

Global Fixed Income, Inflation, and Liquidity Annual Review

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Global Fixed Income

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Executive Summary - Program Performance

| As of June 30, 2018 | 1-YR | 3-YR | 5-YR | 10-YR | 20-YR | Since Inception* |
|---------------------|-------------|-------------|-------------|-------------|-------------|------------------|
| | Net Return | Net Return | Net Return | Net Return | Net Return | Net Return |
| INCOME | 0.4% | 3.2% | 3.8% | 5.7% | 6.1% | 7.7% |
| POLICY INDEX | 0.0% | 2.7% | 3.1% | 4.9% | 5.5% | 7.0% |
| Excess Return | 0.4% | 0.5% | 0.7% | 0.9% | 0.5% | 0.7% |

| As of June 30, 2018 | 1-YR | 3-YR | 5-YR | 10-YR | Since Inception** |
|---------------------|-------------|-------------|--------------|--------------|-------------------|
| | Net Return | Net Return | Net Return | Net Return | Net Return |
| INFLATION | 9.3% | 0.8% | -0.4% | -1.8% | 1.3% |
| POLICY INDEX | 8.9% | 0.5% | -0.9% | -1.0% | 0.9% |
| Excess Return | 0.4% | 0.3% | 0.5% | -0.8% | 0.4% |

| As of June 30, 2018 | 1-YR | 3-YR | 5-YR*** |
|---------------------|-------------|-------------|-------------|
| | Net Return | Net Return | Net Return |
| LIQUIDITY | 1.7% | 0.9% | 0.9% |
| POLICY INDEX | 1.3% | 0.7% | 1.0% |
| Excess Return | 0.4% | 0.3% | -0.1% |

*The inception date is July 1988 and is based on custodian records

**The inception date is October 2007 and is based on custodian records

***Since inception reporting is omitted as the current Liquidity Program Policy went into effect in July 2011. Historical Liquidity composite returns are available from June 1993.

Executive Summary - Portfolio Positioning

| | | Portfolio Over/Underweight | |
|-----------------------------------|---------|----------------------------|--|
| Sector | MV (bn) | Active | |
| INCOME | \$79.1 | - | |
| US Governments | \$28.5 | 0.0% | |
| Credit | \$21.4 | 2.7% | |
| Structured Securities | \$16.3 | -6.4% | |
| International | \$6.7 | -1.5% | |
| Non-Core | \$3.8 | 4.9% | |
| Sovereign | \$2.4 | 0.3% | |
| | | | |
| | | Portfolio Over/Underweight | |
| Sector | MV (bn) | Active | |
| INFLATION | \$20.8 | - | |
| Inflation Linked Bonds | \$15.6 | 0.0% | |
| Commodities | \$5.2 | 0.0% | |
| | | | |
| | | Portfolio Allocation | |
| Sector | MV (bn) | Port | |
| LIQUIDITY | \$11.8 | - | |
| Cash Securities | \$9.1 | 77.1% | |
| Non-Dollar-Denominated Securities | \$1.9 | 16.2% | |
| ABS | \$0.5 | 4.4% | |
| Investment Grade USD Credit | \$0.3 | 2.3% | |

Executive Summary – Business Update

- Fiscal Year 2017-2018 Major Accomplishments
 - Rolled out an internally managed CalPERS Short-Term Investment Fund (STIF) to better control liquidity and risk. The fund has grown to over \$28 billion
 - Reviewed current model and governance structure for the Securities Lending Program and identified potential enhancements
- Fiscal Year 2018-2019 Major Initiatives
 - Implement changes resulting from ALM Process
 - Contribute resources to Sustainable Investments' analysis and research
 - Continue to work with Trust Level Portfolio Management and Opportunistic Strategies in developing Total Fund liquidity and leverage capabilities

Appendix

Review Outline

| Section | Pages | Investment Beliefs Map | | | | | | | | | |
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- 1** Liabilities
- 2** Long-Term Horizon
- 3** Stakeholders
- 4** Three Forms of Capital
- 5** Accountability
- 6** Strategic Allocation
- 7** Risk Reward
- 8** Costs Matter
- 9** Multi-faceted Risk
- 10** Resources/Process

Investment Beliefs Key

| | Short Name | Investment Belief |
|----|------------------------|---|
| 1 | Liabilities | Liabilities must influence the asset structure. |
| 2 | Long-Term Horizon | A long time investment horizon is a responsibility and an advantage. |
| 3 | Stakeholders | CalPERS investment decisions may reflect wider stakeholder views. |
| 4 | Three Forms of Capital | Long-term value creation requires effective management of three forms of capital: financial, physical, and human. |
| 5 | Accountability | CalPERS must articulate its investment goals and performance measure and ensure clear accountability for their execution. |
| 6 | Strategic Allocation | Strategic asset allocation is the dominant determinant of portfolio risk and return. |
| 7 | Risk Reward | CalPERS will take risk only where we have a strong belief we will be rewarded. |
| 8 | Costs | Costs matter and need to be effectively managed. |
| 9 | Multi-faceted Risk | Risk of CalPERS is multi-faceted and not fully captured through measures such as volatility or tracking error. |
| 10 | Resources / Process | Strong processes and teamwork and deep resources are needed to achieve CalPERS' goals and objectives. |

