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October 23, 2019

Pension Obligation Bonds Discussion

City of West Covina

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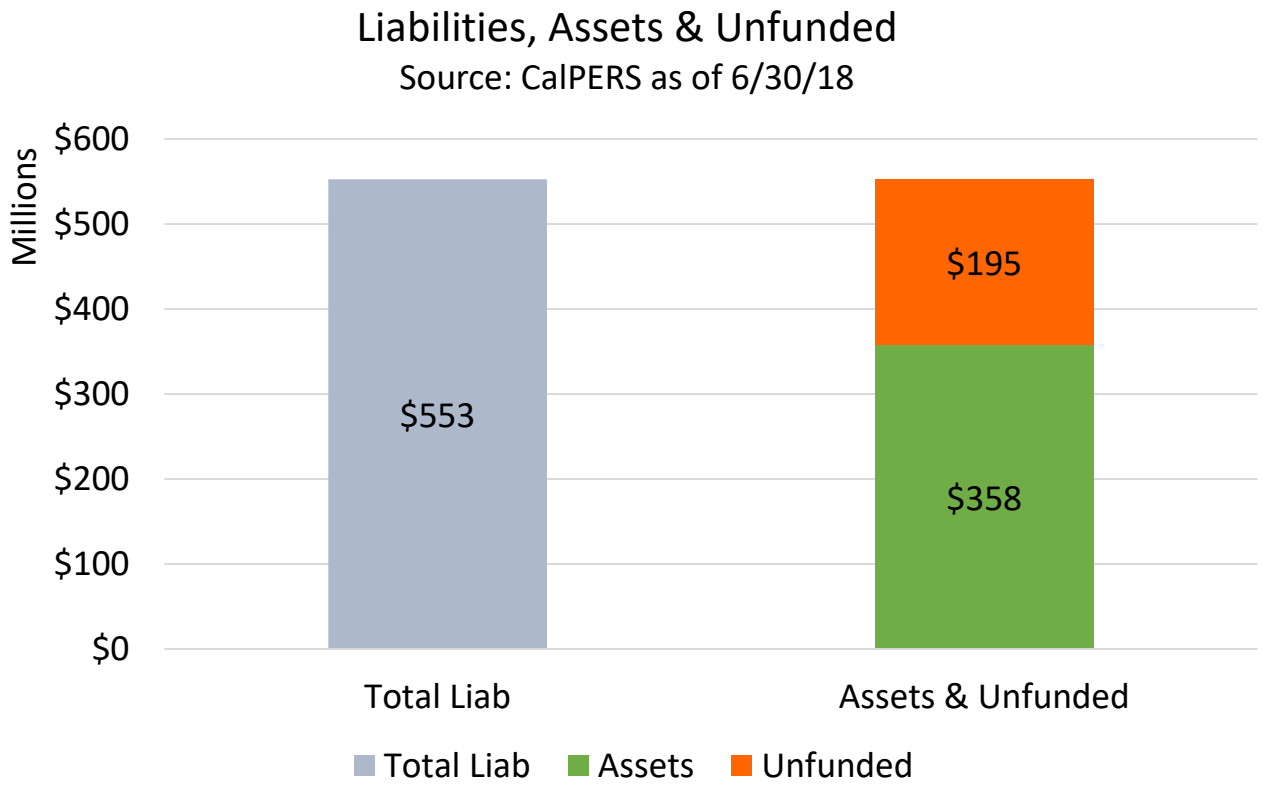
City's CalPERS Liabilities

Tab 1

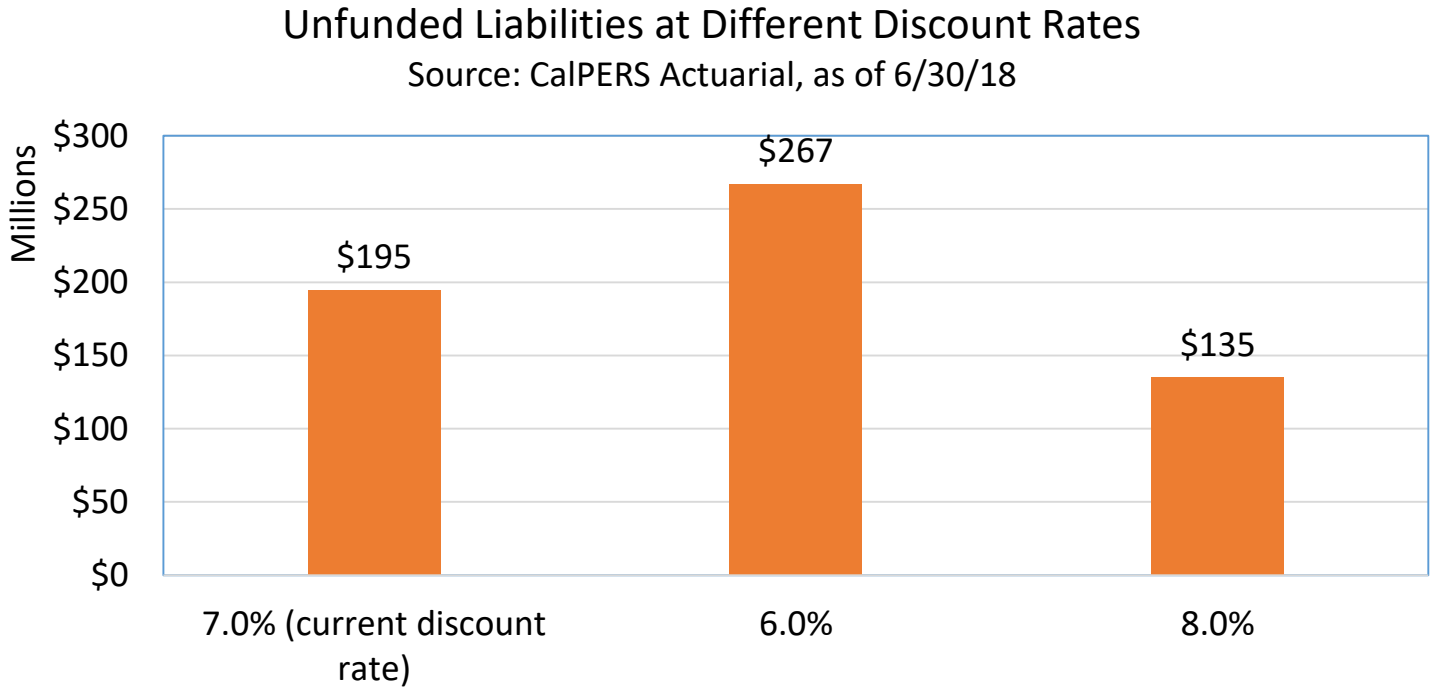
Projected Liabilities, Assets & Unfunded Liabilities

- Projections in this chart are from the 6/30/2018 CalPERS actuarial study
- Includes Safety and Miscellaneous, combined funded ratio is 64.8% @ 7.0% Discount Rate



Projected Safety and Miscellaneous Unfunded Liabilities
Effects of Different Discount Rates

- Many retirement systems have decreased discount rates, commonly by 25-50 basis points; cumulative changes are often larger, e.g., 100 basis points
- CalPERS used a 7.0% discount rate in its 6/30/2018 actuarial study, prior year was 7.25%



Overview of California Pension Obligation Bonds

Tab 2

What is a Pension Obligation Bond ("POB")?

- A bond issued by a municipality from which the proceeds are used to reduce the accrued unfunded liabilities of its pension system (in this case, CalPERS)
- Because of the many variables a municipality must consider, no two situations are the same
- Bond proceeds are typically deposited into a retirement system (in the City's case, CalPERS), and are managed in a similar manner to existing investments

What is a Pension Obligation Bond ("POB")? (continued)

- Target funding levels for POBs can range up to 100%
- If investment returns at a retirement system are higher than POB borrowing costs, budgetary savings to the municipality are very likely
- Unlike most municipal bonds, interest payments on POBs are generally taxable for purpose of federal income taxes, which results in higher interest rates than a similar tax exempt bond from the same issuer

The City's Goals for POB's

1. Reduce chances of service reductions and public safety layoffs
2. Change the payment pattern (e.g., a smooth pattern for bond repayment, vs an irregular pattern with no bonds). Smoother payment patterns make budgeting easier
3. Obtain higher expected investment returns on investments at retirement system (e.g., 7%) than borrowing cost (e.g., ~3.5-4.0%); this is sometimes referred to as "arbitrage"
4. Leave amortization period unchanged
5. Raise the funded level of the pension plan (e.g., from 64.8% to 92%)
6. Do not delay budget pressure and future pain: establish a long-term plan well-suited to the City which incorporates best practices from pension bonds elsewhere
7. Have a POB discussion which involves staff, elected officials, and the community
8. Have a court opinion regarding the legality of all aspects of the proposed transaction before it occurs

Legal Structure / Authorization of California POB's

- Most commonly "Obligations imposed by law"
  - In CA generally issued as refunding bonds under Local Agency Refunding Law (CA Government Code 53580-53589.5, see also CA Constitution Article XVI, Section 18) to refund a portion of the issuer's outstanding obligation to the pension fund
  - Because the outstanding pension obligation is considered an "obligation imposed by law" it is exempt from the California constitutional prohibition on cities or counties incurring a debt or liability without a vote
  - A validation action is needed to establish that the bonds, as refunding bonds, take on the same characteristics as "obligations imposed by law" as the pension obligation being refunded (CA Code of Civil Procedure 860-870.5)
- Typical validation timeframe is 90-120 days

Sources: CA Debt Issuance Primer (CDIAC); CA Govt Code; CA State Constitution; CA Code of Civil Procedure

Will the Pension Fund Have Returns Higher Than Borrowing Costs?

- Good chance pension investment returns will be higher than borrowing costs at some points, and lower than borrowing costs at other points

- An extensive Boston College study in 2014 on pension bonds found:
  - As of February 2014, *"over the period 1992-2014 – which includes both the financial crisis and the subsequent market rebound – the return was 1.5 percent"* (i.e., annual retirement system investment returns were 1.5% above borrowing costs)

- However, a similar approach would produce different results at different dates:
  - *"If the assessment date is the end of 2007 – the peak of the stock market – the picture looks fairly positive... If assessed in the middle of 2009 – right after the market crash – most POBs appear to be a net drain on government revenues. And, as of February 2014, the majority of POBs have produced positive returns due to the large market gains that followed the crisis."*

(source: Center for Retirement Research at Boston College, "An Update on Pension Obligation Bonds, 2014)

What Will CalPERS' Future Returns Be?

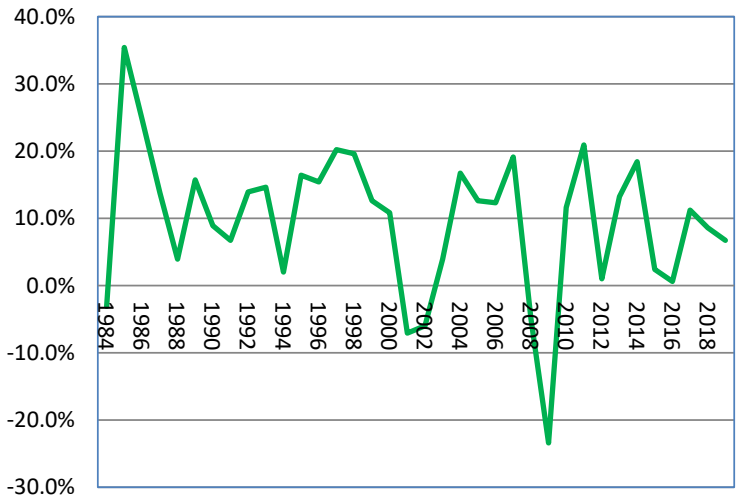
- "It's tough to make predictions, especially about the future". Yogi Berra
- However, numerous investment advisors to public sector pension plans do make forecasts regarding expected future returns. Horizon Actuarial Services LLC performs an annual survey of those advisors.
- For 2019, 34 advisory firms responded to the survey. Here is a summary of the range of forecast investment returns for a typical retirement system investment portfolio with an assumed return of 7.0% (same assumption as CalPERS, Source: page 11 of the 2019 Horizon survey):

	20 Year Horizon		
	Conservative Advisor	Survey Average	Optimistic Advisor
Annualized Return (Geometric)	5.79%	7.01%	8.95%
Average Annual Return (Arithmetic)	6.36%	7.52%	9.47%
Annual Volatility (Standard Deviation)	10.96%	10.55%	10.72%

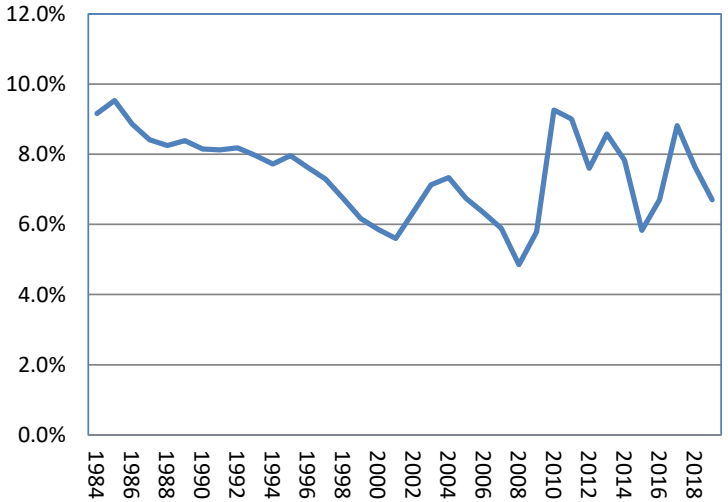
- The lowest expected return of any of the 34 advisors was 5.79%. The average was 7.01%.
- A full copy of the survey is in Tab 5.

