Sustainability of CPP: A Panoramic View

by Jim C. Otar

"The most recent report by the Office of the Chief Actuary of Canada (OCA) indicates that CPP is sustainable over a 75-year projection period." We had this hammered into our brains throughout the last twenty years. Many actually believe it.

In this article, I will cover:

- The backstory
- The costs
- Aftcast using the CPP Investments (CPPI) benchmark
- Aftcast using OCA's assumptions
- Lessons from market history
- Aftcast with realistic assumptions
- Advisor's next steps

According to the OCA's reports, among all factors, variations in investment returns are the most influential ones. Therefore, I will only focus on investment assumptions. For the purposes of keeping-it-simple, this article covers only the "Base CPP" and not the recent "Additional CPP".

The Backstory

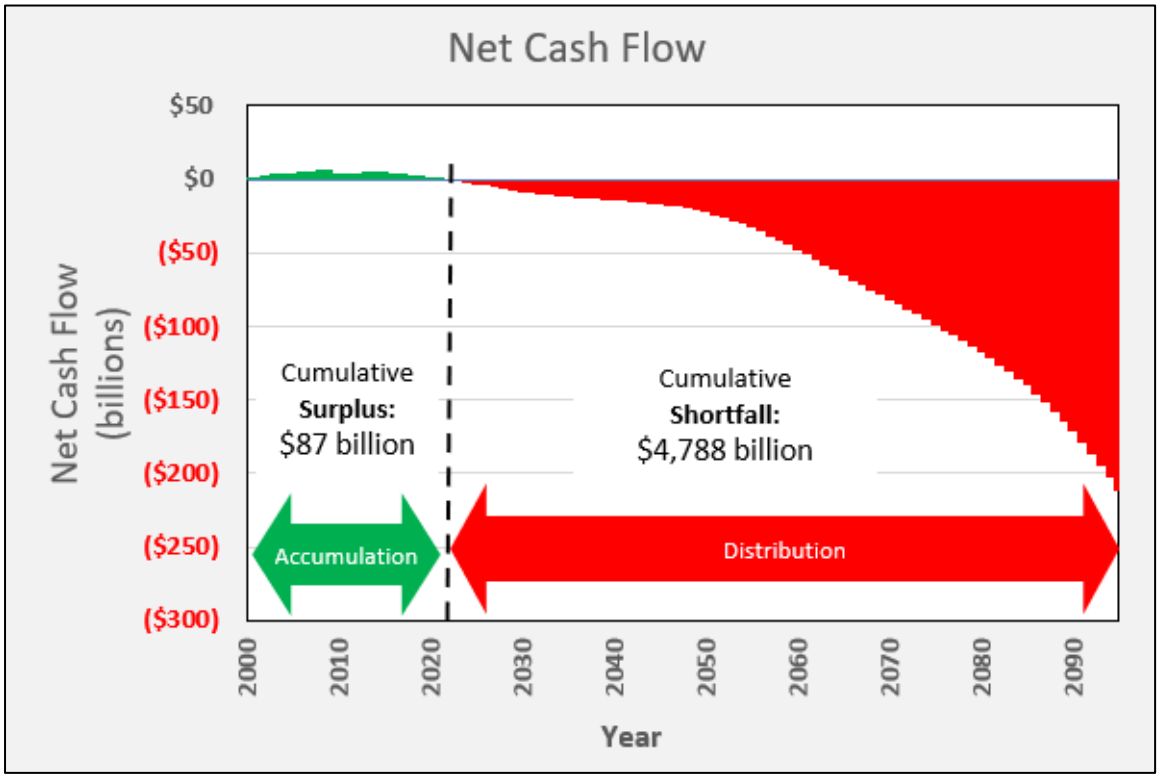
In early 1990's, Canadian demographic trends were making the "pay-as-you-go" model unsustainable. To remedy this, the combined contribution rates by the employee and employer were gradually increased from 4.4% in 1990, to 9.9% in 2003. This created a cash-flow surplus between years 2000 and 2021, i.e., contributions were larger than expenses (CPP expenses are retirement, disability, survivor, death, administrative).

