Reorienting Retirement Risk Management

EDITED BY

Robert L. Clark
and Olivia S. Mitchell

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Great Clarendon Street, Oxford OX2 6DP

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide in

Oxford New York

Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in

Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

Oxford is a registered trade mark of Oxford University Press
in the UK and in certain other countries

Published in the United States
by Oxford University Press Inc., New York

First published 2010

British Library Cataloguing in Publication Data
Data available

Library of Congress Cataloging in Publication Data
Data available

Typeset by SPI Publisher Services, Pondicherry, India
Printed in Great Britain
on acid-free paper by
MPG Books Group, Bodmin and King's Lynn

ISBN 978–0–19–959260–9

1 3 5 7 9 10 8 6 4 2

Chapter 12

Risk Budgeting for the Canadian Pension Plan Investment Board

Sterling Gunn and Tracy Livingstone

The Canada Pension Plan Investment Board (CPPIB) was created in 1999 to manage the surplus contributions of the Canada Pension Plan (CPP). In its early days, CPPIB fund management was outsourced to external managers who passively managed to market indexes. By 2005, the group had built internal active management capabilities and was moving away from the outsourcing business model. While management was already operating under a total portfolio approach, the methodology was refined to explicitly consider trade-offs between risk and return at the fund level, with the development of the Risk–Return–Accountability Framework. In turn, this prompted the design and implementation of a risk-budgeting framework. This chapter explains why risk budgeting is necessary to help public fund managers handle contributions not needed to pay current benefits. In what follows, we first discuss the origins of the CPP and the CPPIB. Next, we take up the implementation of risk budgeting as an integral part of business planning.

Origins of the CPP[1]

During the 1960s, Canada was 'fully engaged in building a welfare state that would render the ravages of the Great Depression in the 1930s a thing of the past' (Little 2008: 2). In 1963, a minority government was elected on a party platform that included a national pension plan and national health insurance. Discussions and negotiations between the Federal government and the nine of the 10 provinces continued until an agreement was reached in 1966 to initiate the CPP. The province of Quebec administers its own pension plan, parallel to the CPP, known as the Quebec Pension Plan (QPP).

Although it is a defined benefit (DB) plan, the CPP was never meant to provide full or near-full support for a beneficiary; rather it was intended to be part of the answer to senior poverty. The CPP is a component of

Canada's three-tier national pension system. The first tier consists of two government support programs paid out of general revenues. Old Age Security (OAS) was put in place in 1952, and it provides a low level of income primarily to senior citizens who never worked for a wage. The Guaranteed Income Supplement (put in place in 1967) is means-tested, and it offers further support to seniors who depend almost entirely on the OAS for their income. The second tier includes the CPP and workplace pensions. These pensions may be DB or defined contribution (DC); beneficiaries and often their employers contribute to these plans, enabling the funds to grow in a tax-deferred environment. The third tier consists of personal saving, whether in a tax-deferred Registered Retirement Savings Plan or in some other saving vehicle.

The design of the CPP was a triumph of compromise. Federal and provincial jurisdiction in Canada separates accountability and authority in ways that are not always intuitive. For instance, the Federal government has exclusive jurisdiction over criminal law, but the provinces have jurisdiction over the administration of justice. The health-care system is administered by the provinces, but substantial funding is provided by the Federal government. In fact, the provinces had full jurisdiction for pensions until the constitutional amendment that instituted OAS in 1952. 'Nonaged benefits' such as disability and survivor benefits remained part of provincial jurisdiction until a subsequent constitutional amendment in 1965 allowed the Federal government to provide these benefits as well. The end result was shared accountability for pensions and a national solution that included pension benefits, disability payments, and survivor benefits. An additional compromise was the change process inserted in the Act. Changes to the CPP require agreement from two-thirds of the provinces with two-thirds of the population, a higher threshold than required for amending the Canadian constitution.[2] From the outset of the negotiations, Quebec chose not to participate in the CPP, and formed its own provincial plan, the QPP. However, agreement was reached between the Federal government and Quebec such that the legislation supporting the CPP and the QPP are identical. The contributions and benefits are the same, and the plan is portable between Quebec and the other provinces.

As originally structured, the CPP did not focus on intergenerational fairness and equity. The generation of Canadians that had lived through the Great Depression and World War II had little opportunity to put aside savings, and faced a poor retirement. The CPP was designed to ensure some support would be available for them, regardless of the length of their participation. Full benefits were to be phased in after the first 10 years of contributions. 'At the extreme, it would be possible for some people to contribute for only ten years and then retire with full CPP benefits for the rest of their lives' (Little 2008: 36). As illustrated in Table 12.1, the return

Table 12.1 Internal rates of return on contributions: Canadian Pension Plan (CPP) (1910–2000)

Birth year	Nominal (%)	Real (%)
1910	33.6	25.3
1920	21.9	14.2
1930	15.6	9.6
1940	10.4	6.2
1950	7.2	4.1
1960	5.6	3.0
1970	4.9	2.4
1980	4.8	2.2
1990	4.7	2.2
2000	4.7	2.2

Sources: TOCA (2009) for birth years 1910–30; TOCA (2006) for birth years 1940–2000.

on contributions was substantial for the first beneficiaries, born in 1911, who retired with full benefits in 1976. The return for later beneficiaries would be significantly lower. In any case, the CPP continues to provide a fully portable, fully indexed, and effectively risk-free pension promise. 'Given plausible inflation-indexed bond returns the CPP would need to charge significantly higher sustainable contribution rates in the 11 to 12½ percent range if it faced the total costs of private annuity providers' (Arnold et al. 2009: 15). On a risk-adjusted basis, the CPP was a great deal for the earlier participants, and it remains a good deal for later participants.

The Evolution of the CPP

The CPP was changed several times over the next 20 years. The retirement age was reduced from 69 in 1966 to 65 in 1970. Both the CPP and the QPP enhanced benefits during the 1970s and added full indexing to inflation in 1974. Survivor benefits were extended to widowers as well as widows. In 1984, the QPP brought in a provision for early retirement with a reduction in benefits paid; the CPP followed suit in 1987. For the first 20 years, alterations to the CPP involved increases or enhancements to benefits; little attention was devoted to long-term funding considerations.

