



# Financial Planning Assumptions

(Factor-Tilted Portfolio)

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This report was written by Raymond Kerzérho. The ideas, opinions, and recommendations contained in this document are those of the authors and do not necessarily represent the views of PWL Capital Inc., A OneDigital Company.

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# 1. Introduction

This guide is intended to provide Canadian financial planners with our best estimates of future asset class returns and volatilities to produce financial projections for their clients. This document assumes that investors hold a broadly diversified portfolio of publicly traded global fixed-income securities and equity, including developed and emerging stock markets. These estimates are valid uniquely in the context of an investor who purposely avoids concentration in one or a few securities or sectors. Our investment horizon is 30 years. Key inputs are highlighted in green for the NaviPlan financial planning software users. We have added an appendix to provide users of NaviPlan with data presented in a more user-friendly format.

We have created this report specifically to help financial advisors who invest with mutual funds from Dimensional Fund Advisors Canada. The asset class expected returns, standard deviations, correlations, and distribution yields are designed to replicate the characteristics of the DFA Global Allocation funds. Importantly, these characteristics account for the exposure of these funds to the Fama-French factors.

## 2. Expected Inflation

Our estimate for long-run Canadian inflation is the average of Canadian historical inflation from 1900 to 2025 and the Bank of Canada's inflation target. These figures are 3.0% and 2.0%, respectively, for an inflation expectation of 2.5%.

**Table 1 - Expected Inflation Composition**

| 0.50 x (Historical Inflation) Plus | 0.50 x (Bank of Canada Target Inflation) | Equals Expected Inflation |
|------------------------------------|--|---------------------------|
| 3.0%                               | 2.0%                                     | 2.5%                      |

Source: PWL Capital; Data Sources: Elroy Dimson, Paul Marsh and Mike Staunton, Bank of Canada.

## 3. Primary Residence

We estimate the expected real capital return for personal residences at 1% annually. The carrying costs of real estate, including maintenance, insurance, and property taxes, must also be captured. We estimate a 1% annual cost for maintenance and insurance. As property taxes vary greatly, we do not attempt to prescribe a figure here, but users should be sure to include them based on their circumstances. A 1% expected real return, less maintenance and property taxes (not to mention the opportunity cost of home equity) may make housing look like a poor investment. However, it is essential to remember that the owner receives imputed rent as a benefit.

Haurin & Zhou (2010) documents the idiosyncratic volatility of individual homes from 1985 to 2003, and Peng & Thibodeau (2016) cover the periods from 1996 to 2000, 2001 to 2007, and 2007 to 2012. We calculate an average from these studies and add it to the general Canadian market volatility to obtain an estimate of 15% for the volatility of Canadian homes, as documented in Table 2 below.

**Table 2 - Canadian Individual Home Volatility Estimate**

|                                     |       |              |
|-------------------------------------|-------|--------------|
| Canadian Market Volatility Estimate |       | 4.5%         |
| Plus: Idiosyncratic Volatility:     |       |              |
| Haurin & Zhou (1985-2003)           | 13.1% |              |
| Peng & Thibodeau (1996-2000)        | 9.4%  |              |
| Peng & Thibodeau (2001-2007)        | 7.9%  |              |
| Peng & Thibodeau (2007-2012)        | 11.5% |              |
| Average                             | 10.5% | 10.5%        |
| Total Volatility                    |       | <b>15.0%</b> |

Source: PWL Capital; Data Sources: Haurin and Zhou, Peng and Thibodeau, Federal Reserve Bank of Saint-Louis, Teranet/National Bank.

## 4. Expected Cost of Borrowing

Like our methodology for estimating the expected return of fixed-income assets, we estimate the expected cost of borrowing from a combination of Market-Based Expected Returns (MBER) and Equilibrium Cost of Capital (ECOC) for five-year fixed-rate mortgages and secured and unsecured personal lines of credit. Our results are summarized in Table 3.