I. Program Overview

Program Roles¹

As defined through the Asset Liability Management Process:

Global Fixed Income (GFI)

Global Fixed Income serves as an economic diversifier to equity risk and a reliable source of income

- Global Fixed Income accounts for \$79.1 billion or 22.5% of the Total Fund, which is 0.5% above interim Policy target

Inflation Assets

Inflation Assets provide liquid and strong protection against inflation

- Inflation Assets accounts for \$20.8 billion or 5.9% of the Total Fund, which is 0.1% below interim Policy target

Liquidity

Liquidity exhibits safety and capital preservation properties as well as to provide an effective risk protection during financial crisis

- Liquidity accounts for \$11.8 billion or 3.3% of the Total Fund, which is 0.3% above interim Policy target

Program Investment Philosophy

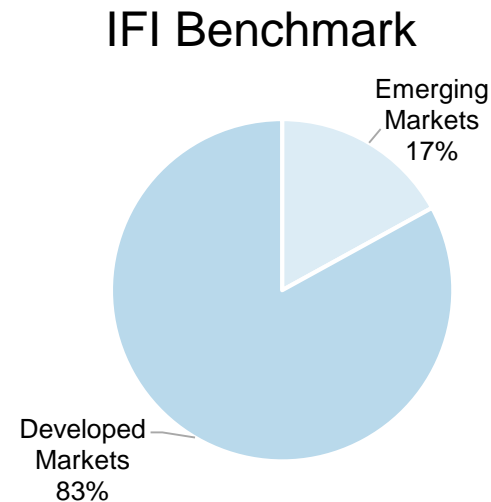
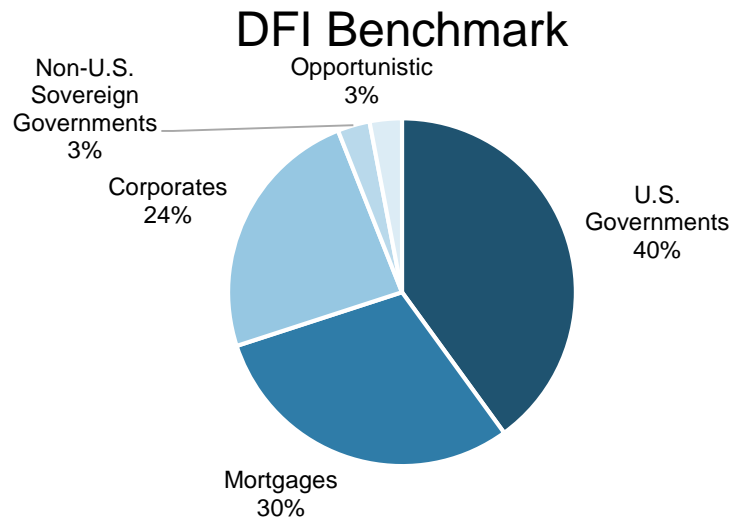
- CalPERS' long-term investment horizon
- Active management adds value in Global Fixed Income
- Costs matter
- Active management is human capital intensive

Investment Decision Process

- Primary Drivers and Decisions
 - Assess stage of economic cycle
 - Manage interest rate risk
 - Manage sector risk
 - Security selection
- Weekly senior team meeting
- FI Annual Long-Term Sector Spreads Meetings
- Use of external managers as extension of staff

Program Characteristics – Global Fixed Income

- Policy Benchmark:
 - 90% U.S. Fixed Income Securities (DFI)
 - 10% Non-U.S. Fixed Income Securities (IFI)
- 93% of Global Fixed Income is managed internally¹



¹As of June 30, 2018

Program Characteristics – Inflation Assets

- Policy Benchmark:
 - 75% Global Inflation-Linked Bonds (ILB)
 - 25% Commodities
- U.S. inflation-linked bonds (TIPS) comprise 2/3 of ILB and the remaining 1/3 is non-U.S. government ILB
- Commodities benchmark is the GSCI Total Return Index
- 100% internally managed

Program Characteristics – Liquidity

- Policy Benchmark:
 - U.S. Treasury Bills of 1-Month Maturity
- 100% internally managed