Historic CalPERS Investment Returns (Data per CalPERS)

CalPERS Returns Thru 6/30/19 (Geometric Avg 9.2%)



CalPERS Compound Annualized Returns Through 6/30/19



- Past experience does not guarantee future results: many factors could change in the future
- Over the past 10 years, lower inflation and inflation expectations have reduced both borrowing costs and expected returns

Potential Pension-Related Risks

	Pension No POB	Pension And POB
PRE-ISSUANCE		
Overall taxable borrowing rates might increase	NA	Yes
Difficulty/delay with a validation suit	NA	Yes
If delayed, authorization might expire	NA	Yes
POST-ISSUANCE		
Discount Rate - Assumed future investment returns at CalPERS (e.g., lowering discount rate)	Yes	Yes
Actual investment returns affect contribution rates	Yes	Yes, and invested assets are larger
Demographic assumptions such as expected longevity affect contribution rates	Yes	Yes
New unfunded liabilities may appear	Yes	Yes
Contributions for normal cost for active employees may increase	Yes	Yes

Careful Analysis and Simulations Can Help

- Careful analysis, simulations, and knowledge of CalPERS, its actuarial methods, and the City's finances can help decide (regarding pension bonds):
  - Whether to issue
  - Sizing
  - Maturity
  - Amortization pattern (e.g., level debt service, or increasing 2% annually)
  - Credit structure and rating presentations
  - Effects of recent decrease in CalPERS discount rate from 7.5% to 7.0%, effects of potential future discount rate changes
  - Bond market conditions (Interest Rates)

Description of Key Risks from GFOA

1. *The invested POB proceeds might fail to earn more than the interest rate owed over the term of the bonds, leading to increased overall liabilities for the government*

2. *POBs are complex instruments that carry considerable risk. POB structures may incorporate the use of guaranteed investment contracts, swaps, or derivatives, which must be intensively scrutinized as these embedded products can introduce counterparty risk, credit risk and interest rate risk*

3. *Issuing taxable debt to fund the pension liability increases the jurisdiction's bonded debt burden and potentially uses up debt capacity that could be used for other purposes. In addition, taxable debt is typically issued without call options or with "make-whole" calls, which can make it more difficult and costly to refund or restructure than traditional tax-exempt debt.*

Source: GFOA - Pension Bond Risks Jan 2015

Description of Key Risks from GFOA (cont'd)

4. *POBs are frequently structured in a manner that defers the principal payments or extends repayment over a period longer than the actuarial amortization period, thereby increasing the sponsor's overall costs.*

5. *Rating agencies may not view the proposed issuance of POBs as credit positive, particularly if the issuance is not part of a more comprehensive plan to address pension funding shortfalls.*

Only risk #1 from GFOA is unavoidable for responsible California city issuers of POBs

Source: GFOA - Pension Bond Risks Jan 2015

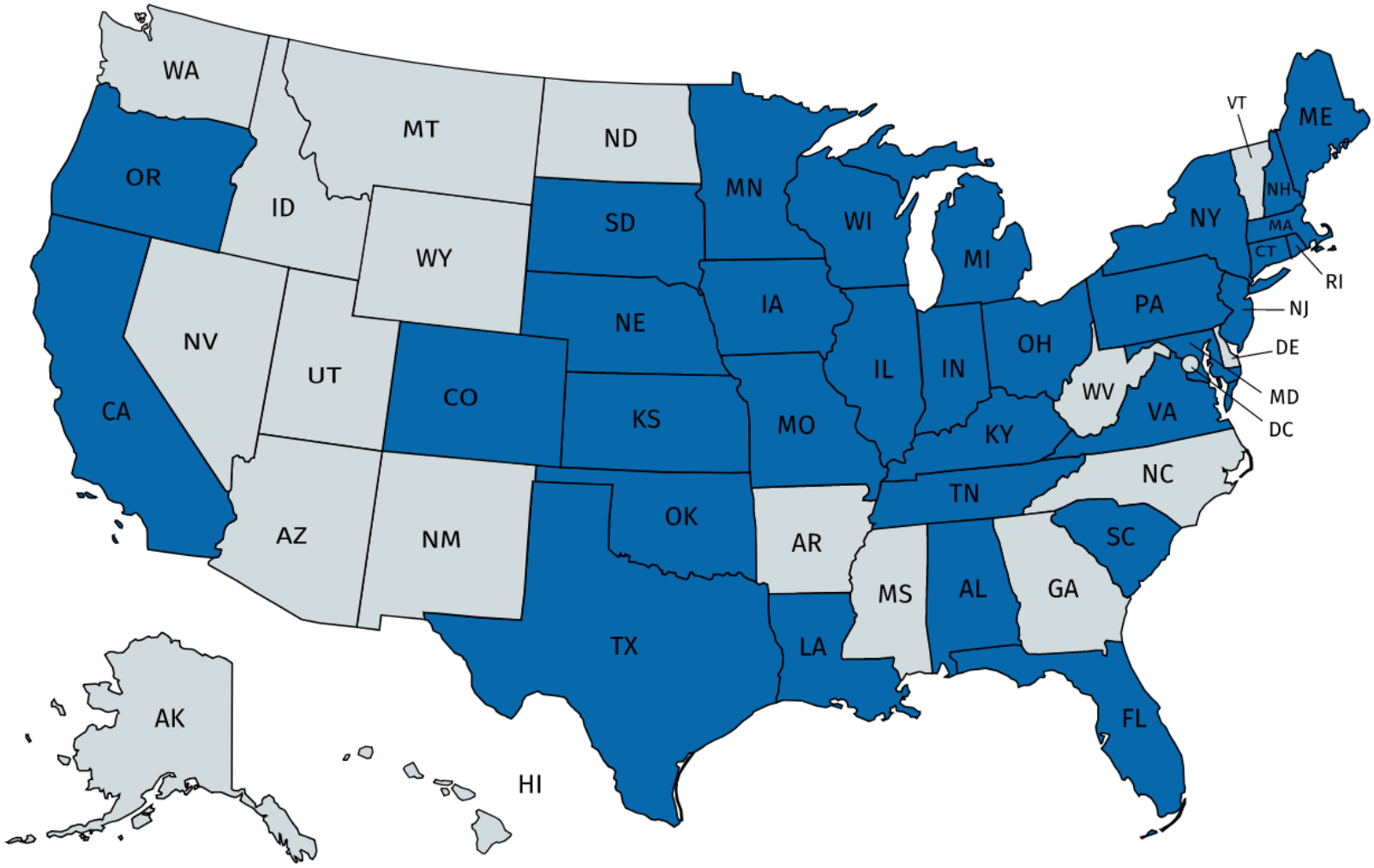
POB Issuance Statistics

- Since 1986 approximately:
  - $106 billion in pension bonds have been issued
  - $28 billion issued in California, from 80 issuers
  - Recent CA pension bonds:
    - AAA, Glendora, $64 million 2019
    - AA+, LaVerne, $52 million 2018
    - AA, Monrovia $11.5 million 2017
    - AA, City of Riverside, $32 million 2017
    - AA-, Baldwin Park, $54 million 2019
    - AA-, Hawthorne, $121 million 2019
    - A-, Chowchilla, $6 million 2019
    - A, Marysville, $15 million 2019
    - A (Underlying) with AA (BAM Insured) Ridgecrest, $20 million 2018
  - Post 2012, all POBs have been sold as fixed rate bonds

Data Sources: MSRB EMMA, IPREO, SDC, Bloomberg, Boston College

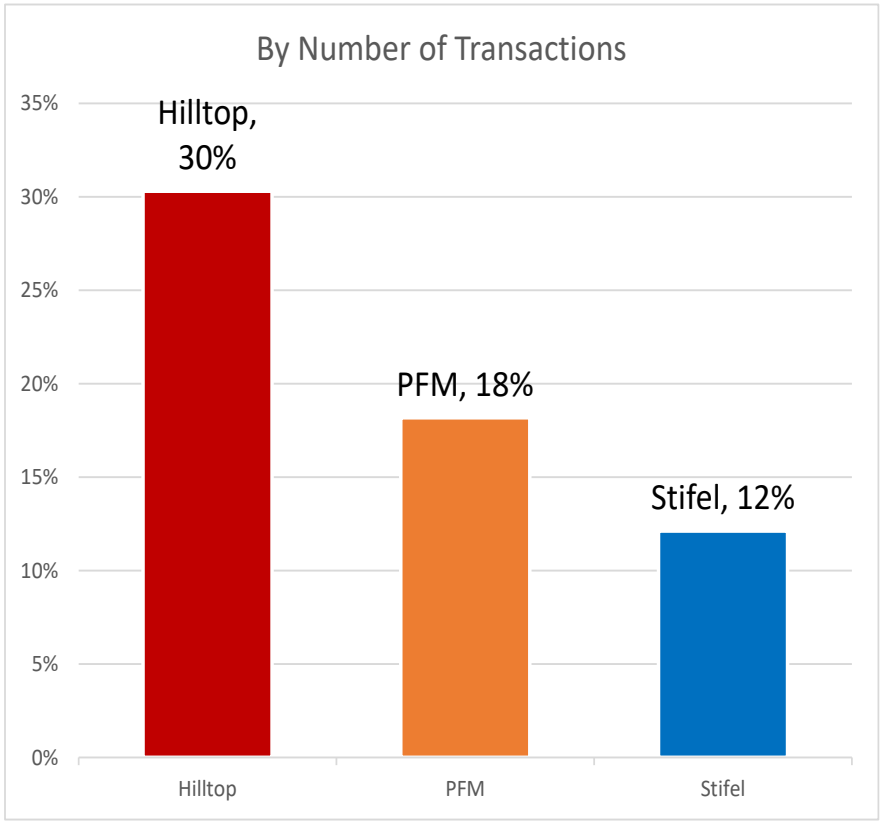
Pension Obligation Bond Issuance by State

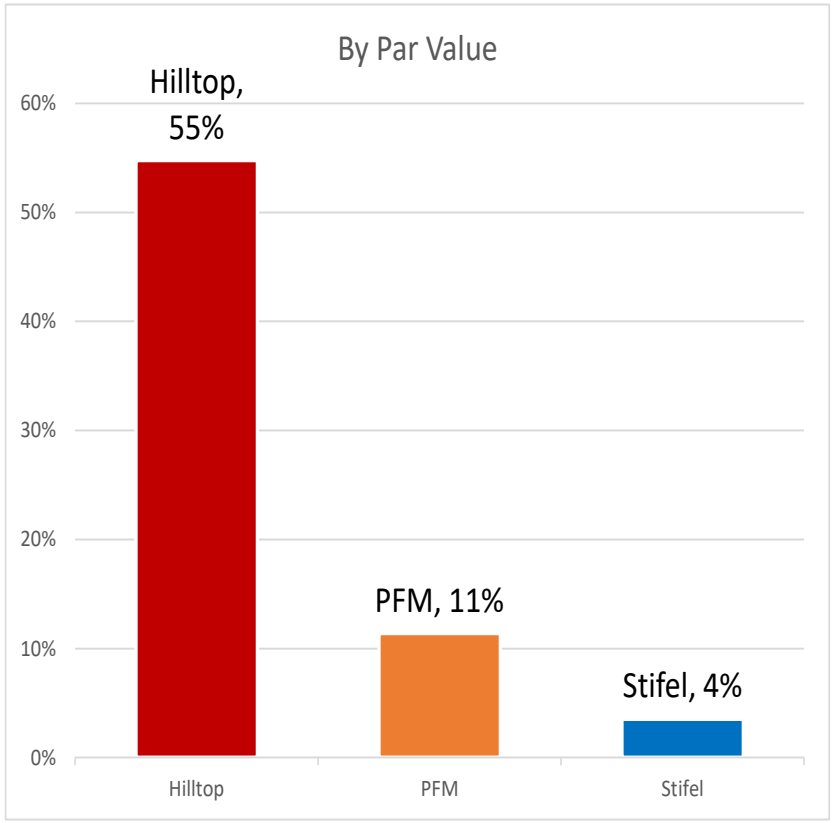
1990 - 2018



Pension Obligation Bond Experience

Acting as Financial Advisor or Underwriter, 2017-2018





CalPERS' Amortizations & Potential POBs

Tab 3

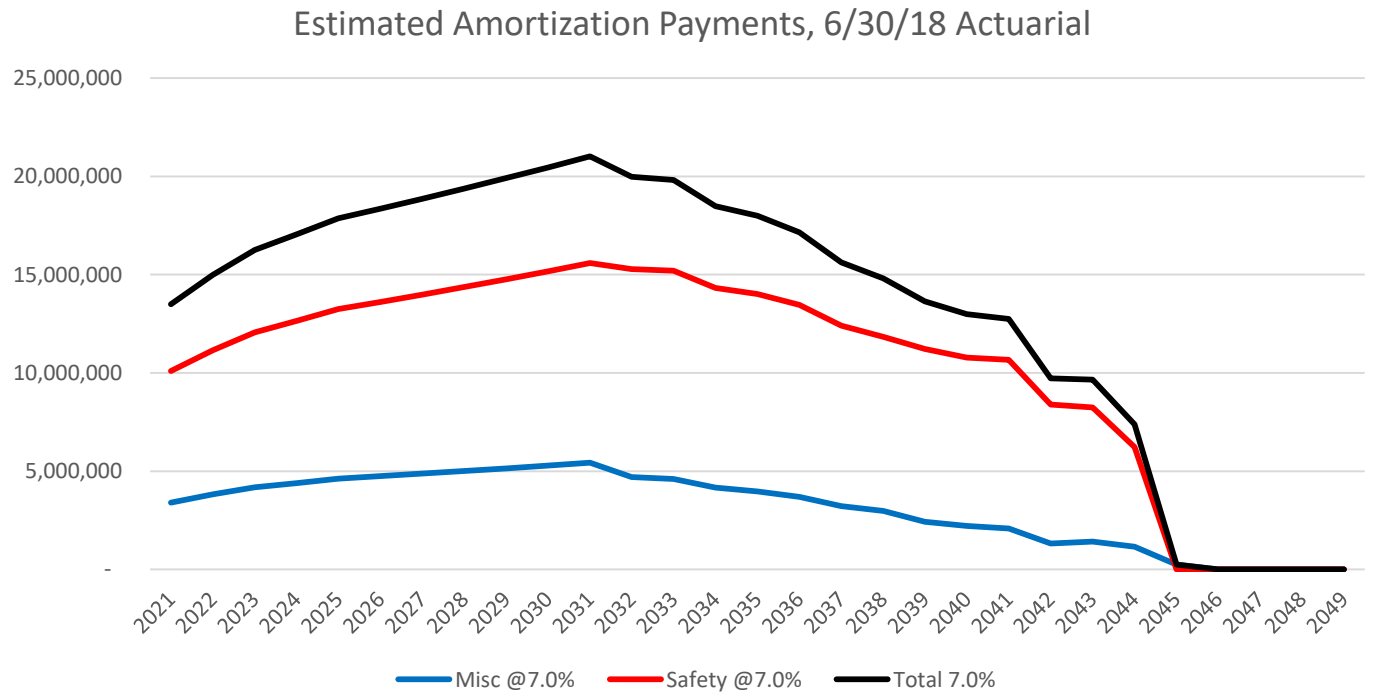
Key Issues Which Affect West Covina's Potential Pension Bond Structure

