Wilshire

Prepared for:

STRS OHIO

Investment Consultant Services

State Teachers Retirement System of Ohio

Felicia Bennett, Managing Director
Christopher Tessman, SVP & Senior Consultant
David Lindberg, CFA, Managing Director
Thomas Toth, CFA, Managing Director
Ned McGuire, CFA, FSA, FRM, Managing Director

September 20, 2023

Agenda

- Consulting Team Background & Experience
- Investment Philosophy & Process
- Investment Monitoring & Reporting
- Fee Proposal
- Q&A
- Appendix

Consulting Team Background & Experience

Please introduce the personnel who will be assigned to STRS Ohio's account and provide relevant background information including education, firm tenure, industry tenure and number and size of clients managed.

Explain why these individuals are the best fit for STRS Ohio.

Detailed team bios are available in the Appendix.

STRS Ohio Consulting Team & Resources

Felicia Bennett, Managing Director

Senior Consultant and Relationship Manager

Christopher Tessman, Senior Vice President

Senior Consultant and Project Manager

David Lindberg, CFA, Managing Director

Institutional Strategic Development

Thomas Toth, CFA, Managing Director

Head of Public Pension Plan Team

Ned McGuire, CFA, FSA, FRM, Managing Director

Head of Asset Allocation Investment Solutions

What is your view of the role of the investment consultant with respect to the trustees and staff?

In the Service of the Board

Long Term Strategic Input

- Investment Governance
- Asset Allocation/Asset-Liability Studies
- Risk Management Framework
- Investment Policy

Reporting & Education

- Quarterly investment performance:
  - Total Fund - Peer - Asset Class
  - Attribution - Leverage
- Organizational change assessment
- Investment education

Ongoing Interaction with Staff

- Risk management and portfolio construction
- Risk factor allocation and attribution analysis
- Portfolio implementation considerations i.e., leverage, overlay solutions, etc.
- Operations and Compliance

Please elaborate on your experience with defined benefit and health care plans.

Defined Benefit & Health Care Plan Experience

- Over 40 years of history working with institutional investors across various plan types
- 80% of Assets Under Advisement are public pensions
- Technology and risk management heritage
- Proprietary tools and risk models — both holdings and returns based; customizable and flexible

Sample List of Clients

Clients listed above utilize one or more services offered by Wilshire and allow Wilshire to disclose the existence of the relationship. Inclusion of a client on the list does not indicate an endorsement of Wilshire or the services provided. Logos are protected trademarks of their respective owners and Wilshire disclaims any association with them and any rights associated with such trademarks. Additional details on Wilshire's client base and experience can be found in the Appendix.

Investment Philosophy & Process

Please explain your view of the role of investment beliefs, investment policy, and fund governance.

Investment Philosophy

Fundamental Beliefs

- Risk should be compensated
- Costs matter and fees should only be paid to harness unique return streams
- Attractive long-term returns can be realized by managing downside and behavioral risks
- An opportunistic investment process can occasionally exploit market pricing
- Manager selection and access is critical to driving attractive returns within alternative investment strategies

Risk Management ≠ Risk Avoidance

Wilshire’s investment platform is focused on adding value by taking smart investment risks, avoiding overdiversification, capitalizing on dislocations, and allocating to compelling opportunities

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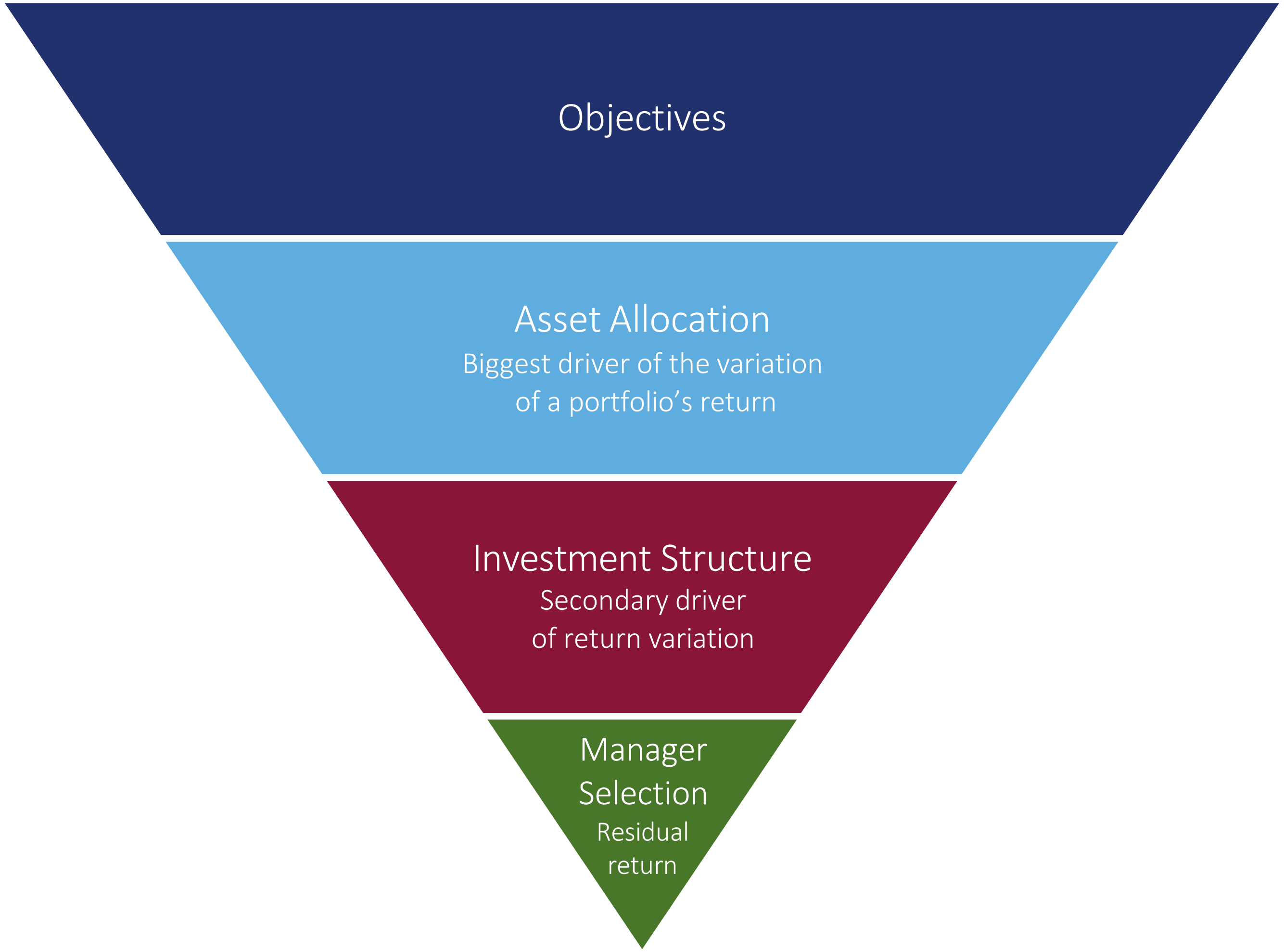
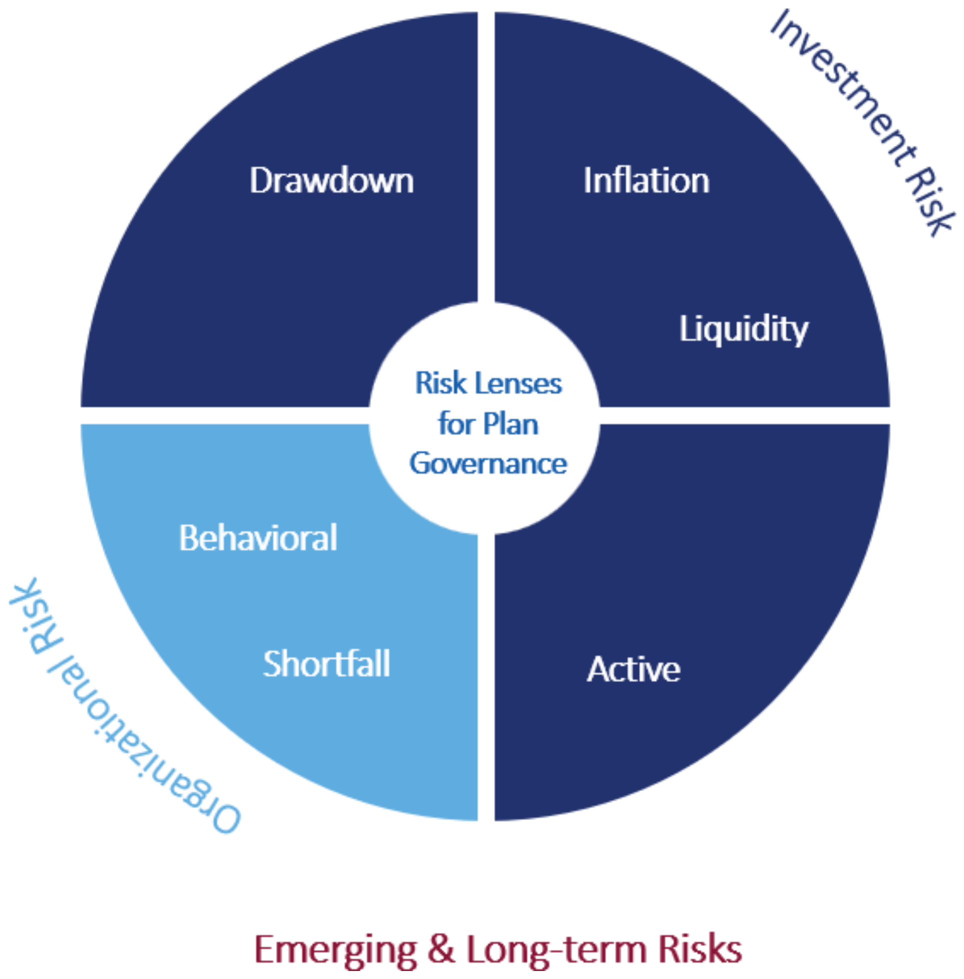
Fund Governance, Investment Beliefs & Policy



Fund Governance, Investment Beliefs & Policy (Cont.)

Risk Lenses

- Investment Policy should reflect the needs and beliefs of the plan
- Risk tolerance
- Liquidity needs
- Efficient vs. Inefficient segments of the market

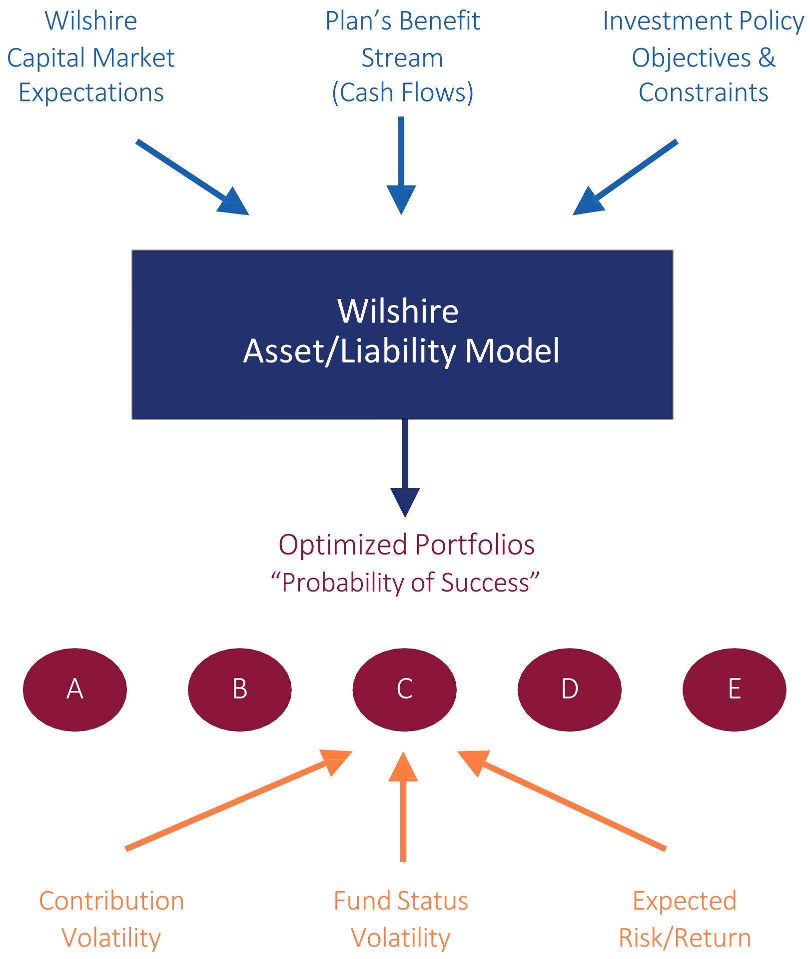


Please elaborate on your firm's asset-liability modeling capability and asset allocation philosophy.

