

Texas Municipal Retirement System

Asset Allocation Study

August 2018



Asset Allocation Overview

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Introduction

The selection of the asset allocation is one of the most important decisions that Texas Municipal Retirement System can make. It is the major determinant of both the long-term rates of return and the volatility of asset values. Two facets comprise the asset allocation decision: identification of the alternative asset allocations to be considered and selection of the alternative allocation that best meets the investment objectives. The identification of alternative asset allocations begins with estimating the probable future performance of the various asset classes. Using these projections, we can identify the most desirable alternative allocations (potential portfolios) and evaluate them in light of the investment objectives to select that which is most appropriate.

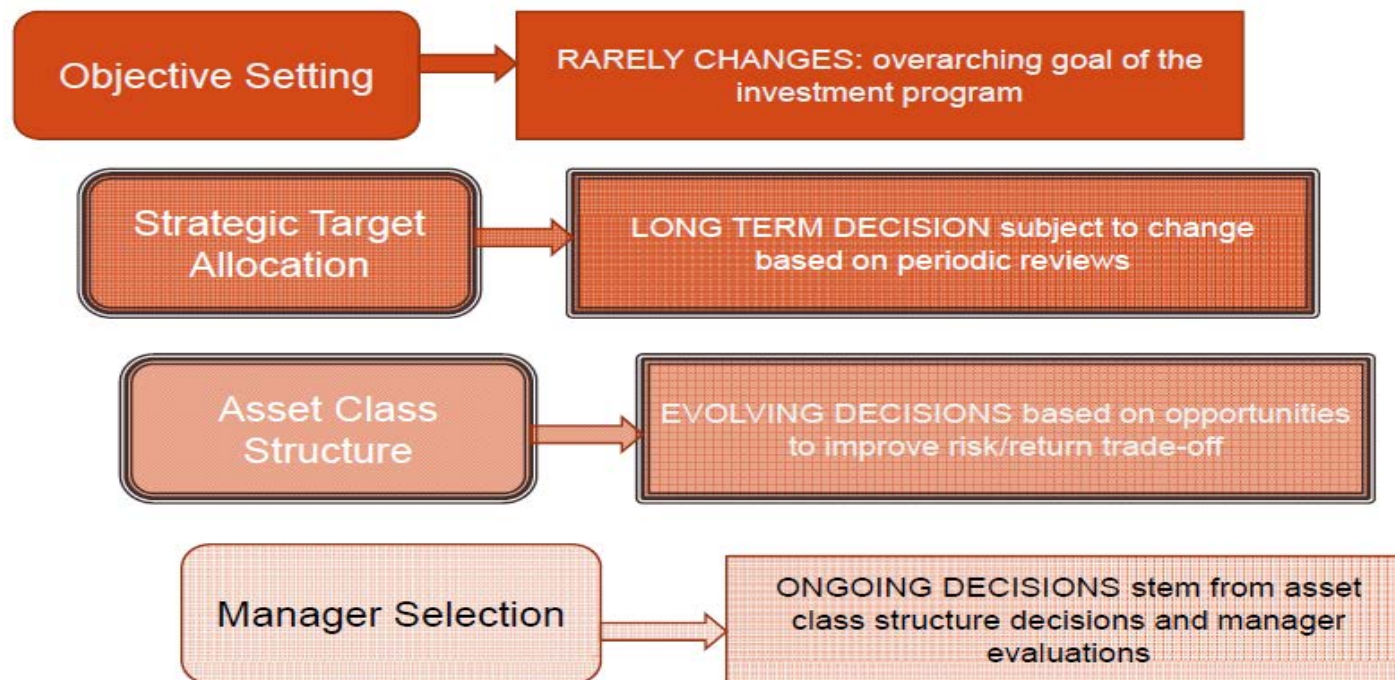
The structure of this report follows the process described above. First, we present our return and risk expectations for each asset class, along with a brief explanation of their relevance to asset allocation. Next, the report will address the creation of the asset allocation alternatives. A description of how the alternatives were identified accompanies a table detailing their composition.

Asset Class Expectations

To create asset allocation alternatives, it is necessary to estimate, for each asset class to be employed, its probable return, risk, and behavior relative to other asset classes. The expected returns are our best estimates of the average annual percentage increases in the values of each asset class over a prospective long period of time. The expected returns and risks (as measured by standard deviation of returns) are listed on the left side of page 10, and the historical risks and returns of each asset class, as measured by comparable indexes, are listed on the right side of page 10.

Asset Allocation Process

- Formal pension financial (asset-liability) study will be conducted at least every five years (2019)
- Formal asset allocation study will be conducted at least every three years to verify or amend the targets
- Strategic Target Allocation will be reviewed at least annually to ensure that the long-term return objective and risk tolerance continues to be appropriate for the current environment and the Board's goals



Asset Allocation Process

Investment Policy Statement: *Investment Beliefs*¹

- The investment beliefs of the Board are based on capital market theories that are generally accepted and followed by institutional investors, who by definition are long-term oriented investors. These beliefs hold that¹:
 - Increasing risk is compensated
 - Risk can be diversified
 - Relative performance of asset classes is reasonably consistent
 - (Return, Volatility and Correlation assumptions are used to represent investment opportunities)
 - The primary determinant of return is asset allocation
 - (The choice of Strategic Target Allocation is the most important investment decision)
 - The risk of tactical shifts between asset classes is hard to diversify and must be used judiciously
 - Active management can improve returns and is inversely dependent on market efficiency
 - (Choices of sub-asset classes, Active Strategies, and Managers are expected to contribute to total performance)
 - Risk Tolerance²: Risk commensurate with a 6.75% target rate of return

1. Summarized from the TMRS Investment Policy Statement (IPS)

2. TMRS IPS Sec. IV. Investment Objective . . . The Board is responsible for approving an Actuarial Return Assumption and accepting that the commensurate risk posture of that portfolio is in line with the Board's Risk Tolerance.

Asset Allocation Process

Investment Policy Statement: *Asset Allocation Policy*

The Board has adopted the following framework for making asset allocation decisions

- The Board will adopt a Strategic Target Allocation that must deliver:
 1. A representation of the Board's long-term return objective with its implied Risk Tolerance;
 2. Sufficient confidence for the Board to “stay the course” given extreme market moves; and
 3. A benchmark against which to measure performance.

Asset Allocation Inputs

Primary Sources of Risk and Return

Alternative asset classes provide diversification by adding new risk premia

| Primary Sources of Risk and Return (Risk Premia) | | Asset Class Examples | | | | | | |
|-----------------------------------------------------|-------------------|----------------------|-------------------|--------|--------------------------|----------------|-------------------------|----------------------------|
| | | Gov't Bonds | Core Fixed Income | Equity | Real Assets ¹ | Private Equity | Non – Core Fixed Income | Absolute Return Strategies |
| Traditional | Interest rates | x | x | | | | | x |
| | Credit | | x | | | | x | x |
| | Equity | | | x | x | | | x |
| | Real Assets | | | | x | x | | x |
| Alternative | Liquidity | | | | x | x | x | x |
| | Direct Engagement | | | | x | x | x | x |
| | Optionality | | | | | | x | x |
| | Complexity | | | | | | x | x |

1. Includes Real Estate and Real Return investments

Capital Market Assumptions

Please reference the RVK Capital Market Assumptions white paper for details of the analysis undergone in developing the assumptions for each asset class. Also, note that the relationship between the asset classes (their positioning in the graph relative to one another) is much more important for investment decision-making than the absolute expected return level of each asset class.

It is important to understand that these expectations are assumptions of long-term future performance and are, therefore, subject to uncertainty. The risk, or volatility, of each asset class reflects this uncertainty, which is quantified by the statistic known as standard deviation of returns. The standard deviation for each asset class is listed on page 10.

The standard deviation of returns measures the volatility ("risk") of an asset class by assigning probabilities to a range of different possible returns. If asset returns are normally distributed (bell-shaped curve) then two-thirds (67%) of all returns are expected to lie within one standard deviation on either side of the mean. For example, we expect Broad US Equity to return, annually on average, 6.80% with a standard deviation of 17.80%, meaning that for a normal distribution two-thirds of the time we expect its returns to lie between -11.00% (= 6.80% - 17.80%) and 24.60% (= 6.80% + 17.80%). Moreover, we expect 95% of all return outcomes to lie within two standard deviations of the mean return, implying only a one-in-twenty chance that the return on Broad US Equity will either fall below -28.80% or rise above 42.40%. Page 31 in the Appendix provides the expected range of single year returns in each asset class using the above methodology, and also uses a bell-shaped (normal distribution) diagram to illustrate the above example for the Texas Municipal Retirement System total portfolio.

