



TEACHERS' RETIREMENT SYSTEM

of the State of Kentucky

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Executive Secretary

Special Workshop Meeting of the TRS Board of Trustees

AGENDA

Monday, November 21, 2022

8:00	Continental Breakfast	
8:30	Introduction	Gary Harbin
9:00	Kentucky Ethics Overview	Beau Barnes
9:30	Actuarial Updates	Ed Koebel Cavanaugh Macdonald
10:30	Break	
10:45	Medical Benefits	Jane Gilbert
Noon	Lunch and discussion of retirement issues	
1:00	Long-term Investing	Curt Scott Jack Holden Jack White Todd Asset Management
2:00	Current Issues	Beau Barnes
2:45	Break	
3:00	Aon's Insights on Investment Climate	P. J. Kelly Aon Investments USA
4:00	Open discussion concerning administrative operations	Gary Harbin

The meeting will take place at the Kentucky Transportation Cabinet Conference Center
at 200 Mero Street, Frankfort, Kentucky.



Teachers' Retirement System of the State of Kentucky

Fiduciary and Ethics Overview

Nov. 21, 2022

Gary L. Harbin, CPA
Executive Secretary

Fiduciary Overview

Fiduciary training helps fiduciaries understand:

- What is a fiduciary?
- Sources and standards of fiduciary duties

What is a Fiduciary?

- Highest duty in law
- Undivided loyalty — Trustees must discharge duties solely in interest of plan participants and beneficiaries and for exclusive purpose of providing benefits to them.
- Trustees should avoid any conflict of interest in which the trustee's interests conflict with interests of plan participants and beneficiaries.

Sources of Fiduciary Duty

Federal Law	Common Law
State Law	Plan and Plan- Related Documents

Fiduciaries have a duty to administer a plan in good faith in accordance with law and its written plan documents and procedures.

Fiduciary Duty in Brief

General Conduct

1. **Honesty and Duty of Full Disclosure** — Trustees must disclose any material fact that could influence in any way the trustee's decisions, actions or willingness to make decisions or to take action. Abstain from votes where trustee has a conflict.
2. **Avoiding Appearance of Impropriety** — “Front Page Test”
3. **Due Care** — The standard is: “What would a prudent public pension plan trustee do?”

Fiduciary Duty in Brief

Specific Duties Owed to Plan Participants and Beneficiaries

1. Providing due process.
2. Informing about the plan.
 - Summary plan description, newsletters, website and social media.
3. Protecting the fund.
 - Preventing incursions into fund for political objectives.
 - Requesting actuarially sound contributions to fund.
 - Requiring and collecting contributions when due.
4. Investing solely to provide legal benefits to plan participants and beneficiaries.
 - Trustees do not have to be investment experts. They do need to feel assured that they have employed competent investment staff and managers with adequate checks and safeguards.

Ethics Standards

Ethics training helps trustees understand:

- Duties under Code of Conduct for Members of a Pension Scheme Governing Body
- Kentucky Executive Branch Code of Ethics
- Teachers' Retirement System of the State of Kentucky (TRS) statutes and policies

Ethics Duties

Duties Under Code for Members of Pension Governing Body

CODE OF CONDUCT
FOR MEMBERS OF A
PENSION SCHEME
GOVERNING BODY



Ethics Duties

Duties for Trustees Under Code of Conduct

1. Act in good faith and in the best interest of the scheme participants and beneficiaries.
2. Act with prudence and reasonable care.
3. Act with skill, competence and diligence.
4. Maintain independence and objectivity by, among other actions, avoiding conflicts of interest, refraining from self-dealing and refusing any gift that could reasonably be expected to affect their loyalty.
5. Abide by all applicable laws, rules and regulations, including the terms of the scheme documents.
6. Deal fairly, objectively and impartially with all participants and beneficiaries.
7. Take actions that are consistent with the established mission of the scheme and the policies that support that mission.
8. Review on a regular basis the efficiency and effectiveness of the scheme's success in meeting its goals, including assessing the performance and actions of scheme service providers, such as investment managers, consultants and actuaries.
9. Maintain confidentiality of scheme, participant, and beneficiary information.
10. Communicate with participants, beneficiaries, and supervisory authorities in a timely, accurate and transparent manner.

Executive Branch Code of Ethics

Statement of Public Policy

Prohibited Conflicts of Interest

When to Abstain

Prohibited Acts

Acceptance of Gifts

Statements of Financial Disclosure

Executive Branch Code of Ethics

Statement of Public Policy

The public policy of the commonwealth requires that:

- A public servant must be independent and impartial;
- Decisions and policies must be made through the established processes of government;
- A public servant should not use public office to obtain private benefits; and
- The public has confidence in the integrity of its government and public servants.

(KRS 11A.050)

Executive Branch Code of Ethics

Prohibited Conflicts of Interest

No public servant, by himself or through others, shall knowingly use or attempt to use his influence:

- In any matter that involves a substantial conflict between a personal/private interest and duties in public interest;
- To obtain financial gain
- To secure or create privileges, exemptions, advantages or treatment for himself or others in derogation of the public interest at large.

(KRS 11A.020)

Executive Branch Code of Ethics

When to Abstain

Some guidelines for determining whether to abstain:

- Does a personal interest create a substantial threat to independence of judgment;
- Is participation likely to have any significant effect on the disposition;
- Will the decision affect the public servant differently from the public or differently from others in similar positions (i.e., jobs);
- A public servant may request an advisory opinion from the Executive Branch Ethics Commission in accordance with the commission's rules of procedure.

(KRS 11A.030)

Executive Branch Code of Ethics

Prohibited Acts

Examples:

- Knowingly disclosing or using confidential information gained in duties.
- Knowingly undertaking, bidding on, negotiating, or enjoying any agreement or purchase made or awarded by the agency where the public servant is employed or supervises for himself or a business where he owns at least 5%.
- Knowingly accepting compensation, other than that provided by law, for performance of official duties without the prior commission approval.
- Violating employment restrictions.
- Lobbying and representation restrictions for one year.

(KRS 11A.040)

Executive Branch Code of Ethics

Acceptance of Gifts

Generally, Board Governance Manual says gifts should be avoided.

The Executive Branch Code provides:

“No public servant ... shall accept any gifts ... totaling more than \$25 in a calendar year from any person or business that does business with ... the agency in which the public servant is employed or which he or she supervises”

Not included: Gifts from family, campaign donations or prizes available to public.
(KRS 11A.010(5))

BUT: Even if otherwise allowed, gifts are a problem if made quid pro quo.

(KRS 11A.045)

Executive Branch Code of Ethics

Statement of Financial Disclosure

Each officer, each public servant listed in KRS 11A.010(9)(a) to (g), and each candidate shall file a statement of financial disclosure with the commission.

(KRS 11A.050)

TRS Conflict of Interest Statute

No trustee or employee of the board shall:

1. Have any interest, direct or indirect, in the gain or profits of any investment or transaction made by the board;
2. Use any TRS assets except to make payments authorized by the board;
3. Become endorser, surety or obligor for money loaned to or borrowed from board;
4. Have a contract with TRS individually or through a business;
5. Use his or her official position with TRS to obtain a financial benefit;
6. Use confidential TRS information to further personal economic interests; or
7. Generally, hold outside employment with any person or business that he or she has involvement as part of TRS position.

(KRS 161.460)

Policy & Form

BOARD GOVERNANCE MANUAL

APPENDIX 7 CONFLICT OF INTEREST AND CONFIDENTIALITY POLICY

INTRODUCTION

1. Adoption of Conflict of Interest and Confidentiality Policy

Pursuant to the provisions of KRS 161.250, the Board of Trustees (board) of the Teachers' Retirement System of the State of Kentucky (TRS) is vested with the responsibility for the general administration and management of the retirement system. The Board may adopt procedures necessary to conduct the business of the retirement system as needed. The law shall control if any inconsistency exists between the law and this policy.

2. Statement of Conflict of Interest and Confidentiality Policy

TRS recognizes the need to maintain the public's confidence and trust in the integrity of TRS and the Commonwealth of Kentucky. Individuals associated with TRS must not engage in activities that have the potential to become a conflict of interest in their association with TRS. Likewise, individuals associated with TRS must not release information about TRS or any of its members that would breach any duty to protect such information. TRS recognizes the need to establish procedures to prevent such conflicts or breaches.

3. Purpose

The purpose of this Conflict of Interest and Confidentiality Policy is to: establish which individuals are subject to TRS's conflict of interest provisions; establish the specific standards of conduct with regard to conflict of interest; establish standards with regard to the confidentiality of information; and establish procedures for obtaining written conflict of interest statements and confidentiality agreements from certain individuals.

4. Procedures Regarding Conflicts of Interest and Confidentiality

A. Application of Policy

- 1) This policy shall apply to all individuals who have a statutory, contractual or working relationship with TRS.
- 2) Individuals affected by this policy shall include, but are not limited to:
 - a) Employees of TRS;
 - b) The board;
 - c) Independent contractors of TRS;

- d) Vendors of TRS;
- e) Employees or Officers of the Commonwealth of Kentucky providing legal or expert advice at the request of TRS; and
- f) Any person acting in a fiduciary capacity for TRS.

B. Standards of Conduct Regarding Conflicts of Interest

- 1) Individuals have an obligation to diligently identify, disclose, avoid and manage conflicts of interest.
- 2) Potential conflicts of interest exist when an individual is, or may be, directly or indirectly financially impacted, by a decision made by TRS in which the individual has a financial interest.
- 3) Individuals and their family members should not be involved in any agency doing business with TRS for financial or other interest, without full disclosure and satisfaction of interest in accordance with the Executive Branch Ethics provisions of KRS 11A.
- 4) Individuals should not be involved in the decision-making process of TRS as a member of their family as defined by the Executive Branch Ethics provisions of KRS 11A.
- 5) Individuals should not conduct business or participate in any agency in which the individual or family member has a financial interest.
- 6) Individuals should not accept campaign contributions, services or other compensation unless it can reasonably be inferred that a major purpose of the transaction is in the performance of their duties for TRS.
- 7) Individuals must avoid all conduct that in any way creates a conflict of interest with TRS or that the individual is using his or her position with TRS for political or private interest.
- 8) Individuals not covered by the conflict of interest statute must not violate any conflict of interest statute or policy of TRS. These individuals must disclose any financial or other transaction with a trustee or other officer of TRS to the Executive Branch Ethics provisions of KRS 11A.

C. Standards of Conduct Regarding Confidentiality

- 1) Individuals associated with TRS may be granted access to confidential information in the course of being a TRS employee, board member or contractor.
- 2) This information may include, but is not limited to, investment trade data; individual member information, including but not limited to, Social Security numbers, names, addresses, phone numbers, birth dates, beneficiaries, health insurance information, member numbers; documents; records; programs; files; scientific or technical information; and other information made available to individuals for purposes of completing their obligations to TRS.
- 3) These individuals have a duty to keep confidential the information to which they are granted access as a result of their association with TRS.
- 4) TRS and these individuals shall also recognize that confidential member information is protected under KRS 161.585.

5. Written Statements of Conflict of Interest and Confidentiality

- A. On an annual basis, the Executive Secretary, Deputy Executive Secretaries, Chief Investment Officer, Director of Investment Strategies, Chief Financial Officer, the members of the board, independent contractors, vendors of TRS and other persons identified in Section 2 (2) shall file a written conflict of interest statement on the form(s) provided by TRS and adopted by the Board of Trustees.
- B. Upon proposal for contract and continuing on an annual basis, any independent contractors and vendors of TRS shall file a written confidentiality agreement on the form provided by TRS and adopted by the Board of Trustees. This form may be amended to conform to specific needs of the individual vendor or contractor as deemed necessary by general counsel or designee.
- C. Other employees of TRS also may be requested to file a written conflict of interest statement as needed or requested by the board.
- D. An individual who abstains from involvement in an official decision because of a personal or private interest must disclose that fact in writing to the executive secretary.

6. Ethics and Confidentiality

Individuals as set forth above shall conform to the Executive Branch Code of Ethics with regard to conflicts of interests as set forth in KRS Chapter 11A and this policy. Individuals as set forth above shall conform to the confidentiality requirements of KRS 161.585.

Conflict of Interest Statement

External Service Provider

TEACHERS' RETIREMENT SYSTEM OF THE STATE OF KENTUCKY

EXTERNAL SERVICE PROVIDER CONFLICT OF INTEREST STATEMENT

I, _____, in my role as _____
for the Teachers' Retirement System of the State of Kentucky
(TRS), recognize the need to maintain the public's confidence and trust in the integrity of TRS
and the Commonwealth of Kentucky.

I understand that I have the obligation to diligently identify, disclose, avoid and manage conflicts
of interest that may arise through my relationship with TRS.

I will conduct my activities with TRS so that I do not advance or protect my own interests or the
private interests of others with whom I have a relationship, in a way that is detrimental to the
interests of TRS.

In every instance in which I am acting on behalf of TRS, I will conduct my activities in a manner
to best promote the interests of TRS.

I agree not to attempt to influence TRS in disregard of the public interest at large.

In all matters where an official decision must be made that may favorably or detrimentally
impact my own financial interests or the financial interests of other individuals or organizations
with whom I have a relationship, I will reveal that relationship and abstain from involvement in
the official decision.

When a conflict of interest arises, or when a potential conflict of interest arises, I will disclose
that conflict or potential conflict to my contact person at TRS and seek resolution of that issue.

I agree not to violate any conflict of interest statute or principle by the performance of my duties
with TRS. I will not engage directly or indirectly in any financial or other transaction with a
trustee or employee of TRS that would violate the standards of the Executive Branch Ethics
provisions, as set forth in KRS Chapter 11A.

Agreed this the _____ day of _____, 20__.

Signature

Name

Title

Company

Read, sign & return to TRS

Conflict of Interest Statement

Board of Trustees and Employees

Read, sign & return to TRS

**TEACHERS' RETIREMENT SYSTEM
OF THE STATE OF KENTUCKY**

**BOARD OF TRUSTEES AND EMPLOYEES
CONFLICT OF INTEREST STATEMENT**

I, _____, in my role as _____
for the Teachers' Retirement System of the State of Kentucky
(TRS), recognize the need to maintain the public's confidence and trust in the integrity of TRS
and the Commonwealth of Kentucky.

I understand that I have the obligation to diligently identify, disclose, avoid and manage conflicts
of interest that may arise through my relationship with TRS.

I will conduct my activities with TRS so that I do not advance or protect my own interests or the
private interests of others with whom I have a relationship, in a way that is detrimental to the
interests of TRS.

In every instance in which I am acting on behalf of TRS, I will conduct my activities in a manner
to best promote the interests of TRS.

I agree not to attempt to influence TRS in disregard of the public interest at large.

In all matters where an official decision must be made that may favorably or detrimentally
impact my own financial interests or the financial interests of other individuals or organizations
with whom I have a relationship, I will reveal that relationship and abstain from involvement in
the official decision.

When a conflict of interest arises, or when a potential conflict of interest arises, I will disclose
that conflict or potential conflict to the TRS Executive Secretary, or his or her designee, and seek
resolution of that issue.

I agree not to violate any conflict of interest statute or principle by the performance of my duties
with TRS. I will not engage directly or indirectly in any financial or other transaction with a
trustee, employee of TRS or any other person or organization that would violate the standards of
the Executive Branch Ethics provisions, as set forth in KRS Chapter 11A.

Agreed this the _____ day of _____, 20__.

Signature

Name

Title

Summary

The provisions of the Executive Branch Code of Ethics and the TRS Conflict of Interest statute provide base guidelines for conduct. As always, it is important to be mindful that TRS needs to avoid not only any actual impropriety, but also even the appearance of impropriety. Just because the code or statute may not prohibit something does not mean that it is OK.



Our Members Come First!

800-618-1687

**8 a.m. – 5 p.m. ET
Monday – Friday**

info@trs.ky.gov
<https://trs.ky.gov>

Protecting & Preserving Teachers' Retirement Benefits



Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

Teachers Retirement System of the State of Kentucky

Actuarial Principles

Board Workshop
November 21, 2022

Ed Koebel, EA, FCA, MAAA
Chief Executive Officer

www.CavMacConsulting.com



Agenda

- 2022 Valuation Key Findings
- Describe the implications of Actuarial Standard of Practice No. 4 (ASOP4) on valuation reports.
- Explain what Actuarial Equivalence means.
- Identify option factors for member's retirement benefits.

Key Findings

- TRS 4 is Here!!
- Over 3,100 new hires since January 1, 2022
 - Most are Part-Timers in the Non-University Group
- Contributions coming in are more than enough to cover liabilities so far, so funding mechanism is working
- Direct-Rate Smoothing is working as well!!
- Due to 2021 assumption changes, phasing in of State contributions to the Plan are increasing approximately 1.72% of payroll each year for 5 years
 - This methodology began last year for the 2021 valuation

Key Findings

- TRS received 100% of the Actuarially Determined Employer Contribution for the fiscal year ending June 30, 2022
- TRS also received \$479.2 Million to pay off the liability for previously awarded ad hoc COLA increases and sick leave allowances granted after 1981
 - This lowered contribution requirements by 0.95% of payroll
- Net Investment Return on Market Value of (10.9)%
 - Trust Fund decreased \$3.0 Billion due to negative investment return in addition to negative cash flow
 - Negative cash flow for 2022 as a percentage of market value of assets is (1.19)%
 - Last year's percentage was (3.85)%

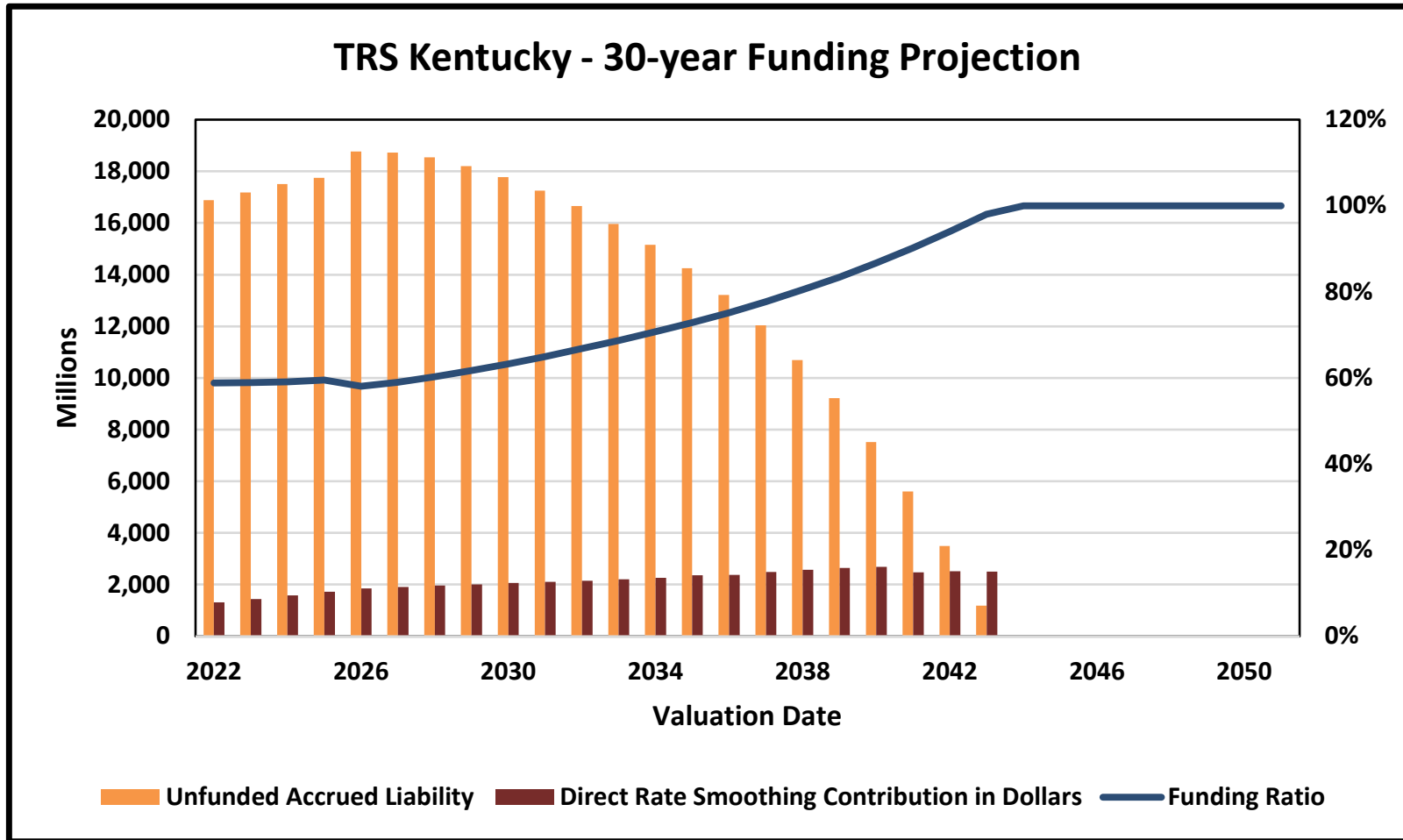
Key Findings

- Actuarial Value of Asset Return of 7.9%
 - Compare to 7.10% investment return assumption for period
 - Smoothing of investment gains and losses over 5-year period
- Increase of 0.34% in State Pension Contribution Requirement from last year
 - Last year was an increase of 0.19%
- Unfunded Accrued Liability (UAL) decreased slightly from \$17.0B to \$16.9B
- Funding Ratio increased from 57.2% to 58.8%

Key Findings

Valuation Year End June 30	Fiscal Year End June 30	Special Appropriations Rate	Cumulative Required Increase Rate	Cumulative Total State Additional Contribution Rate	Cumulative Total State Required Contribution Amounts
2005	2008	4.17%	1.32%	5.49%	\$162,062,900
2006	2009	4.25	1.88	6.13	197,267,800
2007	2010	4.28	2.46	6.74	225,574,200
2008	2011	4.15	3.59	7.74	261,860,000
2009	2012	3.88	5.81	9.69	347,988,000
2010	2013	3.69	7.27	10.96	393,444,000
2011	2014	3.50	8.02	11.52	430,090,000
2012	2015	3.00	10.42	13.42	497,648,000
2013	2016	2.90	12.97	15.87	596,397,000
2014	2017	2.70	13.80	16.50	622,184,000
2015	2018	2.94	13.49	16.43	624,660,000
2016	2019	2.83	14.61	17.44	660,830,000
2017	2020	3.00	14.10	17.10	652,775,000
2018	2021	2.89	14.27	17.16	662,701,000
2019	2022	3.05	14.82	17.87	698,411,000
2020	2023	2.61	15.78	17.39	733,520,000
2021	2024	2.38	16.18	18.56	741,547,000
2022	2025	0.00	18.92	18.92	805,690,000

Key Findings



Actuarial Standards of Practice (ASOPs)

- Provides actuaries with guidance about how to perform certain aspects of actuarial work
- Credentialed actuaries must follow ASOPs
- There are 56 ASOPs but applicable ASOPs vary with practice area
 - Life
 - Health
 - Casualty
 - Pension

Actuarial Standards of Practice (ASOPs)

- Key ASOPs applicable for pension work include:
 - **ASOP 4: Measuring Pension Obligations**
 - ASOP 23: Data Quality
 - ASOP 27: Economic Assumptions
 - ASOP 35: Demographic Assumptions
 - ASOP 41: Actuarial Communications
 - ASOP 44: Asset Valuation methods
 - ASOP 51: Assessment and Disclosure of Risk
 - ASOP 56: Modeling

ASOP No. 4

- ASOP 4 covers about everything actuaries do regarding measuring liabilities or calculating costs and contributions
 - Individual benefit statements or calculations are excluded
- Revised ASOP4 calculations effective for reports and measurement dates after February 15, 2023
 - July 1, 2023 or January 1, 2024 for most plans
- There are lots of significant changes

