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Great Expectations 2019

How to estimate future stock and bond returns when creating a financial plan

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1   Introduction

Determining an appropriate asset allocation is one of the most important decisions an investor will ever make. This decision is based on the investor's ability, willingness and need to take risk.[1] It considers personal factors that will vary among individuals—such as time horizon and comfort level with the ups and downs of the market—but it also requires assumptions about the future returns and volatility of the major asset classes.

Consider an investor who is 20 years from retirement and requires a long-term rate of return of 5% for her portfolio to sustain her to age 90. What mix of stocks and bonds might provide that level of growth? And since returns vary from year to year, how bumpy a ride should she expect along the way?

A financial planner cannot answer these questions without making assumptions about rates of return and volatility. These assumptions don't need to be precise, but they must be reasonable. In this paper, we describe the methodology we use to calculate the expected returns and risk level of stocks and bonds, and how we use these assumptions in our clients' financial plans.

2   Expected inflation

All financial plans need to begin by accounting for the decline of purchasing power due to **inflation**. But how do we estimate future inflation?

As a baseline, we note that in 1991 the Bank of Canada set an inflation-control target of 2%. From 1992 through 2018, the average inflation rate was 1.8%, and only twice during that 27-year period (in 2000 and 2002) was the annual rate above 3%. This is no guarantee inflation will not be higher in the future, but it does suggest the Bank of Canada has been effective at implementing inflation-control measures for almost three decades.

For a market-based estimate of inflation, one can compare the yield of a Government of Canada real-return bond and the yield of a conventional bond of the same maturity. Real-return bonds adjust their principal value every day in line with the Consumer Price Index and therefore have built-in inflation protection. To remove the effect of market volatility on our estimate of expected inflation, we use the 24-month average of the yield difference between long-maturity conventional bonds and real return bonds. As of December 2018, this average was 1.7%.

[1] Larry Swedroe, *The Only Guide You'll Ever Need for the Right Financial Plan*, Bloomberg Press, 2010

3   Expected returns on stocks and bonds

There are two main approaches to estimating expected returns. The first is what we call the **equilibrium cost of capital (ECOC)**. This is an estimate for the 50-year return of an asset class based on history,[2] regardless of current market conditions such as earnings, valuations or interest rates. The basic assumption of ECOC is that all asset classes offer a premium above the expected rate of inflation. For example:

Estimated returns based on equilibrium cost of capital (ECOC)

Asset class[3]	Expected premium above inflation	Expected return with 1.7% inflation
Canadian bonds	2.0%	3.7%
Canadian equities	4.8%	6.5%
U.S. equities	4.8%	6.5%
International developed equities	4.8%	6.5%
Emerging markets equities	5.8%	7.5%

Source: PWL Capital

Using ECOC to estimate expected returns has an obvious shortcoming: it is based on past performance and is insensitive to the current market environment. This is most apparent with fixed income investments. It is difficult to justify using an expected return of 3.7% for bonds when the yield on the benchmark index is just 2.7%, as it was in late 2018. We also know the expected return on stocks is not constant: it is likely to be higher when certain fundamental measures (such as price-to-book and price-to-earnings ratios) are lower, and vice versa.

With these shortcomings in mind, the second approach to estimating expected returns is based on **market conditions**. This is straightforward for fixed income investments: we can simply use the current yield to maturity as our estimate of future returns. With equities, however, this is far more challenging, since any number of metrics can be used to determine whether stocks are overvalued or undervalued.

In a 2012 paper, researchers at Vanguard examined 15 commonly used methods for forecasting stock returns to see how much predictive power they would have had in the past.[4] These included

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[2] Our favorite source of long-term historical return data is: Dimson, E., Marsh, P., Staunton, M., *Global Investment Yearbook*, published annually by Credit Suisse.

[3] Asset classes in this paper are represented by the following indexes: FTSE Canada Bond Universe (Canadian bonds), S&P/TSX 60 (Canadian equities), S&P 500 (U.S. equities), MSCI EAFE (international equities), MSCI Emerging Markets (emerging markets equities). The standard deviation and correlation numbers are calculated from the perspective of a Canadian investor and account for the effect of currency fluctuations.