Asset Allocation Inputs

RVK Assumptions: Summary of Year-over-Year Changes

| Asset Class | Benchmark | 2017 | | | 2018 | | | Change (2018 - 2017) | | |
|----------------------------------------|--------------------------------------|-------------------------|--------------------|-----------------------|-------------------------|--------------------|-----------------------|-------------------------|--------------------|-----------------------|
| | | Nominal Return (Arith.) | Standard Deviation | Nominal Return (Geo.) | Nominal Return (Arith.) | Standard Deviation | Nominal Return (Geo.) | Nominal Return (Arith.) | Standard Deviation | Nominal Return (Geo.) |
| Large/Mid Cap US Equity | S&P 500 (Cap Weighted) | 7.00% | 17.75% | 5.56% | 6.75% | 17.75% | 5.30% | -0.25% | 0.00% | -0.25% |
| Small Cap US Equity | Russell 2000 | 7.50% | 21.25% | 5.46% | 7.25% | 21.25% | 5.20% | -0.25% | 0.00% | -0.25% |
| Broad US Equity | Russell 3000 | 7.05% | 17.80% | 5.60% | 6.80% | 17.80% | 5.35% | -0.25% | 0.00% | -0.25% |
| Dev'd Large/Mid Cap Int'l Equity | MSCI EAFE (Gross) | 8.25% | 19.00% | 6.62% | 8.00% | 19.00% | 6.37% | -0.25% | 0.00% | -0.25% |
| Dev'd Small Cap Int'l Equity | MSCI EAFE Small Cap (Gross) | 8.50% | 23.00% | 6.14% | 8.25% | 23.00% | 5.89% | -0.25% | 0.00% | -0.26% |
| Emerging Markets Equity | MSCI Emerging Markets (Gross) | 10.75% | 29.00% | 7.14% | 10.25% | 29.00% | 6.62% | -0.50% | 0.00% | -0.51% |
| Broad International Equity | MSCI ACW Ex US IMI (Gross) | 8.85% | 20.65% | 6.94% | 8.60% | 20.80% | 6.66% | -0.25% | 0.15% | -0.28% |
| Global Equity | MSCI ACW IMI (Gross) | 7.90% | 18.30% | 6.38% | 7.65% | 18.35% | 6.12% | -0.25% | 0.05% | -0.26% |
| Intermediate Duration Fixed Income | Bloomberg US Aggregate Bond | 3.50% | 6.00% | 3.33% | 3.50% | 6.00% | 3.33% | 0.00% | 0.00% | 0.00% |
| Non-US Dev'd Sovereign Fixed Income UH | Citi Non-US World Gov't Bond | 2.25% | 10.50% | 1.72% | 2.25% | 10.50% | 1.72% | 0.00% | 0.00% | 0.00% |
| Emerging Markets Debt Hard Currency | JPM EMBI Global Diversified | 5.75% | 12.50% | 5.02% | 5.25% | 12.50% | 4.52% | -0.50% | 0.00% | -0.50% |
| Emerging Markets Debt Local Currency | JPM GBI EM Global Diversified | 6.75% | 12.50% | 6.03% | 5.75% | 12.50% | 5.02% | -1.00% | 0.00% | -1.01% |
| TIPS | Bloomberg US Treasury: US TIPS | 3.75% | 6.25% | 3.56% | 3.75% | 6.25% | 3.56% | 0.00% | 0.00% | 0.00% |
| Low Duration Fixed Income | Bloomberg US Gov't/Cred: 1-3 Year | 2.50% | 3.50% | 2.44% | 3.00% | 3.50% | 2.94% | 0.50% | 0.00% | 0.50% |
| Long Duration Fixed Income | Bloomberg US Gov't/Cred: LT Bond | 4.00% | 11.50% | 3.37% | 3.50% | 11.50% | 2.87% | -0.50% | 0.00% | -0.50% |
| High Yield | Bloomberg US Corp: High Yield | 6.00% | 15.00% | 4.95% | 5.50% | 15.00% | 4.45% | -0.50% | 0.00% | -0.50% |
| Core Real Estate | NCREIF ODCE (Gross) (AWA) | 6.25% | 12.50% | 5.52% | 6.25% | 12.50% | 5.52% | 0.00% | 0.00% | 0.00% |
| Global REITs | MSCI World Real Estate Index (Gross) | 6.25% | 19.00% | 4.59% | 6.25% | 19.00% | 4.59% | 0.00% | 0.00% | 0.00% |
| Diversified Hedge Funds | HFRI Fund of Funds Composite Index | 6.25% | 9.50% | 5.83% | 5.75% | 9.50% | 5.33% | -0.50% | 0.00% | -0.50% |
| GTAA | Custom GTAA Index | 6.25% | 10.00% | 5.78% | 6.00% | 10.50% | 5.48% | -0.25% | 0.50% | -0.30% |
| Private Equity | Cambridge US Private Equity Index | 10.00% | 25.50% | 7.16% | 9.75% | 25.50% | 6.90% | -0.25% | 0.00% | -0.26% |
| Commodities | Bloomberg Commodity Index | 5.75% | 19.75% | 3.95% | 5.75% | 19.75% | 3.95% | 0.00% | 0.00% | 0.00% |
| Diversified Inflation Strategies | Custom DIS Index | 5.25% | 11.50% | 4.63% | 5.25% | 11.50% | 4.63% | 0.00% | 0.00% | 0.00% |
| US Inflation | Consumer Price Index | 2.50% | 3.00% | 2.46% | 2.50% | 3.00% | 2.46% | 0.00% | 0.00% | 0.00% |
| Cash Equivalents | BofA ML 3 Mo US T-Bill | 2.25% | 3.00% | 2.21% | 2.50% | 3.00% | 2.46% | 0.25% | 0.00% | 0.25% |

Yellow highlighted cells indicate values are being calculated based on a roll up of underlying asset classes. Global Equity is a combination of 51.7% Broad US Equity and 48.3% Broad International Equity. Broad US Equity is a combination of 91.5% Large/Mid Cap US Equity and 8.5% Small Cap US Equity. Broad International Equity is a combination of 64.4% Dev'd Large/Mid Cap Int'l Equity, 11.2% Dev'd Small Cap Int'l Equity, and 24.4% Emerging Markets Equity. Diversified Inflation Strategies is a combination of 1/3 TIPS, 1/3 Global REITs, and 1/3 Commodities. The Custom DIS Index is comprised of 1/3 BB US Trsry: US TIPS Index, 1/3 MSCI World Real Estate Index, and 1/3 DJ-UBS Commodity Index.

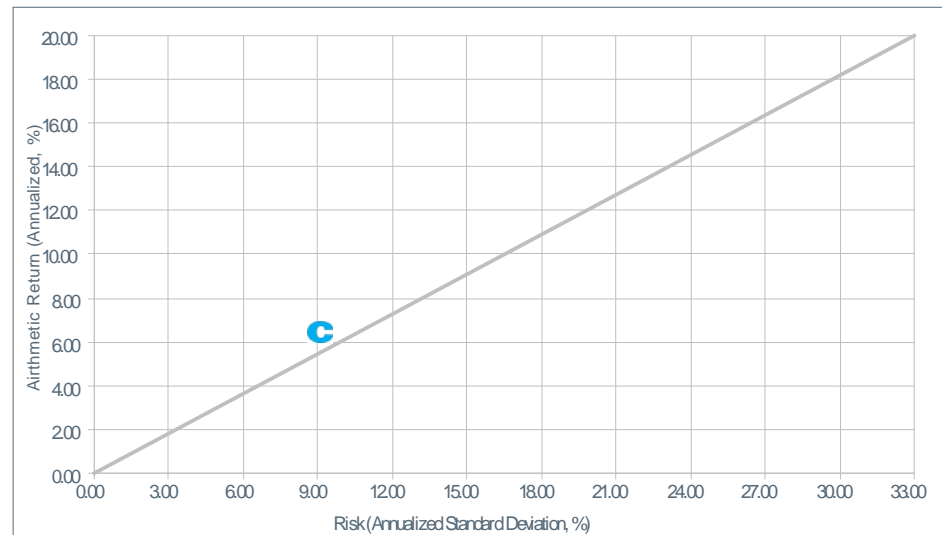
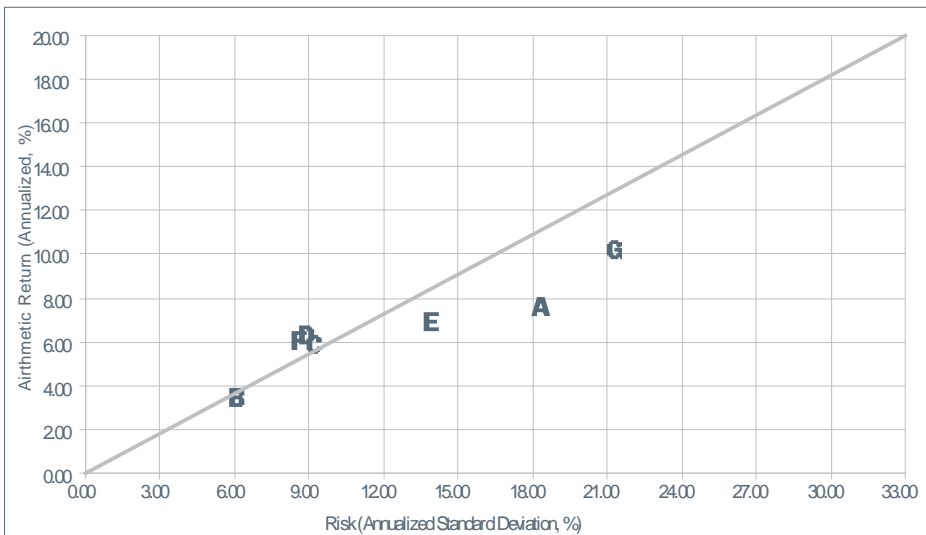
TMRS & RVK Assumptions: 2018

| Asset Class | Index | 2018 | | 2018 | |
|------------------------------------------|--------------------------------------------------|---------------------|--------------------|----------------------------|----------------------------------|
| | | Return (Arithmetic) | Standard Deviation | Expected Return/Risk Ratio | Expected Sharpe Ratio (2.50% RF) |
| Global Equity | MSCI ACW IMI (USD) (Gross) | 7.65% | 18.35% | 0.42 | 0.28 |
| Int. Duration Fixed Income | Bloomberg US Aggregate Bond Index | 3.50% | 6.00% | 0.58 | 0.17 |
| Non-Core Fixed Income | Blended Index: | 5.89% | 9.12% | 0.65 | 0.37 |
| 13% High Yield | Barclays US Corporate: High Yield Index | 5.50% | 15.00% | 0.37 | 0.20 |
| 27% Loans | Credit Suisse Leveraged Loan Index | 5.25% | 10.00% | 0.53 | 0.28 |
| 11% EMD Local | JPM GBI-EM Gbl Diversified TR Index (Unhedged) | 5.75% | 12.50% | 0.46 | 0.26 |
| 27% Opp Fixed Income | Cambridge Private Credit Index | 7.50% | 10.00% | 0.75 | 0.50 |
| 22% Structured Credit | 50/50 Bloomberg MBS/ABS | 5.00% | 9.00% | 0.56 | 0.28 |
| Custom Real Return | Blended Index: | 6.28% | 8.89% | 0.71 | 0.43 |
| 45% Global Linkers | Barclays World Govt Infl-Linked Index (Unhedged) | 4.00% | 8.50% | 0.47 | 0.18 |
| 15% Agriculture | NCREIF Farmland Index | 6.75% | 10.00% | 0.68 | 0.43 |
| 15% MLPs | Alerian MLP Index | 8.50% | 22.00% | 0.39 | 0.27 |
| 15% Energy | Custom Natural Resources Index | 10.75% | 30.00% | 0.36 | 0.28 |
| 10% Timber | NCREIF Timberland Index | 5.75% | 11.00% | 0.52 | 0.30 |
| Custom Real Estate | Blended Index: | 6.94% | 13.93% | 0.50 | 0.32 |
| 75% Core RE | NCREIF ODCE Index (AWA) (Gross) | 6.25% | 12.50% | 0.50 | 0.30 |
| 25% Non-Core RE | Custom Non-Core Real Estate Index | 9.00% | 22.50% | 0.40 | 0.29 |
| Custom Absolute Return Strategies | Blended Index: | 6.06% | 8.54% | 0.71 | 0.42 |
| 17.5% Equity Strategies | HFRI Equity Hedge (Total) Index | 7.00% | 11.00% | 0.64 | 0.41 |
| 17.5% Event Driven | HFRI Event Driven Index | 5.75% | 9.50% | 0.61 | 0.34 |
| 17.5% Credit | HFRI Event Driven Distressed Restructuring | 7.00% | 12.00% | 0.58 | 0.38 |
| 17.5% Relative Value | HFRI Relative Value | 5.00% | 7.50% | 0.67 | 0.33 |
| 12.0% Multi Strat | HFRI FoF Composite Index | 5.75% | 9.50% | 0.61 | 0.34 |
| 18.0% Global Macro | HFRI Macro | 5.75% | 11.00% | 0.52 | 0.30 |
| Custom Private Equity | Cambridge US Private Equity Index | 10.25% | 21.25% | 0.48 | 0.36 |

Assumptions vs. Longest Historical Time Frame

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption |
|---------------------------------|------------------------------|-------------------------------|
| Global Equity | 7.65 | 18.35 |
| Int. Duration Fixed Income | 3.50 | 6.05 |
| TMRS Non-Core Fixed Income | 5.89 | 9.18 |
| TMRS Real Return | 6.28 | 8.91 |
| TMRS Real Estate | 6.94 | 13.93 |
| TMRS Absolute Return Strategies | 6.06 | 8.58 |
| TMRS Private Equity | 10.25 | 21.25 |

| Index | Longest Historical Time Frame | Annualized Arithmetic Return | Annualized Standard Deviation |
|-----------------------------------|-------------------------------|------------------------------|-------------------------------|
| MSCI ACW IMI (Gross) | Jun 1994 - Dec 2017 | 7.72 | 18.89 |
| Bloomberg US Aqq Bond | Jan 1976 - Dec 2017 | 7.45 | 6.80 |
| Custom Blend | Jan 2008 - Dec 2017 | 6.02 | 8.59 |
| Custom Blend | Jan 1997 - Dec 2017 | 9.12 | 5.48 |
| Custom Blend | Apr 1989 - Dec 2017 | 7.84 | 6.56 |
| Custom Blend | Jan 1990 - Dec 2017 | 9.84 | 5.48 |
| Cambridge US Private Equity Index | Jun 1986 - Jun 2017 | 13.64 | 13.20 |