**Table 3 - Expected Cost of Borrowing**

|                                     | W1  | Nominal<br>MBER | W2  | Nominal<br>ECOC | Expected Cost of<br>Borrowing |
|-------------------------------------|-----|-----------------|-----|-----------------|-------------------------------|
| Five-Year Mortgage - Fixed rate     | 75% | 4.19%           | 25% | 4.73%           | 4.33%                         |
| Personal Line of Credit - Secured   | 15% | 3.82%           | 85% | 5.25%           | 5.04%                         |
| Personal Line of Credit - Unsecured | 15% | 7.69%           | 85% | 8.49%           | 8.37%                         |

Source: PWL Capital; Data Sources: Statistics Canada, Bank of Canada, Bloomberg, BMO Global Asset Management.

## 5. Asset Class Expected Returns

We estimate asset class expected returns with a weighted average of the Market-Based Expected Return (MBER) and the Equilibrium Cost of Capital (ECOC). The MBER is an estimate of expected returns based on current market condition metrics. The ECOC estimates expected returns based on more than 120 years of global asset class return historical data. The weighting of each component is derived from the statistical explanatory power of the MBER. Empirical evidence suggests that the MBER has a high explanatory power for fixed income and a relatively low (but significant) explanatory power for equity and cash instruments.

For each asset class, we attribute a weight “W1” to the MBER and the balance of the attribution “W2” to the ECOC to obtain gross nominal asset class returns. We then subtract product MERs to obtain the net nominal expected return. We use DFA F-class mutual fund MERs as our product fee assumption to factor-tilted portfolios. The corresponding funds to each asset class are outlined in the section “Composition of Asset Class Returns.

**Table 4 - Asset Class Expected Returns**

| Asset Class                                  | W1  | Nominal MBER | W2  | Nominal ECOC | Nominal Expected Return - Gross of fees | MER   | Nominal Expected Return - Net of fees |
|--|-----|--------------|-----|--------------|---|-------|---------------------------------------|
| Cash   | 15% | 2.20%        | 85% | 2.99%        | 2.87%                                   | 0.00% | 2.87%                                 |
| Fixed Income - Factor-Tilted                 | 75% | 3.26%        | 25% | 3.77%        | 3.39%                                   | 0.28% | 3.10%                                 |
| Canadian Equity - Factor-Tilted              | 25% | 7.00%        | 75% | 7.78%        | 7.59%                                   | 0.24% | 7.33%                                 |
| US Equity - Factor-Tilted                    | 25% | 5.66%        | 75% | 7.75%        | 7.23%                                   | 0.24% | 6.97%                                 |
| International Equity DV & EM - Factor-Tilted | 25% | 8.57%        | 75% | 7.49%        | 7.76%                                   | 0.39% | 7.34%                                 |

Source: PWL Capital; Data Sources: Bloomberg, Morningstar, Robert Shiller, Elroy Dimson, Paul Marsh and Mike Staunton.

## 6. Expected Standard Deviations

Asset class standard deviations are estimated using a simple average of the 5-year and 20-year historical standard deviations.

**Table 5 - Estimated Volatility of Major Asset Classes**

| Asset Class                          | Five-year Standard Deviation | 20-year Standard Deviation | Estimated Standard Deviation |
|--------------------------------------|------------------------------|----------------------------|------------------------------|
| Fixed Income - Factor-Tilted         | 3.80%                        | 2.81%                      | 3.31%                        |
| Canadian Equity - Factor Tilted      | 14.31%                       | 16.02%                     | 15.16%                       |
| US Equity - Factor Tilted            | 16.13%                       | 16.21%                     | 16.17%                       |
| International Equity - Factor Tilted | 11.30%                       | 14.93%                     | 13.12%                       |

Source: PWL Capital; Data Source: Morningstar.

## 7. Expected Correlations

Asset class correlations are estimated using a simple 5-year- and 20-year historical data average.

**Table 6 - Correlation Estimates**

|                                      | Fixed Income - Factor-Tilted | Canadian Equity - Factor-Tilted | US Equity - Factor-Tilted | International Equity - Factor-Tilted |
|--------------------------------------|------------------------------|---------------------------------|---------------------------|--------------------------------------|
| Fixed Income - Factor-Tilted         | 1.00                         | 0.26                            | 0.33                      | 0.37                                 |
| Canadian Equity - Factor-Tilted      | 0.26                         | 1.00                            | 0.82                      | 0.80                                 |
| US Equity - Factor-Tilted            | 0.33                         | 0.82                            | 1.00                      | 0.80                                 |
| International Equity - Factor-Tilted | 0.37                         | 0.80                            | 0.80                      | 1.00                                 |

Source: PWL Capital; Data Source: Morningstar.

