

Group Case Report 2

Factor Investing: The Reference Portfolio and  
Canada Pension Plan Investment Board

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CFM 301

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1. How is CPPIB's investment team and philosophy enabled and supported by its legislation and governance structure?

CPPIB's investment philosophy is rooted in investing in "the best interests of CPP contributors and beneficiaries and to maximize investment returns without undue risk of loss." CPPIB's realization of this philosophy is effective due to its unique legislative position as the private arm of CPP solely responsible for managing the pension fund. By having this arrangement, CPPIB operates independently from the government, and so is not required to follow the same set of stringent rules as a government division. This enables CPPIB to pursue top talent in the finance industry with strong compensation, and invest freely based on its own rules and values, with less government oversight and investment constraints. This differs greatly from CPP's traditional investment philosophy during the pre-inception period of CPPIB, where investments were passive and lower returns were therefore realized. Moreover, by using the Reference Portfolio, compensation is predictable and the goal for CPPIB managers to create as much added value compared to the portfolio is clear. By being legislated to adhere to these practices, the philosophy is effectively set in stone, promoting long-term investments where additional performance typically lies by ensuring fund managers will receive stable compensation even during economic downturns and therefore alleviating risk-taking agency problems.

To manage its investment risk, CPPIB's governance structure ensures that there are proper checks and balances in place that ensure CPPIB invests according to its mandate and secures the safety of the pensions for CPP contributors. CPPIB's 12-person board of directors are individually appointed by the federal finance minister, after consultation with CPP-participating provinces. Each director is nominated for a term of three years, and all nomination periods are staggered such that no more than half of the directors' terms expire in the same year. This

ensures the stability of the board and gives new board members time to transition into their roles. Each director represents their own region of Canada, ensuring the values of their respective pensioners are reflected in CPPIB's investment activities through their legislated duties and powers. Ultimately, this structure maintains sustainability, stability and confidence in the CPPIB investment team's actions through a supervisory body detached from the government and composed of knowledgeable industry professionals.

2. Does the board's responsibility for the Reference Portfolio and the board's control over CPPIB management by the active risk limit alleviate, or at least mitigate, standard agency problems in delegated portfolio management?

There is one big agency problem that these controls help mitigate. There is the possibility of a new manager coming into a firm and trying to impress the directors recklessly. This would be done by taking on lots of risk in the hopes of a massive return on investment, leading to a good bonus and occasionally new positions in the company, or a massive loss leading to being laid off. However, being laid off isn't much of a consequence for a new hire as they will simply continue their hunt for a job and likely try the same stunt at another firm until it works.

The active risk limit imposed by the board ensures there is a cap on the amount of risk taken on by managers, thus reducing the effectiveness of the agency problem. If the active risk limit is done right, it can greatly limit the corporation's risk of this agency problem.

The reference portfolio also ensures there is a well throughout asset mix so that managers can't create more risk by poorly diversifying.

The mandate of CPPIB also helps here. As a part of the mandate, CPPIB is striving to maximize long-term investments. This is quite different from other investment firms who are usually more focused on the short-term returns to make shareholders happy at the end of the fiscal year.

Having this focus on long-term returns means the compensation structure is set up so that most of the benefits are derived from multi-year returns. This means managers can't jump in and immediately try to go big as they won't see much compensation if they are immediately fired for taking a big loss in their first few years. With a long-term compensation structure, it is now much more likely these risky investments will fail before the manager gets to see their compensation.

### 3. Compute various performance statistics of CPPIB's returns as reported in Exhibit 4.

In your analysis, consider a simple 60%-40% Canadian domestic equities-bond mix as a benchmark as well as the Reference Portfolio.

CPPIB's returns are reported as total fund returns net of fees composing of operating expenses such as team compensation, office expenses, and so on. Notably, these returns do not include withdrawals used to pay pensioners their benefits. CPPIB's existence must be justified as an active fund by having positive excess return, alpha, compared to their reference portfolio which has similar risk characteristics, but is simple to implement with a small investor team, and effectively require zero extra cost since it is passively managed. Since its inception in 2007, this fund has steadily outperformed its benchmark, except for 2010, where the fund still made a significantly large positive return. Note that CPPIB's performance is measured as a comparison to its Reference Portfolio, meaning that CPPIB investors primarily aim to beat the Reference Portfolio which does not necessarily mean that they generate net positive returns, as shown in 2008-2009. This performance characteristic has the effect of incentivising long term growth, focusing on finding value that may not be realized until a future date past the short-term horizon.

The methodology used to compute the returns for a 60%-40% Canadian domestics equities-bond mix (Exhibit 1&2) used the TSX60 index and a Canadian bond index ETF as a proxy for bond returns, with timings aligned to the fiscal calendar used by CPPIB's reporting.

Compared to the 60%-40% Canadian domestic equities-bond mix (Exhibit 1&2), CPPIB appears to slightly underperform, with highly variable excess return characteristics. As a fund with a relatively low risk mandate, comparing its returns to a 60-40 bond portfolio may not be a suitable comparison due to the high variability of equities. Although the 60/40 portfolio may traditionally be viewed as a safe bet for retirement, it appears that CPPIB has found a more suitable solution for a consistently low-risk portfolio that generates sufficient returns for long-term savings goals, such as for retirement or for a large pension fund.

4. How large a difference is there between the actual asset mix and the exposure mix in the actual portfolio, and how does this compare to the Reference Portfolio components?

The difference between the actual asset mix and the exposure mix in the actual portfolio in Exhibit 3 shows how CPPIB allocates funds compared to how it manages risk exposure.