After 2021, these expenses will increasingly exceed the contributions for the foreseeable future, creating a cash flow shortfall.

The idea was to invest this surplus through the CPP Investments (CPPI), hoping that this pool of money will grow large enough to pay this shortfall for the following 75 years.

Figure 1 depicts this surplus/shortfall balance. I marked the surplus stage as "accumulation" and the shortfall stage as "distribution". The graph shows the actual surplus between the years 2000 and 2018. For years after 2018, it is the forecasted shortfall from the OCA's 2018 report, the latest one available at the time of writing.

Figure 1: Canada Pension Plan, net cash flow between 2000 and 2095



The **key question** is, "will the cumulative surplus cash flow of about **$87 billion** between the years 2000 and 2021, plus the growth of the CPPI portfolio, be sufficient to cover the cumulative cash flow shortfall of about **$4,788 billion** over the next 75 years?"

<u>The Costs:</u>

CPP is one of the most expensive large pensions in Canada. A 2016 Fraser Institute report found CPP costs were higher than Ontario's largest public pensions — significantly so in most cases. Table 1 summarizes CPP costs for the fiscal year-end March 31, 2019

Table 1: Portfolio costs for the fiscal year ended March 31, 2019 (in millions of dollars)

CPPI (CPPI 2019 Annual Report, page 60)	Operating Expenses:	$1,203
	External Management Fees:	$1,138
	Transaction Costs:	$390
	Performance Fees:	$620
Government of Canada (Canada Pension Plan, 2018-19 Annual Report, page 29, Table 6)	Employment and Social Development Canada:	$378
	Canada Revenue Agency:	$207
	Treasury Board Secretariat:	$32
	Administrative Tribunals Support Service Canada:	$13
	Public Services and Procurement:	$5
	OCA / OSFI / Finance Canada:	$3
	Estimated benefits for retired government employees: (Otar's estimate)	$5
	TOTAL EXPENSES (millions):	$3,909
	Total Assets at the end of period (millions):	$397,016
	MER:	**0.98%**

For the 2019 fiscal year, the MER was about 0.98%. Between 2009 and 2019, it fluctuated between 0.98% and 1.24%.

If you want to compare CPP costs to a mutual fund, compare it to an F-class fund which is stripped of advisor fees. Furthermore, mutual funds are exposed to HST/GST, where CPPI is not. To compare apples-to-apples, add about 0.1% to CPP's MER for a fair comparison to a mutual fund. You will find that the MER of CPP with about half a trillion-dollar assets is about the same as most F-class retail mutual funds.

Another example: Saskatchewan Pension Plan has about one eight-hundredth of the assets of the CPPI. Its MER fluctuated between 0.8% and 0.9% over the years. Similarly, most other large public pension plans in Canada have significantly lower costs than CPP.

Why am I making such a big deal about this? Using OCA's forecasted asset values, the total MER that Canadians will pay over the next 75 years (2020 to 2095) is about **$865 billion** (that is with a "b"). This is equivalent to 18% of the forecasted cumulative shortfall of $4,788 billion. And this must also be "created" in the growth of CPPI assets. It is interesting to note that the sensitivity analysis tables in OCA's reports do not include the impact of the MER, even though it is such an important factor.

Einstein once said "Compound interest is the eighth wonder of the world". We can add to it "Compound MER is the greatest jinx in a distribution portfolio".

