

Private Bank



Set Sail with Asset Allocation

December 2019



"I'm nervous about markets
so I'm keeping a large portion
of my investments in cash."

"Why would I sell my winners?
I'm making lots of money in these
concentrated positions."

Both of these statements are common investor sentiments. But they may be driven more by emotion and gut feelings rather than a disciplined investment strategy. A large cash position may indicate fear and excessive loss aversion, while concentrated holdings could signal overconfidence, following the herd mentality, or even greed.¹

Although fear-driven or herd behaviors contributed to the survival of our species a million years ago, those emotions are not helpful when constructing a long-term investment strategy designed to help you survive threats, such as bubbles, volatility, and other extreme market events, to your investment goals.²

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¹ For a more in-depth discussion of the cognitive biases in investors' decision-making process, please see: Kahneman, Daniel. *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, 2011.

² Lo, Andrew W. *Adaptive Markets: Financial Evolution at the Speed of Thought*. Princeton, NJ: Princeton University Press, 2017.





INVESTMENT PRODUCTS: NOT FDIC INSURED • NOT CDIC INSURED • NOT GOVERNMENT INSURED • NO BANK GUARANTEE • MAY LOSE VALUE

Additionally, neither of these sentiments is consistent with a disciplined asset allocation approach. An all-cash portfolio leaves you at risk of having less wealth in the long run because cash historically has not kept pace with the rate of inflation. Conversely, a portfolio with concentrated positions is at risk of extreme drawdowns. Interestingly, a similar problem exists with a “buy and hold” approach, whereby a

portfolio can become quite imbalanced as some securities grow to outsized positions over time.

To combat these behaviors, you need a logic-based, disciplined strategy that seeks to keep you on course for investing success.

Build a core investment strategy

 Define Investor Profile (or Investment Policy Statement)	 Establish a Strategic Asset Allocation (SAA)	 Complement with Tactical Asset Allocation (TAA)	 Combine with Security and Manager Selection
<ul style="list-style-type: none">Define your investment objectives, time horizon, risk tolerance, liquidity needs, and any constraints or preferences	<ul style="list-style-type: none">Create a long-term investment plan using a diversified set of asset classes, based on the outlook for returns and risks, with the goal of maximizing portfolio returns given a level of portfolio risk defined in the Investor ProfileAdaptive Valuation Strategies (AVS) is the Private Bank's own strategic asset allocation methodology using a ten year investment horizon	<ul style="list-style-type: none">Make short-term variations to the long-term plan, with the goal of maximizing portfolio return relative to the SAA given a desired level of portfolio risk relative to the SAAThe Global Investment Committee at the Private Bank makes tactical underweights and overweights relative to the AVS SAA using a 12-18 month horizon	<ul style="list-style-type: none">Select specific securities or managers, with the goal of maximizing risk-adjusted returns within each SAA asset classThe Private Bank's Manager Research and Portfolio Management teams evaluate hundreds of third party managers and thousands of securities across AVS SAA asset classes

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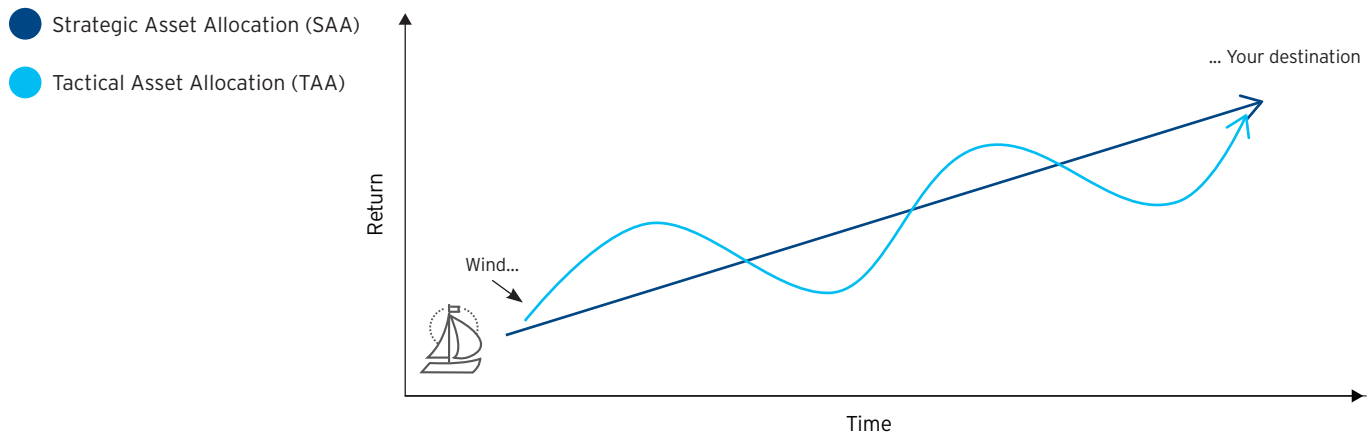
Select your destination

Constructing a long-term core investment strategy is like planning a sailing voyage. Before setting sail, one develops a navigation plan that identifies a destination and lays out the optimal course for efficiently reaching that destination. Similarly, before investing, establishing an Investor Profile (or Investment Policy Statement) identifies your objectives while strategic asset allocation (SAA) lays out the optimal course for efficiently achieving your investment goals.

During your sailing journey, tools such as a sextant and compass, or GPS and radar, can be used to monitor your progress and correct your heading to stay on course. Likewise, during your investment journey, tools such as performance attribution, risk exposure analysis and rebalancing can be

used to guide you toward achieving your financial objectives. Naturally, over your sailing voyage, you will make adjustments to your navigation plan given shifting winds, prevailing currents and unexpected obstacles. Similarly, over your investment voyage you will make adjustments via the tactical asset allocation (TAA) process (under- and overweighting asset classes) given central bank policies, political events and geopolitical conflicts.

