



BOARD EDUCATION DAY

EDUCATION CENTER
EL RANCHO DE LAS GOLONDRINAS
334 LOS PINOS ROAD, SANTA FE, NM 87507

February 27, 2020
10am MT – 4:00pm MT

AGENDA

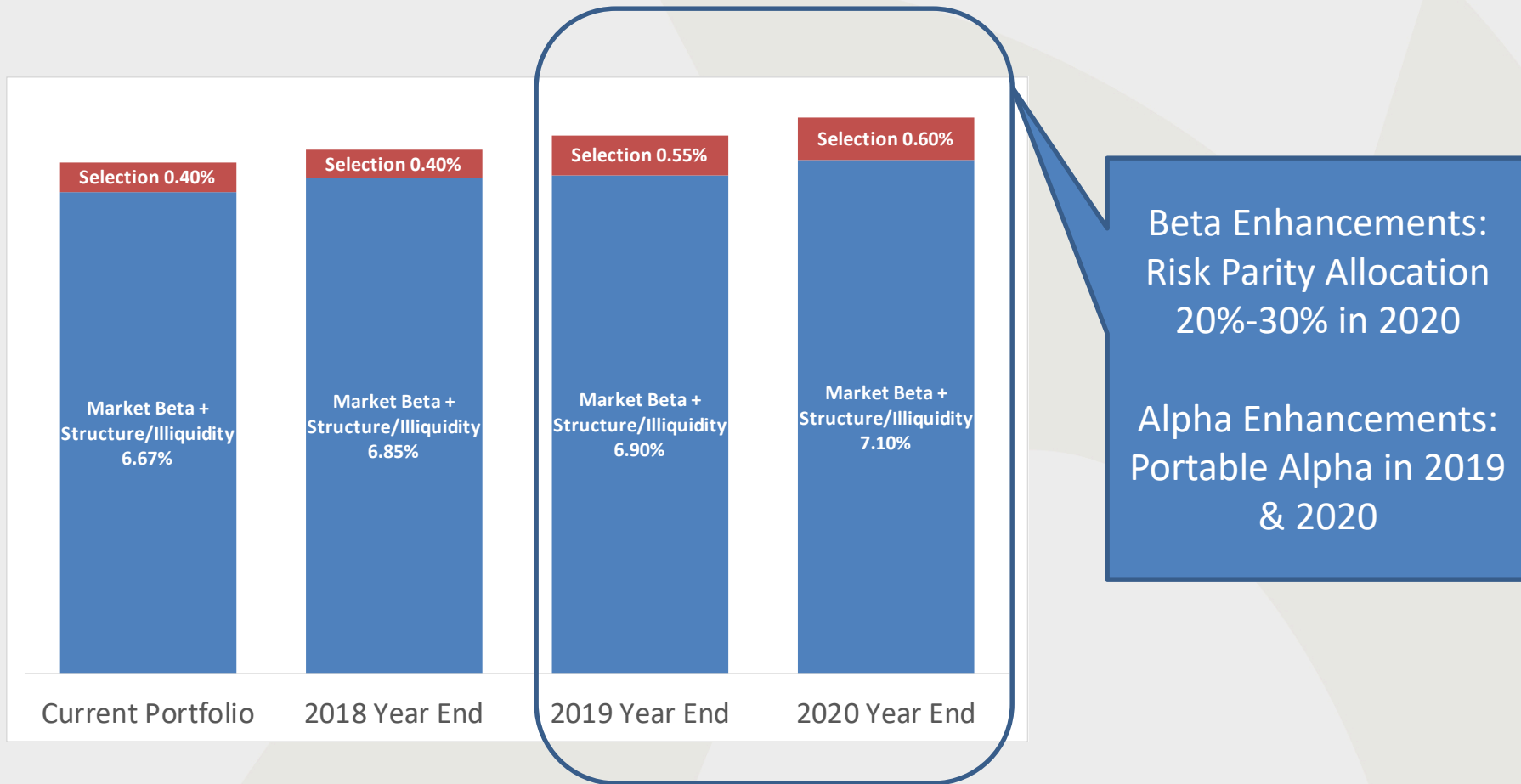
TIME	ITEM	PRESENTER
10:00am – 10:30am	Introduction	Dominic Garcia Chief Investment Officer
10:30am – 12:00pm	Beta Enhancements	Thomas Toth Wilshire Associates Kristin Varela Deputy Chief Investment Officer
12:00pm – 1:00pm	2020 Market Outlook (<i>working lunch</i>)	Ashish Tiwari Executive Vice President, PIMCO
1:00pm – 2:30pm	Alpha Enhancements	James Walsh Sarah Gill Heginbotham Albourne Americas LeAnne Larrañaga-Ruffy Joaquin Lujan Co-Head of Alpha
2:30pm – 3:30pm	Modeling	Thomas Toth Wilshire Associates PERA Investment Staff
3:30pm – 4:00pm	Discuss Potential Recommendations	Thomas Toth Wilshire Associates PERA Investment Staff



Meeting the Investment Challenge

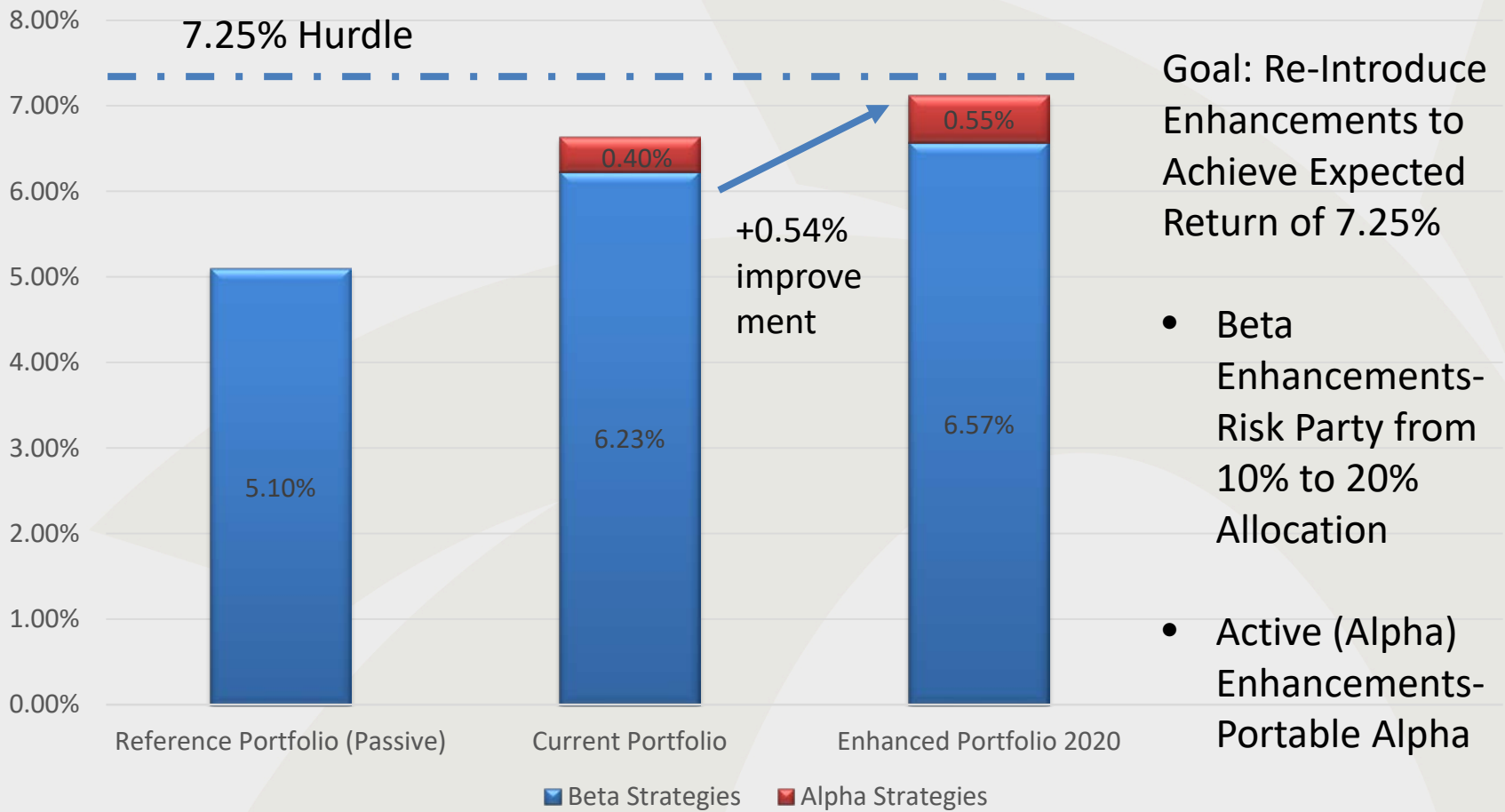
Where We Have Been and Where We Are Going

Board Retreat in July 2018...



Where Are We Today?