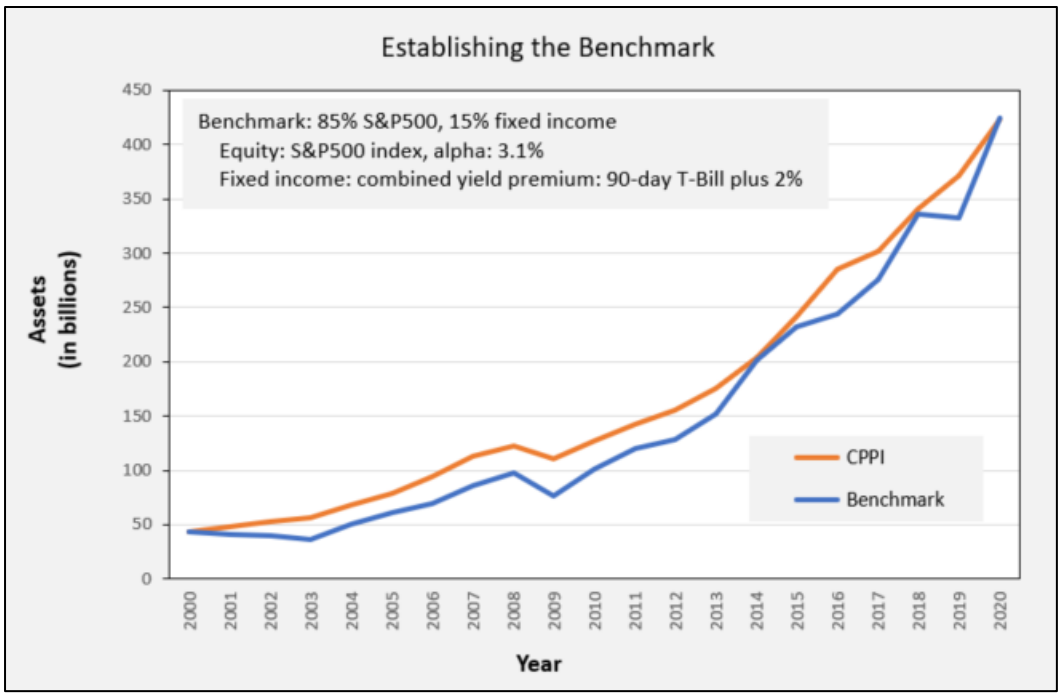
<u>Aftcast using the CPPI benchmark:</u>

To help us determine the CPP's sustainability, we created a benchmark to reflect CPP Investments' performance during the last 20 years. For the asset allocation, we use the reference portfolio in the latest CPPI report: 85% equities and 15% fixed income. For the equity

proxy, we use the S&P500 index which allows using data going back to 1900 for the aftcast. For the bond portfolio yield, we use the historical 90-day T-bill interest rate plus 2%.

We varied the alpha -the standard measure for performance relative to a benchmark- until the asset values at the start and end points match. By trial and error, we achieve this when alpha equals 3.1%. This means, on the average, the equity portion of CPPI outperformed the S&P500 index 3.1% annually between years 2000 and 2020. This is depicted in Figure 2.

Figure 2: Canada Pension Plan, establishing the Benchmark (years 2000 to 2020)



We notice that the CPPI appears to have a lower volatility than its benchmark. This is mostly because a significant portion of its holdings are private investments. These are appraised much less frequently than publicly traded investments. Their valuations can be subjective. The appearance of a lower volatility does not mean the portfolio carries a lower risk; it is just camouflaged well.

Now. we have a benchmark that reflects the last twenty year's performance: 85/15 asset mix. The equity proxy is S&P500 index with an alpha of 3.1%. Its fixed income portion provides a yield premium of 90-day T-Bill plus 2%. Now, we can proceed to the aftcast.