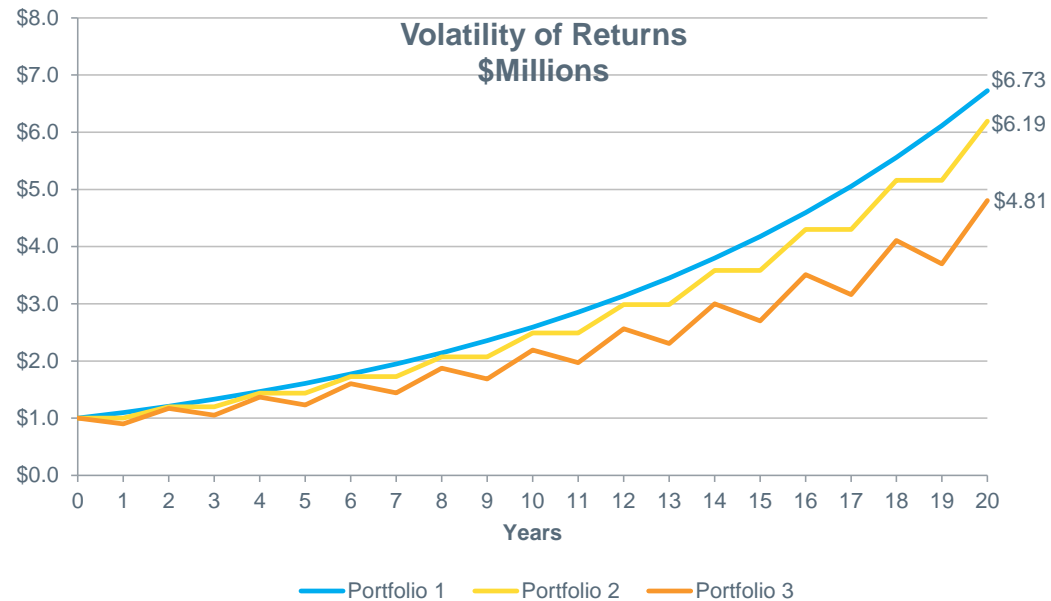
A Global Equity B Int FI C TMRS NC FI D TMRS RR E TMRS RE F TMRS ARS G TMRS PE

Statistics are based on annual periodicity

Geometric vs. Arithmetic Returns

- Arithmetic mean is a simple average of annual returns
- **Geometric mean takes the total return for the entire period and calculates the equivalent annual compound return**
- The higher the return volatility the greater the difference between the two (Arithmetic is larger)

| Years | Portfolio 1 | Portfolio 2 | Portfolio 3 |
|-----------------|-------------|-------------|-------------|
| 1 | 10.0% | 0.0% | -10.0% |
| 2 | 10.0% | 20.0% | 30.0% |
| 3 | 10.0% | 0.0% | -10.0% |
| 4 | 10.0% | 20.0% | 30.0% |
| 5 | 10.0% | 0.0% | -10.0% |
| 6 | 10.0% | 20.0% | 30.0% |
| 7 | 10.0% | 0.0% | -10.0% |
| 8 | 10.0% | 20.0% | 30.0% |
| 9 | 10.0% | 0.0% | -10.0% |
| 10 | 10.0% | 20.0% | 30.0% |
| 11 | 10.0% | 0.0% | -10.0% |
| 12 | 10.0% | 20.0% | 30.0% |
| 13 | 10.0% | 0.0% | -10.0% |
| 14 | 10.0% | 20.0% | 30.0% |
| 15 | 10.0% | 0.0% | -10.0% |
| 16 | 10.0% | 20.0% | 30.0% |
| 17 | 10.0% | 0.0% | -10.0% |
| 18 | 10.0% | 20.0% | 30.0% |
| 19 | 10.0% | 0.0% | -10.0% |
| 20 | 10.0% | 20.0% | 30.0% |
| Average | 10.0% | 10.0% | 10.0% |
| Std. Deviation | 0.0% | 10.3% | 20.5% |
| Compound Return | 10.0% | 9.5% | 8.1% |



- All portfolios start with \$1 million
- After 20 years, the difference between the 0% and 20.5% standard deviation portfolios is \$1.92M

Correlation

Correlation

Creating a diversified portfolio of asset classes enables the investor to achieve a high rate of return while minimizing volatility of the portfolio. Diversification exists because the returns of different asset classes do not always move in the same direction, at the same time, or with the same magnitude. Varied investment environments cause some asset classes to rise in value while others fall, and correlation is the measure that quantifies the degree to which asset classes do not move in tandem.

Correlation can take on values between 1.00 and -1.00. If returns of two asset classes rise or fall at the same time they are said to be perfectly correlated and have a correlation value of 1.00. Conversely, two asset classes that simultaneously move in opposite directions are said to be perfectly negatively correlated and have a correlation value of -1.00. A correlation of 0 indicates no relationship between the returns. It is imperfect correlations between asset classes that enable an investor to create efficient portfolios; that is, those with the highest amount of return at a given level of risk. The correlations for the asset classes used in this study are shown in Table 1 (next page).

The fact that the correlations shown in the table are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others.

Correlation Matrix

| | Global Equity | Int. Duration Fixed Income | TMRS Non-Core Fixed Income | TMRS Real Return | TMRS Real Estate | TMRS Absolute Return Strategies | TMRS Private Equity |
|---------------------------------|---------------|----------------------------|----------------------------|------------------|------------------|---------------------------------|---------------------|
| Global Equity | 1.00 | 0.00 | 0.85 | 0.47 | 0.12 | 0.75 | 0.79 |
| Int. Duration Fixed Income | 0.00 | 1.00 | -0.03 | 0.22 | -0.16 | 0.11 | -0.28 |
| TMRS Non-Core Fixed Income | 0.85 | -0.03 | 1.00 | 0.74 | -0.07 | 0.87 | 0.76 |
| TMRS Real Return | 0.47 | 0.22 | 0.74 | 1.00 | 0.13 | 0.61 | 0.59 |
| TMRS Real Estate | 0.12 | -0.16 | -0.07 | 0.13 | 1.00 | -0.05 | 0.44 |
| TMRS Absolute Return Strategies | 0.75 | 0.11 | 0.87 | 0.61 | -0.05 | 1.00 | 0.77 |
| TMRS Private Equity | 0.79 | -0.28 | 0.76 | 0.59 | 0.44 | 0.77 | 1.00 |

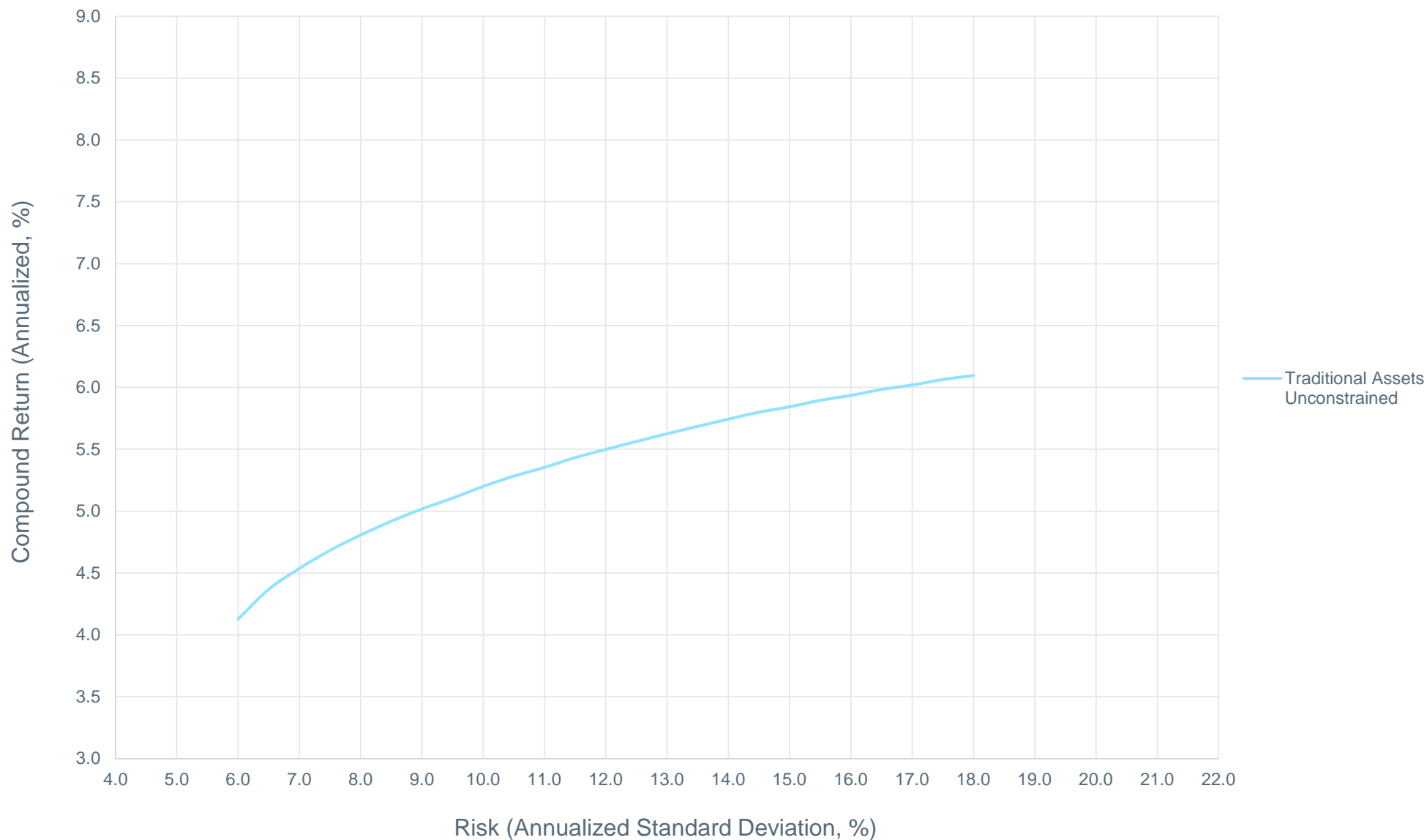
Asset Allocation & Statistics

2015 TMRS AA Constraints

| 2015 TMRS AA Constraints | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | Target | Current 12/31/2017 |
|--------------------------------------|-----|-----|-------------|-------------|--------------|--------------|--------------|--------------|--------------|-----------------------|
| Global Equity | 30 | 40 | 30 | 30 | 30 | 30 | 34 | 39 | 35 | 39 |
| Int. Duration Fixed Income | 0 | 15 | 15 | 14 | 8 | 1 | 0 | 0 | 10 | 16 |
| TMRS Non-Core Fixed Income | 0 | 30 | 14 | 11 | 17 | 24 | 21 | 16 | 20 | 16 |
| TMRS Real Return | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 |
| TMRS Real Estate | 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 8 |
| TMRS Absolute Return Strategies | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 |
| TMRS Private Equity | 0 | 5 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 1 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Capital Appreciation | | | 39 | 42 | 44 | 45 | 49 | 53 | 49 | 47 |
| Capital Preservation | | | 15 | 14 | 8 | 1 | 0 | 0 | 10 | 16 |
| Alpha | | | 22 | 20 | 24 | 27 | 25 | 23 | 20 | 18 |
| Inflation | | | 24 | 23 | 25 | 27 | 26 | 24 | 21 | 19 |
| Expected Return | | | 6.29 | 6.49 | 6.65 | 6.79 | 6.90 | 6.99 | 6.65 | 6.38 |
| Risk (Standard Deviation) | | | 9.00 | 9.50 | 10.00 | 10.50 | 11.00 | 11.50 | 10.42 | 10.04 |
| Return (Compound) | | | 5.91 | 6.07 | 6.18 | 6.28 | 6.34 | 6.38 | 6.14 | 5.91 |
| Return/Risk Ratio | | | 0.70 | 0.68 | 0.67 | 0.65 | 0.63 | 0.61 | 0.64 | 0.64 |
| RVK Liquidity Metric (T-Bills = 100) | | | 57 | 55 | 51 | 48 | 50 | 53 | 55 | 62 |

