projected nominal wage increases, i.e. changes in the Consumer Price Index (CPI) plus real wage increases.

The maximum contributory period for each Plan participant is 47 years; that is, from age 18 to 65. Some periods of low pensionable earnings may be excluded from the benefit calculation by reason of pensions commencing after age 65, disability, child-rearing for a child less than seven years of age, and the low-earnings drop-out provision.

The low-earnings drop-out provision allows for 17% of the number of months in the contributory period with the lowest earnings (up to a maximum of about eight years) to be dropped from the calculation of the retirement benefit.

For the purpose of determining the projected benefits, the low-earnings drop-out provision is applied to the period up to the valuation date. Thus, if a participant has been eligible to contribute for a period of 30 years prior to the valuation date, and is assumed to take his/her retirement benefit at age 65, then only 17% of those years (about 5, in this example) will be dropped and the maximum contributory period will be 42 years (assuming no other drop-outs apply).

A participant's annual 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. It follows that if a contributor paid contributions on earnings equal to the YMPE for thirty years, his average adjusted earnings, taking into account the low-earnings drop-out of 17%, would be determined by multiplying his MPEA by the ratio of 30/42.

The resulting projected expenditures are next discounted using the expected rate of return on the overall CPP assets to determine their present value. This is the actuarial obligations of the Plan under the closed group without future benefit accruals approach, which are also called the "accrued-to-date" obligations. The assets under this approach consist of the Plan's current assets.

Under this approach, as at 31 December 2015, the Plan's asset shortfall is \$886 billion and the total assets represent 24.4% of the actuarial obligations, as shown in Table 5. It should be noted that according to the OCA Actuarial Study No. 13, the total assets as a percentage of the actuarial obligations was 17.4% as at 31 December 2012. The substantial increase in this ratio over the three years from 2013 to 2015 is mainly due to the strong performance of the financial market over that period which resulted in the investment income being 248% higher than anticipated.

As a result of the 1997 Amendments, the Plan has been moving away from pure pay-as-you-go financing (with a small contingency reserve) to partial funding. However, it should be noted that full funding of the Plan (i.e. the accumulation of the invested assets equal to the actuarial obligations under the closed group approach without future accruals) was never intended by the stakeholders. The figure representing the accrued-to-date obligations and the relative size of the asset excess or shortfall under the closed group without future accruals may be used for certain purposes, for example, as a measure of reliance of the Plan's financing on the invested assets. However, since the balance sheet under the closed group methodology does not reflect the nature of the partial financing approach where future contributions represent a major source of financing of future expenditures, it is inappropriate to reach a conclusion regarding the Plan's financial sustainability considering only the asset shortfall or excess under the closed group balance sheet. Furthermore, all disclosures related to the CPP balance sheet under the closed group approach should be accompanied by information on the CPP balance sheet under the open group approach in order to provide users with objective information.

C. Closed Group with Future Accruals

For this group, no new entrants to the Plan are permitted, and current Plan participants who are not receiving benefits at the valuation date are assumed to continue contributing to the Plan beyond that date. Thus, current Plan participants also continue to accrue benefits with future salary increases in line with wage increases. As a result, the obligations side of the balance sheet includes the present value of future expenditures for current Plan participants, while the assets side includes the present value of their future contributions. The asset shortfall under this methodology as at 31 December 2015 is \$591 billion. The balance sheet for the CPP using this alternative methodology is presented in Table 5 together, for comparison, with the closed group without future accruals methodology and the open group methodology, discussed next.

D. Open Group

An open group is defined as one that includes all current and future participants of a plan, where the plan is considered to be ongoing into the future, that is, over an extended time horizon. This means that future contributions of current and new participants and their associated benefits are considered in order to determine whether current assets and future contributions will be sufficient to pay for all future expenditures.

To determine the actuarial obligations of the Plan under the open group approach, future expenditures with respect to current and future Plan participants are first projected using the best-estimate assumptions of the 27th CPP Actuarial Report. Next, in order to determine their present value, the total projected expenditures are discounted using the expected nominal rate of return on CPP assets. This is the actuarial obligations under the open group approach.

To determine the assets of the Plan under the open group approach, the future contributions of current and future contributors are projected using the best-estimate assumptions of the 27th CPP Actuarial Report and the legislated contribution rate of 9.9%. In order to determine their present value, the total projected contributions are discounted using the expected nominal rate of return on CPP assets. This present value is added to the Plan's current assets to obtain the total assets of the Plan.

The asset excess under the open group methodology as at 31 December 2015 is \$1 billion, and the total assets cover 100.1% of the actuarial obligations.

The CPP balance sheet under this methodology as at 31 December 2015 was presented in the 27th CPP Actuarial Report. This information is further included in the Notes to the CPP Consolidated Financial Statements in both the CPP Annual Reports and the Public Accounts of Canada. Section VI of this study provides more discussion on the financial and statistical reporting of the CPP assets and obligations.

The Plan is intended to be long-term and enduring in nature, a fact that is reinforced by the federal, provincial, and territorial governments' joint stewardship through the established strong governance and accountability framework of the Plan. Therefore, if the Plan's financial sustainability is to be measured based on its asset excess or shortfall, it should be done so on an open group basis that reflects the partially funded nature of the Plan, that is, its reliance on both future contributions and invested assets as means of financing its future expenditures. The inclusion of future contributions and benefits with respect to both current and future participants in the assessment of the Plan's financial state confirms that the Plan is able to meet its financial obligations and is sustainable over the long term.

Table 5 Balance Sheet as at 31 December 2015 for the CPP: Groups with and without Future Benefit Accruals – Comparison of Methodologies (9.9% contribution rate)

Present Value as at 31 December 2015 (in \$ billion)	Methodology		
	Excluding Future Benefit Accruals		Including Future Benefit Accruals
	Closed Group	Closed Group	Open Group
Assets			
Current Assets	285	285	285
Future Contributions	0	906	2,262
Total Assets (a)	285	1,191	2,547
Obligations⁽¹⁾			
Current Benefits	446	446	446
Future Benefits	725	1,336	2,100
Total Obligations (b)	1,171	1,782	2,546
Asset Excess (Shortfall) (a) – (b)	(886)	(591)	1
Total Assets as a Percentage of Total Obligations⁽²⁾ (%) (a)/(b)	24.4%	66.9%	100.1%

(1) Obligations include operating expenses.

(2) Percentages are calculated using unrounded values of the assets and obligations.

Compared to the closed group with accruals and the open group, the closed group without future benefit accruals generates the largest asset shortfall, as shown in Table 5. This is because there are no future contributions to the Plan as well as no future benefit accruals. Under the best-estimate assumptions, the present value of future contributions exceeds the present value of the associated future benefits, and, as a result, the asset shortfall decreases for the groups with accruals compared to group without future accruals. However, a substantial shortfall exists under the closed groups (with or without accruals), since these approaches do not fully account for future contributions as a major source of financing for the Plan.

E. Length of the Projection Period

In this study, the cash flows are projected over an extended time period of 150 years. Subsection 115(1.1) of the *Canada Pension Plan* specifies that the CPP actuarial report should present financial information for a period of at least 75 years following the valuation date. For a closed group with or without future accruals, the projection of future contributions and expenditures for a 75-year period is sufficient to cover virtually all future contributions and expenditures associated with the group's participants.

However, the use of a 75-year projection period for the open group balance sheet could be viewed as insufficient. In general, by limiting the projection period, part of the future expenditures for cohorts that will enter the labour force during that time are excluded from the obligations, while most of the contributions for these cohorts are included in the assets.

