TUCSON SUPPLEMENTAL RETIREMENT SYSTEM
BOARD OF TRUSTEES

AGENDA

DATE: Friday, October 28th, 2016
TIME: 8:30 am
PLACE: Arizona Inn – (Safari Room) 2200 East Elm Street, Tucson, AZ

Please Note: Legal action may be taken on any item listed on this agenda

Arizona Inn - Telephone: (520) 325-1541, Fax: (520) 881-5830 Directions: heading eastbound on Speedway from the intersection of Speedway and Stone, turn left (north) at Campbell, and continue to Elm Street, taking a right turn (east) onto Elm Street. Located in a residential zone on the right, approximately 3/10th's of a mile from Campbell (parking area will be to your left, directly in front of the Arizona Inn, on the left side of Elm Street).

Note: Breakfast Buffet is available, starting at 7:45am

Morning Agenda (call to order by 8:30am)

1) **Consent Agenda** (5 min)
   a. Approval of September 29th, 2016 TSRS Board Meeting Minutes
   b. Retirement ratifications for October 2016
   c. September 2016 TSRS Budget Vs Actual Expenses
   d. TSRS Portfolio Composition, Transactions and Performance Review September 2016

2) **Guide to the Markets – Andrew Goldberg, J.P. Morgan Asset Management - Head of the U.S. Market Insights Strategy Team** (45 min)

15 minute Morning Break (estimated at 9:30am)

3) **Actuary Valuation Report for June 30, 2015 – Gabriel Roeder Smith & Assoc., - Leslie Thompson** (60 min all items)
   a. June 30, 2016 TSRS DRAFT valuation report and discussion
   b. Recommended Contribution Rates for 2018 Plan Year Beginning July 1, 2017, Ending June 30, 2018
   c. Review of TSRS Funding Projections
   d. Comparison to other Arizona Plans
   e. Risk Sharing Features Including 50/50 split of TSRS
   f. Acceptance of 6/30/16 Draft Valuation Report, Adoption of FY18 Contribution Rates
   g. Education on Interest Rate Allocated to Member Balances (Note1)

4) **TSRS External Legal Counsel - Catherine Langford**
   a. Intent and Summary for TSRS Funding Policy (15 min)
   b. Arizona Constitution: Pension Provisions Refresher (15 min)
   c. Fiduciary Training (30 min)

5) **Administrator's Report** (10 min)
   a. Report on Office Operations and Key Facts and Figures From the Past Month
   b. Operational Highlight – Board Retreat Planning

Morning Time: 3 hours, 15 minutes (195 minutes)

Lunch Break (estimated time - 11:45am to 1:15pm)

TUCSON SUPPLEMENTAL RETIREMENT SYSTEM
BOARD OF TRUSTEES
Notice of Regular Meeting / Agenda
DATE: Friday, October 29th, 2016

Reconvene at 1:15pm

6) **PIMCO Fund Manager–Matt Clark & Loren Sageser** (60 min)
   a. PIMCO Update
   b. Economic Outlook
   c. Review of StockPlus Portfolio
   d. Review of Diversified Income Portfolio

7) **Education Session - Callan Associates - Gordon Weightman & John Pirone** (60 min all items)
   a. Fixed Income Portfolio Composition
   b. Black Swan Events

8) **Administrative Discussions**
   a. Potential Formation of an Advisory Committee (15 min)

9) **Articles for Board Member Education / Discussion**
   a. J.P. Morgan: An Election of Extremes – But a Government of Moderation
   b. The Wall Street Journal: Is the Bond Market in a Bubble?

10) **Call to Audience**

11) **Future Agenda Items**

12) **Adjournment**

Afternoon Time: 2 hours, 15 minutes

Note 1 – This item was not available when this information was distributed; therefore, the information will be distributed during the meeting.

*Pursuant to ARS 38-431.03(A)(3) and (4): the board may hold an executive session for the purposes of obtaining legal advice from an attorney or attorneys for the Board or to consider its position and instruct its attorney(s) in pending or contemplated litigation. The board may also hold an executive session pursuant to A.R.S. 38-431.03(A)(2) for purposes of discussion or consideration of records, information or testimony exempt by law from public inspection.

TUCSON SUPPLEMENTAL RETIREMENT SYSTEM
BOARD OF TRUSTEES
MEETING MINUTES

DATE: **Thursday, September 29, 2016**
TIME: **8:30 a.m.**
PLACE: **Finance Department Conference Room, 5th floor**
City Hall, 255 West Alameda
Tucson, Arizona 85701

Members Present: Robert Fleming, Chairman
Kevin Larson, City Manager Appointee
Rebecca Hill, Interim HR Director
Silvia Amparano, Director of Finance
Michael Coffey, Elected Representative
Jorge Hernández, Elected Representative
John O'Hare, Elected Retiree Representative

Staff Present: Dave Deibel, Deputy City Attorney (arrived 9:17 AM)
Neil Galassi, Pension Administrator
Dawn Davis, Administrative Assistant
Ginny Rath Pepper, Administrative Assistant

Guests Present: Scott Brayman, Champlain Investment Partners
Judith O'Connell, Champlain Investment Partners

Absent/Excused: None

Robert Fleming called the meeting to order at 8:30 AM.

A. **Consent Agenda**
1. Approval of August 25th, 2016 TSRS Board Meeting Minutes
2. Retirement ratifications for September 2016
3. August 2016 TSRS Budget Vs Actual Expenses
4. TSRS Portfolio Composition, Transactions and Performance Review August 2016

The Consent Agenda was approved by a consensus of 7-0.

B. **Investment Activity Reports**
1. Annual Manager Review – Champlain Investment Partners – Scott T. Brayman, & Judith W. O'Connell

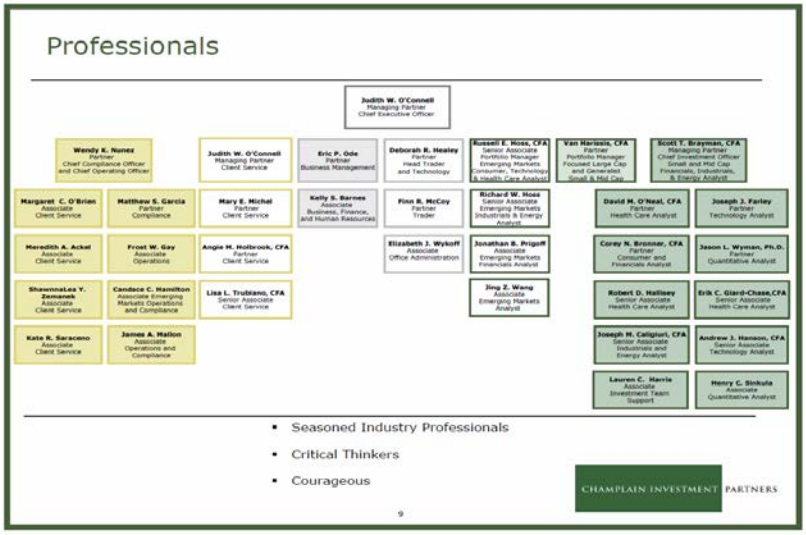
Chairman Fleming asked the presenters from Champlain if they have the list of the questions that the TSRS Board provided to Champlain.

Judith O'Connell stated that Champlain does have the list of questions that were provided and asked Chairman Fleming if it would be okay if Champlain go through the presentation that covers all of the TSRS Board's questions but not in the same order.

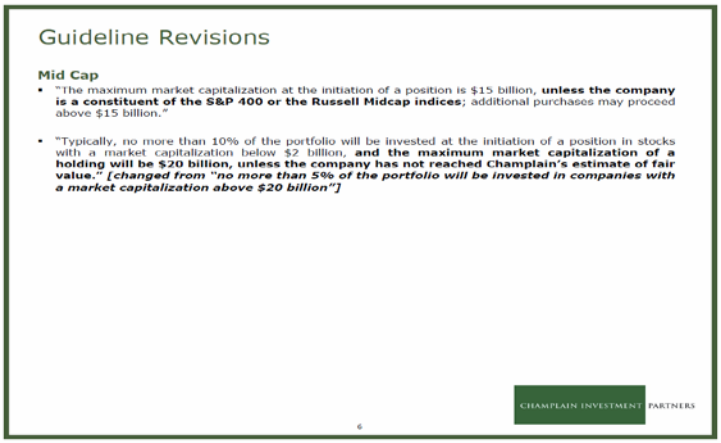
Chairman Fleming stated that he is okay if Champlain does the presentation in any order but would like the presentation from Champlain to be focused solely on the TSRS Board's list of questions rather than Champlain giving a large presentation that wouldn't be productive for the board meeting or be of interest.

Neil Galassi stated to Chairman Fleming that he had spoken with Champlain before the presentation and gave Champlain the general parameters of what the Board is interested in and is confident that the presentation will address the items.

Judith O'Connell stated that the first item she was going to cover is personnel. Judith O'Connell asked that everyone turn to page 9 presented below of the Champlain Investment Partners, LLC, Partners 2Q 2016 booklet. Judith O'Connell stated the personnel highlighted in green comprises their small and Mid-Cap team managed by Scott T. Brayman. Judith O'Connell stated that their partner David M. O'Neal, who is one of the founders of the firm over the covered healthcare sector, will be retiring at the end of 2016 and will remain as a shareholder in Champlain. Judith O'Connell stated that David M. O'Neal made it clear that he will not retire until he felt that Champlain had the appropriate resources in place over healthcare. Judith proceeded to state that founders can retain forty percent of their equity and David M. O'Neal will plan to do that.



Judith O'Connell stated that Champlain made some changes to their guidelines to become more in line with the benchmarks. Judith O'Connell referred to page 6 presented below from the Champlain Investment Partners, LLC, Partners 2Q 2016 booklet. Judith O'Connell stated that as long as withholdings are a part of the benchmark, they can initiate a position above $15 billion and currently about 32% of the Mid-Cap benchmark is above $15 billion. Judith continued to state that as far as holding above $20 billion, that they can do that as long as it is a part of the benchmark. Judith stated that they are not expecting any material changes to the portfolio.



Judith O'Connell stated that assets under management in the Mid Cap strategy are currently at about $3.2 billion, and they plan to close that strategy at $4.5 billion which is similar to what they have done with the small-

cap strategy. Judith stated for reference that when TSRS started with Champlain, Champlain was at $750 million in their Mid-Cap strategy.

John O'Hare asked Champlain Investment Partners how much slippage is there in getting in and out of positions because of size do you have an effect upon the market when you get into position to get out.

Scott Brayman, with Champlain Investment Partners, replied by stating that Champlain runs as much as $4.5 billion in small-cap, Mid Cap is a lot more liquid and has a lot less risk so, he is very comfortable stating that $4.5 billion is an easy number to manage. Scott Brayman proceeded to state that typically 80%-85% of the time, Champlain's activity is against the herd. Scott continued to state when people are fearful, for example, this February 2016 when the market was freaking out and software stocks were down 30% for the year, Champlain was buying and started piling up on networks in the middle of that panic cell. Conversely, after a couple of buyouts this year the software stocks have rallied sharply back, Champlain started cutting the weight on that industry. So a vast majority of the time Champlain is moving against the herd. Therefore, liquidity has not been an issue for Champlain.

Judith O'Connell with Champlain Investment Partners stated that on that topic, Champlain doesn't participate in any separate account wrap programs or give their models to anyone else. Therefore, no one is trading against Champlain. Judith proceeded to state that Champlain manages all of their accounts including Mid-Cap the same, so Champlain is making one call against all of the portfolios.

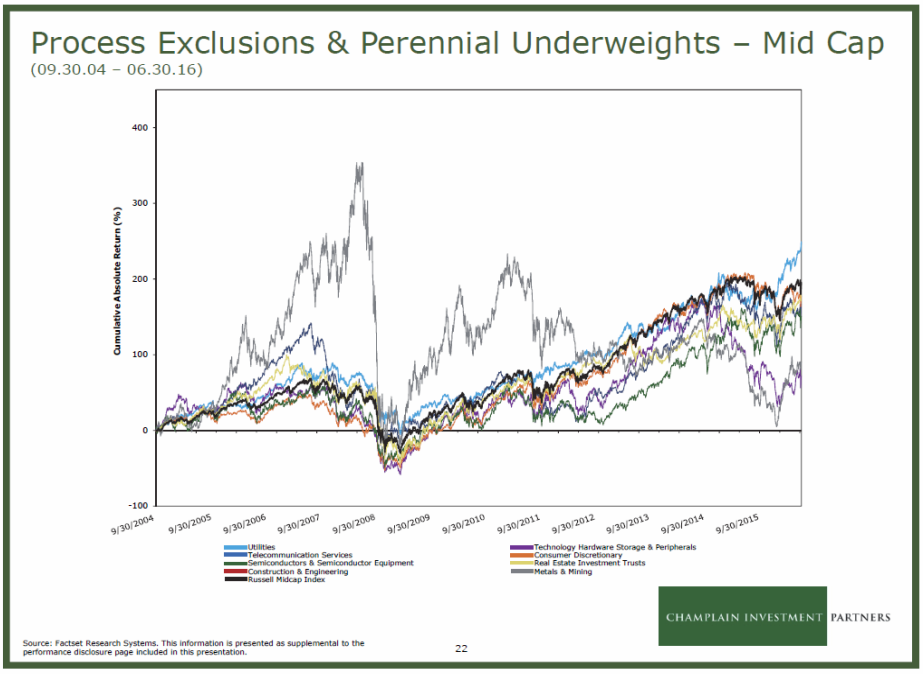
Scott Brayman stated that Champlain does not have many instances in either strategy, but particularly very few instances in Mid-Cap that Scott calls the get off the plane in thirty seconds instance; Chaplain's process does not depend on rapid exits.

Scott Brayman stated that he is now on question number two; investment philosophy, the strategy, and how it's implemented. Scott stated the investment process/philosophy is that we want to own good to great companies but we want to own these at a discount to what we think is their intrinsic or fair value. Scott proceeded to describe how Champlain defines good to great companies. Scott stated these are companies that are highly reliable. Scott stated that Champlain wants to avoid business models that are highly cyclical, capital intensive, labor intensive, or highly regulated. Scott stated that Champlain likes to focus on brands or companies that: control their investment, have steady demands, don't require financing to buy their product, don't depend on interest rate cycles or capital markets, and aren't dependent on consumers having a lot of credit. Champlain looks to companies that focus on products that people consume everyday like food and beverage on the consumer side whereas on the industrial side they like to focus on companies that have business models with a lot of aftermarket or maintenance and repair revenue as opposed to the one time capital expense revenue. They also look for companies that have a high return on capital. These are companies that have a high gross margin structure making it is easier to overcome the inevitable problems and challenges that business throws their way. These companies demonstrate good capital stewardship where management has shown they can earn high returns on capital because the business model is just very profitable but also because management doesn't squander capital. They don't invest prudently or aggressively and are very careful with investment and acquisitions. Scott proceeded to state that each analyst in their sector votes the proxies for the companies in their sector, so they are very attentive to governance issues such as how much skin does management have in the game, who is on the board, and what are the incentives. Scott stated that Champlain focuses on the companies where the board is comprised of operators (i.e. the Business Executive, CEOs, CFOs, and Senior Executive) and comprised of very few referees.

John O'Hare asked Champlain if they like the boards that make decisions that take into account a three year period rather than a quarter by quarter approach. John O'Hare stated that he attended a conference where they were talking about a survey of CEOs and asked CEOs if they had the choice of having a good quarter or having a better one, two to three years down the road; CEOs were always choosing the short term rather than the long term.

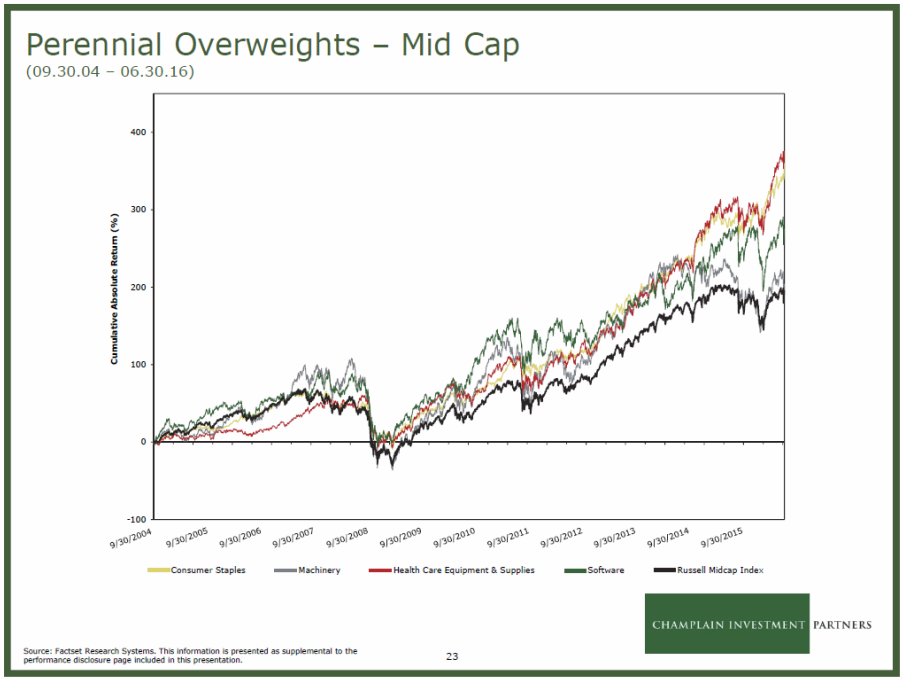
Scott Brayman with Champlain Investment Partners stated that he wants to talk about time horizon as it's something important to Champlain and how Champlain thinks differently than most investors. Champlain looks

for companies that manage the business with a long term time horizon. Scott stated that one of his favorite questions to ask companies is on Champlain's management questionnaire; tell me about a sacrifice you made in the near term earnings to set up a stronger, better company three to five years from now. If they don't have a good answer about a sacrifice that they are making, it tells you that they are running the tank dry and not priming the pump for the future. Scott stated that is a big key to what Champlain does. Scott stated there is a book titled The Compound Effect by Darren Hardy; when you find companies that have good culture and the history of good habits…good habits create little advantages that are almost immeasurable daily, monthly, quarterly, or even yearly, but they add up big over many years. So to really exploit this compound effect, you need to take along a long term investment horizon and Champlain does that. Scott proceeded to state that he wants to be clear that at Champlain, this process that Champlain has, is Champlain's most valuable player. Scott stated that some team members may shift in and out over the years but it's not terribly important. What's important is that Champlain hires the right personality that acknowledges the process is the most valuable player, and doesn't try to over end any other process. Scott stated the heroes in this process are the companies, the management teams that run these businesses. Scott stated that Champlain's process is about having a light impact, and not over engineering that or interfering with the goodness of these companies that are doing great. In regards to the research process, the team meets weekly or twice a week, where they talk about new ideas. Scott stated that Champlain has been doing this for a long time so they are very focused on certain industries. Scott stated that Champlain's process has a sector factor front end which steers them away from about two-thirds of the industries and it focuses only on about one-third. Scott referred to the appendix chart below on page 22 demonstrating the process which shows the industries that Champlain excludes and the industries that Champlain ranks higher. Scott proceeded to state the industries that Champlain excludes are very cyclical and never build a structural advantage relative to the benchmark which is the black line.



Scott Brayman stated that the industries that Champlain focuses on are referred to on the chart below on page 23 as they create a long term structural advantage benchmark, and is why the process is the most valuable player. Scott proceeded to state that the team is very focused on the target rich and very fertile industries that tend to outperform the benchmark over time. Scott stated that the longer you get this process, the greater the advantages should creep. Scott stated that they meet once a week to talk about new ideas. To come up with these ideas they know the industries that are target rich so they know all of the best companies and best management teams. Champlain is watching all of these companies. Some are too expensive, so are on the watch list while others are coming into buy zone. Scott stated that Champlain also gets out and meets with companies and they come out to see Champlain as well. Scott proceeded to state that Champlain has a number of tools that they use to analyze these companies. They have the whole framework which is part of

Credit Suisse and have also added the EBA dimensions which is a model where you take your company's economic profits minus the cost of capital to understand the economic value added. Scott stated that Champlain has built a number of frameworks over the years to help Champlain understand the growth, returns, and the capital allocation.



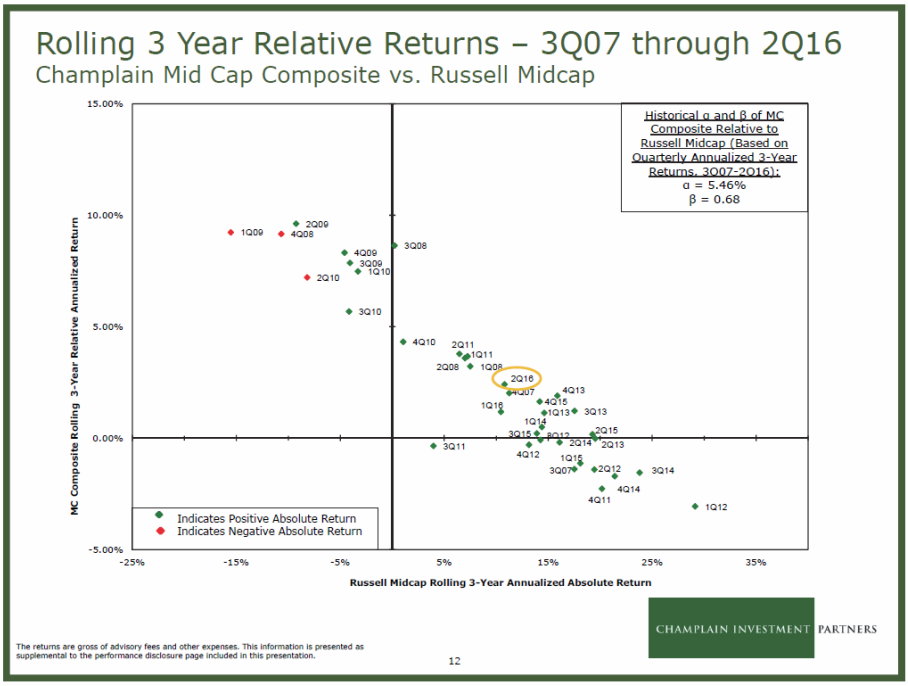
Scott Brayman stated the second meeting they have each week is to make decisions about how to rebalance their client's capital. They are constantly trying to rebalance the capital away from the stocks that are trading rich and above fair value, and to lower existing holdings which are trading at a discount to intrinsic value.

Judith O'Connell with Champlain Investment Partners stated to answer the question, number three, we are bottom up, but for the interest of time, she thinks it makes sense to go to number four first.

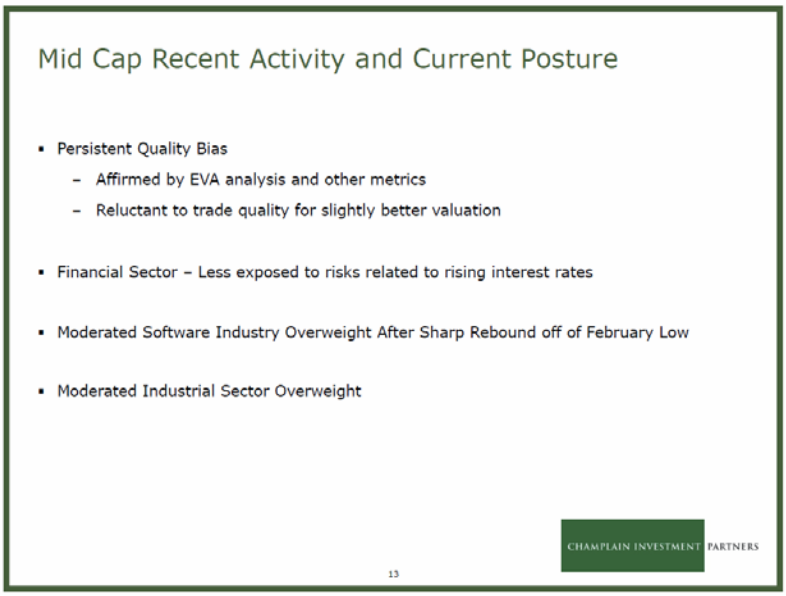
Chairman Fleming replied that would be a good idea and asked Champlain if they already answered question number six.

Judith O'Connell with Champlain Investment Partners replied no, but then stated that she guess's that they covered question number six and concluded to say that they have a lot to say about relative performance.

Scott Brayman asked that everyone refer to page12 presented below as it will answer the question the Board asked about how Chaplain expects to perform relative to the market environment. Scott stated the referred table below shows the historical footprints of Champlain's process. The relative returns for three years are on the vertical axis and the benchmark absolute returns for three years on an annualized basis are on the horizontal axis. If the benchmark is doing 20% a year, on average for three straight years, Champlain expects to be lagging by a couple hundred basis points per year. Scott stated that we have been through that recently and Champlain very much appreciates the patience that TSRS has shown. Scott proceeded to state that as we move into more normalized returns, Champlain expects to be showing TSRS an advantage, and then if we get into difficult markets, Champlain expects to deliver a substantial advantage. Scott stated Champlain expects through a full market cycle, to add quite a bit of value and more than cover Champlain's fees. Scott stated that this little bit of give up is the insurance premium to have this kind of protection. He thinks this is extremely good value proposition with only spending a couple of hundred basis points in the strong markets where Champlain is helping protect the TSRS plan from the difficult markets when the plan may be under pressure.

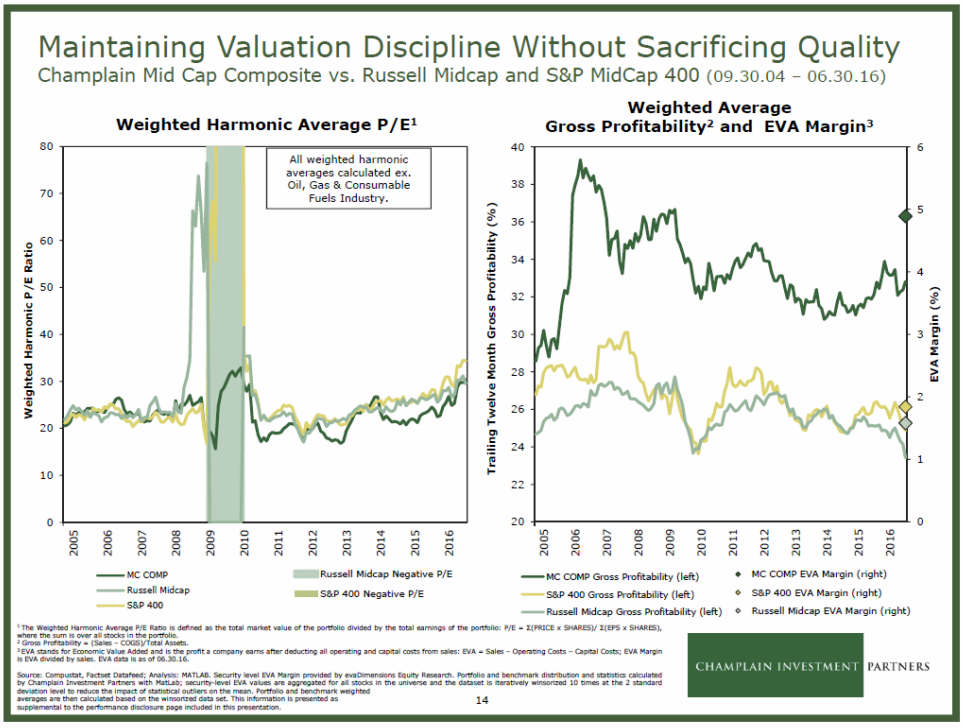


Scott Brayman asked that everyone now refer to page 13 presented below where he will talk about portfolio positioning. Scott stated that the portfolio remains very heavy on quality as evidenced by some characteristics such as borrowing but also the gross profitability and the EVA margin.



Scott Brayman stated the relative advantage to the benchmark is quite significant and is illustrated on page 14 below on the right hand side. Scott stated that you can see the gross profitability on the charts in green and the EVA Margin on the diamond. Champlain is in the dark green in both cases. Scott stated that we are not paying a premium, so we are trading at about the same value valuation as the benchmarks but we own much better quality. Scott stated that he wants to talk about Champlain's financial sector positioning because Champlain has not chased the yield producing investments. We are still outperforming because Champlain has had some very good stock selection and some good events in healthcare particularly, but also the rebound in software stocks has been very helpful coupled with strong industrials. Scott proceeded to state that Champlain's posture in financials is such that we don't need higher interest rates to continue to grow and be

profitable but when higher interest rates occur, if they ever do come, it's going to be very painful for REIT's and utilities. Champlain thinks that you can see permanent capital impairment in these interest rate sensitive industries if and when interest rates ever do go back up. If interest rates do go back up, our banks such as Northern Trust and our insurance companies such as Allied World and Endurance will benefit. They will actually earn more money in a rising interest rate environment than they do today. Scott says that Champlain is geared to benefit from rising rates and thinks much of the benchmark, which Champlain excludes the REIT's and utilities in particular, are going to feel a lot of pain from rising interest rates. Scott stated that Champlain is not smart enough to make a call on interest rates which is why they don't want REIT's and utilities because Champlain will have to make an interest rate call or market timing call. Scott proceeded to state when oil was $27 a barrel last year, we were buying the industrial sector and now that oil has bounced back this year, Champlain has moderated the weight in the industrial sector a little bit. Champlain has also moderated the weight in software which Scott says he covered earlier. Scott proceeded to state that the team has continually demonstrated courage about going into the industries or the areas of the market which are under a lot of pain or where valuations are very attractive. Scott stated that Champlain is still buying good businesses at a discount and has had the courage to unweight the stocks which are much desired. Scott stated an example of that would be one of Champlain's favorite companies, McCormick which is a very simple business; they dominate at 18% market share and their largest competitor is at 6%, so no one is close. Scott stated that it's a great business, but it got way too expensive so Champlain sold it. Scott stated that he loves the company, so it takes some courage for Champlain to sell the great companies that are way too expensive as everyone is chasing dividends and chasing low volatility shares.



Neil Galassi asked Champlain Investment is there a certain level of capitalization that a company Champlain holds attains where they say this is too big for our strategy and they sell off the investment in that company?

Scott Brayman with Champlain Investment Partners replied by stating that Champlain just changed the guidelines to give them more headroom to take their winners of beyond $15 billion, but this is a Mid Cap strategy and Champlain is trying to focus on buying stocks under $15 billion. Scott proceeded to state that the benchmark has 32% of its weight above $15 billion and 16% above $20 billion, so Champlain wants to be able to take them above $20 billion if they are at a discount and they are still a good business. Scott stated that Champlain has been recently seeding the Mid-Cap strategy with their best ideas from Small-Cap, so some of the new names coming to the portfolio are actually at the low end of the market. So the movement to low

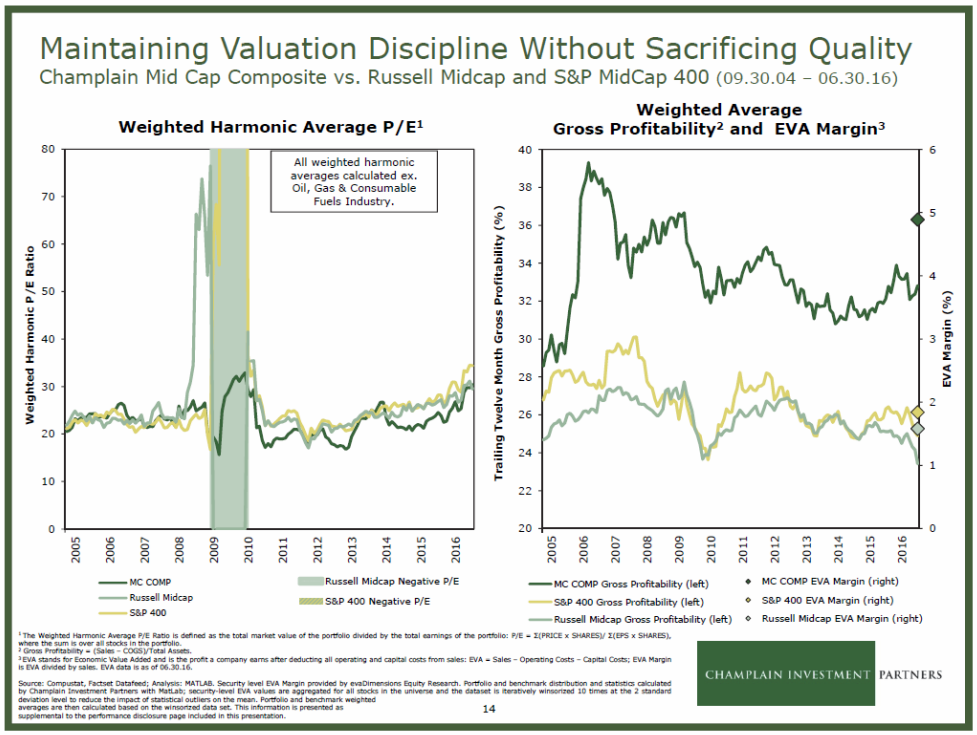
volatility has emphasized the larger companies and the better value is at the smaller end of the market cap right now.

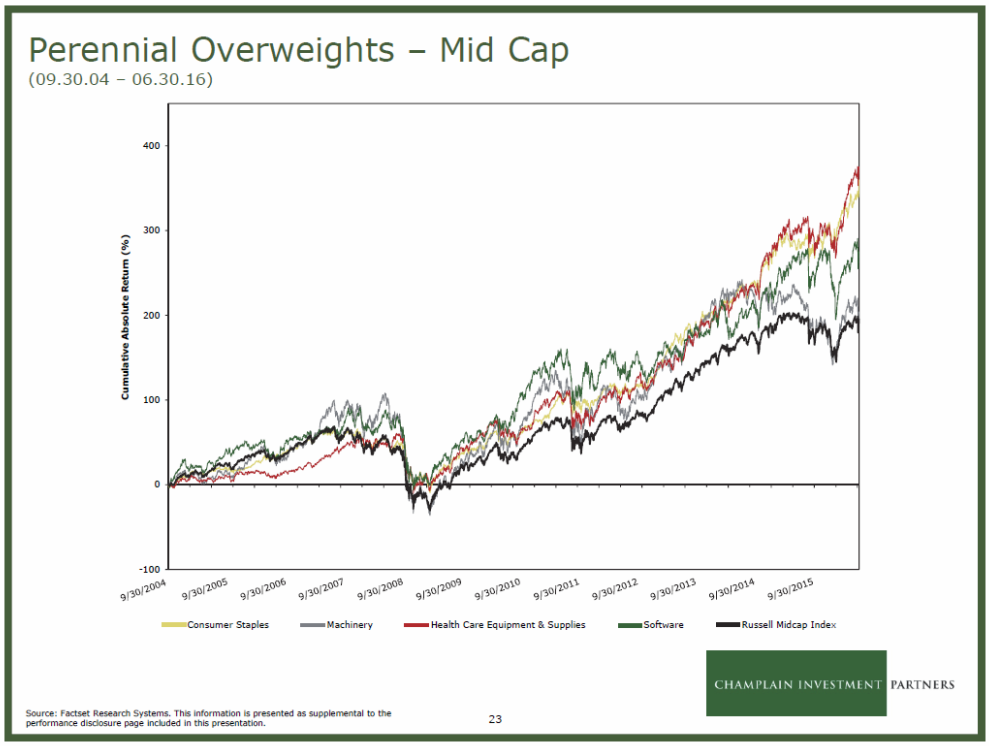
Chairman Fleming replied to Champlain Investments that all they need to do now is tell us about the future.

Scott Brayman replied by stating that he has no idea what is going to happen with the stock market but referred back to page 14 below. Scott stated that he feels pretty good because Champlain has gone through the toughest years with TSRS where the benchmark returns are quite stone. Scott stated that he doesn't know when we are going to have this, but that's just the nature of markets; you run out of buyers, and something happens and it creates sellers and you've exhausted the buyers, so you have downward volatility, it's inevitable. Scott stated that he wants TSRS to know that Champlain isn't afraid of it. Scott stated that we saw earlier the stocks that Champlain likes on the green line on page 23 as referred to below. He stated that the big drop in the green line, Champlain bought that dip for TSRS, so when the market gets clobbered it's a great opportunity to re-prime the portfolio to get good companies at bigger discounts which will probably improve the quality of the portfolio. Scott proceeded to state that he doesn't know what the future holds in terms of how much we decline or how much volatility we see, but we've had a dearth of volatility here recently and Scott thinks that we will have some at some point in the future and Champlain is ready to take advantage of it. Scott stated that there is a lot of reasons, but Champlain just owns great companies and the advantage that he showed earlier in terms of the gross profitability and EVA margin is so big, the longer you get, the better relative terms are going to be produced. Scott proceeded to state that what is important is that we aren't paying a premium, we are at the same P/E as the markets but it's the same as the benchmarks and we own much better companies.

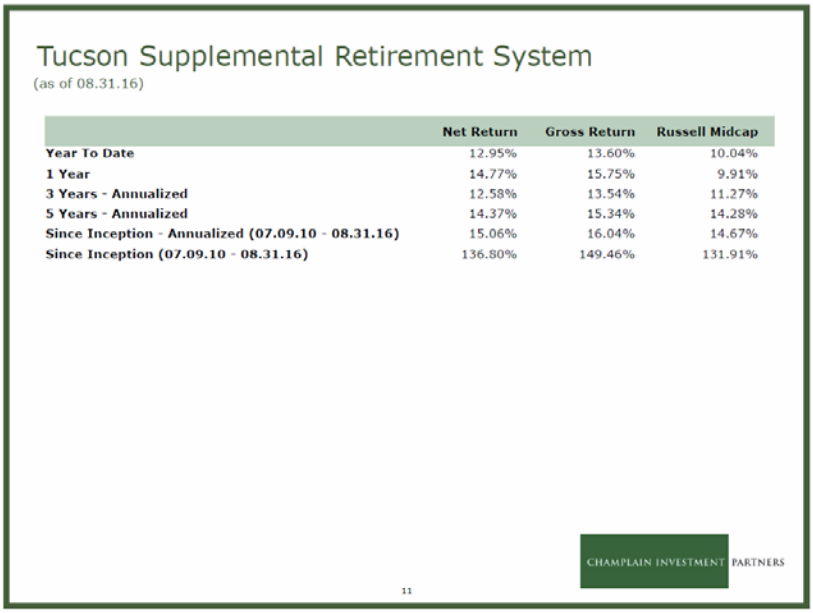
Neil Galassi stated that he has noticed that the Small and Mid-Cap strategies that we hold have done well the past few months, so what fact factors have led to the Small and Mid-Cap space doing well over the past few months and do you see some of those factors continuing?

Scott Brayman replied by stating that there are some things that could be positive for stocks and thinks when the Brexit vote happened, there was an initial panic reaction. Scott proceeded to state that some people thought this is the first redemption on the Euro Ponzi scheme is his opinion, and that's why they went down and right out the gate on the Brexit. Scott proceeded to state that others intuitive reaction was that wow, this is putting a lot of pressure on the politicians to start to get more fiscally involved in the economy. Scott stated that he thinks the market is scaling sharply back from the initial couple of days of pain from the Brexit because they see the pressure building on politicians to start spending money; they can't just rely on central banks and you've seen two candidates running for office in this country talk about big spending on infrastructure and other types of spending. Scott proceeded to state that there is another idea out there and if nobody has noticed it, he thinks they will start to notice it. It's the idea of jubilee or debt forgiveness for student loans. If that were to happen, it would be extremely bullish for inflation and for the economy because if you were to just say, your loan is forgiven, all is good, you have a lot of new car buyers, a lot of new home buyers, a lot of people looking to go out and spend money at restaurants and everything would boom. Scott said those are in the pipeline and thinks that is why the market has really shot back because people are seeing this fear in politicians that might actually get voted out so now they are going to start to gear up and spend. He feels that politicians are getting more fearful.





John O'Hare asked Champlain about the annualized return presented on page 11 as referred to below, four rows down. John O'Hare continued by asking Champlain, on annualized basis gross return versus the index, if I'm reading this right, that Champlain made 137 basis points gross annualized over the six year period since TSRS has been with Champlain.



Scott Brayman answered in the affirmative.

John stated to Champlain that the fees have been at 98 basis points if you subtract the gross from the net, so basically Champlain, over that six year period, is making more in fees than TSRS is getting in net value.

Scott Brayman answered in the affirmative.

Scott Brayman stated that is the insurance policy that TSRS has been paying for in this environment. Scott stated that if we get into this environment, and we don't more than offset, if Champlain doesn't give TSRS a great return on that investment that TSRS has made, and who knows when the music stops, it could have happened during the last six years but it's likely to happen in the next six years and stocks never go up in a straight line without big corrections every so often, and we are probably due as there is a lot of uncertainty around a couple of big issues out there. Scott stated that what Mr. O'Hare is stating is true, and he is confident that he will be sitting here with us some day showing TSRS a great return on the investment that TSRS has made. Scott proceeded to state that the problem for all of us is that we just don't know and Champlain's process isn't about trying to predict that, and he doesn't think that TSRS should be trying to predict that frankly.

John O'Hare stated that the he guesses that the question is that if the Board wants to pay that rich premium, the insurance premium, and maybe that's for the future to discuss.

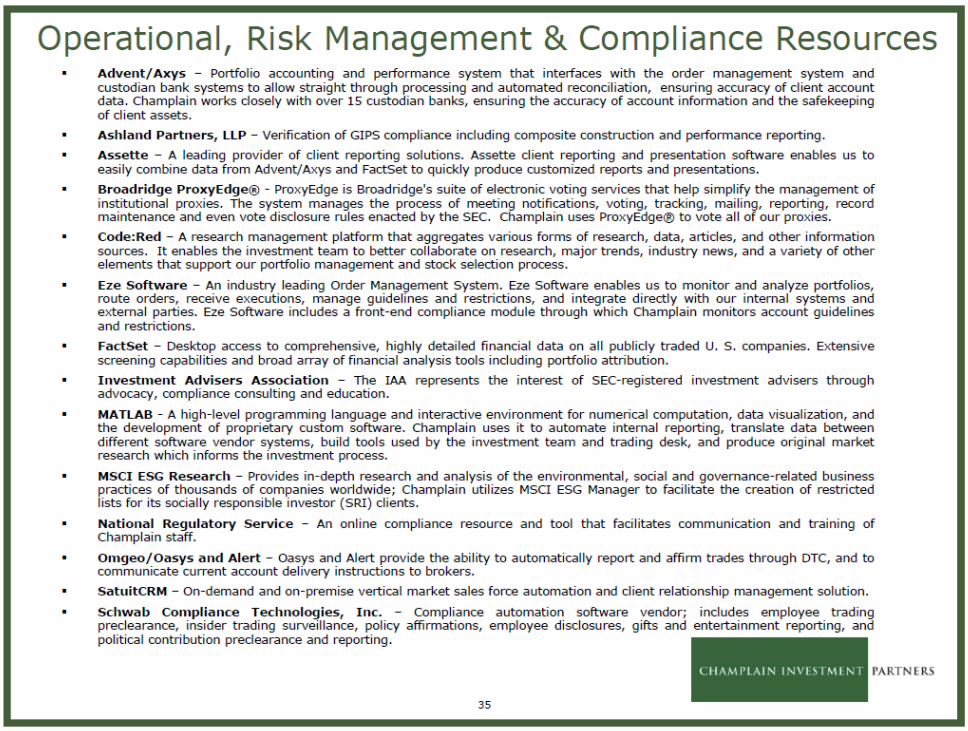
Scott Braymen replied by stating that there is another factor to be thinking of and that is that Champlain has given TSRS a market like return since inception after fees but we haven't taken as much risk as the market, and we don't currently hold a number of key risks that we see in the market., So, Champlain has managed to produce market like returns without owning the interest rates in sensitive stocks. So, if that ever goes the other way, Champlain thinks that there is a huge opportunity for us relative to the benchmark so if you go with passive management; you take on that interest rate risk.

Mr. O'Hare stated to Champlain that when active managers come in on the hiring process, the question is always asked if you would like to be evaluated at certain earnings over the index because we don't want to pay active manager fees if the active manager is only going to be giving us an index return, and they always come out and say sure, for example 3% over the benchmark net for an active manager. Mr. O'Hare stated that he thinks that 150 basis points would be fair net and he doesn't see doesn't see 150 basis points here.

Scott Braymen replied by stating that he appreciates what Mr. O'Hare is saying and suggested to Mr. O'Hare to think about this environment relative to historical storm blown environments where we've have had a central

bank backstopping the market in an extraordinary manner and an unprecedented manner in an effort to, one could argue, stamp out the bear market. Scott proceeded to state that he thinks that this has been a fairly unprecedented environment, and so at some point he thinks the reliance on central banks backstopping the markets becomes risky and it becomes imprudent. Scott stated that Champlain's portfolio is not positioned with a perpetual dependence, or a perpetual effectiveness in the Federal Reserve ban built into it. In fact, when faith dissipates in central banks, the free money environment, vigilantes may take the bottom market apart and cost the capital may go up if the Fed wants it to or not, and we aren't exposed to that risk. Scott proceeded to state we are looking at a 6 year window, which has been unprecedented in terms of monetary policy, and it may not always be that way, but if TSRS is confident that in the next six years is going to look like the past six years, and you don't want this insurance policy, that reasonable choice to make. Scott stated that Champlain isn't here to tell TSRS that Champlain is right but are here to tell TSRS this is Champlain's value position and that this environment is going to happen someday even if the central banks have become very political and have become a bigger force in the markets.

John O'Hare referred to page 35 presented below of the Champlain Investment Partners, LLC, Partners 2Q 2016 booklet, and asked Champlain how they vote TSRS's proxies or does somebody else vote the proxies. Mr. O'Hare referred to the Proxy voting service on the 4th bullet point down.



Operational, Risk Management & Compliance Resources

- **Advent/Axys** – Portfolio accounting and performance system that interfaces with the order management system and custodian bank systems to allow straight through processing and automated reconciliation, ensuring accuracy of client account data. Champlain works closely with over 15 custodian banks, ensuring the accuracy of account information and the safekeeping of client assets.
- **Ashland Partners, LLP** – Verification of GIPS compliance including composite construction and performance reporting.
- **Assette** – A leading provider of client reporting solutions. Assette client reporting and presentation software enables us to easily combine data from Advent/Axys and FactSet to quickly produce customized reports and presentations.
- **Broadridge ProxyEdge®** - ProxyEdge is Broadridge's suite of electronic voting services that help simplify the management of institutional proxies. The system manages the process of meeting notifications, voting, tracking, mailing, reporting, record maintenance and even vote disclosure rules enacted by the SEC. Champlain uses ProxyEdge® to vote all of our proxies.
- **Code:Red** – A research management platform that aggregates various forms of research, data, articles, and other information sources. It enables the investment team to better collaborate on research, major trends, industry news, and a variety of other elements that support our portfolio management and stock selection process.
- **Eze Software** – An industry leading Order Management System. Eze Software enables us to monitor and analyze portfolios, route orders, receive executions, manage guidelines and restrictions, and integrate directly with our internal systems and external parties. Eze Software includes a front-end compliance module through which Champlain monitors account guidelines and restrictions.
- **FactSet** – Desktop access to comprehensive, highly detailed financial data on all publicly traded U. S. companies. Extensive screening capabilities and broad array of financial analysis tools including portfolio attribution.
- **Investment Advisers Association** – The IAA represents the interest of SEC-registered investment advisers through advocacy, compliance consulting and education.
- **MATLAB** - A high-level programming language and interactive environment for numerical computation, data visualization, and the development of proprietary custom software. Champlain uses it to automate internal reporting, translate data between different software vendor systems, build tools used by the investment team and trading desk, and produce original market research which informs the investment process.
- **MSCI ESG Research** – Provides in-depth research and analysis of the environmental, social and governance-related business practices of thousands of companies worldwide; Champlain utilizes MSCI ESG Manager to facilitate the creation of restricted lists for its socially responsible investor (SRI) clients.
- **National Regulatory Service** – An online compliance resource and tool that facilitates communication and training of Champlain staff.
- **Omgeo/Oasys and Alert** – Oasys and Alert provide the ability to automatically report and affirm trades through DTC, and to communicate current account delivery instructions to brokers.
- **SatuitCRM** – On-demand and on-premise vertical market sales force automation and client relationship management solution.
- **Schwab Compliance Technologies, Inc.** – Compliance automation software vendor; includes employee trading preclearance, insider trading surveillance, policy affirmations, employee disclosures, gifts and entertainment reporting, and political contribution preclearance and reporting.

CHAMPLAIN INVESTMENT PARTNERS

35

Scott Braymen answered in the affirmative that, that is the service that Champlain uses to cast their ballot. Scott stated that Champlain makes the vote themselves. Scott stated that Chaplain reads research from Glass Lewis and ISS. Scott proceeded to state that Champlain does read outside research, but Champlain makes the vote and the choice themselves. Scott stated that if TSRS gives Champlain guidelines, that Champlain will consider those guidelines and if not, they will use their own guidelines. Scott stated that Champlain isn't rubberstamping management's compensation packets.

John O'Hare stated that CalPERS seems to be a very progressive fund as far as voting proxies and everything and he is wondering if there is any value in TSRS piggybacking upon how CALPERS votes their proxies.

Chairman Fleming responded by stating to let's have a conversation about it and bring in some outside resources to figure out whether that is a good idea.

John O'Hare asked Champlain if the fees are based on assets under management, which is the value of TSRS's funds with Champlain, and if Champlain's total assets under the management go up 100%, how much do your expenses go up? Do they go up or down 100% just because your assets under management have gone up 100%.

Judith O'Connell answered in the affirmative. Judith stated that Champlain has over time expanded the research team and Champlain is also investing in the business. Judith proceeded to state that Champlain has made significant investment in their tools such as EVA dimensions, and is in the process of building out a data warehouse system and is partnering with SEI, and has added resources to compliance activities. Judith stated it's not a dollar for dollar; it's a leveragable business model.

Mr. O'Hare stated that it is one of the great scalable businesses. Mr. O'Hare asked is it 20%, 30%, 50%, 70%.

Judith O'Connell with Champlain Investment Partners responded that she doesn't know off of the top of her head.

Scott Braymen stated that it is scalable but also there is a lot of alignment in their business model because if Champlain doesn't make assets grow, their compensation goes down. Scott stated that if Champlain doesn't deliver a credible value proposition to the marketplace like this, then Champlain doesn't have a business. Scott stated if this doesn't happen, then Champlain is extinct. When you build this value proposition and continuously deliver this value proposition, you have very good business and clients also have very good outcomes.

John O'Hare stated, looking at what the other Small to Mid-Cap active manager in the portfolio, Fidelity, over the last 60 months, he believes they have returned 400 basis points and Champlain which is a bottom has only returned about 103 basis points.

Judith O'Connell asked John O'Hare if that is Small-Cap or Mid-Cap.

John O'Hare stated that it is Small-Cap he believes the Mid-Cap product to be similar.

Scott Braymen stated that Champlain's Small-Cap has a similar advantage right now, if not more.

John O'Hare asked if TSRS should be in Champlain's Small-Cap.

Scott Braymen replied that Small-Cap and Mid-Cap are apples and oranges. Scott proceeded to state that he doesn't own any passive strategies in any account of his, his relatives have no passive exposure, and he hears Mr. O'Hare's argument. He's a shareholder of Champlain; he believes in active management, he believes in this value proposition, that this is his career and his livelihood. Champlain is gaining share in the market where a lot of active investors are being divested where Champlain is actually growing assets particularly in Mid-Cap.

John O'Hare replied by asking if Champlain has a defined contribution or a defined benefit plan for their employees to help with employee retention.

Judith O'Connell answered in the affirmative. She stated it's a defined contribution plan. Judith stated that Champlain has a profit sharing plan so it goes into there.

Scott Braymen stated that Champlain also makes all key employees owner operators; they are all shareholders. Scott stated that everyone at the firm knows that if Champlain doesn't deliver on this end of the spectrum, then Champlain is toast.

John O'Hare asked if Champlain Investment Partners is a privately held company.

Scott Braymen and Judith O'Connell answered in the affirmative.

Chairman Fleming thanked Scott Braymen and Judith O'Connell with Champlain Investment Partners for their presentaiton.

C. **Plan Administrator's Report**

1. Report on Office Operations and Key Facts and Figures From the Past Month

Chairman Fleming stated that the next item on the agenda is the Plan Administrator's Report.

Neil Galassi thanked Chairman Fleming. Mr. Galassi stated, first of all he would like to introduce to the Board, Ginny Rath Pepper. Mr. Galassi proceeded to state that she came on board as the new Administrative Assistant for the Retirement Office this past Monday, and the office is excited to have Ginny here. Mr. Galassi stated that she is from the Phoenix area and believes that she brings many skills sets to the table that will really benefit the office. Mr. Galassi asked Ginny tell the Board a little bit about herself.

Ginny Rath Pepper introduced herself. Ginny stated that she is new to the Tucson area and is from Phoenix. Ginny proceeded to state that she has been here for a month and a half and is happy to be here. Ginny stated prior to working at the City of Tucson, she was a math teacher, a GED teacher, has a bachelors in Education, and has associate degrees in business and accounting. She has worked in the insurance field as a property adjuster.

Neil Galassi welcomed Ginny and stated that he is happy to have her here with us.

Neil Galassi stated that he wants to mention to the Board the efforts of Veronica Natividad and Cindy Garcia, two administrative assistants within the Finance Department. They both took time from their normal roles to assist the Retirement Office as they worked toward hiring the Administrative Assistant's position. Mr. Galassi stated that their help was very much appreciated by staff and wants to relay that to the Board.

Neil Galassi went over some operational highlights., For month of August, we have processed six normal retirements, five deferred retirements, and two disability retirements. The board may have noticed that there is one retiree on the ratification report that had retired last year but is presented on this month's ratification report. The timing was due to a legal issue for this member's retirement and nothing on the retirement's office's end.

Neil Galassi stated that we have had a total of 2,942 pension payment across all categories in August and of that 2,923 were direct deposit, and 19 were live checks, so we are keeping the live check number low. Mr. Galassi proceeded to state that 20 refunds/rollovers were processed and totaled approximately $219,439.14. Mr. Galassi stated that during the month we had external auditors here, the week of September 5, and that he will go into that in more detail during his operation highlight. Mr. Galassi stated that he did receive the draft of the actuarial valuation from the Actuary, Gabreil Roeder, Smith, and Company. He indicated the Actuary mentioned the draft was provided to us three weeks earlier than they typically do. So, Mr. Galassi wanted to commend the efforts of the retirement office, particularly Dawn Davis and Bob Szelewski who worked diligently to answer the actuarial data questions as well as the Accounting Operations Division for turning around the financial data quickly. Mr. Galassi proceeded to state we began drafting the Comprehensive Annual Financial Report for TSRS now that we have the financial data from Accounting Operations. Mr. Galassi proceeded to state the CAFR process involves coordination from the Investment Consultant and the Actuary as there are pertinent sections where those parties will provide us information. Mr. Galassi stated the he anticipates if all goes smoothly we will have a CAFR draft ready by early November, and it will definitely give us ample time for our internal and external auditor review process to submit a time for the Government Finance Officer's Association award.

Neil Galassi stated in regards to TSRS investment activity during this month, the portfolio remained relatively unchanged from July to August, but during September we had seen some gains equating to roughly 70 basis points mostly in the past week. Mr. Galassi stated that there seems to be three major factors in play this month: a surge in oil prices toward the end of the month lifted the equity indexes with the announcements about OPEC cutting oil production in November. This will give the market some stability in regard to oil prices.

Second, is the presidential election outcome given the differing economic policies of the candidates. Lastly, are the actions of the Federal Reserve. Mr. Galassi stated that there was a Federal Reserve meeting this month. They acknowledged that they have seen progress towards its goal of full employment and has seen stability in regards to interest rates. Mr. Galassi stated that they have given indication that they would like to see progress be more stable and continue that trajectory before a rate hike so they have indicated they are going leave rates on hold taking a Dovish as opposed to an aggressive tone when looking at their projections. Mr. Galassi stated with that we have seen some Fed induced market volatility last month. Leading up to the Fed meeting, the portfolio was declining with speculation on what the Fed was going to decide, and after the meeting when there was some clarity, the portfolio started going up in general when the markets reacted. So, we started seeing gains toward the end of the month Mr. Galassi stated that it is worth noting that a raise in interest rates does have potential to cause volatility in our fixed income portfolios so we are looking to be educated on that area with Callan and Associates giving a presentation at the retreat next month. Mr. Galassi asked the Board if they have any questions about his operational highlights or investment report.

John O'Hare asked Neil Galassi if the Fiscal Year 2018 and the budget calendar out yet.

Silvia Amparano replied by stating that it has not come out yet.

John O'Hare asked Sylvia Amparano if she can give it to the Board when it comes out.

Sylvia Amparano asked John O'Hare if he was referring to the City's Budget.

John O'Hare answered in the affirmative.

Sylvia Amparano answered in the affirmative.

Michael Coffey asked Neil Galassi about the external audit that took place recently and asked if we are going to be printing results from it.

Neil Galassi replied by stating that he will be going into the external audit process, so hopefully he will be able to answer questions.

2. TSRS Operation Highlight – The External Audit Process

Neil Galassi stated for this month's operational highlight he chose the external audit process. Mr. Galassi stated that our external auditors are CliftonLarsenAllen, and they were on-site the week of September 5th. Mr. Galassi stated that the audit process is important because it leads to the opinion on the Financial Statements of the TSRS as to them being free from misstatement in all material respects. Mr. Galassi stated what that means is that our members, the Board, our actuaries, and other interested parties can rely on the information presented in the Financial Statements and related notes for decision making. Mr. Galassi stated the auditors use audit techniques that generally involve analytical analysis, direct confirmation of amounts, like reviewing statements from our custodian bank BNY Melon and investment manager statements, and sampling transactions to determine the functionality of our internal controls over financial reporting. Mr. Galassi stated that they had three auditors on-site and they actually scheduled the visit for 2 weeks, but due to our level of preparation for the process they were able to accomplish their on-site objectives within a week. However, they will be following up with some of the final financial reporting areas for the CAFR later on. Mr. Galassi stated that he thought it would be important for the Board to have an idea of what they did. Mr. Galassi stated that the external auditors drew samples of new retirees during the year, and a sample of recurring pension payments from existing retirees, to verify controls over our calculations of benefits and continuing payment of benefits are functioning. They also reviewed our controls over lump sum payments. The auditors drew a sample of those, and reviewed our internal control processes over that area. They took a sample of employees entering in the system during the year to verify that they were set up with the correct contribution rate as Tier 2, and determine the functionality of controls over contributions ensuring that those are recorded in the plan's records. Mr. Galassi stated that he wants to mention that we do a lot of reconciling of the actuary system to the general ledger, so the auditors reviewed the reconciliations performed over the related areas. They also

reviewed all of the investment balance reconciliations from the accounting records to the reports of the Custodian Bank, BNY Mellon. In addition, they interviewed and performed observations regarding the performance of our duties and our internal controls. Mr. Galassi proceeded to state that it was a very robust process, generating a lot of questions, and he is happy to report the initial results indicate no audit findings for the plan. He believes this is very exceptional given the level of turnover that happened in the Retirement Office during the fiscal year. Mr. Galassi stated that in his experience as an auditor, significant turn over typically led to some audit findings. So, he is very happy to report that initial results indicate a clean audit. Mr. Galassi proceeded to state, that he will of course educate the Board if anything comes up as the auditors complete the audit process.

D. **Administrative Discussions**

1. Renewal of Investment Consultant Contract

Chairman Fleming stated that the next item is the renewal of the Investment Consultant Contract.

Nail Galassi stated that he wanted to add just a few comments before we start. Mr. Galassi stated as part of the audit process, he did find that our investment consultant contract with Callan expired as of June 30, 2016, and there is a provision that he provided to the Board, in the existing contract for us to renew for two additional years under the same fee structure. Mr. Galassi stated that both parties need sign a written amendment to execute the provision. Mr. Galassi stated that Callan has already indicated that they intend to renew with, us as you can see by Gordie already signing the amendment. So, this agenda item is to determine if we want to continue with them for two additional years.

Chairman Fleming stated that if we are going to continue with them for two years, then we will need a motion.

Chairman Fleming stated to Neil Galassi that he thinks that should we get to do one at a time. Chairman Fleming asked Neil Galassi if we are doing it for two years.

Nail Galassi replied by stating that we can renew for two, one year periods. Mr. Galassi stated that this amendment is basically our indication that we are going to stay with them until June 30, 2018.

Chairman Fleming asked Neil Galassi if it is for both of the years then.

Neil Galassi answered in the affirmative.

Chairman Fleming presented a motion to approve the contract amendment.

Silvia Amparano replied second.

John O'Hare replied by asking about the contract provisions for a 30 day mutual bailout.

Neil Galassi responded by stating that he is not sure of that.

Silvia Amparano stated that provision number 4 on the contract addresses that.

John O'Hare responded by asking if we can see if it is available, the breakout of the total fee charged by Callan for their services

Neil Galassi responded we would request that of Callan and Associates.

Chairman Fleming asked if there is any further discussion or questions.

Chairman Fleming stated to the board, all of those in favor of the motion to sign the two, one year extension agreement, indicate by "I".

TSRS Board all replied “I”.

Chairman Fleming asked the board if anyone opposed.

Chairman Fleming stated that he will vote that “I” passes unanimously.

2. Board Member Education Plan Discussion

Chairman Fleming stated that the next item on the agenda is the Board Member Education Plan.

Nail Galassi thanked Chairman Fleming. Mr. Galassi stated that Board requested educational lists for Board members. Mr. Galassi stated that he contacted the COPERS, the City of Phoenix’s Retirement System. Mr. Galassi stated that their Director has experience as a pension lawyer, and he provided this list from the National Association of Public Pension Attorneys. It’s a very robust list of educational sites that hopefully will give the Board some guidance as they look for education opportunities moving forward. Mr. Galassi stated that the next thing he wanted to mention is that when he wrote his synopsis for the Board, the Board Education Plan, he probably should have provided what was stated in our Board adopted Governance Policies, where his synopsis was derived from. Mr. Galassi stated the reason he provided this to the Board is that if we were to change how we require Board member education, it would involve a change to our governance policies. Such changes would have to be approved by the Board. Mr. Galassi wanted to reiterate our current framework as dictated in Governance Policy, is that Board members should identify areas in which they might benefit from additional education and then in turn work with staff to find reasonable and appropriate educational opportunities.

Mr. Galassi asked John O’Hare if he has any proposals to bring forth regarding potential changes to this Governance Policy at this time.

John O’Hare replied by stating that he doesn’t at this time.

Chairman Fleming stated that this is a helpful list and wonders if any of anybody on the list holds educational events the Board could attend.

Neil Galassi replied by stating what he plans on doing is going down the list of organizations and monitoring them. As he sees events occurring he will communicate those to the Board. Mr. Galassi proceeded to state that he did provide the list should anyone on the Board want to go on the websites of these organizations and see what resources they may have available.

Chairman Fleming stated that it strikes him as maybe not terribly productive to look up the National Educations Association, or the National Council on Teacher Retirement, but there are probably ten of these that if they happen to be convenient times and easy locations we would benefit from it.

Neil Galassi stated that some of these organizations may have webinars and other types of online education to look at too.

Chairman Fleming stated that maybe we can set ourselves the task of everybody doing a little bit of moseying around to see if they can find out maybe we can share that back to the group at some future date.

John O’Hare stated that there is the annual Opal Public Funds conference coming up January 9-11, 2017.

Neil Galassi answered in the affirmative. Mr. Galassi stated that he did provide the board a copy of that announcement.

John O’Hare stated that it is a very convenient one as it is in the Phoenix area.

Chairman Fleming responded in the affirmative.

John O'Hare stated that you can go off on a day trip for the meet and greet portion of the conference if people are concerned about time.

Neil Galassi stated that one other comment he would like to make is that he did a little research. Mr. Galassi stated that the Board collectively can attend a conference. Mr. Galassi stated that all we need to do is post a notice that they are doing so, and that no discussion on the Plan or anything regarding business of the Board will be held. Mr. Galassi proceeded to state that as far as members not being at the same session, as long as we announce that a group will be up there, we are perfectly covered and legally.

John O'Hare stated that it is a good thing that Neil is reaching out to the COPERS, plus that he knows Paul Matson who is the head of the ASRS. They are great resources and that all those people are willing to talk to TSRS Board members also.

Neil Galassi stated that Paul Matson wanted to come to our retreat but he had a conflicting Board meeting on that day. Mr. Galassi stated he works to build good relationships with the other retirement systems as he feels it is very important to the TSRS.

Chairman Fleming stated that is good to know and thanked Mr. Galassi.

3. Report From Board Member on 2016 Public Funds Forum

Chairman Fleming stated that the next item is a report from John O'hare. Chairman Fleming asked John O'Hare if the Public Funds Forum is on the list.

John O'Hare responded stating that he didn't see it but that we can put it on there.

John O'Hare stated that this is some of his takeaways from the Annual Public Funds Forum where about 200 fund trustees show up. Mr. O'Hare stated it's 14 sessions over a 4 day period and the featured speaker was Ben Bernanke and it was interesting to get an insider's view on the 2008 economic meltdown and how he saved the country. Mr. O'Hare stated one of the things mentioned is that the Fed has done about all that it can do obviously, and that the country needs a pro-growth policy, and that the CEOs should be looking at the long term instead of a quarter by quarter basis. The conference had a theme that a good long term horizon is a 3 year term. Mr. O'Hare proceeded to state that a study that Mr. Bernanke quoted says that 70%-90% of productivity value comes out about the 3rd year and not on a quarter by quarter basis. Mr. O'Hare stated that there was an author there that wrote a book that it is called "What They Do With Your Money" and it is based upon all of the hidden fees that people are taking out of the transactions and that it amounts to about 2%. If those fees could get down to 1%, the author says that the US economy would grow by 40% which is a pretty startling claim. Mr. O'Hare stated that there was a session on best governing practice for Boards, and it was mentioned a best practice involves the Board benchmarking against other Boards and thinks that we will be able to do that in the future sometime. Mr. O'Hare stated that they were also talking about seeking out specific skills for the Trustees and it is a best practice, which is already built into our Code that the trustees have to have those certain skills. Mr. O'Hare said that they mentioned that advisory committees are a good thing and he thinks that we should look into potential formation of one. Another best practice advises that the boards should be setting their own budgets and that we do that now basically. Another best practice presented involved having a formal education process for new trustees. Mr. O'Hare stated that they recommended a book for new trustees titled, "The Random Walk Down the Wall Street". Mr. O'Hare stated that he thinks the book is about 20 years old.

Chairman Fleming stated that it's rewritten every 5 years or so.

Mr. O'Hare stated that in regards to investing and climate change issues; instead of not investing in companies that don't follow climate change protocol that investors should be engaging those companies and helping them. Mr. O'Hare stated that David Axelrod spoke at the forum who was President Obama's campaign manager for

2008 and 2012, and it was interesting to see how they won the 2008 and 2012 elections. Mr. O'Hare stated that shareholder activism came up, meaning a shareholder's ability to influence a corporation's behavior. We are shareholders on the Board, and with that said what can a $750 million dollar fund, which is a small fund, do in the active shareholder area whereas larger funds like ASRS, a $35 billion dollar fund, and CalPERS plus CalSTRS, which is the California Teachers Fund, totals about $300 billion. Mr. O'hare feels we can align ourselves with what they are doing.

Chairman Fleming thanked Mr. O'Hare.

4. October Board Retreat Update

Mr. Galassi stated that he passed out a draft of the agenda for the October retreat prior to the meeting. Mr. Galassi stated that we are holding it at the Arizona Inn again this year. Mr. Galassi stated that there will definitely be a robust range of speakers; we have planned roughly 5 hours plus of meeting time. Mr. Galassi stated the first presenter will be Andrew Goldberg from JP Morgan. Paul Erlendson from Callan brought him to the table after hearing his presentation called "A Guide to the Capital Markets. Mr. Galassi stated that after that we will have our Actuary, Gabriel Roeder Smith and Company (GRS) do their presentation on the actuarial report. Mr. Galassi stated that he asked GRS to do a comparison of us to the other Arizona plans to help give the Board an idea of where we stand in relation to the other plans in Arizona. GRS will also go into the risk sharing features of our current Tier 1 variable and Tier 2 structures as well as the discussion of a potential Tier with a 50/50 split per request of the Board. Mr. Galassi proceeded to state our external legal counsel, Catherine Langford, will come right after her and give the Board a refresher on the Arizona Constitution as it relates to pension provisions so that the Board is up to date on the State legal requirements over pensions. Mr. Galassi proceeded to state that we are working on having an executive summary for the funding policy as we talked about in June, so it will hopefully bring something to the table for the Board on that to help make that document more digestible for our members and any other interested parties. Mr. Galassi stated that Ms. Langford will also provide the Board with a fiduciary training presentation. Mr. Galassi stated the afternoon will be more investment driven. Mr. Galassi stated that one of our investment managers, PIMCO, will give a presentation on the two strategies they currently manage for us. Callan will present right after PIMCO and go over the Fixed Income Portfolio Composition as they mentioned during their attendance at last month's Board meeting. Mr. Galassi proceeded to state that Gordon Weightman from Callan is going to bring John Pirone with him, who is one of Callan's fixed income strategists, Callan will also address one of our future agenda items, an action plan for Black Swan events. Mr. Galassi stated an administrative discussion will be held on the potential formation of an Advisory Committee which has been a future agenda item. Mr. Galsassi stated that he can add the board member education item to the retreat as well.

Chairman Fleming stated that he thinks the answer is, let's see Mr. O'hare's written proposal and circulate that, but don't put it on the retreat agenda; let's look at it before we get it on the agenda.

Neil Galassi answered in the affirmative.

Michael Coffey stated that it is a massive agenda and wonders if Mr. Galassi thinks it's possible for him to distribute materials more than a week in advance.

Neil Galassi replied by stating that he has been in contact with all of these individuals, and they are aware of their individual presentation requirements. Mr. Galassi proceeded to state he will contact the presenters over the next day to facilitate provision of materials to the Board as early as possible.

Chairman Fleming stated what would good if there was a webpage where you can just stick stuff electronically when you got it and we can all have the link.

Neil Galassi replied by stating that we can either do that or he can email Board members the information when he gets it.

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Chairman Fleming thanked Mr. Galassi.

John O'Hare stated that maybe the webpage is something to think of because there are members beneficiaries that are interested.

Chairman Fleming stated that he was thinking that we could do that for all future meetings too if it turned out to be easy to do.

Neil Galassi answered in the affirmative, and indicated he would post the materials on the TSRS webpage as they are received.

Michael Coffey stated that he would also appreciate a hard copy of the material.

Neil Galassi stated that we are planning on doing compiling binders with the materials as has been done in the past.

Mr. O'Hare stated that we tend to benchmark ourselves with other people in the state but because of the size of our fund, we should possibly be benchmarking ourselves with those of similar size and nature fire throughout the country.

Chairman Fleming asked Mr. O'Hare if we could see what this looks like first. Chairman Fleming stated that he thinks that there are some questions other than just investment issues; there are government issues that are probably controlled by state statutes.

Neil Galassi stated that is why we are having Cassie do a refresher on the State of Arizona Constitutional provisions.

E. **Call to Audience –** none heard.

F. **Future Agenda Items**
   1. Duties and Selection of Advisory Board
   2. TSRS Board Annual Evaluation of Staff and Consultants
   3. RFQ for Actuarial Services
   4. Action Plan for Black Swan Events

G. **Adjournment –** 9:53 AM

Approved:

_____	_____	_____	_____
Michael Coffey, Acting Chair Chairman of the Board	Date	Neil S. Galassi Pension Administrator	Date

Service & Disability Retirements, End of Service Entrants for TSRS Board of Trustees Ratification

09/11/16 - 10/10/16 - September 2016

Name of Applicant	Department	Type	Effective Date	Date of Birth	Age	Credited Service	Present Value	Member's Accumulated Contributions	AFC	Option	Pension
Dodie A Frederickson	General Services	Normal Retirement	9/23/2016	6/24/1951	65.25	22.1332	426,061.18	198,794.17	6,801.60	Single Life	3,387.18
Guadalupe A Martinez	Transportation	Beneficiary	10/1/2016	8/25/1962	54.10	22.607	276,788.42	91,294.76	4,083.86	Term Certain 180	2,002.54
Nick F Pauley	General Services	Normal Retirement	10/1/2016	9/4/1958	58.08	26.5944	239,096.86	79,828.92	2,955.16	J&S 50	1,671.97
Joe L Yanez	General Services	Normal Retirement	9/27/2016	7/10/1948	68.21	13.1321	89,668.14	28,161.00	2,710.25	J&S 100	665.46
Alfred R Carley	Water	Disability Retirement	8/25/2016	9/26/1963	52.91	20.0461	211,582.24	61,360.57	3,259.69	J&S 50	1,422.65
Stacey A Matthews	City Attorney	Normal Retirement	9/10/2016	8/9/1953	63.09	29.9518	376,823.11	126,040.07	4,293.47	Single Life	2,893.44
**Fredrick H Gray Jr.	Parks and Recreation	Normal Retirement	10/4/2016	2/22/1953	63.62	17.45	**	252,261.20	**10,777.87	Single Life	**4,231.66
**Doris L Rentschler	Finance	Normal Retirement	10/4/2016	9/17/1965	51.05	32.1	**	279,629.76	**6,472.27	J&S 100	**4,409.20
									24,104.03		12,043.24
				Averages	31.75		$ 270,003.33	139,671.31	4,017.34		2,007.21

** Due to the timing of employee leave payout processing, the Retirement Office did not have the related final amounts in time to finalize the benefit payment for the first month of retirement for these employees. In the interest of providing these benefits timely to members, the pension payment presented for ratification is an estimated payment based on all available information. In the next month's meeting the final amounts will be reported on this report to the Board for the effected members.

Comparison of Monthly Pension Payments - Beginning of FY 2016 to Current Monthly Pension Payments

	Plan Year beginning 07/01/2015 (*from GRS annual valuation)	Monthly	Annual	September 2016 Pension Payroll		Annualized	Annual change since July 1, 2015	% change
Service Pensions	2,305	5,007,097.17	60,085,166	2,458	5,420,580	65,046,955.80	$ 4,961,789.80	8.26%
Disability Pensions	160	174,259	2,091,109	153	172,208	2,066,494.68	$ (24,614.32)	-1.18%
Survivor Pensions	344	298,979	3,587,750	345	339,505	4,074,062.76	$ 486,312.76	13.55%
	2,809	5,480,335	65,764,025	2,956	5,932,293	71,187,513	$ 5,423,488.24	8.25%
				45	**$ 154,360**			
				(net) change from previous month				
			prior month	2,911	$ 5,777,933.08			

S:\treasdiv\tsrs\retirement\facts&figures\F&F 15-16.xls

Report ID : FIN-COT-BA-0001
Run Date : 10/19/2016
Run Time : 04:35 PM

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Parameter Page

Parameters and Prompts

Fiscal Year	2017
Accounting Period	3
Fund	072
Department	*
Unit	*
Object Code	*

Report Description

The Expenses vs. Actual Report shows expenditures and encumbrances for the selected accounting period and for the selected fiscal year compared against the current expense budget and the unobligated budget balance. The report is sectioned by Department, Fund and Unit and summarized by Object.

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM
Fund 072 - TUCSON SUPP RETIREMENT SYSTEM
Unit 9001 - Normal Retiree Benefit

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
105 - PAYROLL PENSION	0.00	5,418,554.23	5,418,554.23	0.00	16,034,876.90	16,034,876.90	68,300,000	52,265,123.10	76.52 %
Total for 100 - PAYROLL CHGS	**0.00**	**5,418,554.23**	**5,418,554.23**	**0.00**	**16,034,876.90**	**16,034,876.90**	**68,300,000**	**52,265,123.10**	**76.52 %**
Total for Unit 9001 - Normal Retiree Benefit	**0.00**	**5,418,554.23**	**5,418,554.23**	**0.00**	**16,034,876.90**	**16,034,876.90**	**68,300,000**	**52,265,123.10**	**76.52 %**

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM
Fund 072 - TUCSON SUPP RETIREMENT SYSTEM
Unit 9003 - Normal Retiree Beneficiary Benefit

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
105 - PAYROLL PENSION	0.00	310,710.96	310,710.96	0.00	927,513.71	927,513.71	3,100,000	2,172,486.29	70.08 %
Total for 100 - PAYROLL CHGS	**0.00**	**310,710.96**	**310,710.96**	**0.00**	**927,513.71**	**927,513.71**	**3,100,000**	**2,172,486.29**	**70.08 %**
Total for Unit 9003 - Normal Retiree Beneficiary Benefi	**0.00**	**310,710.96**	**310,710.96**	**0.00**	**927,513.71**	**927,513.71**	**3,100,000**	**2,172,486.29**	**70.08 %**

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM

Fund 072 - TUCSON SUPP RETIREMENT SYSTEM

Unit 9020 - Disability Retiree Benefit

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
105 - PAYROLL PENSION	0.00	169,777.57	169,777.57	0.00	510,824.47	510,824.47	1,975,000	1,464,175.53	74.14 %
Total for 100 - PAYROLL CHGS	**0.00**	**169,777.57**	**169,777.57**	**0.00**	**510,824.47**	**510,824.47**	**1,975,000**	**1,464,175.53**	**74.14 %**
Total for Unit 9020 - Disability Retiree Benefit	**0.00**	**169,777.57**	**169,777.57**	**0.00**	**510,824.47**	**510,824.47**	**1,975,000**	**1,464,175.53**	**74.14 %**

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM
Fund 072 - TUCSON SUPP RETIREMENT SYSTEM
Unit 9021 - Pension Fund Administration

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
101 - SALARIES & WAGES FOR PERMANENT EMPLOYEES	0.00	14,097.03	14,097.03	0.00	48,370.21	48,370.21	230,100	181,729.79	78.98 %
103 - OVERTIME WAGES	0.00	0.00	0.00	0.00	344.22	344.22	0	(344.22)	0.00%
108 - DOWNTOWN ALLOWANCE & DISCOUNTED TRANSIT PASSES	0.00	69.24	69.24	0.00	237.40	237.40	1,200	962.60	80.22 %
113 - TSRS PENSION CONTRIBUTION	0.00	4,225.32	4,225.32	0.00	13,203.18	13,203.18	63,280	50,076.82	79.14 %
114 - FICA (SOCIAL SECURITY)	0.00	1,176.21	1,176.21	0.00	3,714.01	3,714.01	17,600	13,885.99	78.90 %
115 - WORKERS COMPENSATION INSURANCE	0.00	181.19	181.19	0.00	646.82	646.82	6,440	5,793.18	89.96 %
116 - GROUP PLAN INSURANCE	0.00	984.18	984.18	0.00	3,671.99	3,671.99	32,760	29,088.01	88.79 %
117 - STATE UNEMPLOYMENT	0.00	17.34	17.34	0.00	60.49	60.49	300	239.51	79.84 %
196 - INTERDEPARTMENTAL LABOR	0.00	0.00	0.00	0.00	0.00	0.00	156,000	156,000.00	100.00 %
Total for 100 - PAYROLL CHGS	**0.00**	**20,750.51**	**20,750.51**	**0.00**	**70,248.32**	**70,248.32**	**507,680**	**437,431.68**	**86.16 %**
202 - TRAVEL	0.00	0.00	0.00	0.00	0.00	0.00	4,000	4,000.00	100.00 %
204 - TRAINING	0.00	0.00	0.00	0.00	315.00	315.00	14,000	13,685.00	97.75 %
205 - PARKING & SHUTTLE SERVICE	0.00	0.00	0.00	0.00	0.00	0.00	220	220.00	100.00 %
212 - CONSULTANTS AND SURVEYS	0.00	0.00	0.00	0.00	0.00	0.00	50,000	50,000.00	100.00 %
215 - AUDITING AND BANK SERVICES	22,300.00	2,000.00	24,300.00	22,300.00	2,000.00	24,300.00	25,000	700.00	2.80 %
219 - MISCELLANEOUS PROFESSIONAL SERVICES	0.00	12,915.00	12,915.00	0.00	(185,016.15)	(185,016.15)	4,176,850	4,361,866.15	104.43 %
221 - INSUR-PUBLIC LIABILITY	0.00	232.74	232.74	0.00	778.65	778.65	32,100	31,321.35	97.57 %
228 - HAZARDOUS WASTE INSURANCE	0.00	45.19	45.19	0.00	152.28	152.28	0	(152.28)	0.00%

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM
Fund 072 - TUCSON SUPP RETIREMENT SYSTEM
Unit 9021 - Pension Fund Administration

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
232 - R&M MACHINERY & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	1,200	1,200.00	100.00 %
235 - MINOR REHAB, REMODEL & ALTER	0.00	0.00	0.00	0.00	114.00	114.00	1,550	1,436.00	92.65 %
245 - TELEPHONE	0.00	420.00	420.00	0.00	420.00	420.00	1,200	780.00	65.00 %
260 - COMPUTER SOFTWARE MAINTENANCE AGREEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	41,000	41,000.00	100.00 %
263 - PUBLIC RELATIONS	0.00	0.00	0.00	0.00	0.00	0.00	2,560	2,560.00	100.00 %
284 - MEMBERSHIPS AND SUBSCRIPTIONS	0.00	0.00	0.00	0.00	458.94	458.94	1,500	1,041.06	69.40 %
298 - PLANNED BUILDING MAINTENANCE	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00%
Total for 200 - PROF CHARGES	**22,300.00**	**15,612.93**	**37,912.93**	**22,300.00**	**(180,777.28)**	**(158,477.28)**	**4,351,180**	**4,509,657.28**	**103.64 %**
311 - OFFICE SUPPLIES	0.00	383.28	383.28	0.00	757.48	757.48	9,000	8,242.52	91.58 %
312 - PRINTING,PHOTOGRAPHY,REPRODUCTION	0.00	0.00	0.00	0.00	483.10	483.10	9,000	8,516.90	94.63 %
314 - POSTAGE	0.00	1,433.07	1,433.07	0.00	1,433.07	1,433.07	12,000	10,566.93	88.06 %
317 - COMPUTER SOFTWARE < $100,000	0.00	0.00	0.00	0.00	0.00	0.00	550	550.00	100.00 %
341 - BOOK, PERIODICALS AND RECORDS	0.00	0.00	0.00	0.00	0.00	0.00	250	250.00	100.00 %
345 - FURNISHINGS, EQUIPMENT AND TOOLS < $5,000	0.00	0.00	0.00	0.00	0.00	0.00	4,700	4,700.00	100.00 %
346 - COMPUTER EQUIPMENT < $5,000	0.00	0.00	0.00	0.00	0.00	0.00	650	650.00	100.00 %
Total for 300 - SUPPLIES	**0.00**	**1,816.35**	**1,816.35**	**0.00**	**2,673.65**	**2,673.65**	**36,150**	**33,476.35**	**92.60 %**
455 - COMPUTER EQ >= $5,000	0.00	0.00	0.00	0.00	0.00	0.00	2,700	2,700.00	100.00 %

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM
Fund 072 - TUCSON SUPP RETIREMENT SYSTEM
Unit 9021 - Pension Fund Administration

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
Total for 400 - CAPITAL OUT	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2,700**	**2,700.00**	**100.00 %**
Total for Unit 9021 - Pension Fund Administration	**22,300.00**	**38,179.79**	**60,479.79**	**22,300.00**	**(107,855.31)**	**(85,555.31)**	**4,897,710**	**4,983,265.31**	**101.75 %**

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM

Fund 072 - TUCSON SUPP RETIREMENT SYSTEM

Unit 9022 - Disability Retiree Beneficiary Benefit

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
105 - PAYROLL PENSION	0.00	30,418.52	30,418.52	0.00	91,255.56	91,255.56	350,000	258,744.44	73.93 %
Total for 100 - PAYROLL CHGS	**0.00**	**30,418.52**	**30,418.52**	**0.00**	**91,255.56**	**91,255.56**	**350,000**	**258,744.44**	**73.93 %**
Total for Unit 9022 - Disability Retiree Beneficiary Ben	**0.00**	**30,418.52**	**30,418.52**	**0.00**	**91,255.56**	**91,255.56**	**350,000**	**258,744.44**	**73.93 %**

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM

Fund 072 - TUCSON SUPP RETIREMENT SYSTEM

Unit 9023 - ACTIVE MEMBER REFUNDS-CONTRBS

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
186 - TSRS REFUNDS	0.00	216,540.45	216,540.45	0.00	642,952.50	642,952.50	2,400,000	1,757,047.50	73.21 %
Total for 100 - PAYROLL CHGS	**0.00**	**216,540.45**	**216,540.45**	**0.00**	**642,952.50**	**642,952.50**	**2,400,000**	**1,757,047.50**	**73.21 %**
Total for Unit 9023 - ACTIVE MEMBER REFUNDS-CON	**0.00**	**216,540.45**	**216,540.45**	**0.00**	**642,952.50**	**642,952.50**	**2,400,000**	**1,757,047.50**	**73.21 %**

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM

Fund 072 - TUCSON SUPP RETIREMENT SYSTEM

Unit 9025 - INTEREST ON REFUNDS

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
186 - TSRS REFUNDS	0.00	2,895.75	2,895.75	0.00	4,488.64	4,488.64	50,000	45,511.36	91.02 %
Total for 100 - PAYROLL CHGS	**0.00**	**2,895.75**	**2,895.75**	**0.00**	**4,488.64**	**4,488.64**	**50,000**	**45,511.36**	**91.02 %**
Total for Unit 9025 - INTEREST ON REFUNDS	**0.00**	**2,895.75**	**2,895.75**	**0.00**	**4,488.64**	**4,488.64**	**50,000**	**45,511.36**	**91.02 %**

City of Tucson
Budget vs Actual Expenses
Through: September, 2017
For Fiscal Year 2017

Department 900 - TUCSON SUPPL RETIREMENT SYSTEM
Fund 072 - TUCSON SUPP RETIREMENT SYSTEM
Unit 9026 - DWE SYSTEM BENEFIT PAYMENT

Object	Current Period Encumbrance	Current Period Expenditure	Current Total Obligations	YTD Encumbrance	YTD Expenditure	YTD Total Obligations	Current Budgeted Amount	Unobligated Budget Balance	Percent
186 - TSRS REFUNDS	0.00	0.00	0.00	0.00	0.00	0.00	200,000	200,000.00	100.00 %
Total for 100 - PAYROLL CHGS	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**200,000**	**200,000.00**	**100.00 %**
Total for Unit 9026 - DWE SYSTEM BENEFIT PAYMEN	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**200,000**	**200,000.00**	**100.00 %**
Total for Fund 072 - TUCSON SUPP RETIREMENT SYS	**22,300.00**	**6,187,077.27**	**6,209,377.27**	**22,300.00**	**18,104,056.47**	**18,126,356.47**	**81,272,710**	**63,146,353.53**	**77.70 %**
Total for Department 900 - TUCSON SUPPL RETIREME	**22,300.00**	**6,187,077.27**	**6,209,377.27**	**22,300.00**	**18,104,056.47**	**18,126,356.47**	**81,272,710**	**63,146,353.53**	**77.70 %**
Grand Totals	**22,300.00**	**6,187,077.27**	**6,209,377.27**	**22,300.00**	**18,104,056.47**	**18,126,356.47**	**81,272,710**	**63,146,353.53**	**77.70 %**

TSRS Portfolio Performance Review

DATE: October 19, 2016

TO: The Board of Trustees
Tucson Supplemental Retirement System

FROM: Neil S. Galassi, CPA
Pension Administrator

SUBJECT: **September 2016 Summary Performance Report**

SUMMARY:

This report presents the Tucson Supplemental Retirement System's investment portfolio as of September, 2016. Attached to this summary is the Callan prepared Investment Measurement Service Monthly Review Report which serves as the basis for this summary.

As of August 31, 2016 and September 30, 2016, the Total Fund balance of was $742.6 million and $740.8 million respectively. This represents an approximate $1.8 million decrease from the prior month. There were withdrawals totaling $3.0 million from the Total Fund to support pension payments during the recent month, and $8.0 million has been withdrawn during fiscal year 2017.

For the month of September, the Total Fund performance, net of fees, was a positive 0.59% which was above custom benchmark return of 0.47%. Total Fund performance was primarily impacted by positive returns during the month in all equity classes with domestic equity returning 0.49% and international equity returning 1.38%. Fixed Income, and Real Estate investment allocations saw modest returns during the month of 0.12% and 0.47%, respectively while Infrastructure returns were a positive 0.41%; the S&P 500 Index returned 0.02% during the month.

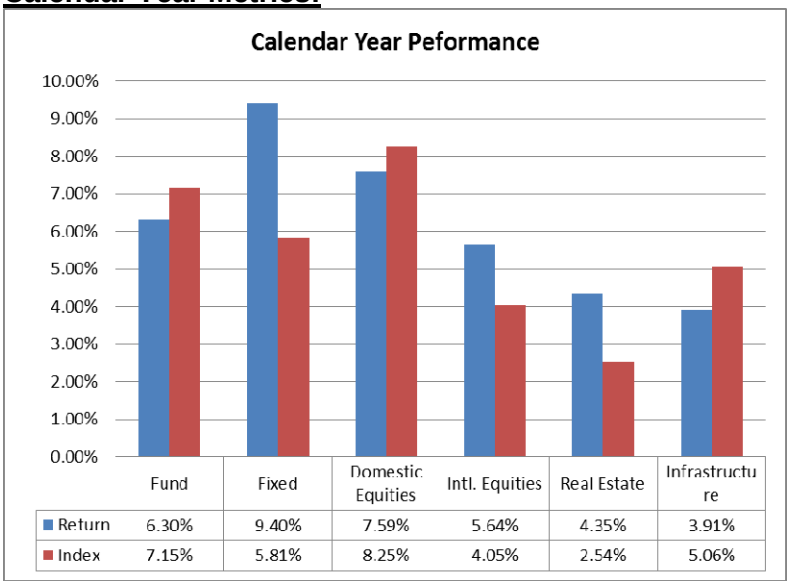
For the last twelve months the Total Fund performance was a positive 7.46% which was slightly above of the custom benchmark return of 6.86% by 60 basis points. The Total Fund performance was impacted by significantly improved returns in the International Equity Markets of 5.67%, which were better than the previous month's 12 month return of positive 1.43%. Large Cap Domestic equity market returns underperformed relative to the benchmark by 1.40% for the same 12 month period with Small/Mid Cap Domestic Equity outperforming the benchmark by 30 basis points. The Fund continues to experience 12 month positive returns on Fixed Income of 9.42% and returns on Real Estate and Infrastructure were 4.69% and 9.29% respectively.

In regards to equity funds over the past 12 month period, the Small/Mid Cap Equity funds for Champlain Mid Cap performed well above their benchmark by 4.22% while Fidelity (formerly Pyramis) Small Cap underperformed relative to the benchmark by 3.86%. Large Cap Equity fund managers were relatively consistent with their benchmark except for T-Rowe Price which underperformed relative to the benchmark by 5.07%. The international equity fund managed by Causeway trailed the benchmark by 5.10% while the Aberdeen international equity fund outperformed the benchmark by 5.03%. The quarter to date return for the American Century international equity fund was 7.64% which was 27 basis points under relative to the benchmark for the same period. Twelve month period returns are not yet available for this investment manager given the strategy was funded in May of 2016. For fixed income funds, the PIMCO Fixed Income Fund outperformed relative to benchmark by 1.43%, while the BlackRock U.S. Debt Fund was consistent with the benchmark of 5.80% at 5.87%. For Real Estate fund managers, both the JPM Strategic Property Fund and JPM Income and Growth Fund trailed the benchmark by 1.28% and 3.51% respectively. The Macquarie European Infrastructure Fund was 3.67% above the benchmark, and the Steel River Infrastructure fund also outperformed the benchmark by 4.82%

The Total Fund total as of today, October 19, 2016 was $744.8 million. This represents an increase of $4.0 million (67 basis points), over the balance as of September 30, 2016. The increase was primarily a result of an increase of 8.44 in Real Estate asset balances since prior month end.

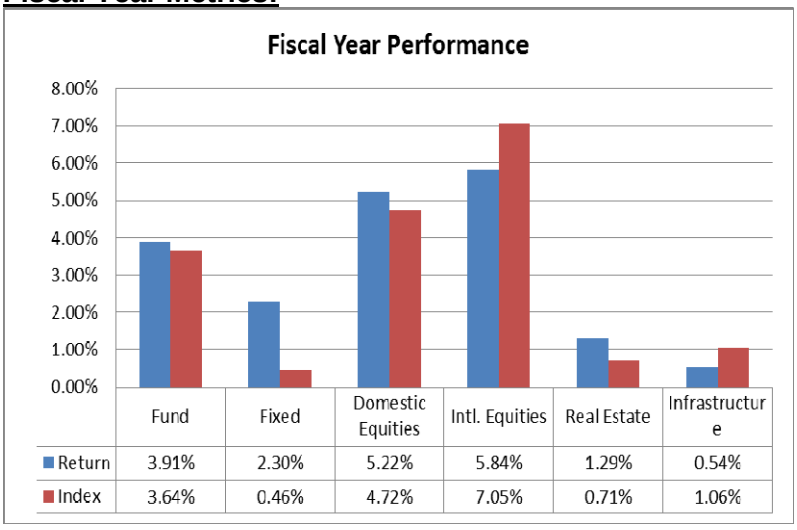
Summary graphs are as follows:

Calendar Year Metrics:



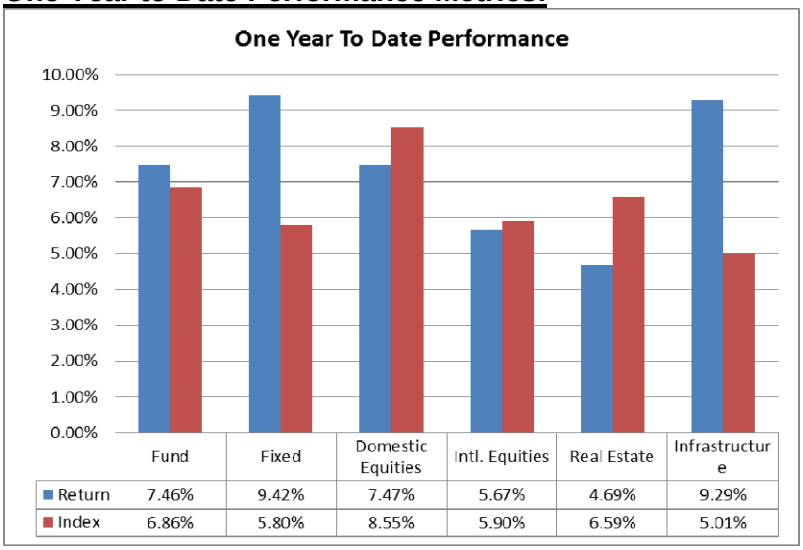
	Fund	Fixed	Domestic Equities	Intl. Equities	Real Estate	Infrastructure
Return	6.30%	9.40%	7.59%	5.64%	4.35%	3.91%
Index	7.15%	5.81%	8.25%	4.05%	2.54%	5.06%

Fiscal Year Metrics:



	Fund	Fixed	Domestic Equities	Intl. Equities	Real Estate	Infrastructure
Return	3.91%	2.30%	5.22%	5.84%	1.29%	0.54%
Index	3.64%	0.46%	4.72%	7.05%	0.71%	1.06%

One Year to Date Performance Metrics:



	Fund	Fixed	Domestic Equities	Intl. Equities	Real Estate	Infrastructure
Return	7.46%	9.42%	7.47%	5.67%	4.69%	9.29%
Index	6.86%	5.80%	8.55%	5.90%	6.59%	5.01%

Callan

September 30, 2016

Tucson Supplemental Retirement System

Investment Measurement Service Monthly Review

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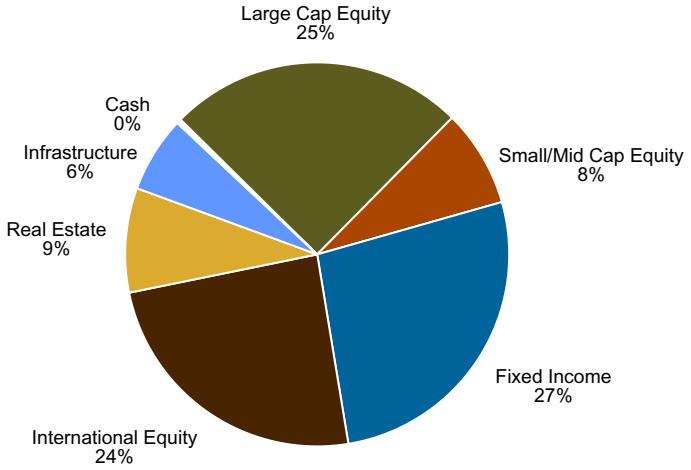
Tucson Supplemental Retirement System
September 30, 2016

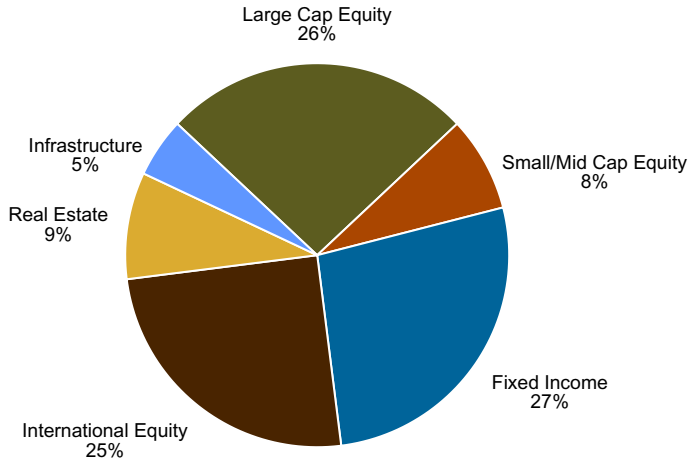
Actual vs Target Asset Allocation

The first chart below shows the Fund's asset allocation as of September 30, 2016. The second chart shows the Fund's target asset allocation as outlined in the investment policy statement.