[4] Joseph Davis, Roger Aliaga-Díaz and Charles J. Thomas. "Forecasting stock returns: What signals matter, and what do they say now?" Vanguard, 2012.

price-to-earnings (P/E) ratios, dividend yield, earnings growth, consensus GDP growth and recent stock returns. About half were found to be entirely useless in forecasting equity performance in the next decade.

The most useful variable turned out to be the Shiller CAPE ratio (CAPE stands for "cyclically adjusted price-to-earnings"), named for Robert Shiller, professor of economics at Yale and a Nobel laureate. Instead of trailing one-year earnings, Shiller's ratio uses the average annual earnings of companies over the past 10 years, adjusted for inflation, to smooth out the numbers over an entire business cycle. This is the metric we use when estimating stock returns based on current market conditions.

Just as ECOC has shortcomings, estimating long-term expected returns from market conditions also has inherent weaknesses. When creating a financial plan, it's common to use projections covering 30 years or more, and investors contribute to their portfolios at many different times along the way. Market conditions will be constantly changing during this period, and so will expected returns. Just as we should not use an expected return of 3.7% for bonds when they are currently yielding 2.7%, it is equally misleading to assume they will still yield 2.7% in three or four decades.

Moreover, any attempt to forecast equity returns based on market conditions is extremely limited. In the Vanguard study, the Shiller CAPE ratio explained just 43% of equity returns in the following 10 years. That means even the most reliable metric "leaves approximately 60% of the historical variation in long-term real returns unexplained," the authors write.

Despite these limitations, we believe the inverse of the CAPE ratio (earnings / price) provides a rough but fair estimate of long-term real (inflation-adjusted) equity returns. For example, if the Canadian equity index trades at a 20.7 times CAPE ratio, our real expected return projection would be 1/20.7 = 4.8%. Therefore, adding back inflation, our projection for the nominal expected return on Canadian equity would be 1.7% + 4.8% = 6.5%.

Estimated returns based on market conditions (as of December 2018)

Asset class	Expected return
Canadian bonds	2.7%
Canadian equities	6.5%
U.S. equities	5.3%
International developed equities	7.2%
Emerging markets equities	9.7%

Source: PWL Capital

While both ECOC and market conditions have strengths and weaknesses, they are somewhat complementary. We believe it is likely that when one methodology overestimates expected returns, the other will underestimate it. Therefore, using a simple average of the two methodologies may produce a more accurate estimate, as the errors tend to offset one another. To return to our bond example, a 3.7% return is likely too optimistic, while 2.7% seems unnecessarily conservative. An average of these two estimates (3.2%) is a reasonable compromise.

When preparing long-term financial plans, therefore, we estimate future asset class returns based on the average of the ECOC and market conditions estimates:

Estimated returns based on average of ECOC and market conditions (as of December 2018)

Asset class	Expected return
Canadian bonds	3.2%
Canadian equities	6.5%
U.S. equities	5.9%
International developed equities	6.8%
Emerging markets equities	8.6%

Source: PWL Capital

These estimated returns are best thought of as a moving target, and all financial plans should be revisited every couple of years to account for changes in market conditions as well as any changes in the client's personal life.

4 Expected risk

There are many types of investment risk, but in a financial plan "risk" is often considered synonymous with volatility. Investors need to understand that if they expect to earn between 6% and 7% from stocks over the long term they will endure many periods when returns are much lower (including large short-term losses) and others where they are far higher. Bond investors, on the other hand, are likely to see fluctuations within a much narrower range.

The traditional measure of volatility is **standard deviation**, which describes the degree to which annual returns vary around the average. Suppose the expected average return for a given asset is 5% and the standard deviation is 10%. This means approximately two-thirds of the time the portfolio's annual return is expected to be within 10 percentage points of the average: in other words, between –5% and +15%. In about 19 years out of 20 it is expected to be within two standard deviations, or between –15% and +25%.

We estimate the standard deviation of asset classes using historical data. Again, we use a simple average of recent data (five years of monthly performance) and longer-term data (20 years of monthly performance) to account for changing market conditions:

Estimated volatility of major asset classes (as of December 2018)

Asset class	Five-year standard deviation	20-year standard deviation	Estimated standard deviation
Canadian bonds	4.0%	3.8%	3.9%
Canadian equities	8.6%	15.1%	11.8%
U.S. equities	11.8%	13.0%	12.4%
International developed equities	11.7%	13.4%	12.5%
Emerging markets equities	13.2%	20.6%	16.9%

Source: Morningstar

WHAT ARE "NORMAL" STOCK RETURNS?

