**Is There an Optimal Level of Pre-Funding? --**
**Optimal Funding of the Canada Pension Plan**
**Presentation at the 28th International Congress of Actuaries, Paris**
**Office of the Chief Actuary, Office of the Superintendent of Financial Institutions**
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Good afternoon. It's a pleasure to be here to talk about optimal funding of social insurance schemes and specifically, of the Canada Pension Plan.

**Objectives of the Canadian Retirement Income Security System *(Slide 3)***
There are three main levels of the Canadian Retirement Income Security System and each level has its own objectives. Old Age Security provides a minimum income benefit at retirement for seniors. This benefit is clawed back through the tax system if the recipient's total income is above a certain level. OAS also provides other benefits including the Guaranteed Income Supplement, which is an income-tested benefit, and the Spousal Allowance.

The objective of the Canada and Québec Pension Plans is to replace 25% of the individual's pre-retirement earnings up to the average of the last five years of the Yearly Maximum Pensionable Earnings, which was $40,540 from years 2002-2006.

Finally, the objective of employer pension plans and private savings, in the forms of Registered Pension Plans and Registered Retirement Savings Plans is to increase retirement savings through tax incentives.

**Funding of the Canadian Retirement Income Security System *(Slide 4)***
At retirement, most Canadians will receive an income from one or both of the following pension schemes. The Old Age Security Program is financed on a pay-as-you-go basis, which means that there is no fund. The Canada Pension Plan, which is similar to the Québec Pension Plan, is financed through contributions paid in equal parts by the employer and employees. The contribution rate of 9.9% in 2005 and thereafter will provide Plan's assets equal to approximately 25% of the Plan's liability within about 15 years. Lastly, private pension plans and RRSPs are fully funded, which means that each generation pays for its own benefits.
A Given these three main sources of income for citizens over 65 years of age, it is reasonable to say that the Canadian system is funded at 40% to 45% of future liabilities. A diversified funding approach allows Canada's retirement income system to be less vulnerable to changes in economic and demographic conditions

than systems in countries that use a single funding approach. In addition, the Canadian approach based on a mix of public and private pensions is an effective way to provide for retirement income needs, according to international organizations.

**Seniors' Income by Source *(Slide 5)***
Over time, the composition of seniors' income has changed, with the three pillars composing different proportions. This has coincided with a substantial fall in poverty rates among the elderly resulting in part from changes to the public pensions. Between 1981 and 2003, CPP and QPP benefits doubled as a proportion of seniors' income from 10% to 20%, and employer and private plan income nearly tripled from 12% to 34%. As a percentage of GDP, total seniors' income increased from 6% to 8%.

Even though the Canadian population is aging and public pension expenditures are expected to continue to increase, due in large part of course by the retirement of the baby boomers, it is also the case that Canada has shown the largest budgetary improvements of any of the other G-7 countries over the past decade. The Canadian Government continues to balance the budget and reduce the debt as a proportion of gross domestic product. Together, these are effective ways to ensure sustainable financing of Old Age Security funded from the Government's Consolidated Revenue Fund.

**CPP 1997 Reforms – Reasons *(Slide 6)***
The 1997 Reforms to the CPP were necessary due to four main factors: the aging of the population, the under-financing of the plan, insufficient assets, and intergenerational equity. Increased longevity and the retirement of the baby boom generation were beginning to lead to aging of the population, which was decreasing the ratio of the number of workers to retirees. Falling fertility rates, more early retirements and higher disability rates were causing the Plan to be underfinanced. The assets were insufficient to cover future obligations because from 1982 to 1996, the contribution rates were lower than the PayGo rates. Intergenerational equity was not being maintained.

Due to these problems in the CPP, joint public consultations on the Canada Pension Plan were held in 1996 as part of the federal/provincial review of the plan. Guided by panels of cross-country elected representatives, the purpose of the consultations was to seek public input on changes to the CPP to ensure its sustainability for future generations of Canadians. A number of themes emerged

during the public consultations. The key recurring theme was that most Canadians believe in the CPP and want it preserved.