The original contribution rate was 3.6 percent of salary, shared equally between employees and employers, though it was recognized that

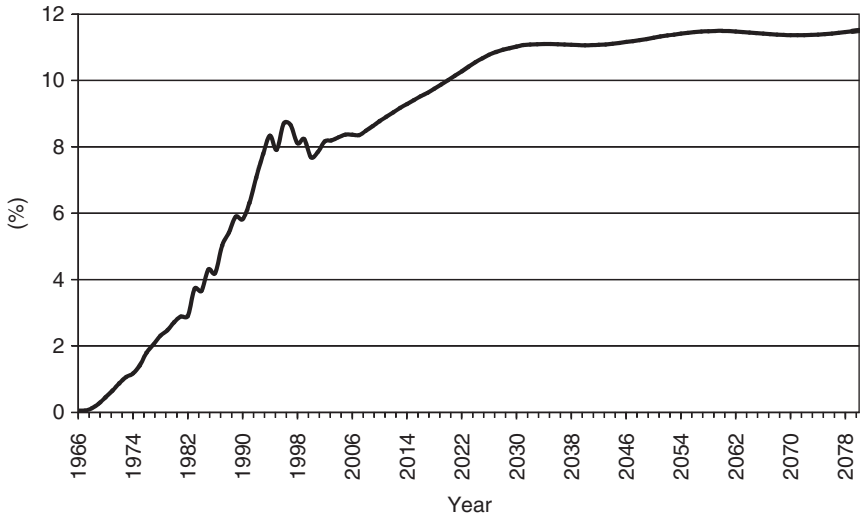

Figure 12.1 Projected pay-as-you-go rates for the Canada Pension Plan (CPP). *Sources*: Authors' calculations derived from TOCA (2006) and CPPIB (various years).

3.6 percent would not be sufficient over the long term. CPP retirement benefits were capped at 25 percent of Yearly Maximum Pensionable Earnings (related to average earnings), and benefits were inflation-adjusted (initially capped at 2 percent per year). The system was mainly pay-as-you-go, after accumulating 2 years of benefit payments in a buffer fund. Other than a small amount of cash retained for liquidity, the monies collected were used to purchase nonmarketable provincial bonds (i.e., the funds were loaned to the provinces at an interest rate equal to Government of Canada 20-year bonds). Until 1999 when the first cash transfers from the Federal government were provided to CPPIB, the basic financing structure remained the same.

Full benefits were first paid to participants in the CPP in 1976. In its first 10 years, the CPP was collecting money at the full 3.6 percent contribution rate, far in excess of what was needed to pay benefits. As illustrated in Figure 12.1, by 1975, while the contribution rate was still fixed at 3.6 percent, the pay-as-you-go rate was only 1.5 percent though it was climbing steadily.

It was known that there would come a time when the pay-as-you-go rate would reach and surpass the fixed contribution rate. The Chief Actuary of the CPP projected that this would occur in 1985 but it came earlier. By

1983, the cost of the CPP had reached 3.7 percent but contributions remained at 3.6 percent. The Stewards of the CPP, the Ministers of Finance for the Federal government, and the nine participating provincial governments responded with a 5-year schedule of increases of 0.2 percent, starting in 1987, and thereafter raising them 0.15 percent each year for the following 20 years. The problem was thus alleviated in the short term but not solved in the longer term.

The contribution rate versus the pay-as-you-go rate was not the entire source of system financing, since the CPP received additional revenue from interest earned on the surpluses loaned to the provinces. Thus, total system revenues were contributions plus interest received on the provincial loans. In 1987, the Chief Actuary forecast that total revenues would be sufficient to pay benefits for another 10 years, until sometime between 1995 and 2000. This day of reckoning again came early: in 1993, the CPP began to use its capital to pay benefits.

The new fiscal responsibility

Thirty years after the launch of the CPP, the issue of financing the plan for future generations finally hit the front page: Canadians had lost confidence that the CPP would provide them with retirement income. An Angus Reid public opinion survey in 1993 found that only 17 percent of Canadians believed CPP benefits would remain the same in their retirement (HRSDC 1995: 7). Another 50 percent believed that the CPP would be providing significantly reduced benefits and 31 percent believed the plan would no longer exist.

The Chief Actuary's 15th review of the CPP in 1995 confirmed that this lack of confidence in the CPP was warranted. With the demographic and economic assumptions in the 15th review, the Office of the Chief Actuary (OCA) forecasted the plan was going to run out of money by 2015, meaning that, as structured, the plan was unsustainable with the current contribution rate structure. In fact, in 1995, the OCA forecasted that a pay-as-you-go contribution rate would be 14.2 percent by 2030 to sustain the CPP. Stakeholders were concerned that such a high contribution level would create intergenerational inequities, inhibit economic growth, and stifle job creation.

A new government was elected in 1993 on a platform of reducing Canada's dependence on deficit financing. The first budget in 1994 ran a deficit, although it was reduced from the previous year. The next year, Paul Martin, the Minister of Finance at the time, put a new budget in place that turned federal finances around, and in 1997–8, led to the first in a series of 11 budget surpluses. These surpluses caused Canada's federal debt as a

percentage of GDP to drop from a peak of 68.4 percent in 1997–8 to 29.8 percent in 2007–8. Although some of Canada's fiscal house was being put in order, the long-term status of the CPP remained a serious challenge. Nevertheless, one of the compromises put into place in 1966 meant the Federal government could not fix the CPP unilaterally: two-thirds of the provinces with two-thirds of the population would need to agree on any proposed changes.

The day of reckoning

In February 1996, the Federal and provincial governments of Canada issued a joint document entitled 'Information Paper for Consultations on the Canada Pension Plan.' This document 'provide(d) Canadians with an opportunity to assess the challenges facing the CPP, form their own opinions, and make their views known during upcoming consultations' (TFPTGC 1996: 7). It laid out the choices the governments were considering and the potential outcomes of those choices. More significantly, the document asked questions of the participants in the CPP and looked for answers: 'How high can the rates go before they become unaffordable? . . . What is the appropriate balance between contribution rate increases and changes to benefits? . . . If a fuller funding approach to the financing of the CPP were adopted, a much larger CPP fund would build up. . . . Should CPP funds be invested so as to earn maximum returns? How could this be done?' (TFPTGC 1996: 47).

These questions made it clear what the governments were asking the stakeholders of the CPP to consider: increased contribution rates, reduced benefits, and a much larger reserve fund. And in a series of meetings held across the country in 1996, the CPP's stakeholders responded with a clear message: the CPP should be maintained. The balancing act between increased contributions and reduced benefits was fundamental to the discussion, but the issue of a bigger fund, and what to do with the money, was also key.

The necessity of increased contributions was recognized. There was general mistrust of the government's ability to manage a large fund, and concern about the impact such a fund would have on the Canadian capital markets. However, it was clear that depending on a portfolio of nonmarketable government bonds invested at below market rates was not a viable investment policy to sustain the system for future generations of Canadians. Instead the preferred outcome was to be a professional investment organization, managing the resulting fund at arm's length from government, specifically exempt from government interference, and 'maximizing return without undue risk of loss' (CPPIB Act 1997).