At the end of the investment voyage, your cumulative portfolio return is the destination you have reached and can be attributed to three components: SAA return, TAA return and investment selection return. While all are important, SAA is the most important determinant of variability in portfolio returns.³



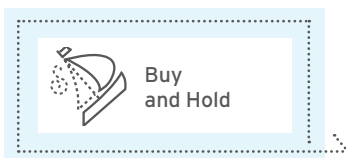
Source: The Private Bank's Global Asset Allocation team. For illustration purposes only. This illustration does not take into consideration volatility in the financial markets. There is no guarantee that returns will go up over time.



- If you are not fully invested, you are like a sailboat with partial or no sails, and you may get to your destination at a slower pace – or not at all
- Inflation may drift you backwards



- If you hold overly concentrated positions, you are unbalanced
- You are susceptible to having your sailboat capsize in a gale wind



- If you are a buy-and-hold investor and are not rebalancing on a disciplined basis, you risk becoming too concentrated
- You are susceptible to drifting off course

Reallocating assets with a suitable SAA has the potential to get you back on course and leave you better positioned to face the next storm.

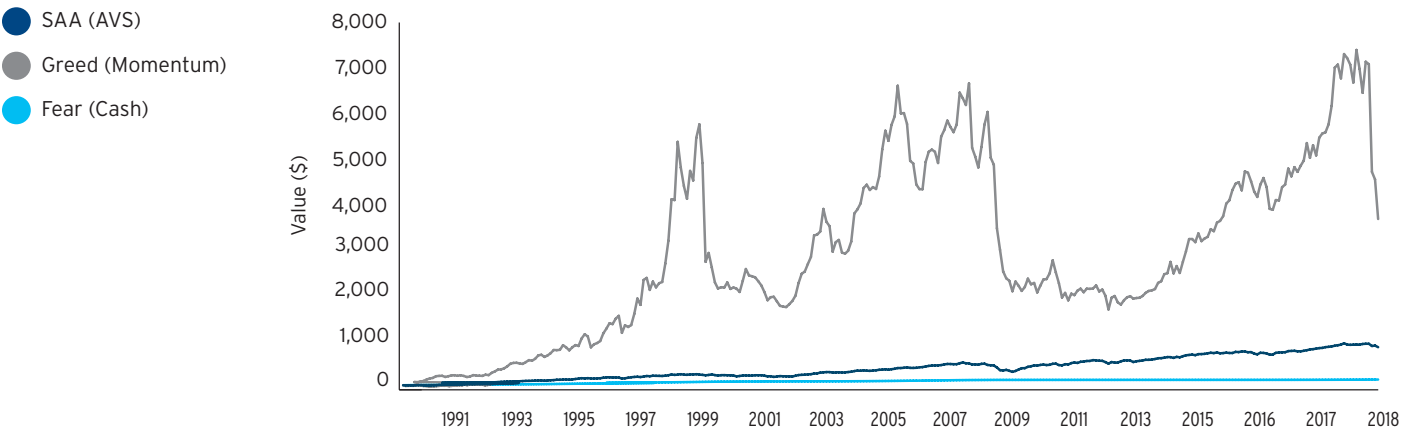
³ See for example: Gary P. Brinson, L. Randolph Hood, and Gilbert L. Beebower, *Determinants of Portfolio Performance*, *Financial Analysts Journal*, July/August 1986. Also see Roger G. Ibbotson, *Importance of Asset Allocation*, *Financial Analyst Journal*, March/April 2010.

The navigation plan

To better explain the effectiveness of establishing an SAA plan, the Private Bank’s Global Asset Allocation team conducted a historical analysis and compared three theoretical portfolios beginning January 1, 1990 through December 31, 2018.⁴

- 1. **SAA strategy**, AVS portfolio with hedge funds Risk Level III⁵
- 2. **Greed (Momentum) strategy**, invested in the top five performing stocks in the S&P 500 over the previous 12 months, holding for one month and then repeating⁴
- 3. **Fear (Cash) strategy**, fully allocated to cash

Figure 1



Source: The Private Bank’s Global Asset Allocation team from January 1, 1990 through December 31, 2018. The SAA (AVS) portfolio shown was calculated on an asset class level using indices as stated at the bottom of page 4 and assumes investing in the USD Global Level III with Hedge Funds and rebalancing monthly. The Greed (Momentum) strategy assumes selecting the top five performing stocks in the S&P 500 in the previous 12 months (equal weighting) and rebalancing monthly. The Fear (Cash) strategy is the yield of the US 3-Month Treasury Bill. Please see Glossary for definitions. **Past performance does not guarantee future returns.** Real results may vary. Note that no fees or commissions were deducted in the analysis for any of the strategies. Summary statistics were computed using closing prices on the last trading day of each month. See Appendix 1 for asset class indices used in the SAA strategy. See Appendix 2 for a listing of the stocks held at year end in the Greed strategy. The Fear strategy uses the cash index noted in Appendix 1.

At first glance, Figure 1 appears to show that greed is good. The Greed strategy had the highest return, up 13.3% on an annualized basis since inception, followed by the SAA portfolio, up 8.0%, annualized, over the analysis period (January 1, 1990 through December 31, 2018). However, on closer inspection we see the Greed strategy had volatility of 30.0%, versus just 9.0% for the SAA portfolio. Greed also sustained a drawdown of -73.8%, versus just -34.8% in the SAA strategy.

Would you have stayed the course in the Greed strategy through the volatility experienced in 2000 and in 2008? Many investors did not and sold off after the crash in ‘08 – thus, they would not have experienced the big gains post-crash reflected in the Greed strategy.

Without a plan, investors are vulnerable to knee-jerk, panic reactions during volatile times.