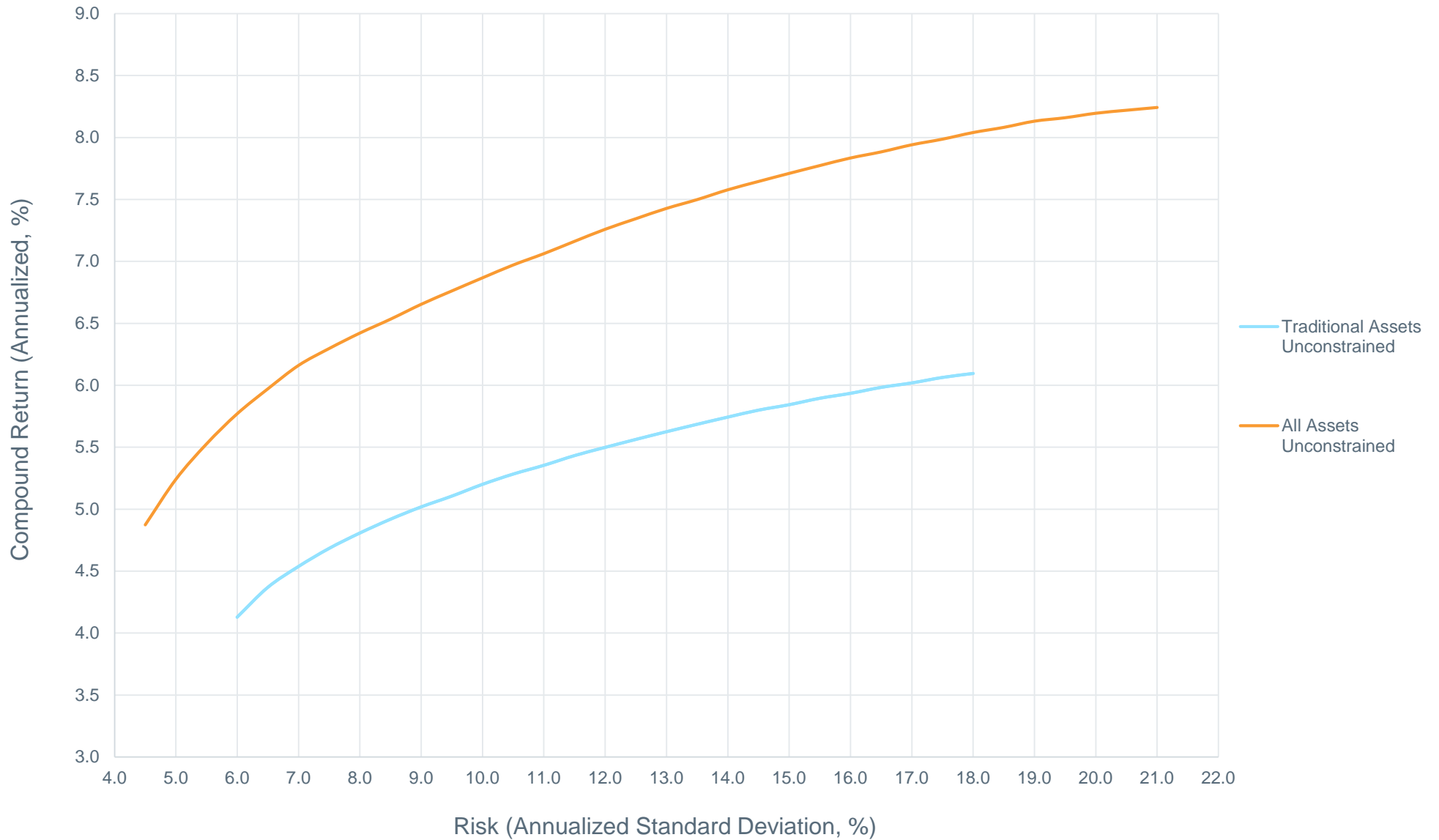
Traditional Assets Unconstrained

Unconstrained Global Equity and Core Fixed Income



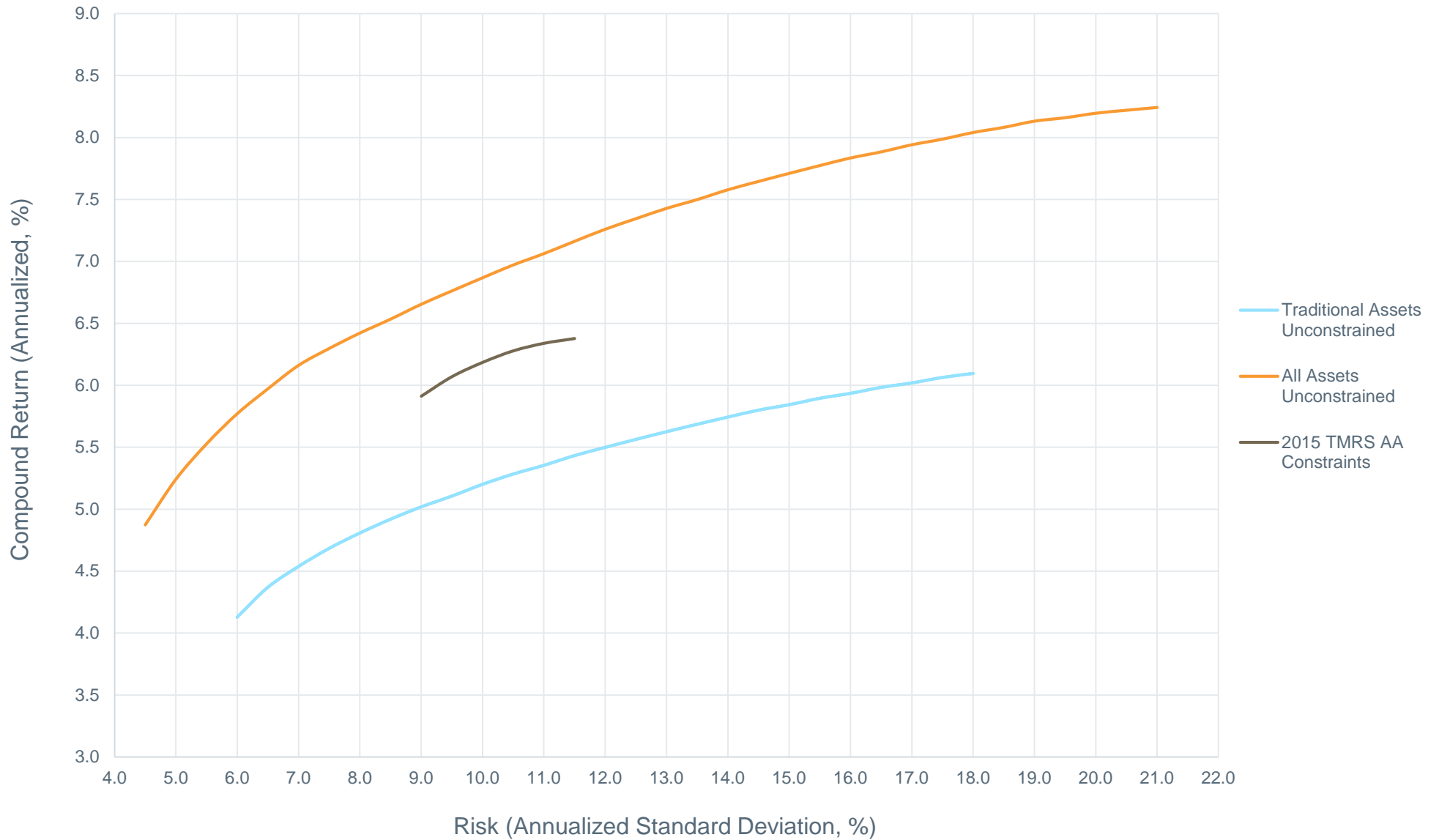
All Assets Unconstrained

Add All Assets Unconstrained



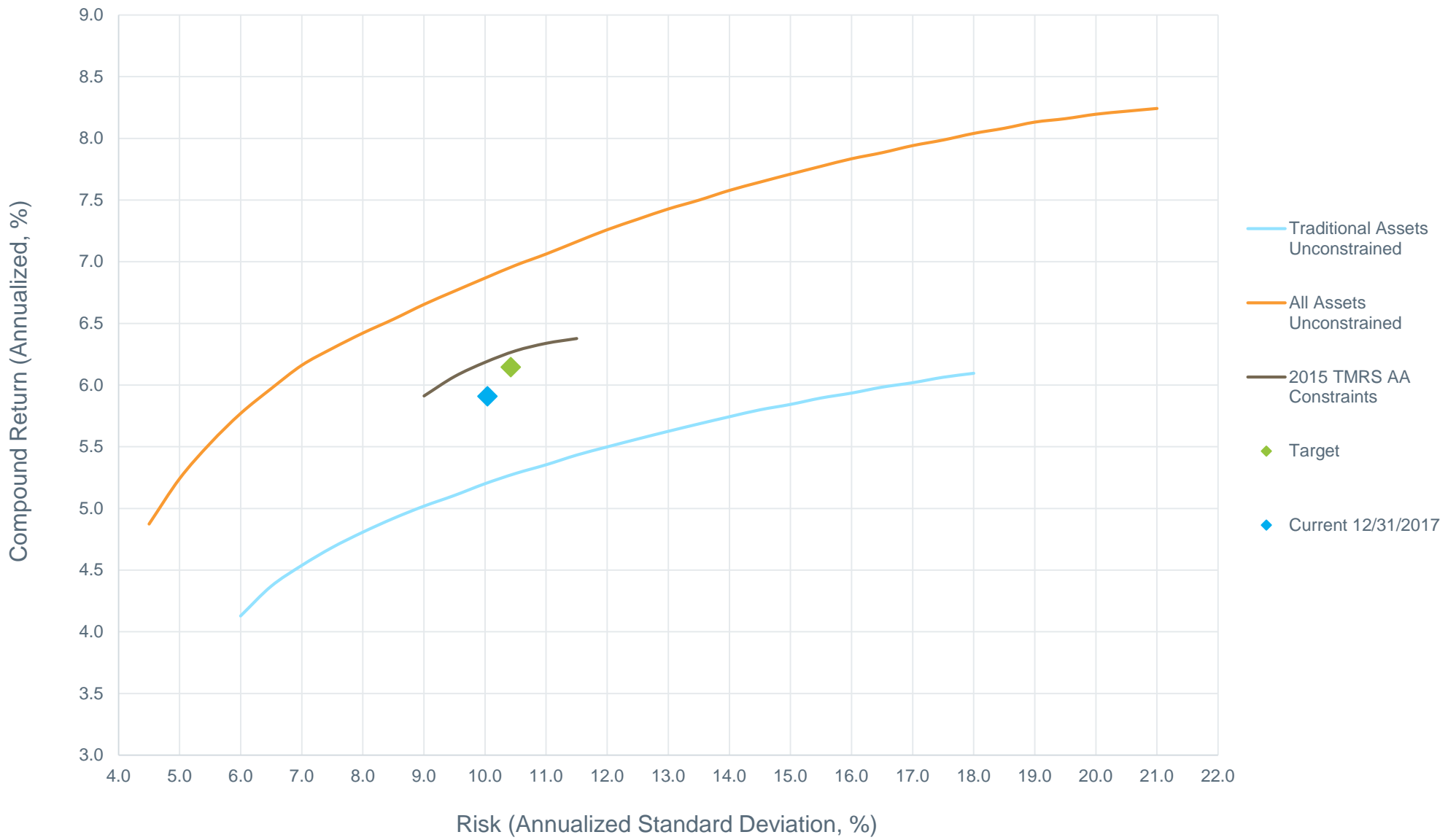
All Assets Unconstrained

Add 2015 TMRS AA Constraints



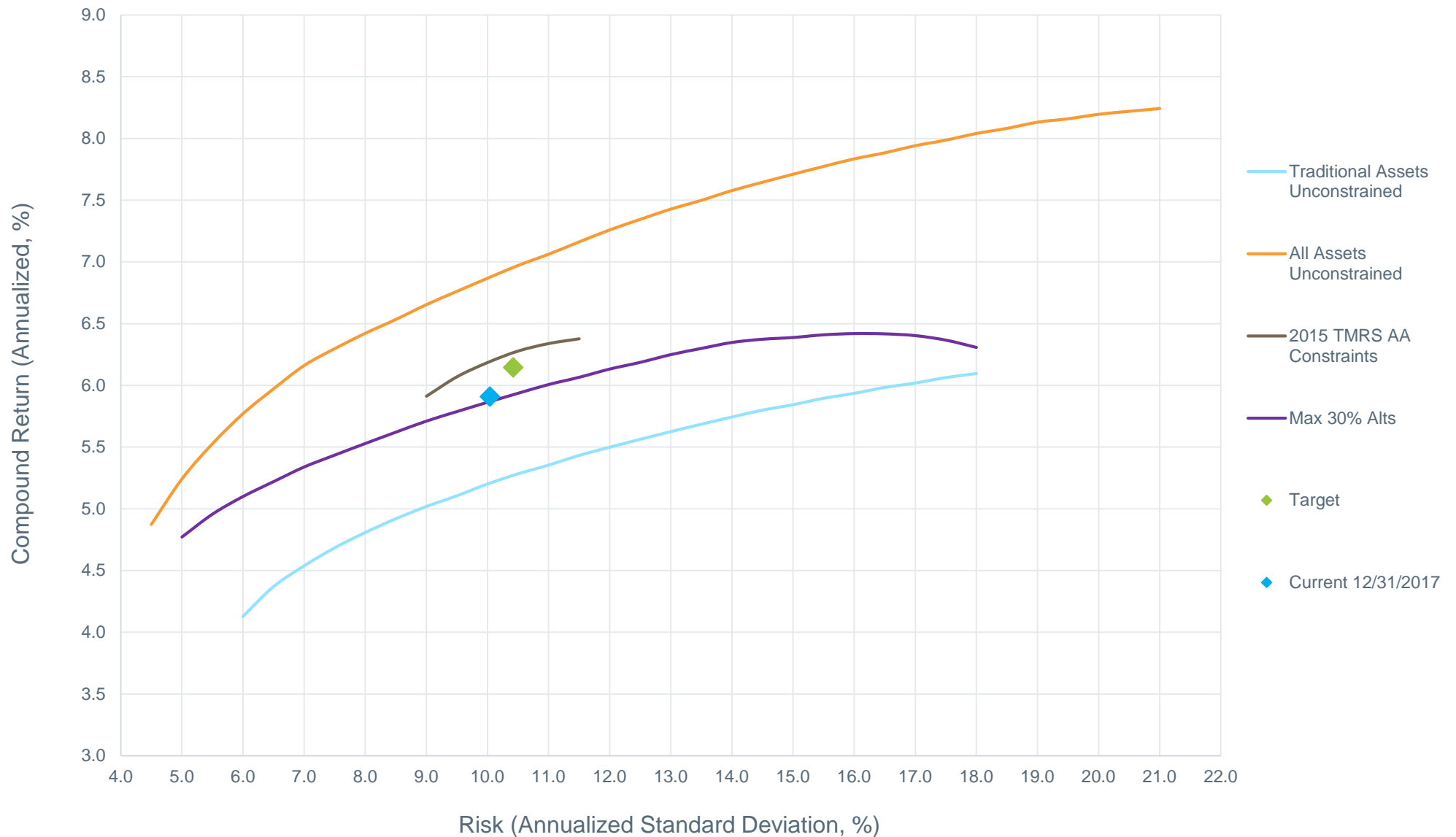
Current Target and Current Allocation

