



Survey of Capital Market Assumptions

2016 Edition



Horizon Actuarial Services, LLC is proud to serve as the actuary to over 90 multiemployer defined benefit pension plans across the United States and across various industries. As actuary to these plans, we must develop assumptions regarding future investment returns on plan assets. We then use those assumptions as we determine the actuarial values of the benefits promised by these plans to their participants and beneficiaries, as well as to project plan funding and solvency levels years into the future.

At Horizon Actuarial, we are actuaries, not investment professionals. Therefore, when developing assumptions as to what returns a pension plan's assets might be expected to earn in the future, we look to our colleagues in the investment advisory community. Each year, as part of this survey, we ask different investment firms to provide their "capital market assumptions" – their expectations for future risk and returns for different asset classes in which pension plans commonly invest. The information gathered from this survey can help answer the common question: "Are my plan's investment return assumptions reasonable?"

Of course, there are many factors to consider when evaluating a plan's investment return assumptions, such as its asset allocation and the maturity of its participant population. Any of these factors can make the expected return for one plan very different from others. Therefore, this report does not opine on the reasonableness of any one plan's investment return assumptions. Nevertheless, we hope this report will be a useful resource for trustees, actuaries, and investment professionals alike.

Horizon Actuarial sincerely thanks the 35 investment advisors who participated in this survey.

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Summary

Horizon Actuarial first conducted this survey in 2010, and it included 8 investment advisors. In 2012, we first published a report on the survey results, which included 17 advisors. The survey has expanded considerably over the past few years; this 2016 edition of the survey includes assumptions from 35 different investment firms.

In general, expected returns have come down in recent years. When we focus on the 11 advisors who participated in each of the last five surveys, we see that expected returns for equity investments generally decreased from 2012 to 2014, with some stabilization (or perhaps increases) in 2015 and 2016. We also see expected returns for fixed income investments have generally decreased over the past few years, though they did increase from 2015 to 2016. Expected volatilities have remained relatively flat in recent years.

As we have seen in prior surveys, expected returns are noticeably lower over the short term than over the long term. This trend is apparent when we focus on the 12 advisors who provided assumptions for both the short term (up to 10 years) and long term (20 years or more). The difference is more pronounced for equity and fixed income investments, but less so for alternative investments such as real estate.

For ongoing pension plans without solvency issues, we believe a horizon of 20 years or more is appropriate for evaluating the reasonableness of the long-term investment return assumption. A shorter horizon, such as 10 years, may be more appropriate for evaluating the return assumption for a plan that is very mature or has solvency issues. Furthermore, even for plans with long-term investment horizons, it is important to understand the potential impact of lower expected returns over the short term. Therefore, this survey evaluates return expectations over horizons of both 10 years and 20 years.

For illustration, this report also constructs an asset allocation for a hypothetical multiemployer pension plan and uses the results from the survey to develop expected returns for the plan. When compared to the 2015 edition of the survey, the expected returns for this 2016 edition were virtually the same over a 10-year horizon and slightly higher over a 20-year horizon. These differences were driven both by changes to individual firms' expectations, as well as new firms being added to the survey.

If you have questions about how the results of this survey relate to your multiemployer plan, please contact your consultant at Horizon Actuarial or visit the "contact us" page on our website, www.horizonactuarial.com. For questions about the survey itself, please contact Jason Russell at jason.russell@horizonactuarial.com.

Horizon Actuarial Services, LLC is an independent consulting firm specializing in providing actuarial and consulting services to multiemployer benefit plans. Horizon Actuarial does not provide investment, legal, or tax advice. Please consult with your investment advisor, legal counsel, or tax advisor for information specific to your plan's investment, legal, or tax implications.

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Survey Participants

Exhibit 1 below lists the 35 investment advisors whose capital market assumptions are included in the 2016 survey. This report will not attribute specific assumptions to individual firms, which is a precondition of the survey.

Originally, this survey was exclusive to the multiemployer plan community; it included only assumptions from investment advisors to multiemployer pension plans. The survey has expanded over the years, and it now includes assumptions from investment advisors outside of the multiemployer plan community.

Of the 35 sets of capital market assumptions included in the 2016 edition of the survey, 25 were provided by investment advisors to multiemployer plans, 7 were obtained from published white papers, and 3 were provided by investment advisors who do not consult with multiemployer plans. The different types of firms participating in the survey are indicated below.

Exhibit 1

2016 Survey Participants	
<i>AJ Gallagher</i>	<i>Merrill Lynch Global</i>
<i>Alan Biller</i>	<i>Institutional Consulting</i>
<i>Aon Hewitt</i>	<i>Morgan Stanley Wealth Management</i>
<i>The Atlanta Consulting Group</i>	<i>New England Pension Consultants (NEPC)</i>
<i>Bank of New York Mellon*</i>	<i>Pavilion Advisory Group**</i>
<i>BlackRock*</i>	<i>Pension Consulting Alliance</i>
<i>Bogdahn Group</i>	<i>The PFM Group</i>
<i>Callan Associates</i>	<i>RVK</i>
<i>CapTrust*</i>	<i>Segal Rogerscasey</i>
<i>Ellwood Associates</i>	<i>SEI</i>
<i>Envestnet**</i>	<i>Sellwood Consulting</i>
<i>Goldman Sachs Asset Management</i>	<i>Summit Strategies Group</i>
<i>Graystone Consulting</i>	<i>SunTrust Investment Advisory Group*</i>
<i>Investment Performance Services, LLC (IPS)</i>	<i>UBS</i>
<i>J.P. Morgan Asset Management*</i>	<i>Verus</i>
<i>Marco Consulting Group</i>	<i>Voya Investment Management*</i>
<i>Marquette Associates</i>	<i>Wells Fargo Investment Institute*</i>
<i>Meketa Investment Group</i>	<i>Willis Towers Watson**</i>

* Assumptions obtained from published white paper
 ** Advisor from outside multiemployer community

Investment Horizons

When evaluating the expected return assumption for an active, ongoing multiemployer pension plan, the plan actuary will usually consider investment returns over a long-term investment horizon of 20 years or more. A shorter time horizon, say over the next 10 years, may be more appropriate when evaluating the return assumption for a very mature plan that has unusually high negative cash flows or is projected to become insolvent.

It is also important to understand the sensitivity of plan funding to changes in future investment returns. For example, the actuary for an active, ongoing pension plan will typically set the plan's investment return assumption based on expectations over a long-term horizon. However, it would still be instructive for the actuary to evaluate the sensitivity of funding results to the extent that short-term investment returns are expected to be higher or lower than the long-term assumption.

Survey participants were requested to provide their most recent capital market assumptions: expected returns for different asset classes, standard deviations for those expected returns, and a correlation matrix. The survey participants were also requested to indicate the investment horizon(s) to which their assumptions apply. If the participant develops separate assumptions for different time horizons, they were requested to provide each set of assumptions.