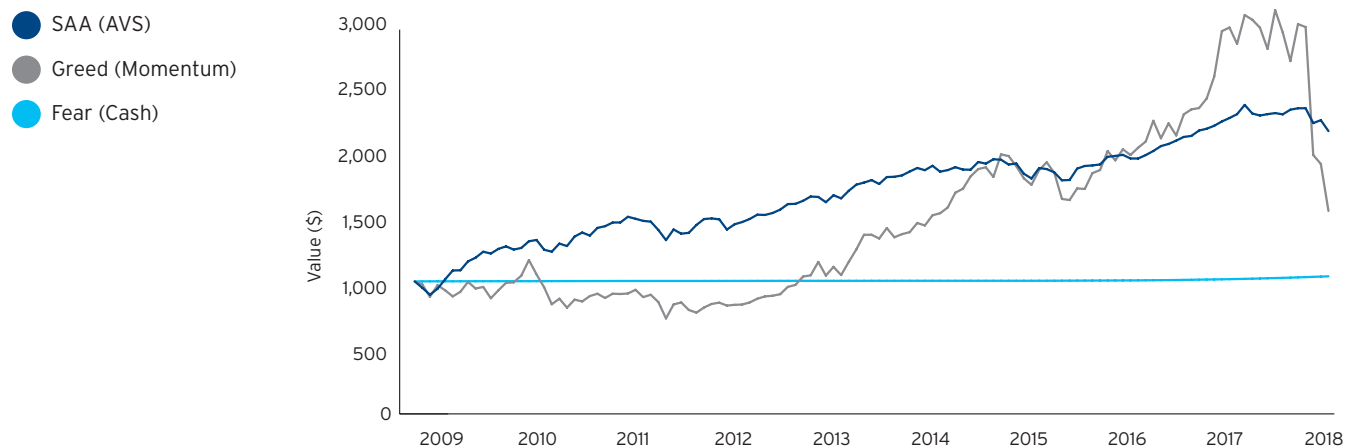
⁴ Note that no fees or commissions were deducted in the analysis for any of the strategies. Summary statistics were computed using closing prices on the last trading day of each month. See Appendix 1 for asset class indices used in the SAA strategy. See Appendix 2 for a listing of the stocks held at year end in the Greed strategy. The Fear strategy uses the cash index noted in Appendix 1.

⁵ Adaptive Valuation Strategies (AVS) is the Private Bank’s proprietary strategic asset allocation methodology. It determines the suitable long-term mix of assets for each client’s investment portfolio. The AVS portfolio shown assumes investing in the USD Global Level III with Hedge Funds and rebalancing monthly.

Table 2

	SAA	Greed	Fear
Annual Return	7.9%	4.4%	0.4%
Annual Standard Deviation	8.9%	23.5%	0.2%
Monthly Minimum	-5.6%	-33.1%	0.0%
Sharpe Ratio	0.9	0.3	2.1
Maximum Drawdown	-11.8%	-49.7%	0.0%

Figure 2



Source: The Private Bank's Global Asset Allocation team from January 1, 2009 through December 31, 2018. The SAA (AVS) portfolio shown was calculated on an asset class level using indices as stated at the bottom of page 4 and assumes investing in the USD Global Level III with Hedge Funds and rebalancing monthly. The Greed (Momentum) strategy assumes selecting the top five performing stocks in the S&P 500 in the previous 12 months (equal weighting) and rebalancing monthly. The Fear (Cash) strategy is the yield of the US 3-Month Treasury Bill. Please see Glossary for definitions. **Past performance does not guarantee future returns.** Real results may vary. Note that no fees or commissions were deducted in the analysis for any of the strategies. Summary statistics were computed using closing prices on the last trading day of each month. See Appendix 1 for asset class indices used in the SAA strategy. See Appendix 2 for a listing of the stocks held at year end in the Greed strategy. The Fear strategy uses the cash index noted in Appendix 1.

Illustrated above are the same three strategies over a shorter period of time beginning January 1, 2009 through December 31, 2018.

In Figure 2, not only is the Greed strategy inferior from a risk-adjusted basis, but also from an absolute return basis. Over this indicated time period, the Greed strategy returned 4.4%, annualized. Meanwhile the SAA strategy achieved a 7.9% return, annualized. Over this post-crash time period, the Greed strategy benefited from popular technology stocks and a long-running bull market. If you are chasing returns at the wrong times – even with great stocks – you could sink.

Not surprisingly, the Fear strategy significantly underperformed the other two strategies over the original analysis period (January 1, 1990 through December 31, 2018). Over the shorter period illustrated above, the Fear strategy returned only 0.4% and would have lost ground to inflation which was 2.4% on an annualized basis over that time period.⁶ This illustrates the dangers of not being fully invested in a diversified portfolio. So don't voyage out with no sails and drift backwards. Set sail with SAA.

Strategic asset allocation best practices

The investment results in our three portfolios are indicative of the value of employing an asset allocation approach. Our strategic asset allocation methodology embodies time-honored asset management best practices.

Diversification may be the only “free lunch” in finance. Why is it a free lunch? Diversification can allow one to add assets while helping lower overall risk in the portfolio, without reducing its potential return.

Asset class diversification

Portfolios should be diversified across asset classes. For example, a portfolio with large amounts of cash is not diversified and risks underperforming broad-based balanced benchmarks.

Geographic diversification

Global diversification should be a default case when considering how to construct a strategic asset allocation for a balanced portfolio. Global investing has the potential to add value, especially when different regions around the world are in different phases of business cycles. Global portfolios have become more easy to implement as financial markets have matured and become more open.

⁶ FRED database based on the Consumer Price Index: Total All Items for United States (Seasonally Adjusted), St. Louis Federal Reserve Board.

Adaptive Valuation Strategies (AVS) is the Private Bank's proprietary strategic asset allocation methodology. It determines the suitable long-term mix of assets for each client's investment portfolio. The AVS portfolio shown assumes investing in the USD Global Level III with Hedge Funds and rebalancing monthly.

Diversification does not guarantee a profit or ensure against a loss of principal.

Sector diversification

Diversifying across sectors is also important as industries have become more globalized (e.g., energy). Researchers have debated which is more important: diversifying across countries/regions or across sectors.⁷ We recommend, to the extent possible, do both.