Add Current Target and Current Allocation



Four “Real World” Frontiers

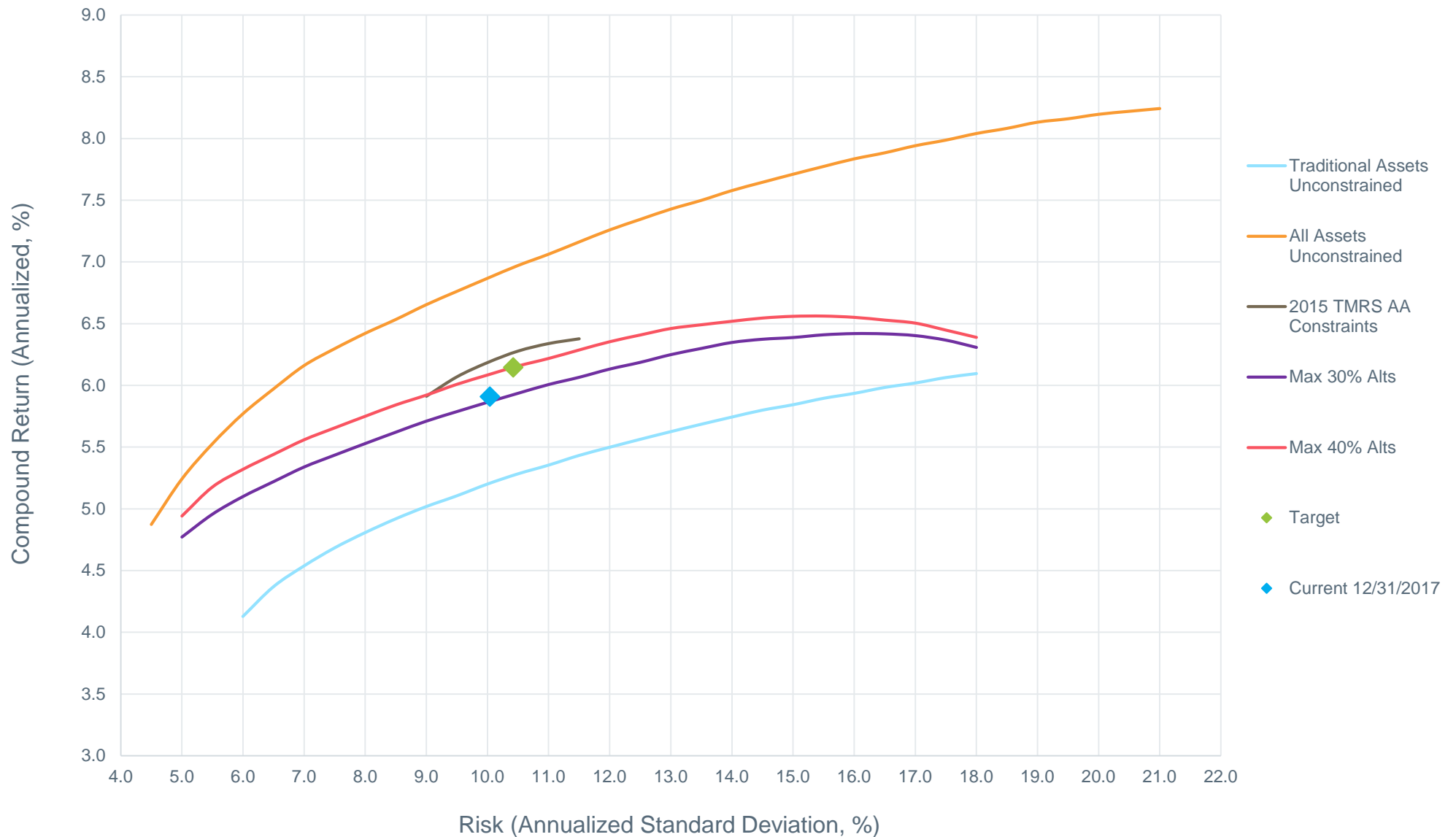
Add Max 30% Alternatives



50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Four “Real World” Frontiers

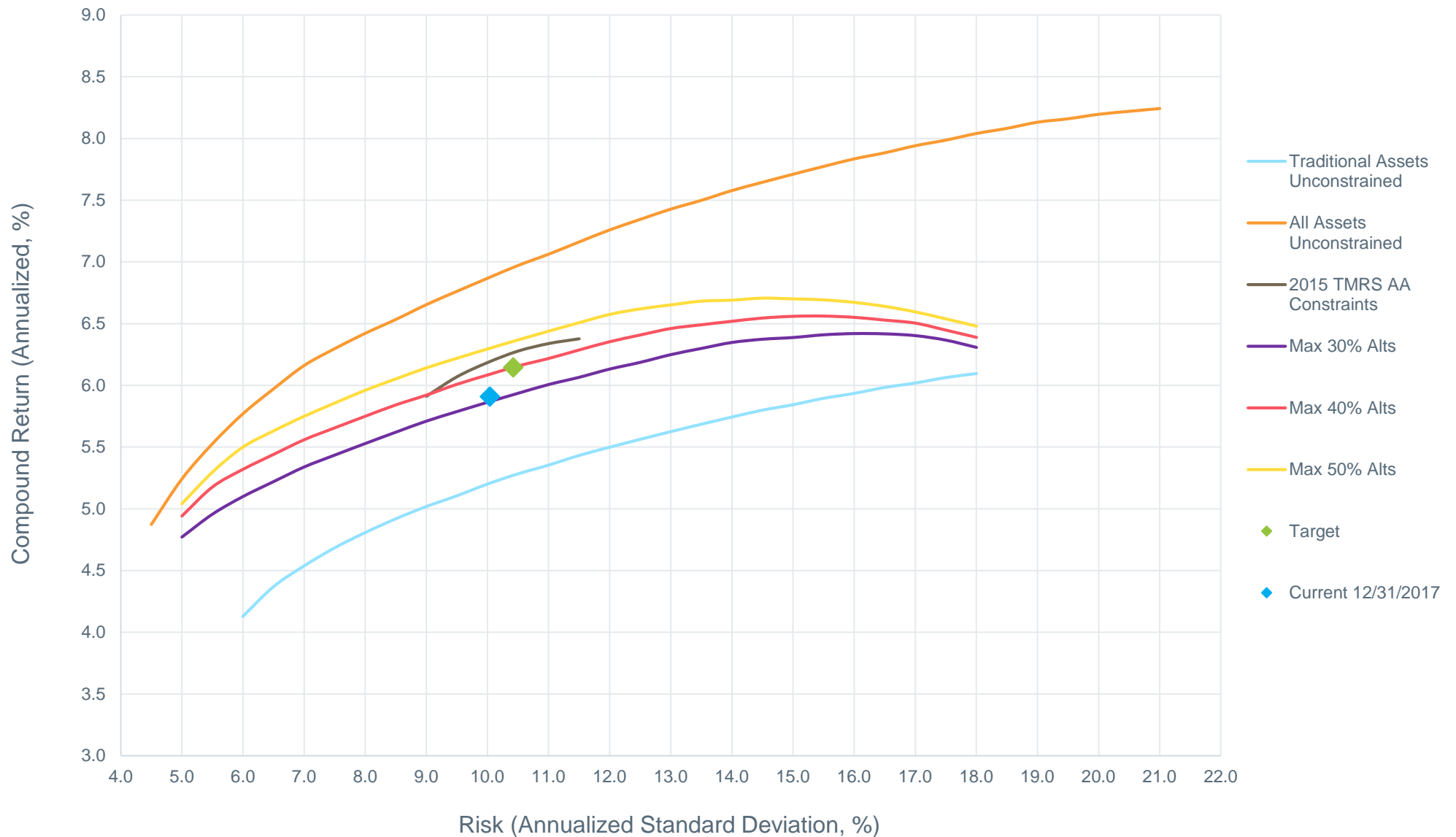
Add Max 40% Alternatives



50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Four “Real World” Frontiers

