

Strategic Asset Allocation – Overview

May 2022

Sound portfolio construction is built on a thorough understanding of market and economic conditions over different time frames. First and foremost, it is built upon an understanding of the long-term behaviour of the major building blocks of our investment universe. These building blocks are equities, fixed income, alternatives and currencies. The Multi-Asset Solutions Team (MAST) implements a multi-step approach to determine the optimal asset mixes of our portfolios. These Strategic Asset Allocation (SAA) mixes form our reference portfolio against which our shorter-term tactical views are expressed. In this paper we will explain the process used to determine the appropriate mix for all our portfolios, from income to growth.

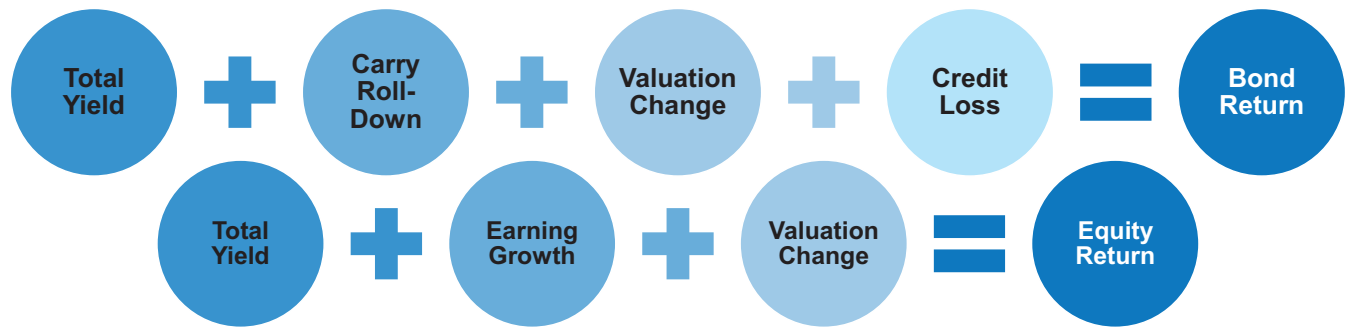
1. Methodology



At MAST, our SAA starts with our Capital Market Assumptions (CMAs). For each asset class, we identify and model a set of macro economic and fundamental drivers that govern returns. Based on historical relationships, we establish correlation characteristics among these asset classes. The result is a set of expected returns, risks, and correlations that form our CMAs. We validate these CMAs based on our assessment of future market and economic conditions and our investment beliefs. Next, we combine these asset classes in an optimization process, producing a set of portfolio mixes. We further refine the mixes based on risk and constraints. The result is a set of portfolio mixes we call our SAA.

1.1 Expected Return: Long Term Capital Market Assumptions (CMAs)

BMO GAM's CMAs cover equity, fixed income, alternatives and currencies over a 10-year horizon. Capital market assumptions for fixed income assets are the result of a bond pricing methodology, where ending yields for government bonds of various maturities and the yield changes from current levels are used to derive the impact on performance. The compensation for carrying credit risk is assumed to be an average of the recent credit spread levels and the levels observed over the past 15 years.



Capital market assumptions for equities are based on a discounted payout model incorporating both dividends and share repurchases. The model incorporates both near-term and long-term growth assumptions, and an equity risk premium that is both historically grounded and forward-looking. The interest rate assumptions embedded in the equity valuation model is derived from the fixed income model, thereby linking the models for internal consistency. While the expected returns from the equity valuation model are lower than long-term averages of historical equity return, much of this difference arises from lower interest rate and inflation projections than what has prevailed in the past.

Alternatives models are specialized and often factor-based, including factors for size, value, momentum, trend following, liquidity, U.S. market, emerging market, changes in treasury yields, and changes in credit spreads. Our foreign exchange forecasts are based on purchasing power parity models that incorporate inflation and interest rate differentials between countries. Consistent with research on exchange rates, we assume that deviations from purchasing power parity are corrected gradually over time.

