

Foundations of Guidance—Capital Market Assumptions and Strategic Asset Allocations



CHIEF INVESTMENT OFFICE

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Clients often ask how Merrill Lynch projects the growth of their investments for planning purposes, and how it arrives at the asset allocation advice it provides. The short answer is that this guidance relies on two methodologies developed by the Global Wealth & Investment Management Chief Investment Office (GWIM CIO)—the Merrill Lynch Capital Market Assumptions and the Merrill Lynch Strategic Asset Allocations. This report explains what these are, how the GWIM CIO develops them and their relevance for clients.

What are the Merrill Lynch Capital Market Assumptions?

The Merrill Lynch Capital Market Assumptions are long-term views of major asset classes—including stocks, bonds, cash and alternative investments.¹ More specifically, they are estimates, for a 25-year planning horizon, of the expected returns, volatility and correlations of a set of asset classes that is broadly representative of the investment universe.²

The Capital Market Assumptions are foundational to many parts of our wealth management process, including wealth projection, measurement of progress toward goals, saving and spending guidance, risk management and, most notably, asset allocation. Their development, therefore, requires a thoughtful, rigorous process.

The Capital Market Assumptions do not serve as a crystal ball. Because returns to risky assets are, by their very nature, impossible to forecast precisely, future realized returns will inevitably differ from today's expected return estimates. The assumptions do, however, offer valuable guidance regarding the *central tendency* and *range* of potential returns for each asset class. This equips us to help our clients plan for the future.

How does the GWIM CIO develop the Merrill Lynch Capital Market Assumptions?

To develop the Merrill Lynch Capital Market Assumptions, we first identify a market index for each asset class that is broadly representative, is widely accepted and has a long history. The index serves as a proxy for the asset class.

Exhibit 1 presents the 2018 Merrill Lynch Capital Market Assumptions. The Capital Market Assumptions for U.S. small cap growth stocks, for example, are based on the Russell 2000 Growth Total Return index. They include annual estimates of several measures for a 25-year planning horizon:

- geometric return of 7.2%
- arithmetic return of 9.5%
- volatility of 22.8%
- geometric return of at least 4.2% with 75% certainty
- geometric return of at least 10.1% with 25% certainty

Box 1 discusses the difference between geometric and arithmetic returns.

¹ An asset class is a group of securities or investments that exhibit similar characteristics, behave similarly in the marketplace and are subject to similar laws and regulations. Each asset class can be divided into sub-asset classes. Alternative investments, for example, can include hedge funds, private equity and real assets.

² A correlation is a statistical measure of the extent to which two variables move together.



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Exhibit 1: 2018 Merrill Lynch Capital Market Assumptions

Asset Class	Proxy Index	Geometric Return	Arithmetic Return	Volatility	Market Scenarios (Geometric Return)	
					Unfavorable	Favorable
Inflation	IA SBBI US Inflation	2.2%	2.2%	2.1%	1.9%	2.4%
Equity						
U.S. Large Cap Growth	Russell 1000 Growth TR	6.1%	7.6%	18.4%	3.6%	8.4%
U.S. Large Cap Value	Russell 1000 Value TR	8.9%	10.2%	17.1%	6.6%	11.1%
U.S. Small Cap Growth	Russell 2000 Growth TR	7.2%	9.5%	22.8%	4.2%	10.1%
U.S. Small Cap Value	Russell 2000 Value TR	9.8%	11.8%	21.5%	7.0%	12.6%
International Developed Equity	MSCI Daily TR Net World Ex USA USD	6.0%	8.0%	21.3%	3.2%	8.7%
Emerging Markets	MSCI Daily TR Net EM USD	5.9%	9.5%	28.9%	2.4%	9.7%
Fixed Income						
U.S. Government	ICE BofAML AAA U.S. Treasury/Agency Master	3.6%	3.7%	5.9%	2.8%	4.3%
U.S. Mortgages	ICE BofAML Mortgage Master	4.0%	4.2%	7.3%	3.0%	4.9%
U.S. Corporates	ICE BofAML U.S. Corp Master	4.5%	4.8%	8.4%	3.4%	5.6%
U.S. High Yield	ICE BofAML High Yield Cash Pay	6.1%	6.7%	11.4%	4.6%	7.7%
International Fixed Income	ICE BofAML Global Broad Market TR ex USD (Hedged)	3.6%	3.7%	4.4%	3.0%	4.2%
Cash	ICE BofAML U.S. Treasury Bills 3 months	2.5%	2.5%	2.4%	2.2%	2.8%
Alternative Investments						
Hedge Funds	Hedge Fund Research HFRI Fund Weighted Composite	7.1%	7.5%	9.2%	5.9%	8.3%
Private Equity	ML Small Cap Research Private Equity/Micro Cap and Russell Microcap Index TR*	8.7%	11.3%	24.2%	5.6%	11.9%
Real Assets	50/25/25 BB Cmdty/NCREIF Property/NCREIF TBI	4.2%	4.7%	10.5%	2.8%	5.5%

Source: GWIM CIO.

*Previously proprietary Merrill Lynch Small Cap Small Cap Research Private Equity/Micro Cap index is no longer provided by Merrill Lynch Research and the proxy was switched to Russell Microcap Index in July 2016.

**This exhibit does not reflect the performance of any specific investment. Assumptions are for a 25-year planning horizon. Returns are before expenses and taxes. For definitions of geometric and arithmetic returns, see Box 1. Volatility is calculated as a standard deviation. Actual returns cannot be predicted and will fluctuate. Your returns may be higher or lower. Data is as of January 2018.

Box 1: Comparing Geometric and Arithmetic Mean Returns

The arithmetic mean, a simple average, provides an unbiased estimate of a variable. If, however, we seek to estimate future compound returns, the more appropriate measure is the geometric mean return. This is the return that, when compounded over the period of time in question, produces the actual realized cumulative return.

To illustrate these concepts, consider the example of a \$100 investment that rises 25% one year (to \$125) and declines 20% the next year (back to \$100). The arithmetic mean return over

the two-year period is $[25\% + (-20\%)]/2$, or 2.5%. But the geometric mean return over the period is 0%.