Asset Allocation Process

- Wilshire believes the mission of a defined benefit plan is to fund benefits promised to participants
- The role of asset allocation is to manage risk in order to fulfill that core mission
  - Maximize safety of promised benefits
  - Minimize cost of funding these benefits
- Wilshire's Asset Liability Model provides methodology for selecting a target portfolio that considers both goals
- Rigorously developed capital market assumptions for risk and return (see appendix)
- Given that short-term volatility is also important, we identify the impact of the asset allocation decision on funded ratios, annual contribution requirements, and other metrics
- Strategic asset allocation is not a guide to outperforming in every market… but it should provide a roadmap for success over a market cycle

Asset Allocation Process (Cont.)



Wilshire Asset-Liability Modeling Capability

Why Introduce Economic Factors?

- Risk Assessment: Including factors within the asset allocation process provides an opportunity to measure asset class (and portfolio) exposures to key economic factors

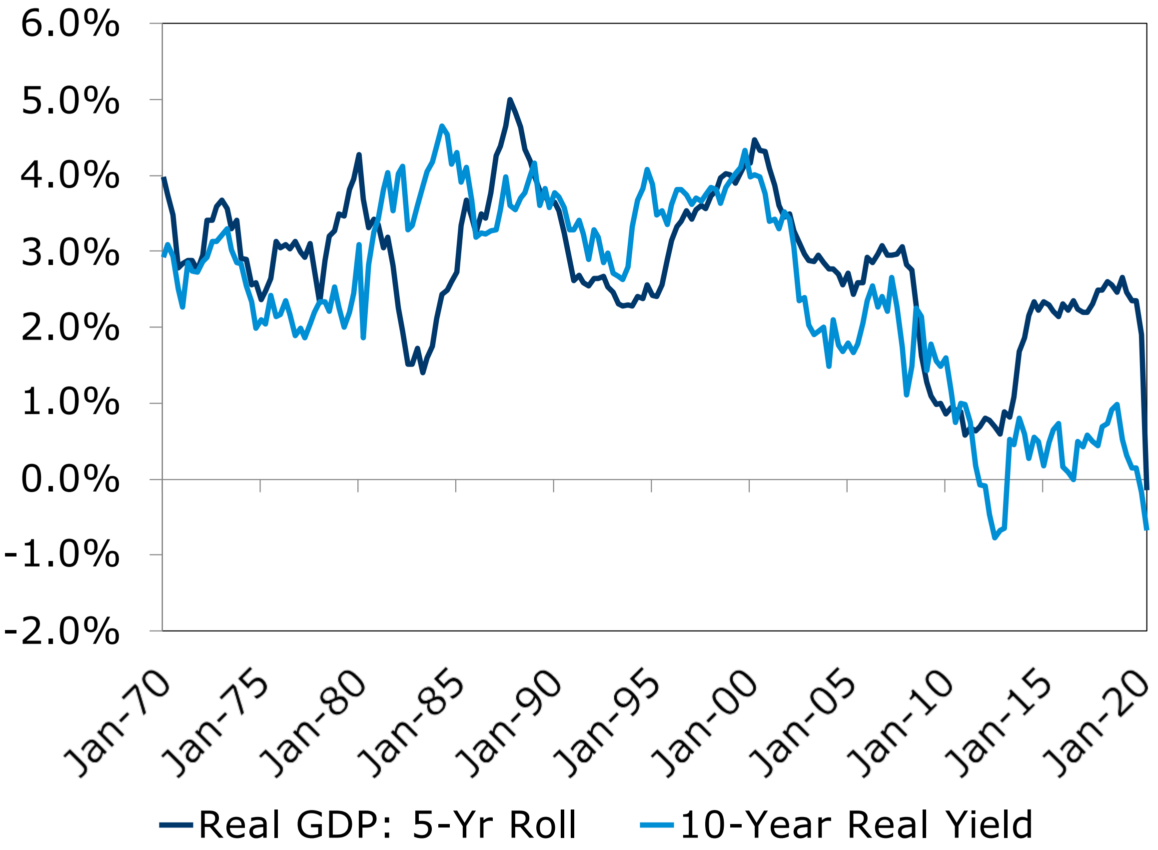
- Economic Efficiency: If the underlying economic activity that drives asset performance can be identified, perhaps it can be used to assist in building economically-efficient portfolios

- Portfolio Stability: Macroeconomic risk factors – when separated from the valuation component inherent in investment pricing – may exhibit more stable correlations and, therefore, can better inform the allocation process

Economic Factors

Growth Proxy

- Interest rates contain information and can reflect economic factors
- Nominal yields aggregate two important and distinct sources of economic information – real yields and expected inflation
- Disaggregating these factors should prove beneficial in developing a set of factors with improved explanatory power

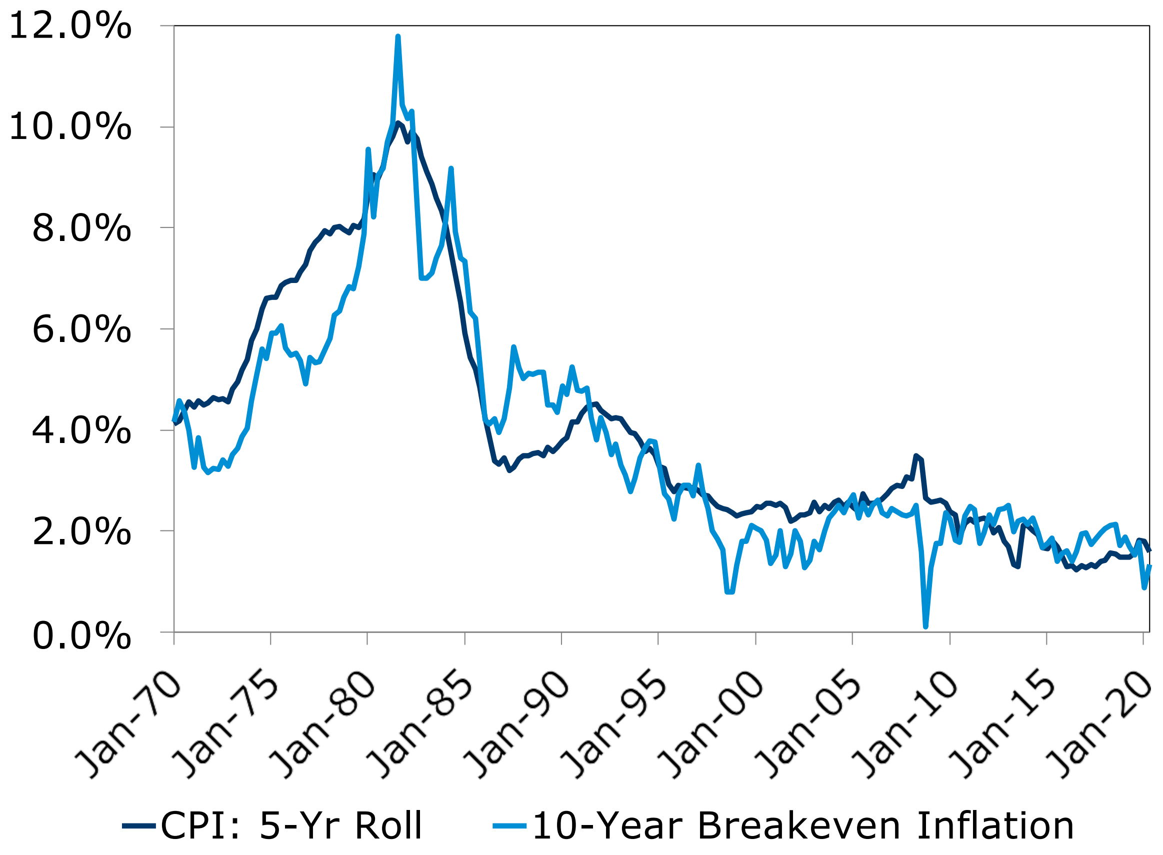


Data Source: Federal Reserve, Bridgewater as of 2021. For illustrative purposes only. There is no assurance that any trends depicted or described will continue.

Economic Factors

Inflation Proxy

- Breakeven inflation is the market's expectation for inflation
- Tends to follow closely with actual, recent inflation and can act as a timely signal of trends in consumer prices

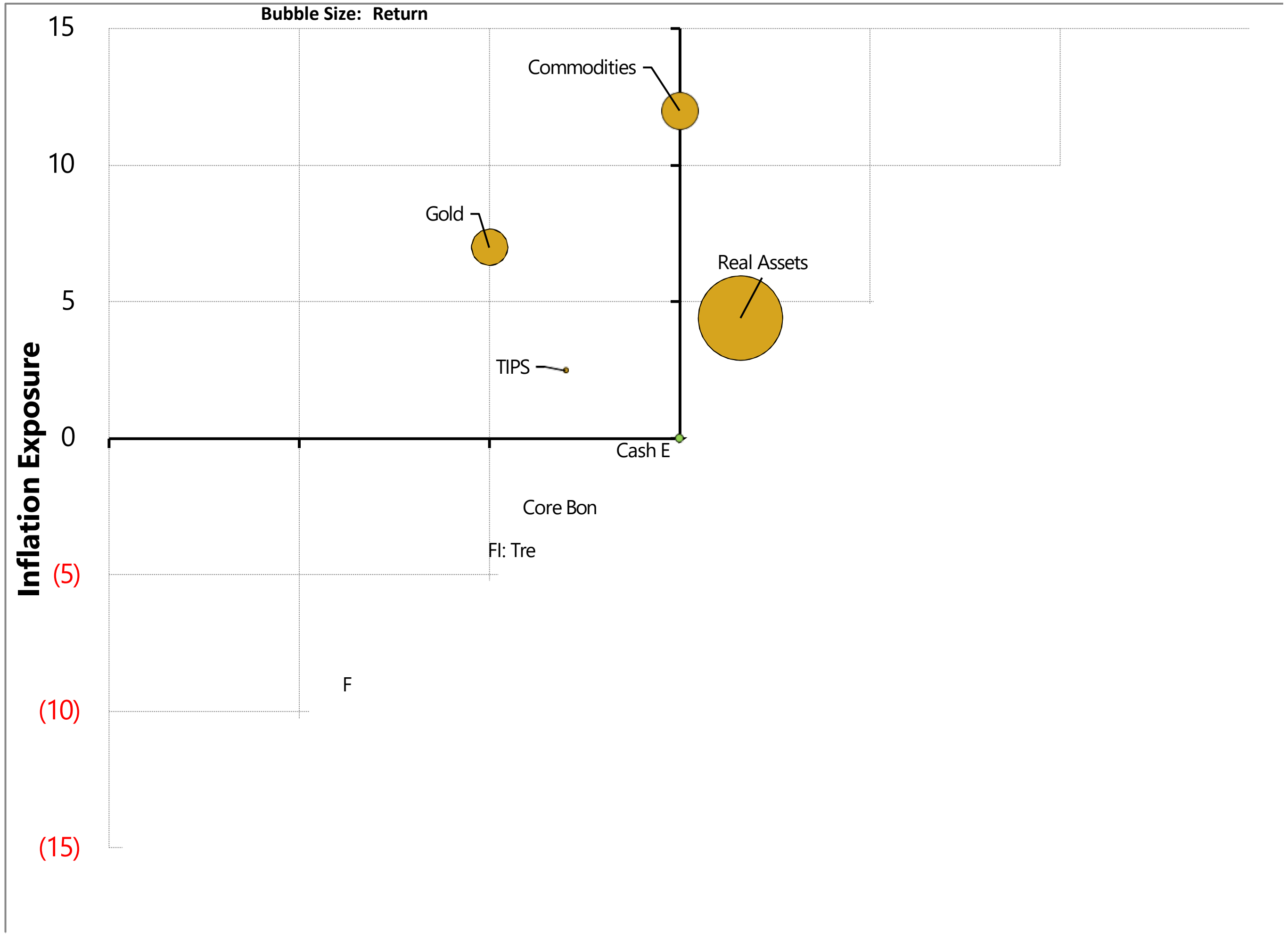


Data Source: Federal Reserve, Bridgewater as of 2021. For illustrative purposes only. There is no assurance that any trends depicted or described will continue.