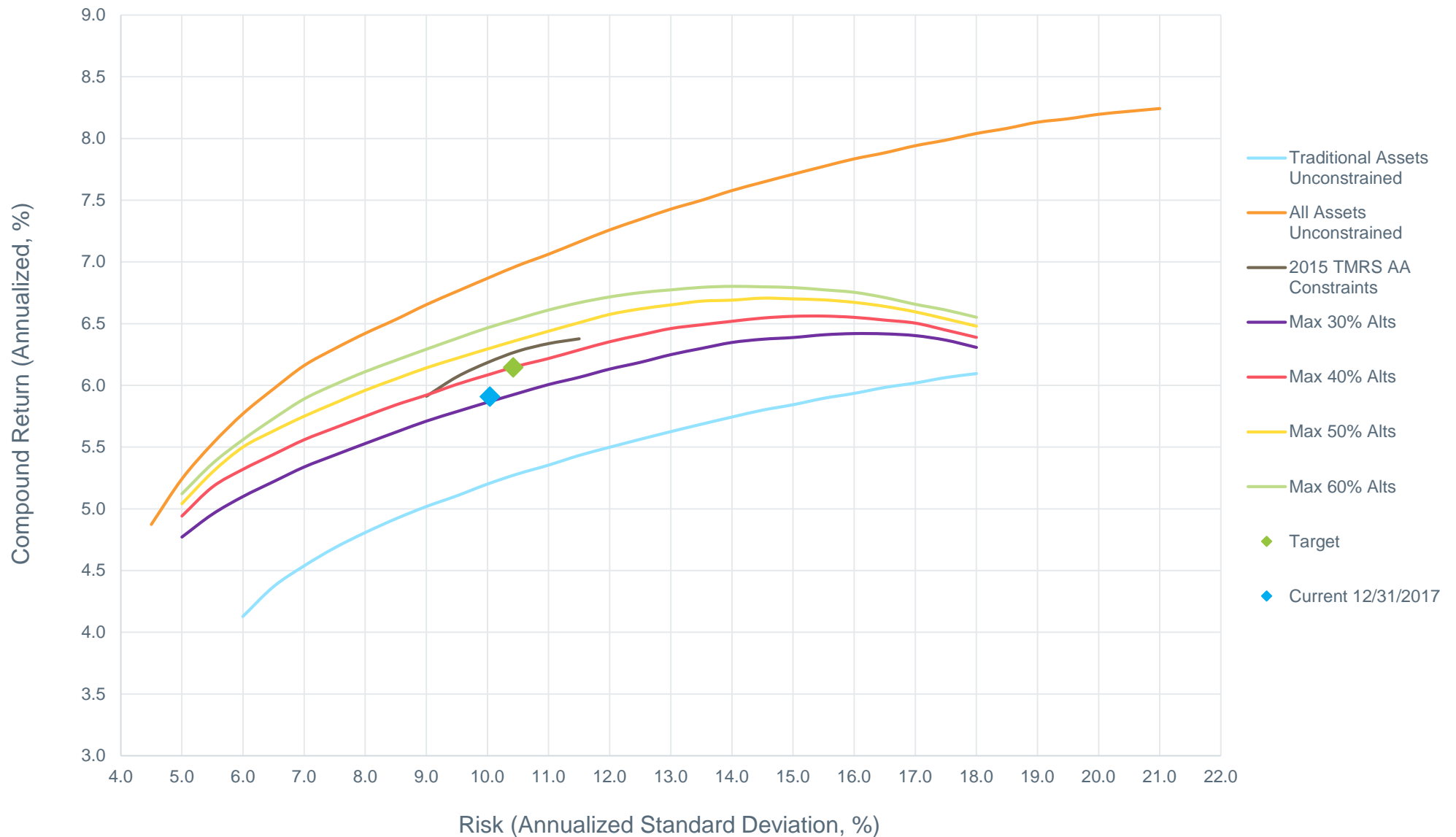
Add Max 50% Alternatives



50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Four “Real World” Frontiers

Add Max 60% Alternatives



50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Asset Allocation & Statistics

Max 40% Alternatives

| Max 40% Alts | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Target | Current 12/31/2017 |
|--------------------------------------|-----|------|-------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|
| Global Equity | 0 | 100 | 0.0 | 12.5 | 24.9 | 27.9 | 30.8 | 33.7 | 36.5 | 42.1 | 58.1 | 90.0 | 35 | 39 |
| Int. Duration Fixed Income | 0 | 100 | 50.4 | 34.8 | 22.3 | 19.3 | 16.4 | 13.5 | 10.7 | 5.1 | 0.0 | 0.0 | 10 | 16 |
| TMRS Non-Core Fixed Income | 0 | 18.8 | 18.8 | 18.8 | 18.8 | 18.8 | 18.8 | 18.8 | 18.8 | 18.8 | 7.9 | 0.0 | 20 | 16 |
| TMRS Real Return | 0 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 0.0 | 10 | 10 |
| TMRS Real Estate | 0 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 1.5 | 10 | 8 |
| TMRS Absolute Return Strategies | 0 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 0.0 | 10 | 10 |
| TMRS Private Equity | 0 | 8.5 | 5.3 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 5 | 1 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Capital Appreciation | | | 13 | 29 | 41 | 44 | 47 | 50 | 53 | 59 | 72 | 99 | 49 | 47 |
| Capital Preservation | | | 50 | 35 | 22 | 19 | 16 | 14 | 11 | 5 | 0 | 0 | 10 | 16 |
| Alpha | | | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 12 | 0 | 20 | 18 |
| Inflation | | | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 16 | 1 | 21 | 19 |
| Expected Return | | | 5.06 | 5.79 | 6.30 | 6.43 | 6.55 | 6.67 | 6.78 | 7.02 | 7.42 | 7.86 | 6.65 | 6.38 |
| Risk (Standard Deviation) | | | 5.00 | 7.00 | 9.00 | 9.50 | 10.00 | 10.50 | 11.00 | 12.00 | 14.00 | 18.00 | 10.42 | 10.04 |
| Return (Compound) | | | 4.94 | 5.56 | 5.92 | 6.01 | 6.08 | 6.16 | 6.22 | 6.35 | 6.52 | 6.39 | 6.14 | 5.91 |
| Return/Risk Ratio | | | 1.01 | 0.83 | 0.70 | 0.68 | 0.66 | 0.64 | 0.62 | 0.59 | 0.53 | 0.44 | 0.64 | 0.64 |
| RVK Liquidity Metric (T-Bills = 100) | | | 56 | 54 | 55 | 55 | 55 | 55 | 55 | 56 | 63 | 82 | 55 | 62 |

50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Appendix



Asset Allocation & Statistics

Unconstrained Global Equity and Core Fixed Income

| Traditional Assets Unconstrained | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Target | Current 12/31/2017 |
|--------------------------------------|-----|-----|-------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------------|
| Global Equity | 0 | 100 | 19 | 35 | 46 | 49 | 52 | 55 | 58 | 67 | 84 | 98 | 35 | 39 |
| Int. Duration Fixed Income | 0 | 100 | 81 | 65 | 54 | 51 | 48 | 45 | 42 | 33 | 16 | 2 | 10 | 16 |
| TMRS Non-Core Fixed Income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 16 |
| TMRS Real Return | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 |
| TMRS Real Estate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 8 |
| TMRS Absolute Return Strategies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 |
| TMRS Private Equity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Capital Appreciation | | | 19 | 35 | 46 | 49 | 52 | 55 | 58 | 67 | 84 | 98 | 49 | 47 |
| Capital Preservation | | | 81 | 65 | 54 | 51 | 48 | 45 | 42 | 33 | 16 | 2 | 10 | 16 |
| Alpha | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 18 |
| Inflation | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 19 |
| Expected Return | | | 4.30 | 4.95 | 5.40 | 5.53 | 5.67 | 5.80 | 5.92 | 6.29 | 7.00 | 7.57 | 6.65 | 6.38 |
| Risk (Standard Deviation) | | | 6.00 | 7.50 | 9.00 | 9.50 | 10.00 | 10.50 | 11.00 | 12.50 | 15.50 | 18.00 | 10.42 | 10.04 |
| Return (Compound) | | | 4.13 | 4.68 | 5.02 | 5.10 | 5.20 | 5.28 | 5.35 | 5.56 | 5.89 | 6.09 | 6.14 | 5.91 |
| Return/Risk Ratio | | | 0.72 | 0.66 | 0.60 | 0.58 | 0.57 | 0.55 | 0.54 | 0.50 | 0.45 | 0.42 | 0.64 | 0.64 |
| RVK Liquidity Metric (T-Bills = 100) | | | 86 | 87 | 87 | 87 | 88 | 88 | 88 | 88 | 89 | 90 | 55 | 62 |

