All or part of the April 19, 2018, meeting of the TRS Investment Management Committee and Board of Trustees may be held by telephone or video conference call as authorized under Sections 551.130 and 551.127 of the Texas Government Code. The Board intends to have a quorum and the presiding officer of the meeting physically present at the following location, which will be open to the public during the open portions of the meeting: 1000 Red River, Austin, Texas 78701 in the TRS East Building, 5th Floor, Boardroom.

AGENDA

April 19, 2018 – 2:00 p.m.
TRS East Building, 5th Floor, Boardroom

1. Call roll of Committee members.

2. Consider the approval of the proposed minutes of the December 14, 2017 committee meeting – Committee Chair.

3. Hedge Fund Challenges and Opportunities – Mr. Sandy Rattray, Man Group CIO

4. Discuss the Fourth Quarter 2017 Performance Review – Steve Voss, Mike McCormick and Mike Comstock, Aon Hewitt.


7. Annual Update on Hedge Funds – Brad Gilbert.

8. Review Board Advisors roles including consider recommending to the Board approval of a Resolution selecting an Advisor consistent with 1.3 of the Investment Policy Statement; and consideration of a finding that deliberating or conferring on the selection of the Board Advisor in open meeting would have a detrimental effect on the position of the retirement system in negotiations with a third person – Jerry Albright.

NOTE: The Board of Trustees (Board) of the Teacher Retirement System of Texas will not consider or act upon any item before the Investment Management Committee (Committee) at this meeting of the Committee. This meeting is not a regular meeting of the Board. However, because the full Committee constitutes a quorum of the Board, the meeting of the Committee is also being posted as a meeting of the Board out of an abundance of caution.
Minutes of the Investment Management Committee

December 14, 2017

The Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on December 14, 2017, in the boardroom located on the fifth floor of the TRS East Building offices at 1000 Red River Street, Austin, Texas.

Committee Members present:
Mr. Joe Colonnetta, Chair
Mr. David Corpus
Mr. Jarvis Hollingsworth
Mr. Chris Moss
Ms. Dolores Ramirez

Other Board Members present:
Mr. John Elliott
Dr. Greg Gibson
Mr. James D. Nance
Ms. Nanette Sissney

Others present:
Brian Guthrie, TRS
Ken Welch, TRS
Carolina de Onis, TRS
Jerry Albright, TRS
Jase Auby, TRS
Mohan Balachandran, TRS
Ashley Baum, TRS
Kyle Schmidt, TRS
Matt Talbert, TRS
James Nield, TRS
Mark Telschow, TRS
Heather Traeger, TRS
Katherine Farrell, TRS
Dr. Keith Brown, Investment Advisor

Investment Management Committee Chair Mr. Colonnetta called the meeting to order at 2:15 p.m.

1. **Call roll of Committee members.**

Ms. Farrell called the roll. A quorum was present.

2. **Consider the approval of the proposed minutes of the September 21, 2017 committee meeting – Committee Chair Joe Colonnetta.**
On a motion by Mr. Corpus, seconded by Ms. Ramirez, the committee voted to approve the proposed minutes for the September 21, 2017, Investment Management Committee meeting as presented with Mr. Hollingsworth abstaining.

3. **Review the Multi-Asset Strategies Group – Mohan Balachandran, Ashley Baum, Kyle Schmidt and Matt Talbert.**

Dr. Mohan Balachandran provided background on the Multi-Asset Strategies Group’s mandate and organizational structure. He said the group is divided up into four portfolios: quant equity strategies, fixed income portion, alternative risk premium and the special opportunities effort. Dr. Balachandran reported that the one-year and three-year alpha numbers for all the portfolios are positive.

Dr. Balachandran discussed the quant equity strategies team. He said this program was launched in 2009 and has generated 219 basis points of annualized alpha. He reported the portfolio represents 2.8 percent of the Trust and expects it to grow. In response to Dr. Brown’s inquiry, Dr. Balachandran reported the portfolios are rebalanced monthly with an annual turnover from 10 to 25 percent.

Dr. Balachandran reported on the fixed income team which runs $17.9 billion in Treasury and Treasury Inflation Protection Securities (TIPS). He stated both real and nominal rates are very low. He said the real role of the Treasury portfolio is the primary diversifier at the Trust level.

Mr. Matt Talbert provided an overview of the alternative risk premium effort. He said the program has run for two-years and has experienced a modest contribution from each of the asset classes. He highlighted they have experienced a 10.1 percent, roughly $57 million of alpha for the Trust. Mr. Kyle Schmidt reported on the risk premium and single name equities. He stated they maintain a diversified risk premia exposure meaning they do not want a single one of these risk premia in equities to be the driver of performance at any given point at time. Mr. Schmidt stated as part of the global equity best practices project, risk premia has been identified as an important component to the global equities portfolio. Dr. Balachandran summarized by stating as part of the multi-asset mandate, they are doing risk premia extraction across all asset classes.

Ms. Ashley Baum reported on the special opportunities platform which was established four years ago. She stated since inception, they have made 16 discrete investments, deployed $1.1 billion and contributed approximately $100 million in profit to the Trust. In response to Mr. Colonnetta’s inquiry, Ms. Baum gave general examples of investments in the portfolio as distressed debt situations, mortgage servicing rights and trade receivables. She said for 2018 they will selectively add new investments including illiquid credit. Ms. Baum reported one percent of the Trust is invested in illiquid credit. She said there is an expectation to grow this to 4 and 5 percent of the Trust but with the caveat that this is subject to availability of the right opportunities.

4. **Review Risk Group Annual Update – James Nield and Mark Telschow.**
Mr. Nield described the risk mandate as composed of two key components. He said one is risk management and the other is risk strategies. He stated risk management is broken out into three key groups which include counterparty risk, counter exposure and leverage liquidities. Mr. Nield said they manage five portfolios, collectively referred to as risk strategies. He reported pretty good performance, 49 basis points over the last year, and 140 basis points over the last three years.

Mr. Nield discussed macro and portfolio risks. Examples of these comprise of counterparty risk, bubble risk and abnormal performance. Mr. Nield stated the risk process as identify, prepare, act – simply identify the key risks, determine what can be done in advance and if need to act, what are the steps. He shared how the risk process applied to each of the previous examples.

Next Mr. Nield discussed risk strategies. He said the goal in risk parity is to achieve balance by investing in a diversified portfolio and use a little bit of leverage to target the desired risk level. Mr. Telschow stated they aim to achieve balance by factor – to balance the growth and inflation factors. Mr. Telschow discussed the low volatility which he said is a $2 billion allocation within the global equity portfolio. He reported the strategy has produced better than benchmark returns while providing both defensive market exposure and diversifying alpha. He said over the past three years, the strategy has outperformed the benchmark by 456 basis points annualized which equates to roughly $52 million.

Mr. Nield concluded by reviewing the risk group’s priorities for the upcoming year.

Without further discussion, the meeting adjourned at 3:25 p.m.


______________________________    _________________
Katherine H. Farrell       Date
Secretary of the TRS Board of Trustees
Hedge fund challenges: It is getting harder to find alpha

Hedge fund opportunities: Potential opportunities remain for investors with appropriate scale, resources and dedication

Investing in strategic partnership: The importance of client relationships

Best practices emanating from Europe
Hedge fund challenges

- It is getting harder to find alpha

Hedge fund opportunities
Investing in partnership
Best practices emanating from Europe
The growth of hedge fund industry assets remains robust

Even in periods of client redemptions, the industry has grown through performance. Assets now stand at over $3 trillion and this may weigh on performance. New money continues to enter the industry in higher return strategies.

Hedge fund AUM ($bn) over time

<table>
<thead>
<tr>
<th>Year</th>
<th>AUM ($bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>9.8</td>
</tr>
<tr>
<td>2001</td>
<td>21.5</td>
</tr>
<tr>
<td>2002</td>
<td>50</td>
</tr>
<tr>
<td>2003</td>
<td>34.3</td>
</tr>
<tr>
<td>2004</td>
<td>182.6</td>
</tr>
<tr>
<td>2005</td>
<td>50</td>
</tr>
<tr>
<td>2006</td>
<td>150</td>
</tr>
<tr>
<td>2007</td>
<td>200</td>
</tr>
<tr>
<td>2008</td>
<td>250</td>
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<td>2009</td>
<td>300</td>
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<td>2010</td>
<td>350</td>
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<td>2014</td>
<td>550</td>
</tr>
<tr>
<td>2015</td>
<td>600</td>
</tr>
<tr>
<td>2016</td>
<td>650</td>
</tr>
<tr>
<td>2017</td>
<td>700</td>
</tr>
</tbody>
</table>

Sources: Hedge fund AUM over time - Barclays, HFR, Strategic Consulting Analysis, as at 31 December 2017; Change in AUM - HFR Global Hedge Fund Industry Report, Year End 2017.
And publically available liquid alternatives have also been growing rapidly

European liquid alternative funds (UCITS) have grown faster than US liquid alternative funds (40 Act) over the last 10 years, and particularly since 2014.

1. Based on global category classification “Alternative”. Data as at 31 December 2016. Source: Morningstar
In addition, there is increased competition from factor investing. Both alternative risk premia and smart beta strategies have been growing very rapidly. This may put pressure on the performance of the risk factors which have been historic drivers of hedge fund returns.

### Growth in smart beta and risk premia AUM

- **Smart beta**
- **Risk premia**

<table>
<thead>
<tr>
<th>Year</th>
<th>AUM (bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>76 15</td>
</tr>
<tr>
<td>2012</td>
<td>109 47</td>
</tr>
<tr>
<td>2013</td>
<td>178 86</td>
</tr>
<tr>
<td>2014</td>
<td>231 98</td>
</tr>
<tr>
<td>2015</td>
<td>259 241</td>
</tr>
<tr>
<td>2016</td>
<td>316 294</td>
</tr>
<tr>
<td>2017 H1</td>
<td>354 669</td>
</tr>
</tbody>
</table>

**44% CAGR**

Source: Citi Business Advisory Services analysis, based on proprietary data subscriptions from SimFund and eVestment.
As a result, it is getting harder to find alpha: simple factor strategy returns have declined over time.

The factors below have contributed materially to macro and equity hedge fund performance historically. We believe core factor returns may persist, but we believe relying on them alone to generate performance in the future is not enough.

**Basic time series momentum factor**

**Basic equity value and momentum factors**

**Basic FX carry factor**

**Basic equity size and quality factors**

Past performance is not indicative of future results.

Date range: 1 January 2000 to 30 March 2018. The Sharpe ratio data shown is not intended to represent the actual past performance or simulated past performance of an investment product. The data relates to internal trading models that follow the indicated strategies. It is shown for information purposes only and should not be used as a guide to the future. Returns are shown gross of fees. Sharpe ratio is a measure of risk-adjusted performance that indicates the level of excess return per unit of risk. It is calculated using the risk-free rate in the appropriate currency over the period analysed. Source: Man Group proprietary database.
However, diversification benefits persist despite lower returns.

The core skills of hedge funds of trading, shorting, leverage and risk management remain valuable in our view. Balanced long-only portfolios can potentially benefit from these skills.

### Annual HFRI Fund-Weighted Index return

<table>
<thead>
<tr>
<th>Year</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>10.2%</td>
</tr>
<tr>
<td>2011</td>
<td>-5.6%</td>
</tr>
<tr>
<td>2012</td>
<td>6.4%</td>
</tr>
<tr>
<td>2013</td>
<td>9.1%</td>
</tr>
<tr>
<td>2014</td>
<td>3.0%</td>
</tr>
<tr>
<td>2015</td>
<td>-1.1%</td>
</tr>
<tr>
<td>2016</td>
<td>5.4%</td>
</tr>
<tr>
<td>2017</td>
<td>8.6%</td>
</tr>
</tbody>
</table>

### Percentage of HFs in the index that would have improved the overall Sharpe Ratio of a 50/50 equity/bond portfolio¹

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>79%</td>
</tr>
<tr>
<td>2011</td>
<td>38%</td>
</tr>
<tr>
<td>2012</td>
<td>74%</td>
</tr>
<tr>
<td>2013</td>
<td>78%</td>
</tr>
<tr>
<td>2014</td>
<td>68%</td>
</tr>
<tr>
<td>2015</td>
<td>60%</td>
</tr>
<tr>
<td>2016</td>
<td>57%</td>
</tr>
<tr>
<td>2017</td>
<td>85%</td>
</tr>
</tbody>
</table>

Past performance is not indicative of future results.