In the 2016 edition of the survey, 23 advisors provided one set of assumptions: of those, 21 specified a time horizon of 10 years and 2 specified a time horizon of 10 to 15 years. The remaining 12 advisors provided assumptions over both shorter-term (5 to 10 years) and longer-term (20 years or more) horizons.

Exhibit 2 below summarizes the time horizons specified by each advisor, grouped by type. Note that of the 12 advisors who provided both short-term and long-term assumptions, 11 of them are advisors to multiemployer pension plans.

Exhibit 2

Investment Time Horizons				
Advisor Type	(A)	(B)	(C)	Total
10 Years	13	6	2	21
10 to 15 Years	1	1	-	2
<u>Both Short and Long-Term</u>	<u>11</u>	<u>-</u>	<u>1</u>	<u>12</u>
Total	25	7	3	35

(A) Multiemployer plan investment advisor
 (B) Published white paper
 (C) Advisor from outside multiemployer community

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Short-Term vs. Long-Term

As noted in the previous section, survey participants provided expected returns over different time horizons. Given current market conditions, many investment advisors may expect returns for certain asset classes to be different in the short term than over the long term.

For comparability, this survey groups expected returns into two time horizons: 10 years and 20 years. We often refer to the 10-year expected returns as “short-term” and the 20-year expected returns as “long-term.” (Note however that many investment firms consider 10-year expectations to be “long-term.”)

When comparing the expected returns for the 12 advisors who provided both short-term and long-term assumptions,¹ we see some interesting differences. See Exhibit 3 below. Expected returns are geometric and are generally considered to be indexed and net of fees.

Exhibit 3

Average Expected Returns: Short-Term vs. Long-Term Subset of 12 Survey Respondents			
Asset Class	10-Year Horizon	20-Year Horizon	Difference
US Equity - Large Cap	6.85%	7.89%	1.04%
US Equity - Small/Mid Cap	7.07%	8.23%	1.16%
Non-US Equity - Developed	7.33%	8.02%	0.69%
Non-US Equity - Emerging	8.62%	9.11%	0.50%
US Corporate Bonds - Core	3.41%	4.58%	1.17%
US Corporate Bonds - Long Dur.	3.72%	4.87%	1.15%
US Corporate Bonds - High Yield	6.18%	6.81%	0.64%
Non-US Debt - Developed	2.52%	3.70%	1.18%
Non-US Debt - Emerging	5.80%	6.43%	0.63%
US Treasuries (Cash Equivalents)	2.19%	3.15%	0.96%
TIPS (Inflation-Protected)	3.12%	3.94%	0.82%
Real Estate	6.52%	6.75%	0.23%
Hedge Funds	5.56%	6.16%	0.60%
Commodities	4.22%	4.84%	0.62%
Infrastructure	6.43%	7.12%	0.69%
Private Equity	9.45%	10.33%	0.89%
Inflation	2.22%	2.31%	0.08%

The 10-year and 20-year returns shown above are the averages for the 12 advisors who provided both short-term and long-term assumptions. Expected returns are annualized (geometric).

The consensus among these 12 advisors was that returns are expected to be lower in the short term compared to the long term. In general, the difference between long

term and short term returns is more pronounced for US equity and fixed income investments.

As noted earlier, the results shown in Exhibit 3 are based on a subset of 12 advisors. If we include all 35 survey advisors, the short-term and long-term expected returns do not change dramatically. See Exhibit 4 below.

Exhibit 4

Average Expected Returns: Short-Term vs. Long-Term All Survey Respondents			
Asset Class	10-Year Horizon	20-Year Horizon	Difference
US Equity - Large Cap	6.64%	7.89%	1.25%
US Equity - Small/Mid Cap	7.00%	8.23%	1.23%
Non-US Equity - Developed	7.12%	8.02%	0.90%
Non-US Equity - Emerging	8.48%	9.11%	0.64%
US Corporate Bonds - Core	3.41%	4.58%	1.17%
US Corporate Bonds - Long Dur.	3.82%	4.87%	1.05%
US Corporate Bonds - High Yield	5.90%	6.81%	0.92%
Non-US Debt - Developed	2.43%	3.70%	1.27%
Non-US Debt - Emerging	5.77%	6.43%	0.66%
US Treasuries (Cash Equivalents)	2.14%	3.15%	1.01%
TIPS (Inflation-Protected)	2.80%	3.94%	1.14%
Real Estate	6.36%	6.75%	0.38%
Hedge Funds	5.41%	6.16%	0.75%
Commodities	3.98%	4.84%	0.86%
Infrastructure	6.59%	7.12%	0.53%
Private Equity	9.22%	10.33%	1.11%
Inflation	2.16%	2.31%	0.15%

*10-year horizon results include all 35 survey respondents.
20-year horizon results include a subset of 12 survey respondents.
Expected returns are annualized (geometric).*

The 10-year expected returns shown above include assumptions from all 35 advisors, while the 20-year expected returns include assumptions from only the 12 advisors who provided longer-term assumptions.

Prior year survey reports showed “blended” assumptions, which included 20-year expected returns from the advisors who provided longer-term assumptions and 10-year expected returns from the others. A significant drawback to using the blended assumptions is that they are not internally consistent and comparable with respect to investment horizons. Therefore, this 2016 survey no longer presents blended assumptions. It instead focuses only on the different expected returns over 10-year and 20-year investment horizons.

¹ In cases where an advisor indicated a time horizon shorter than 10 years (for example, 5 or 7 years), the shorter-term expected returns were combined with the longer-term expected returns to achieve a 10-year horizon. Similarly, if an advisor indicated a time horizon longer than 20 years (for example, 30 years), the longer-term expected returns were combined with the shorter-term expected returns to achieve a 20-year horizon.

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Differing Opinions

Exhibit 5 below shows the distribution of expected returns and standard deviations (i.e., volatilities) for each asset class in the survey, as provided by the 35 individual advisors in the survey. Expected returns are geometric and apply to a 10-year investment horizon.² Average assumptions from the 2016 survey are listed in brackets for each asset class. As noted earlier, returns are assumed to be indexed and net of fees.

The exhibit below shows that there are often significant differences in expected returns and standard deviations between investment advisors. As the saying goes, “reasonable people may differ.”