The arithmetic return of a variable will always be greater than or equal to its geometric return. The greater the volatility, the wider the gap between the arithmetic and geometric returns.

To develop the Capital Market Assumptions, the GWIM CIO uses a proprietary model that reflects the dynamic interrelationships between asset class returns and a set of financial factors known as *risk factors*. Research indicates that a model that incorporates risk factors—a *factor model*—can forecast returns more accurately than one that simply uses historical average returns.³

Our model is guided by economic theory and based on the principle that long-term returns provide compensation for exposure to risk factors. Risky assets (such as stocks) tend to have higher expected returns than safe assets (such as Treasury bills).

In developing the Capital Market Assumptions, for each asset class we identify risk factors that help explain returns, which are listed in Exhibit 2. Each of the risk factors we consider:

- has been found in academic research to represent systematic sources of risk
- exhibits a significant risk premium⁴ that is expected to persist in the future
- has extensive historical data available
- is not exclusively tied to a specific asset class.

Exhibit 2: Risk Factors Used to Develop the Merrill Lynch Capital Market Assumptions

Factor	Market Index	Description
Inflation	IA SBBI US Inflation	The rate of change in consumer prices.
Short Term Real Rate	Long: Ibbotson 30 Day T Bill Short: Ibbotson SBBI Inflation	The real return of US Treasury bills.
Equity Market	IA SBBI US Equity Risk Premium	The difference in returns between US large company stock and US 30 Day T-Bill.
Equity Size Spread Return	IA SBBI US Size Premium	The difference in returns between US small cap and large cap stocks.
Equity Value Spread Return	Fama French Value Factor	The difference in returns between US value and growth stocks.
Term Spread Return	Long: US 10 year Gov. Bond TR Short: Ibbotson 30 Day T Bill	The difference in returns between US government bonds and Treasury bills.
Credit Spread Return	Long: US AAA Corp. Bond TR Short: US 10-Year Gov. Bond TR	The difference in returns between US corporate bonds and government bonds.
Foreign Stock Spread Return	Long: MSCI EAFE Net TR Short: S&P 500 TR	The difference in returns between foreign stocks and US stocks.
Foreign Bond Spread Return	Long: ML Global Govt Bond Ex. US (Hedged) Short: ML US Gov. and Quasi Gov Bond	The difference in returns between foreign bonds hedged for currency risk and US bonds.

Source: GWIM CIO.

³ The relevant academic research includes: Campbell, John Y., and Robert J. Shiller (1998), "Valuation Ratios and the Long-Run Stock Market Outlook," *Journal of Portfolio Management* Winter, 11–26; Fama, Eugene F., and Kenneth R. French (1993), "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33(1), 3–56; Ilmanen, A. (1997), "Forecasting U.S. Bond Returns," *Journal of Fixed Income* 7(1), 22–37; Rapach, David E., Jack K. Strauss, and Guofu Zhou (2010), "Out-of-Sample Equity Premium Prediction: Combination Forecasts and Links to the Real Economy," *Review of Financial Studies* 23(2), 821–862; Cieslak, Anna, and Pavol Povala (2013), "Expected Returns in Treasury Bonds," Manuscript, Northwestern University.

⁴ A risk premium is the incremental return that an investor can expect to earn as compensation for bearing additional risk. The equity risk premium, for example, is the incremental return that an investor can expect to earn by investing in equities as opposed to a risk-free asset. Similarly, the size premium reflects the historical tendency of the stocks of firms with smaller market capitalizations to outperform the stocks of firms with larger market capitalizations.

Exhibit 3 provides an overview of our model. Taking current market conditions such as interest rates and equity market valuation levels as a starting point, the model simulates the future value of the risk factors. Then, based on these values, it simulates future asset class returns. Finally, it uses these simulation results to forecast the expected returns and the volatility of returns for each asset class, as well as return correlations.

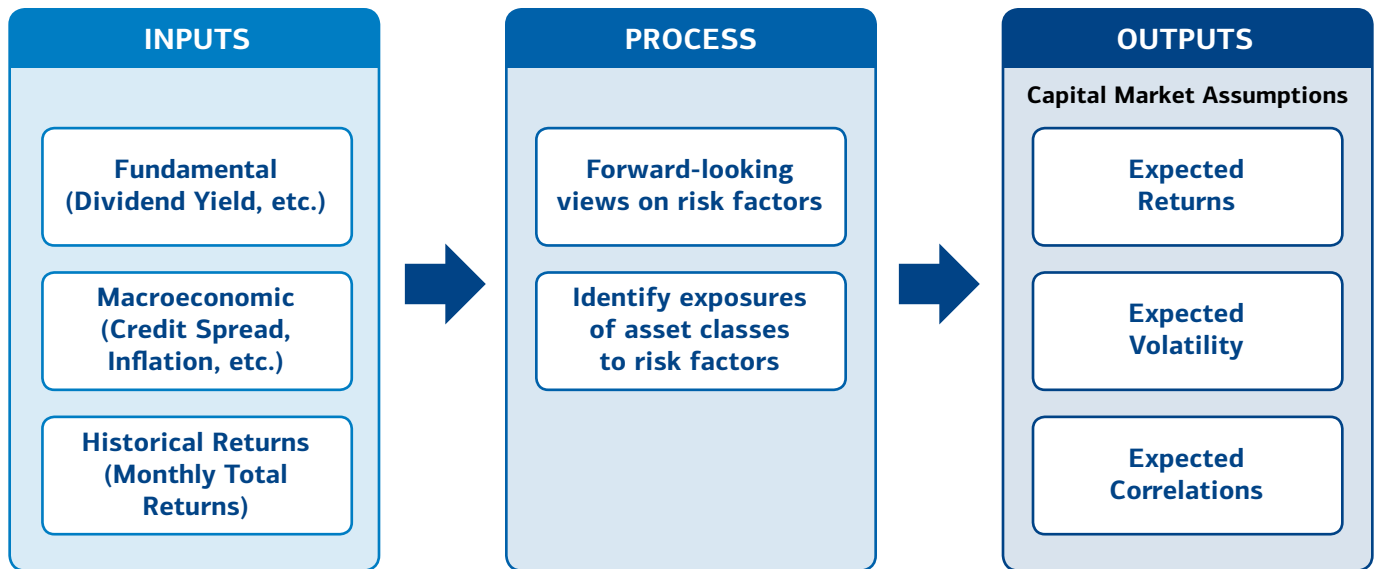
We use historical data to estimate the empirical relationship between each asset class and relevant risk factors. For U.S. equity asset classes, we use three well-known risk factors devised by Fama and French—market, size and value.⁵ For international and emerging market equities, we also include the foreign equity factor. For fixed-income asset classes, we use the term return spread, credit return spread and foreign bond

factors. For alternative investments, which can have elements of equities and fixed income, we consider all of these factors.