Actual Asset Allocation



Target Asset Allocation



Asset Class	$000s Actual	Percent Actual	Percent Target	Percent Difference	$000s Difference
Large Cap Equity	185,394	25.0%	26.0%	(1.0%)	(7,217)
Small/Mid Cap Equity	61,110	8.2%	8.0%	0.2%	1,845
Fixed Income	198,810	26.8%	27.0%	(0.2%)	(1,209)
International Equity	180,596	24.4%	25.0%	(0.6%)	(4,607)
Real Estate	65,197	8.8%	9.0%	(0.2%)	(1,476)
Infrastructure	47,663	6.4%	5.0%	1.4%	10,622
Cash	2,042	0.3%	0.0%	0.3%	2,042
Total	740,812	100.0%	100.0%		

*Current Month Target Performance is calculated using monthly rebalancing.

Investment Manager Asset Allocation

The table below contrasts the distribution of assets across the Fund's investment managers as of September 30, 2016, with the distribution as of August 31, 2016. The change in asset distribution is broken down into the dollar change due to Net New Investment and the dollar change due to Investment Return.

Asset Distribution Across Investment Managers

	September 30, 2016				August 31, 2016	
	Market Value	Weight	Net New Inv.	Inv. Return	Market Value	Weight
Domestic Equity	**$246,504,152**	**33.27%**	**$(5,995,793)**	**$1,197,149**	**$251,302,795**	**33.84%**
Large Cap Equity	**$185,394,130**	**25.03%**	**$(4,498,791)**	**$637,721**	**$189,255,201**	**25.49%**
Transition Account (1)	10,607	0.00%	0	2	10,605	0.00%
Alliance S&P Index	55,628,493	7.51%	780	7,053	55,620,660	7.49%
PIMCO StocksPLUS	28,965,131	3.91%	(1,500,000)	17,067	30,448,064	4.10%
BlackRock Russell 1000 Value	48,854,965	6.59%	(3,005,857)	(131,534)	51,992,356	7.00%
T. Rowe Price Large Cap Growth	51,934,933	7.01%	6,286	745,132	51,183,516	6.89%
Small/Mid Cap Equity	**$61,110,022**	**8.25%**	**$(1,497,002)**	**$559,429**	**$62,047,595**	**8.36%**
Champlain Mid Cap	31,190,246	4.21%	1,198	402,258	30,786,791	4.15%
Pyramis Small Cap	29,919,775	4.04%	(1,498,199)	157,171	31,260,803	4.21%
International Equity	**$180,596,008**	**24.38%**	**$(145,564)**	**$2,463,501**	**$178,278,071**	**24.01%**
Causeway International Opps (2)	72,545,485	9.79%	0	692,390	71,853,095	9.68%
Aberdeen EAFE Plus	72,989,875	9.85%	(145,564)	459,116	72,676,324	9.79%
American Century Non-US SC (1)	35,060,647	4.73%	0	1,311,995	33,748,652	4.54%
Fixed Income	**$198,810,185**	**26.84%**	**$(8,340)**	**$239,266**	**$198,579,258**	**26.74%**
BlackRock U.S. Debt Fund	72,335,139	9.76%	(9,476)	(36,322)	72,380,937	9.75%
PIMCO Fixed Income	126,475,046	17.07%	1,137	275,588	126,198,321	17.00%
Real Estate	**$65,196,961**	**8.80%**	**$0**	**$304,235**	**$64,892,725**	**8.74%**
JPM Strategic Property Fund	47,353,163	6.39%	0	304,235	47,048,928	6.34%
JPM Income and Growth Fund	17,843,798	2.41%	0	0	17,843,798	2.40%
Infrastructure	**$47,662,833**	**6.43%**	**$0**	**$196,067**	**$47,466,766**	**6.39%**
Macquarie European	21,924,377	2.96%	0	196,067	21,728,310	2.93%
SteelRiver Infrastructure	25,738,456	3.47%	0	0	25,738,456	3.47%
Total Cash	**$2,041,598**	**0.28%**	**$0**	**$451**	**$2,041,147**	**0.27%**
Cash	2,041,598	0.28%	0	451	2,041,147	0.27%
Total Fund	**$740,811,737**	**100.0%**	**$(6,149,696)**	**$4,400,670**	**$742,560,763**	**100.0%**

(1) The Domestic Equity transition account was implemented for the May 2016 plan rebalancing. As part of the rebalancing, the American Century Non-US Small Cap strategy was funded on May 27, 2016.

(2) Client transitioned from Causeway International Value to International Opportunities in May 2016.

Investment Manager Returns

The table below details the rates of return for the fund's investment managers over various time periods ended September 30, 2016. Negative returns are shown in red, positive returns in black. Returns for one year or greater are annualized. The first set of returns for each asset class represents the composite returns for all the fund's accounts for that asset class.

Returns for Periods Ended September 30, 2016

	Last Month	Last 3 Months	Year to Date	Last 36 Months	Last 60 Months
Gross of Fees					
Domestic Equity	**0.49%**	**5.32%**	**7.73%**	**10.92%**	**17.57%**
Total Domestic Equity Target (1)	0.13%	4.50%	8.55%	10.46%	16.40%
Large Cap Equity	**0.35%**	**4.98%**	**6.58%**	**10.92%**	**17.15%**
S&P 500 Index	0.02%	3.85%	7.84%	11.16%	16.37%
Alliance S&P Index	0.01%	3.82%	7.69%	11.12%	16.32%
S&P 500 Index	0.02%	3.85%	7.84%	11.16%	16.37%
PIMCO StocksPLUS	0.06%	4.48%	8.53%	11.56%	18.51%
S&P 500 Index	0.02%	3.85%	7.84%	11.16%	16.37%
BlackRock Russell 1000 Value	(0.20%)	3.50%	9.78%	9.75%	16.20%
Russell 1000 Value Index	(0.21%)	3.48%	10.00%	9.70%	16.15%
T. Rowe Price Large Cap Growth	1.46%	8.06%	1.33%	11.40%	18.33%
Russell 1000 Growth Index	0.37%	4.58%	6.00%	11.83%	16.60%
Small/Mid Cap Equity	**0.93%**	**6.38%**	**11.79%**	**10.87%**	**18.92%**
Russell 2500 Index	0.48%	6.56%	10.80%	7.77%	16.30%
Champlain Mid Cap	1.31%	5.47%	15.15%	12.23%	17.87%
Russell MidCap Index	0.20%	4.52%	10.26%	9.70%	16.67%
Pyramis Small Cap	0.54%	7.27%	8.22%	9.36%	19.89%
Russell 2000 Index	1.11%	9.05%	11.46%	6.71%	15.82%
International Equity	**1.38%**	**5.89%**	**6.08%**	**(0.16%)**	**7.31%**
Total International Equity Target (2)	1.41%	7.05%	5.90%	0.21%	6.06%
Causeway International Opps (5)	0.96%	6.71%	1.17%	0.36%	9.54%
MSCI ACWI ex US	1.23%	6.91%	5.82%	0.18%	6.04%
Aberdeen EAFE Plus	0.63%	4.29%	11.25%	(1.48%)	5.07%
MSCI ACWI x US (Net)	1.23%	6.91%	5.82%	0.18%	6.04%
American Century Non-US SC (3)	3.89%	7.64%	-	-	-
MSCI ACWI ex US Small Cap	2.47%	7.91%	7.70%	3.52%	8.60%
Fixed Income	**0.12%**	**2.38%**	**9.67%**	**5.32%**	**5.04%**
Barclays Aggregate Index	(0.06%)	0.46%	5.80%	4.03%	3.08%
BlackRock U.S. Debt Fund	(0.05%)	0.48%	5.90%	4.17%	3.22%
Barclays Aggregate Index	(0.06%)	0.46%	5.80%	4.03%	3.08%
PIMCO Fixed Income	0.22%	3.50%	11.98%	6.01%	6.20%
Custom Index (4)	0.21%	2.33%	10.15%	5.92%	5.52%

(1) The Total Domestic Equity target is currently composed of 76% S&P 500 and 24% Russell 2500 Index.

(2) The Total International Equity Target reflects the MSCI ACWI ex-US (Net Div) through May 2016 and the MSCI ACWI ex-US IMI (Net Div) thereafter.

(3) The American Century Non-US Small Cap strategy was funded May 2016.

(4) The PIMCO custom index is composed of 25% Barclays Mortgage, 25% Barclays Credit, 25% Barclays High Yield, and 25% JP Morgan EMBI Global. Previously the index was composed of 70% Barclays Mortgage, 15% Barclays Credit, and 15% Barclays High Yield.

(5) Client transitioned from Causeway International Value to International Opportunities in May 2016.

Investment Manager Returns

The table below details the rates of return for the fund's investment managers over various time periods ended September 30, 2016. Negative returns are shown in red, positive returns in black. Returns for one year or greater are annualized. The first set of returns for each asset class represents the composite returns for all the fund's accounts for that asset class.

Returns for Periods Ended September 30, 2016

	Last Month	Last 3 Months	Year to Date	Last 36 Months	Last 60 Months
Gross of Fees					
Real Estate	**0.47%**	**1.49%**	**5.43%**	**11.68%**	**12.76%**
NFI-ODCE Value Weight Gr*	0.71%	2.13%	6.59%	12.48%	12.42%
JPM Strategic Property Fund	0.65%	2.06%	6.09%	12.09%	12.67%
JPM Income and Growth Fund	0.00%	0.01%	3.73%	11.14%	14.58%
NFI-ODCE Value Weight Gr*	0.71%	2.13%	6.59%	12.48%	12.42%
Infrastructure	**0.41%**	**0.91%**	**9.86%**	**7.68%**	**7.12%**
CPI + 4%	0.57%	1.07%	5.01%	4.72%	5.04%
Macquarie European Infrastructure Fund	0.90%	2.00%	9.54%	2.00%	6.79%
SteelRiver Infrastructure North Amer.**	0.00%	0.00%	10.15%	14.48%	7.23%
CPI + 4%	0.57%	1.07%	5.01%	4.72%	5.04%
Total Fund	**0.59%**	**4.02%**	**7.80%**	**7.92%**	**11.89%**
Total Fund Target	0.47%	3.65%	6.86%	7.11%	10.55%

* Current Month Target = 27.0% BB Barclays Aggregate Idx, 26.0% S&P 500 Index, 25.0% MSCI ACWI ex US IMI, 9.0% NFI-ODCE Value Weight Gr, 8.0% Russell 2500 Index and 5.0% CPI-W+4.0%.

*The NFI-ODCE Value Weight benchmark current quarter return is preliminary.

**SteelRiver Infrastructure's performance reflects prior month's market value adjusted for flows.

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Returns for Periods Ended September 30, 2016

	Last Month	Last 3 Months	Year to Date	Last 36 Months	Last 60 Months
Net of Fees					
Domestic Equity	**0.49%**	**5.23%**	**7.47%**	**10.59%**	**17.19%**
Total Domestic Equity Target (1)	0.13%	4.50%	8.55%	10.46%	16.40%
Large Cap Equity	**0.35%**	**4.93%**	**6.44%**	**10.76%**	**16.95%**
S&P 500 Index	0.02%	3.85%	7.84%	11.16%	16.37%
Alliance S&P Index	0.01%	3.81%	7.65%	11.08%	16.28%
S&P 500 Index	0.02%	3.85%	7.84%	11.16%	16.37%
PIMCO StocksPLUS	0.06%	4.48%	8.53%	11.56%	18.33%
S&P 500 Index	0.02%	3.85%	7.84%	11.16%	16.37%
BlackRock Russell 1000 Value	(0.20%)	3.50%	9.76%	9.71%	16.17%
Russell 1000 Value Index	(0.21%)	3.48%	10.00%	9.70%	16.15%
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International Equity	**1.38%**	**5.85%**	**5.67%**	**(0.82%)**	**6.57%**
Total International Equity Target (2)	1.41%	7.05%	5.90%	0.21%	6.06%
Causeway International Opps (5)	0.96%	6.59%	0.72%	(0.27%)	8.85%
MSCI ACWI ex US	1.23%	6.91%	5.82%	0.18%	6.04%
Aberdeen EAFE Plus	0.63%	4.29%	10.85%	(2.20%)	4.29%
MSCI ACWI x US (Net)	1.23%	6.91%	5.82%	0.18%	6.04%
American Century Non-US SC (3)	3.89%	7.64%	-	-	-
MSCI ACWI ex US Small Cap	2.47%	7.91%	7.70%	3.52%	8.60%
Fixed Income	**0.12%**	**2.31%**	**9.42%**	**4.99%**	**4.71%**
Barclays Aggregate Index	(0.06%)	0.46%	5.80%	4.03%	3.08%
BlackRock U.S. Debt Fund	(0.05%)	0.48%	5.87%	4.14%	3.19%
Barclays Aggregate Index	(0.06%)	0.46%	5.80%	4.03%	3.08%
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Infrastructure	**0.41%**	**0.55%**	**9.29%**	**6.72%**	**5.86%**
CPI + 4%	0.57%	1.07%	5.01%	4.72%	5.04%
Macquarie European Infrastructure Fund	0.90%	1.20%	8.68%	1.19%	5.68%
SteelRiver Infrastructure North Amer.**	0.00%	0.00%	9.83%	13.28%	5.76%
CPI + 4%	0.57%	1.07%	5.01%	4.72%	5.04%
Total Fund	**0.59%**	**3.92%**	**7.46%**	**7.45%**	**11.35%**
Total Fund Target	0.47%	3.65%	6.86%	7.11%	10.55%

* Current Month Target = 27.0% BB Barclays Aggregate Idx, 26.0% S&P 500 Index, 25.0% MSCI ACWI ex US IMI, 9.0% NFI-ODCE Value Weight Gr, 8.0% Russell 2500 Index and 5.0% CPI-W+4.0%.

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**SteelRiver Infrastructure's performance reflects prior month's market value adjusted for flows.

MARKET INSIGHTS

Guide to the Markets®

U.S. | 4Q 2016 | As of September 30, 2016

J.P.Morgan
Asset Management

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Page reference

J.P.Morgan
Asset Management

S&P 500 Index at inflection points

Equities

S&P 500 Price Index

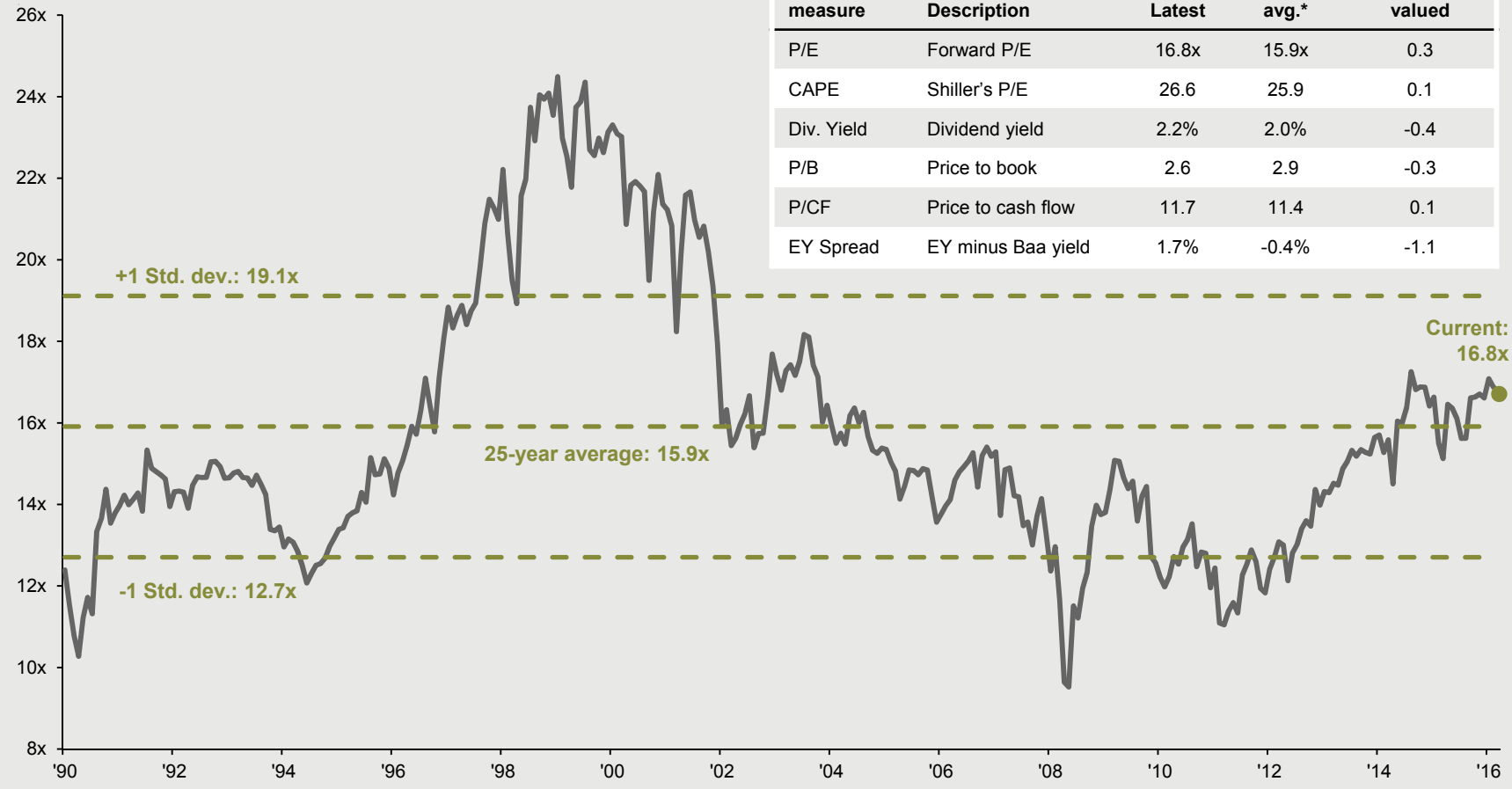
Source: Compustat, FactSet, Standard & Poor's, J.P. Morgan Asset Management.
Dividend yield is calculated as consensus estimates of dividends for the next 12 months, divided by most recent price, as provided by Compustat. Forward price to earnings ratio is a bottom-up calculation based on the most recent S&P 500 Index price, divided by consensus estimates for earnings in the next 12 months (NTM), and is provided by FactSet Market Aggregates. Returns are cumulative and based on S&P 500 Index price movement only, and do not include the reinvestment of dividends. Past performance is not indicative of future returns.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

S&P 500 valuation measures

Equities

S&P 500 Index: Forward P/E ratio



Valuation measure	Description	Latest	25-year avg.*	Std. dev. Over-/under-valued
P/E	Forward P/E	16.8x	15.9x	0.3
CAPE	Shiller's P/E	26.6	25.9	0.1
Div. Yield	Dividend yield	2.2%	2.0%	-0.4
P/B	Price to book	2.6	2.9	-0.3
P/CF	Price to cash flow	11.7	11.4	0.1
EY Spread	EY minus Baa yield	1.7%	-0.4%	-1.1

Source: FactSet, FRB, Robert Shiller, Standard & Poor's, J.P. Morgan Asset Management.
Price to earnings is price divided by consensus analyst estimates of earnings per share for the next 12 months. Shiller's P/E uses trailing 10-years of inflation-adjusted earnings as reported by companies. Dividend yield is calculated as the next 12-month consensus dividend divided by most recent price. Price to book ratio is the price divided by book value per share. Price to cash flow is price divided by NTM cash flow. EY minus Baa yield is the forward earnings yield (consensus analyst estimates of EPS over the next 12 months divided by price) minus the Moody's Baa seasoned corporate bond yield. Std. dev. over-/under-valued is calculated using the average and standard deviation over 25 years for each measure. *P/CF is a 20-year average due to cash flow data availability.
Guide to the Markets – U.S. Data are as of September 30, 2016.

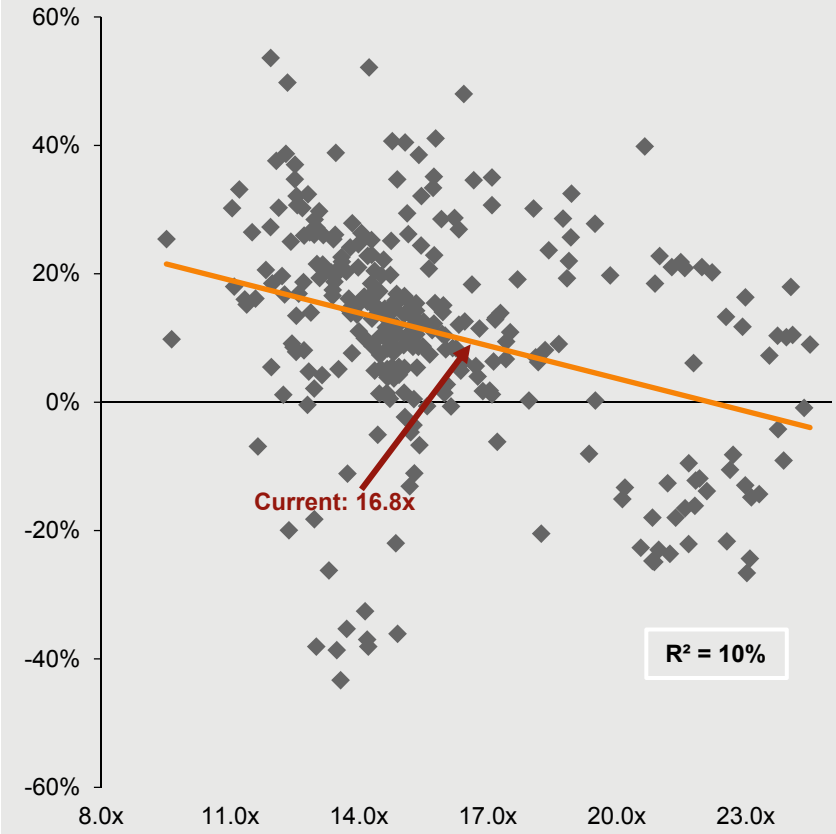
J.P.Morgan Asset Management

P/E ratios and equity returns

Equities

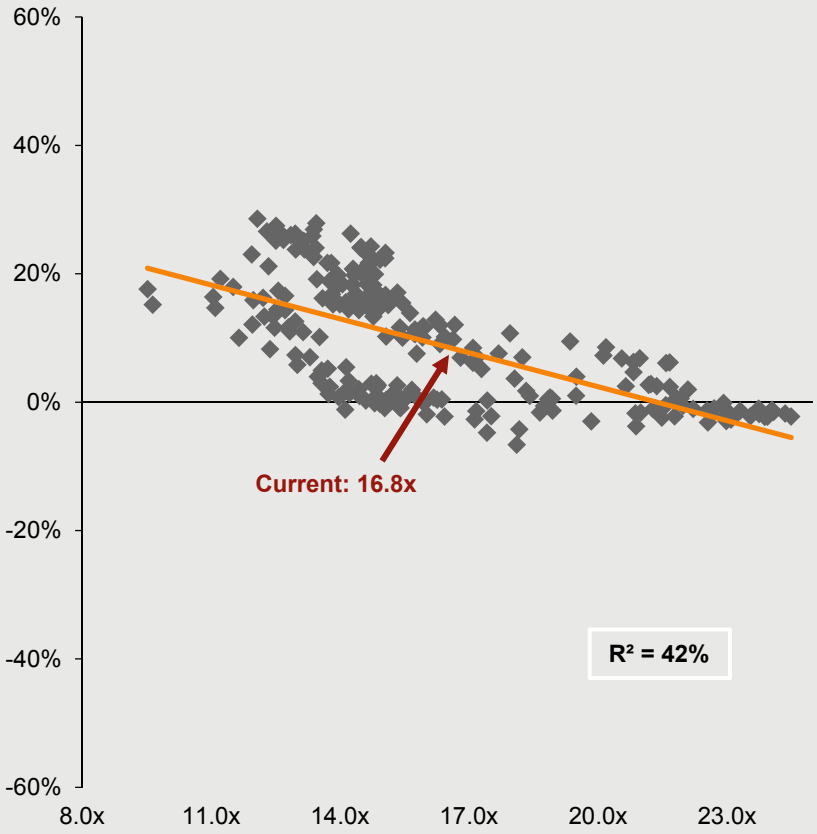
Forward P/E and subsequent 1-yr. returns

S&P 500 Total Return Index



Forward P/E and subsequent 5-yr. annualized returns

S&P 500 Total Return Index



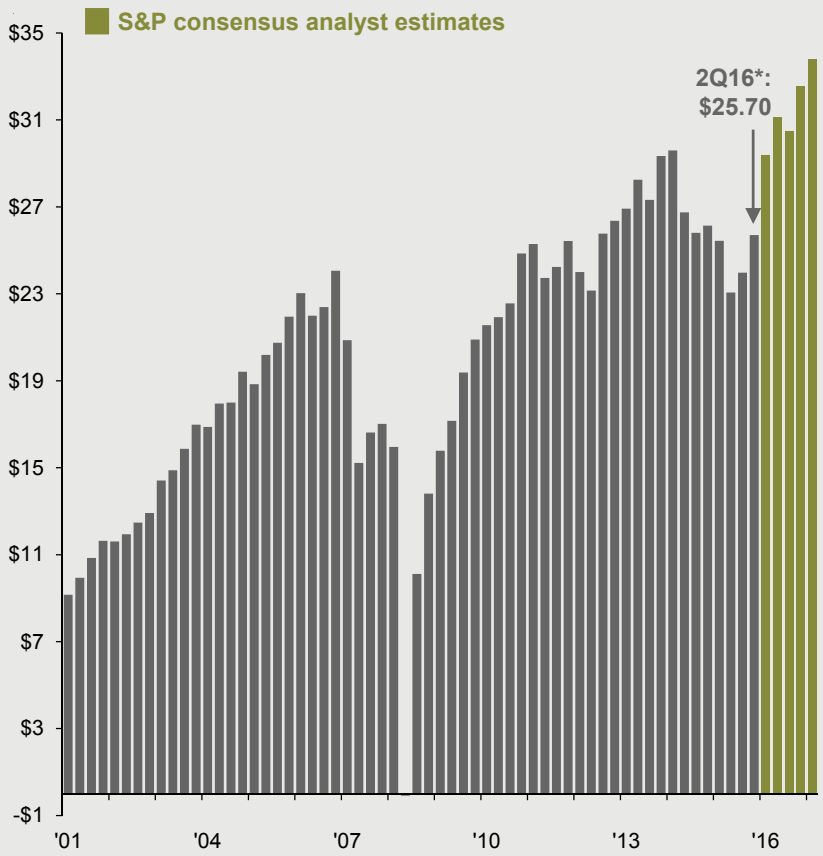
Source: FactSet, Reuters, Standard & Poor's, J.P. Morgan Asset Management.
Returns are 12-month and 60-month annualized total returns, measured monthly, beginning September 30, 1991. R^2 represents the percent of total variation in total returns that can be explained by forward P/E ratios.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Equities

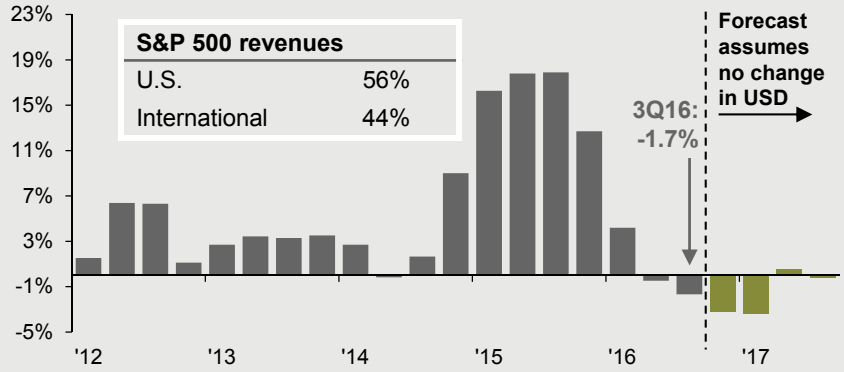
S&P 500 earnings per share

Index quarterly operating earnings



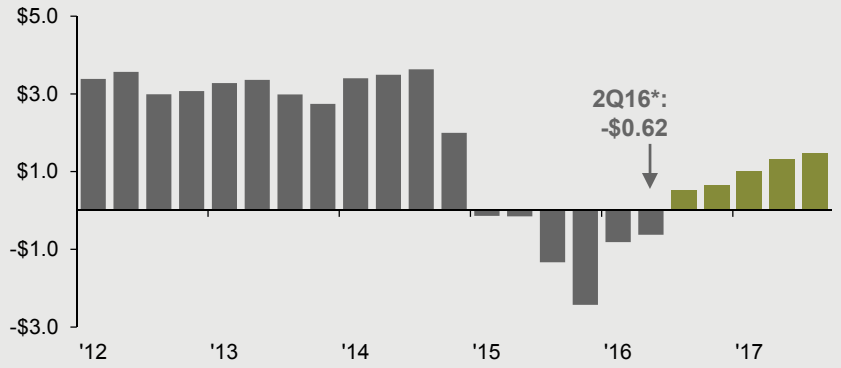
U.S. dollar

Year-over-year % change**, quarterly, USD major currencies index



Energy sector earnings

Energy sector contribution to S&P 500 EPS, quarterly



Source: Compustat, FactSet, Standard & Poor's, J.P. Morgan Asset Management; (Top right) Federal Reserve, S&P 500 individual company 10k filings, S&P Index Alert.

EPS levels are based on operating earnings per share. Earnings estimates are Standard & Poor's consensus analyst expectations. Past performance is not indicative of future returns. Currencies in the Trade Weighted U.S. Dollar Major Currencies Index are: British pound, euro, Swedish krona, Australian dollar, Canadian dollar, Japanese yen and Swiss franc. *2Q16 earnings are calculated using actual earnings for 98.6% of S&P 500 market cap and earnings estimates for the remaining 1.4% of companies. **Year-over-year change is calculated using the quarterly average for each period. USD forecast assumes no change in the U.S. dollar from its September 30, 2016 level.

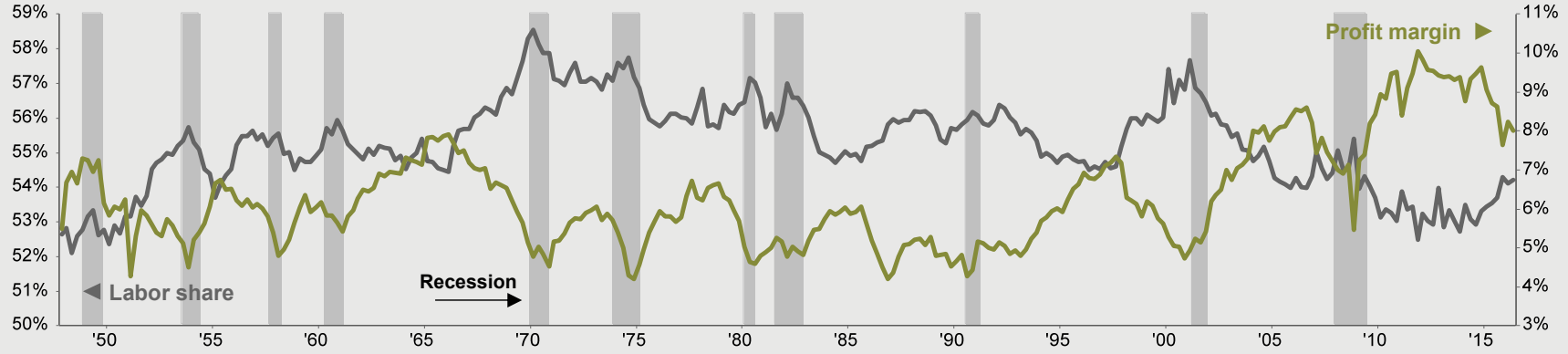
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Profit margins and wages

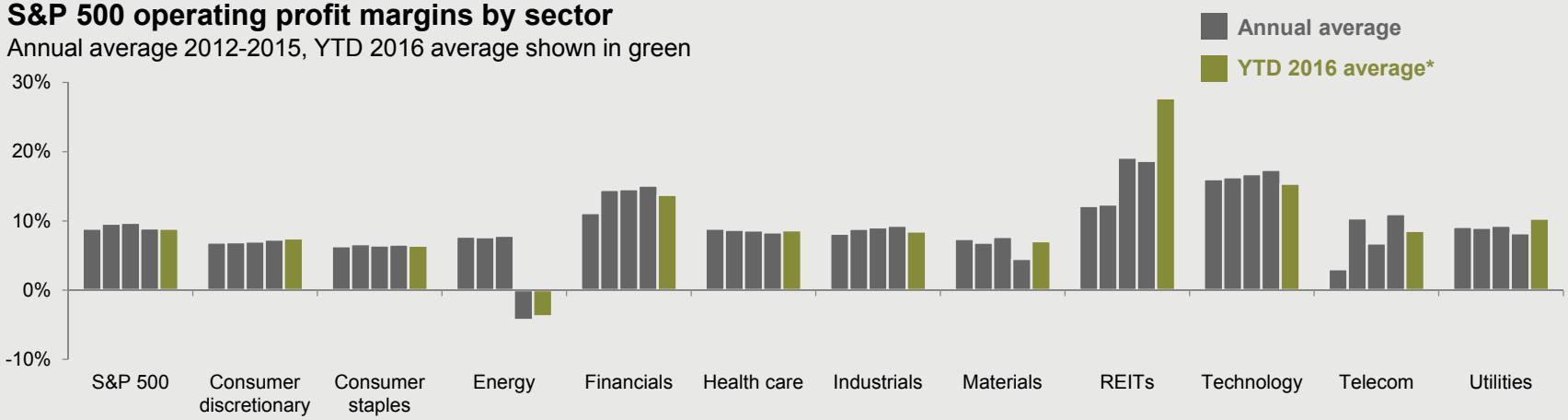
Labor share of income and profit margins

Employee compensation % nominal GDP, after-tax corporate profits with inventory & valuation adjustment % nominal GDP, SAAR



S&P 500 operating profit margins by sector

Annual average 2012-2015, YTD 2016 average shown in green



Source: FactSet, J.P. Morgan Asset Management; (Top) BEA; (Bottom) Standard & Poor's.
*YTD 2016 profit margin estimates are the average of reported data for 1Q16 and estimates for 2Q16. Estimates are based on actual earnings for 98.6% of the S&P 500 market cap and estimates for the remaining 1.4%.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Returns and valuations by style

Equities

QTD

	Value	Blend	Growth
Large	3.5%	3.9%	4.6%
Mid	4.4%	4.5%	4.6%
Small	8.9%	9.0%	9.2%

YTD

	Value	Blend	Growth
Large	10.0%	7.8%	6.0%
Mid	13.7%	10.3%	6.8%
Small	15.5%	11.5%	7.5%

Since market peak (October 2007)

	Value	Blend	Growth
Large	50.4%	68.4%	90.5%
Mid	82.4%	82.9%	80.8%
Small	58.3%	67.9%	76.7%

Since market low (March 2009)

	Value	Blend	Growth
Large	274.9%	276.3%	288.5%
Mid	365.7%	341.4%	318.0%
Small	291.4%	304.8%	316.9%

Current P/E vs. 15-year avg. P/E*

	Value	Blend	Growth
Large	15.8 / 13.8	16.8 / 15.4	18.4 / 17.8
Mid	16.7 / 14.7	18.1 / 16.4	20.1 / 19.4
Small	17.5 / 16.5	22.3 / 20.1	30.5 / 27.1

Current P/E as % of 15-year avg. P/E*

	Value	Blend	Growth
Large	114.2%	109.0%	103.3%
Mid	113.8%	110.4%	103.4%
Small	105.9%	110.7%	112.5%

Source: FactSet, Russell Investment Group, Standard & Poor's, J.P. Morgan Asset Management.
All calculations are cumulative total return, including dividends reinvested for the stated period. Since Market Peak represents period 10/9/07 – 9/30/16, illustrating market returns since the S&P 500 Index high on 10/9/07. Since Market Low represents period 3/9/09 – 9/30/16, illustrating market returns since the S&P 500 Index low on 3/9/09. Returns are cumulative returns, not annualized. For all time periods, total return is based on Russell-style indexes with the exception of the large blend category, which is based on the S&P 500 Index. Past performance is not indicative of future returns.
*Timeframe of average valuation decreased from 20 to 15 years because of a discontinued data series. The new data series shown is the next 12-months FactSet Market Aggregate Price to Earnings ratio.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Returns and valuations by sector

Equities

	Financials	Technology	Health Care	Industrials	Energy	Cons. Discr.	Cons. Staples	Telecom	Utilities	Real Estate	Materials	S&P 500 Index	
S&P weight	**12.8%**	**21.2%**	**14.7%**	**9.7%**	**7.3%**	**12.5%**	**9.9%**	**2.6%**	**3.3%**	**3.1%**	**2.9%**	**100.0%**	Weight
Russell Growth weight	2.7%	31.5%	16.8%	10.4%	0.6%	20.6%	9.6%	1.2%	0.1%	2.8%	3.6%	100.0%	
Russell Value weight	23.4%	10.0%	11.5%	9.5%	13.5%	4.9%	8.9%	3.9%	6.5%	5.1%	2.9%	100.0%	
QTD	4.6	12.9	0.9	4.1	2.3	2.9	-2.6	-5.6	-5.9	-2.1	3.7	3.9	Return (%)
YTD	1.4	12.5	1.4	10.9	18.7	3.6	7.6	17.9	16.1	8.2	11.4	7.8	
Since market peak (October 2007)	-19.8	112.8	137.0	64.7	9.5	146.2	143.4	49.2	70.1	58.0	36.3	68.4	
Since market low (March 2009)	338.1	346.0	282.0	352.6	100.5	469.9	241.3	185.1	197.7	485.7	224.6	276.3	
Beta to S&P 500	1.42	1.10	0.73	1.19	0.98	1.11	0.58	0.61	0.47	1.32	1.28	1.00	β
Correl. to Treas. yields	0.59	0.36	0.19	0.30	0.34	0.36	-0.11	-0.08	-0.66	-0.41	0.40	0.37	ρ
Forward P/E ratio	12.2x	17.0x	15.1x	16.6x	55.5x	17.8x	19.9x	13.6x	17.2x	18.4x	16.7x	16.8x	P/E
20-yr avg.	**13.1x**	**22.4x**	**18.9x**	**17.5x**	**17.3x**	**19.4x**	**20.0x**	**17.9x**	**14.4x**	**18.5x**	**16.5x**	**17.2x**	
Trailing P/E ratio	13.2x	21.4x	21.9x	19.0x	26.1x	20.2x	22.4x	15.0x	21.8x	31.2x	18.9x	19.5x	
20-yr avg.	**15.9x**	**25.8x**	**24.1x**	**20.3x**	**16.6x**	**19.1x**	**21.2x**	**20.2x**	**15.6x**	**34.2x**	**19.2x**	**19.6x**	
Dividend yield	2.2%	1.6%	1.8%	2.4%	2.7%	1.7%	2.8%	4.7%	3.7%	3.6%	2.3%	2.2%	Div
20-yr avg.	**2.3%**	**1.0%**	**1.7%**	**2.1%**	**2.2%**	**1.3%**	**2.3%**	**3.8%**	**3.9%**	**3.6%**	**2.2%**	**1.9%**	

Source: FactSet, Russell Investment Group, Standard & Poor's, J.P. Morgan Asset Management.
All calculations are cumulative total return, not annualized, including dividends for the stated period. Since market peak represents period 10/9/07 – 9/30/16. Since market low represents period 3/9/09 – 9/30/16. Correlation to Treasury yields are trailing 2-year monthly correlations between S&P 500 sector price returns and 10-year Treasury yield movements. Forward P/E ratio is a bottom-up calculation based on the most recent S&P 500 Index price, divided by consensus estimates for earnings in the next 12 months (NTM), and is provided by FactSet Market Aggregates. Trailing P/E ratios are bottom-up values defined as month-end price divided by the last 12 months of available reported earnings. Historical data can change as new information becomes available. Note that P/E ratios for the S&P 500 may differ from estimates elsewhere in this book due to the use of a bottom-up calculation of constituent earnings (as described) rather than a top-down calculation. This methodology is used to allow proper comparison of sector level data to broad index level data. Dividend yield is calculated as the next 12-month consensus dividend divided by most recent price. Beta calculations are based on 10-years of monthly price returns for the S&P 500 and its sub-indices. Betas are calculated on a monthly frequency over the past 10 years. Past performance is not indicative of future returns.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Equities

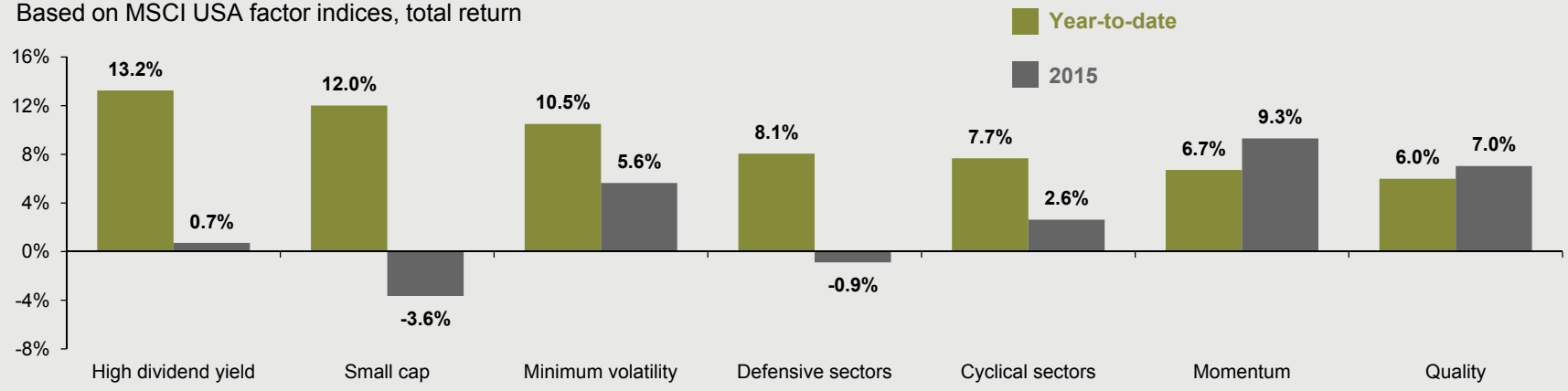
Sector weights over time

S&P 500 sector weights

	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16
Financials	7.5	8.7	10.6	11.2	10.7	13.1	15.0	17.2	15.4	13.0	17.3	17.6	20.1	20.2	20.1	20.5	21.1	16.6	12.3	13.2	14.6	11.6	13.4	14.3	14.3	13.8	9.8
Tech.	6.3	5.3	5.1	5.9	8.6	9.4	12.4	12.3	17.7	29.2	21.2	17.6	14.3	17.7	16.1	15.1	15.1	16.7	15.3	19.9	18.6	19.0	19.0	18.6	19.7	20.7	21.2
Health Care	10.4	12.4	9.9	8.2	9.2	10.8	10.4	11.3	12.3	9.3	14.4	14.4	14.9	13.3	12.7	13.3	12.0	12.0	14.8	12.6	10.9	11.9	12.0	13.0	14.2	15.2	14.7
Industrials	13.6	13.2	13.3	13.9	13.0	12.6	12.7	11.7	10.1	9.9	10.6	11.3	11.5	10.9	11.8	11.3	10.8	11.5	11.1	10.2	10.9	10.7	10.1	10.9	10.4	10.0	9.7
Energy	13.4	10.6	9.7	10.0	10.0	9.1	9.2	8.4	6.3	5.6	6.6	6.3	6.0	5.8	7.2	9.3	9.8	12.9	13.3	11.5	12.0	12.3	11.0	10.3	8.4	6.5	7.3
Cons. Disc.	12.8	14.0	15.8	16.4	14.9	13.0	11.7	12.1	12.5	12.7	10.3	13.1	13.4	11.3	11.9	10.8	10.6	8.5	8.4	9.6	10.6	10.7	11.5	12.5	12.1	12.9	12.5
Cons. Staples	14.0	15.2	14.5	12.5	13.2	12.8	12.7	12.3	11.1	7.2	8.1	8.2	9.5	11.0	10.5	9.5	9.3	10.2	12.9	11.4	10.6	11.5	10.6	9.8	9.8	10.1	9.9
Telecom	8.7	8.0	8.5	9.1	8.6	8.5	6.5	6.9	8.4	7.9	5.5	5.5	4.2	3.5	3.3	3.0	3.5	3.6	3.8	3.2	3.1	3.2	3.1	2.3	2.3	2.4	2.6
Utilities	6.2	5.8	5.6	5.6	4.8	4.5	3.7	3.3	3.0	2.2	3.8	3.1	2.9	2.8	2.9	3.4	3.6	3.6	4.2	3.7	3.3	3.9	3.4	2.9	3.2	3.0	3.3
Materials	7.2	6.8	6.9	7.1	7.1	6.1	5.7	4.5	3.1	3.0	2.3	2.6	2.8	3.0	3.1	3.0	3.0	3.3	2.9	3.6	3.7	3.5	3.6	3.5	3.2	2.8	2.9
Real Estate												0.2	0.3	0.4	0.6	0.7	1.1	1.0	1.0	1.2	1.5	1.8	2.2	1.8	2.4	2.7	3.0

Factor returns

Based on MSCI USA factor indices, total return



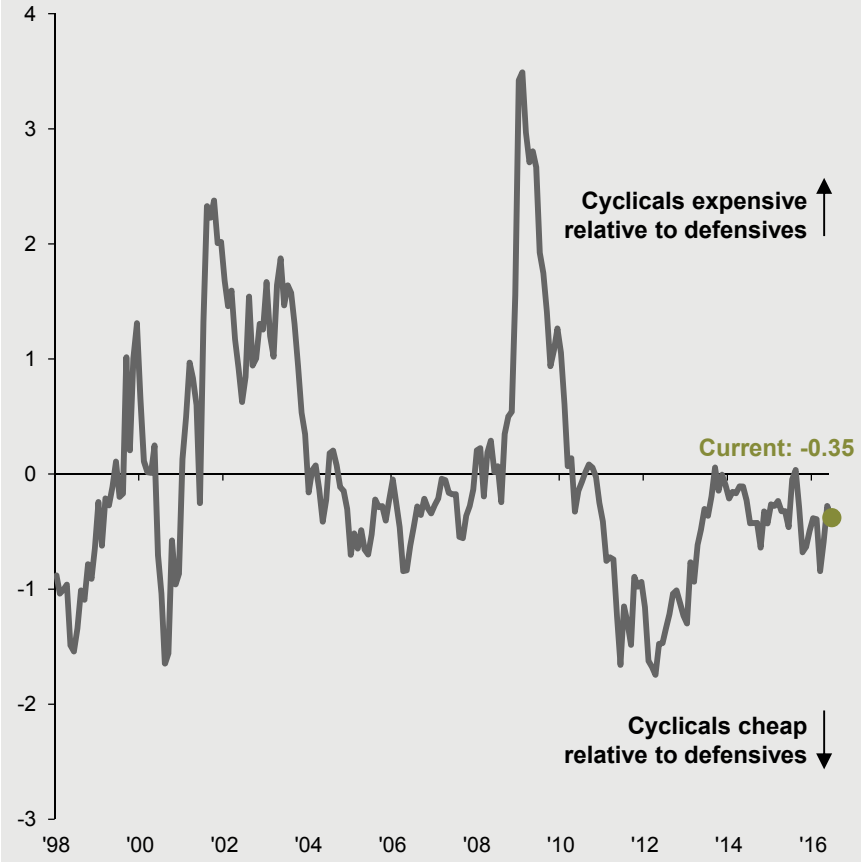
Source: FactSet, J.P. Morgan Asset Management; (Top) Standard & Poor's; (Bottom) MSCI. REITs data unavailable prior to 2001. The **MSCI High Dividend Yield Index** only includes securities that offer a higher than average dividend yield relative to the parent index and that pass dividend sustainability and persistence screens. The **MSCI Minimum Volatility Index** is calculated by optimizing the MSCI USA Index using an estimated security co-variance matrix to produce an index that has the lowest absolute volatility for a given set of constraints. The **MSCI Defensive Sectors Index** includes: Consumer Staples, Energy, Health Care, Telecommunication Services and Utilities. The **MSCI Cyclical Sectors Index** contains: Consumer Discretionary, Financials, Industrials, Information Technology and Materials. Securities in the **MSCI Momentum Index** are selected based on a momentum value based on 12-month and 6-month price performance. Constituents of the **MSCI Quality Index** are selected based on three main variables: high return on equity, stable year-over-year earnings growth and low financial leverage.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Cyclical and defensive sectors

Cyclicals ex-Energy vs. defensive valuations*

Relative fwd. P/E ratio of cyclicals ex-energy vs. defensives, z-score



Cyclicals/defensives relative performance and rates

Cyclical/defensive performance**, 10-year U.S. Treasury yield

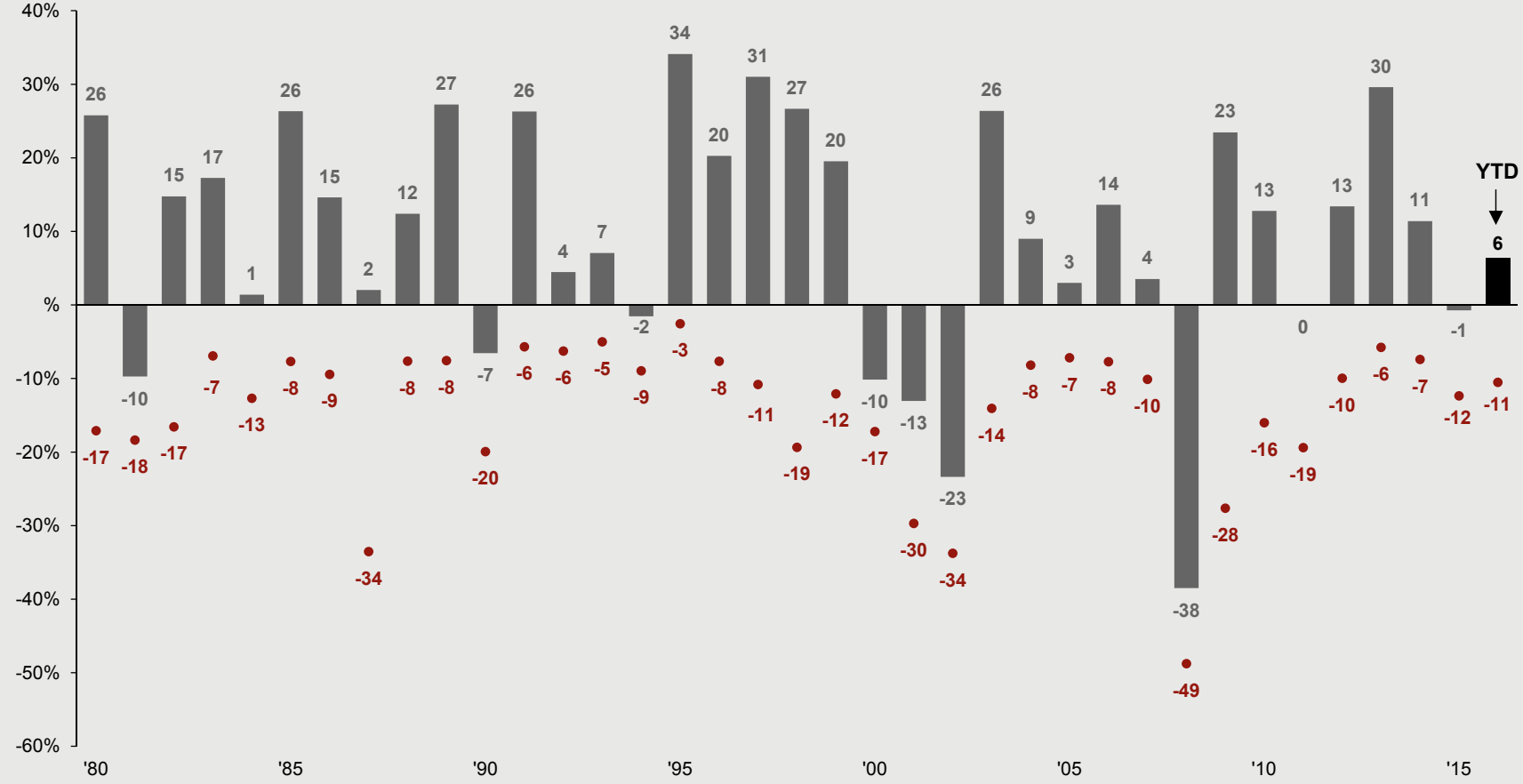
Source: FactSet, J.P. Morgan Asset Management; (Left) Standard & Poor's, (Right) MSCI.
*Cyclical sectors include Consumer Discretionary, Information Technology, Industrials, Financials and Materials. REITs are excluded from this analysis. It is more appropriate to value a REIT by looking at its price relative to its funds from operations (FFO), an income measure that excludes depreciation. P/E ratios look at price relative to net income, a measure that includes depreciation, making the comparison of valuations across sectors inappropriate. Defensive sectors include Telecommunications, Health Care, Utilities and Consumer Staples. REITs are excluded from this analysis. Sector valuations are equal weighted. **Cyclicals represent the MSCI USA Cyclical Sector index and defensives represent the MSCI USA Defensive Sector index.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Equities

S&P 500 intra-year declines vs. calendar year returns

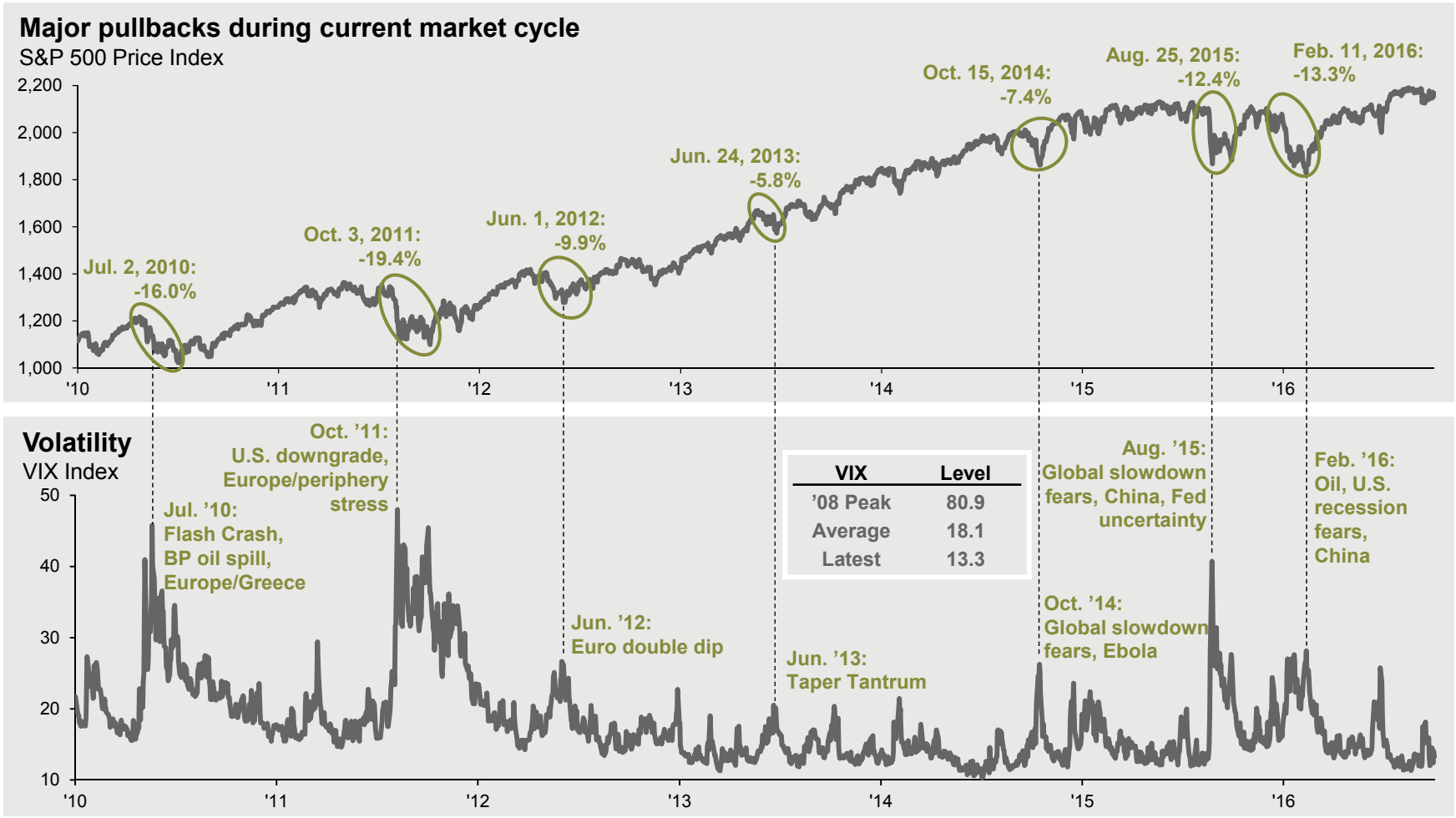
Despite average intra-year drops of 14.2%, annual returns positive in 27 of 36 years



Source: FactSet, Standard & Poor's, J.P. Morgan Asset Management.
Returns are based on price index only and do not include dividends. Intra-year drops refers to the largest market drops from a peak to a trough during the year. For illustrative purposes only. Returns shown are calendar year returns from 1980 to 2015, except for 2016, which is year to date.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Equities



Source: FactSet, Standard & Poor's, J.P. Morgan Asset Management; (Bottom) CBOE.
Drawdowns are calculated as the prior peak to the lowest point.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

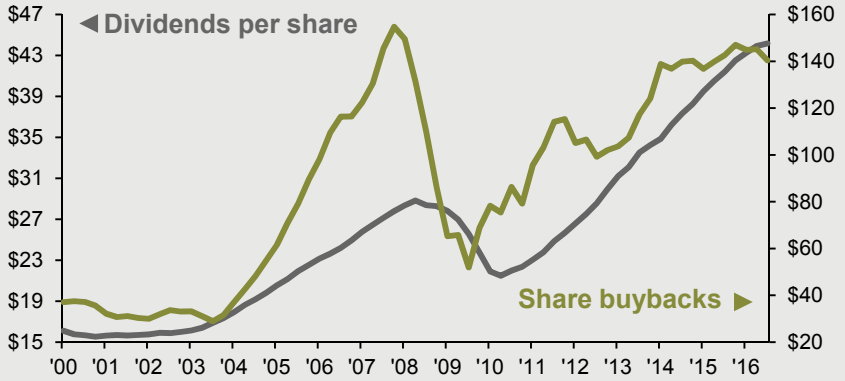
Equities

Corporate cash as a % of current assets

S&P 500 companies – cash and cash equivalents, quarterly

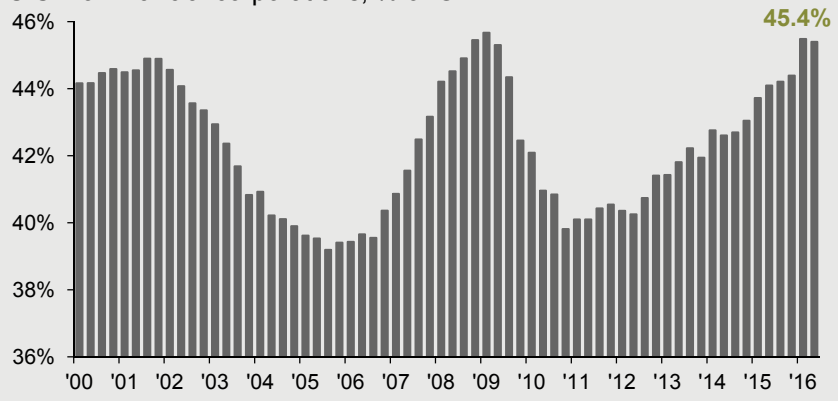
Cash returned to shareholders

S&P 500 companies, rolling 4-quarter averages, $bn



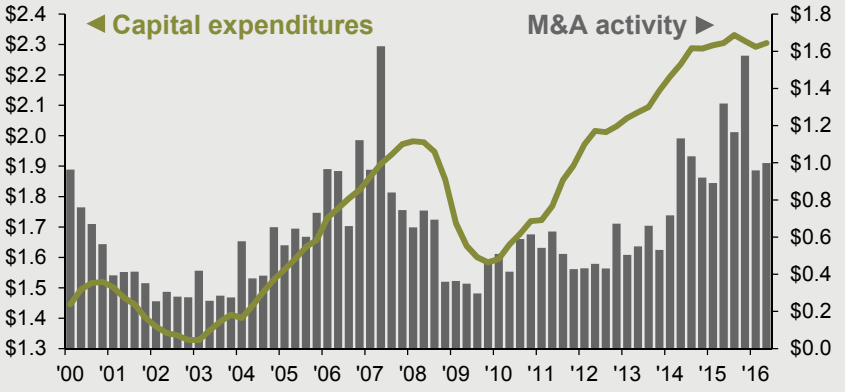
Nonfinancial corporate debt

U.S. nonfinancial corporations, % of GDP



Corporate growth

Private nonresidential fixed investment, value of deals announced, $tn

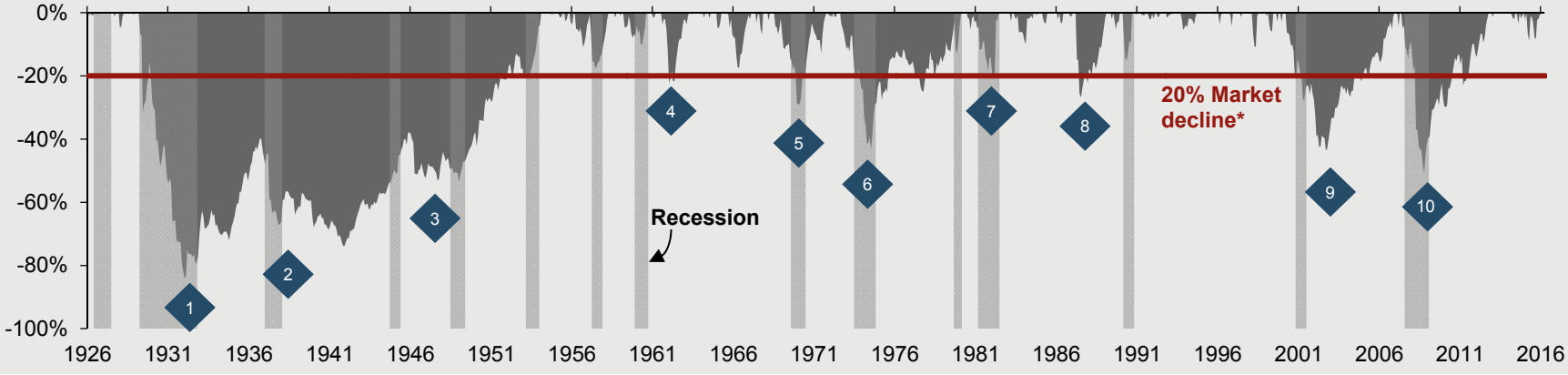


Source: FactSet, Standard & Poor's, J.P. Morgan Asset Management; (Bottom left) BEA, Federal Reserve; (Bottom right) Bloomberg, BEA.
M&A activity is the quarterly value of officially announced transactions, and capital expenditures are private nonresidential fixed domestic investment.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Equities

S&P 500 composite declines from all-time highs



Characteristics of bull and bear markets

	Market Corrections	Bear markets: Market peak	Bear return*	Duration (months)*	Macro environment: Recession	Commodity spike	Aggressive Fed	Extreme valuations	Bull markets: Bull begin date	Bull return	Duration (months)
1	Crash of 1929 - Excessive leverage, irrational exuberance	Sep 1929	-86%	33	◆			◆	Jul 1926	152%	38
2	1937 Fed Tightening - Premature policy tightening	Mar 1937	-60%	63	◆		◆		Mar 1935	129%	24
3	Post WWII Crash - Post-war demobilization, recession fears	May 1946	-30%	37	◆			◆	Apr 1942	158%	50
4	Flash Crash of 1962 - Flash crash, Cuban Missile Crisis	Dec 1961	-28%	7				◆	Oct 1960	39%	14
5	Tech Crash of 1970 - Economic overheating, civil unrest	Nov 1968	-36%	18	◆	◆	◆		Oct 1962	103%	74
6	Stagflation - OPEC oil embargo	Jan 1973	-48%	21	◆	◆			May 1970	74%	32
7	Volcker Tightening - Whip Inflation Now	Nov 1980	-27%	21	◆	◆	◆		Mar1978	62%	33
8	1987 Crash - Program trading, overheating markets	Aug 1987	-34%	3				◆	Aug 1982	229%	61
9	Tech Bubble - Extreme valuations, .com boom/bust	Mar 2000	-49%	31	◆			◆	Oct 1990	417%	115
10	Global Financial Crisis - Leverage/housing, Lehman collapse	Oct 2007	-57%	17	◆	◆	◆		Oct 2002	101%	61
	Current Cycle								Mar 2009	220%	92
	Averages	-	**-45%**	**25**					-	**153%**	**54**

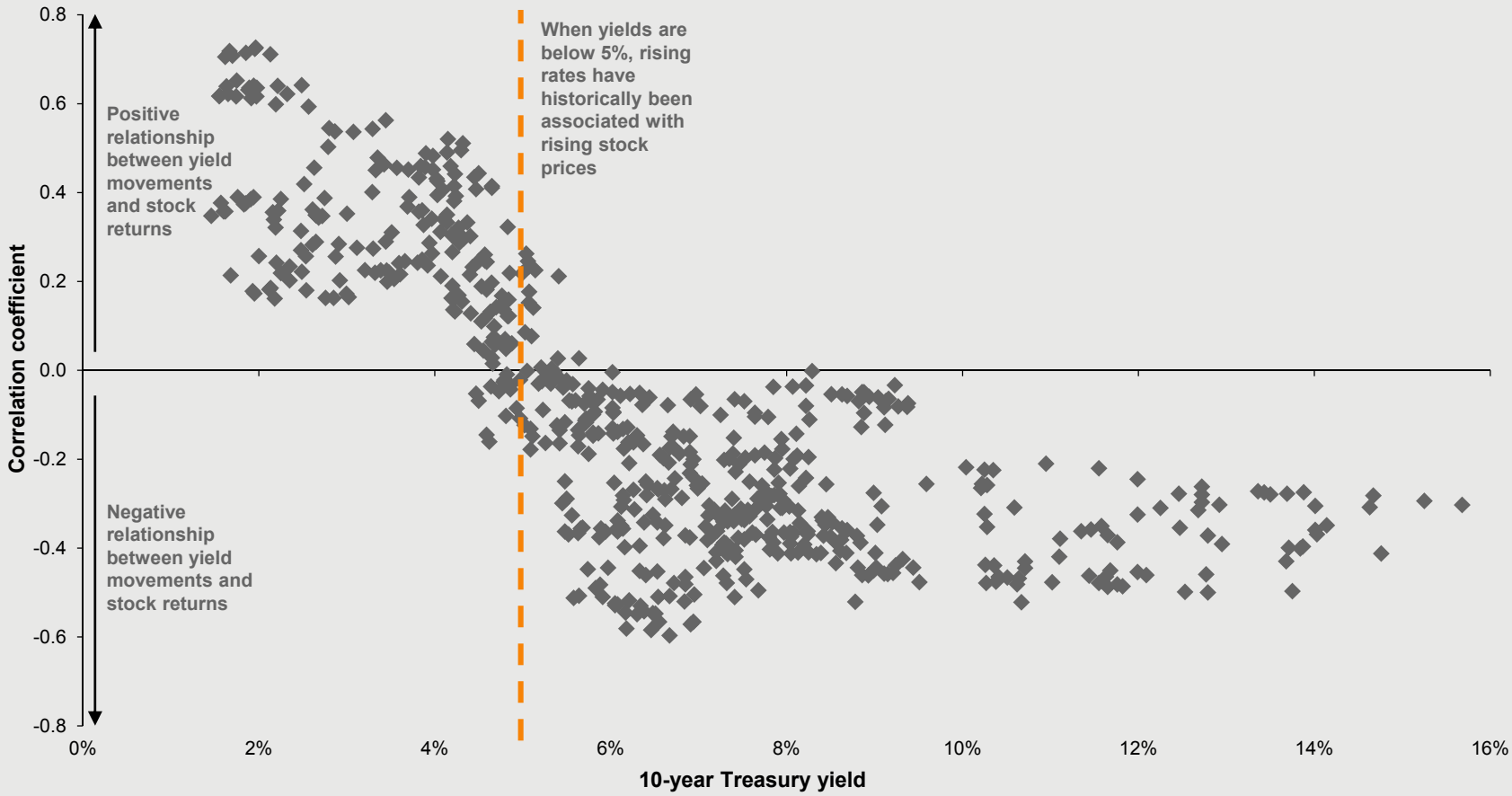
Source: FactSet, NBER, Robert Shiller, Standard & Poor's, J.P. Morgan Asset Management.
*A bear market is defined as a 20% or more decline from the previous market high. The bear return is the peak to trough return over the cycle.
Periods of "Recession" are defined using NBER business cycle dates. "Commodity spikes" are defined as significant rapid upward moves in oil prices.
Periods of "Extreme valuations" are those where S&P 500 last 12 months' P/E levels were approximately two standard deviations above long-run averages. "Aggressive Fed Tightening" is defined as Federal Reserve monetary tightening that was unexpected and/or significant in magnitude.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Equities

Correlations between weekly stock returns and interest rate movements

Weekly S&P 500 returns, 10-year Treasury yield, rolling 2-year correlation, May 1963 – September 2016



Source: FactSet, Standard & Poor's, FRB, J.P. Morgan Asset Management.
Returns are based on price index only and do not include dividends. Markers represent monthly 2-year correlations only.
Guide to the Markets – U.S. Data are as of September 30, 2016.

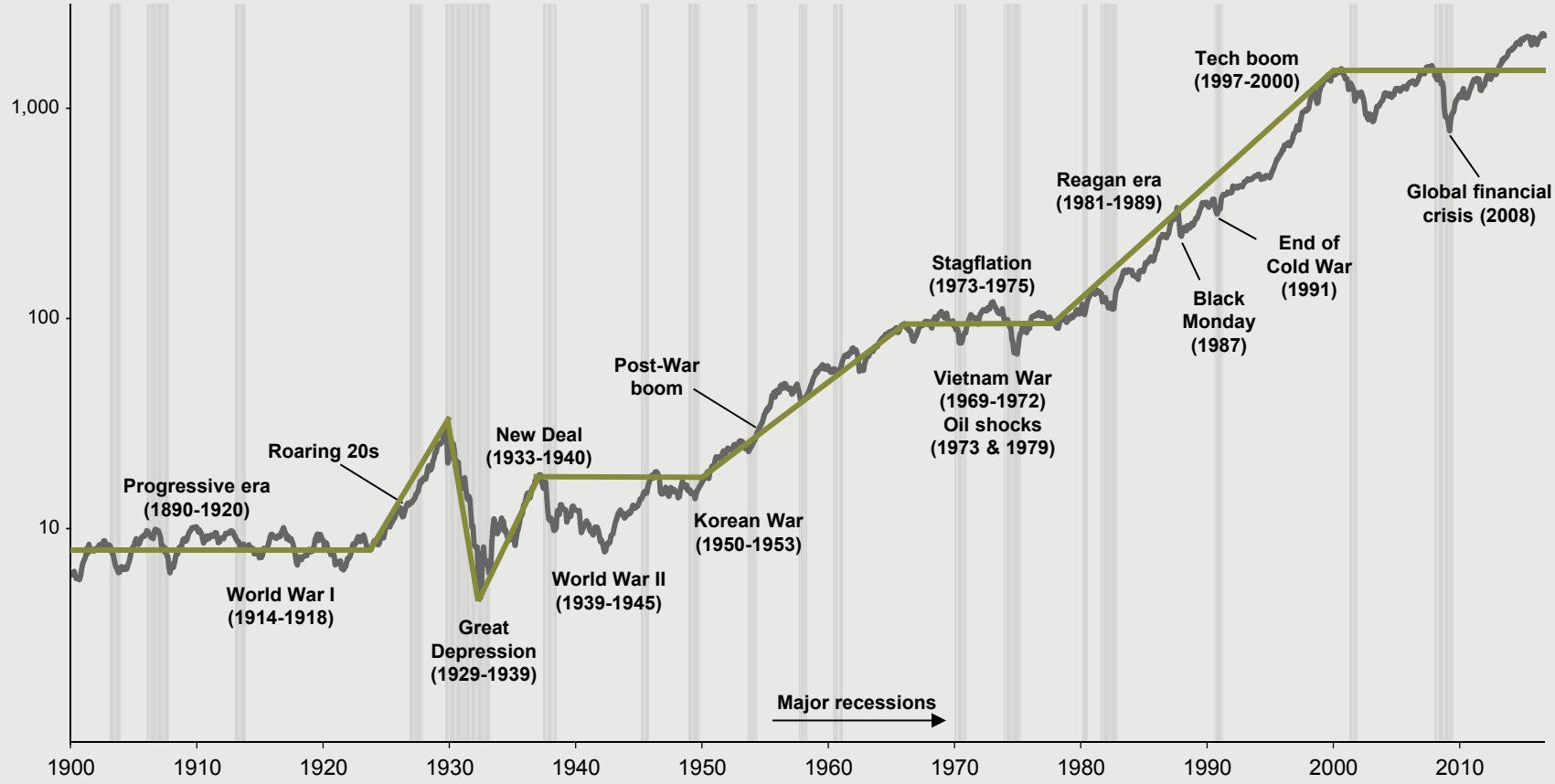
J.P.Morgan
Asset Management

Stock market since 1900

Equities

S&P Composite Index

Log scale, annual

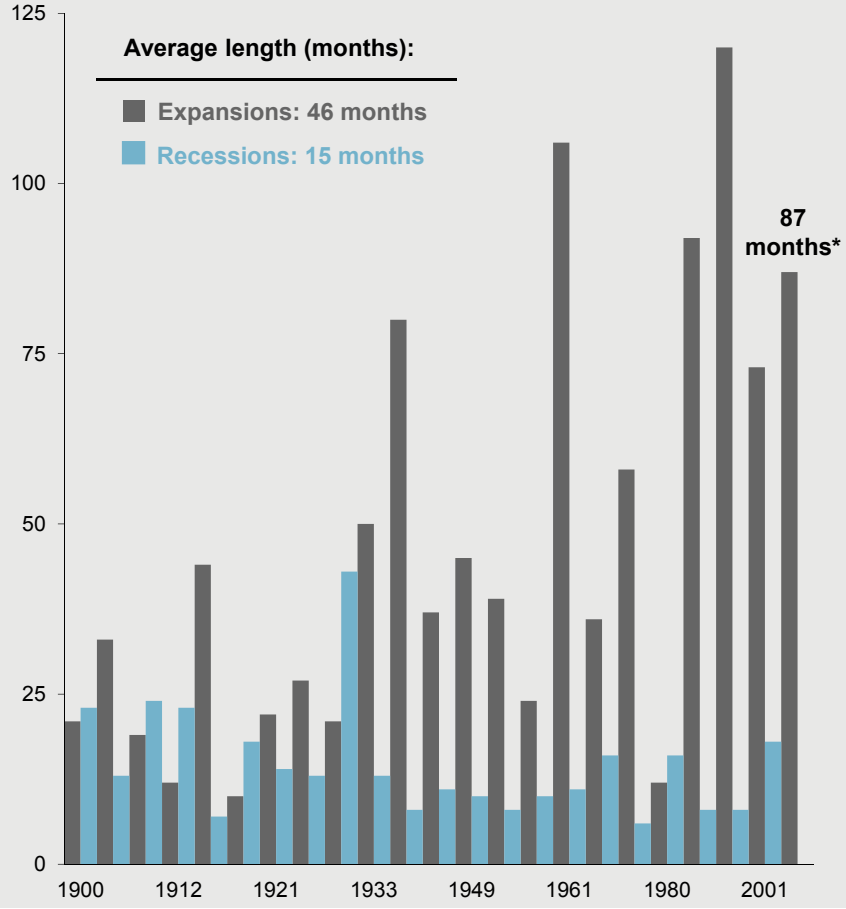


Source: FactSet, NBER, Robert Shiller, J.P. Morgan Asset Management.
Data shown in log scale to best illustrate long-term index patterns.
Past performance is not indicative of future returns. Chart is for illustrative purposes only.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

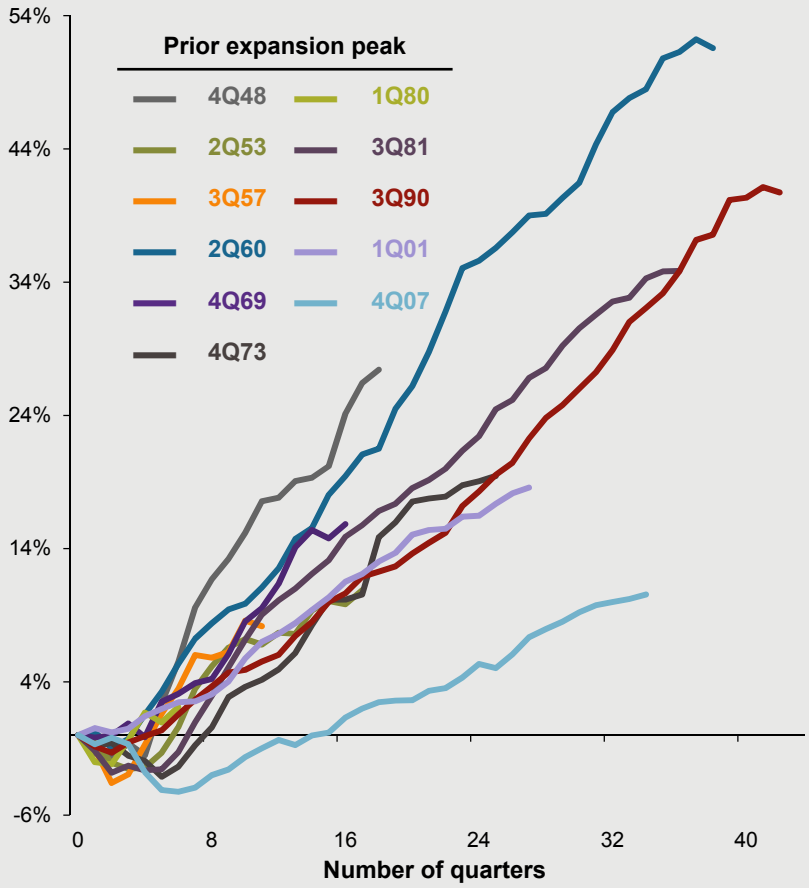
The length and strength of expansions

Length of economic expansions and recessions



Strength of economic expansions

Cumulative real GDP growth since prior peak, percent



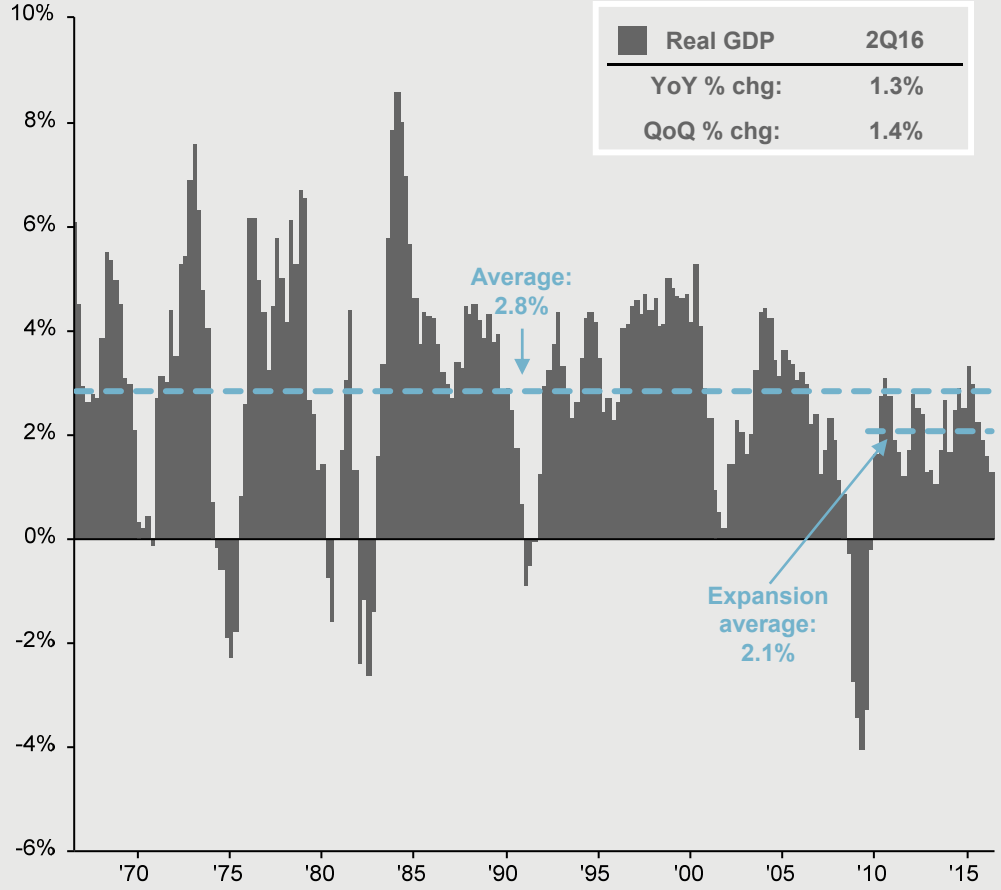
Source: BEA, NBER, J.P. Morgan Asset Management. *Chart assumes current expansion started in July 2009 and continued through September 2016, lasting 87 months so far. Data for length of economic expansions and recessions obtained from the National Bureau of Economic Research (NBER). These data can be found at www.nber.org/cycles/ and reflect information through September 2016.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Economic growth and the composition of GDP

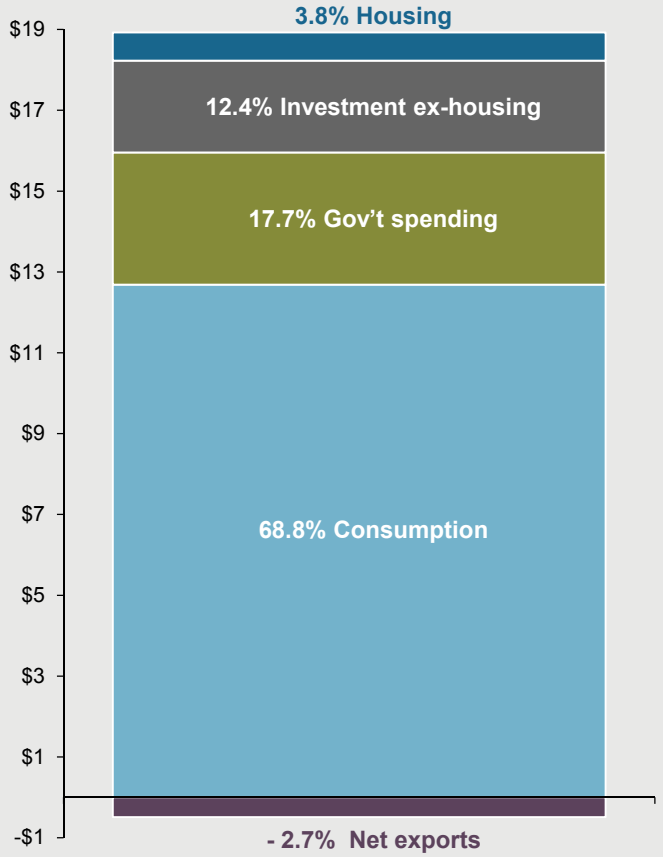
Real GDP

Year-over-year % change



Components of GDP

2Q16 nominal GDP, USD trillions

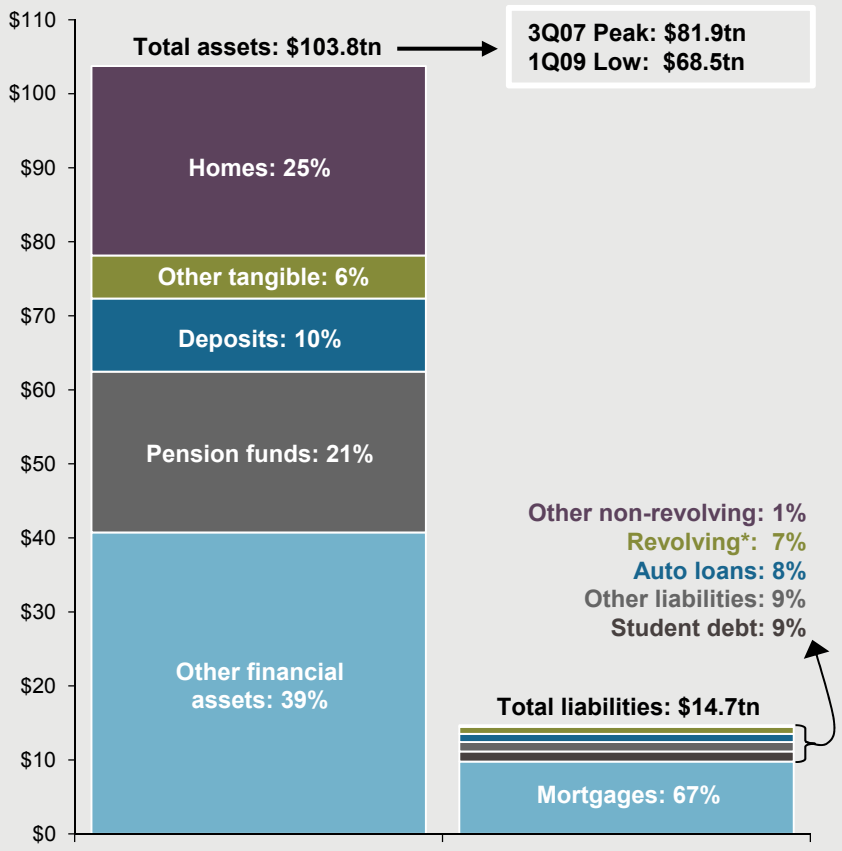


Source: BEA, FactSet, J.P. Morgan Asset Management.
Values may not sum to 100% due to rounding. Quarter-over-quarter percent changes are at an annualized rate. Average represents the annualized growth rate for the full period. Expansion average refers to the period starting in the second quarter of 2009.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

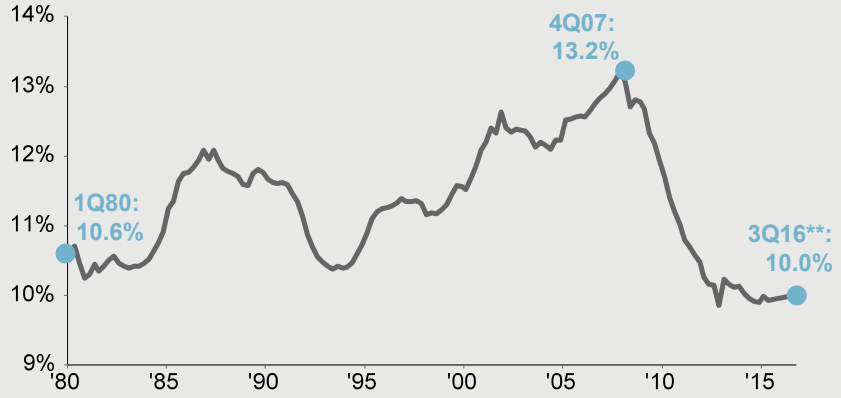
Consumer balance sheet

2Q16, trillions of dollars outstanding, not seasonally adjusted



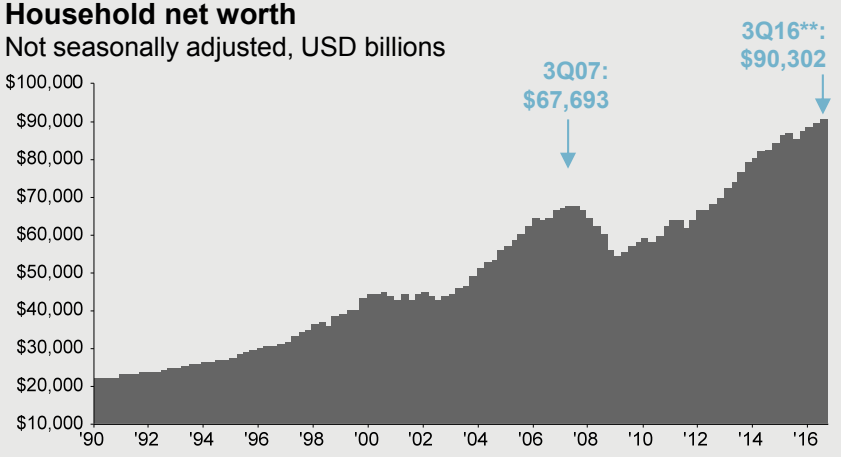
Household debt service ratio

Debt payments as % of disposable personal income, SA



Household net worth

Not seasonally adjusted, USD billions

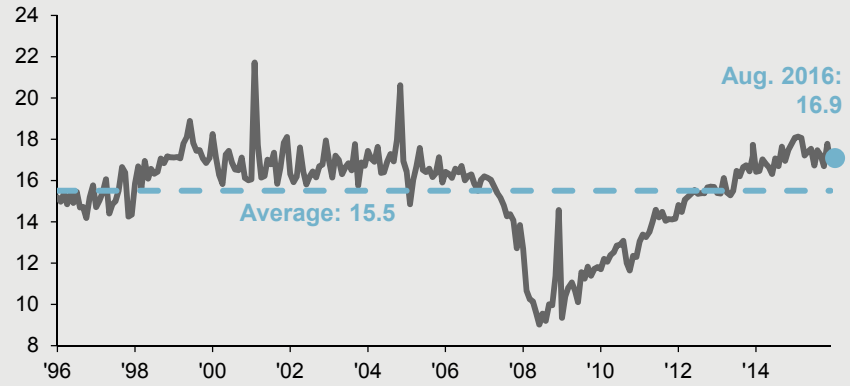


Source: FactSet, FRB, J.P. Morgan Asset Management; (Top and bottom right) BEA.
Data include households and nonprofit organizations. SA – seasonally adjusted.
*Revolving includes credit cards. **3Q16 household debt service ratio and household net worth are J.P. Morgan Asset Management estimates.
Values may not sum to 100% due to rounding.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

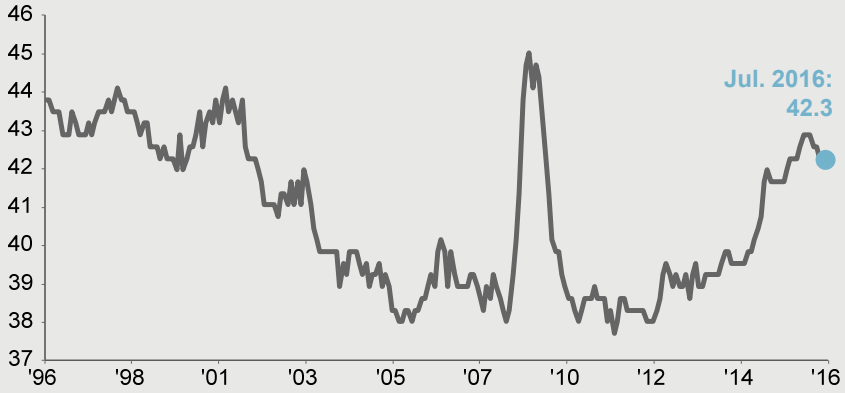
Light vehicle sales

Millions, seasonally adjusted annual rate



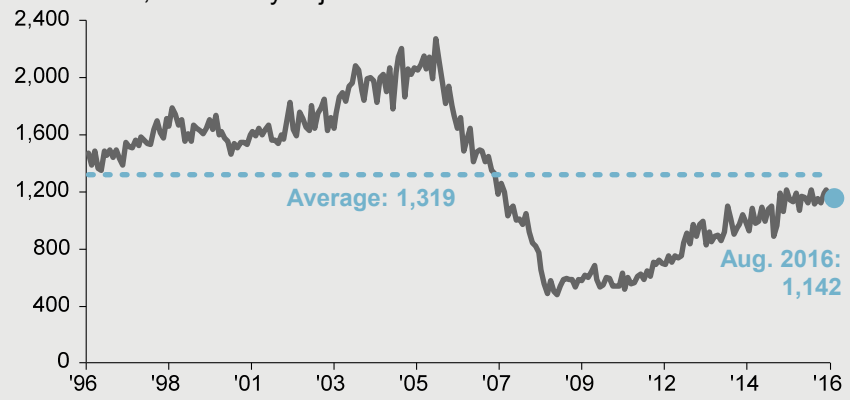
Manufacturing and trade inventories

Days of sales, seasonally adjusted



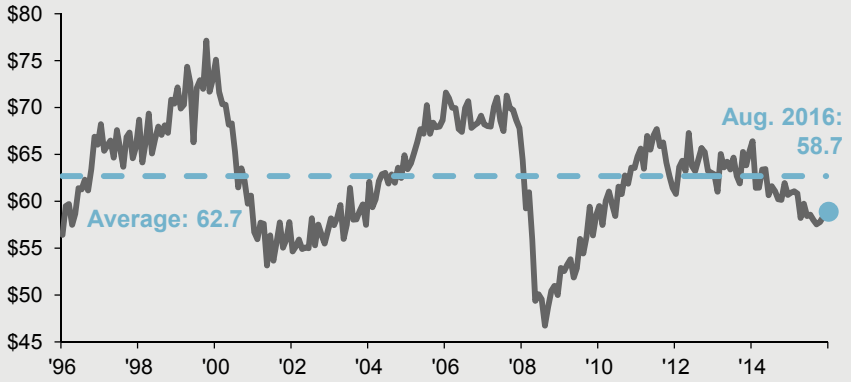
Housing starts

Thousands, seasonally adjusted annual rate



Real capital goods orders

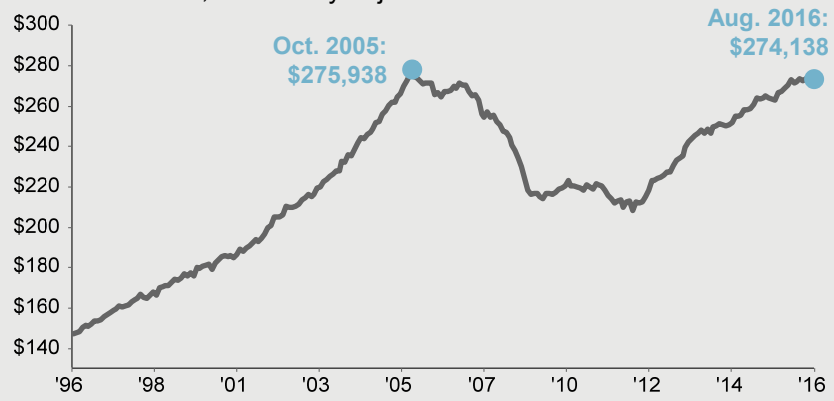
Non-defense capital goods orders ex-aircraft, USD billions, SA



Source: J.P. Morgan Asset Management; (Top left) BEA; (Top and bottom right, bottom left) Census Bureau, FactSet.
Capital goods orders deflated using the producer price index for capital goods with a base year of 2009. August non-defense capital goods orders ex-aircraft is an advance estimate.
SA – seasonally adjusted.
Guide to the Markets – U.S. Data are as of September 30, 2016.