Factor diversification

Less obvious to the naked eye is factor diversification. Factors can be viewed as the underlying forces driving financial assets and are thus, understandably, an important lens through which to view portfolio risk and return exposures. Diversifying across factors (e.g., value versus growth or market capitalization) can be an important way to enhance portfolio efficiency.⁸

Target risk

Investors consider both return and risk when constructing portfolios, but often focus on targeting a specific level of return. And for very good reasons. This is important information for budgeting purposes. However, selecting a return can be difficult for two reasons: First, it is well known that returns are much more difficult to precisely estimate than risk.⁹ Second, return environments vary over time. Thus, setting an ambitious return goal in a lower return market environment will force an investor into a higher risk portfolio that may have undesirable consequences. For these two reasons, it may be preferable for investors to construct portfolios using long-term volatility measures and to select a portfolio risk level consistent with their risk aversion rather than constructing a portfolio solely based on a return objective.

Rebalancing

Not frequently discussed is that portfolio rebalancing can be thought of as diversifying a portfolio over time. Disciplined portfolio rebalancing – taking profits on securities that have appreciated and reallocating to securities that have depreciated – can provide incremental return relative to a buy-and-hold approach. So while initial diversification (geography, sector, etc.) in portfolio construction adds value in and of itself, maintaining that diversification through disciplined rebalancing over time can add even more incremental value in many cases. If diversification is the free lunch, then portfolio rebalancing is the free dessert.¹⁰

Valuation matters

When investors are fearful of markets, you should be greedy and when they are greedy, you should be fearful. If returns in an asset class have been attractive over the past 10 years, AVS implies that strategic return estimates (SRE) over the coming 10 years will be less attractive. Conversely, if an asset class has struggled over the past 10 years, our forecast is generally for more attractive returns in the coming 10 years. This effectively means: be a contrarian investor.

Risk management

Traditional approaches define risk as standard deviation, with no distinction between profitable and unprofitable volatility. However, what is most important to investors is avoiding downside losses. Constructing a portfolio using downside risk measures can help you sleep at night.

Get fully invested

In order to take full advantage of a long-term strategic asset allocation, investors should not sit in cash, but rather be fully invested. When incepting a new portfolio, investors need to first decide how to put their money to work right away. One popular approach is to dollar-cost average into your SAA plan over a period of time (e.g., 18 or 36 months). A more institutionally-oriented approach is to invest immediately based on your Investor Profile (or Investor Policy Statement) and SAA, at least initially, into market-tracking vehicles. Otherwise you are exposing the portfolio to the potential risk of underperforming your SAA benchmark.¹¹

Now that we have shown the value of implementing a long-term investment strategy not based on return-eating emotional reactions, we can discuss how to construct an SAA.

AVS uses a specialized risk measure called **Extreme Downside Risk (EDR)**. This measure calculates the worst potential loss that a particular allocation may suffer within a rolling twelve-month period over ten years. We use this measure to inform how we construct our strategic asset allocations.

⁷ See for example Heston, S. and Rouwenhorst, K. G., "Industry and Country Effects in International Stock Returns," *Journal of Portfolio Management*, Spring 1995, vol. 21, no. 3.

⁸ See for example Ang, A., *Asset Management-A Systematic Approach to Factor Investing*, Oxford University Press, 2014.

⁹ See Merton, R. C., "On Estimating the Expected Return on the Market," *Journal of Financial Economics*, vol. 8, no. 4, 1980.

¹⁰ Willenbrock, S., "Diversification Return, Portfolio Rebalancing, and the Commodity Return Puzzle," *Financial Analysts Journal*, vol. 67, no.4, 2011.

¹¹ See for example Rozeff, M. S., "Lump-Sum Investing versus Dollar-Averaging: Those Who Hesitate, Lose," *Journal of Portfolio Management*, Winter 1994.

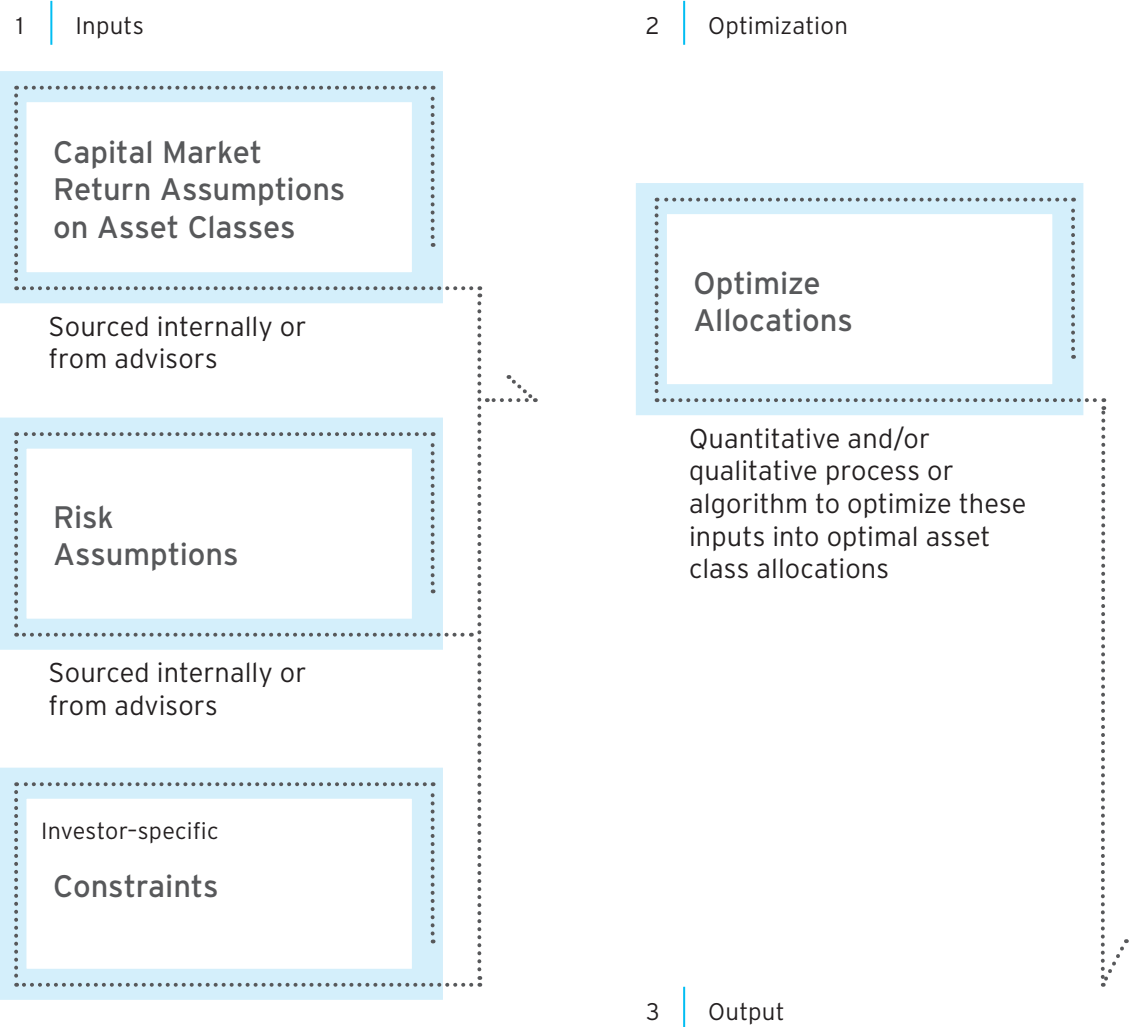
Quote from: *Adaptive Valuation Strategies, A New Approach to Strategic Asset Allocation, 2017 Annual Update*