For example, a 75-year period was historically used to determine the long-term financial sustainability of the Old-Age, Survivors, and Disability Insurance (OASDI) program in the United States. However, "The 2013 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds" (the 2013 Trustees Report) states that "Consideration of summary measures alone (such as the actuarial

balance and open group unfunded obligation⁵) for a 75-year period can lead to incorrect perceptions and to policy prescriptions that do not achieve sustainable solvency.” The 2013 Trustees Report states further that the “measure that reflects the continued, and possibly increasing, annual shortfalls after 75 years is the unfunded obligation extended to the infinite horizon.” On the other hand, the 2017 Trustees Report states that “the degree of uncertainty associated with estimates increases substantially for years further in the future”.

One of the factors that drive the choice of the length of the projection period is a discount rate. This is due to the fact that adding additional projection years beyond a certain point may have a negligible effect because of discounting.

Table 6 presents the CPP open group balance sheet determined using different projection periods. It could be seen that the ratio of total assets to total obligations decreases as the length of projection period increases but at a slowing rate.

There are asset excesses under the open group approach if projection periods of 75, 100, 125 and 150 years are used. The total assets as a percentage of total obligations are 104.4%, 102.1% and 100.8% for the 75, 100 and 125-year projection periods, respectively. These figures compare to 100.1% using the chosen 150-year projection period.

Using projection periods beyond 150 years yields asset shortfalls. Due to the discounting of the cash flows occurring more than 150 years in the future, the declines in total assets as a percentage of total obligations are marginal. The ratio of total assets to total obligations decreases from 100.1% to 99.6% if the 175-year projection period is used and to 99.3% if the 200-year projection period is used.

Finally, it is worth repeating that although increasing the length of the projection period somewhat enhances the assessment of the financial sustainability of the Plan, it also increases the uncertainty of results.

Table 6 Open Group Balance Sheet as at 31 December 2015 for the CPP: Various Projection Periods
 (9.9% contribution rate, \$ billion)

	Length of the Projection Period in Years					
	75	100	125	150	175	200
Total Assets	2,182	2,374	2,484	2,547	2,583	2,604
Total Obligations	2,090	2,326	2,465	2,546	2,594	2,622
Asset excess (shortfall)	92	48	19	1	(11)	(18)
Total Assets as a Percentage of Total Obligations (%)	104.4%	102.1%	100.8%	100.1%	99.6%	99.3%

F. Summary of Assets and Obligations of the CPP

The following Table 7 summarizes the assets, obligations and resulting asset excess or shortfall as at 31 December 2015 and 2025 for the three approaches under the best-estimate assumptions of the 27th CPP Actuarial Report, the legislated contribution rate of 9.9%, and the discount rate as shown in Table 3 (best-estimate assumed nominal rate of the return on CPP assets).

⁵ The term “unfunded obligation” refers to the difference between plan’s obligations and assets, which is a value equal, but opposite in sign, to an asset excess or shortfall.

Table 7 Balance Sheet Summary as at 31 December 2015 and 2025 for the CPP: Groups with and without Future Benefit Accruals (9.9% contribution rate)

Present Value as at 31 December (in \$ billion)⁽¹⁾	2015	2025
<i>Closed Group without Future Accruals</i>		
Assets		
Current Assets	285	476
Future Contributions	-	-
Total Assets (a)	285	476
Obligations		
Current Benefits	446	740
Future Benefits	725	928
Total Obligations (b)	1,171	1,668
Asset Excess (Shortfall) (c) = (a) - (b)	(886)	(1,192)
Total Assets as Percentage of Obligations⁽²⁾ (a)/(b)	24.4%	28.6%
<i>Closed Group with Future Accruals</i>		
Assets		
Current Assets	285	476
Future Contributions	906	1,203
Total Assets (d)	1,191	1,679
Obligations		
Current Benefits	446	740
Future Benefits	1,336	1,741
Total Obligations (e)	1,782	2,481
Asset Excess (Shortfall) (f) = (d) - (e)	(591)	(802)
Change in Asset Excess or Shortfall (f) - (c)	295	390
Total Assets as Percentage of Obligations⁽²⁾ (d)/(e)	66.9%	67.7%
<i>Open Group</i>		
Assets		
Current Assets	285	476
Future Contributions	2,262	3,013
Total Assets (g)	2,547	3,489
Obligations		
Current Benefits	446	740
Future Benefits	2,100	2,756
Total Obligations (h)	2,546	3,496
Asset Excess (Shortfall) (i) = (g) - (h)	1	(7)
Change in Asset Excess or Shortfall (i) - (f)	592	795
Total Assets as Percentage of Obligations⁽²⁾ (g)/(h)	100.1%	99.8%

(1) Obligations include operating expenses.

(2) Percentages are calculated using unrounded values of the assets and obligations.

Table 7 shows that for the closed group without future accruals, the asset shortfall increases from \$886 billion to \$1,192 billion between 2015 and 2025. Despite the growth in the asset shortfall, the ratio of assets to obligations increases from 24% to 29% over the same period.

The closed group with future accruals includes the future contributions and expenditures for current contributors in the calculation of the Plan's assets and obligations. Between 2015 and 2025, the asset shortfall for the closed group with future accruals increases from \$591 billion to \$802 billion. The ratio of the assets to obligations is stable at around 67% in both years.

The open group includes future contributions and expenditures for both current and future participants in the calculation of the assets and obligations. Thus, the asset shortfall decreases compared to both closed groups. The asset excess of \$1 billion in 2015 is projected to become a shortfall of \$7 billion by 2025. The ratio of the assets to obligations remains stable at about 100%. The inclusion of the future contributions and benefits of current and future Plan participants, which is consistent with the CPP financing approach and valuation methodology, demonstrates that the Plan is financially sustainable over the long term. The future contributions under the legislated contribution rate of 9.9% of contributory earnings in combination with investment income are sufficient to pay the future expenditures and build a larger fund. In turn, this larger fund provides additional capacity for mitigating impacts on the Plan's finances from future adverse demographic and economic environments.

IV. Open Group Modified Balance Sheet

In this section the open group balance sheet is presented in a modified form, such that the pay-as-you-go and funded components of the Plan are shown separately in order to analyze the assets and obligations under each component. This modified balance sheet is first discussed under a discount rate assumption equal to the best-estimate real rate of return on assets assumption of the 27th CPP Actuarial Report. Next, the modified balance sheet is discussed under alternative discount rate assumptions that take into account the largely pay-as-you-go nature of the Plan.

As discussed in Section III, the CPP is financed using a steady-state contribution rate methodology that stabilizes the asset/expenditure ratio over time. This approach to financing the Plan is a form of partial funding, that is, a hybrid of pay-as-you-go financing and full funding. This hybrid nature of partial funding allows for a large part of a current year's expenditures to be financed from the same year's contributions, thus creating the pay-as-you-go component of the Plan. The invested assets are used to cover the remaining expenditures, if any, thus creating the funded component of the Plan. Although there is a funded component to steady-state funding, its goal is not to fully fund the Plan. Rather, by stabilizing the asset/expenditure ratio, steady-state funding ensures that the Plan's contributions remain the primary source for covering the Plan's expenditures.

Table 8 presents the splitting of the projected contributions and expenditures into the pay-as-you-go and funded components of the CPP under the best-estimate assumptions and the legislated 9.9% contribution rate. By definition, under the pay-as-you-go component, the contributions and expenditures are exactly equal every year. Contributions for the funded component exist as long as the current year's contributions exceed the same year's expenditures. These excess contributions are added to the Plan's assets, which are invested by the CPPIB. The 27th CPP Actuarial Report projects that contributions will exceed expenditures up to and including the year 2020. Starting in 2021, the expenditures are then projected to be higher than contributions. These excess expenditures are allocated to the funded component of the Plan and are financed by the invested assets.