The 1997 agreement

Several changes intended to improve CPP sustainability were proposed in 1997 by the finance ministers of the Federal and provincial governments. Legislation was enacted that put in place a series of contribution rate increases and modestly reduced the growth of future benefits. In addition, the legislation introduced a default mechanism for adjusting the contribution rate should the Chief Actuary ever deem the contribution rate to be insufficient. Agreement was reached to raise contribution rates to 9.9 percent by 2003, a level viewed as sufficient to sustain the CPP as a partially funded plan. As illustrated in Figure 12.2, the pay-as-you-go rate exceeded the contribution rate in the late 1980s and early 1990s. However, the steady increases in the contribution rate surpassed the pay-as-you-go rate by 2000. Even though the pay-as-you-go rate after 2020 was projected to exceed the contribution rate, the investment income from the Fund is forecasted to be sufficient to sustain the CPP.

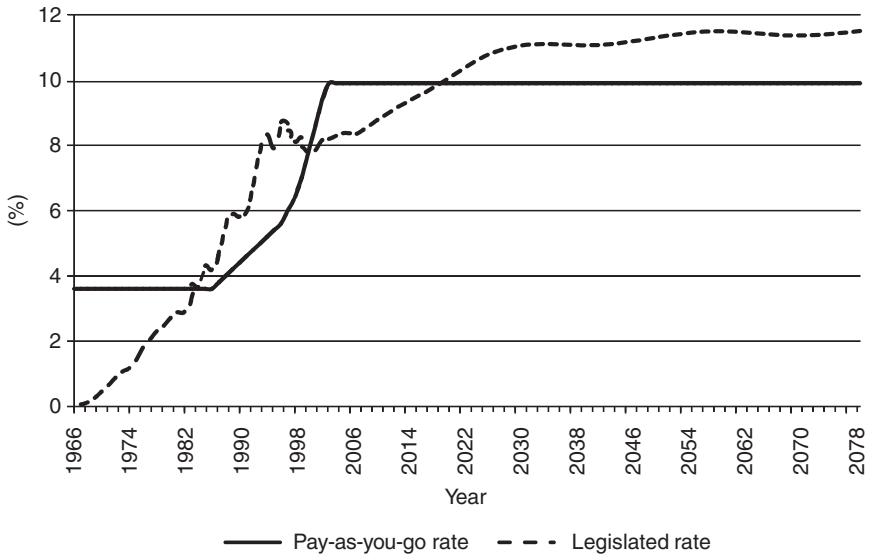

Figure 12.2 Projected pay-as-you-go rates versus legislated rates for the Canada Pension Plan (CPP). *Sources*: Authors' calculations derived from TOCA (2006) and CPPIB (various years).

Early days of the CPPIB

This 1997 legislation also created the CPPIB, a federal crown corporation that operates as an independent professional investment organization. While most Canadian crown corporations are run by the government with a specific mandate administered by the appropriate Minister of the Canadian Parliament, CPPIB is specifically exempt from Divisions I through IV of Part X of the Financial Administration Act that would have made it ultimately accountable to the Minister of Finance. The founding Board of Directors of CPPIB was assembled in 1998, chosen from the provinces and territories to provide a diversity of views and carefully selected to ensure the Board is composed of professionals with relevant experiences and skill. The independence of CPPIB and its Board of Directors from the Federal and provincial governments is central to the firm's governance: Federal and provincial government involvement in the management of CPPIB, defined in the Canada Pension Plan Investment Board Act, is limited to the appointment of the members of the Board of Directors. Apart from appointing the members of the Board, the government remains at arm's length from CPPIB operations. A stringent code of conduct stipulates that any attempt by any level of government to influence investment decisions, hiring practices, or procurement must be appropriately escalated within the organization in order to determine what appropriate action should be taken.

The first transfer of funds from the Federal government to CPPIB occurred in March 1999, and by the end of the month – also the end of the fiscal year – CPPIB had $12 million in investment assets (CPPIB 1999) as reported in the first annual report. That first report also contained projections from the Federal government that the Fund would grow to $88 billion by 2008. The size of the CPP Fund increased rapidly over the next 5 years. Growth came from excess contributions flowing in from contributors and positive investment returns. By June 30, 2005, the Fund had reached $87 billion, almost 3 years ahead of the forecast. By March 31, 2008, the Fund had reached $122.8 billion.

For the first year, the Canadian equity in the CPP Fund was managed passively, as per the legislation. In 2000, the CPPIB Act was revised to allow 50 percent of the Canadian equity in the CPP Fund to be managed actively. And then in 2001, the Act was revised again to allow 100 percent active management. Foreign investments were restricted until the Foreign Property Rule was repealed, effective June 2005. And, even though there were no restrictions on active management after 2001, for the most part, the Fund was still passively managed (Raymond 2009). The risk of the Fund was measured, but investment decisions were motivated by passively managing to a set of benchmarks rather than the risk a particular investment might create.

Initial Risk and Performance Concepts at CPPIB

During its early years, CPPIB performance was compared to a set of benchmarks including a real rate of return calculated by the OCA. By 2004, CPPIB had also adopted the risk-adjusted net value-added (RANVA) performance measure developed by Keith Ambachtsheer (1996). RANVA, defined as the gross return on assets less the return on a risk-free asset (R_{assets}), costs (C), and a charge on risk capital ($\lambda \times \text{Risk}$), is similar to many of the risk-adjusted performance measures used by banks and other financial institutions:

$$\text{RANVA} = R_{\text{assets}} - (R_{\text{risk-free}} + C + \lambda \times \text{Risk})$$

Ambachtsheer defined the risk-free rate as 'that economic return which would be certain to keep a fully funded plan fully funded' and he further stated 'the best estimate of such a return is the return on a portfolio of default-free bonds with the same duration and inflation indexation as those implicit in the accrued pension liabilities' (Ambachtsheer 1996). He acknowledged there was no single right way to measure either the risks taken by a pension fund or assess the risk charge needed to calculate RANVA, but he argued that RANVA was for people 'who would rather measure the right things imperfectly than either measure the wrong things perfectly, or measure nothing of consequence at all' (Ambachtsheer 1996).