¹ 50/50 US portfolio composed of S&P500 Total return index and Barclays US Aggregate Bond Index. Fund judged to have improved the Sharpe ratio of the portfolio if: Sharpe Ratio of Fund > Sharpe Ratio of 50/50 Portfolio * Correlation of Fund and 50/50 Portfolio. Source: Barclays, HFR, Strategic Consulting analysis.
Hedge fund challenges

**Hedge fund opportunities**

- Potential opportunities remain for hedge fund managers with appropriate scale, resources and dedication

Investing in partnership

Best practices emanating from Europe
The growth of data represents both a challenge and an opportunity.

Less resourced investors may struggle to harness the growth of data. We believe the real opportunity is in the areas with high barriers to entry. These can be intellectual, financial or operational.

The explosion of data¹

“Between the dawn of civilization and 2003, we only created five exabytes; now we’re creating that amount every two days.”

Hal Varian, Chief Economist at Google.

1. Source: Patrick Cheesman (via EE Times: Digital Data Storage is Undergoing Mind-Boggling Growth, Dr. Lauro Rizzatti, Verification Consultant 14/9/2016).
The ongoing technology revolution facilitates managers with the capabilities to harness it ... 

The cost of storage has decreased exponentially over the last 30 years, along with the increase in processing power commonly available.

**Computer storage cost per GB**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost per GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>$300,000</td>
</tr>
<tr>
<td>1987</td>
<td>$50,000</td>
</tr>
<tr>
<td>1990</td>
<td>$10,000</td>
</tr>
<tr>
<td>1994</td>
<td>$1,000</td>
</tr>
<tr>
<td>1997</td>
<td>$100</td>
</tr>
<tr>
<td>2000</td>
<td>$10</td>
</tr>
<tr>
<td>2004</td>
<td>$1</td>
</tr>
<tr>
<td>2010</td>
<td>$0.10</td>
</tr>
<tr>
<td>2017</td>
<td>$0.01</td>
</tr>
</tbody>
</table>

**Computer processing power**

Source: Man Group database; IBM, BIG DATA + MAINFRAME, 2014; McKinsey Global Institute, Big data: The next frontier for innovation, competition and productivity, June 2011, and Josh Smith, Hard Drive Prices Over Time: Price per GB from 1981 to 2010, June 2011.
As a footnote: Today’s phones are more powerful than supercomputers of 30 years ago

**Cray 2**
The world’s fastest supercomputer: 1985-1990
- CPU: 1.9 GFLOPs*
- Memory: 2GB
- Weight: 5,500 pounds
- Cost: $32 million (current $)

**2016 iPhone 7 (A10 fusion)**
The iPhone 7 is easily more powerful than the Cray 2
- CPU 178.8 GFLOPs
- Memory: 256 GB

Source: Campbell R. Harvey, Duke University
Quantitative manager challenges

- Invest in new sources and higher volumes of data
- Develop new quantitative techniques
- Invest in speed

Illustrative example. For informational purposes only.
Source: Man Group proprietary database.

Linear Combination

Conventional trend following suggests a neutral position

Machine Learning

Machine Learning algorithm may suggest a long position

Past performance is not indicative of future results. Returns may increase or decrease as a result of currency fluctuations.
... and technology provides opportunities for both quantitative and discretionary managers

### Discretionary manager challenges

- Analyse and improve decisions of human investment managers
- Focus on skills that they have, remove other exposures
- Deliver customised data to investment managers

### Removing factor exposures has been shown to improve discretionary returns

- At Man GLG we found discretionary managers had little alpha from country, market, industry or style selection
- Technology allows us to hedge out those factor exposures and to spend our risk budget better

Past performance is not indicative of future results. Returns may increase or decrease as a result of currency fluctuations.
Average fees have come down, but not for the best and most difficult strategies. Leading to bar-belled approach to fees.

Average fees are declining; this increases barriers to newcomers.

Well established firms with hard to replicate strategies and a culture of investment can maintain competitive advantage.

**Systematic hedge fund fees**

<table>
<thead>
<tr>
<th>Target performance range (Sharpe Ratio)</th>
<th>1.50+</th>
<th>0.75–1.50</th>
<th>&lt;0.75</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alpha</strong></td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td>Low – Medium</td>
<td>Medium – High</td>
<td>High</td>
</tr>
<tr>
<td><strong>Common Strategies</strong></td>
<td>Stat Arb, Multi-Strategy</td>
<td>Managed Futures, EMN Fundamental, Multi-Strategy</td>
<td>Risk Premia / Alt. Beta, Long only</td>
</tr>
<tr>
<td><strong>Tolerable Management Fee Range</strong></td>
<td>0%</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>1%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td><strong>Tolerable Performance Fee Range</strong></td>
<td>0%</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>30%</td>
<td></td>
</tr>
</tbody>
</table>

Past performance is not indicative of future results. Returns may increase or decrease as a result of currency fluctuations.

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The impact of frictional costs on investment returns should not be underestimated.

A simple way to potentially improve returns is to reduce frictional costs in fund management.

Illustrative impact of costs and charges on gross performance

<table>
<thead>
<tr>
<th>Gross Alpha</th>
<th>Net Alpha¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implicit trading costs</td>
<td></td>
</tr>
<tr>
<td>Explicit trading costs</td>
<td></td>
</tr>
<tr>
<td>Prime brokerage and finance</td>
<td></td>
</tr>
</tbody>
</table>

1. Before administration fees, custodian fees, audit fees, legal fees and other sundry costs.

Illustrative example – For information purposes only.
And liquidity in markets no longer comes from banks

Liquidity is created predominantly by specialist market makers. Fund managers should adjust their trading as a result.

**Top US Equities OTC venue firms by market share 2017**

- **Citadel**: 30%
- **Virtu**: 25%
- **Susquehanna**: 15%
- **GS**: 10%
- **Two Sigma**: 5%
- **MS**: 3%
- **UBS**: 2%
- **BAML**: 1%
- **JPM**: 1%

Understanding new liquidity providers is essential to achieving best execution.

Source: J.P. Morgan, BATS. As of December 31 2017.
Hedge fund Challenges
Hedge fund opportunities

**Investing in partnership**
- The importance of client relationships
Best practices emanating from Europe
Large investors can potentially win material benefits

Concentration of investments with fewer managers strengthens the investor’s negotiating position. It can also foster constructive interaction between both parties, including:

- Transparency and access to intellectual capital
- Specialised training and advice for investor staff
- Collaborative research projects
- Bespoke structuring of investments
Hedge fund Challenges
Hedge fund opportunities
Investing in partnership

Best practices emanating from Europe
A key driver of change in Europe is MiFID II.

- Firms must **unbundle research and execution commissions** – European firms will need to be explicit on how they pay for research and how much they are spending.

- Firms must **disclose all costs and charges including implicit & explicit transactions** costs providing increased transparency.

- Investment firms must evidence a cycle of improvement and an appropriate governance structure to **demonstrate best execution**.

- All transactions need to be **reported almost immediately** providing improved external transparency.
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The products described herein are unregistered private investment funds commonly called “hedge funds” (each, a “Private Fund”). Private Funds, depending upon their investment objectives and strategies, may invest and trade in many different markets, strategies and instruments (including securities, non-securities and derivatives) and are NOT subject to the same regulatory requirements as mutual funds, including requirements to provide certain periodic and standardized pricing and valuation information to investors. There are substantial risks in investing in a Private Fund, which also are applicable to the underlying Private Funds in which a Private Fund may invest. Each Fund’s Offering Documents contain important information concerning risk factors, including a more comprehensive description of the risks and other material aspects of the investment (including a Fund’s investment program and applicable fees and expenses), and should be read carefully before any decision to invest is made. You should not rely in any way on this summary.

You should note that:

- A Private Fund represents a speculative investment and involves a high degree of risk. Investors must have the financial ability, sophistication/experience and willingness to bear the risks of an investment in a Private Fund. An investor could lose all or a substantial portion of his/her/its investment.
- An investment in a Private Fund is not suitable for all investors. An investment in a Private Fund should be discretionary capital set aside strictly for speculative purposes. Only qualified eligible investors may invest in a Private Fund.
- A Private Fund’s prospectus or offering documents are not reviewed or approved by federal or state regulators and its privately placed interests are not federally or state registered.
- An investment in a Private Fund may be illiquid and there are significant restrictions on transferring or redeeming interests in a Private Fund. There is no secondary market for an investor’s investment in a Private Fund and none is expected to develop. Substantial redemptions by shareholders within a limited period of time could compel a Private Fund to liquidate its securities positions more rapidly than otherwise would be desirable, which could adversely affect the value of the distribution proceeds and the value of the remaining interests in a Private Fund.
The net asset value of a Private Fund may be determined by its administrator or a pricing committee retained by the Private Fund in consultation with its manager or advisor in certain cases. Certain portfolio assets may be illiquid and without a readily ascertainable market value. Since the value assigned to portfolio securities affects a manager’s or advisor’s compensation, the manager’s or advisor’s involvement in the valuation process creates a potential conflict of interest. The value assigned to such securities may differ from the value a Private Fund is able to realize. Instances of mispriced portfolios, due to fraud or negligence, have occurred in the industry.

A Private Fund may have little or no operating history or performance and may use performance which may not reflect actual trading of the Private Fund and should be reviewed carefully. Investors should not place undue reliance on hypothetical, pro forma or predecessor performance. A Private Fund’s actual performance may differ substantially and may be volatile.

A Private Fund may trade in commodity interests and futures, or may execute a substantial portion of trades on foreign exchanges, each of which could result in substantial risk of loss. Commodities and futures prices may be highly volatile and are difficult to predict.

A Private Fund may use derivative financial instruments, including, futures, swaps, options, credit default swaps and credit default indices, both for hedging and speculative purposes. The use of derivative instruments involves a variety of material risks, including the high degree of leverage often embedded in such instruments and the possibility of counterparty non-performance as well as of material and prolonged deviations between the actual and the theoretical value of a derivative instrument.

A Private Fund’s manager or advisor has total trading authority over a Private Fund. The death or disability of the portfolio manager or advisor, or their departure, may have a material adverse effect on a Private Fund.

A Private Fund may use a single advisor or employ a single strategy, which could mean a lack of diversification and higher risk.

A Private Fund may involve a complex tax structure, which should be reviewed carefully, and may involve structures or strategies that may cause delays in important tax information being sent to investors.

A Private Fund’s fees and expenses – which may be substantial regardless of any positive return – will offset such Private Fund’s trading profits. If a Private Fund’s investments are not successful, these payments and expenses may, over a period of time, deplete the net asset value of a Private Fund.

A Private Fund and its managers/advisors and their affiliates may be subject to various potential and actual conflicts of interest.

A Private Fund may employ investment strategies or techniques aimed to reduce the risk of loss which may not be successful.

A Private Fund may not be required to provide periodic pricing or valuation information to investors.

A Private Fund may employ leverage. The more leverage used, the more likely a substantial change in value may occur, either up or down. A Private Fund may trade futures or may trade on foreign exchanges, where the risk of loss may be substantial.
The above summary is not a complete list of the risks, tax considerations and other important disclosures involved in investing in a Private Fund and is subject to the more complete disclosures in such Fund’s offering documents, which must be reviewed carefully prior to making an investment. For a copy of the Fund’s Offering Documents, please contact your Man sales representative at ussales@man.com or at the number listed below.