Table 8 Splitting of CPP Contributions and Expenditures into Pay-As-You-Go and Funded Components
 (9.9% contribution rate, \$ billion)

	Pay-As-You-Go Component		Funded Component		Total ⁽¹⁾	
	Contributions (a)	Expenditures (b)	Contributions (c)	Expenditures (d)	Contributions (a) + (c)	Expenditures (b) + (d)
2016	42.9	42.9	3.6	0	46.5	42.9
2017	45.1	45.1	2.9	0	48.0	45.1
2018	47.7	47.7	2.3	0	49.9	47.7
2019	50.5	50.5	1.5	0	52.0	50.5
2020	53.4	53.4	0.6	0	54.0	53.4
2021	56.2	56.2	0.0	0.3	56.2	56.5
2022	58.4	58.4	0.0	1.2	58.4	59.6
2023	60.8	60.8	0.0	2.1	60.8	62.9
2024	63.3	63.3	0.0	3.1	63.3	66.3
2025	65.7	65.7	0.0	4.1	65.7	69.9
2026	68.3	68.3	0.0	5.2	68.3	73.4
2027	70.9	70.9	0.0	6.2	70.9	77.1
2028	73.6	73.6	0.0	7.1	73.6	80.7
2029	76.5	76.5	0.0	8.0	76.5	84.5
2030	79.5	79.5	0.0	8.8	79.5	88.3
2031	82.7	82.7	0.0	9.6	82.7	92.2
2032	86.0	86.0	0.0	10.1	86.0	96.1
2033	89.5	89.5	0.0	10.6	89.5	100.1
2034	93.1	93.1	0.0	11.0	93.1	104.1
2035	96.9	96.9	0.0	11.3	96.9	108.2
2036	100.7	100.7	0.0	11.9	100.7	112.5
2037	104.6	104.6	0.0	12.3	104.6	116.9
2038	108.8	108.8	0.0	12.7	108.8	121.4
2039	113.1	113.1	0.0	12.9	113.1	126.1
2040	117.6	117.6	0.0	13.3	117.6	130.9
2045	142.2	142.2	0.0	16.0	142.2	158.2
2050	170.5	170.5	0.0	21.9	170.5	192.4
2055	203.2	203.2	0.0	32.1	203.2	235.3
2060	241.8	241.8	0.0	44.8	241.8	286.6
2065	289.7	289.7	0.0	55.7	289.7	345.4
2070	349.0	349.0	0.0	66.1	349.0	415.1
2075	420.0	420.0	0.0	79.7	420.0	499.7
2080	504.1	504.1	0.0	98.2	504.1	602.3
2085	603.1	603.1	0.0	124.3	603.1	727.4
2090	720.4	720.4	0.0	157.7	720.4	878.0

(1) As shown in Table 3 of subsection III.C.

The open group balance sheet shown in Table 5 of Section III can be regrouped in a way that emphasizes the hybrid nature of partial funding and allows for a better understanding of how future expenditures are financed. As a first step, the assets and obligations sides of the balance sheet are modified as follows:

- On the assets side, the present value of future contributions is broken down into the present value of future contributions that cover future expenditures (pay-as-you-go component future contributions shown in column (a) of Table 8) and the present value of future contributions in excess of future expenditures, which are invested (funded component future contributions shown in column (c) of Table 8);
- On the obligations side of the balance sheet, the present value of future expenditures is similarly broken down into the present value of future expenditures covered by future contributions (pay-as-you-go component future expenditures shown in column (b) of Table 8) and the present value of future expenditures not covered by future contributions and therefore financed by the invested assets (funded component future expenditures shown in column (d) of Table 8).

Then, as the second step, the open group balance sheet is regrouped into its two components: pay-as-you-go and funded. Charts 2 and 3 illustrate the two steps to construct the open group modified balance sheet.

Chart 2 Open Group Modified Balance Sheet Approach – Step 1
 (as at 31 December 2015, 9.9% contribution rate, \$ billion)

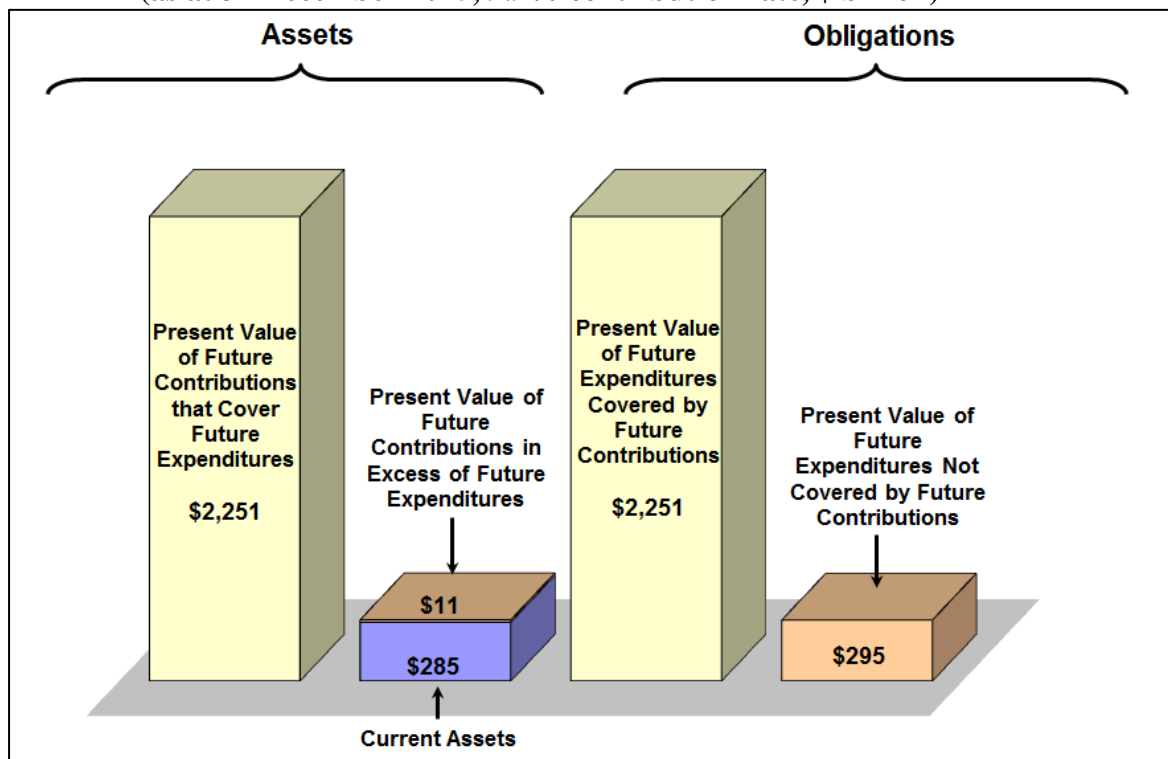


Chart 3 Open Group Modified Balance Sheet Approach – Step 2
 (as at 31 December 2015, 9.9% contribution rate, \$ billion)

