Issues Being Addressed in the 22nd Actuarial Report on the Canada Pension Plan as at 31 December 2006

Presentation to the Board of Directors of the Canada Pension Plan Investment Board

5 June 2006
Presentation

1. Purpose of the CPP Actuarial Report
2. Demographic and Economic Assumptions
3. Main findings
4. Steady-State Funding
5. Peer Review Process
7. Issues Looking Forward
Purpose of the CPP Triennial Actuarial Report

- 21st Actuarial Report Tabled by the Minister of Finance on 8 December 2004

- Inform on the current and projected future financial status of the Canada Pension Plan

- Calculate the steady-state contribution rate
Responsibilities of the Office of the Chief Actuary

CPP Act
- Statutory report & amendments
- Triennial financial review

Public Pensions Reporting Act

Chief Actuary
- Independent reviewers
- Outside experts (seminars)
- CIA Standards of Practice
- International Standards

CPP Stakeholders
- Federal – Provincial Committee

CPPIB

Public

Parliament

Treasury Board & Pension Advisory Committees

PSPIB

Office of the Chief Actuary
Bureau de l’actuaire en chef
1. Purpose of the CPP Actuarial Report
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Demographic Assumptions

- **Fertility**  
  (Number of births)

- **Migration**

- **Mortality**  
  *(Life expectancy)*

- Disability Rates  
- Retirement Rates  

}\ Benefit Assumptions

Age Profile of Canada's Population, 1951 & 2001
More contributors are expected to reach the retirement age of 65. Retirement beneficiaries are expected to receive their benefits for a longer period.
Working Age and Total Population (Canada)

(in millions)

2003


Total 20-64

Annual increases:

<table>
<thead>
<tr>
<th>Period</th>
<th>Total</th>
<th>20-64</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-2000</td>
<td>+1.1%</td>
<td>+1.4%</td>
</tr>
<tr>
<td>2000-2020</td>
<td>+0.8%</td>
<td>+0.8%</td>
</tr>
<tr>
<td>2020-2040</td>
<td>+0.5%</td>
<td>+0.1%</td>
</tr>
</tbody>
</table>

After 2025, almost all projected population increase will come from migration.
Economic Assumptions

• Participation rates
• Employment increase (Job creation rate)
• Unemployment rate
• Inflation rate
• Increase of average employment earnings
• Interest rate and rate of return by asset class

Sources: Historical trends, Recent experience, PEAP from U of T., Department of Finance estimates, Conference Board, Report on Canadian Economic Statistics by CIA, CPPIB, Watson Wyatt Economic Expectations Survey, CPP seminars
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Main Findings – 21st CPP Actuarial Report

• Despite the projected substantial increase in expenditures as a result of the aging of the population, the actuarial report confirms that the Plan will meet its obligations and remain financially sustainable over the projection period.

• From 2004 to 2021, contributions are more than sufficient to cover expenditures. (until 2014 for QPP)

• Asset/Expenditure ratio increases from 3.1 to 5.6 over that period and reaches 6.3 in 2050.
Main Findings – 21st CPP Actuarial Report

Asset/Expenditure Ratio

9.9% Legislated contribution rate
9.8% Steady-state rate

In 2020, CPP/QPP assets are projected to be equal to 17% of the GDP.
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4. **Steady-State Funding**
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CPP Steady-State Funding

- The current legislated contribution rate is 9.9%.
- The steady-state contribution rate is 9.8%.
- If the legislated contribution rate is higher than the steady-state rate, the funding status of the Plan will increase over time.
- The higher this rate is set above the steady-state rate, the faster the Plan will become more funded.
• If legislated contribution rate is lower than the steady-state rate AND if finance ministers cannot reach agreement on a solution, then default provisions apply:
  – Contribution rate increased by ½ of excess over three years, subject to maximum increase of 0.2% per year
  – Benefits frozen until next review (3 years)
  – At end of three years, next review performed to determine financial status of Plan.
Sources of Income

- CPP follows the 70:30 Rule (Contributions:Investment Earnings).
- When the A/E ratio reaches approximately 5.0, 30% of revenues will come from investment earnings.
- Sources of income of fully-funded pension plans are the opposite (the 30:70 Rule).