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Teacher Retirement System of Texas
Performance Review: Fourth Quarter 2017

Aon Hewitt
Retirement and Investment

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Summary

- Led by emerging markets stocks, global equities delivered strong returns for the fourth quarter; fixed income assets delivered modest gains as the yield curve flattened and inflation increased; real assets posted gains as oil prices recovered

- The TRS investment portfolio returned 4.0% for the quarter which outperformed its benchmark by 0.1 percentage points
  - Active management in real assets, non-US developed equities, stable value hedge funds and risk parity were the largest contributors

- For the trailing twelve months, TRS returned 17.3%, outperforming its performance benchmark by 1.1 percentage points
  - Superior relative manager returns in real assets, private equity, and stable value hedge funds contributed most to the outperformance
1. Market Summary – Fourth Quarter 2017

<table>
<thead>
<tr>
<th></th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
<th>Five Years</th>
<th>Ten Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global Equity:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSCI U.S. A. IMI Index</td>
<td>6.3%</td>
<td>21.3%</td>
<td>11.2%</td>
<td>15.6%</td>
<td>8.7%</td>
</tr>
<tr>
<td>MSCI EAFE + Canada index</td>
<td>4.2%</td>
<td>24.2%</td>
<td>7.4%</td>
<td>7.5%</td>
<td>1.9%</td>
</tr>
<tr>
<td>MSCI Emerging Markets Index</td>
<td>7.4%</td>
<td>37.3%</td>
<td>9.1%</td>
<td>4.3%</td>
<td>1.7%</td>
</tr>
<tr>
<td>HFRI Fund of Funds Composite Index</td>
<td>2.0%</td>
<td>7.7%</td>
<td>2.6%</td>
<td>4.0%</td>
<td>1.1%</td>
</tr>
<tr>
<td>State Street Private Equity Index (atr lagged)</td>
<td>3.9%</td>
<td>15.1%</td>
<td>9.8%</td>
<td>11.9%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Global Equity Policy Benchmark</td>
<td>5.1%</td>
<td>22.5%</td>
<td>9.3%</td>
<td>10.3%</td>
<td>5.2%</td>
</tr>
<tr>
<td><strong>Stable Value:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bloomberg Barclays Long Treasury Index</td>
<td>2.4%</td>
<td>8.5%</td>
<td>2.8%</td>
<td>3.5%</td>
<td>6.6%</td>
</tr>
<tr>
<td>HFRI Fund of Funds Conservative Index</td>
<td>1.1%</td>
<td>4.1%</td>
<td>2.1%</td>
<td>3.4%</td>
<td>0.9%</td>
</tr>
<tr>
<td>3 Month LIBOR + 2%</td>
<td>0.9%</td>
<td>3.3%</td>
<td>2.8%</td>
<td>2.6%</td>
<td>2.8%</td>
</tr>
<tr>
<td>90 Day U.S. Treasury Bill</td>
<td>0.3%</td>
<td>0.9%</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Stable Value Policy Benchmark</td>
<td>2.0%</td>
<td>7.0%</td>
<td>2.6%</td>
<td>3.4%</td>
<td>5.6%</td>
</tr>
<tr>
<td><strong>Real Return:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bloomberg Barclays U.S. TIPS Index</td>
<td>1.3%</td>
<td>3.0%</td>
<td>2.1%</td>
<td>0.1%</td>
<td>3.5%</td>
</tr>
<tr>
<td>NCREIF ODCE (atr lagged)</td>
<td>1.6%</td>
<td>6.7%</td>
<td>9.8%</td>
<td>10.6%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Energy, Natural Resources &amp; Infrastructure Benchmark</td>
<td>2.7%</td>
<td>10.8%</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Goldman Sachs Commodities Index</td>
<td>9.9%</td>
<td>8.8%</td>
<td>-7.5%</td>
<td>-12.2%</td>
<td>-10.2%</td>
</tr>
<tr>
<td>Real Return Policy Benchmark</td>
<td>1.8%</td>
<td>6.8%</td>
<td>6.9%</td>
<td>7.2%</td>
<td>5.3%</td>
</tr>
<tr>
<td><strong>Risk Parity:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk Parity Benchmark</td>
<td>4.8%</td>
<td>14.7%</td>
<td>5.9%</td>
<td>5.6%</td>
<td>--</td>
</tr>
<tr>
<td>TRS Policy Benchmark</td>
<td>3.9%</td>
<td>16.2%</td>
<td>7.6%</td>
<td>8.5%</td>
<td>5.7%</td>
</tr>
</tbody>
</table>
2. Market Value Change

Change in Market Value
From October 1, 2017 to December 31, 2017

<table>
<thead>
<tr>
<th></th>
<th>Millions ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Market Value</td>
<td>$146,326,312</td>
</tr>
<tr>
<td>Net Additions / Withdrawals</td>
<td>($911,1)</td>
</tr>
<tr>
<td>Investment Earnings</td>
<td>$5,636,6</td>
</tr>
<tr>
<td>Ending Market Value</td>
<td>$151,251,167</td>
</tr>
</tbody>
</table>

Summary of Cash Flow

<table>
<thead>
<tr>
<th></th>
<th>1 Quarter</th>
<th>1 Year</th>
<th>3 Years</th>
<th>5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fund</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beginning Market Value</td>
<td>146,326,312</td>
<td>132,538,691,260</td>
<td>129,852,698,366</td>
<td>114,384,289,287</td>
</tr>
<tr>
<td>+ Additions / Withdrawals</td>
<td>-911,055,457</td>
<td>-3,126,887,096</td>
<td>-10,891,630,270</td>
<td>-19,662,801,237</td>
</tr>
<tr>
<td>+ Investment Earnings</td>
<td>5,636,610,783</td>
<td>21,540,047,453</td>
<td>32,290,783,521</td>
<td>56,520,383,567</td>
</tr>
<tr>
<td>= Ending Market Value</td>
<td>151,251,851,617</td>
<td>151,251,851,617</td>
<td>151,251,851,617</td>
<td>151,251,851,617</td>
</tr>
</tbody>
</table>
## 3. Asset Allocation Detail

<table>
<thead>
<tr>
<th>Asset Category</th>
<th>Market Value ($ in millions) as of 12/31/2017</th>
<th>Interim Policy Target</th>
<th>Relative Allocation to Interim Policy Target</th>
<th>Long Term Policy Target</th>
<th>Long Term Policy Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fund</td>
<td>$151,252</td>
<td>100.0%</td>
<td>---</td>
<td>100.0%</td>
<td>--</td>
</tr>
<tr>
<td>Total U.S.A.</td>
<td>$26,730</td>
<td>17.7</td>
<td>18.7</td>
<td>-1.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Non-U.S. Developed</td>
<td>$21,550</td>
<td>14.2</td>
<td>13.7</td>
<td>+0.6</td>
<td>13.0</td>
</tr>
<tr>
<td>Emerging Markets</td>
<td>$14,582</td>
<td>9.6</td>
<td>9.7</td>
<td>-0.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Directional Hedge Funds</td>
<td>$5,974</td>
<td>3.9</td>
<td>4.0</td>
<td>-0.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Private Equity</td>
<td>$18,850</td>
<td>12.5</td>
<td>12.7</td>
<td>-0.3</td>
<td>13.0</td>
</tr>
<tr>
<td><strong>Global Equity</strong></td>
<td><strong>$87,687</strong></td>
<td><strong>58.0</strong></td>
<td><strong>58.8</strong></td>
<td><strong>-0.8</strong></td>
<td><strong>57.0</strong></td>
</tr>
<tr>
<td>Long Treasuries</td>
<td>$17,659</td>
<td>11.7</td>
<td>11.7</td>
<td>+0.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Stable Value Hedge Funds</td>
<td>$6,242</td>
<td>4.1</td>
<td>4.0</td>
<td>+0.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Absolute Return (including OAR)</td>
<td>$2,588</td>
<td>1.7</td>
<td>0.0</td>
<td>+1.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Cash</td>
<td>$1,186</td>
<td>0.8</td>
<td>1.0</td>
<td>-0.2</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Stable Value</strong></td>
<td><strong>$27,674</strong></td>
<td><strong>18.3</strong></td>
<td><strong>16.7</strong></td>
<td><strong>+1.6</strong></td>
<td><strong>16.0</strong></td>
</tr>
<tr>
<td>TIPS</td>
<td>$5,307</td>
<td>3.5</td>
<td>3.7</td>
<td>-0.2</td>
<td>3.0</td>
</tr>
<tr>
<td>Real Assets</td>
<td>$16,741</td>
<td>11.1</td>
<td>12.0</td>
<td>-0.9</td>
<td>14.0</td>
</tr>
<tr>
<td>Energy, Natural Resource and Inf.</td>
<td>$6,066</td>
<td>4.0</td>
<td>3.9</td>
<td>+0.1</td>
<td>5.0</td>
</tr>
<tr>
<td>Commodities</td>
<td>$62</td>
<td>0.0</td>
<td>0.0</td>
<td>+0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Real Return</strong></td>
<td><strong>$28,176</strong></td>
<td><strong>18.6</strong></td>
<td><strong>19.6</strong></td>
<td><strong>-0.9</strong></td>
<td><strong>22.0</strong></td>
</tr>
<tr>
<td>Risk Parity</td>
<td>$7,715</td>
<td>5.1</td>
<td>5.0</td>
<td>+0.1</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Risk Parity</strong></td>
<td><strong>$7,715</strong></td>
<td><strong>5.1</strong></td>
<td><strong>5.0</strong></td>
<td><strong>+0.1</strong></td>
<td><strong>5.0</strong></td>
</tr>
</tbody>
</table>

Note: Asset allocation information shown above is based upon PureView reporting. The excess returns shown above may not be a perfect difference between the actual and benchmark returns due entirely to rounding.
4. Total TRS Performance Ending 12/31/2017

Return Summary

<table>
<thead>
<tr>
<th>Period</th>
<th>Total Fund</th>
<th>Total Fund Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Quarter</td>
<td>4.0</td>
<td>3.0</td>
</tr>
<tr>
<td>1 Year</td>
<td>17.3</td>
<td>10.2</td>
</tr>
<tr>
<td>3 Years</td>
<td>8.5</td>
<td>7.6</td>
</tr>
<tr>
<td>5 Years</td>
<td>9.1</td>
<td>8.5</td>
</tr>
<tr>
<td>10 Years</td>
<td>8.0</td>
<td>6.7</td>
</tr>
<tr>
<td>Inception</td>
<td>8.8</td>
<td>2.3</td>
</tr>
</tbody>
</table>
5. Total Fund Attribution - Quarter Ending 12/31/2017

Total Fund Performance

Total Value Added: 0.07%

Total Fund Benchmark: 3.92%

Total Fund: 4.00%

Total Value Added

Asset Allocation: -0.02%

Manager Value Added: 0.10%

Other: -0.01%

Total Asset Allocation: -0.02%

Total Manager Value Added: 0.10%

Weight (%)

Average Active Weight

Asset Allocation Value Added

Manager Value Added
5. Total Fund Attribution – Trailing One Year Ending 12/31/2017

Total Fund Performance

Total Value Added: 1.04%

Total Asset Allocation: 0.09%

Total Manager Value Added: 0.94%
6. Risk Profile: Total Fund Risk-Return vs. Peers

Note: Public Plan peer group composed of 26 public funds with total assets in excess of $10B as of 12/31/2017 for the periods above. An exhibit outlining the asset allocation of the peer portfolios is provided in the appendix of this report.
6. Risk Profile: Trailing 3-Year and 5-Year Risk Metrics Peer Comparison

Note: Public Plan peer group composed of 26 public funds with total assets in excess of $10B as of 12/31/2017 for the periods above. An exhibit outlining the asset allocation of the peer portfolios is provided in the appendix of this report.
### 7. Global Equity: Performance Summary Ending 12/31/2017