II. Investment Review

- a. Global Fixed Income
- b. Inflation Assets
- c. Liquidity

Past Year Environment Review – Global Fixed Income

- Acceleration in both US GDP growth (from 2.1% to 2.8%) and inflation (headline from 1.6% to 2.9%, core from 1.7% to 2.3%)
- The Federal Reserve effected three additional increases in its target interest rate - and also began to unwind its balance sheet holdings of US Treasuries and mortgages
- 10 year US Treasury yields rose by 55bps while 30 year US Treasury yields rose by just 16bps during the fiscal year
- The BoJ and ECB continued with their quantitative easing programs but at a slower rate
- Corporate pension fund demand, asset allocations from equities, and high household savings streams have been additional sources of demand for Treasury bonds

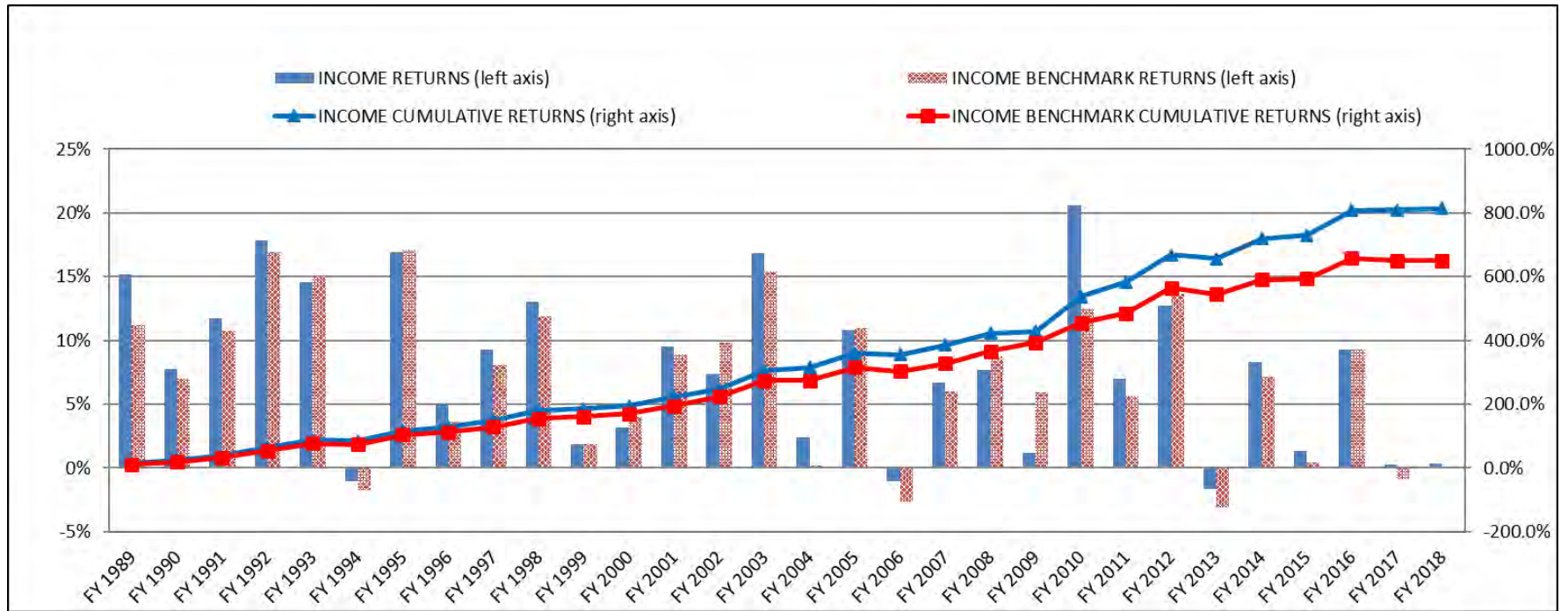
Program Performance Summary - Global Fixed Income

| As of June 30, 2018 | 1-YR | 3-YR | 5-YR | 10-YR | 20-YR | Since Inception* |
|---------------------|-------------|-------------|-------------|-------------|-------------|------------------|
| | Net Return | Net Return | Net Return | Net Return | Net Return | Net Return |
| INCOME | 0.4% | 3.2% | 3.8% | 5.7% | 6.1% | 7.7% |
| POLICY INDEX | 0.0% | 2.7% | 3.1% | 4.9% | 5.5% | 7.0% |
| Excess Return | 0.4% | 0.5% | 0.7% | 0.9% | 0.5% | 0.7% |

- Strong long-term absolute return, low 1-year
- Positive performance versus the benchmark in all time periods