Many people consider "normal" stock returns to be in the range of 7% to 11%, and over multi-decade periods that might be reasonable. From 1970 through 2018, the annualized return on Canadian, U.S. and international stocks was 8.9%, 10.8% and 9% respectively. But what about year-by-year returns? During an investing lifetime, how many years would you have considered "normal"?

You may be shocked to learn that a portfolio with equal amounts of Canadian, U.S. and international equities would have posted annual returns between 7% and 11% just *seven times* in the last 49 years. That means stock returns were in the supposedly "normal" range just once every seven years.

Now let's consider the probability of more "abnormal" outcomes. If the average long-term return for stocks is about 9%, let's look at years where returns were a full 10 percentage points higher or lower. It turns out there were 12 years with losses of at least –1%, and 16 others with gains of at least 19%. In other words, the probability of a significant loss or a huge gain was about 57%, which corresponds to about three years out of every five.

In his book *Debunkery*, Ken Fisher looked at an even larger data set from 1926 through 2009 and found much the same result. The annualized return of U.S. stocks over this period was 9.7%, and the simple average was 11.7%. But individual years almost never looked like this. Two-thirds of the calendar years produced returns of more than 20% or less than –10%. Returns were between 10% and 12% only five times in 84 years. "Normal annual returns are extreme," Fisher writes. "It is hard to get people to accept the degree to which that's true."

When estimating returns for a financial plan, it's crucial to understand that annual returns will vary widely from your long-term expectations. Equities do not provide slow and steady returns: investors must accept their returns will come as a series of sharp declines and soaring recoveries.

5   Asset class correlations

The whole idea of diversification is based on the idea that asset classes do not move in lockstep with one another. **Correlation** is a measure of the degree to which the movement of two asset classes are associated. A correlation of 1 indicates the asset classes move in the same direction by the same amount (perfect positive correlation), while a correlation of –1 indicates they move in opposite directions by the same amount (perfect negative correlation). A correlation of zero means the asset classes have no direct relationship and move independently of one another.

Any correlation less than 1 offers some level of diversification. The greatest benefit comes when two asset classes have positive expected returns and negative correlation: in other words, one tends to rise when the other falls, but both are expected to increase over the long term. Over many periods in history, this has been the case with government bonds and equities. However, correlations between asset classes are not constant: they may change with market conditions and are largely unknowable in advance.

Again, our methodology examines both short-term and longer-term correlations when making financial planning assumptions. We look at five-year and 20-year historical correlations between major asset classes and take a simple average of the two:

Five-year asset class correlations (2014–2018)

Asset class	Canadian bonds	Canadian equities	U.S. equities	Int'l dev. equities	Emerging markets
Canadian bonds		0.07	0.38	0.42	0.40
Canadian equities	0.07		0.44	0.47	0.43
U.S. equities	0.38	0.44		0.77	0.46
International dev. equities	0.42	0.47	0.77		0.66
Emerging markets	0.40	0.43	0.46	0.66	

Source: Morningstar

20-year asset class correlations (1999–2018)

Asset class	Canadian bonds	Canadian equities	U.S. equities	Int'l dev. equities	Emerging markets
Canadian bonds		-0.03	0.00	0.11	0.08
Canadian equities	-0.03		0.57	0.61	0.69
U.S. equities	0.00	0.57		0.77	0.58
International dev. equities	0.11	0.61	0.77		0.75
Emerging markets	0.08	0.69	0.58	0.75	

Source: Morningstar

6　Putting it all together

Now that we have estimated expected returns and standard deviation for each asset class, as well the correlation between each pair of asset classes, we are ready to combine these factors on the portfolio level. With optimizing software (in this case, Morningstar Direct) we can use these inputs to estimate the expected return and standard deviation for various mixes of stocks and bonds.

In the table below, we assume the equity component is split equally between Canadian, U.S. and international stocks.