Wilshire's Approach

Employ a 2-factor regression model (growth and inflation) to formulate factor assumptions

Growth proxy is enhanced by high yield bond spreads to better capture shifts in growth forecasts



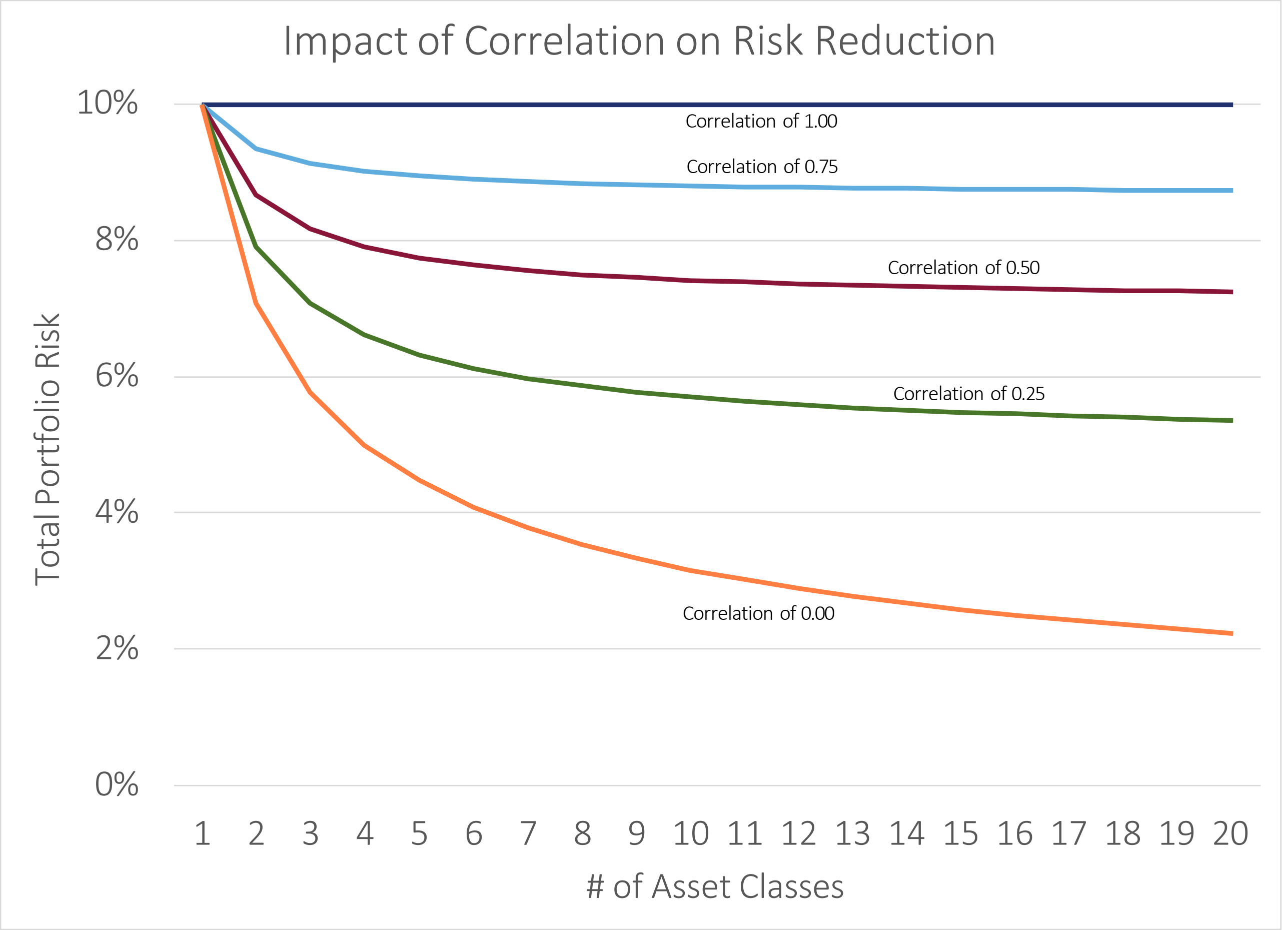
Wilshire's Bucketing & Factor Lens

Asset Class	Current Target
Domestic Equity	26.00%
International Equity	22.00%
Private Equity	9.00%
Total Growth Assets	**57.00%**
Opportunistic/Diversified (Private Credit)	10.00%
Total Defensive Growth Assets	**10.00%**
Liquidity Reserves (Cash)	1.00%
Core Fixed Income (75%)	16.50%
Liquid Treasuries (25%)	5.50%
Total Safety Assets	**23.00%**
Direct Real Estate (70%)	7.00%
Global REITs (30%)	3.00%
Total Real Assets/Inflation Sensitive Assets	**10.00%**
Total Assets	**100.0%**
Expected Return - 10 Years (%)	**6.78**
Expected Return - 10 Years (%) - STAFF	**6.03**
Expected Return - 30 Years (%)	**7.39**
Standard Deviation of Return (%)	**12.46**
Sharpe Ratio	**0.24**
Contribution to Asset Volatility (%):	
Growth	**82.0**
Defensive Growth	**7.5**
Safety	**2.4**
RA/Inflation Sensitive	**8.1**
Cash Yield	**2.9**
Growth Factor	**5.8**
Inflation Factor	**-1.4**
Liquidity	
Market	**71.5**
Stressed	**19.2**

Value of Diversification

Efficient diversification is more than just investing in different asset classes

Diminishing risk reduction benefit by simply adding asset classes – even with uncorrelated assets

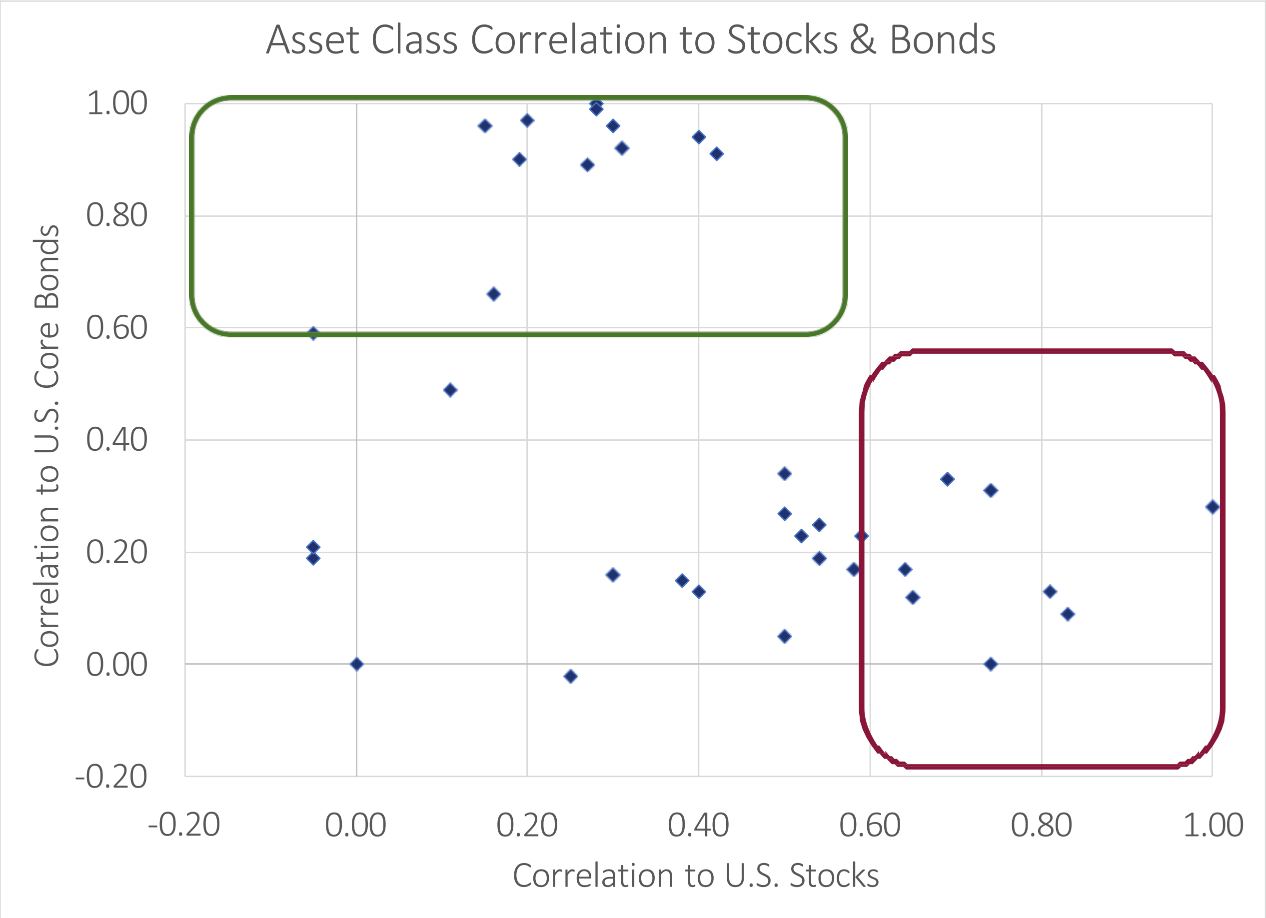


Data Source: Bloomberg. For illustrative purposes only. There is no assurance that any trends depicted or described will continue.

"Bucketing" Asset Classes

Group asset classes together into macro-asset class buckets based on their expected correlations to one another

Combines assets that play similar roles in a portfolio while creating a better understanding of risk and diversification



Data Source: Bloomberg as of 2021. For illustrative purposes only. There is no assurance that any trends depicted or described will continue.

Correlation Instability

Mean variance optimization relies on stable correlations to produce truly efficient portfolios

History shows that correlations are unstable through time

Data Source: Bloomberg as of 2022. For illustrative purposes only. There is no assurance that any trends depicted or described will continue.

Unstable Correlations

- Asset class behavior to economic risk factors varies and leads to correlation instability
- High yield bonds (for example):
  - When economic growth is stable, they behave like high quality bonds, providing a steady income
  - When conditions turn unstable, they behave more like equity as yield spreads can widen dramatically and prices fall
- Quantitatively, one single, static correlation assumption struggles to adequately capture this behavior (while bucketing can help, it does not resolve this issue)

Given the maturity of the defined benefit fund, please provide your thoughts on liquidity management.