The CPPIB RANVA implementation adopted Canadian government real return bonds (RRBs) as the 'minimum-risk' portfolio (a substitute for the risk-free asset called for in the RANVA model). These bonds were thought to be a reasonable proxy for the CPP net liabilities. Risk capital was estimated using a 90th percentile value-at-risk (VaR) measure of the asset–liability mismatch. Yet the CPPIB implementation diverged from the RANVA specification in several ways. First, the CPP was a partially funded plan and was always intended to be only partially funded with surpluses intended as a buffer. This was very different from other pension plans and from the fully funded plan Ambachtsheer had envisioned. Second, the CPPIB RANVA implementation modeled the plan's net cash flows rather than just the liabilities. The cash flows (annual contributions less benefits paid) from the CPP plan are forecast to be positive until roughly 2020, at which point benefits paid are projected to exceed contributions collected and some proportion of investment income would be used to pay benefits (see Figure 12.3).[3]

Third, Ambachtsheer's approach had assumed the CPP net liabilities could be represented by a portfolio of RRBs. In fact, however, CPP net liabilities differ significantly from the liabilities of a typical, fully funded

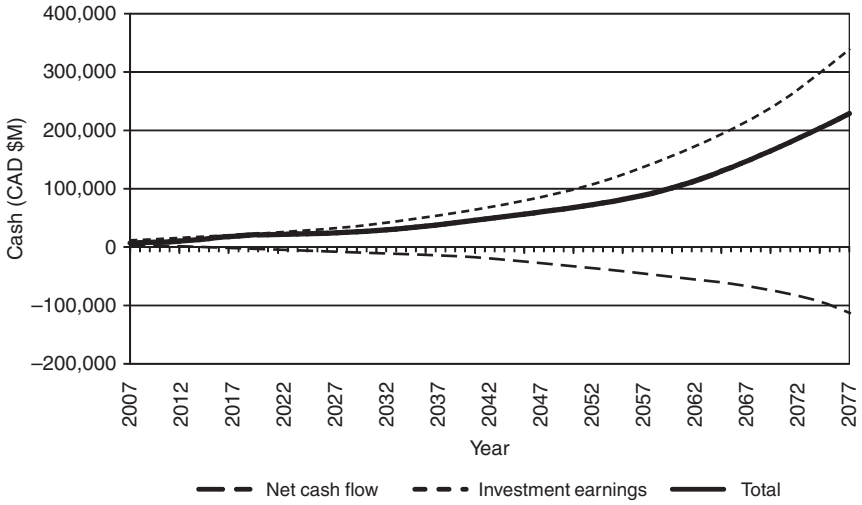

Figure 12.3 Forecast of net liabilities and investment earnings for the Canada Pension Plan (CPP). *Sources*: Authors' calculations derived from TOCA (2006) and CPPIB (various years).

plan or that of a bond portfolio. As a result, CPPIB moved away from the RANVA construct and developed a more sophisticated approach that modeled the net liabilities directly rather than through proxies (James 2007; Ross 2007). In addition, Ambachtsheer's risk-free asset was assumed to have returns sufficient to maintain the sustainability of the plan, but CPPIB's chosen proxy, RRBs, did not. In fact, given the Stewards' policy decision to cap contributions at 9.9 percent, the Chief Actuary's forecast indicated CPPIB needed to generate long-term real returns exceeding 4 percent, well beyond any reasonable long-term return expectation for a portfolio of RRBs. As a result, investing solely in RRBs would have almost certainly threatened the financial stability of the plan, leading to an increase in contribution rates and/or reduction in benefits. Accordingly, equity investments were deemed necessary to finance the liabilities over the long term. The RANVA model looked at total fund performance, adjusted for relatively short-term risk. Although attractive in its simplicity, RANVA was not appropriate to the circumstances of the CPPIB, where total fund performance was considered over long horizons and management was accountable solely for adding value. Plan performance was also sensitive to other factors affecting cash flows, including policy choices,

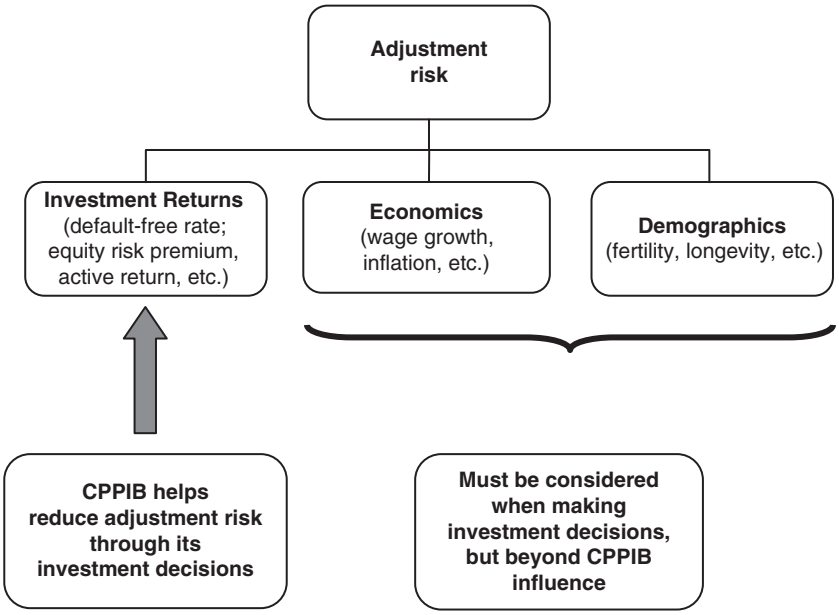

Figure 12.4 Factors affecting financial stability of the Canada Pension Plan (CPP). *Source*: Authors' calculations; see text.

demographic risks, economic risks, and financial risks as illustrated in Figure 12.4. Many of these were beyond the control of the CPPIB.

The year 2005 proved to be a watershed for the CPPIB. While the Fund was not the largest in Canada, it was recognized that its position in the Canadian marketplace was becoming more significant, and the management of the Fund had to evolve in response. David Denison (who became the second president of the CPPIB in 2005), John Ilkiw (vice president of Risk and Research) and Don Raymond (vice president of Public Market Investments, PMI) developed a Risk–Return–Accountability Framework to continue the Fund's evolution. Their goal was to take Ambachtsheer's guidance to heart and begin to measure the right things, though perhaps imperfectly.

The Risk–Return–Accountability Framework

The two control mechanisms that constitute the Risk–Return–Accountability Framework, the CPP Reference Portfolio and the Active Risk Limit, were

developed with the guidance provided in the 1997 Stewards' Agreement. The Stewards had proposed:

> CPP funds [will] be prudently invested in a diversified portfolio of securities in the best interest of contributors and beneficiaries. This new policy is consistent with the investment policies of most other pension plans in Canada and the QPP. Prudent assumptions indicate investing the fund in the market could generate an average real return of 3.8 percent per year – i.e., a return of 3.8 percent above the rate of inflation. . . . The fund will be managed professionally at arm's length from governments by an investment board. The CPP Investment Board will be governed by a qualified board of directors of up to 12 members. The Board will be accountable to the public as well as governments and will report its investment results regularly to Canadians. . . . The Board will be subject to broadly the same investment rules as other pension funds in Canada. (HRDC 1997: 13)

The Reference Portfolio represents the Board of Directors' long-term passive investment strategy, the point of comparison for determining management's value-adding strategies. It is a viable, low-cost, and investable portfolio embodying the Stewards' long-term risk tolerances and return preferences. CPPIB's management discretion to pursue value-adding strategies is controlled by an active risk limit that constrains tactical decisions, as outlined in Figure 12.5. The CPPIB uses historical simulation VaR methodology to estimate active risk, incorporating at least 10 years of historical data, at 90 percent confidence, over a 1-year time horizon. The methodology produces results that are repeatable and verifiable, with underlying assumptions that are transparent and not subject to management interpretation. The 10-year history ensures that the scenario set incorporates enough information to dampen business cycle effects. The 1-year investment horizon was chosen to provide a longer-term view of potential losses than is common in institutions with a shorter-term view of the market.