Our risk factor and asset class return data vary with respect to source and historical availability (Exhibit 4). For most of the risk factors we have nine decades of data, but the data for the foreign equity and foreign bond factors only go back to 1970 and 1986, respectively. Among the asset classes, we have less than three decades of return data for emerging markets equities, international fixed income and hedge funds.

We first forecast returns to the risk factors using data that gauge current market conditions (e.g., interest rates and equity market valuation levels). Next, we quantify the statistical impact of these factors on the returns to each asset class (for details, see Box 2).

Exhibit 3: Merrill Lynch Capital Market Assumptions: Inputs, Outputs and Process Flow



Source: GWIM CIO.

⁵ Fama, Eugene F., and Kenneth R. French (1993), "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33(1), 3–56.

Exhibit 4: Data Sources for Risk Factor and Asset Class Returns

Asset Class	Proxy Index	Data Source	Start Date
Risk Factor			
Inflation	Ibbotson® SBBI® US Inflation	Morningstar	Jan-26
Short Term Real Rate	Ibbotson® SBBI® US 30 Day TBill TR USD and Ibbotson® SBBI® US Inflation	Morningstar	Jan-26
Equity Market	Ibbotson® SBBI® US Equity Risk Premium	Morningstar	Jan-26
Equity Size Spread Return	Ibbotson® SBBI® US Small Stock Premium	Morningstar	Jan-26
Equity Value Spread Return	Fama/French Benchmark Value Factor	Kenneth French	Jul-26
Term Spread Return	US 10-year Government Bond TR and Ibbotson® SBBI® US 30 Day TBill TR USD	Global Financial	Jan-26
Credit Spread Return	Ibbotson® SBBI® US LT Corp TR USD and US 10-year Government Bond TR	Morningstar	Jan-26
Foreign Stock Spread Return	MSCI Daily TR Net EAFE and S&P 500 TR	Bloomberg	Jan-70
Foreign Bond Spread Return	Global Govt Bond II Ex. US (Hedged) and ICE BofAML AAA U.S. Treasury/Agency Master	Bloomberg	Jan-86
Equity			
U.S. Large Cap Growth	Russell 1000 Growth TR	Bloomberg	Jan-79
U.S. Large Cap Value	Russell 1000 Value TR	Bloomberg	Jan-79
U.S. Small Cap Growth	Russell 2000 Growth TR	Bloomberg	Feb-79
U.S. Small Cap Value	Russell 2000 Value TR	Bloomberg	Feb-79
International Developed Equity	MSCI Daily TR Net World Ex USA USD	Bloomberg	Jan-70
Emerging Markets	MSCI Daily TR Net EM USD	Bloomberg	Jan-99
Fixed Income			
U.S. Government	ICE BofAML AAA U.S. Treasury/Agency Master	Bloomberg	Mar-73
U.S. Mortgages	ICE BofAML Mortgage Master	Bloomberg	Jan-76
U.S. Corporates	ICE BofAML U.S. Corp Master	Bloomberg	Mar-73
U.S. High Yield	ICE BofAML High Yield Cash Pay	Bloomberg	Nov-84
International Fixed Income	ICE BofAML Global Broad Market TR ex USD (Hedged)	Bloomberg	Jan-97
Cash	ICE BofAML U.S. Treasury Bills 3 months	Bloomberg	Jan-26*
Alternative Investments			
Hedge Funds	Hedge Fund Research HFRI Fund Weighted Composite	Bloomberg	Jan-90
Private Equity	Merrill Lynch Small Cap Research Private Equity/Micro Cap Russell Microcap Index Total Return	Merrill Lynch Morningstar	Jun-86 Jul-16
Real Assets	50/25/25 BB Cmnty / NCREIF Property / NCREIF TBI	Morningstar (Custom)	Mar-78

Source: GWIM CO.

* Before 1976, the IA SBBI US 30 TBill TR USD index is used.

Box 2: Using a Factor Model

A factor model is a means of estimating the statistical impact of risk factors on the return of an asset class. More specifically, we regress the excess returns⁶ of each asset class on the risk factors to measure their sensitivity to the factors. Exhibit 5 presents an illustrative set of estimates of the relationships between asset class returns and the relevant risk factors.

Exhibit 5: Sensitivity of Returns to Risk Factors for Selected Asset Classes (Illustrative)

Asset Class	Risk Factors						
	Equity Market	Equity Size Spread Return	Equity Value Spread Return	Term Spread Return	Credit Spread Return	Foreign Stock Spread Return	Foreign Bond Spread Return
Equity							
U.S. Large Cap Growth	1.05		-0.38				
U.S. Large Cap Value	0.98	0.08	0.34				
U.S. Small Cap Growth	1.19	0.74	-0.47				
U.S. Small Cap Value	1.00	0.62	0.42				
International Developed Equity	1.00	0.04				0.96	
Emerging Markets	1.20		-0.26			0.91	
Fixed Income							
U.S. Government				0.63	0.10		
U.S. Mortgages				0.72	0.36		
U.S. Corporates				0.87	0.70		
U.S. High Yield	0.36		0.12				
International Fixed Income				0.51	0.07		0.89
Alternative Investments							
Hedge Funds	0.35	0.22	-0.09			0.10	
Private Equity	1.05	1.06					

Source: GWIM CIO.

Continued on next page.

⁶ The excess return of an investment is defined as the difference between its return and the risk-free rate.