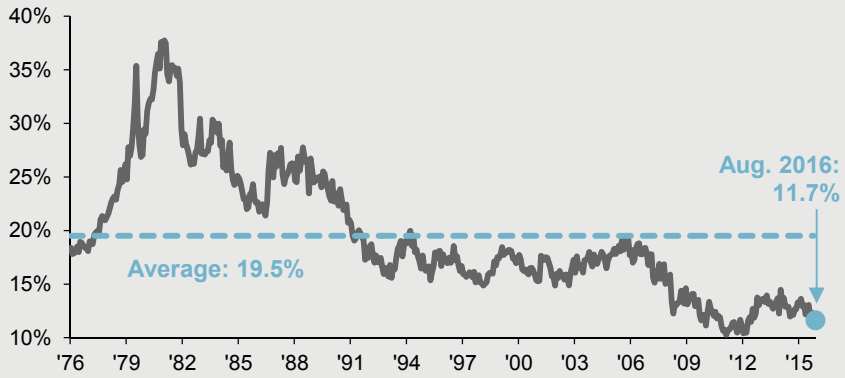
Average price for an existing single family home

Thousands USD, seasonally adjusted



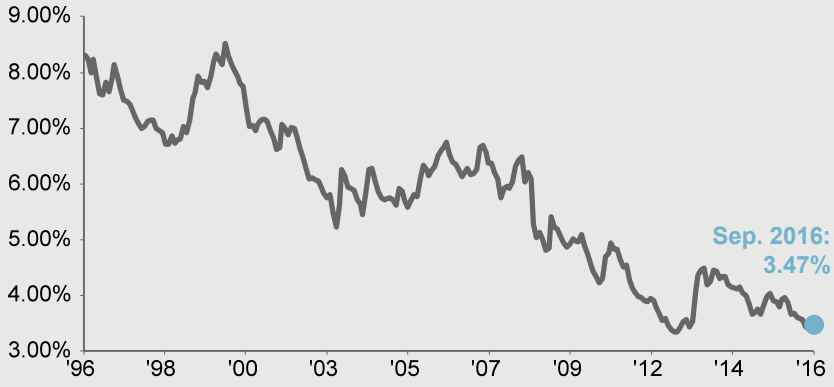
Housing Affordability Index

Avg. mortgage payment as a % of household income



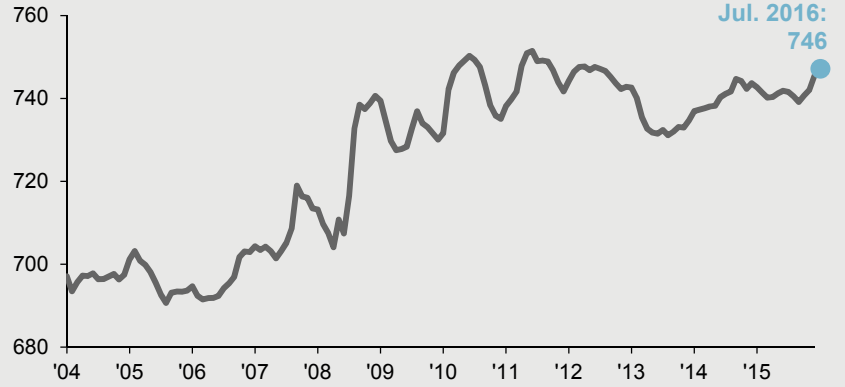
Average interest rate on a U.S. mortgage

30-year fixed-rate mortgage



Lending standards for approved mortgage loans

Average FICO score based on origination date



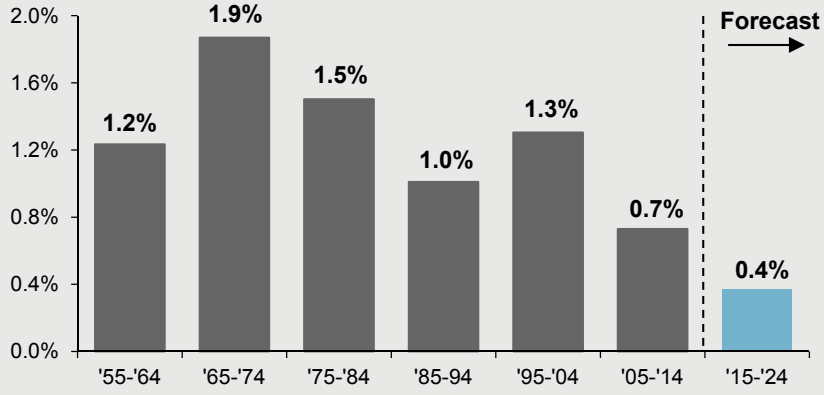
Source: J.P. Morgan Asset Management; (Top left, bottom left and top right) FactSet; (Top left and top right) National Association of Realtors; (Bottom left) Freddie Mac; (Top right) BEA, Census Bureau; (Bottom right) McDash, J.P. Morgan Securitized Product Research.
Monthly mortgage payment assumes the prevailing 30-year fixed-rate mortgage rates and average new home prices excluding a 20% down payment.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Long-term drivers of economic growth

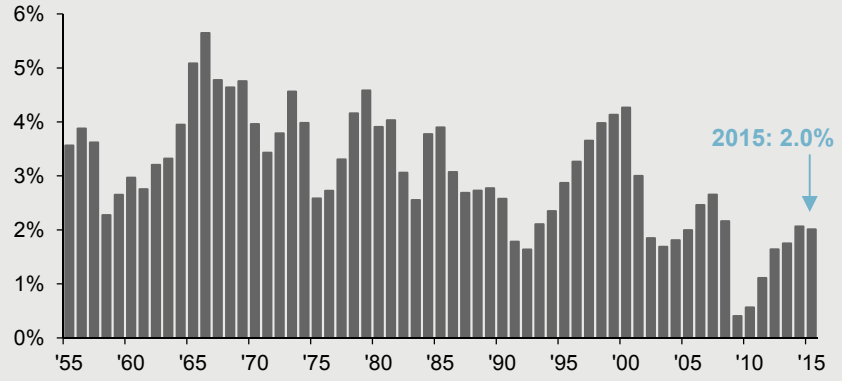
Growth in working age population

Percent increase in civilian non-institutional population ages 16-64



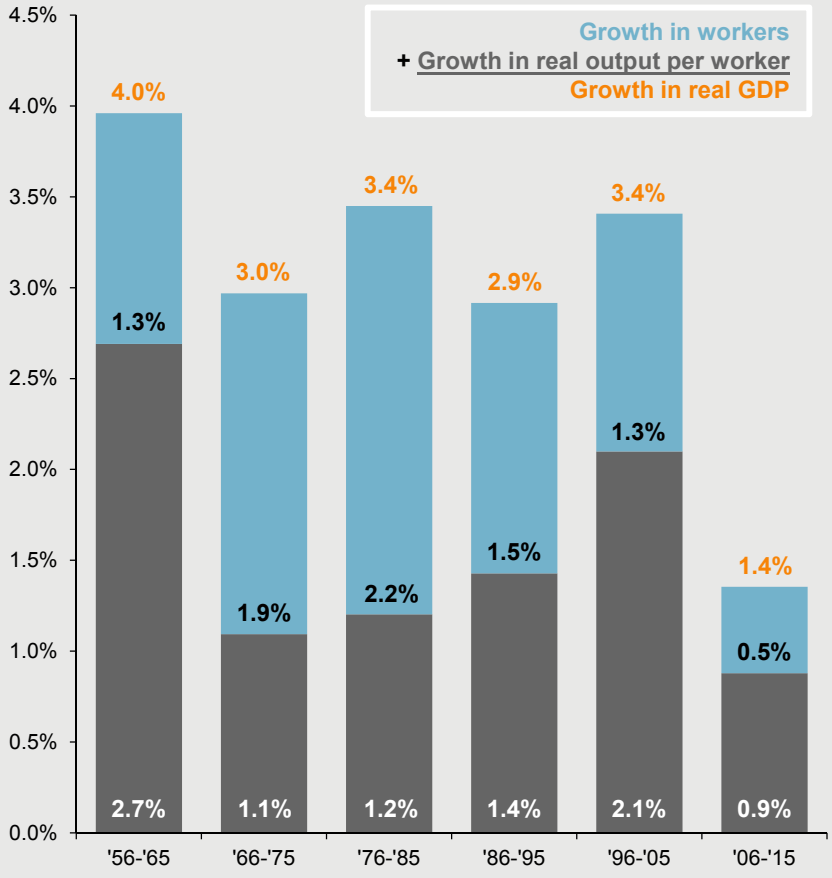
Growth in investment in structures and equipment

Non-residential fixed assets, year-over-year % change



Drivers of GDP growth

Average year-over-year percent change

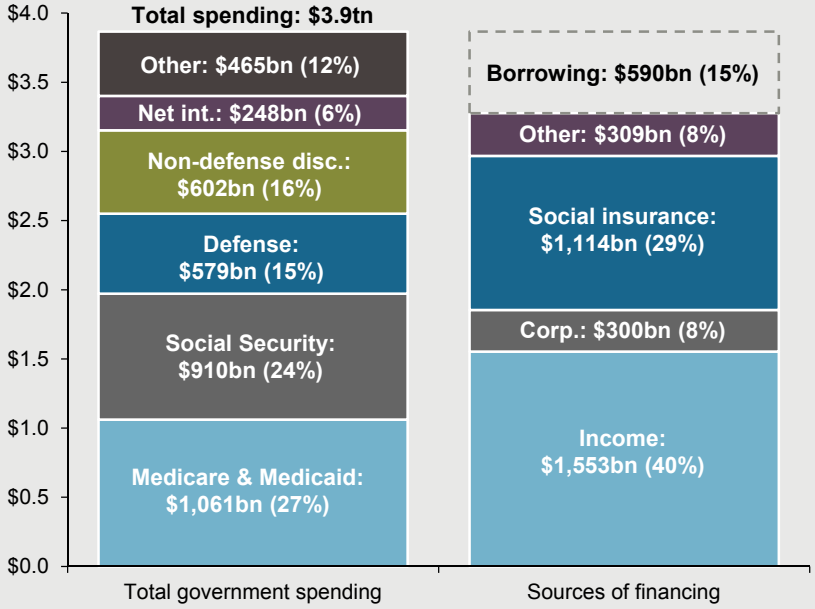


Source: J.P. Morgan Asset Management; (Top left) Census Bureau, DOD, DOJ; (Top left and right) BLS; (Right and bottom left) BEA.
GDP drivers are calculated as the average annualized growth between 4Q of the first and last year. Future working age population is calculated as the total estimated number of Americans from the Census Bureau, controlled for military enrollment, growth in institutionalized population and demographic trends.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

The 2016 federal budget

CBO Baseline forecast, USD trillions

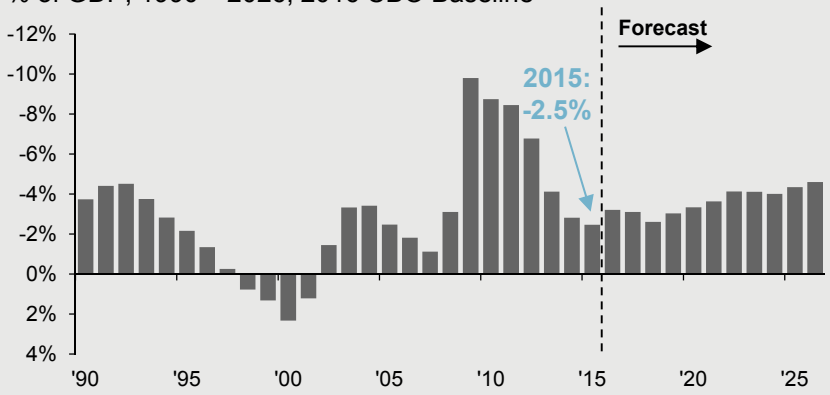


CBO's Baseline assumptions

	2016	'17-'18	'19-'20	'21-'26
Real GDP growth	1.9%	2.3%	1.7%	1.9%
10-year Treasury	1.9%	2.4%	3.2%	3.6%
Headline inflation (CPI)	1.0%	2.3%	2.3%	2.4%
Unemployment	4.9%	4.5%	4.9%	4.9%

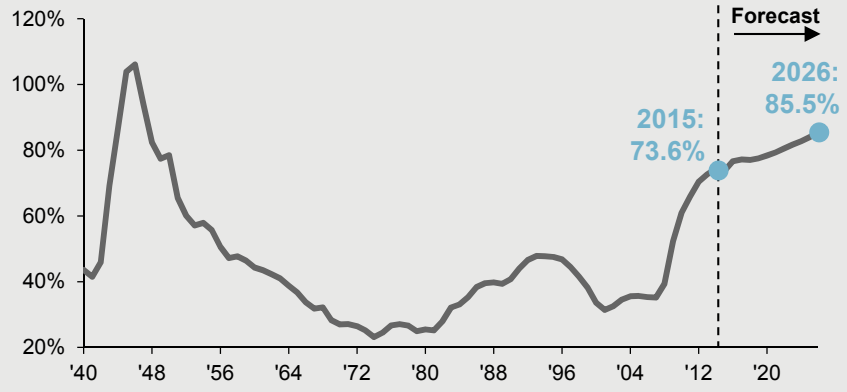
Federal budget surplus/deficit

% of GDP, 1990 – 2026, 2016 CBO Baseline



Federal net debt (accumulated deficits)

% of GDP, 1940 – 2026, 2016 CBO Baseline, end of fiscal year

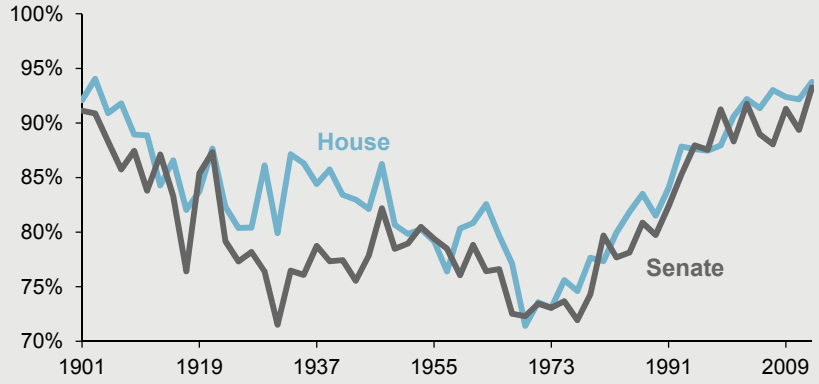


Source: CBO, J.P. Morgan Asset Management; (Top and bottom right) BEA, Treasury Department.
2016 Federal Budget is based on the Congressional Budget Office (CBO) August 2016 Baseline Budget Forecast. Other spending includes, but is not limited to, health insurance subsidies, income security and federal civilian and military retirement.
Note: Years shown are fiscal years (Oct. 1 through Sep. 30).
Guide to the Markets – U.S. Data are as of September 30, 2016.

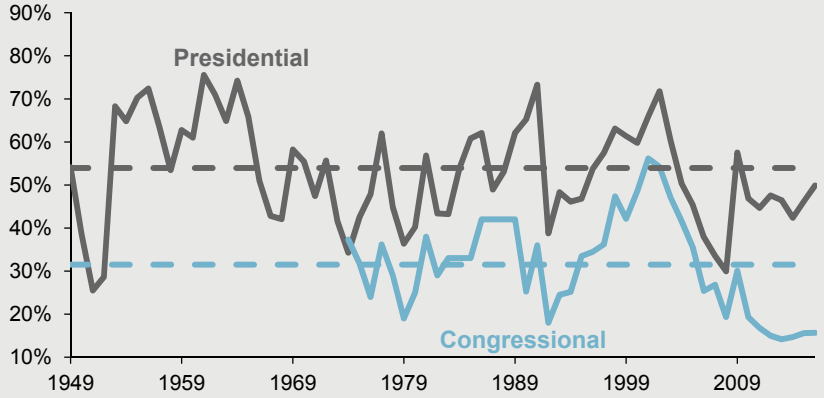
U.S. political perspectives

Political polarization

% of representatives voting with the majority of their party*

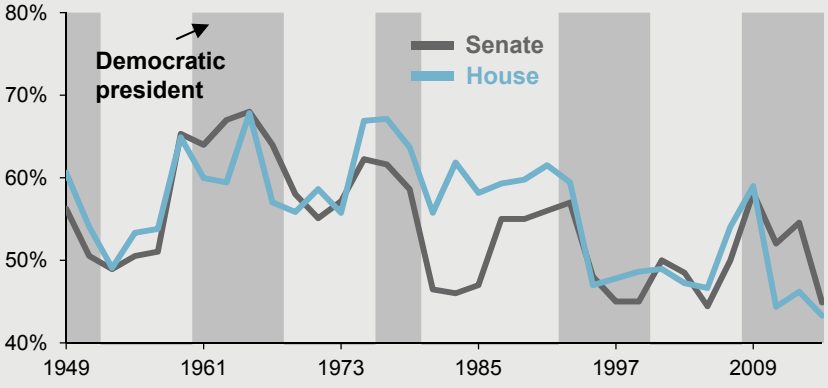


Congressional & presidential approval ratings



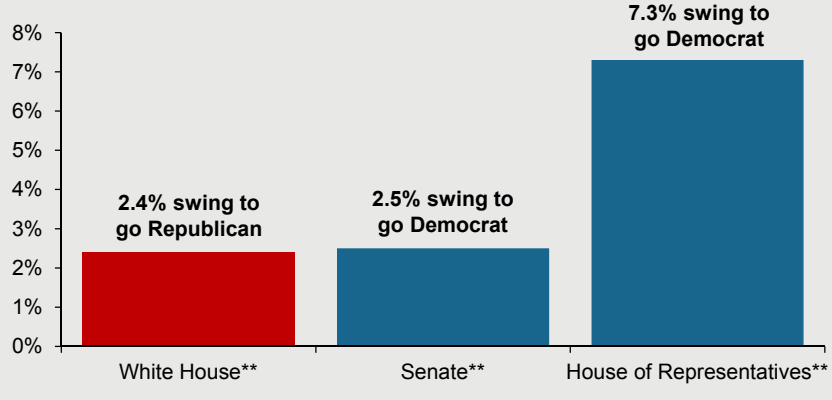
Political party dominance

Democratic % of major party seats



Vote swings and election outcomes

% change in votes required so that a new party takes control



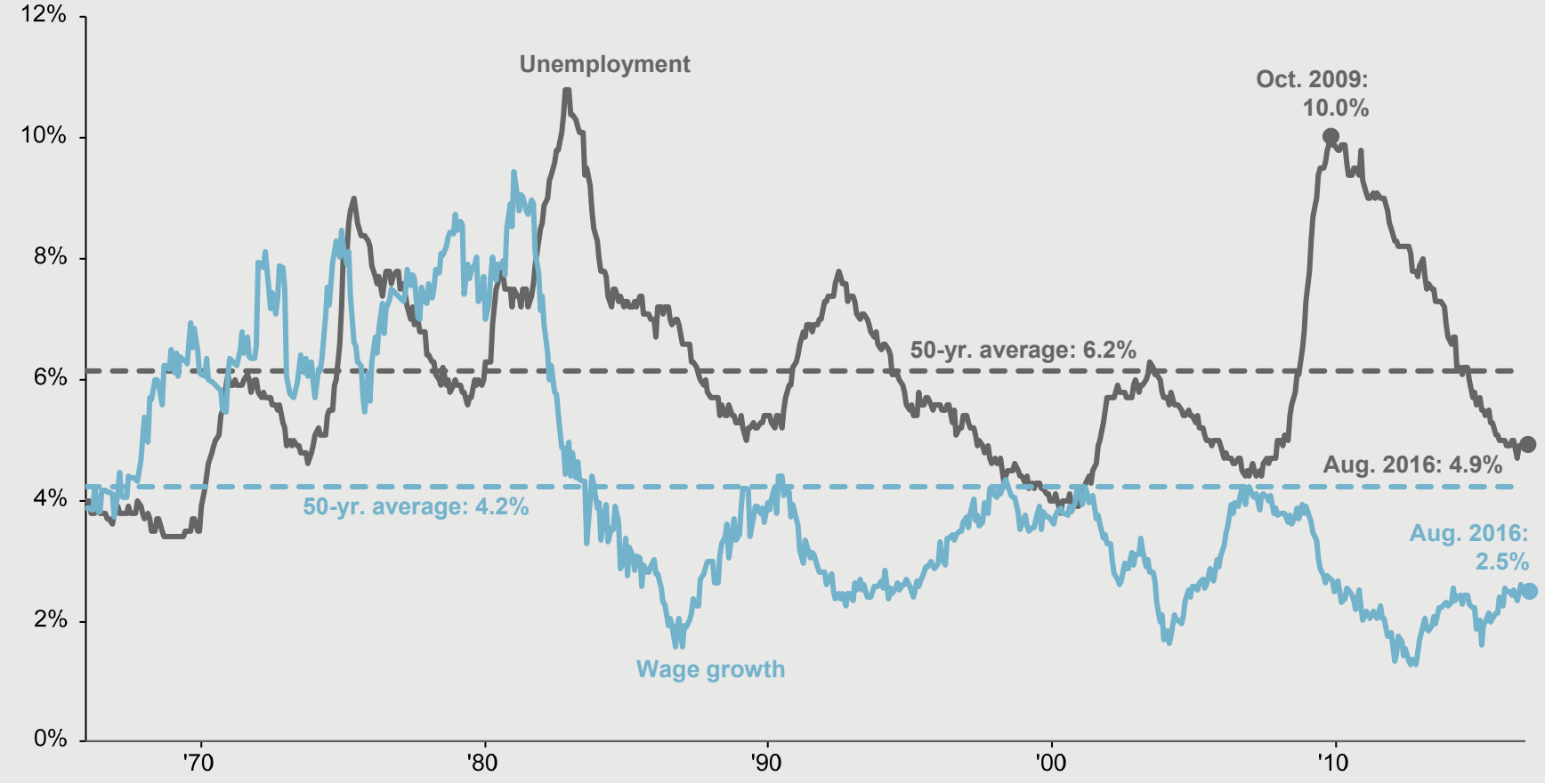
Source: J.P. Morgan Asset Management; (Top left) VoteView; (Bottom left and right) U.S. House of Representatives, U.S. Senate; (Top right) Gallup Inc.; (Bottom right) New York Times, Politico, RealClearPolitics. *In roll call votes where the majority in one party voted the opposite way to the majority in the other. Data compiled by Professors Keith T. Poole and Howard Rosenthal, available at www.voteview.com. Data on voting records are not yet available for the 114th Congress. **Swing required is defined as the percentage of total voters, on a uniform national basis, that would have to switch from voting Republican to Democrat or vice-versa, in order to achieve 270 Electoral College votes, 50 Senate seats or 218 House seats respectively. Calculations are relative to the 2010 Senate election, 2012 Presidential election and 2014 House election respectively. Estimates also count two independent senators currently caucusing with the Democrats as Democrats.

Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Unemployment and wages

Civilian unemployment rate and year-over-year growth in wages of production and non-supervisory workers
Seasonally adjusted, percent



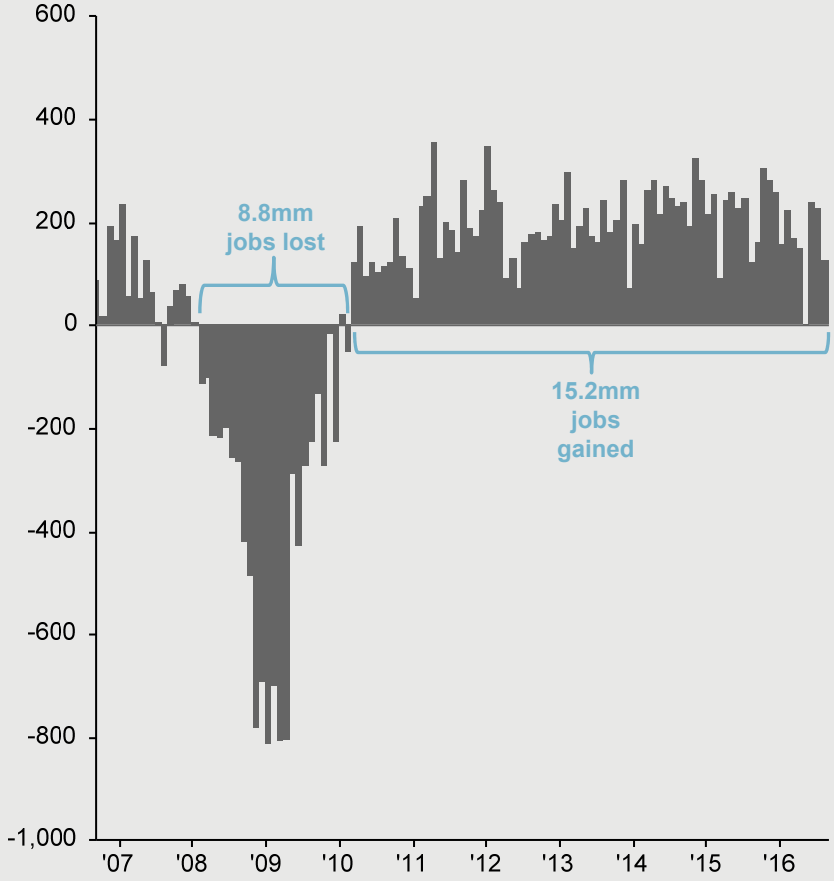
Source: BLS, FactSet, J.P. Morgan Asset Management.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Economy

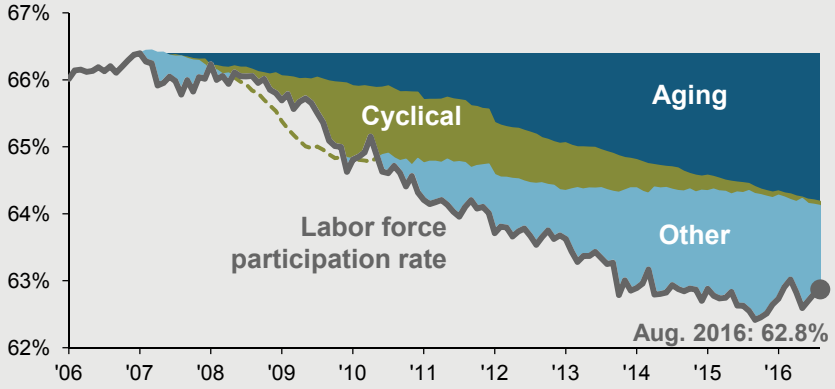
Employment – Total private payroll

Total job gain/loss, thousands



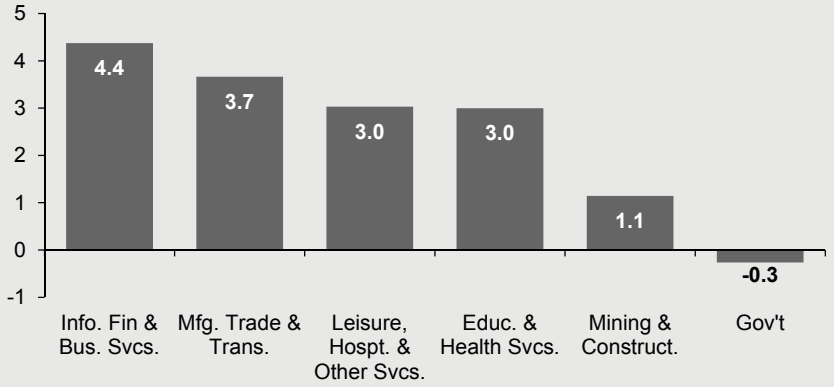
Labor force participation rate decline since 2007 peak*

Population employed or looking for work as a % of total, ages 16+



Net job creation since Feb. 2010

Millions of jobs



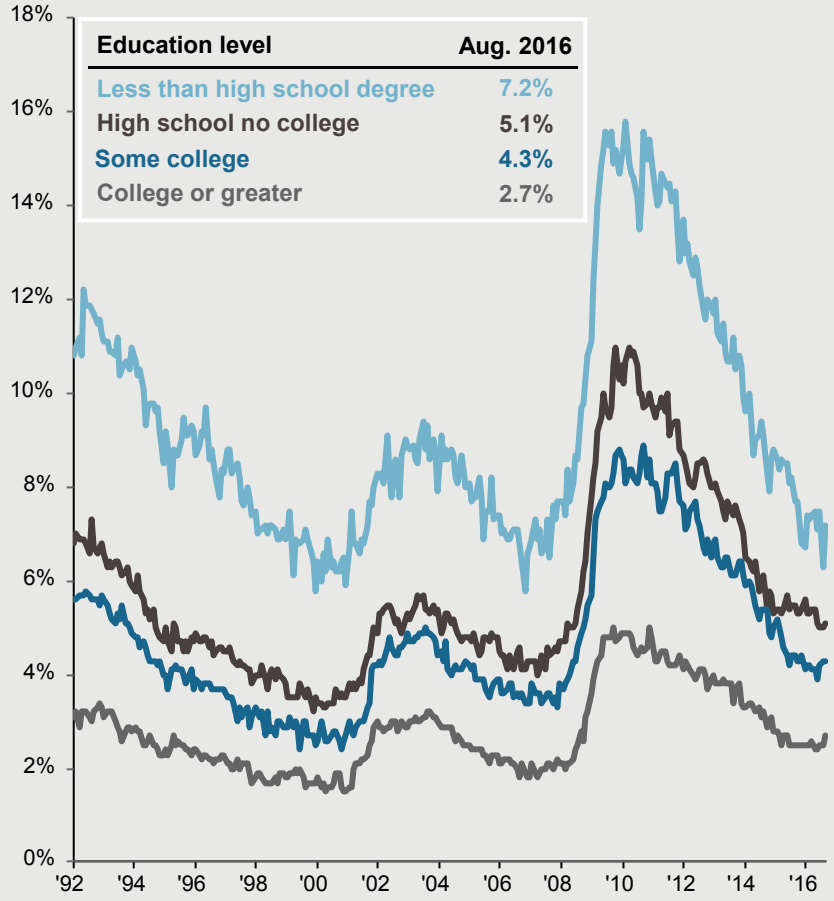
Source: BLS, FactSet, J.P. Morgan Asset Management.
(Bottom right) Info. fin. & bus. svcs. = Information, financial activities and professional and business services; Mfg. trade & trans.= Manufacturing, trade, transportation and utilities; Leisure, hospt. & other svcs.: Leisure, hospitality and other services; Educ. & health svcs.: Education & health services; Mining and construct: Natural resources mining & construction; Gov't: Government. *Aging effect on the labor force participation rate is the estimated number of people who are no longer employed or looking for work because they are retired. Cyclical effect is the estimated number of people who lose their jobs and stop looking for work or do not look for work because of the economic conditions. Other represents the drop in labor force participation from the prior expansion peak that cannot be explained by age or cyclical effects. Estimates for reason of decline in labor force participation rate are made by J.P. Morgan Asset Management.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Employment and income by educational attainment

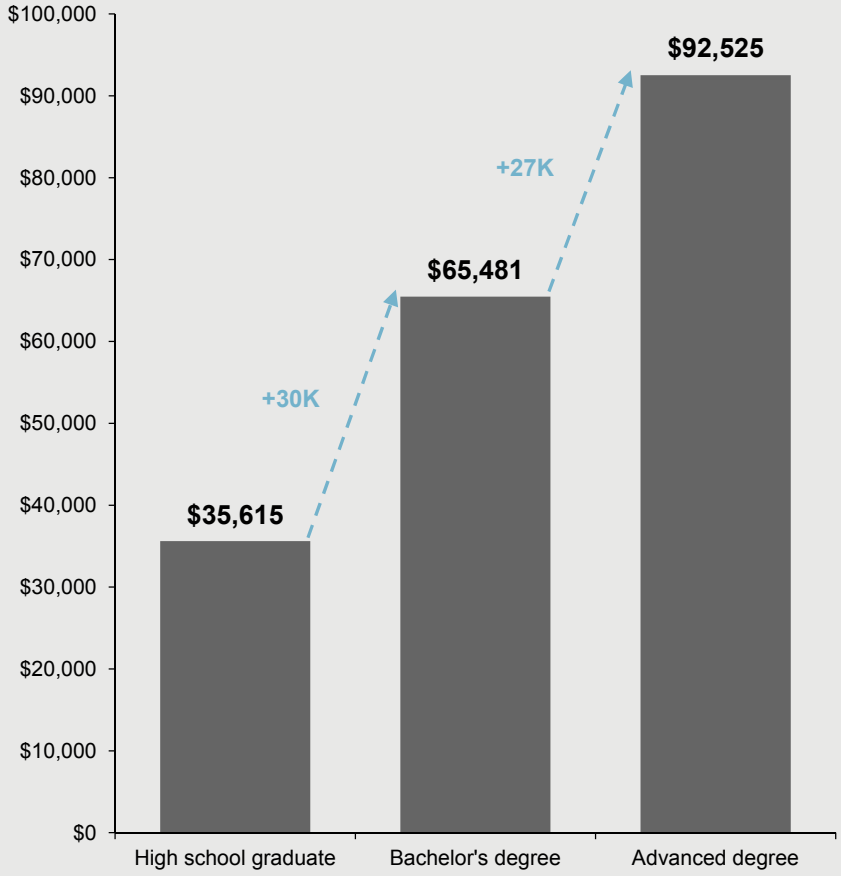
Economy

Unemployment rate by education level



Average annual earnings by highest degree earned

Workers aged 18 and older, 2015

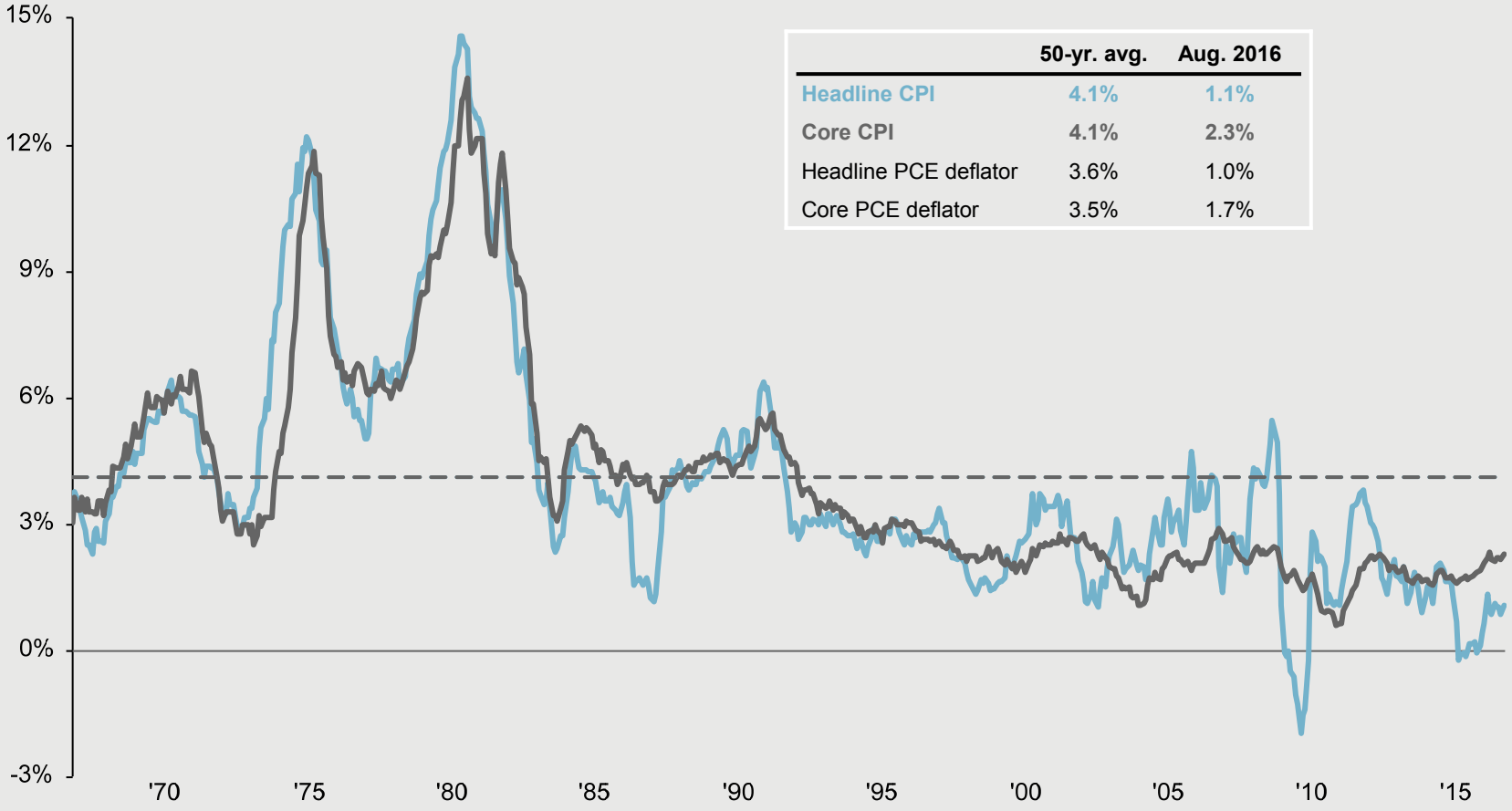


Source: J.P. Morgan Asset Management; (Left) BLS, FactSet; (Right) Census Bureau.
Unemployment rates shown are for civilians aged 25 and older. Earnings by educational attainment comes from the Current Population Survey and is published under historical income tables by person by the Census Bureau.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

CPI and core CPI

% change vs. prior year, seasonally adjusted



	50-yr. avg.	Aug. 2016
Headline CPI	4.1%	1.1%
Core CPI	4.1%	2.3%
Headline PCE deflator	3.6%	1.0%
Core PCE deflator	3.5%	1.7%

Source: BLS, FactSet, J.P. Morgan Asset Management.
CPI used is CPI-U and values shown are % change vs. one year ago and reflect August 2016 CPI data. Core CPI is defined as CPI excluding food and energy prices. The Personal Consumption Expenditure (PCE) deflator employs an evolving chain-weighted basket of consumer expenditures instead of the fixed-weight basket used in CPI calculations.
Guide to the Markets – U.S. Data are as of September 30, 2016.

Trade and the U.S. dollar

Trade balance

Current account balance, % of GDP

U.S. Dollar Index

Monthly average of major currencies nominal trade-weighted index

Source: J.P. Morgan Asset Management; (Left) BEA; (Right) Federal Reserve, FactSet.
Currencies in the Trade Weighted U.S. Dollar Major Currencies Index are: British pound, euro, Swedish kroner, Australian dollar, Canadian dollar, Japanese yen and Swiss franc.
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J.P.Morgan
Asset Management

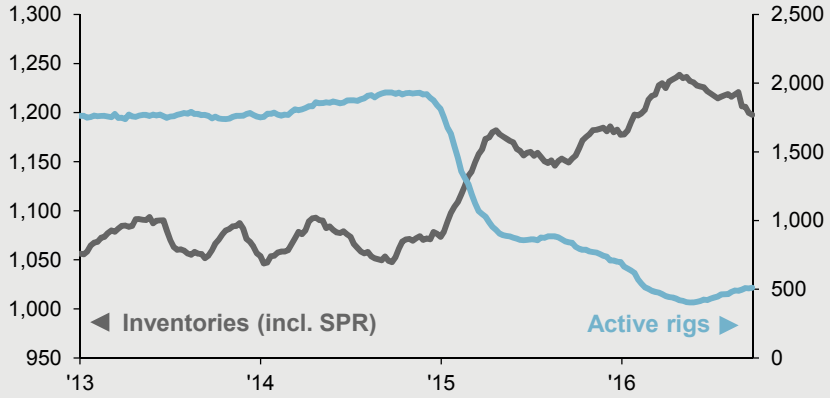
Change in production and consumption of oil

Production, consumption and inventories, millions of barrels per day

	2013	2014	2015	2016*	2017*	Growth since 2013
Production						
U.S.	12.3	14.1	15.0	14.7	14.7	19.4%
OPEC	37.6	37.5	38.3	39.2	40.0	6.5%
Global	**91.0**	**93.4**	**95.7**	**96.2**	**96.8**	**6.4%**
Consumption						
U.S.	19.0	19.1	19.4	19.6	19.7	4.1%
China	10.5	10.9	11.3	11.7	12.1	15.1%
Global	**91.4**	**92.5**	**93.9**	**95.4**	**96.8**	**5.9%**
Inventory Change	-0.4	0.9	1.8	0.8	0.0	

U.S. crude oil inventories and rig count**

Million barrels, number of active rigs



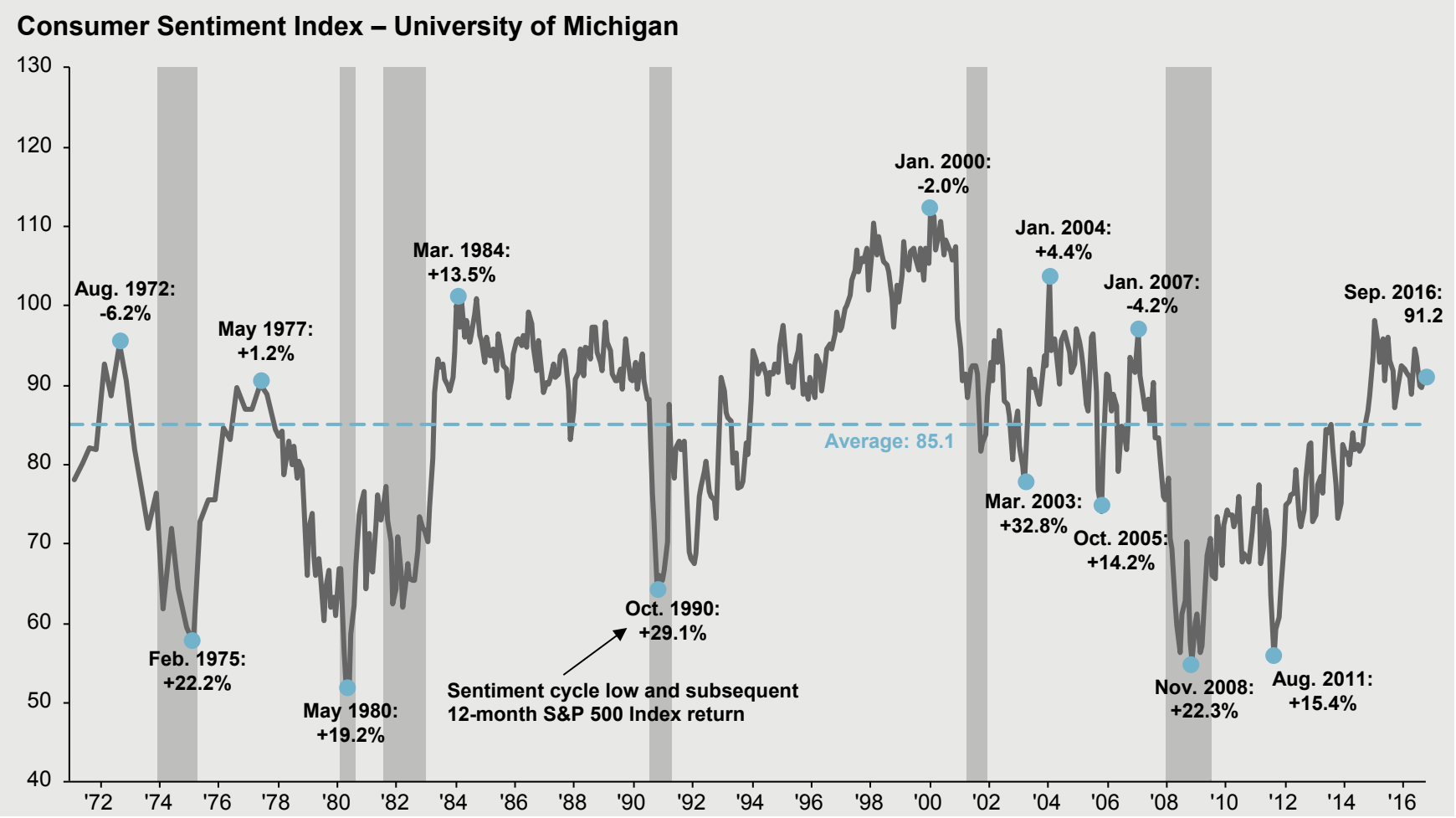
Price of oil

Brent crude, nominal prices, USD/barrel

Source: J.P. Morgan Asset Management; (Top and bottom left) EIA; (Right) FactSet; (Bottom left) Baker Hughes.
*Forecasts are from the September 2016 EIA Short-Term Energy Outlook and start in 2016.
**U.S. crude oil inventories include the Strategic Petroleum Reserve (SPR). Active rig count includes both natural gas and oil rigs.
Brent crude prices are monthly averages in USD using global spot ICE prices.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Consumer confidence and the stock market

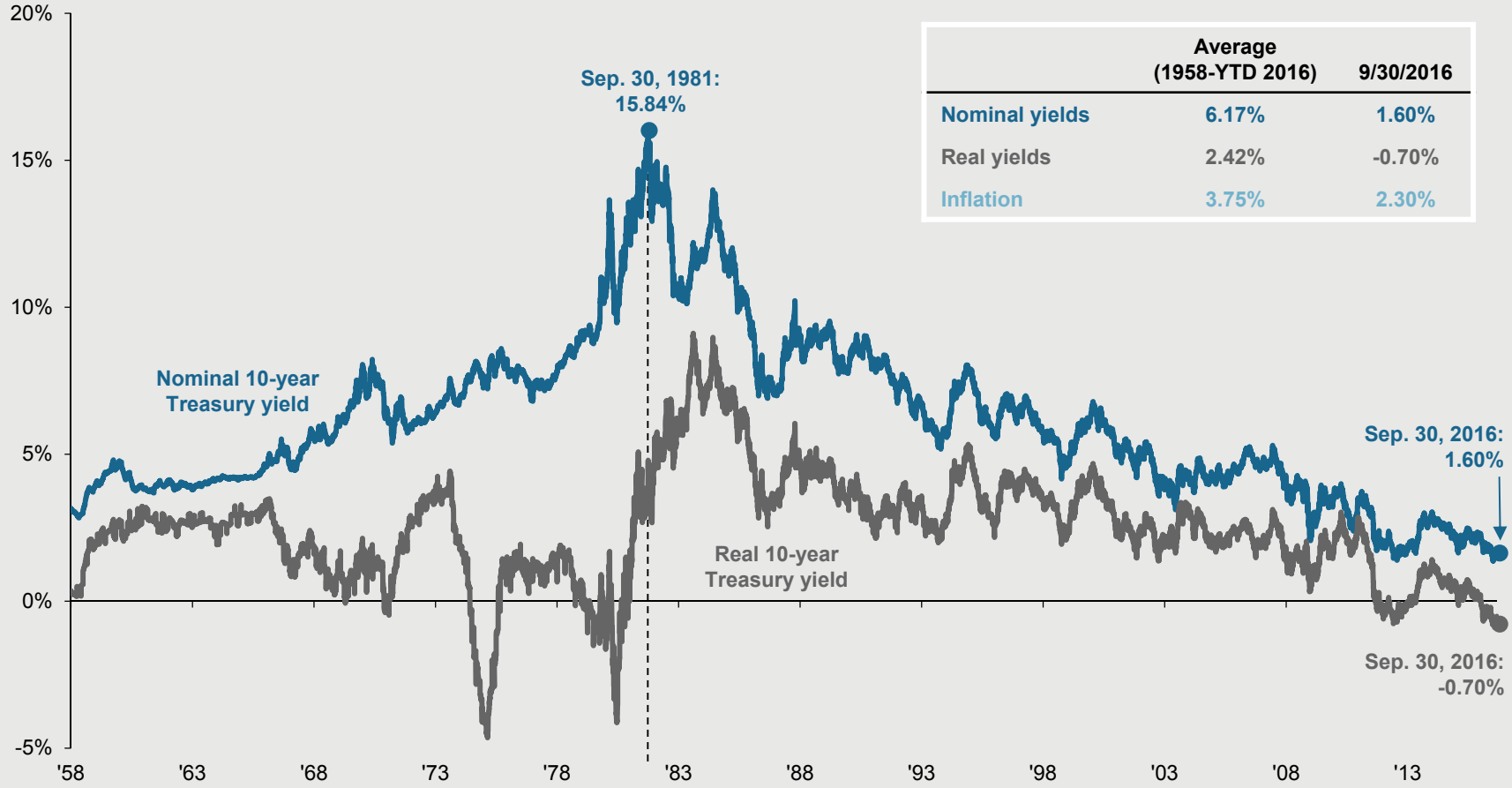


Source: Standard & Poor's, University of Michigan, FactSet, J.P. Morgan Asset Management.
Peak is defined as the highest index value before a series of lower lows, while a trough is defined as the lowest index value before a series of higher highs. Subsequent 12-month S&P 500 returns are price returns only, which excludes dividends.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Interest rates and inflation

Nominal and real 10-year Treasury yields



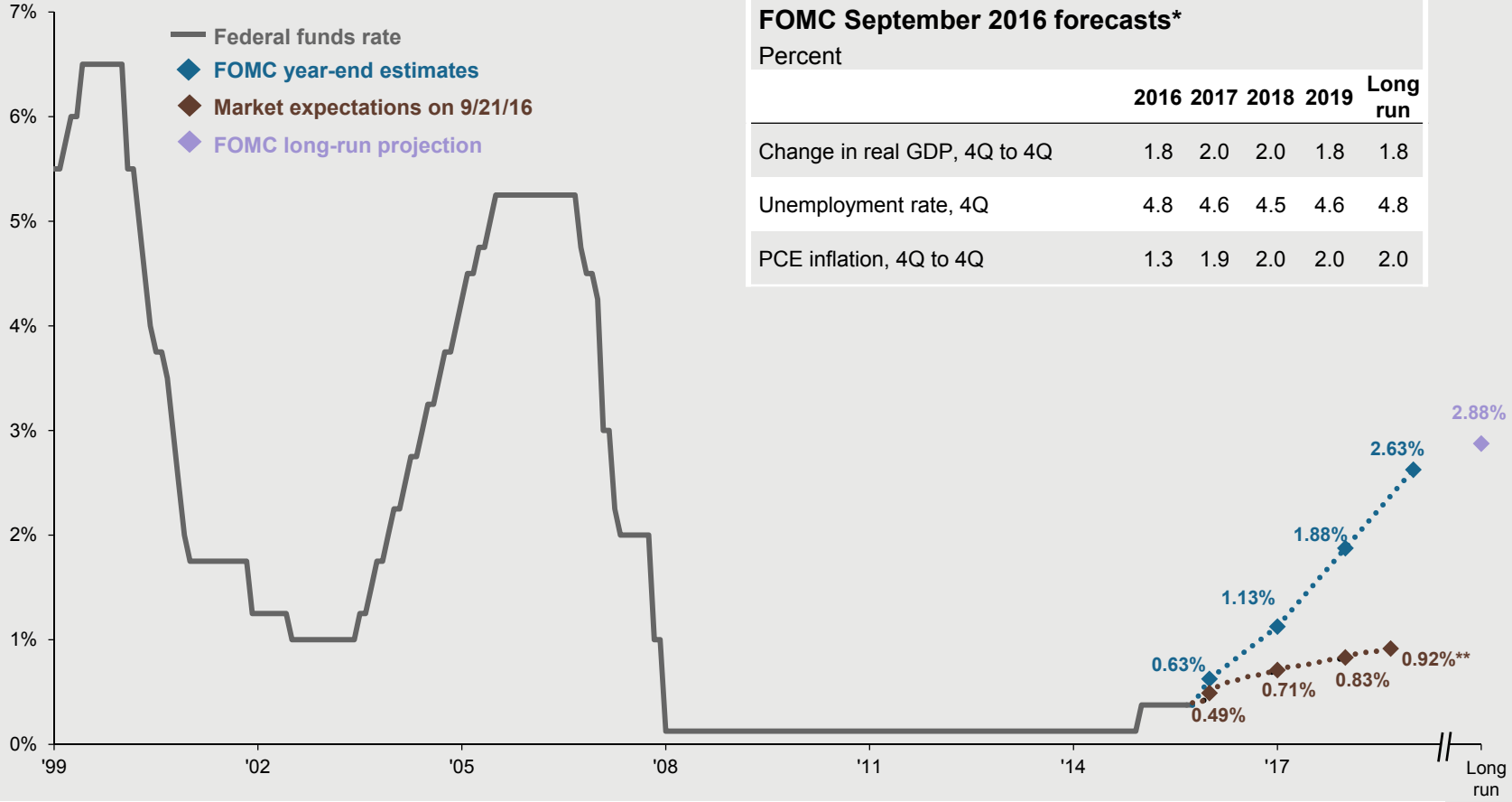
	Average (1958-YTD 2016)	9/30/2016
Nominal yields	6.17%	1.60%
Real yields	2.42%	-0.70%
Inflation	3.75%	2.30%

Source: BLS, Federal Reserve, J.P. Morgan Asset Management.
Real 10-year Treasury yields are calculated as the daily Treasury yield less year-over-year core CPI inflation for that month except for September 2016, where real yields are calculated by subtracting out August 2016 year-over-year core inflation.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Federal funds rate expectations

FOMC and market expectations for the fed funds rate



FOMC September 2016 forecasts*

Percent

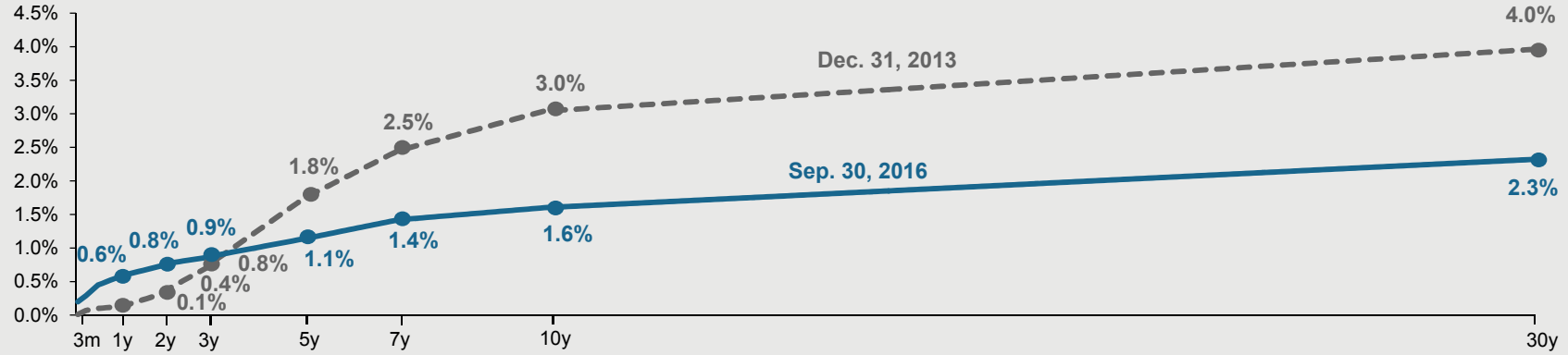
	2016	2017	2018	2019	Long run
Change in real GDP, 4Q to 4Q	1.8	2.0	2.0	1.8	1.8
Unemployment rate, 4Q	4.8	4.6	4.5	4.6	4.8
PCE inflation, 4Q to 4Q	1.3	1.9	2.0	2.0	2.0

Source: FactSet, Federal Reserve, J.P. Morgan Asset Management.
Market expectations are the federal funds rates priced into the fed futures market as of the date of the September 2016 FOMC meeting. *Forecasts of 17 Federal Open Market Committee (FOMC) participants are median estimates. **Last futures market expectation is for August 2019 due to data availability.
Guide to the Markets – U.S. Data are as of September 30, 2016.

Shape of the yield curve

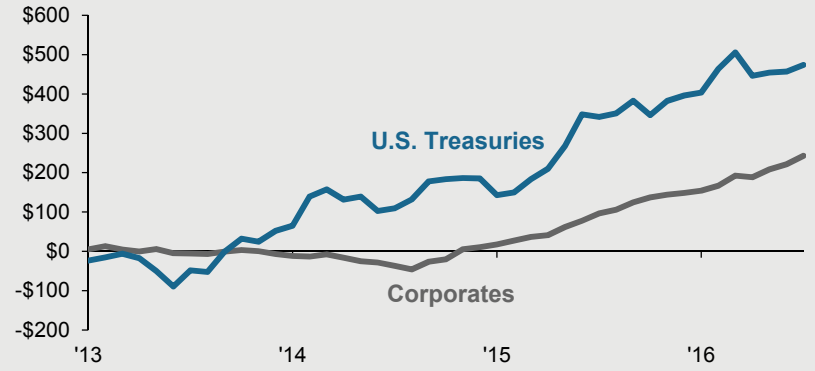
Yield curve

U.S. Treasury yield curve



Private foreign investor net flows to U.S. fixed income

Cumulative foreign private net flows into USTs and Corporates, $ billion



Correlation of government bonds

Correlation* between U.S. Treasury and German Bund yields

Source: FactSet, J.P. Morgan Asset Management; (Bottom left) U.S. Treasury.
*Rolling six-month correlation of weekly change in yield.
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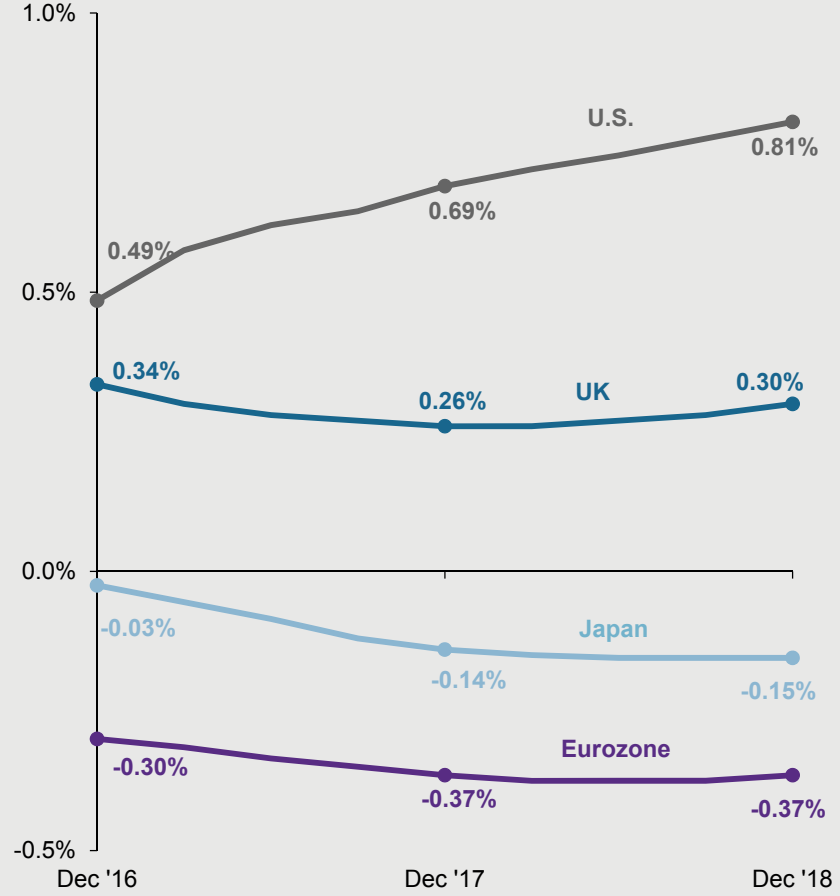
J.P.Morgan
Asset Management

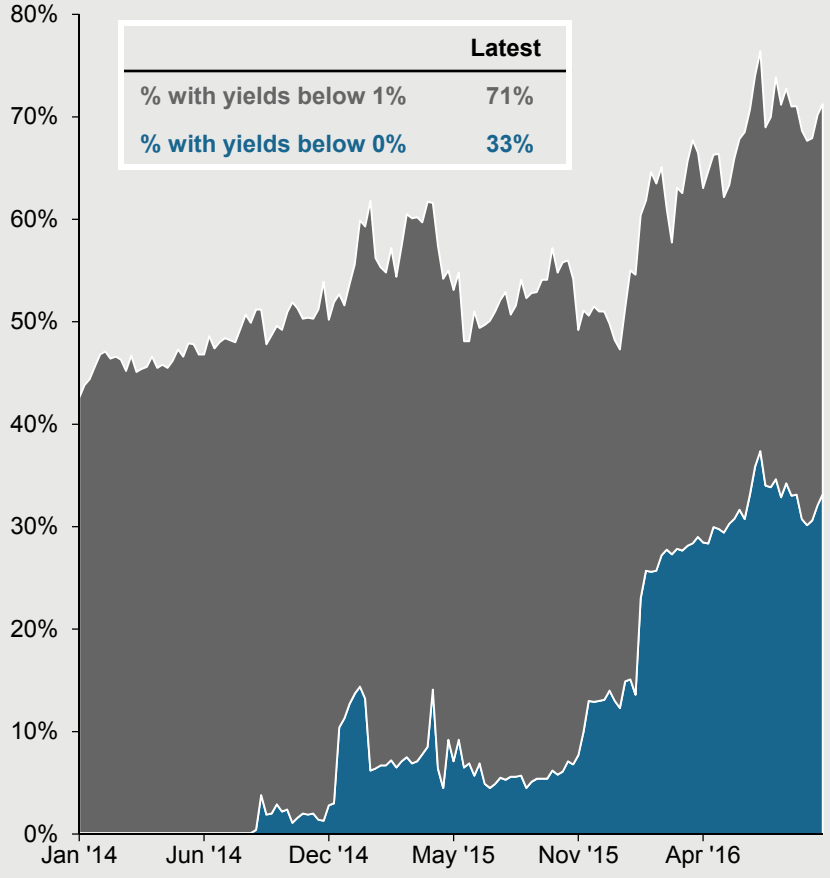
Developed market fixed income dynamics

Market expectations for target policy rate*



Government bonds with low or negative yields

% of government bond index with negative yields



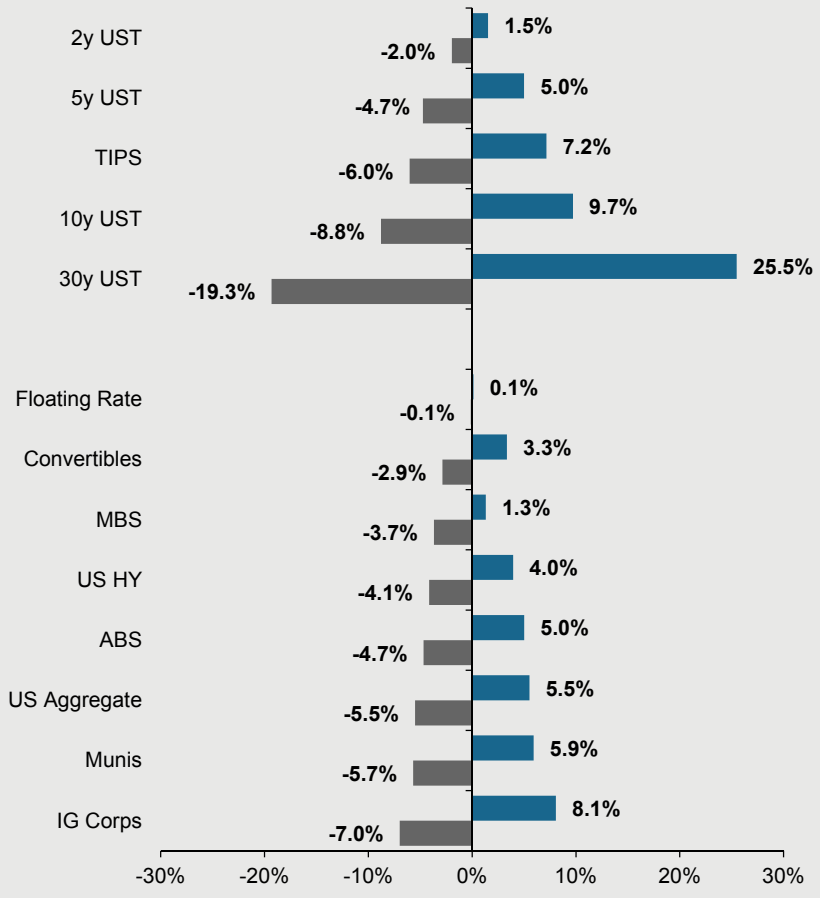
Source: Bloomberg, J.P. Morgan Asset Management; (Right) BofA/Merrill Lynch.
*Target policy rates for Japan are estimated using EuroYen 3m futures contracts less a risk premium of 6bps. Government bond index is the BofAML Global Government Bond Index, which includes investment-grade sovereign debt denominated in the issuer's own domestic currency. The index includes all euro members, the U.S., Japan, the UK, Canada, Australia, New Zealand, Switzerland, Norway and Sweden.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Fixed income yields and returns

U.S. Treasuries	Correlation to 10-year	Avg. Maturity	Yield 9/30/2016	Yield 6/30/2016	Return 2016 YTD
2-Year	0.62	2 years	0.77%	0.58%	1.20%
5-Year	0.91	5	1.14%	1.01%	3.96%
10-Year	1.00	10	1.60%	1.49%	7.14%
30-Year	0.92	30	2.32%	2.30%	16.96%
TIPS	0.57	10	0.00%	0.09%	7.27%
Sector					
Broad Market	0.85	7.8 years	1.96%	1.91%	5.80%
MBS	0.79	5.1	2.06%	2.07%	3.72%
Municipals	0.44	10.0	1.72%	1.57%	4.35%
Corporates	0.43	10.9	2.84%	2.88%	9.20%
High Yield	-0.26	6.3	6.17%	7.27%	15.11%
Floating Rate	-0.21	2.3	1.75%	1.65%	1.93%
Convertibles	-0.31	--	0.99%	0.92%	8.94%
ABS	-0.02	5.4	1.97%	1.94%	5.68%

Price impact of a 1% rise/fall in interest rates*



Source: Barclays, U.S. Treasury, FactSet, J.P. Morgan Asset Management. Sectors shown above are provided by Barclays and are represented by – Broad Market: U.S. Aggregate; MBS: U.S. Aggregate Securitized - MBS; Corporate: U.S. Corporates; Municipals: Muni Bond 10-year; High Yield: Corporate High Yield; TIPS: Treasury Inflation Protection Securities (TIPS). Floating Rate: FRN (BBB); Convertibles: U.S. Convertibles Composite; ABS: ABS + CMBS. Treasury securities data for number of issues based on U.S. Treasury benchmarks from Barclays. Yield and return information based on bellwethers for Treasury securities. Sector yields reflect yield to worst, while Treasury yields are yield to maturity. Correlations are based on 10-years of monthly returns for all sectors. Change in bond price is calculated using both duration and convexity according to the following formula: New Price = (Price + (Price * -Duration * Change in Interest Rates))+(0.5 * Price * Convexity * (Change in Interest Rates)^2). *Calculation assumes 2-year Treasury interest rate falls 0.77% to 0.00%. Chart is for illustrative purposes only. Past performance is not indicative of future results.
Guide to the Markets – U.S. Data are as of September 30, 2016.

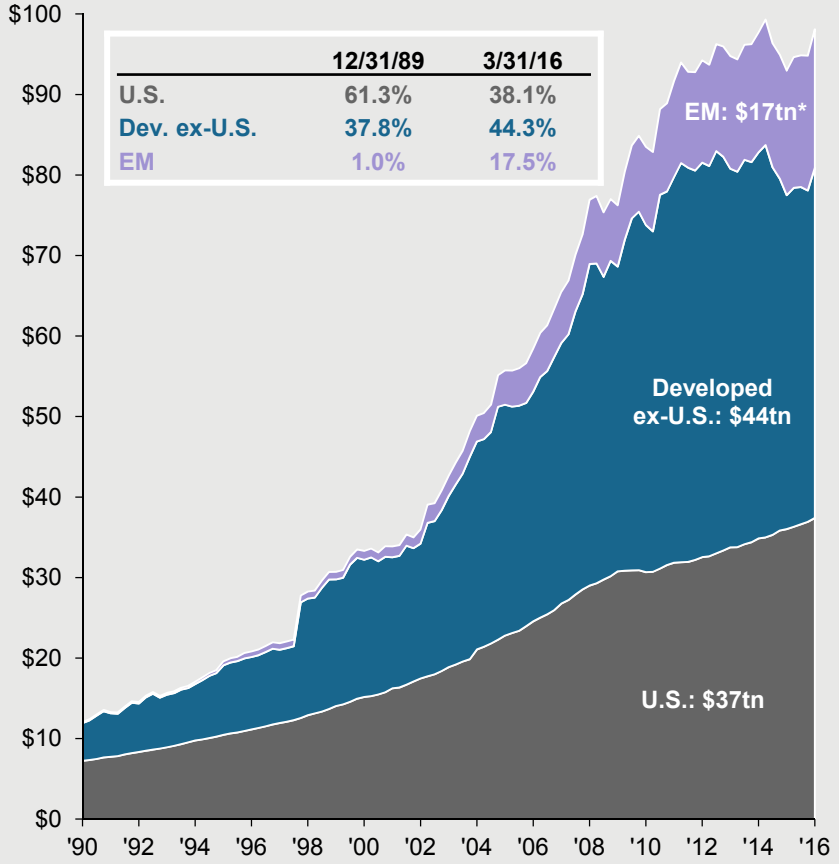
J.P.Morgan Asset Management

Global fixed income

Aggregates	Correl to 10-year	Duration	Yield 9/30/2016	Yield 6/30/2016	2016 YTD Return Local	2016 YTD Return USD
U.S.	0.91	5.5 years	1.96%	1.91%	5.80%	5.80%
Gbl. ex-U.S.	0.22	7.7	0.67%	0.72%		12.46%
Japan	0.51	9.1	0.00%	-0.13%	4.30%	23.90%
Germany	-0.03	6.4	0.09%	0.12%	4.55%	8.16%
UK	0.21	10.4	1.21%	1.41%	16.11%	2.33%
Italy	-0.18	7.0	0.79%	0.88%	4.20%	7.80%
Spain	-0.17	6.7	0.53%	0.74%	6.69%	10.37%
Sector						
Euro Corp.	0.21	5.4 years	0.66%	0.92%	6.00%	9.65%
Euro HY	-0.28	4.1	4.29%	4.90%	4.18%	7.78%
EMD ($)	0.18	6.9	4.98%	5.37%		14.77%
EMD (LCL)	-0.01	5.0	6.18%	6.28%	10.91%	17.07%
EM Corp.	0.07	5.7	4.56%	5.01%		11.11%

Global bond market

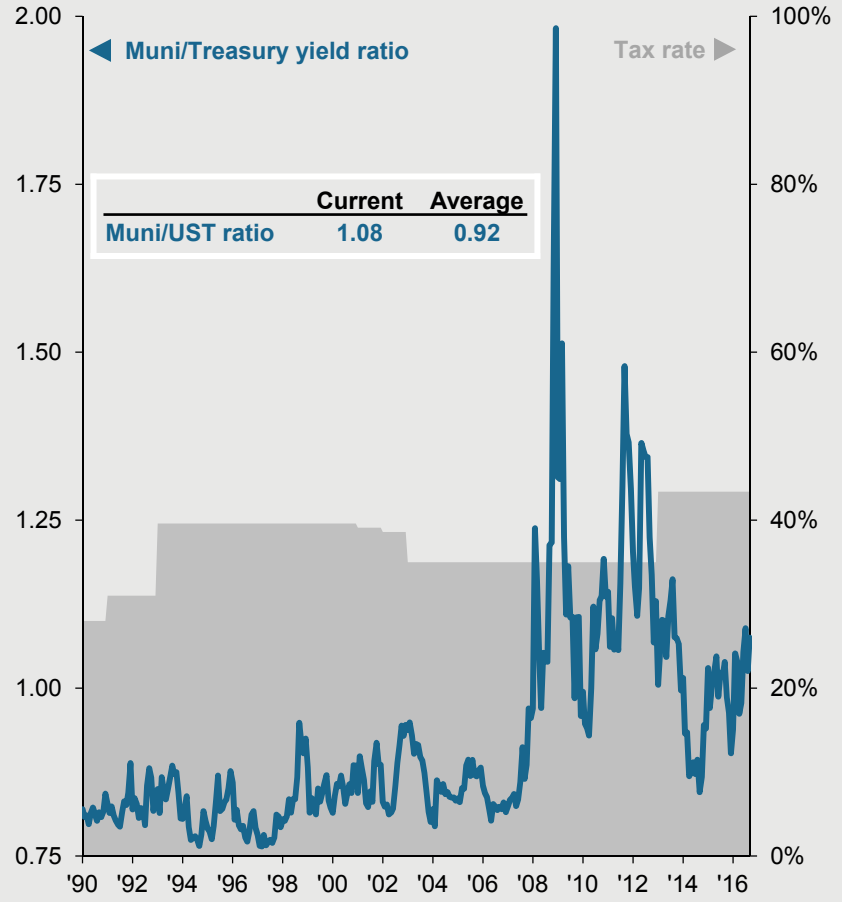
USD trillions



Source: J.P. Morgan Asset Management; (Left) FactSet, Barclays; (Right) BIS.
Fixed income sectors shown above are provided by Barclays and are represented by the global aggregate for each country except where noted. EMD sectors are represented by the J.P. Morgan EMBIG Diversified Index (USD), the J.P. Morgan GBI EM Global Diversified Index (LCL) and the J.P. Morgan CEMBI Broad Diversified Index (Corp). European Corporates are represented by the Barclays Euro Aggregate Corporate Index and the Barclays Pan-European High Yield index. Sector yields reflect yield to worst. Duration is modified duration. Correlations are based on 7 years of monthly returns for all sectors. Past performance is not indicative of future results. Global bond market regional breakdown may not sum to 100% due to rounding. *3Q15, 4Q15 and 1Q16 estimates for domestic Brazilian debt are J.P. Morgan Asset Management calculations based on Brazilian Central Bank data. 1Q16 estimate for total Argentinian debt assumes debt levels are unchanged from the previous quarter.
Guide to the Markets – U.S. Data are as of September 30, 2016.

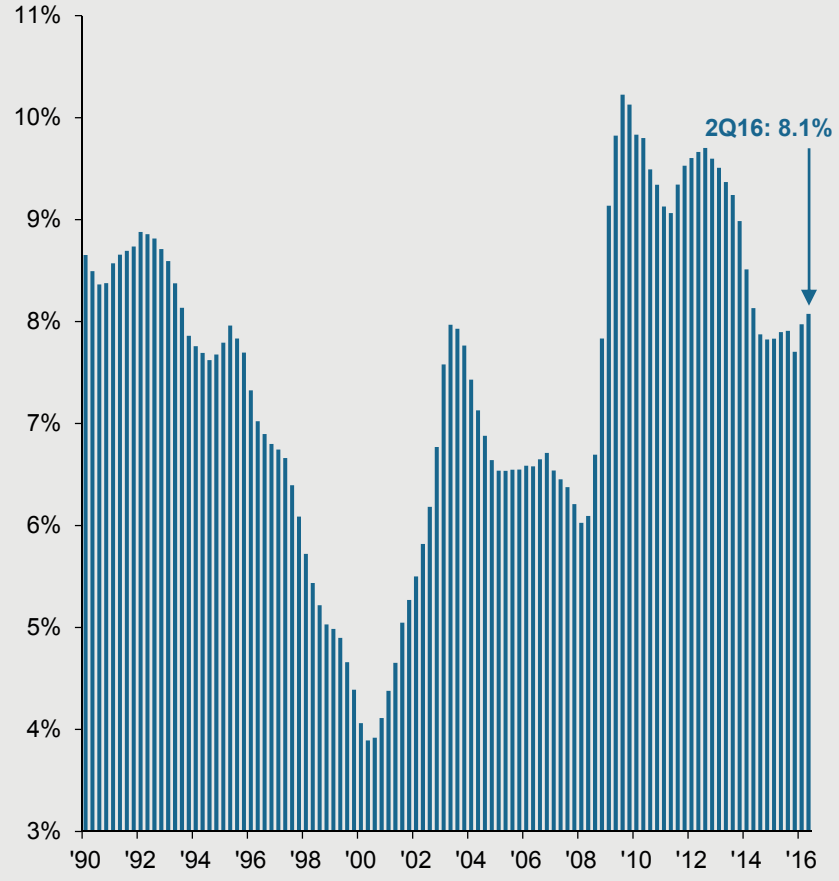
J.P.Morgan Asset Management

Municipal and Treasury bond yields and the tax rate



State and local government debt service

Debt service as % of state and local revenue

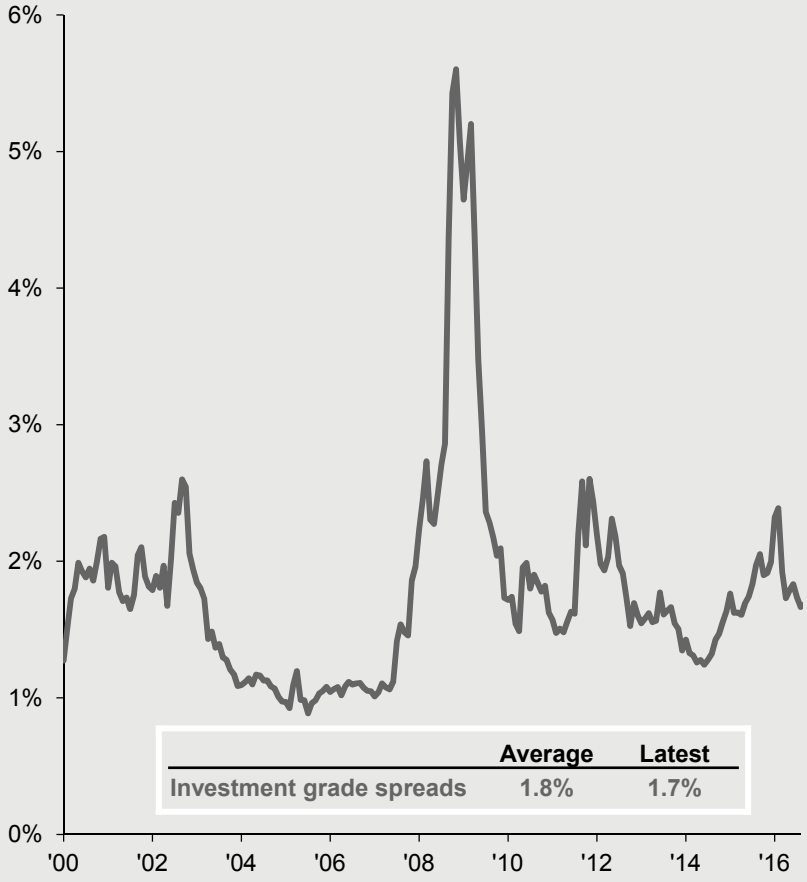


Source: J.P. Morgan Asset Management; (Left) FactSet, Barclays, FRB; (Right) BEA.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

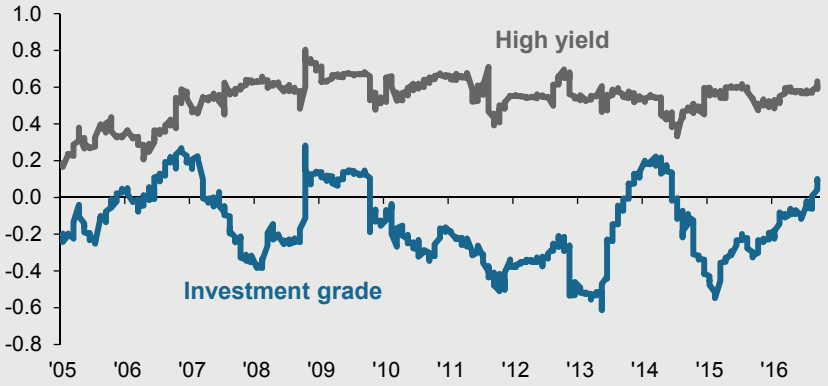
Investment grade spreads

Spread to worst



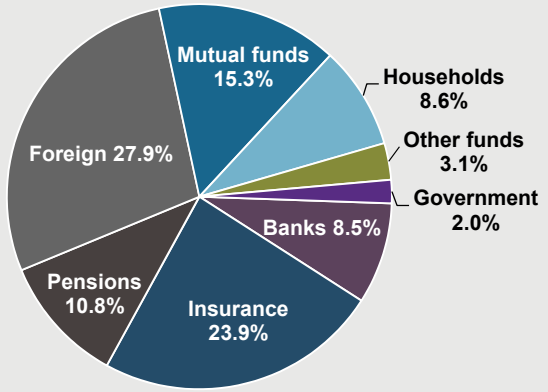
Rolling correlations of stocks and corporate bonds

Correlation* of high yield and investment grade bonds with stocks



Corporate bond ownership

Ownership as percent of amount outstanding 2Q16

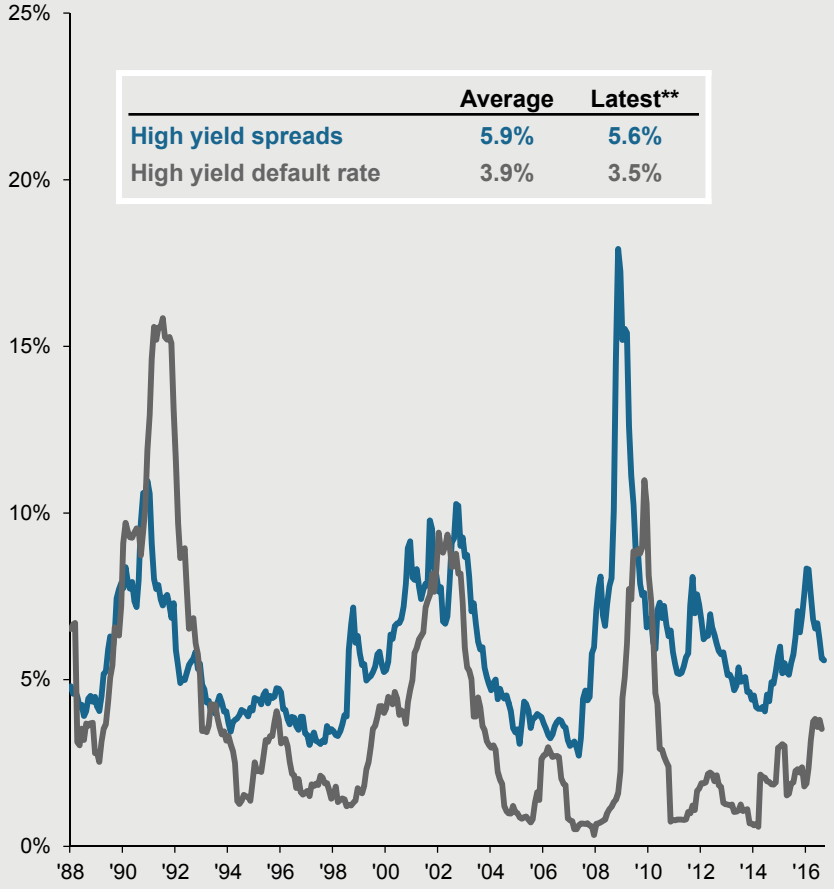


Source: J.P. Morgan Asset Management; (Left) J.P. Morgan Global Economic Research; (Top right) Barclays, FactSet; (Bottom right) FRB.
Investment grade corporate bonds are represented by the J.P. Morgan U.S. Liquid Index (JULI). High yield corporate bonds are represented by the J.P. Morgan Domestic HY Index. Stocks are represented by the S&P 500. Correlation is based on the weekly change in price. Spreads indicated are benchmark yield to worst less comparable maturity Treasury yields. *Rolling 12-month correlation of weekly change in price.
Guide to the Markets – U.S. Data are as of September 30, 2016.

High yield bonds

High yield spreads and default rate

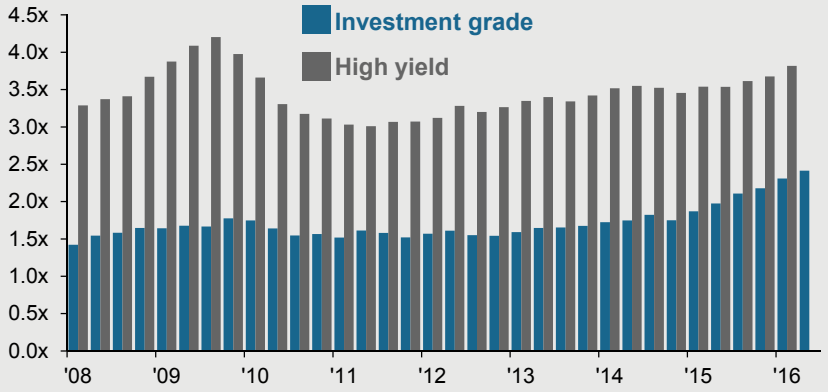
Spread to worst



	Average	Latest**
High yield spreads	5.9%	5.6%
High yield default rate	3.9%	3.5%

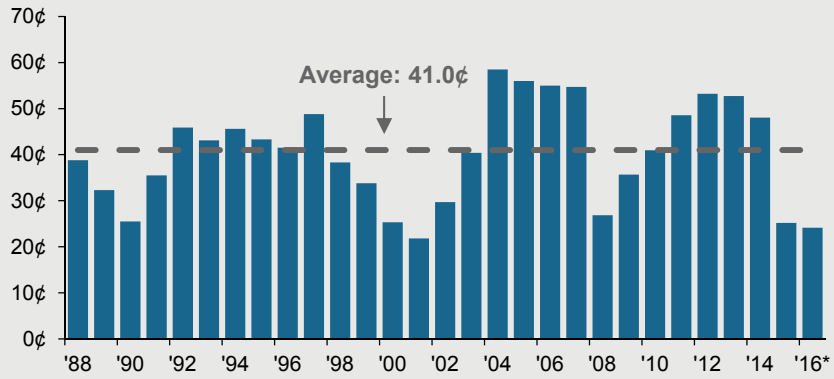
Historical high yield and high grade net leverage

Net debt/EBITDA



Historical high yield recovery rates

Issuer-weighted recovery rate, cents on the dollar



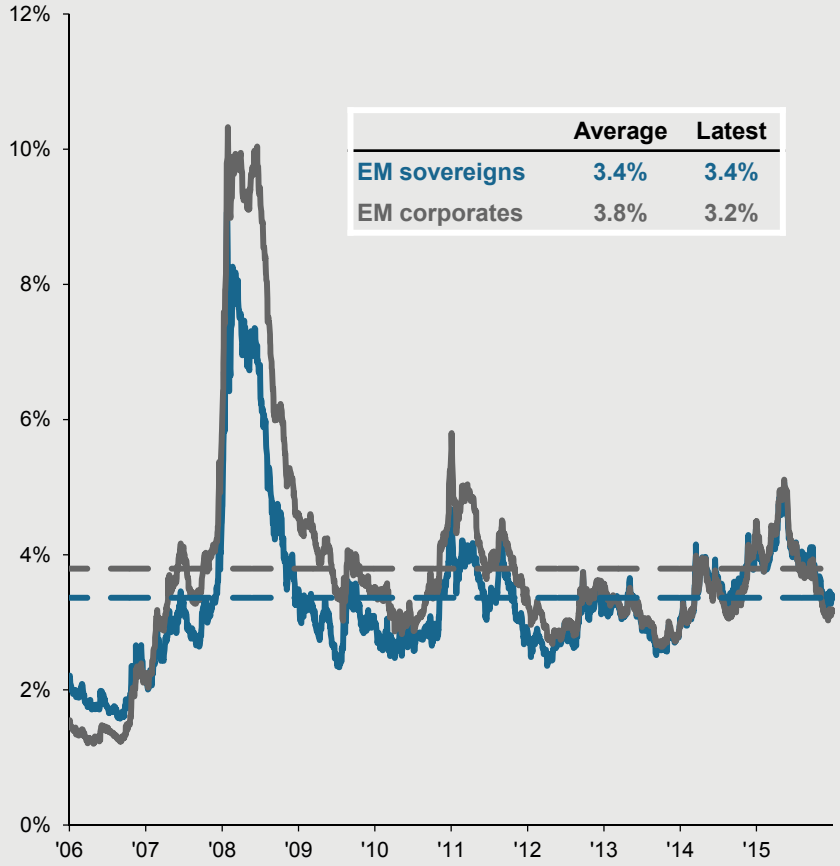
Source: J.P. Morgan Global Economic Research, J.P. Morgan Asset Management.
Default rates are defined as the par value percentage of the total market trading at or below 50% of par value and include any Chapter 11 filing, prepackaged filing or missed interest payments. Spreads indicated are benchmark yield to worst less comparable maturity Treasury yields. Yield to worst is defined as the lowest potential yield that can be received on a bond without the issuer actually defaulting and reflects the possibility of the bond being called at an unfavorable time for the holder. High yield is represented by the J.P. Morgan Domestic HY Index. Investment grade is represented by the J.P. Morgan U.S. Liquid Index. Recovery rates are issuer-weighted and based on bond price 30 days after default date. The 2009 adjusted recovery rate is based on year-end prices. *2016 recovery rate is for the last 12 months, as of 8/31/2016, and is not included in the average recovery rate calculated over the period. **Latest high yield default rate is as of 8/31/2016 due to data availability at time of publication.
Guide to the Markets – U.S. Data are as of August 31, 2016.