Asset Allocation & Statistics

All Assets Unconstrained

| All Assets Unconstrained | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Target | Current 12/31/2017 |
|--------------------------------------|-----|-----|-------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|
| Global Equity | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 39 |
| Int. Duration Fixed Income | 0 | 100 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 16 |
| TMRS Non-Core Fixed Income | 0 | 100 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 16 |
| TMRS Real Return | 0 | 100 | 5 | 28 | 34 | 35 | 36 | 38 | 39 | 32 | 8 | 0 | 10 | 10 |
| TMRS Real Estate | 0 | 100 | 22 | 30 | 28 | 27 | 27 | 27 | 26 | 24 | 20 | 2 | 10 | 8 |
| TMRS Absolute Return Strategies | 0 | 100 | 21 | 42 | 23 | 18 | 14 | 9 | 5 | 0 | 0 | 0 | 10 | 10 |
| TMRS Private Equity | 0 | 100 | 0 | 0 | 15 | 19 | 23 | 26 | 30 | 44 | 71 | 98 | 5 | 1 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Capital Appreciation | | | 10 | 12 | 27 | 31 | 35 | 39 | 42 | 55 | 78 | 99 | 49 | 47 |
| Capital Preservation | | | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 16 |
| Alpha | | | 30 | 42 | 23 | 18 | 14 | 9 | 5 | 0 | 0 | 0 | 20 | 18 |
| Inflation | | | 26 | 46 | 50 | 50 | 51 | 52 | 53 | 45 | 22 | 1 | 21 | 19 |
| Expected Return | | | 5.36 | 6.39 | 7.03 | 7.18 | 7.33 | 7.48 | 7.62 | 8.20 | 9.24 | 10.19 | 6.65 | 6.38 |
| Risk (Standard Deviation) | | | 5.00 | 7.00 | 9.00 | 9.50 | 10.00 | 10.50 | 11.00 | 13.00 | 17.00 | 21.00 | 10.42 | 10.04 |
| Return (Compound) | | | 5.24 | 6.16 | 6.65 | 6.76 | 6.87 | 6.97 | 7.06 | 7.43 | 7.94 | 8.24 | 6.14 | 5.91 |
| Return/Risk Ratio | | | 1.07 | 0.91 | 0.78 | 0.76 | 0.73 | 0.71 | 0.69 | 0.63 | 0.54 | 0.49 | 0.64 | 0.64 |
| RVK Liquidity Metric (T-Bills = 100) | | | 48 | 31 | 27 | 26 | 25 | 24 | 23 | 19 | 11 | 5 | 55 | 62 |

Asset Allocation & Statistics

Max 30% Alternatives

| Max 30% Alts | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Target | Current 12/31/2017 |
|--------------------------------------|-----|------|-------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|
| Global Equity | 0 | 100 | 1.2 | 17.4 | 30.0 | 32.9 | 35.8 | 38.7 | 41.5 | 52.7 | 68.4 | 92.8 | 35 | 39 |
| Int. Duration Fixed Income | 0 | 100 | 56.4 | 40.2 | 27.7 | 24.7 | 21.8 | 19.0 | 16.1 | 5.0 | 0.0 | 0.0 | 10 | 16 |
| TMRS Non-Core Fixed Income | 0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 9.2 | 0.0 | 20 | 16 |
| TMRS Real Return | 0 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 0.0 | 10 | 10 |
| TMRS Real Estate | 0 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 1.7 | 10 | 8 |
| TMRS Absolute Return Strategies | 0 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 0.0 | 10 | 10 |
| TMRS Private Equity | 0 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5 | 1 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Capital Appreciation | | | 14 | 30 | 43 | 45 | 48 | 51 | 54 | 65 | 78 | 99 | 49 | 47 |
| Capital Preservation | | | 56 | 40 | 28 | 25 | 22 | 19 | 16 | 5 | 0 | 0 | 10 | 16 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 20 | 18 |
| Inflation | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 12 | 1 | 21 | 19 |
| Expected Return | | | 4.89 | 5.57 | 6.09 | 6.21 | 6.33 | 6.45 | 6.57 | 7.03 | 7.42 | 7.78 | 6.65 | 6.38 |
| Risk (Standard Deviation) | | | 5.00 | 7.00 | 9.00 | 9.50 | 10.00 | 10.50 | 11.00 | 13.00 | 15.00 | 18.00 | 10.42 | 10.04 |
| Return (Compound) | | | 4.77 | 5.34 | 5.71 | 5.79 | 5.86 | 5.94 | 6.01 | 6.25 | 6.39 | 6.31 | 6.14 | 5.91 |
| Return/Risk Ratio | | | 0.98 | 0.80 | 0.68 | 0.65 | 0.63 | 0.61 | 0.60 | 0.54 | 0.49 | 0.43 | 0.64 | 0.64 |
| RVK Liquidity Metric (T-Bills = 100) | | | 60 | 61 | 62 | 62 | 62 | 62 | 62 | 63 | 70 | 84 | 55 | 62 |

50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Asset Allocation & Statistics

Max 50% Alternatives Portfolio

| Max 50% Alts | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Target | Current 12/31/2017 |
|--------------------------------------|-----|------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|
| Global Equity | 0 | 100 | 0.0 | 7.1 | 23.0 | 25.9 | 28.2 | 28.8 | 31.7 | 56.6 | 76.8 | 86.6 | 35 | 39 |
| Int. Duration Fixed Income | 0 | 100 | 46.2 | 31.3 | 15.4 | 12.5 | 10.2 | 9.6 | 6.7 | 0.0 | 0.0 | 0.0 | 10 | 16 |
| TMRS Non-Core Fixed Income | 0 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 0.0 | 0.0 | 0.0 | 20 | 16 |
| TMRS Real Return | 0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 0.0 | 0.0 | 10 | 10 |
| TMRS Real Estate | 0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 11.2 | 1.4 | 10 | 8 |
| TMRS Absolute Return Strategies | 0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 7.4 | 0.0 | 0.0 | 10 | 10 |
| TMRS Private Equity | 0 | 12.0 | 4.2 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 5 | 1 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Capital Appreciation | | | 12 | 27 | 43 | 46 | 48 | 49 | 52 | 73 | 92 | 99 | 49 | 47 |
| Capital Preservation | | | 46 | 31 | 15 | 12 | 10 | 10 | 7 | 0 | 0 | 0 | 10 | 16 |
| Alpha | | | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 7 | 0 | 0 | 20 | 18 |
| Inflation | | | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 19 | 8 | 1 | 21 | 19 |
| Expected Return | | | 5.16 | 5.98 | 6.64 | 6.76 | 6.86 | 6.88 | 7.00 | 7.59 | 7.88 | 7.95 | 6.65 | 6.38 |
| Risk (Standard Deviation) | | | 5.00 | 7.00 | 9.50 | 10.00 | 10.40 | 10.50 | 11.00 | 14.00 | 16.50 | 18.00 | 10.42 | 10.04 |
| Return (Compound) | | | 5.04 | 5.75 | 6.22 | 6.29 | 6.36 | 6.37 | 6.44 | 6.69 | 6.64 | 6.48 | 6.14 | 5.91 |
| Return/Risk Ratio | | | 1.03 | 0.85 | 0.70 | 0.68 | 0.66 | 0.66 | 0.64 | 0.54 | 0.48 | 0.44 | 0.64 | 0.64 |
| RVK Liquidity Metric (T-Bills = 100) | | | 54 | 48 | 49 | 49 | 50 | 50 | 50 | 61 | 72 | 79 | 55 | 62 |

50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Asset Allocation & Statistics

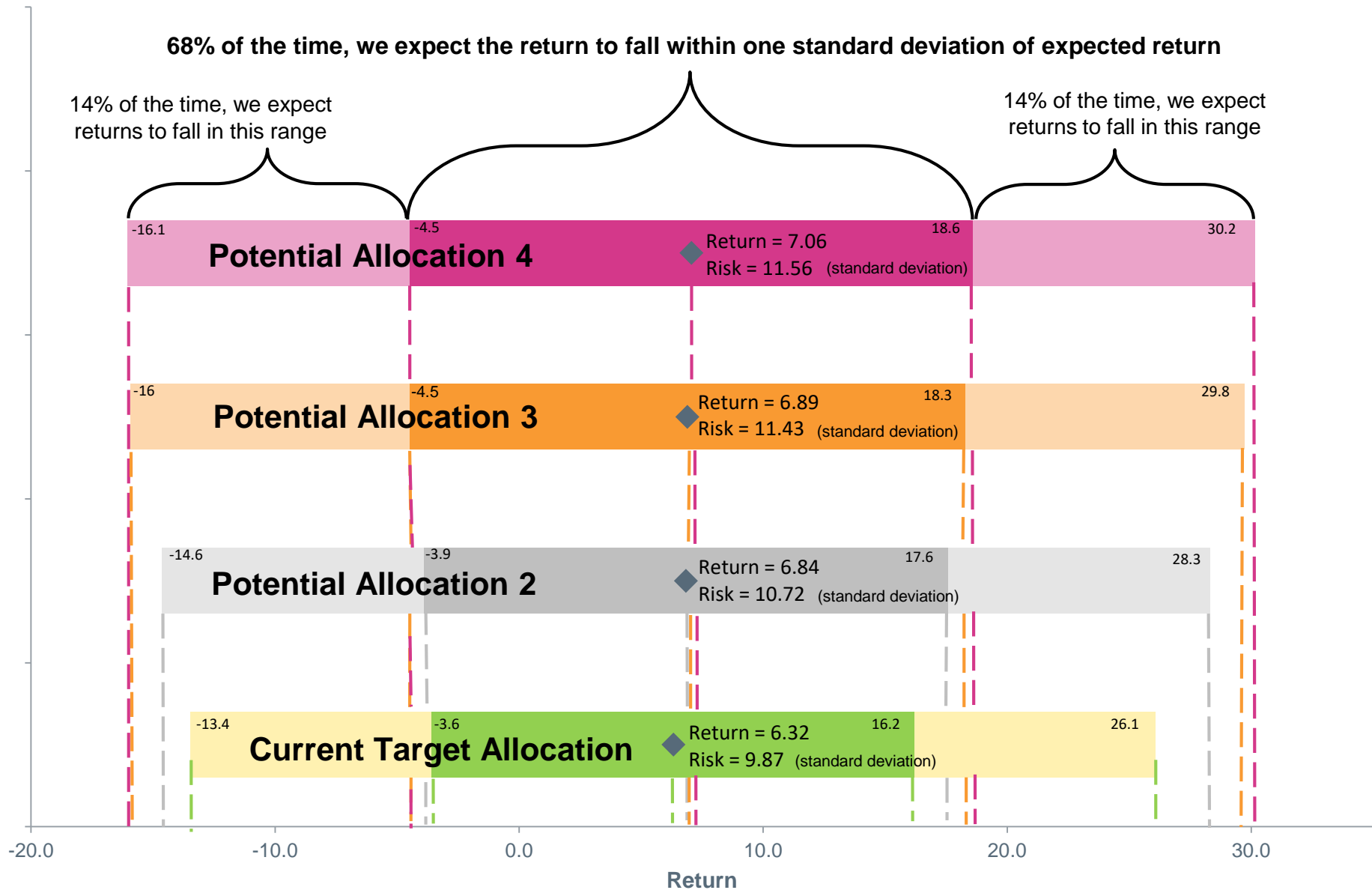
Max 60% Alternatives

| Max 60% Alts | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Target | Current 12/31/2017 |
|--------------------------------------|-----|------|-------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|
| Global Equity | 0 | 100 | 0.0 | 0.0 | 13.3 | 16.4 | 19.4 | 22.3 | 25.3 | 54.7 | 70.6 | 84.0 | 35 | 39 |
| Int. Duration Fixed Income | 0 | 100 | 39.7 | 26.9 | 13.4 | 10.4 | 7.3 | 4.4 | 1.4 | 0.0 | 0.0 | 0.0 | 10 | 16 |
| TMRS Non-Core Fixed Income | 0 | 14.9 | 14.9 | 14.7 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 0.0 | 0.0 | 0.0 | 20 | 16 |
| TMRS Real Return | 0 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 0.3 | 0.0 | 10 | 10 |
| TMRS Real Estate | 0 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 1.4 | 10 | 8 |
| TMRS Absolute Return Strategies | 0 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 1.5 | 0.0 | 0.0 | 10 | 10 |
| TMRS Private Equity | 0 | 14.6 | 1.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | 5 | 1 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Capital Appreciation | | | 11 | 24 | 37 | 40 | 43 | 46 | 49 | 75 | 89 | 99 | 49 | 47 |
| Capital Preservation | | | 40 | 27 | 13 | 10 | 7 | 4 | 1 | 0 | 0 | 0 | 10 | 16 |
| Alpha | | | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 2 | 0 | 0 | 20 | 18 |
| Inflation | | | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 23 | 11 | 1 | 21 | 19 |
| Expected Return | | | 5.24 | 6.12 | 6.67 | 6.80 | 6.93 | 7.05 | 7.17 | 7.70 | 7.92 | 8.02 | 6.65 | 6.38 |
| Risk (Standard Deviation) | | | 5.00 | 7.00 | 9.00 | 9.50 | 10.00 | 10.50 | 11.00 | 14.00 | 16.00 | 18.00 | 10.42 | 10.04 |
| Return (Compound) | | | 5.12 | 5.89 | 6.29 | 6.38 | 6.47 | 6.54 | 6.61 | 6.80 | 6.75 | 6.55 | 6.14 | 5.91 |
| Return/Risk Ratio | | | 1.05 | 0.87 | 0.74 | 0.72 | 0.69 | 0.67 | 0.65 | 0.55 | 0.50 | 0.45 | 0.64 | 0.64 |
| RVK Liquidity Metric (T-Bills = 100) | | | 51 | 41 | 42 | 42 | 42 | 42 | 42 | 59 | 67 | 77 | 55 | 62 |

50% of Non-Core Fixed Income, 60% of Real Return, and 100% of Real Estate, ARS, and Private Equity count towards the Alternatives bucket.