Liquidity Management

Mathematical optimization does not consider liquidity, but good pension plan governance MUST

- $4B in annual benefit payments, with benefit payments ~2x contributions

Even assets with daily liquidity can be challenging or undesirable to sell during market stress

Asset Allocation Approaches:

- Constrain illiquid assets in the modeling process
- Model downside scenarios and likelihood of needing to sell during stressed markets/coverage ratios
- Quantify impact of stressed markets on liquidity: Wilshire liquidity framework includes a penalty process to reflect lost practical liquidity due to asset class volatility/sensitivity to particular economic environments

Implementation:

- Discussion on desirable coverage ratios, trading preferences, cash equitization

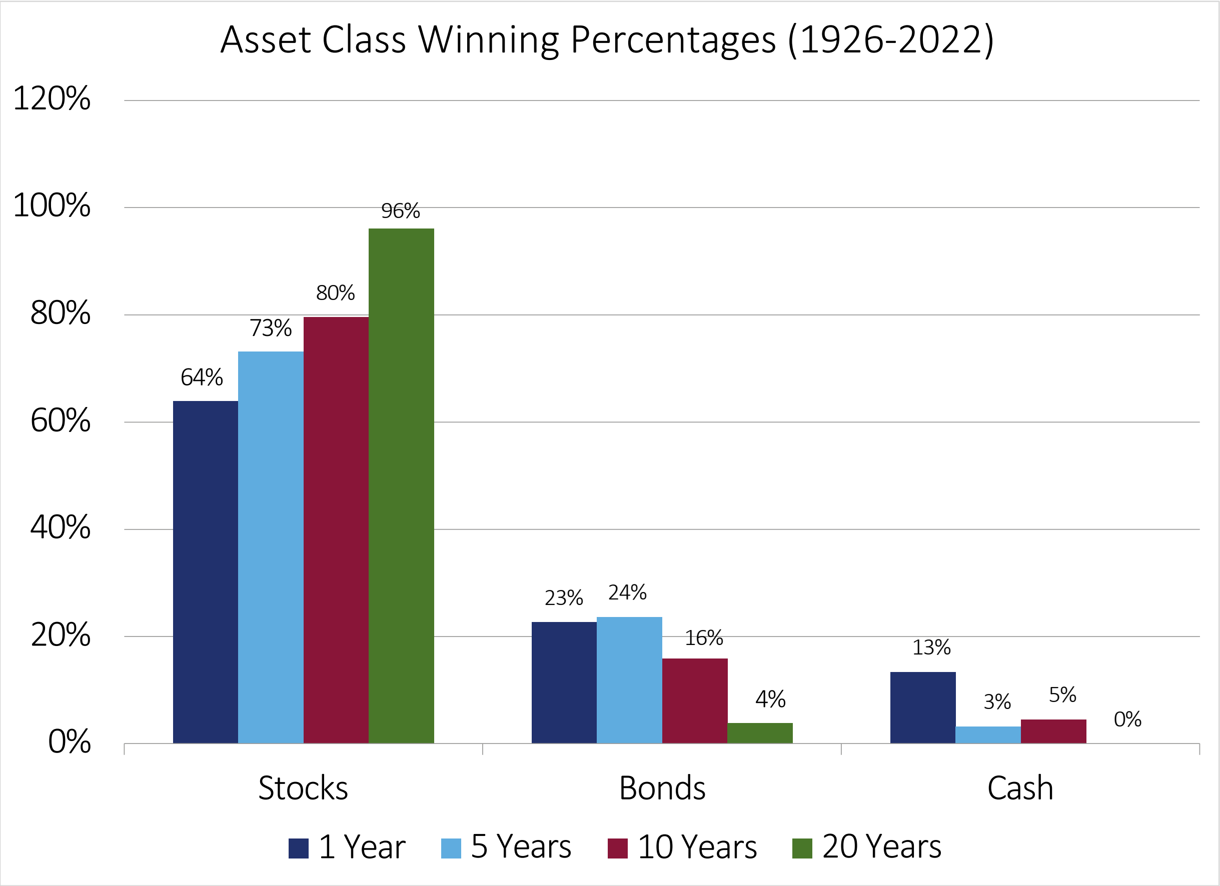
Additional information can be found in the Appendix.

Liquidity Risk: What Are The Consequences?

Default/Insolvency is the most severe outcome from having insufficient liquidity, but…

There are many other, more likely, disruptive impacts that a lack of liquidity can impose on an investment portfolio

- Liquidity breaches can rob an investor of their biggest advantage: a long-term investment horizon
- The timing and price of such sales dictated by liquidity needs rather than by explicit investment rationale
- Can destroy portfolio value and effectively strip a portfolio from its ability to recover from market sell-offs



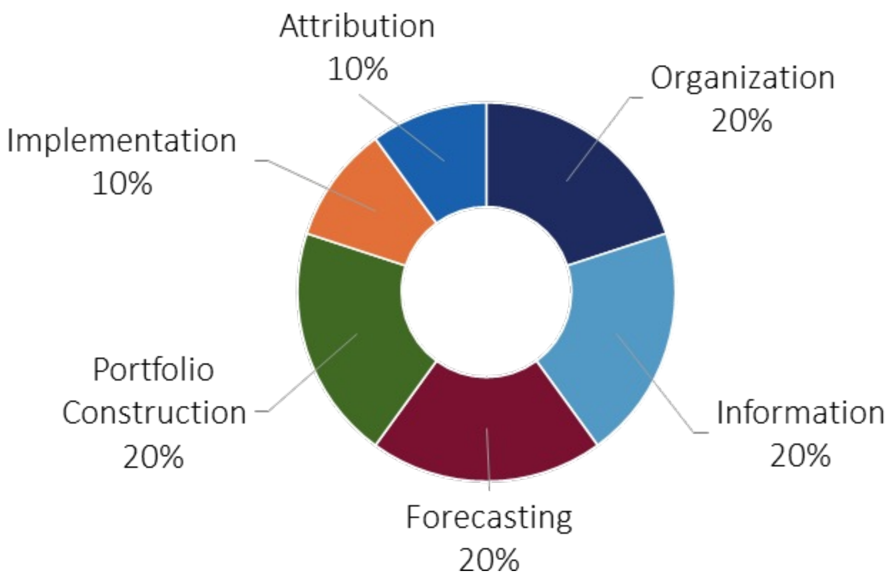
Describe your firm's consulting process regarding internal investment management programs:

- Detail your firm's experience with internally managed mandates
- Provide use cases for active and passive investment management

Internal Investment Programs

Evaluate internal investment programs with the same framework used for external investment organizations

- Quantitative return and risk analysis
- Qualitative diligence



Internal Investment Programs (cont.)

Active Risk Budgeting

- Focus active risk taking in less efficient markets
- Small cap equity
- Emerging markets
- Fixed income

Index Percentile Ranking (thru 2022)

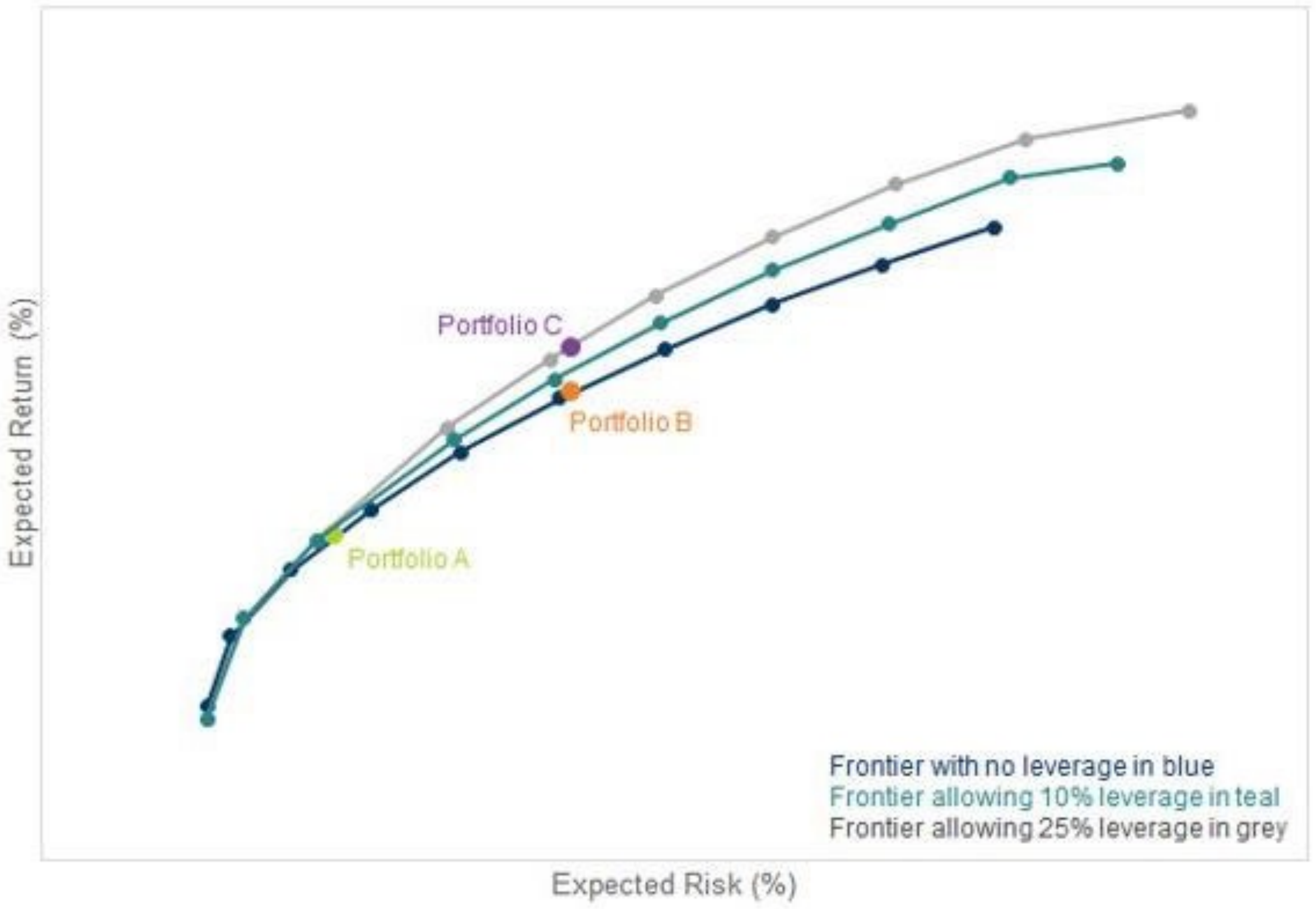
Equity Segments	1 Year	3 Years	5 Years	10 Years
Large Core Wilshire US Large Cap Index	84	49	43	41
Large Growth Wilshire US Large Growth Index	54	33	42	32
Large Value Wilshire US Large Value Index	54	44	39	38
Small Core Wilshire US Small Cap Index	77	79	68	74
Small Growth Wilshire US Small Growth Index	24	77	88	91
Small Value Wilshire US Small Value Index	84	70	61	70
REIT Wilshire REIT Index	77	89	93	89
EAFE MSCI EAFE Index ($N)	34	49	40	84
EAFE Small Cap MSCI EAFE Small Index ($N et)	52	70	51	68
Emerging Markets MSCI Emerging Markets Index ($N et)	51	64	71	91
Global MSCI – AC World Index ($N)	69	49	40	48
Fixed Income Segments				
Core Fixed Income Bloomberg US AG Index	85	96	97	80
U.S. High Yield Bloomberg Barclays US H Y Index	88	76	74	49

Index Quartile
1st Quartile
2nd Quartile
3rd Quartile
4th Quartile

Source: Wilshire Advisors 2022 Active Management Review

Please provide your best ideas to increase risk-adjusted returns.