<table>
<thead>
<tr>
<th></th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
<th>Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Global Equity</strong></td>
<td>4.9%</td>
<td>21.9%</td>
<td>9.3%</td>
<td>10.6%</td>
</tr>
<tr>
<td>Global Equity Benchmark</td>
<td>5.1</td>
<td>22.5</td>
<td>9.3</td>
<td>10.3</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>-0.2</td>
<td>-0.6</td>
<td>+0.0</td>
<td>+0.3</td>
</tr>
<tr>
<td><strong>Total U.S. Equity</strong></td>
<td>5.7</td>
<td>20.3</td>
<td>9.8</td>
<td>14.0</td>
</tr>
<tr>
<td>Total U.S. Equity Benchmark</td>
<td>6.3</td>
<td>21.3</td>
<td>11.2</td>
<td>15.6</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>-0.6</td>
<td>-1.0</td>
<td>-1.4</td>
<td>-1.6</td>
</tr>
<tr>
<td><strong>Non-U.S. Equity</strong></td>
<td>5.6</td>
<td>28.2</td>
<td>8.8</td>
<td>7.2</td>
</tr>
<tr>
<td>Non-U.S. Benchmark</td>
<td>5.6</td>
<td>29.5</td>
<td>8.2</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.0</td>
<td>-1.3</td>
<td>+0.6</td>
<td>+0.9</td>
</tr>
<tr>
<td><strong>Non-U.S. Developed</strong></td>
<td>4.5</td>
<td>23.1</td>
<td>8.1</td>
<td>8.7</td>
</tr>
<tr>
<td>MSCI EAFE + Canada</td>
<td>4.2</td>
<td>24.2</td>
<td>7.4</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.3</td>
<td>-1.1</td>
<td>+0.7</td>
<td>+1.2</td>
</tr>
<tr>
<td><strong>Emerging Markets</strong></td>
<td>7.3</td>
<td>35.7</td>
<td>9.4</td>
<td>5.3</td>
</tr>
<tr>
<td>MSCI Emerging Markets</td>
<td>7.4</td>
<td>37.3</td>
<td>9.1</td>
<td>4.3</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>-0.1</td>
<td>-1.6</td>
<td>+0.3</td>
<td>+1.0</td>
</tr>
</tbody>
</table>

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

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## 7. Global Equity: Performance Summary Ending 12/31/2017 (cont’d)

<table>
<thead>
<tr>
<th></th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
<th>Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directional Hedge Funds</strong></td>
<td>2.0%</td>
<td>7.8%</td>
<td>2.7%</td>
<td>4.7%</td>
</tr>
<tr>
<td>HFRI Fund of Funds Composite Index</td>
<td>2.0</td>
<td>7.7</td>
<td>2.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Difference</td>
<td>+0.0</td>
<td>+0.1</td>
<td>+0.1</td>
<td>+0.7</td>
</tr>
<tr>
<td><strong>Total Public Equity</strong></td>
<td>5.3</td>
<td>23.1</td>
<td>8.7</td>
<td>9.8</td>
</tr>
<tr>
<td>Public Equity Benchmark</td>
<td>5.6</td>
<td>24.2</td>
<td>9.0</td>
<td>9.9</td>
</tr>
<tr>
<td>Difference</td>
<td>-0.3</td>
<td>-1.1</td>
<td>-0.3</td>
<td>-0.1</td>
</tr>
<tr>
<td><strong>Total Private Equity</strong></td>
<td>3.6</td>
<td>17.5</td>
<td>11.8</td>
<td>14.5</td>
</tr>
<tr>
<td>Private Equity Benchmark</td>
<td>3.5</td>
<td>16.3</td>
<td>10.3</td>
<td>11.9</td>
</tr>
<tr>
<td>Difference</td>
<td>+0.1</td>
<td>+1.2</td>
<td>+1.5</td>
<td>+2.6</td>
</tr>
</tbody>
</table>

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*
### 8. Stable Value: Performance Summary Ending 12/31/2017

<table>
<thead>
<tr>
<th></th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
<th>Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Stable Value</strong></td>
<td>2.3%</td>
<td>8.3%</td>
<td>4.1%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Total Stable Value Benchmark</td>
<td>2.0</td>
<td>7.0</td>
<td>2.6</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.3</td>
<td>+1.3</td>
<td>+1.5</td>
<td>+1.5</td>
</tr>
<tr>
<td><strong>Long Treasuries</strong></td>
<td>2.4</td>
<td>9.3</td>
<td>2.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Treasury Benchmark</td>
<td>2.4</td>
<td>8.5</td>
<td>2.8</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.0</td>
<td>+0.8</td>
<td>-0.2</td>
<td>+0.5</td>
</tr>
<tr>
<td><strong>Stable Value Hedge Funds</strong></td>
<td>2.0</td>
<td>7.0</td>
<td>5.1</td>
<td>5.3</td>
</tr>
<tr>
<td>Hedge Funds Benchmark</td>
<td>1.1</td>
<td>4.1</td>
<td>2.1</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.9</td>
<td>+2.9</td>
<td>+3.0</td>
<td>+1.9</td>
</tr>
<tr>
<td><strong>Other Absolute Return</strong></td>
<td>2.2</td>
<td>6.1</td>
<td>5.0</td>
<td>8.7</td>
</tr>
<tr>
<td>Other Absolute Return Benchmark</td>
<td>0.9</td>
<td>3.3</td>
<td>2.8</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+1.3</td>
<td>+2.8</td>
<td>+2.2</td>
<td>+6.1</td>
</tr>
<tr>
<td><strong>Cash Equivalents</strong></td>
<td>1.0</td>
<td>2.8</td>
<td>2.1</td>
<td>2.5</td>
</tr>
<tr>
<td>Cash Benchmark</td>
<td>0.3</td>
<td>0.9</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.7</td>
<td>+1.9</td>
<td>+1.7</td>
<td>+2.2</td>
</tr>
</tbody>
</table>

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*
9. Real Return: Performance Summary Ending 12/31/2017

<table>
<thead>
<tr>
<th></th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
<th>Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Real Return</strong></td>
<td>2.3%</td>
<td>11.7%</td>
<td>8.6%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Real Return Benchmark</td>
<td>1.8</td>
<td>6.8</td>
<td>6.9</td>
<td>7.2</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.5</td>
<td>+4.9</td>
<td>+1.7</td>
<td>+0.8</td>
</tr>
<tr>
<td><strong>TIPS</strong></td>
<td>1.3</td>
<td>3.4</td>
<td>2.2</td>
<td>0.3</td>
</tr>
<tr>
<td>U.S. TIPS Benchmark</td>
<td>1.3</td>
<td>3.0</td>
<td>2.1</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.0</td>
<td>+0.4</td>
<td>+0.1</td>
<td>+0.2</td>
</tr>
<tr>
<td><strong>Real Assets</strong></td>
<td>2.6</td>
<td>13.6</td>
<td>12.5</td>
<td>12.4</td>
</tr>
<tr>
<td>Real Asset Benchmark</td>
<td>1.6</td>
<td>6.7</td>
<td>9.8</td>
<td>10.6</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+1.0</td>
<td>+6.9</td>
<td>+2.7</td>
<td>+1.8</td>
</tr>
<tr>
<td><strong>Energy, Natural Resource and Infrastructure</strong></td>
<td>2.1</td>
<td>13.6</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Energy and Natural Resources Benchmark</td>
<td>2.7</td>
<td>10.8</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>-0.6</td>
<td>+2.8</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Commodities</strong></td>
<td>1.5</td>
<td>16.3</td>
<td>-3.3</td>
<td>-16.5</td>
</tr>
<tr>
<td>Commodities Benchmark</td>
<td>9.9</td>
<td>5.8</td>
<td>-7.5</td>
<td>-12.2</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>-8.4</td>
<td>+10.5</td>
<td>+4.2</td>
<td>-4.3</td>
</tr>
</tbody>
</table>

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.
10. Risk Parity: Performance Summary Ending 12/31/2017

<table>
<thead>
<tr>
<th></th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
<th>Five Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Risk Parity</strong></td>
<td>5.7%</td>
<td>16.0%</td>
<td>7.1%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Risk Parity Benchmark</td>
<td>4.8</td>
<td>14.7</td>
<td>5.9</td>
<td>5.6</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>+0.9</td>
<td>+1.3</td>
<td>+1.2</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*
Appendix – Supplemental Reporting
The chart above depicts the asset allocation of peer public funds with assets greater than $10 billion.

- The ends of each line represent the 95th and 5th percentile of exposures, the middle light blue and grey lines represent the 25th and 75th percentile of exposures, the purple square represents the median, and the green dot represents TRS exposure.

Note: The Public Plan peer universe had 27 observations for the fourth quarter 2017.
Historical Excess Performance Ending 12/31/2017

Quarterly and Cumulative Excess Performance
Total Fund vs. Total Fund Benchmark

Quarterly Excess Performance

Ratio of Cumulative Wealth - 10 Years
## External Manager Program:
### Public Equity Performance as of 12/31/2017

<table>
<thead>
<tr>
<th>Allocation ($ in billions)</th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EP Total Global Equity</strong></td>
<td>$31.3</td>
<td>5.1%</td>
<td>23.4%</td>
</tr>
<tr>
<td>EP Global Equity Benchmark</td>
<td>--</td>
<td>5.3</td>
<td>23.6</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>-0.2</td>
<td>-0.2</td>
</tr>
<tr>
<td><strong>EP U.S.A.</strong></td>
<td>$6.4</td>
<td>4.8</td>
<td>16.8</td>
</tr>
<tr>
<td>EP U.S.A. Benchmark</td>
<td>--</td>
<td>6.3</td>
<td>21.3</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>-1.5</td>
<td>-4.5</td>
</tr>
<tr>
<td><strong>EP Non-U.S. Developed</strong></td>
<td>$5.7</td>
<td>4.9</td>
<td>26.7</td>
</tr>
<tr>
<td>MSCI EAFE + Canada Index</td>
<td>--</td>
<td>4.2</td>
<td>24.2</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>+0.7</td>
<td>+2.5</td>
</tr>
<tr>
<td><strong>EP Emerging Markets</strong></td>
<td>$7.1</td>
<td>7.5</td>
<td>37.1</td>
</tr>
<tr>
<td>MSCI Emerging Markets Index</td>
<td>--</td>
<td>7.4</td>
<td>37.3</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>+0.1</td>
<td>-0.2</td>
</tr>
<tr>
<td><strong>EP World Equity</strong></td>
<td>$6.2</td>
<td>5.7</td>
<td>25.6</td>
</tr>
<tr>
<td>EP World Equity Benchmark</td>
<td>--</td>
<td>5.8</td>
<td>24.4</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>-0.1</td>
<td>+1.2</td>
</tr>
<tr>
<td><strong>EP Directional Hedge Funds</strong></td>
<td>$6.0</td>
<td>2.0</td>
<td>7.9</td>
</tr>
<tr>
<td>HFRI Fund of Funds Composite Index</td>
<td>--</td>
<td>2.0</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>+0.0</td>
<td>+0.2</td>
</tr>
</tbody>
</table>

**Note:** The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

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Proprietary & Confidential  
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<table>
<thead>
<tr>
<th>Allocation ($ in billions)</th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EP Total Stable Value</strong></td>
<td>$6.2</td>
<td>2.0%</td>
<td>7.1%</td>
</tr>
<tr>
<td><strong>EP Stable Value Benchmark</strong></td>
<td>--</td>
<td>1.1</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>+0.9</td>
<td>+3.1</td>
</tr>
<tr>
<td><strong>EP Stable Value Hedge Funds</strong></td>
<td>$6.2</td>
<td>2.0</td>
<td>7.0</td>
</tr>
<tr>
<td><strong>EP Stable Value Hedge Funds Benchmark</strong></td>
<td>--</td>
<td>1.1</td>
<td>4.1</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>+0.9</td>
<td>+2.9</td>
</tr>
<tr>
<td><strong>Total External Public Program</strong></td>
<td>$37.6</td>
<td>4.6</td>
<td>20.7</td>
</tr>
<tr>
<td><strong>EP External Public Benchmark</strong></td>
<td>--</td>
<td>4.5</td>
<td>20.4</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>+0.1</td>
<td>+0.3</td>
</tr>
</tbody>
</table>

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.
### Public Strategic Partnership Program (SPN): Performance Summary as of 12/31/2017

<table>
<thead>
<tr>
<th></th>
<th>Allocation ($ in billions)</th>
<th>Fourth Quarter</th>
<th>One Year</th>
<th>Three Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Strategic Partnership</td>
<td>$8.2</td>
<td>4.9%</td>
<td>21.3%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Public SPN Benchmark</td>
<td>--</td>
<td>4.6</td>
<td>19.0</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>--</td>
<td>+0.3</td>
<td>+2.3</td>
<td>+0.1</td>
</tr>
<tr>
<td>Blackrock</td>
<td>$2.1</td>
<td>5.5</td>
<td>21.0</td>
<td>8.9</td>
</tr>
<tr>
<td>J.P. Morgan</td>
<td>$2.2</td>
<td>5.0</td>
<td>22.3</td>
<td>8.4</td>
</tr>
<tr>
<td>Neuberger Berman</td>
<td>$2.0</td>
<td>4.6</td>
<td>22.1</td>
<td>7.3</td>
</tr>
<tr>
<td>Morgan Stanley</td>
<td>$1.9</td>
<td>4.3</td>
<td>19.5</td>
<td>5.9</td>
</tr>
</tbody>
</table>

The Public SPNs in aggregate outperformed the benchmark during the fourth quarter and also over the trailing one and three-year periods.