ASOP No. 4

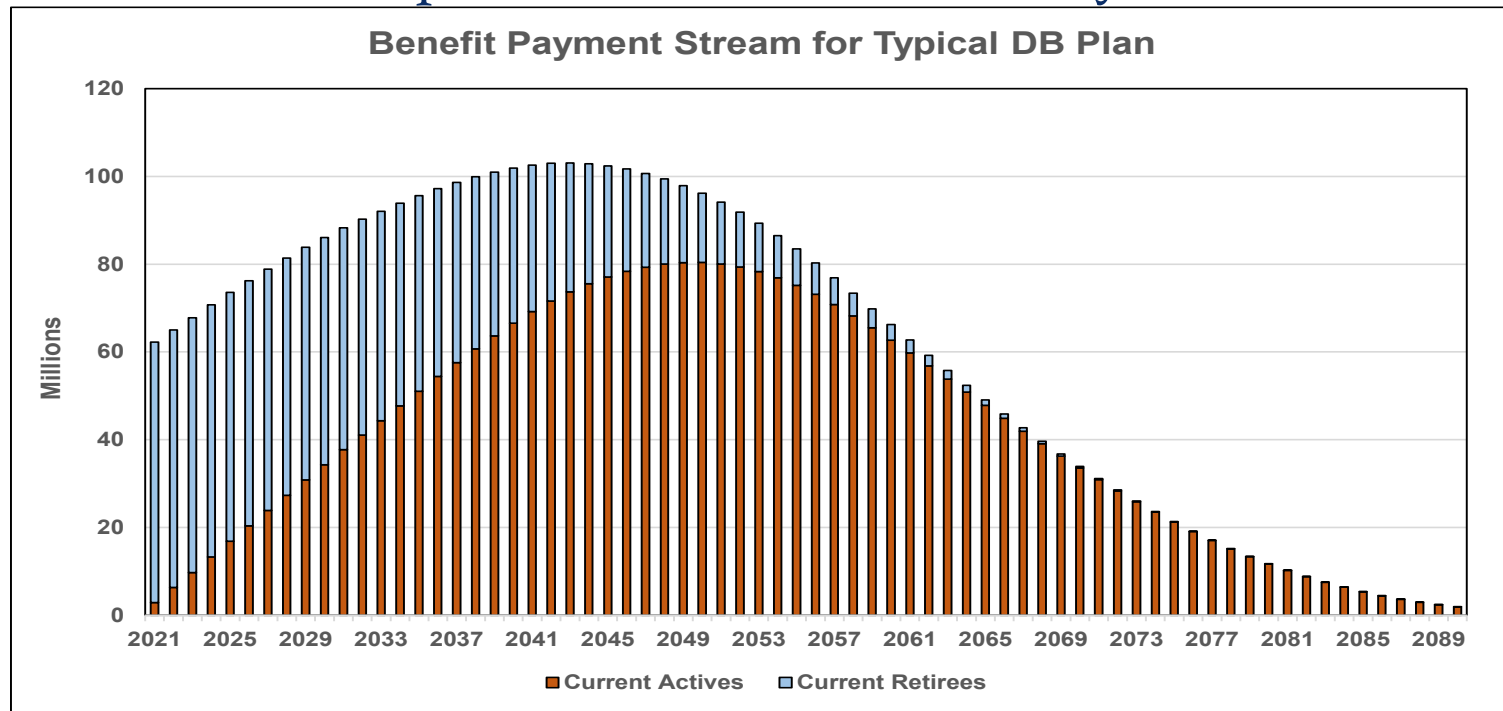
- Changes Impacting Public Plans
 - Disclose Low-Default Risk Obligation Measure (LDROM)
 - Disclose Reasonable Actuarially Determined Contribution (RADC)
 - New guidance on amortization of the unfunded liabilities
 - Assess implications of Funding Policy
 - Other Changes
 - Output Smoothing Methods
 - Addressing contribution lag
 - Gain/Loss analysis

ASOP No. 4

- Low-Default-Risk Obligation Measure
 - Required to be calculated and disclosed for funding valuations
 - Discount rate is to be tied to low-default-risk fixed income securities with cash flows consistent with the benefits paid
 - US Treasury yields
 - Highly rated tax-exempt municipal bonds or corporate bonds
 - If benefits are related to investment returns, the actuary may reflect how the benefits change
 - Can adjust other assumptions for consistency with discount rate

ASOP No. 4

- Low-Default-Risk Obligation Measure Example
 - Current 10-yr US Treasury Yield Rate (11/1/2022) is 4.00%
 - GASB Municipal Bond Rates are currently 3.90%

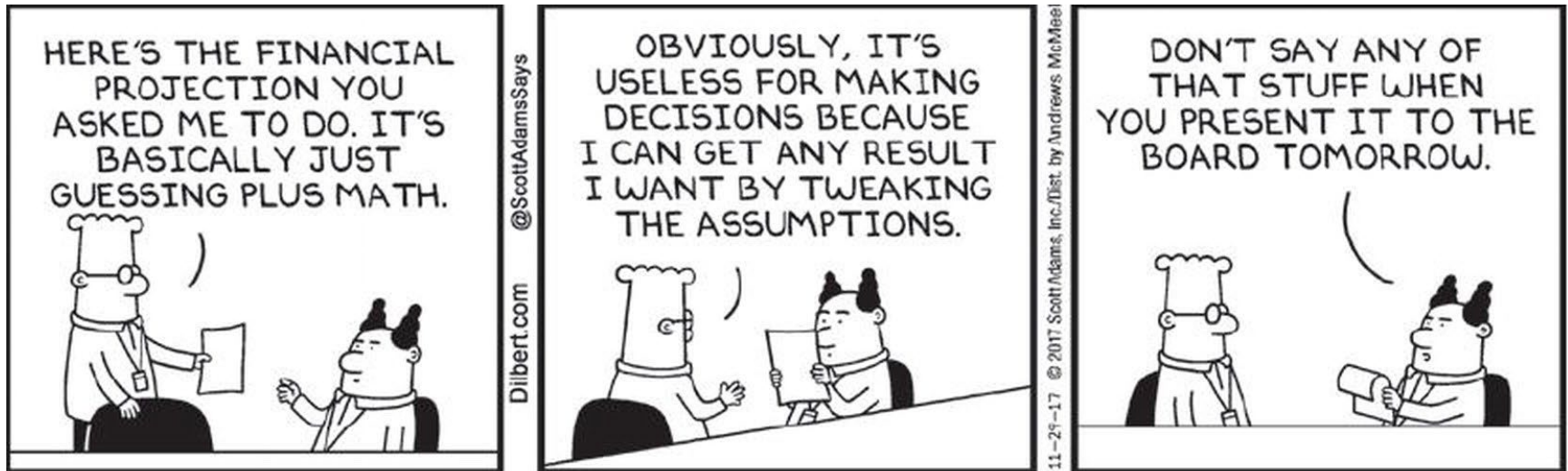


ASOP No. 4

- Low-Default-Risk Obligation Measure Example
 - $C + I = B + E$
 - Lower Investment Earnings means higher Contributions
 - Shows the savings that result from investing the assets with a prudent amount of risk

2021 Valuation Results	Actuarial Accrued Liability (7.10%)	Low Default Risk Obligation Measure (3.50%)
Pension Plan	\$39,581,704,000	\$62,417,345,000
Difference		\$22,835,641,000

ASOP No. 4



ASOP No. 4

- Low-Default-Risk Obligation Measure Disclosures
 - The liability measure (no need to compare to assets)
 - Discount rate(s) and rationale for selection
 - Assumptions that differ from the funding valuation along with an explanation
 - Cost method used (even if same as valuation)
 - Explanation of plan provisions that were valued differently from funding valuation
 - Commentary to help the intended user understand the LDROM measure with respect to funded status, plan contributions, and security of participant benefits

ASOP No. 4

- Low-Default-Risk Obligation Measure Commentary
 - One interpretation of LDROM is the ongoing funding liability if the plan invested in low default risk securities rather than a diversified portfolio
 - Critics of DB Plans are going to say that the LDROM finally shows the “true cost” of the pension promise
 - However, it can also be interpreted as the difference between the LDROM and the funding AL shows the savings to those funding the plan (members, tax-payers, etc.) as a result of a prudent, diversified portfolio
 - Suggest that this measure be included in the ASOP51 section of the report (“Risk Assessment”)

ASOP No. 4

- Reasonable Actuarially Determined Contribution
 - Applicable to funding valuations, but not cost studies
 - Must calculate and disclose a RADC
 - Reasonable assumptions
 - Any methods used (cost method, amortization method, smoothing method, etc.) must meet the ASOP requirements
 - Amortization method cannot include perpetual negative amortization (increasing dollar amount of Unfunded Accrued Liability)
 - Contribution allocation procedure results in the plan accumulating sufficient assets to make benefit payments when due

ASOP No. 4

- Amortization method guidance is enhanced
 - Each individual amortization base should:
 - Fully amortize the base in a reasonable time period
 - Reduce the balance by a reasonable amount each year
 - In total, amortization payments (all bases) should
 - Fully amortize the UAL in a reasonable time period
 - Reduce the UAL by a reasonable amount in a sufficiently short period
 - Open question – if a large gain base and a large loss base in consecutive years do not change the UAL much for several years, is that acceptable?

ASOP No. 4

- Reasonable Time Period Determination
 - Possible Factors
 - Open or Closed Method
 - Source of the Base
 - Pattern of payments
 - Base Positive or Negative
 - Duration of Accrued Liability
 - Average Remaining Service
 - Funded Status
- RADDC Issues
 - Fixed contribution rate where years to amortize is forced
 - Long single amortization base
 - Tight limits on contribution increases

ASOP No. 4

- Assess Implication of Plan's Funding Policy
 - Actuary must provide a qualitative assessment of the funding policy on plan's expected future contributions and funded status
 - Hopefully, most of your actuaries are doing this already
 - Estimate how long before contributions determined by the Funding Policy are expected to exceed normal cost plus interest on the UAL
 - Estimate when UAL is expected to be fully amortized
 - Estimate asset depletion date, if applicable

ASOP No. 4

- Other Changes
 - Output Smoothing Method (OSM)
 - If your plan is smoothing contributions, there are additional requirements
 - Requires that the OSM be within a reasonable range from the ADC
 - Requires that the difference between the OSM and ADC be recognized within a reasonable time period
 - Requires that the ADC be disclosed without the OSM
 - Addressing contribution lag
 - Calculation of the ADC should include the time between the valuation date and when the contribution is made
 - Gain/Loss analysis
 - Must separate the total G/L into Investment and Other

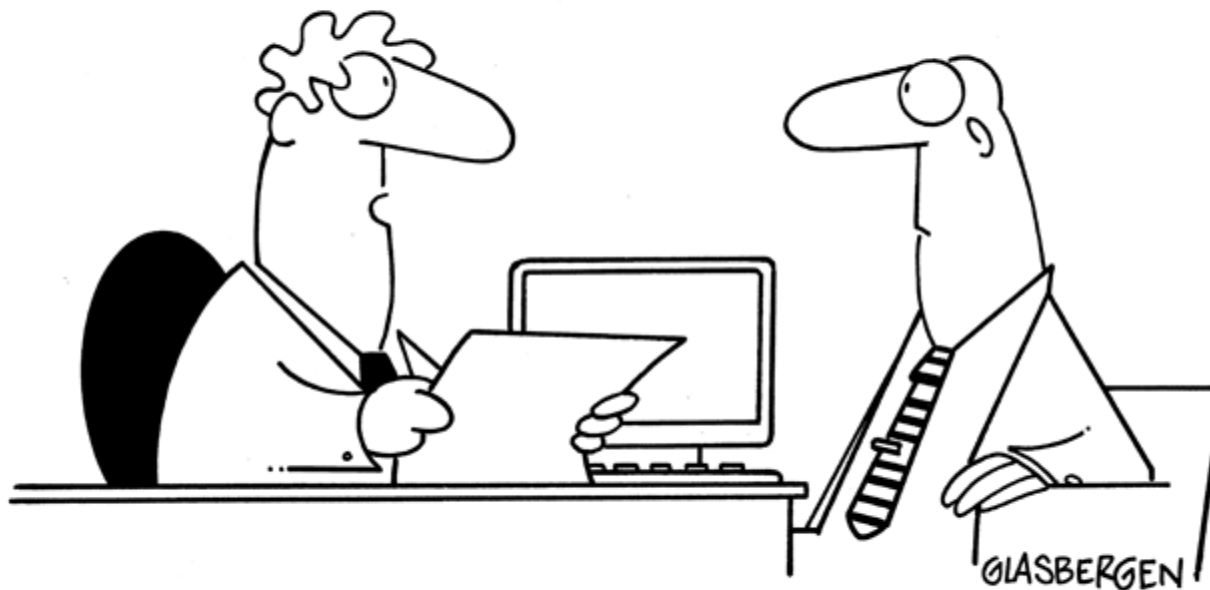
Actuarial Equivalence

- Which would you choose?
 - Lifetime annual annuity of \$100,000 starting now, or
 - Lifetime annual annuity of \$200,000 starting in 10 years
- What factors would you consider in making your decision?
 - History of family's longevity
 - Current financial background
- Ideally you would assign some value to both scenarios and choose the most valuable option.

Actuarial Equivalence

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INVESTMENTS AND RETIREMENT PLANNING



**"If you work hard and invest wisely, you can
afford to turn 65 on your 80th birthday."**

Actuarial Equivalence

- Three Principles to consider when valuing a stream of payments
 - A dollar today is worth more than a dollar a year from now
 - The likelihood of payment decreases over time
 - The first payment after retirement is guaranteed and the second one is extremely likely. But the 45th payment may be very unlikely
 - More payments are expected when a member retires earlier
- Actuarial Present Value ties these three principles together to calculate the value of the stream of benefits and reflects that the payment is contingent on the annuitant's life

Actuarial Equivalence

- So, an annual payment of \$100,000 to a single 65-year-old male who lives in Georgia has a present value of:
 - $\$100,000 \times 10.331$ (annuity factor) = \$1,033,100
- Important to realize that although two retirees may be receiving the same benefit the value of their benefit is not worth the same if they are retiring at different ages
- Annuity factors take a lot into consideration:
 - Discount rate, Retirement Age and Life Expectancy, of course
 - Is there a Cost-of-Living Adjustment provided?
 - What form of payment are they receiving?
 - How old is their spouse?

Actuarial Equivalence

- Actuarial Equivalence is the process of balancing the present value of the expected amounts paid by the Plan under two different forms of payment
- In laymen's terms, the present value of (1) benefit paid to a retiree for his lifetime only should be equal to the present value of (2) benefit paid to a retiree for his lifetime and potentially his spouse's lifetime
 - (2) benefit should be reduced for the retiree, right?

Actuarial Equivalence

- Optional Payment Forms offered by many Defined Benefit Pension Plans
 - Joint and Survivor Options (100%, 75%, 50%)
 - Certain and Life Options (5-years up to 20-years)
 - Certain Only Options
 - Social Security Leveling (receiving more before age 62 and less afterwards)
 - Partial Lump Sums
 - Cash Refunds
 - Multiple Beneficiaries

Actuarial Equivalence

Example of Reduction Factor for a 100% Joint and Survivor (J&S) Optional Form

(1) Member's Age at Retirement:	55
(2) Spouse's Age at Retirement:	55
(3) Annual Single Life Annuity Benefit at Retirement:	\$24,075
(4) Life Annuity Present Value Factor:	13.221641
(5) Present Value of Life Annuity: (3) x (4)	\$318,311
(6) 100% J&S Present Value Factor:	14.817882
(7) Present Value of 100% J&S Annuity: (3) x (6)	\$356,741
(8) Reduction Factor for 100% J&S Option: (5) / (7)	0.8923
(9) Annual Benefit to Retiree for a 100% J&S Option:	\$21,482

Actuarial Equivalence

- The reduction in the original payment to the member should be thought of like a life insurance premium to cover the expected increase in life expectancy of both the member and spouse
- And what happens to the price of life insurance coverage when you buy it age 50 vs when you buy it at age 30?
- It goes up because the carrier has less time until death to collect its premiums
- So...let's add another example at an older retirement age

Actuarial Equivalence

Example of Reduction Factor for a 100% Joint and Survivor (J&S) Optional Form

(1) Member's Age at Retirement:	55	70
(2) Spouse's Age at Retirement:	55	55
(3) Annual Single Life Annuity Benefit at Retirement:	\$24,075	\$24,075
(4) Life Annuity Present Value Factor:	13.221641	9.511402
(5) Present Value of Life Annuity: (3) x (4)	\$318,311	\$228,987
(6) 100% J&S Present Value Factor:	14.817882	13.839423
(7) Present Value of 100% J&S Annuity: (3) x (6)	\$356,741	\$333,184
(8) Reduction Factor for 100% J&S Option: (5) / (7)	0.8923	0.6873
(9) Annual Benefit to Retiree for a 100% J&S Option:	\$21,482	\$16,547

Questions?







BMA's 2022 Medicare Advantage Summit – Relive the Best Moments!

Thanks to everyone who helped make our 2022 Medicare Advantage Summit a success! Below, find videos and resources from the two-day event, including remarks CMMI's Dr. Liz Fowler, CMS's Kathryn Coleman, insightful panel discussions with BMA Allies, and video messages from our bipartisan Medicare Advantage champions in Congress.



Teachers' Retirement System of the State of Kentucky

Medicare Advantage Program 2007-2022

'Keeping the Promise of Retiree Health Care'

**Jane C. Gilbert, CPA
Director of Retiree Health Care**

What TRS Is

Teachers' Retirement System of the State of Kentucky (TRS)

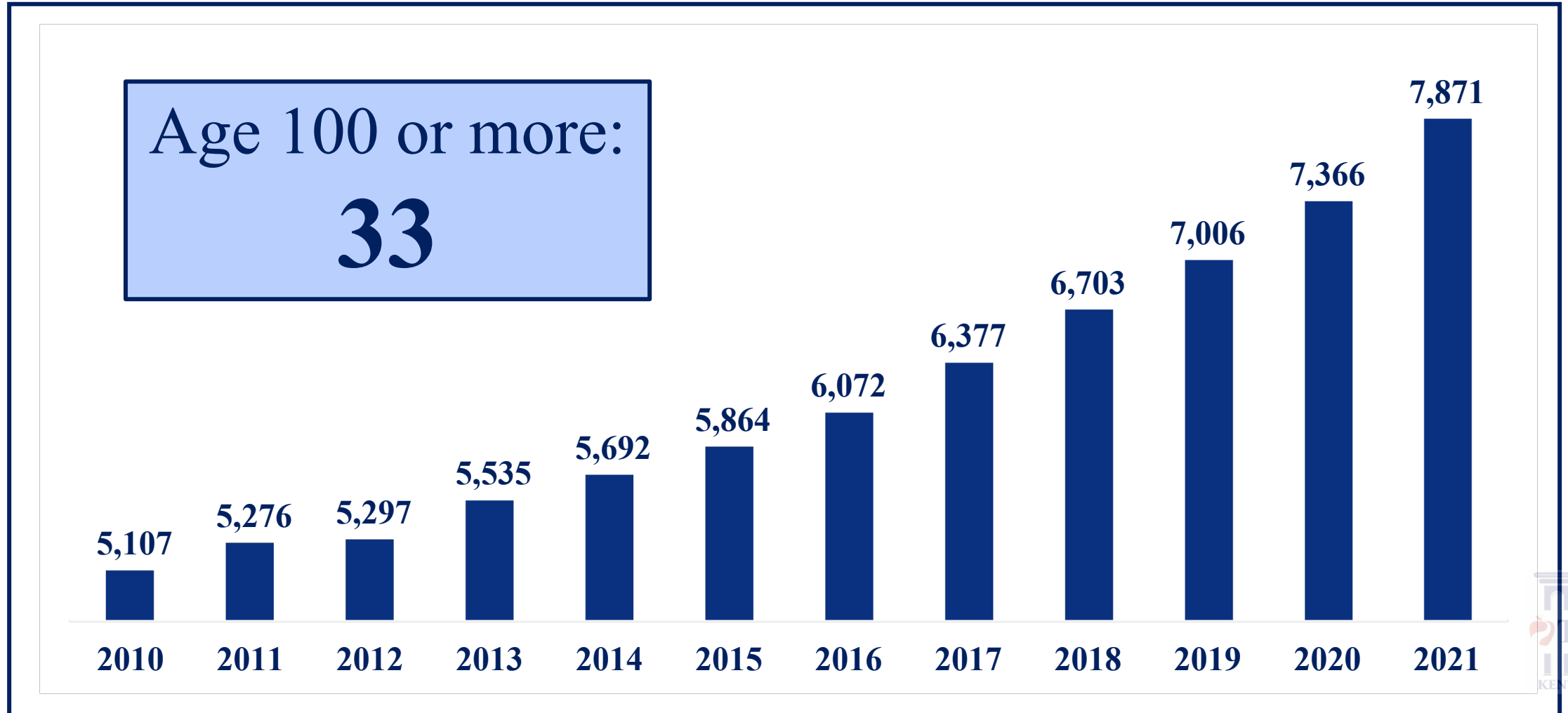
TRS is a defined benefit retirement plan that pays a defined amount in retirement based on the employee's length of service, final average salary and a retirement multiplier. TRS retirement eligibility is determined by the employee's age and years of service. The service retirement annuity is a guaranteed lifetime benefit.

- ◆ Member Recipients:
 - ◆ Female: 73%
 - ◆ Male: 27%



TRS Benefits Protect Teachers

Retirees over 80 as of Dec. 31



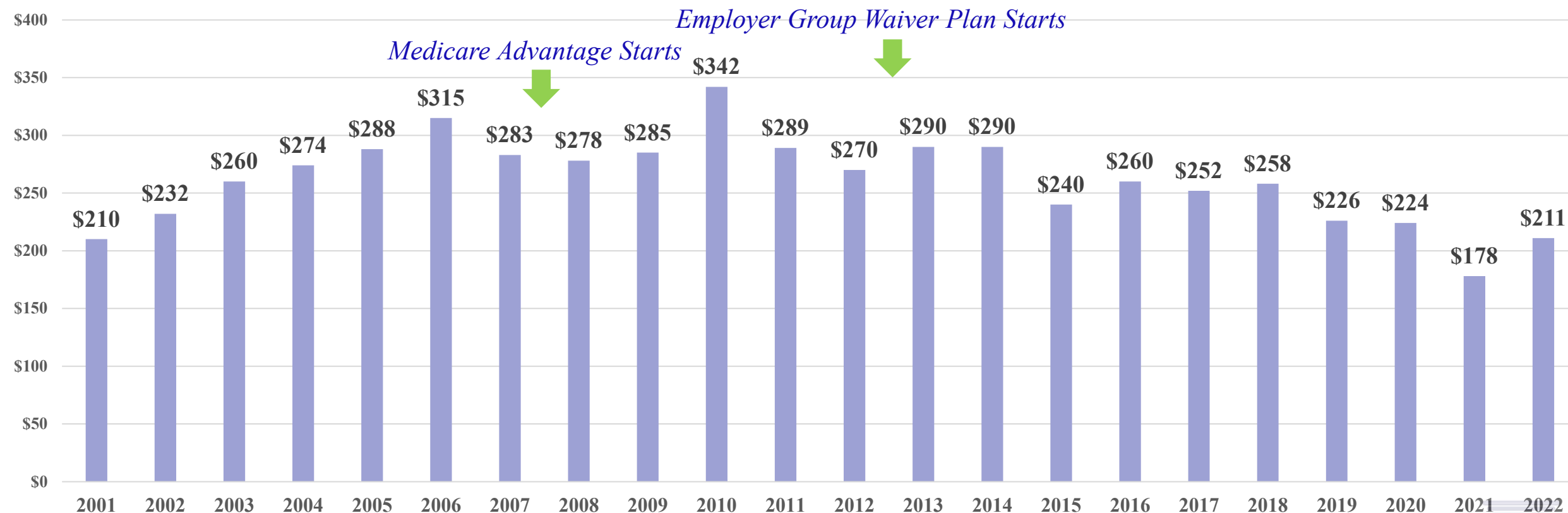
Two Plans for TRS Health Benefits

MEHP **Medicare** **Eligible Health** **Plan**

- Medicare-eligible or 65 & over
- Exclusively TRS members
- One Plan

KEHP **Kentucky** **Employees'** **Health Plan**

- Under 65 and not Medicare-eligible
- Same fund as active teachers and state employees
- Coverage options

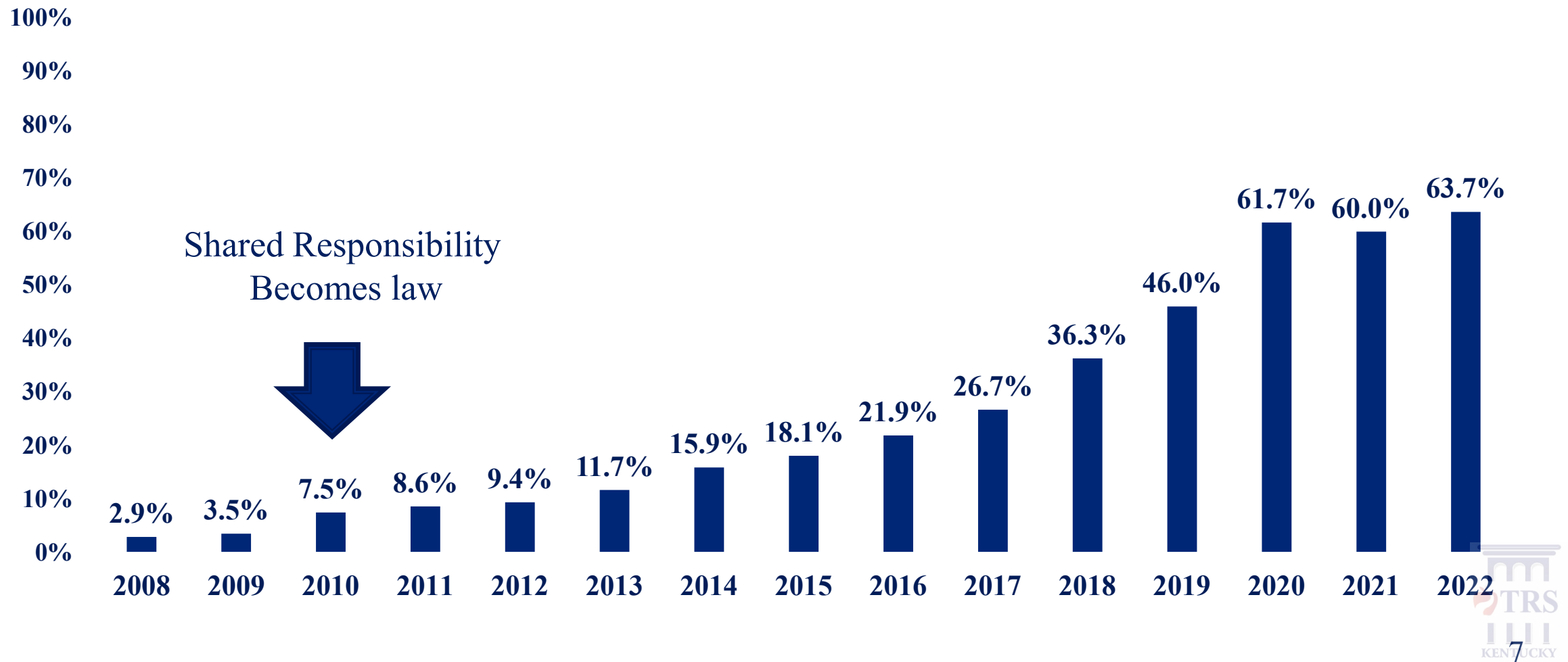


Premiums Held Almost Constant For 20 Years

- Now in our 16th year with Medicare Advantage, TRS currently covers more than 38,000 retired Kentucky teachers and their spouses on a Medicare Advantage Employer Group Waiver Plan (EGWP)
- The Medicare Advantage program now enjoys broad support in Congress
- Medicare Advantage has enabled TRS to better serve our retired members via an EGWP which provides:
 - Care coordination,
 - Part D drug coverage,
 - Stable benefits and high satisfaction rates among our members
- With a Medicare Advantage EGWP, TRS has achieved stability with premiums, and the 2022 premium is less than the premium 20 years ago, with no material changes to the existing plan benefit design
- The TRS Other Post Employment Benefit (OPEB) actuarial liability was reduced by \$1.9 billion with the move to Medicare Advantage

TRS Health Insurance

Funded Status



Register at www.UHCRetiree.com/trs to see these features available to you or call 844-518-5877 for more information.