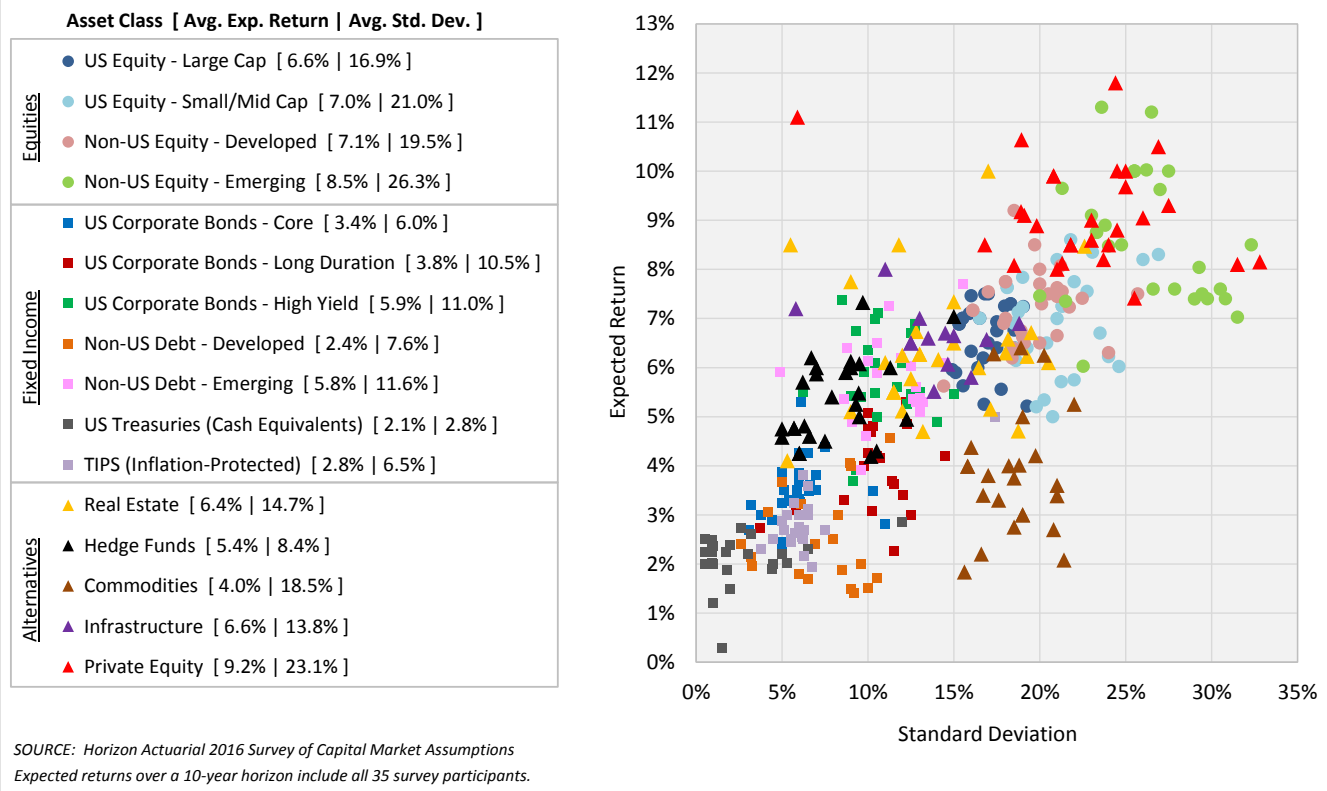
The differences in assumptions are more pronounced for alternative investments such as real estate, hedge funds, and private equity. A contributing factor may be differences in the underlying strategies different advisors apply to these alternative investments (for example, opportunistic versus defensive). To contrast, the differences in expected returns and volatilities are smaller for more traditional investments, such as US equity and US fixed income.

A summary of the average survey assumptions can be found in the appendix to this report as Exhibit 14. This summary includes expected returns, standard deviations, and a correlation matrix.

Exhibit 5

2016 Survey: Distribution of Expected Returns and Standard Deviations

10-Year Horizon | Geometric Returns



² The above exhibit focuses on a 10-year horizon in order to include assumptions from all 35 advisors. See Exhibit 15 in the appendix to this report for the assumptions over a 20-year horizon, based on the 12 advisors who provided longer-term assumptions. Also note that the exhibit above considers both expected returns and standard deviations. Prior editions of this survey showed exhibits that focused only on the ranges of expected returns, without considering the standard deviations that accompanied them. The ranges of expected returns by asset class can be found in the appendix as Exhibits 16 and 17.

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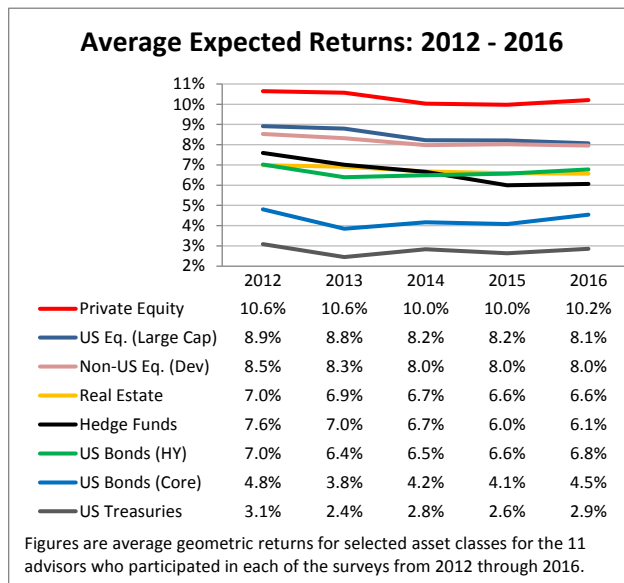
Changing Outlooks: Last Five Years

In recent years, there has been much discussion about whether it is reasonable to expect future investment returns to be as high as they have been historically. Following the financial market collapse of 2008, economic uncertainty and historically low interest rates painted a gloomy outlook for future investment returns. Even with improving economic conditions, interest rates remain low, and concerns about future investment returns remain.

Exhibit 6 below shows average expected returns for selected asset classes each year from 2012 to 2016. For consistency, this exhibit includes only the 11 advisors who participated in the survey in each of these years.

Note that the expected returns shown below are based on a 20-year horizon for advisors who provided longer-term assumptions and a 10-year horizon for others.³ For that reason (as well as the fact that we are dealing with a subset of advisors), the expected returns shown below are not directly comparable with those in other sections.

Exhibit 6

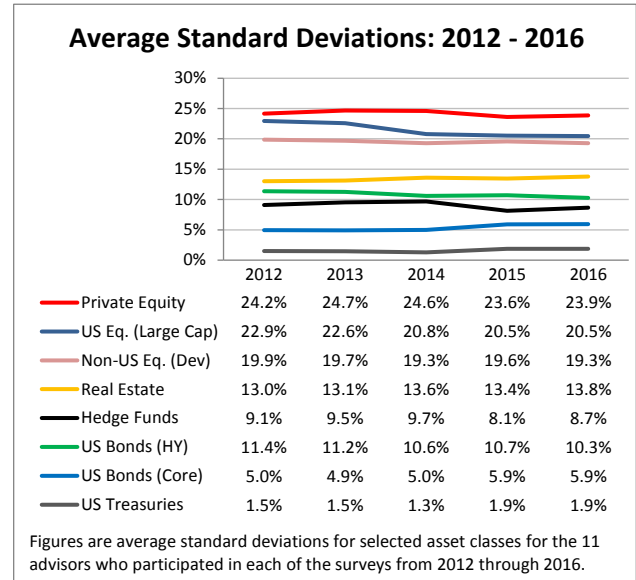


For this subset of advisors, average expected returns for equity-type investments such as US large cap equity, non-US developed equity, and private equity have generally decreased over the last five years, though they have stayed relatively flat (or perhaps increased) since 2014.