Less Rosy Market Expectations

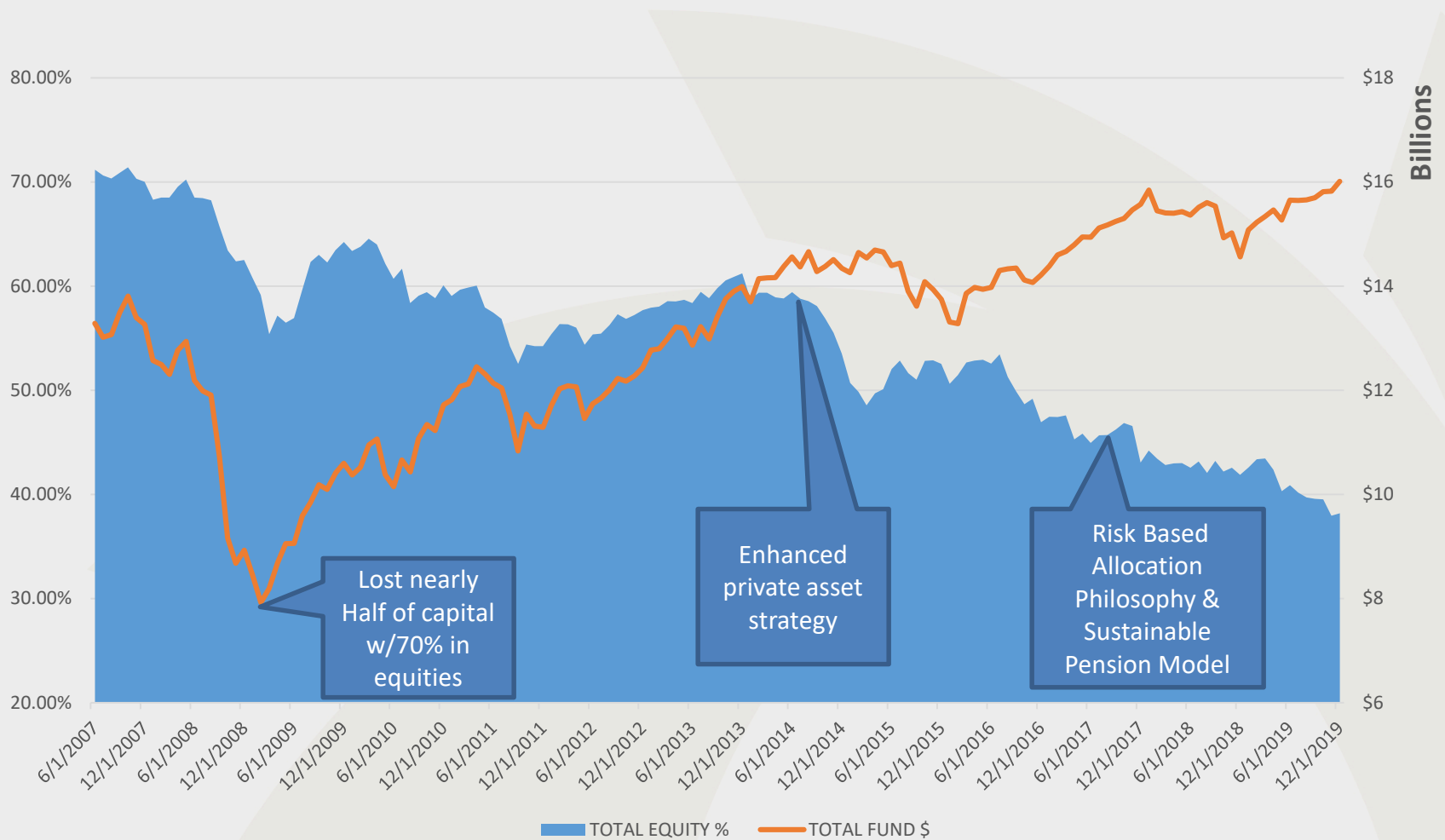


Goal for the Day

- Re-Education on Key Portfolio Enhancements
- **Beta Enhancements**
 - **Re-Education on Importance of Liquidity**
 - **Re-Education on Risk Parity**
- **Alpha Enhancements**
 - **Re-Education on Active Risk Budget and Portable Alpha**
- Initial Modeling
- Next Steps and Recommendations Timeline

Our Journey

PERA 10-Year Strategy Evolution: Diversification into Private Assets and Risk Balance



A Future Model for a Sustainable PERA

A More Robust Operating Model



Adapted from Peter Drucker "Model", research from Keith Ambachtsheer, and Clark and Irwin, (2008) "Best-practice pension fund governance", *Journal of Asset Management*, vol 9, 1, 2-21

What We Have Accomplished

✓ Good Investment Governance

- Set Best Practice for Board-Staff-Consultant role
- Investment Governance Matrix & Delegation

✓ Established Portfolio Best Practices

- Benchmarking, Risk Management & Reporting Upgrades
- Adopted Risk Budget and active management target
- 5-Stage Selection Process, Up-graded monitoring
- Set Reference Portfolio & Risk Tolerance
- Separate Alpha and Beta
- Implemented Risk Parity

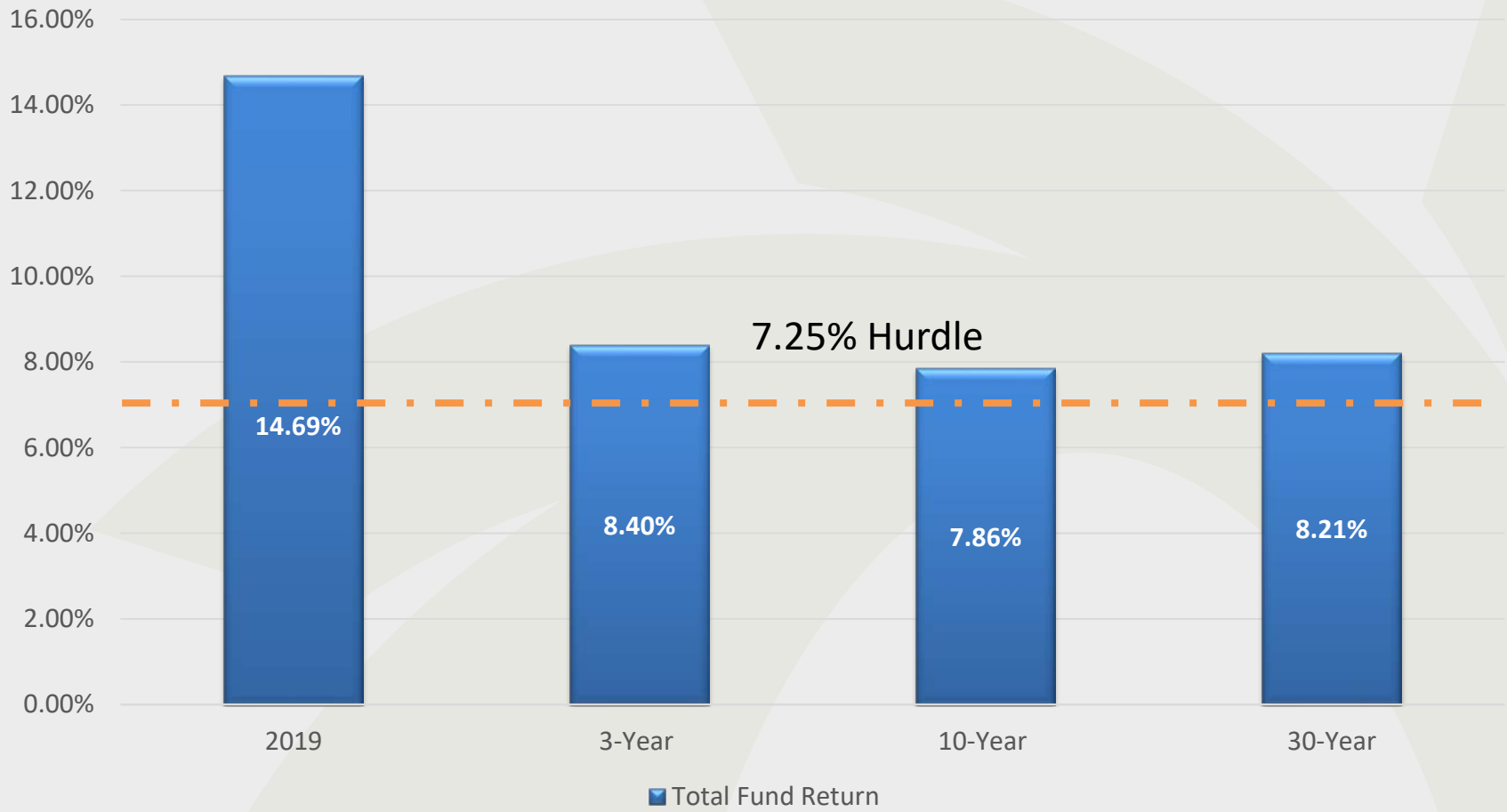
✓ Flexible Pension Design

- Established New Mexico Profit Share

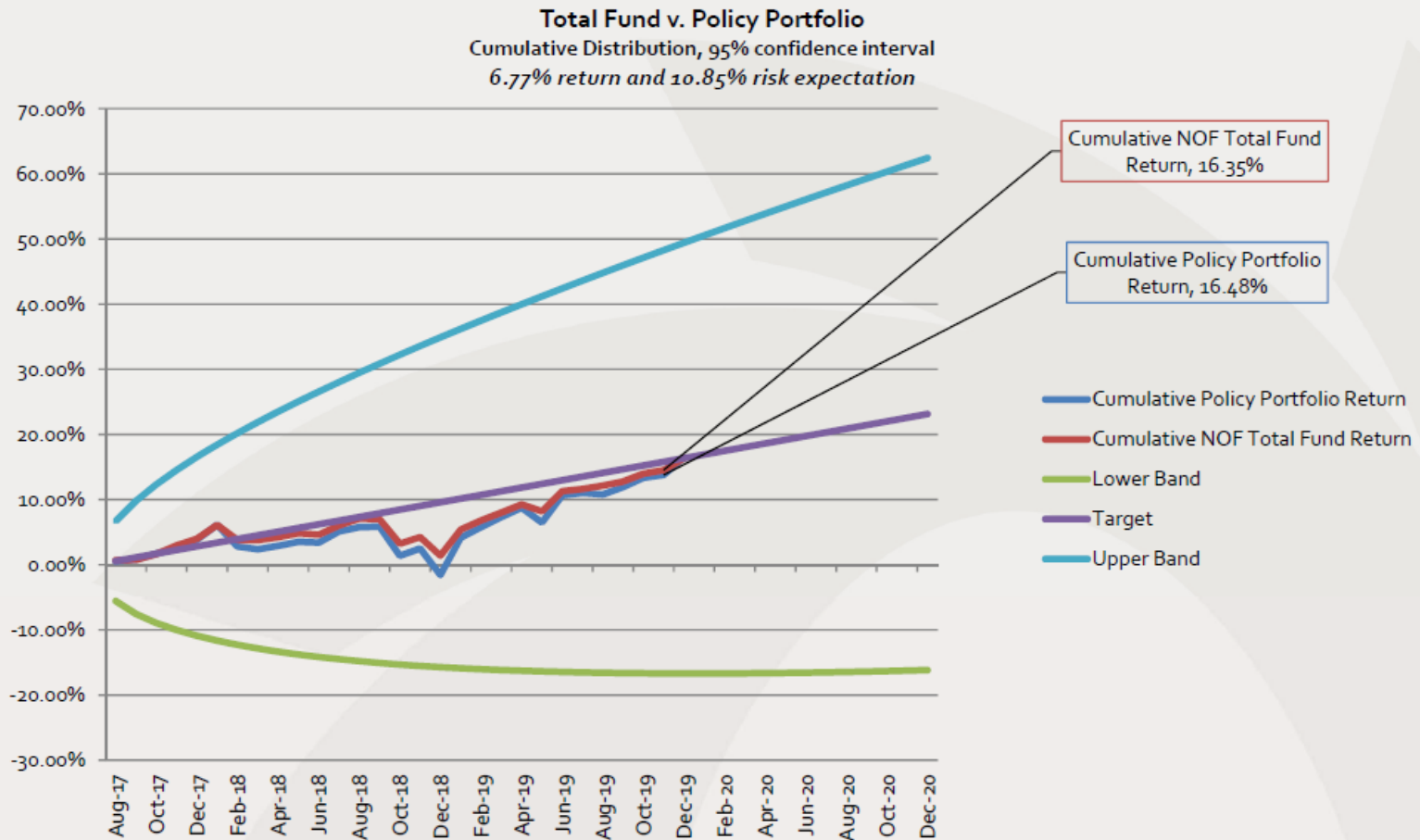
More to Do:

- Meet Investment Challenge
- Attract & Retain Talent
- Build “Internal” Capabilities

PERA Total Return Summary



PERA Since Risk Based Allocation Philosophy On Track



The Investment Challenge Ahead

Market Won't Give it Like it Did in the Past

Asset Market Return Projections

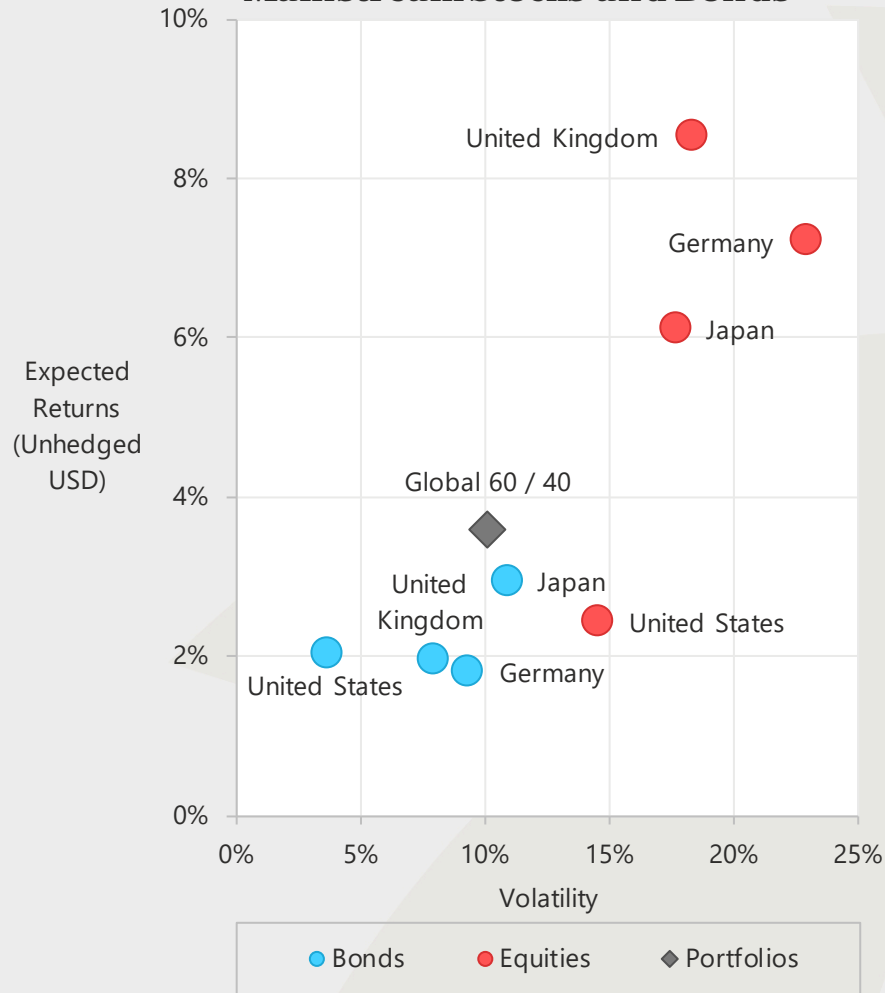
INFORMATION TECHNOLOGY	COMPOUND % RETURNS PER ANNUM		
	PAST 1982-2019	FUTURE 2020-2030	PORTFOLIO WEIGHT
US EQUITIES	11.1	4.0	40
OTHER DEVELOPED EQUITIES	8.5	7.0	20
EM EQUITIES	11.7	9.5	5
10-YEAR TREASURIES	7.1	1.8	25
CORPORATE BONDS	8.1	4.5	10
TOTAL PORTFOLIO*	9.3	4.4	100
US INFLATION	2.8	2.0	
TOTAL PORTFOLIO REAL RETURN	6.5	2.4	

* BASED ON WEIGHTS IN FINAL COLUMN.

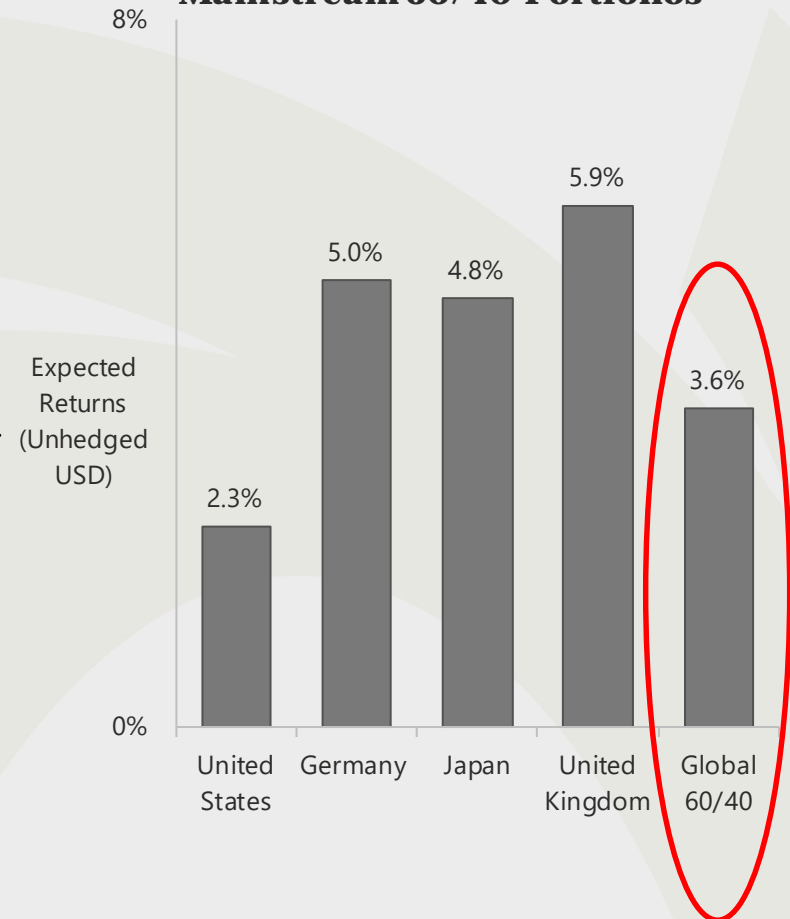
Source: BCA Research Inc.; November 2019

There is Even the Less Optimistic...

Mainstream Stocks and Bonds



Mainstream 60/40 Portfolios*



*60/40 portfolios are represented as 60% core equity index and 40% Treasury 5-7 Year bond index for each specific country. For the US, the Barclays Aggregate is used in lieu of the 5-7 Year Treasury. Source: Research Affiliates, LLC, based on data from Ibbotson, Shiller, Bloomberg, FactSet, MSCI Inc., and Barclays. Please see important information at the end of this presentation regarding simulated data. As of December 31, 2019.