- Routine hearing exam
- HouseCalls in-home assessment
- Hearing aids discount
- Diabetes support program

Quit For Life®

Tobacco Cessation Program



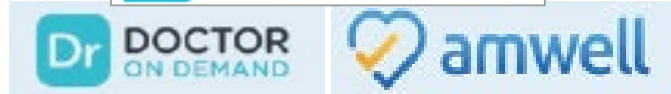
Gift cards for completing certain activities



Weight loss program



Post-hospitalization meals delivered



Virtual visits with doctor



Fitness program

VISA Gift Card
HouseCalls in-home
assessment reward remains
a VISA reward card of \$50



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- In 2022 will be reloadable Visa Cards.
- Funds are loaded within 24 hours of activity completion
- Don't have to track multiple reward card balances and expiration dates
- Consolidated rewards on one card for larger purchases
- Can now see reward card balance and transaction details every time you log-in to Renew Rewards
- Must be used within 12 months

Annual Wellness Visit rewards is now \$25

The value-added supplemental benefits offered to retired Kentucky teachers for 2022 include:

- SilverSneakers
- Post-hospitalization meal delivery
- Weight loss program
- Hearing aid allowance and discounts
- Telehealth, virtual visits
- Medical transportation after certain discharges
- HouseCalls incentive — These visits help to keep retirees engaged with their doctors to get annual visits, receive screenings, vaccines and prescriptions.
- Incentive wellness rewards program

Better health outcomes help keep healthcare costs down. TRS has favorable outcomes with the utilization of Medicare Advantage. Some examples are:

In 2021:

- *Retiree patients received over 9,567 HouseCalls visits per year allowing thousands of referrals to clinical management and case management programs*
 - *85% of eligible female retirees had their breast cancer screening*
 - *80% of eligible retirees had a colon cancer screening*
 - *82% of eligible retirees completed a diabetic eye exam*
 - *56% of retirees had a Medicare Annual Wellness Visit*
 - *73% of retirees had a Hemoglobin A1X*

In 2020:

- *7,856 open care gaps were addressed in the diabetic population*
- *734 home screening kits mailed*
- *1,880 inpatient cases supported by transitional care*

Non-Existent in Medicare FFS

TRS ensures that the Medicare Advantage carrier uses the Medicare subsidy revenue to:

- lower premiums;
- offer supplemental value-added benefits;
- perform care and case management;
- offer incentive wellness programs;
- and supply heightened customer service.

None of this exists in original Medicare FFS.

TRS ensures that greater medical management strategies and programs are designed and utilized for more effective

- clinical intervention,
- coordinated care
- and member engagement.

If Some Old Quarterback Says You Need More Coverage ...

Tell Joe (and others like him),
“No!”

If you are enrolled in the TRS Medicare Eligible Health Plan (MEHP), enrolling in another Medicare Advantage plan would “dynamite” your TRS MEHP coverage.



TRS Health Policy Education







New Date - New Topics - New Location - New Look
CME and CPE (10.75) credits available!

UPDATES IN PRECISION MEDICINE and Pharmacogenomics

March 2-3, 2022

UF Research and Academic Center
6550 Sanger Rd
Orlando, FL



[Register Now](#)

March 2-3, 2023

Orlando, FL

Teachers' Retirement System of the State of Kentucky

Personalized Medicine Partnership



Jane Cheshire Gilbert, CPA
Director, Retiree Health Care

A small, faded version of the TRS Kentucky logo is positioned to the right of the text.

Who We Are

Teachers' Retirement System of the State of Kentucky (TRS)

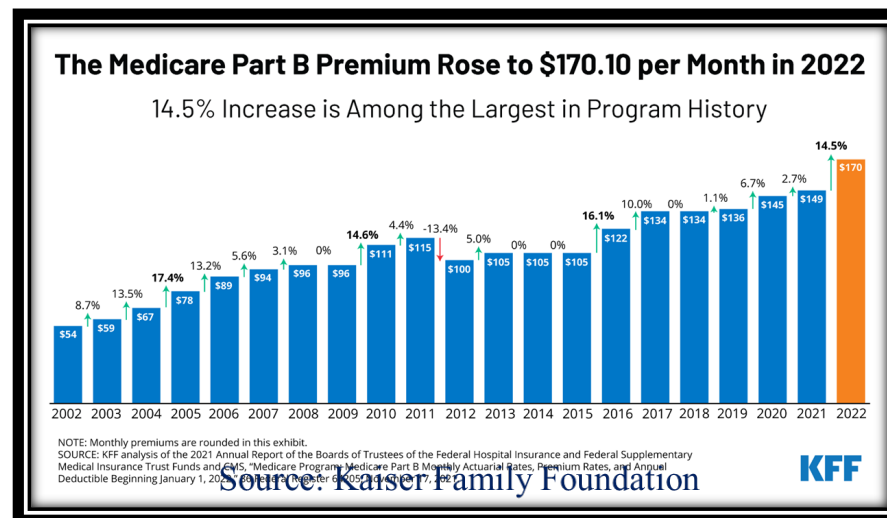
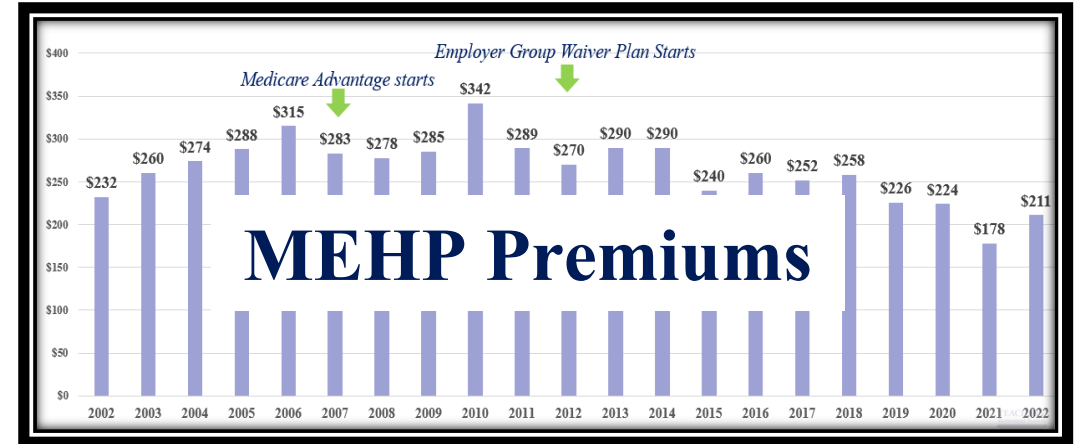
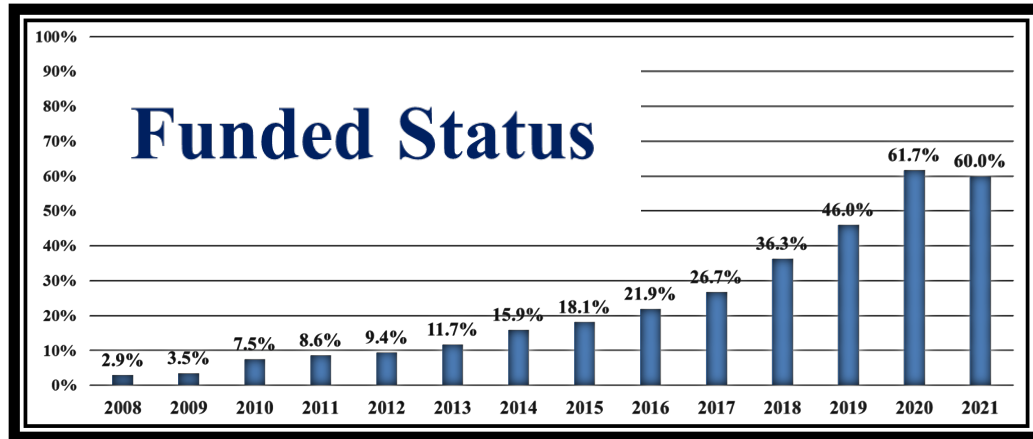
TRS is a comprehensive retirement plan for Kentucky's public school teachers that includes a defined benefit and retiree health insurance.

Member Demographics:

- ♦ Medicare eligible: > 37,000
- ♦ Over age 80: 7,871
- ♦ Over age 100: 33
- ♦ Polypharmacy with many taking an average of 15 prescriptions
- ♦ Personalized Medicine Program participants > 10,000 enrolled with >8,000 genetic interpretations

Personalized Medicine






TRS Kentucky Compelling Financial Pressures



Personalized Medicine

Mission & Goals From Program Kickoff

CORIELL
LIFE SCIENCES

-  Provide a 'zero disruption' implementation.
-  Achieve 5-star feedback from participant members.
-  Demonstrate a 3x return on program investment over 3 years.
-  Be perceived as fiscally responsible, ethically motivated, and medically innovative by all stakeholders.
-  Become a national example of progressive, creative, and innovative leadership in pension fund healthcare management.

Partnership

DNA testing combined with enriched comprehensive medication management to determine if medications work for our members



Population
analytics



Member
engagement &
enrollment



Sample processing
&
Clinical decision
support tool



Pharmacist review
& comprehensive
medication
management

Resulting in improved member health and savings

Personalized Medicine

Why It Works

- 66% had genetic risks detected in a currently prescribed medication
- Helps avoid taking ineffective medications that even could be fatal
- Saves money for retirees and their insurance trust
- Uses DNA testing to help doctors making treatment decisions
- Results help make sure medications are beneficial from the start
- Avoids traditional trial-and-error process without DNA information
- If polypharmacy is necessary, need to make sure the drugs are working for you

Personalized Medicine

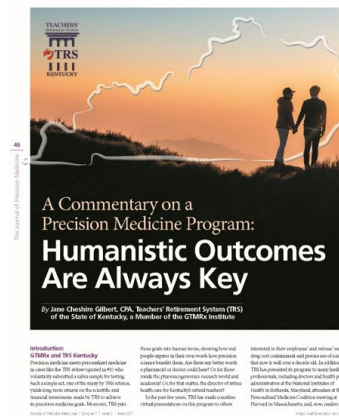
Peer-Reviewed Initial Results Receive Attention

- \$37 million savings in direct medical charges over 32 months
 - \$218 savings a month per member, equates to \$7,000 a member
 - Return on investment of about 1,422%
- 14.9% reduction in inpatient visits
- Humanistic outcomes trump all

KEHP MEHP Personalized Medicine Genetic Testing Wellness Program Gets National Attention



Journal of *Personalized Medicine*



Journal of Precision Medicine



Personalized Medicine

Compelling Retiree Testimonies

“

LIFE SCIENCES

"I received a call from a TRS member who had participated in the DNA testing program with her spouse. The spouse had a **heart attack earlier in the year** and was being discharged on **Clopidogrel**. They called to check this against his DNA results and found out

Clopidogrel would have been ineffective.

The Pharmacist worked with the patient and his doctor to get an **effective medication**. Had the patient not called, there would be a high **likelihood of a readmission and recurrence of future heart attack**.

Not only did this preventive action dramatically affect the member's **quality of life**, but it also **prevented the costs of hospital admission and downstream costs** surrounding heart attack treatment and recovery."

KYRx team member

”

I am *so grateful* for the information that was given to me and my physician. I was taking metoprolol for my **heart condition**. Your tests showed that it **stayed too long in my system**. I sometimes had the feeling that I was on the verge of **fainting**. I **had not had that feeling since I started taking the new suggested medication**. I thank you from the bottom of my heart.

— Member, Teachers' Retirement System of the State of Kentucky

Early Results — Real Story

- TRS member was prescribed a blood thinner after having a stroke
 - TRS member had a mini-stroke while on that blood thinner
 - TRS member took the DNA test and results showed the member was a slow metabolizer of the blood thinner and it did not interact well with their stomach medicine
 - The Know Your Rx pharmacist worked with the TRS member and doctor to change to a different blood thinner
- The member is doing well

Personalized Medicine

What We Learned

- Pharmacists empowered with clinical decision support tools critical to successful impact with pharmacogenetic testing
- Participant eligibility assessment can significantly improve cost savings
- Program sponsor endorsement and early, consistent outreach is key to enrollment

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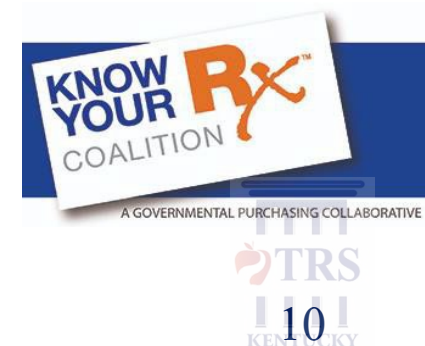


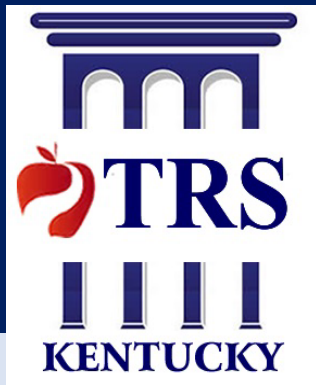
Personalized Medicine

Hurdles to Widespread Adoption

1. PGx needs to become a standard of care
2. PGx should be reimbursed by Medicare and large insurance carriers via employer sponsored health plans/public purchasers of health services and drugs
3. PGx should be completely supported by TPAs and PBMs
4. We can continue to chronicle our program, but 1, 2 & 3 must become a reality

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Teachers' Retirement System of the State of Kentucky

<https://trs.ky.gov>
800-618-1687



**Know Your Rx
Coalition**
855-218-5979

**Coriell Life
Sciences**
888-454-9024



[https://trs.ky.gov/retired-members/
retired-membershealth-care/
personalized-medicine/](https://trs.ky.gov/retired-members/retired-membershealth-care/personalized-medicine/)





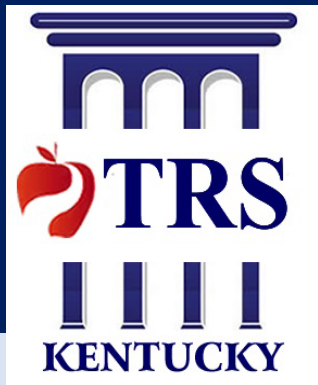


2019 KRTA CONVENTION

SPONSORED BY:
HENRY HENSLEY & ASSOCIATES

**TEACHERS ARE OUR
SUPERHEROS**





Teachers' Retirement System of the State of Kentucky

Insurance 2022

Gary L. Harbin, CPA
Executive Secretary

What TRS Is

Teachers' Retirement System of the State of Kentucky (TRS)

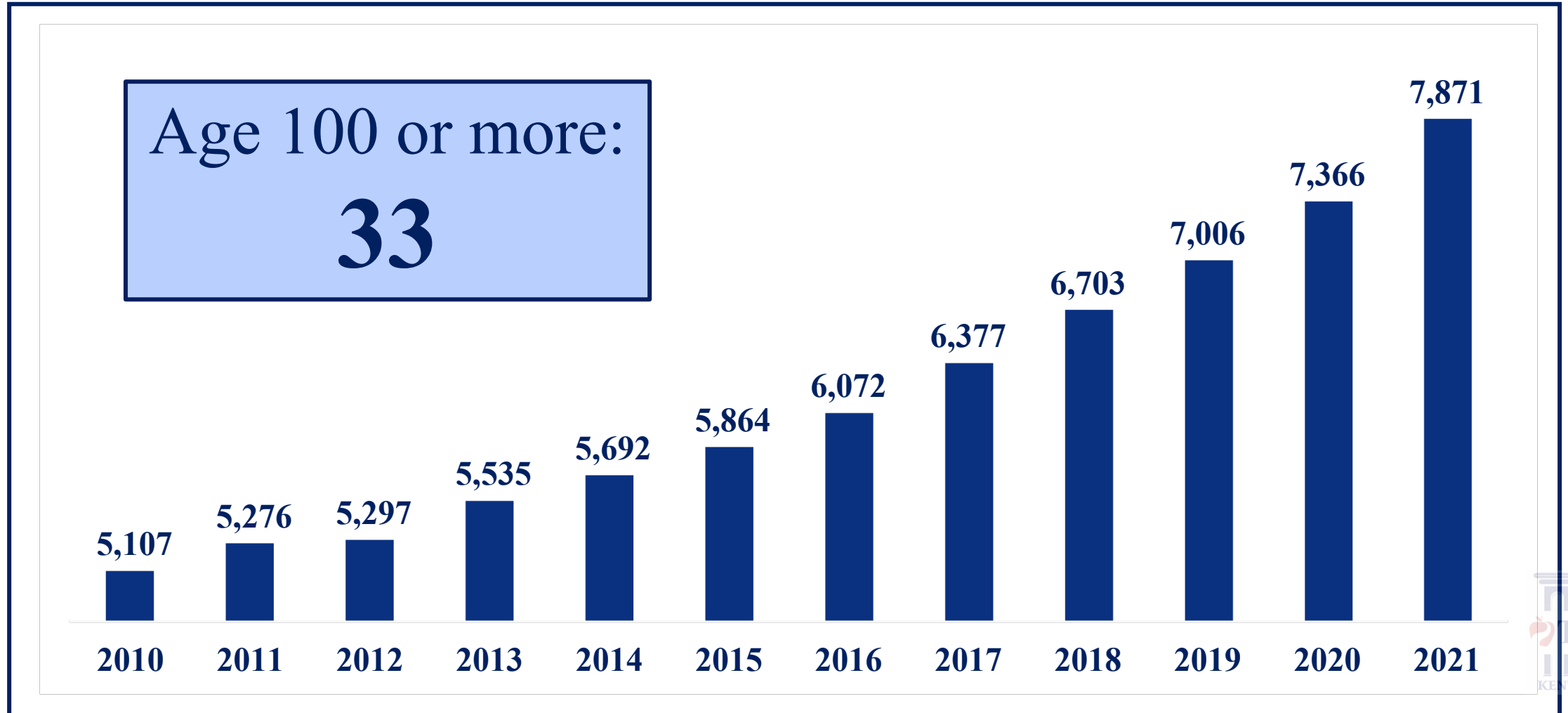
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Health Insurance Details

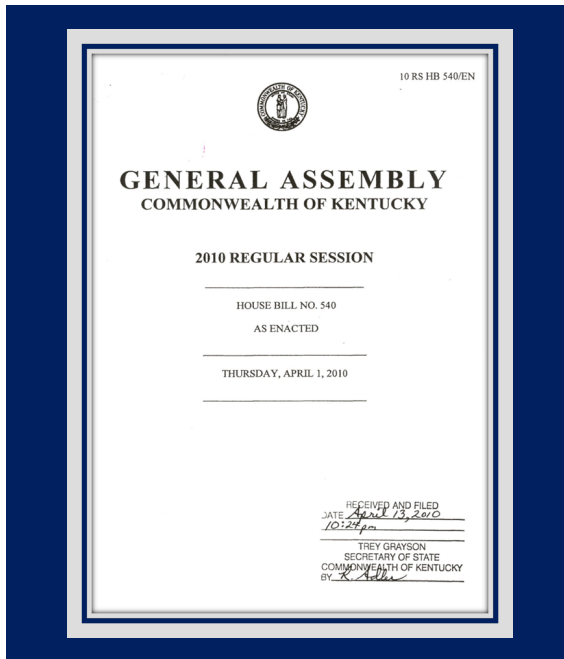
Subject to Change

Kentucky law guarantees retired teachers access to group coverage, but the details of that coverage – including costs and level of coverage – can change.

Shared Responsibility

In Second Decade

Shared solution providing permanent funding for retiree health care



Shared Responsibility Results

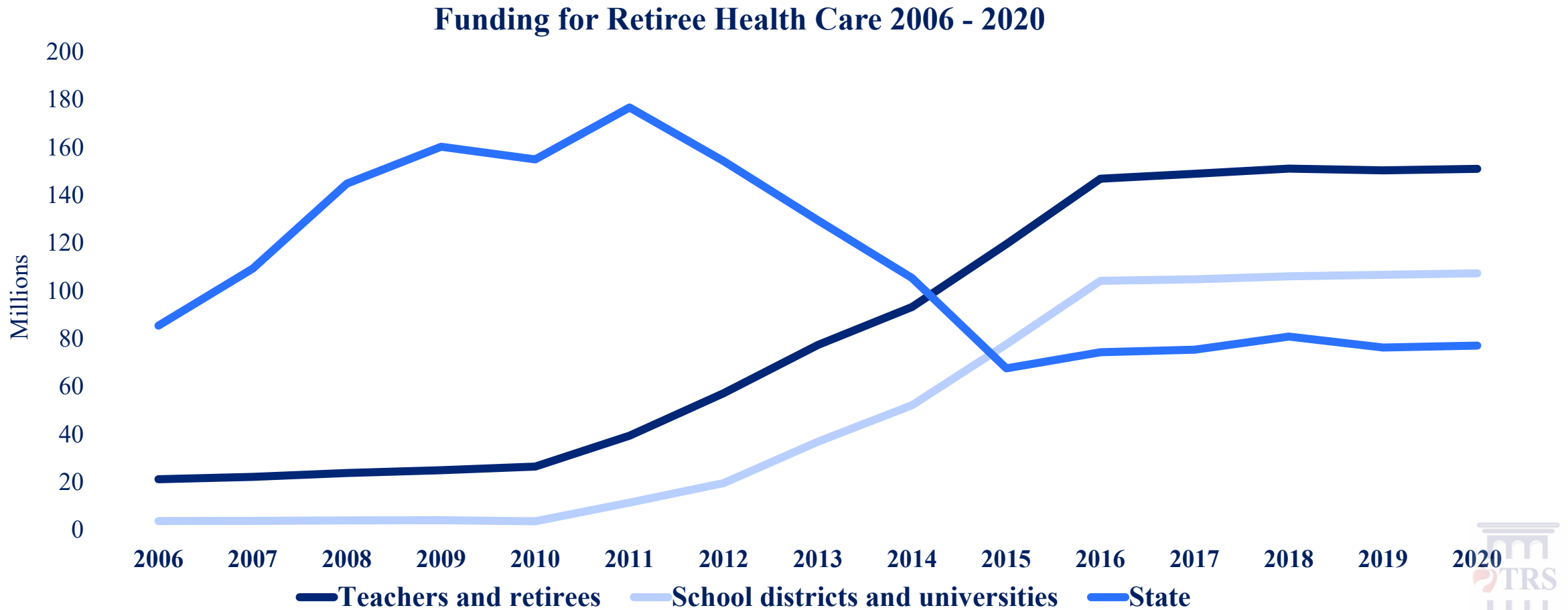
Prefunds Benefits

In 2010, board spearheaded Shared Responsibility passage to fund retiree health insurance, lowering state's cost from \$170 million in 2010 to \$70 million in 2020.