**Equities:** There is a significant increase in exposure to Foreign Developed Market Equities compared to the actual asset mix (45.3% vs. 34.3%, 11% difference) which is indicative of a strategic decision to increase exposure relative to actual holdings. This strategy highlights the pursuit of higher returns and growth opportunities from these foreign markets as well as the benefits from diversification. The alignment in actual allocation and exposure of Emerging Market Equities (0.1% difference) and Canadian Equities (15.2% vs. 14.2%, 1% difference) suggests a balanced approach towards these investments.

**Bonds:** The fixed income actual asset mix is 29.1%, but the exposure mix is 24.8% (-4.3% difference). The reduced economic exposure compared to the actual asset mix potentially reflects a strategy to seek higher returns from other asset classes.

**Inflation Sensitive Assets:** The actual asset mix for inflation-sensitive assets is 16.4% but the exposure mix is much lower at 4.9% (-11.5% difference). This large discrepancy suggests that

while a significant portfolio is nominally allocated to these assets, CPPIB's risk management strategy lowers economic exposure to these assets.

This actual versus exposure analysis demonstrates CPPIB's active management of not only direct investments but also through strategies that alter the economic exposure of its assets. The Reference Portfolio provides a benchmark for CPPIB's active management strategies, the Reference Portfolio is composed of 65% equities and 35% bonds. The actual asset mix's slight deviation from the Reference Portfolio, particularly in Foreign Developed Market Equities (higher nominal allocation, which is a more aggressive position, but aligns with the Reference Portfolio's emphasis on equities), and strategic exposure adjustments, particularly with bonds and inflation-sensitive assets (reduced economic exposure to bonds and inflation-sensitive assets, despite their considerable nominal allocations) demonstrate CPPIB's active management aimed at aligning with the Reference Portfolio's objective while navigating market risks and capturing opportunities for higher returns.

5. Explicitly and intuitively explain the large discrepancy between the asset mix percentages and the economic mix percentages, particularly for equities, bonds, and for real assets in Exhibit 3. What does this imply about the assets' factor exposures, and CPPIB's beliefs about the economic risk-return trade-offs of these assets, in terms of the factors in the Reference Portfolio?

As seen in question 4, the economic exposure to foreign developed equities, foreign sovereign bonds and to a smaller extent Canadian equities is larger than the asset mix valuation for those assets based on asset labels, while the economic exposure to fixed income assets and inflation-sensitive assets like real estate and infrastructure investments is lower than the value from assets labels. This is because of CPPIB's "Total Portfolio Approach", which looked at each investment they made in terms of that investment's exposure to underlying factors, in this case,

the systematic are the asset classes of the Reference Portfolio. For example, consider the purchase of foreign real estate. The risk and return characteristics of this real estate investment were known by CPPIB to be correlated with the characteristics of equity and fixed-income assets, as seen in the second example of Appendix 3. Thus, the amount invested in this real estate would contribute to exposure in categories such as foreign equities and foreign sovereign bonds in addition to the exposure to real estate, which can help to explain discrepancies between asset mix and exposure mix percentages such as the larger exposure percentage for foreign developed equities and foreign bonds and the lower exposure percentage to inflation-sensitive assets.

This implies that CPPIB believes the risk-return trade-offs of these assets can be expressed based on the underlying factors in the reference portfolio and that investment managers can base their decisions on certain investments using the risk-return characteristics of the underlying factors they are exposed to. For example, from 2010 to 2011, CPPIB's asset mix percentage in real estate and infrastructure drastically increased (33% and 42% respectively) and relatively smaller-sized inflation-linked bonds decreased, which should mean the exposure percent of inflation-sensitive assets should increase, but in reality, the exposure mix percentage of inflation-sensitive assets didn't change. Therefore, it implies that CPPIB believes real estate and infrastructure assets have large exposures to other factors in the Reference Portfolio and that the risk-return trade-offs of these assets are highly similar to those of the other factors.

## Appendix

Exhibit 1 - CPPIB Returns vs. Reference Portfolio and 60/40 Portfolio

Year	CPPIB Return	Reference Portfolio	CPPIB Excess Return on Benchmark	60/40 Portfolio*	CPPIB Excess Return on 60/40
2011	11.9%	9.8%	2.1%	11.9%	0.0%
2010	14.9%	20.8%	-5.9%	24.3%	-9.4%
2009	-18.6%	-18.6%	0.0%	-16.1%	-2.5%
2008	-0.3%	-2.7%	2.4%	5.6%	-5.9%
2007	12.9%	10.4%	2.5%	9.5%	3.4%
2006	15.5%			19.7%	-4.2%
2005	8.5%			1.0%	7.5%
2004	17.6%			25.2%	-7.6%
2003	-1.5%			6.4%	-7.9%
2002	4.0%			1.6%	2.4%
2001	7.0%			-10.8%	17.8%
2000	3.2%			30.8%	-27.6%

\* Based on calculations, methodology explained in detail in included notebook



Exhibit 2 - Calculated Portfolio Annual Returns

	Year	equity_ret	bond_ret	60/40 Benchmark
0	2000.0	0.4793	0.0523	0.3085
1	2001.0	-0.2212	0.0615	-0.1081
2	2002.0	0.0084	0.0282	0.0163
3	2003.0	-0.1754	0.1035	-0.0638
4	2004.0	0.3427	0.1149	0.2516
5	2005.0	0.1443	0.0333	0.0999
6	2006.0	0.3013	0.0404	0.1969
7	2007.0	0.1235	0.0530	0.0953
8	2008.0	0.0637	0.0457	0.0565
9	2009.0	-0.3044	0.0551	-0.1606
10	2010.0	0.3740	0.0469	0.2432
11	2011.0	0.1643	0.0502	0.1187