For fixed income-type investments like US core bonds and US Treasuries, expected returns increased from 2013 to 2014, perhaps in anticipation of rising interest rates. Since then, expected returns declined or remained flat.

In addition to expected returns, it is also important to consider expected volatility of the returns, measured by standard deviations. Average standard deviations over the last five years are shown in Exhibit 7 below.

Exhibit 7



Overall, average standard deviations have stayed relatively flat from 2012 to 2016. This may imply that, on average, these 11 advisors expect the financial markets to remain volatile, but they do not necessarily expect volatility to increase.

In general, from one year to the next, these 11 advisors made relatively small adjustments (or no adjustment at all) to their standard deviations. Notable exceptions are US large cap equity and hedge funds, for which a few advisors adjusted their standard deviations significantly downward from 2013 to 2015.⁴ Other exceptions include US core bonds and US Treasuries, for which a few advisors adjusted their standard deviations upward over the past two years.

³ Of the 12 survey advisors who provided both shorter-term and longer-term assumptions, 10 of them indicated no difference in the standard deviations of the expected returns over the short term versus the long term. For the other 2 advisors, the differences between short-term and long-term standard deviations were very minor.

⁴ The increase in average standard deviation for hedge funds from 2015 to 2016 is due mostly to changes in the subgroup: in 2016, one advisor stopped providing assumptions for hedge funds, while another provided assumptions for hedge funds for the first time.

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Evaluating the Return Assumption

Multiemployer pension plans are usually invested in a well-diversified mix of stocks, bonds, real estate, and alternative investments structured to maximize returns over the long term while minimizing return volatility.

The actuary of a multiemployer pension plan must evaluate the plan's asset allocation and, based on expectations of future returns, develop an assumption for what plan assets are projected to earn over the long term. This assumption is then used (along with others) to determine the actuarial present value of the benefits promised by the plan to its participants and beneficiaries.

The actuary will often rely on the future return expectations of the plan's investment advisor in developing the plan's investment return assumption. However, as noted earlier, different investment advisors often have widely differing opinions on what future returns will be. Therefore, it can be beneficial to keep in mind other advisors' expectations when setting the investment return assumption.

In the following exhibits, we will evaluate the investment return assumption for a hypothetical multiemployer pension plan. Exhibit 8 below shows the asset allocation for this hypothetical plan. The asset allocations are arbitrary, except for the fact that we made sure to include at least a small allocation to every asset class in the survey.

Exhibit 8

Hypothetical Multiemployer Plan	
Asset Class	Weight
US Equity - Large Cap	20.0%
US Equity - Small/Mid Cap	10.0%
Non-US Equity - Developed	7.5%
Non-US Equity - Emerging	5.0%
US Corporate Bonds - Core	7.5%
US Corporate Bonds - Long Duration	2.5%
US Corporate Bonds - High Yield	5.0%
Non-US Debt - Developed	5.0%
Non-US Debt - Emerging	2.5%
US Treasuries (Cash Equivalents)	5.0%
TIPS (Inflation-Protected)	5.0%
Real Estate	10.0%
Hedge Funds	5.0%
Commodities	2.5%
Infrastructure	2.5%
Private Equity	5.0%
TOTAL PORTFOLIO	100.0%

The following exhibits show expected annualized (geometric) returns for the hypothetical multiemployer pension plan over two different investment horizons.

Exhibit 9 evaluates the return expectations for the hypothetical plan over a 10-year horizon. These results may be appropriate for modeling sensitivities of future funding results to short-term investment returns, or for evaluating the return assumption for a very mature plan with severely negative cash flows.

Exhibit 10 evaluates the expected returns over a 20-year horizon based on assumptions from the 12 advisors who provided longer-term assumptions. These results may be more appropriate for evaluating the return assumption for an ongoing plan with no projected solvency issues.

Exhibit 9

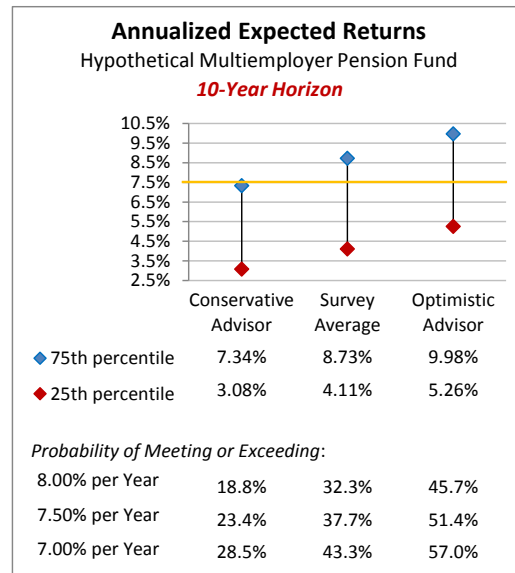
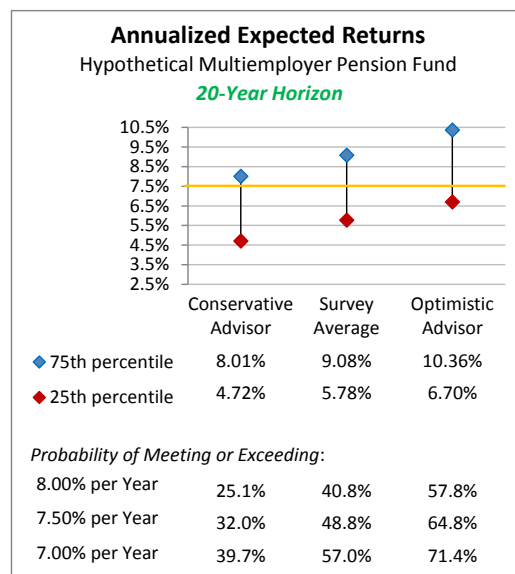


Exhibit 10



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It is important to keep in mind that the expected returns shown in Exhibits 9 and 10 apply only to the hypothetical asset allocation shown in Exhibit 8. The expected returns will be different – perhaps significantly – for different asset allocations.

Exhibit 13 in the appendix to this report shows more detail regarding the derivation of the expected returns for this hypothetical pension plan.

The following are points to consider when reviewing the results in Exhibits 9 and 10:

Reasonable Range: When setting the investment return assumption for pension valuations, actuaries traditionally constructed a “reasonable range” of assumptions and then selected a best-estimate point within that range. Actuaries would often consider the reasonable range to be the middle 50 percent of possible results, bounded by the 25th and 75th percentiles.

The applicable actuarial standards of practice were updated in 2013, and the new standards de-emphasize use of the reasonable range when setting the investment return assumption. Nevertheless, considering this range remains instructive; it may be difficult for an actuary to justify an assumption outside of this range.