**CPP 1997 Reforms *(Slide 7)***

Therefore, in 1997, the provincial and federal governments agreed to change the funding approach of the Plan to a hybrid of pay-as-you-go and full funding, called steady-state funding. Moving to a full-funding approach would have created unfairness across generations. During the transition, contributors of some generations would have paid higher contributions than others – they would have had to pay for the benefits of current retirees while simultaneously saving for their own retirement. A pure pay-as-you-go approach would also have been unfair, as it would have meant a sharp increase in the contribution rate over the coming decades. As a result of the consultation, the contributions were increased, the future growth of benefits was reduced and the CPP Investment Board was created to invest the funds not required by the CPP to pay current benefits. To improve accountability and transparency to the public, the frequency of actuarial and financial reviews of the Plan was increased to a triennial basis.

**Steady-State Contribution Rate *(Slide 8)***

Steady-state funding requires that the contribution rate be set no lower than the lowest expected rate to ensure the long-term financial stability of the Plan without recourse to further rate increases. The current steady-state funding is expected to generate contributions that exceed the benefits paid out every year between 2004 and 2021. Funds not required to pay benefits are transferred to the CPP Investment Board for investment. As a result, Plan assets will cover an increasing number of years of expenditures over this period to more than five years after 2020.

*For bullets 2 and 3: text is self-explanatory.*

**Steady-State Funding – Legislated Rate > Steady-State Rate *(Slide 9)***

At the time of the amendments and according to the actuarial report produced in September 1997, the steady-state rate contribution rate was deemed to be 9.9% in 2003 and to remain at that level thereafter. As a result, the legislated contribution rate is 9.9%. Under the last actuarial report, the steady-state rate now stands at 9.8%. If the legislated contribution rate is higher than the calculated 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 as it is shown in this graph:

**Steady-State Funding – A/E Ratio *(Slide 10)***
Over time, this will create a large enough reserve to help pay the growing costs that are expected as more and more baby boomers begin to collect a retirement pension. CPP and QPP assets are projected to represent 17% of the GDP by 2020.

**Steady-State Funding – Legislated Rate < Steady-State Rate (Default Provisions) *(Slide 11)***
This leads me to the other side of the coin. What could happen if, in future actuarial reports, the calculated steady-state contribution rate is higher than 9.9%? The default provisions in the *Canada Pension Plan* Act may result in adjustments being made to the contribution rate and, perhaps, benefits in payment if the federal and provincial governments reach no agreement in response to the actuarial determination of the steady-state contribution rate. If the new steady-state rate is 10.1%, one half of the excess of the new steady-state rate over the 9.9%, that is 0.1%, will apply to an increase in the contribution rate and the other half will apply to non-indexation of benefits in payment in order to keep the steady-state rate at 10.0%. In other words, the contributors and the beneficiaries would equally support the additional cost shown in the actuarial report.

**CPP 21st Actuarial Report – Purpose *(Slide 12)***
The Office of the Chief Actuary is required by law to produce an actuarial report on the Canada Pension Plan every three years. The report is one of the key items considered by federal and provincial finance ministers when reviewing and making recommendations on the CPP. The purpose of the report is to inform Plan members of the current and projected financial status. Another purpose is to calculate the steady-state contribution rate, which is the lowest rate sufficient to sustain the Plan without further increase. The projections included in this report cover a long period of time- 75 years and require assumptions on demographic factors such as fertility, migration and mortality.

**CPP 21st Actuarial Report – Main Findings *(Slide 13)***
In a time of rising doubts about the sustainability of pension plans, one of the main findings of the actuarial report tabled in December 2004 by the Minister of Finance is: *"Despite the projected substantial increase in expenditures as a result of the aging of the population, the Canada Pension Plan is expected to be able to meet its obligations and remain fully sustainable over the projection period*."

*Rest of the slide: text is self-explanatory.*

**Independent Peer Review – Process *(Slide 14)***
In 1999, federal and provincial finance ministers took additional steps to strengthen the transparency and accountability of actuarial reporting on the CPP. They endorsed regular peer reviews of such reports and consultations by the Chief Actuary with experts on the assumptions to be used in actuarial reports. These peer reviews are conducted as part of an internal quality control process. The statutory actuarial reports are prepared by Fellows of the Canadian Institute of Actuaries and are co-signed with the Chief Actuary to enhance the internal quality control process.

In addition, in the past a panel outside of our office was selected by another office of which we are a part – the Office of the Superintendent of Financial Institutions. However, due to a heightened sensitivity to the need for independence in this process, we felt that the selection of the panel should be independent of OSFI. As suggested by the Auditor General, we entered into an agreement with the United Kingdom Government Actuary's Department to select a panel of independent Canadian actuaries who would perform the peer review and to provide an opinion on the work done by the reviewers once the peer review is completed.