How annual benefits are paid

- Until 2022, contributions exceed benefits. Once the A/E ratio reaches about 5.0, annual contributions will equal approximately 90% of annual benefits paid.
# CPP Steady-State Funding

Percent of investment earnings used to pay benefits

<table>
<thead>
<tr>
<th>Year</th>
<th>Contribution Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.8%</td>
</tr>
<tr>
<td>2030</td>
<td>27%</td>
</tr>
<tr>
<td>2040</td>
<td>31%</td>
</tr>
<tr>
<td>2050</td>
<td>34%</td>
</tr>
</tbody>
</table>
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Independent Peer Review Process

- Auditor General and Selection Process
- Overseeing of the Peer Review by the UK Government Actuary’s Department
- The Independent Review Panel confirmed:
  - That actuarial standards of practice were met;
  - That assumptions were reasonable;
  - That the report fairly communicates the results;
  - The actuarial conclusions reached by the Chief Actuary about the soundness of the CPP.
- and made a series of recommendations.

March 2005
Strengthening the Accountability

- Federal and provincial governments took meaningful steps to strengthen the transparency and accountability of actuarial reporting. They endorsed:
  - an increase in the frequency of actuarial reporting from every five years to every three years;
  - regular consultations by the Chief Actuary with experts on assumptions to be used in actuarial reports;
  - regular peer reviews of future actuarial reports on the CPP.
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CPP Actuarial Report as at 31 December 2006

- Stochastic analysis
  - Determine confidence intervals for assumptions such as fertility, migration, wages increases, investment returns
- Uncertainty of results
  - A new section will be added explaining the uncertainty involved in estimating future contribution rates
- CPP reference portfolio and asset mix
- Assumptions influenced by the opinion of the peer reviewers
Historical Fertility Rate

(Children per woman)

Geometric Mean (1941-2002) = 2.5

Geometric Mean (1977-2002) = 1.6
Fertility Rates (1977-2002)

Steady-State between 10.1% and 9.5%

Stochastic Analysis 20-year periods

High-Cost 1.3
Low-Cost 1.9

µ = 1.62
σ = 0.02
Historical Net Migration Rates

Geometric Mean (1972-2003) = 0.5%
Net Migration Rates (1972-2003)

Steady-State between 9.9% and 9.6%

Stochastic Analysis
20-year periods

μ = 0.50%
σ = 0.05%
Historical Increase in Real Wages

Geometric Mean (1924-2003) = 1.4%
Real Wage Increase (1924-2003)

Stochastic Analysis
20-year periods

Steady-State between 10.3% and 9.2%

4%  84%  12%

\( \mu = 1.4\% \)
\( \sigma = 0.5\% \)
Historical Canadian Equity Return

Geometric Mean (1939-2003) = 6.0%
\[ \sigma = 16.4\% \]
Real Rates of Return (1939-2003)

Steady-State between 10.3% and 9.3%

Stochastic Analysis
20-year periods

CPP 21 Projected Asset Mix

$\mu = 5.7\%$

$\sigma = 2.4\%$

-1.8%  0.7%  3.2%  4.1%  5.7%  8.1%  10.6%  13.1%

15%

26%

3.1%

5.1%

59%
Real Rates of Return (1938-2005)

Stochastic Analysis
20-year periods

CPP 21 Projected Asset Mix

14%
24%
62%

μ = 5.8%
σ = 2.5%

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Uncertainty of Results and potential volatility of future contribution rates

Recommendation #4: Apply more sophisticated stochastic analysis to develop more consistent sensitivity tests.
Asset Mix Assumption (CPP 21)

- Peer review of CPP 18 stated that CPPIB has not yet adopted a long-term asset mix policy.
- Short-term asset mix was provided in the CPPIB Annual Report for fiscal year 2004.
- Expected asset mix in fiscal year 2006
  - 35% fixed income securities
  - 65% variable income securities
- Since OCA takes a long-term view of the CPP, it is necessary to formulate a long-term assumption about the CPPIB asset mix even though little guidance was provided by the CPPIB at that time. In that regard, the OCA most welcomes the concept of a notional CPP reference portfolio.
Asset Mix Assumption (CPP 21)

• From 2006-2020
  – 65% Variable Income
  – 35% Fixed Income

• Transition period from 2021-2024
  (*QPP transition period from 2015-2025: 70%-30% to 60%-40*)

• After 2025
  – 55% Variable Income
  – 45% Fixed Income
**Alternative Asset Mix Scenarios**

« A 65-35 Policy Embodies Stewards’ Revealed Risk Preference »