1.2 Expected Risk: the GARCH-DCC model

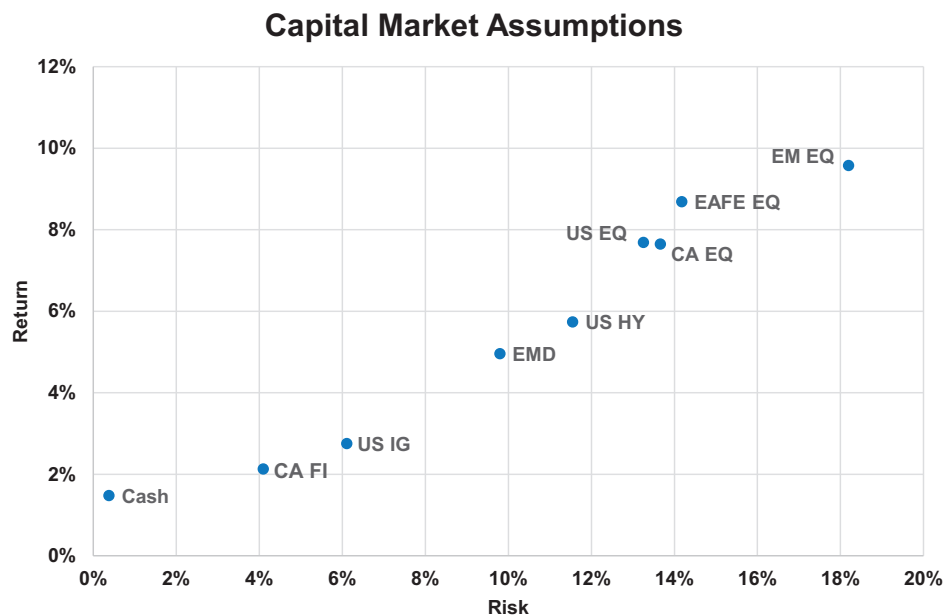
Expected risks, as defined by volatility and correlation, for each asset are derived using a GARCH-DCC model. The model specifies that the expected risk is a weighted average of a long-term average standard deviation, the most recent returns, and the prior periods' standard deviations. We implemented a multivariate time series model, based on the observation that both volatility and correlation vary over time. To incorporate skewness and kurtosis exhibited by asset classes historically, we used an asymmetric Student's t-distribution. A skewed model allows for higher volatility when returns are negative. Finally, to stabilize the correlation matrix, we apply Ledoit-Wolf shrinkage towards equal correlation.

The risk model uses 20-years (or maximum available if historical series is shorter) of historical monthly returns for the representative indices of each asset class.

1.3 Implementing Views: The Black-Litterman Framework

The Black-Litterman framework allows portfolio managers to implement specific views on a selected investment universe while considering initial expected returns and correlations between assets.

We obtained the following final expected returns and risk:



Despite strong returns over the previous decade, we still forecast equity returns to be above 7% in all regions, with international and emerging market equities providing the highest returns, albeit with higher levels of volatility. This is consistent with continued earnings growth across the globe and modest valuations outside North America. We forecast investment grade bonds in North America to

achieve above a 2% return. While interest rates are forecasted to rise from current levels, secular forces constraining yields and inflation are expected to continue. More volatile high-yield and emerging market debt are forecasted to have attractive premiums to domestic aggregate bonds. Lastly, we expect cash to offer stability with returns only modestly less than bonds.

1.4 Constraints

When building the set of optimal portfolios, we applied constraints to ensure that allocations would not be too extreme. Raw expected return and risk sometimes pushed the portfolios to carry weights that focused on too few assets. We used several constraints to keep the portfolios well diversified and to better manage the overall risk:

- We maintained a reasonable level of cash. Cash has a high return/risk ratio and is not correlated with most asset classes, and hence would be overly represented if not constrained.
- We kept the level of emerging market equities constant for all risk groups, hence limiting over exposure in higher risk groups.
- We constrained the amount of total emerging market weights (equities & fixed income) to limit concentration risk.
- We targeted slightly over 60% Canadian content for most risk groups while keeping higher foreign bond content for lower risk groups (See 2.2 Risk Mgmt.).

2. Portfolio Mix

Eq Weight%	Risk Group
100%	Eq Growth
80%	Growth
60%	Balanced
40%	Conservative
27.5%	Income
0%	Fixed Income

Using the outputs from the process, we derived the following SAA mixes for various risk groups. We used increments of 20% equity weights across our risk groups, except for Income. For the treatment of intra-equity and intra-fixed income weights, we broadly separated them into two categories: with and without equities.