Based on the average assumptions in this 2016 survey, the middle 50 percent range for this hypothetical pension plan is very wide: 5.78% to 9.08% over the next 20 years. Note that the reasonable range is even wider for a 10-year horizon: 4.11% to 8.73%. This is due to the fact that, while returns may be volatile from one year to the next, deviations will be lower when returns are annualized (in other words, smoothed out) over longer horizons.

Probability of Meeting/Exceeding the Benchmark: For example, say that the actuary for this hypothetical pension plan expects its investment returns to be 7.50% per year, represented by the gold lines in Exhibits 9 and 10. Based on the average assumptions in the 2016 survey, there is a 48.8% probability the plan will meet or beat its 7.50% benchmark on an annualized basis over a 20-year period. The probability is lower, 37.7%, that the plan will meet or beat its benchmark over the next 10 years.

Also note that over a 20-year period, the probability that the annualized investment return will exceed 8.00% (arbitrarily, 50 basis points above the benchmark return) is 40.8%. The probability that the annualized return will exceed 7.00% (50 basis points below the benchmark) is 57.0%. These probabilities are a bit lower when focusing on a 10-year horizon rather than a 20-year horizon.

Optimistic and Conservative Assumptions: As previously noted, different investment advisors have sometimes widely varying future capital market expectations. Therefore, it may also be interesting to consider the range of expected returns based on the assumptions provided by the most conservative and most optimistic advisors in the survey.

For this hypothetical asset allocation, the assumptions from the most conservative advisor indicate that the probability of beating the 7.50% benchmark assumption over the next 20 years is 32.0%. However, using assumptions from the most optimistic advisor results in a probability of 64.8%. Again, reasonable people may differ.

Limitations: The following are some important limiting factors to keep in mind when reviewing these results:

- The asset classes in this survey do not always align perfectly with the asset classes provided by the investment advisors. Adjustments were made to standardize the different asset classes provided by each of the advisors.
- Many of the advisors develop their future assumptions based on investment horizons of no more than 10 years, and some returns are generally expected to be lower in the short term. The typical multiemployer pension plan will have an investment horizon that is much longer than 10 years.
- The return expectations included in the survey are based on indexed returns. In other words, they do not reflect any additional returns that may be earned due to active asset managers outperforming the market (“alpha”), net of investment expenses.
- The return expectations do not adjust for plan size. Specifically, they do not take into account the fact that certain investment opportunities are more readily available to larger plans, as well as the fact that larger plans may often receive more favorable investment fee arrangements than smaller plans.
- The ranges of expected annualized returns were constructed using basic, often simplified, formulas and methodologies. More sophisticated investment models – which may consider various economic scenarios, non-normal distributions, etc. – could produce significantly different results.

In most cases, adjustments made to account for these limitations tended to slightly lower the expected returns in the survey, for the sake of conservatism.

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Comparison with Prior Surveys

Exhibits 6 and 7 showed how expected returns and standard deviations for certain asset classes have changed over the past few years. Similarly, Exhibits 11 and 12 below show how return expectations for the hypothetical multiemployer pension plan whose asset allocation is shown in Exhibit 8 have changed from 2013 to 2016. (Note that 2013 was the first year this survey developed separate 10-year and 20-year expected returns.)

Both exhibits show the probabilities that the hypothetical pension plan will meet or exceed its 7.50% benchmark return on an annualized basis over the given time horizon. Exhibit 11 focuses on expected returns over a 10-year period, and Exhibit 12 focuses on expected returns over a 20-year period. Probabilities are shown for the survey average for each year from 2013 through 2016. For comparison, probabilities are also shown for the most conservative and optimistic advisors in each survey.

Exhibit 11

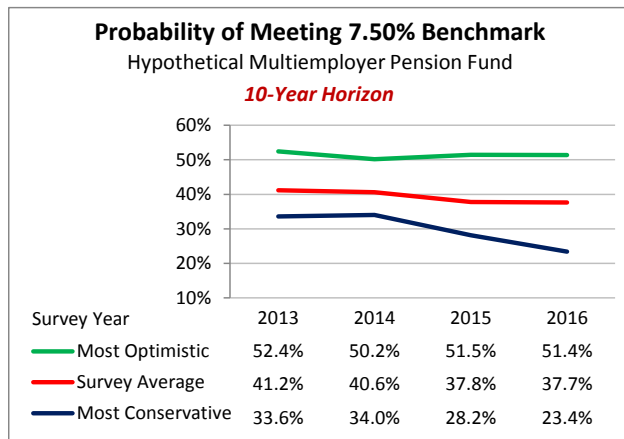
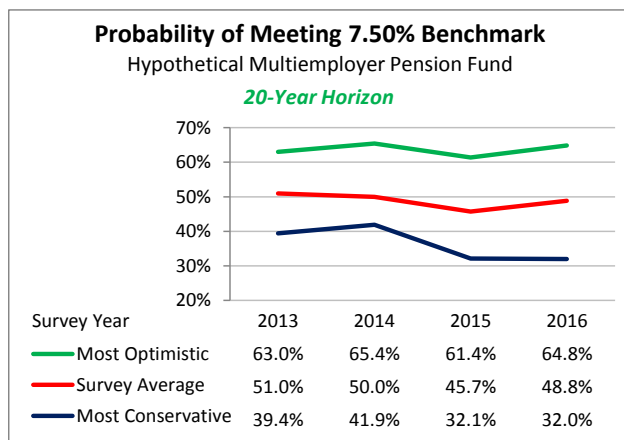


Exhibit 12



As shown in Exhibits 11 and 12, the probabilities that this hypothetical pension plan would meet or beat a benchmark return of 7.50% have generally come down from 2013 to 2015. From 2015 to 2016, the probability of meeting or beating a 7.50% annualized return over a 10-year period, based on the average survey assumptions, stayed relatively flat. The probability increased, however, when based on a 20-year horizon.

For example:

- Based on the average assumptions from the 2016 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.50% over the next 10 years is 37.7%. For comparison, the probability was virtually the same (37.8%) based on average 2015 assumptions.
- Based on the average assumptions from the 2016 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.50% over the next 20 years is 48.8%. The probability was somewhat lower (45.7%) based on average 2015 assumptions.

Other points of note when comparing the results from the 2016 survey to those from prior years:

- In general, expected returns for the next 10 years remained relatively consistent from the 2015 survey to the 2016 survey. Much of the decline in expected 10-year returns is due to the addition of new advisors to the survey. In particular, the two advisors with the most conservative assumptions in the 2016 survey are first-time participants.
- Average expected returns over the next 20 years are generally higher in the 2016 survey than in the 2015 survey. Some continuing survey participants who provide longer-term assumptions adjusted their expected returns upward. Another factor is that the advisor with the most optimistic 20-year assumptions is a first-time participant in 2016.

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Glossary

The following are basic definitions of some of the investment terminology used in this report.

Expected Return

The *expected return* is the amount, as a percentage of assets, that an investment is expected to earn over a period of time. Expected returns presented in this survey are generally assumed to be indexed and net of investment fees.