Total Fund Leverage



Efficient Frontier graph for illustration purpose only. There is no assurance that any trends depicted or described will continue.

Total Fund Leverage (Cont.)

	Portfolio A (%)	
	Weight	Ctrb to Risk
Global Equity	30.0	66.0
U.S. Core Fixed Income	65.0	33.0
Cash	5.0	1.0
Total Assets	100.0	100.0

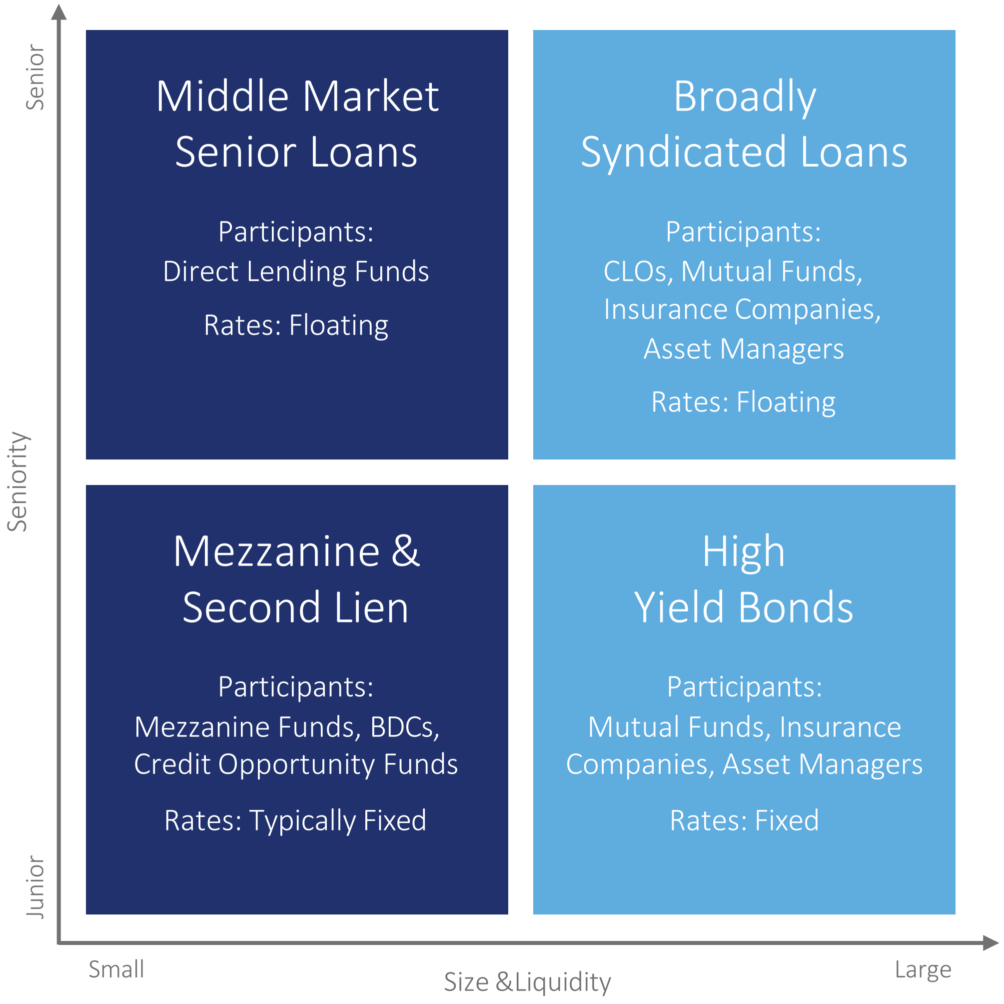
	Portfolio B (%)	
	Weight	Ctrb to Risk
Global Equity	57.0	91.5
U.S. Core Fixed Income	43.0	8.5
Cash	0.0	0.0
Total Assets	100.0	100.0

	Portfolio C (%)	
	Weight	Ctrb to Risk
Global Equity	53.0	81.4
U.S. Core Fixed Income	72.0	18.6
Cash	0.0	0.0
Leverage	25.0	-
Total Assets	125.0	100.0

Private debt

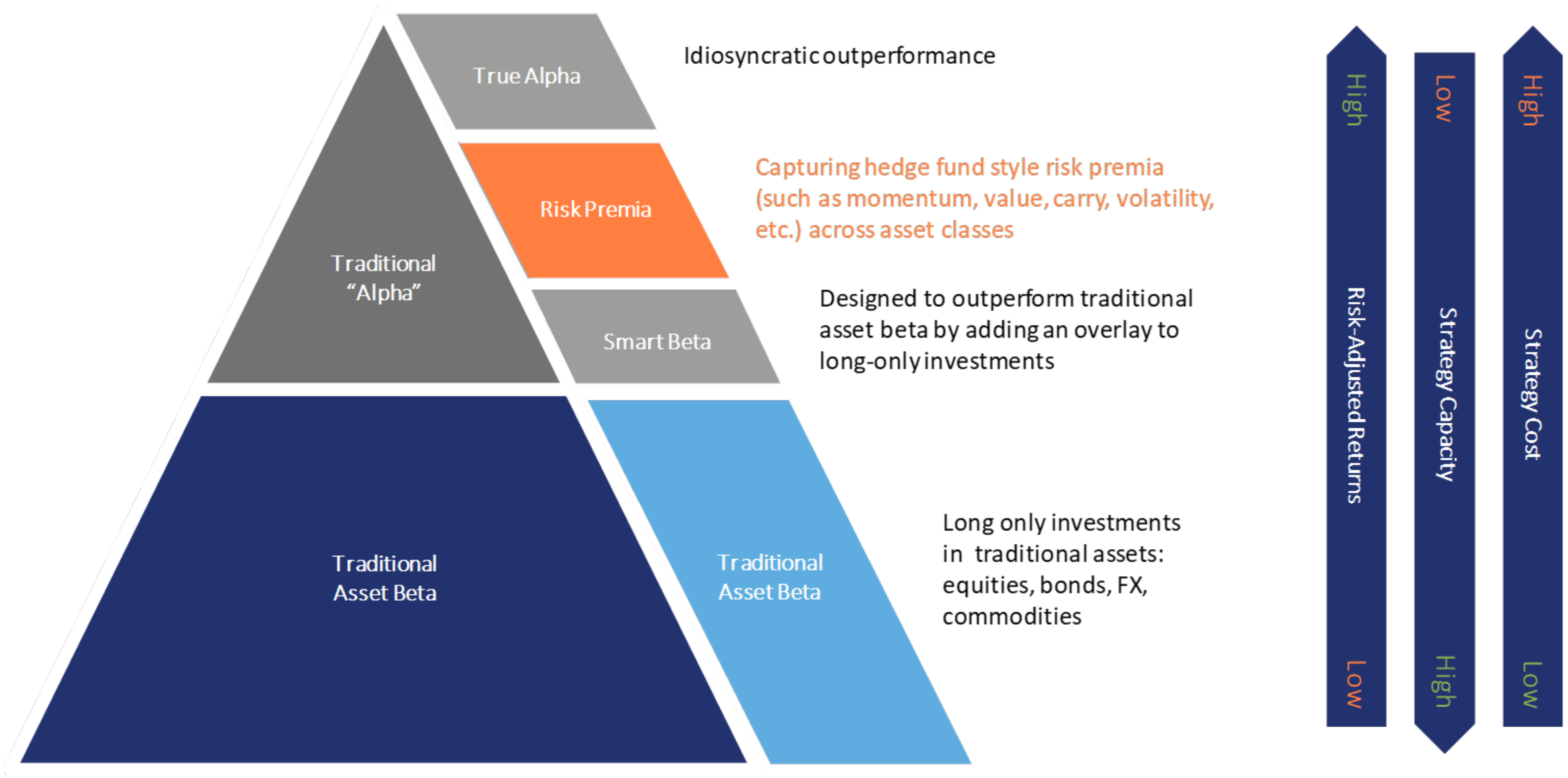
2.15% return premium relative to below investment grade public credit

Improved Sharpe Ratio



Source: Wilshire Advisors Asset Class Assumptions Update – June 2023

Factor Risk Premia



Please elaborate on your philosophy with respect to investment management costs.

Investment Management Costs

Costs matter and fees should only be paid to harness unique return streams

Investment management fees should be:

- Minimized in highly efficient market segments
  - Index/Passive implementation
  - Enhanced index strategies
  - Efficient use of internal resources
- Utilized in less efficient or inefficient market segments to capture alpha on a more consistent basis

Wilshire will aggressively negotiate alongside, or on behalf, of clients to minimize costs wherever possible

Please describe your process to perform investment manager due diligence reviews and external manger searches.

Manager Due Diligence and Searches

Our manager research process is heavily qualitative – drives search candidates

- Focus on six key areas; conduct more than 1,600 manager meetings a year on average
- Analysts have dedicated asset class coverage, with some compensation tied to research/forecasts

Quantitative analysis seeks to uncover portfolio characteristics

- Conduct returns-based, holdings-based and multi-factor risk analyses using sophisticated proprietary analytic tools
- Seek to uncover the key drivers of performance
- Attempt to determine what risks a portfolio

Research team delves beyond the numbers

- Understand investment philosophy
- Evaluate manager and organization

Develop expectations of future performance

- Derive explicit performance and risk forecasts for managers

Manager Search Process

- Define objectives and fit/context of the mandate within the broader portfolio
- Client driven process, with preference for targeted RFP process driven by Wilshire Manager Research evaluations
- Will include at least one diverse owned candidate in all long-only searches unless Ohio STRS opts out.
- Staff involvement and coordination, independent scoring provided by Wilshire

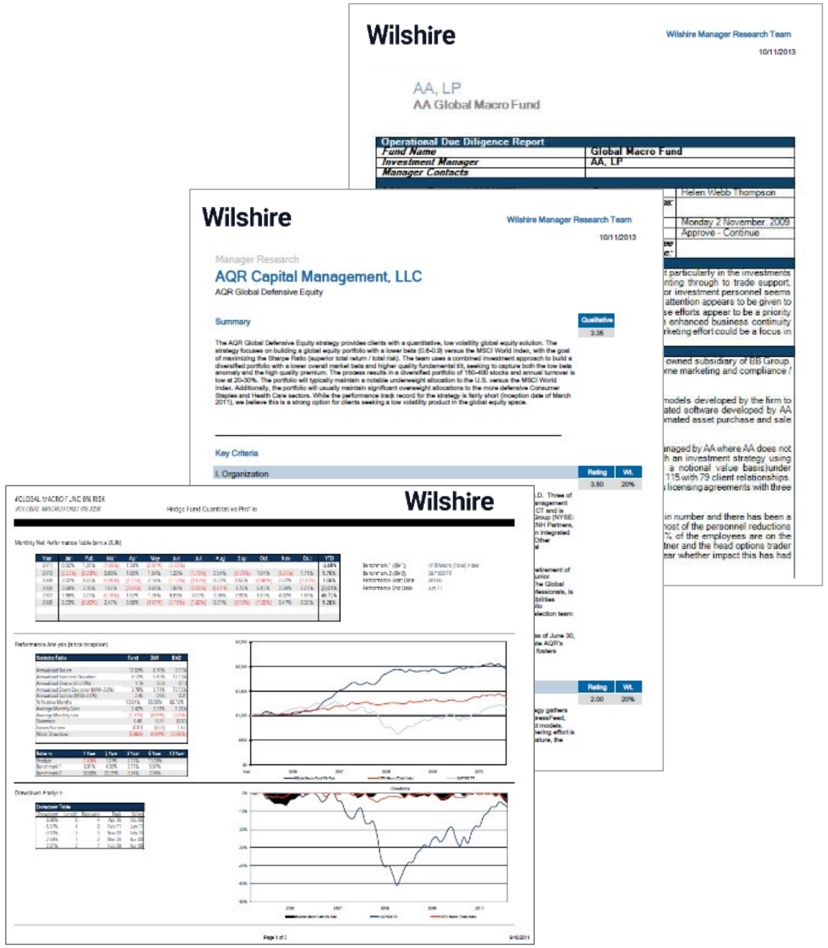
Due Diligence Requirements

Due diligence process entails:

- On-site visits
- Manager Interviews
- Regular conference calls
- Due Diligence Questionnaires

Types of initial due diligence reports completed on each screened manager:

- **Qualitative** – comprehensively evaluate managers using proprietary six factor qualitative research process
- **Quantitative** – conduct returns and holdings based analysis
  where required



Illustrations above represent sample reports.