*The inception date is July 1988 and is based on custodian records

Program Performance Review – Global Fixed Income Cumulative Return

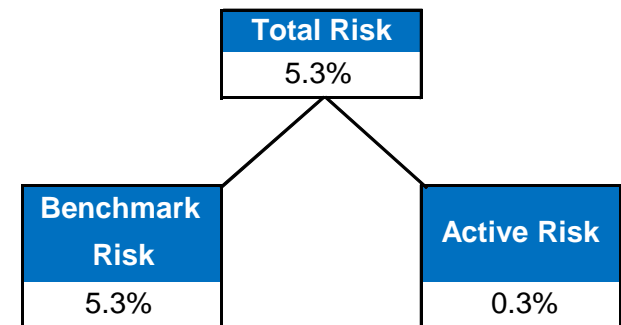


*The inception date is July 1988 and is based on custodian records

Volatility Profile – Global Fixed Income

As of June 30, 2018

- Income Forecast Volatility is 5.3%
- Forecast Tracking Error is 0.3%
- Correlation vs. the entire PERF portfolio is 0.15
- Stress Scenarios:
 - Tech Crash and Recession (Jan 00 – Mar 03) estimated gain is \$9.3B
 - Subprime and Credit Crisis (Oct 07 – Mar 09) estimated loss is \$6.5B



Forward-Looking Commentary – Global Fixed Income

- Challenges remain given the low US rates environment of recent years
- The US economy is entering its tenth year of expansion and government tax and spending policy is adding an estimated 0.5% to 1.0% to US GDP growth, yet monetary conditions are still relatively easy
- The ECB and BoJ both continue to reduce their stimulatory financial policies while China is stepping up theirs. All else equal these international influences will suppress US yields less than in recent years
- That said, the Federal Reserve is tightening monetary policy slowly, in light of: persistently low wage inflation, low leverage growth in the economy (limiting the risk of financial excesses) and waiting to see if stronger productivity and/or labor force participation develops

II. Investment Review

- a. Global Fixed Income
- b. **Inflation Assets**
- c. Liquidity

Past Year Environment Review – Inflation Assets

- US and European inflation increased primarily due to rising energy prices and saw stronger prints over the year. US Headline Inflation reached 2.9% and Eurozone Inflation hit 2.0% at fiscal year end. Core Inflation is lower in both economies but rose over the course of the year in the US to match the highest levels seen since September 2008
- UK inflation remains elevated above 3.0% after the Brexit vote induced devaluation of the currency
- Real yields rose marginally in the US
- Commodities led by oil were stellar performers with the program's commodity index rising almost 26% over the course of the fiscal year

Program Performance Review – Inflation Assets

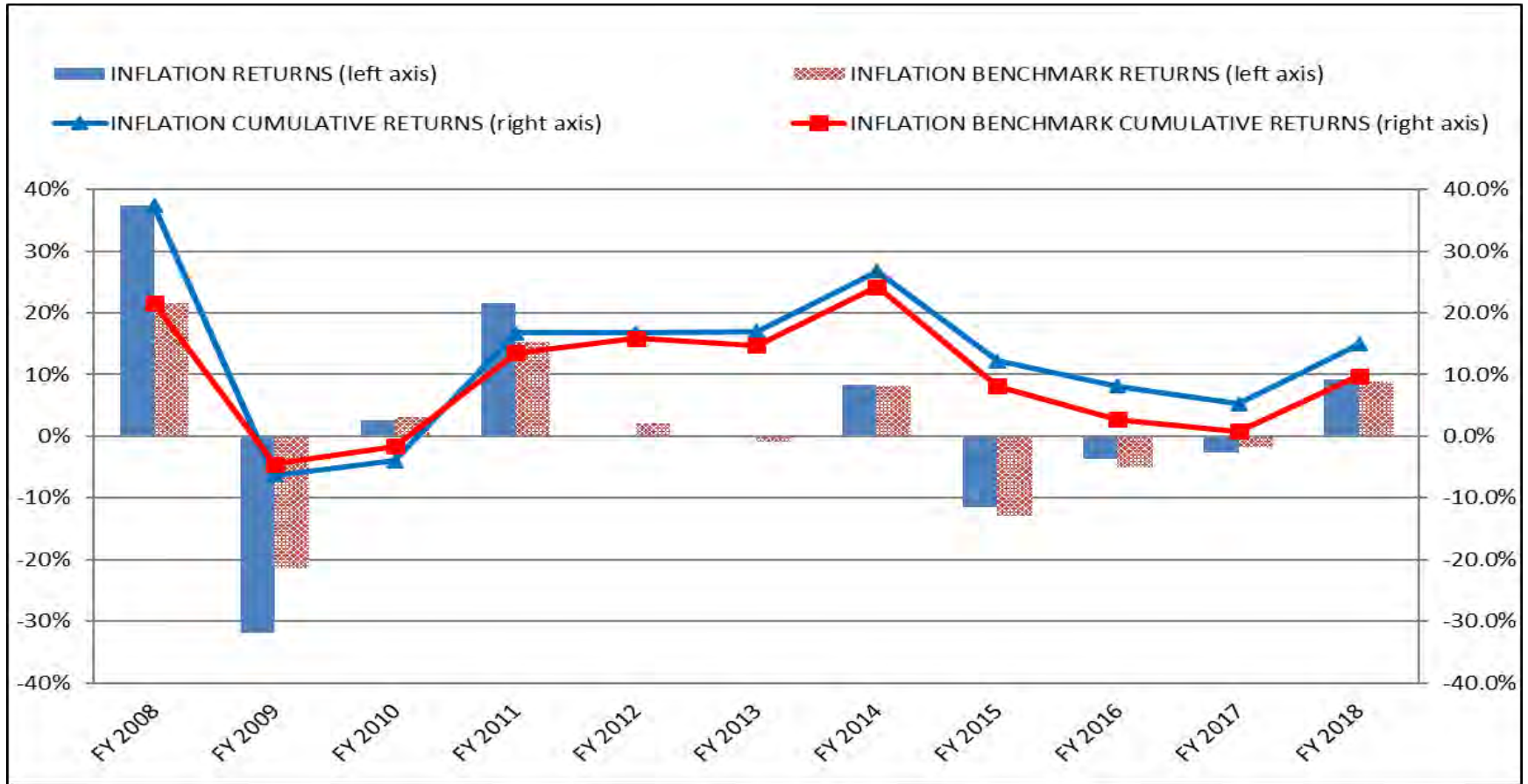
| As of June 30, 2018 | 1-YR | 3-YR | 5-YR | 10-YR | Since Inception* |
|---------------------|-------------|-------------|--------------|--------------|------------------|
| | Net Return | Net Return | Net Return | Net Return | Net Return |
| INFLATION | 9.3% | 0.8% | -0.4% | -1.8% | 1.3% |
| POLICY INDEX | 8.9% | 0.5% | -0.9% | -1.0% | 0.9% |
| Excess Return | 0.4% | 0.3% | 0.5% | -0.8% | 0.4% |