For the groups that contain equities, we apply the same intra-equity and intra-fixed income weights and scaled them according to their cross-asset weights. For the fixed income group, we adopted a mix that contained more foreign assets to compensate for the relative reduction of foreign exposure (See 2.2 Risk Mgmt.). For funds that have the capabilities to hold alternatives, we recommend holding 10% funded equally from US and EAFE.

Intra Equities

Risk Group	Cdn.	US	EAFE	EM.	Alts.
Eq Growth to Income	30%	35%	30%	5%	0%
	30%	30%	25%	5%	10%

Intra Fixed Income

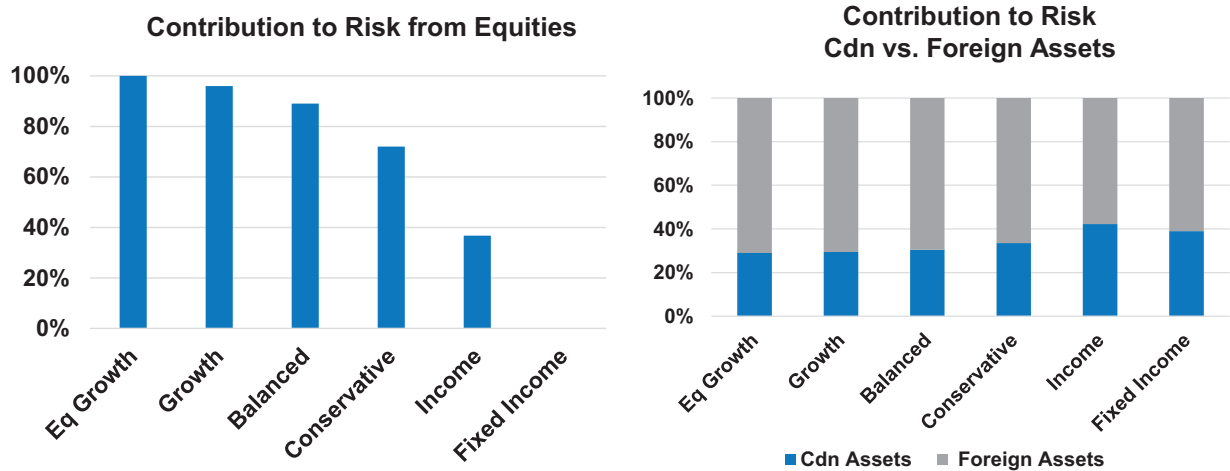
Risk Group	Cdn. bond	US Corp.	US HY	EMD.	Cash
Eq Growth to Income	55%	22.5%	7.5%	7.5%	7.5%
	55%	22.5%	7.5%	7.5%	7.5%
Fixed Income	42.5%	30%	10%	10%	7.5%

2.1 Alternatives

We defined alternatives (Alts) as assets that provide exposures to markets outside of broad equities or fixed income market. Such assets can either be represented as private vehicles or public proxy equivalents. They usually have a lower sensitivity to the broad market and in private form, typically are less liquid than public market assets. Notwithstanding that private debt plays a role in the Alts universe, our initial focus is on equities-based Alts. As a result, Alts were only represented in the intra-equities mix.

2.2 Risk Management

We kept contribution to risk (CTR) from foreign assets roughly consistent across all risk groups with slightly more foreign content for higher risk groups. In addition, we recognized that equities remain a significant source of relative risk for Conservative to Equity Growth.



2.3 Benefits of New SAA Approach

“The whole is greater than the sum of its parts.”