Capital Market Line

- Very Few Traditional Options to Produce 7.25%

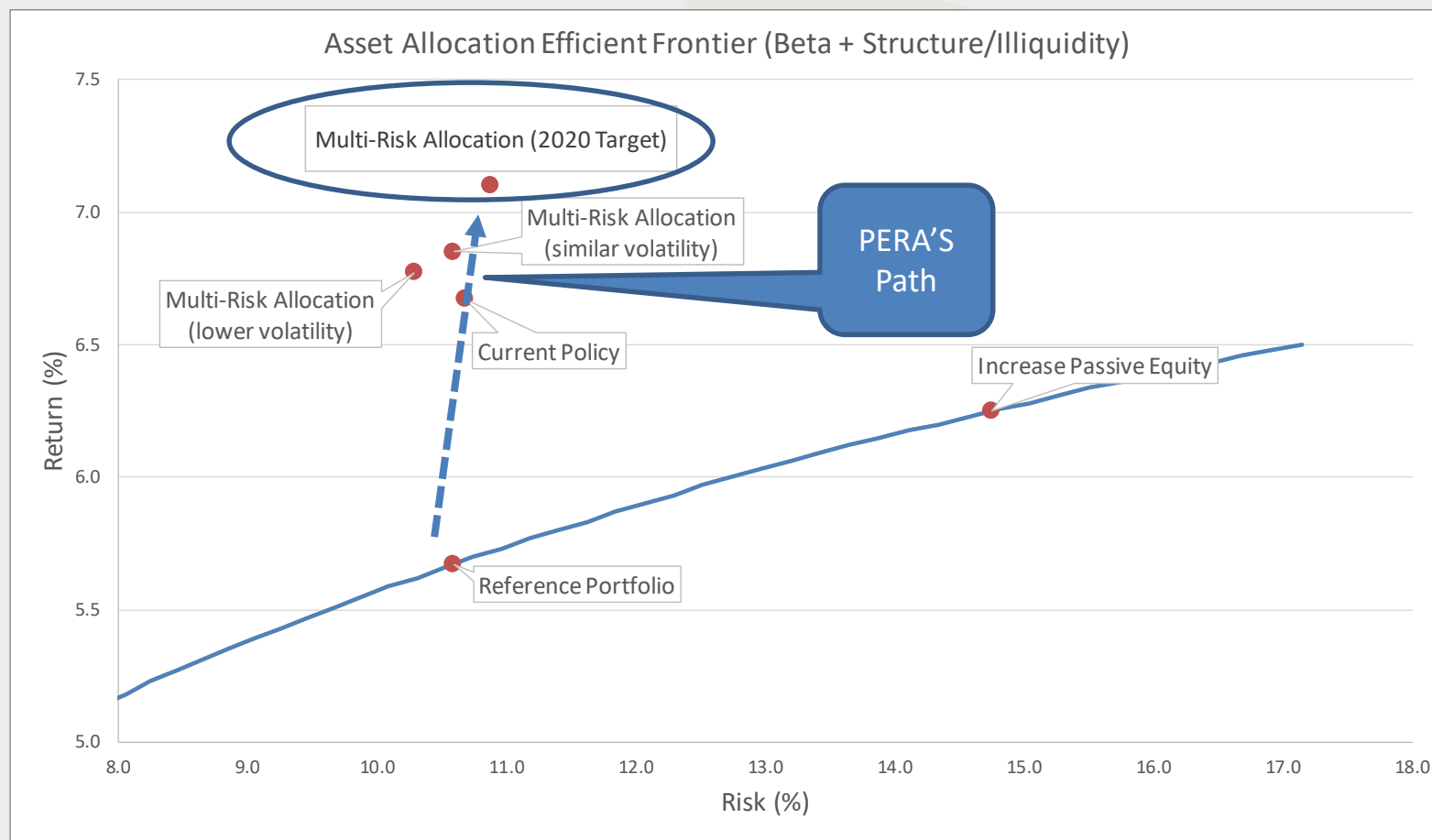


Source: Wilshire

Our Solution

Bridging the Return Gap

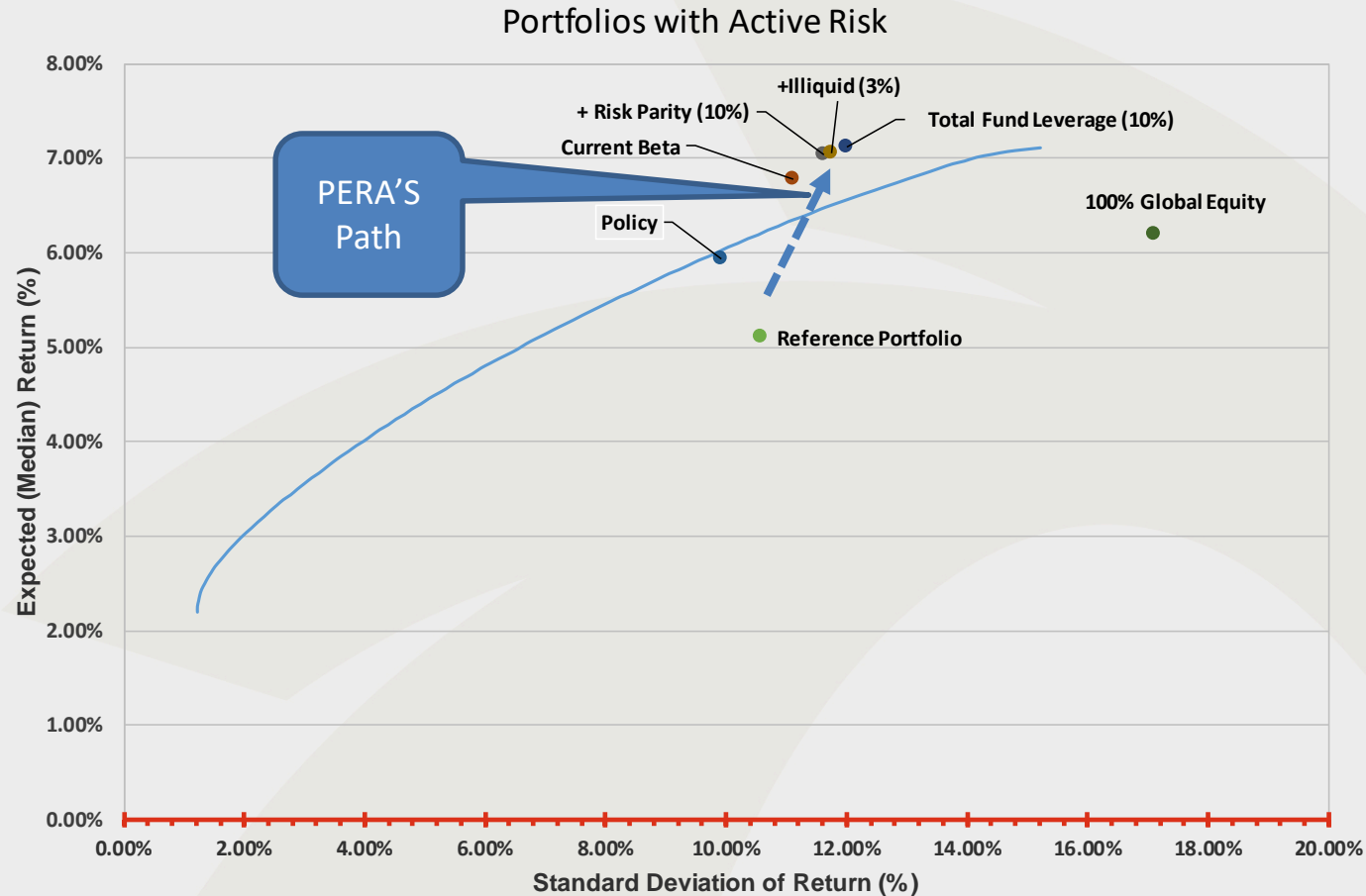
Board Retreat in July 2018



Source: Wilshire

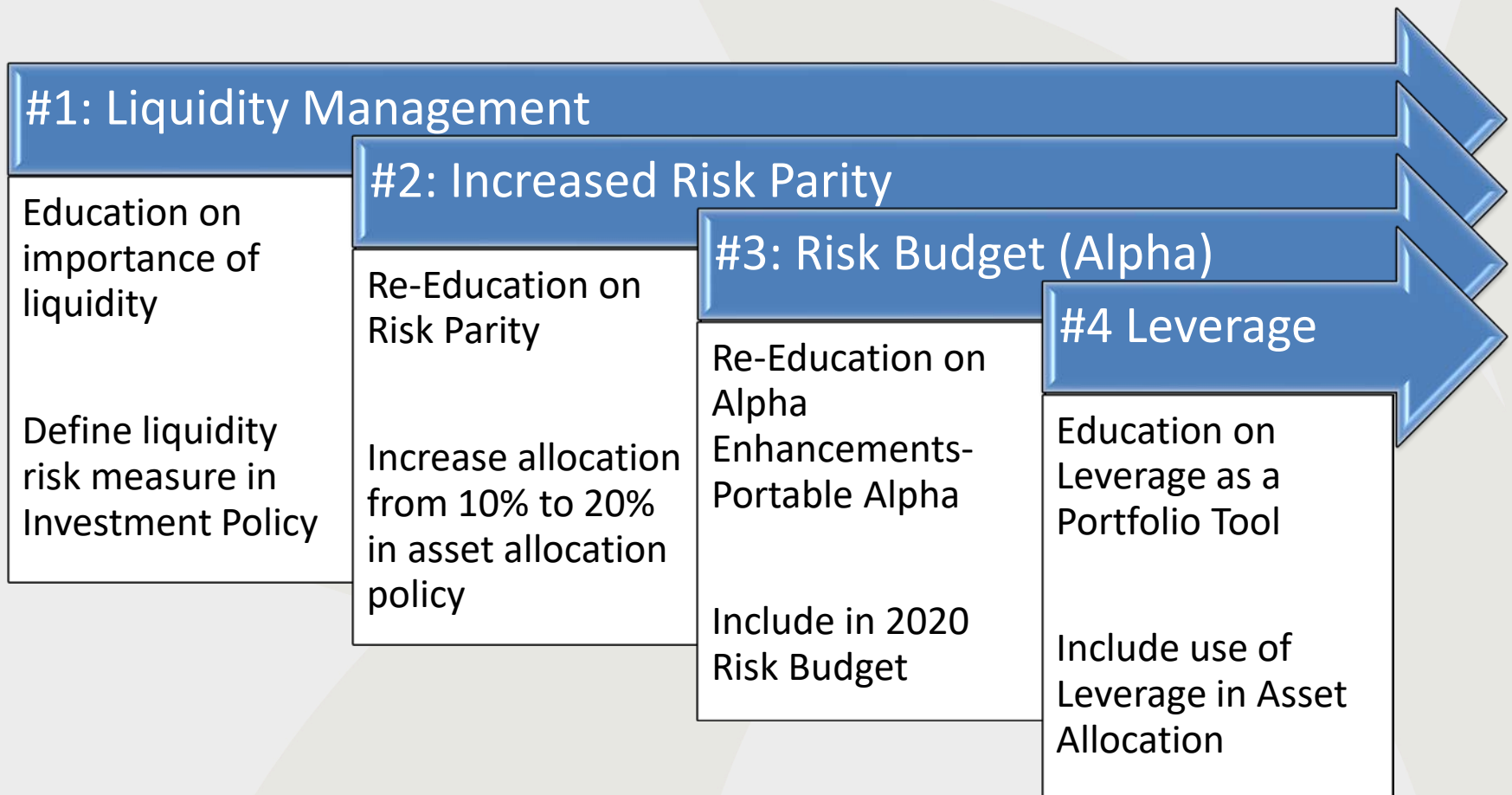
Bridging the Return Gap

Board Retreat Today



Source: Wilshire

Bridging the Gap: Key Initiatives for 2020



What To Expect

➤ Today

- Re-Education on Liquidity
- Re-Education on Risk Parity
- Re-Education on Active Risk Budget (Portable Alpha Enhancements)
- Initial Modelling of All Initiatives