Traditional Manager Evaluations

Qualitative Due Diligence

Organization
Evaluating the investment team resources and background, including how the overall organizational structure promotes stability and focus

Information
Understanding a manager's edge in gathering and processing information

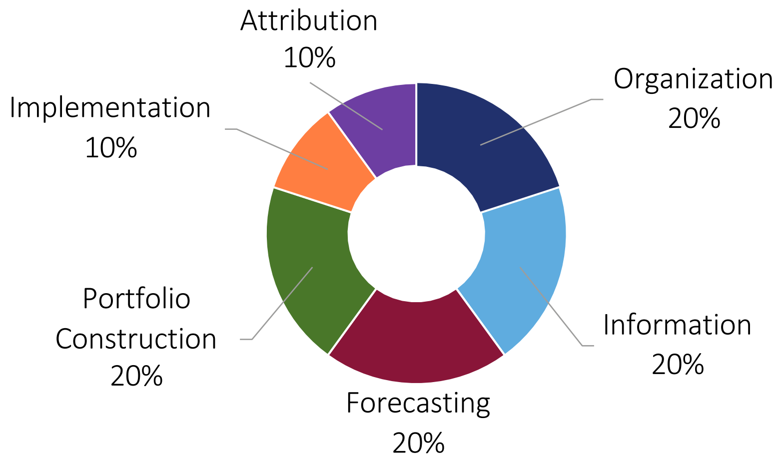
Forecasting
Evaluating how a manager creates forecasts, the accuracy, and how they compare to peers in terms of uniqueness.

Portfolio Construction
Rating how a manager properly aligns assumed risks with their forecasting ability/skill

Implementation
Strong focus on operational effectiveness: measuring a manager's trading capabilities and back-office efficiency

Attribution
Assessing a firm's willingness and ability to constantly revaluate their own investment process/performance and incorporate feedback to improve their decision-making ability

Breakdown of Total Rating



Decile Scoring Tier Mapping

Decile Rating	Decimal Scores From		Decimal Scores To	Grade
1	3.50	-	5.00	A
2	3.25	-	3.49	
3	3.00	-	3.24	B
4	2.75	-	2.99	
5	2.50	-	2.74	C
6	2.25	-	2.49	
7	2.00	-	2.24	D
8	1.75	-	1.99	
9	1.50	-	1.74	F
10	0.00	-	1.49	

Focus List

Investment Monitoring & Reporting

Please provide details on your investment benchmark philosophy.

Benchmark: Standard Against Which Something is Compared

Market Benchmarks

- Asset class benchmark reflects the passive alternative for liquid asset classes – broad opportunity set
- Manager benchmarks reflect manager style and opportunity set- benchmark fit analysis
- Total fund benchmarks – weighted average of asset class benchmarks/ overall objective benchmarks (actuarial rate, real return)

Peer Universe Comparisons

- Available for individual managers, asset classes, total fund

Private Asset Benchmarks

- Time weighted based either on public market "equivalent" or peer (e.g., Prequin/HFRI)
- Alternative statistics such as IRR, TVPI, PME

Ideal Benchmark Characteristics

Unambiguous

Benchmark components and construction methodology are clearly identifiable

Investable

It is possible to replicate and simply hold the benchmark

Measurable

The benchmark's return is readily calculable on an on-going basis

Appropriate

The benchmark is consistent with the composite's objective or manager's investment style

Reflective of current investment options

The manager is knowledgeable of the securities or factor exposures within the benchmark

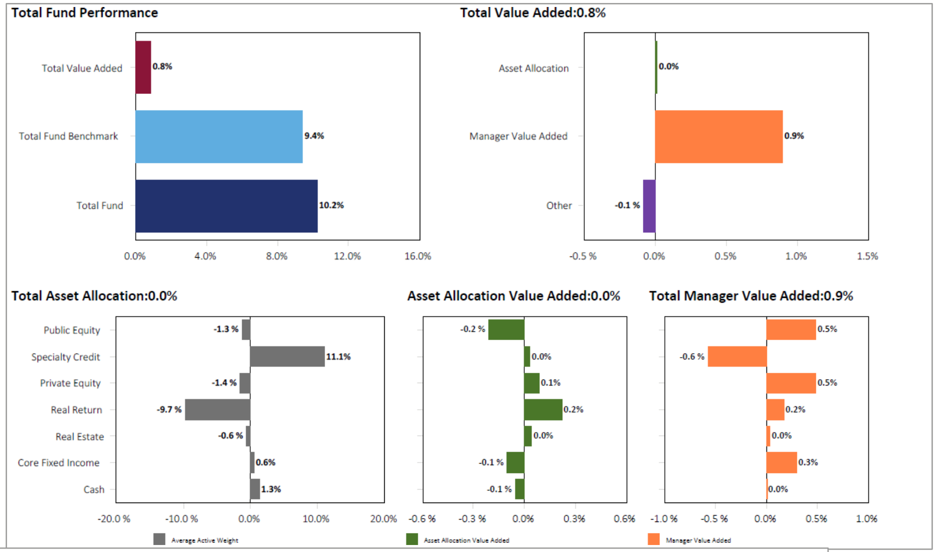
Pre-specified

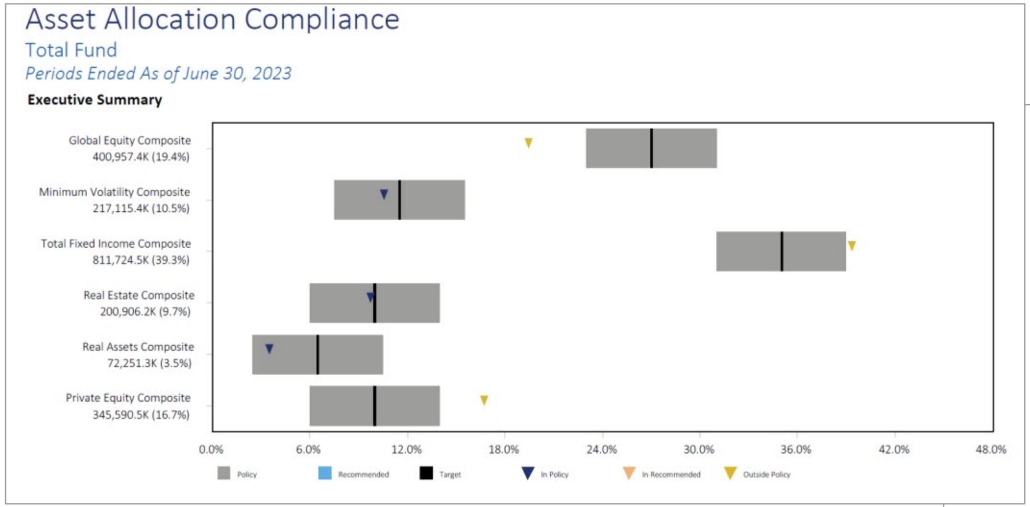
The benchmark is agreed upon prior to the start of the monitoring period

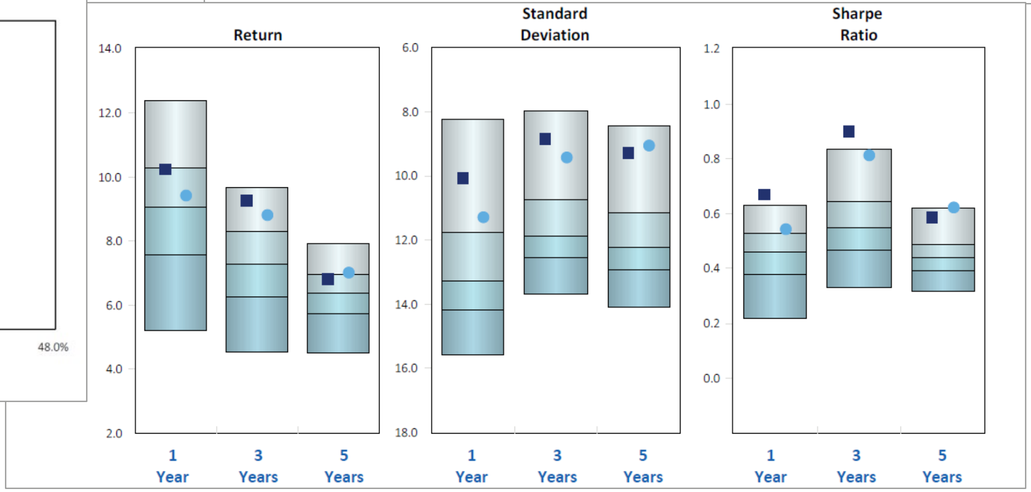
Plan Monitoring & Reporting – Sample Pages

Quarterly reporting includes:

- Asset allocation compliance
- Performance attribution
- Risk and return metrics
- Market benchmark and peer universe relative performance statistics
- Capital markets context







For illustrative purposes only. There is no assurance that any trends depicted or described will continue.

Please describe your process for monitoring and reporting on a client's investment performance.

Performance Preparation & Reporting Pipeline

Automated Data Collection

- Real time, automated, seamless data integration with custodians & most managers through InvestmentMetrics
- Proprietary industry leading investment analytics tools
- Integrated feeds with Manager Research

Numerous Reviews

- Dedicated performance team & client analysts in various geographical locations
- Tight control & procedures with adherence to GIPS
- Multi-level review process
- Established tolerance range
- Monthly/quarterly reconciliation
- Process & comments tracked via a centralized CRM

Client Direct Reporting

- Robust options on both returns & holdings characteristics
- Money-weighted and time-weighted performance returns & benchmarks
    - Proprietary investment analytics
    - Multiple peer universes
    - Market intelligence

Enhancements & Upgrades

- Quarterly performance platform enhancements
- Ongoing discussion with clients about reports
- Budget for customized programming

Fee Proposal

Please elaborate on your fee proposal, including which services are covered de facto by your fee proposal and which services are additional to the scope of services and priced a la carte.

Fee Proposal

Pricing for the DB/HC only and DC only mandates:

- DB/HC only - $450K annually
- DC only - $150K annually

The combined fees as stated in the RFP were $495K annually.

Appendix

STRS Ohio Consulting Team & Resources

Felicia Bennett, Managing Director

Felicia is a Managing Director at Wilshire who works closely with many of the firm's largest corporate, public, foundation and endowment clients.

Felicia joined Wilshire in 2006. Previously, she spent five years at PPG Industries, Inc., where she ran the benefits investment and financing area and had responsibility for over $5 billion of global defined benefit, defined contribution and foundation assets. She also worked with Alcoa Inc.'s $10 billion U.S. pension and foundation portfolios for three-and-a-half years and previously spent seven years working as an analyst in the planning and Treasury functions at Carnegie Mellon University.

Felicia earned bachelor's degrees in political science and German from Allegheny College and holds an MBA with concentrations in finance and economics from Carnegie Mellon University.