With implementation of Shared Responsibility and federal subsidy solutions, the state's \$6.2 billion share of unfunded liability fell to \$1.2 billion.

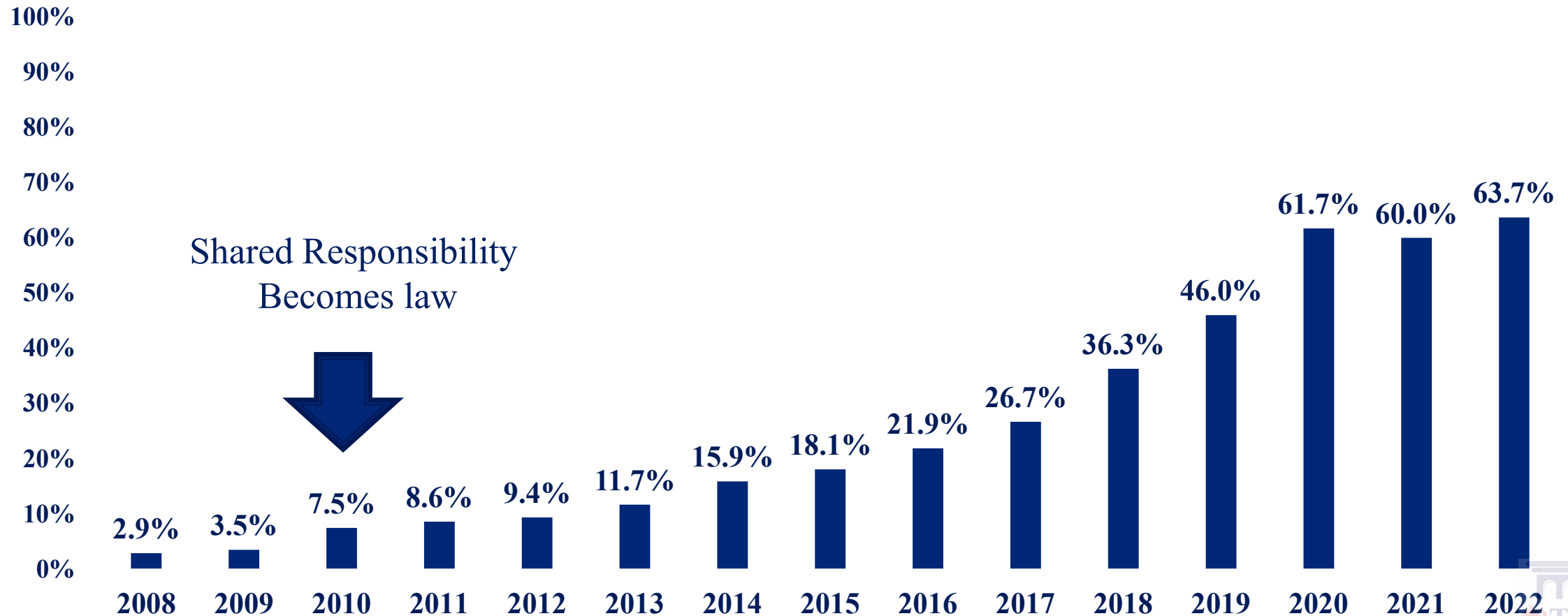
Shared Responsibility

How the Cost Has Been Shared



TRS Health Insurance

Funded Status



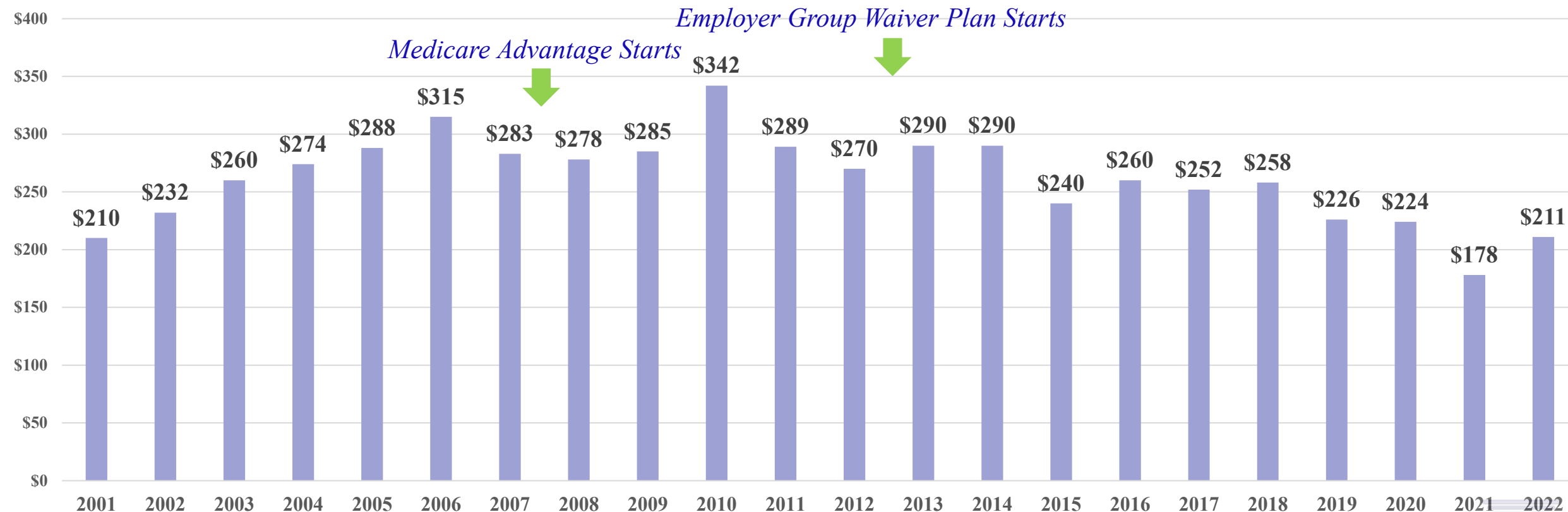
Funding Decisions

2022-24 Biennial Budget

- Means eight straight years of full or nearly full annuity funding
- More than \$1.36 billion to meet actuarially required contribution for annuities
 - About \$900 million more to TRS in salary contributions from education budget
- \$149 million for state statutory contribution for under-65 health insurance under Shared Responsibility
- \$479.2 million to pay off liabilities for certain previously awarded benefits that had been amortized over several years
- \$78 million up front for sick leave-related annuity liabilities projected to occur from retirements in next two years

TRS Health Policy Education

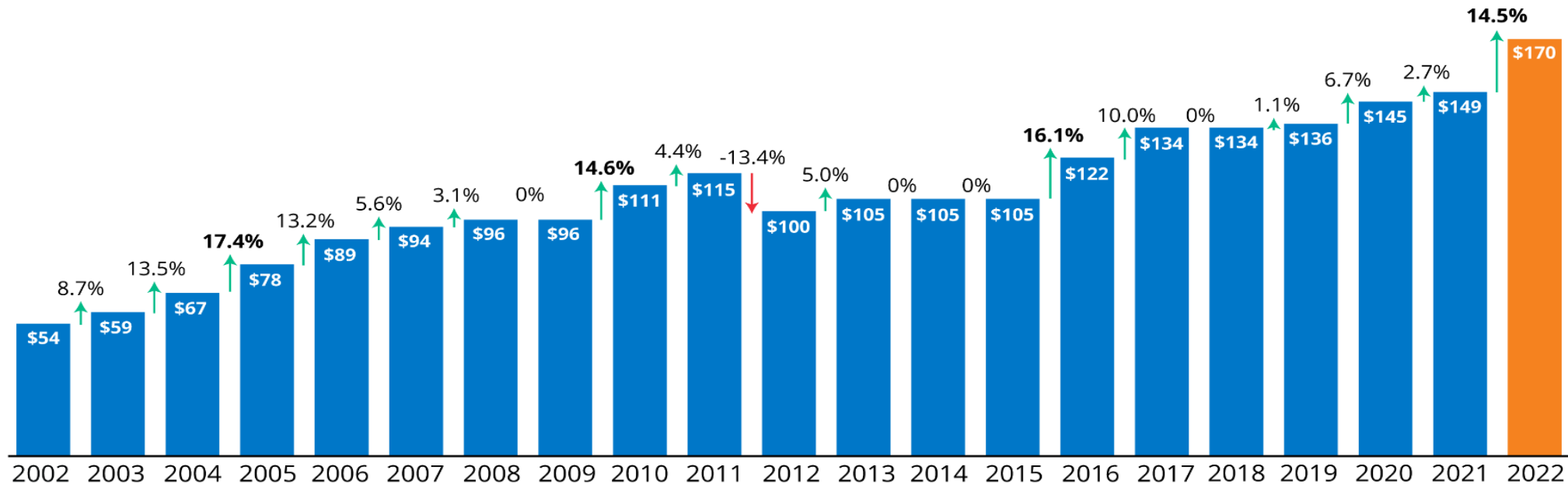




Premiums Held Almost Constant For 20 Years

The Medicare Part B Premium Rose to \$170.10 per Month in 2022

14.5% Increase is Among the Largest in Program History



NOTE: Monthly premiums are rounded in this exhibit.

SOURCE: KFF analysis of the 2021 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds and CMS, "Medicare Program; Medicare Part B Monthly Actuarial Rates, Premium Rates, and Annual Deductible Beginning January 1, 2022," 86 Federal Register 64205, November 17, 2021.

- Based on recent and projected prescription costs increases
- New formulary already used by University of Kentucky retirees
- The new formulary offers medication for everything that the old formulary did.



Register at www.UHCRetiree.com/trs to see these features available to you or call 844-518-5877 for more information.



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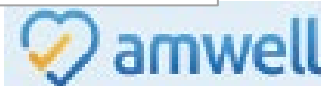
Gift cards for completing certain activities



Weight loss program



Post-hospitalization meals delivered



Virtual visits with doctor



Fitness program





Virtual Education Center

Teachers' Retirement System of the State of Kentucky

[Home](#)[How the Plan Works](#)[HouseCalls](#)[Health & Wellness](#)[Virtual Visits/NurseLine](#)[Clinical Resources Support](#)[Your Plan](#)

Explore your plan benefits virtually to get the most of them in real life

Welcome to the Virtual Education Center, created to make caring for yourself easier. Because it's not always possible to share information face to face, we've brought our resources together in one place, at your fingertips, wherever and whenever you need it.



<https://uhcvirtualretiree.com/trs/>

VISA Gift Card
HouseCalls in-home
assessment reward remains
a VISA reward card of \$50



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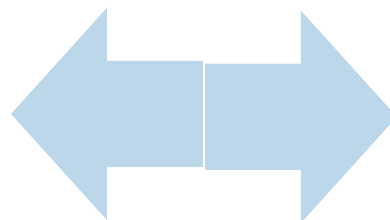


TRS Solution: Personalized Medicine Partnership

CORIELL
LIFE SCIENCES

This personalized medicine program uses DNA testing to help you find out if your medications work for you.

You
Your Doctor
Your Pharmacist



MEHP enrollees can contact Coriell at 888-454-9024 or online at www.coriell.com/trs to request a free DNA kit. Non-Medicare KEHP enrollees are eligible for the DNA kit at a current cost of \$360. Pay through credit card or your CDHP HRA.

Personalized Medicine

Why It Works

- Helps avoid taking ineffective medications that even could be fatal
- Saves money for retirees and their insurance trust
- Uses DNA testing to help doctors making treatment decisions
- Results help make sure medications are beneficial from the start
- Avoids traditional trial-and-error process without DNA information



Journal of Precision Medicine | Volume 7 | Issue 2 | June 2021

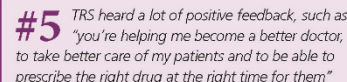
thejournalofprecisionmedicine.com

48 The Journal of Precision Medicine

#4 *Communicating with members early and consistently contributed to the program's successful launch. The overarching message: TRS is making smarter use of the health care dollar through the program because taking medications that do not work is bad for the member's health and for the TRS health insurance fund.*

The process of "test, report, consult" avoids the possibly fatal trial-and-error type of prescribing.

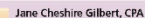
Despite these initial results, PGx still faces resistance – in no small part from the



To implement PGx, engage your medical plan carrier and your pharmacy benefits manager (PBM) in this conversation. PBMs will see the value in lives saved, improved health outcomes and reduced costs; PBMs will come to recognize the value of PGx as a tool to optimize medications through comprehensive medication management (CMM).²⁴ Introducing a pharmacist who works

TRs continues to educate Medicare Advantage carriers and PBMs of the need for PGx inside these federal programs. Including PGx in Medicare Advantage and Medicare Part D would help continue to control the TRS Medicare Eligible Health Plan premium. The 2021 monthly premium is \$178, down \$54 (not adjusted for inflation) from 20 years ago due to increased federal revenues.

The story will get better because this wellness and savings program is a lifetime benefit for each Kentucky retired teacher who volunteered to provide a DNA sample. Testing results that already have paid dividends for the retirees and their health plan can continue to inform every aspect of their pharmaceutical treatment for the rest of their lives. [PNC](#)

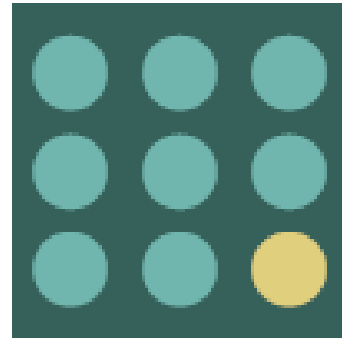


Jane Chesing Gilbert, CPA
Director of Public Health Care
for the Teachers' Retirement
System of the State of Kentucky

Jane has served TRS retirees since April 2007. She manages over 100 active health plans serving 45,000 members. She also serves as a leader in the area of health insurance cost containment, project management, risk management and underwriting. Her career includes positions in management and directorship positions for a Louisville, Kentucky law firm and a cost containment company. The Railways Company, from 1989 through 1997. Prior to 1989, she earned her accounting degree for a major in C.A.B. Gilbert earned a bachelor's degree in accounting from Bellemore University in Louisville, Kentucky and is a certified public accountant and a Certified Retirement Benefits administrator. She has served on the board of the State and Local Government Benefits Association and is a member of the Public Sector Health Equity Roundtable.

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6. *Pharmacist's Handbook: Comprehensive Medication Management*. In: *Second-Book-Case: A Handbook for the Medical Staff*. American College of Clinical Pharmacy. 2008. <http://www.accp.org/Handbook/second-book-case-a-handbook-for-the-medical-staff.aspx>
7. *Pharmacist's Handbook: Comprehensive Medication Management*. In: *Third-Book-Case: A Handbook for the Medical Staff*. American College of Clinical Pharmacy. 2008. <http://www.accp.org/Handbook/third-book-case-a-handbook-for-the-medical-staff.aspx>
8. *Pharmacist's Handbook: Comprehensive Medication Management*. In: *Fourth-Book-Case: A Handbook for the Medical Staff*. American College of Clinical Pharmacy. 2008. <http://www.accp.org/Handbook/fourth-book-case-a-handbook-for-the-medical-staff.aspx>
9. *Pharmacist's Handbook: Comprehensive Medication Management*. In: *Fifth-Book-Case: A Handbook for the Medical Staff*. American College of Clinical Pharmacy. 2008. <http://www.accp.org/Handbook/fifth-book-case-a-handbook-for-the-medical-staff.aspx>

Peer-Reviewed Initial Results Receive Attention



Journal of
*Personalized
Medicine*

- 66% had genetic risks detected in a current medication
- 14.9% reduction in inpatient visits
- 6.8% reduction in emergency room visits
- \$37 million savings in direct medical charges over 32 months

Personalized Medicine

One Retiree's Story

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– Member, Teachers' Retirement System of the State of Kentucky

KEHP

MEHP

Personalized Medicine

How to Sign Up

MEHP

MEHP enrollees can contact Coriell at 888-454-9024 or www.coriell.com/trs to request free DNA kit.

KEHP

Non-Medicare KEHP enrollees can contact Coriell and use HRA funds to pay the \$360 cost.

CORIELL
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A GOVERNMENTAL PURCHASING COLLABORATIVE



Personalized Medicine

Reaching Further After Success of Pharmacogenomics



Pharmacogenomics
Fall 2017



Breast Cancer Index
2021



Looking at other personalized
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2022

If Some Old Quarterback Says You Need More Coverage ...

Tell Joe (and others like him),
“No!”

If you are enrolled in the TRS Medicare Eligible Health Plan (MEHP), enrolling in another Medicare Advantage plan would “dynamite” your TRS MEHP coverage.





LiveHealth
ONLINE

Video chat
with doctors
and therapists

rethink
BENEFITS

Support for
care of kids
with learning
or behavior
challenges

SmartShopper

Cash for using cost-
effective options for
certain procedures.

- Diabetes Prevention Program (DPP)
- Mental health and stress management
- 24/7 Nurse Line
- Substance Use Disorder Support Line
- Tobacco cessation
- Weight management

More information can be found at kehpn.ky.gov



- Living Well KEHP program is administered by WebMD in 2022.
- Earn up to \$200 in rewards for well-being activities that encourage healthy behaviors, as the member.
- Spouses are eligible this year and can earn up to \$100

Note: Dependents are NOT eligible for 2022.

You will need to register for your new account on WebMD



- New program year began on Jan. 1, 2022.
- Online portal.
- Mobile app.
- Health Assessment.
- Many options for device and app connectivity.

- Dates to complete promise are Jan. 1 - July 1, 2022.
- Complete the online Health Assessment or biometric screening.
- If completed, you will receive the \$40 per month premium discount in 2023.

NOTE: Both spouses must complete promise if on a cross-reference plan.

More information can be found at LivingWell.ky.gov

HealthEquity Healthcare Reimbursement Arrangement (HRA) helps reduce costs; remaining funds carry over to next year if remaining in a CDHP plan.



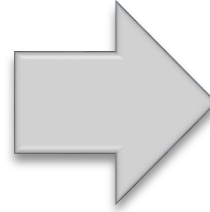
Pay for eligible healthcare expenses such as:

- Medical and pharmacy
- Deductibles
- Copayments and coinsurance
- Some over-the-counter products
- Certain dental and vision fees (does not apply to deductible or maximum out of pocket)

If you're on a CDHP plan and don't have a HealthEquity card, or to determine eligible expenses, call 877-430-5519 or visit [wageworks.com](https://www.wageworks.com).

- If you are enrolled in coverage through TRS and turning 65 in 2022, you will receive a Turning 65 email several months before your birth month.
- You still need to enroll in KEHP to be covered until you become eligible for Medicare (unless your birthday is in January or Feb. 1).
- Do not include your Medicare-eligible spouse or dependent child on your KEHP enrollment if they already are covered in TRS MEHP.

Before moving from KEHP to Medicare



*Web*MD[®]

HealthEquity[®]

**Use or lose your
bucks before KEHP
coverage ends!**

**Funds in Consumer Driven
Health Plan (CDHP) HRA must
be used before moving to
MEHP**

Free counseling with live pharmacists

Know Your Rx Coalition *Pharm-Assist*

Hours: Monday to Friday, 8 a.m. to 6 p.m. ET

Phone: 855-218-5979

Email: KYRx@uky.edu

Website: www.KYRx.org



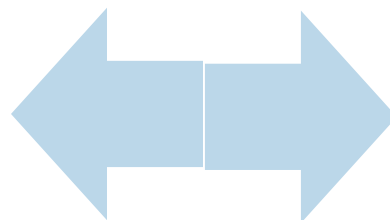


TRS Solution: Personalized Medicine Partnership

CORIELL
LIFE SCIENCES

This personalized medicine program uses DNA testing to help you find out if your medications work for you.

You
Your Doctor
Your Pharmacist



MEHP enrollees can contact Coriell at 888-454-9024 or online at www.coriell.com/trs to request a free DNA kit. Non-Medicare KEHP enrollees are eligible for the DNA kit at a current cost of \$360. Pay through credit card or your CDHP HRA.

How it Can Help

Your DNA matters

Using DNA to see what drugs will be safe and effective — Pharmacogenomics

Steps

Collect genetic information

Empower pharmacists

Communicate the Medication Action Plan

Register for Pathway

You must have a current email on file with TRS to register

Go to <https://mss.trs.ky.gov/>

Click Register



Enter your TRS ID, last 4 Social Security number digits and click Register

Follow additional instructions to complete registration

Did you know TRS retirees can use Pathway to:

- Review your retirement account
- Review your pension check
- Update your address, tax withholding, etc.
- Enroll in health insurance (if eligible)
- Manage health insurance
 - Enroll in MEHP when gaining Medicare
 - Enroll/Terminate with a qualifying event



**As a retiree, you can use our
Pathway for insurance
enrollment.**



What applications can be completed through MSS?

- Turning 65
- Qualifying Event

What cannot?

- KEHP open enrollment uses KHRIS.
- MEHP open enrollment remains passive.

Enrolling Online

No need to mail or fax paper applications when you can enroll online through Pathway online account access site.

Need instructions?

Information Center staff can walk you through the steps of completing an insurance application using Pathway outside of open enrollment.

Videos and instructions are on our website.

KEHP open enrollments are still done through the KHRIS and instructions are available on TRS website.

TRS News & Information



<https://trs.ky.gov>



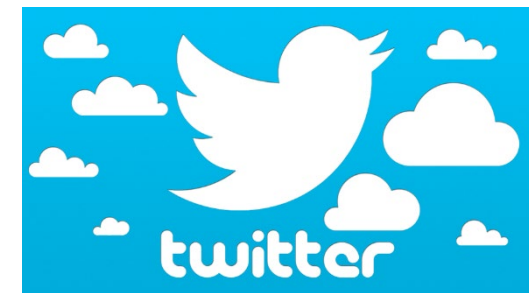
facebook.com/KyTeachersRS



TEACHERS' RETIREMENT SYSTEM
PATHWAY



<https://mss.trs.ky.gov/>



[@KyTeachersRS](https://twitter.com/KyTeachersRS)



Our Members Come First!

800-618-1687

**8 a.m. – 5 p.m. ET
Monday – Friday**

info@trs.ky.gov
<https://trs.ky.gov>

Protecting & Preserving Teachers' Retirement Benefits

Food for Thought

Bonus Slides Discussed but Not Distributed



TRS of Kentucky Trustee Workshop

November 21, 2022

All data and charts as at 9/30/2022 unless otherwise stated

The opinions referenced are sourced from Aon as of the date of publication and are subject to change due to changes in the market or economic conditions and may not necessarily come to pass. Information contained herein is for informational purposes only and should not be considered investment advice. **Past performance is not a guarantee of future results.**

Agenda

- Capital Market Assumptions
 - Background
 - TRS Assumption and Peer Asset Allocation Comparison
- Market Review and Outlook
- Appendix
 - Asset Class Capital Market Assumption Methodology
 - CMA Back Test
 - Return, volatility and correlation assumptions

Capital Market Assumptions

- Background

Capital Market Assumptions

- What are they?
- Aon's asset class return, volatility and correlation assumptions
- Long-term (10-year and 30-year), forward-looking assumptions
 - These are separate from our Medium Term views
- Best estimates (50/50 probability of better or worse long-term results than expected)
- Market returns: no active management value added or fees (other than hedge funds and private equity, where traditional passive investments are not available)
- Produced quarterly by Global Asset Allocation Team

Coverage

Fixed Income	Equities	Alternatives	Macro Variables
Nominal Government Bonds	All major regions covered including Emerging Markets	Hedge Funds (7 Single Strategies; Fund of Hedge Funds; Broad Hedge Funds)	Inflation
Inflation-linked Government Bonds	U.S. Large and Small Cap	Real Estate (Total Market, Core and U.S. REITs)	Currency Movements
Corporate Bonds	Non-U.S. Developed and Emerging Markets	Private Equity	
High Yield Debt	Global Equity	Infrastructure	
Bank Loans	Equity Insurance Risk Premium (High Beta)	Commodities	
Emerging Market Debt (Hard, Local, Corporate)		Equity Insurance Risk Premium (Low Beta)	
Multi-Asset Credit			
Private Debt (Direct Lending)			

- Continually expanding coverage
- Equities and Bond assumptions formed at regional level for the U.S., U.K., Europe ex-U.K., Japan, Canada, Australia and Switzerland. Real estate assumptions for U.S., U.K., Canada and Europe

Capital Market and TRS Assumptions

- Below illustrates the changes in Aon's capital market assumptions from last year 2Q 2021.