## 8. Composition of Asset Class Returns

The composition of asset class returns, primarily consisting of the mix of capital appreciation, interest income and dividends, is essential for financial planning. The tax liability in taxable and non-taxable accounts (due to foreign withholding tax) will hinge on the portion of returns assumed to be coming from interest, Canadian and foreign dividends, and realized and unrealized capital gains.

To determine the composition of asset class returns, we proceed as follows:

- Establish one or more mutual funds or ETFs representing the passive benchmark for each asset class.
- For fixed income, the average distribution yield is assumed to be the lowest of the underlying fund's current yield and the asset class expected return. Distributions are assumed to be 100% interest income.
- For Canadian equity, fund distributions are assumed to be 100% Canadian dividends.
- For US and international equity, fund distributions are assumed to be 100% foreign dividends.
- The balance of expected returns (net of distribution yields) is treated as capital gains.
- We assume a 90%/10% split between unrealized and realized capital gains.

We use the following funds to estimate the composition of asset class returns:

Fixed income: 100% DFA Global Fixed Income F (DFA916)

Canadian equity: 70% DFA Canadian Core Equity F (DFA256) and 30% DFA Canadian Vector Equity F (DFA600)

US Equity: 70% DFA US Core Equity F (DFA293) and 30% DFA US Vector Equity F (DFA223)

International Equity: 70% DFA International Core Equity F (DFA295) and 30% DFA International Vector Equity F (DFA227)

Our estimates for the composition of expected returns are illustrated in Table 7. This data is reproduced in a NaviPlan-compatible format in the Appendix.

**Table 7 - Composition of Expected Asset Class Returns**

| Asset Class                          | Expected Return | Current Yield | Interest & Foreign Dividends | Canadian Dividends | Realized Capital Gains | Unrealized Capital Gains |
|--------------------------------------|-----------------|---------------|------------------------------|--------------------|------------------------|--------------------------|
| Fixed Income - Factor-Tilted         | 3.10%           | 3.08%         | 3.08%                        | 0.00%              | 0.00%                  | 0.02%                    |
| Canadian Equity - Factor-Tilted      | 7.33%           | 2.10%         | 0.00%                        | 2.10%              | 0.52%                  | 4.71%                    |
| US Equity - Factor Tilted            | 6.97%           | 1.03%         | 1.03%                        | 0.00%              | 0.59%                  | 5.35%                    |
| International Equity - Factor Tilted | 7.34%           | 2.64%         | 2.64%                        | 0.00%              | 0.47%                  | 4.23%                    |

Source: PWL Capital; Data Sources: Bloomberg, Morningstar, Robert Shiller, Elroy Dimson, Paul Marsh and Mike Staunton.



## 9. Portfolio Expected Returns

To simplify the practical application of the information presented in this paper, Table 8 shows expected returns, standard deviations, and return composition for portfolios consisting of various mixes between stocks and bonds.