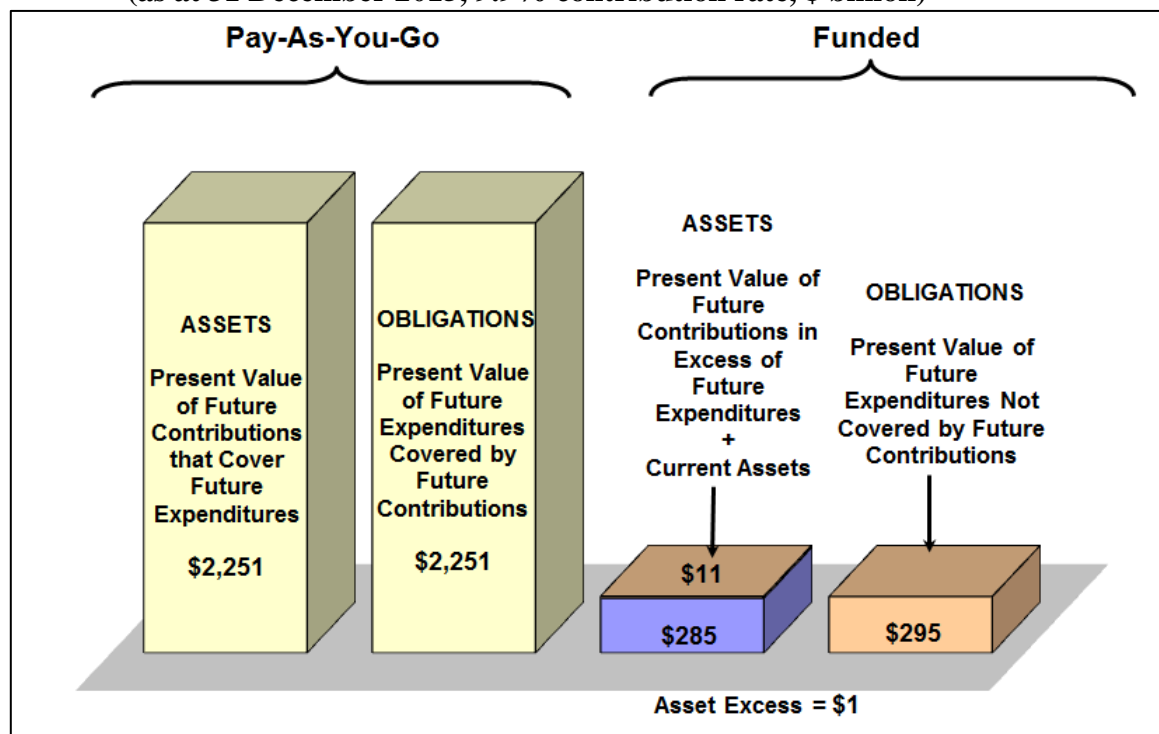


Chart 3 clearly shows that no asset excess or shortfall exists with respect to the pay-as-you-go component. Under pay-as-you-go financing, while both the present values of the assets and obligations could vary depending on past experience and future actuarial assumptions, they will always remain equal. Under the funded component, an asset excess results when the total assets, consisting of the current invested assets and the present value of future contributions in excess of future expenditures, are more than sufficient to pay the future expenditures not covered by future contributions. In the case of the open group under the best-estimate scenario, the asset excess is \$1 billion as at 31 December 2015. On the contrary, an asset shortfall under the funded component arises when the total assets are not sufficient to pay the future expenditures not covered by future contributions.

The financial state of the funded component and its evolution over time provide meaningful measures of the financial state of the CPP. In addition, the relative sizes of the pay-as-you-go and funded obligations may be regarded as measures of the degree to which the Plan is funded. The open group modified balance sheet for years 2015 and 2025 is shown in Table 9.

The funded component's total assets exceed its obligations by \$1 billion as at 31 December 2015. By 2025, the present value of future contributions in excess of future expenditures under the funded component disappears since expenditures are projected to exceed contributions starting from 2021. The value of the Plan's assets increases to \$476 billion and the asset shortfall of \$7 billion emerges. The ratio of the total assets (sum of assets under pay-as-you-go and funded component) to total obligations decreases slightly from 101.1% to 99.8%. The open group methodology confirms that the Plan is financially sustainable over the long term.

The decomposition of the Plan into the pay-as-you-go and funded components provides additional insight into the nature of the risks to which the CPP is exposed. Both the

pay-as-you-go and funded components are subject to demographic and economic risks. The pay-as-you-go component, however, is not exposed to financial market risk since the associated cash flows are not invested. This is in contrast to the funded component, which is subject to financial market risk since its assets are invested. It is important that this additional risk to the funded component of the Plan, and hence to the Plan as a whole, is taken into account in considering both the short-term and long-term financial sustainability of the Plan. Moreover, this consideration will become increasingly important since the share of the funded component's obligations as a percentage of the total CPP's obligations is expected to increase over time. The funded component's share of the obligations was 12% as at the end of 2015, and is projected to increase to 14% by 2025 and to 19% by 2075.

**Table 9 Open Group Modified Balance Sheet – Best-Estimate Scenario
 (9.9% contribution rate)**

Present Value (PV) as at 31 December (in \$ billion) ⁽¹⁾	2015	2025
Pay-As-You-Go Component		
<i>Assets = Obligations</i>		
PV of Future Contributions that Cover Future Expenditures =	2,251	3,013
PV of Future Expenditures Covered by Future Contributions (a)		
<i>No asset excess (shortfall) exists for pay-as-you-go component.</i>		
Funded Component		
<i>Assets</i>		
PV of Future Contributions in Excess of Future Expenditures	11	0
<u>Current Assets</u>	285	476
Total Assets for funded component (b)	296	476
<i>Obligations</i>		
PV of Future Expenditures Not Covered by Future Contributions (c)	295	483
Asset excess (shortfall) with respect to funded component (d) = (b) - (c)	1	(7)
Total Plan		
Total Assets (e) = (a) + (b)	2,547	3,489
Total Obligations (f) = (a) + (c)	2,546	3,496
Total Asset Excess (Shortfall) (g) = (e) - (f)	1	(7)
Total Assets as a Percentage of Total Obligations (h) = (e)/(f)	100.1%	99.8%
Component Obligations as a Percentage of Total Obligations:		
Pay-As-You-Go (a)/(f)	88%	86%
Funded (c)/(f)	12%	14%

(1) Obligations include operating expenses.

The present values in Table 9 were determined using a discount rate equal to the expected nominal rate of return on the CPP assets (average of 5.9% over the 75-year period 2016-2090, and ultimate of 6.0% for 2025 and thereafter). This methodology is similar to the one used for the Trustees Reports on the OASDI program in the United States, where the open group balance sheet entries are determined by discounting the program's future contributions and expenditures using the effective yield on the trust fund assets. However, the cash flows of the pay-as-you-go component are not invested and depend on the demographic and economic factors other than market returns. Therefore, it could be argued that the use of the expected return on the CPP assets as a discount rate for the pay-as-you-go component may not be appropriate.

It is desirable for the discount rate used to determine the present values of future cash flows of a pension system to reflect growth in the system's financing base. Settergren and Mikula (2005) suggest that for a pure pay-as-you-go system that is financed by contributions only, such a discount rate should be equal to the growth in the contributory base. The financing base

of a partially funded system, such as the CPP, has two components: future contributions (contributory base) and the invested assets of the system. As such, discounting the cash flows of the pay-as-you-go component using the growth in the contributory base and discounting the cash flows of the funded component using the expected return on the CPP assets represents a reasonable choice.

The nominal growth in the contributory base consists of three components: growth in the real-wage increase, inflation and growth in the number of contributors. Based on the best-estimate assumptions of the 27th CPP Actuarial Report, the average nominal growth in the contributory base over the 150-year period is 3.7%, or 1.7% in real terms. Table 10 compares an open group modified balance sheet as at 31 December 2015 with the pay-as-you-go component's cash flows discounted using the growth in the contributory base and the expected rate of return on the CPP assets. The funded component's cash flows are discounted using the rate of return on the invested CPP assets in each case. It is worth repeating that the projection period is limited to 150 years.