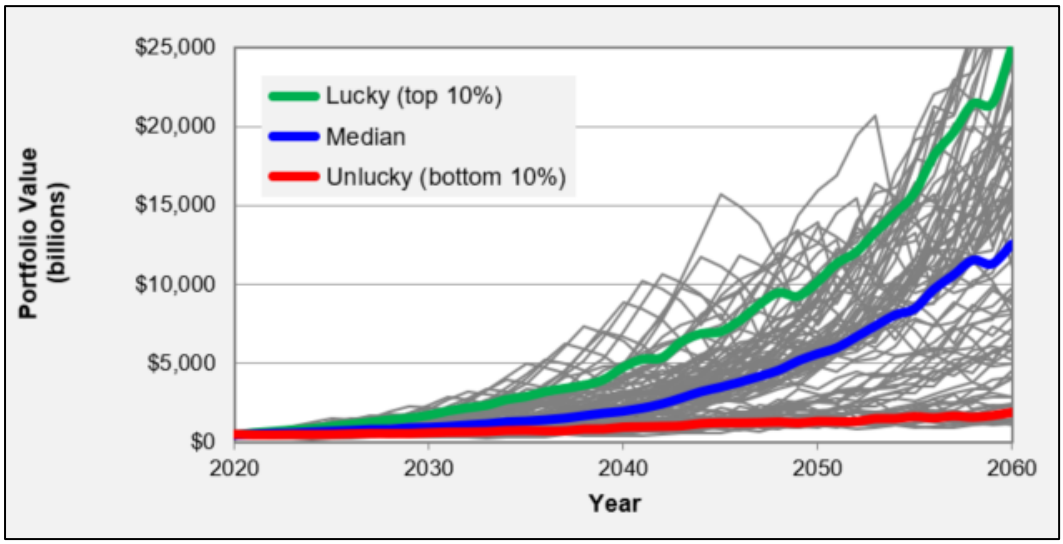
Outcome based on CPPI Benchmark:

Our analysis of investment performance is based on a technique that this author developed about twenty years ago. It is called “aftcasting”, an antonym to “forecasting”. Aftcasting displays a bird’s-eye view of all outcomes of all portfolios since 1900. It provides this with an exact historical accuracy because it includes historical equity performance, inflation and interest rate. This preserves sequence of returns and correlations between each one.

We avoid using any type of stochastic modelling that is based on randomness (like Monte Carlo simulations). This is because randomizing eliminates any correlation between inflation, interest rates, and performance of stocks and bonds, regardless of running ten-thousand or ten-million simulations. If you randomize and lose this correlation, then you also lose two of the most important factors that impact longevity of any distribution portfolio: sequence of returns and inflation.

Figure 3 depicts the outcome of this aftcast. Each gray line represents one specific starting year since 1900. The heavy blue line represents the median portfolio where half of the gray lines are above it and the other half are below. The green line is the “lucky” outcome, the top decile of all outcomes. The red line is the “unlucky” outcome, the bottom decile.

Figure 3: Canada Pension Plan, aftcast using the benchmark based on twenty years of history

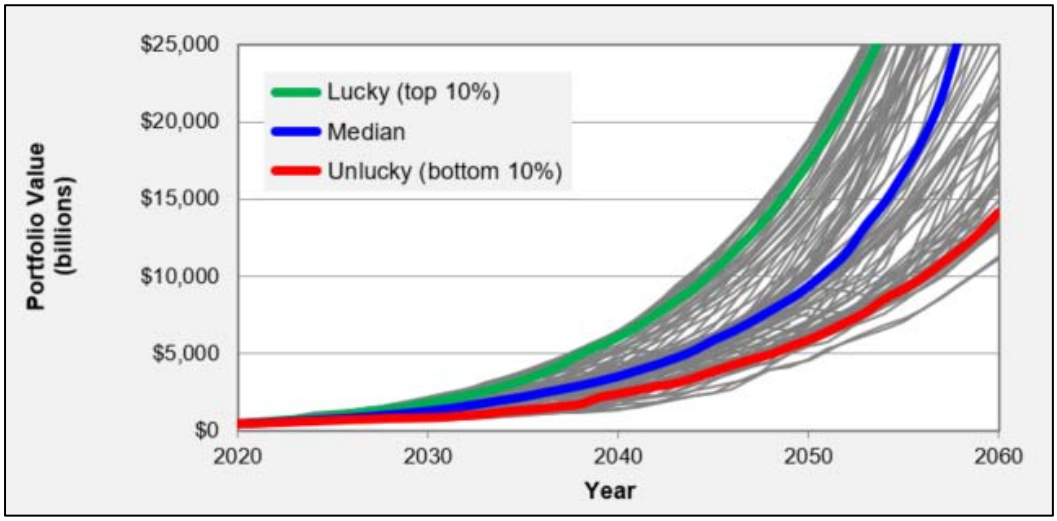


Here is the good news: This aftcast indicates that CPPI can pay all its obligations, even under the “unlucky” circumstances. However, knowing that the accumulation phase is over and the distribution phase is starting, can we safely assume that this stellar performance can continue for the next 75 years?