J.P.Morgan Asset Management

Emerging market debt

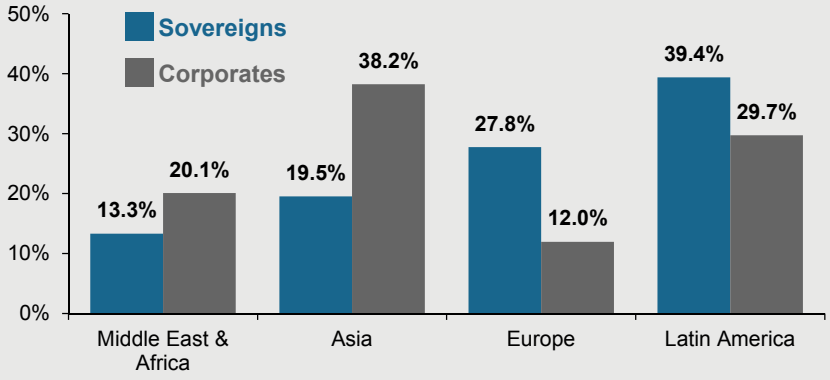
Corporate and sovereign EMD spreads

USD-denominated debt, percentage points over Treasury



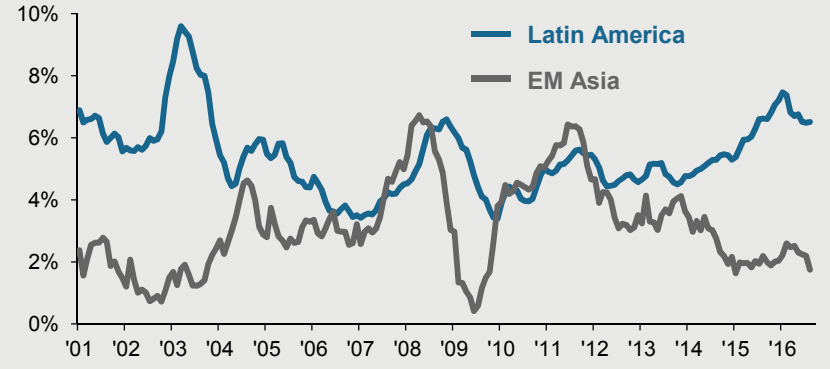
Regional weights in EMD indices

USD-denominated corporate and sovereign regional weightings



Headline inflation

YoY % change, Lat Am* and EM Asia aggregates



Source: J.P. Morgan Global Economic Research, J.P. Morgan Asset Management.
EM sovereigns: J.P. Morgan EMBIG Diversified Index; EM corporates: J.P. Morgan CEMBI Broad Diversified Index. *Lat Am index excludes Argentina, Ecuador and Venezuela.
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J.P.Morgan Asset Management

Fixed income sector returns

2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	YTD	2006 - 2015 Cum.	2006 - 2015 Ann.
EMD LCL. 15.2%	EMD LCL. 18.1%	Treas. 13.7%	High Yield 58.2%	EMD LCL. 15.7%	TIPS 13.6%	EMD USD 17.4%	High Yield 7.4%	Muni 8.7%	Muni 3.8%	EMD LCL. 17.1%	EMD USD 114.0%	EMD USD 7.9%
High Yield 11.8%	TIPS 11.6%	MBS 8.3%	EMD USD 29.8%	High Yield 15.1%	Muni 12.3%	EMD LCL. 16.8%	MBS -1.4%	Corp. 7.5%	MBS 1.5%	High Yield 15.1%	High Yield 95.9%	High Yield 7.0%
EMD USD 9.9%	Treas. 9.0%	Barclays Agg 5.2%	EMD LCL. 22.0%	EMD USD 12.2%	Treas. 9.8%	High Yield 15.8%	Corp. -1.5%	EMD USD 7.4%	EMD USD 1.2%	EMD USD 14.8%	Corp. 67.4%	Corp. 5.3%
Asset Alloc. 5.7%	Barclays Agg 7.0%	Muni 1.5%	Corp. 18.7%	Corp. 9.0%	Corp. 8.1%	Corp. 9.8%	Asset Alloc. -1.9%	MBS 6.1%	Treas. 0.8%	Corp. 9.2%	Muni 66.0%	Muni 5.2%
MBS 5.2%	MBS 6.9%	Asset Alloc. 0.1%	Asset Alloc. 14.7%	Asset Alloc. 7.9%	Asset Alloc. 8.1%	Asset Alloc. 7.4%	Barclays Agg -2.0%	Barclays Agg 6.0%	Barclays Agg 0.5%	Asset Alloc. 7.7%	Asset Alloc. 65.7%	Asset Alloc. 5.2%
Muni 4.7%	Asset Alloc. 6.7%	TIPS -2.4%	TIPS 11.4%	Barclays Agg 6.5%	Barclays Agg 7.8%	TIPS 7.0%	Muni -2.2%	Asset Alloc. 5.5%	Asset Alloc. -0.3%	TIPS 7.3%	EMD LCL. 62.0%	EMD LCL. 4.9%
Barclays Agg 4.3%	EMD USD 6.2%	Corp. -4.9%	Muni 9.9%	TIPS 6.3%	EMD USD 7.3%	Muni 5.7%	Treas. -2.7%	Treas. 5.1%	Corp. -0.7%	Barclays Agg 5.8%	MBS 57.3%	MBS 4.6%
Corp. 4.3%	Corp. 4.6%	EMD LCL. -5.2%	Barclays Agg 5.9%	Treas. 5.9%	MBS 6.2%	Barclays Agg 4.2%	EMD USD -5.3%	TIPS 3.6%	TIPS -1.4%	Treas. 5.1%	Barclays Agg 55.5%	Barclays Agg 4.5%
Treas. 3.1%	Muni 4.3%	EMD USD -12.0%	MBS 5.9%	MBS 5.4%	High Yield 5.0%	MBS 2.6%	TIPS -8.6%	High Yield 2.5%	High Yield -4.5%	Muni 4.4%	Treas. 50.6%	Treas. 4.2%
TIPS 0.4%	High Yield 1.9%	High Yield -26.2%	Treas. -3.6%	Muni 4.0%	EMD LCL. -1.8%	Treas. 2.0%	EMD LCL. -9.0%	EMD LCL. -5.7%	EMD LCL. -14.9%	MBS 3.7%	TIPS 47.0%	TIPS 3.9%

Source: Barclays, FactSet, J.P. Morgan Global Economic Research, J.P. Morgan Asset Management.
Past performance is not indicative of future returns. Fixed income sectors shown above are provided by Barclays unless otherwise noted and are represented by Broad Market: Barclays U.S. Aggregate Index; MBS: Fixed Rate MBS Index; Corporate: U.S. Corporates; Municipals: Muni Bond 10-Year Index; High Yield: U.S. Corporate High Yield Index; Treasuries: Global U.S. Treasury; TIPS: Global Inflation-Linked - U.S. TIPs; Emerging Debt USD: J.P. Morgan EMBIG Diversified Index; Emerging Debt LCL: J.P. Morgan EM Global Index. The "Asset Allocation" portfolio assumes the following weights: 20% in MBS, 20% in Corporate,15% in Municipals, 5% in Emerging Debt USD, 5% in Emerging Debt LCL, 10% in High Yield, 20% in Treasuries, 5% in TIPS. Asset allocation portfolio assumes annual rebalancing.
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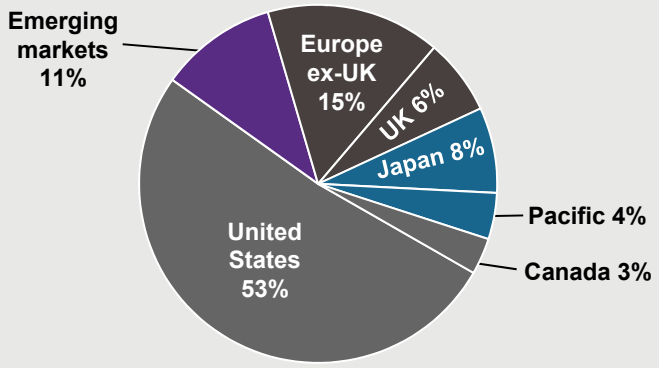
J.P.Morgan Asset Management

Global equity markets

	2016 YTD		2015	
Country / Region	**Local**	**USD**	**Local**	**USD**
Regions / Broad Indexes				
All Country World	5.2	7.1	1.8	-1.8
U.S. (S&P 500)	-	7.8	-	1.4
EAFE	-1.1	2.2	5.8	-0.4
Europe ex-UK	-2.6	0.5	9.1	0.1
Pacific ex-Japan	7.1	11.0	-0.8	-8.4
Emerging Markets	11.6	16.4	-5.4	-14.6
MSCI: Selected Countries				
United Kingdom	14.4	0.9	-2.2	-7.5
France	-0.5	2.9	12.3	0.8
Germany	-1.4	2.0	10.0	-1.3
Japan	-13.4	2.9	10.3	9.9
China	8.9	8.8	-7.7	-7.6
India	7.8	7.1	-1.6	-6.1
Brazil	34.0	63.2	-12.5	-41.2
Russia	16.7	31.3	22.9	5.0

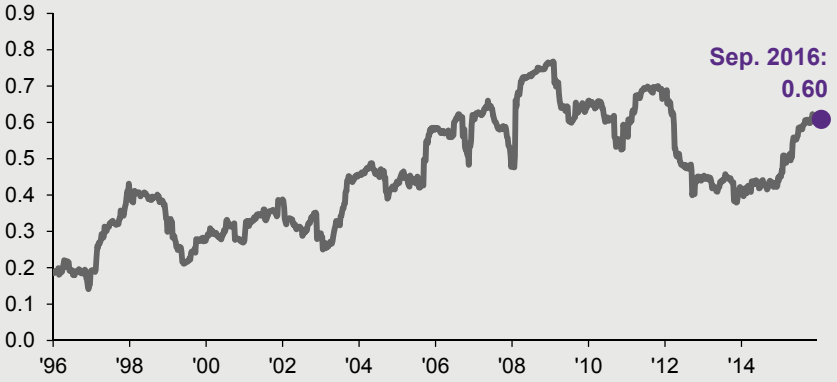
Weights in MSCI All Country World Index

% global market capitalization, float adjusted



Global equity market correlations

Rolling 1-year correlations, 30 countries



Source: FactSet, MSCI, Standard & Poor's, J.P. Morgan Asset Management.
All return values are MSCI Gross Index (official) data. Chart is for illustrative purposes only. Past performance is not indicative of future results. Please see disclosure page for index definitions. Countries included in global correlations include Argentina, South Africa, Japan, UK, Canada, France, Germany, Italy, Australia, Austria, Brazil, China, Colombia, Denmark, Finland, Hong Kong, India, Malaysia, Mexico, Netherlands, New Zealand, Peru, Philippines, Portugal, Korea, Spain, Taiwan, Thailand, Turkey, United States.
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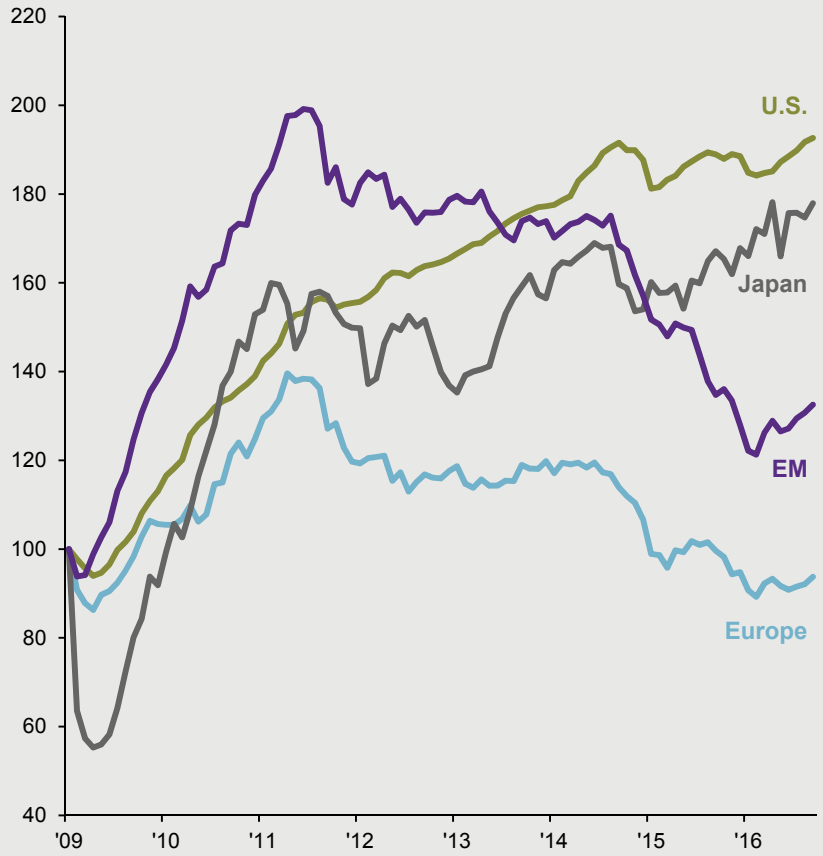
J.P.Morgan
Asset Management

International equity earnings and valuations

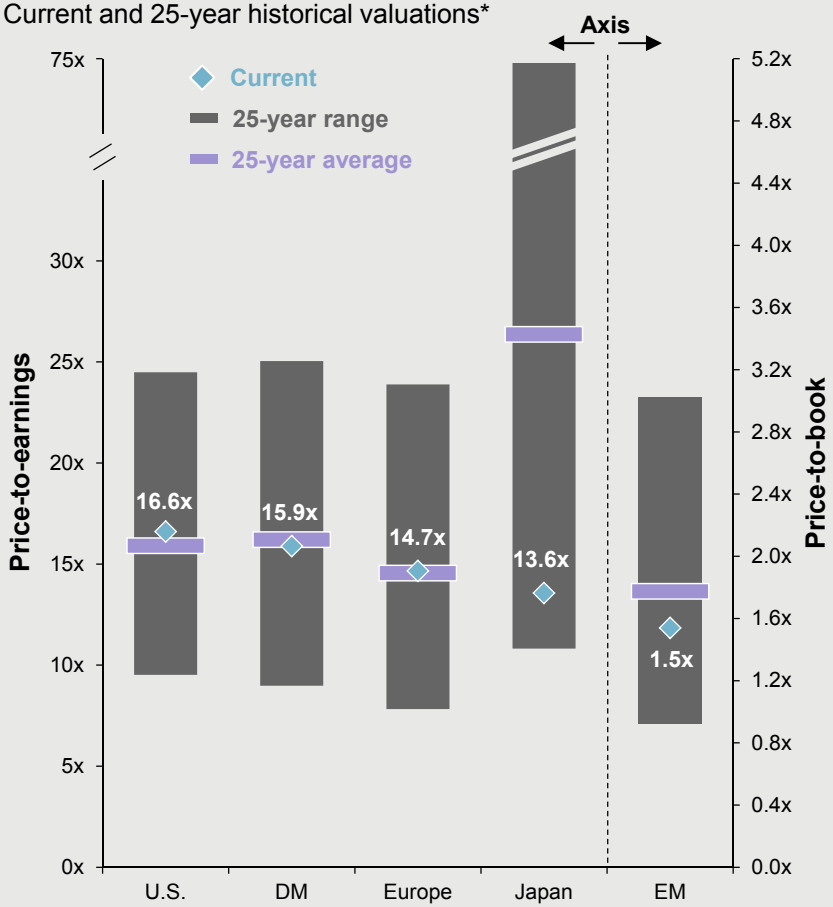
Global earnings

EPS, U.S. dollar, NTMA, Jan. 2009 = 100



Global valuations

Current and 25-year historical valuations*



Source: FactSet, MSCI, Standard & Poor's, J.P. Morgan Asset Management.
*Valuations refer to NTMA P/E for Europe, U.S. and Japan and P/B for emerging markets. Valuation and earnings charts use MSCI indices for all regions/countries, except for the U.S. which is the S&P 500. All indices use IBES aggregate earnings estimates, which may differ from earnings estimates used elsewhere in the book.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Global Purchasing Managers' Index for manufacturing

	Oct'14	Nov'14	Dec'14	Jan'15	Feb'15	Mar'15	Apr'15	May'15	Jun'15	Jul'15	Aug'15	Sep'15	Oct'15	Nov'15	Dec'15	Jan'16	Feb'16	Mar'16	Apr'16	May'16	Jun'16	Jul'16	Aug'16	Sep'16
Global	52.0	51.7	51.4	51.6	51.8	51.5	50.8	51.0	50.9	50.8	50.5	50.4	51.1	51.0	50.7	50.9	50.0	50.6	50.2	50.0	50.4	51.0	50.8	51.0
Developed Markets	53.4	52.8	52.4	52.5	52.8	53.0	52.1	52.4	52.1	52.5	52.3	52.1	53.0	52.6	52.0	52.3	50.9	50.9	50.4	50.2	50.9	51.5	51.3	51.6
Emerging Markets	50.5	50.6	50.4	50.8	50.9	49.8	49.3	49.4	49.2	48.8	48.3	48.3	48.9	49.0	49.2	49.2	48.8	50.0	49.5	49.5	49.3	50.1	49.8	-
U.S.	55.9	54.8	53.9	53.9	55.1	55.7	54.1	54.0	53.6	53.8	53.0	53.1	54.1	52.8	51.2	52.4	51.3	51.5	50.8	50.7	51.3	52.9	52.0	51.5
Canada	55.3	55.3	53.9	51.0	48.7	48.9	49.0	49.8	51.3	50.8	49.4	48.6	48.0	48.6	47.5	49.3	49.4	51.5	52.2	52.1	51.8	51.9	51.1	50.3
U.K.	52.9	53.1	52.6	52.9	54.1	53.7	52.2	52.0	51.2	52.3	51.7	51.5	55.1	52.3	51.7	53.0	50.8	51.0	49.5	50.4	52.1	48.2	53.4	55.4
Euro Area	50.6	50.1	50.6	51.0	51.0	52.2	52.0	52.2	52.5	52.4	52.3	52.0	52.3	52.8	53.2	52.3	51.2	51.6	51.7	51.5	52.8	52.0	51.7	52.6
Germany	51.4	49.5	51.2	50.9	51.1	52.8	52.1	51.1	51.9	51.8	53.3	52.3	52.1	52.9	53.2	52.3	50.5	50.7	51.8	52.1	54.5	53.8	53.6	54.3
France	48.5	48.4	47.5	49.2	47.6	48.8	48.0	49.4	50.7	49.6	48.3	50.6	50.6	50.6	51.4	50.0	50.2	49.6	48.0	48.4	48.3	48.6	48.3	49.7
Italy	49.0	49.0	48.4	49.9	51.9	53.3	53.8	54.8	54.1	55.3	53.8	52.7	54.1	54.9	55.6	53.2	52.2	53.5	53.9	52.4	53.5	51.2	49.8	51.0
Spain	52.6	54.7	53.8	54.7	54.2	54.3	54.2	55.8	54.5	53.6	53.2	51.7	51.3	53.1	53.0	55.4	54.1	53.4	53.5	51.8	52.2	51.0	51.0	52.3
Greece	48.8	49.1	49.4	48.3	48.4	48.9	46.5	48.0	46.9	30.2	39.1	43.3	47.3	48.1	50.2	50.0	48.4	49.0	49.7	48.4	50.4	48.7	50.4	49.2
Ireland	56.6	56.2	56.9	55.1	57.5	56.8	55.8	57.1	54.6	56.7	53.6	53.8	53.6	53.3	54.2	54.3	52.9	54.9	52.6	51.5	53.0	50.2	51.7	51.3
Australia	49.4	50.1	46.9	49.0	45.4	46.3	48.0	52.3	44.2	50.4	51.7	52.1	50.2	52.5	51.9	51.5	53.5	58.1	53.4	51.0	51.8	56.4	46.9	49.8
Japan	52.4	52.0	52.0	52.2	51.6	50.3	49.9	50.9	50.1	51.2	51.7	51.0	52.4	52.6	52.6	52.3	50.1	49.1	48.2	47.7	48.1	49.3	49.5	50.4
China	50.4	50.0	49.6	49.7	50.7	49.6	48.9	49.2	49.4	47.8	47.3	47.2	48.3	48.6	48.2	48.4	48.0	49.7	49.4	49.2	48.6	50.6	50.0	50.1
Indonesia	49.2	48.0	47.6	48.5	47.5	46.4	46.7	47.1	47.8	47.3	48.4	47.4	47.8	46.9	47.8	48.9	48.7	50.6	50.9	50.6	51.9	48.4	50.4	50.9
Korea	48.7	49.0	49.9	51.1	51.1	49.2	48.8	47.8	46.1	47.6	47.9	49.2	49.1	49.1	50.7	49.5	48.7	49.5	50.0	50.1	50.5	50.1	48.6	47.6
Taiwan	52.0	51.4	50.0	51.7	52.1	51.0	49.2	49.3	46.3	47.1	46.1	46.9	47.8	49.5	51.7	50.6	49.4	51.1	49.7	48.5	50.5	51.0	51.8	52.2
India	51.6	53.3	54.5	52.9	51.2	52.1	51.3	52.6	51.3	52.7	52.3	51.2	50.7	50.3	49.1	51.1	51.1	52.4	50.5	50.7	51.7	51.8	52.6	52.1
Brazil	49.1	48.7	50.2	50.7	49.6	46.2	46.0	45.9	46.5	47.2	45.8	47.0	44.1	43.8	45.6	47.4	44.5	46.0	42.6	41.6	43.2	46.0	45.7	46.0
Mexico	53.3	54.3	55.3	56.6	54.4	53.8	53.8	53.3	52.0	52.9	52.4	52.1	53.0	53.0	52.4	52.2	53.1	53.2	52.4	53.6	51.1	50.6	50.9	51.9
Russia	50.3	51.7	48.9	47.6	49.7	48.1	48.9	47.6	48.7	48.3	47.9	49.1	50.2	50.1	48.7	49.8	49.3	48.3	48.0	49.6	51.5	49.5	50.8	51.1

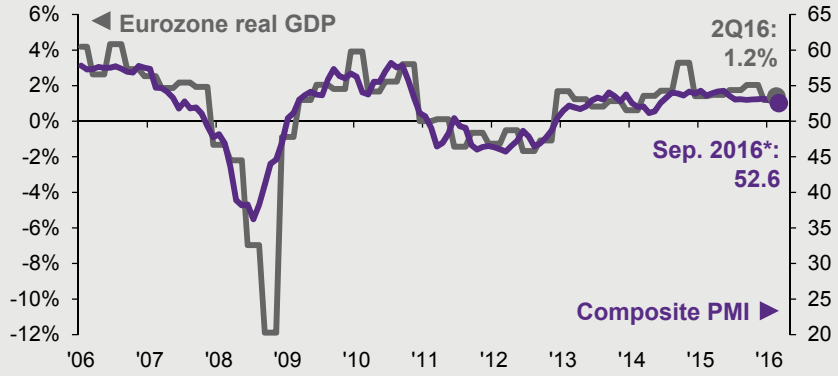
Source: Markit, J.P. Morgan Asset Management.
Heatmap colors are based on PMI relative to the 50 level, which indicates acceleration or deceleration of the sector, for the time period shown.
Guide to the Markets – U.S. Data are as of September 30, 2016.

International

J.P.Morgan Asset Management

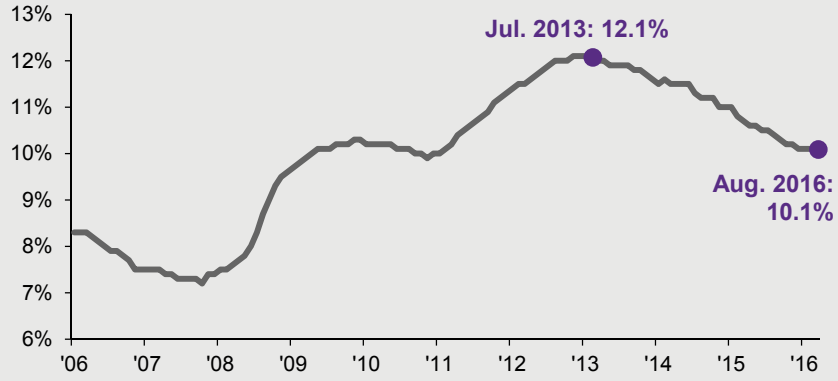
Markit PMI and GDP growth in the eurozone

Markit Composite PMI Index and eurozone real GDP q/q SAAR



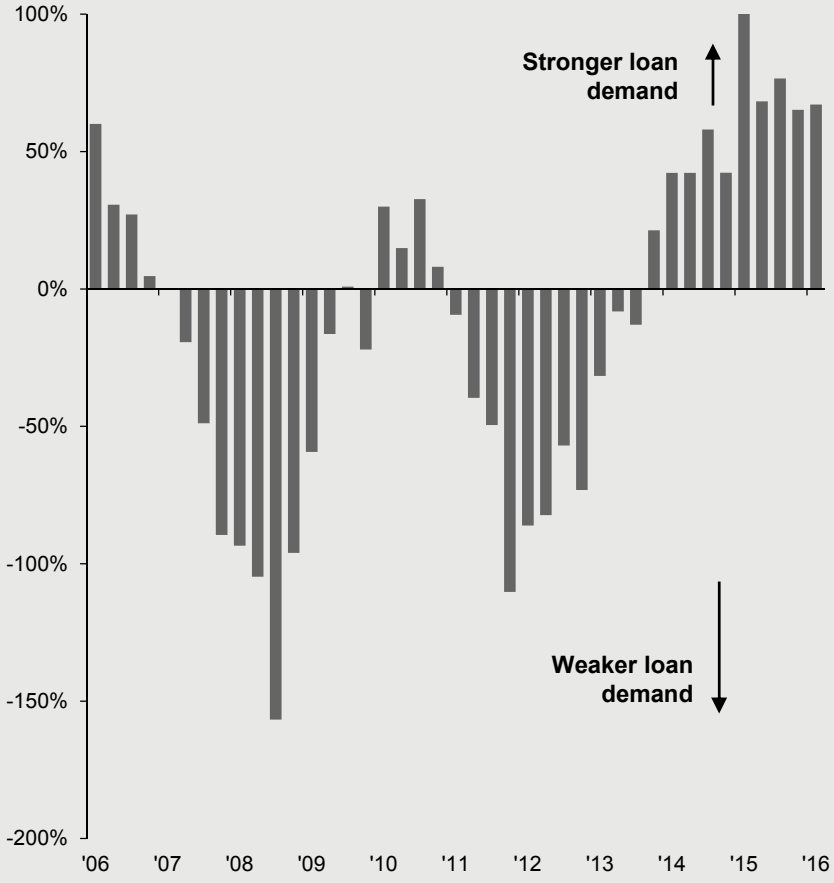
Eurozone unemployment

Persons unemployed as a percent of labor force, seasonally adjusted



Eurozone credit demand

Net % of banks reporting positive loan demand

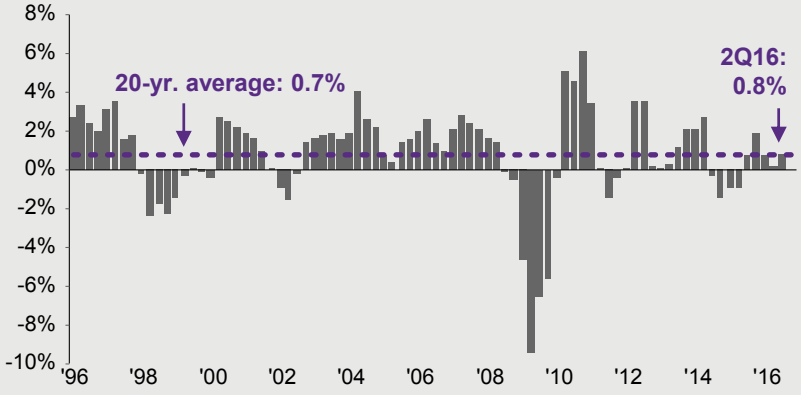


Source: FactSet, J.P. Morgan Asset Management; (Top left) Markit; (Top left and bottom left) Eurostat; (Right) ECB.
SAAR – Seasonally adjusted annual rate. *Eurozone September composite PMI is a flash estimate. Eurozone shown is the aggregate of the 19 countries that currently use the euro.
Guide to the Markets – U.S. Data are as of September 30, 2016.

Japan: Economy and markets

Japanese economic growth

Real GDP, y/y % change



Japanese labor market

Unemployment, y/y % change in wages, 3-month moving average

Japanese yen and the stock market

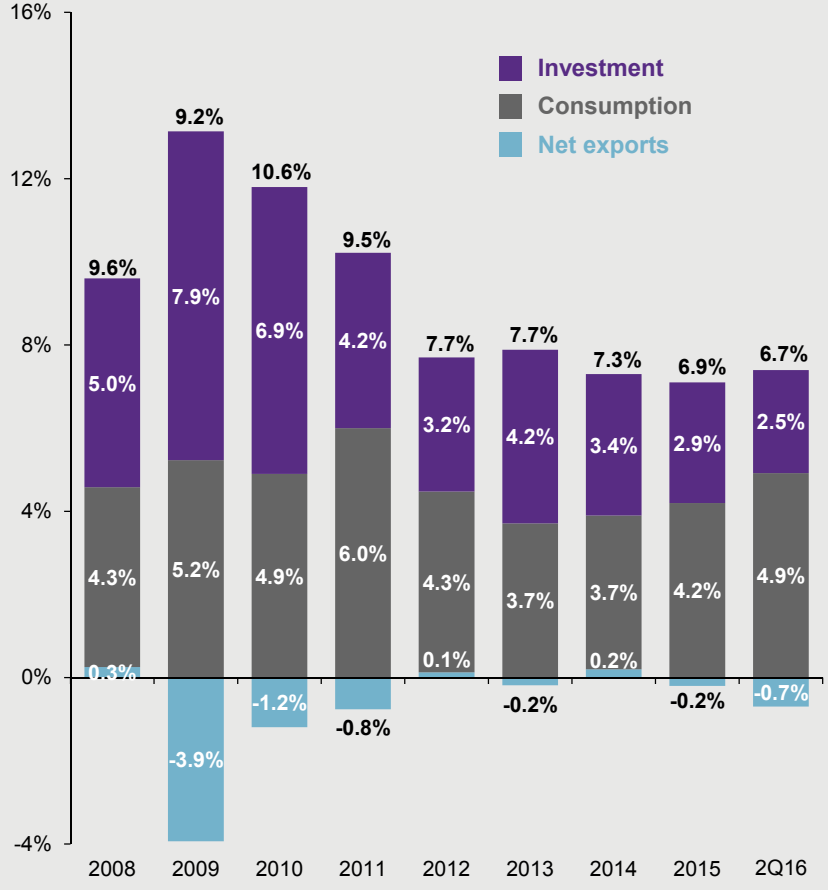
Source: FactSet, J.P. Morgan Asset Management; (Top and bottom left) Japanese Cabinet Office; (Right) Nikkei.
Guide to the Markets – U.S. Data are as of September 30, 2016.

China: Economic and policy snapshot

International

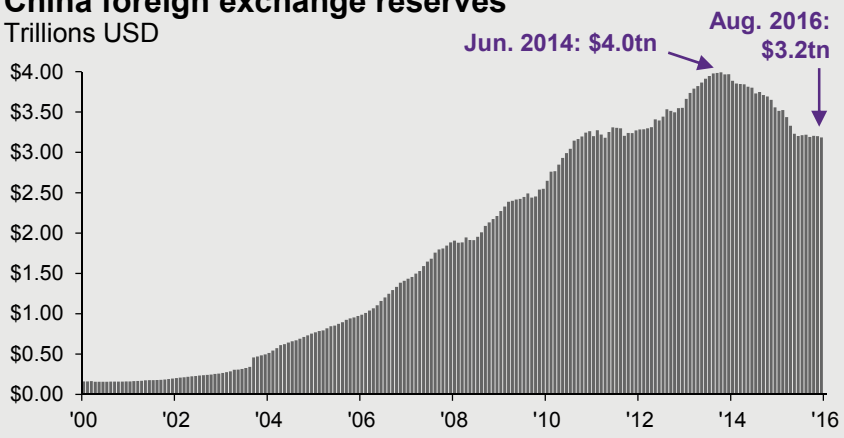
China real GDP contribution

Year-over-year % change



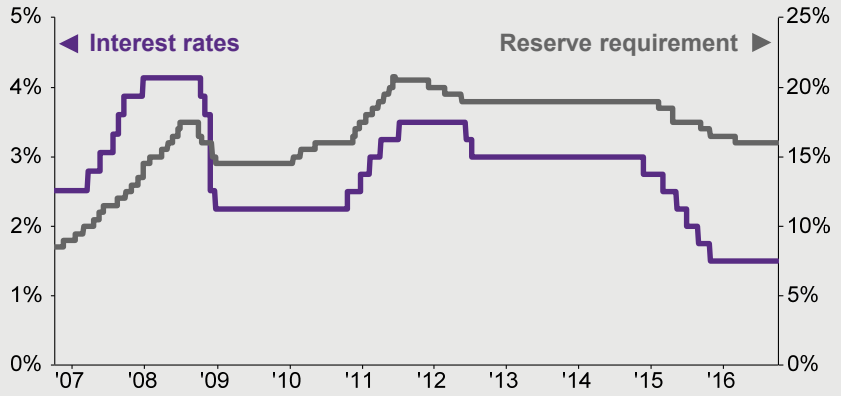
China foreign exchange reserves

Trillions USD



Monetary policy tools

Policy rate on 1-year renminbi deposits



Source: FactSet, J.P. Morgan Asset Management; (Left) CEIC; (Top and bottom right) People's Bank of China.
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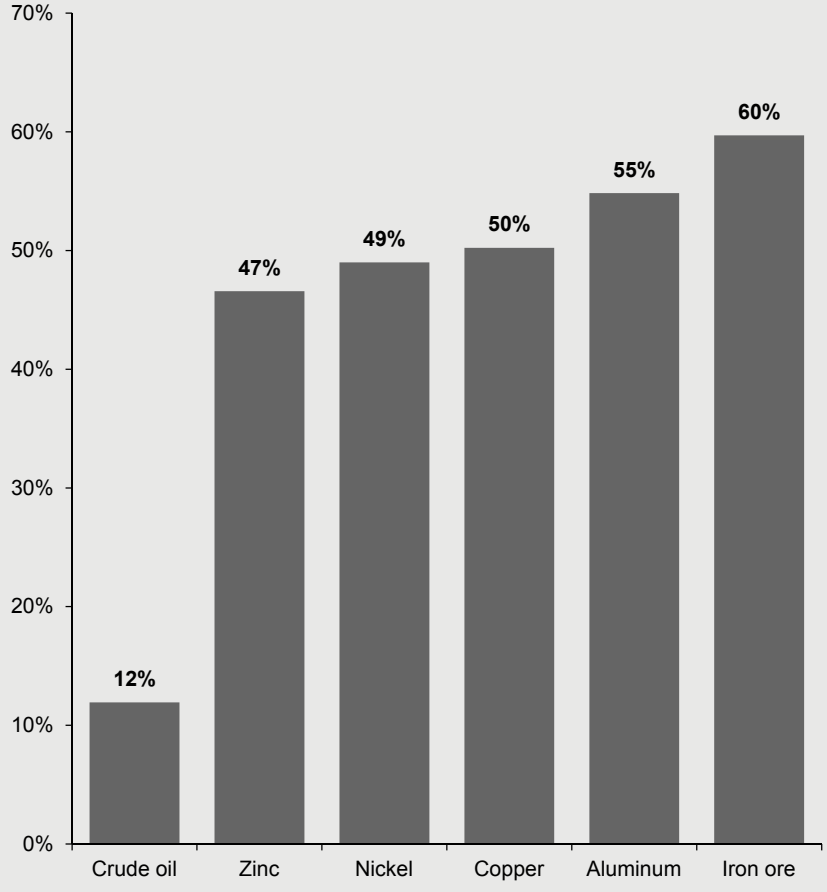
J.P.Morgan
Asset Management

Emerging market headwinds

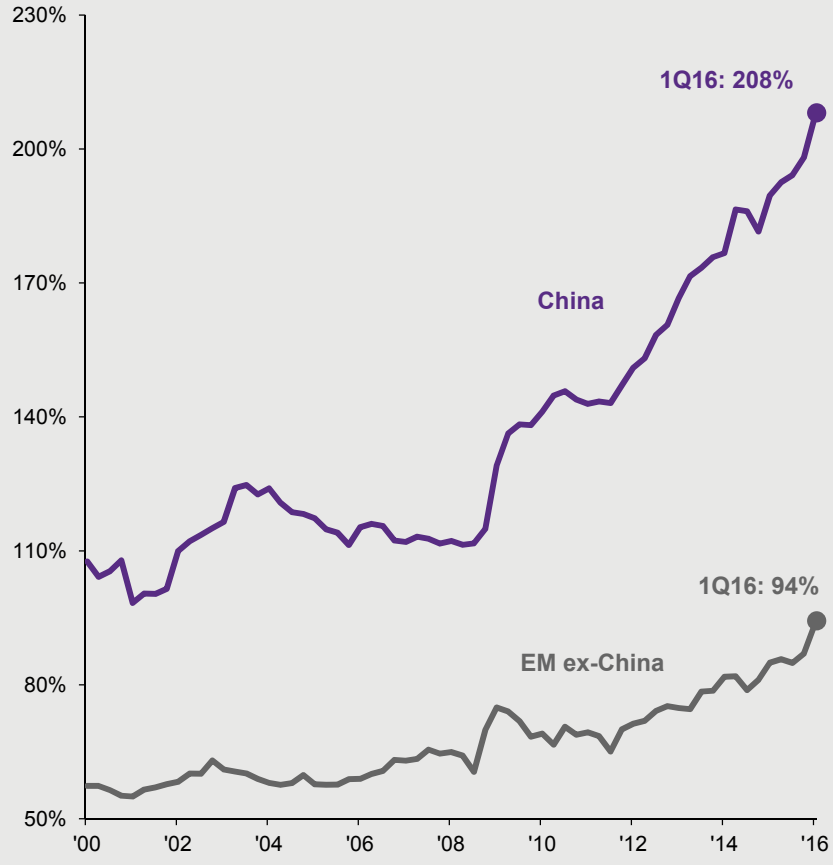
China's consumption of commodities

% of world total, 2015 average



Private credit*

% of GDP



Source: J.P. Morgan Asset Management; (Left) Bloomberg, EIA, World Bureau of Metal Statistics; (Right) BIS, various National Statistics Offices.
*Private credit includes non-financial corporates and households, and bank lending, corporate bonds and shadow banking. Aggregated from BIS underlying data.
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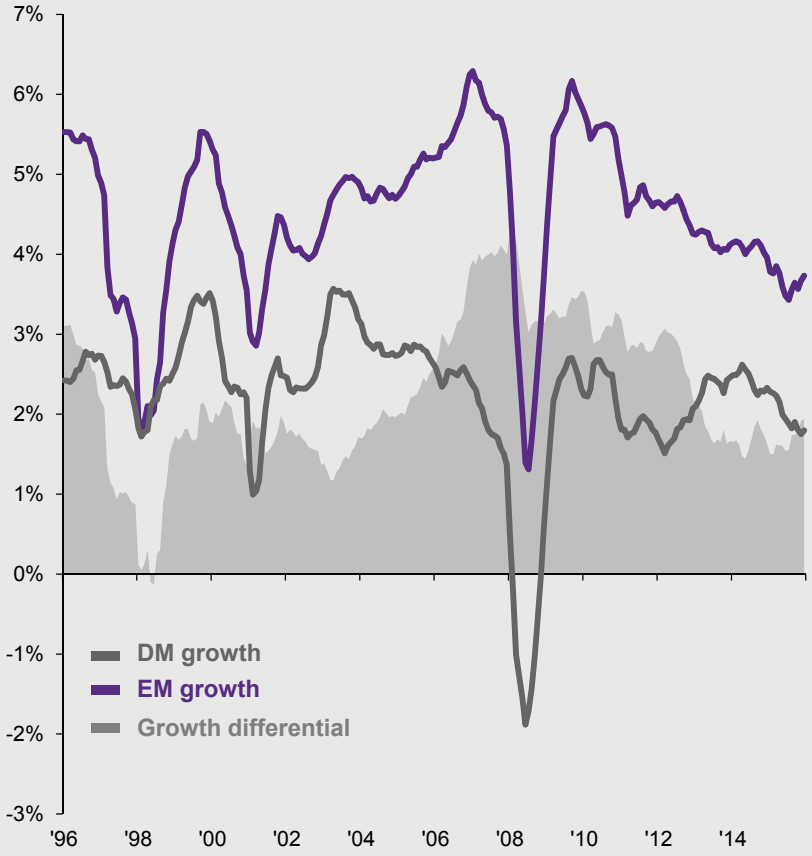
J.P.Morgan
Asset Management

EM vs. DM growth

Monthly, consensus expectations for GDP growth in 12 months



EM earnings by region

EPS for next 12-month consensus, U.S. dollar, rebased to 100

Source: FactSet, MSCI, Consensus Economics, J.P. Morgan Asset Management.
"Growth differential" is consensus estimates for EM growth in the next 12 months minus consensus estimates for DM growth in the next 12 months, provided by Consensus Economics.
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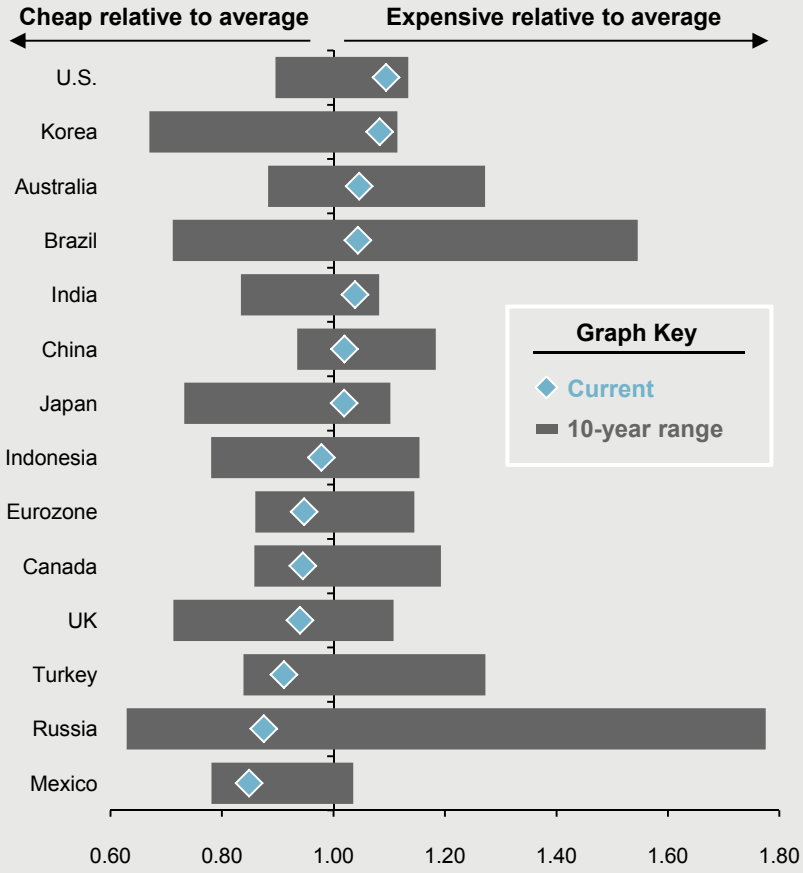
Global currencies

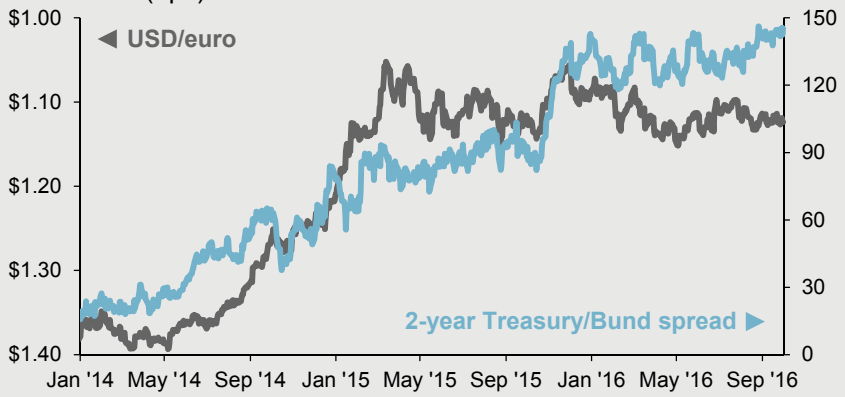
Real effective exchange rates*

FX adjusted for relative inflation changes vs. 10-year average



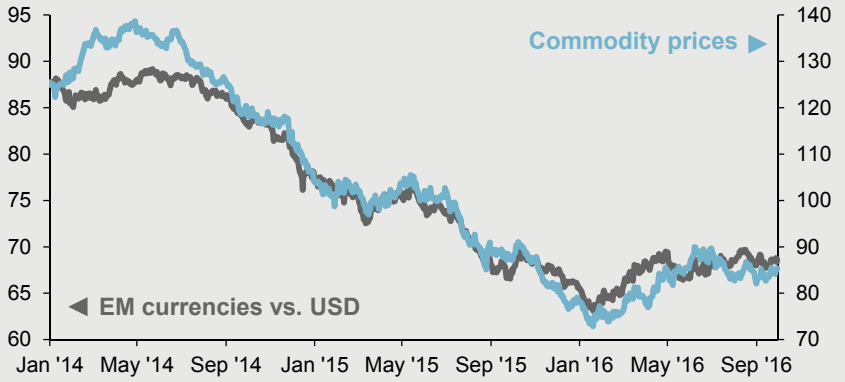
Developed markets

Short rates (bps) and FX



Emerging markets

Commodity prices and FX



Source: J.P. Morgan Asset Management; (Left and bottom right) J.P. Morgan Global Economic Research; (Top right) FactSet, Tullett Prebon; (Bottom right) Bloomberg.

*Real effective exchange rates (REERs) compare the value of a currency to a weighted basket of several foreign currencies. They are deflated using a producer price index, except for Indonesia, which uses a consumer price index. EM currencies is the J.P. Morgan Emerging Market Currencies Index. Commodity prices is the Bloomberg Commodity Price Index.

Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan
Asset Management

Correlations and volatility

	U.S. Large Cap	EAFE	EME	Bonds	Corp. HY	Munis	Currcy.	EMD	Cmdty.	REITs	Hedge funds	Private equity	Ann. Volatility
U.S. Large Cap	1.00	0.89	0.79	-0.30	0.75	-0.12	-0.48	0.62	0.54	0.78	0.81	0.80	16%
EAFE		1.00	0.90	-0.16	0.79	-0.02	-0.64	0.72	0.61	0.67	0.86	0.81	20%
EME			1.00	-0.07	0.85	0.05	-0.67	0.82	0.69	0.56	0.87	0.80	25%
Bonds				1.00	-0.06	0.77	-0.14	0.23	-0.09	-0.01	-0.21	-0.26	3%
Corp. HY					1.00	0.12	-0.52	0.89	0.66	0.67	0.79	0.66	12%
Munis						1.00	-0.10	0.43	-0.07	0.06	-0.03	-0.16	4%
Currencies							1.00	-0.59	-0.67	-0.38	-0.49	-0.56	8%
EMD								1.00	0.60	0.60	0.68	0.58	8%
Commodities									1.00	0.41	0.72	0.70	21%
REITs										1.00	0.53	0.58	26%
Hedge funds											1.00	0.87	7%
Private equity												1.00	11%

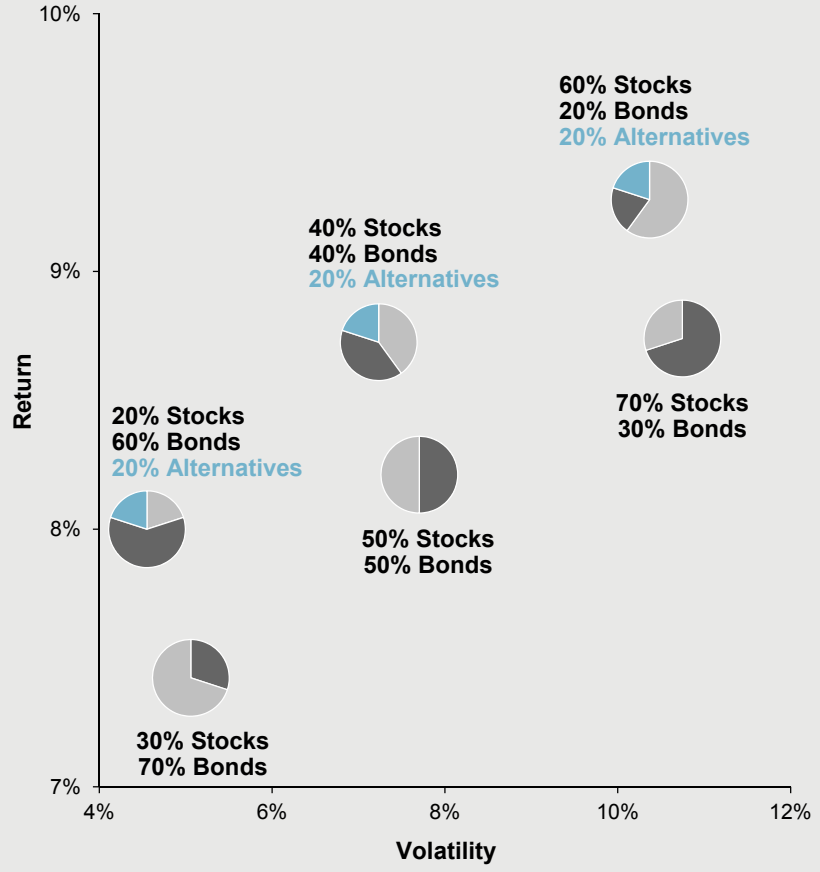
Other asset classes

Source: Barclays Inc., Bloomberg, Cambridge Associates, Credit Suisse/Tremont, FactSet, Federal Reserve, MSCI, NCREIF, Standard & Poor's, J.P. Morgan Asset Management.
Indexes used – Large Cap: S&P 500 Index; Currencies: Federal Reserve Trade Weighted Dollar; EAFE: MSCI EAFE; EME: MSCI Emerging Markets; Bonds: Barclays Aggregate; Corp HY: Barclays Corporate High Yield; EMD: Barclays Emerging Market; Cmdty.: Bloomberg Commodity Index; Real Estate: NAREIT ODCE Index; Hedge Funds: CS/Tremont Hedge Fund Index; Private equity: Cambridge Associates Global Buyout & Growth Index. Private equity data are reported on a two quarter lag. All correlation coefficients and annualized volatility calculated based on quarterly total return data for period 9/30/06 to 9/30/16. This chart is for illustrative purposes only.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

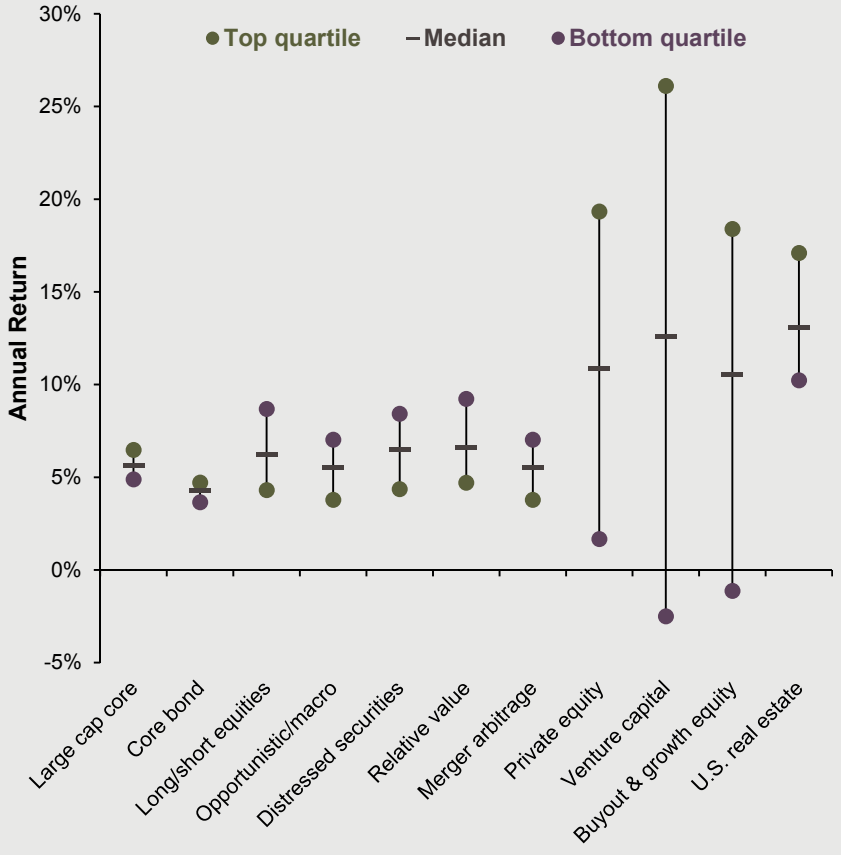
Alternatives and portfolio risk/return

Annualized volatility and returns, 2Q91 – 1Q16



Manager alpha and dispersion

Based on returns from 2006 – 2015*



Source: Cambridge Associates, HFRI, J.P. Morgan Asset Management; (Left) Barclays, FactSet, NCREIF, Standard & Poor's; (Right) Lipper.
The portfolios that do not contain alternatives are a mix of the S&P 500 and the Barclays U.S. Aggregate. The 20% allocation to alternatives shown on the left reflects the following: 10% in hedge funds (HFR FW Comp.), 5% in private equity and 5% in private real estate. The volatility and returns are based on data from 2Q91 to 1Q16, encompassing 25 years of data. *Manager dispersion is based on: 2006 – 2015 annual returns for large cap core, Core Bond; 2006 – 2015 monthly returns for hedge funds; 2006 – 2014 annual returns for private equity, venture capital, and buyout & growth; and 2009 – 2015 quarterly returns for U.S. real estate.
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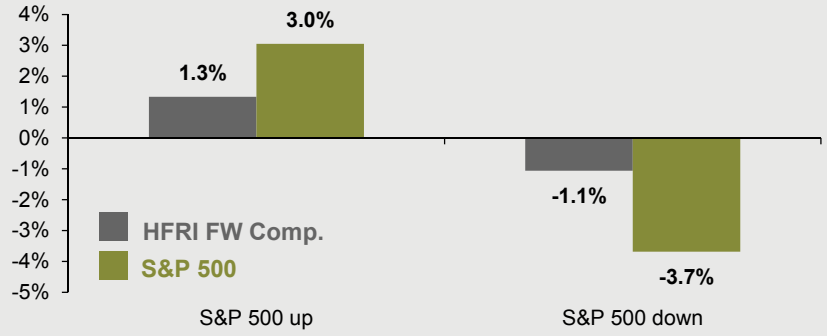
Hedge funds

2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	YTD	14-yrs. '02-'15 Ann.	14-yrs. '02-'15 Vol.
Macro 5.5%	Large Cap 28.7%	Event Driven 14.2%	Equity L/S 10.0%	Large Cap 15.8%	Macro 11.4%	Macro 4.7%	Large Cap 26.5%	Large Cap 15.1%	Large Cap 2.1%	Large Cap 16.0%	Large Cap 32.4%	Large Cap 13.7%	Market Neutral 4.5%	Large Cap 7.8%	Large Cap 6.3%	Large Cap 16.4%
Relative Value 5.3%	Event Driven 23.0%	Large Cap 10.9%	Event Driven 8.6%	Event Driven 15.2%	Equity L/S 11.4%	Market Neutral -3.0%	Relative Value 23.0%	Relative Value 12.5%	Relative Value 0.8%	Relative Value 9.7%	Equity L/S 14.5%	Macro 5.8%	Large Cap 1.4%	Event Driven 6.1%	Event Driven 6.3%	Equity L/S 10.0%
Market Neutral 0.9%	Macro 21.5%	Equity L/S 7.9%	Market Neutral 6.1%	Equity L/S 12.8%	Relative Value 10.0%	Relative Value -17.3%	Equity L/S 22.3%	Event Driven 11.5%	Event Driven -0.5%	Event Driven 6.5%	Event Driven 13.4%	Relative Value 5.3%	Macro 0.4%	Relative Value 4.9%	Relative Value 6.0%	Event Driven 8.6%
Equity L/S -1.7%	Equity L/S 16.9%	Macro 7.5%	Macro 6.1%	Relative Value 12.2%	Event Driven 8.7%	Event Driven -20.8%	Event Driven 20.3%	Equity L/S 8.9%	Macro -0.7%	Equity L/S 4.7%	Relative Value 7.5%	Equity L/S 3.6%	Relative Value 0.2%	Equity L/S 3.1%	Macro 5.5%	Relative Value 6.2%
Event Driven -3.1%	Relative Value 9.1%	Relative Value 6.1%	Relative Value 5.3%	Macro 8.2%	Market Neutral 5.7%	Equity L/S -26.4%	Macro 6.9%	Macro 3.2%	Market Neutral -1.5%	Market Neutral 3.1%	Market Neutral 6.4%	Market Neutral 3.2%	Equity L/S -0.2%	Macro 2.1%	Equity L/S 5.0%	Macro 5.1%
Large Cap -22.1%	Market Neutral 3.3%	Market Neutral 3.4%	Large Cap 4.9%	Market Neutral 7.0%	Large Cap 5.5%	Large Cap -37.0%	Market Neutral -1.7%	Market Neutral 2.5%	Equity L/S -4.3%	Macro -1.3%	Macro 0.1%	Event Driven 2.6%	Event Driven -2.8%	Market Neutral 0.4%	Market Neutral 2.8%	Market Neutral 2.7%

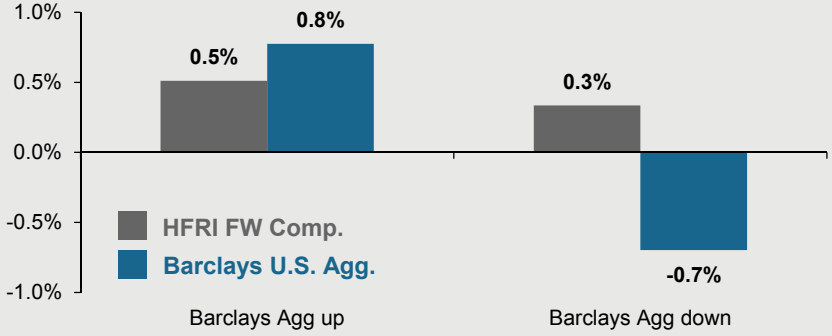
Hedge fund returns in different market environments

Average return in up and down months for S&P 500



Hedge fund returns in different market environments

Average return in up and down months for Barclays Agg.

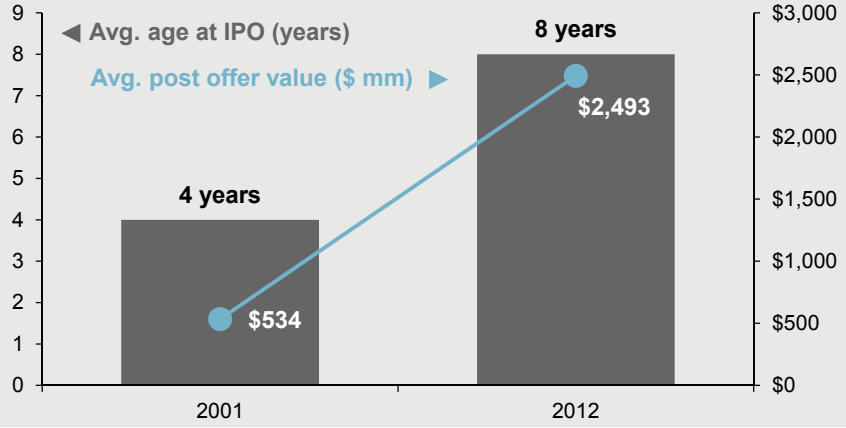


Source: Barclays, FactSet, HFRI, Standard & Poor's, J.P. Morgan Asset Management.
Hedge fund returns in different market environments are based on monthly returns over the past 15 years through August 31, 2016, due to data availability. Year-to-date returns are as of August 31, 2016.
Guide to the Markets – U.S. Data are as of September 30, 2016.

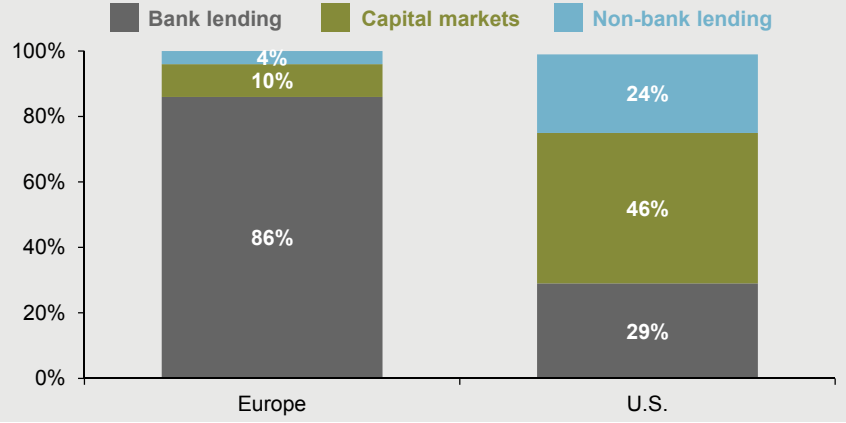
J.P.Morgan Asset Management

Private debt and equity

Private company age and market value

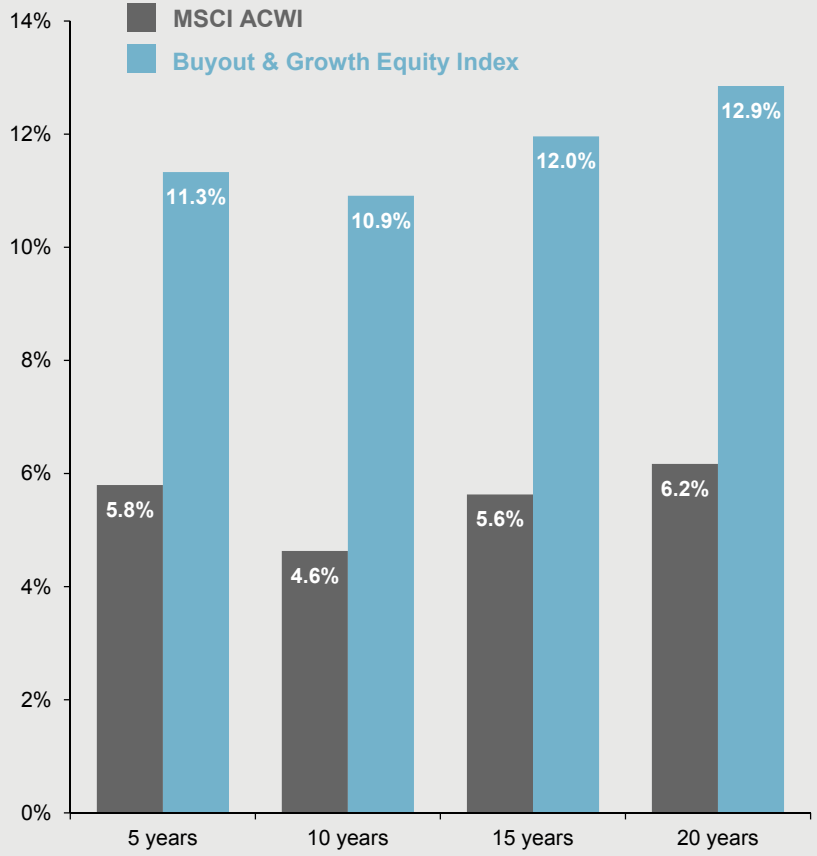


Composition of firms' external financing sources



Public vs. private equity returns

MSCI AC World total return and Global Buyout & Growth Equity Index*



Source: Cambridge Associates, Deutsche Bank, FactSet, MSCI, National Venture Capital Association, J.P. Morgan Asset Management.
Age at IPO is defined as time elapsed from first funding round until IPO date. *Data as of 1Q16.
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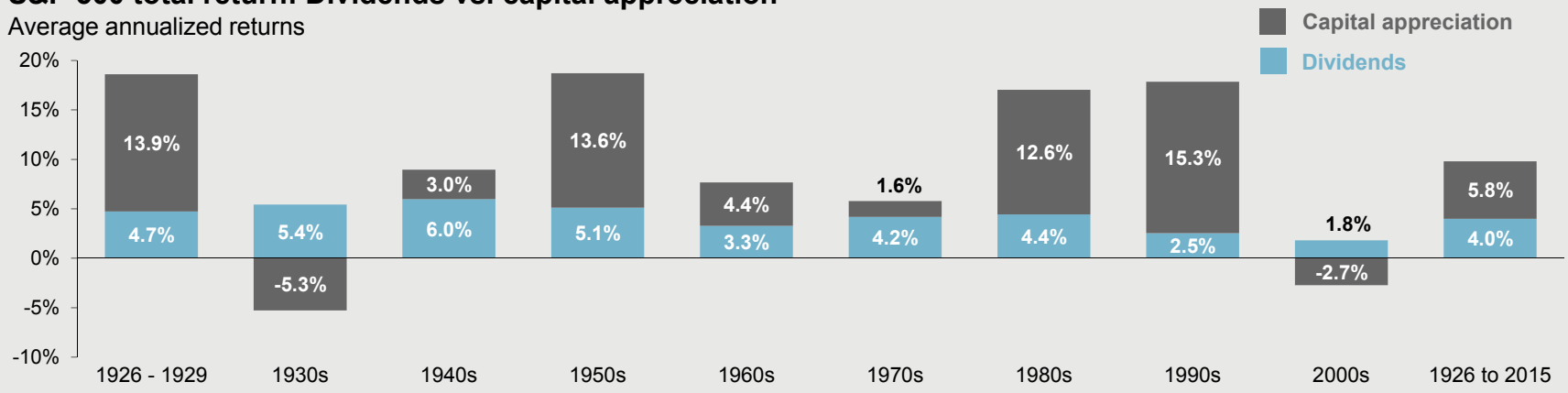
J.P.Morgan Asset Management

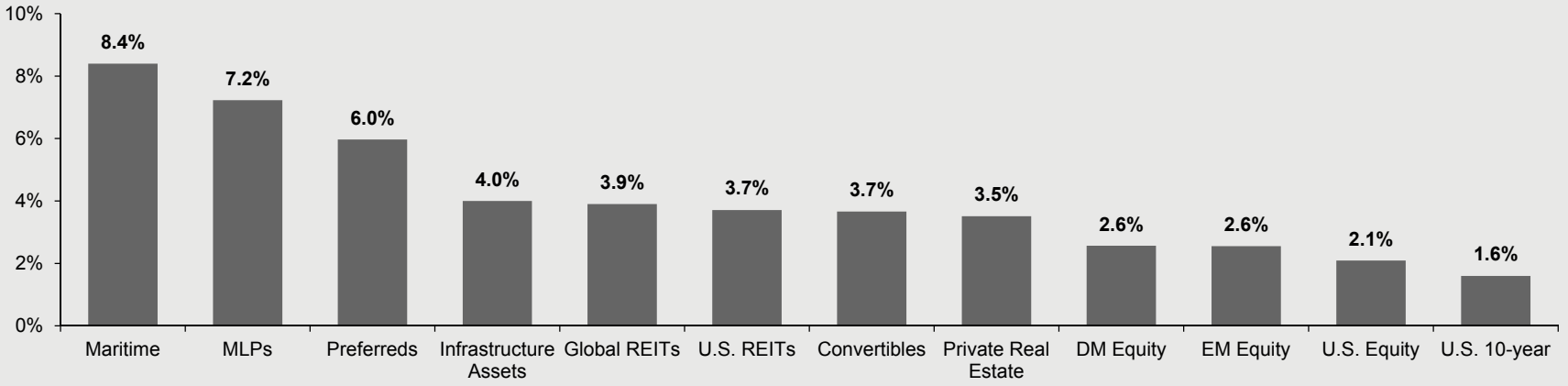
Yield alternatives: Domestic and global

S&P 500 total return: Dividends vs. capital appreciation

Average annualized returns



Asset class yields



Other asset classes

Source: FactSet, J.P. Morgan Asset Management; (Top) Ibbotson, Standard & Poor's; (Bottom) Alerian, BAML, Barclays, Clarkson, Drewry Maritime Consultants, Federal Reserve, FTSE, MSCI, NCREIF, Standard & Poor's. Dividend vs. capital appreciation returns are through 12/31/15. Yields are as of 9/30/16, except maritime (12/31/2015), infrastructure assets and private real estate (6/30/16). Maritime: Unlevered yields for maritime assets are calculated as the difference between charter rates (rental income) and operating expenses as a percentage of current asset value. Yields for each of the sub-vessel types above are calculated and the respective weightings are applied to calculate sub-sector specific yields, and then weighted to arrive at the current indicative yield for the World Maritime Fleet; MLPs: Alerian MLP; Preferreds: BAML Hybrid Preferred Securities; Private Real Estate: NCREIF ODCE; Global/U.S. REITs: FTSE NAREIT Global/USA REITs; Infrastructure Assets: MSCI Global Infrastructure Asset Index; Convertibles: Barclays U.S. Convertibles Composite; EM Equity: MSCI Emerging Markets; DM Equity: MSCI The World Index; U.S. Equity: MSCI USA.
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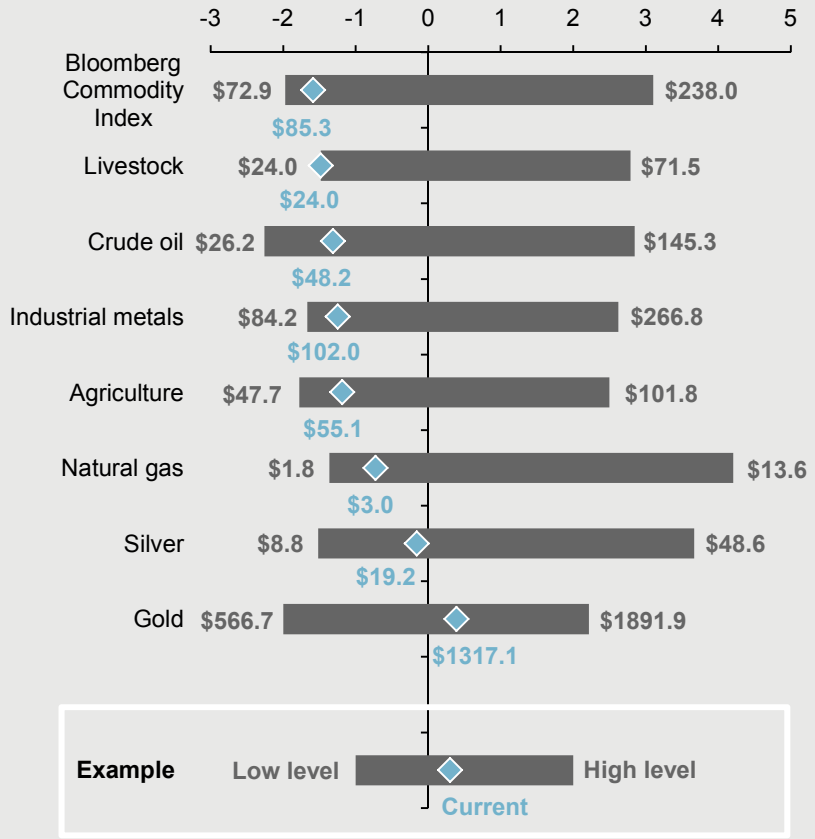
J.P.Morgan Asset Management

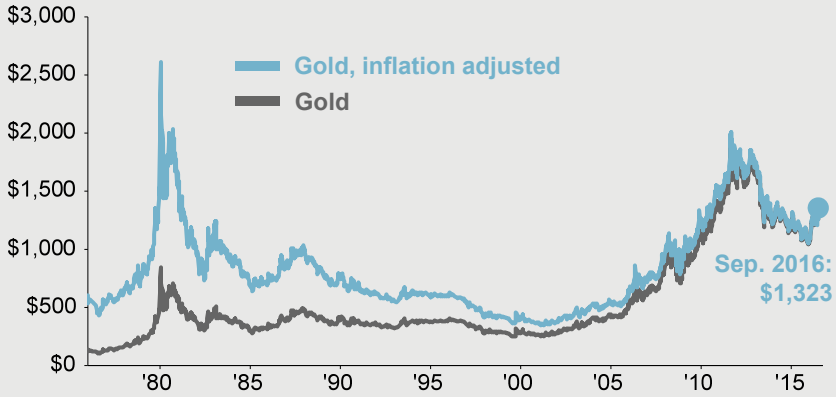
Commodity prices

Commodity price z-scores



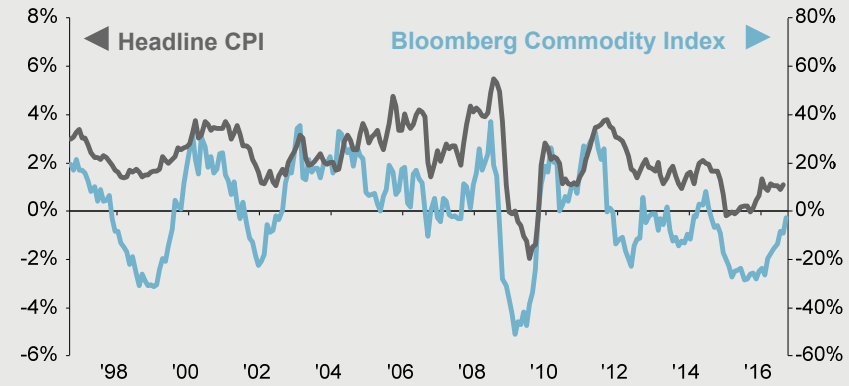
Gold prices

USD per ounce



Commodity prices and inflation

Year-over-year % change



Source: FactSet, J.P. Morgan Asset Management; (Left) Bloomberg, CME; (Top right) BLS, CME; (Bottom right) Bloomberg, BLS.
Commodity prices are represented by the appropriate Bloomberg Commodity sub-index. Crude oil shown is Brent crude. Other commodity prices are represented by futures contracts. Z-scores are calculated using daily prices over the past 10 years.
Guide to the Markets – U.S. Data are as of September 30, 2016.

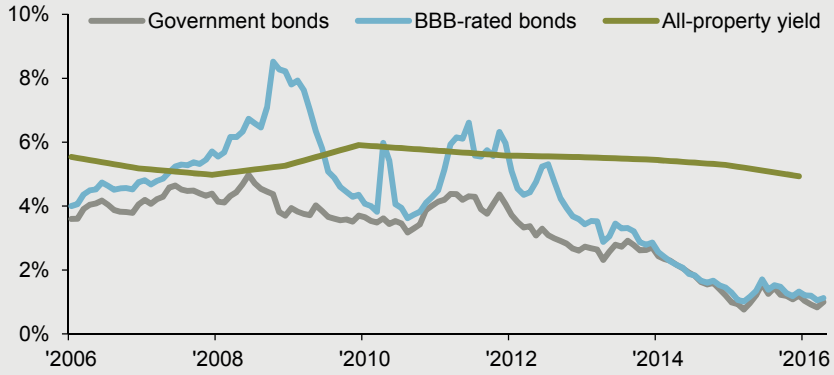
Global commercial real estate

U.S. real estate net operating income growth

Year-over-year NCREIF ODCE Index NOI growth

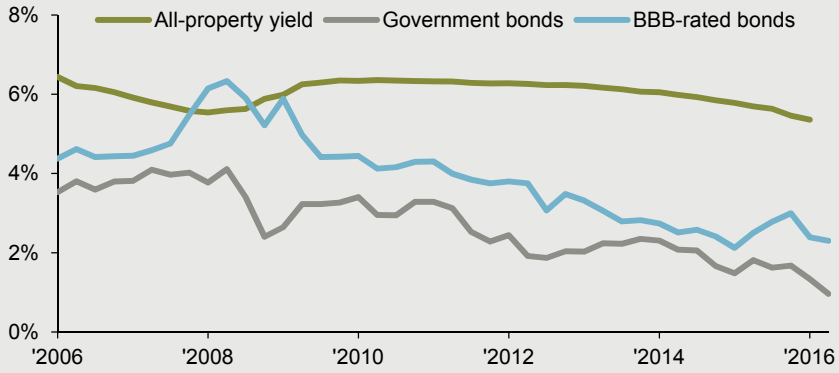
Europe real estate property yield spreads

Property yields vs. government bonds vs. BBB rated bonds



Asia Pacific real estate property yield spreads

Property yields vs. government bonds vs. BBB-rated bonds



Source: (Left) U.S. Real Estate: NCREIF, J.P. Morgan Asset Management; (Top right) Europe real estate: IPD, Barclays J.P. Morgan Asset Management; (Bottom right) Asia Pacific real estate: IPD, FTSE, S&P ASX, J.P. Morgan Asset Management. All property yields (equally-weighted, capitalization rates), government bonds and BBB-rated bonds for Asia Pacific are represented by Australia and Japan.
Guide to the Markets – U.S. Data are as of August 31, 2016.

J.P.Morgan
Asset Management

Asset class returns

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	YTD	2000 - 2015 Ann.	2000 - 2015 Vol.
Comdty. 31.8%	REITs 13.9%	Comdty. 25.9%	EM Equity 56.3%	REITs 31.6%	EM Equity 34.5%	REITs 35.1%	EM Equity 39.8%	Fixed Income 5.2%	EM Equity 79.0%	REITs 27.9%	REITs 8.3%	REITs 19.7%	Small Cap 38.8%	REITs 28.0%	REITs 2.8%	EM Equity 16.4%	REITs 12.0%	EM Equity 25.4%
REITs 26.4%	Fixed Income 8.4%	Fixed Income 10.3%	Small Cap 47.3%	EM Equity 26.0%	Comdty. 21.4%	EM Equity 32.6%	Comdty. 16.2%	Cash 1.8%	High Yield 59.4%	Small Cap 26.9%	Fixed Income 7.8%	High Yield 19.6%	Large Cap 32.4%	Large Cap 13.7%	Large Cap 1.4%	High Yield 14.5%	High Yield 7.9%	REITs 22.0%
Fixed Income 11.6%	Cash 4.1%	High Yield 4.1%	DM Equity 39.2%	DM Equity 20.7%	DM Equity 14.0%	DM Equity 26.9%	DM Equity 11.6%	Asset Alloc. -25.4%	DM Equity 32.5%	EM Equity 19.2%	High Yield 3.1%	EM Equity 18.6%	DM Equity 23.3%	Fixed Income 6.0%	Fixed Income 0.5%	REITs 12.3%	Small Cap 6.6%	Small Cap 21.2%
Cash 6.1%	Small Cap 2.5%	REITs 3.8%	REITs 37.1%	Small Cap 18.3%	REITs 12.2%	Small Cap 18.4%	Asset Alloc. 7.1%	High Yield -26.9%	REITs 28.0%	Comdty. 16.8%	Large Cap 2.1%	DM Equity 17.9%	Asset Alloc. 14.9%	Asset Alloc. 5.2%	Cash 0.0%	Small Cap 11.5%	EM Equity 5.9%	DM Equity 19.6%
High Yield 1.0%	High Yield 2.3%	Cash 1.7%	High Yield 32.4%	High Yield 13.2%	Asset Alloc. 8.1%	Large Cap 15.8%	Fixed Income 7.0%	Small Cap -33.8%	Small Cap 27.2%	Large Cap 15.1%	Cash 0.1%	Small Cap 16.3%	High Yield 7.3%	Small Cap 4.9%	DM Equity -0.4%	Comdty. 8.9%	Asset Alloc. 5.6%	Comdty. 18.7%
Asset Alloc. 0.0%	EM Equity -2.4%	Asset Alloc. -5.9%	Large Cap 28.7%	Asset Alloc. 12.8%	Large Cap 4.9%	Asset Alloc. 15.3%	Large Cap 5.5%	Comdty. -35.6%	Large Cap 25.5%	High Yield 14.8%	Asset Alloc. -0.7%	Large Cap 16.0%	REITs 2.9%	Cash 0.0%	Asset Alloc. -2.0%	Large Cap 7.8%	Fixed Income 5.4%	Large Cap 16.7%
Small Cap -3.0%	Asset Alloc. -3.9%	EM Equity -6.0%	Asset Alloc. 26.3%	Large Cap 10.9%	Small Cap 4.6%	High Yield 13.7%	Cash 4.8%	Large Cap -37.0%	Asset Alloc. 25.0%	Asset Alloc. 13.3%	Small Cap -4.2%	Asset Alloc. 12.2%	Cash 0.0%	High Yield 0.0%	High Yield -2.7%	Asset Alloc. 7.5%	Large Cap 4.1%	High Yield 11.5%
Large Cap -9.1%	Large Cap -11.9%	DM Equity -15.7%	Comdty. 23.9%	Comdty. 9.1%	High Yield 3.6%	Cash 4.8%	High Yield 3.2%	REITs -37.7%	Comdty. 18.9%	DM Equity 8.2%	DM Equity -11.7%	Fixed Income 4.2%	Fixed Income -2.0%	EM Equity -1.8%	Small Cap -4.4%	Fixed Income 5.8%	DM Equity 2.8%	Asset Alloc. 11.2%
DM Equity -14.0%	Comdty. -19.5%	Small Cap -20.5%	Fixed Income 4.1%	Fixed Income 4.3%	Cash 3.0%	Fixed Income 4.3%	Small Cap -1.6%	DM Equity -43.1%	Fixed Income 5.9%	Fixed Income 6.5%	Comdty. -13.3%	Cash 0.1%	EM Equity -2.3%	DM Equity -4.5%	EM Equity -14.6%	DM Equity 2.2%	Cash 1.8%	Fixed Income 3.4%
EM Equity -30.6%	DM Equity -21.2%	Large Cap -22.1%	Cash 1.0%	Cash 1.2%	Fixed Income 2.4%	Comdty. 2.1%	REITs -15.7%	EM Equity -53.2%	Cash 0.1%	Cash 0.1%	EM Equity -18.2%	Comdty. -1.1%	Comdty. -9.5%	Comdty. -17.0%	Comdty. -24.7%	Cash 0.2%	Comdty. 0.8%	Cash 1.0%

Source: Barclays, Bloomberg, FactSet, MSCI, NAREIT, Russell, Standard & Poor's, J.P. Morgan Asset Management.
Large cap: S&P 500, Small cap: Russell 2000, EM Equity: MSCI EME, DM Equity: MSCI EAFE, Comdty: Bloomberg Commodity Index, High Yield: Barclays Global HY Index, Fixed Income: Barclays Aggregate, REITs: NAREIT Equity REIT Index. The "Asset Allocation" portfolio assumes the following weights: 25% in the S&P 500, 10% in the Russell 2000, 15% in the MSCI EAFE, 5% in the MSCI EME, 25% in the Barclays Aggregate, 5% in the Barclays 1-3m Treasury, 5% in the Barclays Global High Yield Index, 5% in the Bloomberg Commodity Index and 5% in the NAREIT Equity REIT Index. Balanced portfolio assumes annual rebalancing. Annualized (Ann.) return and volatility (Vol.) represents period of 12/31/99 – 12/31/15. Please see disclosure page at end for index definitions. All data represents total return for stated period. Past performance is not indicative of future returns.
Guide to the Markets – U.S. Data are as of September 30, 2016.

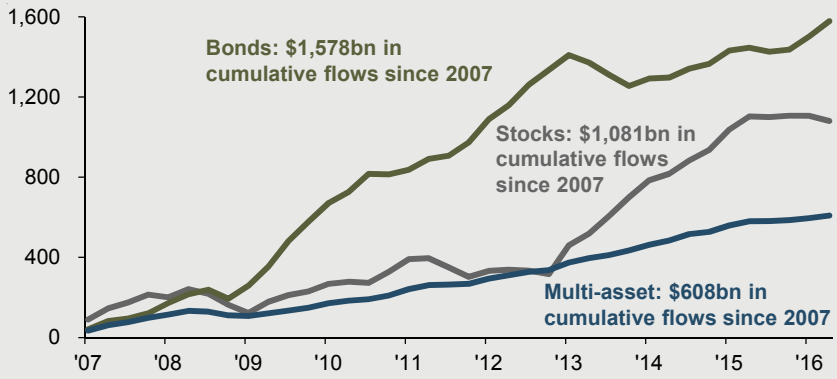
J.P.Morgan Asset Management

Fund flows

		Registered product flows																
USD billions	**AUM**	**YTD 2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**1999**
U.S. equity	6,446	(53)	(36)	93	180	(45)	(43)	13	9	(12)	20	70	101	160	133	47	84	129	122
World equity	2,581	6	207	143	203	59	18	85	58	(39)	194	174	138	92	42	12	(9)	43	22
Taxable bond	3,056	169	50	78	(23)	308	170	221	312	60	108	49	43	25	48	111	62	(10)	10
Tax-free bond	688	51	21	32	(57)	53	(10)	14	73	13	13	17	7	(8)	(4)	13	10	(9)	(7)
Multi-asset	2,109	28	58	92	98	69	58	61	38	12	99	79	81	85	55	24	20	(19)	(12)
Liquidity	2,597	38	35	23	36	9	(69)	(363)	(265)	687	547	185	51	(56)	(102)	19	286	77	131

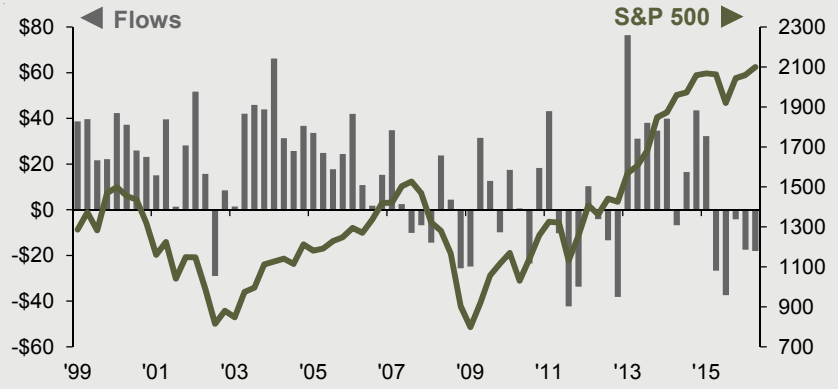
Cumulative flows into long-term asset products

Mutual fund and ETF flows, quarterly, USD billions



Flows into U.S. equity funds & S&P 500 performance

Mutual fund and ETF flows, price index, quarterly, USD billions



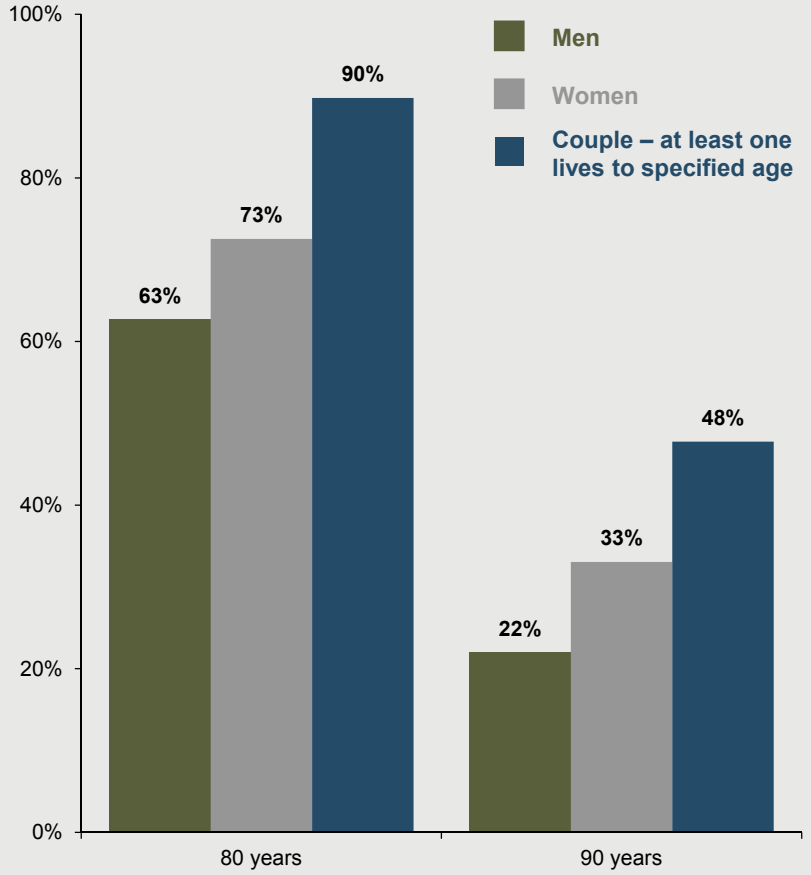
Source: Strategic Insight Simfund, J.P. Morgan Asset Management; (Top) All data includes flows through August 2016 and captures all registered product flows (open-end mutual funds and ETFs); (Bottom left and right) All data includes flows through June 2016 (2Q) and captures all registered product flows (open-end mutual funds and ETFs). Simfund data are subject to periodic revisions. World equity flows are inclusive of emerging market, global equity and regional equity flows. Multi-asset flows include asset allocation, balanced fund, flexible portfolio and mixed income flows.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

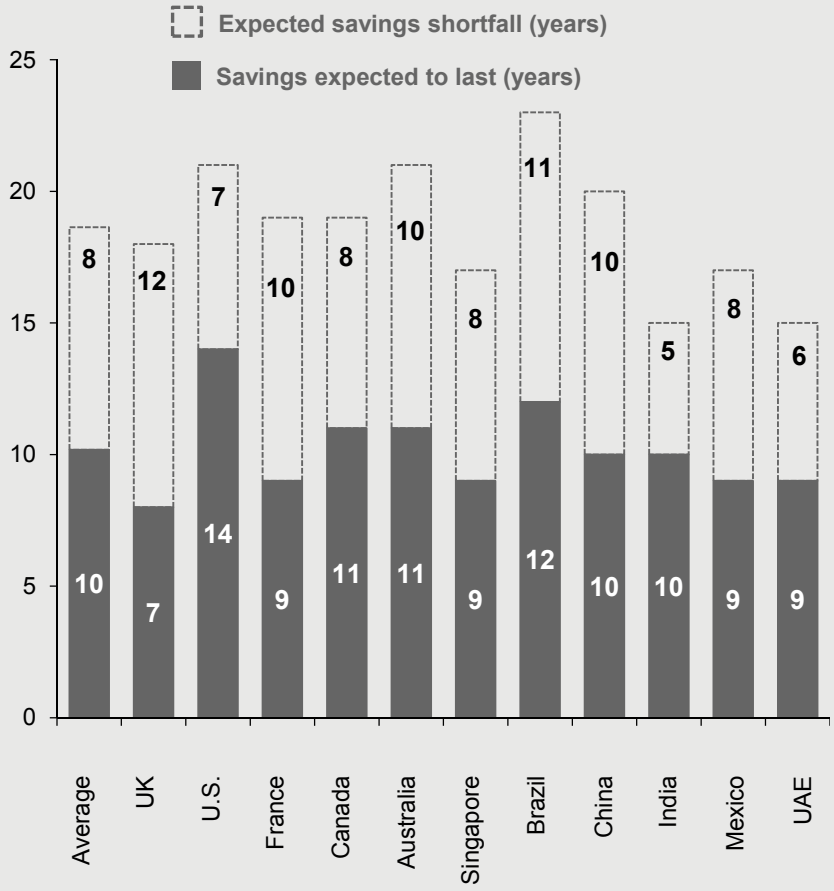
Life expectancy and pension shortfall

Probability of reaching ages 80 and 90

Persons aged 65, by gender, and combined couple



Perceived retirement shortfall by country



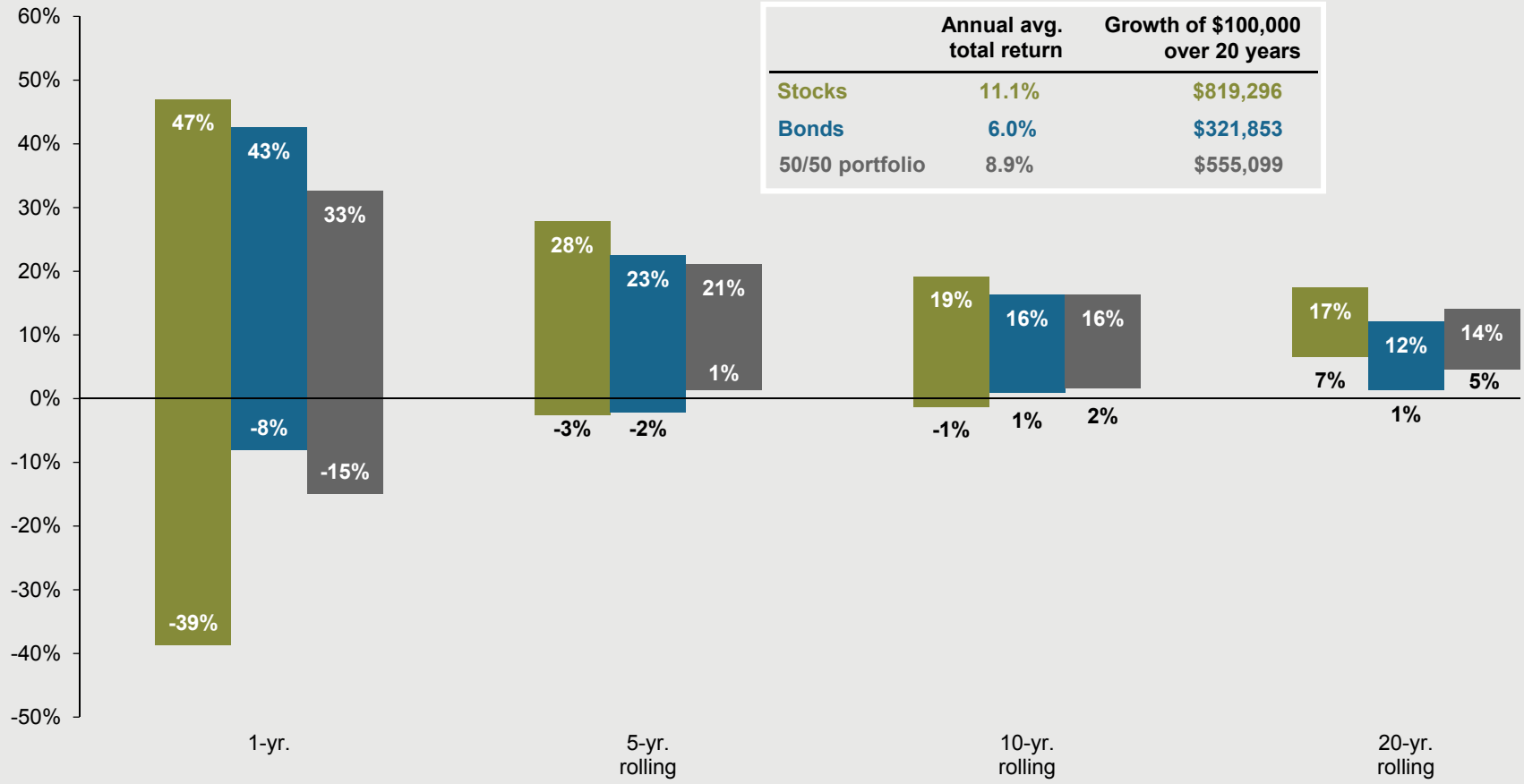
Source: J.P. Morgan Asset Management; (Left) SSA 2013 Life Tables; (Right) "The Future of Retirement: Life after work?" study by HSBC.
Figures represent the expected portion of retirement that will not be covered by retirement savings based on survey data.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Time, diversification and the volatility of returns

Range of stock, bond and blended total returns

Annual total returns, 1950-2015



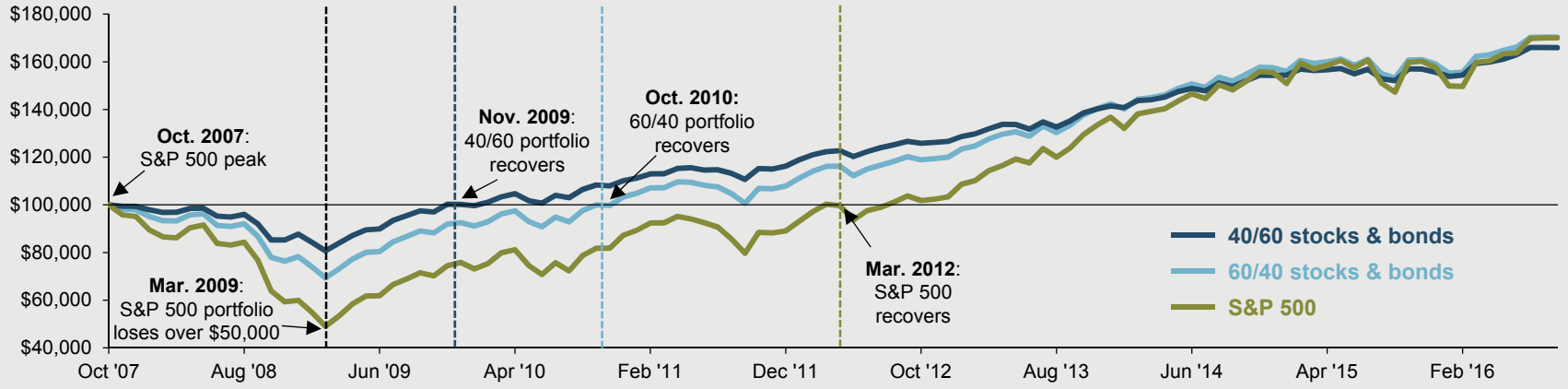
	Annual avg. total return	Growth of $100,000 over 20 years
Stocks	11.1%	$819,296
Bonds	6.0%	$321,853
50/50 portfolio	8.9%	$555,099

Source: Barclays, FactSet, Federal Reserve, Robert Shiller, Strategas/Ibbotson, J.P. Morgan Asset Management.
Returns shown are based on calendar year returns from 1950 to 2015. Stocks represent the S&P 500 Shiller Composite and Bonds represent Strategas/Ibbotson for periods from 1950 to 2010 and Barclays Aggregate thereafter. Growth of $100,000 is based on annual average total returns from 1950 to 2015.
Guide to the Markets – U.S. Data are as of September 30, 2016.