The City's objectives affect pension bond size and structure

1. Change the payment pattern (e.g., a smooth pattern for bond repayment, vs an irregular pattern with no bonds). Smoother payment patterns make budgeting easier
2. Leave amortization period unchanged
3. Raise the funded level of the pension plan (e.g., from 64.8% to 92%)
4. Do not merely delay budget pressure and future pain: establish a long-term plan well-suited to the City which incorporates best practices from pension bonds elsewhere

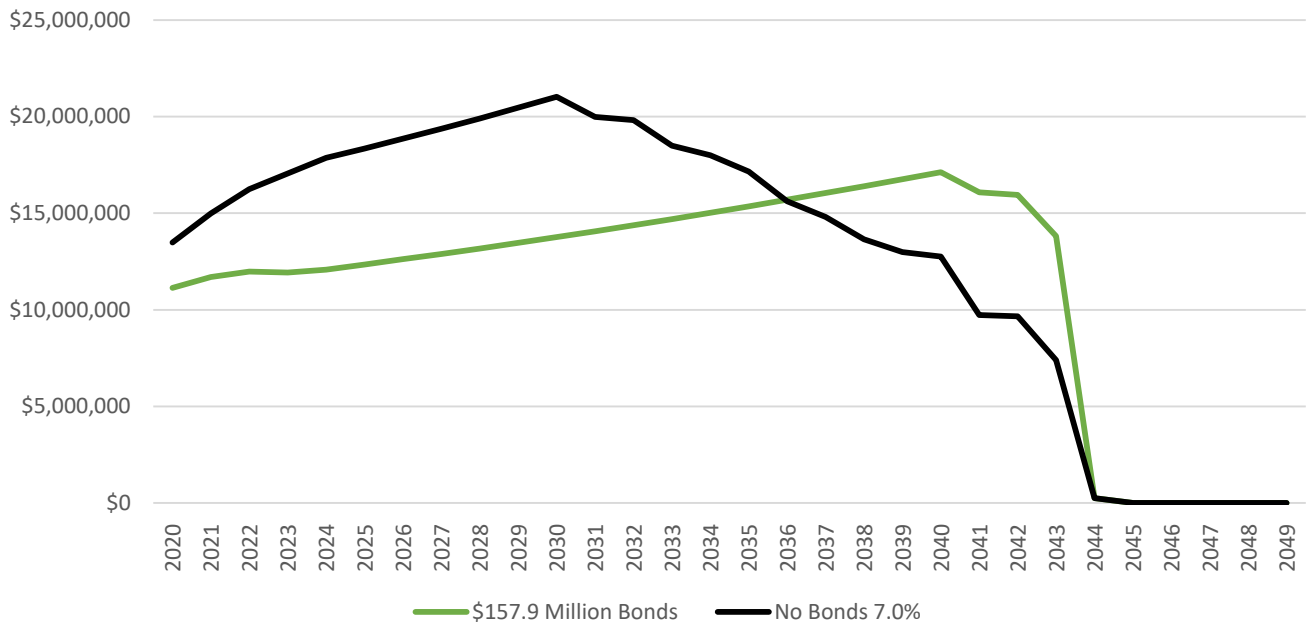
CalPERS' Amortization (6/30/2018 Actuarial)

- Chart uses 7.0% discount rate
- CalPERS' amortization is a projection, and will likely change due to causes such as:
  - Changes in actuarial assumptions, such as expected long term investment returns, inflation, retirement age, and mortality
  - Actual investment returns



POB Case Study: $156 Million Bond

- Results in approximately 92% funded ratio at 7% discount rate
- Includes amortization bases up to 24 years, POB is 24 years
- Produces large expected savings in most years (~3.3-7.3 million)
- Has up to $6.4 million dissavings/additional cost in later years
- NPV Savings estimated at 22.7%, $45.2 million



*Bond interest rates as of 10/16/19

S&P Rating Report – West Covina

Tab 4

S&P Global
Ratings

RatingsDirect®

Summary:

West Covina Public Financing Authority, California
West Covina; Appropriations

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Summary:

West Covina Public Financing Authority, California
West Covina; Appropriations

Credit Profile		
US$19.735 mil lse rev rfdg bnds (West Covina) ser 2018A due 05/01/2044		
Long Term Rating	A+/Stable	New
US$4.835 mil lse rev rfdg bnds (West Covina) ser 2018B due 05/01/2029		
Long Term Rating	A+/Stable	New

Rationale

S&P Global Ratings assigned its 'A+' long-term rating to the West Covina Public Financing Authority, Calif.'s series 2018A lease revenue refunding bonds and its series 2018B lease revenue refunding bonds (taxable), both issued on behalf of West Covina. At the same time, S&P Global Ratings affirmed its 'A+' long-term rating and underlying rating (SPUR) on previously issued debt for which the city is obligor. Inclusive of this refunding, we calculate that the city will have approximately $51 million in appropriation obligations outstanding at the end of fiscal 2019. The outlook is stable.

Security and use of proceeds

Both series are secured by base rental payments that the city will make, as lessee, to the authority, as lessor, for the use of four city facilities: the city hall, its communications building, a police facility, and a parking garage. The city must make semiannual lease payments at least five business days prior to debt service payments scheduled for Nov. 1 (interest) and May 1 (principal and interest), with supplemental liquidity protection in the form of a reserve requirement equal to half of the least of 10% of original principal, 125% of average annual debt service, or maximum annual debt service. We view these elements as effectively mitigating the risk of late appropriation of lease payments because the first payment falls four months after the beginning of the city's fiscal year and is less than the reserve requirement. Payments are subject to abatement in the event of damage to or destruction of leased assets, but the city has covenanted to maintain rental interruption insurance of at least two years and the properties meet our criteria for seismic risk during the life of the obligations. Our ratings on the series 2018A and 2018B and the city's other appropriation obligations are set one notch below our view of the city's general creditworthiness to account for appropriation risk.

The city will use the proceeds to refinance its series 2002B variable-rate lease revenue refunding bonds (public facilities project), series 2004A and 2004B variable-rate lease revenue bonds (golf course project), and series 2013A variable-rate demand lease revenue refunding bonds (community center project) outstanding. The city's municipal advisor estimates that the refinancing will cost the city approximately 1% on a present value basis during the life of the obligations using difficult-to-determine assumptions regarding the cost of variable-rate debt, partly as a result of a

structure that slows amortization relative to the obligations refunded. (We also no longer view the city's direct debt amortization as rapid.) However, the city sees overriding benefits in the form of lowering legal expenses and interest rate risks related to managing variable-rate obligations.

Credit overview

We think West Covina has largely completed a multiyear effort to address process and policy deficiencies outlined in a report the city commissioned from the California State Controller's Office in 2015. The city has used strengthened policies and staff additions to identify and address structural budgetary challenges as part of the fiscal 2019 budget cycle, and, although we view the city's financial performance as very weak and think the city will face challenges in identifying and implementing future expenditure cuts, we view this year's mix of ongoing and one-time actions as representing a willingness to achieve financial sustainability. The key influence on credit quality in the next five years, in our view, will be the city's ability to continue to make budgetary adjustments, particularly because pension contribution requirements are likely to rise relative to overall expenditures into the next decade.

The rating reflects our view of the city's:

- Strong economy, with access to a broad and diverse metropolitan statistical area;
- Strong management, with good financial policies and practices under our Financial Management Assessment methodology;
- Weak budgetary performance, with operating deficits in the general fund and at the total governmental fund level in fiscal 2017;
- Strong budgetary flexibility, with an available fund balance in fiscal 2017 of 22% of operating expenditures, but limited capacity to reduce expenditures;
- Very strong liquidity, with total government available cash at 58.6% of total governmental fund expenditures and 5.8x governmental debt service, and access to external liquidity we consider strong;
- Very weak debt and contingent liability position, with debt service carrying charges at 10.1% of expenditures and net direct debt that is 96.7% of total governmental fund revenue, as well as a large pension and other postemployment benefit (OPEB) obligation and the lack of a plan to sufficiently address the obligation; and
- Strong institutional framework score.

Strong economy

West Covina is well embedded in a broad and diverse region, as it sits 20 miles east of downtown Los Angeles on the Angeles-Long Beach-Anaheim metropolitan statistical area's main east-west corridor, Interstate 10. We consider the city's economy strong. The 108,245-resident city with an $11.9 billion assessed value, has a projected per capita effective buying income of 83.5% of the national level and per capita market value of $110,228. The county unemployment rate was 4.7% in 2017. We anticipate that the city's economic indicators will improve over the next two years, consistent with our projection of real GDP growth in the Western U.S. states through fiscal 2020.

We see the city's economy in transition, with a built-out service area and a slowly growing population with a buoyant regional economy spurring redevelopment. Its most prominent commercial property is its regional mall, Plaza West Covina, which we understand was recently acquired by hotelier Starwood Capital Group, which is seeking to update

the property toward entertainment and lodging from its historical retail focus. In addition, the city and its private partner are in the early stages of developing a 190-acre former landfill site that the city graded with the proceeds of a previous bond issue for a mix of hotel and private and public recreation uses, including a companion to the region's main horse race track, Santa Anita Park (in Los Angeles). On the residential front, the city is participating in the region's surge in ownership and rental prices; the city recently added a 450 multifamily rental project and a 56-unit townhome project. Overall, we think residential values have been crucial in a rise in assessed values, most recently by 6% for fiscal 2019.

Strong management

We view the city's management as strong, with good financial policies and practices under our Financial Management Assessment methodology, indicating our view that financial practices exist in most areas, but that governance officials might not formalize or monitor all of them on a regular basis.

Elements of the city's financial policies and practices include:

- Annual budgeting process guided by a formal policy that includes an analysis of internal expense and revenue trends, economic conditions, and results in a document that includes an analytical discussion of trade-offs and any structural challenges;
- Quarterly, analytically robust budget-to-actual reports provided to council to monitor financial performance;
- Five-year projections of the city's main revenue and expenditure categories that feed into budget presentations on big-picture implications of current decisions but are generally used as a tool for staff rather than the council;
- Five-year capital improvement plan that is integrated with the annual budget document and identifies funding sources for planned projects and lists projects that the city would like to pursue but for which funding has not yet been identified to help the city to weigh options amid limited resources;
- Monthly reporting on investments, which are managed under a comprehensive internal policy;
- Formal internal debt policy that lacks what we consider meaningful quantitative constraints but includes sound policy guidance and is bolstered by a practice of including debt service schedules in the city's annual budget; and
- Formal reserve policy that requires the city to maintain a minimum unassigned fund balance of 17% of expenditures, a three-year recovery period if reserves fall below this threshold, and a multiprong policy basis for this threshold, including managing risks related to economic uncertainties, natural disasters, unforeseen expenditures, and cash flow needs.

We think that the city has largely overcome its financial governance problems after requesting an audit by the California state controller's office in June 2014 of its internal control and fiscal management policies partly as a result of questions regarding a major decline in available general fund balances in fiscal years 2013 and 2014 (after which its balances recovered with the help of one-time resources). The controller's office report, which was released in July 2015, included a dozen findings for the city's core operations, which the city has since responded to. Most relevant to the city's credit profile, in our view, were issues regarding the adequacy of processes and staffing in the finance department. The city had turnover in the finance director role during 2015 to 2017, but after two interim appointments has hired a permanent person who has been in place since August 2018. Since 2015, we understand the city has augmented its financial staff and made multiple financial policy updates, which has led management to view the city

has having largely addressed the state controller's office findings. Partly as a result of the city's execution of a challenging set of budgetary adjustments as part of the fiscal 2019 cycle and continued auditor opinions that lack findings, we think the city has likely found its footing in terms of understanding its true financial position and fulfilling its procedural requirements, but we will continue to monitor the situation.

Weak budgetary performance

West Covina's budgetary performance is weak, in our opinion. The city had operating deficits of 1.6% of expenditures in the general fund and of 6.6% across all governmental funds in fiscal 2017. These ratios include an adjustment to add recurring transfers-out to debt service in our calculation of general fund expenditures and to remove one-time debt defeasances from total governmental funds expenditures for the city's series 2005 lease revenue refunding bonds and for capital leases.

We think that challenges surrounding building capacity in the city's finance department and updating policies and processes in recent years may have delayed the city's efforts to balance its ongoing operations, but we view the city's decisions in the fiscal 2019 budget process as signaling a potential stabilization. Despite a sustained economic expansion that has fueled revenue growth in other cities in the region, the city's general fund and total governmental funds posted negative net operations during fiscal years 2016 and 2017 and preliminary figures suggest a negative net result of about 4% of expenditures for the general fund for fiscal 2018. Management believes that recent deficits primarily stemmed from slow growth in property and sales tax revenue, which we think is likely a function of the city's built-out status in the context of limits on assessed value growth under state law and performance of its retail base (including auto dealerships), as well as rising pension and health care costs. We understand that the city temporarily addressed these with mostly one-time changes to police and fire services that were subsequently rescinded.

We believe that the city's actions for fiscal 2019 show it is determined to achieve lasting structural changes to balance its operations, but we also think that its challenges will persist as a result of scheduled escalations in pension contribution requirements. Concurrent with an increase in its minimum reserve policy to an unassigned general fund balance of 17% of expenditures from 10%, management pursued an iterative process with the city council to make $9.9 million in adjustments to whittle down its fiscal 2019 budgetary gap that started at $8.6 million, or about 13% of expenditures. These actions, which management anticipates will result in a small surplus for fiscal 2019, included mostly ongoing revenue and expenditure changes, the largest of which was a $4 million cut to public safety services, but also include about $3.8 million in one-time adjustments. In the absence of a major economic change that would accelerate tax revenue growth--the city sees property sales and redevelopment of private land as pieces of the long-term solution--we think that budgetary pressures are likely to persist in the medium term, primarily because the city's pension contributions, which already represent what we consider to be a large 16% of total governmental funds expenditures, are likely to grow into the next decade according to guidance from the city's defined benefit pension manager, the California Public Employees Retirement System (CalPERS). Thus, assuming the city is able to achieve its fiscal 2019 goal of balancing the budget, we anticipate that discussions regarding expenditure reductions will likely be part of the city's efforts to sustain balanced operations.