Box 2: Using a Factor Model (continued from previous page)

To demonstrate the use of a factor model, consider a few illustrative examples:

Returns to U.S. large cap growth stocks are driven by the market and value risk factors, which have loadings of +1.05 and -0.38, respectively. This means that each 1% increase in the broad market's performance will typically be associated with a 1.05% increase in U.S. large cap growth returns, and that each 1% increase in the value factor will be associated with a 0.38% decrease in U.S. large cap growth returns.

Returns to corporate bonds are driven by the term return spread and credit return spread risk factors, which have loadings of +0.87 and +0.70, respectively. This means that each 1% increase in the performance of Term Spread Return will typically be associated with a 0.87% increase in corporate bond returns, and that each 1% increase in the performance of AAA corporate bonds relative to Treasury bonds will be associated with a 0.70% increase in corporate bond returns.

Returns to hedge funds are driven by the market, size, value and foreign equity risk factors, which have loadings of +0.35, +0.22, -0.09 and +0.10, respectively. This means that each 1% increase in the broad market's performance will typically be associated with a 0.35% increase in hedge fund returns and that each 1% increase in the size factor will be associated with a 0.22% increase in hedge fund returns. Similarly, each 1% increase in the value factor will typically be associated with a 0.09% decrease in hedge fund returns and each 1% increase in the foreign stock returns will be associated with a 0.10% increase in hedge fund returns.

Returns to private equity are driven by the market and size risk factors, which have, respectively, loadings of +1.05 and +1.06. This means that each 1% increase in the broad market's performance will typically be associated with a 1.05% increase in private equity returns, and that each 1% increase in the size factor will be associated with a 1.06% increase in private equity returns.

Next, based on the estimated relationships between the asset classes and the risk factors, we use a simulation technique called *parametric bootstrapping*⁷ to estimate expected returns for each asset class. This methodology first requires quantifying the interrelationships among the risk factors and then simulating future values of the risk factors based on these interrelationships. We then use these simulated risk factor values to estimate the relationship between asset class returns and risk factors.

Next, we substitute the simulated future value of the risk factors into the estimated relationships between them and asset class returns to construct a possible scenario for a 25-year series of future asset class returns. We repeat the process to generate

a large set of asset class return simulations. Finally, to produce the Merrill Lynch Capital Market Assumptions, we use these simulated time series to forecast expected returns, volatilities and correlations over a 25-year planning horizon.

The Merrill Lynch Capital Market Assumptions provide views of future asset class returns. These expected returns, volatilities and correlations are directly estimated from the simulated return scenarios generated by our proprietary model. *Expected return*, which is computed as a simple arithmetic mean, reflects the average annual return the asset class is expected to provide over the planning horizon. (For a discussion of volatility and correlation measures, see Box 3.)

⁷ Pástor, Lubos, and Robert F. Stambaugh (2012), "Are Stock Really Less Volatile in the Long Run?" *Journal of Finance* 67(2), 431–477.

Box 3: Projecting future return volatility and correlations

Volatility, which reflects future return expectations, is measured as the standard deviation of annual returns. Standard deviation is a common statistical measure that conveys the deviation of a variable (such as asset returns) around its mean. Two useful rules of thumb are that:

- approximately two-thirds of observations of a variable are within one standard deviation of the mean, and
- approximately 95% of observations are within two standard deviations of the mean.

Thus, if an asset class has an expected annual return of 10% and volatility (standard deviation) of 20%, in approximately two-thirds of the years in our planning horizon, returns to the asset class will be between -10% (i.e., $10\% - 20\%$) and 30% ($= 10\% + 20\%$). Similarly, in approximately 95% of the years, these returns will be between -30% ($= 10\% - 2 \times 20\%$) and 50% ($= 10\% + 2 \times 20\%$).

Correlations also reflect future return prospects. The correlation between each pair of asset classes is quantified using the correlation coefficient, another standard statistical measure. By definition, the correlation between two variables can be between -1 and +1. Two asset classes with a correlation of +1 move in perfect lockstep. If they have a correlation of -1, they move synchronously, but in opposite directions. Two asset classes whose correlation is zero are uncorrelated. Most pairs of asset classes are positively correlated, with correlation less than +1.

This simulation-based approach captures several important aspects of returns. In particular, the Capital Market Assumptions:

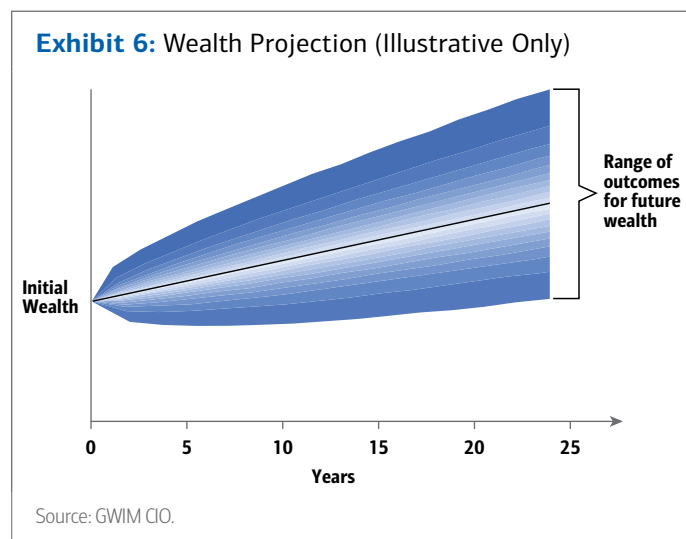
- may deviate from historical averages
- capture current market conditions as they evolve in simulations, and
- allow for risk factors that vary over the planning horizon.

Market conditions change—sometimes quite rapidly. Because of this, we review the Capital Market Assumptions every year. In our reviews, we first update the historical data to reflect the financial and economic developments of the past year. Then,

we generate updated Capital Market Assumptions using our proprietary model and the GWIM CIO Investment Strategy Committee reviews and votes on them. Once finalized, the assumptions are published and disseminated to advisors and their clients.

What do the Merrill Lynch Capital Market Assumptions mean for clients?