Diversification does not guarantee a profit or ensure against a loss of principal.

Strategic Return Estimates (SRE) are not a guarantee of future returns.

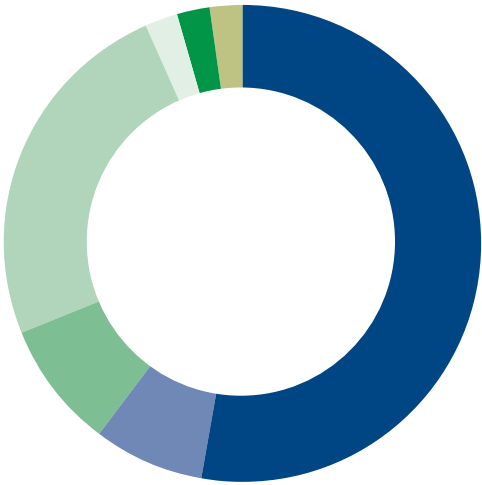
See glossary for definitions of Strategic Return Estimates (SRE) and Extreme Downside Risk (EDR).

Process of creating a strategic asset allocation plan



Allocation corresponds to AVS' Global USD Risk Level III portfolio

- 52.9% Global Developed Equities
- 7.5% Global Emerging Equities
- 8.5% Global Corporate Investment Grade Fixed Income
- 24.7% Global Government Fixed Income
- 2.0% Global High Yield Fixed Income
- 2.4% Global Emerging Fixed Income
- 2.0% Cash



It is important to review your SAA on a periodic basis to help ensure it remains consistent with lifestyle changes and needs. We believe that implementing a strategic asset allocation is one of the most important investment decisions that you can make to help ensure a sustainable asset base. It is the foundation of a disciplined investment plan.

Source: The Private Bank's Global Asset Allocation team.

Tactical asset class calls are made by our **Global Investment Committee (GIC)** on a globally diversified set of asset classes and are intended to take advantage of shorter-term market opportunities and help mitigate shorter-term risks. The GIC's investment horizon is 12 to 18 months and therefore considers return and risk on a shorter-term basis than AVS.

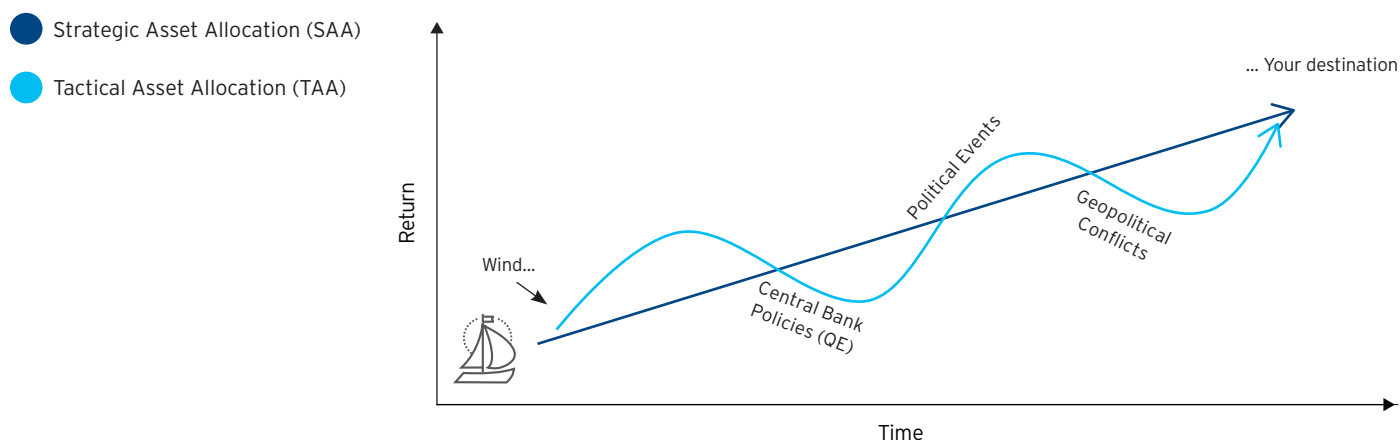
While AVS is a quantitative methodology, the GIC's decision-making process blends quantitative with qualitative inputs from asset-class specialists at Citi Research and from within the Private Bank.

Tactical asset allocation (TAA) – adjusting the sails

While strategic asset allocation is a long-term investment plan, tactical adjustments are generally moderate in size and are embodied and implemented in underweightings and overweightings of asset classes relative to the SAA. Back to sailing, the tactical asset allocations are the adjustments in your sails designed to take advantage of the shifting winds and currents of central bank policies, political events, or to avoid unexpected obstacles from geopolitical conflicts – events that can contribute to overvaluations or undervaluations for securities and markets. These short-term factors might be impossible to anticipate in a longer-term strategic asset allocation and might only be relevant over a 12 to 18 month investment horizon.