- Strong absolute return this fiscal year, but longer term numbers still affected by the almost 70% fall in the price of oil between 2014 and its 2016 trough
- Rising inflation favored inflation linked bonds this fiscal year in the US and Europe
- Excess return performance negative over 10-year period while positive in other periods

*The inception date is October 2007 and is based on custodian records

Program Performance Review – Inflation Assets

Cumulative Return

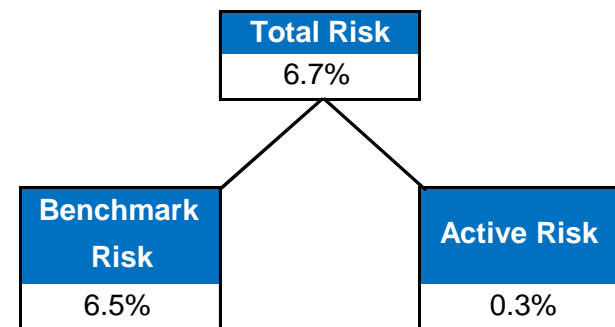


Note: The inception date is October 2007 and is based on custodian records. FY 2008 reflects partial year activity from October 2007 – June 2008.

Volatility Profile – Inflation Assets

As of June 30, 2018

- Inflation Forecast Volatility is 6.7%
- Forecast Tracking Error is 0.3%
- Correlation vs. the entire PERF portfolio is 0.51
- Stress Scenarios:
 - Tech Crash and Recession (Jan 00 – Mar 03) estimated gain is \$4.1B
 - Subprime and Credit Crisis (Oct 07 – Mar 09) estimated loss is \$3.8B



Forward-Looking Commentary – Inflation Assets

- US inflation is likely to remain in excess of 2% given the current stage in the business cycle as core price pressures have moved higher as unemployment has declined to 20 year lows
- European inflation should remain stable but the UK could see a rise in inflation given the risk of a hard Brexit
- Real yields could edge higher as the European Central Bank ends Quantitative Easing and as the US Federal Reserve continues to hike rates and reduce its balance sheet
- The commodity market outlook is currently mixed and the energy sector is subject to geopolitical developments but our index is still 10% below the average price of the past 10 years