Outcome based on OCA's Assumptions:

In case you are thinking that the 3.1% alpha is perhaps too generous of an assumption for the next 75 years then wait, there is more. OCA forecasts that CPPI will provide a real return of 4% over the next 75 years. Figure 4 displays the aftcast for that.

Figure 4: Canada Pension Plan, aftcast using 4% real return of the CPPI portfolio



According to this aftcast, here is the big reveal: in about thirty years, the median CPPI portfolio starts growing vertically. Move over Bezos, Musk, Gates; the CPPI will own the world in about 70 years; lock, stock and barrel. Science fiction can take you to such a wonderful fantasy world!

It is true that over the last century, the average real return of equities was slightly over 4%. However, our objective here is to uncover adverse outcomes and not average outcomes. Adverse outcomes occur when bad sequence of returns and inflation happen in a distribution portfolio.

Markets do not beat inflation all the time. Please see the next section, "Lessons from market history", to see why an average 4% real rate of return in a distribution portfolio is unlikely.

Lessons from Market History:

Before we start dreaming of owning the entire universe in couple of generations, let's look at the market history.

Since the turn of this century, we had three major adverse market events: the high-tech crash, the financial meltdown and the pandemic. Each time, central banks reacted quickly and

lowered interest rates. This helped the markets. In the Wall Street jargon, this is called the "Fed Put". But it comes with a large cost: The global total debt was $87 trillion (US) dollars in year 2000. At the end of 2020, it climbed to $281 trillion. Do you think this can be an inflationary factor, eventually?

OCA assumes an inflation of 2% for the next 75 years. During the last century, the inflation was at or under 2% only in 32% of the time. There was never a streak of 2% (or lower) inflation that lasted 75 years. So, OCA's assumption of a 2% inflation for the next 75 years has no precedent.

Higher inflation impacts the real rate of return. When the inflation is higher, markets perform poorly. Table 2 indicates the relation between inflation rates and market performance during the long-term trends of the last century.

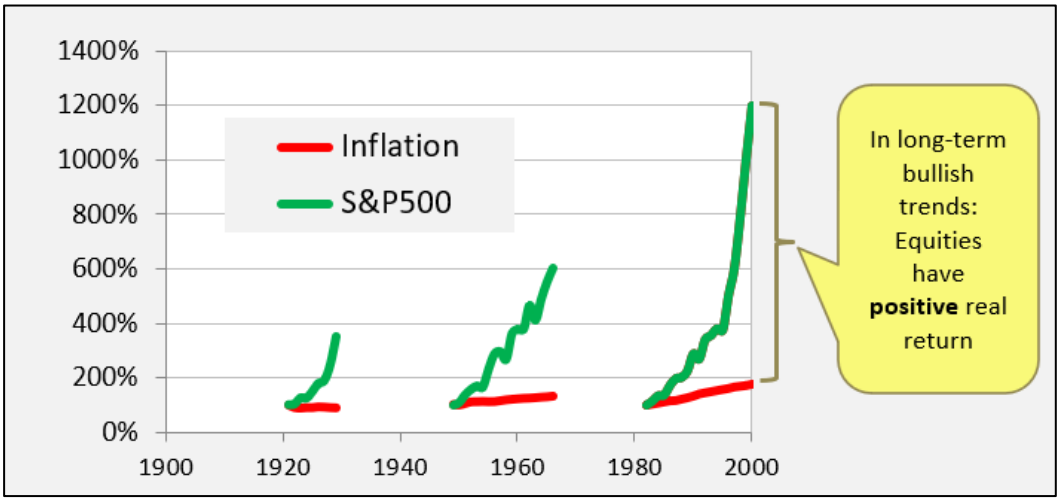
Table 2: Inflation and equity returns during long-term market trends, 1900-1999