Table 10 Open Group Modified Balance Sheet – Alternative Discount Rates
 (9.9% contribution rate)

	Discount Rate for Pay-As-You-Go Component	
	Growth in Contributory Base (3.7%)	Nominal Rate of Return on the CPP Assets (6.0%)
Present Value (PV) as at 31 December 2015 (in \$ billion) ⁽¹⁾		
Pay-As-You-Go Component		
<i>Assets = Obligations</i>		
PV of Future Contributions that Cover Future Expenditures =		
PV of Future Expenditures Covered by Future Contributions (a)	6,883	2,251
<i>No asset excess (shortfall) exists for pay-as-you-go component.</i>		
Funded Component⁽²⁾		
<i>Assets</i>		
PV of Future Contributions in Excess of Future Expenditures	11	11
<u>Current Assets</u>	285	285
Total Assets for funded component (b)	296	296
<i>Obligations</i>		
PV of Future Expenditures Not Covered by Future Contributions (c)	295	295
Asset excess (shortfall) with respect to funded component (d) = (b) – (c)		
	1	1
Total Plan		
Total Assets (e) = (a) + (b)	7,179	2,547
Total Obligations (f) = (a) + (c)	7,178	2,546
Total Asset Excess (Shortfall) (g) = (e) – (f)	1	1
Total Assets as a Percentage of Total Obligations (h) = (e)/(f)	100.0%	100.1%
Component Obligations as a Percentage of Total Obligations:		
Pay-As-You-Go (a)/(f)	96%	88%
Funded (c)/(f)	4%	12%

(1) Obligations include operating expenses.

(2) Discounted at the nominal rate of return on the CPP assets.

Since the rate of growth in the contributory base is lower than the assumed rate of return on the CPP assets, the pay-as-you-go component assets and obligations are much higher if the rate of growth in the contributory base is used as the discount rate. However, the Plan's asset excess or shortfall is generated only by the funded component and remains the same regardless of which discount rate is used for the pay-as-you-go component. Therefore, although the total Plan's obligations increase from \$2.5 trillion to \$7.2 trillion, the asset excess remains at \$1 billion.

The funded component's share of the total obligations decreases to 4% if the growth in the contributory base is used as a discount rate for the pay-as-you-go component. While the funded component may appear to be small, the impact of the Plan's exposure to financial market risk on the stability of the CPP contribution rate should not be underestimated. Both short-term and long-term negative market experiences could result in an increase in the MCR above the legislated rate of 9.9%, as illustrated in Appendix B – Uncertainty of Results of the 27th CPP Actuarial Report.

V. Sensitivity Analysis

The financial sustainability of a partially funded social security system is affected by various factors such as a country’s economic growth, its demographic profile, as well as the ability of the system’s assets to generate sufficient investment income. Different environments impact a system’s contributions and/or expenditures, as well as assets needed to pay its expenditures. These impacts vary as to their extent and timing. For example, the economic growth of a country affects its system’s contributions and expenditures through labour force participation rates, the unemployment rate, and the growth in participants’ earnings. While the fluctuations in these factors have an immediate impact on the system’s contributions, there could be some time before the effect on expenditures is seen.

This subsection discusses the impacts of different demographic, economic and financial market environments other than those assumed under the best-estimate scenario on the assets and obligations of the Plan as assessed under the open group and closed group without future accrual approaches. For the remainder of this section, the terms “closed group without future accruals” and “closed group” are used interchangeably.

The impacts are illustrated using the low-cost and high-cost assumptions for the total fertility rate, mortality rates, real wage increase and real rate of return on assets, as considered in the 27th CPP Actuarial Report. Table 11 below summarizes the assumptions used. The alternative scenarios are described as lower/higher regarding the assumptions used, as well as low/high cost in terms of the resulting MCRs.

Table 11 Individual Sensitivity Tests

	Scenario	Assumption	
Total Fertility Rate (number of children per woman)	Higher Total Fertility Rate - Low Cost	2.00	
	Best Estimate	1.65	
	Lower Total Fertility Rate - High Cost	1.30	
Mortality Rates		Life Expectancy in 2050 at age 65 (years) with assumed future improvements	
		<u>Males</u>	<u>Females</u>
	Higher Mortality Rates - Low Cost	20.9	23.2
	Best Estimate	23.3	25.6
	Lower Mortality Rates - High Cost	25.8	27.9
Real Wage Increase	Higher Real Wage Increase - Low Cost	1.8%	
	Best Estimate	1.1%	
	Lower Real Wage Increase - High Cost	0.4%	
Real Rate of Return (75-year average)	Higher Real Rate of Return - Low Cost	5.6%	
	Best Estimate	3.9%	
	Lower Real Rate of Return - High Cost	2.2%	

This subsection also introduces the concept of a “breakeven contribution rate”. The breakeven contribution rate is defined as the contribution rate that results in the elimination of the asset excess or shortfall under the open group approach, that is, the rate needed to be charged such that the obligations of the Plan would be equal to its assets under the open group approach. While the steady-state rate is defined as a rate that results in the asset to expenditure ratio being equal at two points of time, the breakeven contribution rate does not impose any restrictions on the relative sizes of asset and expenditures. However, the breakeven contribution rate will be affected by the length of the projection period used. As such, even if both rates are used in assessing the financial sustainability of the Plan, they are not necessarily

equal. The breakeven contribution rate under the best-estimate assumptions of the 27th CPP Actuarial Report is 9.89%, which is greater than the MCR (and steady-state rate) of 9.79%.

For the purpose of determining the actuarial assets and obligations shown in this section, the future cash flows are discounted using the assumed nominal rate of return on the CPP assets.

Total fertility rate

The balance sheets for the Plan under the higher and lower total fertility rate scenarios using the legislated 9.9% contribution rate are presented in Table 12. The higher total fertility rates result in a lower cost for the Plan as determined using the statutory steady-state valuation methodology, and vice versa. The MCR applicable for years 2019 and thereafter is determined to be 9.40% under the higher total fertility rate and 10.22% under the lower total fertility rate. These MCRs compare to the best-estimate MCR of 9.79%. The breakeven contribution rate is 9.3% for the higher total fertility rate scenario and 10.5% for the lower fertility rate scenario.

The higher total fertility rate leads to an increase in the number of contributors in the medium and long term and eventually to an increase in the amount of benefits paid in the long term. The total obligations of the Plan under the open group approach are higher, increasing from \$2.5 trillion under the best-estimate scenario to \$2.7 trillion. However, this increase is more than compensated by the higher assets as a result of higher contributions. In such a demographic environment, the asset excess increases to \$138 billion, and the total assets represent 105% of obligations.

In comparison, under the lower total fertility rate scenario, there are fewer contributors and thus eventually less benefits being paid, leading to lower total CPP obligations under the open group approach. However, a lower volume of contributions also leads to lower assets, which fall to a greater extent than the obligations. Thus, there is an asset shortfall of \$106 billion.

It could be concluded that the CPP balance sheet under the open group approach reflects the impact of a changing demographic environment on the financial state of the CPP.

Looking at the balance sheet under the closed group approach, it could be seen that it does not provide any information regarding the changing cost of the CPP under the alternative total fertility rate assumptions: both the asset shortfall of \$886 billion and assets as a percentage of obligations of 24.4% remain unchanged if the total fertility rate expectations change. This is a direct result of the backward-looking nature of the closed group methodology, which does not reflect the reliance of the Plan on future contributions as a major source of financing. The same conclusion could be reached with respect to any other assumption that impacts only future participants (for example, the migration rate).