➤ March

- Recommendation to increase Risk Parity allocation from 10% to 20%
- Approve Risk Budget to include Portable Alpha Enhancements
- Recommend Liquidity risk measure in Investment Policy

➤ July Retreat

- Education on Leverage in the asset allocation
- Education on increased private market exposure

➤ August

- Recommendation on use of leverage in asset allocation
- Recommendation on increased private market exposure



Prepared for

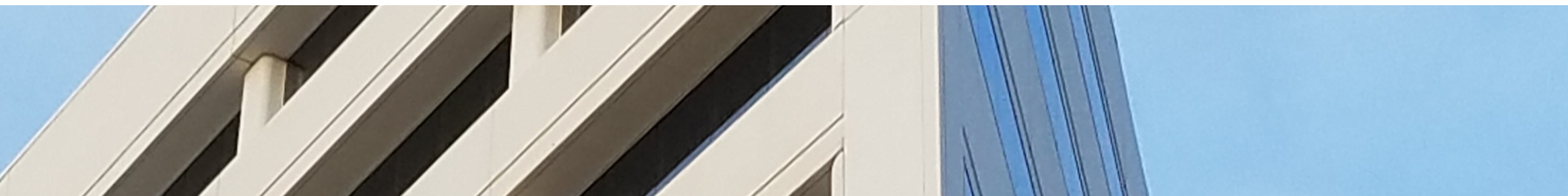


PERA

Public Employees
Retirement Association
of New Mexico

WILSHIRE ASSOCIATES

Board Interim Investment Retreat

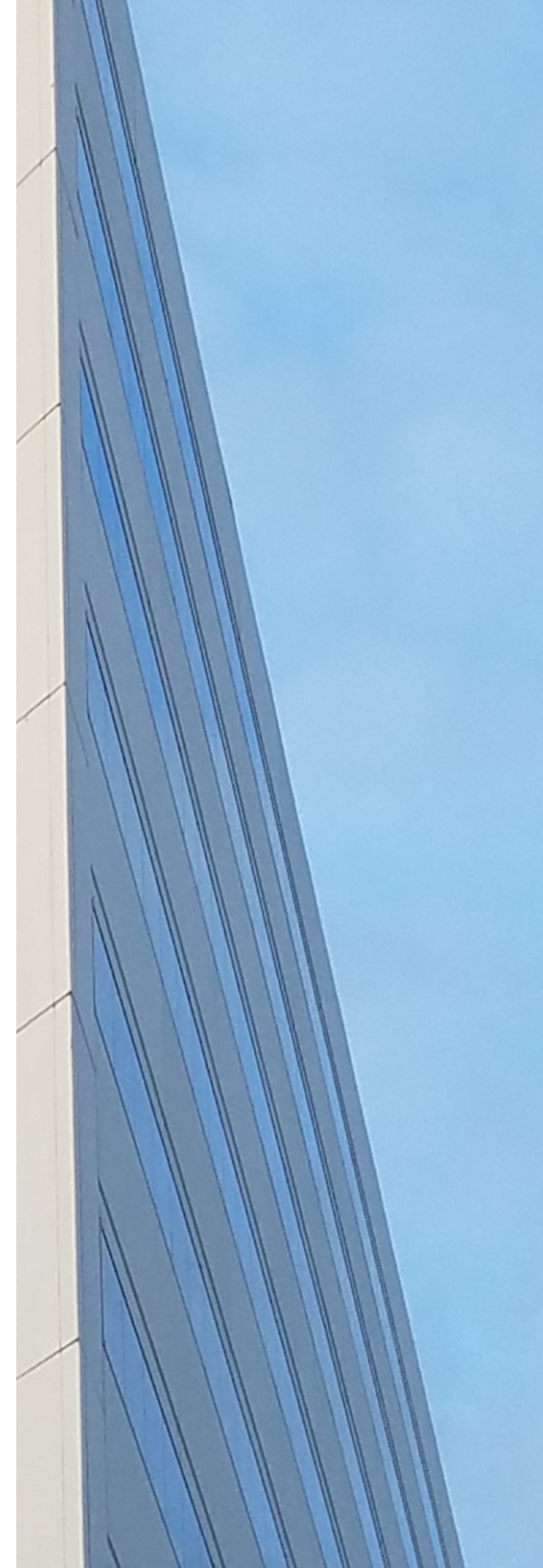


February 2020

INTRODUCTION

5 Key Enhancements for 2020

- Today's Focus:
 - Liquidity Management
 - Increased Risk Parity
 - Portable Alpha Education & Risk Budget Integration
- Future Focus
 - Leverage education & Policy allowance
 - Increase illiquid assets



FUTURE STATE: INTEGRATED ENHANCEMENTS

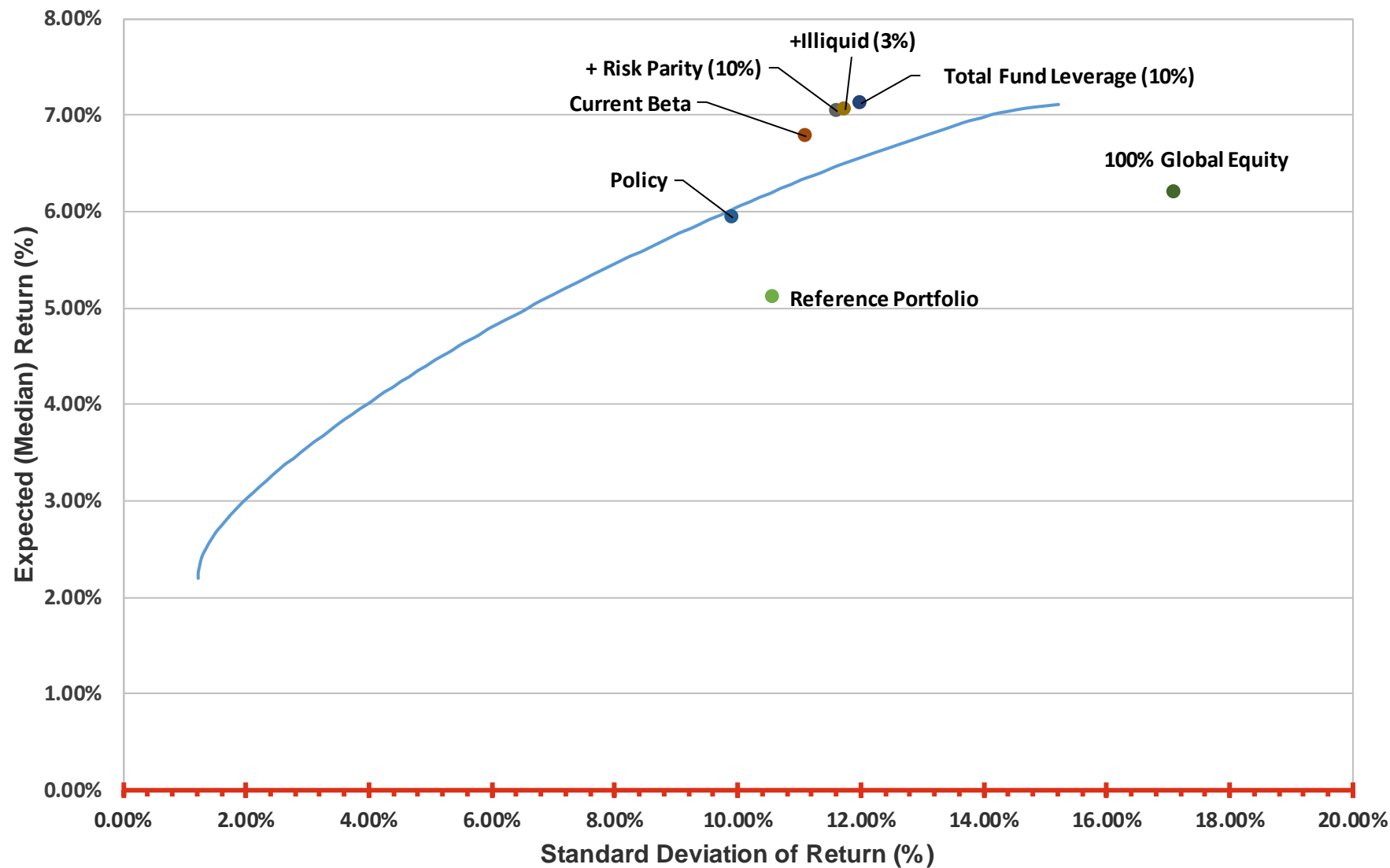
Asset Class	Reference Portfolio	Policy	Current Beta	+ Risk Parity (10%)	+ Illiquid (3%)	Total Fund Leverage (10%)
Global Public Equity	58.00%	28.50%	19.50%	16.00%	15.00%	15.00%
Global Low Volatility Equity		7.00%	7.00%	7.00%	7.00%	7.00%
Private Equity (Blend)			9.00%	9.00%	10.00%	10.00%
Core US Fixed Income	42.00%	17.00%	17.00%	17.00%	17.00%	27.00%
Global Core Fixed Income		2.50%	2.50%			
Global High Yield		12.00%	6.00%	1.00%	1.00%	1.00%
Emerging Market Debt		3.00%	3.00%	3.00%	3.00%	3.00%
Alternative Liquid Credit (Blend)				3.00%	3.00%	3.00%
Private Credit (Blend)			6.00%	6.00%	6.00%	6.00%
Global Real Estate Securities		7.00%	2.00%	2.00%	2.00%	2.00%
Public Real Asset (Basket)						
US TIPS		3.00%	3.00%	1.00%	1.00%	1.00%
Commodities		5.00%				
Global Listed Infrastructure		3.00%				
Master Limited Partnerships		2.00%	2.00%	2.00%		
Private Real Estate (Blend)			5.00%	5.00%	5.00%	5.00%
Private Real Assets (Blend)			8.00%	8.00%	10.00%	10.00%
Risk Parity (15% Volatility)		10.00%	10.00%	20.00%	20.00%	20.00%
Cash Borrowing						-10.00%
Total Assets	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Expected Beta Return - 10 Years (%)	5.10	5.39	6.23	6.49	6.51	6.57
+ Portable Alpha at 10% Target	0.00	0.35	0.35	0.35	0.35	0.35
+ Traditional Active Return	0.00	0.20	0.20	0.20	0.20	0.20
= Total Expected Return - 10 Years (%)	5.10	5.94	6.78	7.04	7.06	7.12
Total Standard Deviation of Return (%)	10.57	9.93	11.11	11.61	11.75	11.99
+ / (-) in Expected Return - 10 Years (bps)		84	168	194	196	202
+ / (-) in SD of Return (bps)		(64)	54	104	118	142
Sharpe Ratio (Geometric)	0.31	0.41	0.44	0.45	0.44	0.44