The Merrill Lynch Capital Market Assumptions have a number of applications. First, they are basic inputs for our projections of the future value of a client's wealth (as in Exhibit 6).⁸ If a wealth projection indicates that a client is not on track to meet his or her goals, the advisor can guide the client to take corrective action, such as saving more, scaling back spending plans or delaying retirement.



One key measure of a client's financial well-being is the funding ratio, defined as the net present value of assets and future income divided by the net present value of future goals and commitments. A client whose funding ratio is 100% is on track to meet goals. A ratio of 125% would indicate ample funding, but a ratio of 75% would signal a meaningful shortfall. The Capital Market Assumptions are key inputs in calculating the funding ratio, which should be monitored regularly by both the client and his or her advisor.

The Capital Market Assumptions form the basis for saving and spending guidance more generally. For example, they help an advisor determine how much a client must save to fund a given goal, or what spending rate will allow a retiree to make use of his or her assets without running the risk of outliving his or her wealth.

⁸ Although the Merrill Lynch Capital Market Assumptions are stated before expenses and taxes, wealth projections and related measures can nonetheless take these into account.

The Capital Market Assumptions also support risk management. They do this by supplying key inputs needed to measure and manage downside risk. An advisor can quantify the losses that a client may experience in the future and verify that these are in line with the client's risk capacity and tolerance. The assumptions also help advisors provide clients a picture of how their portfolios might perform under a range of market scenarios. If these prospects are out of line with a client's time horizon and risk capacity and tolerance, the advisor can adjust the portfolio allocation to better align with the client's goals and preferences.

All of these applications of the Merrill Lynch Capital Market Assumptions—wealth projection, measurement of progress to goals, saving and spending guidance, and risk management—are critical links in our wealth management process. But there is one further use of the assumptions, one that warrants particular attention: the development of the Merrill Lynch Strategic Asset Allocations.

What are the Merrill Lynch Strategic Asset Allocations?

The Merrill Lynch Strategic Asset Allocations are a disciplined approach to long-term investing that entails diversifying across asset classes to help clients achieve their financial goals in a manner consistent with their time horizon and risk capacity and tolerance.

There is ample evidence that asset allocation has a major impact on investment performance. While researchers differ as to the precise magnitude of this impact, there is general consensus that it matters greatly.⁹

How does the GWIM CIO develop the Merrill Lynch Strategic Asset Allocations?

To develop the Merrill Lynch Strategic Asset Allocations, the GWIM CIO implements an enhanced version of the mean-variance optimization approach pioneered by Nobel laureates Harry Markowitz, William Sharpe and James Tobin, among others.¹⁰ The enhancement we use in implementing this approach, known as *robust optimization*, is described in Box 4.

Box 4: Robust Optimization

Traditional mean-variance optimization begins with capital market assumptions regarding expected returns, volatility and correlations. If these measures were known with certainty, the approach would work as intended. A challenge that practitioners face is that capital market assumptions are just that—assumptions. The true expected returns, volatility and correlations can be estimated, but not known with certainty. Yet, traditional mean-variance optimization treats *estimates* of expected returns as if they were the *true values* of these parameters and takes no account of the impact of estimation error.

Through decades of experience implementing mean-variance optimization, practitioners have identified two shortcomings to the approach. First, the asset allocations it produces are highly sensitive to the capital market assumptions used. Second, these allocations can sometimes be concentrated in relatively few asset classes.

To overcome these limitations, we implement mean-variance optimization using an approach known as *robust optimization*.¹¹ Robust optimization explicitly takes into account the uncertainty inherent in capital market assumptions. The approach generates allocations that are satisfactory, even if the input parameters on which they are based are imprecise. Thus, the approach builds on the strength of traditional mean-variance optimization while acknowledging that the inputs it uses cannot be known with certainty.

In our own work, we have compared mean-variance optimization with robust optimization in a variety of contexts. We find that robust optimization generally outperforms mean-variance optimization with respect to risk-adjusted returns and that robust optimization typically produces portfolios that are more diversified than does mean-variance optimization.

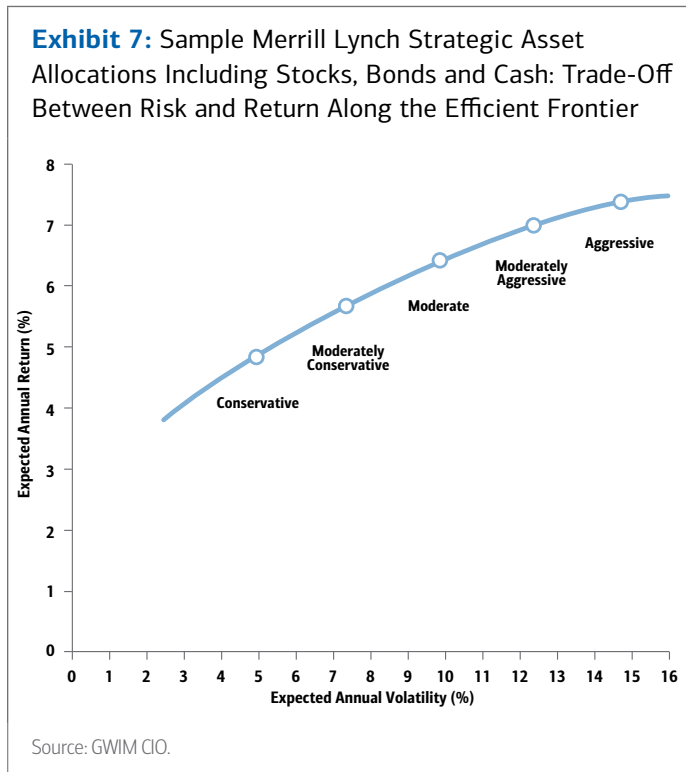
* Asset allocation and diversification do not assure a profit or protect against a loss during declining markets.

⁹ See Roger Ibbotson, "The Importance of Asset Allocation," *Financial Analysts Journal*, March/April 2010.

¹⁰ The seminal paper in this literature is Harry Markowitz, "Portfolio Selection," *Journal of Finance*, March 1952.