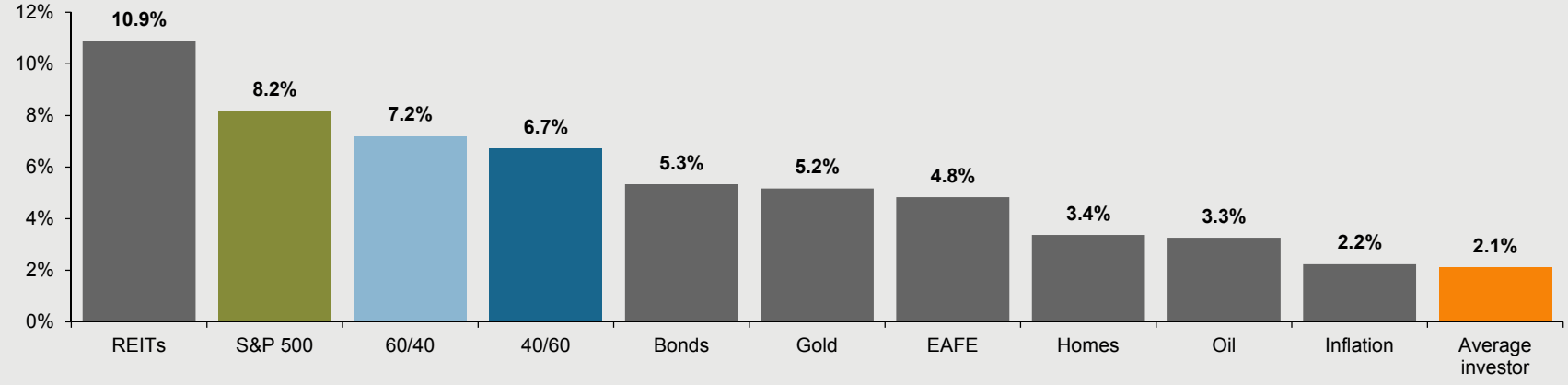
J.P.Morgan Asset Management

Diversification and the average investor

Portfolio returns: Equities vs. equity and fixed income blend



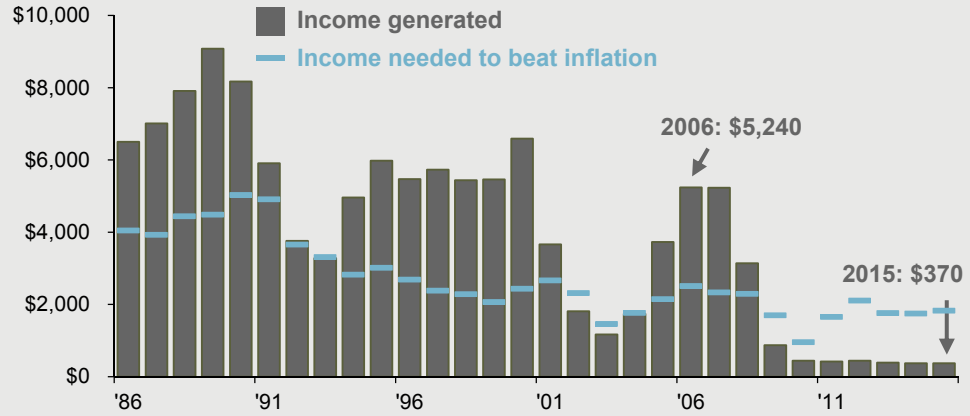
20-year annualized returns by asset class (1996 – 2015)



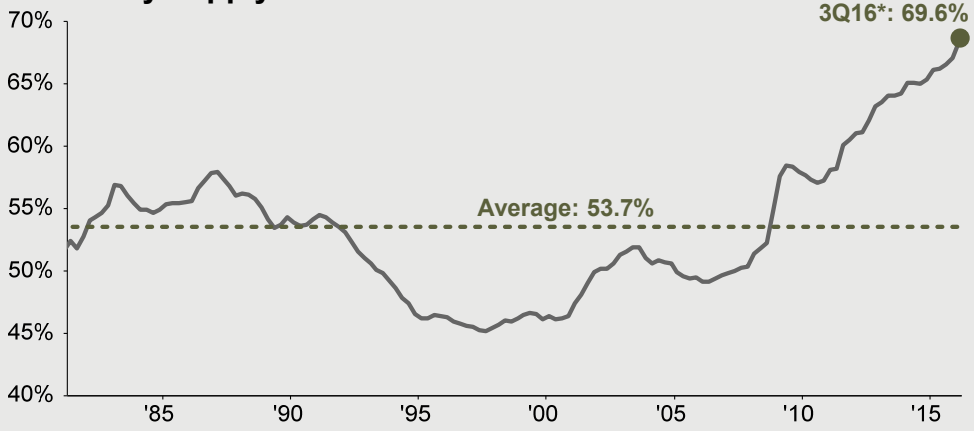
Source: J.P. Morgan Asset Management; (Top) Barclays, FactSet, Standard & Poor's; (Bottom) Dalbar Inc.
Indexes used are as follows: REITS: NAREIT Equity REIT Index, EAFE: MSCI EAFE, Oil: WTI Index, Bonds: Barclays U.S. Aggregate Index, Homes: median sale price of existing single-family homes, Gold: USD/troy oz, Inflation: CPI. 60/40: A balanced portfolio with 60% invested in S&P 500 Index and 40% invested in high quality U.S. fixed income, represented by the Barclays U.S. Aggregate Index. The portfolio is rebalanced annually. Average asset allocation investor return is based on an analysis by Dalbar Inc., which utilizes the net of aggregate mutual fund sales, redemptions and exchanges each month as a measure of investor behavior. Returns are annualized (and total return where applicable) and represent the 20-year period ending 12/31/15 to match Dalbar's most recent analysis.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Annual income generated by $100,000 investment in a 6-mo. CD



M2 money supply as a % of nominal GDP

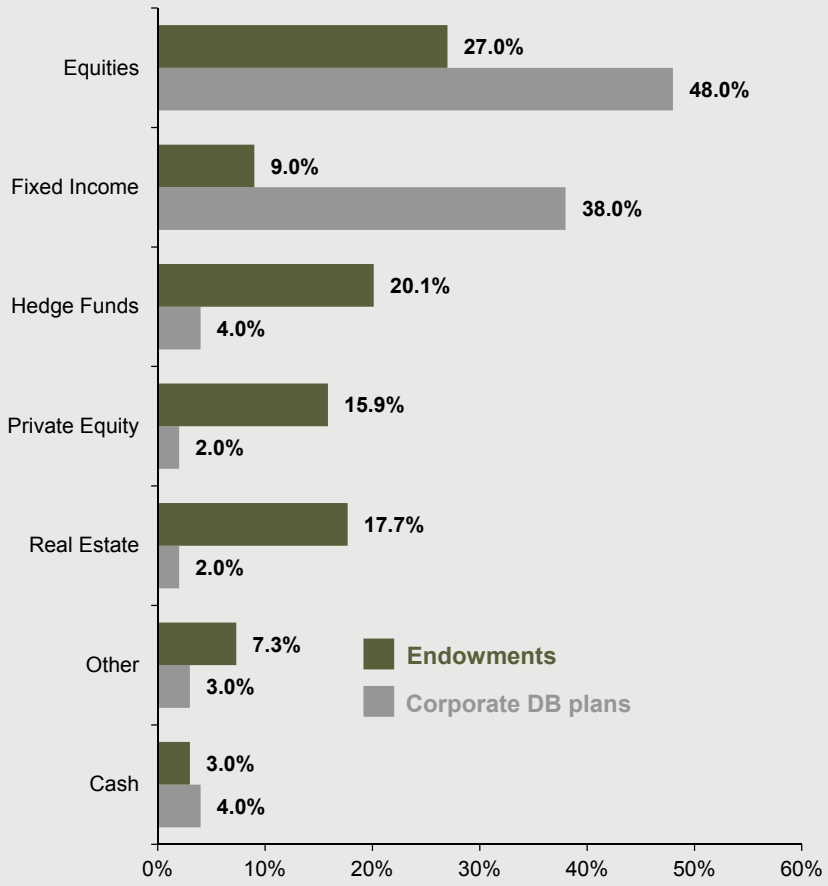


Money supply component	USD billions	Weight in money supply
M2-M1	**$9,691**	**79.3%**
Retail MMMFs	$689	5.6%
Savings deposits	$8,611	70.5%
Small time deposits	$391	3.2%
Institutional MMMFs	**$1,852**	**15.2%**
Cash in IRA & Keogh accounts	**$676**	**5.5%**
Total	**$12,219**	**100.0%**

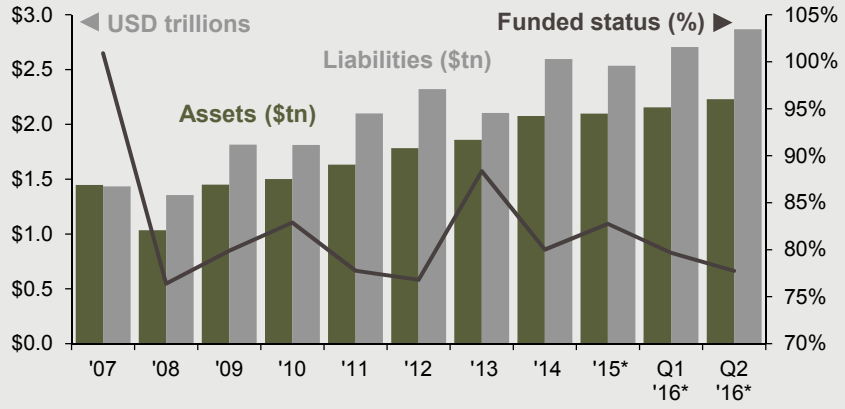
Source: FactSet, J.P. Morgan Asset Management; (Top left) Bankrate.com; (Bottom left and right) BEA, Federal Reserve, St. Louis Fed.
All cash measures obtained from the Federal Reserve are latest available seasonally adjusted month averages. All numbers are in billions of U.S. dollars. Small-denomination time deposits are those issued in amounts of less than $100,000. All IRA and Keogh account balances at commercial banks and thrift institutions are subtracted from small time deposits. Annual income is for illustrative purposes and is calculated based on the 6-month CD yield on average during each year and $100,000 invested. IRA and Keogh account balances at money market mutual funds are subtracted from retail money funds. Past performance is not indicative of comparable future results. *3Q M2 money supply as a % of GDP is a J.P. Morgan Asset Management estimate.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

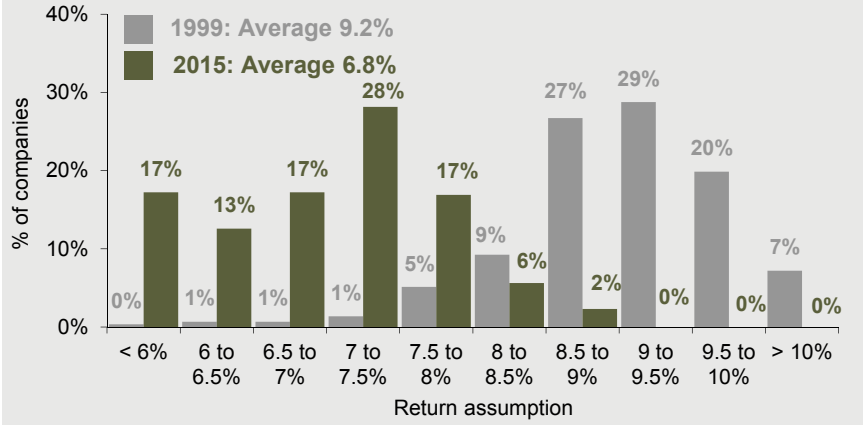
Asset allocation: Corporate DB plans vs. endowments



Defined benefit plans: Russell 3000 companies



Pension return assumptions: S&P 500 companies



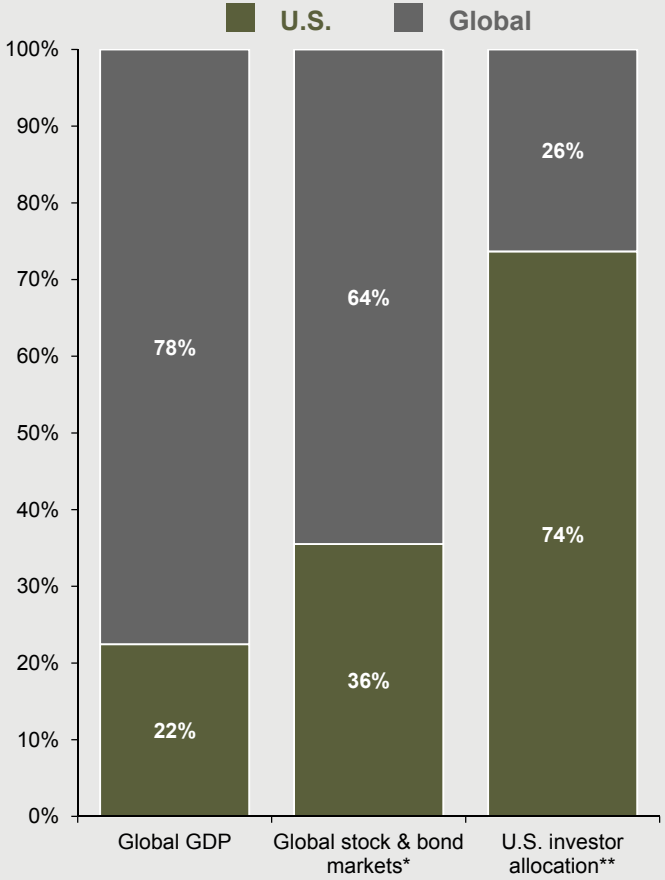
Source: J.P. Morgan Asset Management; (Left) NACUBO (National Association of College and University Business Officers), Towers Watson; (Top right) Bloomberg, Russell 3000 corporate 10-Ks; (Bottom right) Compustat/FactSet, S&P 500 corporate 10-Ks.
Asset allocation as of 2012. Endowments represents dollar-weighted average data of 842 colleges and universities. Pension return assumptions based on all available and reported data from S&P 500 Index companies. Pension assets, liabilities and funded status based on Russell 3000 companies reporting pension data. Return assumption bands are inclusive of upper range. *2015 and 2016 estimates are based on market moves only and do not include contributions, benefit payments and service costs.
All information is shown for illustrative purposes only.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

Local investing and global opportunities

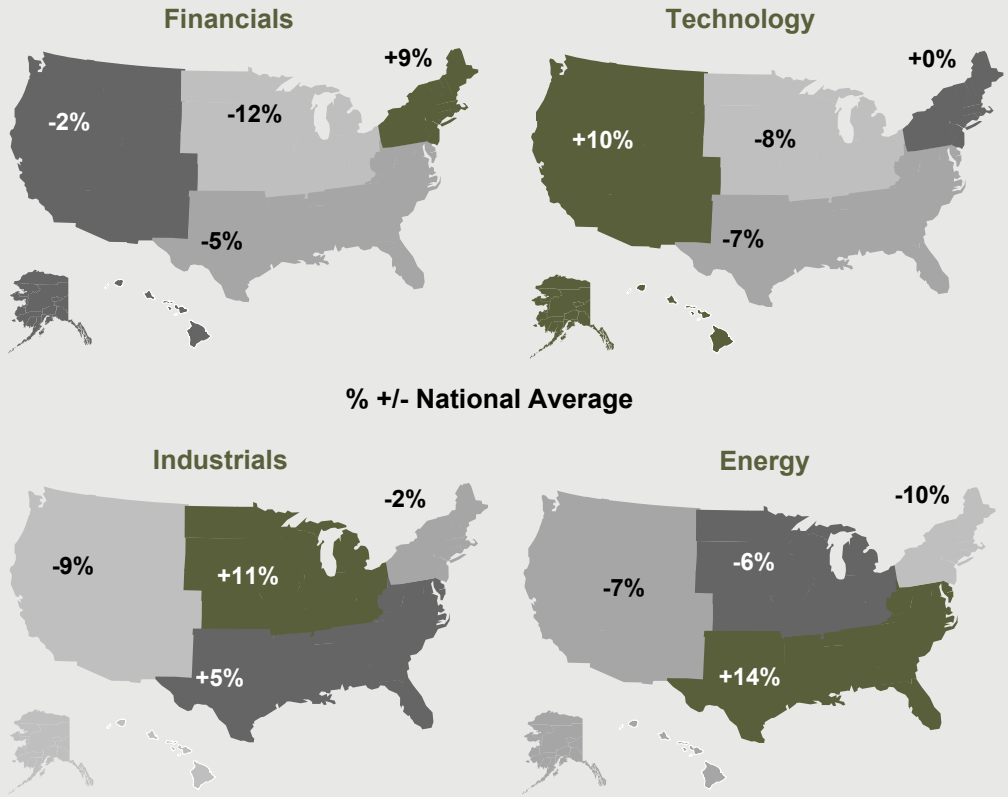
Investment universe & U.S. investors

Percentage of total net assets, 2014



Investor allocation by region

Likelihood of owning stocks in an industry vs. national average***



Source: Openfolio, IMF, ICI, J.P. Morgan Asset Management.
*Global stock and bond markets data are as of 2013. **U.S. investor allocation is the total value of investments in global or domestic equity mutual funds and ETFs. ***Investor allocation by region is based on data collected by Openfolio. Average sector allocations at the national level are determined by looking at the sector allocations of over 20,000 brokerage accounts, and taking a simple average. Portfolio allocations are then evaluated on a regional basis, and the regional averages are compared to the national average to highlight any investor biases. Further details can be found on openfolio.com.
Guide to the Markets – U.S. Data are as of September 30, 2016.

J.P.Morgan Asset Management

J.P. Morgan Asset Management – Index definitions

All indexes are unmanaged and an individual cannot invest directly in an index. Index returns do not include fees or expenses.

Equities:

The **Dow Jones Industrial Average** is a price-weighted average of 30 actively traded blue-chip U.S. stocks.

The **MSCI ACWI (All Country World Index)** is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets.

The **MSCI EAFE Index (Europe, Australasia, Far East)** is a free float-adjusted market capitalization index that is designed to measure the equity market performance of developed markets, excluding the US & Canada.

The **MSCI Emerging Markets Index** is a free float-adjusted market capitalization index that is designed to measure equity market performance in the global emerging markets.

The **MSCI Europe Index** is a free float-adjusted market capitalization index that is designed to measure developed market equity performance in Europe.

The **MSCI Pacific Index** is a free float-adjusted market capitalization index that is designed to measure equity market performance in the Pacific region.

The **Russell 1000 Index®** measures the performance of the 1,000 largest companies in the Russell 3000.

The **Russell 1000 Growth Index®** measures the performance of those Russell 1000 companies with higher price-to-book ratios and higher forecasted growth values.

The **Russell 1000 Value Index®** measures the performance of those Russell 1000 companies with lower price-to-book ratios and lower forecasted growth values.

The **Russell 2000 Index®** measures the performance of the 2,000 smallest companies in the Russell 3000 Index.

The **Russell 2000 Growth Index®** measures the performance of those Russell 2000 companies with higher price-to-book ratios and higher forecasted growth values.

The **Russell 2000 Value Index®** measures the performance of those Russell 2000 companies with lower price-to-book ratios and lower forecasted growth values.

The **Russell 3000 Index®** measures the performance of the 3,000 largest U.S. companies based on total market capitalization.

The **Russell Midcap Index®** measures the performance of the 800 smallest companies in the Russell 1000 Index.

The **Russell Midcap Growth Index ®** measures the performance of those Russell Midcap companies with higher price-to-book ratios and higher forecasted growth values. The stocks are also members of the Russell 1000 Growth index.

The **Russell Midcap Value Index ®** measures the performance of those Russell Midcap companies with lower price-to-book ratios and lower forecasted growth values. The stocks are also members of the Russell 1000 Value index.

The **S&P 500 Index** is widely regarded as the best single gauge of the U.S. equities market. The index includes a representative sample of 500 leading companies in leading industries of the U.S. economy. The **S&P 500 Index** focuses on the large-cap segment of the market; however, since it includes a significant portion of the total value of the market, it also represents the market.

Fixed income:

The **Barclays 1-3 Month U.S. Treasury Bill Index** includes all publicly issued zero-coupon US Treasury Bills that have a remaining maturity of less than 3 months and more than 1 month, are rated investment grade, and have $250 million or more of outstanding face value. In addition, the securities must be denominated in U.S. dollars and must be fixed rate and non convertible.

The **Barclays Global High Yield Index** is a multi-currency flagship measure of the global high yield debt market. The index represents the union of the US High Yield, the Pan-European High Yield, and Emerging Markets (EM) Hard Currency High Yield Indices. The high yield and emerging markets sub-components are mutually exclusive. Until January 1, 2011, the index also included CMBS high yield securities.

The **Barclays Municipal Index**: consists of a broad selection of investment- grade general obligation and revenue bonds of maturities ranging from one year to 30 years. It is an unmanaged index representative of the tax-exempt bond market.

The **Barclays US Dollar Floating Rate Note (FRN) Index** provides a measure of the U.S. dollar denominated floating rate note market.

The **Barclays US Corporate Investment Grade Index** is an unmanaged index consisting of publicly issued US Corporate and specified foreign debentures and secured notes that are rated investment grade (Baa3/BBB or higher) by at least two ratings agencies, have at least one year to final maturity and have at least $250 million par amount outstanding. To qualify, bonds must be SEC-registered.

The **Barclays US High Yield Index** covers the universe of fixed rate, non-investment grade debt. Eurobonds and debt issues from countries designated as emerging markets (sovereign rating of Baa1/BBB+/BBB+ and below using the middle of Moody's, S&P, and Fitch) are excluded, but Canadian and global bonds (SEC registered) of issuers in non-EMG countries are included.

The **Barclays US Mortgage Backed Securities Index** is an unmanaged index that measures the performance of investment grade fixed-rate mortgage backed pass-through securities of GNMA, FNMA and FHLMC.

The **Barclays US TIPS Index** consists of Inflation-Protection securities issued by the U.S. Treasury.

The **J.P. Morgan Emerging Market Bond Global Index (EMBI)** includes U.S. dollar denominated Brady bonds, Eurobonds, traded loans and local market debt instruments issued by sovereign and quasi-sovereign entities.

The **J.P. Morgan Domestic High Yield Index** is designed to mirror the investable universe of the U.S. dollar domestic high yield corporate debt market.

The **J.P. Morgan Corporate Emerging Markets Bond Index Broad Diversified (CEMBI Broad Diversified)** is an expansion of the **J.P. Morgan Corporate Emerging Markets Bond Index (CEMBI)**. The CEMBI is a market capitalization weighted index consisting of U.S. dollar denominated emerging market corporate bonds.

The **J.P. Morgan Emerging Markets Bond Index Global Diversified (EMBI Global Diversified)** tracks total returns for U.S. dollar-denominated debt instruments issued by emerging market sovereign and quasi-sovereign entities: Brady bonds, loans, Eurobonds. The index limits the exposure of some of the larger countries.

The **J.P. Morgan GBI EM Global Diversified** tracks the performance of local currency debt issued by emerging market governments, whose debt is accessible by most of the international investor base.

The **U.S. Treasury Index** is a component of the U.S. Government index.

J.P.Morgan
Asset Management

Other asset classes:

The **Alerian MLP Index** is a composite of the 50 most prominent energy Master Limited Partnerships (MLPs) that provides investors with an unbiased, comprehensive benchmark for the asset class.

The **Bloomberg Commodity Index** and related sub-indices are composed of futures contracts on physical commodities and represents twenty two separate commodities traded on U.S. exchanges, with the exception of aluminum, nickel, and zinc

The **Cambridge Associates U.S. Global Buyout and Growth Index®** is based on data compiled from 1,768 global (U.S. & ex – U.S.) buyout and growth equity funds, including fully liquidated partnerships, formed between 1986 and 2013.

The **CS/Tremont Hedge Fund Index** is compiled by Credit Suisse Tremont Index, LLC. It is an asset-weighted hedge fund index and includes only funds, as opposed to separate accounts. The Index uses the Credit Suisse/Tremont database, which tracks over 4500 funds, and consists only of funds with a minimum of US$50 million under management, a 12-month track record, and audited financial statements. It is calculated and rebalanced on a monthly basis, and shown net of all performance fees and expenses. It is the exclusive property of Credit Suisse Tremont Index, LLC.

The **HFRI Monthly Indices (HFRI)** are equally weighted performance indexes, utilized by numerous hedge fund managers as a benchmark for their own hedge funds. The HFRI are broken down into 4 main strategies, each with multiple sub strategies. All single-manager HFRI Index constituents are included in the HFRI Fund Weighted Composite, which accounts for over 2200 funds listed on the internal HFR Database.

The **NAREIT EQUITY REIT Index** is designed to provide the most comprehensive assessment of overall industry performance, and includes all tax-qualified real estate investment trusts (REITs) that are listed on the NYSE, the American Stock Exchange or the NASDAQ National Market List.

The **NFI-ODCE**, short for NCREIF Fund Index - Open End Diversified Core Equity, is an index of investment returns reporting on both a historical and current basis the results of 33 open-end commingled funds pursuing a core investment strategy, some of which have performance histories dating back to the 1970s. The NFI-ODCE Index is capitalization-weighted and is reported gross of fees. Measurement is time-weighted.

Definitions:

Investing in **alternative assets** involves higher risks than traditional investments and is suitable only for sophisticated investors. Alternative investments involve greater risks than traditional investments and should not be deemed a complete investment program. They are not tax efficient and an investor should consult with his/her tax advisor prior to investing. Alternative investments have higher fees than traditional investments and they may also be highly leveraged and engage in speculative investment techniques, which can magnify the potential for investment loss or gain. The value of the investment may fall as well as rise and investors may get back less than they invested.

Bonds are subject to interest rate risks. Bond prices generally fall when interest rates rise.

Investments in **commodities** may have greater volatility than investments in traditional securities, particularly if the instruments involve leverage. The value of commodity-linked derivative instruments may be affected by changes in overall market movements, commodity index volatility, changes in interest rates, or factors affecting a particular industry or commodity, such as drought, floods, weather, livestock disease, embargoes, tariffs and international economic, political and regulatory developments. Use of leveraged commodity-linked derivatives creates an opportunity for increased return but, at the same time, creates the possibility for greater loss.

Derivatives may be riskier than other types of investments because they may be more sensitive to changes in economic or market conditions than other types of investments and could result in losses that significantly exceed the original investment. The use of derivatives may not be successful, resulting in investment losses, and the cost of such strategies may reduce investment returns.

Distressed Restructuring Strategies employ an investment process focused on corporate fixed income instruments, primarily on corporate credit instruments of companies trading at significant discounts to their value at issuance or obliged (par value) at maturity as a result of either formal bankruptcy proceeding or financial market perception of near term proceedings.

Investments in **emerging markets** can be more volatile. The normal risks of investing in foreign countries are heightened when investing in emerging markets. In addition, the small size of securities markets and the low trading volume may lead to a lack of liquidity, which leads to increased volatility. Also, emerging markets may not provide adequate legal protection for private or foreign investment or private property.

The price of **equity** securities may rise, or fall because of changes in the broad market or changes in a company's financial condition, sometimes rapidly or unpredictably. These price movements may result from factors affecting individual companies, sectors or industries, or the securities market as a whole, such as changes in economic or political conditions. Equity securities are subject to "stock market risk" meaning that stock prices in general may decline over short or extended periods of time.

Equity market neutral strategies employ sophisticated quantitative techniques of analyzing price data to ascertain information about future price movement and relationships between securities, select securities for purchase and sale. Equity Market Neutral Strategies typically maintain characteristic net equity market exposure no greater than 10% long or short.

Global macro strategies trade a broad range of strategies in which the investment process is predicated on movements in underlying economic variables and the impact these have on equity, fixed income, hard currency and commodity markets.

International investing involves a greater degree of risk and increased volatility. Changes in currency exchange rates and differences in accounting and taxation policies outside the U.S. can raise or lower returns. Some overseas markets may not be as politically and economically stable as the United States and other nations.

There is no guarantee that the use of **long and short positions** will succeed in limiting an investor's exposure to domestic stock market movements, capitalization, sector swings or other risk factors. Using long and short selling strategies may have higher portfolio turnover rates. Short selling involves certain risks, including additional costs associated with covering short positions and a possibility of unlimited loss on certain short sale positions.

Merger arbitrage strategies which employ an investment process primarily focused on opportunities in equity and equity related instruments of companies which are currently engaged in a corporate transaction.

Mid-capitalization investing typically carries more risk than investing in well-established "blue-chip" companies. Historically, mid-cap companies' stock has experienced a greater degree of market volatility than the average stock.

Price to forward earnings is a measure of the price-to-earnings ratio (P/E) using forecasted earnings. **Price to book value** compares a stock's market value to its book value. **Price to cash flow** is a measure of the market's expectations of a firm's future financial health. **Price to dividends** is the ratio of the price of a share on a stock exchange to the dividends per share paid in the previous year, used as a measure of a company's potential as an investment.

Real estate investments may be subject to a higher degree of market risk because of concentration in a specific industry, sector or geographical sector. Real estate investments may be subject to risks including, but not limited to, declines in the value of real estate, risks related to general and economic conditions, changes in the value of the underlying property owned by the trust and defaults by borrower.

Relative Value Strategies maintain positions in which the investment thesis is predicated on realization of a valuation discrepancy in the relationship between multiple securities.

Small-capitalization investing typically carries more risk than investing in well-established "blue-chip" companies since smaller companies generally have a higher risk of failure. Historically, smaller companies' stock has experienced a greater degree of market volatility than the average stock.

J.P.Morgan
Asset Management

The Market Insights program provides comprehensive data and commentary on global markets without reference to products. Designed as a tool to help clients understand the markets and support investment decision-making, the program explores the implications of current economic data and changing market conditions.

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Unless otherwise stated, all data are as of September 30, 2016 or most recently available.

Guide to the Markets – U.S.

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J.P.Morgan
Asset Management

CITY OF TUCSON

Supplemental Retirement System
October 28, 2016

ACTUARIAL VALUATION
As of June 30, 2016

Leslie Thompson, FSA, FCA, EA, MAAA
Senior Consultant

GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries
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Introduction

- Prepared as of June 30, 2016, financial data, benefit and contribution provisions, actuarial assumptions and methods
- There are three tiers
  - "Old Hire-Fixed Rate"— legacy group hired prior to June 30, 2006;
  - "Tier 1-Variable Rate" — hired between July 1, 2006 and June 30, 2011
  - "Tier 2 –Variable Rate" — hired on or after July 1, 2011
- Fifth year with Tier 2-Variable Rate members entering the plan
- Purposes:
  - Measure the actuarial liabilities
  - Determine adequacy of current contributions and review impact of the new funding policy
  - Provide other information for reporting
    - GASB
    - Comprehensive Annual Financial Report (CAFR)
  - Explain changes in the actuarial condition of plan

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Asset Returns

- Market return was 2.5% in FY2016; return on the Actuarial Value of Assets (AVA) was 8.0% (due to deferred asset gains from earlier years)

Fiscal Year ended	Actuarial Value rate of return	Market Value rate of return
2013	4.1%	14.3%
2014	13.8%	19.1%
2015	12.1%	4.3%
2016	8.0%	2.5%
Four year average	9.4%	9.8%

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Actuarial Valuation – Key Results

- The unfunded accrued liability (smoothed basis) decreased from $314.6 million to $297.8 million
  - Demographic gain of $6.5 million
  - Investment gain of $5.5 million
- Normal cost by variable rate Tier
  - "Tier 1 – Variable Rate" is 13.10% (13.20% last year)
  - "Tier 2 – Variable Rate" is 9.78% (9.78% last year)
  - Aggregate over the entire plan decreased from 11.57% to 11.40%
- UAL amortization over 20 years is 18.85% (previously was 18.59%) of pay
  - However, this is primarily due to the 7% reduction in payroll from the early retirement incentive.
  - Makes things look larger as a rate of pay
  - Dollar payment decreased due to favorable experience

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Year Plan projected to pay off the UAL

- Each year a projection is performed to estimate the time at which the unfunded liability will be paid off (funded ratio is equal to 100%).
- Historically, the year of full funding for each valuation year has been:

Valuation Date- June 30	Year of Full Funding (UAL paid off)
2016	2035
2015	2031

- Prior years did not have a funding policy that measured the year of full funding.
- The 20 year "open" method, with the rounding policy, acts as a "closed" amortization method.
- The increase of four years from 2031 to 2035 was primarily due to the return on the market value of assets of 2.5% (rather than the assumed rate of 7.25%).

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Contribution rates

TSRS Member and City Rates by year				
	2016	2015	2014	2013
Total Normal Cost	11.40%	11.57%	11.71%	12.08%
Total Amortization Payment	18.85%	18.59%	20.52%	20.14%
Administrative Expenses	.68%	0.53%	NA	NA
Total contribution	30.93%	30.69%	32.23%	32.22%
Member aggregate contributions	5.15%	5.17%	5.20%	5.27%
City financed portion	25.78%	25.52%	27.03%	26.95%

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Member and City "Raw" Rates by Tier

- Based on the July 1, 2016 valuation effective for fiscal year beginning July 1, 2017-before application of the funding (rounding) policy

FY Beginning July 1, 2016 "Raw" Rates	Member Contribution	City Contribution	Total Contribution
Old Hire – Fixed Rate	5.00%	25.93%	30.93%
Tier 1 – Variable Rate	6.55%	24.38%	30.93%
Tier 2 – Variable Rate	4.89%	26.04%	30.93%
Blended Across Tiers	5.15%	25.78%	30.93%

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Schedule of Funding Progress

Tucson Supplemental Retirement System: Schedule of Funding Progress							
	2016	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**
Actuarial Value of Assets (in thousands)	$732,927	$706,774	$655,998	$600,330	$597,107	$624,665	$641,819
Market Value of Assets (in thousands)	$728,234	$739,794	$735,737	$641,046	$580,383	$599,712	$514,122
Funded Ratio (AVA)	71.11%	69.20%	64.8%	63.3%	63.5%	67.3%	71.0%
Funded Ratio (MVA)	70.65%	72.43%	72.67%	67.6%	61.7%	64.6%	56.8%

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Historical Annual Returns-Actuarial and Market Value of Assets

- The actuarial value of assets exceeds the market value by $4.7 million; these deferred losses will enter the actuarial value of assets in future years and will create an upward pressure on the contribution rate.

Annual return during fiscal year-	Geometric Average return over 6 years	2016	2015	2014	2013	2012	2011
Actuarial Value of Assets	6.5%	8.0%	12.1%	13.8%	4.1%	0.1%	1.8%
Market Value of Assets	10.4%	2.5%	4.3%	19.1%	14.3%	1.5%	22.9%

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Gain/Loss- the explanation of what happened between last year and this year

- Gain/loss is measured each year on the change in the accrued liabilities
- It is a measure of the *expected liabilities*, using the probabilities for decrement, against the actual liabilities
- The expected is developed from the actuarial assumptions
  - *The Board keeps the assumptions updated through a regular review of experience vs. assumptions (the experience study).*
  - *The last experience study was for the five year period ending June 30, 2013.*

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History of Gains and (Losses) on the Accrued Liability and the Actuarial Assets

Tucson Supplemental Retirement System-gains and (losses) by primary category						
Experience type by calendar year	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**
Investment Experience gains and (losses) on the AVA	$5,503,878	$30,256,913	$37,505,177	$(22,189,089)	$(47,621,333)	$(37,800,287)
All Demographic gains and (losses)	$6,529,764	$9,718,036	$ (1,003,585)	$ 14,195,354	$ 9,090,921	$ (1,946,348)
Total Experience gains and (losses)	$12,033,642	$39,974,949	$36,501,592	$(7,993,735)	$(38,530,412)	$(39,746,635)

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Change in the Unfunded Accrued Liability (UAL)

- The 2015 UAL was $315 million
- The expected UAL for 2016 was $310 million
- The actual 2016 UAL is $298 million
  - The difference between the expected and actual is $12 million, and is detailed on the previous slide
  - Each year the UAL increases with normal cost and decreases with total contributions (all adjusted with interest)
  - Asset and liability gains positively impact the UAL
- The "lower than expected" UAL occurred due to the variations in experience discussed on the previous slide

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"Growth/Control" of the Normal Cost

- The normal cost is also a component of the annual cost
- New tiers help to manage the growth, or "control" normal cost
- Decreasing normal cost in Tier 2 – Variable Rate group is shown below
  - Legacy – Fixed Rate 11.83% normal cost
  - Tier 1 – Variable Rate 13.10% normal cost
  - Tier 2 – Variable Rate 9.78% normal cost
  - Aggregate normal cost 11.40% (11.57% last year)
- Over the long term, as the population turns over and new hires enter Tier 2, the aggregate normal cost will continue to decrease (ultimately reaching the Tier 2 variable normal cost rate of 9.78%)

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Active Membership and Payroll

Tucson Supplemental Retirement System- Active Counts by Tier				
Year	Old Hire – Fixed Rate	Tier 1 – Variable Rate	Tier 2 – Variable Rate	Total Actives
2012	1,955	502	261	2,718
2013	1,802	456	492	2,750
2014	1,687	404	623	2,714
2015	1,566	360	739	2,665
2016	1,355	315	825	2,495

Tucson Supplemental Retirement System- Change in total payroll by tier											
Old Hire – Fixed Rate			Tier 1 – Variable Rate			Tier 2 – Variable Rate			Total		
2016 Payroll	2015 Payroll	% Change	2016 Payroll	2015 Payroll	% Change	2016 Payroll	2015 Payroll	% Change	2016 Payroll	2015 Payroll	% Change
$69.2M	$79.9M	(13%)	$13.2M	$14.9M	(11%)	$32.7	$28.6M	14%	$115M	$123M	(7%)

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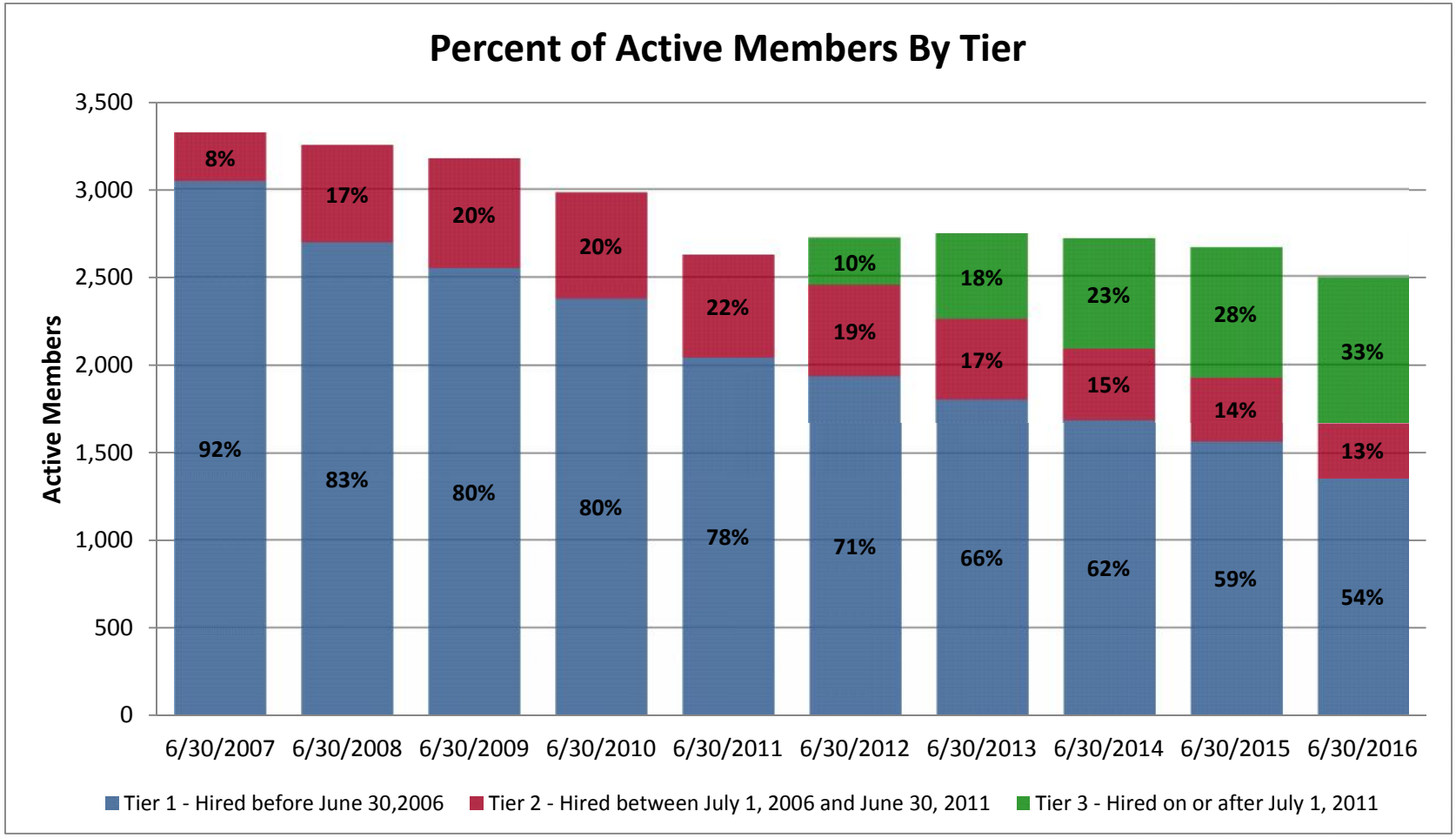
PERCENT OF ACTIVES BY TIER 2007-2016



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Pay-Status Membership

- The number of members in payment status increased by 136, from 2,809 to 2,945
  - Number includes service retirees, disabled retirees, beneficiaries and alternate payees receiving benefits
- Average annual retiree benefit is $26,302, compared to $26,067 last year, with the average increase of .9%
- There is 10 to 8.5 ratio of pay status members to active members
- Pay-status liabilities comprise 68% of the total accrued liabilities;
- Benefit payments run about $70 million per year
- The plan is maturing and mortality risk is becoming a larger part of the risk of the plan.

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Assets – Market Value

- Fair market value decreased from $740 million to $728 million
- Contributions
  - Member contributions = $7.3 million ($7.5 million LY)
  - Member contributions depend on hire date
  - Employer contributions = $34.4 million ($34.0 million LY)
- Total contributions of $41.7 million, compared to $41.5 million in FY 2015

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Assets – Changes in the Market Value

- Why did the assets fall $12 million?
- The net income was $12 million less than the net expenses
- Investment income was $22 million, while contributions were $42 million and the benefit payments and expenses were $75 million.

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Schedule of asset gains and losses

- Actuarial value increased from $707 million to $733 million.
- All actuarial calculations are based on actuarial value of assets, not market value.
- The method smoothes gains and losses over the last five years.
- There are "gain" bases in 2013 and 2014, and "loss" bases in 2012 , 2015 and 2016.
- The loss bases outweigh the gain bases (creating deferred losses in the actuarial value of assets of $4.7 million).

Tucson Supplemental Retirement System- schedule of asset gains and losses			
Year	**Gain/(Loss)**	**Percent Deferred**	**Amount Deferred**
2016	$(34,602,453)	80%	$ (27,681,962)
2015	(21,568,941)	60%	(12,941,365)
2014	71,196,036	40%	28,478,414
2013	37,262,213	20%	7,452,443
2012	(36,737,183)	0%	0
Total	$15,549,672		$ (4,692,470)

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Summary of Rates

- Required Contribution (no change recommended)
  - City financed (actuarial, unrounded) rate increased from 25.52% to 25.78%; based on the funding policy we recommend maintaining the 27.5% rate.
  - Employee Rates:

Employee Contribution Rates			
	Actuarial Rate	Proposed for FY 2018	Rate in Effect for FY 2017
Hired Prior to 7/1/06	5.00%	5.00%	5.00%
Hired 7/1/06 to 6/30/11	6.55%	6.75%	6.75%
Hired After 6/30/11	4.89%	5.25%	5.25%

- Funded ratio increased from 69.2% to 71.1%
- Based on current assumptions the total policy contribution rate of 27.5% plus the employee contributions would be sufficient to meet future benefit obligations as valued in the valuation
  - These rates are based on a 20 year amortization period

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Comparison to the Arizona Plans

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Actuarial Condition of Arizona Plans

Plan Name	Valuation Date	Assumed Interest Rate	Wage Growth	Mortality	Funded Ratio Market-Actuarial		Asset Smoothing for rates
Arizona State *Retirement System (ASRS)	June 30, 2015	8.00%	3.00%	Static projected to 2015	78.3%	77.1%	10 year smoothing
PSPRS	June 30, 2015	7.85% (7.5% adopted for 2016)	4.00%	Static projected to 2015	47.9%	49.0%	7 year smoothing
Phoenix	June 30, 2015	7.50%	3.50%	Generational	55.6%	55.4%	4 year smoothing
Tucson	June 30, 2015	7.25%	3.00%	Static projected to 2020	72.43%	69.20%	5 year smoothing
*excluding retiree medical							

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Contributions to the Plans

Plan Name	Valuation Date	Employee Contributions	Employer Contributions	Amortization policy
Arizona State Retirement System (ASRS)	June 30, 2015	11.34%**	10.78%**	(uses PUC funding method) 30 year closed level dollar amortization
PSPRS	June 30, 2015	11.65%	42.36%*	21 year closed amortization level percent of payroll-when a surplus exists the amortization payment calculation will change to 20 year open. Board allows employers to phase in rate increase over a three year period.
Phoenix T1	June 30, 2015	5.00%	30.60%	G/L 20 years; Assumption change 20 year amortization and phasing in assumption change costs over 4 years
Phoenix T2/3		11.00% (max ee contribution)	30.60%	
Tucson Tier 1	June 30, 2015	5.00%	27.50%	20 year open, level percent of pay. No rate reductions will be recommended by the Board until the plan reaches full funding. The Board employs a rounding policy to the member and employer contribution rates.
Tucson Tier 2		6.60%	27.50%	
Tucson Tier 3		5.00%	27.50%	

*without regard to any employer phase in

** not including the retiree medical

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Comparison to Colorado Plans of similar size

Peer Group Member	Plan Type	Normal Retirement Ages	Multiplier	Early Retirement Ages	Early Retirement Reduction	Final Average Compensation	Employee contributions	Interest on employee contributions	Employer contributions	Assumed rate of return	Funded Ratio
Adams County	DB	65; R80 min55	1.75%	55 & 10	4% per year for 3 years; then 5% per year	career average	9.00%	3.00%	7.75% to 9.00%	7.50%	56.2%
Arapahoe County	DB	65;R85 min60	1.85%	55 & 8	6.66% first 5 years then 4.50% thereafter	five year	8.00%	3.00%	8.00%	7.50%	61.7%
City of Aurora "GERP"	DB	67&5; R80 min 50	1.75% plus $176 per month	50 & 10	6% per year early	three year	7.00%	4.00%	7%	7.75%	97.8%
City of Denver "DERP"	DB	R85 min60	1.50%	60&5	6% per year	five year	8.00%	3.00%	11.50%	7.75%	72.2%
El Paso County	DB	R75 with 8 years	2.00%	55 & 8 years	3% per year	three year	8.00%	3.00%	8.00%	8.00%	70.9%
City of Englewood "NERP"	DB	65; R88 min 55	1.50%	55 & 5	3% per year	three year	3.00%	3.50%	20.80%	6.50%	75.7%
City of Longmont	DB	R80 min60	2.20%	60 & 5	6% per year	three year	Legacy-5.7%; new hires 4.7%	3.00%	6.70%	7.50%	92.5%

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Risk Sharing Features of TSRS

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Risk Sharing Features of TSRS

- Comparison to PSPRS
  - For members hired after June 30, 2017 they will share 50/50 in the cost of their tier.
  - Older members share in the cost but at a much lower rate than 50/50
- TSRS member rates
  - For the variable rate members, defined as 50% of their tier's normal cost
  - For the new tiers, their UAL is very low. It is the older tier that has the greatest UAL. Thus the new method is very similar to PSPRS- just need to add a measuring and monitoring feature
  - To truly value the cost of the tiers, would need actuarial valuations for each tier (3 valuations per year)
  - Then can assess the portion of normal cost to the members that has them pay 50% of the total cost (if indeed that is the objective of TSRS).

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Consultants & Actuaries

TUCSON SUPPLEMENTAL RETIREMENT SYSTEM

ACTUARIAL VALUATION REPORT

AS OF JUNE 30, 2016

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October 5, 2016

The Board of Trustees
Tucson Supplemental Retirement System
Tucson, Arizona

Re: Actuarial Valuation of the Tucson Supplemental Retirement System as of June 30, 2016

Dear Board Members:

We are pleased to present the Report on the actuarial valuation of the Tucson Supplemental Retirement System as of June 30, 2016.

This Report presents the results of the June 30, 2016 actuarial valuation of the Tucson Supplemental Retirement System. The Report describes the current actuarial condition of the Tucson Supplemental Retirement System, determines recommended annual employer and employee contribution rates, and analyzes changes in these required rates. This report should not be relied on for any purpose other than the purpose described in the primary communication. Information needed to comply with Statements No. 67 and 68 is provided in a separate accounting report.

We certify that the information included herein and contained in the June 30, 2016 Actuarial Valuation Report is accurate and fairly presents the actuarial position of the Tucson Supplemental Retirement System as of the valuation date.

Contribution Rates

There are no recommended changes to the contribution rates for FY 2018. Based on the TSRS funding policy, the recommended employer rate will remain at 27.5%, and the recommended employee rates by tier will remain at 5.00%, 6.75% and 5.25%. Full details of these calculations are in the report.

Financing Objectives

The employer contributions, when combined with the contributions made by members, are intended to cover the Actuarially Determined Contribution (ADC), which is the sum of the Normal Cost plus a 20-year open level percent-of-pay amortization payment of the Unfunded Actuarial Accrued Liability (UAAL). If the contributions made are equal to the ADC, and if all actuarial assumptions are met, there will still be an unfunded accrued liability at the end of the 20-year period. This is due to "open" amortization – an amortization method that resets the payment period to 20 years with each valuation. However, the Board has adopted a funding policy which rounds up the employee and City contribution rates, and in addition, sets a 27.50% minimum on the City contribution rate until full funding is reached. Based on this funding policy, the System is projected to reach full funding in 2035.

Progress Toward Realization of Financing Objectives

The UAAL/(surplus) and the funded ratio (ratio of the actuarial value of assets to the actuarial accrued liability) illustrate the progress toward the realization of certain financing objectives. Based on the actuarial valuation as of June 30, 2016, the Plan has an unfunded liability of $297.8 million and a funded ratio of 71.1%.

The increase in the funded ratio, from 69.2% to 71.1%, is primarily due to asset gains on the smoothed or actuarial value of assets as well as liability gains from salary increases less than expected. In addition, contributions in excess of the ADC furthered the funded ratio improvement. A funded ratio less than 100% indicates an actuarially determined contribution that will require a normal cost and an amortization payment. If the contributions equal the ADC, and if all assumptions are met, the funded ratio should improve over time.

The Total Actuarially Determined Contribution as a percentage of pay based on the actuarial valuation as of July 1, 2016 is 30.93% compared to the total contribution rate in the prior year of 30.69%. This total rate, net of the employee contributions, is used in setting City rates for the fiscal year beginning July 1, 2017 (FY 2018).

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in Section G of this report. This report does not include an assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the System's financial condition.

Benefit Provisions

All of the benefit provisions reflected in this valuation are those which were in effect on June 30, 2016. There were no changes to the benefit provisions since the prior valuation. The benefit provisions are summarized in Section D of this Report.

Assumptions and Methods

There were no changes in actuarial methods and assumptions since the prior report. The Board has sole authority to determine the actuarial assumptions used for the Plan. The assumptions that are based upon the actuary's recommendations are internally consistent and are reasonably based on the actual past experience of the Plan.

The current assumptions were adopted by the Board in 2014 for first use in the June 30, 2014 valuation following a regularly scheduled experience study. The rationale for all of the current assumptions is included in that report, dated May 30, 2014.

The mortality tables include projection to 2020 to provide margin for future mortality improvement.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the

economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. The actuarial calculations presented in this Report are intended to provide information for rational decision making.

Data

The valuation was based upon information as of June 30, 2016, furnished by Tucson Supplemental Retirement System staff, concerning Plan benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not otherwise audit the data. We are not responsible for the accuracy or completeness of the information provided by Tucson Supplemental Retirement System staff.

Certification

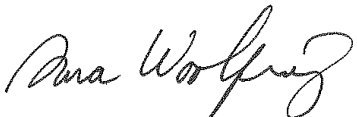
All of our work conforms with generally accepted actuarial principles and practices, and to the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of, where applicable, the Internal Revenue Code, and ERISA.

The signing actuaries are independent of the plan sponsor. Leslie Thompson and Dana Woolfrey are Enrolled Actuaries and are Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries. Finally, both of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

Leslie Thompson, FSA, FCA, EA, MAAA
Senior Consultant



Dana Woolfrey, FSA, FCA, EA, MAAA
Consultant

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SECTION A

EXECUTIVE SUMMARY

Actuarial Valuation

Valuations are prepared annually, as of July 1 of each year, the first day of the fiscal year. The primary purposes of the valuation report are to measure the plan's liabilities, to determine the required contribution rates and to analyze changes in the Tucson Supplemental Retirement System's actuarial position.

In addition, the report provides summaries of the member data, financial data, plan provisions, and actuarial assumptions and methods.

Experience During the Year

The plan experienced a liability gain of $6.5 million during fiscal year 2016, primarily due to salary increases less than expected. The plan experienced an asset gain of $5.5 million during fiscal year 2016. Please see page B-5 for further information. Although the market value of assets returned less than 7.25% during the year, there were deferred gains from fiscal year ending 2011 in the actuarial value of assets as of June 30, 2015 which were fully recognized as of the June 30, 2016 valuation, creating the observed gain.

Financial Position

The funded ratio increased from June 30, 2015 to June 30, 2016, primarily due to asset gains on the smoothed or actuarial value of assets as well as liability gains from salary increases less than expected to June 30, 2016. On a market value basis, the funded ratio decreased from June 30, 2015 to June 30, 2016 due to market value investment returns less than 7.25% during the year.

Funded Status Summary ($ in millions)		
Valuation Date	**June 30, 2016**	**June 30, 2015**
Accrued Liability	$1,030.7	$1,021.4
Actuarial Value of Assets (smoothed)	732.9	706.8
Unfunded Accrued Liability	$297.8	$314.6
Funded Ratio	71.11%	69.20%
Market Value of Assets	$728.2	$739.8
Unfunded Accrued Liability	$302.5	$281.6
Funded Ratio	70.65%	72.43%

Financing Objectives and Funding Policy

The financing objective of the Retirement System is to establish and receive contributions, expressed as percent of active member payroll, which will remain approximately, level from year to year and thereby minimize inter-generational cost transfers.

The Tucson Supplemental Retirement System is supported by member contributions, employer contributions, and investment return from retirement system assets. Currently, the member hired prior to July 1, 2006 contribute a flat rate, while members hired after June 30, 2006 are subject to variable rates that are 50% of their tiers' normal cost, subject to a floor of 5.0%. The rates are outlined in the table below. These rates are further subject to a 5.00% floor and a roundup policy rounding the next 0.25% percent - in this case, making the rates for fiscal year 2018, 5.00%, 6.75%, and 5.25%, respectively.

	Actuarial (Non Rounded) Rates	
Employee Group	**FY 2017***	**FY 2018***
Employees hired prior to July 1, 2006	5.00%	5.00%
Tier I Variable - employees hired after June 30, 2006, before July 1, 2011	6.60%	6.55%
Tier II Variable - employees hired after June 30, 2011	4.89%	4.89%

**Before application of 5.0% floor or roundup policy but including administrative expenses for the FY 2018 rate*

Total contributions which satisfy the funding objective are determined by the annual actuarial valuation and are sufficient to:

(1) cover the normal cost (the actuarial present value of benefits allocated to the current year by the actuarial cost method described in Section C); and

(2) finance over a period of future years the annual payment of the unfunded actuarial accrued liability (the actuarial present value of benefits not covered by valuation assets and anticipated future normal costs); and

(3) cover administrative expenses of the System.

It is assumed that the investment return assumption of 7.25% is net of investment expenses. The additional explicit administrative expense charge to the contribution rate is applied to the recommended employer contribution.

The Total Actuarially Determined Contribution which is used to set rates for fiscal year 2017 increased from 30.69% as of the prior valuation to 30.93% as of the current valuation. The System had asset gains on the smoothed value of assets as well as liability gains from salaries increasing less than expected. This resulted in lower *dollar* contribution requirements for fiscal year 2018. However, because the valuation payroll was reduced from $123 million as of June 30, 2015 to $115 million as of June 30, 2016, the contribution *rate* as a percentage of pay increased as shown. Essentially, even though the unfunded liability is less than expected as of the valuation date, there is less payroll over which to spread the financing of this debt.

Contribution Requirement Summary **All Numbers Reported Middle of Year, Percent of Pay**		
Fiscal Year Beginning	**July 1, 2017**	**July 1, 2016**
Total Actuarial Determined Contribution	30.93%	30.69%
Estimated Member Contribution	5.15%	5.17%
Net Annual Required Contribution	25.78%	25.52%

Normal Cost by Tier	
Aggregate Total Normal Cost	11.40%
Tier I Normal Cost (Hired between July 1, 2006 and June 30, 2011)	13.10%
Tier II Normal Cost (Hired after June 30, 2011)	9.78%

Member and City Rates by Tier for Fiscal Year Beginning July 1, 2017			
Tier	Member Contribution*	City Contribution*	Total Contribution
Hired Prior to July 1, 2006	5.00%	25.93%	30.93%
Hired between July 1, 2006 and June 30, 2011	6.55%	24.38%	30.93%
Hired after June 30, 2011	4.89%	26.04%	30.93%
Blended Across Tiers	5.15%	25.78%	30.93%

*Prior to application of roundup policy and funding policy minimums. It is anticipated that the three member groups will contribute 5.00%, 6.75%, and 5.25%, respectively. It is anticipated that the City will contribute 27.50% of pay, in accordance with the funding policy minimum.

The recommended rates, with the application of the administrative expenses and the round up policy, are illustrated below:

FY 18 Recommended Rates Based on TSRS Funding Policy (full description of the TSRS funding policy may be found in Section I)				
Employee Rates	Actuarial Rate (50% of Normal Cost)	Round up to nearest .25%	FY 18 Board Recommended Rates	FY 17 Recommended Rates
Tier				
Hired prior to 7/1/2006	5.00%*	n/a	5.00%	5.00%
Hired 7/1/2006 to 6/30/2011	6.55%	6.75%	6.75%	6.75%
Hired after 6/30/2011	5.00%**	5.25%	5.25%	5.25%
**Rate set in ordinance at 5.00%*				
*** Minimum 5% rate*				
Employer Rates		Round up to nearest .50%	FY 18 Board Recommended Rates	FY 17 Recommended Rates
Tier				
Hired prior to 7/1/2006	25.93%	n/a		
Hired 7/1/2006 to 6/30/2011	24.38%	n/a		
Hired after 6/30/2011	26.04%	n/a		
Blended Rate	25.78%	n/a	27.50%*	27.50%
**Minimum 27.5% recommended rate*				

Exhibit A.1
Tucson Supplemental Retirement System
Executive Summary

	June 30, 2016	June 30, 2015
1. **Actuarially Determined Contribution**		
a. Total	30.93%	30.69%
b. Blended Member %	5.15%	5.17%
c. Blended Net Employer %	25.78%	25.52%
2. **Funded Status**		
a. Actuarial Accrued Liability	$ 1,030,694,946	$ 1,021,377,564
b. Actuarial Value of Assets (AVA)	732,926,710	706,773,630
c. Unfunded Liability (AVA-basis)	297,768,236	314,603,934
d. Funded Ratio (AVA-basis)	71.11%	69.20%
e. Market Value of Assets (MVA)	$ 728,234,240	$ 739,793,547
f. Unfunded Liability (MVA-basis)	302,460,706	281,584,017
g. Funded Ratio (MVA-basis)	70.65%	72.43%
3. **Summary of Census Data**		
a. Actives		
i. Counts	2,495	2,665
ii. Total Annual Covered Payroll	$ 115,183,349	$ 123,414,560
iii. Average Covered Payroll	46,166	46,309
iv. Average Age	47.8	48.0
v. Average Service	11.9	12.1
b. Members with Refunds Due Counts	78	44
c. Deferred Vested Member Counts	312	284
d. Retired Member Counts	2,435	2,305
e. Beneficiary Counts	315	309
f. Disabled Retiree Counts	155	160
g. Alternate Payees	40	35
h. Total Members Included in Valuation	5,830	5,802

SECTION B

VALUATION RESULTS

Exhibit B.1
Tucson Supplemental Retirement System
Actuarial Valuation Results
Actuarial Accrued Liability

	June 30, 2016	June 30, 2015
1. **Active Members**		
a. Retirement Benefits	$ 292,606,270	$ 323,702,517
b. Withdrawal Benefits	8,304,010	8,890,652
c. Disability Benefits	1,814,990	1,929,369
d. Death Benefits	5,642,961	6,218,844
e. Total	$ 308,368,231	$ 340,741,382
2. **Members with Deferred Benefits**	$ 22,446,075	$ 19,147,214
3. **Members Receiving Benefits**	$ 699,577,704	$ 661,292,061
4. **Non-Vested Terminated Members Due Refund**	$ 302,936	$ 196,907
5. **Total**	$ 1,030,694,946	$ 1,021,377,564
6. **Actuarial Value of Assets**	$ 732,926,710	$ 706,773,630
7. **Unfunded Actuarial Accrued Liability**	$ 297,768,236	$ 314,603,934

Exhibit B.2
Tucson Supplemental Retirement System
Actuarial Valuation Results
Normal Cost

	July 1, 2016	July 1, 2015
1. **Normal Cost Rate**		
a. Retirement Benefits	8.82 %	8.98 %
b. Withdrawal Benefits	2.07	2.08
c. Disability Benefits	0.24	0.24
d. Death Benefits	0.27	0.27
e. Total	11.40 %	11.57 %

Exhibit B.3
Tucson Supplemental Retirement System
Actuarial Valuation Results
Present Value of Projected Benefits

	June 30, 2016	June 30, 2015
1. **Active Members**		
a. Retirement Benefits	$ 355,755,082	$ 391,871,542
b. Withdrawal Benefits	24,387,853	25,897,876
c. Disability Benefits	3,732,762	3,930,568
d. Death Benefits	7,670,619	8,329,892
e. Total	$ 391,546,316	$ 430,029,878
2. **Members with Deferred Benefits**	$ 22,446,075	$ 19,147,214
3. **Members Receiving Benefits**	$ 699,577,704	$ 661,292,061
4. **Non-Vested Terminated Members Due Refund**	$ 302,936	$ 196,907
5. **Total**	$ 1,113,873,031	$ 1,110,666,060

Exhibit B.4
Tucson Supplemental Retirement System
Development of the Actuarially Determined Contribution

Fiscal Year Beginning[1]	**July 1, 2016**	**July 1, 2015**
1. Total Normal Cost	11.40%	11.57%
2. Total Contribution to the Unfunded Actuarial Accrued Liability[2]	18.85%	18.59%
3. Administrative Expenses	0.68%	0.53%
4. Total Computed Contribution	30.93%	30.69%
5. Member Financed Portion[3]	5.15%	5.17%
6. City Financed Portion[4]	25.78%	25.52%

[1] *One-year lag in contribution timing. Contribution rates developed for the fiscal year beginning July 1, 2016 are used to set the actual contribution rates for fiscal year beginning July 1, 2017.*

[2] *Financed as a level percent of active member payroll over a period of 20 years from June 30, 2016.*

[3] *This percentage reflects the fact that members hired prior to July 1, 2006 contributed 5.00% of pay per year and members hired between July 1, 2006 and June 30, 2011 (Tier I variable class) and for those hired after July 1, 2011 (Tier II variable class), employee contributions are 50% of the respective Normal Cost for each class with a floor of 5.0%. The employee contribution rates, before application of the floor or roundup policy, for fiscal year 2018 are 6.55% and 4.89%, respectively.*

[4] *Prior to round up policy and application of 27.5% minimum.*

Exhibit B.5
Tucson Supplemental Retirement System
Plan Experience for Fiscal Year 2016

	Liabilities	
1.	Actuarial Accrued Liability at June 30, 2015	$ 1,021,377,564
2.	Normal Cost during Fiscal Year 2016	14,279,065
3.	Benefit Payments during Fiscal Year 2016	70,445,750
4.	Interest on Items 1-3 to End of Year	72,013,831
5.	Change in Actuarial Accrued Liability Due to Assumption Changes	-
6.	Change in Actuarial Accrued Liability Due to Provision Changes	-
7.	Expected Actuarial Accrued Liability at June 30, 2016	1,037,224,710
8.	Actual Actuarial Accrued Liability at June 30, 2016	1,030,694,946
9.	Liability Gain/(Loss)	6,529,764
	Assets	
10.	Actuarial Value of Assets at June 30, 2015	$ 706,773,630
11.	Benefit Payments and Administrative Expenses during Fiscal Year 2016	71,231,778
12.	Contributions during Fiscal Year 2016	41,710,054
13.	Interest on Items 10-12 to End of Year	50,170,926
14.	Expected Actuarial Value of Assets at June 30, 2016	727,422,832
15.	Actual Actuarial Value of Assets at June 30, 2016	732,926,710
16.	Asset Gain/(Loss)	5,503,878
	Total	
17.	Total Gain/(Loss)	**$ 12,033,642**

SECTION C

PLAN ASSETS

Exhibit C.1
Tucson Supplemental Retirement System
Statement of Plan Net Assets

	June 30, 2016	June 30, 2015
Assets		
Cash & Equivalents	$ 6,280,183	$ 6,759,380
Short-term investments	47,381,965	28,834,913
Real estate investments	64,188,363	58,761,226
Fixed income securities	171,641,992	118,134,945
Domestic equity	242,729,611	372,249,062
International equity	167,960,887	97,369,073
Other	48,875,450	80,105,389
Total assets	749,058,451	762,213,988
Liabilities and net assets held in trust for benefits		
Accounts payable	20,824,211	22,420,441
Total payables	20,824,211	22,420,441
Net assets held in trust for pension benefits	$ 728,234,240	$ 739,793,547

Exhibit C.2
Tucson Supplemental Retirement System
Statement of Changes in Plan Net Assets

	Year Ended June 30, 2016	Year Ended June 30, 2015
Additions to Net Assets Attributed to:		
Contributions		
Employer contributions	$34,381,127	$33,985,523
Plan members contributions	7,328,927	7,531,845
Total	41,710,054	41,517,368
Net Investment Income		
Net appreciation in fair value of investments	8,758,641	22,467,139
Interest and dividends	13,058,239	12,309,498
Other	253,772	118,247
	22,070,652	34,894,884
Total additions	63,780,706	76,412,252
Deductions to Net Assets Attributed to:		
Benefit payments	67,910,496	65,216,458
Refunds	2,535,254	2,395,893
Investment expenses	3,996,555	4,092,449
Administrative expenses	786,028	650,405
Other	111,680	
Total deductions	75,340,013	72,355,205
Change in net assets	(11,559,307)	4,057,047
Net assets held in trust for benefits:		
Beginning of year	739,793,547	735,736,500
End of year	$ 728,234,240	$ 739,793,547

Exhibit C.3
Tucson Supplemental Retirement System
Development of the Actuarial Value of Assets

	Item				Year Ending June 30, 2016
1.	Market value of assets, at beginning of year				739,793,547
2.	Net new investments				
	a. Contributions received for prior plan year			$	41,710,054
	b. Benefits paid and administrative expenses				(71,231,778)
	c. Net			$	(29,521,724)
3.	Market value of assets, at end of year			$	728,234,240
4.	Net MVA earnings [(3) - (1) - (2c)]			$	17,962,417
5.	Assumed investment return rate				7.25%
6.	Expected return [(5)*(1)+(5)*(2c)/2]			$	52,564,870
7.	Excess return [(4) - (6)]			$	(34,602,453)
8.	Deferred amounts for fiscal year ending June 30,				
	Year	Gain/(Loss)	Percent Deferred		Amount Deferred
	a. 2016	(34,602,453)	80%		(27,681,962)
	b. 2015	(21,568,941)	60%		(12,941,365)
	c. 2014	71,196,036	40%		28,478,414
	d. 2013	37,262,213	20%		7,452,443
	e. 2012	(36,737,183)	0%		0
	f. Total	15,549,672			(4,692,470)
9.	Actuarial value of assets (Item 3 - Item 8f)			$	732,926,710

Exhibit C.4
Average Annual Rates of Investment Return

Fiscal Year Ended June 30,	Actuarial Value	Market Value
2013	4.1 %	14.3 %
2014	13.8	19.1
2015	12.1	4.3
2016	8.0	2.5

SECTION D

SUMMARY OF BENEFIT PROVISIONS

SUMMARY OF BENEFIT PROVISIONS

JUNE 30, 2016

NORMAL RETIREMENT (NO REDUCTION FACTOR)

Eligibility :

Tier 1 – Members hired before July 1, 2011. Age 62, or a combination of age and creditable service equal to 80 (for those hired on or after July 1, 2009, eligibility at age 62 requires a minimum of 5 years of accrued service).

Tier 2 – Members hired on or after July 1, 2011. Age 65 with 5 years of service or a combination of age and creditable service equal to 85 and the attainment of age 60.

Amount - Creditable service times 2.25% of average final compensation for Tier 1 and 2.00% of average final compensation for Tier 2.

Average Final Compensation - The average monthly creditable compensation for the period of 36 consecutive months during which the member's creditable compensation was the highest during the 120 months immediately preceding the date of retirement for Tier 1 and 60 consecutive months during which the member's creditable compensation was the highest during the 120 months immediately preceding the date of retirement for Tier 2. Effective July 1, 2000, accrued unused sick leave at the final salary shall be substituted for an equal number of hours at the beginning of the 36 month period for Tier 1.

EARLY RETIREMENT (REDUCTION FACTOR)

Eligibility - Age 55 with 20 or more years of creditable service for Tier 1 and age 60 with 20 or more years of creditable service tor Tier 2.

Amount - An amount computed as for normal retirement but reduced by 1/2 of 1% per month for each month (6% per year) retirement precedes normal retirement.

DEFERRED RETIREMENT (VESTED TERMINATION)

Eligibility - 5 or more years of accrued service. Deferred retirement benefits for terminated vested employee becomes automatic at age 62 (age 65 for Tier 2) or when a combination of age and creditable service equals 80 (85 with the attainment of age 60 for Tier 2), unless the member elects to withdraw the employee contribution account in lieu of a deferred retirement benefit. In addition to the eligibility listed above, the term-vested member may chose an Early Retirement (minimum age of 55 for Tier 1 and 60 for Tier 2 and minimum service of 20 yrs) subject to the

same reduction – reduced by ½ of 1% per month for each month (6% per year) retirement precedes normal retirement eligibility.

Amount - An amount computed as for normal retirement.

DISABILITY RETIREMENT

Eligibility - Eligibility requires 10 or more years of credited service and a disability that is total and permanent.

Amount - An amount computed as for normal retirement. Disability Retirement Benefits are offset, if the combination of all employer-provided benefits exceeds 100% of the members adjusted income base, then members pension benefit from TSRS is reduced so income does not exceed the 100% maximum allowed.

PRE-RETIREMENT SURVIVOR BENEFITS

Eligibility - 5 or more years of accrued service and not eligible to retire.

Amount - Lump sum payment equal to twice the member's contributions, with interest.

Eligibility - After attaining eligibility for retirement, in the event the member dies prior to submitting an application for retirement benefits:

Amount - If the member is married, a default provision allows the member's spouse to elect to receive either a lump sum payment of twice the member's contributions account, or receive a lifetime annuity benefit determined as if the member had elected a joint & last survivor benefit of 100% survivor annuity prior to death. If the member is not married and has named a single non-spousal beneficiary, the beneficiary may elect to receive either a lump sum payment of twice the member's contributions account, or receive a 15 year annuity benefit determined as if the member elected payment of a 15 year term certain annuity. If the member has named multiple designated beneficiaries, a lump sum refund of the member's account balance will be paid to the named beneficiaries.

OTHER TERMINATION BENEFITS

Eligibility - Termination of employment without eligibility for any other benefit.

Amount - Accumulated contributions and interest in members account at time of termination.

EMPLOYEE CONTRIBUTIONS

Interest is credited to member accumulated contributions accounts as simple interest two times per year at an annual interest rate of 6%. For those hired prior to July 1, 2006, employee

contributions are 5.00% of salary. For those hired between July 1, 2006 and June 30, 2011 (Tier I variable class) and for those hired after July 1, 2011 (Tier II variable class), employee contributions are 50% of the respective Normal Cost for each class, with a floor of 5.0%. The employee contributions for the Tier I and Tier II variable classes for FY 17/18 are 6.55% and 4.89%, respectively, before application of the floor or roundup policy.

CITY CONTRIBUTIONS

City Contributions are actuarially determined; which together with employee contributions and investment earnings will fund the obligations of the System in accordance with generally accepted actuarial principles. (please refer to the Funding Policy in Section I of this report).

POST-RETIREMENT ADJUSTMENTS

The TSRS Board has established formal policies to determine whether the system shall fund an annual supplemental post-retirement benefit payment to retired members and beneficiaries.

SECTION E

SUMMARY OF PARTICIPANT DATA

Exhibit E.1
Tucson Supplemental Retirement System
Summary of Census Data

	July 1, 2016	July 1, 2015
1. **Active Members**		
a. Counts	2,495	2,665
b. Annual Covered Payroll	$ 115,183,349	$ 123,414,560
c. Average Annual Compensation	$ 46,166	$ 46,309
d. Average Age	47.8	48.0
e. Average Service	11.9	12.1
f. Accumulated Member Contributions with Interest	$ 119,316,146	$ 129,747,618
2. **NonVested Members with Refunds Due**		
a. Counts	78	44
b. Amount of Refunds Due	$ 302,936	$ 196,907
3. **Deferred Vested Members**		
a. Counts	312	284
b. Annual Deferred Benefits	$ 3,602,119	$ 3,159,384
c. Average Benefit	$ 11,545	$ 11,125
4. **Retired Members**		
a. Counts	2,435	2,305
b. Annual Benefits	$ 64,045,953	$ 60,085,166
c. Average Benefit	$ 26,302	$ 26,067
5. **Beneficiaries**		
a. Counts	315	309
b. Annual Benefits	$ 3,699,929	$ 3,587,750
c. Average Benefit	$ 11,746	$ 11,611
6. **Disabled Retirees**		
a. Counts	155	160
b. Annual Benefits	$ 2,057,306	$ 2,091,109
c. Average Benefit	$ 13,273	$ 13,069
7. **Alternate Payees**	40	35
8. Total Members Included in Valuation	5,830	5,802

Exhibit E.2
Summary of Changes in Participant Status
During Fiscal Year 2016

	Active Participants	Terminated Vested	Terminated Non-vested	Retirees	Disabled Retirees	Beneficiaries	Alternate Payees	Total
A. Number as of June 30, 2015	2,665	284	44	2,305	160	309	35	5,802
1. Age Retirements	(179)	(9)		188				-
2. Disability Retirements	(5)				5			-
3. Deceased	(1)			(58)	(10)	(10)		(79)
5. Terminated - Deferred	(46)	46						-
6. Terminated - Due Refund	(65)		65					-
7. Cashouts	(105)	(7)	(31)					(143)
8. Rehired as Active	2	(2)						-
9. New Hires	230					16	4	250
10. Expired Benefits								-
11. Data Adjustments	(1)						1	-
B. Number as of June 30, 2016	2,495	312	78	2,435	155	315	40	5,830

Exhibit E.3
Active Member Counts by Age and Service
as of July 1, 2016

Age	Service							
	0-4	5-9	10-14	15-19	20-24	25-29	Over 30	Total
Under 20	1	0	0	0	0	0	0	1
20-24	27	0	0	0	0	0	0	27
25-29	126	5	1	0	0	0	0	132
30-34	149	38	20	2	0	0	0	209
35-39	120	43	49	30	0	0	0	242
40-44	102	56	85	66	21	0	0	330
45-49	89	47	87	98	60	11	1	393
50-54	78	52	83	89	99	26	14	441
55-59	73	45	83	117	56	35	25	434
60-64	50	25	40	46	24	23	16	224
65-69	5	3	12	9	6	5	12	52
Over 70	1	1	2	2	2	1	1	10
Total	821	315	462	459	268	101	69	2,495

Exhibit E.4
Active Member Average Salary by Age and Service
as of July 1, 2016

Age	Service							
	0-4	5-9	10-14	15-19	20-24	25-29	Over 30	Total
Under 20	*	*	*	*	*	*	*	*
20-24	$31,613	*	*	*	*	*	*	$31,613
25-29	35,298	33,555	*	*	*	*	*	35,190
30-34	36,480	39,097	33,901	*	*	*	*	36,687
35-39	37,689	39,642	40,858	46,296	*	*	*	39,745
40-44	39,056	42,777	45,015	46,630	45,743	*	*	43,163
45-49	43,733	40,646	45,357	49,888	58,066	63,207	*	48,032
50-54	44,627	41,978	46,667	51,787	55,712	61,268	51,565	49,833
55-59	42,886	41,777	44,469	51,532	56,868	61,140	59,153	49,618
60-64	50,105	49,042	46,947	51,366	56,541	70,416	63,262	53,396
65-69	52,104	*	55,290	53,881	57,391	55,665	72,854	59,938
Over 70	*	*	*	*	*	*	*	65,869
Total	$39,680	42,052	44,730	50,095	56,243	63,695	60,785	$46,166

**Data excluded when cell contains less than five active members.*

SECTION F

HISTORICAL SCHEDULES

Exhibit F.1
Tucson Supplemental Retirement System
Schedule of Funding Progress
$ in thousands

Actuarial Valuation Date	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Unfunded AAL (UAAL)	Funded Ratio	Covered Payroll	UAAL as a Percentage of Covered Payroll
(1)	(2)	(3)	(4)=(3)-(2)	(5)=(2)/(3)	(6)	(7)=(4)/(6)
6/30/1991	$ 164,268	$ 175,537	$ 11,269	93.6%	$86,830	13.0%
6/30/1992	179,570	187,812	8,242	95.6%	86,205	9.6%
6/30/1993	197,282	208,024	10,742	94.8%	92,867	11.6%
6/30/1994	213,541	230,026	16,485	92.8%	94,180	17.5%
6/30/1995	237,713	249,049	11,336	95.4%	99,847	11.4%
6/30/1996	266,740	269,186	2,446	99.1%	105,230	2.3%
6/30/1997	304,684	297,490	(7,194)	102.4%	110,189	-6.5%
6/30/1998	353,057	348,966	(4,090)	101.2%	113,729	-3.6%
6/30/1999	402,875	400,224	(2,651)	100.7%	126,817	-2.1%
6/30/2000	453,954	437,750	(16,204)	103.7%	134,088	-12.1%
6/30/2001[1]	470,672	486,702	16,030	96.7%	145,059	11.1%
6/30/2001[2]	470,672	495,359	24,687	95.0%	145,059	17.0%
6/30/2002	463,102	553,947	90,845	83.6%	153,580	59.2%
6/30/2003	458,857	601,173	142,316	76.3%	143,164	99.4%
6/30/2004	494,987	645,351	150,364	76.7%	149,782	100.4%
6/30/2005	538,789	693,871	155,082	77.6%	162,149	95.6%
6/30/2006[1]	588,228	734,377	146,149	80.1%	155,855	93.8%
6/30/2006[2]	588,228	735,793	147,565	79.9%	155,855	94.7%
6/30/2007[1]	634,763	758,427	123,663	83.7%	159,250	77.7%
6/30/2007[2,3]	634,763	763,539	128,776	83.1%	159,250	80.9%
6/30/2008	650,227	822,205	171,978	79.1%	153,982	111.7%
6/30/2009	665,298	859,485	194,187	77.4%	149,925	129.5%
6/30/2010	641,819	904,480	262,662	71.0%	141,459	185.7%
6/30/2011	624,665	928,609	303,944	67.3%	121,631	249.9%
6/30/2012	597,107	940,939	343,832	63.5%	125,003	275.1%
6/30/2013	600,330	948,562	348,232	63.3%	125,858	276.7%
` 6/30/2014	655,998	1,012,393	356,396	64.8%	126,639	281.4%
6/30/2015	706,774	1,021,378	314,604	69.2%	123,415	254.9%
6/30/2016	732,927	1,030,695	297,768	71.1%	115,183	258.5%

[1] *Before benefit changes.*
[2] *After benefit changes.*
[3] *Reflects an ad hoc pension increase.*

The funded status measure may be appropriate for assessing the need for future contributions. The funded status is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

Exhibit F.2
Tucson Supplemental Retirement System
Schedule of Employer Contributions

Fiscal Year Ended June 30,	Annual Required Contribution	Actual City Contribution	Percentage Contributed
1996	8.55 %	8.18 %	95.67 %
1997	8.05	8.38	104.10
1998	8.05	8.38	104.10
1999	7.41	7.91	106.75
2000	6.07	7.35	121.09
2001	6.77	7.35	108.57
2002	6.30	7.35	116.67
2003	8.41	8.41	100.00
2004	11.17	11.17	100.00
2005	14.06	14.06	100.00
2006	14.83	14.83	100.00
2007	15.04	15.04	100.00
2008	15.21	15.21	100.00
2009	14.37	14.37	100.00
2010	16.84	16.84	100.00
2011	18.02	18.02	100.00
2012	23.38	23.38	100.00
2013	28.77	28.77	100.00
2014	27.09	27.09	100.00
2015	26.95	27.50	102.04
2016	27.03	27.50	101.74
2017	25.52	N/A	N/A
2018	25.78	N/A	N/A

Exhibit F.3
Tucson Supplemental Retirement System
Schedule of Retirees and Beneficiaries Added to and Removed from Rolls

	Added to Rolls		Removed from Rolls		Rolls End of Year			
Fiscal Year	Number	Annual Allowances	Number	Annual Allowances	Number	Annual Allowance	Average Annual Allowance	Percentage Increase in Allowance
6/30/2005	68	$3,498,948	42	$485,633	1,791	$ 31,990,842	17,796	
6/30/2006	101	$2,335,032	53	$656,383	1,878	$ 35,092,308	18,686	4.61%
6/30/2007	213	$6,055,096	36	$403,347	2,018	$ 39,883,032	19,764	5.77%
6/30/2008	313	$10,001,857	24	$395,246	2,307	$ 49,489,643	21,452	8.54%
6/30/2009	112	$2,005,399	54	$684,115	2,365	$ 50,810,927	21,485	0.15%
6/30/2010	141	$3,089,275	56	$784,935	2,450	$ 53,115,267	21,680	0.91%
6/30/2011	332	$9,880,306	73	$1,284,997	2,709	$ 61,710,576	22,780	5.07%
6/30/2012	64	$1,084,848	69	$1,057,560	2,704	$ 61,737,864	22,832	0.23%
6/30/2013	96	$2,027,292	81	$1,216,923	2,719	$ 62,548,233	23,004	0.75%
6/30/2014	114	$2,635,101	69	$907,497	2,764	$ 64,275,837	23,255	1.09%
6/30/2015	127	$3,157,078	82	$1,299,698	2,809	$ 66,133,217	23,543	1.24%
6/30/2016	214	$5,463,524	78	$1,339,953	2,945	$ 70,256,788	23,856	1.33%

*Figures Prior to 6/30/2008 were obtained from the TSRS CAFR

Exhibit F.4
Tucson Supplemental Retirement System
Comparative Schedule of Annual Pension Benefits Paid

Year Ending June 30	Retired Members	Annual Pensions	% Increase	No. of Active Per Retired	Pensions as % of Active Payroll	Average Pensions	Actuarial Present Value of Pensions	Expected Removals	
								No.	Pensions
1989 [1]	780	$ 5,344,719	17.6 %	4.2 [2]	6.6 %	$ 6,852	$ 46,556,352	26.6	$ 133,860
1990	832	6,488,714	21.4	3.9	7.5	7,799	57,430,128	28.5	150,864
1991 [1]	918	8,111,103	25.0	3.5	9.3	8,836	72,419,436	29.8	172,608
1992	965	9,010,345	11.1	3.3	10.5	9,337	80,342,604	32.3	208,068
1993 [1]	989	9,704,929	7.7	3.3	10.5	9,813	85,832,484	34.3	235,068
1994	1,035	10,612,612	9.4	3.2	11.3	10,254	95,449,308	35.8	263,340
1995 [1]	1,065	11,429,402	7.7	3.1	11.4	10,732	102,511,728	35.8	270,600
1996	1,105	12,236,298	7.1	3.1	11.6	11,074	109,572,672	37.7	302,952
1997 [1]	1,156	13,391,185	9.4	3.0	12.2	11,594	119,508,312	39.4	325,440
1998	1,208	14,479,476	8.1	2.9	12.7	11,986	129,345,816	42.4	370,344
1999 [1]	1,260	15,721,865	8.6	2.8	12.4	12,478	139,805,832	44.2	402,504
2000 [1]	1,301	16,966,042	7.9	2.8	12.7	13,041	150,527,136	46.2	445,464
2001 [1]	1,355	18,505,247	9.1	2.7	12.8	13,657	161,740,968	47.1	484,776
2002 [1]	1,442	21,273,162	15.0	2.5	13.9	14,753	187,508,568	53.3	622,236
2003 [1]	1,742	29,767,500	39.9	1.9	20.8	17,088	275,193,384	58.2	742,908
2004 [1]	1,753	30,491,864	2.4	2.0	20.4	17,394	286,698,084	55.7	717,888
2005 [1]	1,793	32,027,305	5.0	2.0	19.8	17,862	298,395,396	58.3	781,152
2006 [1]	1,878	35,091,468	9.6	1.7	22.5	18,686	326,828,088	61.1	857,760
2007 [1]	2,018	39,883,032	13.7	1.6	25.0	19,764	371,497,680	66.3	977,328
2008	2,307	49,489,643	24.1	1.4	32.1	21,452	473,240,976	74.4	1,134,019
2009	2,365	50,810,927	2.7	1.3	33.9	21,485	494,923,021	63.8	994,553
2010	2,450	53,115,267	4.5	1.2	37.5	21,680	525,200,232	58.9	948,815
2011	2,709	61,710,576	16.2	1.0	50.7	22,780	614,497,202	63.5	1,059,171
2012	2,704	61,737,864	0.0	1.0	49.4	22,832	607,450,331	66.1	1,125,302
2013	2,719	62,548,233	1.3	1.0	49.7	23,004	609,558,963	69.0	1,200,744
2014	2,764	64,275,837	2.8	1.0	50.8	23,255	647,811,688	70.4	1,219,112
2015	2,809	66,133,217	2.9	0.9	53.6	23,543	661,292,061	73.7	1,301,409
2016	2,945	70,256,788	6.2	0.8	61.0	23,856	699,577,704	75.9	1,392,573

[1] Includes ad-hoc cost-of-living increases.
[2] Reflects increase in the number of active members as a result of an amendment which eliminated the one year service requirement for participation in the Retirement System.

Exhibit F.5
Tucson Supplemental Retirement System
Solvency Test

Valuation Date	Aggregate Accrued Liabilities For (1) Active Member Contributions	(2) Retirants and Beneficiaries	(3) Active Member (Employer Financed Portion)	Valuation Assets	Portion of Accrued Liabilities Covered by Reported Assets (1)	(2)	(3)
6/30/1991	$ 44,496,039	$ 72,419,436	$ 86,372,322	$164,268,134	100.0 %	100.0 %	54.8 %
6/30/1992	49,238,019	80,342,604	86,902,648	179,569,858	100.0	100.0	57.5
6/30/1993	55,146,786	85,832,484	98,492,344	197,281,861	100.0	100.0	57.2
6/30/1994	60,424,161	95,449,308	105,838,311	213,540,661	100.0	100.0	54.5
6/30/1995	66,316,408	102,511,728	113,211,848	237,712,863	100.0	100.0	60.8
6/30/1996	72,294,235	109,572,672	118,739,900	266,740,007	100.0	100.0	71.5
6/30/1997	78,991,358	119,508,312	128,878,531	304,684,444	100.0	100.0	82.4
6/30/1998	85,106,175	129,345,816	134,514,294	353,056,577	100.0	100.0	103.0
6/30/1999	92,367,491	139,805,832	168,050,794	402,875,158	100.0	100.0	101.6
6/30/2000	100,413,022	150,527,136	186,809,583	453,953,722	100.0	100.0	108.7
6/30/2001	108,696,394	161,740,968	224,921,223	470,671,667	100.0	100.0	89.0
6/30/2002	118,913,979	187,508,568	247,524,186	463,101,526	100.0	100.0	63.3
6/30/2003	110,195,709	275,193,384	215,784,329	458,856,831	100.0	100.0	34.0
6/30/2004	123,643,527	286,698,084	235,009,321	494,986,798	100.0	100.0	36.0
6/30/2005	135,346,297	298,395,396	260,129,138	538,788,828	100.0	100.0	40.4
6/30/2006	140,387,532	326,828,088	268,577,863	588,227,845	100.0	100.0	45.1
6/30/2007	136,028,896	371,497,680	256,012,354	634,763,193	100.0	100.0	49.7
6/30/2008	125,331,432	473,240,976	223,632,380	650,227,215	100.0	100.0	23.1
6/30/2009	133,633,947	494,923,021	230,928,190	665,298,494	100.0	100.0	15.9
6/30/2010	140,224,998	525,200,232	239,055,106	641,818,551	100.0	95.5	0.0
6/30/2011	119,049,097	614,497,202	195,062,492	624,664,880	100.0	82.3	0.0
6/30/2012	122,240,396	607,450,331	211,247,995	597,106,511	100.0	78.2	0.0
6/30/2013	138,342,388	609,558,963	200,661,102	600,330,066	100.0	75.8	0.0
6/30/2014	142,418,791	647,811,688	222,162,858	655,997,802	100.0	79.3	0.0
6/30/2015	143,648,835	661,292,061	216,436,668	706,773,630	100.0	85.2	0.0
6/30/2016	133,200,540	699,577,704	197,916,702	732,926,710	100.0	85.7	0.0

SECTION G

ACTUARIAL ASSUMPTIONS AND METHODS

SUMMARY OF ACTUARIAL METHODS AND ASSUMPTIONS

I. Valuation Date

The valuation date is July 1st of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the employer contribution rate is the sum of (i) the employer normal cost rate, and (ii) a rate that will amortize the unfunded actuarial liability.

1. The valuation is prepared on the projected benefit basis. The present value of each participant's expected benefit payable at retirement or termination is determined, based on age, service, sex, compensation, and the interest rate assumed to be earned in the future (7.25%). The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service benefit. Future salary increases are also anticipated. The present value of the expected benefits payable on account of the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Plan on account of the present group of participants and beneficiaries.

2. The employer contributions required to support the benefits of the Plan are determined following a level funding approach, and consist of a normal cost contribution and an accrued liability contribution.

3. The normal contribution is determined using the Entry Age Normal method. Under this method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution which, if applied to the compensation of each new participant during the entire period of his anticipated covered service, would be required in addition to the contributions of the participant to meet the cost of all benefits payable on their behalf. Effective July 1, 2013 the TSRS funding policy requires the computation of normal cost separately for those members in Tier 1 and Tier 2 (the variable rate tiers).

4. The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability and amortizing the result over 20 years from the valuation date as a level percentage of pay. It is assumed that payments are made throughout the year.

5. Administrative expenses for the recent year will be added to the employer normal cost in the current valuation and will be reflected in the recommended employer rate for the upcoming fiscal year.

III. Actuarial Value of Assets

The actuarial value of assets is based on recognizing gains and losses over a five-year period where gains and losses are determined by comparing the projected market value return (based on the prior year's market value of assets, cash flows during the year and expected investment returns on those amounts) to the actual market investment return.

IV. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.25% per annum, compounded annually, composed of an assumed 3.00% inflation rate and a 4.25% real rate of return. This rate represents the assumed return, net of all investment expenses.

2. Salary increase rate:

Sample Attained Age	Percentage Increase in Salary with Less than Five Years of Service		
	Merit	Inflation	Total
0	3.50 %	3.00 %	6.50 %
1	3.00	3.00	6.00
2	2.50	3.00	5.50
3	2.00	3.00	5.00
4	1.50	3.00	4.50

Sample Attained Age	Percentage Increase in Salary with Five or More Years of Service		
	Merit	Inflation	Total
25	1.50 %	3.00 %	4.50 %
30	1.50	3.00	4.50
35	1.50	3.00	4.50
40	1.00	3.00	4.00
45	0.50	3.00	3.50
50	0.25	3.00	3.25
55	0.25	3.00	3.25
60	0.25	3.00	3.25
65	0.00	3.00	3.00

3. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 3.00% per year. This increase rate is primarily due to the effect of inflation on salaries, with no allowance for future membership growth.

B. Demographic Assumptions

1. Mortality rates (pre- and post-retirement) – RP-2000 Combined Mortality Table for males and females projected with Scale BB to 2020. Mortality rates were adjusted to include margin for future mortality improvement as described in the table name above.

2. Mortality rates (post-disablement) – RP-2000 Disabled Mortality Table for males and females.

Sample Attained Ages	Probability of Death Pre- and Post-Retirement	
	Men	Women
20	0.03 %	0.02 %
25	0.04	0.02
30	0.04	0.02
35	0.07	0.04
40	0.10	0.07
45	0.14	0.11
50	0.20	0.16
55	0.34	0.25
60	0.59	0.41
65	1.00	0.76
70	1.64	1.32
75	2.80	2.21
80	4.76	3.60
85	8.19	6.08
90	14.70	10.55

Sample Attained Ages	Probability of Death Post-Disability	
	Men	Women
20	2.26 %	0.75 %
25	2.26	0.75
30	2.26	0.75
35	2.26	0.75
40	2.26	0.75
45	2.26	0.75
50	2.90	1.15
55	3.54	1.65
60	4.20	2.18
65	5.02	2.80
70	6.26	3.76
75	8.21	5.22
80	10.94	7.23
85	14.16	10.02
90	18.34	14.00

3. Disability rates. Sample rates shown below:

Sample Attained Ages	Probability of Disablement Next Year	
	Men	Women
25	0.01 %	0.01 %
30	0.07	0.07
35	0.09	0.09
40	0.14	0.14
45	0.17	0.17
50	0.25	0.25
55	0.36	0.36
60	0.48	0.48

4. Termination rates (for causes other than death, disability or retirement): Termination rates are based on service and age. Termination rates are not applied after a member becomes eligible for a retirement benefit. Rates are shown:

Sample Attained Age	Years of Credible Service	Probability of Termination
Any	0	18.00 %
	1	13.00
	2	10.00
	3	8.00
	4	7.50
20	5 & over	7.05
25		7.05
30		6.65
35		4.65
40		3.65
45		2.95
50		2.55
55		2.45

5. Forfeiture rates: The percentages below represent the probability that a vested terminated member will take a refund of contributions rather than receive a deferred annuity benefit.

Sample Ages	% of Vested Terminating Members Choosing Refund at Termination
Under 30	50 %
30	45
35	40
40	35
45	30
50	25
55	20
60 and Over	0

6. Retirement rates for Tier 1. For those ages 62+, the Rule of 80 retirement rates only applies if the Rule of 80 is attained by age 62.

Attained Age	Tier 1 Members Percentage of Those Eligible Retiring During the Year		
	Rule of 80	Age Based	Early
50-54	27.0 %		
55-59	27.0		8.5 %
60	27.0		
61	27.0		
62	27.0	33.0 %	
63	27.0	16.0	
64	27.0	20.0	
65	27.0	24.0	
66-69	27.0	35.0	
70 & Over	100.0	100.0	

Retirement rates for Tier 2. For those ages 65+, the Rule of 85 retirement rates only applies if the Rule of 85 is attained by age 65.

Attained Age	Tier 2 Members Percentage of Those Eligible Retiring During the Year		
	Rule of 80	Age Based	Early
60	27.0 %		8.5 %
61	27.0		8.5
62	27.0		8.5
63	27.0		8.5
64	27.0		8.5
65	27.0	24.0 %	
66-69	27.0	35.0	
70 & Over	100.0	100.0	

Deferred vested members are assumed to retire at age first eligibility for unreduced benefits.

C. Other Assumptions

1. Percent married: 80% of employees are assumed to be married.
2. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.
3. Cost of living adjustment: None.
4. Optional forms: Members are assumed to elect the normal form of benefit.
5. Current and future deferred vested participants are assumed to retire at the earlier of age 62 and eligibility for rule of 80 for tier 1 and the earlier of age 65 and eligibility for the rules of 85 (but at least 60) for Tier 2.
6. Administrative expenses: Administrative expenses are added to the employer normal cost , before application of the round up policy.
7. Pay increase timing: End of year.
8. Decrement timing: Decrements of all types are assumed to occur mid-year.

9. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

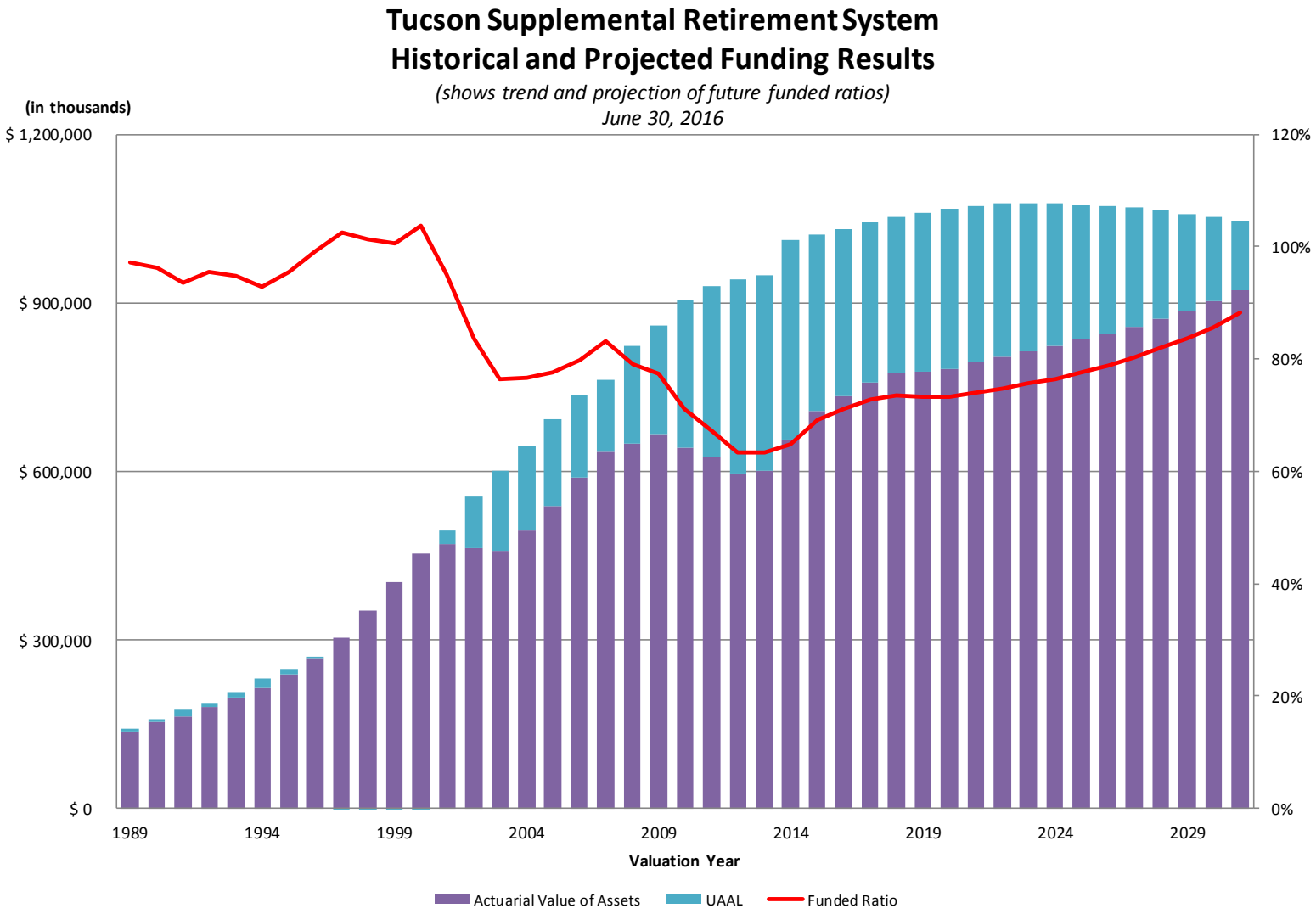
10. Decrement relativity: Decrement rates are used directly, without adjustment for multiple decrement table effects.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Benefit and Eligibility Service due to Accrued Sick and Vacation Leave at Retirement and Termination: Tier 1 Members are assumed to have an additional 0.019 years per year of benefit and eligibility service at early or normal retirement and termination due to accrued sick and vacation leave. This assumption was developed using sick and vacation leave and service amounts for active members included in the actuarial valuation as of June 30, 2013.

SECTION H

30-YEAR DETERMINISTIC PROJECTIONS



Funding policy reflects 27.50% of pay minimum City contribution until full funding is reached.