Arithmetic vs. Geometric Returns

The *arithmetic* return is the average return in any one year; in other words, it has a one-year investment horizon. A *geometric* return is the annualized return over a multi-year period. In general, when evaluating expected returns over multi-year horizons, we find it more appropriate to focus on geometric returns.

Since 2013, the survey has presented expected returns on a geometric basis. Many advisors provide both arithmetic and geometric expected returns. For advisors who provided expected returns only on an arithmetic basis, we converted them to geometric returns for consistency. The following formula was used in making this conversion.

$$E[R_G] = ((1 + E[R_A])^2 - \text{VAR}[R])^{1/2} - 1$$

In this formula, $E[R_G]$ is the expected geometric return, $E[R_A]$ is the expected arithmetic return, and $\text{VAR}[R]$ is the variance of the expected annual return.

Standard Deviation

The *standard deviation* is a measure of the expected volatility in the returns. Generally, the standard deviation expresses how much returns may vary in any one year. Assuming that returns are “normally distributed,” there is about a 68% probability that the actual return for a given year will fall within one standard deviation (higher or lower) of the expected return. There is about a 95% probability that the actual return will fall within two standard deviations of the expected return.

Correlation

An important aspect of capital market assumptions is the degree to which the returns for two different asset classes move in tandem with one another: this is their *correlation*. For example, if two asset classes are perfectly correlated, their correlation coefficient will be 1.00; in other words, if one asset class has a return of X% in a given market environment, then the other asset class is expected to also have a return of X%. A portfolio becomes better diversified as its asset classes have lower (or even negative) correlations with each other.

Methodology

The following is a high-level description of the methodology used in compiling the survey results.

Standardized Asset Classes

Not all investment advisors use the same asset classes when developing their capital market assumptions. Some are very specific (more asset classes), while others keep things relatively simple (fewer asset classes).

We exercised judgment in classifying each advisor’s capital market assumptions into a standard set of asset classes. In the event that an advisor did not provide assumptions for a given asset class, the average assumptions from the other advisors was used when developing expected returns for that advisor.

Investment Horizons

This survey considers “short-term” expected returns to apply to 10-year investment horizon, and “long-term” expected returns to apply to a 20-year horizon.

In the 2016 survey, 23 of the 35 advisors provided only short-term assumptions, indicating a horizon of no more than 10 years. Included in this group are 2 advisors who provided assumptions over a horizon of 10 to 15 years.

All 12 advisors who provided long-term assumptions over horizons of 20 years or more also provided short-term assumptions. In cases where such an advisor indicated a horizon shorter than 10 years, the shorter-term expected returns were combined with the longer-term expected returns to achieve a 10-year horizon. If an advisor indicated a horizon longer than 20 years, the expected returns were assumed to also apply to a 20-year horizon.

No Adjustment for Alpha

No adjustment was made to reflect the possible value added by an active investment manager outperforming market returns (earning “alpha”).

Normally-Distributed Returns

This survey assumes that investment returns will be normally distributed according to the capital market assumptions provided. The survey also assumes that the investment return in one year does not affect the investment return in the following year.

Equal Weighting

Each advisor was given equal weight in developing the average assumptions for the survey, regardless of factors such as total assets under advisement, number of clients common with Horizon Actuarial, etc.

Exhibit 13

The following exhibit evaluates the investment return assumption for a hypothetical multiemployer pension plan. It reflects the same hypothetical asset allocation as shown in Exhibit 8, and it provides more detail than Exhibits 9 and 10. Note that the most conservative and optimistic advisors for the 10-year horizon are not necessarily the same as the most conservative and optimistic advisors for the 20-year horizon. This hypothetical pension plan has a benchmark return of 7.50% per year, which is indicated by the gold line in the exhibit below.