The CPP Risk–Return–Accountability Framework clarifies stakeholder accountabilities. The Board of Directors, acting on behalf of the Stewards, is held accountable for policy decisions exposing the Fund to the many factors affecting the Fund stability, including the desire to passively harvest long-term capital market returns. Management is held accountable for adding value relative to the Board of Directors' long-term risk and return expectations, as embodied by the Reference Portfolio. Unlike a typical policy portfolio, the Reference Portfolio does not bind management to a set of asset allocations. Rather, investment discretion is governed by an active risk limit, not by bands around a target allocation. Numerous authors have noted that policy portfolios tend to generate most of the returns and risks (Brooks et al. 2001; Brinson, Hood, and Beebower 1986). Thus, the choice of Reference Portfolio is the most important investment decision made by the Board of Directors of the CPPIB.

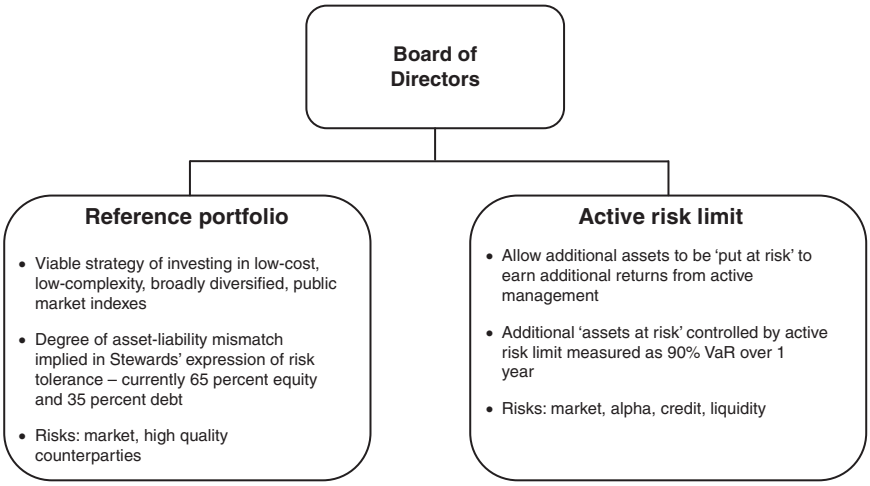

Figure 12.5 Two levers governing strategic risk-taking at the Canada Pension Plan Investment Board (CPPIB). *Source*: Authors' calculations; see text.

Designing the first Reference Portfolio

The first Reference Portfolio was designed in late 2005, reflecting the Board's risk preferences while still having a reasonable expectation of delivering the actuarially required rate of return needed to fund the plan. It was clear that a portfolio of RRBs would not provide sufficient returns to sustain the Fund:

> We then considered the risk factors driving CPP liabilities and the risk mitigating characteristics of easy-to-implement, low cost exposures to broad market and publicly priced asset classes: foreign equities, Canadian equities, Canadian real returns bonds and Canadian nominal bonds. After considering their expected return patterns and risk-mitigating behavior, and the legacy portfolio of Federal-provincial non-marketable bonds, we settled on sub-asset class exposures that would be optimal under reasonable capital market and liability behavior assumptions. (Ilkiw and Raymond 2005)

The original CPP Reference Portfolio contained 65 percent equity (40 percent unhedged foreign equity and 25 percent Canadian equity) and 35 percent Canadian fixed income (25 percent Canadian nominal bonds and 10 percent Canadian RRBs). This portfolio mix was reasonably expected to provide the level of return necessary to sustain the Fund over the long term,[4] and it represented the systematic risk deemed acceptable by the Board.

The governance provisions of the Risk–Return–Accountability Framework are contained in a suite of documents, both public and proprietary. CPPIB's constitution document is the 'Statement of Investment Objectives, Policies, Return Expectations and Risk Management for the Investment Portfolio of the Canada Pension Plan' (CPPIB 2008), which describes the CPPIB's investment objectives, and describes the Reference Portfolio, the associated Board Active Risk Limit, and the factors affecting the ability of the CPP to meet its objectives. A companion document, the 'Policy for the Measurement, Management, and Reporting of CPP Investment Portfolio Risk' is a proprietary nonpublic document describing risk management practices, defining the methodology for measuring VaR, and specifying the active risk limit. These two documents, with other supporting proprietary documents, describe the Risk–Return–Accountability Framework.

Total portfolio management

CPPIB believes it can best meet its objectives by managing the risk and return characteristics of the total portfolio, rather than allocating capital in a disjointed fashion to individual investment departments. As a result, the Reference Portfolio design is not an exercise in traditional asset allocation, but instead is designed to meet the long-term risk and return expectations of the Board. The outcome of both exercises – asset allocation or total portfolio design – is superficially the same. But the thought process, the focus, and the governance models at CPPIB are risk-based – quite different from a traditional asset allocation.

It should be noted that pension funds and other investors often hold investment managers accountable for policy decisions and risk factors beyond their control. The use of non-investable performance measures (such as inflation plus benchmarks) is likely to lead to management explaining discrepancies from target to the stakeholders, or fund managers being given credit unfairly for positive results. Neither circumstance is under the fund manager's control nor achieves the objective of holding fund managers accountable for their investment decisions. The CPP Risk–Return–Accountability Framework clarifies management's accountabilities. The Active Risk Limit, incorporating market and credit risk measured relative to the Reference Portfolio, differs from the limit structures in place at many other pension funds. Within the Active Risk Limit, CPPIB management has the discretion to improve overall portfolio performance by investing in non-Reference Portfolio asset classes and by pursuing alpha-type strategies. These strategies can add value through excess returns and/or improved total portfolio diversification.

As noted earlier, CPPIB expects to receive significant positive net contributions over the next 10 years, causing assets to grow extraordinarily. Therefore, the CPPIB is willing to take on opportunistic investments that might appear disproportionate in the current portfolio, knowing its portfolio will grow into such position over time. As a result, CPPIB pursues opportunistic strategies not explicitly limited by allocations. Each such opportunistic investment is analyzed in terms of its potential impact on the risk and return profile of the total portfolio. Sizable real estate and infrastructure investment opportunities, for example, arise infrequently. So during the initial growth of the Fund, CPPIB management has not governed these investment strategies by setting allocations. Instead, management reviews these opportunities as they arise and makes decisions based on contributions such proposed investments would make to long-term total portfolio risks and returns.