SECTION I

Funding Policy of the TSRS Board

Basis for variable employee contribution rates

Effective July 1, 2013 the contribution requirement for members hired after July 1, 2006 was changed from 40% of the Actuarial Required Contribution (or "ARC," as defined below) to a range of 50% to 100% of the normal cost of their given tier. In no event shall the variable contribution tier members contribute less than 5% of pay as set forth in TCC §22-34(a) and (b). Members hired prior to 7/1/2006 contribute 5% of pay.

Amortization Policy

The Board has adopted a 20 year open, level percent of pay amortization policy. A single unfunded amount is determined with each actuarial valuation, and that amount is then amortized over a 20 year period, assuming that the contribution amounts will remain level as a percent of the total payroll (so the dollar amount of the contribution is assumed to grow each year). The Board's amortization policy was most recently revised effective July 1, 2013, and later updated effective June 30, 2016.

Administrative Expenses

The annual administrative expenses incurred by the System, based on the administrative operating budget approved by the Board in advance of the fiscal year and determined as of the end of the fiscal year, shall be included in the calculation of the Actuarially Determined Contribution in accordance with sound actuarial principles. Administrative expenses paid by the System and included in the calculation of the ADC shall be reasonable and appropriate, and shall include staff salaries and related overhead expenses, actuarial, legal and other professional consulting fees, accounting charges, compliance expenses, and other fees and expenses necessary for the efficient administration of the System. Investment fees and expenses shall not be included in the calculation of the ADC.

Contribution Rounding Policy

I. Member Contribution Rates: Member Contributions for Legacy Members, Tier I Members and Tier II Members shall be determined by the TSRS actuary pursuant to TCC Section 22-34: members hired prior to July 1, 2006 (the "Legacy Members"), members hired between July 1, 2006 and June 30, 2011 ("Tier I Members") and members hired on or after July 1, 2011 ("Tier II Members"). The actuarially determined Member Contribution rate for each group shall be referred to as the "Calculated Rate" for the applicable group.

   The Board will then review the Calculated Rate for each member group and set the "Charged Rate" for the upcoming fiscal year. The Charged Rate will equal the Calculated Rate, rounded up to the nearest 0.25. The Charged Rate for a member group shall never be less than the Calculated Rate for that member group (for that same fiscal year). The Charged Rate for the legacy members is set at 5.00%.

II. City Contribution Rates: The City Contribution rate for a particular fiscal year equals the difference between the Actuarially Determined Contribution and the Member Contribution rate(s). TCC §22-30(t). Because there are three different Member Contribution rates, the TSRS actuary shall calculate a City Contribution rate for each member group and a blended City Contribution rate for the entire member population. In no event shall the blended City Contribution rate for the entire member population be less than the City Contribution rate for any member group. The City Contribution rates calculated by the TSRS actuary are referred to as the "Calculated Rates."

The Board will then review the Calculated Rates and set the "Charged Rate" for the City Contribution for the upcoming fiscal year. The Charged Rate will equal the blended Calculated City Contribution rate, rounded up to the nearest 0.50. The Charged Rate shall be rounded up to the nearest 0.50 instead of the nearest 0.25 because the Charged Rate is a blended rate. The Charged Rate shall never be less than the Calculated Rate for any member group for that same fiscal year.

III. Funded Status of TSRS: It is the goal of the Board to increase the funded status of TSRS. The Board anticipates that Calculated Rates for both Member Contributions and City Contributions may decrease from time to time, based on various actuarial factors. The Board will not recommend a decrease in the Charged Rate for Member and/or City Contributions until such point as TSRS is fully funded because the unfunded accrued liability has been extinguished, and the Calculated Rates for Member and City Contributions represent the payment of the normal cost of benefits only. Moreover, the Board shall recommend a decrease in the Charged Rates for Member Contributions only to the extent that the Charged Rates for Tier I Member Contributions and Tier II Member Contributions decrease simultaneously, in the same percentage of pay.

GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

TUCSON SUPPLEMENTAL RETIREMENT SYSTEM

GASB STATEMENT NOS. 67 AND 68 ACCOUNTING AND FINANCIAL REPORTING FOR PENSIONS

JUNE 30, 2016

GRS
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Denver, CO 80237-2746
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October 14, 2016

Board of Trustees
Tucson Supplemental Retirement System

Dear Board Members:

This report provides information required by the Tucson Supplemental Retirement System (TSRS) in connection with the Governmental Accounting Standards Board (GASB) Statement No. 67 "Financial Reporting for Pension Plans."

Our actuarial calculations for this report were prepared for the purpose of complying with the requirements of GASB Statements Nos. 67 and 68. These calculations have been made on a basis that is consistent with our understanding of this Statement.

Our calculation of the liability associated with the benefits described in this report was performed for the purpose of satisfying the requirements of GASB Statements Nos. 67 and 68. The Net Pension Liability is not an appropriate measure for measuring the sufficiency of plan assets to cover the estimated cost of settling the employer's benefit obligation. The Net Pension Liability is not an appropriate measure for assessing the need for or amount of future employer contributions. A calculation of the plan's liability for purposes other than satisfying the requirements of GASB Statement Nos. 67 and 68 may produce significantly different results. This report may be provided to parties other than the Tucson Supplemental Retirement System ("TSRS") only in its entirety and only with the permission of TSRS.

This report is based upon information, furnished to us by TSRS, concerning retirement and ancillary benefits, active members, deferred vested members, retirees and beneficiaries, and financial data. This information was checked for internal consistency, but it was not audited.

This report complements the actuarial valuation report that was provided to TSRS and should be considered in conjunction with that report. Please see the actuarial valuation report as of June 30, 2016 for additional discussion of the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

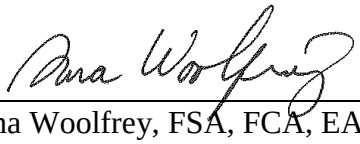
To the best of our knowledge, the information contained with this report is accurate and fairly represents the actuarial position of the Tucson Supplemental Retirement System. All calculations have been made in conformity with generally accepted actuarial principles and practices as well as with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

The signing actuaries are independent of the plan sponsor.

Leslie Thompson and Dana Woolfrey are members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,

By 
Leslie Thompson, FSA, FCA, EA, MAAA

By 
Dana Woolfrey, FSA, FCA, EA, MAAA

Auditor's Note – This information is intended to assist in preparation of the financial statements of the Tucson Supplemental Retirement System. Financial statements are the responsibility of management, subject to the auditor's review. Please let us know if the auditor recommends any changes.

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SECTION A

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY
AS OF JUNE 30, 2016

	2016
Actuarial Valuation Date	June 30, 2016
Measurement Date of the Net Pension Liability	June 30, 2016
Employer's Fiscal Year Ending Date (Reporting Date)	June 30, 2016
Membership	
Number of	
- Retirees and Beneficiaries	2,945
- Inactive, Nonretired Members	390
- Active Members	2,495
- Total	5,830
Covered Payroll	$ 115,183,349
Net Pension Liability	
Total Pension Liability	$ 1,030,694,946
Plan Fiduciary Net Position	728,234,240
Net Pension Liability	$ 302,460,706
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	70.65 %
Net Pension Liability as a Percentage of Covered Payroll	262.59 %
Development of the Single Discount Rate	
Single Discount Rate	7.25 %
Long-Term Expected Rate of Investment Return	7.25 %
Long-Term Municipal Bond Rate*	2.85 %
Last year ending June 30 in the 2017 to 2116 projection period for which projected benefit payments are fully funded	2116
Total Pension Expense	$ 27,504,176

Deferred Outflows and Deferred Inflows of Resources by Source to be recognized in Future Pension Expenses

	Deferred Outflows of Resources	Deferred Inflows of Resources
Difference between expected and actual experience	$ -	$ 9,076,059
Changes in assumptions	-	16,459,457
Net difference between projected and actual earnings on pension plan investments	40,741,121	-
Total	$ 40,741,121	$ 25,535,516

*Source: *"State & local bonds" rate from Federal Reserve statistical release (H.15) as of 42551. The statistical release describes this rate as "Bond Buyer Index, general obligation, 20 years to maturity, mixed quality." In describing this index, the Bond Buyer notes that the bonds' average credit quality is roughly equivalent to Moody's Investors Service's Aa2 rating and Standard & Poor's Corp.'s AA.*

DISCUSSION

Accounting Standard

For pension plans that are administered through trusts or equivalent arrangements, Governmental Accounting Standards Board (GASB) Statement No. 67 establishes standards of financial reporting for separately issued financial reports and specifies the required approach for measuring the pension liability. Similarly, GASB Statement No. 68 establishes standards for state and local government employers (as well as non-employer contributing entities) to account for and disclose the net pension liability, pension expense, and other information associated with providing retirement benefits to their employees (and former employees) on their basic financial statements.

The following discussion provides a summary of the information that is required to be disclosed under these accounting standards. A number of these disclosure items are provided in this report. However, certain information, such as notes regarding accounting policies and investments, is not included in this report and the retirement system and/or plan sponsor will be responsible for preparing and disclosing that information to comply with these accounting standards.

Financial Statements

GASB Statement No. 68 requires state or local governments to recognize the net pension liability and the pension expense on their financial statements. The net pension liability is the difference between the total pension liability and the plan's fiduciary net position. In traditional actuarial terms, this is analogous to the accrued liability less the market value of assets (not the smoothed actuarial value of assets that is often encountered in actuarial valuations performed to determine the employer's contribution requirement).

Paragraph 34 of GASB Statement No. 68 states, "Contributions to the pension plan from the employer subsequent to the measurement date of the collective net pension liability and before the end of the employer's reporting period should be reported as a deferred outflow of resources related to pensions." The information contained in this report does not incorporate any contributions made to TSRS subsequent to the measurement date of June 30, 2016.

The pension expense recognized each fiscal year is equal to the change in the net pension liability from the beginning of the year to the end of the year, adjusted for deferred recognition of the liability and investment experience.

Pension plans that prepare their own, stand-alone financial statements are required to present two financial statements – a statement of fiduciary net position and a statement of changes in fiduciary net position in accordance with GASB Statement No. 67. The *statement of fiduciary net position* presents the assets and liabilities of the pension plan at the end of the pension plan's reporting period. The *statement of changes in fiduciary net position* presents the additions, such as contributions and investment income, and deductions, such as benefit payments and expenses, and net increase or decrease in the fiduciary net position.

Notes to Financial Statements

GASB Statement No. 68 requires the notes of the employer's financial statements to disclose the total pension expense, the pension plan's liabilities and assets, and deferred outflows and inflows of resources related to pensions.

GASB Statement Nos. 67 and 68 require the notes of the financial statements for the employers and pension plans to include certain additional information. The list of disclosure items should include:

- a description of benefits provided by the plan;
- the type of employees and number of members covered by the pension plan;
- a description of the plan's funding policy, which includes member and employer contribution requirements;
- the pension plan's investment policies;
- the pension plan's fiduciary net position and the net pension liability;
- the net pension liability using a discount rate that is 1% higher and 1% lower than used to calculate the total pension liability and net pension liability for financial reporting purposes;
- significant assumptions and methods used to calculate the total pension liability;
- inputs to the discount rates; and
- certain information about mortality assumptions and the dates of experience studies.

Retirement systems that issue stand-alone financial statements are required to disclose additional information in accordance with GASB Statement No. 67. This information includes:

- the composition of the pension plan's Board and the authority under which benefit terms may be amended;
- a description of how fair value is determined;
- information regarding certain reserves and investments, which include concentrations of investments greater than or equal to 5%, receivables, and insurance contracts excluded from plan assets;
- annual money-weighted rate of return;

Required Supplementary Information

GASB Statement No. 67 requires a 10-year fiscal history of:

- sources of changes in the net pension liability;
- information about the components of the net pension liability and related ratios, including the pension plan's fiduciary net position as a percentage of the total pension liability, and the net pension liability as a percent of covered-employee payroll; and
- a comparison of the actual employer contributions to the actuarially determined contributions based on the plan's funding policy.

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.25% on the actuarial value of assets), then the following outcomes are expected:

1. The employer normal cost as a percentage of pay is expected to decrease over time as the percentage of Tier 2 employees increases. Once all active members are Tier 2, the normal cost is expected to remain level as a percentage of payroll.
2. The funded status of the plan is expected to increase gradually towards a 100% funded ratio.

This funding policy results in an expected crossover date in 2116 and a GASB single discount rate of 7.25%. The projections in this report are strictly for the purpose of determining the GASB single discount rate and are different from a funding projection for the ongoing plan.

Timing of the Valuation

An actuarial valuation to determine the total pension liability is required to be performed at least every two years. The net pension liability and pension expense should be measured as of the pension plan's fiscal year end (measurement date) on a date that is within the employer's prior fiscal year. If the actuarial valuation used to determine the total pension liability is not calculated as of the measurement date, the total pension liability is required to be rolled forward from the actuarial valuation date to the measurement date.

The total pension liability shown in this report is based on an actuarial valuation performed as of June 30, 2016 and a measurement date of June 30, 2016.

Single Discount Rate

Projected benefit payments are required to be discounted to their actuarial present values using a Single Discount Rate that reflects (1) a long-term expected rate of return on pension plan investments (to the extent that the plan's fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating (which is published by the Federal Reserve) as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.25%; the municipal bond rate is 2.85% (based on the weekly rate closest to but not later than the measurement date of the "state & local bonds" rate from Federal Reserve statistical release (H.15)); and the resulting Single Discount Rate is 7.25%.

Effective Date and Transition

GASB Statement Nos. 67 and 68 are effective for fiscal years beginning after June 15, 2013, and June 15, 2014 respectively, earlier application is encouraged by the GASB.

SECTION B

FINANCIAL STATEMENTS

Auditor's Note – This information is intended to assist in preparation of the financial statements of the Tucson Supplemental Retirement System. Financial statements are the responsibility of management, subject to the auditor's review. Please let us know if the auditor recommends any changes.

PENSION EXPENSE UNDER GASB STATEMENT NO. 68
FISCAL YEAR ENDED JUNE 30, 2016

A. Expense

1. Service Cost	14,279,065
2. Interest on the Total Pension Liability	72,013,831
3. Current-Period Benefit Changes	-
4. Employee Contributions (made negative for addition here)	(7,328,927)
5. Projected Earnings on Plan Investments (made negative for addition here)	(52,570,020)
6. Pension Plan Administrative Expense	786,028
7. Other Changes in Plan Fiduciary Net Position	(142,092)
8. Recognition of Outflow (Inflow) of Resources due to Liabilities	(10,797,436)
9. Recognition of Outflow (Inflow) of Resources due to Assets	11,263,727
10. Total Pension Expense	**27,504,176**

STATEMENT OF OUTFLOWS AND INFLOWS ARISING FROM CURRENT REPORTING PERIOD

FISCAL YEAR ENDED JUNE 30, 2016

A. Outflows (Inflows) of Resources due to Liabilities

1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	$	(6,529,764)
2. Assumption Changes (gains) or losses	$	-
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years}		4.1451
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience of the Total Pension Liability	$	(1,575,297)
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for assumption changes	$	-
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	(1,575,297)
7. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for the difference between expected and actual experience of the Total Pension Liability	$	(4,954,467)
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for assumption changes	$	-
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	(4,954,467)

B. Outflows (Inflows) of Resources due to Assets

1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	34,749,695
2. Recognition period for Assets {in years}		5.0000
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	$	6,949,939
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	27,799,756

STATEMENT OF OUTFLOWS AND INFLOWS ARISING FROM CURRENT AND PRIOR REPORTING PERIODS
FISCAL YEAR ENDED JUNE 30

A. Outflows and Inflows of Resources due to Liabilities and Assets to be Recognized in Current Pension Expense

	Outflows of Resources	Inflows of Resources	Net Outflows of Resources
1. Due to Liabilities	$ -	$ 10,797,436	$ (10,797,436)
2. Due to Assets	11,263,727	-	11,263,727
3. Total	$ 11,263,727	$ 10,797,436	$ 466,291

B. Outflows and Inflows of Resources by Source to be Recognized in Current Pension Expense

	Outflows of Resources	Inflows of Resources	Net Outflows of Resources
1. Differences between expected and actual experience	$ -	$ 3,422,136	$ (3,422,136)
2. Assumption Changes	-	7,375,300	(7,375,300)
3. Net Difference between projected and actual earnings on pension plan investments	11,263,727	-	11,263,727
4. Total	$ 11,263,727	$ 10,797,436	$ 466,291

C. Deferred Outflows and Deferred Inflows of Resources by Source to be Recognized in Future Pension Expenses

	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows of Resources
1. Differences between expected and actual experience	$ -	$ 9,076,059	$ (9,076,059)
2. Assumption Changes	-	16,459,457	(16,459,457)
3. Net Difference between projected and actual earnings on pension plan investments	40,741,121	-	40,741,121
4. Total	$ 40,741,121	$ 25,535,516	$ 15,205,605

D. Deferred Outflows and Deferred Inflows of Resources by Year to be Recognized in Future Pension Expenses

Year Ending June 30	Net Deferred Outflows of Resources
2017	$ 466,291
2018	466,291
2019	7,551,660
2020	6,721,363
2021	-
Thereafter	0
Total	$ 15,205,605

STATEMENT OF FIDUCIARY NET POSITION
AS OF JUNE 30, 2016

		2016
Assets		
Cash and Deposits	$	49,440,710
Receivables		
Accounts Receivable - Sale of Investments	$	912,620
Accrued Interest and Other Dividends		1,857,456
Contributions		1,451,362
Total Receivables	$	4,221,438
Investments		
Fixed Income	$	171,641,992
Domestic Equities		242,729,611
International Equities		167,960,887
Real Estate		64,188,363
Other		48,875,450
Total Investments	$	695,396,303
Total Assets	$	749,058,451
Liabilities		
Payables		
Accounts Payable - Purchase of Investments	$	20,824,211
Accrued Expenses		-
Total Liabilities	$	20,824,211
Net Position Restricted for Pensions	$	728,234,240

STATEMENT OF CHANGES IN FIDUCIARY NET POSITION FOR YEAR ENDED JUNE 30, 2016

		2016
Additions		
Contributions		
Employer	$	34,381,127
Employee		7,328,927
Other		-
Total Contributions	$	41,710,054
Investment Income		
Net Appreciation in Fair Value of Investments	$	8,758,641
Interest and Dividends		13,058,239
Less Investment Expense		(3,996,555)
Net Investment Income	$	17,820,325
Other	$	253,772
Total Additions	$	59,784,151
Deductions		
Benefit Payments, including Refunds of Employee Contributions	$	70,445,750
Pension Plan Administrative Expense		786,028
Other		111,680
Total Deductions	$	71,343,458
Net Increase in Net Position	$	(11,559,307)
Net Position Restricted for Pensions		
Beginning of Year	$	739,793,547
End of Year	$	728,234,240

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Auditor's Note – This information is intended to assist in preparation of the financial statements of the Tucson Supplemental Retirement System. Financial statements are the responsibility of management, subject to the auditor's review. Please let us know if the auditor recommends any changes.

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS
CURRENT PERIOD
FISCAL YEAR ENDED JUNE 30, 2016

A. Total pension liability		
1. Service Cost	$	14,279,065
2. Interest on the Total Pension Liability		72,013,831
3. Changes of benefit terms		-
4. Difference between expected and actual experience of the Total Pension Liability		(6,529,764)
5. Changes of assumptions		-
6. Benefit payments, including refunds of employee contributions		(70,445,750)
7. Net change in total pension liability	$	9,317,382
8. Total pension liability – beginning		1,021,377,564
9. Total pension liability – ending	**$**	**1,030,694,946**
B. Plan fiduciary net position		
1. Contributions – employer	$	34,381,127
2. Contributions – employee		7,328,927
3. Net investment income		17,820,325
4. Benefit payments, including refunds of employee contributions		(70,445,750)
5. Pension Plan Administrative Expense		(786,028)
6. Other		142,092
7. Net change in plan fiduciary net position	$	(11,559,307)
8. Plan fiduciary net position – beginning		739,793,547
9. Plan fiduciary net position – ending	**$**	**728,234,240**
C. Net pension liability	**$**	**302,460,706**
D. Plan fiduciary net position as a percentage of the total pension liability		**70.65%**
E. Covered-employee payroll	**$**	**115,183,349**
F. Net pension liability as a percentage of covered employee payroll		**262.59%**

SCHEDULES OF REQUIRED SUPPLEMENTARY INFORMATION
SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS MULTIYEAR

Last 10 Fiscal Years (which may be built prospectively)

Fiscal year ending June 30,	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Total Pension Liability										
Service Cost	$ 14,279,065	$ 15,753,944	$ 14,825,019							
Interest on the Total Pension Liability	72,013,831	70,688,775	66,915,612							
Benefit Changes	-	-	-							
Difference between Expected and Actual Experience	(6,529,764)	(7,815,270)	325,890							
Assumption Changes	-	(31,210,057)	76,945,563							
Benefit Payments	(67,910,496)	(65,216,458)	(63,714,857)							
Refunds	(2,535,254)	(2,395,893)	(2,287,156)							
Net Change in Total Pension Liability	9,317,382	(20,194,959)	93,010,070							
Total Pension Liability - Beginning	1,021,377,564	1,041,572,523	948,562,453							
Total Pension Liability - Ending (a)	$ 1,030,694,946	$ 1,021,377,564	$1,041,572,523							
Plan Fiduciary Net Position										
Employer Contributions	$ 34,381,127	$ 33,985,523	$ 34,189,288							
Employee Contributions	7,328,927	7,531,845	7,338,543							
Pension Plan Net Investment Income	17,820,325	30,684,188	119,729,154							
Benefit Payments	(67,910,496)	(65,216,458)	(63,714,857)							
Refunds	(2,535,254)	(2,395,893)	(2,287,156)							
Pension Plan Administrative Expense	(786,028)	(650,405)	(735,739)							
Other	142,092	118,247	171,077							
Net Change in Plan Fiduciary Net Position	(11,559,307)	4,057,047	94,690,310							
Plan Fiduciary Net Position - Beginning	739,793,547	735,736,500	641,046,190							
Plan Fiduciary Net Position - Ending (b)	$ 728,234,240	$ 739,793,547	$ 735,736,500							
Net Pension Liability - Ending (a) - (b)	302,460,706	281,584,017	305,836,023							
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	70.65 %	72.43 %	70.64 %							
Covered Employee Payroll	$ 115,183,349	$ 123,414,560	$ 126,639,423							
Net Pension Liability as a Percentage of Covered Employee Payroll	262.59 %	228.16 %	241.50 %							

Notes to Schedule:

N/A

SCHEDULES OF REQUIRED SUPPLEMENTARY INFORMATION
SCHEDULE OF THE NET PENSION LIABILITY MULTIYEAR

Last 10 Fiscal Years (which may be built prospectively)

FY Ending June 30,	Total Pension Liability	Plan Net Position	Net Pension Liability	Plan Net Position as a % of Total Pension Liability	Covered Payroll	Net Pension Liability as a % of Covered Payroll
2014	1,041,572,523	735,736,500	305,836,023	70.64 %	126,639,423	241.50 %
2015	1,021,377,564	739,793,547	281,584,017	72.43 %	123,414,560	228.16 %
2016	1,030,694,946	728,234,240	302,460,706	70.65 %	115,183,349	262.59 %

SCHEDULE OF CONTRIBUTIONS MULTIYEAR
LAST 10 FISCAL YEARS

Valuation Date	FY Ending June 30,	Actuarially Determined Contribution	Actual Contribution	Estimated Covered Payroll	Contribution Deficiency (Excess)
6/30/2012	2014	27.09%	27.09%	$ 125,857,903	0.00%
6/30/2013	2015	26.95%	27.50%	$ 126,639,423	-0.55%
6/30/2014	2016	27.03%	27.50%	$ 123,414,560	-0.47%
6/30/2015	2017	25.52%	N/A	$ 115,183,349	N/A
6/30/2016	2018	25.78%	N/A	N/A	N/A

NOTES TO SCHEDULE OF CONTRIBUTIONS

Valuation Date:	June 30, 2014
Notes	Actuarially determined contribution rates are calculated for the fiscal year beginning one year after the valuation date (one year lag). The actuarial valuation as of June 30, 2014 determines the contribution for fiscal year ending June 30, 2016.

Methods and Assumptions Used to Determine Contribution Rates:

Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Open
Remaining Amortization Period	20 years
Asset Valuation Method	5 Year smoothed market
Inflation	3.00%
Salary Increases	3.00% to 6.50% including inflation
Investment Rate of Return	7.25%
Retirement Age	Age-based table of rates that are specific to the type of eligibility condition. Last updated for the 2009 valuation pursuant to an experience study of the period 2009 - 2013.
Mortality	Pre and Post-retirement: RP-2000 Combined Mortality Table for males and females projected with Scale BB to 2020. Disabled retirement: RP-2000 Disabled Mortality Table for males and females.

Other Information:

Notes	There were no benefit changes during the year.

SCHEDULE OF INVESTMENT RETURNS MULTIYEAR
LAST 10 FISCAL YEARS

FY Ending June 30,	Annual Return[1]
2014	19.17 %
2015	4.17 %
2016	2.38 %

[1] *Annual money-weighted rate of return, net of investment expenses, provided by Callan.*

SECTION D

NOTES TO FINANCIAL STATEMENTS

Auditor's Note – This information is intended to assist in preparation of the financial statements of the Tucson Supplemental Retirement System. Financial statements are the responsibility of management, subject to the auditor's review. Please let us know if the auditor recommends any changes.

Long-Term Expected Return on Plan Assets

The assumed rate of investment return was adopted by the plan's trustees after considering input from the plan's investment consultant(s) and actuary(s). Additional information about the assumed rate of investment return is included in our actuarial valuation report as of June 30, 2015.

The long-term expected rate of return on pension plan investments was determined using a building-block method in which expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These real rates of return are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. For each major asset class that is included in the pension plan's target asset allocation as of June 30, 2016, these best estimates are summarized in the following table:

ASSET ALLOCATION

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return	Allocation-Weighted Long-Term Expected Real Rate of Return
Domestic Fixed Income	27.00%	0.75%	0.20 %
Domestic Equity	34.00%	5.10%	1.73 %
International Equity	25.00%	5.00%	1.25 %
Real Estate	9.00%	3.75%	0.34 %
Infrastructure	5.00%	4.00%	0.20 %

The expected real rates of return were obtained from Callan's 2016 Capital Market Projections. Gabriel, Roeder, Smith & Company does not provide investment advice.

Single Discount Rate

A Single Discount Rate of 7.25% was used to measure the total pension liability. This Single Discount Rate was based on the expected rate of return on pension plan investments of 7.25%. The projection of cash flows used to determine this Single Discount Rate assumed that plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the difference between actuarially determined contribution rates and the member rate. Based on these assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Regarding the sensitivity of the net pension liability to changes in the Single Discount Rate, the following presents the plan's net pension liability, calculated using a Single Discount Rate of 7.25%, as well as what the plan's net pension liability would be if it were calculated using a Single Discount Rate that is one percent lower or one percent higher:

SENSITIVITY OF NET PENSION LIABILITY TO THE SINGLE DISCOUNT RATE ASSUMPTION

1% Decrease	Current Single Discount Rate Assumption	1% Increase
6.25%	7.25%	8.25%
$ 407,718,893	$ 302,460,706	$ 212,694,267

SUMMARY OF POPULATION STATISTICS

Inactive Plan Members or Beneficiaries Currently Receiving Benefits	2,945
Inactive Plan Members Entitled to But Not Yet Receiving Benefits	390
Active Plan Members	2,495
Total Plan Members	5,830

SECTION E

SUMMARY OF BENEFITS

SUMMARY OF BENEFIT PROVISONS

JUNE 30, 2016

NORMAL RETIREMENT (NO REDUCTION FACTOR)

Eligibility :

Tier 1 – Members hired before July 1, 2011. Age 62, or a combination of age and creditable service equal to 80 (for those hired on or after July 1, 2009, eligibility at age 62 requires a minimum of 5 years of accrued service).

Tier 2 – Members hired on or after July 1, 2011. Age 65 with 5 years of service or a combination of age and creditable service equal to 85 and the attainment of age 60.

Amount - Creditable service times 2.25% of average final compensation for Tier 1 and 2.00% of average final compensation for Tier 2.

Average Final Compensation - The average monthly creditable compensation for the period of 36 consecutive months during which the member's creditable compensation was the highest during the 120 months immediately preceding the date of retirement for Tier 1 and 60 consecutive months during which the member's creditable compensation was the highest during the 120 months immediately preceding the date of retirement for Tier 2. Effective July 1, 2000, accrued unused sick leave at the final salary may be substituted for an equal number of hours at the beginning of the 36 month period for Tier 1.

EARLY RETIREMENT (REDUCTION FACTOR)

Eligibility - Age 55 with 20 or more years of creditable service for Tier 1 and age 60 with 20 or more years of creditable service tor Tier 2.

Amount - An amount computed as for normal retirement but reduced by 1/2 of 1% per month for each month (6% per year) retirement precedes normal retirement.

DEFERRED RETIREMENT (VESTED TERMINATION)

Eligibility - 5 or more years of accrued service. Deferred retirement benefits for terminated vested employee becomes automatic at age 62 (age 65 for Tier 2) or when a combination of age and creditable service equals 80 (85 with the attainment of age 60 for Tier 2), unless the member elects to withdraw the employee contribution account in lieu of a deferred retirement benefit. In addition to the eligibility listed above, the term-vested member may chose an Early Retirement (minimum age of 55 for Tier 1 and 60 for Tier 2 and minimum service of 20 yrs) subject to the same reduction – reduced by ½ of 1% per month for each month (6% per year) retirement precedes normal retirement eligibility.

Amount - An amount computed as for normal retirement.

DISABILITY RETIREMENT

Eligibility - Eligibility requires 10 or more years of credited service and a disability that is total and permanent.

Amount - An amount computed as for normal retirement. Disability Retirement Benefits are offset, if the combination of all employer-provided benefits exceeds 100% of the members adjusted income base, then members pension benefit from TSRS is reduced so income does not exceed the 100% maximum allowed.

PRE-RETIREMENT SURVIVOR BENEFITS

Eligibility - 5 or more years of accrued service and not eligible to retire.

Amount - Lump sum payment equal to twice the member's contributions, with interest.

Eligibility - After attaining eligibility for retirement, in the event the member dies prior to submitting an application for retirement benefits:

Amount - If the member is married, a default provision allows the member's spouse to elect to receive either a lump sum payment of twice the member's contributions account, or receive a lifetime annuity benefit determined as if the member had elected a joint & last survivor benefit of 100% survivor annuity prior to death. If the member is not married and has named a single non-spousal beneficiary, the beneficiary may elect to receive either a lump sum payment of twice the member's contributions account, or receive a 15 year annuity benefit determined as if the member elected payment of a 15 year term certain annuity. If the member has named multiple designated beneficiaries, a lump sum refund of the member's account balance will be paid to the named beneficiaries.

OTHER TERMINATION BENEFITS

Eligibility - Termination of employment without eligibility for any other benefit.

Amount - Accumulated contributions and interest in members account at time of termination.

EMPLOYEE CONTRIBUTIONS

Interest is credited to member accumulated contributions accounts as simple interest two times per year at an annual interest rate of 6%. For those hired prior to July 1, 2006, employee contributions are 5.00% of salary. For those hired between July 1, 2006 and June 30, 2011 (Tier I variable class) and for those hired after July 1, 2011 (Tier II variable class), employee contributions are 50% of the respective Normal Cost for each class, with a floor of 5.0%. The employee contributions for the Tier I and Tier II variable classes for FY 16/17 are 6.60% and 4.89%, respectively, before application of the floor or roundup policy.

CITY CONTRIBUTIONS

City Contributions are actuarially determined; which together with employee contributions and investment earnings will fund the obligations of the System in accordance with generally accepted actuarial principles. (please refer to the Funding Policy in Section I of the funding report).

POST-RETIREMENT ADJUSTMENTS

The TSRS Board has established formal policies to determine whether the system shall fund an annual supplemental post-retirement benefit payment to retired members and beneficiaries.

SECTION F

ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS

SUMMARY OF ACTUARIAL METHODS AND ASSUMPTIONS

I. Valuation Date

The valuation date is July 1st of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the employer contribution rate is the sum of (i) the employer normal cost rate, and (ii) a rate that will amortize the unfunded actuarial liability.

1. The valuation is prepared on the projected benefit basis. The present value of each participant's expected benefit payable at retirement or termination is determined, based on age, service, sex, compensation, and the interest rate assumed to be earned in the future (7.25%). The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service benefit. Future salary increases are also anticipated. The present value of the expected benefits payable on account of the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Plan on account of the present group of participants and beneficiaries.

2. The employer contributions required to support the benefits of the Plan are determined following a level funding approach, and consist of a normal cost contribution and an accrued liability contribution.

3. The normal contribution is determined using the Entry Age Normal method. Under this method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution which, if applied to the compensation of each new participant during the entire period of his anticipated covered service, would be required in addition to the contributions of the participant to meet the cost of all benefits payable on their behalf. Effective July 1, 2013 the TSRS funding policy requires the computation of normal cost separately for those members in Tier 1 and Tier 2 (the variable rate tiers).

4. The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability and amortizing the result over 20 years from the valuation date as a level percentage of pay. It is assumed that payments are made throughout the year.

5. Administrative expenses for the recent year will be added to the employer normal cost in the current valuation and will be reflected in the recommended employer rate for the upcoming fiscal year.

III. Actuarial Value of Assets

For the actuarially determined contribution, the actuarial value of assets is based on recognizing gains and losses over a five-year period where gains and losses are determined by comparing the projected market value return (based on the prior year's actuarial market value of assets, cash flows during the year and expected investment returns on those amounts) to the actual market investment return. For GASB, the market value of assets is used.

IV. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.25% per annum, compounded annually, composed of an assumed 3.00% inflation rate and a 4.25% real rate of return. This rate represents the assumed return, net of all investment expenses.

2. Salary increase rate:

Sample Attained Age	Percentage Increase in Salary with Less than Five Years of Service		
	Merit	Inflation	Total
0	3.50 %	3.00 %	6.50 %
1	3.00	3.00	6.00
2	2.50	3.00	5.50
3	2.00	3.00	5.00
4	1.50	3.00	4.50

Sample Attained Age	Percentage Increase in Salary with Five or More Years of Service		
	Merit	Inflation	Total
25	1.50 %	3.00 %	4.50 %
30	1.50	3.00	4.50
35	1.50	3.00	4.50
40	1.00	3.00	4.00
45	0.50	3.00	3.50
50	0.25	3.00	3.25
55	0.25	3.00	3.25
60	0.25	3.00	3.25
65	0.00	3.00	3.00

3. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 3.00% per year. This increase rate is primarily due to the effect of inflation on salaries, with no allowance for future membership growth.

B. Demographic Assumptions

1. Mortality rates (pre- and post-retirement) – RP-2000 Combined Mortality Table for males and females projected with Scale BB to 2020. Mortality rates were adjusted to include margin for future mortality improvement as described in the table name above.

2. Mortality rates (post-disablement) – RP-2000 Disabled Mortality Table for males and females.

Sample Attained Ages	Probability of Death Pre- and Post-Retirement	
	Men	Women
20	0.03 %	0.02 %
25	0.04	0.02
30	0.04	0.02
35	0.07	0.04
40	0.10	0.07
45	0.14	0.11
50	0.20	0.16
55	0.34	0.25
60	0.59	0.41
65	1.00	0.76
70	1.64	1.32
75	2.80	2.21
80	4.76	3.60
85	8.19	6.08
90	14.70	10.55

Sample Attained Ages	Probability of Death Post-Disability	
	Men	Women
20	2.26 %	0.75 %
25	2.26	0.75
30	2.26	0.75
35	2.26	0.75
40	2.26	0.75
45	2.26	0.75
50	2.90	1.15
55	3.54	1.65
60	4.20	2.18
65	5.02	2.80
70	6.26	3.76
75	8.21	5.22
80	10.94	7.23
85	14.16	10.02
90	18.34	14.00

3. Disability rates. Sample rates shown below:

Sample Attained Ages	Probability of Disablement Next Year	
	Men	Women
25	0.01 %	0.01 %
30	0.07	0.07
35	0.09	0.09
40	0.14	0.14
45	0.17	0.17
50	0.25	0.25
55	0.36	0.36
60	0.48	0.48

4. Termination rates (for causes other than death, disability or retirement): Termination rates are based on service and age. Termination rates are not applied after a member becomes eligible for a retirement benefit. Rates are shown:

Sample Attained Age	Years of Credible Service	Probability of Termination
Any	0	18.00 %
	1	13.00
	2	10.00
	3	8.00
	4	7.50
20	5 & over	7.05
25		7.05
30		6.65
35		4.65
40		3.65
45		2.95
50		2.55
55		2.45

5. Forfeiture rates: The percentages below represent the probability that a vested terminated member will take a refund of contributions rather than receive a deferred annuity benefit.

Sample Ages	% of Vested Terminating Members Choosing Refund at Termination
Under 30	50 %
30	45
35	40
40	35
45	30
50	25
55	20
60 and Over	0

6. Retirement rates for Tier 1. For those ages 62+, the Rule of 80 retirement rates only applies if the Rule of 80 is attained by age 62.

Attained Age	Tier 1 Members Percentage of Those Eligible Retiring During the Year		
	Rule of 80	Age Based	Early
50-54	27.0 %		
55-59	27.0		8.5 %
60	27.0		
61	27.0		
62	27.0	33.0 %	
63	27.0	16.0	
64	27.0	20.0	
65	27.0	24.0	
66-69	27.0	35.0	
70 & Over	100.0	100.0	

Retirement rates for Tier 2. For those ages 65+, the Rule of 85 retirement rates only applies if the Rule of 85 is attained by age 65.

Attained Age	Tier 2 Members Percentage of Those Eligible Retiring During the Year		
	Rule of 80	Age Based	Early
60	27.0 %		8.5 %
61	27.0		8.5
62	27.0		8.5
63	27.0		8.5
64	27.0		8.5
65	27.0	24.0 %	
66-69	27.0	35.0	
70 & Over	100.0	100.0	

Deferred vested members are assumed to retire at age first eligibility for unreduced benefits.

C. Other Assumptions

1. Percent married: 80% of employees are assumed to be married.
2. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.
3. Cost of living adjustment: None.
4. Optional forms: Members are assumed to elect the normal form of benefit.
5. Current and future deferred vested participants are assumed to retire at the earlier of age 62 and eligibility for rule of 80 for tier 1 and the earlier of age 65 and eligibility for the rules of 85 (but at least 60) for Tier 2.
6. Administrative expenses: Administrative expenses are added to the employer normal cost , before application of the round up policy.
7. Pay increase timing: End of year.
8. Decrement timing: Decrements of all types are assumed to occur mid-year.
9. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
10. Decrement relativity: Decrement rates are used directly, without adjustment for multiple decrement table effects.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Benefit and Eligibility Service due to Accrued Sick and Vacation Leave at Retirement and Termination: Tier 1 Members are assumed to have an additional 0.019 years per year of benefit and eligibility service at early or normal retirement and termination due to accrued sick and vacation leave. This assumption was developed using sick and vacation leave and service amounts for active members included in the actuarial valuation as of June 30, 2013.

SECTION G

CALCULATION OF THE SINGLE DISCOUNT RATE

CALCULATION OF THE SINGLE DISCOUNT RATE

GASB Statement No. 67 includes a specific requirement for the discount rate that is used for the purpose of the measurement of the Total Pension Liability. This rate considers the ability of the Fund to meet benefit obligations in the future. To make this determination, employer contributions, employee contributions, benefit payments, expenses and investment returns are projected into the future. The Plan Net Position (assets) in future years can then be determined and compared to its obligation to make benefit payments in those years. As long as assets are projected to be on hand in a future year, the assumed valuation discount rate is used. In years where assets are not projected to be sufficient to meet benefit payments, the use of a municipal bond rate is required, as described in the following paragraph.

The Single Discount Rate (SDR) is equivalent to applying these two rates to the benefits that are projected to be paid during the different time periods. The SDR reflects (1) the long-term expected rate of return on pension plan investments (during the period in which the fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating (which is published by the Federal Reserve) as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.25%; the municipal bond rate is 2.85%; and the resulting Single Discount Rate is 7.25%.

The tables in this section provide background for the development of the Single Discount Rate.

The **Projection of Contributions** table shows the development of expected contributions in future years. Normal Cost contributions for future hires are not included (nor are their liabilities).

The **Projection of Plan Fiduciary Net Position** table shows the development of expected asset levels in future years.

The **Present Values of Projected Benefit Payments** table shows the development of the Single Discount Rate (SDR). It breaks down the benefit payments into present values for funded and unfunded portions and shows the equivalent total at the SDR.

SINGLE DISCOUNT RATE DEVELOPMENT PROJECTION OF CONTRIBUTIONS ENDING JUNE 30 FOR 2017 TO 2066

Year	Projected Payroll for Current Employees	Projected Payroll for Future Employees	Projected Contributions from Current Employees	Projected Contributions from Future Employees	Projected Total Contributions
2016	$ 115,183,349				
2017	108,982,900	$ 10,231,866	$ 35,582,917	$ 2,350,260	$ 37,933,176
2018	101,291,736	22,095,546	33,071,752	5,075,347	38,147,099
2019	94,619,940	33,085,898	30,893,410	7,599,831	38,493,241
2020	88,285,691	43,889,851	28,825,278	10,081,499	38,906,777
2021	82,175,736	54,625,950	26,830,378	12,547,581	39,377,959
2022	76,566,883	65,022,862	24,999,087	14,935,752	39,934,839
2023	71,247,787	75,297,599	23,262,403	17,295,858	40,558,261
2024	66,090,802	85,583,673	21,578,647	19,658,570	41,237,216
2025	61,148,348	95,834,733	19,964,936	22,013,238	41,978,174
2026	56,386,511	106,090,978	18,410,196	24,369,098	42,779,294
2027	51,852,715	116,311,486	16,929,911	26,716,748	43,646,660
2028	47,546,382	126,503,566	15,523,894	29,057,869	44,581,763
2029	43,515,767	136,625,929	14,207,898	31,382,976	45,590,874
2030	39,755,974	146,690,682	12,980,325	33,694,850	46,675,175
2031	36,263,992	156,708,297	11,840,193	35,995,896	47,836,089
2032	33,095,094	166,631,225	10,805,548	38,275,192	49,080,741
2033	30,203,981	176,512,759	9,861,600	40,544,981	50,406,581
2034	27,495,258	186,456,568	8,977,202	42,829,074	51,806,275
2035	24,895,819	196,544,321	8,128,485	45,146,231	53,274,715
2036	22,453,964	206,736,580	7,331,219	-	7,331,219
2037	20,212,942	216,999,272	6,599,525	-	6,599,525
2038	18,158,973	227,355,668	5,928,905	-	5,928,905
2039	16,314,260	237,793,393	5,326,606	-	5,326,606
2040	14,681,774	248,319,648	4,793,599	-	4,793,599
2041	13,240,132	258,966,339	4,322,903	-	4,322,903
2042	11,920,326	269,813,371	3,891,987	-	3,891,987
2043	10,700,536	280,893,842	3,493,725	-	3,493,725
2044	9,563,213	292,236,967	3,122,389	-	3,122,389
2045	8,479,708	303,883,478	2,768,625	-	2,768,625
2046	7,460,904	315,834,995	2,435,985	-	2,435,985
2047	6,458,752	328,152,502	2,108,783	-	2,108,783
2048	5,513,392	340,809,257	1,800,122	-	1,800,122
2049	4,648,506	353,795,435	1,517,737	-	1,517,737
2050	3,823,299	367,166,180	1,248,307	-	1,248,307
2051	3,040,389	380,933,722	992,687	-	992,687
2052	2,351,143	395,062,062	767,648	-	767,648
2053	1,778,650	409,544,018	580,729	-	580,729
2054	1,310,434	424,408,527	427,857	-	427,857
2055	943,944	439,675,180	308,198	-	308,198
2056	671,274	455,369,519	219,171	-	219,171
2057	463,467	471,538,755	151,322	-	151,322
2058	314,817	488,207,482	102,788	-	102,788
2059	207,411	505,413,169	67,720	-	67,720
2060	124,672	523,192,627	40,706	-	40,706
2061	67,753	541,565,653	22,121	-	22,121
2062	34,976	560,555,598	11,420	-	11,420
2063	17,171	580,194,074	5,606	-	5,606
2064	6,378	600,512,260	2,082	-	2,082
2065	1,953	621,534,838	638	-	638
2066	1,060	643,289,518	346	-	346

The projections in this report are strictly for the purpose of determining the GASB single discount rate and are different from a funding projection for the ongoing plan.

SINGLE DISCOUNT RATE DEVELOPMENT PROJECTION OF PLAN FIDUCIARY NET POSITION ENDING JUNE 30 FOR 2017 TO 2066

Year	Projected Beginning Plan Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.250%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2016	$ 728,234,240	$ 37,933,176	$ 73,101,878	$ 741,084	$ 51,518,028	$ 743,842,483
2017	743,842,483	38,147,099	75,804,811	688,784	52,562,840	758,058,827
2018	758,058,827	38,493,241	78,210,527	643,416	53,521,788	771,219,913
2019	771,219,913	38,906,777	80,727,287	600,343	54,402,593	783,201,653
2020	783,201,653	39,377,959	82,931,632	558,795	55,211,021	794,300,205
2021	794,300,205	39,934,839	84,850,273	520,655	55,968,524	804,832,639
2022	804,832,639	40,558,261	86,600,084	484,485	56,693,297	814,999,628
2023	814,999,628	41,237,216	88,264,591	449,417	57,396,551	824,919,387
2024	824,919,387	41,978,174	89,748,161	415,809	58,090,482	834,824,072
2025	834,824,072	42,779,294	90,934,062	383,428	58,796,021	845,081,896
2026	845,081,896	43,646,660	91,903,675	352,598	59,537,169	856,009,453
2027	856,009,453	44,581,763	92,684,885	323,315	60,335,941	867,918,957
2028	867,918,957	45,590,874	93,199,231	295,907	61,217,978	881,232,670
2029	881,232,670	46,675,175	93,339,136	270,341	62,217,768	896,516,136
2030	896,516,136	47,836,089	93,256,859	246,595	63,370,942	914,219,713
2031	914,219,713	49,080,741	92,763,088	225,047	64,717,134	935,029,453
2032	935,029,453	50,406,581	92,028,807	205,387	66,299,913	959,501,753
2033	959,501,753	51,806,275	91,072,252	186,968	68,158,731	988,207,539
2034	988,207,539	53,274,715	89,940,327	169,292	70,333,144	1,021,705,780
2035	1,021,705,780	7,331,219	88,468,180	152,687	71,178,477	1,011,594,608
2036	1,011,594,608	6,599,525	86,767,975	137,448	70,480,454	1,001,769,165
2037	1,001,769,165	5,928,905	84,807,146	123,481	69,814,558	992,582,001
2038	992,582,001	5,326,606	82,703,875	110,937	69,202,394	984,296,189
2039	984,296,189	4,793,599	80,376,007	99,836	68,665,993	977,279,938
2040	977,279,938	4,322,903	77,786,755	90,033	68,233,118	971,959,171
2041	971,959,171	3,891,987	75,148,003	81,058	67,926,316	968,548,412
2042	968,548,412	3,493,725	72,445,915	72,764	67,761,384	967,284,841
2043	967,284,841	3,122,389	69,556,292	65,030	67,759,741	968,545,649
2044	968,545,649	2,768,625	66,685,084	57,662	67,941,073	972,512,601
2045	972,512,601	2,435,985	63,749,349	50,734	68,321,635	979,470,137
2046	979,470,137	2,108,783	60,947,550	43,920	68,914,433	989,501,883
2047	989,501,883	1,800,122	58,157,492	37,491	69,730,341	1,002,837,364
2048	1,002,837,364	1,517,737	55,345,863	31,610	70,787,454	1,019,765,082
2049	1,019,765,082	1,248,307	52,613,932	25,998	72,102,617	1,040,476,076
2050	1,040,476,076	992,687	49,954,814	20,675	73,689,956	1,065,183,230
2051	1,065,183,230	767,648	47,335,023	15,988	75,566,682	1,094,166,550
2052	1,094,166,550	580,729	44,717,967	12,095	77,754,663	1,127,771,880
2053	1,127,771,880	427,857	42,143,622	8,911	80,277,405	1,166,324,609
2054	1,166,324,609	308,198	39,626,752	6,419	83,157,945	1,210,157,581
2055	1,210,157,581	219,171	37,146,496	4,565	86,421,067	1,259,646,758
2056	1,259,646,758	151,322	34,711,066	3,152	90,093,406	1,315,177,269
2057	1,315,177,269	102,788	32,337,318	2,141	94,202,218	1,377,142,815
2058	1,377,142,815	67,720	30,045,725	1,410	98,775,114	1,445,938,514
2059	1,445,938,514	40,706	27,840,443	848	103,840,403	1,521,978,332
2060	1,521,978,332	22,121	25,721,611	461	109,428,106	1,605,706,487
2061	1,605,706,487	11,420	23,695,888	238	115,570,172	1,697,591,952
2062	1,697,591,952	5,606	21,767,499	117	122,300,346	1,798,130,289
2063	1,798,130,289	2,082	19,938,076	43	129,654,409	1,907,848,661
2064	1,907,848,661	638	18,206,704	13	137,670,605	2,027,313,186
2065	2,027,313,186	346	16,573,233	7	146,389,950	2,157,130,242

The projections in this report are strictly for the purpose of determining the GASB single discount rate and are different from a funding projection for the ongoing plan.

SINGLE DISCOUNT RATE DEVELOPMENT PRESENT VALUES OF PROJECTED BENEFITS ENDING JUNE 30 FOR 2017 TO 2066

Year	Projected Beginning Plan Net Position	Projected Benefit Payments	Funded Portion of Projected Benefit Payments	Unfunded Portion of Projected Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of All Benefit Payments using Single Discount Rate (SDR)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=((c)/(1+SDR)^(a-.5)
2017	$ 728,234,240	$ 73,101,878	$ 73,101,878	$ -	$ 70,587,838	$ -	$ 70,587,838
2018	743,842,483	75,804,811	75,804,811	-	68,249,712	-	68,249,712
2019	758,058,827	78,210,527	78,210,527	-	65,655,628	-	65,655,628
2020	771,219,913	80,727,287	80,727,287	-	63,187,301	-	63,187,301
2021	783,201,653	82,931,632	82,931,632	-	60,524,660	-	60,524,660
2022	794,300,205	84,850,273	84,850,273	-	57,738,845	-	57,738,845
2023	804,832,639	86,600,084	86,600,084	-	54,945,972	-	54,945,972
2024	814,999,628	88,264,591	88,264,591	-	52,216,380	-	52,216,380
2025	824,919,387	89,748,161	89,748,161	-	49,504,936	-	49,504,936
2026	834,824,072	90,934,062	90,934,062	-	46,768,370	-	46,768,370
2027	845,081,896	91,903,675	91,903,675	-	44,071,844	-	44,071,844
2028	856,009,453	92,684,885	92,684,885	-	41,441,928	-	41,441,928
2029	867,918,957	93,199,231	93,199,231	-	38,854,924	-	38,854,924
2030	881,232,670	93,339,136	93,339,136	-	36,282,751	-	36,282,751
2031	896,516,136	93,256,859	93,256,859	-	33,800,251	-	33,800,251
2032	914,219,713	92,763,088	92,763,088	-	31,348,519	-	31,348,519
2033	935,029,453	92,028,807	92,028,807	-	28,998,019	-	28,998,019
2034	959,501,753	91,072,252	91,072,252	-	26,756,747	-	26,756,747
2035	988,207,539	89,940,327	89,940,327	-	24,637,940	-	24,637,940
2036	1,021,705,780	88,468,180	88,468,180	-	22,596,425	-	22,596,425
2037	1,011,594,608	86,767,975	86,767,975	-	20,664,019	-	20,664,019
2038	1,001,769,165	84,807,146	84,807,146	-	18,831,741	-	18,831,741
2039	992,582,001	82,703,875	82,703,875	-	17,123,265	-	17,123,265
2040	984,296,189	80,376,007	80,376,007	-	15,516,360	-	15,516,360
2041	977,279,938	77,786,755	77,786,755	-	14,001,410	-	14,001,410
2042	971,959,171	75,148,003	75,148,003	-	12,612,067	-	12,612,067
2043	968,548,412	72,445,915	72,445,915	-	11,336,668	-	11,336,668
2044	967,284,841	69,556,292	69,556,292	-	10,148,705	-	10,148,705
2045	968,545,649	66,685,084	66,685,084	-	9,072,054	-	9,072,054
2046	972,512,601	63,749,349	63,749,349	-	8,086,403	-	8,086,403
2047	979,470,137	60,947,550	60,947,550	-	7,208,395	-	7,208,395
2048	989,501,883	58,157,492	58,157,492	-	6,413,435	-	6,413,435
2049	1,002,837,364	55,345,863	55,345,863	-	5,690,794	-	5,690,794
2050	1,019,765,082	52,613,932	52,613,932	-	5,044,187	-	5,044,187
2051	1,040,476,076	49,954,814	49,954,814	-	4,465,504	-	4,465,504
2052	1,065,183,230	47,335,023	47,335,023	-	3,945,285	-	3,945,285
2053	1,094,166,550	44,717,967	44,717,967	-	3,475,206	-	3,475,206
2054	1,127,771,880	42,143,622	42,143,622	-	3,053,747	-	3,053,747
2055	1,166,324,609	39,626,752	39,626,752	-	2,677,271	-	2,677,271
2056	1,210,157,581	37,146,496	37,146,496	-	2,340,046	-	2,340,046
2057	1,259,646,758	34,711,066	34,711,066	-	2,038,812	-	2,038,812
2058	1,315,177,269	32,337,318	32,337,318	-	1,770,990	-	1,770,990
2059	1,377,142,815	30,045,725	30,045,725	-	1,534,254	-	1,534,254
2060	1,445,938,514	27,840,443	27,840,443	-	1,325,542	-	1,325,542
2061	1,521,978,332	25,721,611	25,721,611	-	1,141,874	-	1,141,874
2062	1,605,706,487	23,695,888	23,695,888	-	980,835	-	980,835
2063	1,697,591,952	21,767,499	21,767,499	-	840,106	-	840,106
2064	1,798,130,289	19,938,076	19,938,076	-	717,483	-	717,483
2065	1,907,848,661	18,206,704	18,206,704	-	610,889	-	610,889
2066	2,027,313,186	16,573,233	16,573,233	-	518,491	-	518,491

The projections in this report are strictly for the purpose of determining the GASB single discount rate and are different from a funding projection for the ongoing plan.

SINGLE DISCOUNT RATE DEVELOPMENT PRESENT VALUES OF PROJECTED BENEFITS ENDING JUNE 30 FOR 2067 TO 2116 (CONCLUDED)

Year	Projected Beginning Plan Net Position	Projected Benefit Payments	Funded Portion of Projected Benefit Payments	Unfunded Portion of Projected Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of All Benefit Payments using Single Discount Rate (SDR)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=((c)/(1+SDR)^(a-.5)
2067	$ 2,157,130,242	$ 15,037,955	$ 15,037,955	$ -	$ 438,657	$ -	$ 438,657
2068	2,297,948,795	13,598,250	13,598,250	-	369,847	-	369,847
2069	2,450,467,521	12,251,024	12,251,024	-	310,681	-	310,681
2070	2,615,439,062	10,993,858	10,993,858	-	259,953	-	259,953
2071	2,793,672,982	9,823,888	9,823,888	-	216,586	-	216,586
2072	2,986,040,500	8,738,321	8,738,321	-	179,630	-	179,630
2073	3,193,478,894	7,734,297	7,734,297	-	148,243	-	148,243
2074	3,416,996,353	6,808,923	6,808,923	-	121,684	-	121,684
2075	3,657,677,160	5,959,525	5,959,525	-	99,305	-	99,305
2076	3,916,686,977	5,183,611	5,183,611	-	80,537	-	80,537
2077	4,195,278,553	4,478,609	4,478,609	-	64,879	-	64,879
2078	4,494,798,130	3,841,843	3,841,843	-	51,893	-	51,893
2079	4,816,692,321	3,270,554	3,270,554	-	41,190	-	41,190
2080	5,162,515,476	2,761,755	2,761,755	-	32,431	-	32,431
2081	5,533,937,731	2,312,229	2,312,229	-	25,317	-	25,317
2082	5,932,753,636	1,918,513	1,918,513	-	19,586	-	19,586
2083	6,360,891,432	1,576,949	1,576,949	-	15,011	-	15,011
2084	6,820,422,947	1,283,693	1,283,693	-	11,393	-	11,393
2085	7,313,574,198	1,034,682	1,034,682	-	8,562	-	8,562
2086	7,842,736,794	825,686	825,686	-	6,371	-	6,371
2087	8,410,480,118	652,387	652,387	-	4,693	-	4,693
2088	9,019,564,304	510,519	510,519	-	3,425	-	3,425
2089	9,672,954,014	395,847	395,847	-	2,476	-	2,476
2090	10,373,833,235	304,275	304,275	-	1,774	-	1,774
2091	11,125,621,033	231,935	231,935	-	1,261	-	1,261
2092	11,931,988,363	175,340	175,340	-	889	-	889
2093	12,796,875,934	131,446	131,446	-	621	-	621
2094	13,724,513,312	97,662	97,662	-	430	-	430
2095	14,719,439,387	71,857	71,857	-	295	-	295
2096	15,786,524,326	52,307	52,307	-	200	-	200
2097	16,930,993,170	37,633	37,633	-	134	-	134
2098	18,158,451,202	26,742	26,742	-	89	-	89
2099	19,474,911,220	18,759	18,759	-	58	-	58
2100	20,886,822,857	12,989	12,989	-	38	-	38
2101	22,401,104,063	8,877	8,877	-	24	-	24
2102	24,025,174,914	5,992	5,992	-	15	-	15
2103	25,766,993,890	3,991	3,991	-	9	-	9
2104	27,635,096,813	2,626	2,626	-	6	-	6
2105	29,638,638,613	1,704	1,704	-	3	-	3
2106	31,787,438,147	1,091	1,091	-	2	-	2
2107	34,092,026,284	687	687	-	1	-	1
2108	36,563,697,478	427	427	-	1	-	1
2109	39,214,565,102	261	261	-	0	-	0
2110	42,057,620,801	156	156	-	0	-	0
2111	45,106,798,148	90	90	-	0	-	0
2112	48,377,040,921	51	51	-	0	-	0
2113	51,884,376,335	28	28	-	0	-	0
2114	55,645,993,590	16	16	-	0	-	0
2115	59,680,328,109	8	8	-	0	-	0
2116	64,007,151,888	5	4	1	0	0	0
				Totals	$ 1,113,873,031	$ -	$ 1,113,873,031

The projections in this report are strictly for the purpose of determining the GASB single discount rate and are different from a funding projection for the ongoing plan.

SECTION H

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Accrued Service	Service credited under the system that was rendered before the date of the actuarial valuation.
Actuarial Accrued Liability (AAL)	The AAL is the difference between the actuarial present value of all benefits and the actuarial value of future normal costs. The definition comes from the fundamental equation of funding which states that the present value of all benefits is the sum of the Actuarial Accrued Liability and the present value of future normal costs. The AAL may also be referred to as "accrued liability" or "actuarial liability."
Actuarial Assumptions	These assumptions are estimates of future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and compensation increases. Actuarial assumptions are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (compensation increases, payroll growth, inflation and investment return) consist of an underlying real rate of return plus an assumption for a long-term average rate of inflation.
Actuarial Cost Method	A mathematical budgeting procedure for allocating the dollar amount of the actuarial present value of the pension trust benefits between future normal cost and actuarial accrued liability. The actuarial cost method may also be referred to as the actuarial funding method.
Actuarial Equivalent	A single amount or series of amounts of equal actuarial value to another single amount or series of amounts, computed on the basis of appropriate actuarial assumptions.
Actuarial Gain (Loss)	The difference in liabilities between actual experience and expected experience during the period between two actuarial valuations is the gain (loss) on the accrued liabilities.
Actuarial Present Value (APV)	The amount of funds currently required to provide a payment or series of payments in the future. The present value is determined by discounting future payments at predetermined rates of interest and probabilities of payment.
Actuarial Valuation	The actuarial valuation report determines, as of the actuarial valuation date, the service cost, total pension liability, and related actuarial present value of projected benefit payments for pensions.
Actuarial Valuation Date	The date as of which an actuarial valuation is performed.
Actuarially Determined Contribution (ADC) or Annual Required Contribution (ARC)	A calculated contribution into a defined benefit pension plan for the reporting period, most often determined based on the funding policy of the plan. Typically the Actuarially Determined Contribution has a normal cost payment and an amortization payment.

GLOSSARY OF TERMS

Amortization Method — The method used to determine the periodic amortization payment may be a level dollar amount, or a level percent of pay amount. The period will typically be expressed in years, and the method will either be "open" (meaning, reset each year) or "closed" (the number of years remaining will decline each year).

Amortization Payment — The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.

Cost-of-Living Adjustments — Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.

Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan) — A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.

Covered-Employee Payroll — The payroll of employees that are provided with pensions through the pension plan.

Deferred Inflows and Outflows — The deferred inflows and outflows of pension resources are amounts used under GASB Statement No. 68 in developing the annual pension expense. Deferred inflows and outflows arise with differences between expected and actual experiences; changes of assumptions. The portion of these amounts not included in pension expense should be included in the deferred inflows or outflows of resources.

Deferred Retirement Option Program (DROP) — A program that permits a plan member to elect a calculation of benefit payments based on service credits and salary, as applicable, as of the DROP entry date. The plan member continues to provide service to the employer and is paid for the service by the employer after the DROP entry date; however, the pensions that would have been paid to the plan member are credited to an individual member account within the defined benefit pension plan until the end of the DROP period. Other variations for DROP exist and will be more fully detailed in the plan provision section of the valuation report.

Discount Rate — For GASB purposes, the discount rate is the single rate of return that results in the present value of all projected benefit payments to be equal to the sum of the funded and unfunded projected benefit payments, specifically:

1. The benefit payments to be made while the pension plans' fiduciary net position is projected to be greater than the benefit payments that are projected to be made in the period; and
2. The present value of the benefit payments not in (1) above, discounted using the municipal bond rate.

GLOSSARY OF TERMS

Entry Age Actuarial Cost Method (EAN)	The EAN is a cost method for allocating the costs of the plan between the normal cost and the accrued liability. The actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis (either level dollar or level percent of pay) over the earnings or service of the individual between entry age and assumed exit ages(s). The portion of the actuarial present value allocated to a valuation year is the normal cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is the actuarial accrued liability. The sum of the accrued liability plus the present value of all future normal costs is the present value of all benefits.
Fiduciary Net Position	The fiduciary net position is the market value of the assets of the trust dedicated to the defined benefit provisions.
GASB	The Governmental Accounting Standards Board is an organization that exists in order to promulgate accounting standards for governmental entities.
Long-Term Expected Rate of Return	The long-term rate of return is the expected return to be earned over the entire trust portfolio based on the asset allocation of the portfolio.
Money-Weighted Rate of Return	The money-weighted rate of return is a method of calculating the returns that adjusts for the changing amounts actually invested. For purposes of GASB Statement No. 67, money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.
Multiple-Employer Defined Benefit Pension Plan	A multiple-employer plan is a defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
Municipal Bond Rate	The Municipal Bond Rate is the discount rate to be used for those benefit payments that occur after the assets of the trust have been depleted.
Net Pension Liability (NPL)	The NPL is the liability of employers and non-employer contributing entities to plan members for benefits provided through a defined benefit pension plan.
Non-Employer Contributing Entities	Non-employer contributing entities are entities that make contributions to a pension plan that is used to provide pensions to the employees of other entities. For purposes of the GASB accounting statements, plan members are not considered non-employer contributing entities.
Normal Cost	The portion of the actuarial present value allocated to a valuation year is called the normal cost. For purposes of application to the requirements of this Statement, the term normal cost is the equivalent of service cost.

GLOSSARY OF TERMS

Other Postemployment Benefits (OPEB) All postemployment benefits other than retirement income (such as death benefits, life insurance, disability, and long-term care) that are provided separately from a pension plan, as well as postemployment healthcare benefits regardless of the manner in which they are provided. Other post-employment benefits do not include termination benefits.

Real Rate of Return The real rate of return is the rate of return on an investment after adjustment to eliminate inflation.

Service Cost The service cost is the portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.

Total Pension Expense The total pension expense is the sum of the following items that are recognized at the end of the employer's fiscal year:

1. Service Cost
2. Interest on the Total Pension Liability
3. Current-Period Benefit Changes
4. Employee Contributions (made negative for addition here)
5. Projected Earnings on Plan Investments (made negative for addition here)
6. Pension Plan Administrative Expense
7. Other Changes in Plan Fiduciary Net Position
8. Recognition of Outflow (Inflow) of Resources due to Liabilities
9. Recognition of Outflow (Inflow) of Resources due to Assets

Total Pension Liability (TPL) The TPL is the portion of the actuarial present value of projected benefit payments that is attributed to past periods of member service.

Unfunded Actuarial Accrued Liability (UAAL) The UAAL is the difference between actuarial accrued liability and valuation assets.

Valuation Assets The valuation assets are the assets used in determining the unfunded liability of the plan. For purposes of GASB Statement Nos. 67 and 68, the valuation assets are equal to the market value of assets.

Tucson Supplemental Retirement System
Funding Policy
Intent and Summary

The Tucson Supplemental Retirement System is a defined benefit pension plan maintained for the benefit of City of Tucson employees. TSRS is governed by provisions of the Tucson City Code, the public pension protections included in the Arizona Constitution, and the Internal Revenue Code. Within that framework, the TSRS Board has adopted a Funding Policy to ensure that TSRS will remain sustainable and to assist in the accumulation of adequate resources to fund the costs of TSRS benefits.

The costs of defined benefit pension benefits generally fall into three categories:

1. The cost of pension benefits earned by employee members each year, referred to as the "normal cost" of benefits;
2. The unfunded liabilities that have accumulated in the retirement program over time, as the retirement program grows and benefit liabilities exceed the assets held in the program; and
3. The administrative costs of operating the retirement program.

These cost elements are funded on an annual basis through a combination of employer contributions, employee contributions and investment returns.

Intent

The intent of the TSRS Funding Policy is to set forth the policies and practices that will be used to determine City and employee member contributions to TSRS each year. Contributions calculated in accordance with the Funding Policy will be designed to achieve full funding of the TSRS benefit liabilities over a prudent time horizon, while balancing the goals of:

- Maintaining retirement benefit security;
- Incorporating experience based actuarial assumptions into all contribution calculations;
- Keeping contribution rates relatively stable on an annual basis; and
- Allocating contribution costs in an equitable manner to mitigate intergenerational transfers of retirement program liabilities.

Summary

It is the goal of the Board to increase the funded status (the ratio of the assets to the accrued liabilities) of TSRS on an annual basis. Under the TSRS Funding Policy, the actuarially determined contributions calculated for the City and the employee members include the payment of:

a. The normal cost of benefits;
b. The annual amortized payment on TSRS' unfunded liabilities, calculated over a 20 year open, level percent of pay amortization policy;
c. The reasonable and appropriate annual administration costs of TSRS; and
d. The additional contribution element attained through the rounding of employee member and City contribution rates pursuant to the Board's rounding policy, which is designed to assist with the achievement of the full funding of TSRS over a reasonable timeframe.

Tucson Supplemental Retirement System
Board of Trustees
Funding Policy

Effective as of July 1, 2015
As Reviewed and Documented by TSRS Board on June 30, 2016

Background: The TSRS Funding Policy is designed to provide assurance that the Tucson Supplemental Retirement System ("TSRS") will remain viable and sustainable, and that the cost of the benefits provided by TSRS will be funded in an equitable manner. The TSRS funding policy is based on the following primary principles:

1. As of December 2014, the Board intends to encourage the City to extinguish the TSRS unfunded liability over a 12 – 15 year time period by recommending the following:
    a. That the City contribution to TSRS be based on the Actuarially Determined Contribution ("ADC") instead of the Annual Required Contribution ("ARC"), and
    b. That the City contribution to TSRS be a minimum of 27.5% of payroll, subject to changing market conditions.
2. The ADC will be calculated in a manner designed to fully fund (and not over-fund) the long-term costs for the benefits while balancing the goals of stable contribution rates and the allocation of members' costs over their working lifetime.
3. The TSRS Board wishes to demonstrate accountability and transparency by communicating all of the information necessary for assessing the City's progress toward meeting its pension funding objectives.

Purpose: The Funding Policy will govern the determination of the ADC, which shall take into account the following three core elements:

1. ***Annual Required Contribution or ARC*** - The annual amount necessary to fund the sum of the employer normal cost, the employee segment normal cost amounts, and the annual amortization requirements for the System's unfunded accrued liability.
2. ***Administrative Expenses*** - The reasonable and appropriate costs incurred in connection with the administration of the System on an annual basis.
3. ***Rounding Policy*** **-** The adjustment to the actuarially determined contribution rates, designed to minimize volatility in contribution rates from year to year.

Authority: The Board has been granted the power and authority necessary to effectuate the administration, management and operation of TSRS. TCC §22-44(a). The Board is required to certify to the City Manager the ARC, the Member Contribution rate(s) and the Employer Contribution. TCC §22-35(b). The City is required to appropriate and pay over to TSRS 100% of the Employer Contribution, as that term is defined in Section 22-30(t) of the Tucson City Code ("TCC").

The ADC is a recommendation of the Board to the City. TSRS will obtain the Actuarially Determined Contribution ("ADC") annually from the System Actuary, determined in accordance with this Funding

Policy. The ADC will serve as the basis for the recommended contribution rate to the City, subject to the additional policy considerations and funding concerns explained below.

Policy:

1. **Annual Required Contribution**

The ARC is determined on a fiscal year basis by the System's actuary in accordance with sound actuarial principles. The ARC is the sum of the employer normal cost, the employee segment normal cost and the annual amortization of the System's unfunded liability, calculated with the following actuarial assumptions:

a. Actuarial Cost Method

The actuarial cost method is the individual entry age normal cost method, level percent of pay. This method conforms to the actuarial standards of practice and allocates normal costs over a period beginning no earlier than the date of employment and does not exceed the last assumed retirement age. This cost method fully funds the long-term costs of the promised benefits of the employees' period of active service.

b. Asset Valuation Method

To minimize the volatility effect of contribution rates affected by investment gains or losses during the year, the Board has adopted a smoothing process that involves spreading the difference between actual and expected market returns over a five year period to determine the actuarial value of assets.

c. Amortization Policy

The Board has adopted a 20 year open, level percent of pay amortization policy. A single unfunded amount is determined with each actuarial valuation, and that amount is then amortized over a 20 year period, assuming that the contribution amounts will remain level as a percent of the total payroll (so the dollar amount of the contribution is assumed to grow each year). The Board's amortization policy was most recently revised effective July 1, 2013.

2. **Administrative Expenses**

The annual administrative expenses incurred by the System, based on the administrative operating budget approved by the Board in advance of the fiscal year and determined as of the end of the fiscal year, shall be included in the calculation of the ADC in accordance with sound actuarial principles. Administrative expenses paid by the System and included in the calculation of the ADC shall be reasonable and appropriate, and shall include staff salaries and related overhead expenses, actuarial,

legal and other professional consulting fees, accounting charges, compliance expenses, and other fees and expenses necessary for the efficient administration of the System. Investment fees and expenses shall not be included in the calculation of the ADC.

3. **Contribution Rounding Policy**

a. Purpose

This Contribution Rounding Policy is intended to (1)minimize volatility in the Member Contribution rates and the related impact on the net take home pay of employees, (2) eliminate minor adjustments in contribution rates, and (3) recognize the inherent timing gap between actuarial valuation data and the effective date of new contribution rates.

b. Rounding Policy

The Board shall determine Member and City Contribution rates in accordance with all applicable provisions of the TCC and, effective July 1, 2014, the terms of this Contribution Policy as set forth below. The Member and City Contribution rates determined in accordance with this Contribution Policy shall be incorporated into the ADC.

I. Member Contribution Rates: Member Contributions for Legacy Members, Tier I Members and Tier II Members shall be determined by the System actuary pursuant to TCC Section 22-34: members hired prior to July 1, 2006 (the "Legacy Members"), members hired between July 1, 2006 and June 30, 2011 ("Tier I Members") and members hired on or after July 1, 2011 ("Tier II Members"). The Legacy Members contribute 5% of pay. The Tier I Members and Tier II Members are referred to collectively as the variable contribution tier Members, and they make Member Contributions equal to a percentage of the normal cost for their particular Tier. The percentage applicable to the variable contribution tier Members currently is set at 50%, but can be changed by the City in accordance with Section 22-34(b) of the TCC. In no event shall the variable contribution tier members contribute less than 5% of pay as set forth in TCC §22-34(a) and (b).

The actuarially determined Member Contribution rate for each group shall be referred to as the "Calculated Rate" for the applicable group. The Board will then review the Calculated Rate for each member group and set the "Charged Rate" for the upcoming fiscal year. The Charged Rate will equal the Calculated Rate, rounded up to the nearest 0.25. The Charged Rate for a member group shall never be less than the Calculated Rate for that member group (for that same fiscal year).

Examples:

Year 1:	Actuarially Calculated Tier I Member Contribution Rate:	6.67% of pay
	Charged Rate for Tier I Member Contribution:	6.75% of pay
Year 2:	Actuarially Calculated Tier I Member Contribution Rate:	6.48% of pay
	Charged Rate for Tier I Member Contribution:	6.50% of pay

II. City Contribution Rates: Pursuant to TCC Section 22-30(t), the City is required to fund the Employer Contribution for a particular fiscal year, which equals the difference between the ARC and the Member Contribution rate(s). For purposes of determining the ADC that will be recommended by the Board to the City, the System actuary will be asked to prepare the following calculations:

Because there are three different Member Contribution rates, the System actuary shall calculate a City Contribution rate for each member group and a blended City Contribution rate for the entire member population. In no event shall the blended City Contribution rate for the entire member population be less than the City Contribution rate for any member group. The City Contribution rates calculated by the System actuary are referred to as the "Calculated Rates."

The Board will then review the Calculated Rates and set the "Charged Rate" for the City Contribution for the upcoming fiscal year. The Charged Rate will equal the blended Calculated City Contribution rate, rounded up to the nearest 0.50. The Charged Rate shall be rounded up to the nearest 0.50 instead of the nearest 0.25 because the Charged Rate is a blended rate. The Charged Rate shall never be less than the Calculated Rate for any member group for that same fiscal year.

Example:

Actuarial Calculated City Contribution Rates
for three member groups:

Legacy Members:	27.22% of pay
Tier I Members:	25.55% of pay
Tier II Members:	27.08% of pay

Actuarially Calculated Blended City Contribution Rate 26.95%

Charged Rate for City Contribution: (Charged Rate is not set at 27.0% because that would be less than the Calculated Rate for two of the member groups)	27.50% of pay

III. Funded Status of TSRS: It is the goal of the Board to increase the funded status of TSRS. The Board anticipates that Calculated Rates for both Member Contributions and Employer Contributions may decrease from time to time, based on various actuarial factors. The Board will not recommend a decrease in the ADC until such point as TSRS is fully funded because the unfunded accrued liability has been extinguished, and the ADC represents the payment of the normal cost of benefits only. Moreover, the Board shall recommend a decrease in the Charged Rates for Member Contributions only to the extent that the Charged Rates for Tier I Member Contributions and Tier II Member Contributions decrease simultaneously, in the same percentage of pay.

Attachment: TSRS Actuarial Assumptions Addendum to TSRS Code Sec. 22-30(d)

Tucson Supplemental Retirement System
Board of Trustees
Funding Policy

Tucson Supplemental Retirement System ("TSRS")

Addendum to TSRS Code Sec. 22-30(d)

TSRS Actuarial Assumptions

To determine the value of actuarially equivalent member benefits under TSRS, the following actuarial assumptions shall continue to be applied, effective as of July 1, 2016:

Interest Rate:	**7.25%**
Mortality Table:	**Mortality Table: RP-2000 Combined Mortality Table for males and females projected with Scale BB to 2020**

The foregoing actuarial assumptions are adopted in accordance Tucson Code Chapter 22, Section 22-30(d) and are incorporated into this Addendum as required pursuant to Section 401(a)(25) of the Internal Revenue Code of 1986, as amended.

This Addendum hereby is executed by an authorized representative of the Tucson Supplemental Retirement System Board of Trustees, pursuant to action taken at a duly called meeting of the Board held on the 24th day of September, 2015, at which a quorum was present.

By: _____
Name: Robert Fleming
TSRS Board of Trustees

Tucson Supplemental Retirement System
Funding Policy

Glossary of Terms and Concepts used in TSRS Funding Policy

Actuarial Cost Method: the method used by the actuary to allocate total benefit costs between employees' past and future service. The actuarial cost method determines the normal cost for a year.

Accrued Liability: the present value of retirement benefits earned by employees for past service.

Actuarially Determined Contribution: the annual contributions to the plan determined by the actuary, taking all features of the plan's funding policy into account.

Amortization: the process of paying off the unfunded accrued liability over time.

Annual Required Contribution: the annual contributions to the plan necessary to pay the normal cost and the annual amortization payment on any unfunded accrued liability, which may be a lesser amount than the actuarially determined contribution.

Calculated Rate: the City contribution rate calculated by the actuary in accordance with the funding policy for each of the benefit tiers offered under the plan.

Charged Rate: the City contribution rate recommended by the Board after the rounding policy has been applied, which may be more than the calculated rate.

Entry Age Normal Cost Method: the actuarial cost method which produces the normal cost of an employee's retirement benefits as a level percent of pay, beginning at the employee's age when he or she enters the plan and continuing until the employee reaches retirement age.

Full Funding: occurs when the unfunded accrued liability is $0 and the funded ratio is 100%.

Funded Ratio or Funded Status: the ratio of assets available to pay retirement benefits to accrued liability under the plan (liabilities associated with retirement benefits earned by employees).

Level Percent of Pay: calculating plan contributions as a consistent percentage of annual payroll costs each year and assuming that future contributions will increase by the same rate as payroll increases.

Normal Cost: the annual present value or costs for benefits earned by employees during the year.

Open Amortization: using a period of years that does not change over time to determine annual contributions to pay down the unfunded accrued liability. With each annual calculation, the period of years used to determine the payment is reset to the original period; the number of years in the amortization schedule does not decline to zero.

Smoothing: an actuarial method of spreading out investment gains and losses over a stated period of time, used to minimize volatility in the calculation of contributions to the plan.

Unfunded Accrued Liability: the difference between the assets and the accrued liability.

Tucson Supplemental Retirement System
Board of Trustees
Governance Policies

Purpose: The Board of Trustees (the "Board") of the Tucson Supplemental Retirement System ("TSRS" or the "System") strives to administer the System appropriately, competently and in the best interests of the TSRS members and beneficiaries. The Board desires to document its governance policies in an effort to provide Board members with a clear understanding of their responsibilities and to create a transparent environment in which the Board can operate can carry out its duties.

Authority: The Board is created and authorized pursuant to Tucson City Code ("TCC") Section 22-44. The Board has been granted the power and authority necessary to effectuate the administration, management and operation of TSRS, as well as the power and authority to construe, interpret and implement the TCC provisions which constitute the System. TCC §22-44(a). The Board also has the full power and authority to prudently invest the System assets. TCC §22-45.

Definition of Fiduciary: In the context of TSRS, a fiduciary is a person who exercises discretionary authority in the administration of TSRS benefits and liabilities or the management (including custody, payment and investment) of TSRS assets.

Governance Policies:

1. **Attendance**

All Board members are expected to attend all Board and applicable committee meetings. While attendance is not always possible, Board members should note any scheduling conflicts as soon as reasonably possible and attempt to manage their schedules to avoid creating additional conflicts. When absence from a Board meeting is unavoidable, it may be advisable to send a delegate to the Board meeting on behalf of the absent Board member, to allow continuity of Board business and representation of the Board member. The Board shall determine on a case by case basis whether it is appropriate for a delegate to exercise a proxy and vote on behalf of the Board member. Delegates should be used minimally.

2. **Committee Service**

Each Board member should serve on committees as requested by the Board Chair.

3. **Preparation**

Board members should come to Board meetings having read the materials prepared and circulated by the System Administrator and Board consultants, and having asked any questions of TSRS staff necessary to the Board members' understanding of the materials.

4. **Inquisitiveness**

Board members should be inquisitive and should appropriately question staff, advisors and fellow Board members as circumstances require. The inquisitive nature of Board members helps to build the institutional knowledge base of the Board.

5. **Integrity**

Board members should conduct themselves with integrity and dignity, maintaining the highest ethical conduct at all times.

6. **Confidentiality**

Board members shall not reveal confidential matters and will not use confidential information for personal gain or for the benefit of outside interests. Board members shall exercise due care with regard to all confidential information in their possession.

7. **Knowledge**

Board members should develop and maintain their knowledge and understanding of the issues involved in the management of the system. The specific areas in which board members should develop and maintain a high level of knowledge should include:

- Public pension plan governance.
- Asset allocation and investment management.
- Actuarial principles and funding policies.
- Financial reporting, controls and audits.
- Benefits administration.
- Vendor selection process.
- Open meeting and public records laws.
- Fiduciary responsibility.
- Ethics, conflicts of interest and disclosures.

8. **Education**

Board members should identify areas in which they might benefit from additional education and work with staff to find reasonable and appropriate educational opportunities. Members periodically should attend public sector pension conferences and educational programs and educational sessions provided internally by consultants and special guests. Board members should avail themselves of educational materials available from the System Administrator to keep current on public pension plan issues and topics.

9. **Collegiality**

Board members shall make every effort to engage in collegial deliberations, and to maintain an atmosphere in which Board or committee members can speak freely, explore ideas before becoming committed to positions and seek information from staff and other members. Board members should approach issues impacting TSRS with an open mind.

10. **Mentoring**

Any new Board member may request a mentor to assist him or her in becoming familiar with his or her responsibilities on the Board. If a request is made, the Board chair will designate one experienced current or former Board member to be a mentor to the new Board member for a period of one year. The mentor will be available to the new Board member outside of regularly scheduled board meetings, for consultation or discussion on a reasonable basis.

11. **Open and Accountable to Members and the City.**

Board members shall be appropriately open in the way key decisions are made and publicly disclosed. The Board shall conduct its business in accordance with the Arizona Open Public Meeting Law, as summarized in Exhibit A to these Governance Policies. The Board is accountable to both System members and the City of Tucson (the "City) for their performance in accordance with the applicable provisions of the TCC and these Governance Policies.

12. **Public Statements**

Board members shall not make public statements on behalf of the Board or TSRS without the advance authorization of the Board. Any public statements made by Board members on behalf of the Board shall be identified clearly as statements on behalf of the Board, in its fiduciary capacity as the TSRS Trustee. Any public statement by an individual Board member that relates to TSRS business and is not made on behalf of the Board shall be identified clearly as a statement of the individual Board member, not on behalf of the Board. When making a public statement regarding TSRS, Board members shall exercise due care and be mindful of public perceptions of the Board member's authority and any potential conflict of interest issues.

13. **Duty of Loyalty**

Board members staff shall discharge their duties with respect to the System solely in the interest of the TSRS members, retirees and beneficiaries for the exclusive purpose of:

- Providing benefits to members and beneficiaries.
- Defraying reasonable expenses of administering the plan.

14. **Duty to Act Prudently**

Board members must discharge their duties with the same care, skill and diligence under the circumstances then prevailing which a prudent person acting in a like capacity and familiar with the matters at hand would use in the conduct of an activity of like character and purpose. This requires:

- Undertaking an appropriate analysis of a proposed course of action, including determination of the relevant facts, considering alternative courses of action and obtaining expert advice as needed.
- Acting in accordance with the laws, documents and instruments governing the System.

15. **Duty to Invest Prudently**

The Board must invest the TSRS assets prudently and productively, in a manner consistent with portfolio management theory. Working with qualified investment consultants, the Board shall invest TSRS assets in accordance with the TSRS Statement of Pension Investment Policy and Objectives, and shall keep such Statement up to date and consistent with current investment goals and strategies.

16. **Exclusive Purpose of Systems Assets**

The assets of the System shall never inure to the benefit of the City of Tucson (the "City") and shall be held for the exclusive purposes of providing benefits to members and beneficiaries and defraying reasonable expenses of administering the system.

17. **Prohibitions Against Self-Dealing**

Board members shall not do any of the following:

- Deal with the assets of the System in their own interest or for their own account.
- In their individual, or any other capacity, act in any transaction involving TSRS on behalf of a party, or represent a party, whose interests are adverse to the interests of the System or the interests of the members and beneficiaries.
- Receive any consideration for their personal account from any party conducting business with the System in connection with a transaction involving TSRS assets.

18. **Avoidance of Conflicts of Interest and Appearance of Conflicts of Interest**

Individuals appointed to serve on the Board bring specialized information and knowledge to the Board from their positions with the City and from their represented constituencies. However, when sitting as a Board member, the member must take all reasonable steps to avoid both actual conflicts of interest and the appearance of conflicts of interest as they carry out their Board duties for the exclusive benefit of TSRS members and beneficiaries. Board members shall conduct themselves in accordance with the Conflict of Interest Policy attached as Exhibit B to these Governance Policies.

Tucson Supplemental Retirement System
Board of Trustees
Governance Policies

19. **Delegations of Authority**

The individual members of the Board cannot reasonably perform all acts necessary to operate TSRS; they must rely on TSRS staff and contractors to carry out many activities and functions. Accordingly, the Board may delegate authority to committees of its members, the System Administrator and outside consultants and contractors. Delegations must be prudent and consistent with the Board's fiduciary responsibilities. The Board shall (a) select delegatees with care, (b) define delegated authority clearly, (c) monitor the performance of delegatees, and (d) take corrective action when appropriate. Attached as Exhibit C to these Governance Policies is a listing of powers reserved by the City Council and active delegations from the Board.

Tucson Supplemental Retirement System
Board of Trustees
Governance Policies

Exhibit A – Arizona Open Public Meeting Law Summary

OPEN PUBLIC MEETING LAW
(A.R.S. SEC. 38-431, ET SEQ.)

It is the policy of the State of Arizona that meetings of public bodies be conducted openly. Notices and agendas are to be provided for such meetings and must contain information necessary to inform the public of the matters to be discussed or decided. All or any part of a public meeting of a public body may be recorded by any person in attendance by means of a tape recorder, camera or other means of sonic reproduction, provided that there is no active interference with the conduct of the meeting. A "Meeting" means the gathering, in person or through technological devices, of a quorum of members of a public body at which they discuss, propose or take legal action, including any deliberations by a quorum with respect to such action. The definition of a meeting was modified by the Arizona Legislature in 2000 to prohibit a quorum of a public body from secretly communicating through technological devices, including facsimile machines, telephones and electronic mail.

A. Public Bodies Defined

The TSRS Board is a "public body" for purposes of the Open Public Meeting Law.

"Public body means the legislature, all boards and commissions of the state or political subdivisions, all multi-member governing bodies of departments, agencies, institutions and instrumentalities of the state or political subdivisions, including without limitation all corporations and other instrumentalities whose boards of directors are appointed or elected by the state or political subdivision. Public body includes all quasi-judicial bodies and all standing, special or advisory committees or subcommittees of, or appointed by, such public body."

B. Public Notice Requirements

Notice of all meetings, including executive sessions, must be given to members of the TSRS Board and to the public. Generally, notice of meetings must be posted in a public manner no less than twenty-four (24) hours prior to the time of the meeting. Additionally, every year the TSRS Board must file with the City Clerk a disclosure statement indicating where all public notices of meetings will be posted. If preferred, the City Clerk will post notices for the public body in the locations established by the City Clerk for that purpose.

The notice should include the following information:

1. The full name of the TSRS Board. (In general, acronyms or other abbreviations should not be used alone. When a committee of the Board is meeting, include the name of the Board as well as the name of the committee.)

2. The date and time of the meeting.

3. The place of the meeting. (Include the name of the building and floor or suite number [if applicable], street address and City).

If the TSRS Board intends to meet for a specified calendar period on a regular day or date during the period, and at a regular place and time, may post public notice of meetings at the beginning of the period and need not post additional notices for each meeting unless there are changes to the schedule. The notice must specify the period for which the notice is applicable. The City Clerk prepares such a notice at the beginning of each calendar year based upon the contents of the annual disclosure statement filed by each public body. (This method of posting does not satisfy the agenda requirements unless the notice also contains a clear statement that the agenda for meetings will be available at least twenty-four [24] hours in advance of the meeting and a statement as to where and how the public may obtain a copy of the agenda.)

In case of an actual emergency, a meeting may be held upon such notice as is appropriate to the circumstances. Contact the City Clerk for further information.

A meeting may be recessed and resumed with less than twenty-four (24) hours' notice if public notice of the initial session of the meeting is given as required, and if, prior to recessing, notice is publicly given as to the time and place of the resumption of the meeting or the method by which notice shall be publicly given.

C. Agendas

In addition to the public notice requirements, the TSRS Board must provide an agenda of the matters to be discussed, considered or decided at each meeting which must be available to the public a minimum of twenty-four (24) hours prior to the time of the meeting. The agenda must contain a listing of the "specific matters to be discussed, considered or decided at the meeting". General terms such as "personnel," "new business," "old business", etc. may not be used unless the specific matters or items to be discussed are identified. Agendas should "contain such information as is reasonably necessary to inform the public of the matters to be discussed or decided."

A public body may include items such as "future agenda items" to schedule items for future agendas, or "call to the audience" to designate that part of the meeting at which members of the public may address the public body. Any discussions or decisions regarding a matter brought up under "future agenda items" or "call to the audience" should be rescheduled for a later meeting in order to properly agendize the item.

The Open Meeting law allows the Board chair or presiding Board member to present a brief summary of current events without listing in the agenda the specific matters to be summarized, provided that the summary is listed on the agenda and that the Board does not propose, discuss, deliberate or take legal action at that meeting on any matter in the summary unless the specific matter is properly noticed for legal action.

The agenda may be made available to the public by including it as part of the notice of the meeting or by stating in the notice how the public may obtain a copy of the agenda. Changes in the agenda must be prepared and distributed in the same manner as the original agenda at least twenty-four (24) hours prior to the time of the meeting.

Questions regarding content of the agenda should be discussed with the City Clerk.

D. Record of Meetings

The TSRS Board must maintain minutes of all meetings held either in the form of a taped recording (with supplemental notes, if necessary) or a written record. The record of the meeting must be available for public inspection within three (3) working days after the meeting. The minutes of a public meeting must include the following information:

1. The date, time and place of the meeting;

2. The members of the public body recorded as either present or absent;

3. A general description of the matters discussed or considered. The Law requires that minutes contain information regarding matters considered or discussed at the meeting even though no formal action or vote was taken with respect to the matter;

4. An accurate description of all legal actions proposed, discussed or taken and the names of members who proposed each motion. This does not require that the name of each member who votes on a motion be indicated but only that the member who proposed it be shown in the minutes. Generally, however, the Board, for its own benefit, will include the names of the member who seconded the motion and those who voted in favor of or against the motion. In any case, the minutes must reflect how the Board voted and the numerical breakdown of the vote (for example: 3 in favor, 1 against, 1 abstention);

5. "Legal action" means a collective decision, commitment or promise made by a majority of the Board members pursuant to the Tucson City Code, other authority of the Board, and the laws of this state.

6. The name of each person making statements or presenting material to the TSRS Board and a specific reference to the legal action to which the statement or presentation relates;

7. If the discussion in the public session did not adequately disclose the subject matter and specifics of the action taken, the minutes of the public meeting at which such action was taken should contain sufficient information so that the public may investigate further the background or specific facts of the decisions.

Tucson Supplemental Retirement System
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E. Executive Sessions

Executive sessions may only be held for specific purposes. Notice of the executive session must be given to the members of the TSRS Board, and to the general public in the same manner as all other meetings and must include the specific provision of the law authorizing the executive session.

Once proper notice has been given, the executive session may only be held following a public majority vote of a quorum of the Board members and a public announcement by the Board identifying the specific section of the law authorizing the executive session. The purposes for which an executive session may be called are narrowly defined in the law. Questions regarding holding an executive session should be discussed with the City Clerk.

F. Circumvention of the Open Meeting Law

Discussions and deliberations between less that a majority of the members of the TSRS Board, if used to circumvent the purposes of the Open Meeting Law violate that law. The Board may not circumvent public discussion by splintering the quorum and having separate or serial discussions with a majority of the Board members, whether in person or through technological devices. Board members should refrain from any activities that may undermine public confidence in the public decision making process established in the Open Meeting Law, including any actions that may appear to remove discussion and decision from the public view.

Relevant Arizona Attorney General Opinions:

Ariz. Att'y Gen. Ops. 75-8: All discussions among a majority of Board members subject to Open Meeting Law requirements.
Ariz. Att'y Gen. Ops. 78-1: Public participation in open meetings.
Ariz. Att'y Gen. Ops. I79-45: Changes to the agenda and timely publication.
Ariz. Att'y Gen. Ops. I79-49 and I96-012: Right of affected individuals involved in personnel matters before the Board.
Ariz. Att'y Gen. Ops. I90-19: Placing legal advice executive session notification on agenda.
Ariz. Att'y Gen. Ops. I90-058, I87-038; I87-131: Handling confidential records.
Ariz. Att'y Gen. Ops. I91-033. I83-135: Board member telephonic participation in meetings.
Ariz. Att'y Gen. Ops. I99-006: Limitations on responses to issues raised in call to the public.
Ariz. Att'y Gen. Ops. I05-004: Email to and from Board members.
Ariz. Att'y Gen. Ops. I07-013: Comments to the media regarding issues before the Board.

Tucson Supplemental Retirement System
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Governance Policies

Exhibit B – Conflict of Interest Policy

1. Individual Board members are fiduciaries and trustees. As such, Board members will at all times act in the best interest of TSRS and its members and beneficiaries, consistent with the Board member's fiduciary duty, and take positive steps to prohibit breaches of duty through negligence or intentional action.

2. Board members will never act where the Board or the individual member has determined that a conflict of interest exists. A conflict of interest is understood to be a situation where a relationship exists that could reasonably be expected to diminish independence of judgment in performance of official responsibilities as a Board member.

3. Board members may not participate in decisions which might result in significant personal economic advantage.

4. An ex-officio member shall not use his or her position with the City to influence Board or TSRS decisions in which the City has a material financial interest, or where they have a duty or responsibility that may give the appearance of a conflict of interest.

5. Board members will take positive steps to prohibit unauthorized communications with and from individuals seeking to influence the Board or who may receive personal benefit or gain as a result of Board actions.

6. To avoid the appearance of undue influence, Board members will refrain from communications with staff, outside of a Board or committee meeting, wherein the Board member advocates for or directs a specified action, decision or course of conduct regarding any existing or prospective investment transaction, benefit payment, service contract or other System transaction. The foregoing is not intended to place limitations on a Board member's ability to work with staff on routine Board members or to request public information.

7. Board members will not seek nor accept any compensation or political contributions that would violate Arizona or City law.

8. Board members shall not solicit or accept any gift, service, favor anything of value, or any compensation for any service rendered in connection with that individual's Board duties and responsibilities. Board members shall not accept or solicit, directly or indirectly, anything of economic value such as a gift, gratuity, favor, entertainment or loan that may appear to be designed to influence the Board member. This provision does not prohibit acceptance of minor promotional items such as calendars and pens; food and refreshments delivered as a gift to the work place for consumption on the premises by all employees at the work place; and business meals paid for by vendors or consultants in the normal course of business.

9. Each Board member shall have the authority to call an actual or perceived conflict to the attention of the Board for discussion and consideration. Similarly, the Board chair shall have the authority to ask whether any Board member has a conflict to disclose prior to discussion or action on any Board item.

10. Any Board member who is affected by an actual conflict of interest must (i) inform the Board of the conflict and (ii) refrain from voting upon or otherwise participating in the Board decision or action.