**Table 12 Balance Sheet under Open and Closed Group without Future Accruals:
 Sensitivity to Total Fertility Rate**

As at 31 December 2015 (9.9% contribution rate, \$ billion)

Best Estimate Total Fertility Rate: 1.65 children per woman, MCR of 9.79%		
	<u>Closed Group without Future Accruals</u>	<u>Open group</u>
Total Assets	285	2,547
Obligations	1,171	2,546
Asset Excess/Shortfall	(886)	1
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	24.4%	100.1%
(a)/(b)		
Higher Total Fertility Rate: 2.00 children per woman, MCR of 9.40%		
	<u>Closed Group without Future Accruals</u>	<u>Open group</u>
Total Assets	285	2,819
Obligations	1,171	2,681
Asset Excess/Shortfall	(886)	138
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	24.4%	105.2%
(a)/(b)		
Lower Total Fertility Rate: 1.30 children per woman, MCR of 10.22%		
	<u>Closed Group without Future Accruals</u>	<u>Open group</u>
Total Assets	285	2,324
Obligations	1,171	2,430
Asset Excess/Shortfall	(886)	(106)
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	24.4%	95.6%
(a)/(b)		

(1) Percentages are calculated using unrounded values of the assets and obligations.

Mortality Rates

The balance sheets for the Plan under the higher and lower mortality rates scenarios using the legislated 9.9% contribution rate are presented in Table 13. The higher mortality rates result in a lower cost for the Plan as determined using the statutory steady-state valuation methodology, and vice versa. As shown in Table 13, the MCR applicable for years 2019 and thereafter is determined to be 9.46% under higher mortality rates and 10.10% under lower mortality rates. These MCRs compare to the best-estimate MCR of 9.79%. The breakeven contribution rate is 9.4% for the higher mortality rates scenario and 10.3% for the lower mortality rates scenario.

Under the higher mortality rates scenario, fewer individuals reach retirement age, and the payment period for beneficiaries is shorter. This scenario leads to lower expenditures mainly due to shorter durations of benefit payments. At the same time, since mortality rates before age 65 remain quite low, there is almost no change to the contributions stream. As at 31 December 2015, there is an asset excess of \$109 billion, and the total assets represents 105% of obligations.

The lower mortality rates scenario leads to higher life expectancies at age 65, and, therefore to higher expenditures. Once again, since the best-estimate mortality rates before age 65 are already very low, under this scenario there is almost no change to the contributions stream. As at 31 December 2015, there is an asset shortfall of \$89 billion, and the total assets represent 97% of obligations.

Contrary to the total fertility rate scenarios, the CPP balance sheet under the closed group approach is impacted by changes in the level of mortality. However, the impacts are much

lower than those emerging under the open group approach since younger generations who are affected the most by the changes in future mortality are either not included at all in the valuation or have low accrued-to-date benefits. As shown in Table 13, the asset shortfall under the closed group approach increases from \$886 billion under the best-estimate scenario to \$910 billion under the lower mortality rates scenario, an overall increase in the asset shortfall of \$24 billion. This compares to a change of \$90 billion under the open group approach: from a \$1 billion asset excess under the best-estimate scenario to an \$89 billion asset shortfall under the lower mortality rates scenario.

Table 13 Balance Sheet under Open and Closed Group without Future Accruals: Sensitivity to Mortality Rates

As at 31 December 2015 (9.9% contribution rate, \$ billion)

Best Estimate Total Mortality Rates		
Life expectancy at age 65 in 2050: 23.3 males and 25.6 females, MCR of 9.79%		
	<u>Closed Group without</u>	<u>Open group</u>
	<u>Future Accruals</u>	
Total Assets	285	2,547
Obligations	1,171	2,546
Asset Excess/Shortfall	(886)	1
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	24.4%	100.1%
(a)/(b)		
Higher Total Mortality Rates		
Life expectancy at age 65 in 2050: 20.9 males and 23.2 females, MCR of 9.46%		
	<u>Closed Group without</u>	<u>Open group</u>
	<u>Future Accruals</u>	
Total Assets	285	2,522
Obligations	1,147	2,413
Asset Excess/Shortfall	(861)	109
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	24.9%	104.5%
(a)/(b)		
Lower Total Mortality Rates		
Life expectancy at age 65 in 2050: 25.8 males and 27.9 females, MCR of 10.10%		
	<u>Closed Group without</u>	<u>Open group</u>
	<u>Future Accruals</u>	
Total Assets	285	2,567
Obligations	1,195	2,656
Asset Excess/Shortfall	(910)	(89)
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	23.9%	96.7%
(a)/(b)		

(1) Percentages are calculated using unrounded values of the assets and obligations

Real Wage Increase

Table 14 presents the balance sheets for the Plan under the higher and lower real wage increase scenarios using the legislated contribution rate of 9.9%.

Under the higher real wage increase scenario, higher earnings lead to higher contributions and eventually to higher benefits being paid. The immediate impact of higher contributions outweighs the later impact of eventual higher benefits and results in a lower MCR of 9.31% compared to the best-estimate MCR of 9.79%. Under the lower real wage increase scenario, lower earnings and lower contributions result in a higher MCR of 10.32%. The breakeven contribution rate is 9.4% for the higher real wage increase scenario and 10.4% for the lower real wage increase scenario.

The impacts of changes in the real wage increase on the financial state of the CPP as measured under the open group approach are consistent with the changes in the MCR determined under the statutory steady-state methodology. Under the higher real wage increase assumption, while both open group assets and obligations increase compared to the best-estimate scenario, the increase in assets outpaces the increase in obligations creating an asset excess of \$143 billion. Under the lower real wage increase assumption, the assets decrease more than the obligations, and there is an asset shortfall of \$87 billion.

Under the closed group methodology, the eventually higher benefits in a higher real wage increase environment result in higher obligations. At the same time, higher contributions are not reflected in the assets. Therefore, if the financial state of the CPP is assessed using the closed group approach, the change in the real wage increase expectations leads to conclusions that are opposite to those reached using the statutory methodology: the higher real wage increase results in a higher asset shortfall of \$913 billion, and the lower real wage increase results in a lower asset shortfall of \$853 billion.

**Table 14 Balance Sheet under Open and Closed Group without Future Accruals:
 Sensitivity to Real Wage Increase**

As at 31 December 2015 (9.9% contribution rate, \$ billion)

Best-Estimate Real Wage Increase: 1.10% per year, MCR of 9.9%		
	<u>Closed Group without Future Accruals</u>	<u>Open group</u>
Total Assets	285	2,547
Obligations	1,171	2,546
Asset Excess/Shortfall	(886)	1
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	24.4%	100.1%
(a)/(b)		
Higher Real Wage Increase: 1.80% per year, MCR of 9.31%		
	<u>Closed Group without Future Accruals</u>	<u>Open group</u>
Total Assets	285	3,233
Obligations	1,198	3,090
Asset Excess/Shortfall	(913)	143
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	23.8%	104.6%
(a)/(b)		
Lower Real Wage Increase: 0.40% per year, MCR of 10.32%		
	<u>Closed Group without Future Accruals</u>	<u>Open group</u>
Total Assets	285	2,079
Obligations	1,138	2,166
Asset Excess/Shortfall	(853)	(87)
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	25.1%	96.0%
(a)/(b)		

(1) Percentages are calculated using unrounded values of the assets and obligations

Real Rate of Return on Assets

Changes in financial market returns do not affect the stream of contributions and expenditures of Plan under the legislated contribution rate of 9.9%. However, returns do affect the second source of the Plan's revenues – investment income.