Risk budgeting

In order to enable the investment process to be truly risk-based, firm-wide, and transparent, risk budgeting was the next iteration in the development of the Risk–Return–Accountability Framework. Yet the concept of risk budgeting means different things to different investors. For instance, Pearson (2002: 7) stated: 'Narrowly defined, *risk budgeting* is a process of measuring and decomposing risk, using the measures in asset-allocation decisions, assigning portfolio managers *risk budgets* defined in terms of these measures, and using these risk budgets in monitoring the asset allocations and portfolio managers.' By contrast, de Bever et al. (2000) argued that a portfolio's risk budget

> is a measure of risk tolerance, defined as the loss one rarely expects to exceed over a specific time horizon. The portfolio's estimated 'risk capital usage' must fall within this risk budget. The appropriate time horizon and the definition of 'rarely' depend on the organization. Ontario Teachers' Pension Plan ('Teachers') has a long-term focus on managing surplus (assets-liabilities) and surplus risk, so we express our 'surplus risk' budget as the annual surplus loss we are prepared to absorb in the 1 in 100 worst-case outcome.

And still a third approach was offered by Brooks et al. (2001) who stated that risk budgeting refers 'to the process of establishing a) how much investment risk should be taken; and b) where it is most efficient to take it in order to maximize returns.'

The distinguishing feature of these definitions is not their similarity but rather the linkage each makes to investment objectives. In an investment

environment where managers are working to achieve a target asset allocation, assigning a fixed risk budget is simple in concept. By contrast, in an environment where growth is rapid and the horizons of investment strategies differ greatly, greater flexibility is required.

Risk budgeting at CPPIB

CPPIB management has been refining its forecasting of active risk since the approval of the first Reference Portfolio in 2006. By the end of fiscal 2007, an informal risk budget for fiscal 2008 was negotiated between the PMI department and the president. Over the course of fiscal 2008, the PMI risk budget was measured and monitored as part of the regular risk reports. In April 2008, a formal project was initiated, engaging an outside consultant to determine the shape of risk budgeting at CPPIB. This project was completed in August 2008, and its recommendations formed the basis of the risk budgets put in place for fiscal 2010, starting in April 2009.

To develop risk budgeting at CPPIB, it was first necessary to clarify its purpose. CPPIB embarked on a series of internal interviews to gather viewpoints of different investment and finance groups. Many questions arose regarding risk 'philosophy' including: Are risk budgets limits or targets? And if a risk budget effectively represents a limit, is it a hard limit or a soft limit? How granular does the analysis of results have to be? What measures will be used to negotiate risk budgets and to track results? Could investment departments allocate risk within their risk budgets to the groups within their respective departments? What are potential outcome scenarios, and what kind of discussions should result? How often are results monitored and reported? And then, who takes responsibility for risk budgeting? In practice, there was widespread agreement on the value of risk budgeting: when risk is a scarce resource, it is a clear advantage to the firm to have a risk-budgeting framework in place and operating effectively. And a main benefit of risk budgeting is the enhanced transparency it brings to the process of making investment decisions.

Since the development of the Risk–Return–Accountability Framework and the expansion of CPPIB's active investment programs, there has been a conscious consideration of the risk an investment adds to the Fund, particularly in the case of large lumpy investments like real estate and infrastructure. Risk budgeting enhances that consideration by first providing a formal mechanism with a defined methodology for measuring the risk return trade-off, and second, by reinforcing that risk is a scarce resource which must be used in an efficient and cost-effective manner. In

order for risk budgeting to be effective, the investment decision process becomes a collaborative effort between the investment departments, Portfolio Design and Investment Research (PDIR), and Investment Risk Management.

Budgets versus expectations

PMI was accustomed to a conscious consideration of the trade-offs between risk and return, using an information ratio to measure the success of internal and external managers. And since PMI had been operating under an informal risk-budgeting regime for fiscal 2008, the implementation of a formal risk budget was almost a nonevent. Discussions with the real estate investments (REI) and private investments (PI) groups were more challenging. As discussed earlier, the CPPIB business model treats alternative investments as opportunistic, without specific allocations, yet strict risk budgeting would require explicit allocations to real estate, private equity, and infrastructure. Accordingly, management developed a fundamental definition of risk budgeting that was more appropriate to the opportunistic aspects of CPPIB's investment strategy. The 'Risk-Budgeting Operating Framework' is therefore 'judgment-based, supported by analytics' (Gunn, Livingstone, and Wyman 2008). A graphical overview of the process appears in Figure 12.6.

Accountability for risk budgeting

The collective viewpoint of management at CPPIB is conveyed through the Investment Planning Committee (IPC), chaired by the president, with its membership comprised of the Investment SVPs, the COO, the CFO, and the SVP of PDIR. PDIR is the working arm of the IPC, and as its name suggests, is accountable for the research and analysis that motivate the design of the Reference Portfolio and the Active Risk Limit, as well as the active investments in the Fund. The risk tolerance of the firm as expressed through risk budgeting is an integral part of portfolio design. PDIR has the accountability for negotiating risk budgets with the investment departments on behalf of the IPC, and bringing them to the committee for approval. Investment Risk Management is responsible for measuring outcomes versus approved risk budgets and reporting the results to the investment departments and to management. Midyear adjustments, due to unforeseen market events or responses to opportunistic investments, are within PDIR's accountability as well.