This independent panel of actuaries released a report in March 2005 confirming that the work of the Chief Actuary meets professional standards of actuarial practice. The Review Panel found that the assumptions used by the Chief Actuary were reasonable and within acceptable ranges. The Review Panel also supported the actuarial conclusions reached by the Chief Actuary about the soundness of the Canada Pension Plan. The Review Panel report made a series of recommendations dealing with data, methodology, assumptions and communication of results.

**Independent Peer Review – Recommendations *(Slide 15)***
Two of these recommendations were as follows: A that the Chief Actuary would review the steady-state funding methodology A and that the Chief Actuary would keep the finance ministers informed of research done by our office on optimal funding of social insurance schemes. We are in the process of implementing these recommendations by way of an optimal funding study of social insurance schemes, and particularly on the CPP.

**Optimal Funding of Social Insurance Schemes – Types and Objectives *(Slide 16)***
Before discussing our optimal funding study, I would like to talk generally about optimal funding of social insurance schemes. There are three ways to fund such schemes, from pure pay-as-you-go, to partial funding, to full funding at the other

extreme. The PayGo contribution rate is the ratio of total scheme expenditures to total insured or contributory earnings. For a fully funded scheme, the contribution rate at a given point in time is determined based on the discounted value of future benefits.

The funding method chosen will depend on the given objective, that is, whether to stabilize and/or minimize the contribution rate or to stabilize the funding level. The Canada Pension Plan is partially funded. In general, a scheme may be partially funded in order to respond to changing demographics or to stabilize and minimize the contribution rate over the long term. Depending on the expected future demographic and economic environment, it may be appropriate to partially fund a scheme, especially in the context of low wage growth and high interest rates.

**Criteria for Choosing a Funding Method – Contribution Rate *(Slide 17)***
The contribution rate for a public pension scheme will be affected by demographic and economic factors and so will vary over time. The impact of these fluctuations will be especially felt for defined benefit schemes. However, although the rate is subject to change, a stable contribution rate is generally considered desirable for the followings reasons:

- to reinforce the contribution/benefit link (assuming a stable benefit level),
- to distribute costs more equally across generations (especially in the context of an aging population)
- to strengthen fiscal discipline and governance by way of early recognition of the long-term implications of plan amendments (that is, modifying the contribution rate at the time of the introduction of amendments), and
- to promote greater confidence in the scheme.

When investment returns are higher than the growth in earnings, a higher level of funding is deemed more appropriate. The reason is that in this environment, the revenue generated from investment earnings will help reduce the need to raise the contribution rate in the future. On the other hand, when investment returns are lower than growth in earnings, a pay-as-you-go funding strategy is deemed a more efficient strategy.

**Economic Variables Influencing In/Outflows of a Pension Plan *(Slide 18)***
This schematic shows the inflows, outflows, and resulting reserve of a pension plan. Inflows come from contributions and investment income. Contributions are affected by the growth in the workforce and in wages, which is in turn affected by

inflation. Investment income is affected by interest rates, which are also affected by inflation.
Total outflows are comprised of benefits paid and administrative costs. Benefits are affected by wage growth and inflation, and administrative costs also rise with inflation. The difference between total inflows and outflows is the reserve.

**Impact of Demographic and Economic Environment on Contribution Rate, Canada *(Slide 19)***
The 1960s environment in Canada favoured PayGo financing of social security plans since real interest rates were not greater than real wage increases. However, in the 1990s real interest rates were greater than real wage growth, and so PayGo financing was not favoured; instead, fuller funding was preferred. This is reflected in the table by the change in costs of public retirement benefits between the two periods.

**Financial Point of View *(Slide 20)***
We may consider a social insurance scheme from a financial perspective. Specifically, to optimize a scheme we could examine the relation between the real rate of return and wage growth. The return on investments higher than the increase in total contributory earnings would indicate that partial funding may be appropriate.