	Policy	10 Year			30 Year		
		Q3 2022	Q2 2021	Change ¹	Q3 2022	Q2 2021	Change ¹
U.S. Large Cap Equity	37.4%	7.3%	5.8%	+1.5%	7.3%	6.4%	+0.9%
U.S. Small Cap Equity	2.6%	7.5%	6.0%	+1.5%	7.8%	6.9%	+0.9%
Developed Int'l Equity	16.5%	7.6%	6.6%	+1.0%	7.7%	7.2%	+0.5%
Emerging Markets Equity	5.5%	8.0%	7.1%	+0.9%	8.2%	7.4%	+0.8%
Inv Grade Fixed Income	15.0%	4.7%	2.2%	+2.5%	4.1%	2.8%	+1.3%
High Yield	4.5%	6.6%	3.5%	+3.1%	6.1%	4.5%	+1.6%
Bank Loans	2.5%	6.6%	4.3%	+2.3%	5.9%	5.3%	+0.6%
Real Estate ²	7.0%	5.7%	5.6%	+0.1%	5.3%	5.6%	-0.3%
Private Equity	7.0%	9.9%	8.3%	+1.6%	10.4%	8.9%	+1.5%
Cash	2.0%	4.3%	2.2%	+2.1%	3.9%	2.7%	+1.2%
Inflation	---	2.5%	2.1%	+0.4%	2.4%	2.1%	+0.3%
TRS Total Assumption	100.0%	7.5%	6.0%	+1.5%	7.4%	6.6%	+0.8%

¹ Change reflects difference between Q3 2022 assumption and Q2 2021 assumption

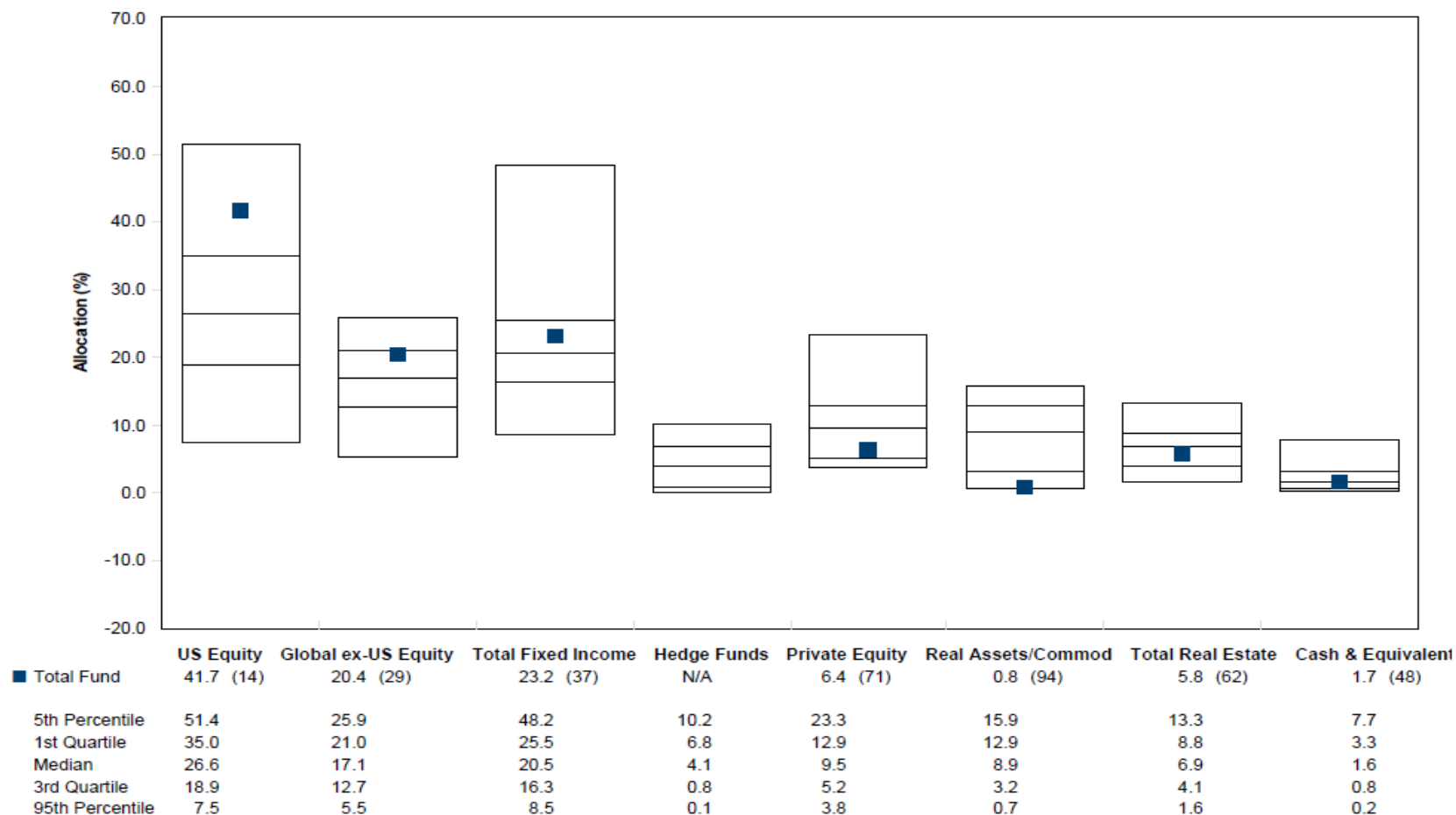
² 75% Core Real Estate / 25% Non-Core Real Estate

Peer Comparison – Asset Allocation

As of September 30, 2021

Plan Sponsor TF Asset Allocation

All Public Plans > \$1B-Total Fund



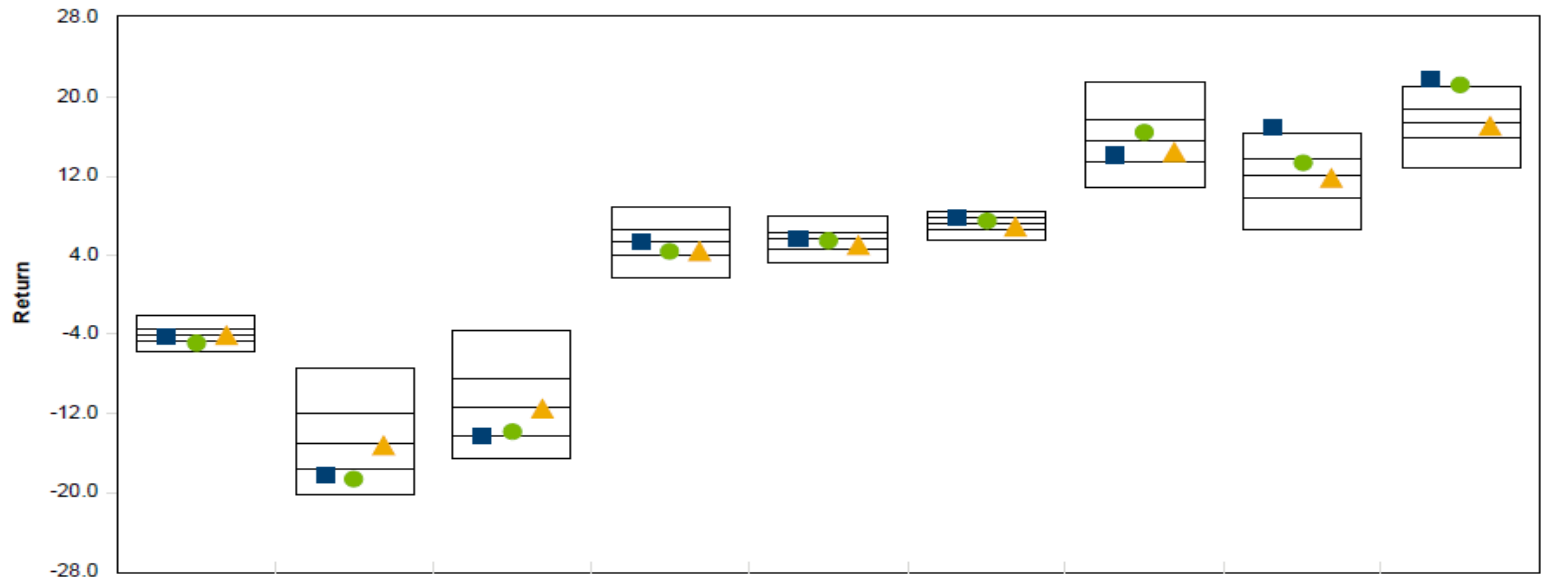
Parentheses contain percentile rankings.

Peer Comparison – Pension Returns

As of September 30, 2022

Plan Sponsor Peer Group Analysis

All Public Plans > \$1B-Total Fund

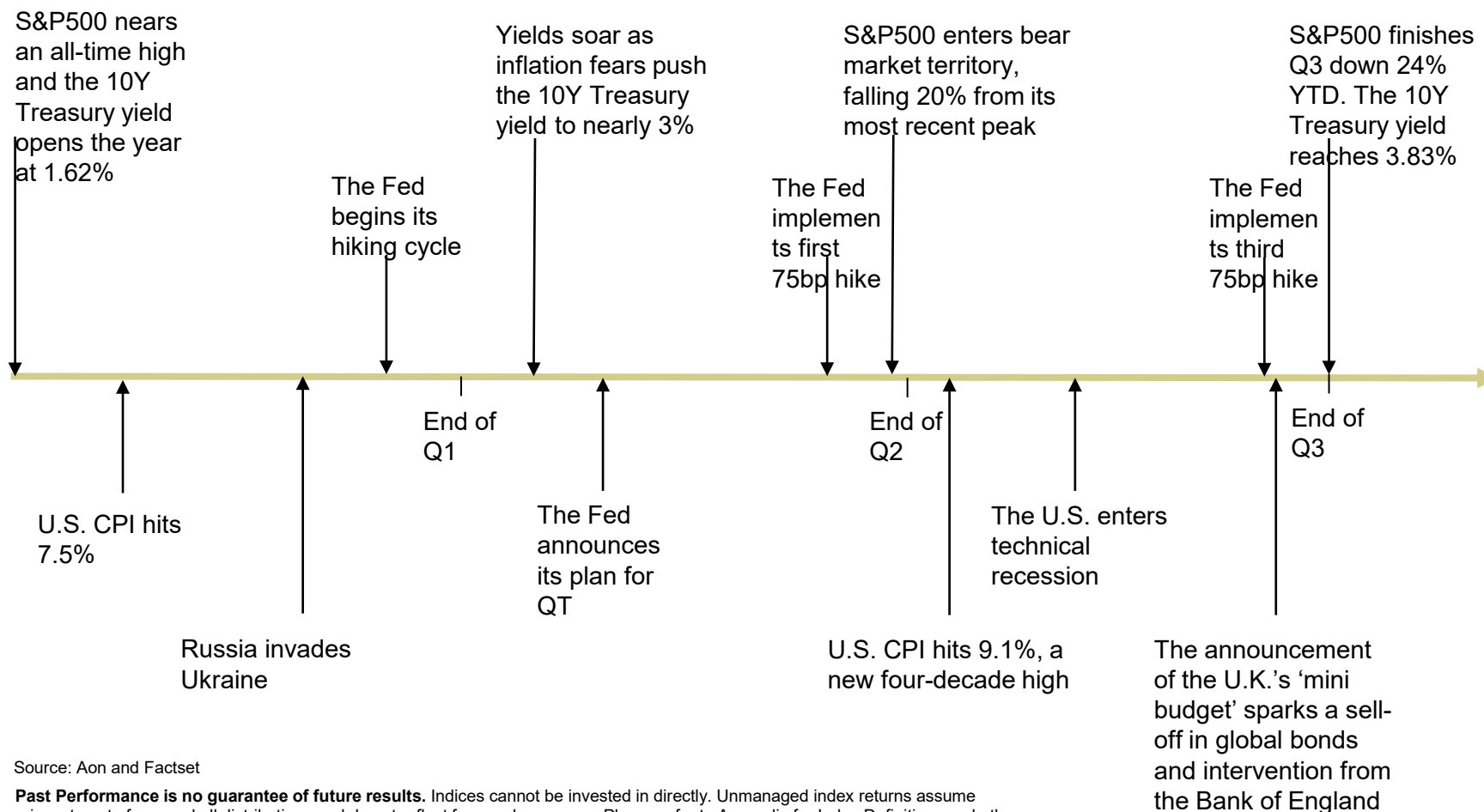


	1 Quarter	Year To Date	1 Year	3 Years	5 Years	10 Years	2021	2020	2019
■ Total Fund	-4.1823 (51)	-18.1661 (79)	-14.2380 (74)	5.2940 (50)	5.7060 (46)	7.8411 (22)	14.1843 (67)	16.8530 (3)	21.9055 (2)
● Policy Benchmark	-4.8086 (76)	-18.5450 (84)	-13.8228 (72)	4.4626 (64)	5.4253 (54)	7.4408 (38)	16.4971 (42)	13.3118 (32)	21.1420 (5)
▲ Public Fund Index	-4.1589 (50)	-15.2502 (52)	-11.5650 (52)	4.3844 (65)	5.0020 (67)	6.8131 (69)	14.3947 (63)	11.7684 (54)	17.0970 (56)
5th Percentile	-2.0295	-7.2692	-3.6647	8.9075	7.8771	8.4615	21.5280	16.2391	21.1125
1st Quartile	-3.5021	-11.9742	-8.4077	6.5654	6.3003	7.7323	17.7066	13.7751	18.6914
Median	-4.1589	-15.0626	-11.3438	5.2921	5.5816	7.1680	15.5280	12.0595	17.3013
3rd Quartile	-4.7574	-17.5865	-14.3347	3.9160	4.5984	6.4849	13.4347	9.8338	15.7654
95th Percentile	-5.8514	-20.2071	-16.6196	1.8132	3.2870	5.4189	10.8589	6.5852	12.8821

Population 133 128 126 124 123 118 213 238 232
 Parentheses contain percentile rankings.

Market Update and Key Trends

Market Trends – 2022 In Review

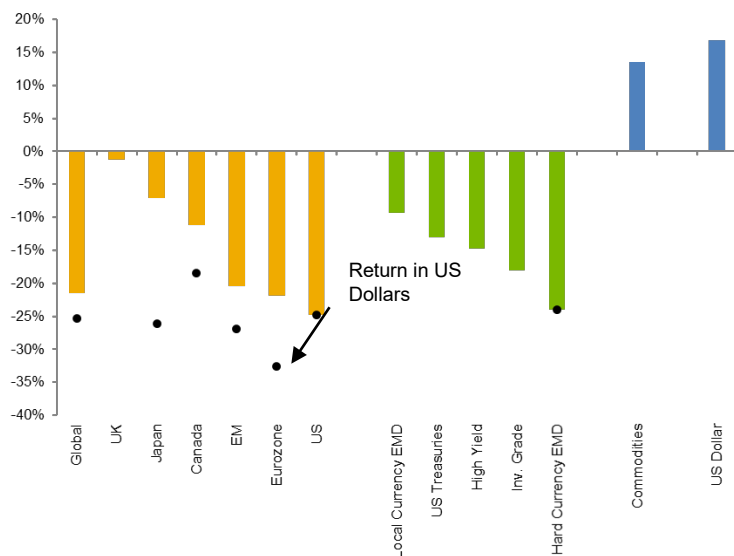


Source: Aon and Factset

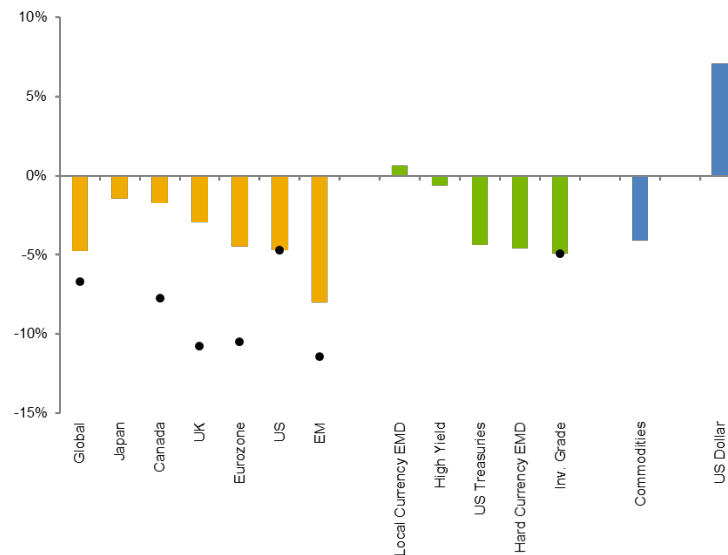
Past Performance is no guarantee of future results. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees and expenses. Please refer to Appendix for Index Definitions and other General Disclosures.

Market Returns

2022 Year-to-Date



Third Quarter 2022

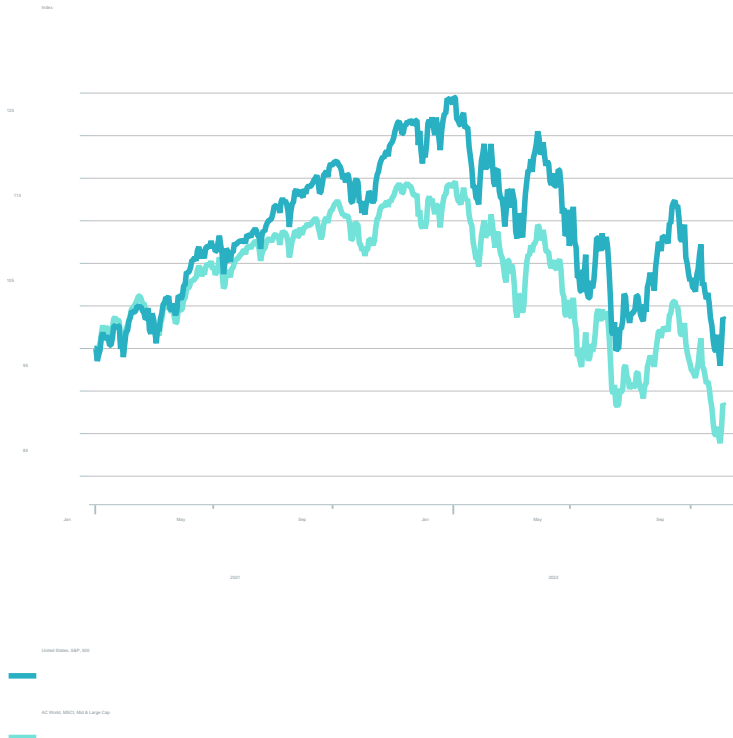


Source: Factset

Past Performance is no guarantee of future results. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees and expenses. Please refer to Appendix for Index Definitions and other General Disclosures.

The State of Play - Markets

Equity Markets



Source: Macrobond

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10-Year US Treasury Yield



Market Outlook

Key Questions for Markets



- Has the Fed tightened enough?



- Are we in a recession?
If not, are we heading for a recession?

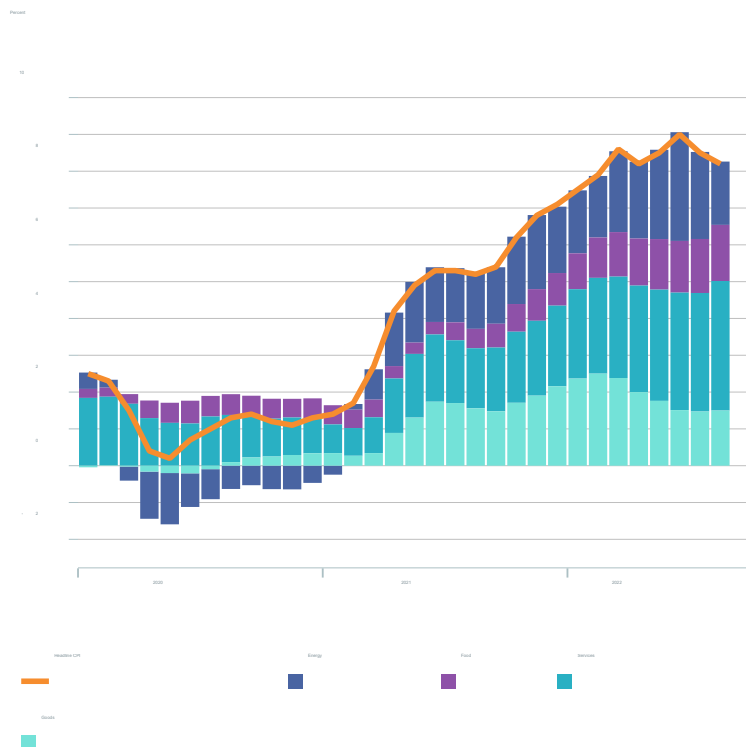


- Do valuations look attractive given this year's sell-off across conventional asset classes?

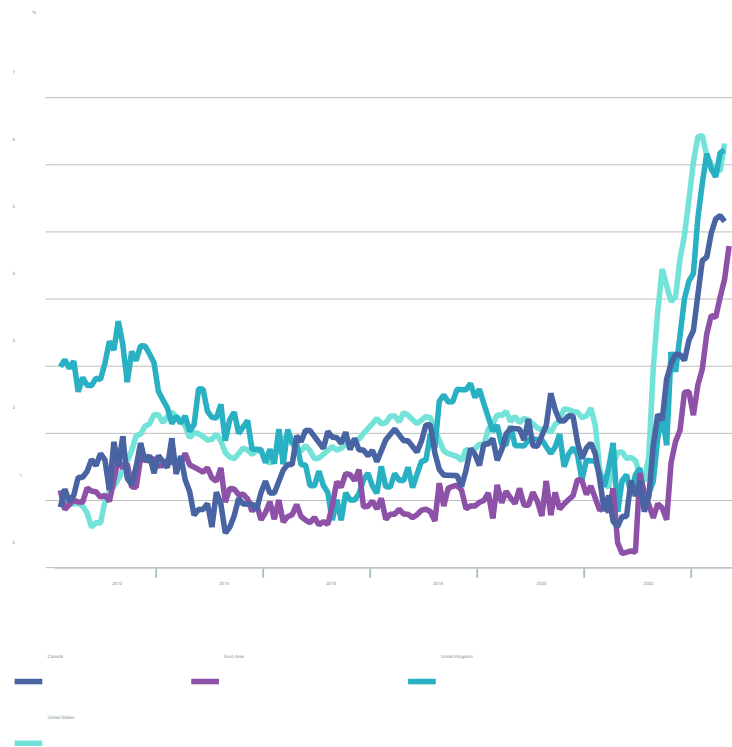
Has inflation peaked?

Inflation may have peaked but appears to be sticky

CPI breakdown



Core CPI across developed economies



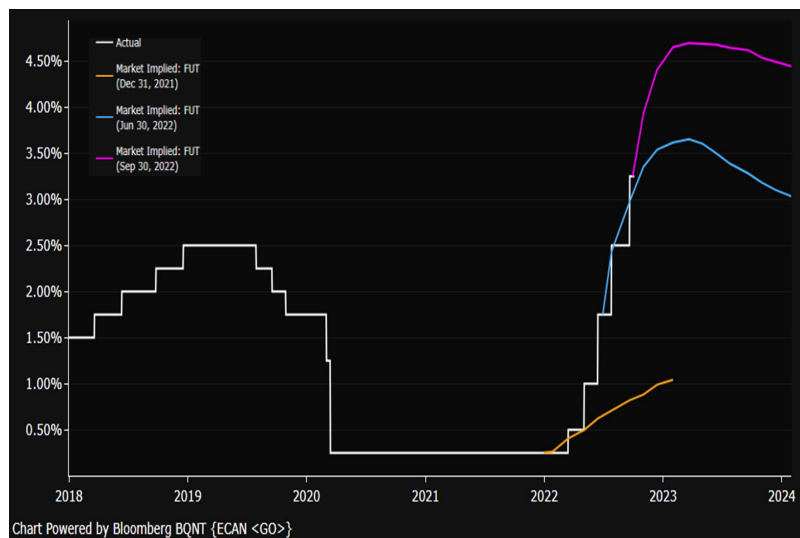
Sources: Macrobond, Aon

Past Performance is no guarantee of future results. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees and expenses. Please refer to Appendix for Index Definitions and other General Disclosures.