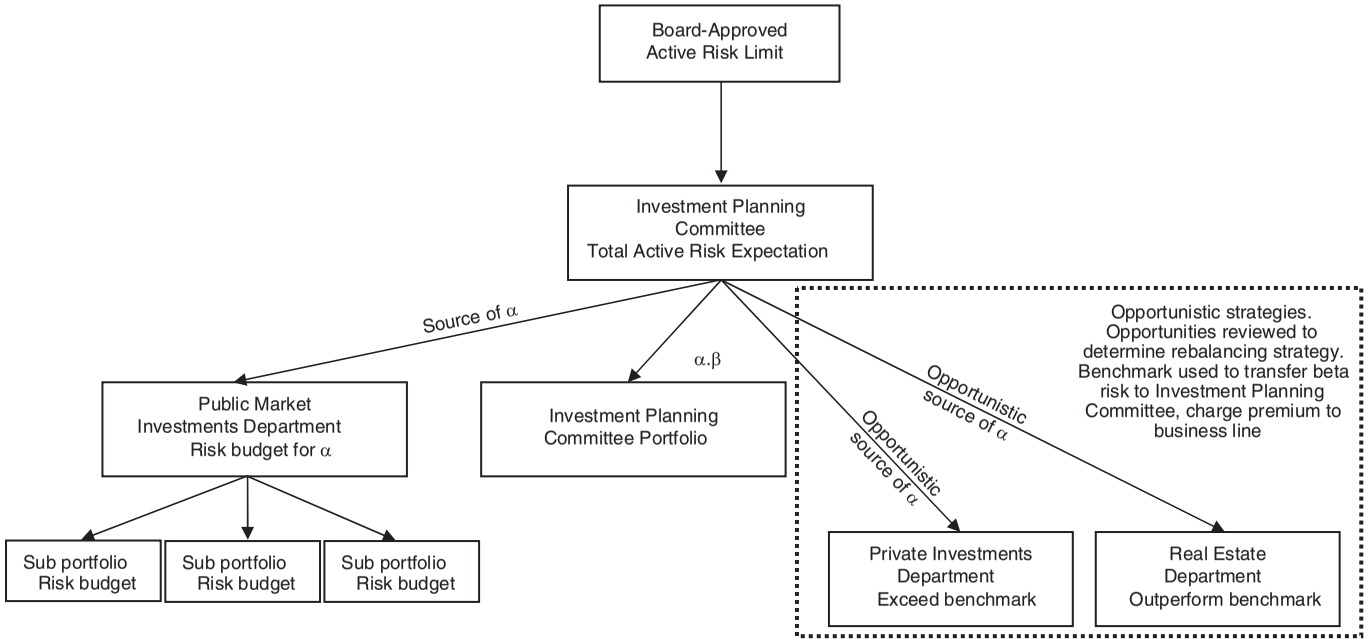

Figure 12.6 The risk-budgeting framework of the Canada Pension Plan Investment Board (CPPIB). *Source*: Authors' calculations; see text.

Measurement of risk-budgeting outcomes

CPPIB uses VaR to measure risk relative to the CPP Reference Portfolio. It was recognized that the investment departments do not manage their investment activities using VaR. However, during the course of the risk-budgeting design project, it was determined that it was better to be consistent with the firm-wide risk measure than to design a different measure that would then have to be reconciled to the firm-wide risk measure. A VaR measure relative to the Reference Portfolio is used at the investment department level to set the risk budgets in the performance agreements and to monitor against them.

Investment department group risk budgets

In order to motivate the groups within the investment departments to maximize their opportunities within the department risk budgets, the SVPs may choose to disaggregate their risk budgets and assign group risk budgets. These intradepartmental risk budgets may be in terms of risk measures more appropriate for managing the activities of the various groups. For example, groups within PMI have typically managed to a dollar-based volatility target expressed as a standard deviation. The transformation of a risk-budgeting target expressed in terms of VaR to another volatility measure is usually straightforward, and then an allocation within the department can be accomplished.

Benefits to the CPPIB of risk budgeting

As a management tool, risk budgeting will strengthen accountability and transparency. Improved accountability for risk-adjusted returns is provided through Investment Department performance agreements that define departmental accountability for risk and return, and in aggregate, align with commitments to the Board for value added and risk. Transparency is improved through dialogue and disclosure around risk and return expectations, initially as performance agreements are negotiated, and subsequently as results are monitored, reported and discussed, and decisions are made based on the outcomes. The decision framework reveals the trade-offs between the opportunities within a department and between departments, and the marginal risk and return impacts on the total portfolio.

As an investment tool, risk budgeting will enhance efficiency and prioritization. The ratio of risk vs. return highlights explicitly the cost of return – that is, how much risk is expended to achieve a measured level of return – revealing the efficiency of portfolio decisions. Risk, return and efficiency ratios provide an objective and

transparent method of choosing one investment opportunity over another. (Gunn, Livingstone, and Wyman 2008)

PDIR, the department responsible for recommending the Reference Portfolio design and risk budgets, gained final approval for the risk-budgeting process at the August 2008 meeting of the IPC. Risk budgets are now part of investment department Performance Agreements, which specify the level of returns necessary to meet performance targets and are an integral part of the business planning process.

PDIR kicked off fiscal 2010 risk budgeting in September 2008, 6 months in advance of the start of fiscal 2010. Preliminary meetings were scheduled with each of the investment department heads to discuss business plans for the coming year. It was expected that these discussions would establish the baseline for the fiscal 2010 risk budgets. But CPPIB found itself developing its risk budgets in the midst of a financial perfect storm.

Risk budgeting to a moving target

Capital markets were crumbling, levered investors were selling into a falling market, and regulators were struggling to address systemic issues that threatened to swamp the global financial system. A flight to quality was crushing the equity and credit markets. By the end of September 2008, the S&P 500 had dropped to 1166.36, from its peak of 1565.15 as at October 8, 2007. CPPIB investment returns were −8.5 percent for the quarter ending September 30, 2008.

CPPIB's total portfolio approach meant risk budgeting required forecasts for a number of moving parts. But risk estimates were sensitive to the value of assets held in the portfolio, the volatility of the asset prices, and to the interdependencies between the asset prices. And all of these variables were changing dramatically during the market upheaval. And when correlations between assets increase dramatically during a crisis, diversification benefits disappear.

Private and public equity, for example, were considered a single asset class over the long term and were treated as such when rebalancing the portfolio. But in such volatile markets, how much equity would CPPIB have at the beginning of the coming fiscal year? Public equity was revalued continually, and forecasts readily available, but private equity was revalued infrequently and forecasts were difficult to develop. Public markets, represented by the S&P 500, had dropped a further 22.56 percent between September and December. Would private equity valuations follow? Estimating the starting value of these assets for the coming fiscal year had become challenging.

The markets continued to drop. CPPIB reported third quarter returns as of December 31, 2008 of −6.7 percent – and assets under management were now $108.9B CAD, down from $122.8B CAD at March 31, 2008. Elsewhere, public reports and market intelligence indicated many other funds, in efforts to raise cash, were being forced to sell and realize significant losses. CPPIB management was monitoring the effects of the market downturn on its own balance sheet, as part of an effort to 'keep its powder dry.' Because of its balance sheet flexibility, a luxury lost to many other fund managers, CPPIB management felt well positioned to take advantage of market opportunities in the coming year.

Performance agreements

PMI

The performance agreement for active strategies within PMI included a fixed-dollar risk budget. Consistent with being a purely active manager, PMI was allocated risk, not assets, and so no initial asset value was required to set the fiscal 2010 performance agreement. The level of risk was a stretch target for PMI, intended to encourage PMI to find value-adding opportunities. The return hurdles were set to reward PMI for achieving high quantile realized information ratios (the ratio of excess return relative to risk taken), so that PMI was incentivized to take on only those transactions that were expected to pay for the risks taken.

REI

The REI department was pursuing an opportunistic investment strategy in private real estate, with long-term multiyear objectives. There were a number of phases in the development of the REI performance agreement. Changes in the REI portfolio could arise from changes in the value of existing assets, and from the acquisition of new assets. So PDIR and REI reviewed the real estate deal pipeline, developing a sense of the potential to originate new real estate assets in fiscal 2010. The result was a set of low, mid, and high net new real estate asset origination projects. PDIR and REI then worked to estimate the value of the real estate portfolio at the beginning of fiscal 2010. These two factors, the initial starting value plus the value of net new real estate assets, were used to estimate the low, mid, and high values of the real estate portfolio. PDIR also reviewed the balance sheet implications of these scenarios, including the funding strategies.