Trend	Average Growth	Average Inflation	Total Length, years
Bullish 1921 - 1928 1949 – 1965 1982 - 1999	15.0%	1.8%	43
Sideways 1900 – 1920 1937 – 1948 1966 – 1981	2.4%	5.6%	49
Bearish 1929 – 1932	-31.7%	-6.4%	4
Other (cyclical bullish) 1933 – 1936	33.5%	1.7%	4

Once a portfolio switches from accumulation to distribution, then wishing it "long term" does not make it so. Inflation and sequence of returns become prominent determinants of its sustainability regardless of how long you wish it would last.

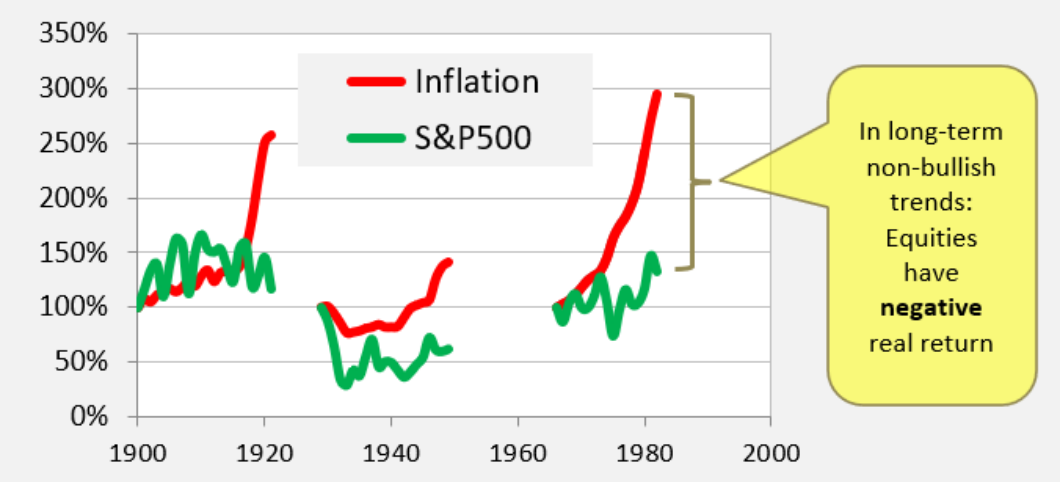
It is true that during long-term bullish trends, growth of equities handily beats inflation, as depicted in Figure 5. During the last century, this happened 43% of the time. This is also when many in the investment business confuse luck with talent.

Figure 5: Equities and inflation during long-term bullish trends



Eventually, a bullish trend needs time to consolidate. This gives rise to a subsequent sideways trend. Historically, these consolidation periods spanned 49% of the last century. Figure 6 shows that return on equities is decidedly lower than inflation during these time periods.

Figure 6: Equities and inflation during long-term non-bullish trends



For these reasons, with these multi-year bad sequence of returns and inflation, 4% real return for the next 75 years is not realistic for a distribution portfolio.

Aftcast with realistic assumptions:

Let's look at each questionable assumption:

Alpha: Can we reasonably expect CPPI outperform the benchmark index for the next 75 years? As it is switching to distribution phase only now, we have no actual data to calculate it. However, there is something we can say: 3.1% alpha is exaggerated because the benchmark portfolio is based on the S&P500 index only and not the total return.

The average dividend payout of the S&P500 index is about 2%. Dividend income is not as result of talent. Dividends are part and parcel of equity investments, just like interest income is part and parcel of investing in bonds. Adjusting for dividends, alpha is not 3.1%, it is 1.1% on total return.

The portfolio also needs to pay MER. Assuming it remains at 1%, deduct it from alpha. Now, we have a net alpha of 0.1%, the net added value of active investing.