Rate expectations have increased sharply

Meanwhile, inflation expectations have collapsed

Fed Funds Rates and Futures pricing



5-Year Breakeven inflation



Sources: Macrobond, Bloomberg, Aon

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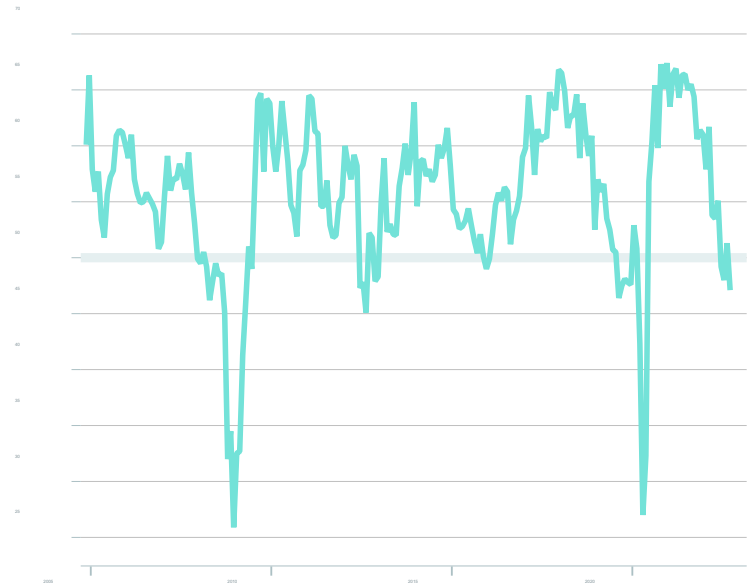
The economy appears to be cooling

Consumers and the labor market remain robust, but there are warning signs

Job Openings



New Orders



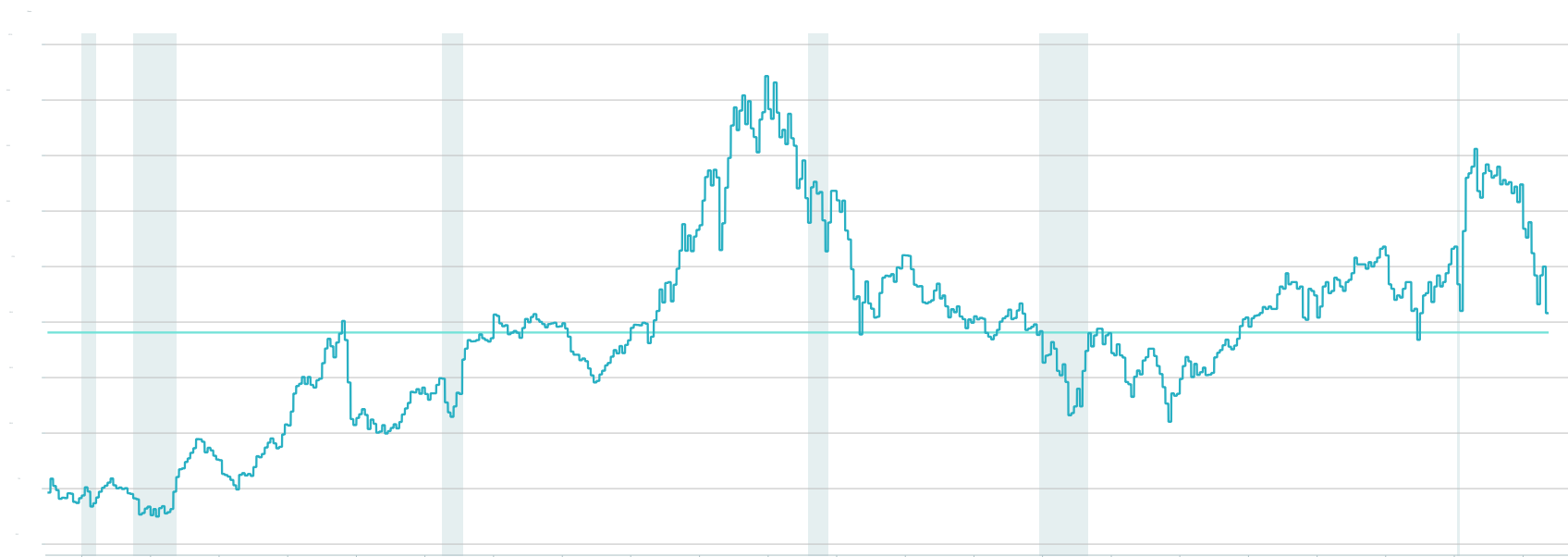
Sources: Macrobond, Aon

Past Performance is no guarantee of future results. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees and expenses. Please refer to Appendix for Index Definitions and other General Disclosures.

Are Valuations More Attractive?

Equities are better value but not cheap yet

S&P 500 12-month Forward PE Ratio and Recessions



Sources: Macrobond, Aon

Past Performance is no guarantee of future results. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees and expenses. Please refer to Appendix for Index Definitions and other General Disclosures.

Investment Grade Corporate Yields Look Attractive

Investment grade corporate yields are at levels not seen in more than a decade



Past Performance is no guarantee of future results. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees and expenses. Please refer to Appendix for Index Definitions and other General Disclosures.

What Should You be Doing?



What Should You be Doing?

1

More resilient asset classes such as real assets and investment-grade credit may offer value. Higher total yields have brought back value in some areas of credit, especially in higher quality investment grade bonds. However, economic conditions will remain difficult and we recommend gradual position-building only.

2

In the short term, we remain cautious about asset classes that are correlated with changes in the economic cycle and rates, such as equities (relative to your long-term target) Significant falls in equities have improved valuations but further downside risks remain and we remain cautious. We do not yet recommend increasing allocations above targets.

3

This is a good time to see which of diversifiers in a portfolio might be expected to perform well when equities and bonds become correlated

Diversification does not ensure a profit nor does it protect against loss of principal. Diversification among investment options and asset classes may help to reduce overall volatility.

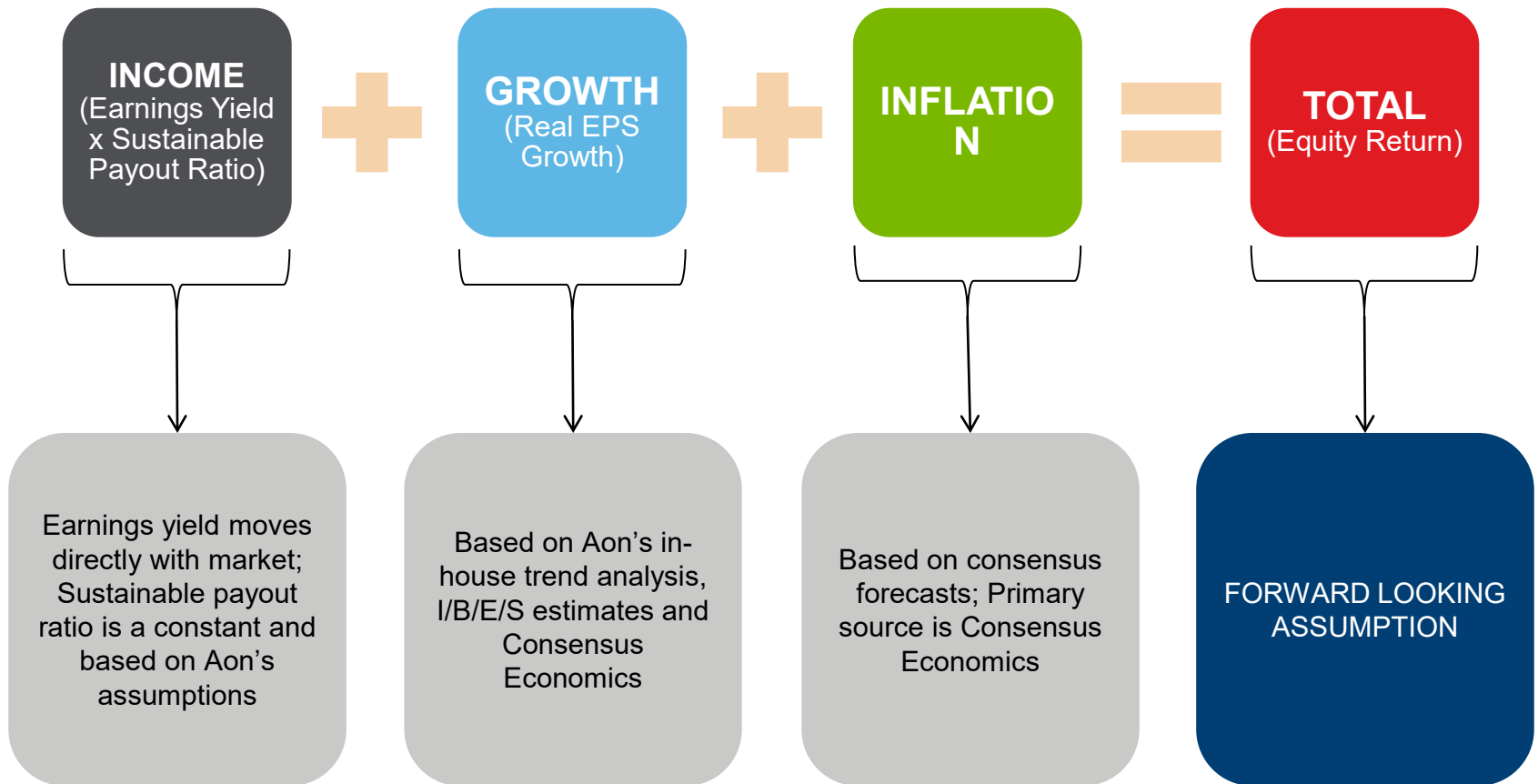
Medium Term Views represents AIUSA's outlooks on capital markets and economies over the next several years. These views are constructed based on our framework of analyzing fundamental, valuation and near-term drivers of capital markets. The opinions referenced are as of the date of publication and are subject to change due to changes in the market or economic conditions and may not necessarily come to pass.

- Asset Class Methodology and Current Assumptions

Inflation

- Common approach is to use market implied break-even inflation rates (the difference between yields on nominal and inflation-linked government bonds of equivalent maturity or duration)
- We do not believe that Break-Even Inflation is a good estimator of future inflation
 - Break-even inflation = Expected Inflation + Inflation Risk Premium (IRP)
 - Inflation is a risk for many investors and therefore a premium is demanded to protect against it. Therefore, we would expect $IRP > 0$ in the long-term
 - Break-even is affected by lots of things unrelated to inflation expectations
- Aon Inflation assumption based on consensus forecasts
- Principal source is Consensus Economics
- Supplement with other sources (e.g., Philadelphia Fed)
- Current 10-year Inflation forecast = 2.5%
- Lower than the level in the previous quarter (6/30/2022)

Equities



Equity Return Assumption

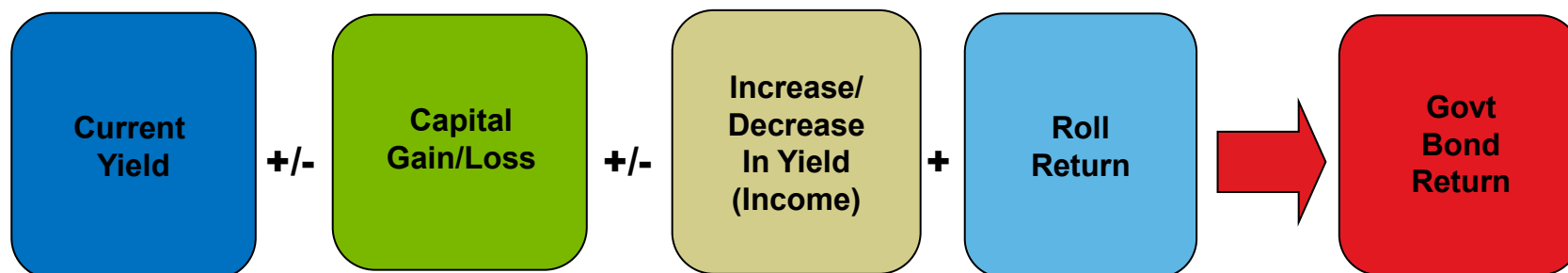
	U.S. ⁽²⁾	Europe ex U.K.	U.K.	Canada	Japan	Switzer- land	Emerging Markets*	Australia	China
Earnings Yield * Sustainable Payout Ratio	3.3%	3.4%	4.4%	3.5%	3.5%	2.8%	3.8%	3.9%	2.1%
Long Term Real Earnings Growth	1.4	1.2	1.3	1.3	0.9	1.2	1.9	1.6	2.7
Near Term Earnings Adjustment	0.0	-0.1	-0.7	-0.4	0.1	0.1	-0.1	-0.5	0.1
Inflation	2.5	2.2	2.5	2.2	1.0	1.0	2.5	2.5	2.1
Methodological Differences ⁽¹⁾	0.1	0.1	0.1	0.1	0.0	0.1	-0.1	0.2	0.1
Valuation Adjustment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Current Nominal Return Assumption (Local Currency)	7.3%	6.8%	7.6%	6.6%	5.6%	5.2%	8.0%*	7.6%	7.2%

* EM in USD

(1) Aon model is a Discounted Cash Flow (DCF) model, not an additive building block model

(2) Represents Large Cap

Government Bonds



- We start from the current yield curve for government bonds
- Using a simulation model, we combine the current yield curve with an assumption on the long-term behaviour of the yield curve to derive how yields are expected to evolve over time
 - Dominant driver of government returns is what is priced into the yield curve
- Total return assumptions are then derived from the forward looking yield curves
- A similar methodology is followed for inflation-linked bonds but based on real yields and incorporating our inflation assumptions

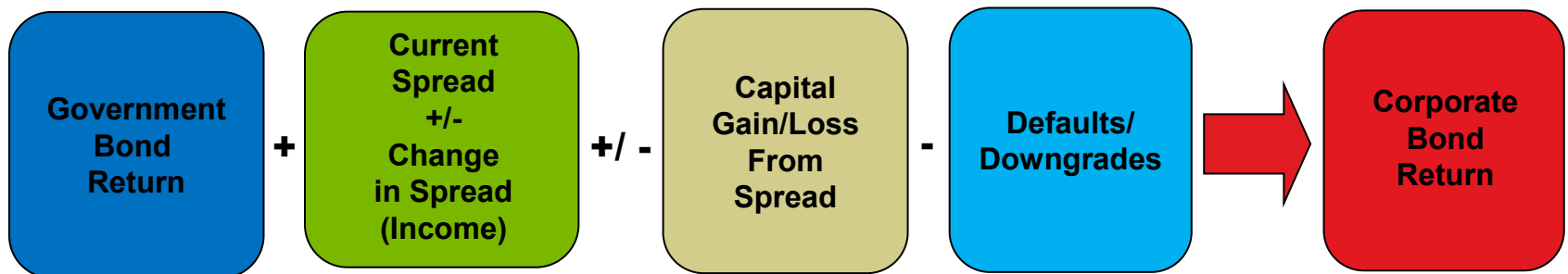
Intermediate Government Bond Return Assumption (5-year Duration)

Return Component*	9/30/2022	
Initial Yield	4.1%	Prevailing market yield
Capital Gain/Loss	0.2%	Projected yield increase results in projected capital losses. Long Duration bonds suffer larger losses than short
Increase/Decrease in Yield (Income)	-0.4%	Projected yield increases leads to ability to reinvest at higher yields in future
Roll Return	0.0%	Roll return on rebalancing has a positive impact on the return assumption
Total 10-Year Return Assumption	3.9%	

* Components do not sum perfectly to the total because they are medians, which are not additive. All figures are rounded.

Corporate Bonds and Aggregate Index

- Corporate bond expected return is made up of three components: Government yield, corporate spread, and expected losses from defaults and downgrades
- All three are modeled using a wide range of simulation scenarios
- We assume that credit risk premiums revert over time from current levels to long-term historical averages
- Expected losses from defaults and downgrades are modeled using a forward-looking probability transition matrix*
- Broad bond market returns are modeled as a combination of government and corporate bonds



* Based partly on historical default rates (Source: Moody's) and partly on Aon's subjective views

Intermediate Corporate Bond Return Assumption (5-year Duration; AA Rated)

Return Component*	9/30/2022	
Intermediate Gov't Bond Return	3.9%	See previous slides
Initial Spread	0.7%	Prevailing spread
Increase/Decrease due to Spread	0.0%	Spreads are assumed to revert to fair value in the long run. (Projected) narrowing/widening of credit spreads results in decline/increase of income
Capital Gain/Loss (from spread)	0.1%	(Projected) narrowing/widening of credit spreads results in projected capital gain/loss
Roll Return	0.4%	When yield curve slopes upward, as bonds approach maturity, yields fall and prices rise. Flatter yield curve reduces this beneficial effect.
Defaults & Downgrades	-0.2%	Expected default and downgrade losses depend on the probability of a bond defaulting or being downgraded, and will vary over time
Total 10-Year Return Assumption	4.9%	

* Components do not sum perfectly to the total because they are medians, which are not additive. All figures are rounded.

Core Fixed Income Return Assumption (5-year Duration)

Return Component*	9/30/2022
Intermediate Gov't Bond Return	3.9%
Initial Spread	0.4%
Increase/Decrease due to Spread	0.0%
Capital Gain/Loss (from spread)	0.1%
Roll Return	0.3%
Defaults & Downgrades	0.0%
Total 10-Year Return Assumption	4.7%

* Components do not sum perfectly to the total because they are medians, which are not additive. All figures are rounded.

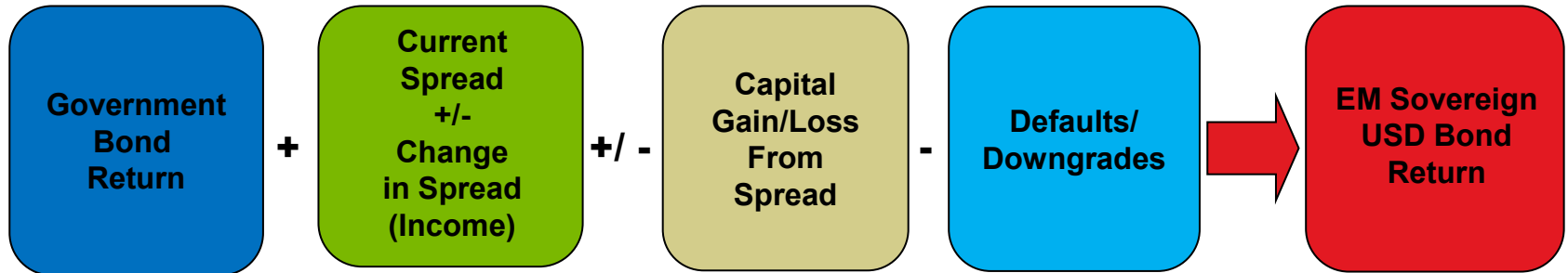
High Yield Debt Return Assumption

- Methodology similar to corporate bonds
- We assume that the long-term average default rate is 4.0%
 - Calculated using annual default rates (for BB, B, CCC-) over 1990-2007 (covering the period when market was well developed but prior to the default spike that took place during the credit crisis)
 - Recovery rate is assumed to be 40%

Expected Return*	9/30/2022
5 Year Treasury Return	3.9%
Spread	5.2%
Default/Downgrade Losses	-2.5%
Total 10-Year Return Assumption	6.6%

* Components do not sum perfectly to the total because they are medians, which are not additive. All figures are rounded.

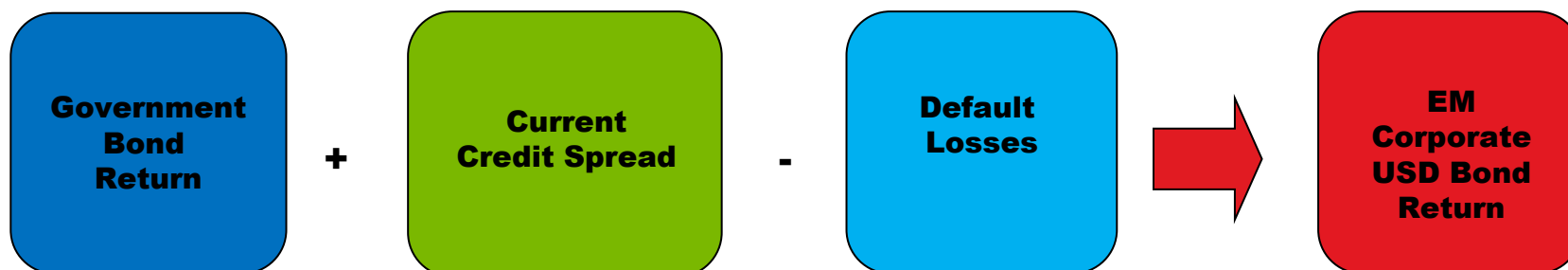
Emerging Market Debt Return Assumption (Sovereign, US Dollar)



- Methodology similar to corporate bonds but take account of specific features:
 - Assume that the default and downgrade risk is equivalent to that of a comparably rated corporate bond

Expected Return	9/30/2022
US 7 Year Treasury Return	4.1%
Spread	5.3
Default Losses and Net Downgrade Losses	-1.5
Total 10-Year Return Assumption	7.9%

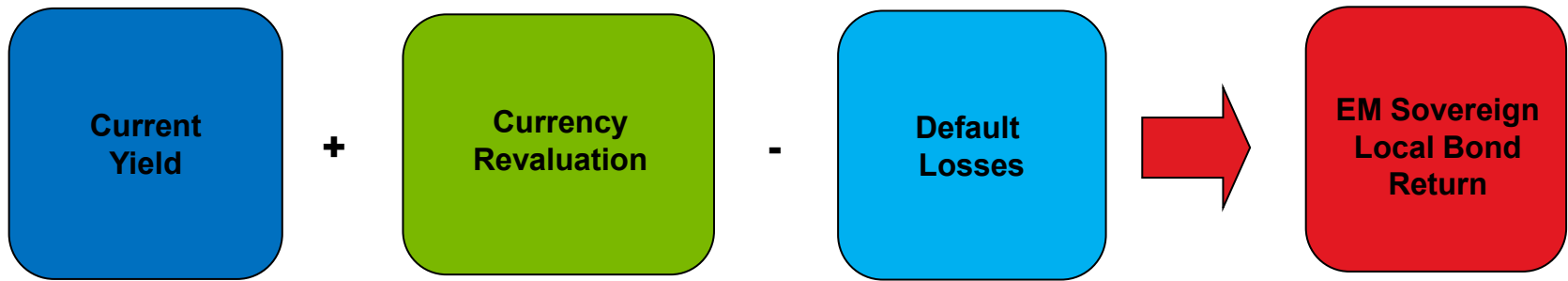
Emerging Market Debt Return Assumption (Corporate, US Dollar)



- Methodology similar to corporate bonds but take account of specific features:
 - Corporate EM debt spans investment grade and high yield – so we do not have to take account of downgrade losses

Expected Return	9/30/2022
US 5 Year Treasury Return	3.9%
Spread	3.7
Default Losses	-1.3
Total 10-Year Return Assumption	6.3%

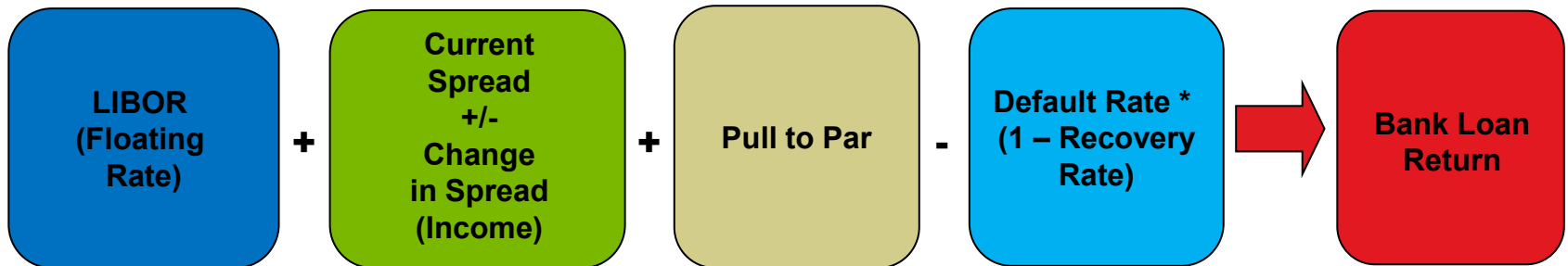
Emerging Market Debt Return Assumption (Sovereign, Local)



- Methodology similar to corporate bonds but take account of specific features:
 - Allow for currency appreciation
 - Local currency EM debt spans investment grade and high yield – so we do not have to take account of downgrade losses

Expected Return	9/30/2022
Yield	7.3%
Currency Revaluation	0.0
Default Losses	-0.7
Total 10-Year Return Assumption	6.6%

Bank Loans

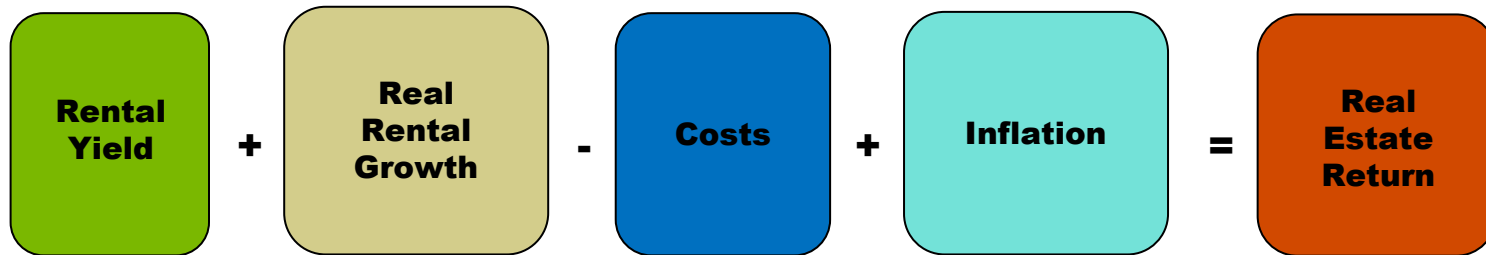


- Bank loans are currently trading close to par. So, the impact of price change (pull to par) is negligible. This is in contrast to extreme credit conditions (e.g., 2007), when bank loans traded substantially away from par

Expected Return	9/30/2022
LIBOR (floor)	4.2%
Spread Over LIBOR	5.1%
Impact of Price Change	0.0%
Default Losses	-2.7%
Total 10-Year Return Assumption	6.6%

Real Estate

- Methodology similar to equities:



- Starting point is the rental yield each market is offering
- Real rental growth incorporates both a short term cyclical and long term aspect
 - We assume rents increase in line with consensus expectations over short term. In the long-term we assume rents grow in line with inflation
- Allow for unavoidable costs of direct real estate investment
- A real return assumption is calculated as the internal rate of return (IRR) of the projected cash flows (discounted cash flow analysis similar to equities)
- Nominal return is then calculated using our expected inflation
- No manager alpha as return assumption represents the real estate property market (and not real estate funds)

Real Estate Return Assumptions

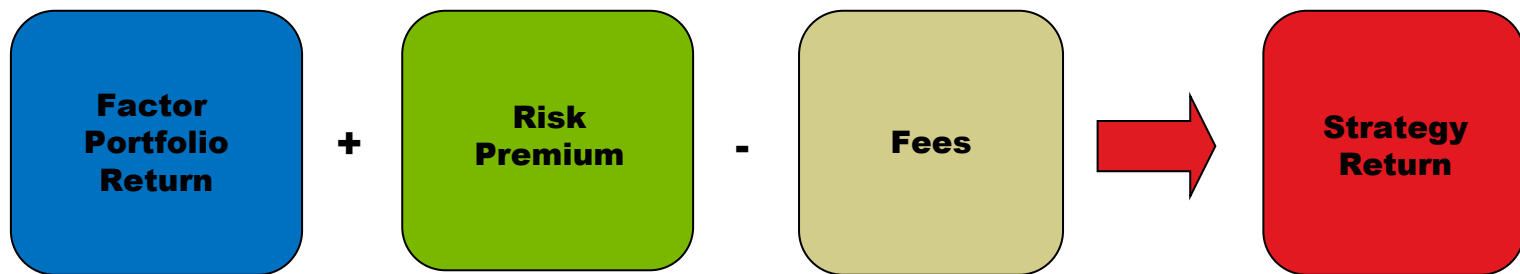
Core (NCREIF - ODCE)	9/30/2022
Rental Yield	3.2%
Real Rental Growth	0.2
Management Costs	-1.0
Inflation	2.5
Unlevered 10-Year Return	4.9%
Leverage 25% (4.9% X 1.25%)	6.1
Cost of Financing (.25 X 5.8%)	-1.4
Alpha	0.4
Other Impacts	0.0
Total 10-Year Return Assumption	5.1%

Non - Core (50% VA/50% Opportunistic)	9/30/2022
Core Real Estate (gross of fees) 6.1% x 2 leverage	12.2%
Cost of Financing	-6.2
Management Costs	-2.0
Alpha	3.0
Other Impacts	0.0
Total 10-Year Return Assumption	7.0%

* Components do not sum perfectly to the total because they are medians, which are not additive. All figures are rounded.