II. Investment Review

- a. Global Fixed Income
- b. Inflation Assets
- c. **Liquidity**

Past Year Environment Review – Liquidity

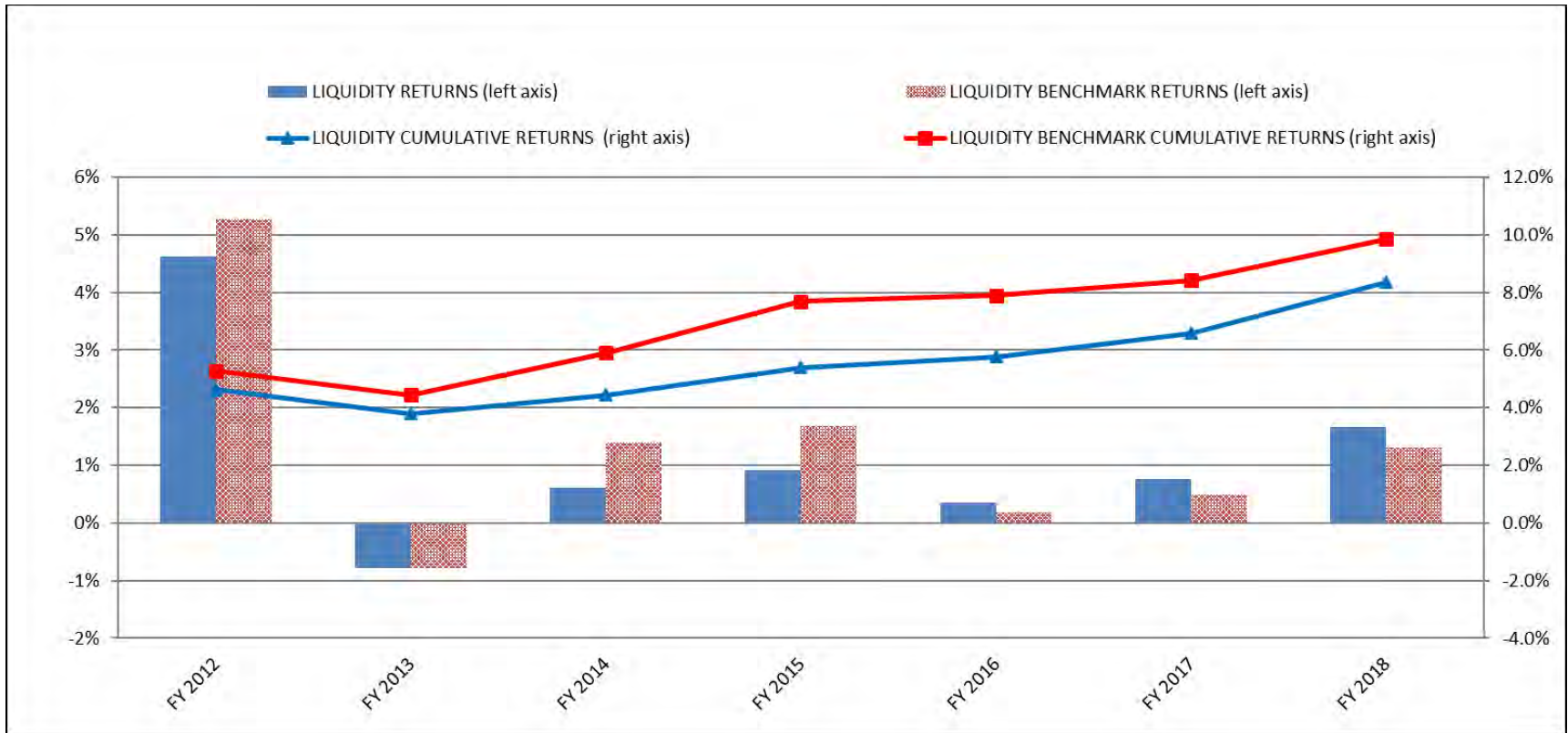
- The US Federal Reserve raised the Fed Funds rate three times given their view of realized and expected labor conditions and inflation
- The Federal Reserve rate hikes resulted in a steepening of US interest rates in the short term markets as the markets began to price in expected future Federal Reserve interest rate hikes

Program Performance Review – Liquidity

| As of June 30, 2018 | 1-YR | 3-YR | 5-YR* |
|---------------------|------------|------------|------------|
| | Net Return | Net Return | Net Return |
| LIQUIDITY | 1.7% | 0.9% | 0.9% |
| POLICY INDEX | 1.3% | 0.7% | 1.0% |
| Excess Return | 0.4% | 0.3% | -0.1% |

- The Liquidity Program role focusing on a low-risk profile and high liquidity results in limited opportunities for absolute returns
- Excess performance is positive for the 1-year and 3-year periods and slightly negative over the 5-year period

Program Performance Review – Liquidity Cumulative Return

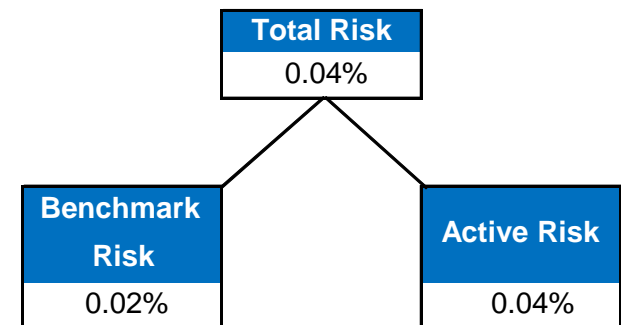


Note: Cumulative return is presented since July 2011 and based on when the current Liquidity Program Policy went into effect. Historical Liquidity composite returns are available from June 1993.