A second budgetary challenge, in our view, would be California voters' approval of Proposition 6, which would rescind a recent statewide increase in the state gas tax that generates revenue that flows to local governments such as the city by formula. The city reports that its "pavement condition index" is high by county standards and thus that it may have

more flexibility than most cities to defer road projects should state distributions fall in the coming years. And unlike many of its peers, the city has reserved its additional revenue under the increase to be conservative.

Strong budgetary flexibility

West Covina's budgetary flexibility is strong, in our view, with an available fund balance in fiscal 2017 of 22% of operating expenditures, or $14.1 million.

After resolution of uncertainties regarding the city's relationship with its redevelopment agency, which was dissolved earlier in the decade consistent with changes in state law, since fiscal 2015 the city's available general fund balance has exceeded the city's recently upgraded reserve policy of 17% of expenditures. We view the city's fiscal 2019 budgetary revisions as creating the conditions to remain in compliance with its policy through fiscal 2020 but note that its long-term projections suggest that baseline operations would cause the city's available reserves to fall below its policy-mandated level by fiscal 2020. Given our view that reducing expenditures by finding additional cuts to core services such as public safety could be difficult, our assessment of budgetary flexibility includes a negative adjustment.

Very strong liquidity

In our opinion, West Covina's liquidity is very strong, with total government available cash at 58.6% of total governmental fund expenditures and 5.8x governmental debt service in 2017. In our view, the city has strong access to external liquidity if necessary, given its frequent issuance of appropriation debt during the last 20 years. We anticipate that the city's liquidity profile will remain very strong for the foreseeable future despite our view that the city's financial performance is weak, because its liquidity ratios substantially exceed our minimum thresholds for very strong liquidity even before our adjustment for access to external liquidity. Management has confirmed that the city has no alternative financing, which we find can represent a source of contingent liquidity risk, outstanding.

We do not view the city's investments portfolio as aggressive, as it largely consists of cash and cash equivalents (44% as of July 2018) and federal agencies and treasuries (29%). Corporate obligations (15%), which are limited by policy to a maximum maturity of five years and a rating of at least 'A', represent the third-largest category and most of the balance of the portfolio.

Very weak debt and contingent liability profile

In our view, West Covina's debt and contingent liability profile is very weak. Total governmental fund debt service is 10.1% of total governmental fund expenditures, and net direct debt is 96.7% of total governmental fund revenue.

Our calculation of net direct debt and debt amortization reflects our inclusion of tax increment debt and a revised debt service schedule on a pro forma basis as part of the issuance of the series 2018A and 2018B. As part of the change in payment structure associated with this refunding, we calculate that the city's amortization has slowed to a level slightly below our 65% threshold for rapid debt amortization.

In our opinion, a credit weakness is West Covina's large pension and OPEB obligation, without a plan in place that we think will materially lower its annual contribution burden during the next five years. West Covina's required pension and actual OPEB contributions totaled 16.4% of total governmental fund expenditures in 2017, with 13.8% representing required contributions to pension obligations and 2.6% representing OPEB payments. The city made its full annual required pension contribution in 2017. The funded ratio of the largest pension plan is 63.5%.

The city participates in agent, multiple-employer defined benefit miscellaneous and safety pension plans managed by CalPERS. Under Governmental Accounting Standard Board (GASB) Statement Nos. 67 and 68, the city's fiduciary net position as of June 30, 2015 was $218.1 million for the safety plan and $104.9 million for the miscellaneous plan. These translated into funded levels of 63.5% and 73.2%, respectively, relative to the total pension liabilities. For fiscal 2017, the city's combined contribution, which was equal to its actuarially required contribution, was equal to 16.3% of total government funds expenditures.

We anticipate that pension costs will become an increasing budgetary challenge in the next five years because, effective June 30, 2019, CalPERS will convert to a layered 20-year, level dollar amortization policy on new gains and losses, from the layered 30-year, level percent approach CalPERS has used since 2013. While the new approach will lead to more rapid contribution increases and increased payment volatility, shorter amortization will provide a faster recovery to plan funding following years of poor investment performance or upward revisions to pension liability. In the long run we expect these changes to be a credit positive.

The city meets its OPEB obligation, which consists of a capped health care benefit and a capped life insurance benefit, on a pay-as-you go basis. Its unfunded actuarial accrued liability (UAAL) stood at $55.8 million as of its June 30, 2015 measurement date. (We understand the liability dropped by $9.4 million from June 30, 2013 after the removal of an assumption that a cost-of-living adjustment would be built into the benefit.) The city has not set up an irrevocable trust that could be used to report an actuarial asset to address the liability, but, as part of its 2018 revision to its reserve policy, plans to use 25% of future surpluses to set aside resources for OPEB payments.

Because the city does not plan to issue additional debt for the foreseeable future, we believe we will likely again view the city's debt portfolio as having a rapid amortization schedule by 2020. However, we anticipate that our assessment of the city's debt and contingent liability profile will remain very weak during the next two years unless the city's total governmental funds expenditures or market value accelerate significantly.

Strong institutional framework

The institutional framework score for California municipalities required to submit a federal single audit is strong.

The city is subject to the federal single-audit requirement given that federal awards over multiple programs greatly exceed $750,000 per year. These conditions trigger enhanced financial reporting requirements under state law.

Outlook

The stable outlook reflects our view that the city's efforts to balance its operations may come to fruition for fiscal 2019 but that the prominence of one-time measures as part of this year's budget-balancing actions and the likelihood of increases in pension contributions into the next decade suggest continued weak financial performance and persistent challenges in maintaining compliance with the city's recently strengthened reserve policy. The outlook also reflects our anticipation of property tax and sales tax revenue growth through fiscal 2020, albeit modest. We do not anticipate changing our rating during our two-year outlook horizon.

Upside scenario

We could raise the rating if we come to believe that the city has sustainably resolved its medium- to long-term budgetary challenges, likely as a result of a combination of multiple factors, such as a major strengthening of the tax base and ongoing expenditure changes. Making a positive rating action more likely in this context would be strengthening in the city's economic profile and/or improvements to the city's institutional policies and practices as inventoried in our financial management assessment.

Downside scenario

Given our view that the city faces challenges in maintaining financial sustainability, we see continued negative general fund net results, particularly if they erode the city's reserves to a level below its 17%-of-expenditures policy minimum without a credible plan to restore compliance, as the most likely factor that could lead us to lower the rating. We plan to monitor the extent to which the city's leadership is able to continue to explore budget-balancing actions as part of its next two budget cycles.

Related Research

2018 Update Of Institutional Framework For U.S. Local Governments

Ratings Detail (As Of October 12, 2018)		
West Covina Pub Fin Auth, California		
West Covina, California		
West Covina Pub Fin Auth APPROP		
Long Term Rating	A+/Stable	Affirmed
West Covina Pub Fin Auth APPROP		
Long Term Rating	A+/Stable	Affirmed
West Covina Pub Fin Auth lse rev (Big League Dreams Proj) ser 2006B (XLCA)		
Unenhanced Rating	A+(SPUR)/Stable	Affirmed

Many issues are enhanced by bond insurance.

Certain terms used in this report, particularly certain adjectives used to express our view on rating relevant factors, have specific meanings ascribed to them in our criteria, and should therefore be read in conjunction with such criteria. Please see Ratings Criteria at www.standardandpoors.com for further information. Complete ratings information is available to subscribers of RatingsDirect at www.capitaliq.com. All ratings affected by this rating action can be found on S&P Global Ratings' public website at www.standardandpoors.com. Use the Ratings search box located in the left column.

Investment Advisor Survey

Tab 4

Horizon Actuarial Services, LLC

Survey of Capital Market Assumptions

2019 Edition

Horizon Actuarial Services, LLC is proud to serve as the actuary to over 100 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 retirement and healthcare 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 seek input from 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?"

There are many factors to consider when evaluating a plan's investment return assumptions, such as its asset allocation, the maturity of its participant population, and the purpose of the measurement. 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 34 investment advisors who participated in this survey.

Atlanta ▪ Cleveland ▪ Denver ▪ Irvine ▪ Los Angeles
Miami ▪ San Diego ▪ San Francisco ▪ Washington, D.C.

 www.horizonactuarial.com Published: August 2019

Survey of Capital Market Assumptions: 2019 Edition

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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.

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 2019 edition of the survey includes assumptions from 34 different investment firms.

In general, expected returns have declined in recent years. When we focus on the 25 advisors who participated in each of the last five surveys, we see that expected returns for equity and alternative investments generally decreased from 2015 to 2019. During the same period, expected returns for core fixed income and U.S. Treasuries have increased slightly. The expected volatility for private equity has decreased in recent years, but volatilities have not changed significantly for other asset classes.

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 16 advisors who provided assumptions for both the short term (up to 10 years) and long term (20 years or more).

For less mature 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 more mature or has solvency issues. 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 shows 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 a range of reasonably expected returns for the plan. When compared to the 2018 edition of the survey, the expected returns for this 2019 edition were 15 basis points higher over a 10-year horizon and 11 basis points lower over a 20-year horizon. These changes were driven not only by changes in expectations for continuing advisors, but also by changing participation in the survey.

Although the number of advisors has remained level at 34, past participants were excluded due to mergers, and new participants were included. In addition, multiple advisors who previously provided only short-term assumptions also included long-term assumptions in 2019.

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 Ben Ablin at ben.ablin@horizonactuarial.com.

Survey Participants

Exhibit 1 below lists the 34 investment advisors whose capital market assumptions are included in the 2019 survey. This report does 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.

A complete listing of the firms participating in the survey is provided below.

Exhibit 1

2019 Survey Participants	
AJ Gallagher	*Marquette Associates*
Alan Biller	*Meketa Investment Group*
AndCo Consulting	*Mercer*
Aon Hewitt	*Merrill Lynch Global Institutional Consulting*
The Atlanta Consulting Group	*Morgan Stanley Wealth Management*
*Bank of New York Mellon**	*NEPC*
*BlackRock**	*PFM Asset Management, LLC*
Callan Associates	*Research Affiliates, LLC**
Cambridge Associates	*RVK*
CapTrust	*Segal Marco Advisors*
Ellwood Associates	*SEI*
Envestnet	*Sellwood Consulting*
Goldman Sachs Asset Management	*SunTrust**
Graystone Consulting	*UBS*
Investment Performance Services, LLC (IPS)	*Verus*
Janney Montgomery Scott, LLC	*Voya Investment Management**
*J.P. Morgan Asset Management**	*Willis Towers Watson*

* Assumptions obtained from published white paper

Investment Horizons

When evaluating the expected return assumption for an active, ongoing multiemployer pension plan, actuaries 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 mature plan, a plan that has high negative cash flows, or a plan that 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, evaluating the sensitivity of funding results to short-term investment returns that are expected to be higher or lower than the long-term assumption also plays an integral role in the decision making process.

Survey participants were requested to provide their most recent capital market assumptions: expected returns for different asset classes, standard deviations (i.e., volatilities) 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 2019 edition of the survey, 18 advisors provided one set of assumptions: of those, 17 specified a time horizon of 10 years and 1 specified a time horizon of 7 years. The remaining 16 advisors provided assumptions over both shorter-term (5 to 10 years) and longer-term (20 years or more) horizons. Note that two of the advisors rely on the same assumptions as other survey participants. Each assumption set was only counted once, even if it was provided by more than one advisor.

Exhibit 2 below summarizes the time horizons specified by each advisor, grouped by type.

Exhibit 2

Investment Time Horizons			
Advisor Type	**(A)**	**(B)**	**Total**
5 to 10 Years	13	5	18
Both Short- and Long-Term	15	1	16
Total	28	6	34

(A) Survey respondent
(B) Published white paper

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 versus over the long term.

For comparability, this survey groups expected returns into two time horizons: 10 years and 20 years. As pension plan actuaries, 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 16 advisors who provided both short-term and long-term assumptions,[1] we see some interesting differences. See Exhibit 3 below. The expected returns shown below 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 16 Survey Respondents

Asset Class	10-Year Horizon	20-Year Horizon	Difference
US Equity - Large Cap	6.09%	7.05%	0.97%
US Equity - Small/Mid Cap	6.72%	7.54%	0.83%
Non-US Equity - Developed	7.44%	7.70%	0.26%
Non-US Equity - Emerging	8.24%	8.67%	0.44%
US Corporate Bonds - Core	3.53%	4.30%	0.77%
US Corporate Bonds - Long Dur.	3.49%	4.39%	0.90%
US Corporate Bonds - High Yield	5.14%	5.82%	0.68%
Non-US Debt - Developed	2.75%	3.43%	0.68%
Non-US Debt - Emerging	5.56%	6.06%	0.50%
US Treasuries (Cash Equivalents)	2.78%	3.03%	0.25%
TIPS (Inflation-Protected)	3.04%	3.49%	0.45%
Real Estate	6.01%	6.82%	0.82%
Hedge Funds	5.58%	6.18%	0.60%
Commodities	4.69%	4.68%	0.00%
Infrastructure	6.96%	7.24%	0.27%
Private Equity	9.27%	10.10%	0.83%
Private Debt	7.49%	7.76%	0.28%
Inflation	2.30%	2.29%	-0.01%

The 10-year and 20-year returns shown above are the averages for the 16 advisors who provided both short-term and long-term assumptions. Expected returns are annualized (geometric).

The consensus among these 16 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. The differences are also relatively large for alternative investments such as private equity, real estate, and hedge funds.