**Table 8 - Portfolio Expected Returns**

| Asset Mix<br>(Equity/Bond) | Expected<br>Return | Expected<br>Standard<br>Deviation | ESTIMATED RETURN COMPOSITION       |                       |                           |                             |
|----------------------------|--------------------|-----------------------------------|------------------------------------|-----------------------|---------------------------|-----------------------------|
|                            |                    |                                   | Interest<br>& Foreign<br>Dividends | Canadian<br>Dividends | Realized<br>Capital Gains | Unrealized<br>Capital Gains |
| 0/100                      | 3.10%              | 3.31%                             | 3.08%                              | 0.00%                 | 0.00%                     | 0.02%                       |
| 5/95                       | 3.35%              | 3.45%                             | 2.99%                              | 0.04%                 | 0.03%                     | 0.30%                       |
| 10/90                      | 3.60%              | 3.71%                             | 2.89%                              | 0.08%                 | 0.06%                     | 0.57%                       |
| 15/85                      | 3.84%              | 4.06%                             | 2.79%                              | 0.11%                 | 0.09%                     | 0.84%                       |
| 20/80                      | 4.07%              | 4.49%                             | 2.68%                              | 0.15%                 | 0.12%                     | 1.12%                       |
| 25/75                      | 4.31%              | 4.97%                             | 2.58%                              | 0.19%                 | 0.15%                     | 1.38%                       |
| 30/70                      | 4.53%              | 5.49%                             | 2.48%                              | 0.23%                 | 0.18%                     | 1.65%                       |
| 35/65                      | 4.76%              | 6.05%                             | 2.37%                              | 0.26%                 | 0.21%                     | 1.91%                       |
| 40/60                      | 4.98%              | 6.62%                             | 2.27%                              | 0.30%                 | 0.24%                     | 2.17%                       |
| 45/55                      | 5.19%              | 7.21%                             | 2.16%                              | 0.34%                 | 0.27%                     | 2.43%                       |
| 50/50                      | 5.41%              | 7.82%                             | 2.06%                              | 0.37%                 | 0.29%                     | 2.68%                       |
| 55/45                      | 5.61%              | 8.43%                             | 1.96%                              | 0.40%                 | 0.32%                     | 2.93%                       |
| 60/40                      | 5.82%              | 9.06%                             | 1.86%                              | 0.44%                 | 0.35%                     | 3.17%                       |
| 65/35                      | 6.02%              | 9.69%                             | 1.75%                              | 0.47%                 | 0.38%                     | 3.41%                       |
| 70/30                      | 6.21%              | 10.32%                            | 1.65%                              | 0.51%                 | 0.40%                     | 3.65%                       |
| 75/25                      | 6.40%              | 10.96%                            | 1.55%                              | 0.54%                 | 0.43%                     | 3.88%                       |
| 80/20                      | 6.59%              | 11.61%                            | 1.46%                              | 0.57%                 | 0.45%                     | 4.11%                       |
| 85/15                      | 6.78%              | 12.25%                            | 1.36%                              | 0.60%                 | 0.48%                     | 4.34%                       |
| 90/10                      | 6.96%              | 12.90%                            | 1.26%                              | 0.63%                 | 0.50%                     | 4.56%                       |
| 95/5                       | 7.13%              | 13.56%                            | 1.17%                              | 0.66%                 | 0.53%                     | 4.78%                       |
| 100/0                      | 7.30%              | 14.21%                            | 1.07%                              | 0.69%                 | 0.55%                     | 4.99%                       |

Source: PWL Capital; Data Sources: Bloomberg, Morningstar, Robert Shiller, Elroy Dimson, Paul Marsh and Mike Staunton.

# Appendix: Financial Planning Assumptions – Naviplan Input Format

**Table 9 - Composition of Asset Class Returns (NaviPlan format)**

|                                      | Interest | Dividends | Capital Gains | Deferred Growth | Total | Standard Deviation |
|--------------------------------------|----------|-----------|---------------|-----------------|-------|--------------------|
| Fixed Income - Factor-Tilted         | 3.08%    |           | 0.00%         | 0.02%           | 3.10% | 3.31%              |
| Canadian Equity - Factor-Tilted      |          | 2.10%     | 0.52%         | 4.71%           | 7.33% | 15.16%             |
| US Equity - Factor Tilted            | 1.03%    |           | 0.59%         | 5.35%           | 6.97% | 16.17%             |
| International Equity - Factor Tilted | 2.64%    |           | 0.47%         | 4.23%           | 7.34% | 13.12%             |
| Fixed Income - MCW                   | 3.33%    |           | 0.02%         | 0.20%           | 3.55% | 5.38%              |
| Canadian Equity - MCW                |          | 2.22%     | 0.46%         | 4.15%           | 6.83% | 14.19%             |
| US Equity - MCW                      | 0.84%    |           | 0.56%         | 5.00%           | 6.39% | 14.52%             |
| International Equity - MCW           | 2.40%    |           | 0.47%         | 4.23%           | 7.10% | 12.34%             |

Source: PWL Capital; Data Sources: Bloomberg, Morningstar, Robert Shiller, Elroy Dimson, Paul Marsh and Mike Staunton.