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*
**Benchmarks**

- **Total Fund Performance Benchmark** – 18.7% MSCI U.S.A. IMI, 13.7% MSCI EAFE plus Canada Index, 9.7% MSCI Emerging Markets Index, 4.0% HFRI FoF Composite Index, 12.7% State Street Private Equity Index (1 quarter lagged), 11.7% Blmb. Barc. Long Term Treasury Index, 4.0% HFRI FoF Conservative Index, 1.0% Citigroup 3 Mo. T-Bill Index, 3.7% Blmb. Barc. U.S. TIPS Index, 12.0% NCREIF ODCE Index (1 quarter lagged), 3.9% Energy and Natural Resources Benchmark, and 5.0% Risk Parity Benchmark

- **Global Equity Benchmark** – 31.8% MSCI U.S.A. IMI, 23.3% MSCI EAFE plus Canada Index, 16.5% MSCI Emerging Markets Index, 6.8% HFRI FoF Composite Index, and 21.7% State Street Private Equity Index (1 quarter lagged)
  - TF U.S. Equity Benchmark - MSCI U.S.A. Investable Markets Index (IMI)
  - Emerging Markets Equity Benchmark – MSCI Emerging Markets Index
  - Non-US Developed Equity Benchmark– MSCI EAFE plus Canada Index
  - Directional Hedge Funds – HFRI Fund of Funds (FoF) Composite Index
  - Private Equity Benchmark - State Street Private Equity Index (1 quarter lagged)

*Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*
Benchmarks (cont’d)

- Stable Value Benchmark – 70.0% Blmb. Barc. Long Term Treasury Index, 24.0% HFRI FoF Conservative Index, and 6.0% Citigroup 3 mo. T-Bill.
  - US Treasuries Benchmark – Bloomberg Barclays Long Term Treasury Index
  - Stable Value Hedge Funds – HFRI Fund of Funds (FoF) Conservative Index
  - Other Absolute Return Benchmark - 3 Mo. LIBOR + 2%
  - Cash Benchmark - Citigroup 3 Mo. Treasury Bill Index

- Real Return Benchmark – 61.4% NCREIF ODCE Index, 18.8% Blmb. Barc. U.S. TIPS Index, and 19.8% Energy & Natural Resources Benchmark
  - Real Assets Benchmark – NCREIF ODCE Index (1 quarter lagged)
  - US TIPS Benchmark – Bloomberg Barclays U.S. TIPS Index
  - Energy and Natural Resources Benchmark – 75% Cambridge Associates Natural Resources Index (reweighted) and 25% quarterly Seasonally-Adjusted Consumer Price Index (1 quarter lagged)
  - Commodities Benchmark – Goldman Sachs Commodity Index

Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.
Description of Performance Attribution

- A measure of the source of the deviation of a fund's performance from that of its policy benchmark. Each bar on the attribution graph represents the contribution made by the asset class to the total difference in performance. A positive value for a component indicates a positive contribution to the aggregate relative performance. A negative value indicates a detrimental impact. The magnitude of each component's contribution is a function of (1) the performance of the component relative to its benchmark, and (2) the weight (beginning of period) of the component in the aggregate.

- The individual Asset Class effect, also called Selection Effect, is calculated as
  \[
  \text{Actual Weight of Asset Class} \times (\text{Actual Asset Class Return} - \text{Asset Class Benchmark Return})
  \]

- The bar labeled Allocation Effect illustrates the effect that a Total Fund's asset allocation has on its relative performance. Allocation Effect calculation = \((\text{Asset Class Benchmark Return} - \text{Total Benchmark Return}) \times (\text{Actual Weight of Asset Class} - \text{Target Policy Weight of Asset Class})\).

- The bar labeled Other is a combination of Cash Flow Effect and Benchmark Effect:
  - Cash Flow Effect describes the impact of asset movements on the Total Fund results. Cash Flow Effect calculation = \((\text{Total Fund Actual Return} - \text{Total Fund Policy Return}) - \text{Current Selection Effect} - \text{Current Allocation Effect}\)
  - Benchmark Effect results from the weighted average return of the asset classes’ benchmarks being different from the Total Funds’ policy benchmark return. Benchmark Effect calculation = \(\text{Total Fund Policy Return} - (\text{Asset Class Benchmark Return} \times \text{Target Policy Weight of Asset Class})\).

- Cumulative Effect
  
  Cumulative Effect calculation = \(\text{Current Effect}_t \times (1+\text{Cumulative Total Fund Actual Return}_{t-1}) + \text{Cumulative Effect}_{t-1} \times (1+\text{Total Fund Benchmark Return}_t)\)
Disclaimers and Notes
Disclaimers and Notes

Disclaimers:

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- The client portfolio data presented in this report have been obtained from the custodian. AHIC has compared this information to the investment managers’ reported returns and believes the information to be accurate. AHIC has not conducted additional audits and cannot warrant its accuracy or completeness. This document is not intended to provide, and shall not be relied upon for, accounting and legal or tax advice.
- Refer to Hedge Fund Research, Inc. [www.hedgefundresearch.com](http://www.hedgefundresearch.com) for more information on HFR indices

Notes:

- The rates of return contained in this report are shown on an after-fees basis unless otherwise noted. They are geometric and time weighted. Returns for periods longer than one year are annualized.
- Universe percentiles are based upon an ordering system in which 1 is the best ranking and 100 is the worst ranking.
- Due to rounding throughout the report, percentage totals displayed may not sum up to 100.0%. Additionally, individual fund totals in dollar terms may not sum up to the plan totals.
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Investment Risk Report

James Nield, Chief Risk Officer

April 2018
<table>
<thead>
<tr>
<th>Risk Metric</th>
<th>Value</th>
<th>In Compliance?</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Asset Allocation: Overweight Stable Value</td>
<td>Overweight +1.6%</td>
<td>✓</td>
<td>3 – 5</td>
</tr>
<tr>
<td>2. Drawdown Risk: VaR estimate declined</td>
<td>6.3% VaR</td>
<td>✓</td>
<td>6 - 8</td>
</tr>
<tr>
<td>3. Tracking Error: Total Trust tracking error declined</td>
<td>109 bp</td>
<td>✓</td>
<td>9 – 10</td>
</tr>
<tr>
<td>4. Leverage: Trust gross leverage declined</td>
<td>111% Gross, 105% Net</td>
<td>✓</td>
<td>11</td>
</tr>
<tr>
<td>5. Liquidity: Remained strong</td>
<td>10.9 Coverage Ratio</td>
<td>✓</td>
<td>12</td>
</tr>
<tr>
<td>8. Securities Lending: Quarterly earnings declined</td>
<td>$12.3 mm</td>
<td>✓</td>
<td>16</td>
</tr>
</tbody>
</table>

Unless otherwise noted, data presented as of December 31, 2017
Trust asset allocation in line with policy

Actual Asset Class Weights Trend

- Global Equity
- Stable Value
- Real Return
- Risk Parity

Actual Asset Class Weights Q4 2017

Source: State Street Bank
Shift to overweight in Stable Value

Relative Asset Class Positions Through Time

- Global Equity
- Stable Value
- Real Return
- Risk Parity

Source: State Street Bank; relative positions shown in comparison to prior quarter-end Trust benchmark weights as defined in policy
Stable Value overweight driven by credit allocation

Global Equity
- USA: -1.0%
- Non-US Developed: 0.6%
- Private Equity: -0.3%
- Emerging Markets: 0.0%
- Directional HF: -0.1%

Stable Value
- US Treasury: 0.0%
- Stable Value HF: 0.1%
- Absolute Return: 1.7%
- Cash: -0.2%

Real Return
- Real Assets: -1.0%
- ENRI: 0.1%
- US TIPS: -0.2%
- Commodities: 0.0%

Global Equity UW -0.8%
Stable Value OW +1.6%
Real Return UW -0.9%

As of December 31, 2017
Source: State Street Bank; private credit allocation included in Absolute Return
VaR estimate declined to 6.3%

**VaR History**

- Total Fund
- Benchmark
- Policy Max / Min

**Global Equity**

- % of Assets: 58.0%
- % of VaR: 82.2%

**Stable Value**

- % of Assets: 18.3%
- % of VaR: -8.2%

**Real Return**

- % of Assets: 18.6%
- % of VaR: 21.0%

**Risk Parity**

- % of Assets: 5.1%
- % of VaR: 5.1%

As of December 31, 2017
Source: State Street Bank
Stable Value assets are a key source of diversification

* These assets contribute less risk than their dollar allocation

As of December 31, 2017
Source: State Street Bank
Trust expected to perform in line with benchmark

Scenario Analysis

- Total Fund
- Benchmark

Worst GFC Month
- Oct ‘08
- Dot Com Burst
  - Jul ‘98 - Aug ‘98
- Bond Crash
  - Feb ‘94 - May ‘94
- Taper Tantrum
  - May ’13 - Jun ’13
- Sovereign Debt Crisis
  - Aug ’11
- Asian Crisis
  - Jul ’97
- Dot Com Bubble
  - Nov ’99 - Jan ’00
- EM Asia Rally
  - Jan ’99 - May ’99
- Best GFC Month
  - Apr ’09

As of December 31, 2017
Source: State Street Bank
As of December 31, 2017
Source: State Street Bank; Current forecast tracking error uses past experiences from January 1, 2008 to December 31, 2017 and therefore includes the effects of the Global Financial Crisis.
Forecasted Trust tracking error declined

Source: State Street Bank
Trust gross leverage declined

Source: State Street Bank; Total Trust leverage excludes securities lending which is reported separately.
Trust liquidity remained strong

<table>
<thead>
<tr>
<th>Sources of Liquidity</th>
<th>Market Value</th>
<th>Stressed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Cash</td>
<td>$1.2</td>
<td>$1.2</td>
</tr>
<tr>
<td>US Treasuries and TIPS</td>
<td>22.2</td>
<td>21.0</td>
</tr>
<tr>
<td>Other Liquid Assets (Equity, Commodities)</td>
<td>69.8</td>
<td>37.2</td>
</tr>
<tr>
<td>Risk Parity</td>
<td>7.7</td>
<td>5.1</td>
</tr>
<tr>
<td><strong>Total Sources of Liquidity</strong></td>
<td><strong>$100.8</strong></td>
<td><strong>$64.5</strong></td>
</tr>
</tbody>
</table>

Note: Excluded Illiquid Private Assets and Hedge Funds

<table>
<thead>
<tr>
<th>Uses of Liquidity</th>
<th>Market Value</th>
<th>Stressed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Uses of Liquidity</td>
<td>$0.4</td>
<td>$(0.3)</td>
</tr>
<tr>
<td>Stressed Securities Lending</td>
<td></td>
<td>(3.2)</td>
</tr>
<tr>
<td>Stressed Non-collateralized assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stressed Derivatives</td>
<td></td>
<td>(0.5)</td>
</tr>
<tr>
<td>Stressed Private Markets</td>
<td></td>
<td>(1.9)</td>
</tr>
<tr>
<td><strong>Total Uses of Liquidity</strong></td>
<td><strong>$0.4</strong></td>
<td><strong>$(5.9)</strong></td>
</tr>
</tbody>
</table>