As noted earlier, the results shown in Exhibit 3 are based on a subset of 16 advisors. If we include all 34 survey advisors, the differences between short-term and long-term expected returns do not change dramatically for most asset classes. 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	6.03%	7.05%	1.02%
US Equity - Small/Mid Cap	6.55%	7.54%	0.99%
Non-US Equity - Developed	6.83%	7.70%	0.87%
Non-US Equity - Emerging	7.77%	8.67%	0.91%
US Corporate Bonds - Core	3.58%	4.30%	0.71%
US Corporate Bonds - Long Dur.	3.53%	4.39%	0.86%
US Corporate Bonds - High Yield	5.10%	5.82%	0.72%
Non-US Debt - Developed	2.56%	3.43%	0.87%
Non-US Debt - Emerging	5.57%	6.06%	0.50%
US Treasuries (Cash Equivalents)	2.66%	3.03%	0.37%
TIPS (Inflation-Protected)	3.10%	3.49%	0.39%
Real Estate	5.79%	6.82%	1.04%
Hedge Funds	5.27%	6.18%	0.91%
Commodities	3.90%	4.68%	0.78%
Infrastructure	6.78%	7.24%	0.46%
Private Equity	8.97%	10.10%	1.13%
Private Debt	7.37%	7.76%	0.39%
Inflation	2.21%	2.29%	0.08%

10-year horizon results include all 34 survey respondents.
20-year horizon results include a subset of 16 survey respondents.
Expected returns are annualized (geometric).

The 10-year expected returns shown above include assumptions from all 34 advisors, while the 20-year expected returns include assumptions from only the 16 advisors who provided longer-term assumptions.

Given the significant differences in expected returns over the short term and the long term, it remains important for actuaries to illustrate the effects of near-term underperformance on their clients' pension funds. Furthermore, it may be appropriate for actuaries to attribute more weight to nearer term expectations when setting the investment return assumption for mature plans whose liabilities have a shorter duration.

[1] In cases where an advisor indicated a time horizon shorter than 10 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, the longer-term expected returns were combined with the shorter-term expected returns to achieve a 20-year horizon.

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 34 individual advisors in the survey. The expected returns shown are geometric. As noted earlier, returns are assumed to be indexed and net of fees.

Note that the exhibit below focuses on a 10-year horizon in order to include assumptions from all 34 advisors. See Exhibits 16 and 17 in the appendix to this report for a more detailed look at the distribution of expected returns and standard deviations over both 10- and 20-year horizons. The ranges of expected returns by asset class can be found in the appendix as Exhibits 18 and 19.

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

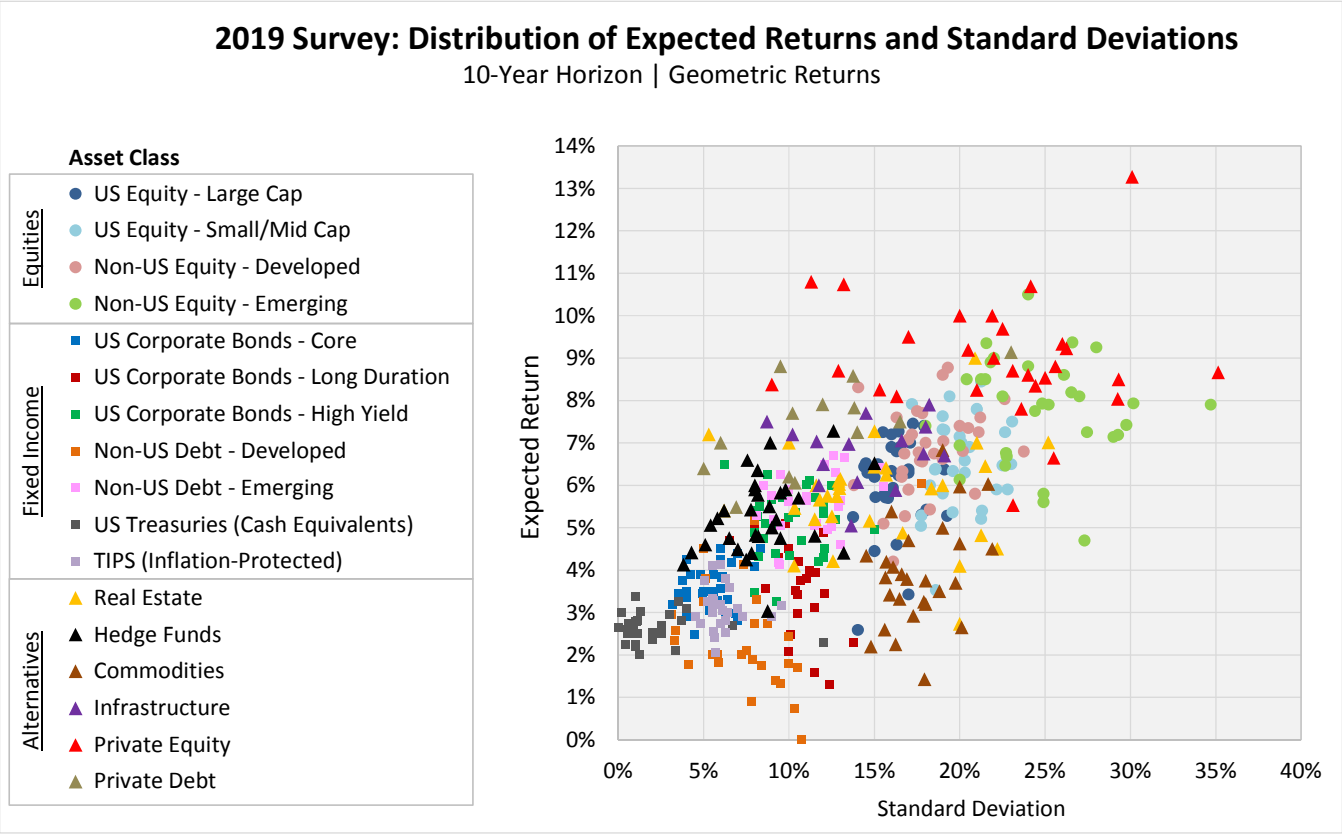
The differences in assumptions are more pronounced for alternative investments such as real estate, hedge funds, and private equity.

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.

Another reason for the significant differences among investment advisors is the effective date of the assumptions. Some advisors update their assumptions annually, while others update their assumptions more frequently (e.g., quarterly). Since current price and yield information are two of the most important inputs in developing capital market assumptions, differing prices and yields at different effective dates can have a significant impact on future expectations. For example, the assumptions that were provided as of January 1, 2019 tended to be significantly higher than those that were provided as of April 1, 2019.

A summary of the average survey assumptions can be found in the appendix to this report as Exhibit 15. This summary includes expected returns, standard deviations, and a correlation matrix.

Exhibit 5



Changing Outlooks: 2015 to 2019

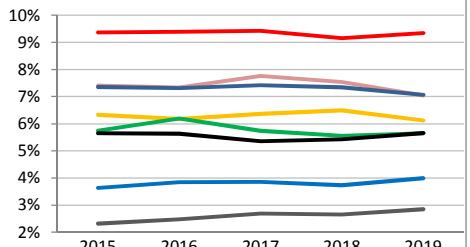
In recent years, there has been much discussion about whether it is reasonable to expect that future investment returns will be as high as they have been historically. Citing various reasons such as increased equity prices, tightening credit spreads, and continuing low interest rates, many advisors have lowered their expectations over the last five years.

Exhibit 6 below shows average expected returns for selected asset classes each year from 2015 to 2019. For consistency, this exhibit includes only the 25 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.[2] For that reason (as well as the fact that we include only a subset of advisors), the expected returns shown below are not directly comparable with those in other sections or previous surveys.

Exhibit 6

Average Expected Returns: 2015 - 2019



	2015	2016	2017	2018	2019
Private Equity	9.4%	9.4%	9.4%	9.2%	9.3%
Non-US Eq. (Dev)	7.4%	7.3%	7.8%	7.5%	7.0%
US Eq. (Large Cap)	7.4%	7.3%	7.4%	7.3%	7.1%
Real Estate	6.3%	6.2%	6.4%	6.5%	6.1%
US Bonds (HY)	5.7%	6.2%	5.7%	5.6%	5.6%
Hedge Funds	5.6%	5.6%	5.4%	5.4%	5.7%
US Bonds (Core)	3.6%	3.8%	3.9%	3.7%	4.0%
US Treasuries	2.3%	2.5%	2.7%	2.7%	2.8%

Figures are average geometric returns for selected asset classes for the 25 advisors who participated in each of the surveys from 2015 through 2019.

For this subset of advisors, average expected returns have declined for certain asset classes and increased for others. The sharpest declines from 2015 to 2019 were for emerging market equity (from 7.4% to 7.0%) and US large cap equity (from 7.4% to 7.1%).

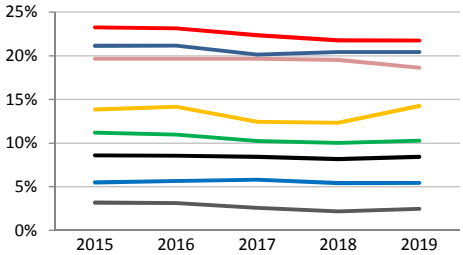
Other asset classes, such as private equity, high-yield bonds, and hedge funds have seen relatively flat expectations over the five-year period.

Average expected returns for asset classes with lower expected returns such as core fixed income and US Treasuries have increased from 2015 to 2019.

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

Average Standard Deviations: 2015 - 2019



	2015	2016	2017	2018	2019
Private Equity	23.3%	23.1%	22.3%	21.8%	21.8%
Non-US Eq. (Dev)	19.6%	19.7%	19.7%	19.5%	18.7%
US Eq. (Large Cap)	21.1%	21.2%	20.1%	20.4%	20.4%
Real Estate	13.8%	14.2%	12.4%	12.3%	14.3%
US Bonds (HY)	11.2%	11.0%	10.3%	10.0%	10.3%
Hedge Funds	8.6%	8.6%	8.4%	8.2%	8.4%
US Bonds (Core)	5.5%	5.7%	5.8%	5.4%	5.5%
US Treasuries	3.2%	3.1%	2.6%	2.2%	2.5%

Figures are average standard deviations for selected asset classes for the 25 advisors who participated in each of the surveys from 2015 through 2019.

In general, average standard deviations have declined from 2015 to 2019. The declines for private equity, emerging market equity, US large cap equity and high-yield bonds were the most pronounced.

Standard deviations have remained relatively flat for other asset classes such as hedge funds and core US bonds.

Real estate is the only asset class for which the average standard deviation has increased over the five-year period. It is important to note that the expectations in this survey generally represent equity real estate expectations for core real estate and REITs. The return and volatility expectations for other classes of real estate (e.g., value-add, opportunistic, real estate debt, etc.) may differ widely from the expectations shown here.

[2] Of the 16 survey advisors who provided both shorter-term and longer-term assumptions, 13 of them indicated no difference in the standard deviations of the expected returns over the short term versus the long term. For the other 3 advisors, the differences between short-term and long-term standard deviations were very minor.

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 meet the goals of the Trustees. This typically involves maximizing returns over the long term while minimizing return volatility.

The actuary of a multiemployer pension plan must consider 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 seek input on future return expectations from 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.

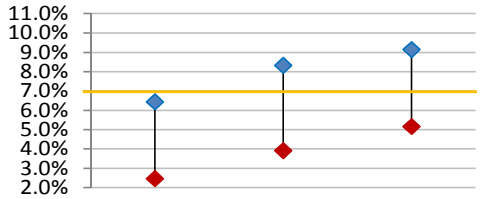
Exhibit 8

Asset Class - Hypothetical Plan	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	7.5%
Hedge Funds	5.0%
Commodities	2.5%
Infrastructure	2.5%
Private Equity	5.0%
Private Debt	2.5%
TOTAL PORTFOLIO	**100.0%**

Exhibit 9 shows expected annualized (geometric) returns 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 plan with severely negative cash flows or solvency issues.

Exhibit 9

Annualized Expected Returns
Hypothetical Multiemployer Pension Fund
10-Year Horizon

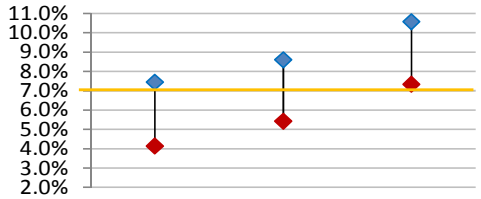


	Conservative Advisor	Survey Average	Optimistic Advisor
75th percentile	6.43%	8.32%	9.13%
25th percentile	2.46%	3.90%	5.15%
Probability of Meeting or Exceeding:			
7.50% per Year	14.9%	33.6%	45.2%
7.00% per Year	19.2%	39.3%	51.9%
6.50% per Year	24.2%	45.3%	58.6%

Exhibit 10 shows expected annualized (geometric) returns for the hypothetical plan over a 20-year horizon based on assumptions from the 16 advisors who provided longer-term assumptions. These results may be more appropriate for evaluating the return assumption for a less mature plan with no projected solvency issues.

Exhibit 10

Annualized Expected Returns
Hypothetical Multiemployer Pension Fund
20-Year Horizon



	Conservative Advisor	Survey Average	Optimistic Advisor
75th percentile	7.44%	8.60%	10.57%
25th percentile	4.14%	5.42%	7.33%
Probability of Meeting or Exceeding:			
7.50% per Year	24.3%	41.7%	72.7%
7.00% per Year	31.1%	50.1%	79.2%
6.50% per Year	38.6%	58.5%	84.6%

Evaluating the Return Assumption (cont)

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:

Range of Reasonable Assumptions: When setting the investment return assumption for pension valuations, actuaries traditionally constructed a range of reasonable 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 2019 survey, the middle 50 percent range for this hypothetical pension plan is very wide: 5.42% to 8.60% over the next 20 years. Note that the range is even wider for a 10-year horizon: 3.90% to 8.32%. 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 7.00% per year, represented by the gold lines in Exhibits 9 and 10. Based on the average assumptions in this 2019 survey, there is a 50.1% probability the plan will meet or beat its 7.00% benchmark on an annualized basis over a 20-year period. The probability is lower, 39.3%, 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 7.50% (arbitrarily, 50 basis points above the benchmark return) is 41.7%. The probability that the annualized return will exceed 6.50% (50 basis points below the benchmark) is 58.5%. 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 may have 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 7.00% benchmark assumption over the next 20 years is 31.1%. Using assumptions from the most optimistic advisor results in a probability of 79.2%. Again, reasonable people may differ.