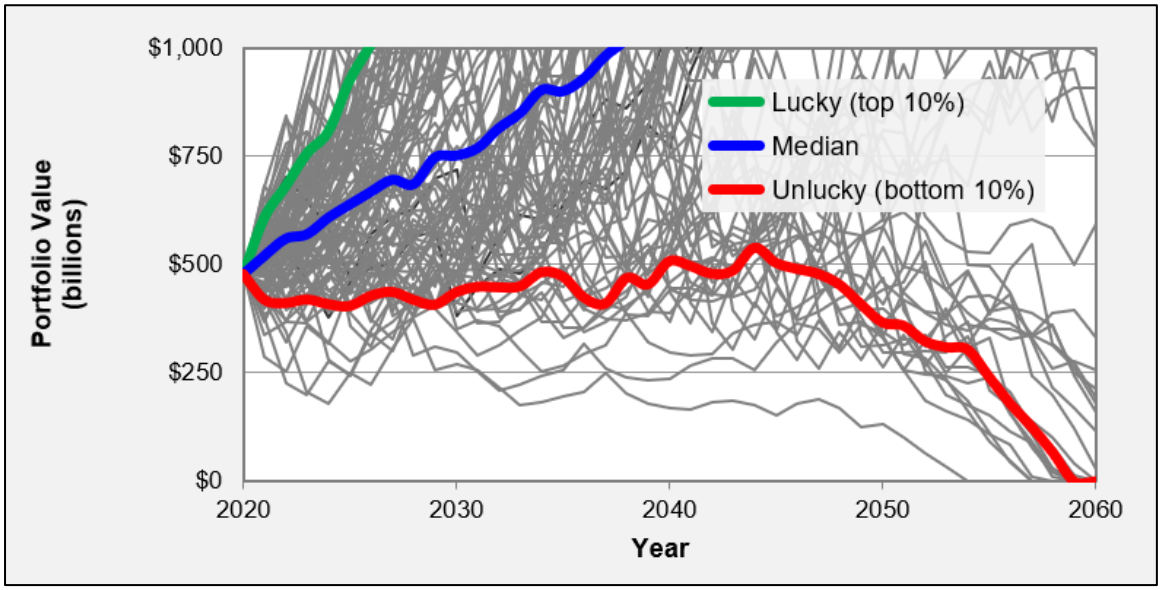
Inflation: The assumption of 2% inflation for the next 75 years is unrealistic. The average inflation rate for the last century was 3.3%, so we'll use that for the aftcast. As a simple approximation, we increase the net cash flow projections stated in the OCA's report by 1.3% for each year to adjust for higher inflation.

The Aftcast: We apply 0.1% alpha and 3.3% inflation to aftcast which depicted in Figure 7. The red line (bottom decile) indicates that CPP is not unconditionally sustainable for the next 75 years.

If the lucky (top decile) outcome occurs, the CPPI assets will reach $1 trillion in 2026, a very desirable outcome. In the median scenario, the asset value rises gradually by about $31 billion per year for the next 17 years and hits the $1 trillion mark around 2038. This would also fulfill the CPPI objectives.

The problem is the unlucky (bottom decile) outcome. Here, CPPI assets linger around the half-trillion mark (or lower) for the next 25 years and then decline to zero around 2060. In spite of the OCA's "best estimate" forecasts, only time will tell where this goes in the next 75 years.

Figure 7: CPPI aftcast with realistic assumptions



Next Steps:

What can you do as an advisor? Depends at what stage your client is.

- For retired clients: There is no perceivable risk for this group, no need to worry.
- For working clients: Keep an eye on CPPI annual reports. If its asset value starts appearing below the blue line (median), then this can be a problem. Eventually, the government might freeze annual inflation adjustments to CPP benefits. If CPPI asset value starts getting closer to the red line, OCA would go back to the drawing board, and the government would then raise CPP premiums, likely by several percent. Meanwhile, your clients maximize contributions to RRSP's and TFSA's. They should also consider portable pensions like the Saskatchewan Pension Plan to cover any potential shortfall of client's essential and basic expenses during retirement.