<table>
<thead>
<tr>
<th></th>
<th>100% Equities</th>
<th>CPP 21 (65%-35%)</th>
<th>100% Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contribution Rate</strong></td>
<td>9.5%</td>
<td>9.9%</td>
<td>10.5%</td>
</tr>
<tr>
<td><strong>Expected Net Cash Flow 2007-2016</strong></td>
<td>$24.4 B</td>
<td>$40.2 B</td>
<td>$63.9 B</td>
</tr>
<tr>
<td><strong>Last Year of Positive Net Cash Flow</strong></td>
<td>2018</td>
<td>2021</td>
<td>2026</td>
</tr>
<tr>
<td><strong>Percent of Investment Earnings to Pay Benefits in 2050</strong></td>
<td>41.2%</td>
<td>29.2%</td>
<td>22.7%</td>
</tr>
</tbody>
</table>
### Sustainability of the 9.9% Contribution Rate Under Extreme Conditions for the next 6 years (2004-2009)

<table>
<thead>
<tr>
<th>Asset Mix of CPP 21</th>
<th>Steady-State Rate</th>
</tr>
</thead>
</table>
| **Lowest real rate of return**  
(1969-1974)  
-3.8% | 10.0%  |
| **Long-term real rate of return**  
4.1% | 9.8%  |
| **Highest real rate of return**  
(1993-1998)  
16.3% | 9.4%  |
Real Rates of Return (1938-2005)

Stochastic Analysis
Consecutive 6-year periods

25%
12%
3.1%
5.1%
4.1%
63%

CPP Reference Portfolio
(10% Real Return Bonds)

μ = 6.3%
σ = 4.8%
Real Rates of Return (1938-2005)

Stochastic Analysis
20-year periods

CPP Reference Portfolio
(10% Real Return Bonds)

μ = 5.8%
σ = 2.7%
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Securing the Canada Pension Plan
Issues Looking Forward

• Economic value of the pension promise

• Actuarial study on optimal funding of the CPP
Economic Value of Pension Promise

• What would be the implications of purchasing a benefit equal to the CPP in the private annuity market?

<table>
<thead>
<tr>
<th>Annuitant</th>
<th>Maximum CPP Benefit ($)</th>
<th>Private Annuity Lump Sum ($) 1</th>
<th>Implied Real Rate of Return 2</th>
<th>Implied CPP Lump Sum ($) 3</th>
<th>Implied/Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male, 60</td>
<td>570</td>
<td>137,496</td>
<td>0.70%</td>
<td>91,894</td>
<td>67%</td>
</tr>
<tr>
<td>Male, 65</td>
<td>814</td>
<td>167,628</td>
<td>0.17%</td>
<td>112,213</td>
<td>67%</td>
</tr>
<tr>
<td>Female, 60</td>
<td>570</td>
<td>151,816</td>
<td>1.05%</td>
<td>101,726</td>
<td>67%</td>
</tr>
<tr>
<td>Female, 65</td>
<td>814</td>
<td>187,467</td>
<td>0.82%</td>
<td>128,430</td>
<td>69%</td>
</tr>
</tbody>
</table>

1. Cost of purchasing an annuity that will provide monthly benefit equal to max CPP benefit
2. Implied rate of return on annuity purchased in the private market if CPP mortality assumptions are used
3. Cost of purchasing an annuity that earns the return assumed in CPP21 and assumes CPP mortality

• Only 2/3 of the CPP benefit can be provided by an insurance provider for the same capital.
### Normal Cost vs Rate of Return

<table>
<thead>
<tr>
<th>Rate of Return</th>
<th>Normal Cost *</th>
<th>Liabilities (in billions)</th>
<th>Funded Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(as % of contributory earnings)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1%</td>
<td>5.5%</td>
<td>$584</td>
<td>11.6%</td>
</tr>
<tr>
<td>3.5%</td>
<td>6.5%</td>
<td>$649</td>
<td>10.4%</td>
</tr>
<tr>
<td>3.0%</td>
<td>7.5%</td>
<td>$710</td>
<td>9.5%</td>
</tr>
<tr>
<td>2.5%</td>
<td>8.9%</td>
<td>$781</td>
<td>8.7%</td>
</tr>
<tr>
<td>2.0%</td>
<td>10.1%</td>
<td>$863</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

* Normal cost for calendar year 2004
Optimal Funding of the CPP

• OCA Actuarial Study
• Examine different ways and objectives of funding a social insurance scheme
• Discuss history and funding of the CPP
• Examine appropriateness and robustness of CPP steady-state funding methodology using sensitivity analysis