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

- 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.
- Many of the advisors develop their future assumptions based on investment horizons of no more than 10 years, and 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 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.

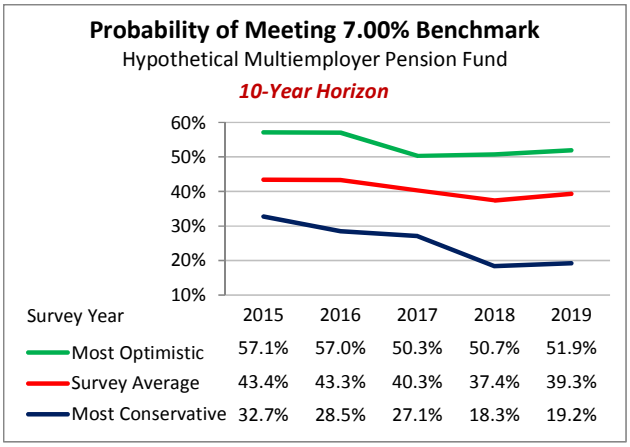
Use of the Survey: This survey is not intended to be a substitute for the expectations of individual portfolio managers, advisors, or actuaries performing their own independent analyses. The actuarial standards of practice provide for various methods of selecting the investment return assumption. This survey is intended to be used in conjunction with these methods, with appropriate weighting of various resources based on the plan actuary's professional judgment.

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 2015 to 2019. (Note that the allocation was changed slightly to include private debt for the first time in 2019.)

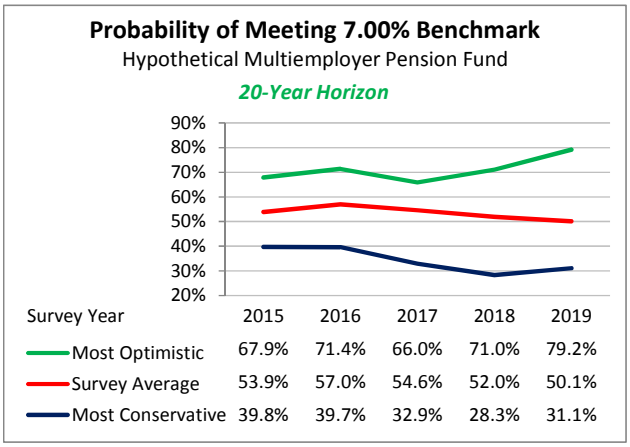
Both exhibits show the probabilities that the hypothetical pension plan will meet or exceed its 7.00% benchmark return on an annualized basis over the given time horizon. Exhibit 11 focuses on expected returns over a 10-year period, and Exhibit 12 focuses on expected returns over a 20-year period. Probabilities are shown for the survey average for each year from 2015 through 2019. For comparison, probabilities are also shown for the most conservative and optimistic advisors in each survey.

Exhibit 11



Survey Year	2015	2016	2017	2018	2019
Most Optimistic	57.1%	57.0%	50.3%	50.7%	51.9%
Survey Average	43.4%	43.3%	40.3%	37.4%	39.3%
Most Conservative	32.7%	28.5%	27.1%	18.3%	19.2%

Exhibit 12



Survey Year	2015	2016	2017	2018	2019
Most Optimistic	67.9%	71.4%	66.0%	71.0%	79.2%
Survey Average	53.9%	57.0%	54.6%	52.0%	50.1%
Most Conservative	39.8%	39.7%	32.9%	28.3%	31.1%

As shown in Exhibits 11 and 12, the probabilities that this hypothetical pension plan would meet or beat a benchmark return of 7.00% have generally decreased from 2015 to 2019. However, the probabilities over a 10-year horizon have actually increased since the prior survey was conducted in 2018.

For example:

- Based on the average assumptions from the 2019 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.00% over the next 10 years is 39.3%. While this represents a small increase from 2018 when the probability was only 37.4%, the probability was considerably higher (43.4%) five years ago when the 2015 survey was conducted.

- Based on the average assumptions from the 2019 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.00% over the next 20 years is 50.1%. This represents a decline from 2018 when the probability was 52.0% and also from 2015 when the probability was 53.9%.

Other points of note when comparing the results from the 2019 survey to those from prior years:

- The results for the most conservative advisor decreased significantly from 2015 to 2018 over both 10- and 20-year horizons. This trend has reversed for 2019, where we see a small increase in the probability of the hypothetical plan meeting its 7.00% benchmark over both 10- and 20-year horizons. Even with these increases, the most conservative advisor over a 10-year horizon projects less than a 1 in 5 chance of meeting the benchmark. The prognostication is slightly better for the most conservative advisor over a 20-year horizon, but remains less than 1 in 3.

- The results for the most optimistic advisor in each survey have increased in recent years. Over a 10-year horizon, the probability of meeting the 7.00% benchmark reached a low of 50.3% in 2017 and has since increased to 51.9%. Over a 20-year horizon, the results are more pronounced. After reaching a low of 66.0% in 2017, the most optimistic advisor in the 2019 survey projects a 79.2% chance of meeting the 7.00% benchmark over the long term.

- Note that the most conservative and most optimistic advisors are not necessarily the same from year to year.

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 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, it is more appropriate to focus on geometric returns. However, arithmetic returns are also important. For example, the expected return of a portfolio is calculated as the weighted average of arithmetic returns, not geometric returns.

This survey focuses on geometric returns. 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.

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

In this formula, $E[R_G]$ is the expected geometric return, $E[R_A]$ is the expected arithmetic return, and VAR[R] is the variance of the expected annual (arithmetic) 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 a 10-year investment horizon, and "long-term" expected returns to apply to a 20-year horizon.

In this 2019 edition of the survey, 18 of the 34 advisors provided only short-term assumptions, indicating a horizon of no more than 10 years. Included in this group is 1 advisor who provided assumptions over a horizon of 7 years.

All 16 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 time horizon longer than 20 years, the longer-term expected returns were combined with the shorter-term expected returns to achieve 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 assumption set was given equal weight in developing the average assumptions for the survey, regardless of factors such as total assets under advisement, research methodology, etc.

Exhibit 13

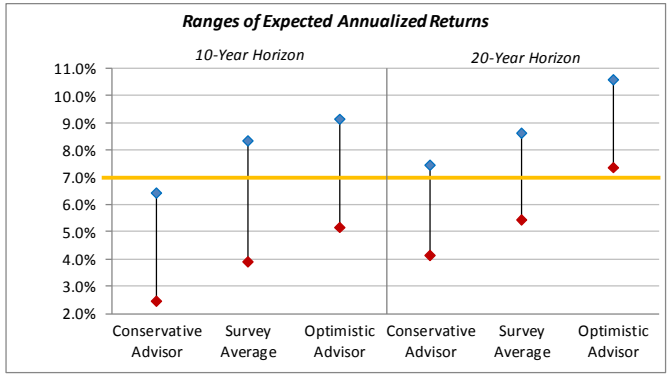
The following exhibit evaluates the investment return assumption for a hypothetical multiemployer pension plan. It reflects the same hypothetical asset allocation as shown in Exhibit 8, and it provides more detail than Exhibits 9 and 10. Note that the most conservative and optimistic advisors for the 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 7.00% per year, which is indicated by the gold line in the exhibit below.

Hypothetical Multiemployer Plan

2019 Survey of Capital Market Assumptions

		Average Survey Assumptions		
Asset Class	Portfolio Weight	10-Year Horizon	20-Year Horizon	Standard Deviation
US Equity - Large Cap	20.0%	6.03%	7.05%	16.17%
US Equity - Small/Mid Cap	10.0%	6.55%	7.54%	20.15%
Non-US Equity - Developed	7.5%	6.83%	7.70%	18.23%
Non-US Equity - Emerging	5.0%	7.77%	8.67%	24.73%
US Corporate Bonds - Core	7.5%	3.58%	4.30%	5.47%
US Corporate Bonds - Long Duration	2.5%	3.53%	4.39%	10.50%
US Corporate Bonds - High Yield	5.0%	5.10%	5.82%	10.06%
Non-US Debt - Developed	5.0%	2.56%	3.43%	7.61%
Non-US Debt - Emerging	2.5%	5.57%	6.06%	11.31%
US Treasuries (Cash Equivalents)	5.0%	2.66%	3.03%	2.31%
TIPS (Inflation-Protected)	5.0%	3.10%	3.49%	6.11%
Real Estate	7.5%	5.79%	6.82%	15.03%
Hedge Funds	5.0%	5.27%	6.18%	8.38%
Commodities	2.5%	3.90%	4.68%	17.66%
Infrastructure	2.5%	6.78%	7.24%	14.39%
Private Equity	5.0%	8.97%	10.10%	22.05%
Private Debt	2.5%	7.37%	7.76%	11.62%
Inflation	N/A	2.21%	2.29%	1.73%
TOTAL PORTFOLIO	**100.0%**	*Expected returns are geometric.*		

	10-Year Horizon			*20-Year Horizon*		
	Conservative Advisor	**Survey Average**	**Optimistic Advisor**	**Conservative Advisor**	**Survey Average**	**Optimistic Advisor**
Expected Returns						
Average Annual Return (Arithmetic)	4.85%	6.62%	7.55%	6.36%	7.52%	9.47%
Annualized Return (Geometric)	4.44%	6.11%	7.14%	5.79%	7.01%	8.95%
Annual Volatility (Standard Deviation)	9.31%	10.36%	9.33%	10.96%	10.55%	10.72%
Range of Expected Annualized Returns						
75th Percentile	6.43%	8.32%	9.13%	7.44%	8.60%	10.57%
25th Percentile	2.46%	3.90%	5.15%	4.14%	5.42%	7.33%
Probabilities of Exceeding Certain Returns						
7.50% per Year, Annualized	14.9%	33.6%	45.2%	24.3%	41.7%	72.7%
7.00% per Year, Annualized	19.2%	39.3%	51.9%	31.1%	50.1%	79.2%
6.50% per Year, Annualized	24.2%	45.3%	58.6%	38.6%	58.5%	84.6%



Considerations and Limitations

- Allocations may be approximated if certain asset classes are not included in the survey.
- Many investment advisors provided only shorter-term assumptions (10 years or less).
- Assumptions are generally based on indexed returns and do not reflect anticipated alpha.
- Assumptions do not reflect investment opportunities or fee considerations available to larger funds.

SOURCE: Horizon Actuarial 2019 Survey of Capital Market Assumptions

Expected returns over a 10-year horizon include all 34 survey participants.

Expected returns over a 20-year horizon are based a subset of 16 survey participants who provided long-term assumptions.

Exhibit 14

The following exhibit shows the distribution of expected annualized returns and annual standard deviations for the same hypothetical asset allocation that is shown in Exhibit 13. The expected annualized return and annual standard deviation of the hypothetical asset allocation are shown separately for each advisor who participated in the survey. Individual advisors are grouped by investment horizon, and the survey average assumptions are shown in red. The exhibit shows that there are a wide variety of investment return assumptions that could be considered to be reasonable for any given asset allocation.

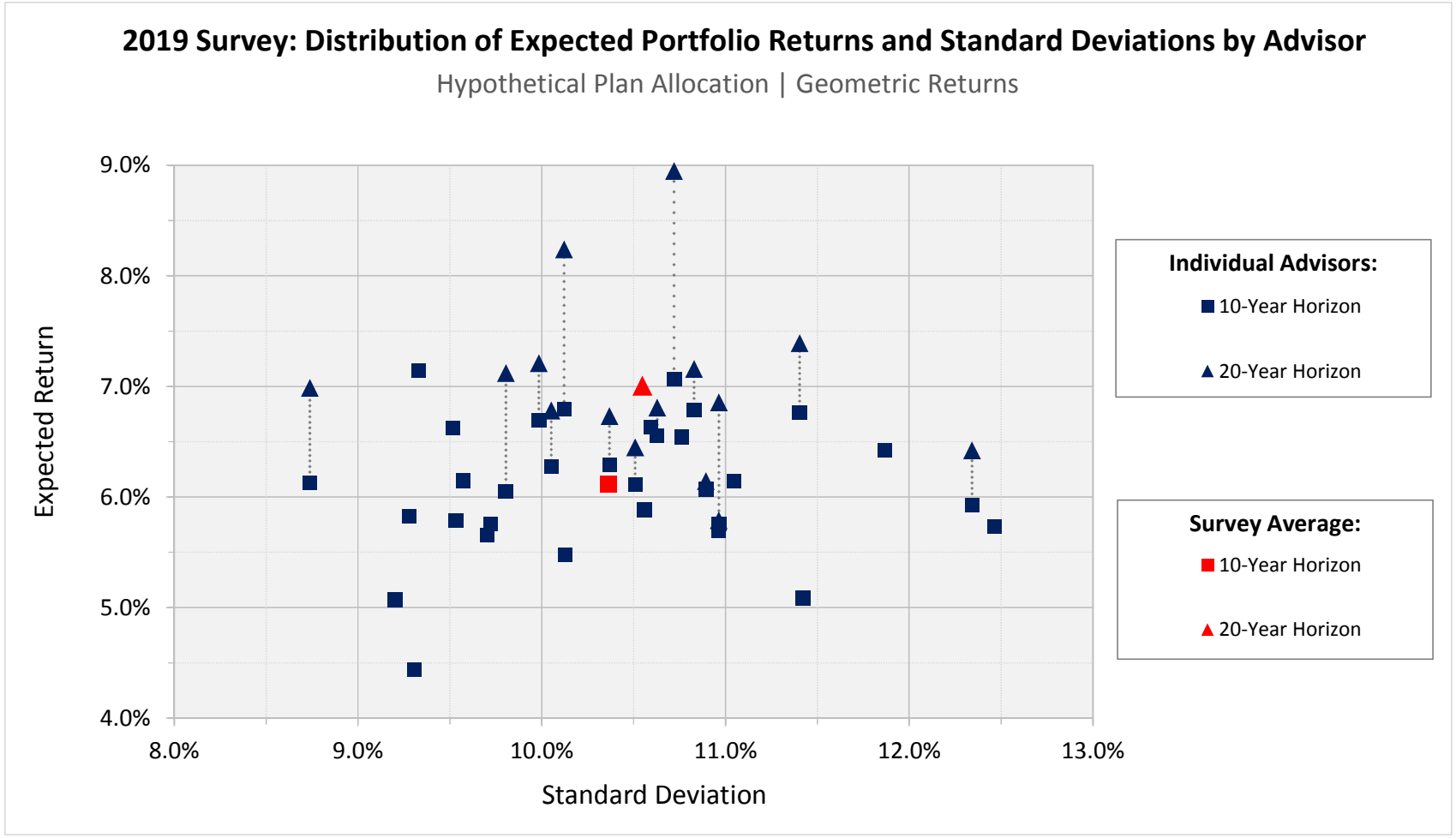


Exhibit 15

The following exhibit provides the average capital market assumptions for all 34 investment advisors in the 2019 survey. Each of the 34 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 2019 Survey of Capital Market Assumptions