¹¹ For more on this, see Richard Michaud, "The Markowitz Optimization Enigma: Is 'Optimized' Optimal?" *Financial Analysts Journal*, January/February 1989; and Donald Goldfarb and Garud Iyengar, "Robust Portfolio Selection Problems," *Mathematics of Operations Research*, 28.1 (2003): 1-38.

Mean-variance optimization begins with Capital Market Assumptions. Taking the Merrill Lynch Capital Market Assumptions as inputs, we identify the *efficient frontier*, which represents a set of portfolios that provide an optimal trade-off between risk and return. Exhibit 7 shows the efficient frontier for sample Strategic Asset Allocations including stocks, bonds and cash.



We identify a set of five Strategic Asset Allocations that run the gamut of client risk preferences. These range from conservative to aggressive and include three intermediate allocations.

It should be noted that, in both developing and implementing the Strategic Asset Allocations, we impose constraints on the asset class weights (for more details, see Box 5.)

Box 5: Guardrails Placed on the Merrill Lynch Strategic Asset Allocations

To help ensure that the Merrill Lynch Strategic Asset Allocations are feasible, broadly diversified and consistently followed, we apply guardrails both to their development and to their implementation.

Development Guardrails

The GWIM CIO recommends neither short selling, nor leverage in the Strategic Asset Allocations. Consistent with this, the portfolio weight of each asset class is restricted to between 0% and 100%. Also, as a practical matter, the Strategic Asset Allocations must offer some liquidity. We therefore require a minimum allocation to cash of 2%.

Another consideration is that the allocations should bear some relationship to the relative market capitalizations of the underlying asset classes. An extremely large allocation to a small asset class may prove impossible to implement. We also want to ensure that large asset classes are meaningfully represented in the Strategic Asset Allocations.

To achieve this balance, we place restrictions on the weights of sub-asset classes relative to the broader asset classes of which they are a part (see Exhibit 8). Each large-scale U.S. equity sub-asset class is restricted to a portfolio weight that is between 75% and 125% of its market capitalization relative to that of U.S. equities overall. Thus, because the market capitalization of U.S. Large Cap Growth equities is 45% of the total market capitalization of U.S. equities, we restrict its allocation to be between 34% and 56% of the total allocation to U.S. stocks. For smaller sub-asset classes, such as U.S. Large Cap Value equities, we use wider guardrails, ranging from 50% to 150% of the relative market capitalization.

Similar constraints apply to international developed market and emerging market equities, as well as to the various fixed income sub-asset classes. Finally, to promote diversification among alternative investments, each of the three sub-asset classes is constrained to have a relative weight between 0% and 50%.

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Box 5: Guardrails Placed on the Merrill Lynch Strategic Asset Allocations (continued from previous page)

Exhibit 8: Group Comparison Constraints on Strategic Asset Allocations (Illustrative)

Constraint Description	Lower Bound	Upper Bound	Rationale
Equity			
U.S. Large Cap Growth vs. U.S. Equity	34%	56%	Between 75% and 125% of market cap weight
U.S. Large Cap Value vs. U.S. Equity	35%	59%	Between 75% and 125% of market cap weight
U.S. Small Cap Growth vs. U.S. Equity	2%	6%	Between 50% and 150% of market cap weight(1)
U.S. Small Cap Value vs. U.S. Equity	2%	6%	Between 50% and 150% of market cap weight(1)
U.S. Equity vs. Equity	42%	70%	Between 75% and 125% of market cap weight
Intl. Dev. Equity vs. Equity	25%	42%	Between 75% and 125% of market cap weight
EM equity vs. Equity	5%	16%	Between 50% and 150% of market cap weight(1)
Fixed Income			
U.S. Government vs. U.S. Fixed Income	32%	54%	Between 75% and 125% of market cap weight
U.S. Mortgages vs. U.S. Fixed Income	18%	30%	Between 75% and 125% of market cap weight
U.S. Corporates vs. U.S. Fixed Income	20%	34%	Between 75% and 125% of market cap weight
U.S. High Yield vs. U.S. Fixed Income	3%	8%	Between 50% and 150% of market cap weight(1)
International Fixed Income vs. Fixed Income	5%	50%	Home country bias(2)
Alternative Investments			
Hedge Funds vs. Alternative Investments	0%	50%	Diversification within Alternative Investments(3)
Private Equity vs. Alternative Investments	0%	50%	Diversification within Alternative Investments(3)
Real Assets vs. Alternative Investments	0%	50%	Diversification within Alternative Investments(3)

Source: GWIM CIO.

Notes: The market capitalization data used are as of June 30, 2017. We plan to update these data every June 30 for subsequent use.

(1) The band is twice as wide when the market capitalization weight is less than 10%.

(2) Home country bias towards U.S. fixed income and investment capacity is low for U.S.-domiciled investors.

(3) The concept of market capitalization does not apply to alternative investment (AI) sub-asset classes. Therefore, we use the most diversified allocation of equal weights as a starting point. An equal-weighted allocation within AI amounts to a 33.3% allocation to each of hedge funds, private equity and real assets. We allow an allocation of up to 1.5 times 33.3% (= 50%) to each sub-AI asset class. The lower bound is set to be 0%.

Exhibit 9 presents sample Strategic Asset Allocations with varying allocations to stocks, bonds and cash that reflect a range of investor preferences. The conservative portfolio has a large allocation to bonds and cash, while the aggressive portfolio has a substantial allocation to stocks. As one would expect, there is a

trade-off between risk and return. The higher the expected return one seeks from a Strategic Asset Allocation, the greater the resulting risk. In identifying the most appropriate Strategic Asset Allocation for a client, it is important to consider the client's goals, investment time horizon and risk capacity and tolerance.