Asset Allocation Return Expectations

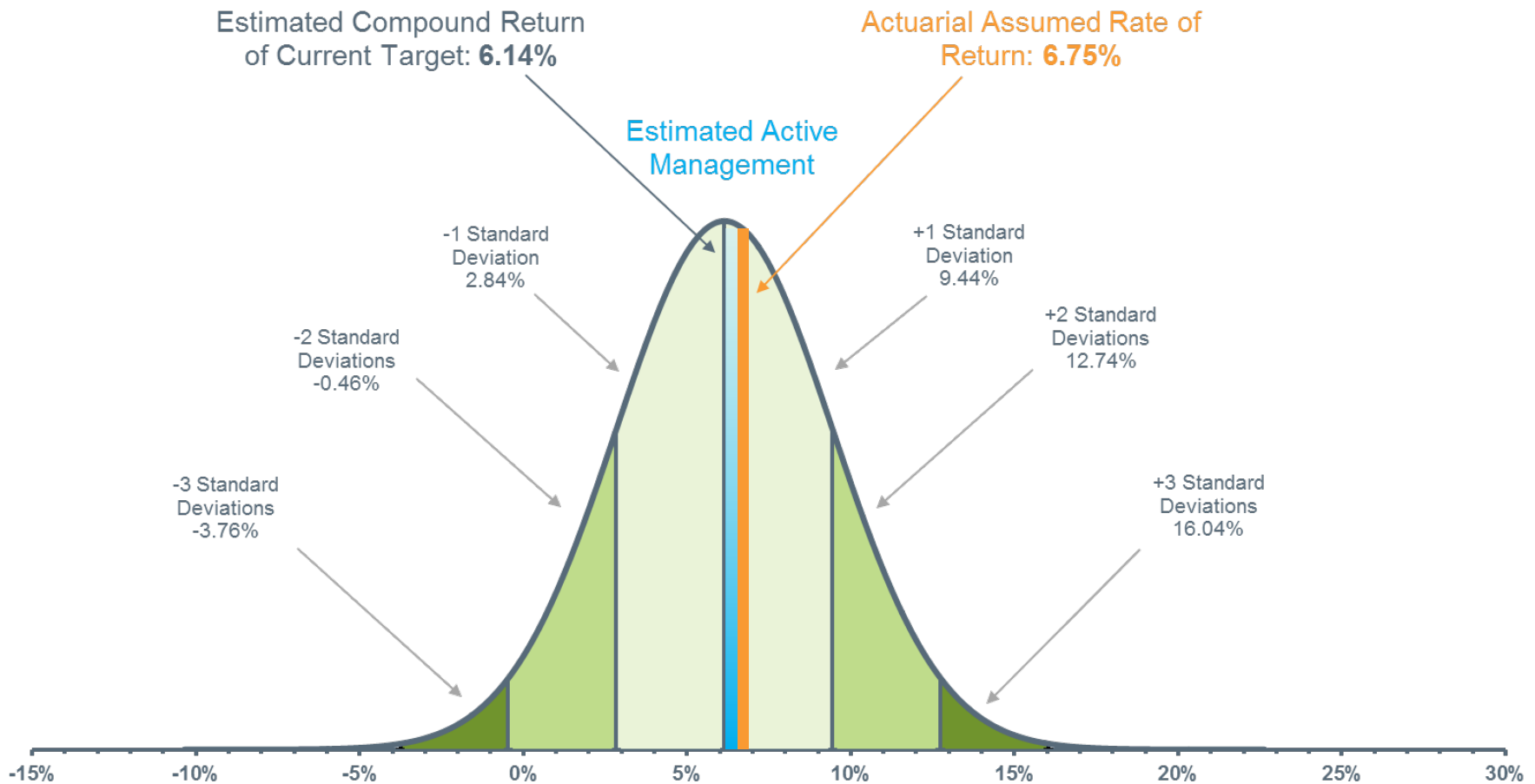
From 2015 TMRS Asset Allocation Study



Please note, standard deviation/volatility risk is not the only risk to consider

Annual Volatility of Returns

| | -3 St Dev | -2 St Dev | -1 St Dev | Expected Return | +1 St Dev | +2 St Dev | +3 St Dev |
|---------------------------------|-----------|-----------|-----------|-----------------|-----------|-----------|-----------|
| Global Equity | -47.40 | -29.05 | -10.70 | 7.65 | 26.00 | 44.35 | 62.70 |
| Int. Duration Fixed Income | -14.65 | -8.60 | -2.55 | 3.50 | 9.55 | 15.60 | 21.65 |
| TMRS Non-Core Fixed Income | -21.65 | -12.47 | -3.29 | 5.89 | 15.07 | 24.25 | 33.43 |
| TMRS Real Return | -20.45 | -11.54 | -2.63 | 6.28 | 15.19 | 24.10 | 33.01 |
| TMRS Real Estate | -34.85 | -20.92 | -6.99 | 6.94 | 20.87 | 34.80 | 48.73 |
| TMRS Absolute Return Strategies | -19.68 | -11.10 | -2.52 | 6.06 | 14.64 | 23.22 | 31.80 |
| TMRS Private Equity | -53.50 | -32.25 | -11.00 | 10.25 | 31.50 | 52.75 | 74.00 |



RVK Thematic Buckets & Liquidity Metrics

| Asset Class | Thematic Bucket | Liquidity Bucket | RVK Liquidity Metric |
|----------------------------------------|----------------------|------------------|----------------------|
| Broad US Equity | Capital Appreciation | Liquid | 95 |
| Large/Mid Cap US Equity | Capital Appreciation | Liquid | 95 |
| Broad International Equity | Capital Appreciation | Liquid | 90 |
| Dev'd Large/Mid Cap Int'l Equity | Capital Appreciation | Liquid | 90 |
| Global Equity | Capital Appreciation | Liquid | 90 |
| Dev'd Small Cap Int'l Equity | Capital Appreciation | Liquid | 85 |
| Emerging Markets Equity | Capital Appreciation | Liquid | 85 |
| Small Cap US Equity | Capital Appreciation | Liquid | 85 |
| Convertibles | Capital Appreciation | Liquid | 80 |
| Distressed Debt | Capital Appreciation | Less Liquid | 50 |
| Emerging Markets Debt (Local and Hard) | Capital Appreciation | Less Liquid | 50 |
| High Yield Fixed Income | Capital Appreciation | Less Liquid | 50 |
| Non-Core Real Estate | Capital Appreciation | Not Liquid | 5 |
| Private Equity | Capital Appreciation | Not Liquid | 5 |
| T-Bills and Treasurys | Capital Preservation | Liquid | 100 |
| Cash Equivalents | Capital Preservation | Liquid | 98 |
| Int. Duration Fixed Income | Capital Preservation | Liquid | 85 |
| Long Duration Fixed Income | Capital Preservation | Liquid | 85 |
| Low Duration Fixed Income | Capital Preservation | Liquid | 85 |
| Stable Value | Capital Preservation | Less Liquid | 50 |
| Non-US Dev'd Sovereign Fixed Income UH | Capital Preservation | Less Liquid | 50 |
| GTAA | Alpha | Liquid | 88 |
| Diversified Hedge Funds | Alpha | Less Liquid | 35 |
| Equity Market Neutral | Alpha | Less Liquid | 35 |
| Long-Biased Long/Short Equity | Alpha | Less Liquid | 35 |
| Managed Futures FoF | Alpha | Less Liquid | 35 |
| Commodities | Inflation | Liquid | 98 |
| TIPS | Inflation | Liquid | 95 |
| Diversified Inflation Strategies | Inflation | Liquid | 93 |
| Global REITs/MLPs | Inflation | Liquid | 85 |
| Bank Loans | Inflation | Less Liquid | 50 |
| Core Real Estate | Inflation | Not Liquid | 25 |
| Infrastructure | Inflation | Not Liquid | 5 |
| Timber | Inflation | Not Liquid | 5 |

Appendix

Appendix

Definition of terms used in this analysis:

Asset Allocation is a systematic analysis of the properties of specified asset classes to determine the allocation of those assets that meet the return targets of a portfolio.

Correlation is a statistical measure of the relationship between asset class returns. A value of 1.00 is a perfect correlation; that is, the asset classes always move in the same direction. A value of -1.00 indicates a perfect negative correlation, in which the asset classes always move in opposite directions of each other. A value of 0 indicates there is no relationship between the direction of returns of the two asset classes. Correlation calculations only consider the direction of changes relative to two variables and not the magnitude of those changes.

The **Efficient Frontier** is the set of portfolios that minimizes risk at given target levels of return. This process takes into account the risk, return and correlation of the asset classes to arrive at the most efficient set of portfolios.

Expected Equity Beta is a measure of the sensitivity of a portfolio to movements in the Large/Mid Cap US Equity market. It is a measure of a portfolio's non-diversifiable or systematic risk.

Performance Expectation is the best estimate of the average annual percentage increase in the value of an asset class over the next ten years.

Risk is quantified by the *standard deviation* of returns. Also known as the volatility of returns, it provides a statistical range of performance relative to the average expectations. With this measure, we can establish a level of "confidence" about the expected range of returns for the portfolios.

RVK Liquidity Metric is a qualitative method for determining the relative amount of liquidity in a portfolio. The characteristics considered when determining relative liquidity include trading volume, gates for redemption, leverage, nature of transactions, and pricing mechanisms. The RVK Liquidity Metric is calculated using investment weights applied to each corresponding asset class liquidity rating. See next page for more details.

Thematic Classification - Represents dedicated manager allocations; as such, thematic allocations are approximations. RVK categorizes asset classes as Alpha, Capital Appreciation, Capital Preservation, and Inflation as displayed in the table on the next page.

Custom Index Definitions:

Custom Diversified Inflation Strategies Index = 1/3 Barclays US TIPS + 1/3 Bloomberg Commodity + 1/3 MSCI Global Real Estate (Gross)

Custom GTAA Index = 60% MSCI ACW IMI (Gross) + 40% Barclays US Aggregate Bond Index