Under the higher real rate of return on assets scenario, higher investment income leads to a lower cost for the Plan with the MCR decreasing to 8.54% compared to the best-estimate MCR of 9.79%. Under the lower real rate of return on assets scenario, lower investment income results in a higher MCR of 11.05%. The breakeven contribution rate is 8.6% for the higher real rate of return scenario and 11.1% for the lower real rate of return scenario.

The amount of the obligations under both the open and closed group depends directly on the expected rate of return on assets, since the cash flows are discounted at this rate. Therefore, a higher expected real rate of return leads to lower obligations under both open and closed groups, and vice versa.

Under the open group, a higher expected rate of return leads to lower assets as a result of discounting at a higher rate. However, the decrease in assets is less than the decrease in obligations. As shown in Table 15, under the higher real rate of return scenario, the obligations under the open group approach decrease to \$1.5 trillion from \$2.5 trillion under the best-estimate scenario, and the assets decrease to \$1.7 trillion from \$2.5 trillion under the best-estimate scenario. These changes result in an asset excess of \$164 billion. Under the lower real rate of return scenario, there is an asset shortfall of \$621 billion.

Under the closed group approach, the higher real rate of return on assets scenario results in a lower asset shortfall of \$636 billion, and the lower real rate of return on assets scenario results in a higher asset shortfall of \$1,275 billion compared to the best-estimate scenario.

**Table 15 Balance Sheet under Open and Closed Group without Future Accruals:
 Sensitivity to Real Rate of Return on Assets
 As at 31 December 2015 (9.9% contribution rate, \$ billion)**

Best-Estimate Real Rate of Return: 75-year average of 3.9% per year, MCR of 9.79%		
	<u>Closed Group without</u>	
	<u>Future Accruals</u>	<u>Open group</u>
Total Assets	285	2,547
Obligations	1,171	2,546
Asset Excess/Shortfall	(886)	1
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	24.4%	100.1%
(a)/(b)		
Higher Real Rate of Return: 75-year average of 5.6% per year, MCR of 8.54%		
	<u>Closed Group without</u>	
	<u>Future Accruals</u>	<u>Open group</u>
Total Assets	285	1,656
Obligations	921	1,492
Asset Excess/Shortfall	(636)	164
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	31.0%	111.0%
(a)/(b)		
Lower Real Rate of Return: 75-year average of 2.2% per year, MCR of 11.05%		
	<u>Closed Group without</u>	
	<u>Future Accruals</u>	<u>Open group</u>
Total Assets	285	5,387
Obligations	1,560	6,008
Asset Excess/Shortfall	(1,275)	(621)
Total Assets as a Percentage of Obligations ⁽¹⁾ (%)	18.3%	89.7%
(a)/(b)		

(1) Percentages are calculated using unrounded values of the assets and obligations

The provisions of the *Canada Pension Plan*, including the regular review process by federal and provincial Ministers of Finance, ensure the continual monitoring and management of the financing of the Plan. The CPP is unique in terms of the structure and long-term nature of its obligations, the associated contributions and assets that must cover those obligations, and the dynamics between them. As such, ensuring the Plan's long-term financial sustainability requires regularly assessing the characteristics of and the relationship between its assets and obligations.

The sensitivity analysis presented in this section highlight the importance of managing the risks that the Plan could face from varying demographic, economic, and financial market environments. This analysis also highlights the importance of measuring the Plan's assets and obligations in a way that provides meaningful indications of how various risks may impact the financial state of the Plan. Measuring the Plan's assets and obligations using the open group approach provides information that properly reflects how changes in the economic, demographic and financial market environments affect the long-term sustainability of the CPP.

On the other hand, the analysis in this section demonstrates that the relationship between the assets and obligations of the CPP determined under the closed group without future accruals approach may provide incomplete information, as in the case of changes in the total fertility rate and level of mortality, or even misleading information, as in the case of changes in real wage increase expectations.

VI. Reporting on the Financial State of the Canada Pension Plan

The processes used to assess the financial sustainability of the CPP and the corresponding reporting are recognized around the world as best practices⁶.

A main tool used by the CPP stakeholders to assess the long-term financial sustainability of the Plan is the statutory actuarial reports prepared by the OCA. As discussed in Section II, the 1997 Amendments strengthened the CPP stewardship and accountability to Canadians. In particular, the frequency of both the statutory actuarial reports and the periodic reviews of the Plan by the federal and provincial Finance Ministers was increased from once every five years to every three years. By legislation, actuarial reports produced by the Chief Actuary are one of the main elements taken into consideration by the Finance Ministers when they perform their financial review of the CPP. These reports provide a comprehensive actuarial assessment of the financial state of the Plan. They include detailed projections of the Plan's future cash flows, the minimum contribution rates, as well as extensive discussion on the uncertainty of the results.

Further to the 1997 Amendments, the federal, provincial and territorial Finance Ministers took additional steps in 1999 to strengthen the transparency and accountability of actuarial reporting on the CPP. They endorsed regular independent peer reviews of the actuarial reports and consultations by the Chief Actuary with experts on the assumptions to be used in the reports.

As of 2018, there have been seven independent reviews performed. All information related these reviews can be found on the OCA website⁷.

The United Kingdom Government Actuary's Department, recognized for its expertise in the field of social security selects the members of the peer review panel through an open process and provides an independent opinion of the review. The term of references of the panel is to provide opinion on the following questions:

1. Is the professional experience of the Chief Actuary and his staff who worked on the report adequate for carrying out the work required?
2. Has the work been completed in compliance with the relevant professional standards of practice and statutory requirements?
3. Did the Chief Actuary have access to the information required to perform the valuation, and were relevant tests and analysis on the data completed as might be expected?
4. Were the actuarial methods and assumptions used in completing the report reasonable?
5. Does the report fairly communicate the results of the work performed by the Chief Actuary and his staff?

The most recent independent review of the statutory actuarial report on the CPP confirmed that the methods and assumptions used in the 27th CPP Actuarial Report were reasonable and the work of the Chief Actuary is of sound quality. The peer reviewers also provide

⁶ For examples of such recognition the reader is referred to the database of the International Social Security Association Good Practices https://www.issa.int/en_GB/good-practices as well as the paper of the Social Security Committee of the International Actuarial Association "Measuring and Reporting Actuarial Obligations of Social Security Systems" https://www.actuaries.org/CTTEES_SOCSEC/Papers/AOofSSS_FinalFormatted_27March2018.pdf.

⁷ <http://www.osfi-bsif.gc.ca/Eng/oca-bac/ipr-rip/Pages/default.aspx>

recommendations for future reports. Each recommendation is reviewed and considered by the OCA. Over the years, many of the recommendations have been incorporated into subsequent actuarial reports to provide Canadians with more information and to improve the quality and transparency of the actuarial reports.

To ensure the quality of actuarial reports, the Chief Actuary also consults with experts in the fields of demography, economics, and investments, and periodic CPP seminars are hosted by the OCA where such experts are present their views. The information and presentations from these seminars can be found on the OCA's website⁸.

In 2010, the Office of the Auditor General Canada (OAG) asked the management of the Department of Employment and Social Development Canada (ESDC, the CPP administrators) to include information on the actuarial obligations of the CPP to the notes of the CPP consolidated financial statements. As a result of cooperation between the OAG, ESDC, and the OCA, the decision was taken to provide further relevant and more complete information regarding the financing of the CPP, the long-term financial sustainability of the CPP as assessed by the statutory actuarial reports, and the actuarial balance sheets under both open and closed group approaches. It was felt such multiple disclosures will allow providing all stakeholders with accurate, appropriate and comprehensive information that enables informed decisions to be made.