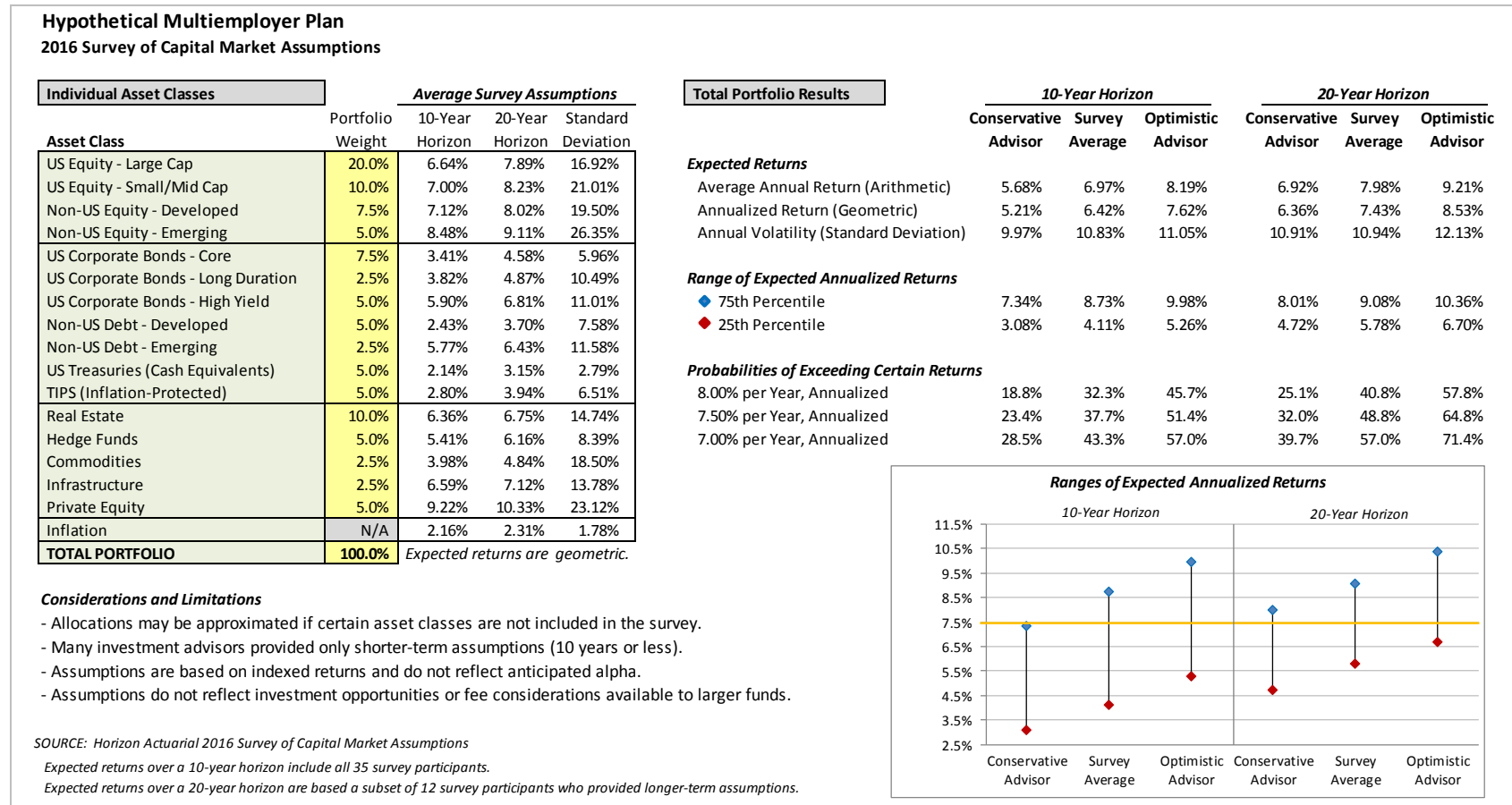


Exhibit 14

The following exhibit provides the average capital market assumptions for all 35 investment advisors in the 2016 survey. Each of the 35 advisors was given equal weight in determining the average assumptions. For reference, expected returns are shown over 10-year and 20-year horizons. Expected returns are also provided on both an arithmetic basis (one-year average) and geometric basis (multi-year annualized). The standard deviations (volatilities) and correlations apply to both arithmetic and geometric expected returns.

Horizon Actuarial 2016 Survey of Capital Market Assumptions						Correlation Matrix																				
Average Survey Assumptions																										
						Expected Returns																				
						10-Year Horizon		20-Year Horizon																		
						Arith.	Geom.	Arith.	Geom.																	
						Standard Deviation																				
Asset Class										1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	US Equity - Large Cap	7.98%	6.64%	9.25%	7.89%	16.92%				1.00																
2	US Equity - Small/Mid Cap	9.07%	7.00%	10.40%	8.23%	21.01%	0.90			1.00																
3	Non-US Equity - Developed	8.90%	7.12%	9.77%	8.02%	19.50%	0.82	0.76		1.00																
4	Non-US Equity - Emerging	11.68%	8.48%	12.46%	9.11%	26.35%	0.73	0.72	0.79		1.00															
5	US Corporate Bonds - Core	3.59%	3.41%	4.75%	4.58%	5.96%	0.15	0.11	0.15	0.10		1.00														
6	US Corporate Bonds - Long Duration	4.37%	3.82%	5.58%	4.87%	10.49%	0.13	0.09	0.14	0.11	0.91		1.00													
7	US Corporate Bonds - High Yield	6.49%	5.90%	7.40%	6.81%	11.01%	0.64	0.64	0.62	0.64	0.36	0.35		1.00												
8	Non-US Debt - Developed	2.74%	2.43%	4.01%	3.70%	7.58%	0.11	0.06	0.30	0.17	0.57	0.53	0.21		1.00											
9	Non-US Debt - Emerging	6.42%	5.77%	7.20%	6.43%	11.58%	0.55	0.51	0.59	0.66	0.44	0.38	0.63	0.40		1.00										
10	US Treasuries (Cash Equivalents)	2.22%	2.14%	3.18%	3.15%	2.79%	(0.08)	(0.10)	(0.06)	(0.06)	0.30	0.22	(0.04)	0.23	0.10		1.00									
11	TIPS (Inflation-Protected)	3.03%	2.80%	4.27%	3.94%	6.51%	0.02	0.01	0.08	0.13	0.68	0.63	0.27	0.51	0.40	0.29		1.00								
12	Real Estate	7.48%	6.36%	7.75%	6.75%	14.74%	0.38	0.38	0.36	0.31	0.07	0.11	0.31	0.06	0.25	0.04	0.13		1.00							
13	Hedge Funds	5.77%	5.41%	6.59%	6.16%	8.39%	0.62	0.62	0.65	0.64	0.14	0.10	0.54	0.11	0.48	(0.01)	0.11	0.27		1.00						
14	Commodities	5.62%	3.98%	6.47%	4.84%	18.50%	0.30	0.30	0.40	0.44	0.07	0.03	0.32	0.20	0.36	0.02	0.26	0.22	0.43		1.00					
15	Infrastructure	7.52%	6.59%	8.26%	7.12%	13.78%	0.53	0.51	0.56	0.50	0.23	0.21	0.48	0.23	0.37	0.02	0.16	0.27	0.46	0.32		1.00				
16	Private Equity	11.77%	9.22%	12.94%	10.33%	23.12%	0.77	0.76	0.72	0.64	0.02	0.05	0.54	0.06	0.46	(0.05)	(0.04)	0.39	0.60	0.29	0.43		1.00			
	Inflation	2.16%	2.16%	2.31%	2.31%	1.78%																				

SOURCE: Horizon Actuarial 2016 Survey of Capital Market Assumptions

Expected returns over a 10-year horizon include all 35 survey participants.

Expected returns over a 20-year horizon are based a subset of 12 survey participants who provided longer-term assumptions.

Exhibit 15

Earlier in this report, Exhibit 5 showed the distribution of expected returns and standard deviations over an investment horizon of 10 years. Exhibit 15 below shows the same distribution, but for a horizon of 20 years. Note that while Exhibit 5 included assumptions for all 35 advisors in the survey, the exhibit below includes only assumptions for the 12 advisors who provided longer-term assumptions (horizons of 20 years or more).