Assumes no correlation between active returns and beta returns

Note: Long-term forecast. Actual results may vary.

PATH OF PROGRESSION

Portfolios with Active Risk



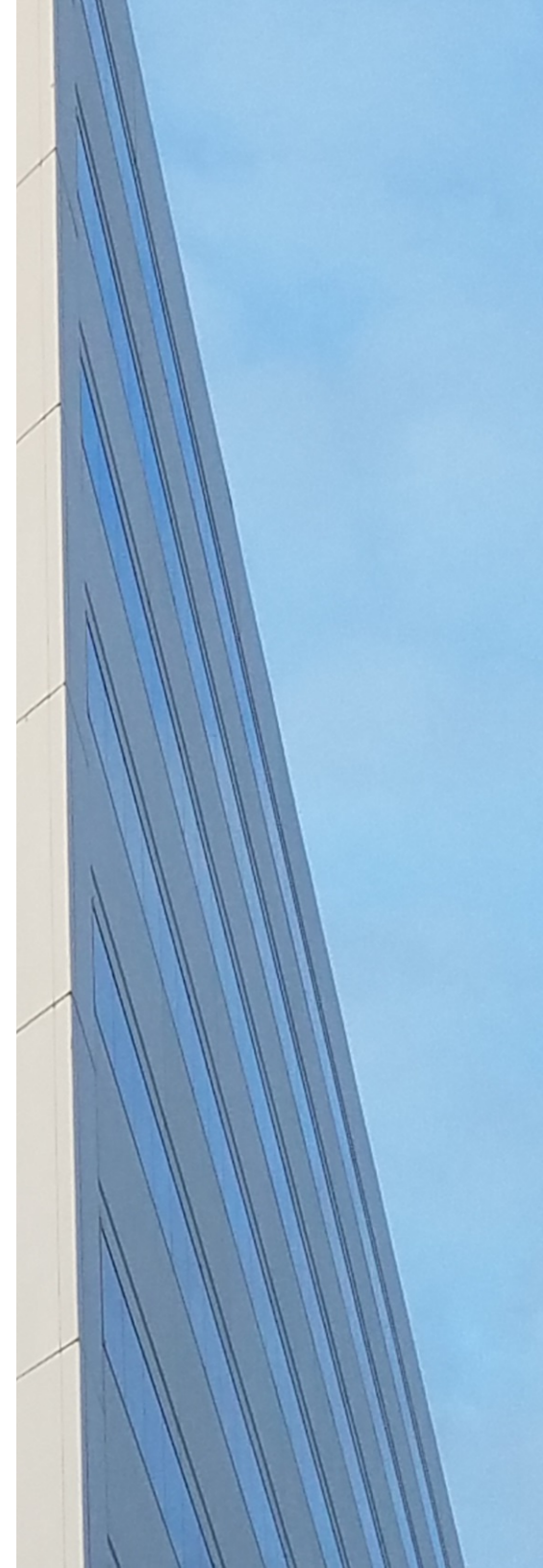
ANTICIPATED TIMELINE

Education February 27, 2020 with final recommendation on March 26, 2020:

- Liquidity Management
- Increased Risk Parity
- Portable Alpha Education & Risk Budget Integration

Education at July Board retreat with final recommendation on August 27, 2020:

- Leverage Allowance
- Increased Illiquid assets

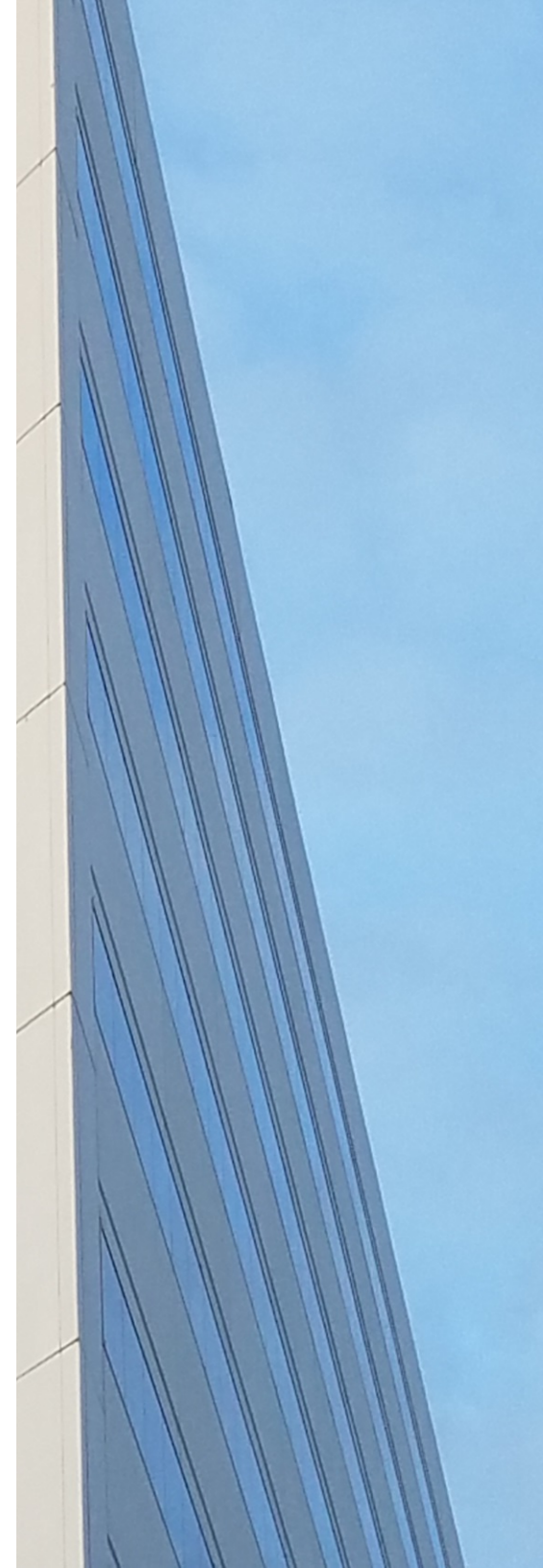


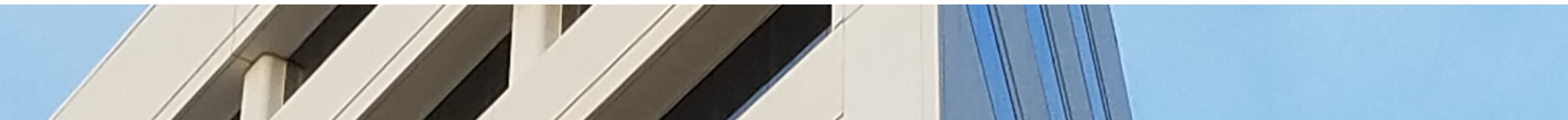
Wilshire Associates

AGENDA

Managing Liquidity

Increasing Risk Parity





MANAGING LIQUIDITY

THE WORLD THROUGH RISK LENSES

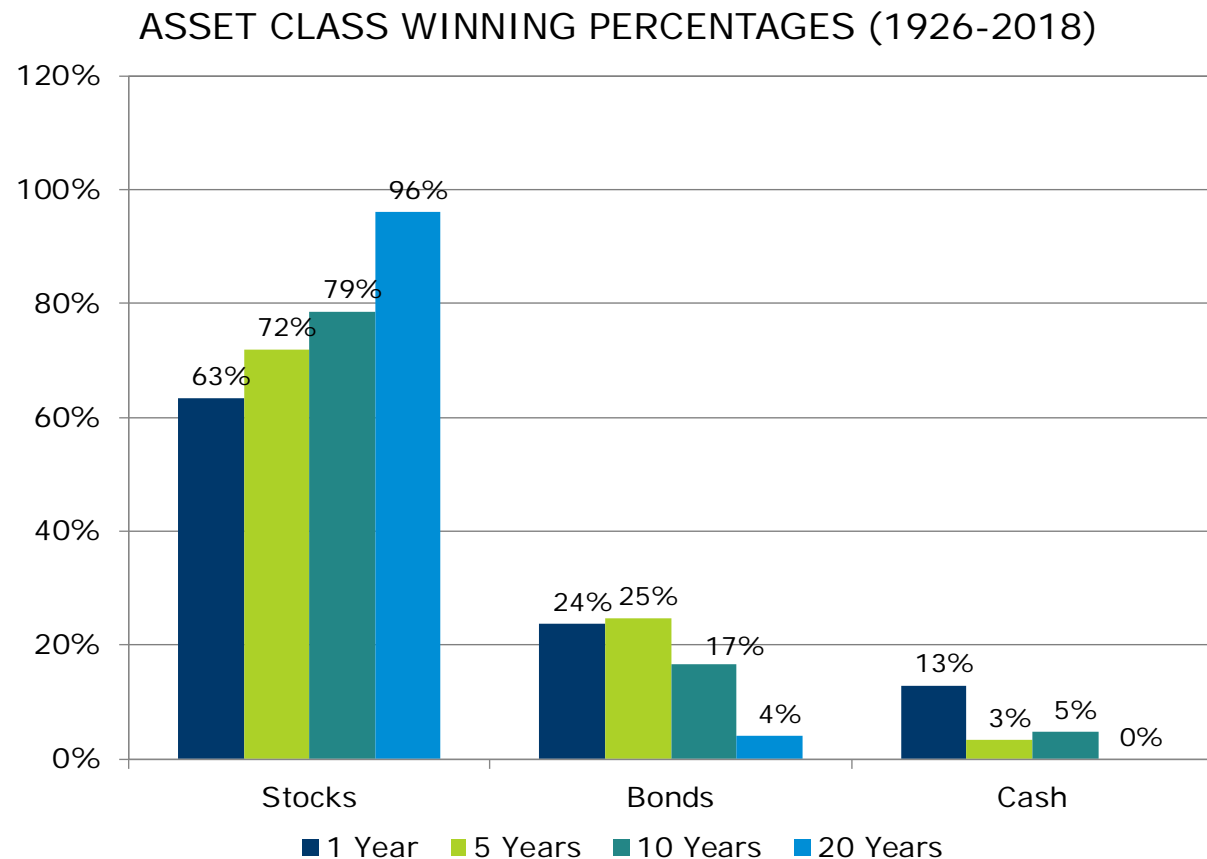
- Liquidity Risk is one of Wilshire's six essential Risk Lenses faced by all investors
- Its interaction with other risks may make managing illiquidity risk the single most important risk to address in avoiding financial calamity
- Liquidity management is the exercise of ensuring sufficient cash is on hand to meet financial commitments (i.e. pay the bills when they come due)
- May seem simple on the surface, but properly balancing liquidity requirements against other portfolio objectives can sometimes prove to be a complex risk to manage in practice



WHY LIQUIDITY MATTERS

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

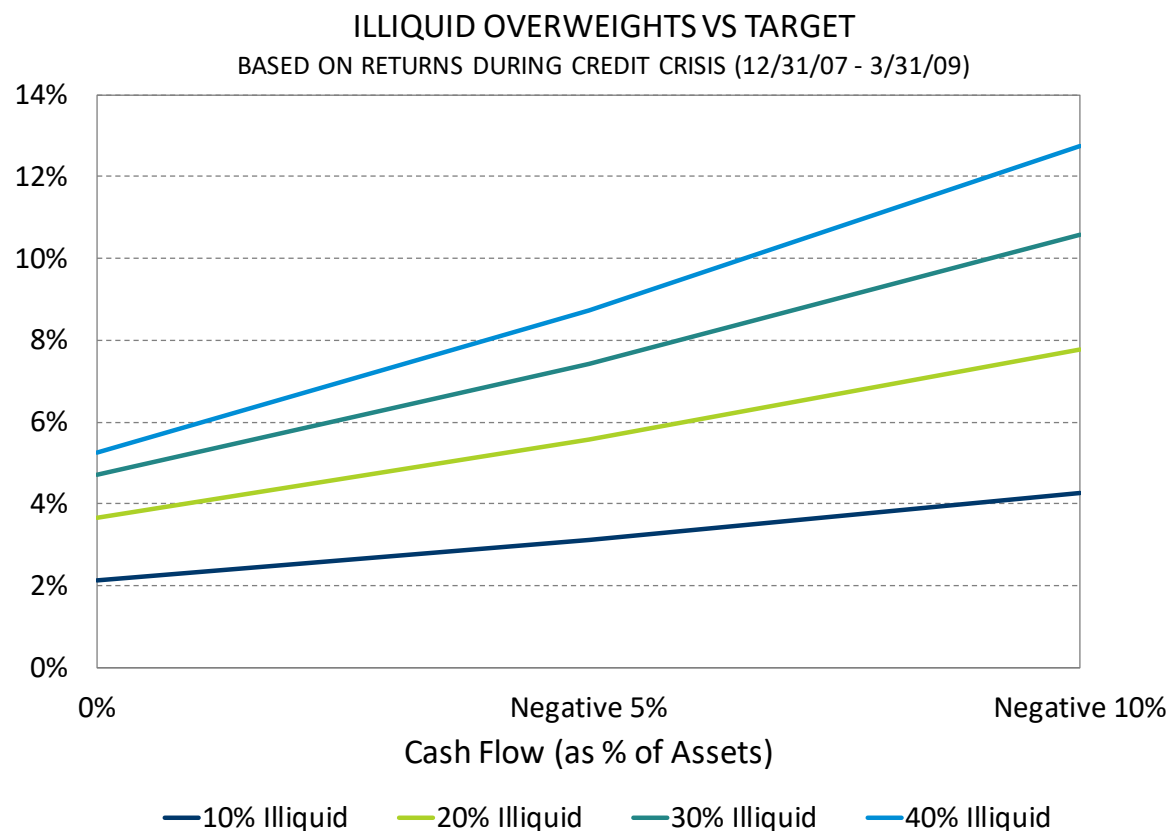


WHY LIQUIDITY MATTERS

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 larger required cash outflows (i.e., greater liquidity needs)
- With larger allocations to illiquid assets



APPROACHES FOR MANAGING LIQUIDITY

Two basic approaches (best if used in combination):

- **Direct Approach** – appropriate to set governance guidelines and ensure liquidity is available on an ongoing basis
- **Indirect Approach** – useful for evaluating strategic alternative policy targets during the asset allocation process

Direct Approach

- Set a minimum % of assets aside to meet X months of net cash outflows (“Encumbered Liquidity”) plus additional funds to manage against unexpected outflows (“Full Liquidity”)
- Cash allocation size is dependent on investor’s liquidity risk tolerance and the volatility of non-cash (“Convertible Liquidity”) assets

Advantage: can dampen the risk of forced selling in a down market through a more manageable and orderly cash harvesting process

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.)

Full and Encumbered liquidity exist within the PERA portfolio as frictional cash, but do not have a permanent allocation target

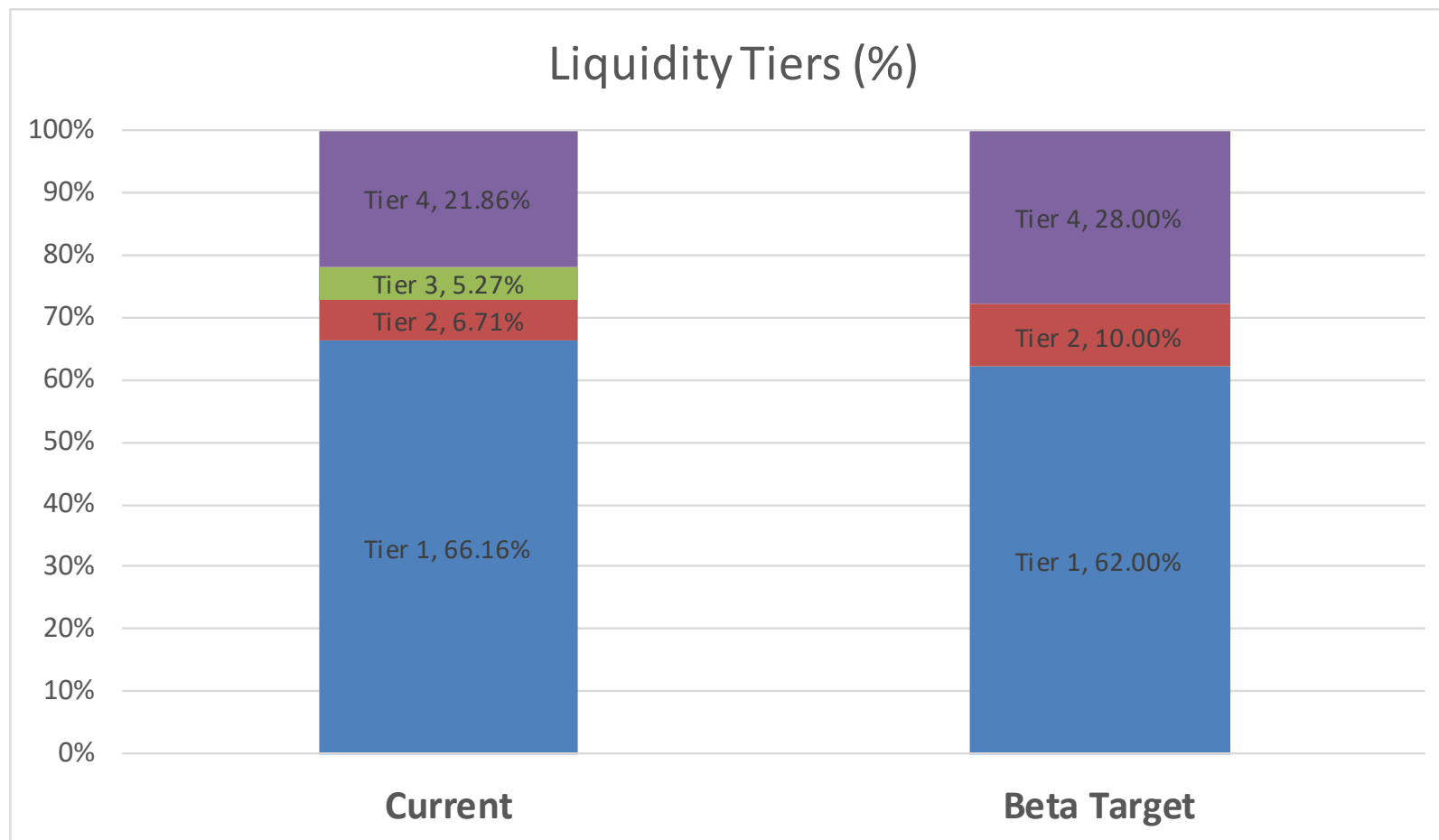
- Structured to avoid return penalty associated with an allocation to cash – i.e. cash drag