Private Equity

- Return assumptions are formulated for each strategy (sub-sector) based on an analysis of the exposure of each strategy to various market factors with associated risk premiums
- Explicit fee assumptions are subtracted from expected returns; including base and performance-based fee/carry as appropriate
- Strategies include leveraged buyouts (LBOs), venture capital, mezzanine, and distressed investments



- Assumptions for a diversified (broad) private equity portfolio is aggregation of assumptions for these underlying strategies

Private Equity Factor Exposures

Strategy	U.S. Large Cap Equity	U.S. Small Cap Equity	U.S. High Yield
Venture Capital	--	100%	--
LBOs	100%*	--	--
Distressed Debt	50%	--	50%
Mezzanine	25%	--	75%

* 60% leverage is assumed

Private Equity Return Assumption

	Weights	Expected Returns
		9/30/2022
Venture Capital	24%	11.3%
Buyouts (LBOs)	54%	9.6%
Distressed Debt	16%	9.3%
Mezzanine	6%	9.5%
Total Private Equity	100%	9.9%

Hedge Funds

- Granular modeling of hedge funds at the individual hedge fund strategy level. Assumptions exist for 7 single-strategy hedge funds, Fund of Hedge Funds, and Broad Hedge Funds (diversified portfolio of direct hedge funds)
- Unlike most other asset classes, manager skill (alpha) is allowed for. We also make allowance for fees
- Assumptions are developed in a three step process:
 - “Beta” component returns and risks formulated by factor analysis¹ of underlying building blocks of 7 individual hedge fund strategies. For example, equity long/short has net long position in equity markets
 - “Alpha” component returns and risks set with reference to total future volatility levels (of hedge fund strategy) and information ratios² (ratio of excess returns to excess volatility relative to a benchmark)
 - Explicit fee assumptions are subtracted from expected returns; including base and performance-based fee/carry as appropriate

¹ A multivariate regression analysis procedure to identify exposures to different factors. Hedge Fund strategy returns are used as dependent variable and asset class returns are used as the independent variables

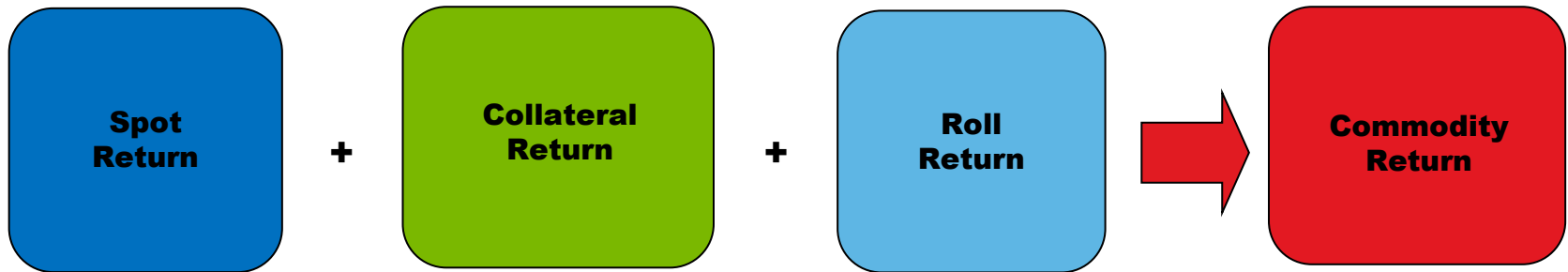
² Incorporates both historical analysis and Aon's forward-looking views of information ratios relative to factor portfolios

Hedge Fund Return Assumption

- Individual strategy returns are then combined in the proportions below to form hedge fund of fund assumptions with adjustments for additional costs associated with fund-of-funds management
- In addition to fund of funds, we also have assumption for Broad Hedge Funds that can be used to model a diversified portfolio of “direct” hedge fund investments
 - This category excludes the additional costs associated with fund-of-funds management
- Buy List represents the top tier hedge fund managers of each strategy based on our research

		Expected Returns 9/30/2022	
Individual Strategies	Weights	Universe	Buy List
Equity Long/Short	25%	6.1%	7.6%
Equity Market Neutral	14%	6.0%	5.8%
Fixed Income Arbitrage	6%	5.9%	6.1%
Distressed Debt	13%	6.9%	8.8%
Event Driven	19%	6.9%	7.9%
Global Macro	18%	6.0%	8.1%
CTAs	5%	6.6%	8.6%
Total Hedge Fund-of-Funds	100%	4.9%	6.1%
Total Broad Hedge Funds		6.5%	7.8%

Commodities



- Our commodity assumption is for a diversified portfolio of commodity futures contracts. Commodity futures returns are composed of three components:
- Over long-term, we believe spot prices (of a diversified basket of commodities) will increase in-line with inflation
- Collateral return is assumed to be LIBOR
- Roll returns have historically been a large contributor to commodity returns, but has been a significant detractor in recent years. We assume roll returns to be near 0% over the next 10 years

Commodities Return Assumption

Expected Return	9/30/2022
Spot Return (Inflation)	2.5%
Cash (LIBOR)	4.3%
Roll Return	0.0%
Total 10-Year Expected Return	6.8%

* Components do not sum perfectly to the total because they are medians, which are not additive. All figures are rounded.

Infrastructure Return Assumption

Expected Return	9/30/2022
Initial Yield	4.6%
Inflation	2.5%
Capital Growth	2.2%
Return Before Leverage	9.3%
Return Including Leverage of 55%	14.3%
Debt Financing Costs (Interest rate 7.0% x 55% Leverage)	-3.8%
Management Fees	-1.3%
Return Before Taxes	9.2%
Taxes (21%)	-1.9%
Other Impacts	0.0%
Total 10-Year Return Assumption	7.3%

Timberland

- CPI + Biological Growth 3.5% (Net of Costs) – Fund Fees 1.0% = Expected Return
 $2.5\% + 3.5\% - 1.0\% = 5.0\%$
- Standard deviation based on “unsmoothed” NCREIF Timber Index return series
 - 10 & 30 year expected risk = 12.0%
- Correlations are based on inflation simulation with noise added
 - Solve for 0.30 correlation to farmland by adding beta (based on historical data)
 - Zero correlation to global equity and risk assets (based on historical data)

Farmland

Row Crops

- CPI + Current Yield 2.8% + Capital Appreciation 0% - 1.0% Fund Fees = Expected Return
 $2.5\% + 2.8\% + 0\% - 1.0\% = 4.3\%$

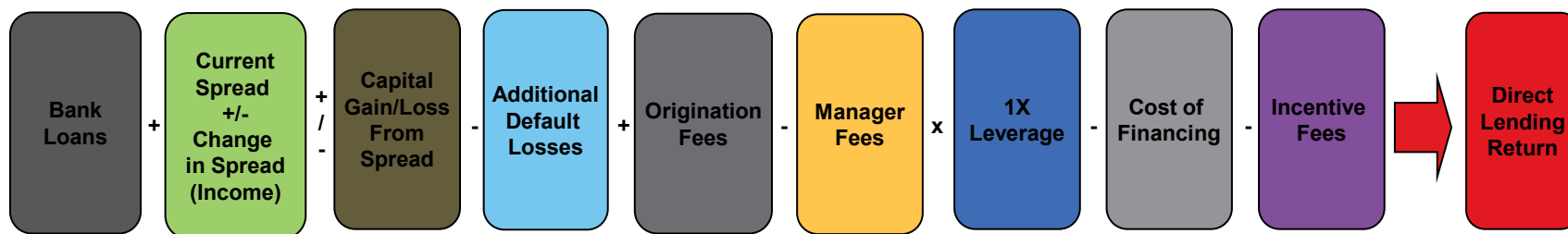
Permanent Crops

- CPI + Current Yield 6.0% + Capital Appreciation 0% - 1.5% Fund Fees = Expected Return
 $2.5\% + 6.0\% + 0\% - 1.5\% = 7.0\%$

Farmland Assumption

- Based on 50% row crops and 50% permanent crops
- $4.3\% \times 50\% + 7.0\% \times 50\% = 5.7\%$ Expected Return
- Volatility based on “unsmoothed” NCREIF Farmland Index = 15% for 10 & 30 years

Direct Lending (Private Debt)



- We assume current 300 bps yield spread over bank loans which reverts back to the long-term average of 300 bps over the next 10 years. We assume yield spreads have annual volatility of 1.5%.
- We expect additional default losses of 0.4% over bank loans
- Origination fees for the average fund is around 2.0% which is amortized over five years (add 0.4% to annual returns)
- Additional management costs over bank loans is 1.5%
- Funds are typically levered 100% with cost of financing 250 bps over LIBOR
- Performance fees are expected to be 15% with hurdle return of 6%
- Unlevered Return = 6.6% bank loans + 3.0% average spread + 0.0% gain from spread compression – 0.4% defaults + 0.4% origination fees – 1.5% manager costs ≈ 8.1%
- Levered assumption (net of fees) = 9.6% X 2 = 19.2% - 6.8% cost of financing – 1.5% manager costs - 1.1% incentive fee – 1.3% other impacts ≈ 8.5%
- Volatility is similar to public equities at approximately 16.5%
- We assume the correlation to other asset classes is similar to that of bank loans

Volatility and Correlation

- We take a forward-looking view when setting volatility assumptions as opposed to using purely historic averages. The credit crisis demonstrated the dangers of relying solely on historical values.
- We consider:
 - Implied volatilities priced into option contracts of various terms
 - Historical volatility levels
 - The broad economic/market environment
- We assume that volatilities are not constant over time; we assume that the volatility of "risky" asset classes such as equities will be at historically high levels in the next few years before declining over time.
- For illiquid asset classes such as real estate, de-smoothing techniques are employed when assessing historic volatility levels.
- Correlation assumptions are formulated with reference to historic experience over different time periods and during different economic conditions
- We take into account the fact that correlations are highly unstable over time and, in particular, we take into account the fact that correlations are very different in stressed environments

Fees

- Objective is to develop return assumptions that reflect the cost of implementing an investment program
- Liquid, publicly traded asset classes are investable passively at very low cost
 - Fee assumption is zero
- For asset classes such as emerging market debt which cannot be invested in passively at very low cost, it is assumed for modeling purposes that manager alpha is offset by fees
- For real estate there is an allowance for the unavoidable costs associated with investing in a real estate portfolio. These include property management costs, trading costs and investment management expenses.
- For hedge funds, private equity and infrastructure, explicit fee assumptions are subtracted from expected returns; include base and performance-based fee/carry as appropriate

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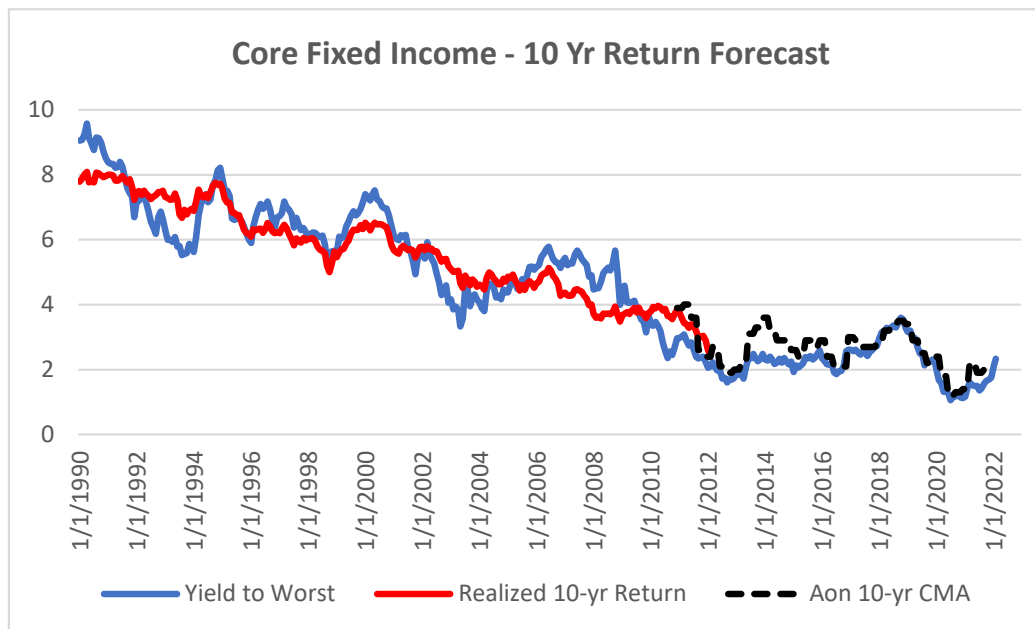
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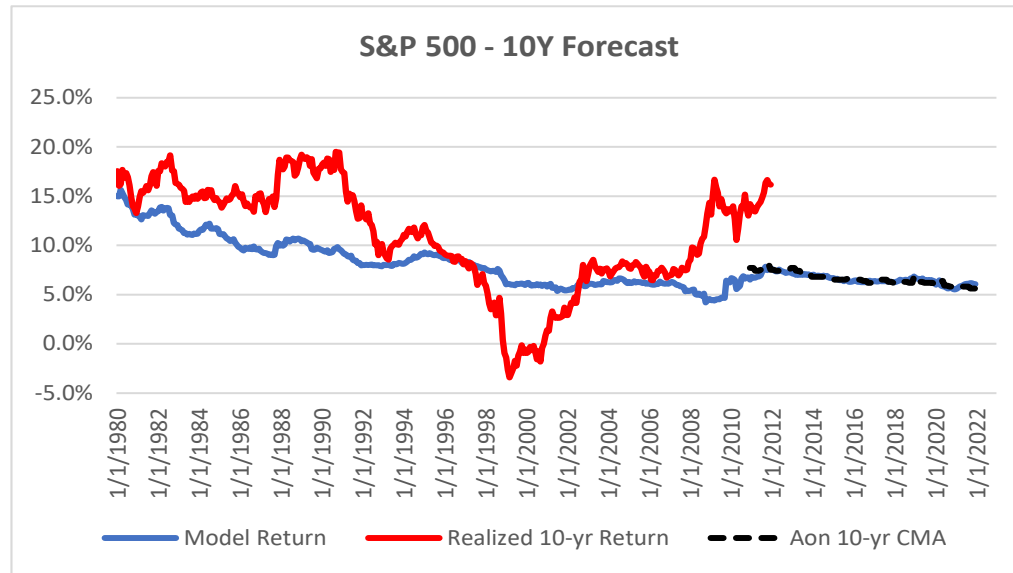
Core Fixed Income – 10 Year Forecast¹



- There has been a strong relationship between current bond yields and subsequent 10-year aggregate bond returns (red and blue lines)
- Majority of Aon's bond return expectations, since inception (2011), are driven by current bond yields as seen in the close tracking between (blue and black dotted lines)
- Since Aon's aggregate bond CMAs track yield to worst and yield to worst is a good predictor of 10-year bond returns, we expect realized 10-yr returns (red line) will track Aon's CMAs (black dotted line) fairly closely over time

1) Bloomberg Barclays Aggregate bond index yield-to-worst compared to subsequent 10-year total return (realized 10-yr return).

U.S. Large Cap Equity – 10 Year Forecast¹



- Aon's public equity assumptions are principally driven by the following building blocks;
 - $[E/P \times .5] + 10\text{-Yr Inflation} + 10\text{-Yr Real GDP} = \text{U.S. equity return}$
- To test the accuracy of Aon's U.S. large cap CMA, we replicate Aon's public equity CMA historically using *model return* (blue line) using the following information;
 - S&P 500's current Earnings/Price ratio*.5 reinvestment ratio + actual 10-yr inflation + actual 10-yr GDP growth to estimate model return.
 - Simplified representation of Aon's methodology (no near-term earnings adjustments are made in this back-test).
- The model return does a decent job directionally, however there is often significant deviations between model return and actual equity performance, over a 10-year time horizon. However, we expect it to eventual revert to model return trends.
- Aon's public equity CMA tracks very closely with the model return, since the inception of the CMA (2011)

1) E/P is based on 12-month trailing S&P 500 P/E ratios. Inflation is represented by actual annualized 10-yr CPI. 10-yr annualized real GDP is growth sourced from St. Louis FED data.

9/30/2022 Assumptions (10-Year): Expected Returns and Risks

	10-yr	10-yr	10-yr
	Expected Real Return ¹	Expected Nominal Return ¹	Expected Volatility
Equity			
1 Large Cap U.S. Equity	4.7%	7.3%	17.0%
2 Small Cap U.S. Equity	4.9%	7.5%	23.0%
3 Global Equity	5.1%	7.7%	18.0%
4 International Developed Equity	5.0%	7.6%	20.5%
5 Emerging Markets Equity	5.4%	8.0%	24.0%
Fixed Income			
6 Cash (Gov't)	1.3%	3.8%	1.5%
7 Cash (LIBOR)	1.8%	4.3%	1.5%
8 TIPS	1.7%	4.2%	4.5%
9 Core Fixed Income (Market Duration)	2.1%	4.7%	5.0%
10 Core Plus Bonds			
11 Long Duration Bonds – Gov't / Credit	3.0%	5.6%	11.0%
12 Long Duration Bonds – Credit	3.5%	6.1%	11.5%
13 Long Duration Bonds – Gov't	2.2%	4.8%	11.0%
14 High Yield Bonds	4.0%	6.6%	10.5%
15 Bank Loans	4.0%	6.6%	7.0%
16 Non-US Developed Bonds (0% Hedged)	0.8%	3.3%	10.5%
17 Non-US Developed Bonds (50% Hedged)	1.4%	3.9%	6.0%
18 Non-US Developed Bonds (100% Hedged)	1.7%	4.2%	3.5%
19 Short Govt Bonds	1.3%	3.8%	2.5%
20 Short Corporate Bonds	1.9%	4.4%	2.5%
21 Intermediate Govt Bonds	1.4%	3.9%	4.0%
22 Intermediate Corporate Bonds	2.2%	4.8%	4.5%
23 25-year Government Bond	2.0%	4.5%	14.5%
24 Emerging Market Bonds (Sovereign USD)	5.3%	7.9%	11.0%
25 Emerging Market Bonds (Corporate USD)	3.7%	6.3%	11.0%
26 Emerging Market Bonds (Sovereign Local)	4.0%	6.6%	13.0%
Alternative Investments			
27 Broad Hedge Funds ²	3.9%	6.5%	9.0%
28 Broad Hedge Funds ² (Buy List)	5.2%	7.8%	9.0%
29 Hedge Fund-of-Funds ³	2.3%	4.9%	9.0%
30 Hedge Fund-of-Funds ³ (Buy List)	3.5%	6.1%	9.0%
31 eLDI	3.7%	6.3%	5.5%
32 Real Estate (Core)	2.5%	5.1%	15.0%
33 U.S. REITs	4.5%	7.1%	18.5%
34 Commodities	4.2%	6.8%	17.0%
35 Private Equity	7.2%	9.9%	25.0%
36 Infrastructure	4.7%	7.3%	14.5%
37 Multi Asset Credit	4.9%	7.5%	9.0%
38 ILS	4.2%	6.8%	5.5%
39 Equity Insurance Risk Premium - High Beta	3.8%	6.4%	11.0%
40 Equity Insurance Risk Premium - Low Beta	3.7%	6.3%	5.0%
41 Private Debt -Direct Lending	5.9%	8.5%	16.5%
42 Alternative Risk Premia (ARP)	5.7%	8.3%	9.5%
43 Closed-End Real Assets	5.2%	7.8%	15.5%
44 U.S. Inflation	0.0%	2.5%	2.0%

1) All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees

2) Fund of hedge funds

3) Diversified portfolio of Direct hedge fund investments

9/30/2022 Assumptions (30-Year): Expected Returns and Risks

	30-yr	30-yr	30-yr	
	Expected Real Return ¹	Expected Nominal Return ¹	Expected Volatility	Sharpe Ratio
Equity				
1 Large Cap U.S. Equity	4.8%	7.3%	17.5%	0.229
2 Small Cap U.S. Equity	5.3%	7.8%	23.5%	0.191
3 Global Equity	5.4%	7.9%	18.5%	0.249
4 International Developed Equity	5.2%	7.7%	20.5%	0.215
5 Emerging Markets Equity	5.7%	8.2%	24.5%	0.200
Fixed Income				
6 Cash (Gov't)	0.9%	3.3%	2.0%	0.000
7 Cash (LIBOR)	1.5%	3.9%	2.0%	0.300
8 TIPS	1.7%	4.1%	4.5%	0.178
9 Core Fixed Income (Market Duration)	1.7%	4.1%	5.0%	0.160
10 Core Plus Bonds				
11 Long Duration Bonds – Gov't / Credit	2.4%	4.9%	10.5%	0.152
12 Long Duration Bonds – Credit	2.9%	5.4%	11.0%	0.191
13 Long Duration Bonds – Gov't	1.8%	4.2%	11.0%	0.082
14 High Yield Bonds	3.6%	6.1%	10.5%	0.267
15 Bank Loans	3.4%	5.9%	7.5%	0.347
16 Non-US Developed Bonds (0% Hedged)	1.1%	3.5%	11.0%	0.018
17 Non-US Developed Bonds (50% Hedged)	1.2%	3.6%	6.5%	0.046
18 Non-US Developed Bonds (100% Hedged)	1.3%	3.7%	4.0%	0.100
19 Short Govt Bonds	1.0%	3.4%	2.5%	0.040
20 Short Corporate Bonds	1.6%	4.0%	3.0%	0.233
21 Intermediate Govt Bonds	1.0%	3.4%	4.0%	0.025
22 Intermediate Corporate Bonds	2.0%	4.4%	4.5%	0.244
23 25-year Government Bond	1.5%	3.9%	14.5%	0.041
24 Emerging Market Bonds (Sovereign USD)	3.8%	6.3%	11.0%	0.273
25 Emerging Market Bonds (Corporate USD)	3.2%	5.7%	11.0%	0.218
26 Emerging Market Bonds (Sovereign Local)	4.2%	6.7%	13.5%	0.252
Alternative Investments				
27 Broad Hedge Funds3	3.7%	6.2%	9.0%	0.322
28 Broad Hedge Funds3 (Buy List)	5.0%	7.5%	9.0%	0.467
29 Hedge Fund-of-Funds2	2.2%	4.7%	9.0%	0.156
30 Hedge Fund-of-Funds2 (Buy List)	3.4%	5.9%	9.0%	0.289
31 eLDI	3.2%	5.7%	5.5%	0.436
32 Real Estate (Core)	2.3%	4.8%	15.5%	0.097
33 U.S. REITs	4.5%	7.0%	19.0%	0.195
34 Commodities	3.8%	6.3%	17.0%	0.176
35 Private Equity	7.8%	10.4%	25.5%	0.278
36 Infrastructure	4.7%	7.2%	15.0%	0.260
37 Multi Asset Credit	4.5%	7.0%	9.0%	0.411
38 ILS	3.4%	5.9%	7.5%	0.347
39 Equity Insurance Risk Premium - High Beta	3.8%	6.3%	11.0%	0.273
40 Equity Insurance Risk Premium - Low Beta	3.3%	5.8%	5.5%	0.455
41 Private Debt (Direct Lending)	5.0%	7.5%	17.5%	0.240
42 Alternative Risk Premia (ARP)	5.4%	7.9%	9.5%	0.484
43 Closed-End Real Assets	5.2%	7.7%	16.0%	0.275
44 U.S. Inflation	0.0%	2.4%	2.0%	-0.450