Volatility Profile – Liquidity

As of June 30, 2018

- Liquidity Forecast Volatility is 0.04%
- Forecast Tracking Error is 0.04%
- Correlation vs. the entire PERF portfolio is 0.43
- Stress Scenarios:
 - Tech Crash and Recession (Jan 00 – Mar 03) estimated gain is \$0.04B
 - Subprime and Credit Crisis (Oct 07 – Mar 09) estimated gain is \$0.01B

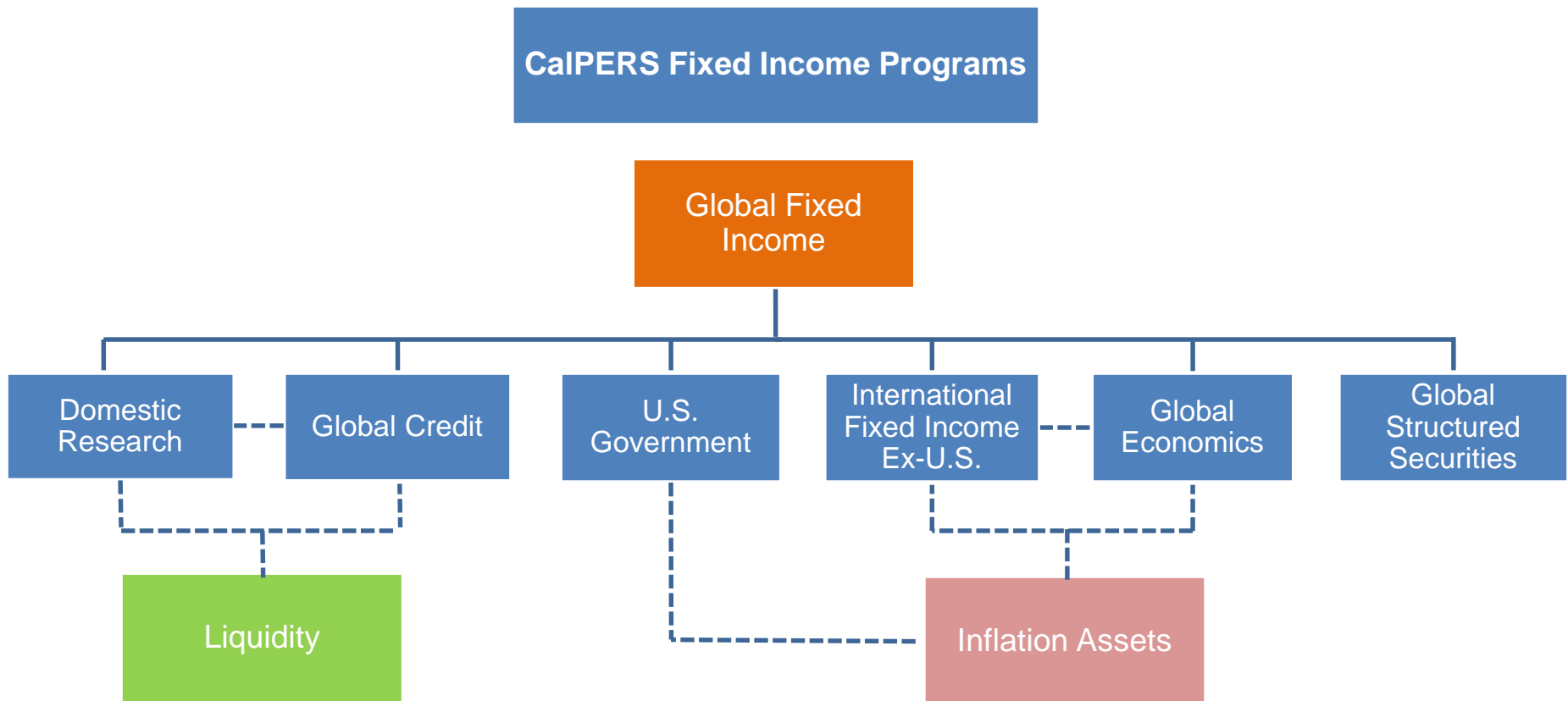


Forward-Looking Commentary – Liquidity

- US Federal Reserve policy remains accommodative but is getting closer to neutral
- Fed Funds futures contracts are pricing in two more Fed Funds hikes by year end 2018

III. Business Review

Functional Organizational Chart



Staffing Overview

TOTAL PROGRAM ¹

- 42 total positions within Fixed Income compared to 46 positions in FY 2016-17

STAFFING UPDATES ¹

- Hired 2 IOs and 3 SCs
- Lost 1MID, 3 IOs and 4 SCs
- Promoted 1 AIM and 3 IOs
- Transferred 1 IM and 1 IO to new Opportunistic Strategies Unit