Therefore, starting from the fiscal year ending 31 March 2011, the discussion on the long-term sustainability of the CPP appears in the notes to the CPP consolidated financial statements in both the CPP Annual Reports and the Public Accounts of Canada. Both sources provide the same information.

Initially, a single note to the CPP consolidated financial statements titled "Actuarial obligation in respect of benefits" was introduced. It discussed the financing approach of the CPP, the statutory methodology used by the Chief Actuary to assess the long-term sustainability of the Plan, and the actuarial balance sheets under both the open group and the closed group without future accruals. The emphasis was put on the statutory assessment and the results under the open group approach. To quote the initial note to the financial statements:

"The CPP was never intended to be a fully-funded plan... although the relative size of the unfunded obligation under the closed group may be used as a measure of the Plan's financial status, the key financial measure for evaluating the sustainability of the Plan is the adequacy and stability of the steady-state contribution rate over time. Due to the CPP's long-term and enduring nature, if the Plan's sustainability is to be measured based on its unfunded obligation, the open group approach that includes both future contributions and future benefits with respect to both current and future participants provides the more appropriate assessment of the Plan's financial status."

In 2015, the notes to the CPP consolidated financial statements were further modified to draw a clearer distinction between the financing of the CPP and its long-term sustainability as assessed by the Chief Actuary, and the information presented through the actuarial balance sheets. As a result, Note 13 on the "Financing of the Canada Pension Plan" concentrates on the description of the financing approach of the CPP and on the main results of the most recent actuarial report, including the sensitivity of these results to alternative demographic and economic environments. Note 14 on the "Actuarial Obligation in respect of benefits" presents the actuarial balance sheet under both open group and closed group approaches with the

⁸ <http://www.osfi-bsif.gc.ca/Eng/oca-bac/is-ci/Pages/default.aspx>

emphasis on the results under the open group. This note further stresses that “the financial sustainability of the CPP is not assessed based on its actuarial obligation in respect of benefits”.

In summary, the decision to include further relevant and more complete information using multiple disclosures in the CPP consolidated financial statements in the CPP Annual Reports and Public Accounts of Canada serves the objective of educating readers by providing meaningful information and explaining how different measures should be interpreted.

VII. Conclusion

Major amendments in 1997 led to a change in financing of the CPP from a pay-as-you-go basis to a form of partial funding called steady-state funding. The 1997 Amendments, and particularly steady-state funding, restored the Plan's financial sustainability for current and future generations. The purpose of the steady-state financing methodology is to produce an asset/expenditure ratio that is relatively stable over time.

From its inception, the CPP was never intended to be a fully funded plan. Instead, under steady-state funding, the goal is to build a reserve of assets such that investment income on this pool of assets will help to pay benefits when needed (for example, as the large cohort of baby boomers retires). The net cash flows of the Plan, that is, contributions less expenditures, are expected to be positive until 2020 inclusive, resulting in an increase in the Plan's assets and asset/expenditure ratio.

Although a number of approaches may be used to assess the Plan's financial state, the key financial measure for evaluating the Plan is the steady-state contribution rate, in particular its adequacy and stability over time.

Partially funded systems, as well as pay-as-you-go ones, represent social contracts where, in any given year, current contributors allow the use of their contributions to pay current beneficiaries' benefits. Such social contracts create claims for current and past contributors to contributions of future contributors. The proper assessment of the financial sustainability of a social security pay-as-you-go or partially funded system by means of its balance sheet should take into account these claims. The traditional closed group methodologies do not reflect these claims, since only current participants are considered. On the contrary, the open group approach accounts explicitly for these claims by considering the contributions and benefits of both the current and future system's participants.

Given the long-term nature of the CPP, the fact that its stewards are the federal, provincial and territorial governments, and the strong governance and accountability framework of the Plan, it is unlikely that the Plan would become insolvent. Therefore, if the Plan's financial sustainability is to be measured based on its asset excess or shortfall, it should be done so on an open group basis that reflects the partially funded nature of the Plan, that is, its reliance on both future contributions and invested assets as a means of financing future expenditures. The inclusion of future contributions and benefits with respect to both current and future contributors in the assessment of the Plan's financial state shows that the Plan is able to meet its financial obligations and is sustainable over the long term.

Future demographic, economic and financial market environments may differ from those assumed under the best-estimate scenario of the 27th CPP Actuarial Report, and, as such, may impact the Plan's finances differently. As different environments unfold over time, the Plan's stakeholders, as part of their regular reviews of the Plan, will need to consider the benefit and contribution structure of the Plan in light of how each side of the balance sheet is affected. As such, the measures that properly reflect the unique characteristics of the Plan's long-term obligations and the assets needed to meet those obligations, as well as the dynamics between them should be used in ensuring the long-term financial sustainability of the CPP.

The statutory actuarial reporting and the provision of further relevant and complete information using multiple disclosures in the CPP consolidated financial statements of the CPP Annual Reports and Public Accounts of Canada are aimed at providing all stakeholders with accurate, appropriate, and comprehensive information to enable informed decisions to be made.

VIII. Appendices

A. Principles to Guide Federal-Provincial Decisions on the Canada Pension Plan

This appendix presents the nine guiding principles that were formally put forth by the Plan's stakeholders as part of the CPP review of the late 1990s. At the time, the legislated contribution rate was set to increase to 10.1% (as mentioned in Principle 4) in accordance with a schedule of contribution rates, which was shown in the 13th Actuarial Report on the CPP as at February 1992 and shown or discussed in several subsequent actuarial reports. This schedule was later replaced by a revised schedule as part of the 1997 Amendments (see Table 2 in Section III.B). In addition, a Seniors Benefit (mentioned in Principle 2) had been proposed in the 1996 Federal Budget to replace the basic Old Age Security pension and Guaranteed Income Supplement in 2001, but which was revoked before it came into effect.

The nine guiding principles and the context surrounding them at the time of the review were as follows:

“Following extensive consultations across Canada on the Canada Pension Plan, governments agreed that they must put to rest the worries that Canadians have that their CPP pensions will not be there for them when they retire in the future. They therefore agreed that they must solve the problems facing the CPP quickly, and that they will be guided by the following principles in doing so:

1. The CPP is a key pillar of Canada's retirement income system that is worth saving.
2. The CPP is an earnings-related program. Its fundamental role is to help replace earnings upon retirement or disability, or the death of a spouse – not to redistribute income. The income redistribution role is the responsibility of the income tax system, the Old Age Security/Guaranteed Income Supplement/Seniors Benefit, and other income-tested programs paid from general tax revenues.
3. The solutions to the CPP's problems must be fair across generations and between men and women.
4. The CPP must be affordable and sustainable for future generations. This requires fuller funding and a contribution rate no higher than the already legislated future rate of 10.1 per cent. In deciding how quickly to move to this rate, governments must take economic and fiscal impacts into account.
5. Governments must tighten administration as the first step towards controlling costs.
6. Disability and survivor benefits are important features of the CPP. However, they must be designed and administered in a way that does not jeopardize the security of retirement pensions.
7. Any further benefit improvements must be fully funded.
8. CPP funds must be invested in the best interests of plan members, and maintain a proper balance between returns and investment risk. Governance structures must be created to ensure sound fund management.
9. Governments must monitor changing economic, demographic, and other circumstances which can affect the CPP, and act to respond to these changing conditions. Annually, Ministers of Finance should provide Canadians with the appropriate information so they can judge for themselves that the integrity and security of the CPP is being protected.

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