**PayGo Versus Full Funding – Factors that Determine the Contribution Rate *(Slide 21)***
The contribution rate will be affected by factors in different ways depending on the funding method chosen. Expenditures will be affected by the growth in benefits and will tend to increase in the years following the inception of the scheme. This will tend to increase the PayGo rate. Higher rates of earnings growth will tend to decrease the PayGo rate, while more benefits paid out, especially for an aging population, will cause the rate to increase. Over time, as the scheme matures, gradual variations in the rate will occur.

For a fully funded defined benefit scheme, the contribution rate is reviewed periodically to take into account future service accrual, expected outcomes versus actual experience and any past liabilities. Such periodic adjustments result in more short-term variations in the rate.

**Demographic and Economic Trends of OECD Countries – Observations *(Slide 22)***

Canada as well as other developed countries are all expected to face increasingly older populations in the future. The old-age dependency ratio will increase substantially, largely due to the aging of the baby boomers. Although there have been steady increases in the labour force in the past resulting from the entry of the boomers and higher participation rates of women, this growth has slowed. Moreover, the economic environment has changed – wage growth has slowed to rates lower than interest rates in Canada, the U.S. and other countries.

**Demographic and Economic Trends of OECD Countries – Conclusions *(Slide 23)***

The combination of aging populations and volatile economic environments have presented difficulties for PayGo schemes and shown the increased importance of funding. A level of funding provides a measure of security against volatile contribution rates in light of uncertain future wage increases and investment returns. PayGo schemes are especially sensitive to demographic changes, whereas fully funded schemes are less so. However, demographic changes may have an indirect impact on fully funded schemes by way of changes in the economy. For instance, liquidation of savings by the boomers in retirement could affect investment returns.

**Wage increases and Rates of Return in Canada (1960-2005) *(Slide 24)***

In Canada prior to 1980, wage growth was rapid. However, since 1980 wage growth has slowed substantially, and has been less than long-term interest rates and investment returns. Note that a negative correlation exists between wage growth and rates of return.

**Optimal Funding of the CPP Study (OFS) – Purpose *(Slide 25)***

Our optimal funding study, though focussing on the Canada Pension Plan, will also discuss optimal funding of social insurance schemes in general. With respect to the Plan, the study will focus on the continued appropriateness and robustness of the steady-state funding methodology by way of sensitivity analysis.

**OFS – Sensitivity Analysis Overview *(Slide 26)***

Various sensitivity tests will be performed for the study. Presented here is an overview of initial analysis performed, broken down by type of scenario. These scenarios are variations of the best-estimate case as presented in the 21$^{st}$ CPP Actuarial Report. Demographic and economic assumptions were changed accordingly from their best-estimates, holding all other assumptions equal. Each

scenario represents a stressor to the best-estimate case to analyze the effect on the steady-state rate and more generally, the long-term financial sustainability of the Plan. I will next discuss the results of these tests.

**Young Scenarios PayGo Rates *(Slide 27)***

If the Canadian population is younger than expected in the future as a result of higher fertility and migration rates and decreased longevity, what would be the effect on the PayGo and steady-state rates of the Plan? A The PayGo rate would be lower and stable, and the steady-state rate would fall by half a percentage point. If we then push this scenario A to the extreme with a much younger population combined with strong economic growth early on, then the impact is immediate with a large drop in the PayGo rate to below 8%, and a 2.2 percentage drop in the steady-state. In such as environment, the old-age dependency ratio would fall, unemployment would be low, labour force participation rates high, and real wage increases would also be high. All these conditions would lead to higher contributions to the Plan and lower benefits paid out.

**Young Scenarios Funded Ratios *(Slide 28)***

Since the 1997 Reforms, the Plan has been moving away from pay-as-you-go toward fuller funding. Under the best-estimate projection, the funding level of the Plan is expected to reach about 25% by 2025. With a younger population, the funding level would increase significantly if the current legislated contribution rate of 9.9% was maintained. In the extreme case of a much younger population with economic growth, the Plan would become fully funded by 2070.

**Young and Old Scenarios PayGo Rates *(Slide 29)***

In contrast, what would happen if the population were older than expected, or much older under an environment of economic stagnation? A If the population was simply older, then the PayGo would increase over time and the steady-state rate would also increase. In the extreme case, A the PayGo rate would be unstable and significantly increase to about 19% by the end of the projection period. The steady-state rate would increase by almost 2 percentage points and would exceed the legislated rate. In this environment, the old-age dependency ratio would rise, unemployment would be high, and labour force participation rates and real wages increases would be low. These conditions would result in lower contributions to the Plan and higher benefits paid out.