Note: Net Stressed Liquidity (Sources less Uses) $58.6

Note: Past 12 Months of Benefit Payments $3.9

Liquidity Ratio

Ratio (Sources/Uses) 10.9

Alert Threshold 2.0

Test Result Pass

As of December 31, 2017
Source: State Street Bank, TRS IMD

Assumptions: The stress case assumes liquid assets experience 1.5x the worst rolling monthly return since 2008 plus an additional liquidity stress. Operational uses of liquidity reflects the lesser of forecasted cash flows or monthly benefit payments. Stressed securities lending reflects potential costs associated with termination including a liquidity stress. Stressed non-collateralized assets and derivatives reflect margin calls based on the same market stress applied to Liquid Assets. Private Market investments are assumed to return half as much capital as currently planned and experience capital calls equivalent to total unfunded commitments in equal installments over the course of 12 months.
Counterparty health continued to improve

### Over the Counter (OTC)

<table>
<thead>
<tr>
<th>OTC Counterparty</th>
<th>S&amp;P</th>
<th>Moody’s</th>
<th>Fitch</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank of America, N.A.</td>
<td>A+</td>
<td>Aa3</td>
<td>A+</td>
<td>$0.0</td>
</tr>
<tr>
<td>Barclays Bank PLC</td>
<td>A</td>
<td>A1</td>
<td>A</td>
<td>0.0</td>
</tr>
<tr>
<td>BNP Paribas SA</td>
<td>A</td>
<td>Aa3</td>
<td>A+</td>
<td>0.0</td>
</tr>
<tr>
<td>Citibank N.A.</td>
<td>A+</td>
<td>A1</td>
<td>A+</td>
<td>3.4</td>
</tr>
<tr>
<td>Credit Suisse International</td>
<td>A</td>
<td>A1</td>
<td>A-</td>
<td>0.0</td>
</tr>
<tr>
<td>Deutsche Bank AG</td>
<td>A-</td>
<td>A3</td>
<td>BBB+</td>
<td>2.6</td>
</tr>
<tr>
<td>Goldman Sachs International</td>
<td>A+</td>
<td>Aa3</td>
<td>A</td>
<td>0.0</td>
</tr>
<tr>
<td>JPMorgan Chase Bank N.A.</td>
<td>A+</td>
<td>Aa2</td>
<td>AA-</td>
<td>0.0</td>
</tr>
<tr>
<td>Macquarie Bank Limited</td>
<td>A+</td>
<td>A1</td>
<td>A</td>
<td>0.0</td>
</tr>
<tr>
<td>Morgan Stanley</td>
<td>A+</td>
<td>Aa3</td>
<td>A</td>
<td>0.0</td>
</tr>
<tr>
<td>Societe Generale</td>
<td>A</td>
<td>A1</td>
<td>A</td>
<td>0.6</td>
</tr>
<tr>
<td>The Toronto-Dominion Bank</td>
<td>AA-</td>
<td>Aa1</td>
<td>AA-</td>
<td>0.0</td>
</tr>
<tr>
<td>UBS AG</td>
<td>A+</td>
<td>Aa3</td>
<td>AA-</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### Futures Commission Merchant (FCM)

<table>
<thead>
<tr>
<th>FCM Counterparty</th>
<th>S&amp;P</th>
<th>Moody’s</th>
<th>Fitch</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Suisse Securities (USA) LLC</td>
<td>A</td>
<td>NR</td>
<td>NR</td>
<td>$202.1</td>
</tr>
<tr>
<td>Goldman Sachs &amp; Co</td>
<td>A+</td>
<td>NR</td>
<td>A+</td>
<td>104.3</td>
</tr>
<tr>
<td>JP Morgan Securities LLC</td>
<td>A+</td>
<td>Aa2</td>
<td>AA-</td>
<td>67.2</td>
</tr>
</tbody>
</table>

As of December 31, 2017
Source: State Street Bank, Bloomberg. OTC counterparty exposure represents positive market value of all OTC derivative positions less collateral posted. Futures Commission Merchant (FCM) counterparty exposure reflects margin posted.
Gross derivative notional declined in second half of 2017

Gross Notional by Instrument (% of Total Trust)

- Swaps
- Futures
- Forwards
- Options

Net Notional by Instrument (% of Total Trust)

Source: State Street Bank; derivative positions represent transactions in which TRS is a counterparty
Derivatives contributed small portion of drawdown risk

Gross vs Net Derivatives Notional by Portfolio

- Total Gross = $24.4b
- Total Net = $5.7b

VaR Contribution from Derivatives

- Total Trust VaR
- Contribution from Derivatives
This slide was intentionally left blank.
In conclusion, key points are the following:

• Overweight to Stable Value (+1.6%) driven primarily by credit allocation
• Scenario analysis revealed few biases in Trust performance
• Public Trust forecast tracking error was below policy neutral
• Trust liquidity remained strong
• Risk metrics were within desired parameters
Public Equity

Dale West, Senior Managing Director

April 2018
Overview

• Global Equity Overview
• Best Practices Review
• Internal Quantitative
• Internal Fundamental
• External Manager
Global Equity Overview

Global Equity’s role in the Trust:

Global Equity Breakdown

PUBLIC EQUITY PORTFOLIO

<table>
<thead>
<tr>
<th></th>
<th>Assets (in billions)</th>
<th>Assets (percent of Trust)</th>
<th>Team Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Quantitative</td>
<td>$10.6</td>
<td>7.0</td>
<td>11</td>
</tr>
<tr>
<td>Internal Fundamental</td>
<td>11.6</td>
<td>7.7</td>
<td>24</td>
</tr>
<tr>
<td>External Manager</td>
<td>25.3</td>
<td>16.8</td>
<td>14</td>
</tr>
<tr>
<td>Passive</td>
<td>9.2</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>Total Public Equity</td>
<td>$56.7</td>
<td>37.5</td>
<td>49</td>
</tr>
</tbody>
</table>
Public Equity Best Practices Review

Conclusions

1. Improve organizational focus on overall results
2. Increase allocation to internal quantitative portfolios
3. Address challenged alpha in US portfolios
4. Focus on compensated risk premiums
1. Improve Organizational Focus on Overall Results

Public Markets Senior Leadership Team

- Three distinct groups with one leadership team
- One comprehensive view of portfolio construction
- Improved communication and alignment
- Compensated on one result
2. Increase Allocation to Internal Quantitative Portfolios

Internal Quantitative Portfolios

<table>
<thead>
<tr>
<th>Date</th>
<th>Quantitative Equity Strategies (QES)</th>
<th>USA High Quality</th>
<th>Low Volatility</th>
<th>Multifactor</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/30/17</td>
<td>Launch: 2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/31/18</td>
<td>Launch: 2011</td>
<td>23% of Public Equity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated 12/31/18</td>
<td>$4.5 billion</td>
<td>$1.5 billion</td>
<td>$1.5 billion</td>
<td>$4.5 billion</td>
</tr>
</tbody>
</table>

Source: State Street Bank
3. Address Challenged Alpha in US Portfolios

<table>
<thead>
<tr>
<th>Assets (in billions)</th>
<th>Assets (percent of Trust)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$20.8</td>
<td>14.7%</td>
</tr>
</tbody>
</table>

Source: State Street Bank
4. Focus on Compensated Risk Premiums

- Target exposure to compensated risk premiums
- Use active management where we can generate alpha in excess of risk premiums
- We have increased the level of compensated risk premiums in the Public Equity portfolio

Sources: State Street Bank, MSCI Barra, Factset
Public Equity Performance

Public Equity Portfolios
As of 12/31/17

<table>
<thead>
<tr>
<th>Region</th>
<th>Assets (in millions)</th>
<th>Assets (percent of Trust)</th>
<th>Return (%)</th>
<th>Alpha (bp)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US</strong></td>
<td><strong>$20,873</strong></td>
<td><strong>13.8</strong></td>
<td>5.4</td>
<td>-94</td>
</tr>
<tr>
<td>MSCI U.S. IMI</td>
<td></td>
<td></td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td><strong>Non-US Developed</strong></td>
<td><strong>17,282</strong></td>
<td><strong>11.4</strong></td>
<td>4.4</td>
<td>+16</td>
</tr>
<tr>
<td>MSCI EAFE + Canada</td>
<td></td>
<td></td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td><strong>Emerging Markets</strong></td>
<td><strong>12,422</strong></td>
<td><strong>8.2</strong></td>
<td>7.5</td>
<td>+7</td>
</tr>
<tr>
<td>MSCI Emerging Markets</td>
<td></td>
<td></td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td><strong>World Equity</strong></td>
<td><strong>6,169</strong></td>
<td><strong>4.1</strong></td>
<td>5.7</td>
<td>-8</td>
</tr>
<tr>
<td>MSCI AC World</td>
<td></td>
<td></td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td><strong>Total Public Equity</strong></td>
<td><strong>$56,747</strong></td>
<td><strong>37.5</strong></td>
<td>5.6</td>
<td>-23</td>
</tr>
</tbody>
</table>

Public Equity Policy Benchmark 5.9

Source: State Street Bank

• In general portfolios kept up with very high-returning markets in Q4 2017
• Pre-IPO strategies in the US detracted from returns
• High quality strategies also lagged as interest rates rose
Internal Quantitative Team

Mohan Balachandran, PhD
Sr. Managing Director
PhD, Physics, Brown University

Wayne Speer, CFA
Sr. Investment Manager
MBA, SMU

Jingshan Fu, PhD
Investment Manager
PhD, Demography, Harvard University

Solomon Gold
Investment Manager
MS, Economics, UT Austin

Ryan Leary
Sr. Associate
MBA, Rice University

Anthony Paolini
Associate
BBA, MPA UT Austin

Paul Waclawsky
Administrative
BS, Accounting
University of Maryland

EXPERIENCE SUMMARY
4 PhDs
6 Masters Degrees
2 CFA Charter Holders
# Internal Quantitative Performance

## Internal Quantitative Portfolios

**As of 12/31/17**

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Assets (in millions)</th>
<th>1-Year</th>
<th>3-Year</th>
<th>5-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US</strong></td>
<td>$6,342</td>
<td>24.5</td>
<td>+324</td>
<td>12.4</td>
</tr>
<tr>
<td>MSCI USA</td>
<td>21.3</td>
<td>11.2</td>
<td></td>
<td>15.7</td>
</tr>
<tr>
<td><strong>Non-US Developed</strong></td>
<td>3,103</td>
<td>27.5</td>
<td>+327</td>
<td>8.8</td>
</tr>
<tr>
<td>MSCI EAFE + Canada</td>
<td>24.2</td>
<td>7.4</td>
<td></td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Emerging Markets</strong></td>
<td>1,148</td>
<td>42.4</td>
<td>+510</td>
<td>9.4</td>
</tr>
<tr>
<td>MSCI Emerging Markets</td>
<td>37.3</td>
<td>9.1</td>
<td></td>
<td>4.4</td>
</tr>
</tbody>
</table>

- Strong long-term results from internal quantitative portfolio
- One-year results were particularly strong and above trend, reflecting a year with low volatility and few economic surprises

Source: State Street Bank
Internal Quantitative Strategies

### Quantitative Equity Strategies
- **Quant Dynamic** 25%
- **Quant Strategic** 50%
- **Quant Macro Distance** 25%

### Low Volatility
- **Low Vol EM** 10%
- **Low Vol EAFE+C** 29%
- **Low Vol USA** 61%

### Multifactor
- **CRP**
- **CRP USA** 130/30 34%
- **CRP EAFE+C** 130/30 32%
- **CRP EM** 34%

### Assets (in millions)
- **Internal Quant (As of 12/31/17):**
  - Alpha Strategy: $6,537
  - Low Volatility: $2,683
  - Multifactor: $319
  - US High Quality: $1,055

### Regional Focus/Benchmark
- Alpha Strategy: Developed Region/Sector and Emerging Country Models
- Low Volatility: US, EAFE+C, and EM
- Multifactor: US, EAFE+C, and EM
- US High Quality: US