Exhibit 9: Sample Merrill Lynch Strategic Asset Allocations Including Stocks, Bonds and Cash

Asset Class	All Fixed Income	Conservative	Moderately Conservative	Moderate	Moderately Aggressive	Aggressive	All Equity
Equity	0%	21%	37%	54%	70%	84%	98%
U.S. Large Cap Growth	0%	5%	8%	12%	15%	18%	22%
U.S. Large Cap Value	0%	8%	13%	19%	25%	30%	36%
U.S. Small Cap Growth	0%	1%	2%	2%	3%	3%	4%
U.S. Small Cap Value	0%	1%	2%	2%	3%	3%	4%
International Developed Equity	0%	5%	9%	14%	17%	21%	25%
Emerging Markets	0%	1%	3%	5%	7%	9%	7%
Fixed Income	98%	57%	61%	44%	28%	14%	0%
U.S. Government	27%	17%	17%	14%	9%	4%	0%
U.S. Mortgages	24%	14%	16%	11%	7%	3%	0%
U.S. Corporates	24%	11%	16%	13%	9%	5%	0%
U.S. High Yield	7%	4%	4%	4%	2%	1%	0%
International Fixed Income	16%	11%	8%	2%	1%	1%	0%
Cash	2%	22%	2%	2%	2%	2%	2%
Expected Return (Geometric)	4.2%	4.8%	5.8%	6.4%	6.9%	7.3%	7.6%
Expected Return (Arithmetic)	4.3%	4.9%	6.1%	6.9%	7.6%	8.3%	8.9%
Expected Risk (Volatility)	5.4%	5.0%	7.3%	9.8%	12.4%	14.7%	16.9%
Expected Yield	2.5%	2.1%	2.4%	2.5%	2.4%	2.4%	2.3%

Source: GWIM CIO.

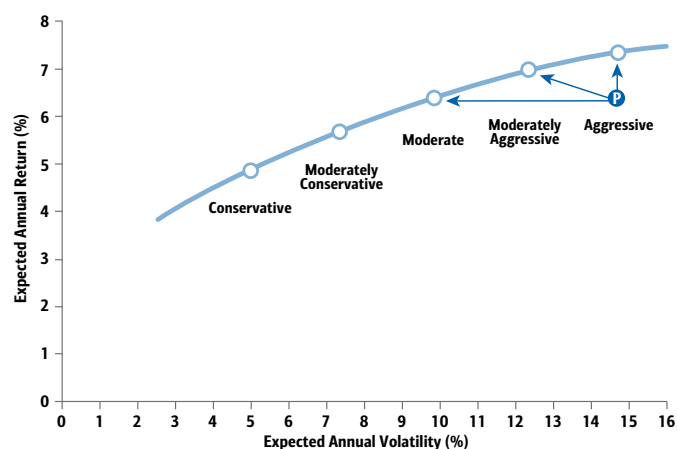
Note: Data are as of January, 2018. Figures may not sum due to rounding. Actual returns cannot be predicted and will fluctuate. Your returns may be higher or lower.

It is possible to perform mean-variance optimization with just a few high-level asset classes (e.g., stocks, bonds and cash). But this would not provide sufficient asset allocation guidance to advisors and clients. Conversely, if we use sub-asset classes that are too specialized, there will not be enough historical data to allow us to develop accurate forecasts. Another key decision in developing a Strategic Asset Allocation is whether or not to include alternative investments (for more on this, see Box 6).

The use of Strategic Asset Allocations can improve portfolio performance relative to what one might achieve through a less disciplined approach. An investor who does not deliberately select a portfolio on the efficient frontier will typically end up with a portfolio that offers substantial room for improvement.

Consider, for example, an investor who holds Portfolio P, which lies under the efficient frontier (see Exhibit 10). The client can have a higher expected return with the same risk by switching to an aggressive Strategic Asset Allocation. Alternatively, the client could shift from Portfolio P to a moderate Strategic Asset Allocation, which would provide the same expected return but meaningfully less risk. Or, finally, the client could shift to a moderately aggressive Strategic Asset Allocation, which would produce a higher expected return with less risk than Portfolio P.

Exhibit 10: Sample Merrill Lynch Strategic Asset Allocations Including Stocks, Bonds and Cash: Trade-Off Between Risk and Return Within the Efficient Frontier



Source: GWIM CIO.

By investing according to a Strategic Asset Allocation, the client is positioned to earn the highest possible expected return for a given level of risk (or, equivalently, has the lowest risk exposure for a given expected return). It is this efficiency that has prompted economists to call the mean-variance optimization used to construct strategic asset allocations one of the rare “free lunches” that financial markets offer investors. Investors who do not pursue this approach might leave money on the table.

Box 6: Strategic Asset Allocations Including Alternative Investments

A basic decision that investors face is whether or not to include alternative investments—such as hedge funds, private equity and real assets—in their portfolios. Investors who do not qualify to hold alternative investments, or who choose not to, will have Strategic Asset Allocations such as those shown in Exhibits 9 and 10, which have no allocations to alternative

investments. Investors who qualify to hold alternative investments and wish to do so will allocate some of their assets to these investments (see Exhibit 11). Including alternative investments has the potential to enhance the trade-off between risk and return, as depicted by an upward shift in the efficient frontier (see Exhibit 12).

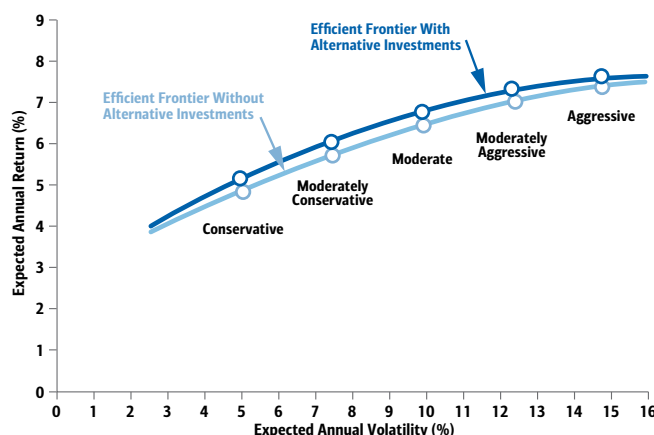
Exhibit 11: Sample Merrill Lynch Strategic Asset Allocations Including Stocks, Bonds, Cash and Alternative Investments