**Table 10 - Correlations (NaviPlan format)**

|                                      | Fixed Income - Factor Tilted | Canadian Equity - Factor Tilted | US Equity - Factor Tilted | International Equity - Factor Tilted | Fixed Income - MCW | Canadian Equity - MCW | US Equity - MCW | International Equity - MCW |
|--------------------------------------|------------------------------|---------------------------------|---------------------------|--------------------------------------|--------------------|-----------------------|-----------------|----------------------------|
| Fixed Income - Factor Tilted         | 1.00                         | 0.26                            | 0.33                      | 0.37                                 | 0.98               | 0.36                  | 0.40            | 0.49                       |
| Canadian Equity - Factor Tilted      | 0.26                         | 1.00                            | 0.82                      | 0.80                                 | 0.29               | 0.97                  | 0.65            | 0.69                       |
| US Equity - Factor Tilted            | 0.33                         | 0.82                            | 1.00                      | 0.80                                 | 0.36               | 0.85                  | 0.91            | 0.73                       |
| International Equity - Factor Tilted | 0.37                         | 0.80                            | 0.80                      | 1.00                                 | 0.38               | 0.80                  | 0.69            | 0.95                       |
| Fixed Income - MCW                   | 0.98                         | 0.29                            | 0.36                      | 0.38                                 | 1.00               | 0.39                  | 0.45            | 0.48                       |
| Canadian Equity - MCW                | 0.36                         | 0.97                            | 0.85                      | 0.80                                 | 0.39               | 1.00                  | 0.71            | 0.71                       |
| US Equity - MCW                      | 0.40                         | 0.65                            | 0.91                      | 0.69                                 | 0.45               | 0.71                  | 1.00            | 0.71                       |
| International Equity - MCW           | 0.49                         | 0.69                            | 0.73                      | 0.95                                 | 0.48               | 0.71                  | 0.71            | 1.00                       |

Source: PWL Capital; Data Sources: Bloomberg, Morningstar, Robert Shiller, Elroy Dimson, Paul Marsh and Mike Staunton.

**Table 11 - Portfolio Asset Mixes**

| Asset Mix (Equity/<br>Bond) | Fixed Income – Factor<br>Tilted | Canadian Equity –<br>Factor Tilted | US Equity – Factor<br>Tilted | International Equity –<br>Factor Tilted |
|-----------------------------|---------------------------------|------------------------------------|------------------------------|---|
| 0/100                       | 100.00%                         | 0.00%                              | 0.00%                        | 0.00%                                   |
| 5/95                        | 95.00%                          | 1.62%                              | 2.23%                        | 1.15%                                   |
| 10/90                       | 90.00%                          | 3.24%                              | 4.46%                        | 2.29%                                   |
| 15/85                       | 85.00%                          | 4.87%                              | 6.69%                        | 3.44%                                   |
| 20/80                       | 80.00%                          | 6.49%                              | 8.93%                        | 4.59%                                   |
| 25/75                       | 75.00%                          | 8.11%                              | 11.16%                       | 5.73%                                   |
| 30/70                       | 70.00%                          | 9.73%                              | 13.39%                       | 6.88%                                   |
| 35/65                       | 65.00%                          | 11.35%                             | 15.62%                       | 8.03%                                   |
| 40/60                       | 60.00%                          | 12.98%                             | 17.85%                       | 9.17%                                   |
| 45/55                       | 55.00%                          | 14.60%                             | 20.08%                       | 10.32%                                  |
| 50/50                       | 50.00%                          | 16.22%                             | 22.32%                       | 11.47%                                  |
| 55/45                       | 45.00%                          | 17.84%                             | 24.55%                       | 12.61%                                  |
| 60/40                       | 40.00%                          | 19.46%                             | 26.78%                       | 13.76%                                  |
| 65/35                       | 35.00%                          | 21.09%                             | 29.01%                       | 14.90%                                  |
| 70/30                       | 30.00%                          | 22.71%                             | 31.24%                       | 16.05%                                  |
| 75/25                       | 25.00%                          | 24.33%                             | 33.47%                       | 17.20%                                  |
| 80/20                       | 20.00%                          | 25.95%                             | 35.70%                       | 18.34%                                  |
| 85/15                       | 15.00%                          | 27.57%                             | 37.94%                       | 19.49%                                  |
| 90/10                       | 10.00%                          | 29.20%                             | 40.17%                       | 20.64%                                  |
| 95/5                        | 5.00%                           | 30.82%                             | 42.40%                       | 21.78%                                  |
| 100/0                       | 0.00%                           | 32.44%                             | 44.63%                       | 22.93%                                  |

Data Source: DFA



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