Tucson Supplemental Retirement System
Board of Trustees
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Exhibit C – Reserved Powers and Delegations of Authority

Powers Reserved for the Mayor and City Council

1. Design Terms and Conditions of TSRS
2. Amend, Modify and Terminate TSRS
3. Set Member Contribution Rate
4. Set Employer Contribution Rate
5. Appoint TSRS Board Chair

Powers Granted to TSRS Board

1. Administration, Management and Operation of TSRS
2. Investment of TSRS assets
3. Establish and Maintain Investment Policy
4. Determine, Monitor and Adjust Actuarial Assumptions
5. Establish and Maintain Funding Policy
1. Certify Required Annual Contributions from Members and City, Based on Annual Valuation by TSRS Actuary
6. Recommend Member Contribution Rate
7. Recommend Employer Contribution Rate
8. Select, Monitor, Remove and Replace TSRS Service Providers
9. Oversee TSRS System Administrator and Staff
10. Conduct TSRS Board Meeting and Set Agendas
11. Adopt and Maintain TSRS Administrative Policies and Procedures
12. Ratify Retirement Applications
13. Determine Eligibility for Disability Pensions
14. Approve Member Service Purchases
15. Manage IRS and Other Legal Compliance Issues
16. Conduct Hearings and Make Determinations Regarding Member Benefits

Tucson Supplemental Retirement System
Board of Trustees
Governance Policies

Powers Granted to City Finance Director

1. Collect Member Contributions and Transmit to TSRS Trust
2. Collect Employer Contributions and Transmit to TSRS Trust

Powers Delegated to TSRS System Administrator

2. Provide TSRS System Information to Members and Beneficiaries
3. Enroll Members in TSRS
4. Collect and Maintain Beneficiary Designations and Member Pension Elections
5. Maintain Database of Member Information
6. Determine Benefit Eligibility and Perform Benefit Calculations
7. Make Benefit Payments When Due to Members and Beneficiaries
8. Facilitate Transfers of Assets and Liabilities to State Retirement Systems as Needed
9. Compile Information Necessary for, and Assist TSRS Board in Conducting Review of, Disability Pension Applications
10. Respond to Inquiries from Members, Beneficiaries, City Officials
11. Recommend Administrative Policies and Fee Assessments to TSRS Board
12. Manage IRS Compliance Requirements for Individual Member Benefits and for TSRS System Tax Status
13. Manage TSRS Board Meeting Schedule and Prepare Board Meeting Materials
14. Create, Retain and Manage TSRS Records
15. Manage TSRS Staff Budget and Resources
16. Facilitate Service Provider Contracts and Payments
17. Interface with TSRS Actuary and Legal Counsel as Needed
18. Make Regular Reports on Administrative Activities to TSRS Board

Tucson Supplemental Retirement System
Board of Trustees
Governance Policies

Powers Delegated to TSRS Investment Manager

1. Monitor TSRS System Investments
2. Work with TSRS Investment Consultant and Investment Providers to Oversee Investment of TSRS Assets in Accordance with TSRS Investment Policy
3. Monitor and Manage Liquidity Requirements for TSRS Benefit Payments
4. Facilitate Movement of TSRS Assets
5. Assist TSRS Board in the Selection, Review and Replacement of Investment Providers
6. Interface with TSRS Investment Consultant and Investment Providers as Needed
7. Make Regular Reports on Investment Activities to TSRS Board

FIDUCIARY TRAINING

TUCSON SUPPLEMENTAL RETIREMENT SYSTEM

Board of Trustees

October 28, 2016

WHAT LAW GOVERNS TSRS AND BOARD ACTIONS?

- Tucson City Code
- Arizona State law
- Arizona common law of trusts
- Internal Revenue Code
- Courts may consider:
  - Uniform Management of Public Employee Retirement Systems Act
  - ERISA (Employee Retirement Income Security Act of 1974)
  - Uniform Prudent Investor Act

PUBLIC PENSION PROTECTIONS IN ARIZONA CONSTITUTION

- Arizona Constitution protects public pensions in two ways: contract clause and pension clause.
- "Membership in a public retirement system is a contractual relationship that is subject to [the Constitution's contract clause] and public retirement system benefits shall not be diminished or impaired." Ariz. Const. Art. XXIX, §1.
- Together, the Constitutional provisions create a rule that a public employee's interest in his retirement pension is a contractual right that vests at the beginning of employment.
- The employee has a vested right to continued membership in the pension plan, under the same rules and regulations existing at the beginning of his employment.

RECENT AND PENDING ARIZONA CONSTITUTIONAL CASES

- Barnes v. ASRS: 2012 Maricopa County Superior Court case.
  - S.B. 1614 had increased employee contributions from 50% to 53%, while decreasing employer contributions from 50% to 47%.
  - Change in employee rate had no effect on funded status of ASRS.
  - Court held that S.B. 1614 was an unconstitutional impairment of employees' contractual rights, with no significant and legitimate corresponding public purpose.
  - Court found violations of the Arizona and U.S. Constitutions.
  - Legislature repealed S.B. 1614 and reverted to 50/50 contribution rate structure.
  - ASRS paid contribution refunds, returning extra 3% collected from employees, and surcharged employers for contributions of less than 50% collected prior to repeal of S.B. 1614.

RECENT AND PENDING ARIZONA CONSTITUTIONAL CASES

- Fields v. EORP: 2014 Arizona Supreme Court case.
  - S.B. 1609 had increased contribution rates and changed the calculation of cost of living increases under PSPRS, CORP and EORP.
  - Plaintiffs challenged the provision of S.B. 1609 that limited the amount of excess assets that could be used to fund permanent benefit increases ("PBI") under the EORP and the provision that tied the PBI to the funded status of the EORP.
  - Superior Court, AZ Court of Appeals and AZ Supreme Court held that retired judges were fully vested in right to continue to receive PBIs calculated in accordance with method in place at the time of retirement.
  - AZ Supreme Court held that potential diminishment cases must be decided under the pension clause of the Constitution, as opposed to the contracts clause (stricter standard).
  - AZ Supreme Court rejected argument that EORP must be funded using actuarial methods and assumptions that are generally accepted actuarial standards.

RECENT AND PENDING ARIZONA CONSTITUTIONAL CASES

- Hall v. EORP: Case currently pending with AZ Supreme Court.
  - S.B. 1609 increased the employee contribution rate from 7% to 13% (over time)and changed PBI calculation method for currently employed judges under EORP.
  - Plaintiffs are challenging the contribution increase and arguing that the right to cost of living increases vests at employment as opposed to retirement.
  - Superior Court held that increase in employee contributions violated the pension clause of the AZ Constitution.
    - EORP argued that contributions should be changeable when necessary to preserve actuarial soundness of system. Court disagreed and stated that EORP will remain actuarially sound as long as both employees and employers make required contributions.
    - EOP argued that the employee contribution rate is not the protected pension benefit, but rather the cost of the protected pension benefit. Court disagreed based on prior AZ case law.

RECENT AND PENDING ARIZONA CONSTITUTIONAL CASES

- Hall v. EORP: Continued
  - Superior Court held that the cost of living increases are protected at varying degrees.
    - For employees hired into EORP prior to 2000, the cost of living increases are protected at the outset of employment, based on the language of the EORP.
    - For employees hired into EORP in 2000 or later, the vesting schedule in the statute states that employees vest at retirement. The Court agreed with EORP that the judges who entered EORP in 2000 or later are subject to changes in the cost of living increases made prior to their individual retirement dates because of the vesting schedule.
  - Case is on appeal to special panel of judges acting on behalf of the AZ Supreme Court. All Supreme Court judges recused themselves because they are participating EORP members. All members of the special panel became judges after S.B. 1609 was enacted.
  - Oral arguments were held in February 2016, no decision yet.

PSPRS EFFORTS TO REFORM IN CURRENT CONSTITUTIONAL ENVIRONMENT

- Additional PSPRS Reform
  - S.B. 1428 and Proposition 124
  - S.B. 1428 changes the calculation method for cost of living increases and caps the adjustments at 2% beginning July 1, 2017, adds a new benefit tier for PSPRS members entering July 2017 and later which includes an optional defined contribution plan and protects the legislature's right to make additional benefit changes for all future employees.
  - Prop. 124 was a Constitutional amendment, specific to the reforms included in S.B. 1428 that impact current employees, retirees and survivors
    - Allowing employees hired after 2012 to opt into supplemental defined contribution plan, and
    - Modifying cost of living increase formula effective July 1, 2017.

SUMMARY OF CONSTITUTIONAL STATUS

- Pending the Supreme Court's decision in Hall:
  - The pension clause reigns supreme over the contracts clause, which provides a very high level of protection for public pension benefits.
  - Employee contribution rates are protected pension benefits.
  - COLAs and the related COLA formulas are protected pension benefits.
  - Funded status arguments regarding the actuarial soundness of a plan are not likely to justify benefit reductions.
  - Cost related arguments regarding excessive taxpayer burden or extraordinary impact on governmental services are not likely to justify benefit reductions.
  - Flexible language in the governing documents, such as the contribution rate language for the TSRS variable tiers, is likely to be respected by the Courts.

FIDUCIARY TRAINING: WHY DO WE TRAIN?

- Appropriate execution of fiduciary duties requires specialized knowledge.
- Regular training in fiduciary issues demonstrates fiduciary prudence.
- TCC Section 22-44(k) requires the Board to "do all … things necessary or prudent for the proper administration of the provision of" TSRS.

KNOWING THE FIDUCIARY ROLE AND OBLIGATIONS

- The Fiduciary Role can be summarized as the obligation
  - To administer the plan and
  - To invest the plan assets --

  All with the same care, skill and diligence under the circumstances then prevailing which a *prudent person* acting in a like capacity and *familiar with those matters* would use in the conduct of an activity of like character and purpose.

  - Fiduciaries must act as an experienced or knowledgeable expert might act.

SETTLORS AND FIDUCIARIES

- Settlor vs. Fiduciary Functions
- A Settlor is the person or entity who establishes a trust
  - Settlor functions in the retirement context include establishing, designing, amending and terminating the pension plan
- A Fiduciary is the person or entity who is entrusted with the management of the Settlor's trust
  - Fiduciary functions are administration and investment
- Fiduciaries have no control over Settlor functions, and vice versa

KEY AREAS OF FIDUCIARY CONCERN

- System Governance
- Actuarial Management
- Investment Selection/Monitoring
- Administrative Oversight
- Communication

PRINCIPAL FIDUCIARY DUTIES

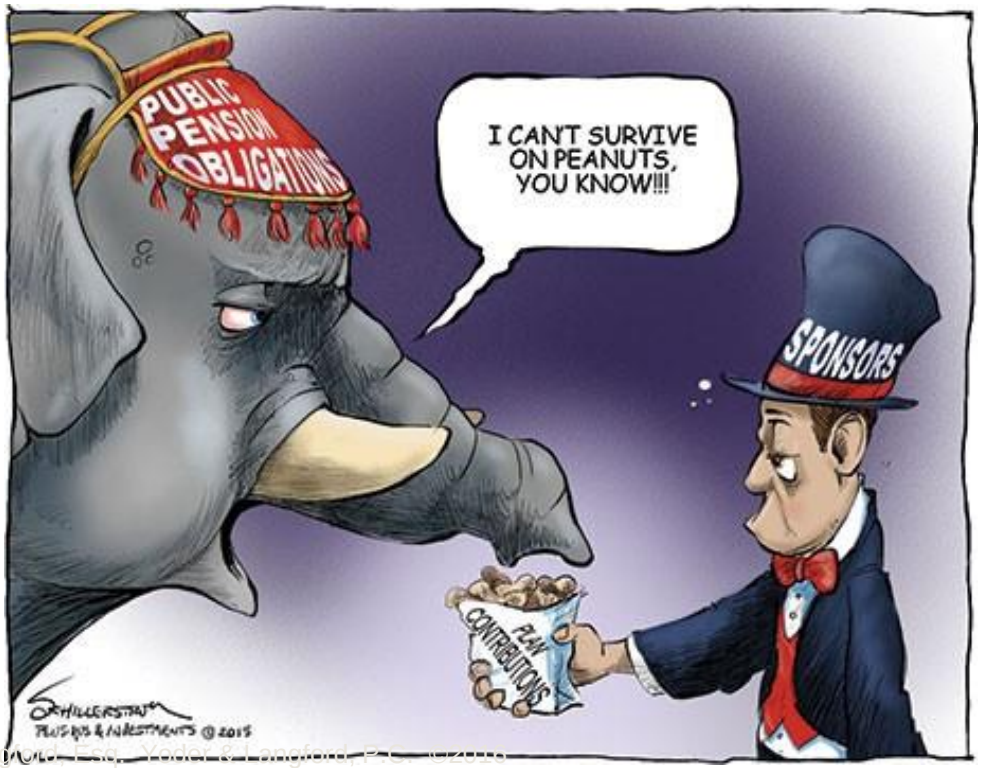
- Duty of Prudence and Duty to Exercise Due Care
- Duty of Loyalty and Duty to Act Impartially, in Good Faith
- Duty to Comply with Applicable Law

THE DUTY OF PRUDENCE

- Must exercise care and diligence in following governing terms, making investment selections, hiring providers.
- Prudence encompasses Investment and Administration
- Investments
  - A primary duty of Board is to ensure TSRS' trust is productively invested.
  - Prudent investment process (selection, monitoring and change) is required.
  - Board is not required to guarantee investment results.
  - Payment of only reasonable and appropriate fees.

PRUDENT INVESTMENTS

- Prudent investments maximize return without incurring undue or inappropriate levels of risk
- Evaluate on portfolio basis and on individual investment basis
- Investment returns directly impact required contributions



PRUDENCE (CONTINUED)

- Administration
  - Annual review of funded status and future projections.
  - Prudence in setting actuarial and valuation factors is required (use of experience based assumptions).
  - Ongoing monitoring and adjustment of administrative policies and procedures is required as circumstances evolve.
  - Documentation of decisions, policies, procedures

THE DUTY OF LOYALTY

- Board owes duty of loyalty to TSRS members and beneficiaries.
- Codified in Internal Revenue Code as the "exclusive benefit" rule:
  - It must be impossible, under the governing instruments, for the plan assets and income to be used for, or diverted to, purposes other than for the exclusive benefit of employees and beneficiaries, or to pay reasonable plan expenses.
- TCC Section 22-32 incorporates the exclusive benefit rule into TSRS:
  - The Tucson Supplemental Retirement System shall operate for the exclusive purpose of providing benefits to the members and their beneficiaries. It is prohibited for any part of the corpus or income of the trust fund to be used for, or diverted to, purposes other than for the exclusive benefit of the members or their beneficiaries.
- Fiduciary loyalty is complete and unwavering, and must overcome all other loyalties owed by Board member.

LOYALTY (CONTINUED)

- Loyalty prohibits self-dealing.
- Loyalty prohibits conflicts of interest.
- Loyalty requires:
  - Acting on behalf of TSRS, not the City.
  - No personal (or political) stake in the outcome of a Board decision.
  - Impartiality is required.

CONFLICTS OF INTEREST

- Most Board members wear at least two hats.
- Board members often serve as result of position with City or as elected representative of TSRS group.
- During Board service, members must avoid conflicts between their dual roles and conflicts relating to personal interest in TSRS.
- Some conflicts cannot be eliminated.
- Board member may have to abstain from voting and/or recuse self from deliberations.

DELEGATIONS TO AND MONITORING OF SYSTEM ADMINISTRATOR

- Board is responsible for investments and administration – more work than the Board can possibly perform.
- Proper delegations to Administrator and Staff require examination of experience, knowledge and capacity.
- Delegations must be clear and understood.
- Work performed under delegation must be supervised.
- Fiduciary responsibility can be shared, but it cannot be delegated.

SELECTION, MONITORING AND OVERSIGHT OF SERVICE PROVIDERS

- Service providers should be engaged when Board does not possess necessary expertise or work capacity.
  - Selection process is key – must obtain all relevant and reasonably available information on candidates.
  - Current service providers must be monitored for quality of service and reasonable fees on ongoing basis.
- Board has fiduciary responsibility for engagement of service providers, and may have responsibility for their actions.

RECOMMENDED PRACTICES FOR BOARD MEMBERS

- Be familiar with TSRS Code and Board Policies.
- Stay informed about key issues facing public retirement systems.
- Build you peer network, allowing you to draw on experience and knowledge of others working in the pubic retirement arena.
- Stay up to date about compliance changes and industry trends.
- Make a professional commitment to ongoing training and development.

CONCLUSION

- Effective plan governance improves plan performance and operations.
- Poor plan governance will be identified in the event of any legal challenges.
- Fiduciary training and good management improve administration, service to members and technical compliance; all of which reduce risk.
- Communication regarding how the Board implements good governance policies and procedures increases confidence in the system.

PIMCO

Strategy review
28 October 2016

Tucson Supplemental Retirement System

MORNINGSTAR Awards 2015™

Morningstar's U.S. Fixed-Income Fund Manager of the Year three of the last four years:
2012 | 2013 | 2015

A company of Allianz

Disclosures

Past performance is not a guarantee or a reliable indicator of future results. Shares distributed by **PIMCO Investments LLC.**

The Morningstar Fixed-Income Fund Manager of the Year award [PIMCO Short-Duration (2015) awarded to Jerome Schneider and Team; PIMCO Income (2013) awarded to Dan Ivascyn and Alfred Murata; PIMCO Investment Grade Corporate (2012) awarded to Mark Kiesel] is based on the strength of the manager, performance, strategy and firm's stewardship. Morningstar Awards 2015©. Morningstar, Inc.

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Biographical information

R. Matthew Clark, CFA

Mr. Clark is a senior vice president and account manager in the Newport Beach office with a focus on institutional client servicing. Prior to joining PIMCO in 2002, he served as an officer in the U.S. Army for eight years, achieving the rank of captain. He has 15 years of investment experience and holds an MBA from Harvard Business School. He received an undergraduate degree from Trinity University, San Antonio.

Loren Sageser

Mr. Sageser is a senior vice president in the Newport Beach office and a product manager focused on credit products. He is also a member of the core leadership team for PIMCO's global sustainability initiative. Prior to joining PIMCO in 2011, he worked as a product manager at Babson Capital Management. Previously, Mr. Sageser was a deal manager for credit products at Wachovia Securities and a fixed income investment analyst at the Franklin Templeton Group. He has 16 years of investment experience and holds an MBA from the Anderson School of Management at the University of California, Los Angeles. He received a bachelor's degree in economics and a master's degree in sociology from Stanford University.

Agenda

1/Market review

2/Strategy review

3/Economic outlook

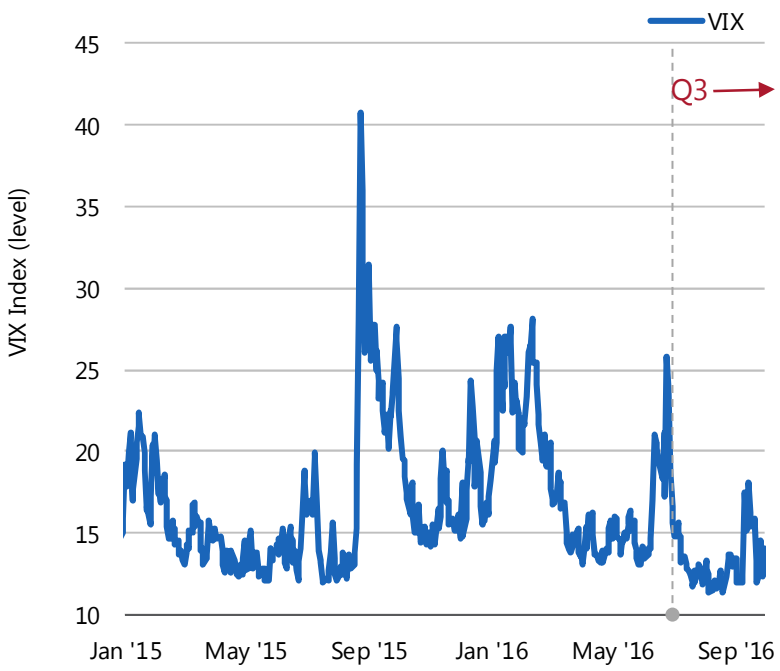
4/PIMCO update

5/Appendix

Market review

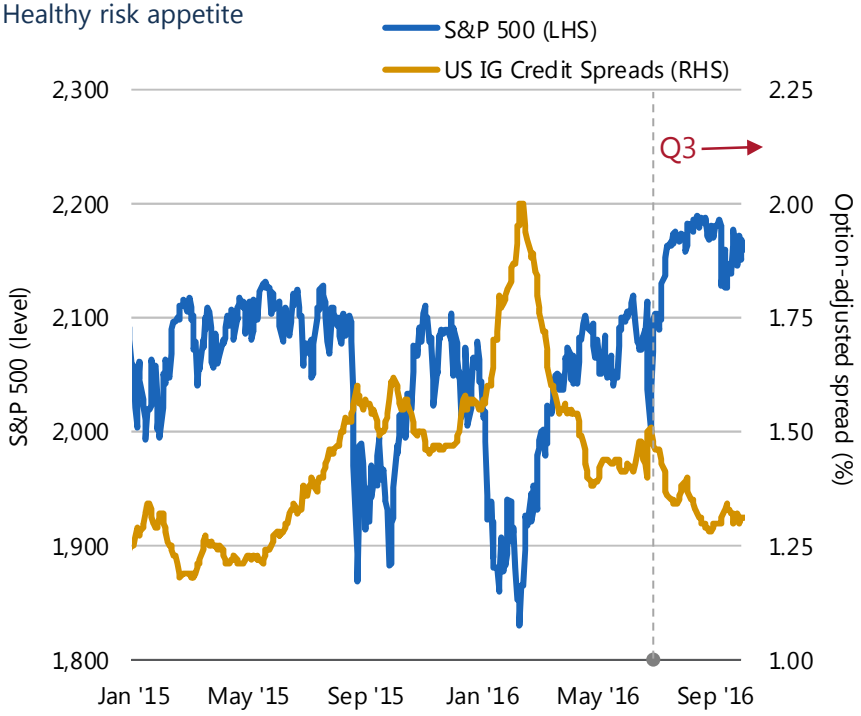
Markets brushed off Brexit and geopolitical events

Eerie calm



The low level of volatility highlighted the relatively benign market environment for much of the quarter

Healthy risk appetite



U.S. equities set record highs and credit spreads tightened as risk appetites built globally post-Brexit

Volatility remained low, spreads tightened and equities rallied in a relatively quiet quarter for markets

As of 30 September 2016
SOURCE: PIMCO, Bloomberg

Diversified Income strategy

PIMCO's diversified income strategy:
A flexible approach to global investing

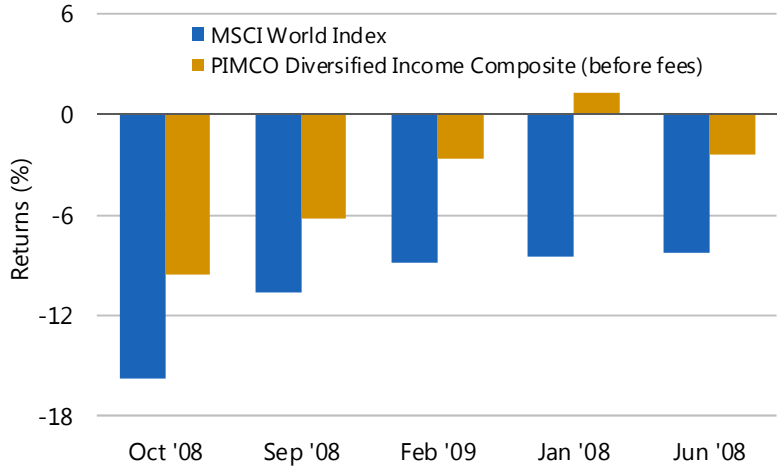
Objective	• Seeks to provide investors with flexible and highly tactical access to the full global credit opportunity set
Risk-adjusted returns	• Seeks to provide investors with higher returns relative to high grade credit, but with less volatility than a pure high yield strategy
Downside protection	• A diversified, risk-conscious approach targeting volatility levels nearly one-third lower than high yield bonds[1]
A global opportunity set	• Active management across corporate, emerging market, real estate, municipal and consumer credit markets, leveraging PIMCO's broad credit resources
Role in Portfolio	• Complements Tucson Supplemental Retirement System's passive Barclays Aggregate exposure

Tucson Supplemental Retirement System's customized benchmark contains 25% agency MBS, 25% investment grade credit, 25% high yield credit, and 25% EM external bonds.
As of 30 September 2016
[1] Annualized volatility of Diversified Income Composite since inception (8/31/2003): 6.6%; annualized volatility of Barclays Global High Yield BB-B Constrained Index since 8/31/2003: 9.0%
Refer to Appendix for additional investment strategy and risk information.

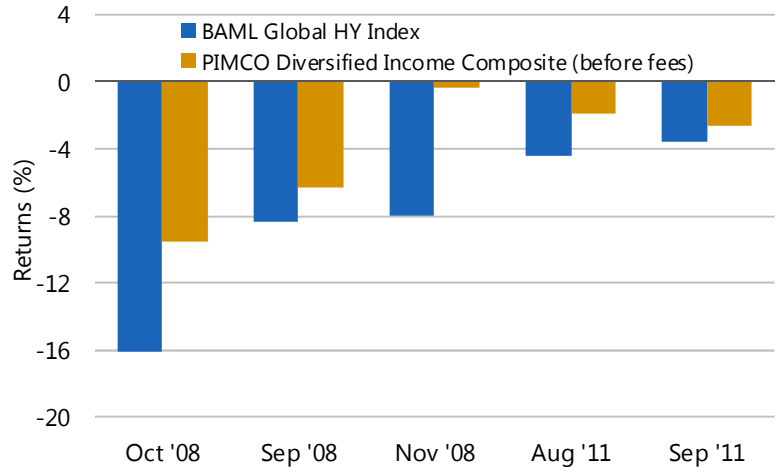
PIMCO's approach to diversified income investing focuses on avoiding large drawdowns

- Diversified income is a source of potentially attractive risk-adjusted yield as investors seek income in today's low-yield world
- Flexibility to actively manage exposure between credit markets in efforts to navigate relative value dislocations
- Diverse sources of return, as well as credit selection and sector rotation, provide hedging from large drawdowns
- A vehicle for high return potential with historically lower volatility than equities[1], as well as low correlation to core bonds

Five worst equity index months

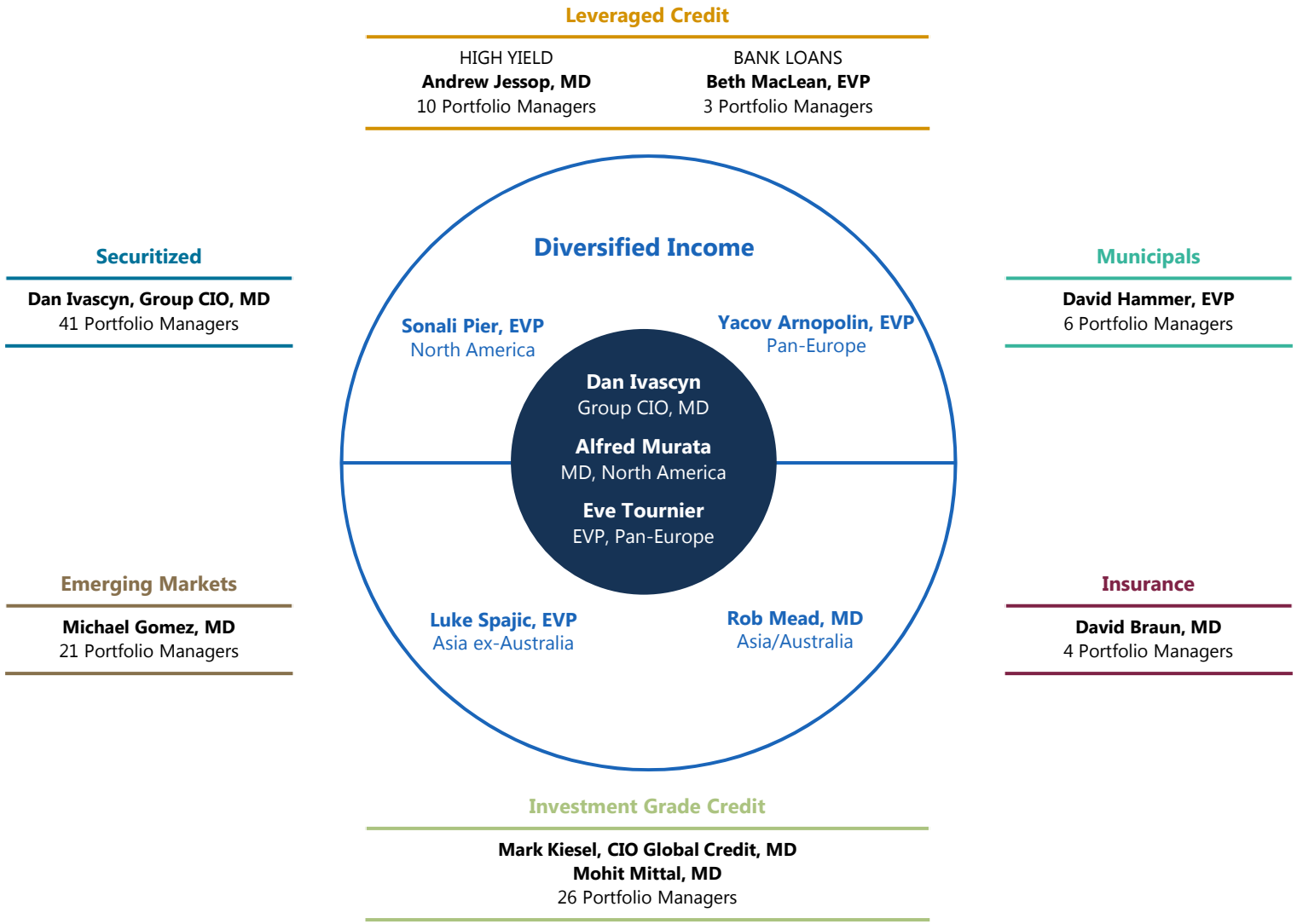


Five worst high yield months



As of 30 September 2016
[1] Annualized volatility of MSCI World Index since 8/31/2003: 13.2%
Refer to Appendix for additional performance and fee, composite, investment strategy, index and risk information..

PIMCO's diversified income portfolio management resources



As of 30 September 2016
SOURCE: PIMCO

PIMCO's credit research team

50+
CREDIT RESEARCH ANALYSTS

40+
INDUSTRIES COVERED

10+
LANGUAGES SPOKEN

24
HOUR GLOBAL CREDIT COVERAGE

Weekly
MEETING WITH PORTFOLIO MANAGERS AND ANALYSTS

Managing Director, Head of Global Credit Research

Christian Stracke

Newport Beach

Christian Stracke, Head of Global Credit Research

Del Anderson	Ronald Jin
Suhasini Bhargava	Joe Pattaphongse
Mark Chin	Steve Pawliczek
John Devir	Laura Robinson
David Gluckman	Joseph Silva
Brendan Hanley	Scott Striegel
Richard Hofmann	Jackson Thies
Jiaying Huang	Elizabeth Wegener
Ray Huang	Jinhy Yoon

New York

Mirette Kouchouk
Sean McCarthy
Jules Naters
Michael O'Connor
John Pollakowski
Matthew Sinni
Jessica Tom

Rio De Janeiro

Alessandro Baldoni
Natalia Lima

London

Philippe Bodereau Head of European Credit Research

Matteo Bertolo
Matthieu Loriferne
Maren Proeve
Charles Watford
David Werthan
Alexis Yannas

Hong Kong

Raja Mukherji Head of Asian Credit Research

Emily Au-Yeung
Yishan Cao
Dorris Chen
Frank Chen
Taosha Wang

Munich

Juergen Dahlhoff
Christian Schuetz
Christian Wild

Tokyo

Maiko Tamura
Takanori Miyoshi

Distressed Credit

Sai Devabhaktuni, Head of Distressed Credit

Adam Gubner	Chris Neumeyer
Greg Kennedy	Ben Petkevicius
Lionel Laurant	Ethan Schwartz
Manon Medez	

Special Situations

Zubin Kapadia

As of 9 September 2016

Key tenets of PIMCO's diversified income investment process

Focus on risk-adjusted returns	• We construct portfolios to provide attractive risk-adjusted returns across a range of economic scenarios
Leverage top down process	• Leverage PIMCO's top-down macroeconomic process to identify the most attractive credit opportunities within the context of our macroeconomic outlook
Maintain risk factor diversification	• Portfolio construction is based on a risk-factor diversification, helping to ensure that no single risk factor dominates the volatility of the strategy
Employ granular security selection	• PIMCO's team of ~55 credit analysts helps to identify issuers with robust business models, competent management teams, and solid growth potential
Collaboration across credit specialty desks	• PIMCO's multi-sector credit team leverages portfolio management specialists spanning all facets of corporate, emerging market, municipal and securitized credit

Refer to Appendix for additional investment strategy and risk information.

Common credit investing pitfalls…What can go wrong?

	PIMCO's Approach
Concentrated Risk	• We scale investments based on valuation and conviction. This serves as an embedded risk management tool and helps ensure that no single investment dominates returns
Limited sector specific expertise	• Our multi-sector credit investment process leverages teams of sector specialists across corporate, securitized, emerging market and municipal credit markets
Style bias	• Strong team of multi-sector credit specialists with experience managing flexible credit strategies across the liquidity and return spectrum
Under-emphasizing the macro	• Macroeconomic factors cannot be ignored. We focus on the best credit opportunities within the context of our macroeconomic views
Reaching for yield	• PIMCO has always focused on maintaining responsible levels of risk across market cycles. This is especially critical during periods of historically low volatility

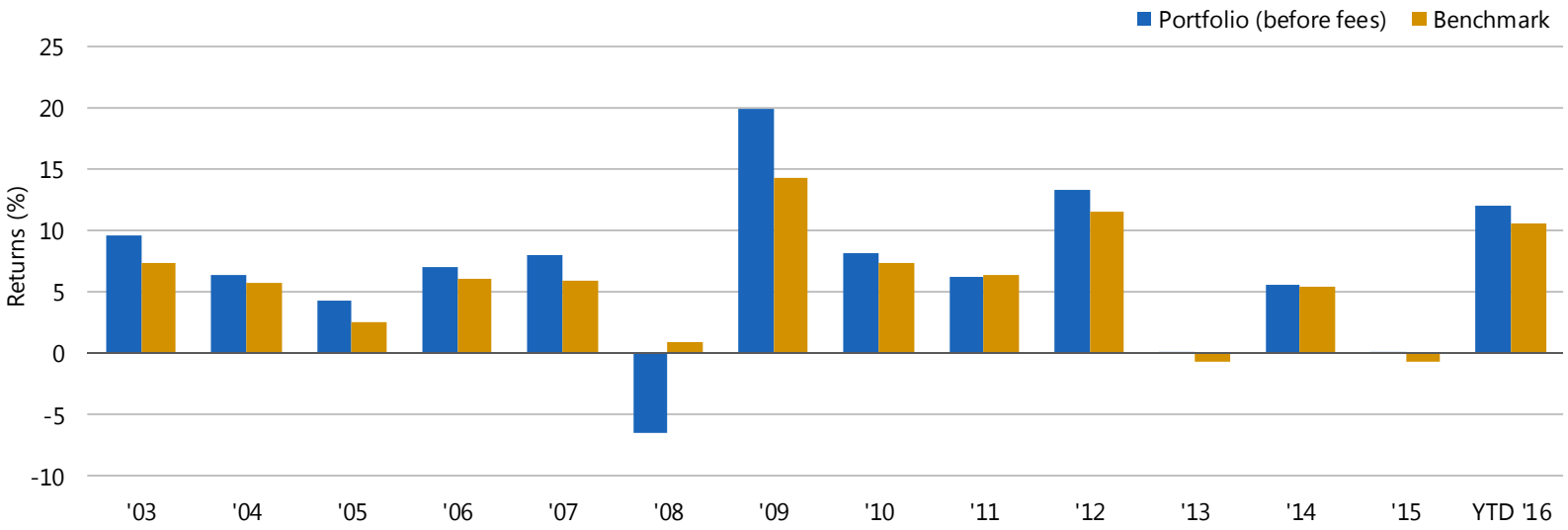
Refer to Appendix for additional investment strategy and risk information.

Tucson Supplemental Retirement System performance review

Tucson Supplemental Retirement System

Market value as of Sep '16	$	126,749,571

Performance



	S.I. 30 Jun '02	10 yrs.	5 yrs.	3 yrs.	1 yr.	6 mos.	3 mos.	YTD 30 Sep '16
Before fees (%)	6.8	6.6	6.4	6.2	12.6	8.4	3.6	12.0
After fees (%)	6.3	6.2	5.8	5.7	12.0	8.2	3.4	11.6
Benchmark (%)	6.1	6.2	5.5	5.5	10.3	6.8	2.8	10.6

As of 30 September 2016
All periods longer than one year are annualized
Benchmark: BC25%(Morg Ind,CreInd,H Yid);25%JPMEMBI

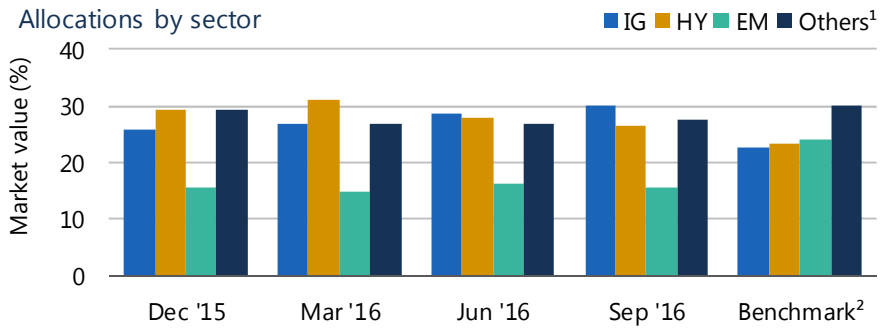
Strategic outlook
Current top four investment themes in Diversified Income

	Position	Rationale
Investment grade	**Overweight**	• Financial institutions in the U.S. and Europe continue to de-lever and build capital amid regulatory scrutiny; falling supply also reinforces positive market technicals; recent sell-off has created additional pockets of opportunity • We continue to find value in securities throughout the capital structure of de-leveraging, de-risking financial issuers with attractive long-term prospects.
High yield	**Overweight**	• HY corporates offered compelling relative value amid the selloff early in the first quarter, although the retracement in credit spreads has reduced its attractiveness • With the exception of the energy sector, we do not expect a broad based increase in HY market default rates. • We continue to focus on controlling risk through security selection and diversification
Emerging markets	**Underweight**	• Emerging markets continue to outperform broader high yield markets, due to weaker links to energy-related weakness and country-specific outperformance • We expect volatility to continue, but are positioning the portfolio to benefit from continued EM outperformance relative to developed credit markets
MBS/Securitized	**Overweight**	• We continue to focus on non-agency mortgages as a complement to traditional high yield corporates, while adding exposure to high quality CLO debt and senior student loan issues

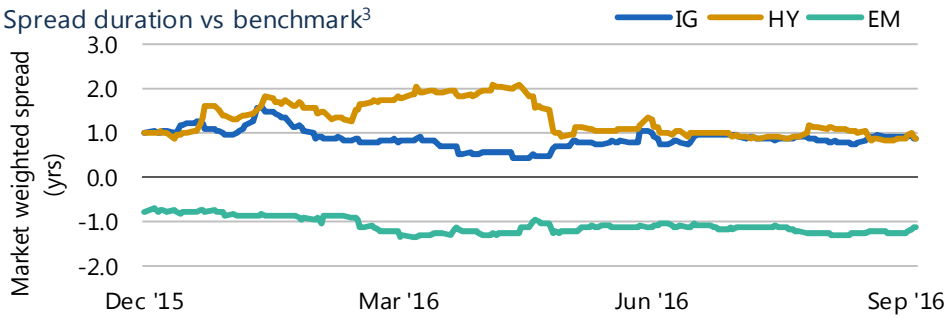
As of 30 September 2016
SOURCE: PIMCO

Tucson Supplemental Retirement System portfolio structure

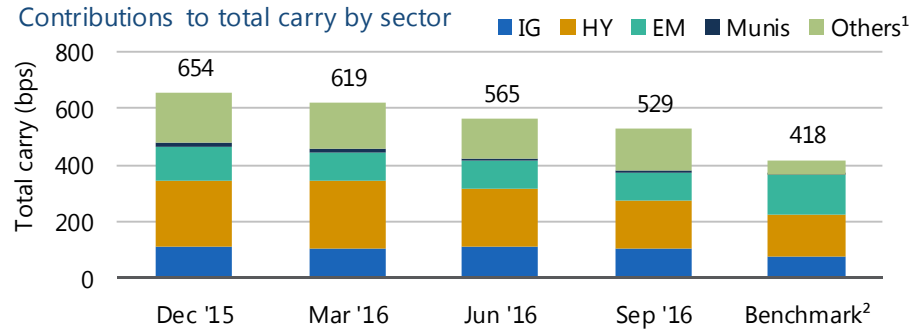
- On a market value basis, the portfolio has seen a modest decline in HY exposure, and we maintain an underweight in emerging markets



- HY spread duration[3] has been gradually reduced, reflecting an up-in-quality bias amid the credit market's broad YTD rally



- The portfolio continues to maintain a carry advantage versus the benchmark, boosted by tactical allocations to sectors such as non-agency mortgages and subordinated debt



As of 30 September 2016
SOURCE: PIMCO
[1]Others: Treasuries, MBS, non-agency mortgages
[2]Equally weighted blend of the following four indices: Barclays Mortgage Index, Barclays Credit Index, Barclays High Yield Index, JP Morgan EMBI Global
We reclassify IG and HY corporate issues issued by EM countries into the EM bucket and government related issues in the Global Aggregate Credit Index into "Others."
[3]Spread duration represents a fund's sensitivity to credit spreads movement. Underweight spread duration when spreads widen will lead the fund outperform the benchmark.

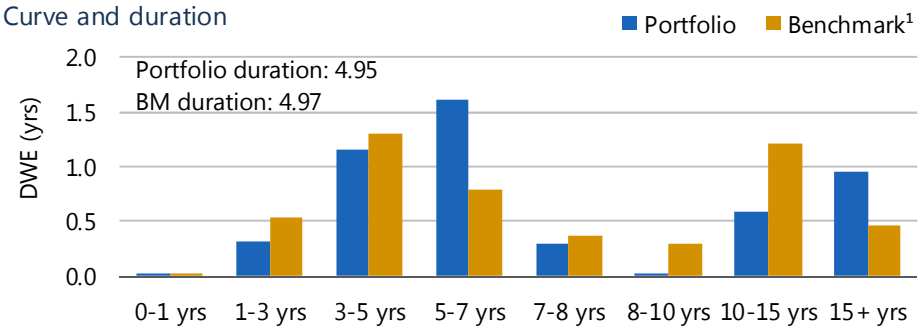
Tucson Supplemental Retirement System portfolio structure

- The Fund's total duration is currently modestly below benchmark levels given the rally in global yields this year

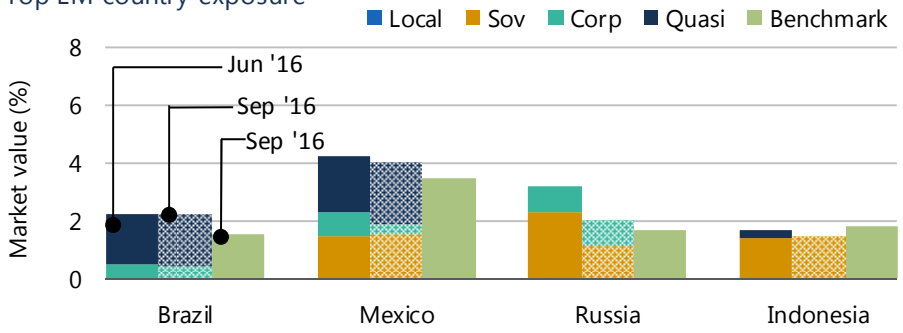
- During the quarter the portfolio reduced its exposure to Russian sovereign debt

- The Fund continues to favor financial issuers, with a focus on subordinated bank debt poised to benefit from ongoing deleveraging

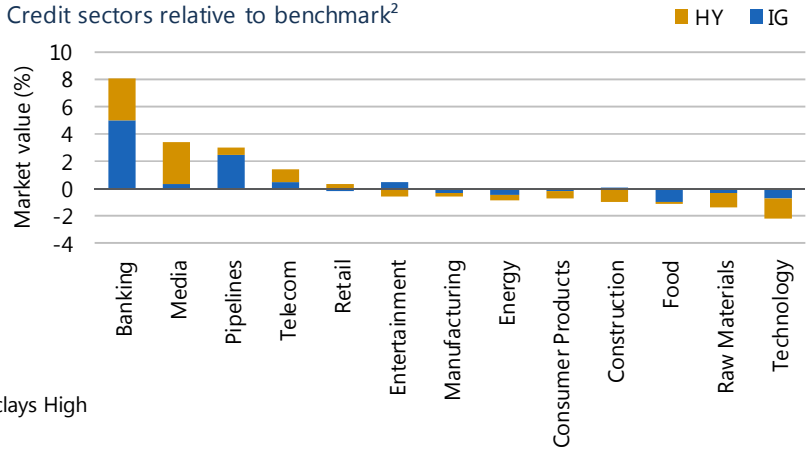
Curve and duration



Top EM country exposure



Credit sectors relative to benchmark[2]



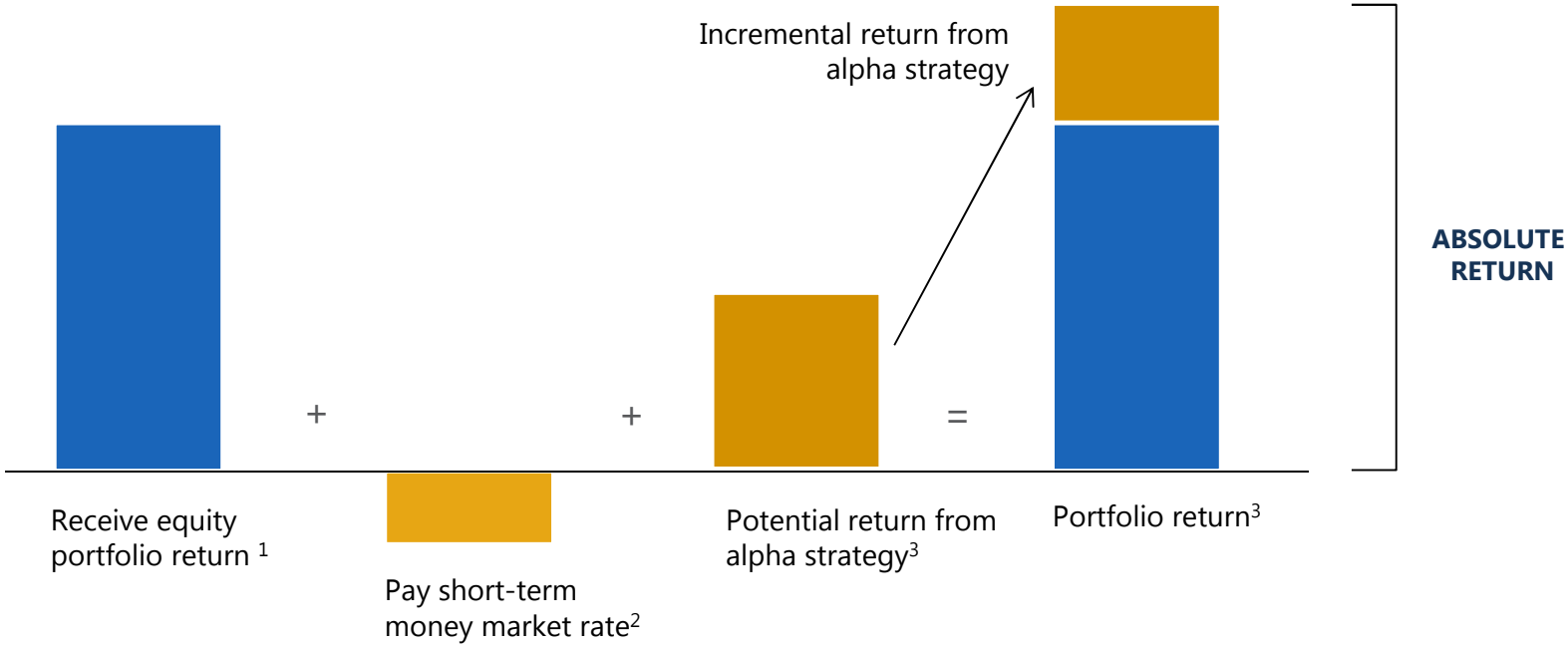
As of 30 September 2016
SOURCE: PIMCO
[1]Equally weighted blend of the following four indices: Barclays Mortgage Index, Barclays Credit Index, Barclays High Yield Index, JP Morgan EMBI Global
[2]Credit sectors excluding EM issuers

StocksPLUS® strategy

StocksPLUS aims to outperform market by transporting extra return from independent, structurally-based sources

Own full equity market exposure through forward instruments, such as futures, and then enhance equity returns with a bond strategy designed to add alpha

HYPOTHETICAL EXAMPLE

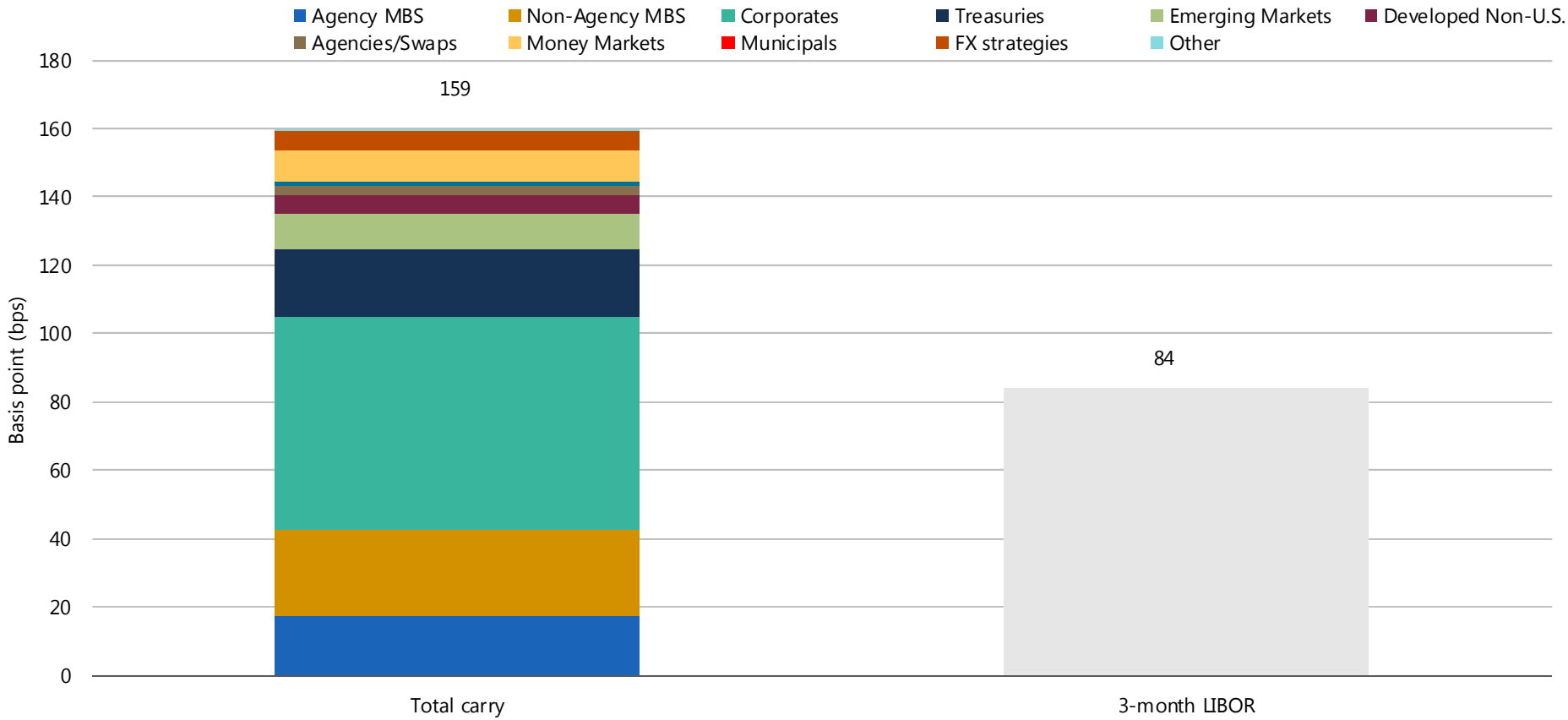


[1]Equity index or reference portfolio as specified by the investment guidelines
[2]Short-term interest rate paid generally constrained to LIBOR by short, uncertain time horizon of majority of buyers of stock index futures; total return swaps generally specify a cost of LIBOR +/- a spread
[3]The return on the alpha strategy may be less than the short term money market financing rate, which would result in negative excess returns
Sample for illustrative purposes only

Opportunities to capture high quality sources of structural yield persist

PIMCO STOCKSPLUS®, L.P. FUND B

Structural yield advantage*



As of 30 September 2016

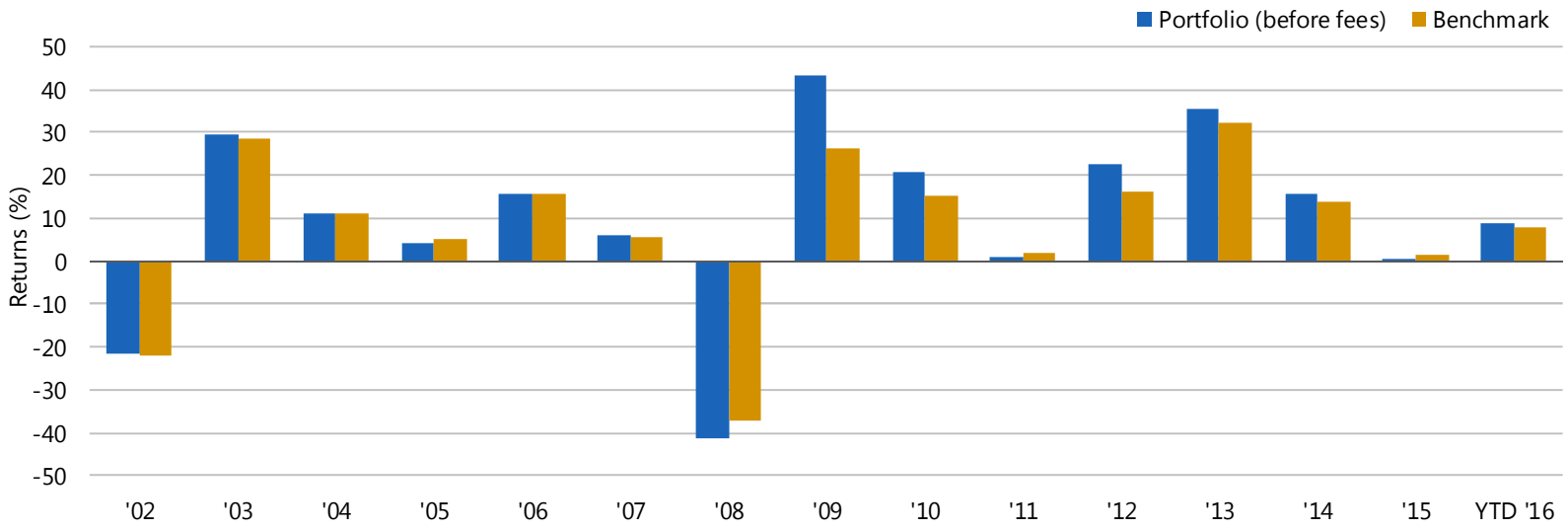
*"Structural yield advantage" is a proprietary PIMCO measure of potential total return in excess of LIBOR associated with the amount of extra yield earned by a portfolio plus any additional return garnered (or given up) through yield curve roll down, option positions, and financing

PIMCO StocksPLUS® LP Fund B performance review

Tuscon Supplemental Retirement System

Market value as of Sep '16	$	28,985,949

Performance

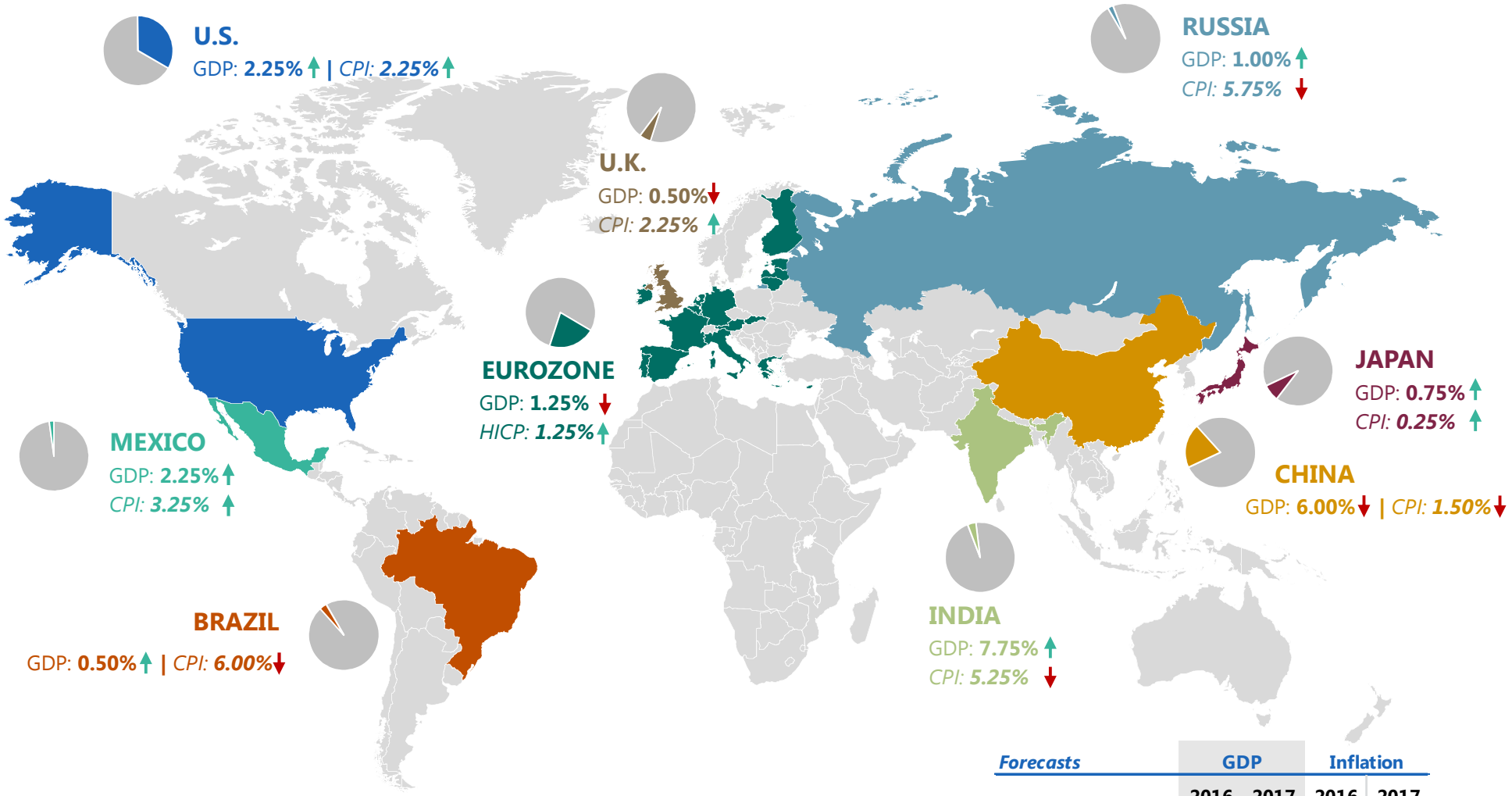


	S.I. 30 Sep '87	10 yrs.	5 yrs.	3 yrs.	1 yr.	9 mos.	6 mos.	3 mos.
Before fees (%)	10.5	9.3	18.8	11.9	16.4	8.6	7.6	4.6
After fees (%)	10.1	8.6	18.3	11.6	16.3	8.5	7.5	4.5
Benchmark (%)	9.2	7.2	16.4	11.2	15.4	7.8	6.4	3.9

As of 30 September 2016
All periods longer than one year are annualized
Benchmark: S&P 500 Index

Economic outlook

PIMCO's 2017 cyclical outlook

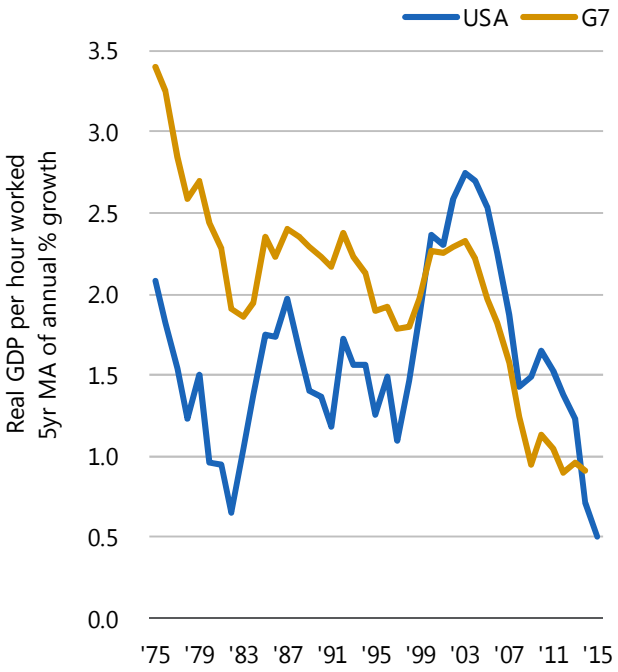


Forecasts	GDP		Inflation	
	2016	2017	2016	2017
Developed Markets	1.50	1.50	0.60	1.75
Emerging Markets	4.50	5.00	3.30	2.50
World	**2.50**	**2.75**	**1.60**	**2.00**

PIMCO forecast ranges as of September 2016.
Real GDP and inflation projections reflect the midpoints of PIMCO's forecast ranges for 2017.

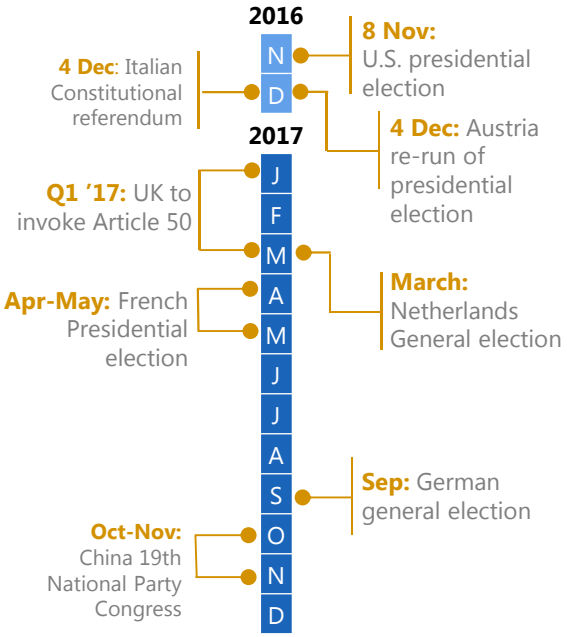
Key swing factors for 2017: The "3 Ps"

Productivity



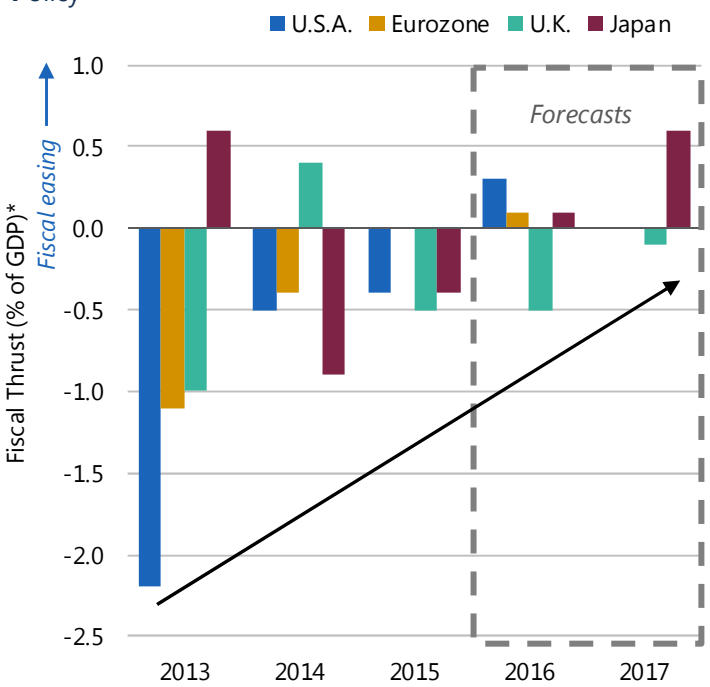
Low productivity has weighed on potential growth, but any recovery could bolster the outlook

Politics



Political events could materially affect the global landscape over the next year

Policy



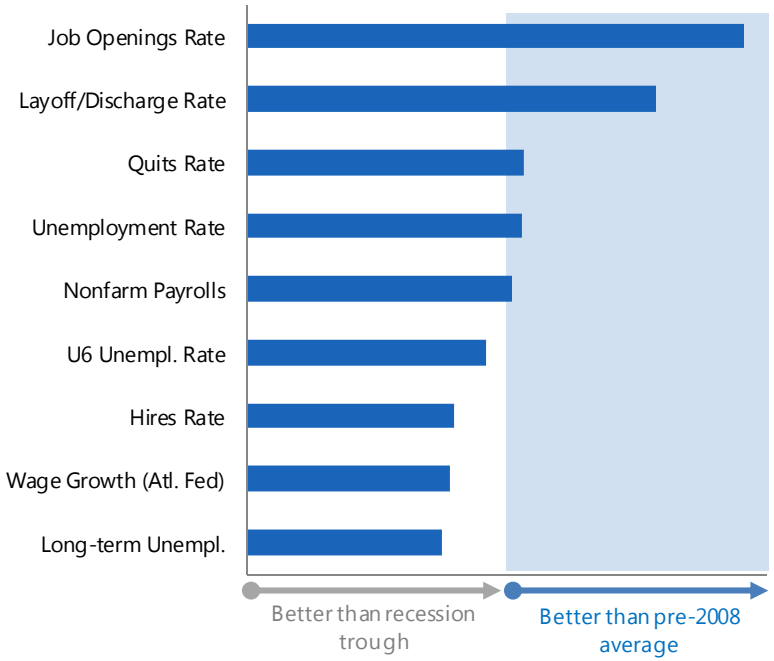
Less drag from fiscal policy could ease the burden of monetary policy in boosting growth

Ongoing developments in politics, (fiscal and monetary) policy and productivity will be key drivers of the outlook ahead

As of 30 September 2016
*Change in the structural deficit as % of potential GDP
SOURCE: PIMCO, Bloomberg, IMF, JPMorgan

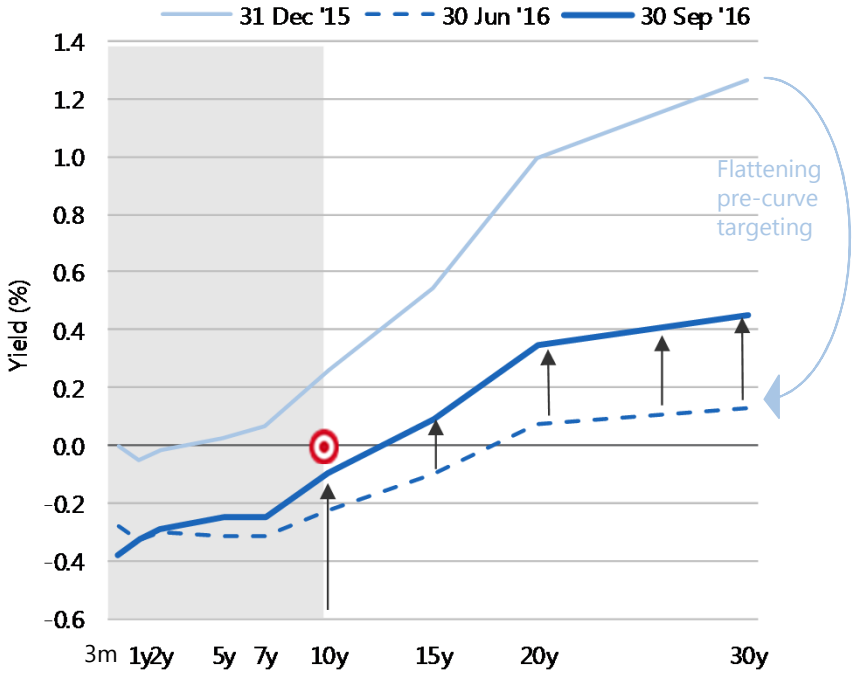
Global growth rests on still-solid fundamentals in the U.S. and evolving monetary policy globally

U.S.: Labor market tightening



Labor market indicators continue to show robust gains, with many exceeding pre-2008 levels

BoJ throws a curve ball



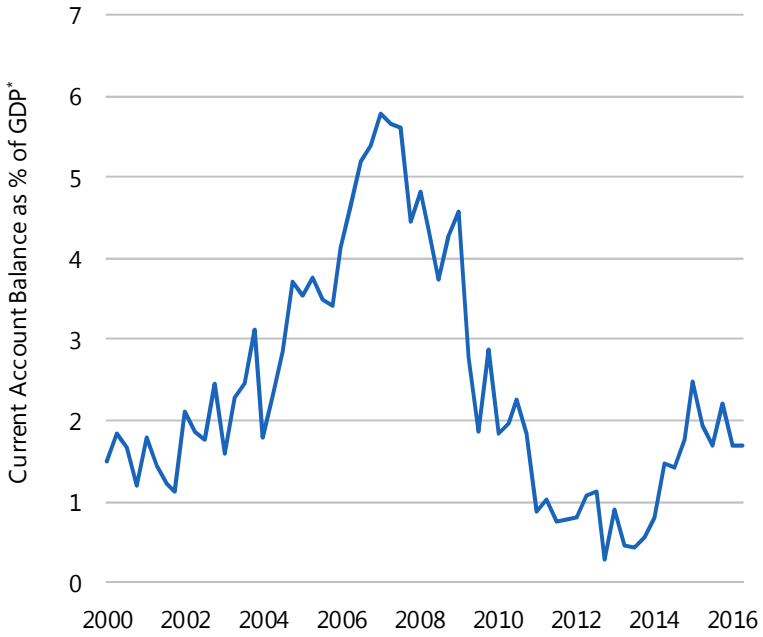
Following dramatic curve flattening, the BoJ shifted its framework from base-money targeting to yield curve targeting

Labor market trends suggest Fed on track for normalization, while other central banks confront the limits of policy effectiveness

As of 30 September 2016
SOURCE: PIMCO, Bloomberg, Haver Analytics, Bureau of Labor Statistics, Federal Reserve Bank of Atlanta

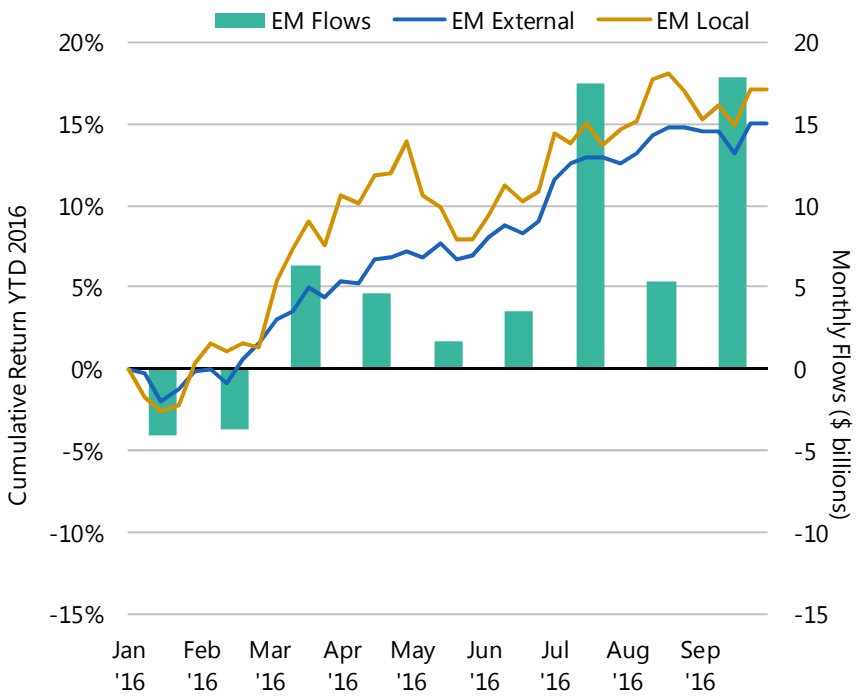
Emerging Markets: A more constructive turn in fundamentals along with resurgent flows have buoyed the asset class

Striking a better balance



Improved trade dynamics have helped stabilize current account balances, mitigating a key source of external vulnerability

Improved performance



Strength in both flows and performance have provided a self-reinforcing dynamic

Improving fundamentals and compelling valuations have restored the perception of EM's value proposition

As of 30 September 2016.
SOURCE: PIMCO, Haver Analytics, Bloomberg, JPMorgan
* GDP-weighted current account balance of Brazil, Chile, China, Colombia, Czech Republic, Hong Kong, Hungary, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Singapore, South Africa, South Korea, Taiwan, Thailand and Turkey as calculated by PIMCO

PIMCO update

PIMCO: Focused on delivering returns and managing risks

Firm snapshot

Assets under management
- $1.51 trillion[1]

Deep global resources
- 13 offices across five continents
- Over 2,200 total employees
  - 240+ portfolio managers
  - 115+ analysts
  - Promoted 229 officers in 2015

Comprehensive investment solutions
- Alternatives
- Asset allocation
- Equities
- Fixed income
- Real Assets

Diversified global business
- One of the largest alternatives platforms
- Global AUM
  - Americas: 64%, EMEA: 22%, APAC: 14%

PIMCO's value proposition

Time-tested investment philosophy
- Diversified set of alpha engines
  - Top down
  - Bottom up
  - Structural tilts

Client-focused culture
- Board education programs
- Client seminars
- Solutions capabilities

Thought leadership
- Global market dynamics
- Economic analysis
- Central bank policy
- Industry trends

Access to our latest views: Blog.PIMCO.com
- Now Available:
  - "Investing in a Stable But Not Secure Global Economy" by Daniel J. Ivascyn and Andrew Balls
  - "Brexit Aftermath: Outlook for the UK" by Mike Amey

"What's new?"

Strategic new hires
- Emmanuel Roman: PIMCO CEO (starting Nov '16)
- Jamil Baz: MD, Head of Client Analytics
- Gene Frieda: EVP, Global and EM Strategist
- Yacov Arnopolin: EVP, Emerging Markets PM
- Paul Vosper: EVP, Real Estate Strategist

New product launches
- Opportunistic, PE-style 'follow on' fund to capitalize on regulatory reform dislocations
- Opportunistic PE-style 'follow on' fund to capitalize on corporate stressed/distressed middle-market opportunities

Industry recognition
- Morningstar Awards
  - 2015 Fixed Income Manager of the Year award (US) – Jerome Schneider & team
  - Third time in four years; testament to PIMCO's time-tested investment process[2]
- 2016 Civic 50 Award
  - PIMCO recognized as one of the 50 most community-minded companies in America

As of 30 June 2016. SOURCE: PIMCO.

[1] Effective 31 March 2012, PIMCO began reporting the assets managed on behalf of its parent's affiliated companies as part of its assets under management.

[2] The Morningstar Fixed Income Fund Manager of the Year (U.S.) award is based on the strength of the manager, performance, strategy, and firm's stewardship. Awarded to Jerome Schneider and team (2015), Daniel Ivascyn and Alfred Murata (2013) and Mark Kiesel (2012). Morningstar Awards 2016©. Morningstar, Inc. All Rights Reserved.

Assets under management by strategy

PIMCO manages $1.51 trillion in assets, including $1.1 trillion in third-party client assets

Alternatives		Billions ($)
Hedge Funds	Global macro, long/short credit, multi-asset volatility arbitrage strategies, relative value commodities	17.47
Liquid Absolute Return	Unconstrained bond strategies, credit absolute return, other absolute return strategies	14.42
Opportunistic/Distressed	Opportunistic strategies focusing on real estate related assets (residential, commercial), corporate credit	6.54
Asset Allocation		
Asset Allocation Strategies	Global Multi Asset, All Asset, EM Multi Asset, RealPath, Inflation-Response Multi Asset, DRA	38.14
Equities		
Equity Strategies	Combines enhanced equities and active equities	22.37
Real Return		
Real Return Strategies	Combines inflation linked strategies, actively managed commodities, and real-estate linked exposure	58.37
Fixed Income		
Total Return[1]	Total Return	106.50
Intermediate[2]	Core Strategies, Moderate Duration	111.91
Credit	Investment Grade Corporates, Bank Loans, High Yield Corporates, Convertibles	184.92
Long Duration	Focus on long-term bonds; asset liability management	125.99
Income	Income-oriented, insurance income	108.84
Global	Non-US and global multiple currency formats	96.43
Cash Management[2]	Money Market, Short-Term, Low Duration	87.31
Emerging Markets	Local debt, external debt, currency	43.40
Mortgages	Agency MBS, structured credit (non-Agency MBS, CMBS, and ABS)	33.54
Diversified Income	Global credit combining corporate and emerging markets debt	19.82
Municipals	Tax-efficient total return management	15.34
Other	Custom mandates	14.42
Total assets under management		**$ 1,105.73 B**
Stable Value[2]	Stable income with emphasis on principal stability	19.97
Tail-Risk Hedging[3]	Pooled and customized portfolios of actively managed tail-risk hedges	33.79

As of 30 June 2016. SOURCE: PIMCO

Assets reflect those managed on behalf of third-party clients and exclude affiliated assets. Fund of funds assets have been netted from each strategy.

Potential differences in asset totals are due to rounding. Represents assets of strategy group in dedicated and non-dedicated portfolios.

1 Total Return has been segregated to isolate the assets of PIMCO sponsored U.S. Total Return 1940-act fund and foreign pool fund accounts. All other U.S. Total Return portfolios are included in the Intermediate category.

2 Stable value assets have not been netted from U.S. Total Return, U.S. Moderate Duration and U.S. Low Duration assets.

3 Tail-risk hedging assets reflect total notional value of dedicated mandates and are not counted towards PIMCO total assets under management.

Appendix

Case for active

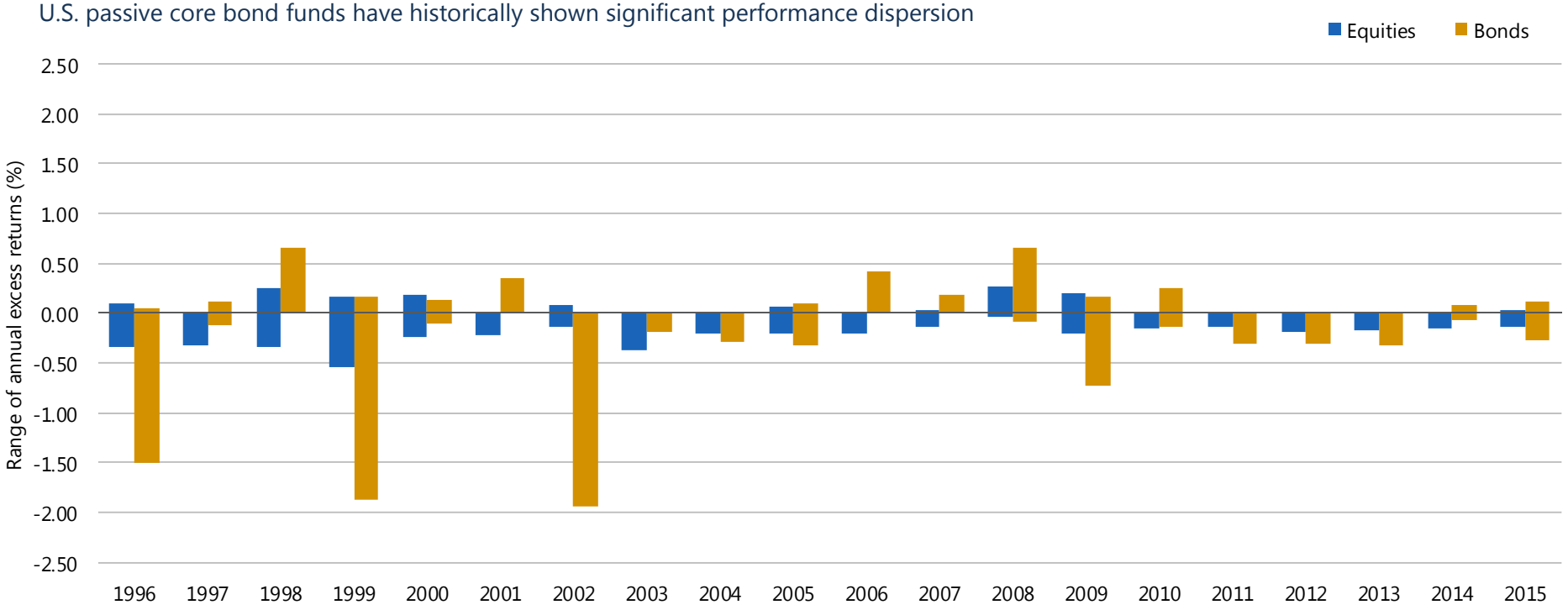
Investors should consider the investment objectives, risks, charges and expenses of the funds carefully before investing. This and other information are contained in the fund's prospectus and summary prospectus, if available, which may be obtained by contacting your investment professional or PIMCO representative or by visiting www.pimco.com. Please read them carefully before you invest or send money.

PIMCO Investments LLC

When does passive investing make sense?

- Does the index carry risks that offer attractive relative value?
- Is it feasible to own all index holdings?
- Do active managers consistently underperform?
- Are transaction costs low and liquidity high?
- Is there a lack of structural market inefficiencies?
- Is economic uncertainty and market volatility persistently low?

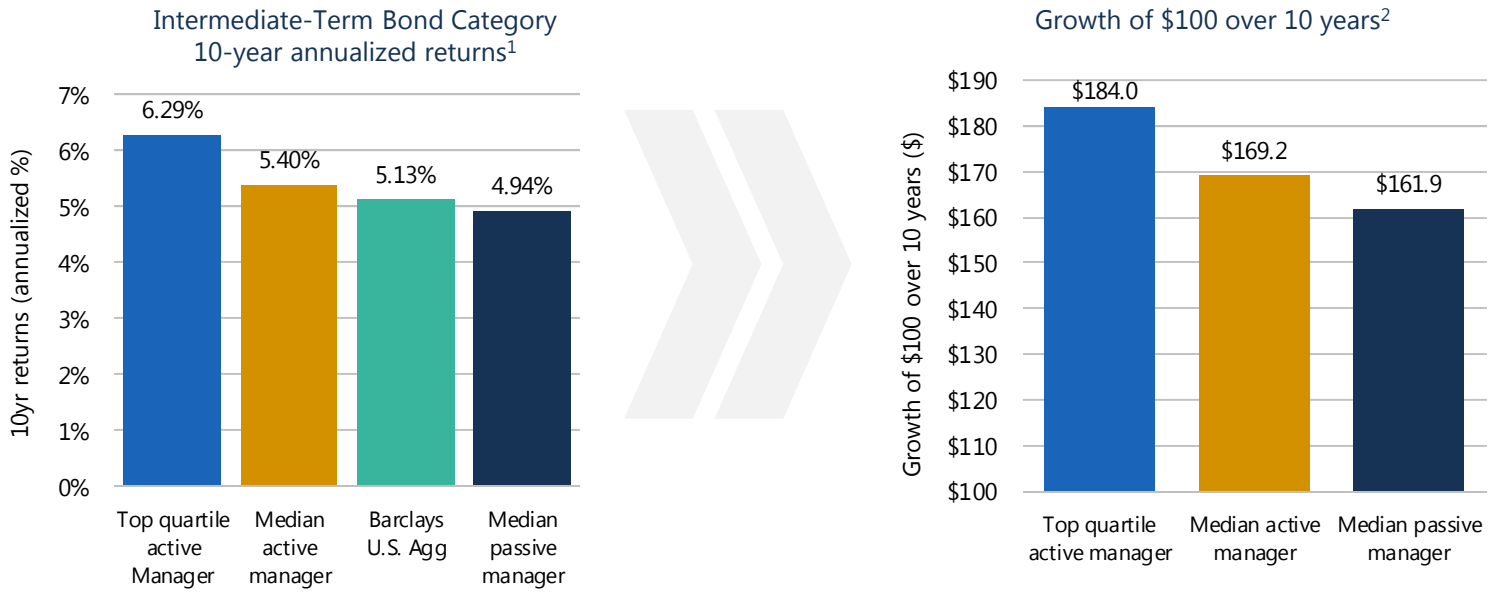
U.S. passive core bond funds have historically shown significant performance dispersion



SOURCE: Morningstar
Ranges are based on the institutional share class of all passive funds as determined by Morningstar in the Intermediate-Term Bond and US Large Cap equity categories that have a maximum expense ratio of 0.10%.

Investors have been compensated over time for investing actively within fixed income

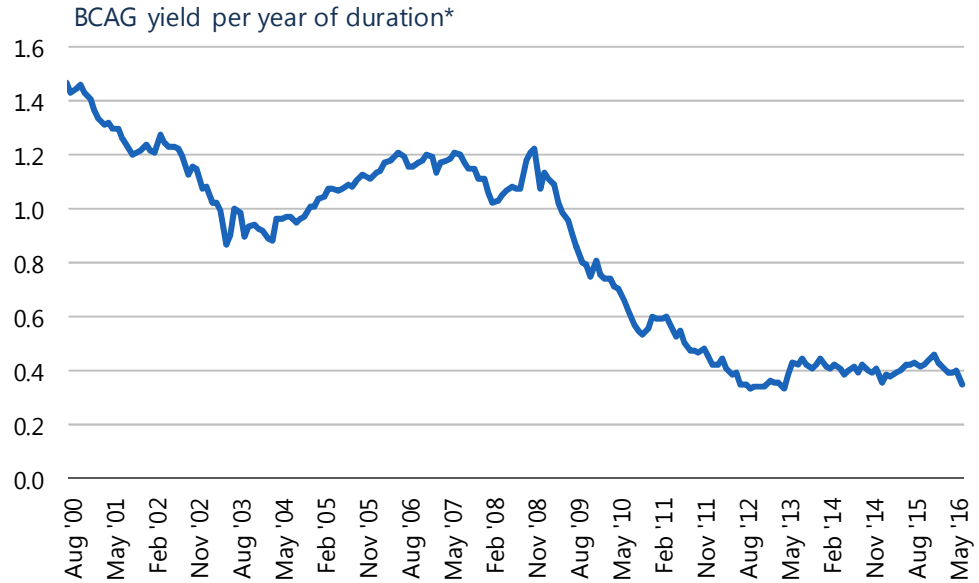
- The median active manager in the intermediate-term bond category has outperformed (after-fees) both the Barclays US Aggregate Index and the median passive manager over the last 10 years
- Over the long-run, these differences in performance can lead to large differences in investor wealth



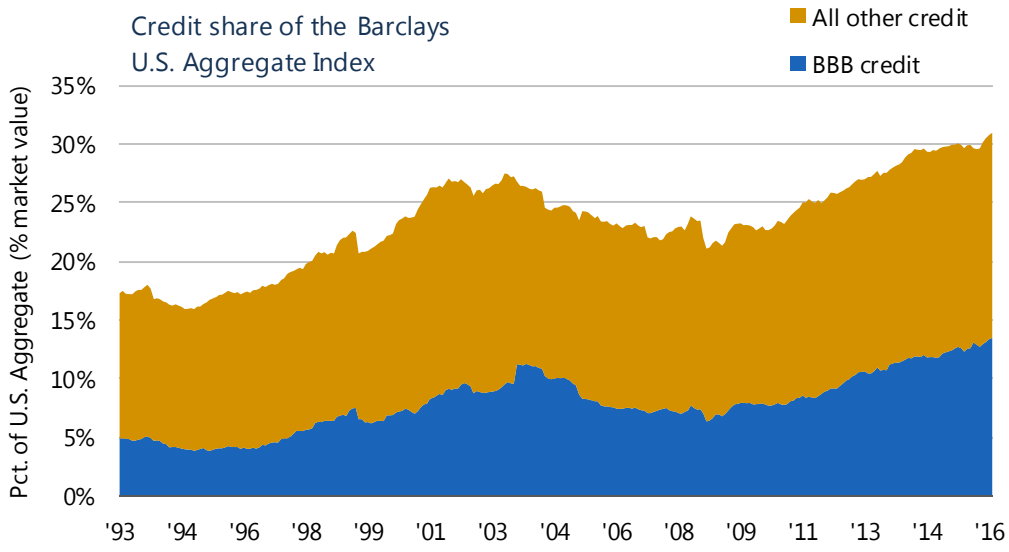
As of 30 June 2016
SOURCE: Morningstar, Bloomberg, PIMCO
[1] Returns are based on the institutional share class of all active and passive funds as determined by Morningstar in the Intermediate-Term Bond category that have at least 10-years of performance history. Returns over different time periods or of different share classes may not show the same results.
[2] Growth of $100 reflects the total return performance of the respective categories shown in the 10yr Annualized Returns chart, and reflects changes in share price and reinvestment of dividend and capital gain distributions.
* The "top quartile active manager" reflects the average return of active institutional shareclasses in the top quartile.

Investors are taking on more and more risk with less and less compensation

- The duration of the Barclays Agg has extended as yields have declined
- Thus, compensation per unit of interest rate risk (i.e., yield per unit of duration) has declined dramatically



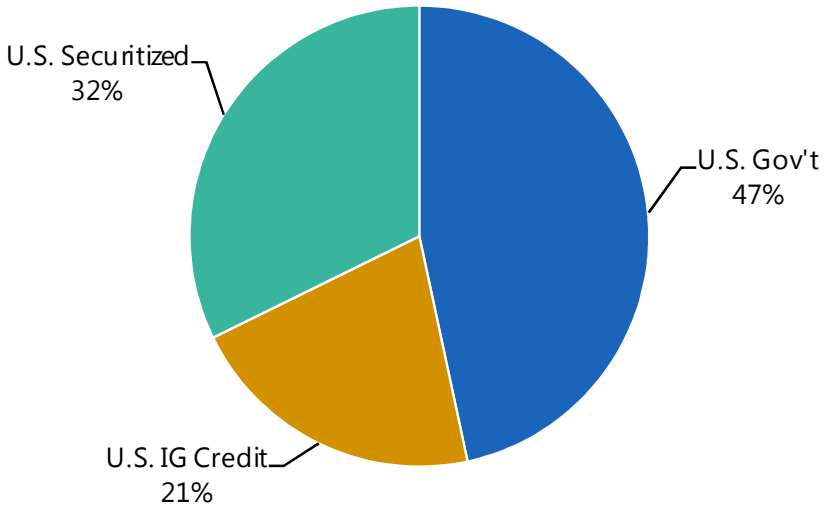
- In addition, the climbing share of credit—and in particular, BBBs—means that investors are taking on even more credit risk



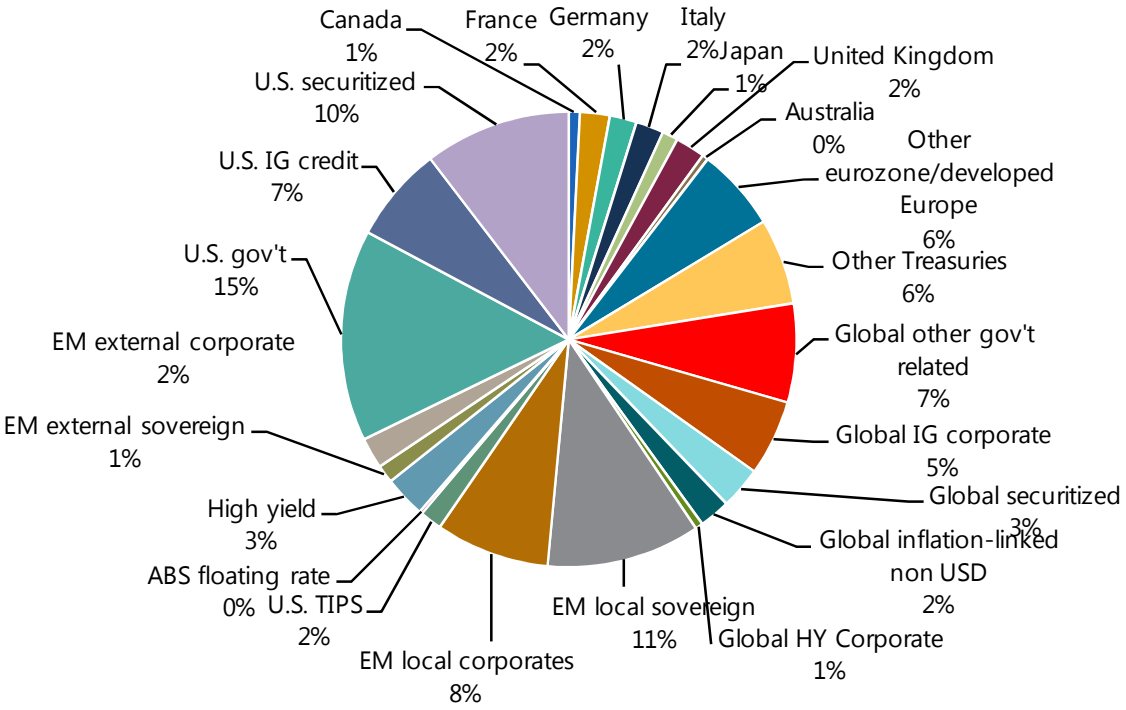
As of 30 June 2016
SOURCE: Bloomberg
* Yield to worst

Passive indices can exclude several sectors of the bond market that may offer attractive value

Sector decomposition – Barclays U.S. Aggregate



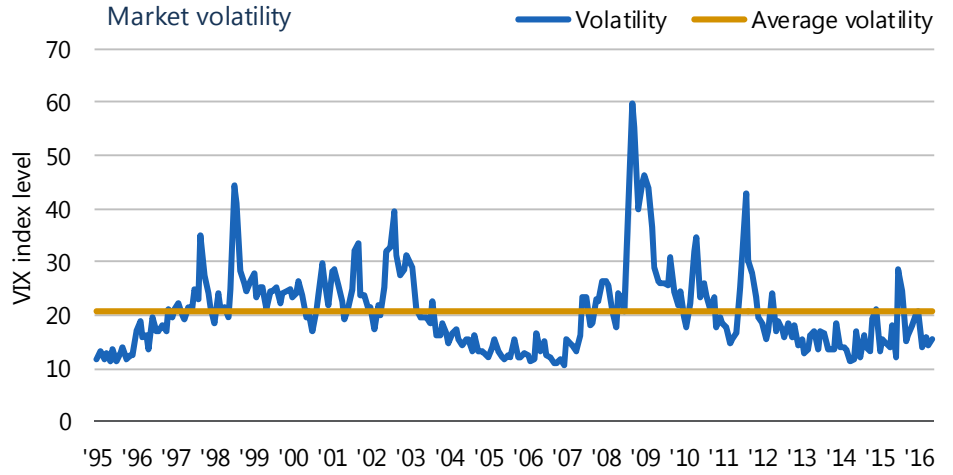
Global fixed income market



Market volatility has historically led to alpha-rich environments

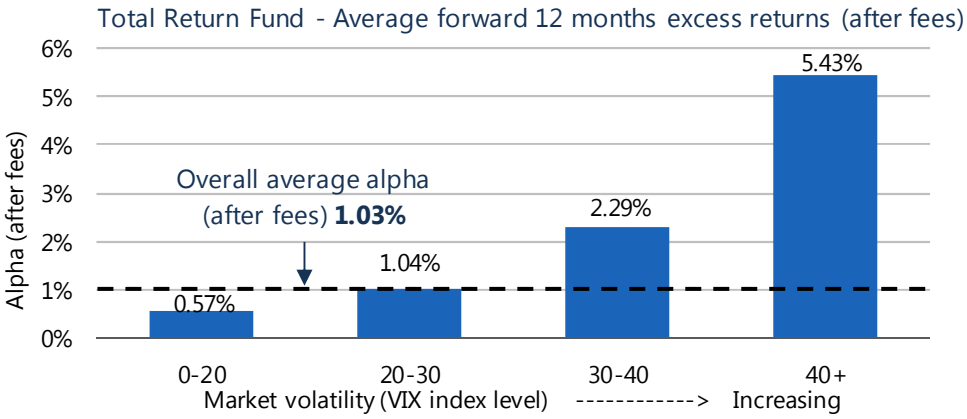
Volatility ahead?