### Launch Dates
- Alpha Strategy: 2009 (Strategic and Dynamic) and 2012 (Macro Distance)
- Low Volatility: 2013 (US) and 2016 (EAFE+C and EM)
- Multifactor: 2017
- US High Quality: 2011

*Source: State Street Bank*
Internal Quantitative Priorities

- **Develop**
  - Quant Refresh
  - Enhanced Custody at State Street
  - Apply Long Short to existing and additional portfolios
  - Continue to Size Quant per Active Public Market targets

- **Priorities**
  - Launched Multifactor portfolios
  - Cross train personnel for redundancy
  - Continue to focus on the Public Equity Project & Implementation

- **Expand Capabilities**
  - Created QES Datacube
  - Launched Long Short Single Name Equities
  - Launched 5 Regional Quant Paper Portfolios

- **Improved Quality Control and Automation**
  - Transitioned Optimization Platforms
  - Enhanced Transaction Cost Modeling
  - Launched Factor Portfolios

- **Plan and Set Foundation**
  - Long Term Models GBI (2007)
  - Long Term Global Portfolio launched (2009)
  - Additional portfolios launched (2009, 2012)

Source: State Street Bank
Internal Fundamental Team

**Portfolio Management**

- **Patrick Cosgrove, CFA**
  - Sr. Director
  - MBA, St. Mary’s University

- **Kay Cuclis**
  - Director
  - BA, UT Austin

- **David DeStefano, CFA**
  - Sr. Director
  - MBA, UT Austin

- **Ralph Linn, CFA**
  - Sr. Director
  - MBA JD, Tulane University

- **Shayne McGuire**
  - Director
  - MBA, UT Austin

- **Michael Poustovoi, CFA**
  - Sr. Investment Manager
  - MBA, Oklahoma City University

- **Jared Ryan**
  - Senior Associate
  - BS, Trinity University

- **Monica Larson**
  - Executive Assistant

**Fundamental Research**

- **KJ Van Ackeren, CFA**
  - Sr. Director
  - MBA, Texas Christian University

- **Jeremy Aston, CFA**
  - Sr. Associate
  - MBA, UT Austin

- **Lee Carter, CFA**
  - Sr. Investment Manager
  - MBA, Rice University

- **Mark Cesanta, CFA**
  - Sr. Investment Manager
  - MBA, UT Austin

- **Frank Crown, CFA**
  - Sr. Investment Manager
  - MBA, Georgia State University

- **Richard Garchitorena, CFA**
  - Sr. Investment Manager
  - MBA, University of Toronto

- **Mack Hogan**
  - Sr. Investment Manager
  - MBA, Babson College

- **Khoi Tran**
  - Investment Manager
  - BA, UT Austin

- **Stacey Penn, CFA**
  - Sr. Investment Manager
  - MBA, UT Austin

- **Richard Watkins, CFA**
  - Sr. Investment Manager
  - MBA, UT Austin

- **Joseph Vaughan**
  - Sr. Analyst
  - BA, UT Austin

**EXPERIENCE SUMMARY**

- 15 CFA Charter Holders
- 18 Masters Degrees
## Internal Fundamental Performance

As of 12/31/17

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>1-Year</th>
<th>3-Year</th>
<th>5-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assets (in millions)</td>
<td>Return (%)</td>
<td>Alpha (bp)</td>
</tr>
<tr>
<td><strong>Non-US Developed</strong></td>
<td>$7,538</td>
<td>21.9</td>
<td>-232</td>
</tr>
<tr>
<td>MSCI EAFE + Canada</td>
<td>24.2</td>
<td>7.4</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Emerging Markets</strong></td>
<td>3,607</td>
<td>34.7</td>
<td>-260</td>
</tr>
<tr>
<td>MSCI Emerging Markets</td>
<td>37.3</td>
<td>9.1</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>Alpha Opportunities</strong></td>
<td>430</td>
<td>6.4</td>
<td>-1856</td>
</tr>
<tr>
<td>Alpha Opportunities Benchmark</td>
<td>25.0</td>
<td>9.8</td>
<td>11.1</td>
</tr>
</tbody>
</table>

• Fundamental portfolios lagged over the one-year period, the flipside of strong quantitative performance
• The team continues to generate value over the long term in international markets
• Alpha Opportunities (Pre-IPO strategy) lagged strong public markets during the year, negatively impacted by some individual company disappointments

Source: State Street Bank
Internal Fundamental Priorities

• Alpha generation in international portfolios
• U.S. midcap strategy
  o Progressing through research and development process
  o Funding targeted for Q4 2018
• Greater use of quantitative methods
  o Decision support
  o Analyst rating system
**External Manager Team**

### INVESTMENTS TEAM
- **Brad Gilbert, CFA, CAIA**
  - Sr. Director, Hedge Funds
  - BBA, UT Austin
- **Susanne Gealy, CAIA**
  - Director, External Public Equity
  - MBA, University of Chicago
- **Joel Hinkhouse, CFA**
  - Sr. Investment Manager
  - MBA, University of Chicago
- **Brad Gilbert, CFA, CAIA**
  - Sr. Director, Hedge Funds
  - BBA, UT Austin
- **Lulu Llano, CFA**
  - Investment Manager
  - BBA, UT Austin
- **Steven Wilson, CAIA**
  - Investment Manager
  - MBA, Rice University
- **Scott Gonsoulin, CFA**
  - Investment Manager
  - MS, Texas A&M
- **Cason Beckham, CFA, CAIA**
  - Sr. Associate
  - BBA, Texas A&M
- **Michael Ijeh**
  - Sr. Analyst
  - BBA, Texas Tech
- **Jordyn Beaty**
  - Analyst
  - BBA, University of Georgia

### ANALYTICS
- **Joe Tannehill, CFA**
  - Sr. Investment Manager
  - MBA, UNC Chapel Hill
- **Kevin Taylor**
  - Sr. Associate
  - MS, UT Austin
- **Scott Gonsoulin, CFA**
  - Investment Manager
  - MS, Texas A&M
- **Jordyn Beaty**
  - Analyst
  - BBA, University of Georgia
- **Kevin Taylor**
  - Sr. Associate
  - MS, UT Austin
- **Patty Steinwedell**
  - Analyst
  - BA, North Carolina State
- **Irma Martinez**
  - Analyst, Contractor
  - BBA, St. Edwards

### RELATIONSHIP MANAGEMENT
- **Jon Klekman**
  - Analyst
  - BA, SUNY Binghamton

### EXPERIENCE SUMMARY
- 6 CFA Charter Holders
- 4 CAIAs
- 6 Masters Degrees
## External Manager Public Equity Portfolios

### As of 12/31/17

<table>
<thead>
<tr>
<th>Country</th>
<th>Assets (in millions)</th>
<th>1-Year</th>
<th></th>
<th>3-Year</th>
<th></th>
<th>5-Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Return (%)</td>
<td>Alpha (bp)</td>
<td>Return (%)</td>
<td>Alpha (bp)</td>
<td>Return (%)</td>
<td>Alpha (bp)</td>
<td>Return (%)</td>
</tr>
<tr>
<td><strong>US</strong></td>
<td>$6,369</td>
<td>16.8</td>
<td>-450</td>
<td>8.9</td>
<td>-233</td>
<td>13.1</td>
<td>-252</td>
</tr>
<tr>
<td>External Public USA Benchmark</td>
<td>21.3</td>
<td>11.2</td>
<td>15.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non-US Developed</strong></td>
<td>5,655</td>
<td>26.7</td>
<td>+254</td>
<td>10.7</td>
<td>+334</td>
<td>9.8</td>
<td>+238</td>
</tr>
<tr>
<td>MSCI EAFE + Canada</td>
<td>24.2</td>
<td>7.4</td>
<td>7.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Emerging Markets</strong></td>
<td>7,145</td>
<td>37.1</td>
<td>-17</td>
<td>9.7</td>
<td>+56</td>
<td>5.2</td>
<td>+84</td>
</tr>
<tr>
<td>MSCI Emerging Markets</td>
<td>37.3</td>
<td>9.1</td>
<td>4.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>World Equity</strong></td>
<td>6,169</td>
<td>25.6</td>
<td>+126</td>
<td>10.4</td>
<td>+74</td>
<td>11.6</td>
<td>+56</td>
</tr>
<tr>
<td>MSCI AC World</td>
<td>24.4</td>
<td>9.7</td>
<td>11.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total External Manager</strong></td>
<td>$25,338</td>
<td>27.0</td>
<td>-35</td>
<td>10.0</td>
<td>+31</td>
<td>10.3</td>
<td>+6</td>
</tr>
</tbody>
</table>

### Source: State Street Bank

**Note:** Performance is net of fees

- Strong alpha generation in international strategies
- During 2H 2017, terminated five managers with a total of $3.8 billion in assets
External Manager Priorities

- Prune strategies that can be duplicated internally, reducing fee spending
- Focus on high alpha, diversifying strategies (specialists)
Summary

• Public equity team and portfolios are now integrated and aligned for one best result
  o Flexibility to use the best tool for the job
• Focus is on continued excellence in international markets and improvement in downsized US portfolios
• Internal quantitative strategies will continue to grow in importance and assets
  o Current strategies and an active R&D pipeline
• The portfolio is positioned with positive exposure to compensated risk premiums
APPENDIX
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## Legislative Authority Detail for Agency Agreements

**As of December 31, 2017**

<table>
<thead>
<tr>
<th>External Managers</th>
<th># of Portfolios</th>
<th>Assets ($ billions)</th>
<th>Percentage of Trust</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agency</td>
<td>LP</td>
<td>Total</td>
</tr>
<tr>
<td>US Portfolio</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Non-US Developed</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Emerging Markets</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>World Equity</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total Equity</strong></td>
<td>19</td>
<td>15</td>
<td>34</td>
</tr>
<tr>
<td>Public Market SPN</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>25</td>
<td>15</td>
<td>40</td>
</tr>
</tbody>
</table>

- TRS is limited by law to 30% Agency Agreement authority. 22% is currently utilized.

**Source:** State Street Bank
Long Term Alpha Cycles

How have our TUCS peers performed?

Source: Total returns from TUCS; alpha calculated versus MSCI indexes from Bloomberg. Green line is rolling five year average.
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Executive Summary

- Hedge funds have outperformed policy benchmarks over a 1, 3 and 5 year basis
- Both hedge fund portfolios are delivering on all their respective objectives
- TRS successfully implemented its new fee philosophy and is realizing the benefits
- Team continues to examine peer best practices to improve its investment in hedge funds
  - We continually self-evaluate for improvement and innovation
Performance Update

### Hedge Fund Portfolios

As of 12/31/17

<table>
<thead>
<tr>
<th>Hedge Fund Portfolios</th>
<th>Assets ($, millions)</th>
<th>1-Year</th>
<th>3-Year</th>
<th>Since Inception (Oct. 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Return (%)</td>
<td>Alpha (bp)</td>
<td>Return (%)</td>
<td>Alpha (bp)</td>
</tr>
<tr>
<td>Directional Hedge Funds</td>
<td>$5,974</td>
<td>7.9</td>
<td>+16</td>
<td>2.7</td>
</tr>
<tr>
<td>HFRI Fund of Funds Composite</td>
<td>7.7</td>
<td></td>
<td></td>
<td>2.6</td>
</tr>
<tr>
<td>Stable Value Hedge Funds</td>
<td>$6,242</td>
<td>7.0</td>
<td>+300</td>
<td>5.1</td>
</tr>
<tr>
<td>HFRI Fund of Funds Conservative</td>
<td>4.0</td>
<td></td>
<td></td>
<td>2.1</td>
</tr>
<tr>
<td>Total Hedge Funds¹</td>
<td>$12,215</td>
<td>7.4</td>
<td>+156</td>
<td>3.8</td>
</tr>
<tr>
<td>Total Hedge Funds Benchmark</td>
<td></td>
<td>5.9</td>
<td></td>
<td>2.3</td>
</tr>
</tbody>
</table>