Average Survey Assumptions

		Expected Returns					*Correlation Matrix*														
		10-Year Horizon		20-Year Horizon		Standard															
	Asset Class	Arith.	Geom.	Arith.	Geom.	Deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	US Equity - Large Cap	7.26%	6.03%	8.34%	7.05%	16.17%	1.00																
2	US Equity - Small/Mid Cap	8.45%	6.55%	9.52%	7.54%	20.15%	0.86	1.00															
3	Non-US Equity - Developed	8.40%	6.83%	9.30%	7.70%	18.23%	0.83	0.74	1.00														
4	Non-US Equity - Emerging	10.62%	7.77%	11.67%	8.67%	24.73%	0.72	0.67	0.78	1.00													
5	US Corporate Bonds - Core	3.74%	3.58%	4.46%	4.30%	5.47%	0.15	0.07	0.17	0.17	1.00												
6	US Corporate Bonds - Long Duration	4.07%	3.53%	4.97%	4.39%	10.50%	0.13	0.07	0.14	0.13	0.84	1.00											
7	US Corporate Bonds - High Yield	5.60%	5.10%	6.38%	5.82%	10.06%	0.60	0.58	0.61	0.61	0.41	0.33	1.00										
8	Non-US Debt - Developed	2.80%	2.56%	3.81%	3.43%	7.61%	0.20	0.12	0.32	0.29	0.53	0.50	0.23	1.00									
9	Non-US Debt - Emerging	6.19%	5.57%	6.76%	6.06%	11.31%	0.51	0.47	0.54	0.64	0.45	0.35	0.59	0.42	1.00								
10	US Treasuries (Cash Equivalents)	2.71%	2.66%	3.07%	3.03%	2.31%	(0.06)	(0.07)	(0.05)	(0.03)	0.23	0.17	(0.01)	0.20	0.07	1.00							
11	TIPS (Inflation-Protected)	3.29%	3.10%	3.69%	3.49%	6.11%	0.04	0.01	0.08	0.14	0.68	0.52	0.27	0.45	0.35	0.24	1.00						
12	Real Estate	6.95%	5.79%	7.94%	6.82%	15.03%	0.48	0.49	0.46	0.41	0.16	0.15	0.42	0.15	0.33	0.03	0.15	1.00					
13	Hedge Funds	5.63%	5.27%	6.61%	6.18%	8.38%	0.64	0.62	0.64	0.62	0.18	0.11	0.53	0.19	0.42	(0.02)	0.13	0.36	1.00				
14	Commodities	5.41%	3.90%	6.29%	4.68%	17.66%	0.31	0.30	0.38	0.42	0.10	0.04	0.32	0.22	0.31	0.02	0.22	0.27	0.38	1.00			
15	Infrastructure	7.79%	6.78%	8.46%	7.24%	14.39%	0.50	0.46	0.52	0.45	0.21	0.24	0.41	0.29	0.39	0.00	0.13	0.41	0.35	0.25	1.00		
16	Private Equity	11.34%	8.97%	12.82%	10.10%	22.05%	0.75	0.70	0.70	0.63	0.05	0.07	0.50	0.11	0.39	(0.06)	0.00	0.43	0.58	0.32	0.40	1.00	
17	Private Debt	8.09%	7.37%	8.57%	7.76%	11.62%	0.40	0.39	0.41	0.41	0.21	0.30	0.55	0.19	0.43	0.01	0.14	0.30	0.40	0.22	0.27	0.47	1.00
	Inflation	2.22%	2.21%	2.29%	2.29%	1.73%																	

Expected returns over a 10-year horizon include all 34 survey participants.

Expected returns over a 20-year horizon are based a subset of 16 survey participants who provided long-term assumptions.

Exhibit 16

Earlier in this report, Exhibit 5 showed the distribution of expected returns and standard deviations for all 34 advisors who provided short-term assumptions. The exhibit below shows the same distribution, broken out by asset type: equities, fixed income, and alternatives. Note that the average expected return and standard deviation from the 2019 survey are listed in brackets for each asset class. Also note that every advisor did not provide expectations for every asset class.

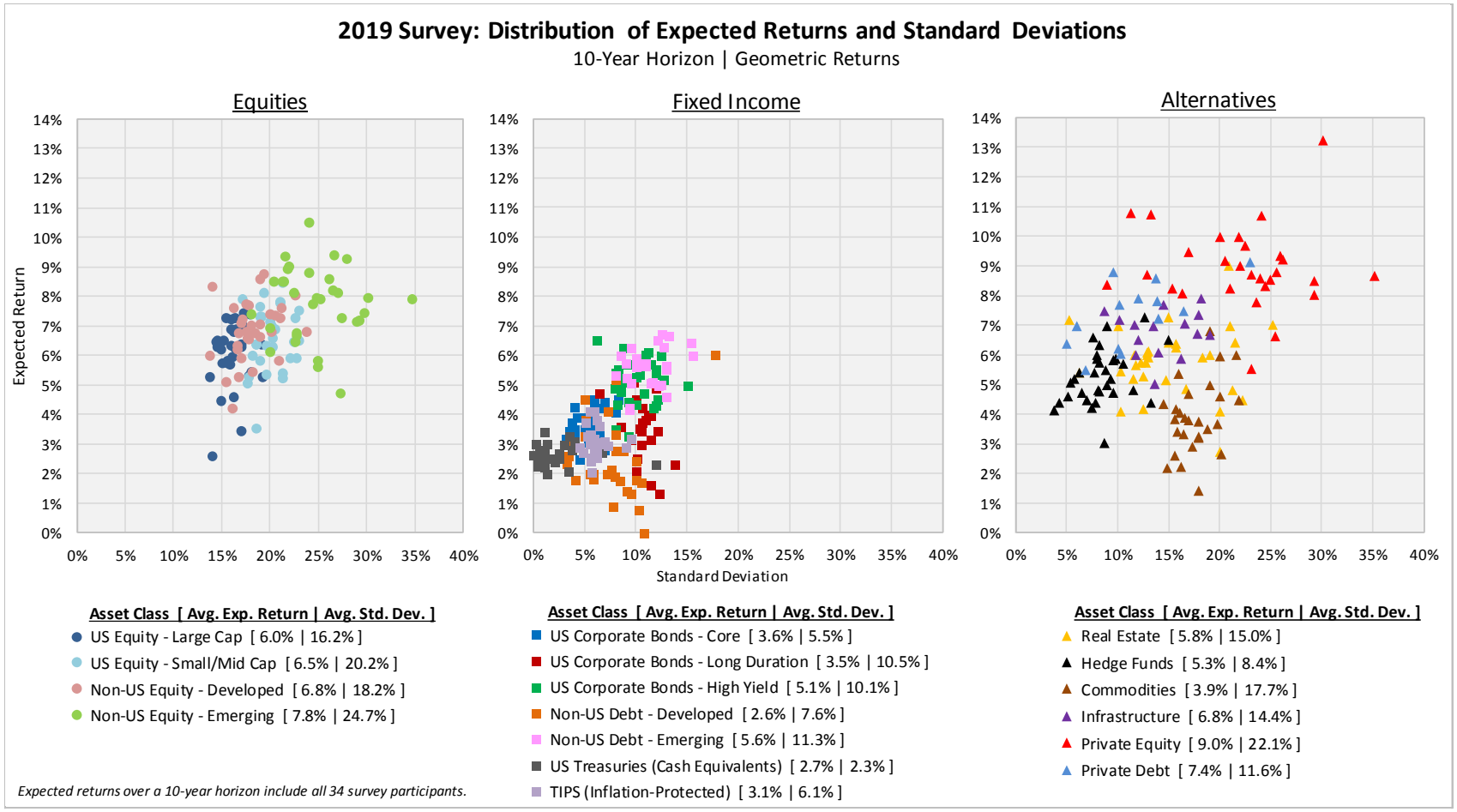


Exhibit 17

Exhibit 16 showed the distribution of expected returns and standard deviations over an investment horizon of 10 years. The exhibit below shows the same distribution, but for a horizon of 20 years. Note that while Exhibit 16 included all 34 advisors in the survey, the exhibit below only includes assumptions for the 16 advisors who provided longer-term assumptions (horizons of 20 years or more). Also note that every advisor did not provide expectations for every asset class.

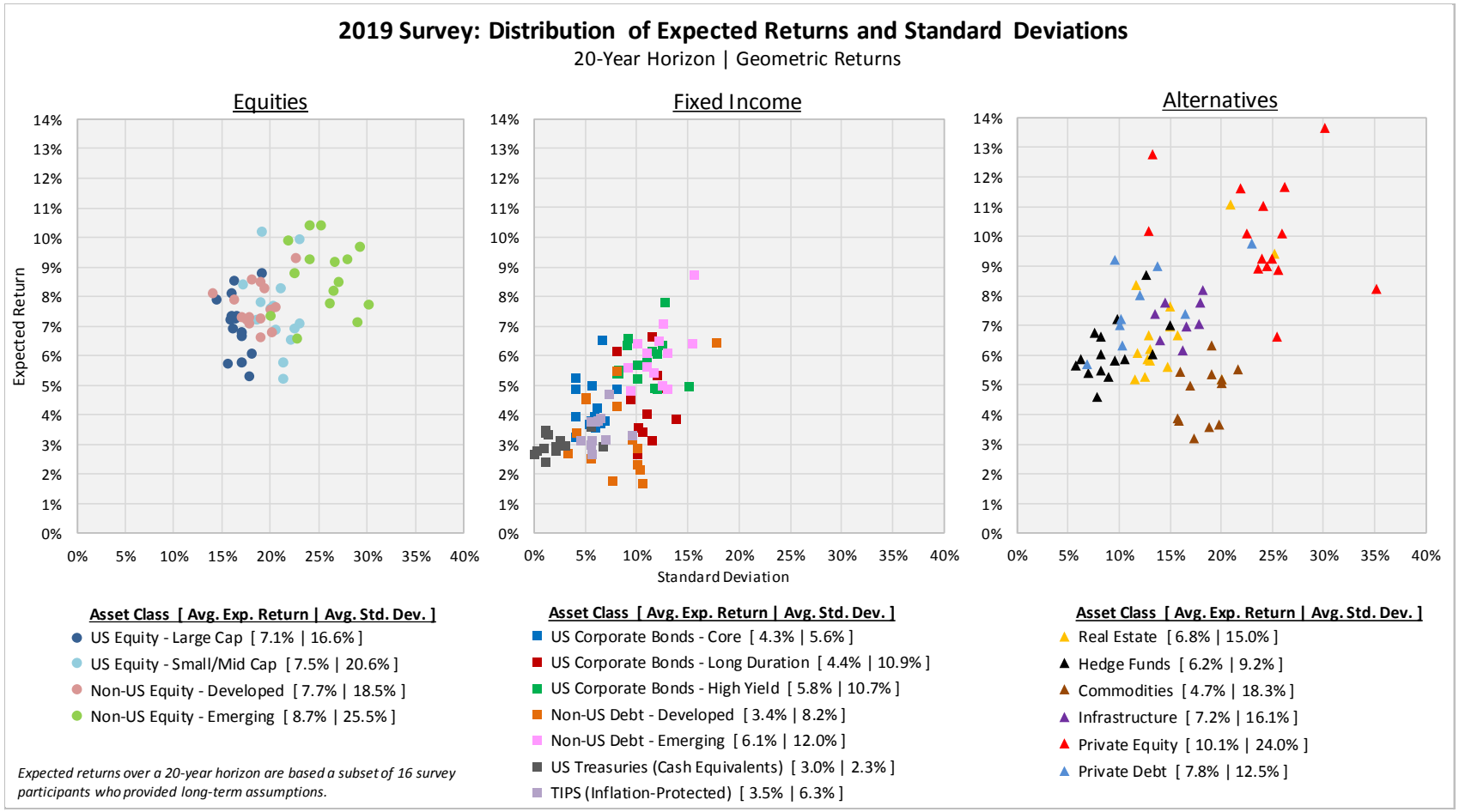


Exhibit 18

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 34 advisors in the 2018 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.