1) All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees

2) Fund of hedge funds

3) Diversified portfolio of Direct hedge fund investments

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1 Large Cap U.S. Equity	1.00	0.93	0.97	0.81	0.73	0.10	0.10	-0.02	0.00	-0.03	0.04	-0.12	0.61	0.48	0.06	0.04	-0.01	0.46	0.66	0.53	0.35	0.65	0.47	0.62	0.35	0.02	0.05	-0.06	0.03	-0.13	0.45	0.60	0.66	0.52	0.45	0.37	0.61	0.03	0.51	0.92	0.33	0.16	0.05	0.52	0.09
2 Small Cap U.S. Equity		1.00	0.93	0.75	0.69	0.09	0.08	-0.02	0.00	-0.03	0.03	-0.12	0.58	0.46	0.05	0.03	-0.02	0.43	0.62	0.49	0.33	0.61	0.42	0.60	0.34	0.01	0.05	-0.06	0.02	-0.12	0.42	0.54	0.61	0.49	0.43	0.36	0.57	0.02	0.47	0.86	0.31	0.15	0.04	0.50	0.09
3 Global Equity			1.00	0.90	0.83	0.09	0.09	-0.02	0.00	-0.04	0.04	-0.13	0.66	0.52	0.17	0.14	-0.01	0.49	0.65	0.52	0.37	0.64	0.49	0.63	0.35	0.01	0.04	-0.07	0.02	-0.13	0.49	0.64	0.65	0.51	0.48	0.40	0.66	0.02	0.49	0.90	0.33	0.16	0.04	0.54	0.11
4 International Equity				1.00	0.76	0.05	0.05	-0.02	-0.04	0.03	-0.13	0.60	0.48	0.40	0.32	-0.02	0.44	0.56	0.45	0.35	0.55	0.50	0.56	0.31	-0.01	0.01	-0.08	0.01	-0.13	0.46	0.62	0.56	0.45	0.44	0.38	0.61	0.01	0.40	0.75	0.29	0.14	0.03	0.50	0.11	
5 Emerging Markets Equity					1.00	0.08	0.08	-0.02	0.00	-0.03	0.05	-0.12	0.66	0.51	0.18	0.15	-0.01	0.48	0.48	0.38	0.33	0.50	0.36	0.53	0.30	0.01	0.04	-0.06	0.02	-0.12	0.48	0.56	0.48	0.38	0.41	0.40	0.64	0.02	0.38	0.68	0.27	0.17	0.05	0.46	0.09
6 Gov Cash						1.00	0.98	0.48	0.44	0.23	0.21	0.23	0.16	-0.12	0.12	0.29	0.59	0.19	-0.03	-0.02	0.17	0.10	0.21	0.10	0.15	0.85	0.80	0.54	0.49	0.17	0.08	0.02	-0.03	-0.02	0.16	-0.24	0.06	0.29	0.42	0.20	0.23	0.32	0.41	0.19	0.44
7 LIBOR Cash							1.00	0.47	0.44	0.22	0.21	0.23	0.16	-0.10	0.12	0.28	0.58	0.19	-0.02	-0.01	0.17	0.10	0.20	0.10	0.14	0.83	0.80	0.54	0.49	0.17	0.08	0.02	-0.02	-0.01	0.16	-0.22	0.07	0.29	0.41	0.19	0.23	0.32	0.41	0.19	0.43
8 TIPS								1.00	0.56	0.46	0.43	0.46	0.09	-0.14	0.06	0.13	0.26	0.18	-0.10	-0.08	0.05	0.01	0.13	-0.01	0.05	0.60	0.58	0.59	0.54	0.39	0.02	-0.10	-0.08	0.04	-0.18	0.01	0.14	0.17	0.04	0.10	0.44	0.53	0.06	0.29	
9 Core Fixed Income (Market Duration)									1.00	0.84	0.83	0.79	0.23	-0.04	0.17	0.32	0.56	0.46	-0.04	-0.03	0.05	0.01	0.04	0.01	0.05	0.80	0.83	0.95	0.98	0.69	0.13	0.11	-0.04	-0.03	0.04	-0.09	0.17	0.13	0.17	0.05	0.11	0.87	0.99	0.06	0.02
10 Long Duration Bonds – Gov't / Credit										1.00	0.98	0.95	0.11	-0.07	0.15	0.27	0.45	0.35	-0.02	-0.01	0.00	-0.02	-0.02	-0.03	0.01	0.52	0.5																		

9/30/2022 Assumptions (10-Year): Expected Returns and Risks

	10-yr	10-yr	10-yr
	Expected Real Return ¹	Expected Nominal Return ¹	Expected Volatility
Equity			
1 Large Cap U.S. Equity	4.7%	7.3%	17.0%
2 Small Cap U.S. Equity	4.9%	7.5%	23.0%
3 Global Equity	5.1%	7.7%	18.0%
4 International Developed Equity	5.0%	7.6%	20.5%
5 Emerging Markets Equity	5.4%	8.0%	24.0%
Fixed Income			
6 Cash (Gov't)	1.3%	3.8%	1.5%
7 Cash (LIBOR)	1.8%	4.3%	1.5%
8 TIPS	1.7%	4.2%	4.5%
9 Core Fixed Income (Market Duration)	2.1%	4.7%	5.0%
10 Core Plus Bonds			
11 Long Duration Bonds – Gov't / Credit	3.0%	5.6%	11.0%
12 Long Duration Bonds – Credit	3.5%	6.1%	11.5%
13 Long Duration Bonds – Gov't	2.2%	4.8%	11.0%
14 High Yield Bonds	4.0%	6.6%	10.5%
15 Bank Loans	4.0%	6.6%	7.0%
16 Non-US Developed Bonds (0% Hedged)	0.8%	3.3%	10.5%
17 Non-US Developed Bonds (50% Hedged)	1.4%	3.9%	6.0%
18 Non-US Developed Bonds (100% Hedged)	1.7%	4.2%	3.5%
19 Short Govt Bonds	1.3%	3.8%	2.5%
20 Short Corporate Bonds	1.9%	4.4%	2.5%
21 Intermediate Govt Bonds	1.4%	3.9%	4.0%
22 Intermediate Corporate Bonds	2.2%	4.8%	4.5%
23 25-year Government Bond	2.0%	4.5%	14.5%
24 Emerging Market Bonds (Sovereign USD)	5.3%	7.9%	11.0%
25 Emerging Market Bonds (Corporate USD)	3.7%	6.3%	11.0%
26 Emerging Market Bonds (Sovereign Local)	4.0%	6.6%	13.0%
Alternative Investments			
27 Broad Hedge Funds ²	3.9%	6.5%	9.0%
28 Broad Hedge Funds ² (Buy List)	5.2%	7.8%	9.0%
29 Hedge Fund-of-Funds ³	2.3%	4.9%	9.0%
30 Hedge Fund-of-Funds ³ (Buy List)	3.5%	6.1%	9.0%
31 eLDI	3.7%	6.3%	5.5%
32 Real Estate (Core)	2.5%	5.1%	15.0%
33 U.S. REITs	4.5%	7.1%	18.5%
34 Commodities	4.2%	6.8%	17.0%
35 Private Equity	7.2%	9.9%	25.0%
36 Infrastructure	4.7%	7.3%	14.5%
37 Multi Asset Credit	4.9%	7.5%	9.0%
38 ILS	4.2%	6.8%	5.5%
39 Equity Insurance Risk Premium - High Beta	3.8%	6.4%	11.0%
40 Equity Insurance Risk Premium - Low Beta	3.7%	6.3%	5.0%
41 Private Debt -Direct Lending	5.9%	8.5%	16.5%
42 Alternative Risk Premia (ARP)	5.7%	8.3%	9.5%
43 Closed-End Real Assets	5.2%	7.8%	15.5%
44 U.S. Inflation	0.0%	2.5%	2.0%

1) All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees

2) Fund of hedge funds

3) Diversified portfolio of Direct hedge fund investments

9/30/2022 Assumptions (30-Year): Expected Returns and Risks

	30-yr	30-yr	30-yr	
	Expected Real Return ¹	Expected Nominal Return ¹	Expected Volatility	Sharpe Ratio
Equity				
1 Large Cap U.S. Equity	4.8%	7.3%	17.5%	0.229
2 Small Cap U.S. Equity	5.3%	7.8%	23.5%	0.191
3 Global Equity	5.4%	7.9%	18.5%	0.249
4 International Developed Equity	5.2%	7.7%	20.5%	0.215
5 Emerging Markets Equity	5.7%	8.2%	24.5%	0.200
Fixed Income				
6 Cash (Gov't)	0.9%	3.3%	2.0%	0.000
7 Cash (LIBOR)	1.5%	3.9%	2.0%	0.300
8 TIPS	1.7%	4.1%	4.5%	0.178
9 Core Fixed Income (Market Duration)	1.7%	4.1%	5.0%	0.160
10 Core Plus Bonds				
11 Long Duration Bonds – Gov't / Credit	2.4%	4.9%	10.5%	0.152
12 Long Duration Bonds – Credit	2.9%	5.4%	11.0%	0.191
13 Long Duration Bonds – Gov't	1.8%	4.2%	11.0%	0.082
14 High Yield Bonds	3.6%	6.1%	10.5%	0.267
15 Bank Loans	3.4%	5.9%	7.5%	0.347
16 Non-US Developed Bonds (0% Hedged)	1.1%	3.5%	11.0%	0.018
17 Non-US Developed Bonds (50% Hedged)	1.2%	3.6%	6.5%	0.046
18 Non-US Developed Bonds (100% Hedged)	1.3%	3.7%	4.0%	0.100
19 Short Govt Bonds	1.0%	3.4%	2.5%	0.040
20 Short Corporate Bonds	1.6%	4.0%	3.0%	0.233
21 Intermediate Govt Bonds	1.0%	3.4%	4.0%	0.025
22 Intermediate Corporate Bonds	2.0%	4.4%	4.5%	0.244
23 25-year Government Bond	1.5%	3.9%	14.5%	0.041
24 Emerging Market Bonds (Sovereign USD)	3.8%	6.3%	11.0%	0.273
25 Emerging Market Bonds (Corporate USD)	3.2%	5.7%	11.0%	0.218
26 Emerging Market Bonds (Sovereign Local)	4.2%	6.7%	13.5%	0.252
Alternative Investments				
27 Broad Hedge Funds3	3.7%	6.2%	9.0%	0.322
28 Broad Hedge Funds3 (Buy List)	5.0%	7.5%	9.0%	0.467
29 Hedge Fund-of-Funds2	2.2%	4.7%	9.0%	0.156
30 Hedge Fund-of-Funds2 (Buy List)	3.4%	5.9%	9.0%	0.289
31 eLDI	3.2%	5.7%	5.5%	0.436
32 Real Estate (Core)	2.3%	4.8%	15.5%	0.097
33 U.S. REITs	4.5%	7.0%	19.0%	0.195
34 Commodities	3.8%	6.3%	17.0%	0.176
35 Private Equity	7.8%	10.4%	25.5%	0.278
36 Infrastructure	4.7%	7.2%	15.0%	0.260
37 Multi Asset Credit	4.5%	7.0%	9.0%	0.411
38 ILS	3.4%	5.9%	7.5%	0.347
39 Equity Insurance Risk Premium - High Beta	3.8%	6.3%	11.0%	0.273
40 Equity Insurance Risk Premium - Low Beta	3.3%	5.8%	5.5%	0.455
41 Private Debt (Direct Lending)	5.0%	7.5%	17.5%	0.240
42 Alternative Risk Premia (ARP)	5.4%	7.9%	9.5%	0.484
43 Closed-End Real Assets	5.2%	7.7%	16.0%	0.275
44 U.S. Inflation	0.0%	2.4%	2.0%	-0.450

1) All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees

2) Fund of hedge funds

3) Diversified portfolio of Direct hedge fund investments

9/30/2022 Assumptions (10-Year): Expected Nominal Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1 Large Cap U.S. Equity	1.00	0.93	0.97	0.81	0.73	0.10	0.10	-0.02	0.00	-0.03	0.04	-0.12	0.61	0.48	0.06	0.04	-0.01	0.46	0.66	0.53	0.35	0.65	0.47	0.62	0.35	0.02	0.05	-0.06	0.03	-0.13	0.45	0.60	0.66	0.52	0.45	0.37	0.61	0.03	0.51	0.92	0.33	0.16	0.05	0.52	0.09
2 Small Cap U.S. Equity		1.00	0.93	0.75	0.69	0.09	0.08	-0.02	0.00	-0.03	0.03	-0.12	0.58	0.46	0.05	0.03	-0.02	0.43	0.62	0.49	0.33	0.61	0.42	0.60	0.34	0.01	0.05	-0.06	0.02	-0.12	0.42	0.54	0.61	0.49	0.43	0.36	0.57	0.02	0.47	0.86	0.31	0.15	0.04	0.50	0.09
3 Global Equity			1.00	0.90	0.83	0.09	0.09	-0.02	0.00	-0.04	0.04	-0.13	0.66	0.52	0.17	0.14	-0.01	0.49	0.65	0.52	0.37	0.64	0.49	0.63	0.35	0.01	0.04	-0.07	0.02	-0.13	0.49	0.64	0.65	0.51	0.48	0.40	0.66	0.02	0.49	0.90	0.33	0.16	0.04	0.54	0.11
4 International Equity				1.00	0.76	0.05	0.05	-0.02	-0.02	-0.04	0.03	-0.13	0.60	0.48	0.40	0.32	-0.02	0.44	0.56	0.45	0.35	0.55	0.50	0.56	0.31	-0.01	0.01	-0.08	0.01	-0.13	0.46	0.62	0.56	0.45	0.44	0.38	0.61	0.01	0.40	0.75	0.29	0.14	0.03	0.50	0.11
5 Emerging Markets Equity					1.00	0.08	0.08	-0.02	0.00	-0.03	0.05	-0.12	0.66	0.51	0.18	0.15	-0.01	0.48	0.48	0.38	0.33	0.50	0.36	0.53	0.30	0.01	0.04	-0.06	0.02	-0.12	0.48	0.56	0.48	0.38	0.41	0.40	0.64	0.02	0.38	0.68	0.27	0.17	0.05	0.46	0.09
6 Gov Cash						1.00	0.98	0.48	0.44	0.23	0.21	0.23	0.16	-0.12	0.12	0.29	0.59	0.19	-0.03	-0.02	0.17	0.10	0.21	0.10	0.15	0.85	0.80	0.54	0.49	0.17	0.08	0.02	-0.03	0.16	-0.24	0.06	0.29	0.42	0.20	0.23	0.41	0.19	0.44		
7 LIBOR Cash							1.00	0.47	0.44	0.22	0.21	0.23	0.16	-0.10	0.12	0.28	0.58	0.19	-0.02	-0.01	0.17	0.10	0.20	0.10	0.14	0.83	0.80	0.54	0.49	0.17	0.08	0.02	-0.02	-0.01	0.16	-0.22	0.07	0.29	0.41	0.19	0.23	0.32	0.41	0.19	0.43
8 TIPS								1.00	0.56	0.46	0.43	0.46	0.09	-0.14	0.06	0.13	0.26	0.18	-0.10	-0.08	0.05	0.01	0.13	-0.01	0.05	0.60	0.58	0.59	0.54	0.39	0.02	-0.02	-0.10	-0.08	0.04	-0.18	0.01	0.14	0.17	0.04	0.10	0.44	0.53	0.06	0.29
9 Core Fixed Income (Market Duration)									1.00	0.84	0.83	0.79	0.23	-0.04	0.17	0.32	0.56	0.46	-0.04	-0.03	0.05	0.01	0.04	0.01	0.05	0.80	0.83	0.95	0.98	0.69	0.13	0.11	-0.04	-0.03	0.04	-0.09	0.17	0.13	0.17	0.05	0.11	0.87	0.99	0.06	0.02
10 Long Duration Bonds – Gov't / Credit										1.00	0.98	0.95	0.11	-0.07	0.15	0.27	0.45	0.35	-0.02	-0.01	0.00	-0.02	-0.02	-0.03	0.01	0.52	0.54	0.74	0.77	0.93	0.06	0.08	-0.02	-0.01	0.00	-0.09	0.08	0.07	0.07	0.05	0.79	0.83	0.00	-0.14	
11 Long Duration Bonds – Credit											1.00	0.86	0.28	0.11	0.15	0.26	0.43	0.48	0.12	0.10	0.03	0.03	-0.01	0.03	0.04	0.49	0.53	0.68	0.78	0.84	0.17	0.16	0.12	0.10	0.03	0.06	0.25	0.07	0.10	0.06	0.07	0.84	0.85	0.05	-0.13
12 Long Duration Bonds – Gov't												1.00	-0.14	-0.33	0.15	0.26	0.44	0.14	-0.21	-0.16	-0.04	-0.08	-0.04	-0.11	-0.04	0.54	0.51	0.77	0.69	0.98	-0.08	-0.04	-0.21	-0.16	-0.06	-0.30	-0.15	0.07	0.03	-0.09	0.02	0.66	0.73	-0.06	-0.15
13 High Yield Bonds													1.00	0.83	0.18	0.18	0.09	0.79	0.64	0.51	0.26	0.41	0.40	0.46	0.27	0.14	0.22	0.06	0.27	-0.18	0.63	0.60	0.64	0.51	0.33	0.64	0.91	0.05	0.34	0.58	0.25	0.46	0.34	0.39	0.20
14 Bank Loans														1.00	0.07	0.03	-0.11	0.56	0.72	0.57	0.19	0.32	0.25	0.38	0.20	-0.22	-0.05	-0.28	0.05	-0.32	0.59	0.47	0.71	0.56	0.24	0.81	0.83	-0.03	0.18	0.43	0.14	0.27	0.11	0.28	0.05
15 Non-US Developed Bond (0% Hedged)															1.00	0.95	0.38	0.21	0.05	0.04	0.01	0.03	0.45	-0.01	0.00	0.16	0.16	0.16	0.17	0.13	0.21	0.50	0.05	0.04	0.04	0.04	0.26	0.04	0.07	0.07	0.07	0.17	0.16	0.03	0.13
16 Non-US Developed Bond (50% Hedged)																1.00	0.64	0.25	0.03	0.03	0.02	0.03	0.41	-0.01	0.02	0.34	0.34	0.32	0.32	0.24	0.20	0.45	0.03	0.03	0.05	-0.02	0.23	0.09	0.13	0.07	0.10	0.29	0.31	0.04	0.17
17 Non-US Developed Bond (100% Hedged)																	1.00	0.24	-0.04	-0.03	0.06	0.01	0.10	-0.01	0.05	0.64	0.64	0.57	0.56	0.39	0.08	0.11	-0.04	-0.03	0.05	-0.17	0.07	0.17	0.22	0.06	0.13	0.45	0.54	0.06	0.19
18 Hard Emerging Market Bonds																		1.00	0.54	0.43	0.20	0.30	0.25	0.33	0.20	0.28	0.37	0.28	0.49	0.09	0.69	0.62	0.54	0.43	0.25	0.42	0.79	0.06	0.28	0.44	0.20	0.59	0.34	0.08	
19 Hedge Funds Universe																			1.00	0.72	0.22	0.43	0.31	0.42	0.23	-0.15	-0.04	-0.22	0.02	-0.18	0.56	0.54	0.99	0.71	0.29	0.57	0.69	-0.01	0.30	0.61	0.20	0.20	0.07	0.34	0.04
20 Hedge Funds Buy List																				1.00	0.17	0.34	0.25	0.33	0.19	-0.12	-0.03	-0.17	0.02	-0.14	0.44	0.43	0.71	0.99	0.23	0.46	0.55	-0.01	0.24	0.48	0.15	0.17	0.06	0.27	0.04
21 Core Real Estate																					1.00	0.44	0.11	0.32	0.19	0.12	0.13	0.04	0.07	-0.05	0.17	0.12	0.22	0.17	0.96	0.12	0.22	0.05	0.22	0.34	0.15	0.10	0.07	0.85	0.10
22 REITs																						1.00	0.29	0.44	0.24	0.04	0.06	-0.02	0.03	-0.08	0.29	0.37	0.42	0.34	0.47	0.24	0.40	0.02	0.34	0.61	0.22	0.12	0.04	0.48	0.08
23 Commodities																							1.00	0.14	0.10	0.14	0.14	0.05	0.06	-0.06	0.29	0.45	0.31	0.25	0.18	0.17	0.39	0.06	0.30	0.45	0.19	0.10	0.05	0.19	0.40
24 Private Equity																								1.00	0.33	0.03	0.06	-0.05	0.03	-0.11	0.29	0.22	0.42	0.33	0.38	0.29	0.40	0.03	0.33	0.59	0.22	0.13	0.05	0.45	0.08
25 Infrastructure																									1.00	0.09	0.11	0.03	0.06	-0.04	0.16	0.11	0.23	0.19	0.22	0.14	0.23	0.05	0.22	0.34	0.15	0.10	0.07	0.64	0.09
26 Short Govt Bonds																										1.00	0.95	0.90	0.82	0.42	0.07	0.03	-0.15	-0.11	0.10	-0.29	0.04	0.25	0.33	0.11	0.19	0.60	0.75	0.12	0.29
27 Short Corporate Bonds																											1.00	0.86	0.88	0.40	0.12	0.08	-0.04	-0.03	0.11	-0.15	0.14	0.24	0.32	0.14	0.19	0.67	0.81	0.14	0.27
28 Intermediate Govt Bonds																												1.00	0.91	0.65	0.02	0.01	-0.22	-0.17	0.02	-0.30	-0.02	0.16	0.18	0.01	0.11	0.73	0.88	0.03	0.07
29 Intermediate Corporate Bonds																													1.00	0.59	0.16	0.13	0.02	0.02	0.06	-0.03	0.22	0.15	0.20	0.08	0.12	0.86	0.98	0.08	0.06
30 25-year Government Bond																														1.00	-0.10	-0.05	-0.18	-0.14	-0.07	-0.28	-0.17	0.05	0.01	-0.10	0.01	0.60	0.64	-0.07	-0.18
31 Corporate Emerging Market Bonds																															1.00	0.61	0.56	0.44	0.23	0.46	0.73	0.02	0.24	0.42	0.17	0.30	0.20	0.25	0.09
32 Local Emerging Market Bonds																																1.00	0.53	0.42	0.21	0.37	0.74	0.01	0.29	0.55	0.21	0.26	0.17	0.22	0.00
33 Broad Hedge Funds - without fees (Universe)																																	1.00	0.71	0.29	0.57	0.69	-0.01	0.30	0.60	0.20	0.20	0.07	0.34	0.04
34 Broad Hedge Funds - without fees (BuyList)																																		1.00	0.23	0.45	0.55	-0.01	0.24	0.48	0.15	0.16	0.06	0.27	0.04
35 Private Real Estate (Non-Core)																																			1.00	0.17	0.30	0.04	0.27	0.44	0.18	0.11	0.07	0.89	0.11
36 Private Debt - Direct Lending																																				1.00	0.65	-0.07	0.09	0.32	0.07	0.17	0.03	0.20	-0.01
37 Multi Asset Credit																																													

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Aon Investments USA Inc.
200 E. Randolph Street
Suite 700
Chicago, IL 60601
ATTN: Aon Investments Compliance Officer

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