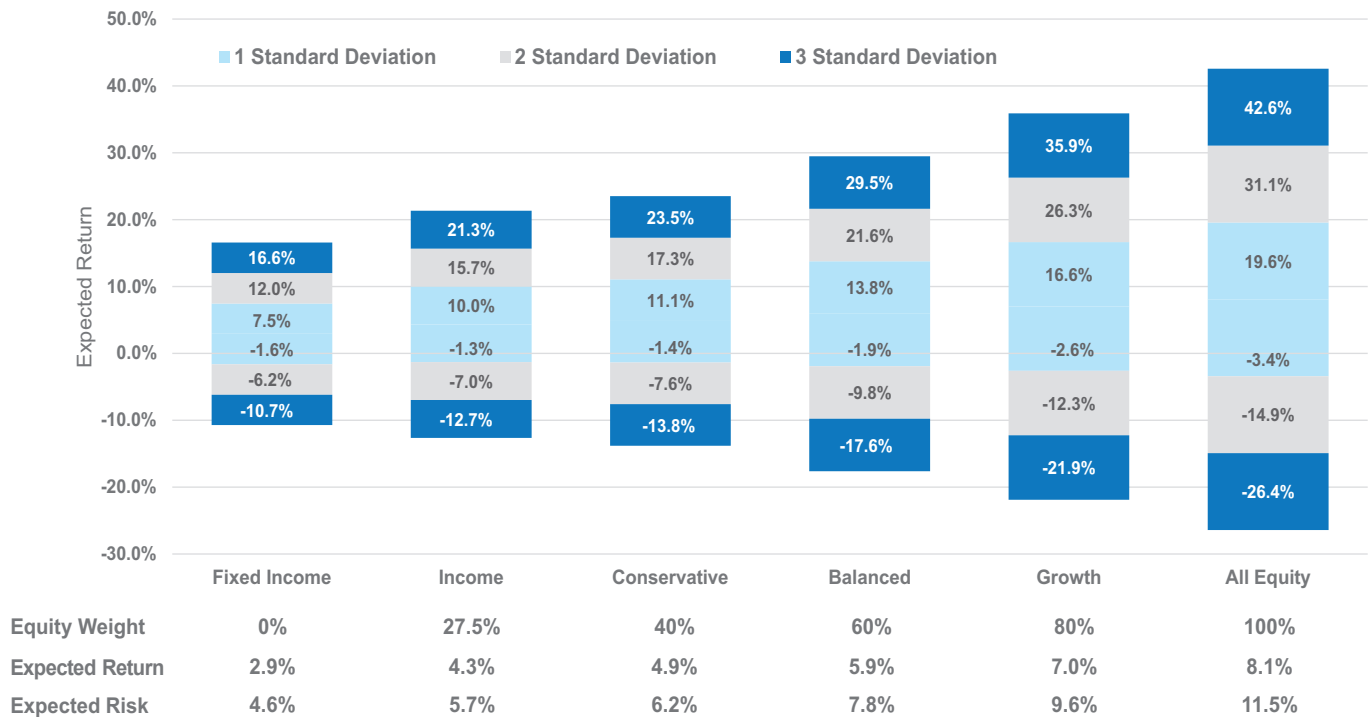
- **Forward looking:** Our SAA approach is based on expected risk and return, and accounts for long term trends and macro themes like impacts of global warming and ESG¹. Moreover, Black-Litterman methodology facilitates the implementation of specific long term views.
- **Robust:** In line with industry best practices, our SAA process relies on well recognized, empirically and academically supported methodologies.
- **Coherent:** Our SAA building block approach allows for transparent and consistent messaging across solutions.
- **Risk Aware:** The final model was fine-tuned to achieve a sufficient level of diversification to minimize adverse impact from market events.
- **Dynamic:** Investment universe and peer portfolio positioning are closely monitored. Our SAA process is revised annually and incorporates the latest structural forces impacting both market expected risk and return.



¹ As an example, dependence of Canadian economy to fossil energies were considered when estimating LT Canadian equity returns.

2.4 Long Term Return Range

The following chart shows the expected returns and risk for each portfolio mix. The range of expected returns in any one year is represented by the 1, 2 and 3 standard deviation bands. Using the balanced portfolio as an example, the expected long-term return is 5.9% and the risk is 7.8%. This translates to an expected range of 29.5% and -17.6% in any one year. These are not limits, drawdowns and recoveries can be larger in magnitude, especially for periods shorter than a year. Returns within the light blue band have a 68% chance of occurrence, grey 95% and blue 99.7%.



We offer every investor a portfolio that provides the highest expected return while considering their willingness and capacity to tolerate risk. SAA is just the starting point of our investment process. We employ tactical asset allocation against this starting point to take advantage of short-term opportunities and mitigate risk. Taken together, the resulting asset mixes provide our investors competitive risk/adjusted returns with a more predictable range of outcomes.

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