What are some of the sources of tactical asset allocation (TAA) opportunities? First, the investing missteps discussed earlier, driven by human emotions, have a short-term component as well. Second, large groups of investors, in aggregate, who are driven by emotions will influence markets in the short run – “herd behavior.” This observation was made by economist John Maynard Keynes who famously suggested that markets are moved by animal spirits rather than by logic.

Overreaction-driven market flows – herd behavior – have the potential to create opportunities for sophisticated investors. The asset flows lead to changes in the attractiveness of one asset class relative to another, presenting an opportunity for an investor to take advantage of shorter-term market opportunities and to help mitigate shorter-term risks.



Source: The Private Bank's Global Asset Allocation team. For illustration purposes only. This illustration does not take into consideration volatility in the financial markets. There is no guarantee that returns will go up over time.

Overreactions are evident from the herd behavior and flows into “hot” asset classes:

“Risk-on” periods

Investors generally become more risk tolerant and we see large asset flows into momentum strategies – recall the Greed strategy.

“Risk-off” periods

Investors generally become more risk averse and we see large asset flows into cash and highly defensive strategies – recall the Fear strategy.

Purposely navigating off course for a short period of time to avoid a risk has the potential to add value to your portfolio: you may get to your destination faster by taking advantage of a puff of wind, while simultaneously reducing risk by not colliding with the hazard on your course.

There are opportunities for TAA to add value, but TAA also comes with a challenge. The challenge relates to the “Fundamental Law of Active Management” which states that the magnitude of the potential return/risk ratio for a strategy decreases when fewer number of independent investment decisions are made in the strategy.¹²

To understand the implication of this, compare an active portfolio manager (eg an active stock selector) to a tactical asset allocator implementing a TAA strategy. Active stock selection requires a large number of decisions due to the large number of securities in the investment universe. TAA requires fewer investment decisions (i.e., asset classes) because there are far fewer asset classes than individual securities. Therefore, since the tactical asset allocator is making fewer independent decisions, he/she faces a higher hurdle than the active stock selector in achieving high return/risk ratios.

Does this mean you never want to do TAA? On the contrary. While using a tactical strategy employing just two asset classes (e.g. cash versus equities) is a risky proposition, just like a wager on a single coin toss, research has shown that diversified TAA strategies, which make tactical allocations to many asset classes, have the potential to enhance core portfolio returns.¹³ Additionally, the advantage the active stock selector has over the asset allocator may diminish during periods of stress when securities are driven more by macro factors than fundamentals and securities tend to move together (i.e., periods of low cross-sectional stock volatility).

So, from a performance perspective, both security selection and tactical asset allocation can independently be meaningful sources of additional value to an investor’s portfolio in addition to the fundamental strategic asset allocation return contribution.

“To reach a port we must sail,
sometimes with the wind, and
sometimes against it. But we
must not drift or lie at anchor.”

Oliver Wendell Holmes, Sr.

¹² Fundamental Law of Active Portfolio Management is $IR = IC \times \sqrt{BR}$, where IR is Information Ratio (i.e., return/risk ratio), IC is Information Coefficient (i.e., forecasting accuracy) and BR is Breadth (i.e., number of independent decisions). For details see Grinold, R and Kahn, R, Active Portfolio Management, McGraw Hill, 1999.

¹³ Blitz, David and van Vliet, Pim, Global Tactical Cross-Asset Allocation: Applying Value and Momentum Across Asset Classes (2008).

Tactical asset allocation best practices

- 1 Define investment goals and objectives
- 2 Collect inputs both internally (to the extent that resources exist in-house) and externally
- 3 Diversify. To combat the Fundamental Law of Active Management, having a larger set of asset classes in your portfolio will allow you to make more TAA individual investment decisions
- 4 Be disciplined. Establish parameters around your TAA individual investment decisions (size of individual investment decisions and time horizon) – it takes discipline to avoid chasing an event that may reverse itself in the next month or two
- 5 Measure your performance relative to the SAA – your benchmark – to see if you are adding value

Real Estate and Private Equity are not candidates for TAA due to long-term liquidity constraints, but there are many traditional global asset classes to build a diversified portfolio – and make more asset class investment decisions. With a larger number of opportunities, you can afford to be wrong on some of them.

Approaches used to select tactical allocations often involve comparisons of relative valuations across asset classes, such as:

- Valuation ratios of onshore equity markets versus offshore equity markets
- Dividend yield on equities versus coupon yield on bonds
- Current valuation of an asset class to its own historical value

Determining the optimal SAA can effectively take a quantitative approach; however, TAA decision making often includes shorter-term qualitative inputs, in conjunction with quantitative inputs. Please consult your Private Banker when determining an optimal allocation.

Waypoints to success

The biggest problem we see among investors is they often lack discipline in their investment approach. They may hold a haphazard collection of securities whose properties as a portfolio have not been fully thought through. They may overestimate their tolerance for risk. They may not regularly review and rebalance their portfolio. Investors get emotional, they panic, they ride a security up for too long, they sell at the wrong time, and they do not stay invested.

The steps for developing a successful strategy to achieve long-term investment goals starts with establishing an Investor Profile or a formal Investment Policy Statement (IPS). An IPS defines objectives, time horizon, risk tolerance, liquidity needs, constraints, preferences, core asset classes, and benchmarks used for measuring performance. Informed by the IPS and using the principles described in this article, the next step is to create a strategic asset allocation where target weights are assigned to each of the core asset classes to maximize long-term risk-adjusted returns. Then a process is established for making tactical adjustments to the strategic allocations based on shorter-term market conditions.

The final step in converting the asset allocation plan described here into an actual, implementable portfolio is to select the investment vehicles used to populate the plan allocations. The roster selected may include only actively managed vehicles, only passive vehicles, or a hybrid of both. Taking these steps to create a long-term plan and a balanced, core portfolio lays the foundation for achieving long-term investment goals. This core, long-term asset allocation plan can be supplemented with opportunistic investment ideas, including investments in out-of-benchmark asset classes, which have the potential to contribute additional value based on your investment objectives and risk tolerances.