Expected return and risk of various portfolios

Asset mix (Equity/bond)	Expected return	Standard deviation
0% / 100%	3.2%	3.9%
10% / 90%	3.5%	4.0%
20% / 80%	3.9%	4.1%
30% / 70%	4.2%	4.6%
40% / 60%	4.6%	5.3%
50% / 50%	4.9%	6.0%
60% / 40%	5.2%	6.8%
70% / 30%	5.6%	7.7%
80% / 20%	5.9%	8.7%
90% / 10%	6.2%	9.6%
100% / 0%	6.6%	10.6%

Source: Morningstar

While volatility is an important measure of risk, it is incomplete. Standard deviation generally does a good job of quantifying annual ups and downs in the markets, but it does not tell the whole story. Even if it is accurate in 19 years out of 20, losses in that 20th year can be much greater than two standard deviations. In theory, an annual gain or loss of three standard deviations (which corresponds to a return about 40 percentage points above or below the average) should occur only once every 333 years or so. However, stock markets have seen several one-year losses of three standard deviations or more over the last 93 years, including 1931, 1937 and 2008.

For this reason, we believe it is important for planners to disclose the maximum loss an investor might expect in a calendar year, as well as the largest drawdown (that is, the greatest decline from peak to trough over any period) that might be expected based on history.

Again, the table below assumes the equity component is split equally between Canadian, U.S. and international stocks. One-year losses in some of the individual countries have been much larger.

Worst Loss for Various Portfolios (1988-2018)

Asset mix (Equity/bond)	Maximum annual loss	Largest cumulative loss
0% / 100%	-4.3%	−11%
10% / 90%	-3.1%	−10%
20% / 80%	-1.9%	−10%
30% / 70%	-3.9%	−10%
40% / 60%	-7.3%	−14%
50% / 50%	-10.8%	−18%
60% / 40%	-14.2%	−23%
70% / 30%	-17.6%	−28%
80% / 20%	-21.1%	−33%
90% / 10%	-24.5%	−39%
100% / 0%	-28.0%	−44%

Source: Morningstar

WHY EXPECTED RETURNS ARE LOWER

If you have looked at the returns of a balanced portfolio over the last quarter century, you may be surprised (and disappointed) by the expectations we have described in this paper. After all, since the late 1980s, traditional index portfolios delivered returns close to 8%, even with a conservative asset mix. Compare these historical numbers to our expected returns:

	Returns (1988–2018)	Expected Returns
Conservative (30% Equity / 70% Fixed Income)	7.9%	4.2%
Balanced (50% Equity / 50% Fixed Income)	8.1%	4.9%
Aggressive (70% Equity / 30% Fixed Income)	8.3%	5.6%

The first thing you will notice is that the historical returns of the conservative, balanced and aggressive portfolios are all very similar. This is because the returns of stocks and bonds were not very different during this period. As interest rates trended steadily downward (10-year Government of Canada bonds yielded close to 10% in 1988, compared to 1.9% currently), bond returns were exceptionally high during the last three decades. This cannot be expected going forward. For this reason, there is a 1.4% difference between our expected returns for the conservative and the aggressive portfolio, which is more in line with expectations over the very long term.

Moreover, it is reasonable to expect equity returns to be lower than they have been since 1988. By traditional valuation measures, stocks are relatively expensive compared to the beginning of the period we've looked at here. For example, the S&P 500 had a P/E ratio of 14 at the beginning of 1988; today this metric stands at 30.

Finally, inflation is much lower today than in the 1980s. For example, inflation was 4% in 1988, compared with just 2% in 2018. Remember that a 6% return with 2% inflation is very similar to an 8% return with 4% inflation. When viewed in terms of purchasing power, the gap between historical returns and expected future returns is not as wide as it first appears.

6   Final words

People have a natural distaste for uncertainty. We would all be more comfortable if we knew what future returns would be, but this is simply not possible. While we believe our method of estimating expected returns is useful, there are no guarantees in investing.

We want to emphasize that our estimates are designed to help with long-term planning. They tell you nothing about what the markets will do next year, or three years from now. Expected returns used in financial plans are *not* forecasts: they simply represent the average of thousands of possible outcomes.

You have only one life to live, and it is unlikely that your outcome will be very close to this average. However, there is no way to avoid making assumptions when preparing a financial plan. (A thorough financial plan will also include a Monte Carlo simulation, which considers the range of possible outcomes and estimates the probability you will reach your financial goals.)

A financial plan is not a one-time activity: it is an ongoing process that must continually adapt to changes in the financial markets, the economy and personal circumstances. We encourage investors to review their financial plan annually and make any necessary adjustments.

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