Asset Class	Conservative	Moderately Conservative	Moderate	Moderately Aggressive	Aggressive
Equity	17%	32%	47%	60%	73%
U.S. Large Cap Growth	4%	7%	10%	13%	16%
U.S. Large Cap Value	6%	12%	17%	22%	26%
U.S. Small Cap Growth	1%	1%	2%	2%	3%
U.S. Small Cap Value	1%	1%	2%	2%	3%
International Developed Equity	4%	8%	12%	15%	18%
Emerging Markets	1%	3%	4%	6%	7%
Fixed Income	55%	51%	34%	18%	3%
U.S. Government	17%	15%	10%	6%	1%
U.S. Mortgages	13%	13%	8%	4%	1%
U.S. Corporates	10%	14%	11%	6%	1%
U.S. High Yield	4%	4%	3%	1%	0%
International Fixed Income	11%	5%	2%	1%	0%
Cash	15%	2%	2%	2%	2%
Alternative Investments	13%	15%	17%	20%	22%
Hedge Funds	6%	8%	9%	10%	11%
Private Equity	2%	3%	4%	6%	7%
Real Assets	5%	4%	4%	4%	4%
Expected Return (Geometric)	5.1%	6.1%	6.7%	7.2%	7.6%
Expected Return (Arithmetic)	5.2%	6.3%	7.1%	7.9%	8.6%
Expected Risk (Volatility)	4.9%	7.4%	9.8%	12.3%	14.7%
Expected Yield	2.0%	2.2%	2.2%	2.0%	1.9%

Source: GWIM CIO.

Note: Data are as of January, 2018. Figures may not sum due to rounding. Actual returns cannot be predicted and will fluctuate. Your returns may be higher or lower.

Exhibit 12: Sample Merrill Lynch Strategic Asset Allocations With and Without Alternative Investments



Source: GWIM CIO.

The Merrill Lynch Strategic Asset Allocations, like the Merrill Lynch Capital Market Assumptions, are reviewed annually to ensure that they reflect the latest market developments. The GWIM CIO Investment Strategy Committee then votes on the Strategic Asset Allocations. This process helps assure that they remain relevant to our clients' needs.

What do the Merrill Lynch Strategic Asset Allocations mean for clients?

The Merrill Lynch Strategic Asset Allocations are used extensively in providing guidance to clients. In particular, they are a critical input to Merrill Lynch's:

- asset allocation guidance
- supervision process
- financial planning tools
- performance review tools, and
- centrally managed portfolios.

Asset allocation guidance. As noted, strategic asset allocation is a critical determinant of portfolio performance and clients' success in achieving their goals. Thus, identifying which allocation best suits each client is an important step in our advice and guidance process. To do so, we take into account the client's risk capacity and tolerance, as well as the time horizon of the client's goals. After identifying an appropriate allocation for a client, the advisor periodically reviews the client's personal situation and goals to verify that this allocation is still a good fit. In addition, the GWIM CIO provides tactical asset allocation guidance, which seeks to enhance investment performance by taking advantage of short-term market opportunities.

Financial planning tools. The Strategic Asset Allocations serve as inputs to Merrill Lynch's proprietary financial planning tools, such as Wealth Outlook. In particular, the Strategic Asset Allocations are the building blocks that help identify an asset allocation appropriate for each client's goals.

Performance review tools. The Strategic Asset Allocations also serve as inputs to tools that monitor how well our clients' investments are faring, providing a benchmark for making that determination.

Centrally managed portfolios. Merrill Lynch makes its disciplined investment process available to clients through centrally managed portfolios that are benchmarked to the Strategic Asset Allocations. This helps ensure that these portfolios are broadly diversified over a range of asset classes, consistent with the guidance of the GWIM CIO.

Conclusion

The GWIM CIO provides industry-leading investment solutions, portfolio construction advice and wealth management guidance to help our advisors address their clients' goals. Underlying these offerings are:

- the Merrill Lynch Capital Market Assumptions, thoughtfully developed long-term views on various asset classes, and
- the Merrill Lynch Strategic Asset Allocations, the basis for diversified portfolios designed to help clients achieve their financial goals in a manner consistent with their investment time horizon and risk capacity and tolerance.

The GWIM CIO reviews both the assumptions and the allocations annually, and updates them as needed, in the context of the latest economic and financial developments. These methodologies have served our advisors and their clients well and will remain foundations of GWIM CIO guidance for years to come.

Important Information

The Global Wealth & Investment Management Chief Investment Office (GWIM CIO) provides industry-leading investment solutions, portfolio construction advice and wealth management guidance. This material was prepared by the GWIM CIO and is not a publication of BofA Merrill Lynch Global Research. The views expressed are those of the GWIM CIO only and are subject to change. This information should not be construed as investment advice. It is presented for information purposes only and is not intended to be either a specific offer by any Merrill Lynch entity to sell or provide, or a specific invitation for a consumer to apply for, any particular retail financial product or service that may be available.

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Past performance is no guarantee of future results.

Alternative Investments, such as hedge funds and private equity, can result in higher return potential but also higher loss potential. Before you invest in alternative investments, you should consider your overall financial situation, how much money you have to invest, your need for liquidity, and your tolerance for risk. Some or all alternative investment programs may not be suitable for certain investors.

Alternative investments are typically sold in private placements and may be offered only to individuals who are both Qualified Purchasers and Accredited Investors and for whom the investment is otherwise suitable.

No investment program is risk-free and a systematic investing plan does not ensure a profit or protect against a loss in declining markets. Any investment plan should be subject to periodic review for changes in your individual circumstances, including changes in market conditions and your financial ability to continue purchases.

The investments discussed have varying degrees of risk. Some of the risks involved with equities include the possibility that the value of the stocks may fluctuate in response to events specific to the companies or markets, as well as economic, political or social events in the U.S. or abroad. Bonds are subject to interest rate, inflation and credit risks. Investments in foreign securities involve special risks, including foreign currency risk and the possibility of substantial volatility due to adverse political, economic or other developments. These risks are magnified for investments made in emerging markets.

Neither Merrill Lynch nor any of its affiliates or financial advisors provide legal, tax or accounting advice. You should consult your legal and/or tax advisors before making any financial decisions.

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