Investors need to be cognizant that, at times, market returns will be higher than expected, or lower than expected, but you need to stay the course – and stay invested. This is not easy to do when it is your own money on the line. However, we believe investing according to a plan, perhaps with the help of a more emotionally-removed, but trusted, advisor is the best way to achieve your investment goals.

For more information about, and advice on, implementing the Private Bank's strategic and tactical asset allocation, please contact your Private Banker.

“Any fool can carry on, but a wise man knows how to shorten sail in time.”

Joseph Conrad

Glossary

Extreme Downside Risk (EDR):	A measure used to estimate the risk of an asset allocation. EDR seeks to estimate the typical type of loss, over a 12-month time horizon, that an asset allocation may experience in a period of extreme market stress. It is calculated using a proprietary methodology and database. For a given asset allocation, this approach estimates the loss, over a 12-month time horizon, that the asset allocation may have experienced during historical periods of extreme market stress. EDR is calculated by taking the average loss in the worst 5% of this historical periods of extreme market stress. EDR does not estimate the maximum possible loss. Potential losses for a given asset allocation may exceed the value of the EDR.
Maximum Drawdown:	The maximum loss from a peak to a trough of a portfolio, before a new peak is attained.
Monthly Minimum:	The minimum monthly performance.
Sharpe Ratio:	A measure that indicates the average return minus the risk-free return divided by the standard deviation of return on an investment.
Standard Deviation:	A measure of how much the values in a distribution vary from the mean of the distribution.
Strategic Return Estimate (SRE):	<p>The Private Bank's forecast of returns for specific asset classes over a 10-year time horizon. The forecast for each specific asset class is made using a proprietary methodology that is appropriate for that asset class. Equity asset classes are forecast using a proprietary methodology based on the calculation of valuation levels with the assumption these valuation levels revert to their long-term trends over time. Fixed Income asset classes are forecast using a proprietary methodology based on current yield levels. Other asset classes have other specific forecasting methodologies. Please note that hedge funds, private equity, real estate, structured products and managed futures are generally illiquid investments and are subject to restrictions on transferability and resale.</p> <p>The SRE for each asset class is determined using a forecasting methodology that is appropriate for each asset class. Equity asset classes utilize a proprietary forecasting methodology based on the assumption that equity valuations revert to their long-term trend over time. The methodology is built around specific valuation measures that require several stages of calculation. Assumptions on the projected growth of earnings and dividends are additionally applied to calculate the SRE of the equity asset class. Fixed Income asset class forecasts use a proprietary forecasting methodology that is based on current yield levels. For other asset classes we use specific forecasting methodologies.</p> <p>Each SRE is gross of actual client fees and expenses. Components of the methodology used to create the SREs include the rate of return for various asset classes based on indices. Termination and replacement of investments may subject investors to new or different charges. Past performance is not indicative of future results. Future rates of return cannot be predicted with certainty. Investments that pay higher rates of return are often subject to higher risk and greater potential loss in an extreme scenario. The actual rate of return on investments can vary widely over time, especially for long-term investments. This includes the potential loss of principal on your investment. It is not possible to invest directly in an index.</p>

Appendix 1: Asset class indices

Global Developed Market Equity	The asset class is composed of MSCI indices capturing large-, mid- and small-cap representation across 23 individual developed-market countries, as weighted by the market capitalization of these countries. The composite covers approximately 95% of the free float-adjusted market capitalization in each country.
Global Emerging Market Equity	The asset class is composed of MSCI indices capturing large and mid-cap representation across 20 individual emerging-market countries. The composite covers approximately 85% of the free float-adjusted market capitalization in each country. For the purposes of supplemental long-term historical data, local-market country indices are used, wherever applicable.
Global Developed Investment Grade Fixed Income	<p>The asset class is composed of Bloomberg Barclays indices capturing investment-grade debt from twenty different local currency markets. The composite includes fixed-rate treasury, government-related, and investment grade rated corporate and securitized bonds from the developed-market issuers.</p> <p>Local market indices for US, UK and Japan are used for supplemental historical data.</p>
Global High Yield Fixed Income	The asset class is composed of Bloomberg Barclays indices measuring the non-investment grade, fixed-rate corporate bonds denominated in US dollars, British pounds and Euros. Securities are classified as high yield if the middle rating of Moody's, Fitch and S&P is Ba1/BB+/BB+ or below, excluding emerging market debt. Ibbotson High Yield Index, a broad high yield index including bonds across the maturity spectrum, within the BB-B rated credit quality spectrum, included in the below-investment-grade universe, is used for supplemental historical data.

Appendix 1: Asset class indices (continued)

Global Emerging Fixed Income	The asset class is composed of Bloomberg Barclays indices measuring performance of fixed-rate local currency emerging markets government debt for 19 different markets across Latin America, EMEA and Asia regions. iBoxx ABF China Govt. Bond , the Markit iBoxx ABF Index comprising local currency debt from China, is used for supplemental historical data.
Cash	The asset class is represented by US 3-Month Government Bond TR , measuring the US dollar-denominated active 3-Month, fixed-rate, nominal debt issues by the US Treasury.
Hedge Funds	The asset class is composed of investment managers employing different investment styles as characterized by different sub categories – HFRI Equity Long/Short: Positions both long and short in primarily equity and equity derivative securities; HFRI Credit: Positions in corporate fixed income securities; HFRI Event Driven: Positions in companies currently or prospectively involved in wide variety of corporate transactions; HFRI Relative Value: Positions based on a valuation discrepancy between multiple securities; HFRI Multi Strategy: Positions based on realization of a spread between related yield instruments; HFRI Macro: Positions based on movements in underlying economic variables and their impact on different markets; Bloomberg Barclays Trader CTA Index: The composite performance of established programs (Commodity Trading Advisors) with more than four years of performance history.
Private Equity	The asset class characteristics are driven by those for Developed Market Small Cap Equities, adjusted for illiquidity, sector concentration and greater leverage.
Real Estate	The asset class contains index contains all Equity REITs (US REITs and publicly-traded real estate companies) not designated as Timber REITs or Infrastructure REITs: NAREIT US REIT Index, NAREIT Canada REIT Index, NAREIT UK REIT Index, NAREIT Switzerland REIT Index, NAREIT Euro-zone REIT Index, NAREIT Japan REIT Index, NAREIT Hong Kong REIT Index, NAREIT Singapore REIT Index, NAREIT Australia REIT Index.
Commodities	The asset class contains the index composites – GSCI Precious Metals Index , GSCI Energy Index , GSCI Industrial Metals Index , and GSCI Agricultural Index – measuring investment performance in different markets, namely precious metals (e.g., gold, silver), energy commodity (e.g., oil, coal), industrial metals (e.g., copper, iron ore), and agricultural commodity (i.e., soy, coffee) respectively. Reuters/Jeffries CRB Spot Price Index, the TR/CC CRB Excess Return Index, an arithmetic average of commodity futures prices with monthly rebalancing, is used for supplemental historical data.