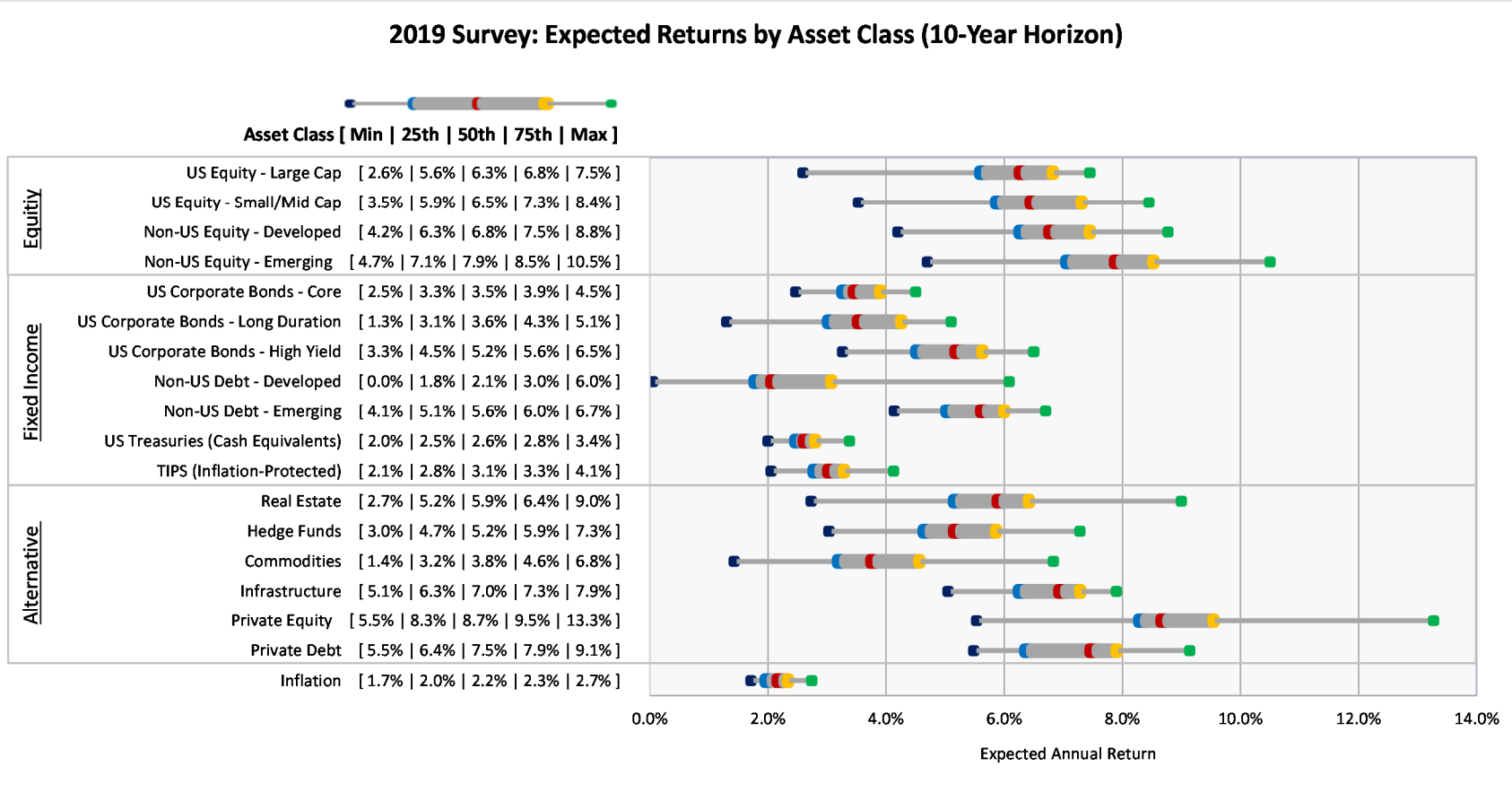
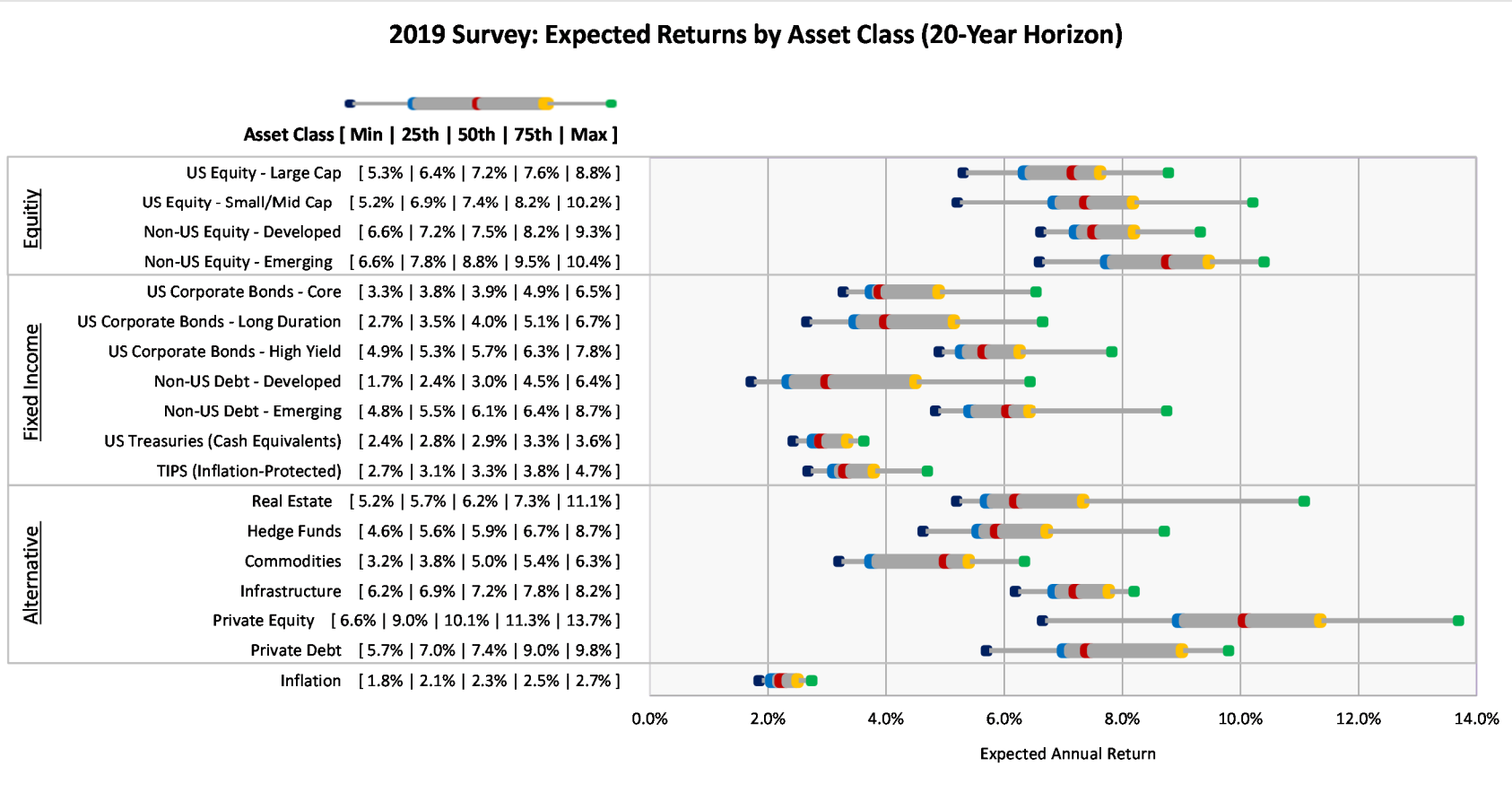


Exhibit 19

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 13 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.



Appendix A: Hilltop Background & Resumes

HilltopSecurities has been a Leader in Public Finance since 1946

Overview

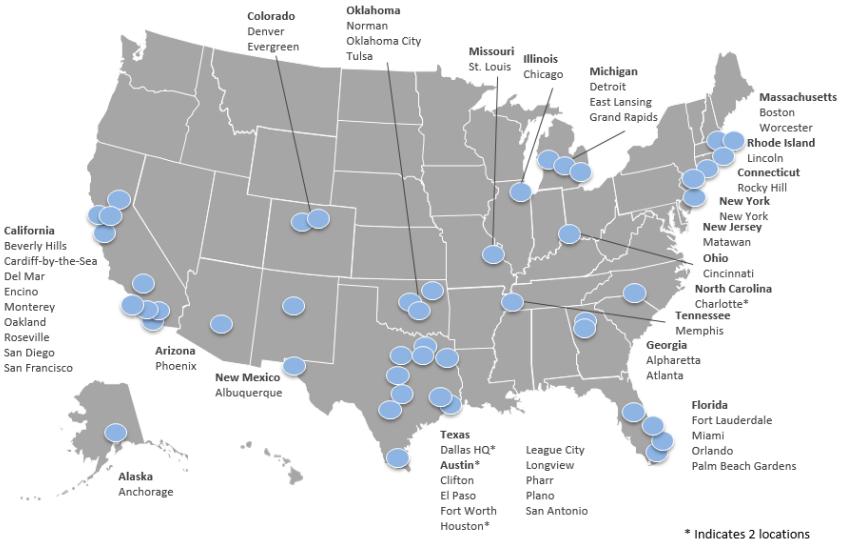
- More than 70 years of industry experience and approximately 200 employees committed to public finance
- Involved in an average of 24 deals, totaling approximately $1.2 billion per week as underwriter or municipal advisor
- Public finance is HilltopSecurities' primary business
- Municipal advisory expertise provides us with a unique perspective not available to many broker-dealers
- Registered Broker-Dealer with transparency and accountability; subject to SEC, MSRB and FINRA rules and regulations

Sector Expertise

Airports/Ports	**Pensions**
Benefit Plan Services	Public Power
Convention Center / Hotel	School Districts
General Obligation	Special Districts
Healthcare	State Revolving Funds
Higher Education	Student Loans
Housing	Toll Roads / Rapid Transit
Public-Private Partnership	Water and Sewer

Municipal Products

National Platform – 52 Office Locations in 20 States



Municipal Market Experience

Extensive Volume Nationally

- Since 2014, HilltopSecurities has provided municipal services on 6,178 transactions totaling more than $321 billion as municipal advisor or underwriter

- On average, HilltopSecurities is involved in **24 financings per week** as either municipal advisor or underwriter

Municipal Advisor Experience		
Year	**No. of Issues**	**Par ($mils)**
2014	1,013	37,564
2015	1,016	39,155
2016	1,044	41,021
2017	946	44,194
2018	691	28,318
Total	**4,710**	**$190,252**

Underwriting Experience (Senior Manager or Co-Manager)		
Year	**No. of Issues**	**Par ($mils)**
2014	384	28,580
2015	394	28,208
2016	318	29,404
2017	203	27,167
2018	169	18,253
Total	**1,468**	**$131,612**

Role	No. of Issues	Par ($mils)
Underwriter	1,468	131,612
Municipal Advisor	4,710	190,252
Total	**6,178**	**$321,864**

Source: Ipreo MuniAnalytics

Representative Pension / OPEB Clients

Select Current and Former Clients

Pension and OPEB Expertise

Dedicated Service

Our pension and OPEB services include:

- Pension and OPEB bonds (as FA or underwriter); whether to issue; structuring and savings calculations; simulation of investment returns; original research on POBs and subsequent ratings
- Pension TRANs, RANs, TANs, or other short term funding for contributions.
- Customized simulations and models to evaluate impact of investment volatility, changes to asset allocation, contributions, amortization, actuarial assumptions, etc.
- Comparative Data; extensive info from outside sources and our own research, including: contributions, funded ratios, governance, plan benefits, actuarial assumptions, legislation.
- Disclosure; assist with drafting CAFRs, official statements, etc. to conform with GASB, SEC/MSRB, & industry best practices.
- Education; explaining complex pension, OPEB and investment issues to finance officials, boards/councils.
- Pension and OPEB funding policies customized for employer circumstances.
- Establishing single employer and multiemployer OPEB trusts.
- Financial distress; working with employers in bankruptcy or other forms of distress; original research on bankruptcies and pension arrangements. Pension plan closure.
- Proposed Legislation; nonpartisan research, relevant examples from across the U.S.
- Ratings; preparation of presentation materials for rating agencies and evaluation of rating effects from proposed system changes; Moody's and S&P rating models in Excel.

Todd Smith

Managing Director

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Areas of Focus

- Project Revenue Bonds, Lease Purchase, Certificates of Participation, Water & Wastewater, Land Secured, Tax Allocation Bonds, Affordable Housing, General Obligation Bonds, Pension Obligation Bonds, K-14 Education

Profile

- With the firm since 2008; previously with M.L. Stern
- In Public Finance since 1994
- $5.5 billion in underwritings since 1996
- Bond Buyer Deal of the Year Award (Far West Region) in 2008 for the Yuba County Levee Improvement Authority and 2009 Chawanakee Unified School District

Education

- Bachelor of Arts in Economics, California State University Fullerton

Licenses Held/Designations

- Financial Industry Regulatory Authority (FINRA):
  - General Securities Representative (Registered Representative), Series 7
  - Uniform Securities Agent, Series 63

Brian Whitworth

Director

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Areas of Focus

- Pension and OPEB, OPEB trusts, funding policies, CAFR disclosures, official statements, review of actuarial studies, GASB rules and Moody's pension "adjustments", federal grants, employees funded by capital construction bonds, pension and OPEB bonds.

Profile

- Nationally recognized expert and frequent speaker on pension and OPEB**;** full-time pension and OPEB specialist
- With the firm since 2009; previously with JPMorgan, Marsh McLennan
- More than 28 years of experience
- Helped a large city with innovative reforms saving an estimated $2.8 billion
- Launched PEB Trust, a group OPEB trust, and single employer OPEB trusts
- Contributed material to the GASB Implementation Guide, testified on proposed GASB rules
- Built extensive simulation models including pension, OPEB cost and general fund revenues
- Has worked on OPEB and/or pension issues for states, counties, cities, authorities, school districts, and other organizations in over 30 states
- Awarded four patents on municipal bonds, risk management and related software
- Reviewed over 3000 pension and OPEB actuarial reports, draft CAFR and official statement disclosures
- Found billions of dollars in actuarial errors and opportunities for savings, including plans which had already been reviewed by independent actuaries, auditors, and State commissions; found over half a trillion dollars in errors in widely circulated estimates of national pension and OPEB liabilities

Education

- Bachelor of Arts in Physics, University of Chicago
- Master of Business Administration in Finance, University of California at Los Angeles

Licenses Held/Designations

- Financial Industry Regulatory Authority (FINRA):
  - General Securities Representative (Registered Representative), Series 7
  - Municipal Advisor Representative, Series 50
  - Uniform Securities Agent, Series 63
  - Investment Advisor Representative, Series 66
  - Investment Banking Representative, Series 79
- CFA Institute, Chartered Financial Analyst® (CFA ®); instructor for CFA Los Angeles exam preparation class

* The terms Chartered Financial Analyst® and CFA® are the property of CFA Institute

Andy Kuo

Director

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Dallas, TX 75270

Phone: 214.859.9457

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Areas of Focus

- General obligation, revenue, appropriation, land-secured, special districts, multi-family housing, and lease financing.

Profile

- With the firm since 2008; previously with M.L. Stern
- In Public Finance since 2004
- Provides analytical and transactional support

Education

- Bachelor of Arts in Pure Mathematics and Economics, UC Berkeley

Licenses Held/Designations

- Financial Industry Regulatory Authority (FINRA):
  - General Securities Representative (Registered Representative), Series 7
  - Municipal Advisor Representative, Series 50
  - Uniform Securities Agent, Series 63