- Since 2012, market volatility has trended below its long term average
- Central bank quantitative easing programs have been a significant factor behind the low volatility
- As monetary policies diverge, bouts of higher volatility are likely going forward



PIMCO's alpha tends to increase following more volatile periods

- While PIMCO has consistently generated alpha over time, more volatile markets have typically led to stronger outperformance

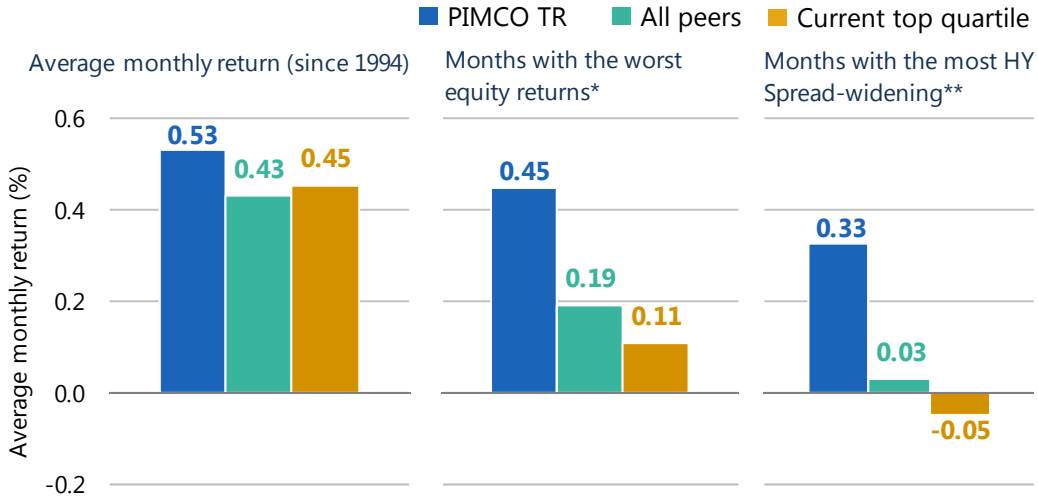


Performance quoted represents past performance. Past performance is not a guarantee or a reliable indicator of future results. Investment return and the principal value of an investment will fluctuate. Shares may be worth more or less than original cost when redeemed. Current performance may be lower or higher than performance shown. For performance current to the most recent month-end, visit www.PIMCO.com or call (888) 87-PIMCO.

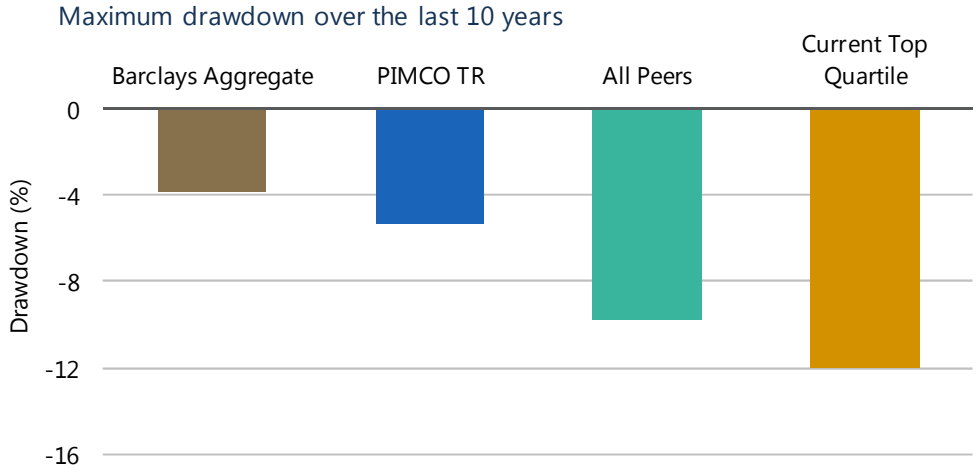
As of 30 June 2016
SOURCE: PIMCO
PIMCO Total Return (TR) performance reflects the institutional share class (PTTRX).
Refer to Appendix for additional performance and fee, index and risk information.

PIMCO's diverse set of alpha strategies leads to strong performance through times of market stress

- PIMCO doesn't structurally overweight credit in an effort to outperform
- As a result, relative returns are less impacted by equity and credit market sell-offs



- This has enabled PIMCO to be more effective in preserving capital and avoiding large market drawdowns



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As of 30 June 2016. SOURCE: Morningstar, PIMCO.
Equities are represented by the S&P 500 Total Return Index. High Yield is represented by the Barclays U.S. Corporate High Yield Index. Peer group based on all share classes of funds in Morningstar's OE Intermediate-Term Bond Category. PIMCO Total Return (TR) performance reflects the institutional share class (PTTRX). The current top quartile reflects those share classes currently in the top quartile based on three-year returns. Monthly returns are calculated from January 1994, the earliest available date for the HY index
* The worst equity returns are identified as the worst 25% of months with negative S&P 500 returns
** The most HY spread-widening months are identified as the widest 25% of months with spread widening
Performance shown is for the institutional share class.

Appendix

PERFORMANCE AND FEE
Past performance is not a guarantee or a reliable indicator of future results. The performance figures presented reflect the total return performance for Institutional Class shares (after fees) and reflect changes in share price and reinvestment of dividend and capital gain distributions. All periods longer than one year are annualized. The minimum initial investment for iclass shares is $1 million; however, it may be modified for certain financial intermediaries who submit trades on behalf of eligible investors.

CHART
Performance results for certain charts and graphs may be limited by date ranges specified on those charts and graphs; different time periods may produce different results.

INVESTMENT STRATEGY
There is no guarantee that these investment strategies will work under all market conditions or are suitable for all investors and each investor should evaluate their ability to invest long-term, especially during periods of downturn in the market.

MORNINGSTAR RANKING
Past rankings are no guarantee of future rankings. Morningstar Ranking as of 31 March 2016 for the Institutional Class Shares; other classes may have different performance characteristics. The Morningstar Rankings are calculated by Morningstar and are based on the total return performance, with distributions reinvested and operating expenses deducted. Morningstar does not take into account sales charges.

OUTLOOK
Statements concerning financial market trends are based on current market conditions, which will fluctuate. There is no guarantee that these investment strategies will work under all market conditions, and each investor should evaluate their ability to invest for the long-term, especially during periods of downturn in the market. Outlook and strategies are subject to change without notice.

PORTFOLIO STRUCTURE
Portfolio structure is subject to change without notice and may not be representative of current or future allocations.

STANDARD DEVIATION
Standard deviation is a statistical measure of dispersion about an average which, for a mutual fund, depicts how widely the returns varied over a certain period of time. The greater the dispersion, the greater the risk.

RISK
Investing in the **bond market** is subject to risks, including market, interest rate, issuer, credit, inflation risk, and liquidity risk. The value of most bonds and bond strategies are impacted by changes in interest rates. Bonds and bond strategies with longer durations tend to be more sensitive and volatile than those with shorter durations; bond prices generally fall as interest rates rise, and the current low interest rate environment increases this risk. Current reductions in bond counterparty capacity may contribute to decreased market liquidity and increased price volatility. Bond investments may be worth more or less than the original cost when redeemed. Investing in **foreign denominated and/or domiciled securities** may involve heightened risk due to currency fluctuations, and economic and political risks, which may be enhanced in emerging markets. **Mortgage and asset-backed securities** may be sensitive to changes in interest rates, subject to early repayment risk, and their value may fluctuate in response to the market's perception of issuer creditworthiness; while generally supported by some form of government or private guarantee there is no assurance that private guarantors will meet their obligations. **High-yield**, lower-rated, securities involve greater risk than higher-rated securities; portfolios that invest in them may be subject to greater levels of credit and liquidity risk than portfolios that do not. **Derivatives** may involve certain costs and risks such as liquidity, interest rate, market, credit, management and the risk that a position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested. **Diversification** does not ensure against loss.

Appendix

INDEX DESCRIPTIONS

Barclays U.S. Aggregate Index represents securities that are SEC-registered, taxable, and dollar denominated. The index covers the U.S. investment grade fixed rate bond market, with index components for government and corporate securities, mortgage pass-through securities, and asset-backed securities. These major sectors are subdivided into more specific indices that are calculated and reported on a regular basis.

It is not possible to invest directly in an unmanaged index.

Callan

October 28, 2016

Tucson Supplemental Retirement System

Fixed Income Workshop

Gordon Weightman, CFA
Vice President

John Pirone, CFA, CAIA
Senior Vice President

Agenda

- Overview of fixed income
  - The role of fixed income at the overall portfolio level
  - Commonly employed fixed income strategies
  - Challenges currently faced by fixed income investors
- Overview of TSRS's current fixed income structure
  - Characteristics
  - Evaluation of fixed income sector correlations with the broader plan
  - Active vs. passive considerations

Overview of Fixed Income

The ABC(&D)s of Bonds

Bonds are debt securities whereby the purchaser of the bond is lending money to the issuer in exchange for specified rate of interest during the life of the bond and for the face value (or, principal amount) to be repaid upon maturity.

- Maturity – the number of years before the bond comes due and the bond issuer must repay the principal to the bond holder.
- Coupon rate – the interest rate that the issuer pays the lender (calculated as a percentage of the face value of the bond).
- Bond prices – have an inverse relationship with interest rates. If interest rates rise, a bond's price must fall to keep the yield constant.
- Duration – expressed as a number of years, tells you how much a bond's price will change given a 1.00% change in interest rates.
  - For example, if interest rates rise (fall) 1.00%, the price of a bond with a duration of five years will fall (rise) by 5.00%.
- Bond Managers seek to add value with three basic levers:
  - Duration management
  - Sector rotation
  - Issue selection

Types of Fixed Income Investors

	Income Oriented Investor	Total Return Investor	Liability Driven Investor (LDI)
Type of Investor	• Retirees • Insurance Companies	• Public Pension Plans • Taft-Hartley Plans • Corporate Pension Plans • Endowments • Foundations	• Corporate Pension Plans
Objectives	• Income Generation • Capital Preservation • Liquidity • Meet Solvency Requirements	• Diversification • Flight to Quality/Deflation Hedge • Liquidity • Additional Return	• Hedge Liabilities • Additional Return

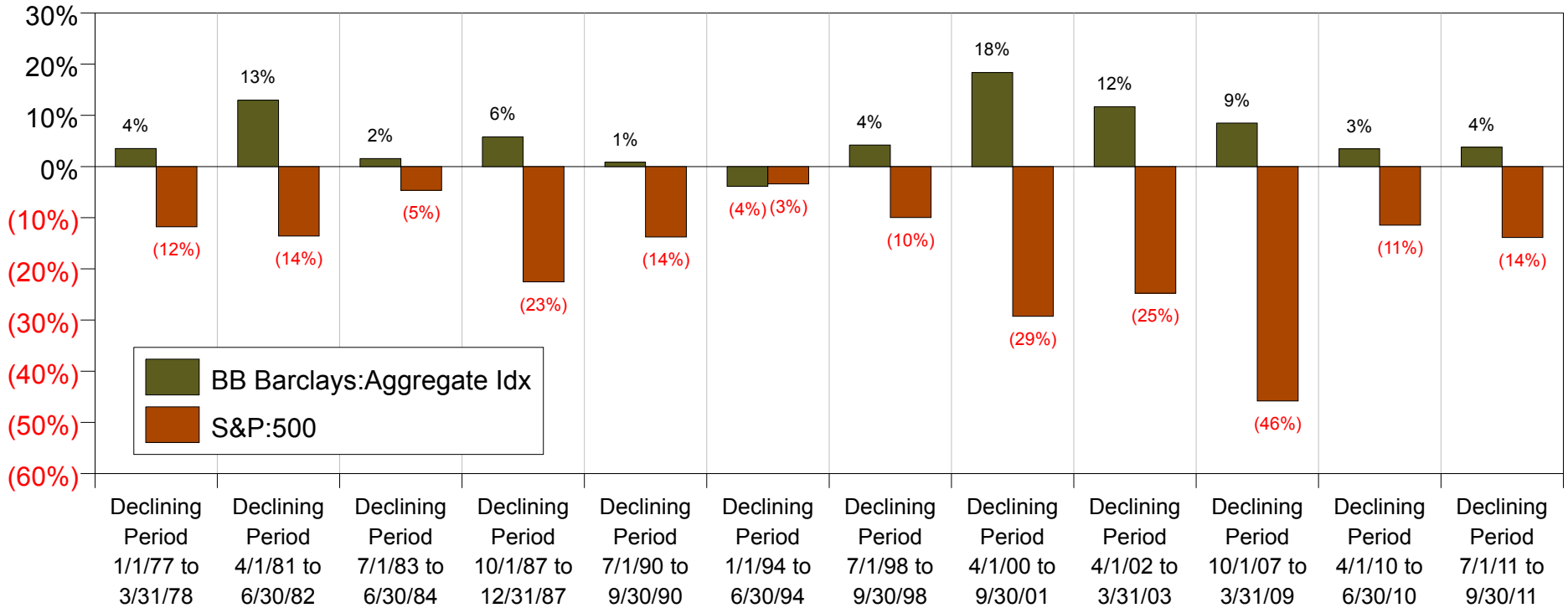
- Fixed income investors can be categorized into three types depending on investment objectives, time horizon, liquidity needs, risk tolerance, and regulatory framework among many other factors.
- TSRS is a total return investor.

Fixed Income

Role as the “Anchor to Windward”

- Within a total return strategy the role of fixed income is to serve as a low-risk, diversifying anchor against which an investor takes on riskier investments in assets such as equity.

Cumulative Returns in Periods when Domestic Equity Declines



Overview of Fixed Income Strategies

- Fixed income is typically a low risk, diversifying asset for the equity allocation rather than a primary source of additional return to a fund.
  - Bonds offer protection in the short run.
  - Dependable income provides comfort in economic downturns or sudden market corrections.
- The three main factors that define fixed income strategies are:
  - Active versus passive implementation.
  - Use of tactical “core plus” mandates versus dedicated allocations to securities outside of the benchmark, primarily high yield (in the case of the Barclays Aggregate) and non-U.S. bonds.
  - Broad market exposure versus one narrowed by sector or duration.
- The most commonly employed strategies include:
  - Passive (benchmarked to the Barclays Aggregate)
  - Active core
  - Active core plus
  - Global/Non-US
  - Specialty
  - Unconstrained

Fixed Income Strategies

Descriptions, Pros and Cons

- Passive Core: Replicates the return of the underlying index
  - Pros
    - *Virtually no tracking error*
    - *Low cost*
    - *Large Treasury allocation expected to perform well when equities perform poorly*
    - *Provides liquidity for cash flows, rebalancing, and transitions*
    - *Simple to monitor*
  - Cons
    - *Lacks the potential to add value over the index*
    - *Large Treasury allocation likely to be a drag on returns in normal markets due to low yields*

BlackRock US Debt Index is an example of this style in TSRS's portfolio

- Active Core: Attempts to add modest amounts of value over the return of the Aggregate index while experiencing a limited amount of tracking error
  - Pros
    - *Expectation of value added by modest interest rate, sector, and security management*
    - *Low tracking error*
  - Cons
    - *Outperformance over the index can be difficult to achieve net of fees*
    - *Active core managers can underperform during times of equity market stress due to low Treasury allocations*

Fixed Income Strategies

Descriptions, Pros and Cons

- Core Plus: Attempts to add significant value over the Aggregate with relatively high tracking error due in part to the use of non-index securities such as high yield and emerging market bond debt
  - Pros
    - *Managers have generally added value over the index net of fees*
    - *Tactical allocation to non-index securities when their valuations make them attractive*
  - Cons
    - *Higher tracking error may not be consistent with stabilizing role of fixed income*
    - *Non-index securities tend to have higher correlations to equities limiting the amount of overall portfolio diversification*

  PIMCO's custom strategy (¼ high yield, ¼ emerging market debt, ¼ mortgages, and ¼ investment grade credit) is an example of this style in TSRS's portfolio

- Global/Non-U.S: Broadly diversified allocations to bonds across the globe; can be active or passive, hedged or unhedged, with varying degrees of risk and use of non-benchmark securities
  - Pros
    - *Managers have the ability to move between under and over-valued markets*
    - *Can reduce the complexity of the structure*
  - Cons
    - *Similar to the U.S., yields overseas are at historical lows*
    - *Government securities dominate the non-U.S. debt market*
    - *Requires a well-resourced firm to adequately cover the markets*
    - *Currency volatility can overwhelm return expected from underlying bond holdings*

Fixed Income Strategies

Descriptions, Pros and Cons

- Specialty: Separate, dedicated allocations to fixed income sectors such as credit, high yield and emerging markets debt
  - Pros
    - *Managers focused on specific markets tend to add more value due to specialization*
  - Cons
    - *No ability to move tactically between under and over-valued markets*
    - *Committee must set target allocation and rebalancing ranges*
    - *Leads to complex structures which are difficult to maintain*
    - *Lower allocation sizes in specialized areas can lead to higher fees*

- Unconstrained Global: Attempts to add value by scanning the global fixed income market for the most attractive investment opportunities; generally not constrained to a benchmark
  - Pros
    - *Increased return expectations*
    - *Allows for more active duration management across global fixed income sectors*
    - *Potential diversification benefits depending on regional/currency exposure*
    - *Removes the allocation and rebalancing decisions from the plan sponsor*
  - Cons
    - *Correlation to equities may be higher due to greater use of credit and active duration management*
    - *Limited peer group*
    - *Many managers have short track records*

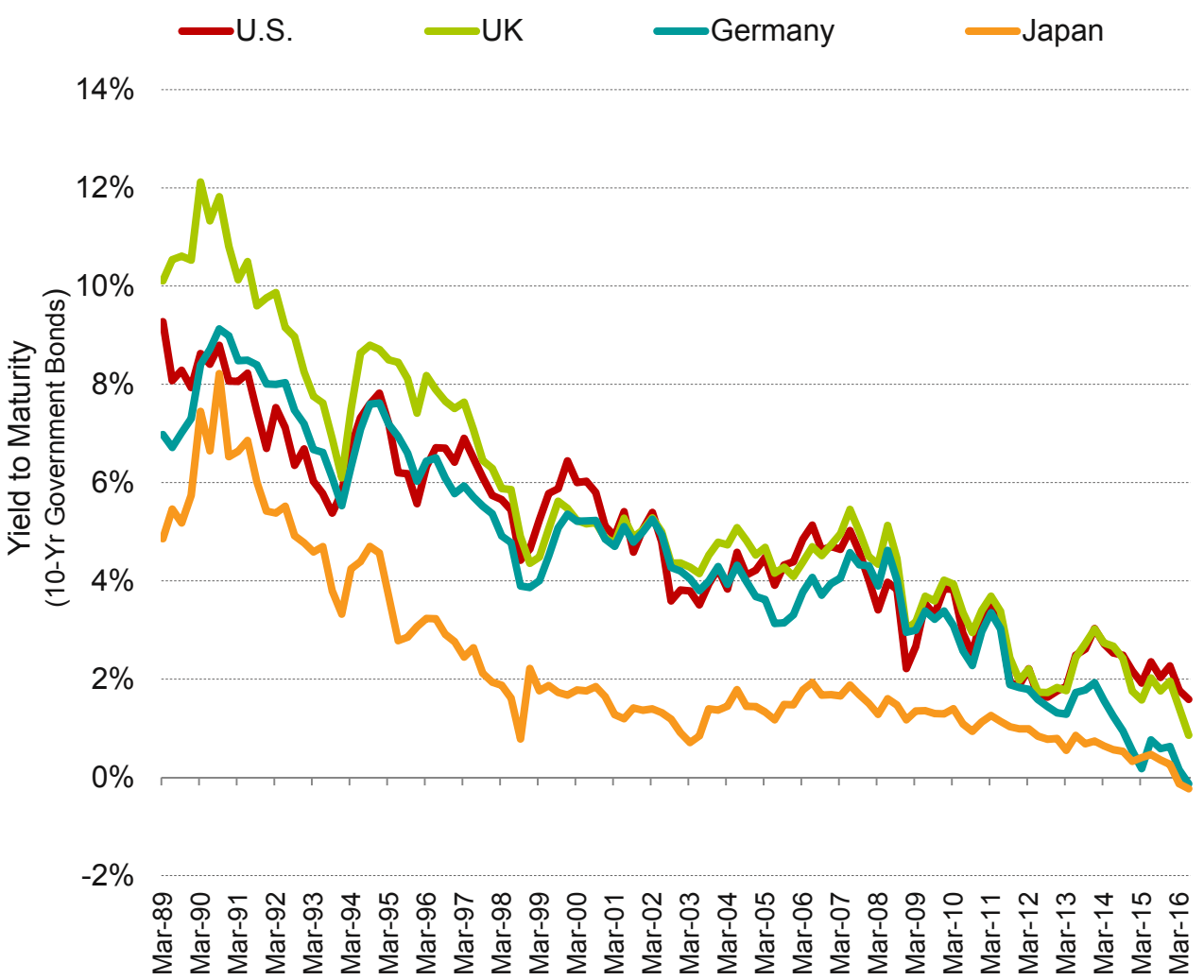
Major Issues Facing Fixed Income Investors Today

Issue	Consequence
Low Yield Environment	Difficult for investors to achieve return targets.
Potential for Rising Rates	Investors are grappling with the reality of potentially negative returns on their fixed income portfolios.
Dysfunctional Political System and Uncertain Macro Environment	Global government intervention and uncertain policy make it difficult for investors to position their portfolio.

Fixed Income

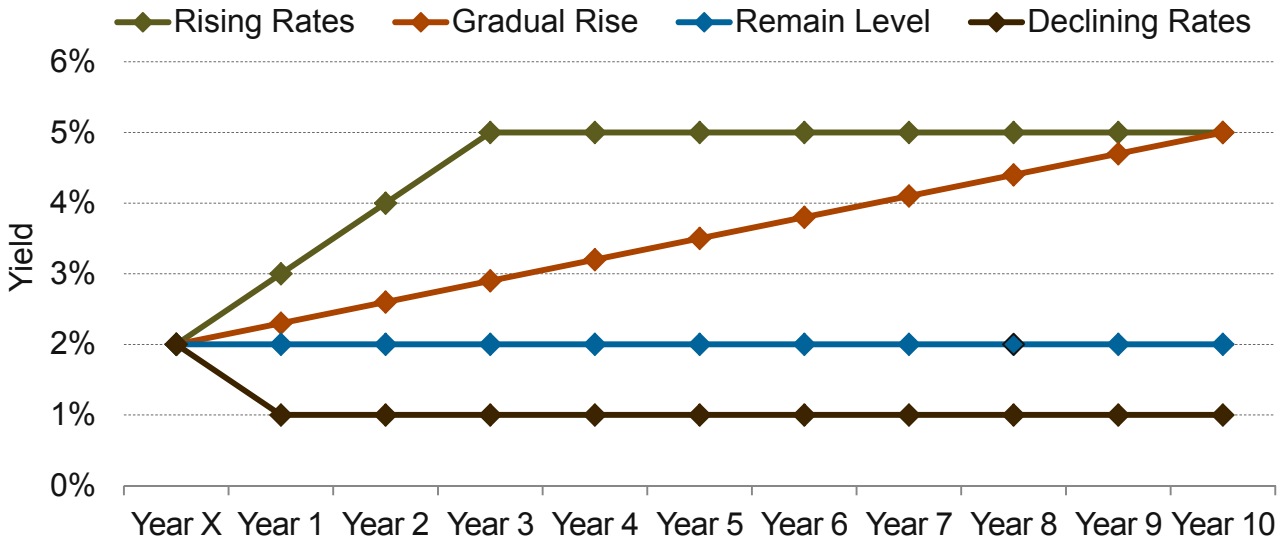
Government Interest Rates

- Interest rates have reached lows not seen in many decades, for a number of reasons including:
  - Central bank intervention including quantitative easing ("QE")
  - Low inflation
  - Flight to quality investments
  - Expanded or new roles for debt (bank capital, long-term liability hedging)
- US government bond rates are higher than other developed markets
  - Makes global benchmark centric strategies look relatively unattractive



Are Rising Rates Necessarily A Bad Thing?

- Fixed income returns derive from income, capital gains/losses and reinvestment of interim cash flows.
  - A rise in yields may lead to higher returns if the time horizon is long.
  - A prolonged period of low rates is not a good environment for long-term investors.



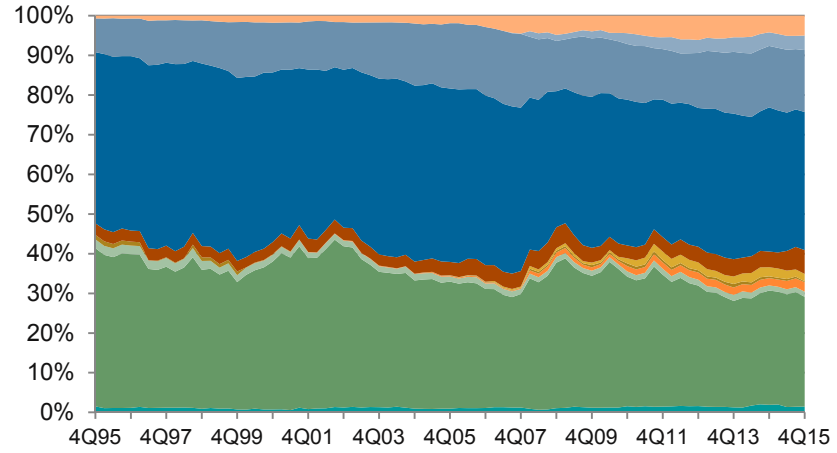
	1-Year*	3-Year*	10-Year*
Rising Rates	-2.60%	-1.70%	3.00%
Gradually Rise	0.60%	0.90%	1.90%
Remain Level	2.00%	2.00%	2.00%
Declining Rates	6.60%	2.80%	1.50%

* Assumes constant five-year duration, parallel shift in the yield curve and 100% reinvestment at new yield every year.

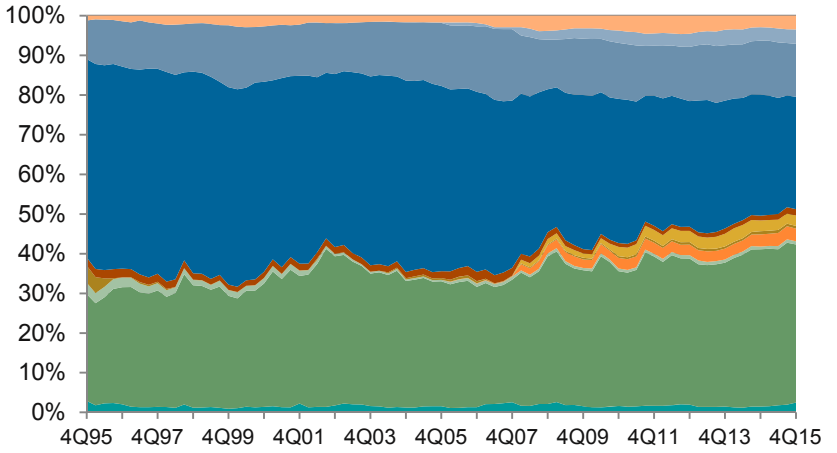
Plan Sponsors Have Been Reducing Fixed Income for 20 Years

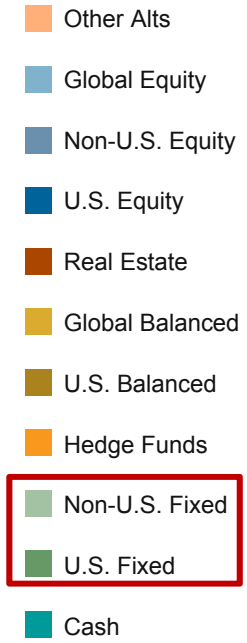
Except corporate defined benefit plans, due to LDI considerations

Public Funds

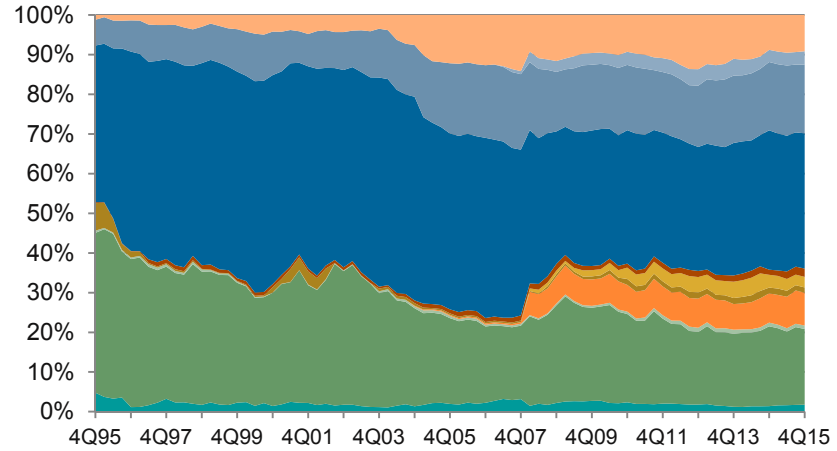


Corporate Funds

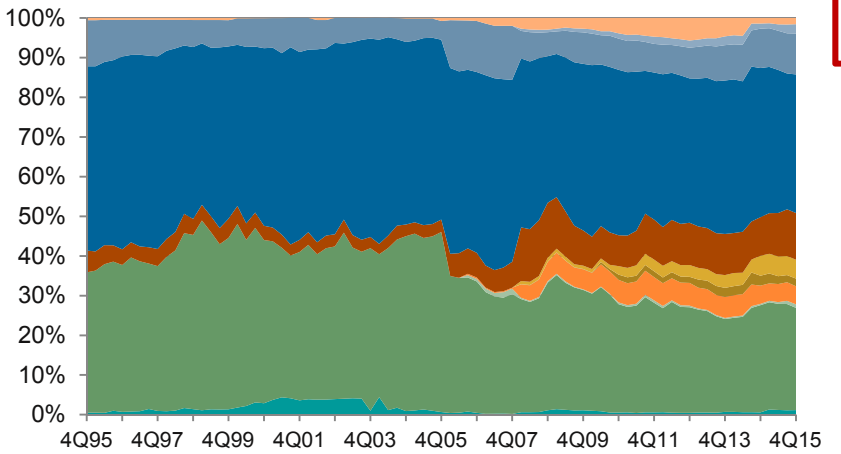




Endowment/Foundations



Taft-Hartley



Source: Callan. Callan's database includes the following groups: public defined benefit, corporate defined benefit, endowments/foundations, and Taft-Hartley plans. Approximately 10-15% of the database constituents are Callan's clients. All database group returns presented gross of fees. Past performance is no guarantee of future results.

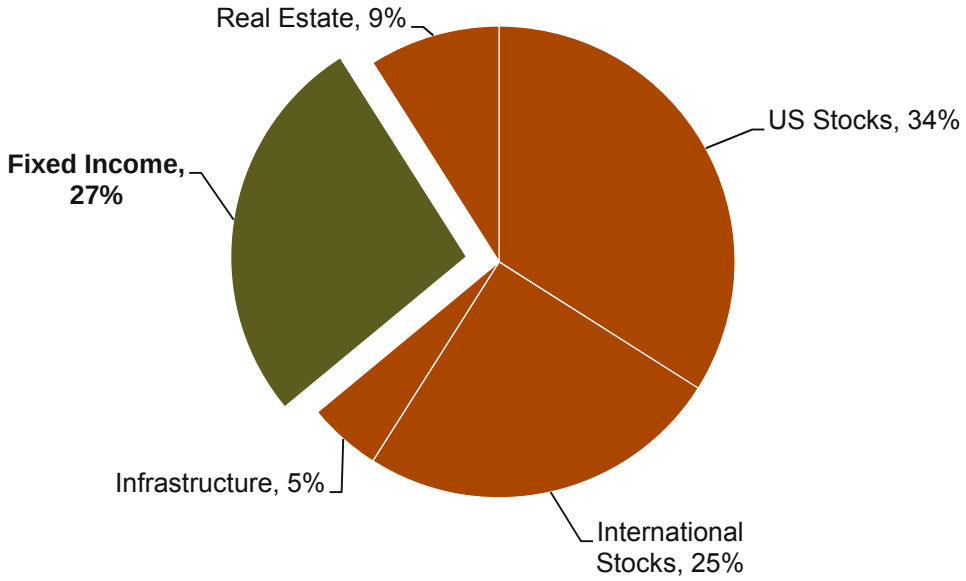
Current Fixed Income Structure

TSRS's Current Strategic Asset Allocation

As of September 30, 2016

- The target asset allocation is well diversified with exposure to both public and private asset classes
- Fixed income represents 27% of the portfolio
  - 27% fixed income equates to approximately $200 million as of September 30, 2016
  - The median allocation to fixed income for Public DB plans as of 6/30/16 was 27% with a range of 14% - 40%.
- In the 2014 asset allocation study, fixed income was benchmarked to the Barclays Aggregate
  - TSRS's actual fixed income composition has a greater allocation to higher risk bond sectors

Current Target Asset Allocation

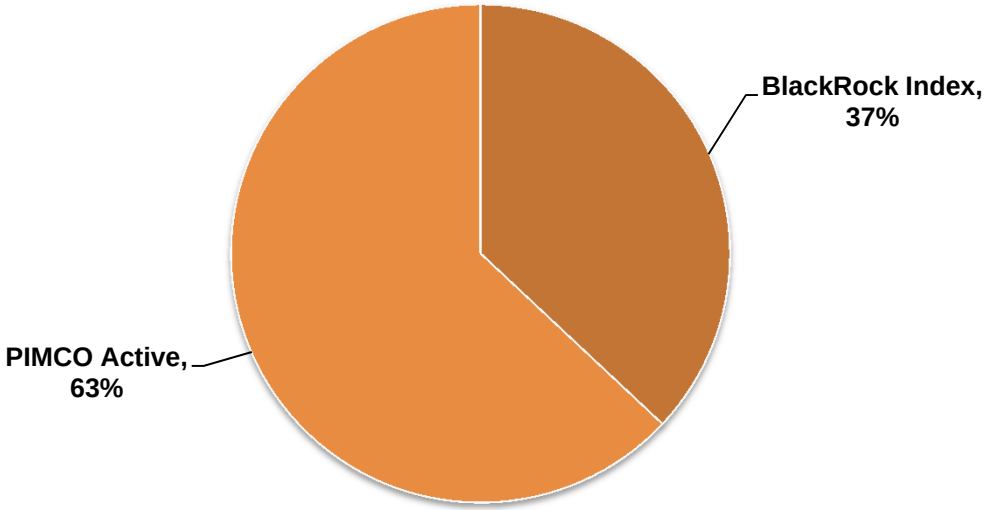


TSRS's Target Fixed Income Structure

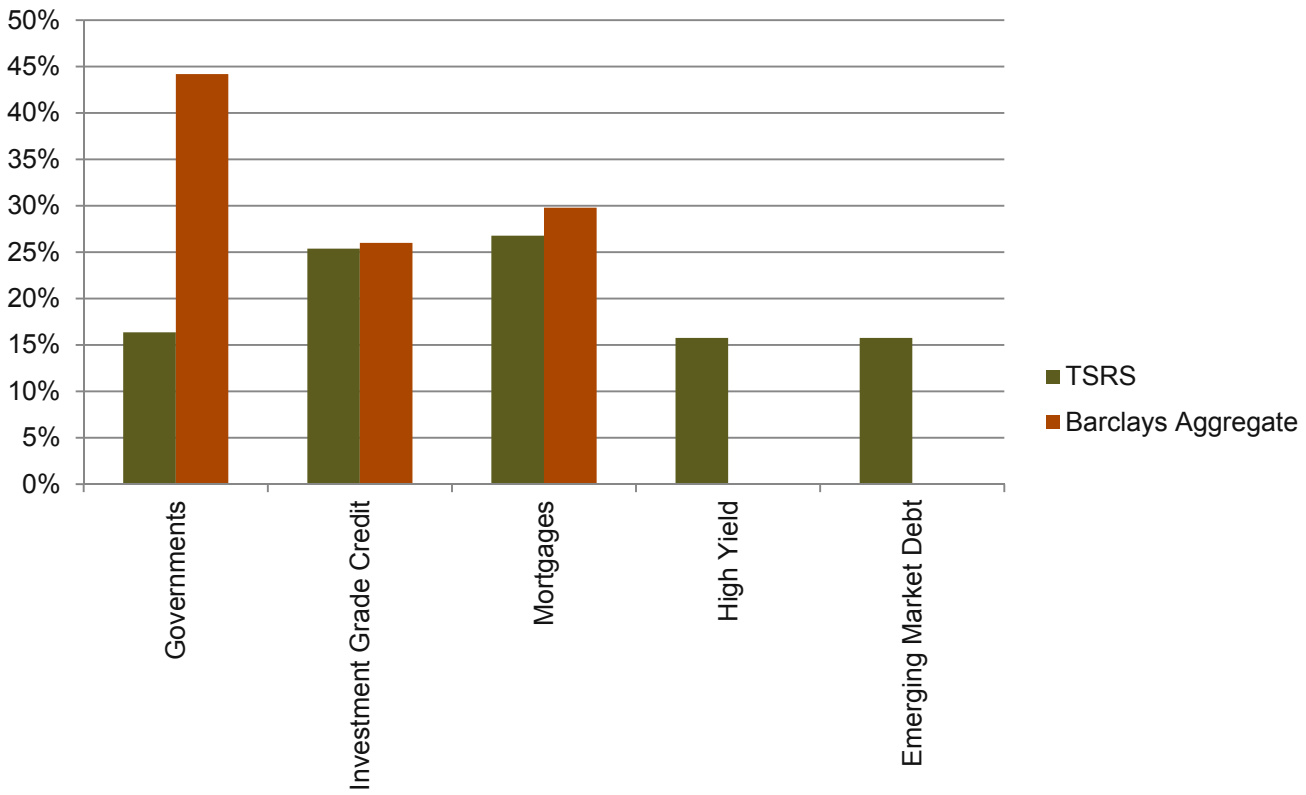
As of September 30, 2016

- The current target structure employs two managers, with PIMCO at a 63% target allocation
- The PIMCO active mandate has a custom benchmark (25% each to high yield, emerging market debt, mortgages and investment grade credit). It can at times be highly correlated with the equity markets, particularly in periods of market stress
- The BlackRock portfolio is passively managed and replicates the Barclays Aggregate index

Current Target Fixed Income Structure



Comparison of TSRS's Structure to the Barclays Aggregate



- TSRS has exposure to high yield, and emerging market debt outside of the Barclays Aggregate
- TSRS is underweight governments relative to the Barclays Aggregate
- Investment grade credit and mortgage exposure are comparable to the benchmark

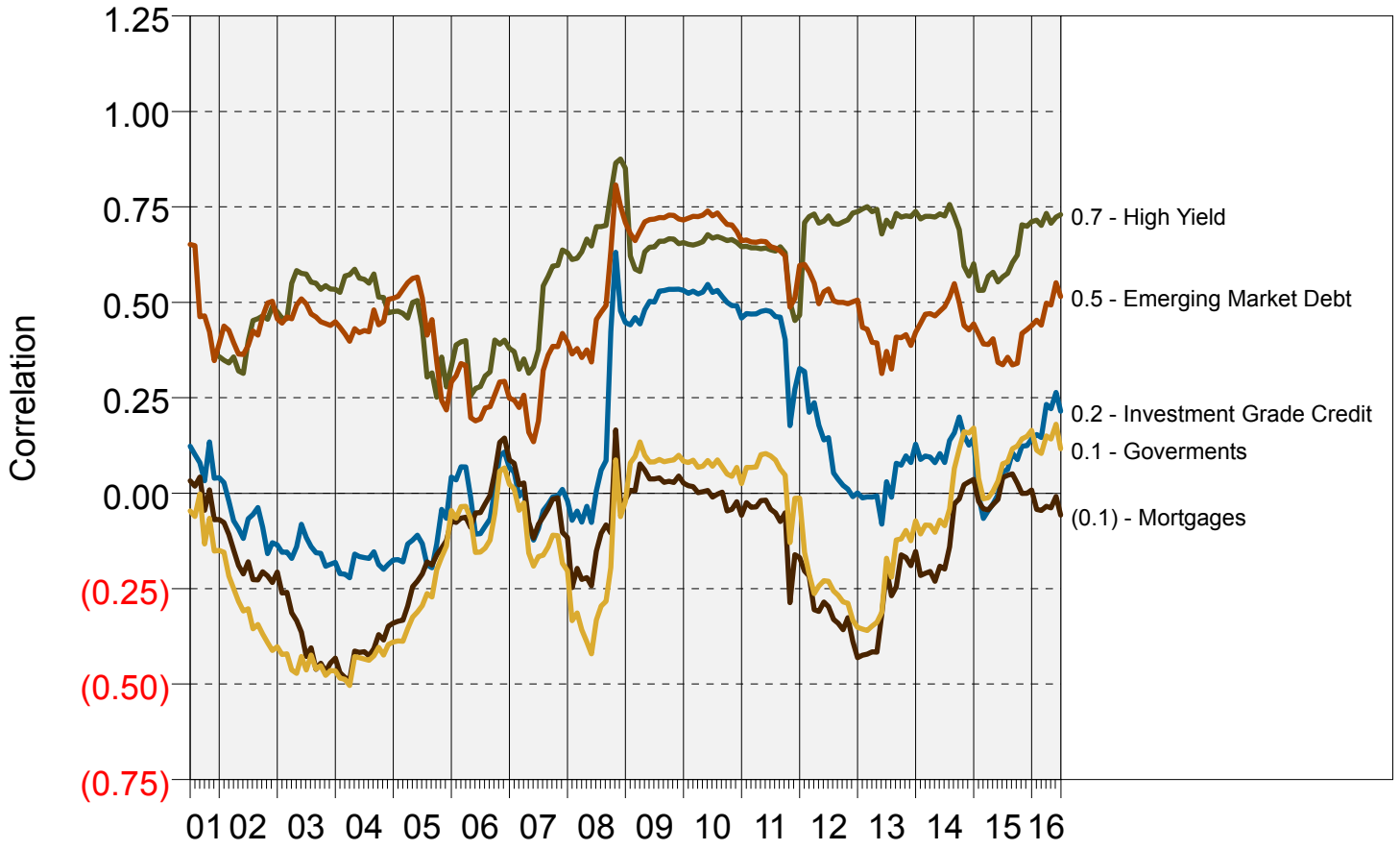
As of 9/30/2016. TSRS exposures are based on the underlying benchmarks for PIMCO and BlackRock combined at policy weights.

Introduction to Correlation

- Correlation measures the degree to which two variables, such as asset classes, move in relation to each other. Correlations range from -1 to +1.
- -1 correlation:
  - Returns of two investment move in precisely opposite directions.
  - Good returns of one investment cancel out bad returns of other investment.
  - Maximum reduction in volatility.
- 0 correlation:
  - The relationship between the returns of two investments is unrelated.
  - Substantial, but not complete, reduction in volatility.
- +1 correlation:
  - Returns are completely synchronized.
  - Said to be “perfectly correlated.”
  - No diversification/volatility reduction.

Correlation of Fixed Income Sectors with Equity

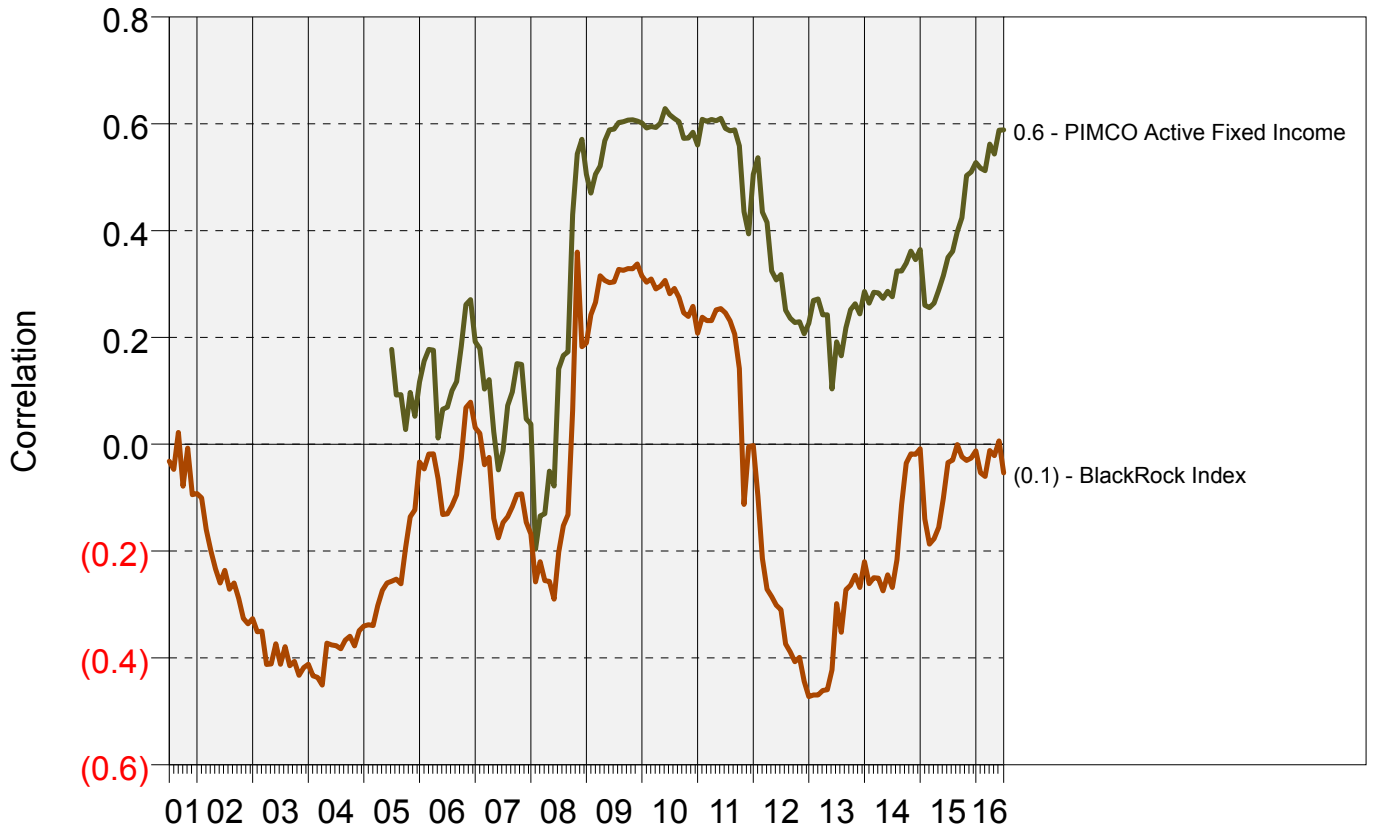
Rolling 36 Month Correlation Relative To S&P:500
for 15 Years Ended June 30, 2016



- High yield, emerging market debt and investment grade credit can be highly correlated with stocks
- Mortgages and governments have exhibited zero or negative correlations with equity

TSRS's Manager Correlations with Equity

Rolling 36 Month Correlation Relative To S&P:500
for 15 Years Ended June 30, 2016

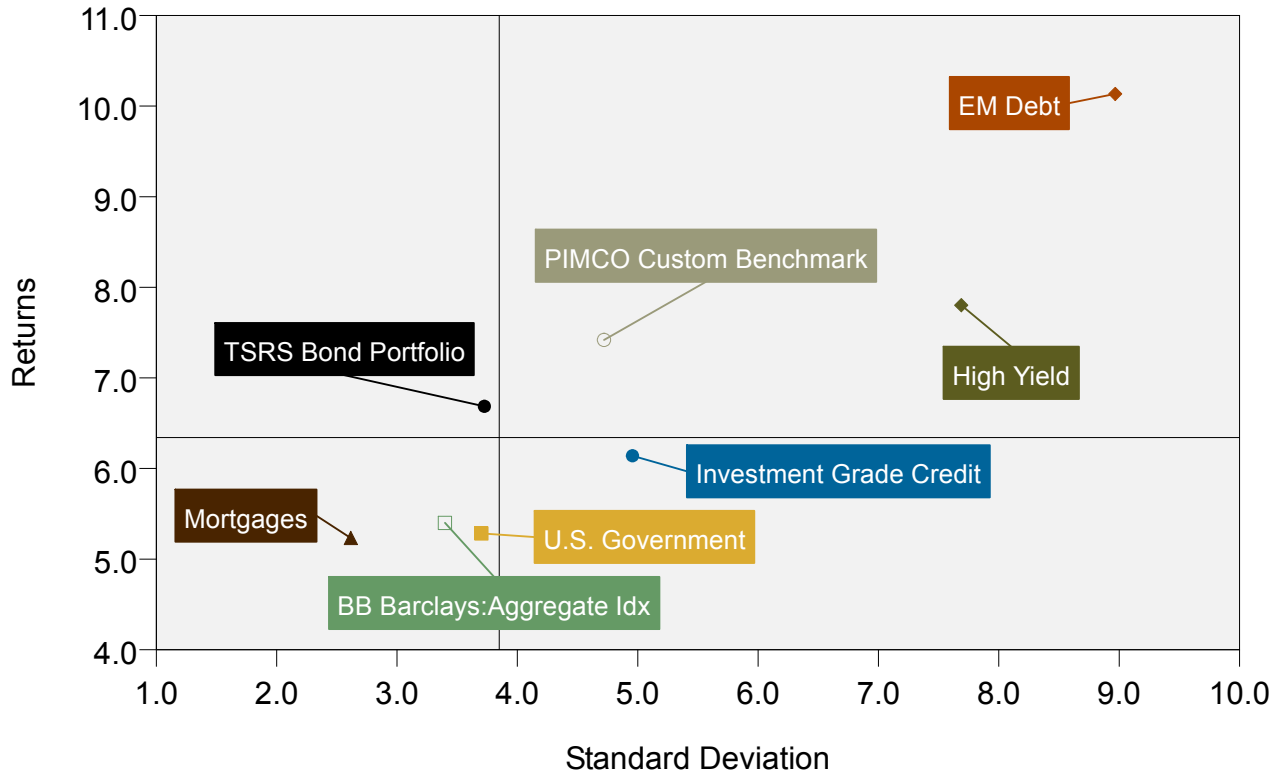


- PIMCO is significantly more correlated with equity than BlackRock

Return and Risk

Bond portfolios and sectors in which TSRS is invested

Scatter Chart
for 17 Years Ended June 30, 2016



- The TSRS Bond Portfolio shown is 63% PIMCO benchmark and 37% Barclays Aggregate.
  - Benchmarks were used to show longer history. The PIMCO benchmark is 25% each to mortgages, high yield, EMD and Investment Grade Credit.
  - The PIMCO custom benchmark has displayed greater risk and return historically then the median core plus fixed income manager (represented by the cross hair). This has been partially offset by diversified exposure to the Barclays Aggregate Index.

Calendar Year Returns

Returns
for Calendar Years
10 Years Ended June 30, 2016

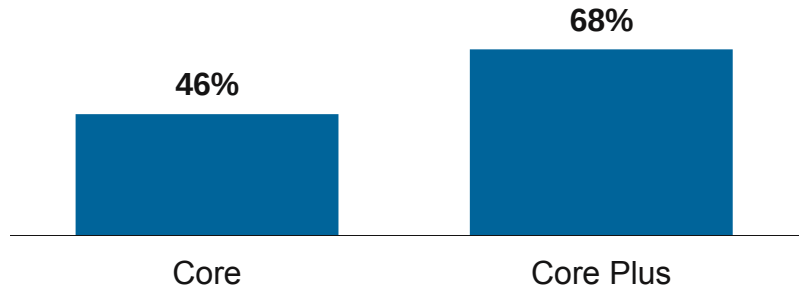
	2 Qtrs. 2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
BB Barclays:Aggregate Idx	5.31	0.55	5.97	(2.02)	4.21	7.84	6.54	5.93	5.24	6.97
PIMCO Custom Benchmark	7.65	0.39	6.33	(1.76)	10.97	7.74	10.04	22.78	(5.58)	5.39
EM Debt	12.29	1.82	6.15	(8.32)	18.04	9.20	11.83	25.95	(9.70)	6.45
High Yield	7.72	(1.13)	5.40	4.95	14.31	6.90	13.94	45.93	(17.26)	3.05
Investment Grade Credit	7.54	(0.77)	7.53	(2.01)	9.37	8.35	8.47	16.04	(3.08)	5.11
Mortgages	3.10	1.51	6.08	(1.41)	2.59	6.23	5.37	5.89	8.34	6.90
U.S. Government	5.69	(0.39)	6.14	(2.71)	4.90	6.67	5.02	2.48	8.51	7.96
TSRS Bond Portfolio	6.78	0.46	6.20	(1.85)	8.44	7.79	8.75	16.30	(1.64)	5.98

- Riskier segments of the bond market have larger drawdowns and swings in performance year-to year.
- The TSRS Bond Portfolio is constructed using indices to show longer history.

Active vs. Passive Considerations

- Active and passive strategies can be complementary and can both play important roles in a portfolio
- Passive mandates provide low-cost exposure to the market
- Passive allocations are good liquidity vehicles for rebalancing, transition management, and making cash contributions/distributions
- Passive allocations are simple to monitor with less manager (and business) risk
- Passive mandates provide competitive performance in efficient markets and lower the tracking error for the total portfolio
- There are active managers who outperform the index – the challenge is to identify and hold them throughout their full performance cycle
- Like any style of investing, passive management will go in and out of favor over time

Percent of 3-Year periods where the median manager beat the benchmark after fees, for 20 years ended June 30, 2016



Fee Assumptions: Core = 0.25%, Core Plus = 0.30%

Questions for the Board

- What is the role of fixed income in the TSRS portfolio?
  - Should it act solely as an anchor to windward and a flight to quality asset?
  - Should it seek higher yield in this low return environment?
  - Is there a way to accomplish both objectives?
- How much risk is the Board willing to take in fixed income?
  - More risk results in higher correlation to growth assets.
- Is there a place for active and passive management? Does the Board favor one approach?
- At our next meeting, Callan will present alternative fixed income portfolio structures for the Board's consideration.

Disclaimers

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ADVISORY COMMITTEE FORMATION DISCUSSION

Purpose: An agenda item has been proposed by the Board to discuss the potential formation of an advisory committee. This communication serves to educate the Board on what the related City Code and Board Governance Policy provisions exist, and provide some history regarding the existence of an advisory committee in the past.

Legal Framework:

The following language regarding advisory committees is contained in City Code over TSRS:

Sec. 22-44(l). Advisory committees and subcommittees. The board may establish advisory committees and subcommittees consistent with the needs of administering the system. Advisory committees and subcommittees shall report directly to the board and have no authority to make decisions on behalf of the board.

Additionally, the adopted Board Governance Policies contain the following language that is relevant to advisory committees:

19. Delegations of Authority:

The individual members of the Board cannot reasonably perform all acts necessary to operate TSRS; they must rely on TSRS staff and contractors to carry out many activities and functions. Accordingly, the Board may delegate authority to committees of its members, the System Administrator and outside consultants and contractors. Delegations must be prudent and consistent with the Board's fiduciary responsibilities. The Board shall (a) select delegatees with care, (b) define delegated authority clearly, (c) monitor the performance of delegatees, and (d) take corrective action when appropriate.

Prior History:

The TSRS had an active Investment Advisory Committee in the past. The committee was subsequently dissolved by the Board. In 2004 the Board requested TSRS staff provide the Board with the background regarding the dissolution of the Investment Advisory Committee. That memo has been included as an attachment to this communication. The memo concluded in regards to the Board's dissolution of the previous investment advisory committee that: *Relying on the professional investment advice of the consultant under contract, the Board has not previously found it necessary to replace advisory committee members as they resigned or stopped participating.*

Staff Comment:

At this time Staff is not bringing forward any formal recommendations for the Board in regards to formation of a committee. The above information is to simply educate the Board on the legal framework and past experience with advisory committees to facilitate Board discussion of this item. It can be concluded by the attached memo that the Board should ensure the formation of any committee must provide visible value to the TSRS and its Trustees. It is worth noting that committees formed by the Board are formal bodies that are subject to open meeting laws. Accordingly, The Retirement Office must have the resources to support the committee to include agenda generation and support of the committee.

MEMORANDUM

DATE: June 18, 2004

TO: Board of Trustees
Tucson Supplemental Retirement System

FROM: Joe Ladenburg
Deputy Finance Director

SUBJECT: Investment Advisory Committee

At the May 27, 2004 meeting of the TSRS Board of Trustees, a request was made for staff to provide background on the Investment Advisory Committee.

An Investment Advisory Committee was originally established to serve in an advisory capacity to the Board in managing the investments of the retirement system. At the time, the Board used consultants on an ad hoc basis for asset allocation studies and manager searches but had not hired an investment consultant on a retainer basis. The committee was established in the 1980s as the board began to consider diversifying the system's assets from domestic fixed income only. The first additional allocation was to an S&P 500 Equity Index mandate. Over the years, as the retirement system grew and matured, the asset mix expanded to include other domestic and international equity mandates, domestic and international fixed income, as well as an allocation to domestic real estate.

In 1992, the Board made the decision to contract with an investment consultant not only to conduct manager searches, but also to advise the Board on investment matters and asset allocation and to conduct the performance review of the individual manager's. Prior to hiring a consultant, the performance measurement function was conducted by the master custodian for the retirement system assets.

The investment advisory committee originally met infrequently, never more than quarterly and it was often difficult to assure a quorum for these meetings. Eventually, the committee members primarily attended regular meetings of the Board when investment managers were scheduled to present a review of their performance, or when manager candidates were being interviewed. This participation was irregular.

Relying on the professional investment advice of the consultant under contract, the Board has not previously found it necessary to replace advisory committee members as they resigned or stopped participating.

In a related agenda item, a recommendation is being made to the Board for the renewal of the contract with Hewitt Associates for investment consulting services.

JL:ljl

MARKET INSIGHTS

An election of extremes—but a government of moderation

How long-term investors should view the 2016 election

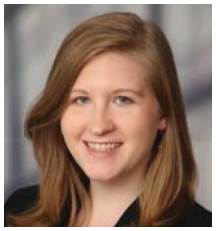
September 9, 2016

IN BRIEF

- We are in the midst of a very unusual U.S. election campaign. But for markets, the impact of the election is likely to be more muted than the campaign hype might suggest.
- While imperfect, our system of divided government helps to ensure that no leader can implement his or her policy ideas unfettered. With our base case one of de facto divided government, markets may well be facing a largely status quo outcome.
- Historical analysis suggests that markets tend to favor incumbent candidates in the months leading up to presidential elections, likely because they represent less uncertainty to investors. However, political considerations have proven to be less of a driver for markets over longer periods.
- Regardless of who wins the election, investors should expect a recession at some point during the next four years. While long-term investors should continue to capitalize on the ongoing expansion for now, it will also be important to establish a plan for the next downturn as the cycle matures.

AUTHORS

Andrew Goldberg
Global Market Strategist



Hannah Anderson
Market Analyst

This U.S. election cycle has been unusual from the start, most notably for the unexpected rise of non-establishment candidates Donald Trump and Senator Bernie Sanders. In the months ahead, voters will be subjected to a deluge of negativity as the candidates largely continue to make the case against each other, rather than for themselves. However, the impact of the election on markets is likely to be far more muted than the intensity of campaign rhetoric might suggest.

In this paper, we consider:

- How we got here: Why economic angst has contributed to a frustrated electorate
- Why our base case of de facto divided government is what ultimately matters most for markets
- What history tells us about market behavior before, during and after presidential elections
- Why either a President Trump or Clinton will likely face a recession in his/her first term, and how investors should think about their portfolios given where we are in the economic cycle

J.P.Morgan
Asset Management

Not out of nowhere: The rise of populism and the legacy of the Great Recession

More than seven years after the end of the Great Recession, the fallout from the downturn continues to shape the American economic and political landscape. Despite substantial economic progress, in many ways the mood of the public is sour and distrustful. An average of polls compiled by RealClearPolitics (RCP), for example, shows that 63% of Americans believe the country is on the "wrong track," vs. less than 28% who say it is on the "right track."[1]

It is not hard to understand why. The pace of recovery has been conspicuously slow—around half that of a typical cycle—real income growth has been anemic and, while wealthy households have enjoyed a boost from rising stock and home prices, middle-income households have been disproportionately penalized by ultra-low interest rates.

Moreover, structural changes in the economy, including the ongoing shift from manufacturing to services, technological innovation and increasing globalization, have created a fertile ground for populist candidates who rail against a "broken" or "rigged" system.

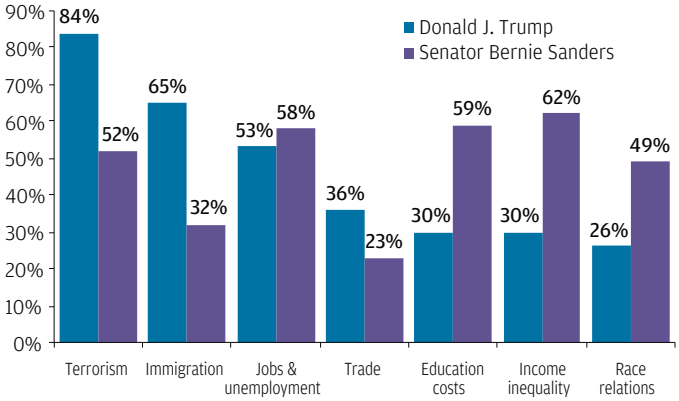
These and other frustrations have fueled the success of anti-establishment candidates. As highlighted in **Exhibit 1**, when surveyed, supporters of Donald Trump pointed to immigration as being among the most important issues to them, a sensitivity that is likely driven by economic anxiety and the fear that increased immigration represents competition for jobs. Economic issues were also important to Bernie Sanders' supporters, who cared most about income inequality, education costs and jobs.

POLITICAL POLARIZATION

Further frustrating voters, the 2016 election has unfolded amid intense political polarization. As shown in **Exhibit 2**, a study of roll call votes in the House and the Senate reveal partisanship to be at its highest in over a century. Experts point to a number of causal explanations, including increased ideological purity within major political parties[2] and years of Congressional redistricting by state legislators, which has created more "safe seats," reducing the need for politicians to compromise. Voters are unimpressed; a recent Gallup poll shows that 78% of voters disapprove of the way Congress is handling its job.[3]

Different parties have different priorities

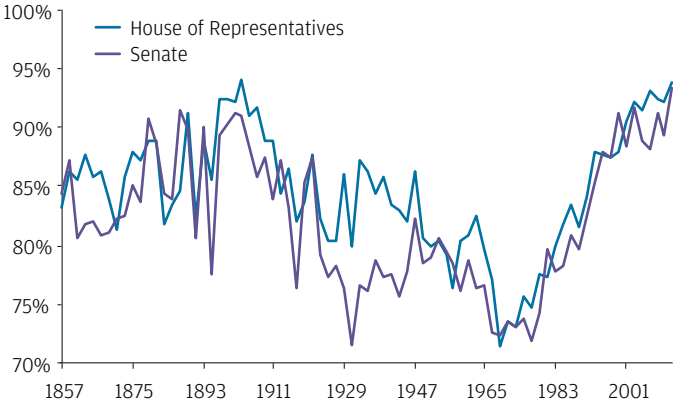
EXHIBIT 1: PERCENT OF SUPPORTERS LISTING ISSUE AS CRITICALLY IMPORTANT TO THEIR VOTE



Source: Brookings Institution, PRRI, Washington Post, J.P. Morgan Asset Management; data are as of September 9, 2016. For illustrative purposes only. Trump supporters are registered Republicans and independents who self-report as leaning Republican who put Trump as their preferred Republican nominee in a June 2016 survey. Sanders supporters were Democrats and self-identified Democratic-leaning independents who named Sanders as their top choice.

Polarization has not been this high since the turn of the 20th century

EXHIBIT 2: PERCENT OF REPRESENTATIVES VOTING WITH THE MAJORITY OF THEIR PARTY*



Source: Vote View, J.P. Morgan Asset Management; data are as of September 9, 2016. For illustrative purposes only. *In roll call votes where the majority in one party voted the opposite way to the majority in the other. Data compiled by Professors Keith T. Poole and Howard Rosenthal, available at www.voteview.com. Data on voting records are not yet available for the 114th Congress.

[1] "Direction of Country, RealClearPolitics Average." *RealClearPolitics*. RealClearPolitics Average. August 1 - September 6, 2016.

[2] Hill, Seth J., and Tausanovitch, Chris. "A Disconnect in Representation? Comparison of Trends in Congressional and Public Polarization." *The Journal of Politics* 77.4 (2015): 1058-075.

[3] Congress and the Public. "Congressional Job Approval Ratings." Gallup. August 3-7, 2016.

The presidential race—as it stands

At the time of writing, polls show Hillary Clinton with a clear lead over her Republican rival, including significant advantages in some key battleground states. According to an electoral map from RCP, Clinton has the edge in electoral votes, leading Trump 229 to 154, with 155 toss-up votes still up for grabs (270 votes are needed to win).

But it is early yet. Three presidential debates are scheduled and both Trump and Clinton struggle with dismal approval ratings (the latest RCP average finds a 54.8% unfavorable rating for Clinton vs. 58.5% for Trump).[4] Moreover, there is always the potential that a major event (terrorist attack, market shock, new hacks, unusually high or low voter turnout, an unexpectedly large result for the Libertarian or Green Party, etc.) will change the shape of the election.

TWO SCENARIOS

Acknowledging that we are not political experts, we consider two potential outcomes.

Scenario 1: Hillary Clinton as president negotiating with a Paul Ryan-led, Republican House of Representatives (with the Senate in either Republican or Democratic hands)—a very status quo outcome for markets.

Scenario 2: Donald Trump as president with GOP majorities in the House and Senate.

We note that it is unlikely that the Democrats would gain the 32 seats necessary for House control if Trump wins the national vote, and while possible, it is also unlikely that a Clinton win would be enough for the Republicans to lose the House.[5]

IF HILLARY CLINTON WINS

If Clinton wins, and assuming a GOP-controlled House, there would likely be little change in the direction of macro-economic policy; the House of Representatives would be unlikely to support expansionary fiscal policy (other than the possibility of some infrastructure spending), big tax increases on the rich or significantly more restrictive financial regulations. We do see the potential for one significant policy change: If Republicans felt that Trump's anti-immigration rhetoric helped them lose the White House, they might want to enact some version of immigration reform. We might also see some corporate tax reform if Clinton and Speaker Ryan can find common ground encompassing lower rates but fewer loopholes.

In **Exhibit 3** we consider a range of sectors and industries in the context of Ms. Clinton's proposals.

EXHIBIT 3: CLINTON'S PROPOSALS AND MARKET IMPLICATIONS

SECTOR	IMPLICATION
Trade	Current agreements remain in place; potential for action on new version of Trans Pacific Partnership (TPP), but anti-trade wing of the Democratic party will stall any TPP action
Health care	Congress will keep ACA subsidies in place, benefiting hospitals, Medicaid HMOs; pharmaceutical companies will face pricing pressure and drug costs will be targeted
Infrastructure	Infrastructure spending is likely to rise, increasing demand for raw goods and construction expertise; any infrastructure deal is likely to contain a large boost for information infrastructure, potentially benefiting some technology companies
Energy	Increased regulation of fossil fuels, especially on fracking; possible increase in federal spending on alternative energy development
Consumer	Expanded earned income tax credit and maintained safety net programs to boost spending by low income households; a federal minimum wage hike could increase consumer spending but would also hurt retailers and restaurants
Agriculture	Immigration reform could increase supply of, and bring certainty to the legal status of, temporary laborers

Source: Cornerstone Macro, Strategas Research Partners, Washington Analysis, J.P. Morgan Asset Management; data are as of September 9, 2016. Comments reflect the candidate's policy stance and proposals and do not consider the likelihood of enactment of these proposals. For illustrative purposes only.

IF DONALD TRUMP WINS

A Trump victory would bring greater uncertainty both because of uncertainty about his final policy proposals and because of the difficulty he might have in moving these proposals through an "establishment" Congress, albeit a Republican one.

As president, Trump would have executive authority to arrest and deport undocumented immigrants. However, he might well hesitate to do so immediately because of the economic disruption that would inevitably cause. He could also ask the Treasury department to label China a "currency manipulator" and use that ruling to impose countervailing duties on specific industries. However, it is possible that he would threaten to do so as an opening bid in an attempt to negotiate certain trade issues with China.

[4] "Clinton & Trump: Favorability Ratings, RealClearPolitics Average." *RealClearPolitics*. RealClearPolitics Average. August 24 - September 6, 2016.
[5] 32-seat gain assumes 186 seats currently held by Democrats, 246 seats held by Republicans and 3 vacancies, with 218 needed for a majority (as of September 7, 2016).

In one of the signature proposals of his campaign, Trump has vowed to exit and renegotiate the 1994 North American Free Trade Agreement (NAFTA)—a stance that he has now softened somewhat. As investors digest these and other proposals, it is important to recognize that trade deals are often written into existing law after the agreements are signed, suggesting that significant changes to the provisions of a trade agreement could well require an act of Congress. Some market participants also worry that the threat of economic disruption from mass deportations or a trade war could have ramifications for markets.

Of course, a president also wields significant power in the realm of foreign policy. Some worry that a more forceful approach to foreign policy under a Trump presidency could also act to unnerve markets.

Trump's tax proposals are generally estimated to be pro-growth, but they would greatly increase the deficit because of the massive cost of lost tax revenue. On health care, Trump might get a bill through Congress that repeals parts of the Affordable Care Act, but we point out that the removal of individual and company insurance mandates would necessitate the abandonment of widely popular coverage for pre-existing conditions, which would present a political challenge.

A president also exerts power through executive appointments. Over a four-year term, either candidate could name several new Supreme Court justices, potentially moving the court in a significantly more partisan direction. The president could also appoint Federal Reserve governors, with two vacant positions to be filled currently. However, he or she would not be able to replace or reappoint Fed Chair Janet Yellen until her term expires in February 2018. Moreover, a choice for Secretary of Energy, Treasury Secretary or even the creation of new posts has the ability to shape the country for far longer than one presidential term.

In **Exhibit 4** we consider a range of sectors and industries in the context of Mr. Trump's proposals.

In short, the immediate aftermath of a Trump win and full Republican control of Congress could generate considerably more uncertainty—at least initially—than a Clinton victory, primarily owing to the potential for more radical policy changes.

It should be emphasized that a Trump-GOP sweep would be different from past electoral sweeps: After all, the "establishment" GOP and its presidential nominee have not exactly seen eye to eye on many important issues, and markets should appreciate that a Paul Ryan-led House would ultimately act to dilute a fair bit of a President Trump's boldest proposals. This could make a Trump victory much more of a de facto status quo than people perceive today.

EXHIBIT 4: TRUMP'S PROPOSALS AND MARKET IMPLICATIONS

SECTOR	IMPLICATION
Trade	Companies with international supply and assembly chains may have to rethink locations; prices of consumer goods and business inputs likely to rise; internationally exposed large companies likely to be hurt the most
Health care	ACA repeal likely to hurt hospitals and HMOs as they lose subsidies; pharmaceutical companies are likely to benefit as pressure to lower drug prices is diminished
Infrastructure	Significant disagreement between Republican factions; highway restoration bill likely and would benefit industrial firms
Energy	Less regulation of energy extraction could open up new areas for energy exploration; energy transporters likely to benefit as Keystone and other similar projects are likely to be approved
Consumer	Simplified consumer tax code could increase consumer spending; firms paying minimum wage likely safe from a mandated wage increase
Financial markets	Lower corporate tax rates could boost earnings for corporations; increases in federal debt could push interest rates higher
Security	Private security firms and prisons would likely be called in to assist with immigration policy changes
Banks	Regulatory relief likely for small and community banks; tax increases on certain activities likely
Gold	Heightened global risks and higher federal deficits likely to make gold more attractive as a safe asset

Source: Cornerstone Macro, Strategas Research Partners, Washington Analysis, J.P. Morgan Asset Management; data are as of September 9, 2016. Comments reflect the candidate's policy stance and proposals and do not consider the likelihood of enactment of these proposals. For illustrative purposes only.

But there is more to the upcoming election than a new president; a third of Senate seats and all House seats will be decided on Election Day. And as we will soon see, Congress matters a lot for markets.

The importance of Congress

Winston Churchill famously quipped, "Democracy is the worst form of government, except for all the others." And while voters may be rightfully frustrated, in a sense, our system's shortcomings also constitute its strength. The Founding Fathers created a political system defined by separation of powers (executive, legislative and judicial) held in balance by a structure of checks and balances. These checks ensure (among other things) that no individual leader or party can wield unfettered power. In this context, Congress has often proven to be a useful buffer between the president's aspirations and the economy.

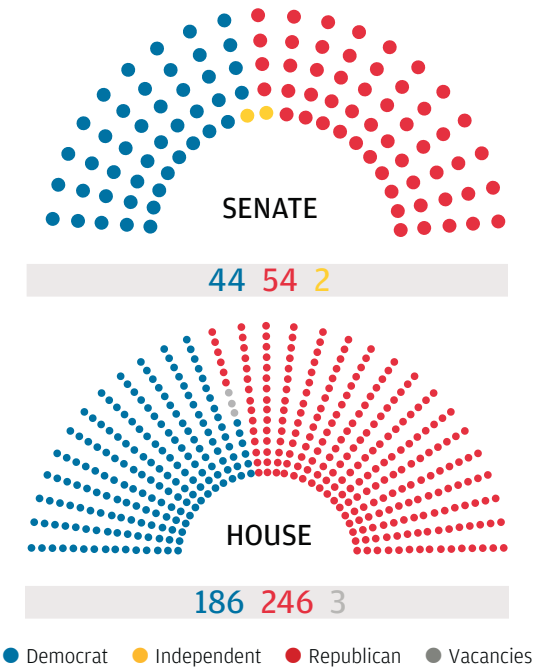
Anecdotal evidence of this is easy enough to come by; a quick Google search for the phrase "Congress watered down" reveals a battery of purportedly "watered-down" bills on taxes, privacy, foreign policy, financial regulation, tax reform, immigration and, for that matter, health care. In other words, investors shouldn't measure market prospects based on the raw proposals they hear during the campaign season.

Our base case: Continued divided government

Currently, both the Senate (54 Republicans, 46 Democrats) and the House (246 Republicans, 186 Democrats, 3 vacancies) are under Republican control (**Exhibit 5**).

The Democrats would need to win 32 seats—a high hurdle—to take control of the House

EXHIBIT 5: CONGRESSIONAL CHAMBER CONTROL



Source: U.S. House of Representatives, U.S. Senate, J.P. Morgan Asset Management; data are as of September 9, 2016. For illustrative purposes only.

Democratic control of the Senate is well within the realm of possibility. Democrats need a four-seat pick-up to gain a majority (assuming Clinton wins the White House, as the vice president casts tie-breaking votes). If Clinton does prevail, we see a higher than 50% probability of a Democratic-controlled Senate.

The House of Representatives is a different story. There, Democrats would need to win 32 seats—a high hurdle. It may be manageable in a "wave election" in which a landslide Clinton victory cascades down ballot.

[6] For more on debt, see Market Insights bulletins, *Living on borrowed time* and *5 government debt myths*.

The federal debt—a growing problem

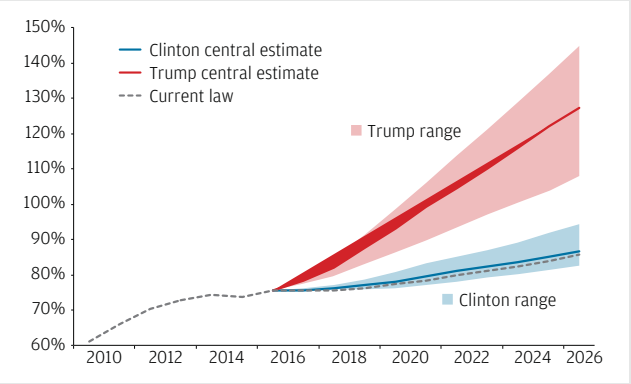
What happens to federal debt in the next administration? It's a serious issue. An improving economy and budget agreements like the Budget Control Act and American Taxpayer Relief Act have had a positive fiscal effect that is starting to fade. Despite a dramatic reduction in the federal deficit from 9.8% of GDP in 2009 to 2.5% of GDP today, the federal debt held by the public currently amounts to just over 76% of GDP—up from 39% before the financial crisis. By 2026, the Congressional Budget Office (CBO) estimates the ratio will reach 86%, before ultimately exceeding the post-World War II peak of 107% by the 2040s. These trends are exacerbated by an aging population and rising interest costs.

At first glance, the policy proposals of both candidates would likely exacerbate the fiscal deficit. Clinton's increased expenditures, partially offset by higher tax revenues, would moderately increase the deficit above the current CBO baseline estimate. As we have noted, most estimates—including those from the Committee on a Responsible Federal Budget—suggest that Trump's proposals would exacerbate this; while his proposed tax cuts might stimulate growth, the effects would likely be overwhelmed by the massive cost of lost tax revenue.

Exhibit 6 depicts the possible trajectories for the federal debt, based on each candidate's published budget proposals. While we do not believe either candidate is likely to see his/her policies implemented unfettered (and so the chart probably exaggerates the impact), investors should recognize the costs associated with a worsening debt environment, including slower growth, higher taxes and potentially higher interest rates.

Debt likely to grow under either candidate

EXHIBIT 6: DEBT AS A PERCENT OF GDP, EACH CANDIDATES' PUBLISHED PROPOSALS



Source: Committee for a Responsible Federal Budget, J.P. Morgan Asset Management; data are as of September 9, 2016. For illustrative purposes only.

What history does (and does not) tells us about market behavior around elections

It's human nature to look for patterns, be they in the clouds or in historical market and economic data. But when it comes to historical market returns and politics, we caution investors not to believe everything they see in the numbers… it all depends on how you slice the data.

For example, a simple analysis of past market returns (looking at S&P 500 data back to 1925) suggests that the *worst* combination for markets has been "R-D-R," or a Republican president with a Democratic Senate and a GOP-led House. But a closer look shows that this is entirely owing to two years, 2001 and 2002, during which time markets were dominated by the fallout from the bursting of the Tech Bubble in 2000 and the terrorist attacks on September 11, 2001.

Another example: The *best* combination for markets, based on a study of returns since 1933, has been an across-the-board GOP government, which saw average annual returns of 15.6%. But by simply extending that historical period by one more presidential term back to 1928, the "R-R-R" combination return falls to 6.2%, and fourth place, behind "D-D-R," "D-R-R" and "D-D-D."

Rather quickly, then, it becomes clear that averages like these tell us less about the impact of elections on the markets and more about the circumstantial timing and impact of major world events on those same averages.

HOW ABOUT SOMETHING USEFUL?

Can market data tell us anything useful about elections? Perhaps surprisingly, they can. Looking over the last 22 election cycles (since 1928), in the three months leading up to the election, a rising stock market accurately predicted a victory by the incumbent party's candidate, while a down market predicted a victory by the challenger party—in 86% of all observations. The data is in **Exhibit 7**.

Heading into November, it would not surprise us to see a higher market eventually predict a Clinton victory, or a lower market forecast a Trump win. We caution that this pattern is less a market vote on the long-term impact of policy proposals than a referendum on uncertainty vs. status quo. Again—markets dislike uncertainty.

TREES DO NOT GROW TO THE SKY

The next president will likely preside over a recession during his/her first term. In their recent publication, "Recession Risks," our Chief Global Strategist, Dr. David Kelly, along with colleagues Ainsley Woolridge and Hannah Anderson, argues that the cumulative probability of a recession beginning in any given quarter rises over time, starting at around 20% in the next 12 months, but growing to over 50% by year three.

Exhibit 8, which shows a comparison of the length of past expansions since 1900, emphasizes this point. No past expansion has lasted more than 10 years; for the current expansion to outlast the first term of our next president, it would need to do exactly that—making it the longest expansion on record. While anything is possible, it does not seem likely to us.

Market "votes" can be seen as a referendum on uncertainty vs. status quo

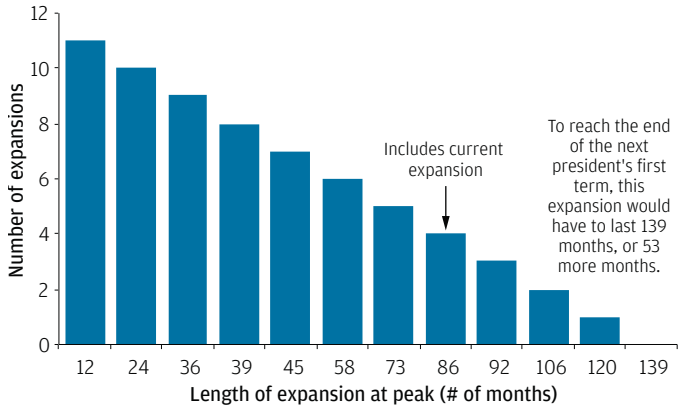
EXHIBIT 7: MARKETS AND ELECTION OUTCOMES

Election year	1928	1932	1936	1940	1944	1948	1952	1956	1960	1964	1968	1972	1976	1980	1984	1988	1992	1996	2000	2004	2008	2012	2016
S&P 500 (% change 3 months leading up to election)	14.9%	-2.6%	7.9%	8.6%	2.3%	5.4%	-3.3%	-2.6%	-0.7%	2.6%	6.5%	6.9%	-0.1%	6.7%	4.8%	1.9%	-1.2%	8.2%	-3.2%	2.2%	-19.5%	2.5%	6.7% (YTD)
Incumbent	Won	Lost	Won	Won	Won	Won	Lost	Won	Lost	Won	Lost	Won	Lost	Lost	Won	Won	Lost	Won	Lost	Won	Lost	Won	?
Match?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	?

Source: Office of the President, Standard & Poor's, Strategas Research Partners, J.P. Morgan Asset Management; data are as of September 9, 2016. For illustrative purposes only.

It would be unprecedented for this expansion to last through the next president's term

EXHIBIT 8: NUMBER OF EXPANSIONS LASTING EACH NUMBER OF MONTHS



Source: NBER, J.P. Morgan Asset Management; data are as of September 9, 2016. For illustrative purposes only.

Conclusion

Markets dislike uncertainty, as investors well know. In this election cycle, the prospect of a Trump victory represents the more uncertain outcome for markets. But investors should also remember that Congress—even under GOP control—will probably act to muffle the impact of either president's proposals, as de facto divided government is the most likely outcome.

We also conclude that fundamentals—not elections—will be the more important drivers of asset prices in the coming years. Investors should focus on valuations, the health of corporate balance sheets, the level of interest rates, the path for the U.S. dollar and the economic cycle, all of which will have a greater influence on portfolios.

Currently, the U.S. economy appears set for stronger growth and a lift in corporate profits. Consumer balance sheets are strong, and with only a slow rise in inflation and an even milder increase in interest rates expected, a recession is anything but imminent. Investors should continue to take advantage of the good weather while it lasts.

But trees do not grow to the sky, and eventually the next recession will come. Today, we see the expansion as being closer to the seventh inning than the second, and it is only prudent for investors to consider positioning more cautiously by reducing large risk overweights that might define an early or mid-cycle portfolio.

Relative to a long-term strategic allocation, our Multi-Asset Solutions team has gradually shifted from a significant equity overweight toward a neutral stock-bond allocation, favoring the U.S. for its status as a high-quality, safe harbor market. We believe that investors should also consider the inclusion of defensive equity strategies with attractive downside capture ratios or lower betas—although here we point out that valuations present something of a challenge for certain defensive stocks and sectors given the ongoing hunt for yield.

With respect to fixed income, the anatomy of the next recession will play an important role in determining the right approach, requiring investors to be somewhat flexible. For example, in a labor supply-constrained economy, such as the U.S., it is possible that any upward demand shock could result in an overheating scenario, catching the Fed—and bond markets—off guard. This could push interest rates higher, hurting fixed income investors with too much duration exposure.

On the other hand, a slow-growth economy that gradually coasts to softer growth might favor high-quality duration. In other words, investors will have to be more nimble—there is no simple formula this time around.

To be clear, prudence is not to be confused with panic. Neither the prospects for a recession in the coming years, nor the impact of the upcoming election, justify drastic action. Instead, investors should take a disciplined, balanced approach that enables them to stay invested so that they can participate in any upside offered in the late stages of the expansion, while feeling more confident that a market downturn won't upend their retirement plans.

As always, we look to help long-term investors keep emotion out of their financial decisions. In the final months of the presidential campaign, it is easy to become distracted by heated rhetoric and gyrating polls. As needed, we will provide market updates—and repeat our call for calm.

NEXT STEPS

For more information about the Market Insights program, contact your J.P. Morgan representative.

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THE WALL STREET JOURNAL.

http://www.wsj.com/articles/is-the-bond-market-in-a-bubble-1476065220

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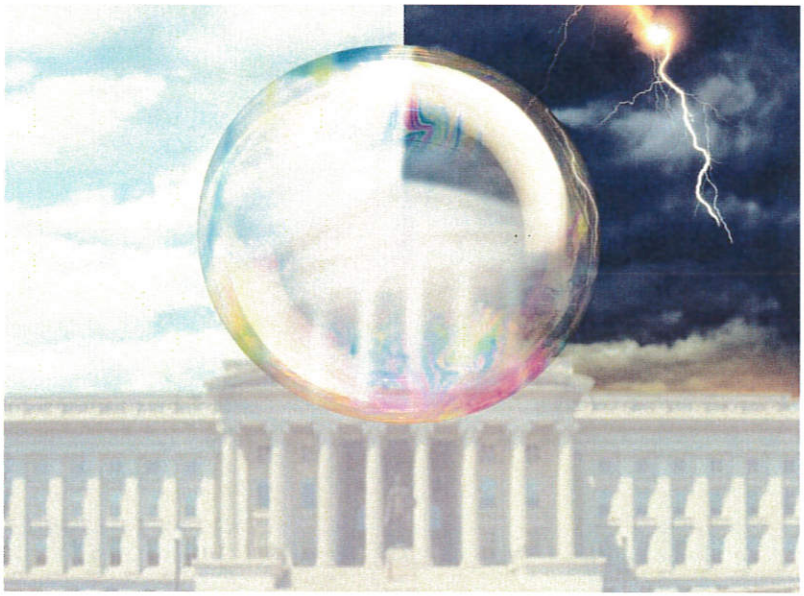
Is the Bond Market in a Bubble?

Two experts square off on one of the crucial issues facing investors today



Two bond experts, MIT's Robert Pozen and Janney's Guy LeBas, square off over whether the bond market is in a bubble. *ILLUSTRATION: STEPHEN WEBSTER/ WORLDWIDE HIDEOUT*

Updated Oct. 9, 2016 11:59 p.m. ET

Bonds issued by governments and companies are priced high these days. In the seesaw relation of bond prices to their yields, prices are up, and yields are smacking hard against the ground, at record lows.

Investors, wary of stock valuations and looking desperately for yield, have

poured money into bonds and bond funds.

There was a brief scare in September when bond prices suddenly fell over concerns that the Federal Reserve and other central banks might end their "easy money" policies.

But that pullback quickly vanished, with investors convinced that the Fed will move slowly in eventually raising rates. Bond prices recovered.

INVESTING IN FUNDS & ETFS

So, are we left with a valuation bubble that will burst, as tech-stock investors experienced more than 15 years ago? Or are the worries merely another false alarm, which bond investors have heard before for many years?

Robert C. Pozen, a senior lecturer at MIT Sloan School of Management and former mutual-fund executive, argues that the situation is verging on a bubble

as yield-hungry investors are gravitating toward riskier bonds. Guy LeBas, chief fixed-income strategist at Janney Montgomery Scott in Philadelphia, says he doesn't see the credit excesses that would qualify this market as a bubble.

YES: Investors Are Reaching for Yield, at Their Peril

By Robert C. Pozen

Mr. Pozen says to be careful before buying bonds these days. *PHOTO: RUSS CAMPBELL*

The global bond markets are verging on a bubble, which will likely result in a significant loss of principal value for major types of bonds by the end of 2017.

For many investors, the stock market seems overpriced, so they are seeking better returns in bonds, whether U.S. Treasurys, corporate junk bonds or emerging-markets securities. As buyers pour in, bond prices are soaring and yields (which decline as prices rise) are shrinking.

The situation verges on a bubble not only because bond yields are at historic lows, but also because investors are gravitating to lower-quality and longer-term

bonds with higher risks. When these risks become realities, bond investors will flock to the exits—reducing liquidity and further depressing bond prices. If the bubble deflates, bond holders will experience deep declines in the current value of their bond portfolios.

The rate question

Let's begin with the situation in U.S. Treasurys. Because of the unorthodox tactics of the Federal Reserve, including massive bond purchases, the yield on the 10-year Treasury bond was down below 1.4% in July, the lowest on record—even lower than in 1933, when the U.S. unemployment rate reached 25%.

JOURNAL REPORT

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To obtain higher yields, some investors have bought 30-year Treasury bonds. Yet the yield on these longer bonds is only 2.47%, down from 3% in January. If interest rates revert to January levels, the current value of $100,000 of these bonds will drop by over $10,000.

True, central banks in Europe have gone negative on interest rates, and the U.S. could do the same. But the Fed faces pressure to raise rates, and I believe it must relent. Rates are too low to be sustainable with improving economic trends. U.S. prices—the key driver of interest rates—have risen for most of the year in health care, housing and wages. These trends were reinforced by the Labor Department's report that "core prices"—minus food and energy—rose 0.3% in August alone.

Investors face similar risks with junk bonds, those rated below investment grade. Very low yields make these bonds vulnerable to modest rises in interest rates. Between January and August, the current yields on double-B bonds fell to 4.5% from 6.8%; on single-B bonds, to 6% from 10%; and on triple-C, to 13.6% from 19.7%.

Moreover, many investors have gravitated to the "junkiest" of the junk—rated

triple-C or lower. This rating means that bond defaults are likely or imminent. In the event of defaults, investors trying to sell junk bonds will find few buyers and face steep losses.

The overseas picture

Finally, yield-hungry U.S. investors have piled into emerging-markets bonds—again, creating huge interest-rate risks. Can you believe that the interest rate on 10-year Bulgarian bonds is 1.8%—only slightly higher than 10-year U.S. Treasury bonds?

The worst danger lurks in emerging-markets bonds issued in the currency of the local country. This raises two special risks for sizable U.S. bond funds.

First, if U.S. interest rates rise, the dollar will strengthen and local currencies will weaken. So these bonds' value will fall on currency alone. Second, local-currency bond markets are thinly traded. If problems occur in these emerging markets, U.S. investors will not easily sell these bonds.

Some argue against a bond bubble because in theory people can't expect that the value of a bond at maturity will rise. More pragmatically, they argue that investors in bonds tend to hold them for the long term.

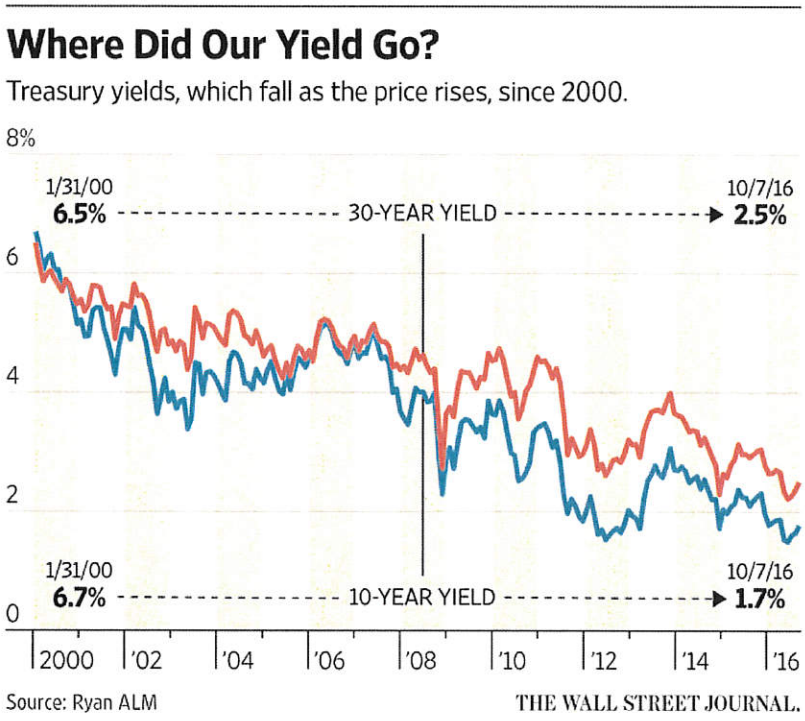
But that ignores the reality of bond investment. Most investors aren't willing to hold bonds for 20 to 30 years, so drops in current values have a negative impact over shorter periods. Also, many investors buy bonds through mutual funds, which effectively don't have a fixed maturity date.

In short, with investors reaching for yield into low-quality bonds, small bumps in the road will cause significant portfolio losses. And the bigger threat lies on the highway ahead: The losses will multiply if central bankers hint that their massive support for bonds will diminish. So be careful before buying bonds; we are on the verge of a bubble.

Mr. Pozen is a senior lecturer at MIT Sloan School of Management and former mutual-fund executive. He can be reached at reports@wsj.com.

NO: Without Credit Excesses, There Can't Be a Bubble

By Guy LeBas



Are we in a bond bubble? Or heading toward one? No.

An asset bubble requires a few things. Chief among them is the purchase of an asset at progressively higher prices with ongoing speculation that tomorrow and the day after that the asset's value will increase. Investors paid astronomical sums for now-defunct dot-com companies in 1999 because they thought company valuations would continuously rise in 2000, in 2005, in 2010 and so on.

This definition is critically important in discussing the presence of bubbles in the bond market. Bonds, by their nature, have maturity dates—a point in the future when a given security will be worth a fixed sum of money. Mathematically, therefore, it is impossible for the value of a bond to be worth progressively more moving forward. As a result, it's metaphysically impossible for an individual bond—and, by extension, the entire bond market—to be in a bubble.

The reality of the market

While charges of a bond bubble are clearly acquitted on this technicality, there's a reasonable argument to be made that many types of bonds are currently overvalued. Inflation expectations are low, but if they do rise significantly, fixed-income investors would face market-value losses. The price of credit risk is also low, but if investors start pricing the risk that a sovereign or company might default more highly, market values of many types of bonds would presumably decline. Supply in higher-quality bonds has been growing only modestly, and demand for these assets is clearly strong—but if either of these components change with, say, a global infrastructure-spending binge, it's possible that

Mr. LeBas sees no bubble, whether metaphysical or real. *PHOTO: JEFF WOJTASZEK*

investors could face broad declines in bonds' market values.

That said, any move to higher inflation is likely to be gradual, and expectations are still compressed. Credit-risk pricing has already harmed investors in 2015 and early 2016 with limited lasting effects. And the supply of bonds hasn't increased nor demand waned even years after the low-interest-rate environment became truly entrenched. To think that all of these factors will change on a dime, without investors across the globe clamoring to buy bonds with higher returns, belies the last half-decade of the bond market's experience.

How investors really buy

The bigger error that bubble doomsayers make is that they ignore how people and institutions actually buy bonds. Most individual investors, even many who purchase corporate junk bonds, are in it for the long haul, and they don't intend to make short-term trades—which means that they won't run for the exits if there are big price swings in the bond market. They intend to recoup the fixed value of the bonds at the maturity date, and don't care what happens before

then.

True, that's not necessarily the case for individual holders of bond mutual funds, who have a greater tendency to rush for the exits when returns turn negative. Fortunately, a few 2015 "crowded exit" scares have encouraged many major bond mutual funds to step up liquidity by taking out, for example, bank lines of credit. That way, if there is a rush to the exits, those mutual funds can still sell down their holdings in a gradual, orderly manner.

When it comes to institutions, according to Federal Reserve data, more than half of bond owners—a group that includes banks, insurance companies, pension funds and more—face restrictions that don't allow them to unload bonds and head for stocks if bond prices turn down. So how will this supposed bond bubble burst?

In conclusion, consider a quote from Jim Chanos, the guru of short selling: "Bubbles are best identified by credit excesses, not valuation excesses." Is the U.S. government issuing debt to excess? Net issuance of Treasury notes and bonds is down 30% year-to-date through the end of August. Are U.S. high-yield companies issuing debt to excess? Gross high-yield issuance is down more than 20% year-to-date.

That story is repeated time and again across fixed-income markets in the U.S. and abroad. Simply put, if there's no possibility of perpetually higher valuations and no evidence of credit excesses, there can be no bubble in the bond markets.

Mr. LeBas is chief fixed-income strategist at Janney Montgomery Scott in Philadelphia. He can be reached at reports@wsj.com.