Appendix 2: Constituents of the greed strategy

The Greed portfolio invested in the top 5 performing stocks in the S&P 500 over the previous 12 months, holding for one month and then repeating from January 1, 1990 through December 31, 2018.

12/31/90	Alberto-Culver	Home Depot, Inc.	NCR Corporation	NIKE, Inc. Class B	Service Corporation International
12/31/91	Advanced Micro Devices, Inc.	Biomet Inc.	Data General Corporation	Gap, Inc.	Novell, Inc.
12/31/92	Unisys Corporation	Chrysler Corporation	DSC Communications Corporation	Harrah's Entertainment Corp.	Scientific-Atlanta Inc.
12/31/93	Clark Equipment Company	DSC Communications Corporation	Echo Bay Mines Ltd.	Harrah's Entertainment Corp.	Lotus Development Corporation
12/30/94	Andrew Corp.	ChemFirst Inc.	Micron Technology, Inc.	Stone Container Corporation	Amdahl Corporation
12/29/95	Boston Scientific Corporation	Cisco Systems, Inc.	Bally Entertainment Corporation	Sun Microsystems	US Airways Group Inc.
12/31/96	EMC Corporation	Dell Inc.	Intel Corporation	TJX Companies Inc	Rowan Cos. Plc Class A
12/31/97	Caliber System Inc.	Dell Inc.	Clear Channel Communications Inc.	Navistar International Corporation	US Airways Group Inc.
12/31/98	Apple Inc.	Ascend Communications Inc.	Dell Inc.	EMC Corporation	Lucent Technologies Inc.
12/31/99	LSI Corporation	Nextel Communications Inc.	QUALCOMM Incorporated	Nortel Networks Corporation	Sprint Corporation
12/29/00	Calpine Corp.	Dynegy Inc.	EOG Resources, Inc.	Encompass Health Corporation	Reebok International Ltd.
12/31/01	AutoZone, Inc.	Best Buy Co., Inc.	NVIDIA Corporation	Office Depot, Inc.	J. C. Penney Company, Inc.
12/31/02	Apollo Education Group, Inc. Class A	Ball Corporation	Boston Scientific Corporation	Newmont Goldcorp Corporation	Provident Financial Corporation
12/31/03	Avaya Inc.	Novell, Inc.	Dynegy Inc.	PMC-Sierra, Inc.	Williams Companies, Inc.
12/31/04	Apple Inc.	Autodesk, Inc.	Monsanto Company	TXU Corporation	Valero Energy Corporation
12/30/05	Apple Inc.	EOG Resources, Inc.	Express Scripts Holding Company	Burlington Resources Inc.	Valero Energy Corporation
12/29/06	Allegheny Technologies Incorporated	Big Lots, Inc.	NVIDIA Corporation	OfficeMax Incorporated	Terex Corporation
12/31/07	Amazon.com, Inc.	Apple Inc.	SunEdison, Inc.	Jacobs Engineering Group Inc.	National Oilwell Varco, Inc.
12/31/08	Amgen Inc.	Family Dollar Stores, Inc.	H&R Block, Inc.	Celgene Corporation	UST Inc.
12/31/09	Ford Motor Company	Advanced Micro Devices, Inc.	Genworth Financial, Inc. Class A	Tenet Healthcare Corporation	XL Group Ltd
12/31/10	American International Group, Inc.	Cummins Inc.	F5 Networks, Inc.	Netflix, Inc.	Zions Bancorporation, N.A.
12/30/11	Biogen Inc.	Cabot Oil & Gas Corporation	El Paso Corp.	Intuitive Surgical, Inc.	Mastercard Incorporated Class A
12/31/12	Expedia, Inc.	Bank of America Corp	PulteGroup, Inc.	Sprint Nextel Corporation	Whirlpool Corporation
12/31/13	Best Buy Co., Inc.	Delta Air Lines, Inc.	Micron Technology, Inc.	Netflix, Inc.	E*TRADE Financial Corporation
12/31/14	Allergan, Inc.	Edwards Lifesciences Corporation	Electronic Arts Inc.	Broadcom Inc.	Southwest Airlines Co.
12/31/15	Activision Blizzard, Inc.	Amazon.com, Inc.	Netflix, Inc.	NVIDIA Corporation	Cablevision Systems Corporation Class A
12/30/16	Applied Materials, Inc.	Freeport-McMoRan, Inc.	Newmont Goldcorp Corporation	NVIDIA Corporation	ONEOK, Inc.
12/31/17	Align Technology, Inc.	Boeing Company	NRG Energy, Inc.	Vertex Pharmaceuticals Incorporated	Wynn Resorts, Limited
12/31/18	ABIOMED, Inc.	Advance Auto Parts, Inc.	Advanced Micro Devices, Inc.	Fortinet, Inc.	TripAdvisor, Inc.

Source: Factset and the Global Asset Allocation team at the Private Bank.

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