PI

The PI group is responsible for private equity, infrastructure, and private debt. PDIR worked with PI to estimate low, mid, and high scenarios for the dollars invested of the private equity, infrastructure, and private debt portfolios. Again, PDIR also reviewed the balance sheet implications of these scenarios, including funding strategies. Once these individual scenarios were developed, PDIR then estimated a number of risk measures associated with these strategies.

Total fund risk budget

PDIR estimated the stand-alone risk measure for each department. These numbers were somewhat comparable to the risk budget allocated to PMI. PDIR then combined the low, mid, and high scenarios of the departments, and then for each resulting scenario measured the risk contribution each department made to the active portfolio and to the total Fund. This analysis provides a sense of the range of risk contributions each department might make. These contribution measures also provide insights into the strategies diversification benefits for the total and active portfolios.

IPC approval

By December, having performed a number of risk-budget iterations in response to the volatile capital markets, CPPIB management had become proficient at updating and revising its risk budget forecasts. In January 2009, the IPC accepted the recommended risk budgets, which anticipated the market would present a number of opportunities as other investors were forced to sell. Board approval was gained in February 2009.

Conclusion

The mission of CPPIB is to safeguard the CPP for 16 million participants by establishing a clear link between investment objectives and outcomes, and between actions and accountability. This chapter has reviewed the CPP and CPPIB's history, and the risk-budgeting design process to illustrate why risk budgeting was seen as an appropriate course of action, as well as why the strict risk-budgeting framework was reworked to fit within the opportunistic business model for illiquid assets in place at CPPIB. Risk budgeting is a familiar construct in the capital market sector, and the PMI group has always worked within a 'risk budget,' looking at the quantitative measures of volatility and risk in the context of investment decisions. The PI and REI

groups have considered the implications of risk in their investment decisions, but on a more qualitative basis. Changing the business model to fit within a risk-budgeting framework was never considered; rather risk budgeting was changed to fit the business model.

In an environment where risk is a scarce resource, prioritization of scant resources and increased efficiency in the use of risk can only have positive implications. While formal risk budgeting has only been in place for a short time at the CPPIB, it is expected that it will provide real and measurable benefits. As a management tool, the risk-budgeting process allows CPPIB to define accountabilities clearly and increase transparency into the trade-offs implicit in investment decisions.

Notes

[1] This section draws on Little (2008).

[2] Amendments to the Canadian constitution require approval by the Canadian House of Commons, the Canadian Senate, and two-thirds majority of the provincial legislatures representing at least 50 percent of the population.

[3] The OCA forecasts that no more than approximately 34 percent of investment earnings will be needed to pay benefits. Real growth is expected to slow, but a sale of assets is not anticipated.

[4] Although the Stewards' Agreement in 1997 specified a return of 3.8 percent, the Chief Actuary later determined that a real return of 4.2 percent was necessary.

References

Ambachtsheer, Keith (1996). 'How All Pension Funds Should Be Measured.' *Ambachtsheer Newsletter 130–131*. Toronto, CA: K.P.A Advisory Services.

Arnold, Jennifer, John Ilkiw, Steven James, and James Pesando (2009). 'The Fair Value of the Canada Pension Plan: The Role of Risk and Cost Structure.' Rotman Institute Working Paper. Toronto, CA: Rotman School of Management at the University of Toronto.

Brinson, Gary P., L. Randolph Hood, and Gilbert L. Beebower (1986). 'Determinants of Portfolio Performance,' *Financial Analysts Journal*, 42(4): 45–51.

Brooks, Mike, David Bowie, Martin Cumberworth, Allistari Haig, and Bernie Nelson (2001). *The Practicalities of Budgeting, Managing and Monitoring Investment Risk for Pension Funds*. Guernsey, UK: Faculty and Institute of Actuaries, Finance and Investment Conference. http://www.actuaries.org.uk/__data/assets/pdf_file/0019/26308/brooks.pdf

Canada Pension Plan Investment Board (CPPIB) (1999). *Annual Report*, Toronto, CA: CPPIB.

Canada Pension Plan Investment Board (CPPIB) (2008). *Investment Statement*, Toronto, CA: CPPIB.

Canada Pension Plan Investment Board Act (CPPIB Act) (1997). *The Canada Pension Plan Investment Board Act, 1997, c. 40*. Ontario, CA: CPPIB.

de Bever, Leo, Wayne Kozun, Valter Viola, and Barbara Zvan (2000). 'Pension Risk Budgeting: Something Old, Something New, Something Borrowed . . . ,' *Journal of Performance Measurement*, 4(4): n.p.

Gunn, Sterling, Tracy Livingstone, and Oliver Wyman (2008). *Risk Budgeting Governance and Measurement Principles*. Toronto, CA: CPPIB.

Human Resources and Skills Development Canada (HRSDC) (1995). *Phase I of the Evaluation of the Canada Pension Plan (CPP) – July 1995*. Ontario, CA: HRSDC. http://www.hrsdc.gc.ca/eng/cs/sp/sdc/evaluation/sp-ah008e/page07.shtml#fn85

Human Resources Development Canada (HRDC) (1997). *Securing the Canada Pension Plan: Agreement on Proposed Changes to the CPP*. Ontario, CA: HRDC.

Ilkiw, John and Donald Raymond (2005). *Derivation of CPP Reference Portfolio*. Toronto, CA: CPPIB.

James, Steven, (2007). *CPPIB Internal Memo*. Toronto, CA: CPPIB.

Little, Bruce (2008). *Fixing the Future: How Canada's Usually Fractious Governments Worked Together to Rescue the Canada Pension Plan*. Toronto, CA: Rotman/University of Toronto Press.

Pearson, Neil D. (2002). *Risk Budgeting: Portfolio Problem Solving with Value-at-Risk*. New York: John Wiley & Sons.

Raymond, Donald (2009). 'Integrating Goals, Structure, and Decision-Making at the Canada Pension Plan Investment Board,' *Rotman International Journal of Pension Management*, (2)1: 22–9.

Ross, Raymond (2007). *CPPIB Internal Memo*. Toronto, CA: CPPIB.

The Federal, Provincial and Territorial Governments of Canada (TFPTGC) (1996). *An Information Paper for Consultations on the Canada Pension Plan*, Ontario, CA: TFPTGC.

The Office of the Chief Actuary (TOCA) (2006). *Actuarial Report on the Canada Pension Plan as at 31 December 2006*. Ontario, CA: TOCA.

——(2009). *Internal Rates of Return on Contributions: Canadian Pension Plan 1910–1930*. Ontario, CA: TOCA.