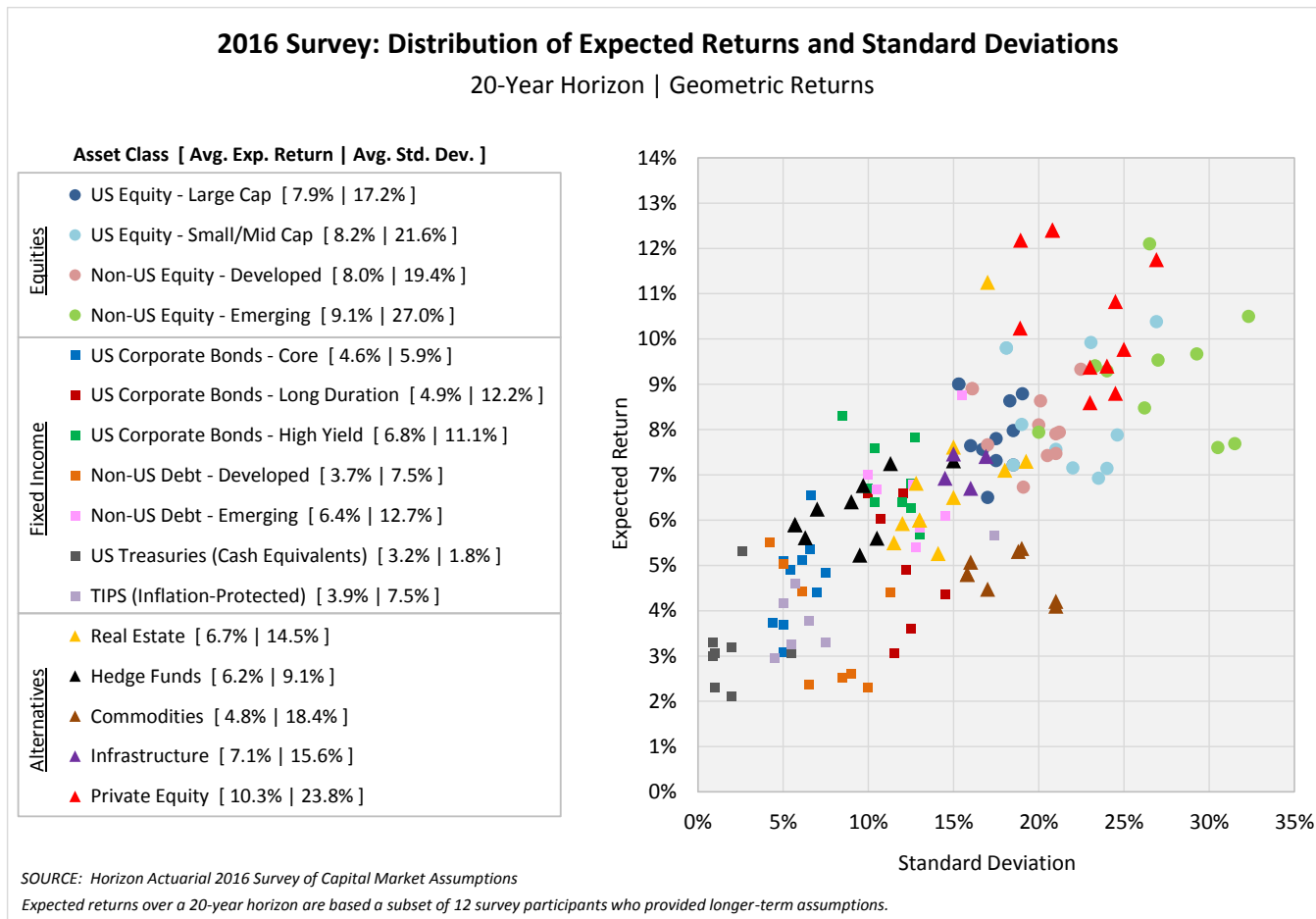


Exhibit 16

The exhibit below shows the ranges of expected annual returns for different asset classes over a 10-year investment horizon. The ranges shown below include assumptions for all the 35 advisors in the 2016 survey. Expected returns shown below are annualized (geometric).

To illustrate the distribution of expected returns, the exhibit shows the range of the middle 50 percent of results: the range between the 25th and 75th percentiles. It also shows the median expected return for each asset class: the 50th percentile. Note that the expected returns for the *median* advisor shown below are not the same as the *average* expected returns shown elsewhere in the report. In most cases, however, the differences between median and average expected returns are relatively small.

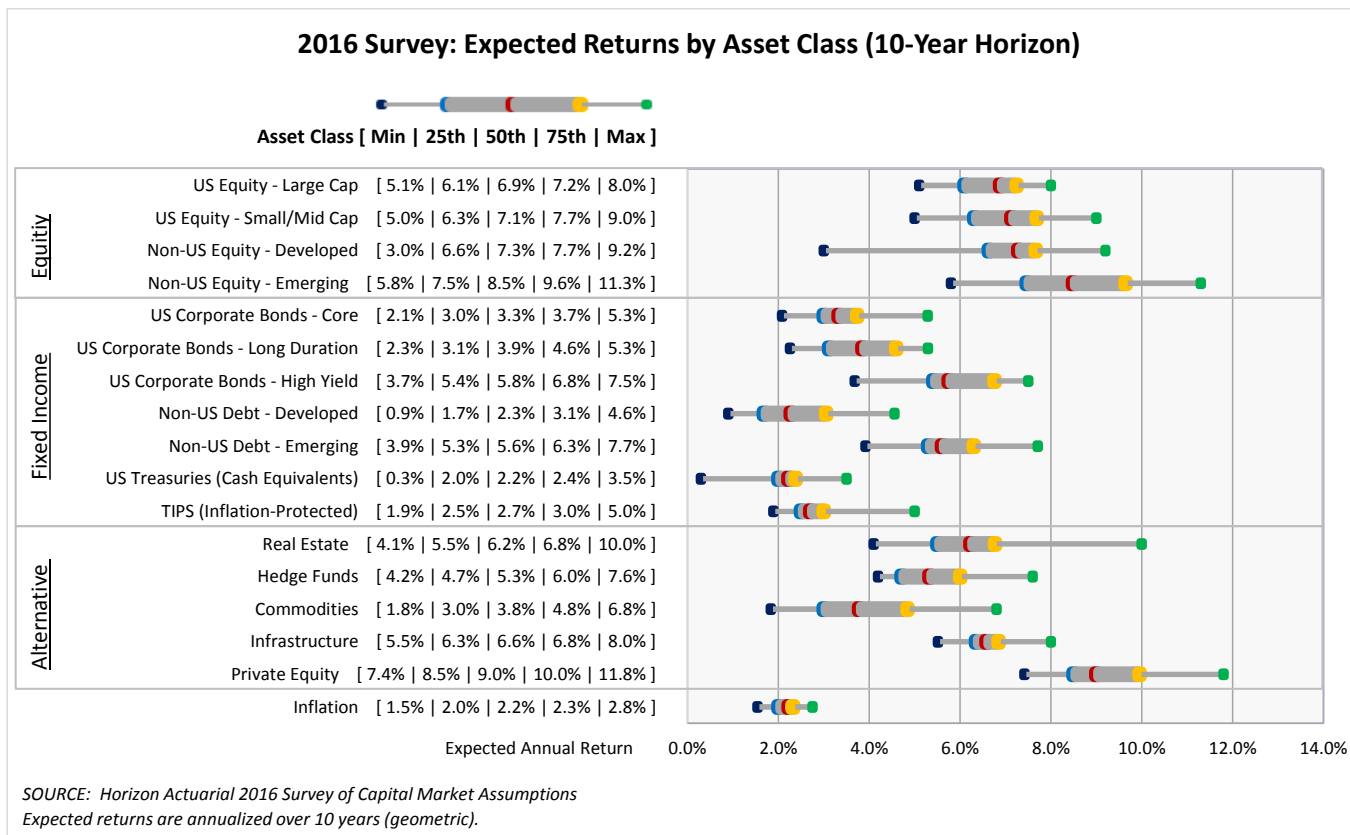


Exhibit 17

The exhibit below shows the ranges of expected annual returns for different asset classes over a 20-year investment horizon. The ranges shown below are based on the assumptions for 12 advisors who provided longer-term assumptions (horizons of 20 years or more). Expected returns shown below are annualized (geometric). Note that the ranges of expected returns are somewhat narrower when the investment horizon is longer.

To illustrate the distribution of expected returns, the exhibit shows the range of the middle 50 percent of results: the range between the 25th and 75th percentiles. It also shows the median expected return for each asset class: the 50th percentile. Note that the expected returns for the *median* advisor shown below are not the same as the *average* expected returns shown elsewhere in the report. In most cases, however, the differences between median and average expected returns are relatively small.