Christopher Tessman, SVP & Senior Consultant

Chris is a Senior Vice President and senior consultant. He leads management of the Wilshire Compass portal. In addition to providing consulting services for the firm's advisory clients, Chris provides client service to a wide variety of asset owners -- public/corporate pension plans, foundations/endowments, insurance companies, family offices and other wealth managers. Chris assists across a range of topics including asset allocation, manager evaluation and selection, investment structure and risk management.

Chris joined Wilshire in 2000 and brings over 20 years of industry experience. He earned a bachelor's degree from the University of Southern California.

STRS Ohio Consulting Team & Resources (Cont.)

David Lindberg, CFA, Managing Director

David is a Managing Director and leads strategic development efforts for Wilshire's institutional client business.

David joined Wilshire in 2001 and has over 30 years of industry experience. He has led several of the firm's largest institutional client relationships. Prior to joining Wilshire, David spent 12 years at Carnegie Mellon University where he was Assistant Treasurer with responsibility for endowment other financial assets.

David earned a bachelor's degree in business from the University of Pittsburgh and holds an MBA with a concentration in finance from Carnegie Mellon University. He holds a Chartered Financial Analyst designation and is a member of the CFA Society Pittsburgh.

Thomas Toth, CFA, Managing Director

Tom is a Managing Director providing client service for a variety of pension, endowment and foundation clients at Wilshire. He is a member of Wilshire's Investment Strategy Committee.

Tom joined the firm in 2004 and initially worked in the investment research group, where he wrote white papers on topics including hedge funds, private equity and infrastructure. Before joining the firm, he worked in New York for fixed income asset manager Fischer Francis Trees and Watts.

Tom earned his bachelor's degree from the University of California, San Diego and holds an MBA with a concentration in finance/capital markets from the USC Marshall School of Business. Tom also holds the Chartered Financial Analyst designation.

STRS Ohio Consulting Team & Resources (Cont.)

Ned McGuire, CFA, FSA, FRM, Managing Director

Ned is a Managing Director at Wilshire and leads the Asset Allocation Investment Solutions team. He is responsible for researching and maintaining Wilshire's proprietary asset allocation models, conducting asset allocation studies and also serves as a consultant to plan sponsors.

Ned joined Wilshire in 2011. Previously, he worked as a risk management consultant overseeing asset-liability management and pension risk projects, and as an actuarial consultant to defined benefit plan clients.

He earned a bachelor's degree in mathematics from St. Olaf College and holds a master's degree in operational research from the University of North Carolina, Chapel Hill. Ned is a Fellow of the Society of Actuaries, a member of the American Academy of Actuaries and holds the Chartered Financial Analyst and Financial Risk Manager designations.

Wilshire Firm Overview

Since 1972, Wilshire has been dedicated to improving investment outcomes for institutional investors and financial intermediaries worldwide.

- Institutional advisory and OCIO services
- Discretionary and advisory solutions for financial intermediaries
- Full spectrum provider of alternative investment solutions
- Multi-asset analytics

500+
clients

$86 Billion
in assets under management

$1.3 Trillion
in assets under advisement[1]

$4.9 Billion
in **alternative** assets under management

$68 Billion
in total **alternative** assets invested by clients[2]

As of 3/31/2023.

[1] Assets under advisement includes assets under management.

[2] Total alternative assets invested by clients includes alternative assets under management

Wilshire Investment Resources

Our client service teams are supported by the resources of the entire Wilshire organization

Team Resources*

Wilshire Portfolio Management & Risk Management	Traditional Manager Research	Wilshire Alpha Strategies	Alternatives Manager Research	Wilshire Capital Markets Research
• Deep teams of experienced professionals • Focus on portfolio structuring and implementation. • Utilize industry leading analytics to establish and monitor risk framework	• 40+ professionals contributing to manager research • Conduct more than 1,600 manager meetings a year on average	• Utilize quantitative methods to support investment strategy • Research & development of quantitative signals and solutions • Evaluate investment process for areas of enhancement	• 30+ professionals • Global presence • Actively sourced 3,100+ investment opportunities in 2021	• Asset class expectations • Research, white papers, and education • Quarterly market reviews and timely market updates

*Includes dual role personnel

Key Wilshire Differentiators

Harnessing our extensive global research, and qualitative and quantitative tools, we can tailor investment solutions to clients' specific needs and objectives

Public fund expertise

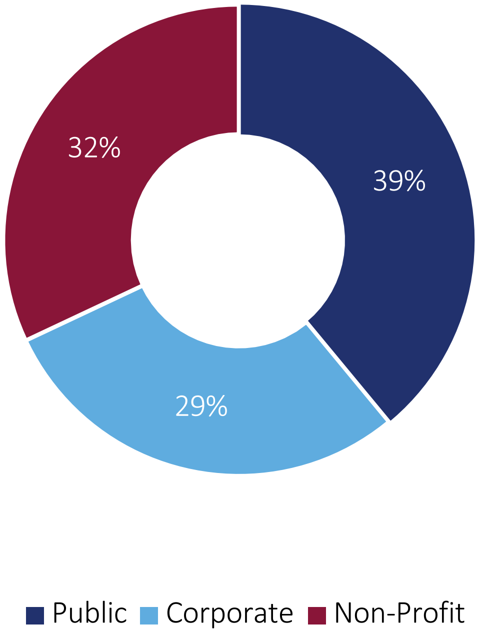
- 80% of AUA are public pensions
- Technology and risk management heritage
- Proprietary tools and risk models — both holdings and returns based; customizable and flexible

Thought leadership in emerging risks and evolving opportunities

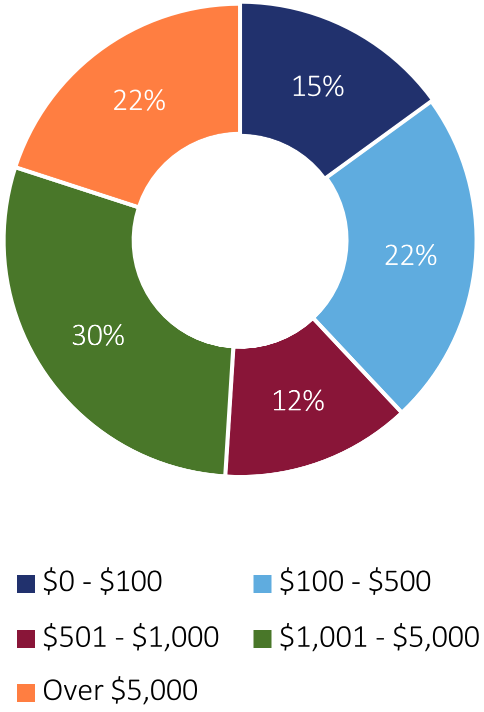
- Research dedication and leadership

Institutional Client Base

Institutional Client Base by Type



Institutional Client Base by Asset Size ($M)



As of 3/31/2023

Sample List of Clients

Clients listed above utilize one or more services offered by Wilshire and allow Wilshire to disclose the existence of the relationship. Inclusion of a client on the list does not indicate an endorsement of Wilshire or the services provided. Logos are protected trademarks of their respective owners and Wilshire disclaims any association with them and any rights associated with such trademarks.

Global presence

300+
Associates worldwide

66
Investment professionals

40
CFA charterholders

9
CAIA® designation

As of 3/31/2023.

Investment Policy Review

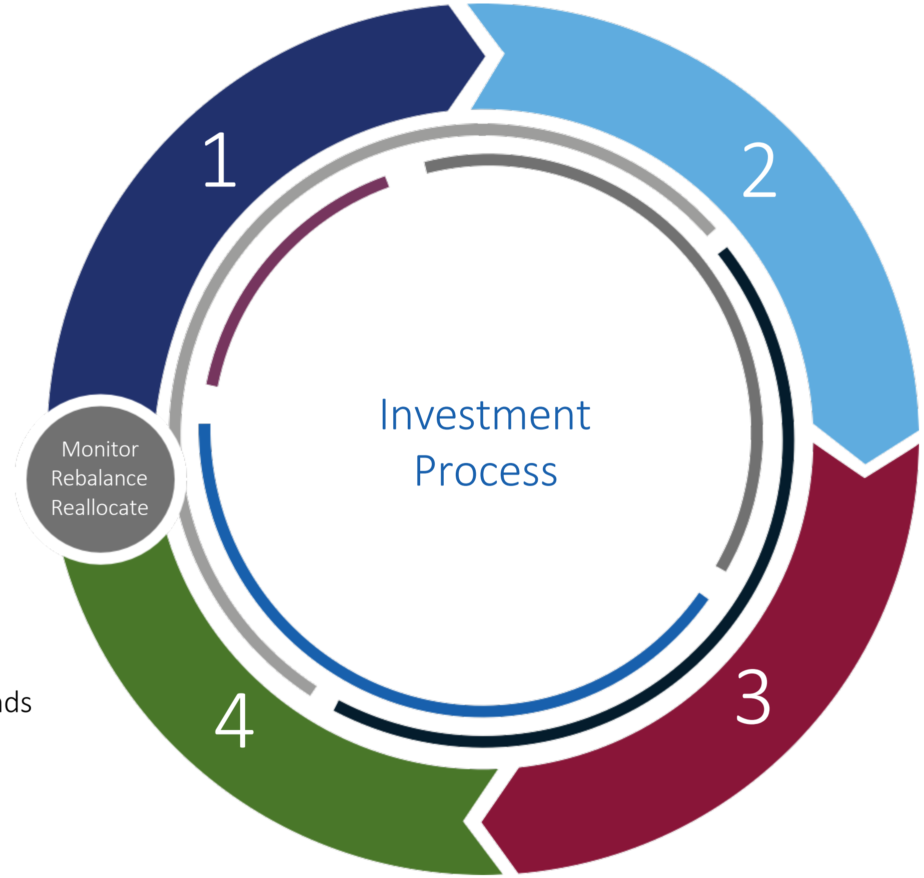
Wilshire has over 40 years of consulting experience in assisting clients with the development of investment policies, procedures, and guidelines. The development of the policy is an interactive process between the organization's management/trustees and the consultant.

1. Statement of the document's purpose ✓
2. Roles and responsibilities of all parties ✓
3. General fund policies ✓
4. Investment Goals and Objectives ✓
5. Asset allocation ✓ – Rebalancing ranges are wider than peers
6. Investment Structure ✓
7. Investment Performance Measurement and Monitoring ✓

Investment Process

1 Forward-looking Asset Allocation

- Leverage access to asset class preferences of institutional investors
- Develop forward-looking strategic forecasts based on institutional data
- Utilize a wide array of core and specialty asset classes



2 Extensive Manager Research

- 70+ individuals contribute to manager research
- Screen, evaluate and select managers based on insight into drivers of risk and return
- Qualitative depth and quantitative sophistication

3 Risk-Controlled Portfolio Construction

- Forecast alpha, tracking error and correlations
- Blend underlying managers with different and complementary styles into risk-controlled portfolios
- Employ risk budgeting techniques

4 Ongoing Monitoring

- Monitor portfolios and underlying funds
- Seek to minimize style drift
- Update capital market assumptions

Risk Assessment Framework

Wilshire's multi-dimensional view of risk integrates organizational and investment considerations into a comprehensive framework for evaluating strategic decisions.

Shortfall: Support distributions and long-term growth

Behavioral: Instill strong governance

Drawdown: Limit portfolio losses

Inflation: Preserve long-term purchasing power

Liquidity: Balance near-term needs, long-term opportunities

Active: Ensure unique exposures

Emerging & Long-Term: Environmental, Social & Governance risks, such as externalities, intangibles and reputation may be linked to various risk lenses

Recommendation/Allocation Approach

Wilshire's process integrates Policy or Fund objectives, existing exposures, macroeconomic outlooks, market information, strategy views and robust analytics to develop portfolios that perform in a consistent manner throughout a variety of market environments.