CURRENT VACANCIES ²

- 1 MID
- 1 ID
- 2 IM
- 2 AIMs
- 1 IO

Program Expenses

| <i>Expense Category</i> | 2017-18 | | | FY 2016-17 | | |
|----------------------------------|---------------------|---------------------------|---------------------------------|---------------------|---------------------------|---------------------------------|
| | AUM (\$billions) | Fees Paid (\$millions) | Fees Paid ¹ (BPS) | AUM (\$billions) | Fees Paid (\$millions) | Fees Paid ¹ (BPS) |
| Internal Management | \$106 | \$11 | 1 | \$100 | \$10 | 1 |
| External Management ² | \$6 | \$11 | 19 | \$4 | \$14 | 36 |
| Consultants Expense | N/A | \$0 | 0 | N/A | \$0 | 0 |
| Technology & Operating Expense | N/A | \$13 | 1 | N/A | \$11 | 1 |
| <i>Total Program</i> | <i>\$112</i> | <i>\$35</i> | <i>3</i> | <i>\$104</i> | <i>\$35</i> | <i>3</i> |

IV. Governance & Sustainability Integration

The Six UN PRI Principles

- 1 We will incorporate ESG issues into investment analysis and decision-making processes.*
- 2 We will be active owners and incorporate ESG issues into our ownership policies and practices.*
- 3 We will seek appropriate disclosure on ESG issues by the entities in which we invest.*
- 4 We will promote acceptance and implementation of the principles within the investment industry.*
- 5 We will work together to enhance out effectiveness in implementing the Principles.*
- 6 We will each report on our activities and progress towards implementing the Principles.*



Global Fixed Income ESG Integration

Principle 1: We will incorporate ESG issues into investment analysis and decision-making processes.

Global Fixed Income Actions:

Policy required: Exclude tobacco bonds from portfolios

- Use ESG-related tools, metrics, and analyses
 - Use MSCI ESG scores to assess ESG related risks in our Internal Credit portfolios
 - Use MSCI carbon data to complete Carbon Footprint comparison of Internal Credit Portfolio relative to our benchmark
 - Use Covenant Review to provide insight into understanding Bondholder rights stated in Bond Indentures
- Assess the capabilities of internal and external investment managers to incorporate ESG issues
 - Quarterly review of our Internal Credit portfolio positions to ESG scores
 - Utilize various social measures for Internal Sovereign portfolios – Corruptions, Transparency, Inequality Indices
 - Completed survey of External Manager integration of ESG into their research and portfolio process
- Ask investment service providers to integrate ESG factors into evolving research and analysis
 - Barclays Research: Governance scores have strongest link to performance

Global Fixed Income ESG Integration

Principle 1: *We will incorporate ESG issues into investment analysis and decision-making processes.*

Global Fixed Income Actions (continued):

Specific portfolio decisions and engagements

- Evaluated for purchase the bonds of Anglo American Capital. Staff determined the risk of potential liabilities due to pipeline leaks was too high of a risk factor vs the reward.
- Increased portfolio position to Cenovous Energy bonds after directly engaging Management on their carbon reduction and deleveraging plan.
- Underweighted Turkey Sovereign bonds due to the erosion of governance and negative societal impacts when the President was granted powers that superseded the parliament and compromised independent institutions and conducted mass dismissals/arrests of civil servants and journalists.
- Over weighted Mexico Sovereign bonds due to the anticipatory improvements in governance, anti-corruption and transparency that will take place post the election of the leading candidate to the Presidency.

Global Fixed Income ESG Integration

Principle 1: *We will incorporate ESG issues into investment analysis and decision-making processes.*

Global Fixed Income Actions (continued):

- Purchased/Own \$59mm of Utility Green Bonds in Corporate portfolio

Principle 3: *We will seek appropriate disclosure on ESG issues.*

Global Fixed Income Actions:

- Directly engaged and led a group of investors that engaged TransCanada to reinstate full financial statement disclosures for a wholly owned subsidiary. Subsequent to the engagement, TransCanada Management agreed to reinstate financial reporting.

Global Fixed Income ESG Integration

Principle 4: We will promote acceptance and implementation of the principles within the investment industry

Global Fixed Income Actions:

- Through our membership in the Credit Roundtable, staff advised and endorsed comment letters to the SEC from the Credit Roundtable on measures that sought to retain timely disclosure and access to information needed to conduct sufficient analysis and to make investment decisions.
- Provided investor perspective and insight to the FASAC (Financial Accounting Standard Advisory Committee), which advises the FASB (Financial Accounting Standards Board) on new accounting projects, research focus and procedural matters.

Global Fixed Income ESG Integration | Looking Forward

Annual Survey Summary

- 4 High Yield Credit Managers
- 5 International Fixed Income Managers
 - 8 of 9 are UNPRI Signatories
 - All 9 are considering ESG factors in their investment process



Conclusions Drawn

- As signatories the Managers are moving toward UNPRI integration requirements
- Some have more formalized organizational structure and roles to implement the integration process

Next Steps

- Seek additional engagement opportunities with like minded investors
- Staff participating on cross asset class team researching Water Issues and Disruptive Technologies