**Young and Old Scenarios Funded Ratios *(Slide 30)***

The funded ratio would be affected adversely in these cases. Under an older population, the legislated rate would be insufficient to stop the fund from being

depleted by 2074. With a much older population combined with economic stagnation, the fund would be depleted much sooner – by 2040. The financial reviews of the Plan by the ministers every three years provide a means for the ministers to monitor and take corrective actions as appropriate under such situations. As a further protective measure, the default provisions may also apply.

**Older Scenario Variations PayGo Rates *(Slide 31)***
Now, what would happen if the population were older and the markets' performance was even lower, and that at the extreme, there was no real wage growth? The effect on the PayGo rate would be significant and immediate, rising throughout the projection period. The steady-state rate would increase substantially to 13%. In such a case, what would it take to offset or at least mitigate such an environment? Raising the contribution rate would be difficult since it is linked with a certain income replacement level. If instead all Plan members were to retire later, at age 70, and at the same time labour force participation rates prior to age 70 increased, the PayGo rate would initially fall and then rise due to a delay in retirement benefits being paid out. The steady-state rate would also come back down to 9.9% - closer to its best-estimate value.

**Older Scenario Variations Funded Ratios *(Slide 32)***
The resulting funded ratios both before and after the retirement age change are shown here. Implementing the retirement age change prevents the fund from being depleted. In fact, the funded ratio improves in this case over the best-estimate projection, increasing to about 40% and remaining at that level for a large part of the projection period.

**Evolution of Steady-State Rate *(Slide 33)***
The steady-state rate depends on the PayGo rate over time. The PayGo rate is projected to increase gradually over time as Plan costs increase faster than contributory earnings. As it increases, the steady-state rate, which is recalculated every three years with each valuation, will also increase. As such, an unstable PayGo rate will tend to lead to instability in the steady-state rate. However, as mentioned earlier, default provisions exist within the Plan's legislation to deal with adverse outcomes as required. Although instability is present in the rates, the 1997 Reforms have ensured the long-term financial sustainability of the Plan by incorporating the aging of the population in addition to other factors.

**Demographic Impact on Funding Level (Slide 34)**
The degree of population aging will impact the level of funding required to sustain the Plan. The older the population, the lower the contributions and the higher the

benefits expenditures. This would require a higher level of funding. At the extreme, the Plan would be fully funded. Conversely, the younger the population, the lower the level of funding that would be required. If the population is young enough, the Plan could be sustained through pay-as-you-go funding.
Our study will attempt to determine the optimal demographic and economic conditions for different target funding levels.

**Real Total Earnings Growth and Rate of Return Impact on A/E Ratio, Funding Level *(Slide 35)***
Real total earnings will increase as real wages and the number of workers increase. The higher this growth, the lower the funding level that will be needed; that is the environment will be more favourable toward pay-as-you-go funding. On the other hand, in an environment of low or even negative growth in real total earnings, fuller funding becomes more appropriate in order to avoid escalating contribution rates in the future and the transfer of costs to future generations.

When real returns are higher, the fund performs well accruing more investment earnings while at the same time, the liabilities reduce from being valued at high real rates. Conversely, when returns are lower, the funding level can quickly fall and the liabilities increase from valuation at low real rates.

**Conclusions - General *(Slide 36)***
In conclusion, a social insurance scheme's contribution rate is sensitive to both the demographic and economic environments. Demographic and economic variables will influence the contribution rate is different ways and to different extents. However, these fluctuations can be managed by immunizing the scheme. Two such ways of doing so include moving to partial funding and/or a mixed system. In any case, the funding method chosen should be appropriate given the current and projected environments, and should be re-evaluated regularly.

**Conclusions – Steady-State Funding Methodology *(Slide 37)***
The Reforms of 1997 have ensured the long-term sustainability of the Canada Pension Plan. Switching from a PayGo basis to partial funding by way of the steady-state rate methodology helped to improve intergenerational equity and sustain the Plan. This funding methodology is sufficient, appropriate and projected to remain so assuming reasonable returns on the fund, and a PayGo rate not too much higher than the steady-state rate. Both of these assumptions are reasonable over the long term. In summary, the Canada Pension Plan has been preserved for the present and future generations.
**Thank you.**