Top Down Process

Fund objectives and role of Marketable Alternatives allocation framework

Existing Fund asset class & manager exposures

Identify pockets of opportunity: Asset classes & strategies

Alternatives Allocations

Iterative scenario, sensitivity & contribution analysis

Deep Quantitative & Quantitative Research

Global Manager Sourcing

Bottom Up Process

Wilshire Asset Allocation Differentiator

- Traditional asset allocation seeks to build efficient portfolios using:
  - Asset class return, risk and correlation assumptions
  - Exposure constraints reflecting investor-specific needs or preferences
- History has shown diversification offers less protection than expected against drawdowns during major market events
- Factor-based asset allocation attempts to incorporate macroeconomic factors that:
  - Drive asset performance
  - May be helpful in identifying areas of portfolio vulnerability
- Wilshire developed a practical and intuitive approach that delivers the key beneficial elements of incorporating economic factors

Data Source: Bloomberg as of December 2021. For illustrative purposes only. There is no assurance that any trends depicted or described will continue.

Wilshire’s Bucketing Approach to Asset Allocation

	Defensive Equity			
U.S. Equity	Public Credit	Cash	Infrastructure	
Non-U.S. Equity	Private Credit	Treasuries	Real Estate	Hedge Fund
Private Equity	Bank Loan	Core Fixed Income	Natural Resources	Marketable Alts
Growth	**Defensive-growth**	**Defensive**	**Inflation-sensitive**	**Diversifying** (Non-directional)

Why Introduce Factors?

Risk Assessment

Including factors within the asset allocation process provides an opportunity to measure asset class (and portfolio) exposures to key economic factors

Economic Efficiency

If the underlying economic activity that drives asset performance can be identified, perhaps it can be used to assist in building economically-efficient portfolios

Portfolio Stability

Macroeconomic risk factors — when separated from the valuation component inherent in investment pricing — may exhibit more stable correlations and, therefore, can better inform the allocation process

Identifying Key Factors

Ideal factors are the primary economic drivers to which investments respond and should include the following attributes

- Relationship with returns is straightforward, intuitive and easily understood
- Explanatory power/statistical value in describing asset class behavior
- Has a low correlation to other factors
- Measurable with reasonable frequency
- Contemporaneous, free from significant timing lags
- Identifying useful factors is challenging:
  - For example, real GDP growth is only measured quarterly, is reported with a lag, is commonly revised and says nothing about future growth expectations
  - Proxy for growth (and other economic drivers) is necessary to attempt to capture various asset classes’ sensitivity to growth expectations

Regression Output: Two-Factor Model

Equities show meaningful exposure (slope) to growth, high quality bonds and gold exhibit negative exposure

Positive exposure to inflation of TIPS, commodities and gold are intuitive, as are negative exposures of most high-quality bonds

Data Source: Wilshire Compass

A Definitional Framework

In its purest sense, full liquidity represents full, unencumbered and immediate access to one's assets or wealth.

We more clearly define liquidity via a structural hierarchy that moves from its purest sense to three other investment classifications that typically provide lower levels of liquidity.

Liquidity Definitional Hierarchy

Full Liquidity

Purest form of liquidity, consisting of cash that has not been allocated to any other purpose (i.e., it is not callable or committed to other investments).

Encumbered Liquidity

Cash that has been set aside for a specific future purpose (e.g., allocated cash not deployed by investment managers, known capital calls, projected benefit payments etc.).

Convertible Liquidity

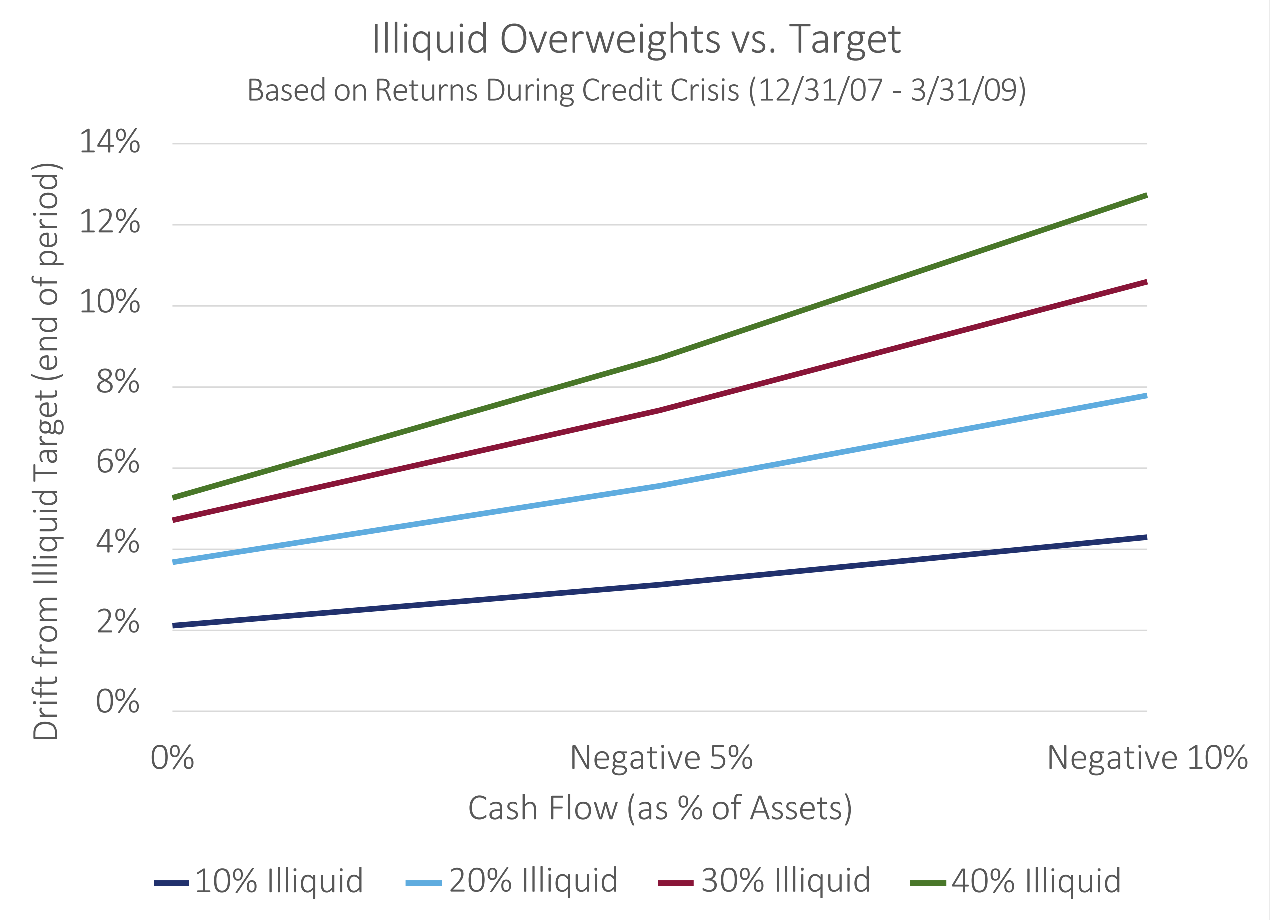
A level of access to liquidity from assets that can be sold (i.e., liquidated) within X days at a maximum discount of Y% of their current market value.

Delayed Liquidity

Captures all remaining assets that could be sold (or liquidated), but at greater expense and/or over longer timeframes than for "Convertible Liquidity" (e.g., private market investments, public market investment through limited partners with infrequent openings, hedge fund investments, funds with longer commitments and other related fund vehicles with lengthy redemption periods or restrictive terms, etc.).

Selling During Stressed Markets

- Meeting liquidity needs with a "sell as you go" process can tear portfolios away from their asset allocation targets during stressed market environments
- Potentially leading to undesirable risk characteristics and/or increased market vulnerability
- The threat of being pushed away from allocation targets increases with:
  1. larger required cash outflows (i.e., greater liquidity needs)
  2. larger allocations to illiquid assets



Data Source: Wilshire Compass

Wilshire Stressed Liquidity Metric

Stressed Level of Liquidity Metric*

Asset Class	Market Liquidity	Liquidity Penalty Components			Applied Penalty	Stressed Liquidity
		Growth	Inflation	Volatility		
U.S. Equity	100	50			50	0
Dev ex-U.S. Equity	100	50			50	0
EM Equity	90	50			50	0
Private Equity	0	50			0	0
Cash Equivalents	100				0	100
Core Bonds	100		8		8	86
High Yield Bonds	80	40		10	40	0
U.S. Real Estate Securities	90	50		24	50	0
Private Real Estate	0	50		18	0	0
Commodities	90			20	20	55

Applied Penalty = Min(Max(Growth + Inflation, Volatility), Market Liquidity)

Stressed Liquidity * = Market Liquidity - (1.75 x Applied Penalty)

*If less than 20, Stressed Liquidity is assumed to be 0

Wilshire Diverse-Owned Manager Initiative

Manager Search Process

- Include a diverse-owned firm in every public securities manager search by Wilshire
- Products must fit client mandate and be scored in top four deciles

Diverse Ownership

- Search books include percentage of ownership by women and minorities
- Highlights diversity in the manager search process

Aligning Interests

- Discretionary compensation for consultants tied to interaction with diverse-owned firms
- Specifically aligns interests of senior leaders

Internal Governance

- Diverse-owned manager asset class committee governs the initiative
- Focused effort, tracking and accountability

Education

- Broaden outreach to diverse-owned firms
- “Welcome to Wilshire,” a series of educational seminars for diverse-owned firms

Raising the profile of diverse-owned managers provides clients with opportunity to capitalize on diversified perspectives in an increasingly complex and global world

The initiative has proactively engaged with the community and had a demonstrable impact on awareness and outreach

Performance & Reporting

Timeliness and Accuracy

- Dedicated staff
- Independent verifications and reconciliation
- Multilevel review process

Client Directed Reporting

- Customized reporting
- Monthly and quarterly reports
- Executive summary

Return/Risk Analysis

- Risk analysis
- Style analysis
- Return attribution

Universe Analysis

- Total fund
- Asset class composites
- Manager comparisons

Benchmark Selection and Custom Benchmarking

An expression of the Fund’s long-term goals is the construction of relevant benchmarks

Performance Attribution

Decomposition of sources of return, such as asset allocation, active vs. passive management, manager skill, etc.

Insight on Risk/Returns

Insight into level of risk being taken to generate return and the volatility of return over time

Manager Evaluation

Measure against which manager performance can be evaluated to assist in retention/ termination decisions

Benchmark Selection Considerations

Total Fund Benchmark

- Does it appropriately match the plan sponsor's investment philosophy and objectives and reflect the overall structure of the fund?

Asset Class Benchmark

- Does it reflect a broad universe of investment opportunities in an asset class and offer a "target" for combining multiple managers within the asset class?

Manager Benchmark

- Does it appropriately reflect the objective of the strategy and is it consistent with the asset class objective?

Benchmarking Private Assets

Benchmarking private assets is not as straightforward as public assets

- Available private asset “benchmarks” from industry providers are actually universe comparisons, either of private market funds or other plan sponsor private programs
- Not investable in the same manner as public indexes
- Underlying constituents can shift depending on data availability
- Data availability is limited to quarterly periodicity

Choosing Private Market Benchmarks

Plan Sponsors have widely used a public market index plus a premium for benchmarking

- Identify best underlying public market beta representation
- For private equity, common to use public equity cap weighted benchmark
- For private debt many investors use a bank loan index such as S&P/LSTA US Leverage Loan 100 Index
- Lagged vs. Non-Lagged Index?
- Given the lagged nature of valuations for private investments, one way to reduce tracking error between actual investments is to lag the public market index by one quarter
- Apply an illiquidity return premium
- Investors allocate to private markets because they will be rewarded for giving up liquidity, so intuitive to want that premium factored into benchmark
- Using capital market assumptions to back into a premium is common approach

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