- Solid absolute performance from both hedge fund portfolios in 2017
- Strong long-term alpha performance since inception
  - Over 1 year, Total Hedge Funds added $154mm in value versus policy benchmarks
  - Over 5 years, Total Hedge Funds added $741mm in value versus policy benchmarks
- Diversification effect has been additive
  - Hedge funds contribute 2.3% to trust-level VaR at 8% of assets²

**Notes:**

1. Total Trust hedge fund assets are $12.4 bn, or 8.2% of Trust assets, including assets in the Risk Parity portfolio that are classified as hedge funds and reported with that portfolio

2. The current legislative cap for total Trust hedge fund assets is 10%.
Stable Value Hedge Fund Portfolio

<table>
<thead>
<tr>
<th>Stable Value Hedge Fund Objectives</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hedge Fund Types</strong>&lt;br&gt;Focus on absolute return hedge funds</td>
<td>✔️</td>
<td>• Return: 4.6%&lt;sup&gt;1&lt;/sup&gt;&lt;br&gt;• Stable Value HF Volatility: 2.3%&lt;br&gt;• Sharpe Ratio: 1.9</td>
</tr>
<tr>
<td><strong>Market Sensitivity and Risk</strong>&lt;br&gt;Core strategies have low to negative market sensitivity</td>
<td>✔️</td>
<td>• Correlation to MSCI AC World: 0.1&lt;br&gt;• Beta to MSCI AC World: 0.0</td>
</tr>
<tr>
<td><strong>Market Regime Performance</strong>&lt;br&gt;Expected to have positive returns when markets are down</td>
<td>✔️</td>
<td>• Outperformed equities in every down month for stocks, by an average of 2.6%&lt;br&gt;• Positive returns in 63% of 24 down equity months since October 2011</td>
</tr>
<tr>
<td><strong>Performance versus US Treasuries</strong>&lt;br&gt;Expected to outperform US Treasuries over the long term</td>
<td>✔️</td>
<td>• 4.6% return vs. Treasuries&lt;sup&gt;2&lt;/sup&gt; 3.7%&lt;br&gt;• 2.3% volatility vs. Treasuries&lt;sup&gt;2&lt;/sup&gt; 10.3%&lt;br&gt;• Current 10-year Treasury yield-to-maturity: 2.4%</td>
</tr>
<tr>
<td><strong>Performance versus Benchmark</strong>&lt;br&gt;HFRI Fund of Funds Conservative benchmark with target tracking error of 4%</td>
<td>✔️</td>
<td>• 1.2% ahead of HRFI benchmark since inception&lt;br&gt;• Tracking Error: 2.4%</td>
</tr>
</tbody>
</table>

Sources: State Street Bank, Bloomberg
Note: Performance is annualized and is net of fees
<sup>1</sup>Dates: October 2011 (inception) to December 2017
<sup>2</sup>Return of Bloomberg Barclays US Long Treasury Total Return Index
Why Hedge Funds: Stable Value

- Hedge funds are a key asset in the Trust’s Stable Value allocation
- Stable Value Hedge Funds have been the best performing asset in absolute and risk-adjusted terms since the hedge fund portfolio split in 2011

Sources: State Street Bank, Bloomberg
Note: Performance is annualized and is net of fees
Dates: October 2011 (inception) to December 2017
1Return of Bloomberg Barclays US Long Treasury Total Return Index
2Return of Citigroup 3-month Treasury Bill
Why Hedge Funds: Stable Value

Protection in down markets...

Annualized Returns in Negative Equity Months\(^1\)
(October 2011 to December 2017)

- SVHF (Annualized): 2.4%
- US Treasuries (Annualized): 1.7%
- HFRI Conservative (Annualized): -2.8%
- MSCI All Country World Index (Annualized): -25.2%

...while contributing less risk

SVHF Trust Contributions

<table>
<thead>
<tr>
<th>% of Capital</th>
<th>% of VaR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>1.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>2.0%</td>
<td>2.0%</td>
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<tr>
<td>2.5%</td>
<td>2.5%</td>
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<tr>
<td>3.0%</td>
<td>3.0%</td>
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<tr>
<td>3.5%</td>
<td>3.5%</td>
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<tr>
<td>4.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>4.5%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Sources: State Street Bank, Bloomberg
Note: Performance is annualized and is net of fees
\(^1\)There have been 24 months of negative global equity returns during the period
# Directional Hedge Fund Portfolio

<table>
<thead>
<tr>
<th>Directional Hedge Fund Objectives</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Hedge Fund Types**<br>Focus on equity and market sensitive hedge funds | ![Checkmark](#) | • Return: 5.5%<sup>1</sup>  
• Correlation to MSCI AC World: 0.8  
• Sharpe Ratio: 1.1 |
| **Market Sensitivity and Risk**<br>Core strategies have moderate market sensitivity (beta) and lower risk (volatility) than equities | ![Checkmark](#) | • Beta to MSCI AC World: 0.3  
• Directional HF Volatility: 4.8%  
• MSCI AC World Volatility: 11.2% |
| **Market Regime Performance**<br>Expected to outperform equities when markets are down, but will underperform strong markets | ![Checkmark](#) | • Outperformed equities in 88% of down months for stocks, by an average of 1.4%  
• Inception to date return of 5.5% versus MSCI AC World 12.8% |
| **Performance versus US Treasuries**<br>Expected to outperform US Treasuries over the long term | ![Checkmark](#) | • 5.5% vs. Treasuries<sup>2</sup> 3.7%  
• Current 10-year Treasury yield-to-maturity: 2.4% |
| **Performance versus Benchmark**<br>HFRI Fund of Funds Composite benchmark with target tracking error of 6% | ![Checkmark](#) | • 1.6% ahead of HFRI benchmark since inception  
• Tracking Error: 2.4% |

Sources: State Street Bank, Bloomberg  
Note: Performance is annualized and is net of fees  
<sup>1</sup>Dates: October 2011 (inception) to December 2017  
<sup>2</sup>Return of Bloomberg Barclays US Long Treasury Total Return Index from
Why Hedge Funds: Directional

**Directional HF Current Allocation**

- **Global Equity**: 58%
- **Public Equities**: 46%
  - USA 18%
  - Non-US Developed 14%
  - Emerging Markets 10%
- **Directional Hedge Funds**: 4%
- **Private Equity**: 12%

**Diversification versus Global Public Equity**

- **Correlation and Beta to MSCI ACWI**
  - Internal Quantitative
  - Internal Fundamental
  - External Manager
  - DHF

**Jensen’s Alpha Comparison**

- **Directional Hedge Fund Portfolio**
- **Jensen’s Alpha Since Inception**

**Monthly Returns of Public Equities Portfolios**

- **When Equities are down**
  - External Manager
  - Internal Quantitative
  - Internal Fundamental
  - DHF
- **When Equities are up**
  - External Manager
  - Internal Quantitative
  - Internal Fundamental
  - DHF

---

Sources: State Street Bank, Bloomberg
Note: Performance is annualized and is net of fees
Dates: October 2011 (inception) to December 2017
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Priorities

• Evaluate portfolio construction practices
• Evaluate proportion of Directional and Stable Value strategies in Strategic Asset Allocation
• Reinsurance and diversifying strategies
• Peer best practices
• Dislocation playbook
• Prepare for discussion on sunset date on the authority to invest in hedge funds
APPENDIX
Hedge Fund Timeline through December 31, 2017

- TRS makes initial allocation to HFs; 2% of Trust
- TRS HF allocation increased to 4%, with a Legislative cap of 5% of Trust
- TRS HF Legislative cap is increased to 10% of Trust; introduction of Directional HF portfolio
- TRS current HF allocation is $12.2 bn, or 8% of Trust

Net Flows
AUM
Executive Summary

• The majority of the Board Advisors’ contracts end August 31, 2018
  o Advisors are AON, Albourne, Hamilton Lane and Townsend
  o Dr. Brown’s contract was extended in 2017 and Principal Investment Advisors (TPH, Blackrock and LaSalle) are at TRS discretion and we are not reviewing them at this time

• Board approves Advisors as outlined in the Investment Policy Statement (IPS)
• IPS requires prudent investment letters for all external investments unless an exemption has been made by the CIO
  o Potential change under consideration for policy updates in September
• IMD believes there are efficiency gains and cost improvements we can make to these Advisor arrangements
• Board resolution required for transfer of advisory engagement from TPH to Perella Weinberg Partners Capital Management LP due to merger – see appendix
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APPENDIX
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Whereas, Pursuant to that certain Resolution regarding Engagement of Tudor Pickering Holt & Co. as Investment Advisors to the Board of Trustees attached hereto as Exhibit A, the Board resolved on March 27, 2014 to authorize the engagement of Tudor Pickering Holt & Co. as consultant to assist and advise the Investment Management Division (“Investment Division”) with respect to the Energy and Natural Resources Portfolio (the “Engagement Resolution”);

Whereas, Pursuant to and in accordance with such Engagement Resolution, the Executive Director’s authorized designee duly executed all documents on September 21, 2015 (“Investment Counseling and Advisory Services Agreement”) to engage TPH Asset Management LLC, a subsidiary of Tudor Pickering Holt & Co. (“TPH”) as Advisor to the Investment Division with respect to the Energy and Natural Resources Portfolio, including the provision of prudence or recommendation letters, and took all actions deemed necessary or advisable to implement the Engagement Resolution;

Whereas, In November 2016, Tudor Pickering Holt & Co. entered into a merger transaction agreement with Perella Weinberg Partners to combine the two companies;

Whereas, the Investment Division acting through the Internal Investment Committee has recommended that the Board of Trustees approve the transfer of the Investment Counseling and Advisory Services Agreement to Perella Weinberg Partners Capital Management LP, a subsidiary of Perella Weinberg Partners (“PWP”);

Whereas, TPH remained the Advisor to TRS under the Investment Counseling and Advisory Services Agreement until March 31, 2018;

Whereas, Pursuant to Section 1.3(e) of the Investment Policy Statement, the Investment Division is authorized to engage Advisors to assist the Investment Division with respect to investment opportunities and the Board of Trustees must approve each Advisor prior to engagement; now therefore, be it

Resolved, That the Board of Trustees hereby approves and authorizes the engagement of PWP as Advisor to TRS in place of TPH;

and

Resolved, That the Executive Director or his designees is authorized to negotiate the terms and documentation of such engagement.
Exhibit A

TEACHER RETIREMENT SYSTEM OF TEXAS
BOARD RESOLUTION

Engagement of Tudor Pickering Holt & Co. as Investment Advisors to the
Board of Trustees

March 27-28, 2014

Whereas, The Investment Management Division of the Teacher Retirement System of Texas (TRS) desires to engage the services of Tudor Pickering Holt & Co. to assist and advise the Energy and Natural Resources staff and the Chief Investment Officer has recommended that the TRS Board of Trustees authorize such engagement; and

Whereas, Tudor Pickering Holt & Co. has demonstrated the requisite qualifications and experience to act as a portfolio consultant to the TRS, assist the Investment Management Division with due diligence, and to deliver prudence letters for prospective investment transactions as required by the board’s Investment Policy Statement; now, therefore, be it

Resolved, That the TRS Board of Trustees hereby authorizes the engagement of Tudor Pickering Holt & Co. as a consultant to assist and advise the Investment Management Division with respect to the Energy and Natural Resources Portfolio; and

Resolved, That the Board authorizes the Executive Director or his designee to implement the Board’s authorization to engage Tudor Pickering Holt & Co. and further to execute all documents and take all actions deemed by the Executive Director or his designee to be necessary or advisable to implement this resolution, as well as all actions deemed by him to be necessary to negotiate an agreement on substantially the same terms presented to the Board and on such other terms and conditions deemed by the Executive Director in his discretion to be in the best interest of the retirement system, and from time to time to amend, modify, or extend the contract as deemed by the Executive Director, in his discretion, to be in the best interest of the retirement system, it being stipulated that the Board’s authorizations pursuant to this resolution shall not be construed as a binding agreement or obligation to contract, and there shall be no binding agreement among the parties until a definitive written agreement is successfully negotiated and executed by both parties.