DIRECT APPROACH

For portfolio management and governance purposes, guidelines should be set for Convertible and Delayed categories to ensure adequate liquidity exists to meet PERA obligations over time

- **Convertible Liquidity**
 - Tier 1 are assets available within 1 – 30 days
 - » Include all liquid equity, risk mitigation, high yield, emerging market debt, and real asset mandates
 - » Include overlays that are readily adjusted
 - Tier 2 are assets available within 30 – 90 days
 - » Include Multi-Risk Allocation assets to be conservative, though terms are close to 30 day time frame
- **Delayed Liquidity**
 - Tier 3 are assets available with 90 days – 12 months
 - » Include Alternative Liquid Credit and other Limited Partnerships with available but less frequent liquidity windows
 - Tier 4 are assets available 12 months +
 - » Include all private market investments across equity, credit, and real assets

DIRECT APPROACH



- Current portfolio holds liquid Tier 1 exposures in place of illiquid Tier 4 assets
 - Endeavour to provide similar economic exposure while waiting for committed capital to be drawn down

INDIRECT APPROACH

Indirect Approach

- Approach attempts to constrain asset class weights to manage liquidity risk
- Public (“liquid”) vs. private (“illiquid”) asset classes, where constraints are applied on the maximum allocation to private assets
- While simple, this approach generally ignores the volatility and liquidity characteristics of public market (“liquid”) asset classes

Wilshire’s Liquidity Metric

- Improves on the indirect approach by attaching liquidity metrics, or scores, to all asset classes and was a decision factor in the 2018 asset allocation process.
 - Provide more information than the simple “liquid” or “illiquid” binary approach
 - Allows for trade-offs within public market (“liquid”) asset classes
 - Designed to capture distinguishing characteristics within “Convertible Liquidity” and “Delayed Liquidity” assets (i.e., from the definitional framework)

WILSHIRE LIQUIDITY METRIC

Wilshire's Liquidity Metric framework has multiple levels:

- Market Level of Liquidity
- Stressed Liquidity Metric

Market Level of Liquidity

- Quantified on scale from 0% (low liquidity) to 100% (high liquidity)
- Designed to capture general notion of marketable versus private/off-market transactions
 - Marketable asset classes typically reflect a 90% or 100%
 - Private asset classes reflect 0%

Stressed Liquidity Metric

Includes a penalty process to reflect the loss in practical liquidity due to asset class volatility and sensitivity to particular economic environments

Penalty Components

Growth Penalty:

- Impacts asset classes with vulnerability to slowing growth
- Recognizes the hit to liquidity that can occur during growth related bear markets

Inflation Penalty:

- Impacts asset classes with vulnerability to rising inflation
- Recognizes the hit to liquidity that can occur during inflation driven bear markets

Volatility Penalty:

- Impacts higher volatility asset classes
- Recognizes the hit to liquidity that can occur from any form of volatility

WILSHIRE LIQUIDITY METRIC

PUTTING IT ALL TOGETHER

Standard ACA (10 Years)	Liquidity Market Level	Liquidity Stressed Metric
Global Public Equity	90.0%	2.5%
Global Low Volatility Equity	90.0%	2.5%
Private Equity (Blend)	0.0%	0.0%
Core US Fixed Income	100.0%	86.0%
Global Core Fixed Income	100.0%	82.5%
Global High Yield	81.0%	12.0%
Emerging Market Debt	75.0%	40.0%
Alternative Liquid Credit (Blend)	95.0%	64.0%
Private Credit (Blend)	0.0%	0.0%
Global Real Estate Securities	90.0%	2.5%
Public Real Assets (Blend)	90.0%	2.5%
US TIPS	90.0%	86.5%
Commodities	90.0%	55.0%
Global Listed Infrastructure	90.0%	2.5%
Master Limited Partnerships	90.0%	20.0%
Private Real Estate (Blend)	0.0%	0.0%
Private Real Assets (Blend)	0.0%	0.0%
Risk Parity (15% Volatility)	89.0%	13.0%
Cash Borrowing	100.0%	100.0%

- Based on underlying asset class assumptions
- Vehicle structuring can impact available liquidity regardless of underlying assets

FINAL CONSIDERATIONS

Summary

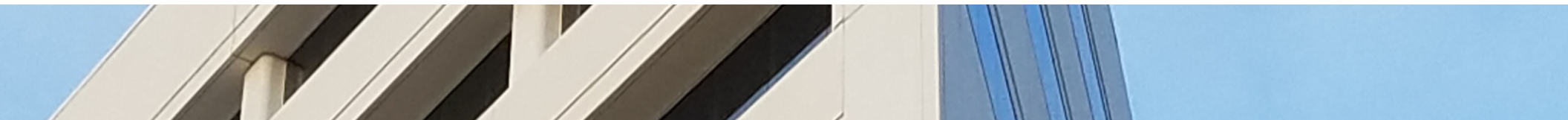
- Direct and Indirect approaches have a place in risk management.
 - Indirect approach utilizing Wilshire's liquidity metrics are included in asset allocation modeling as a decision factor
- Propose including a direct liquidity governance limit as a portfolio management guideline specified and approved in the Investment Policy Statement

Considerations

- Liquidity targets will shift based on key initiatives for 2020
 - Tilt towards less liquid opportunities (portable alpha and increased illiquid opportunities) to enhance return potential of the Total Fund

Next Steps

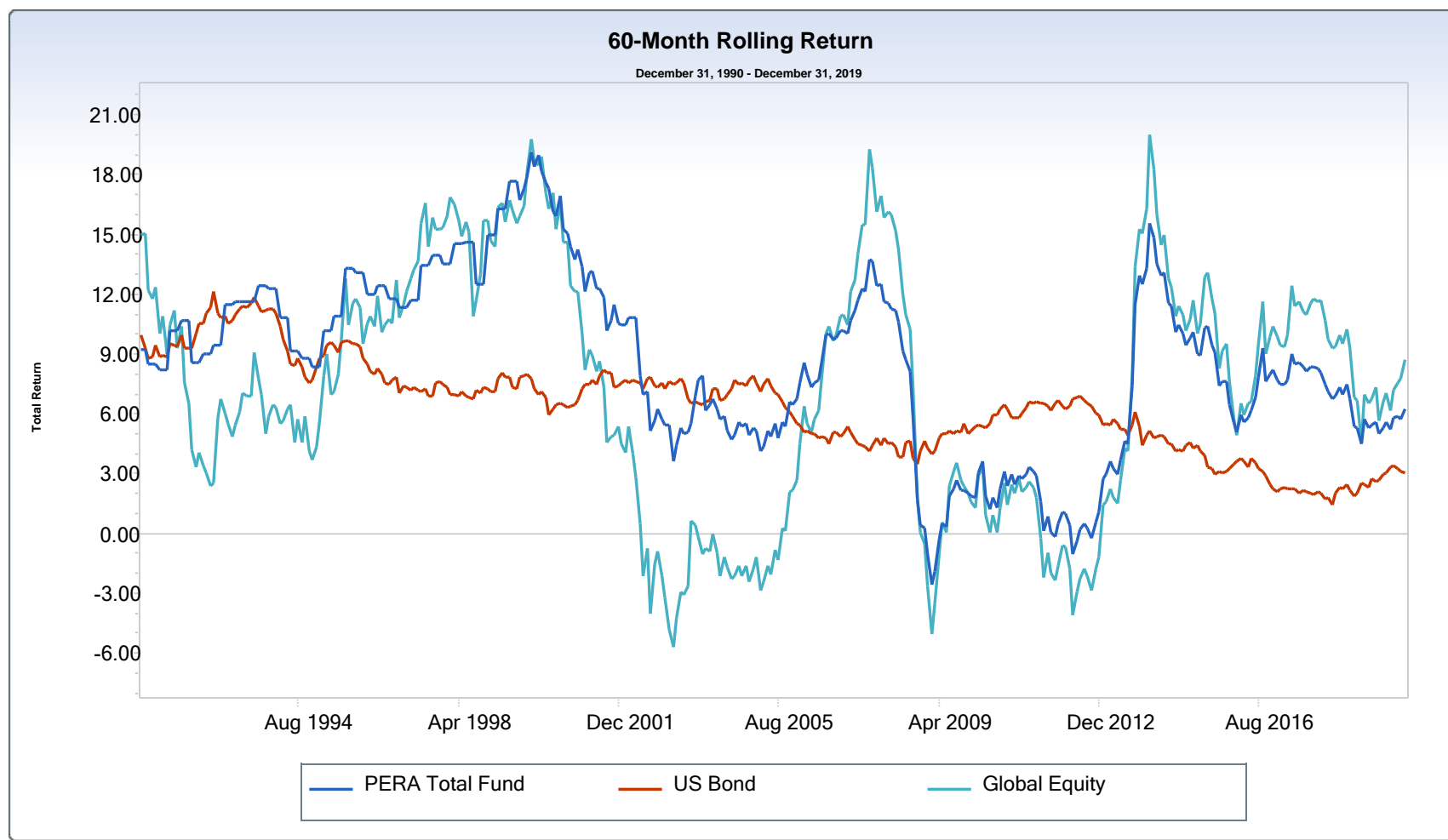
- Return in March with direct liquidity guideline recommendations to be added as an appendix to the Investment Policy Statement.



RISK PARITY

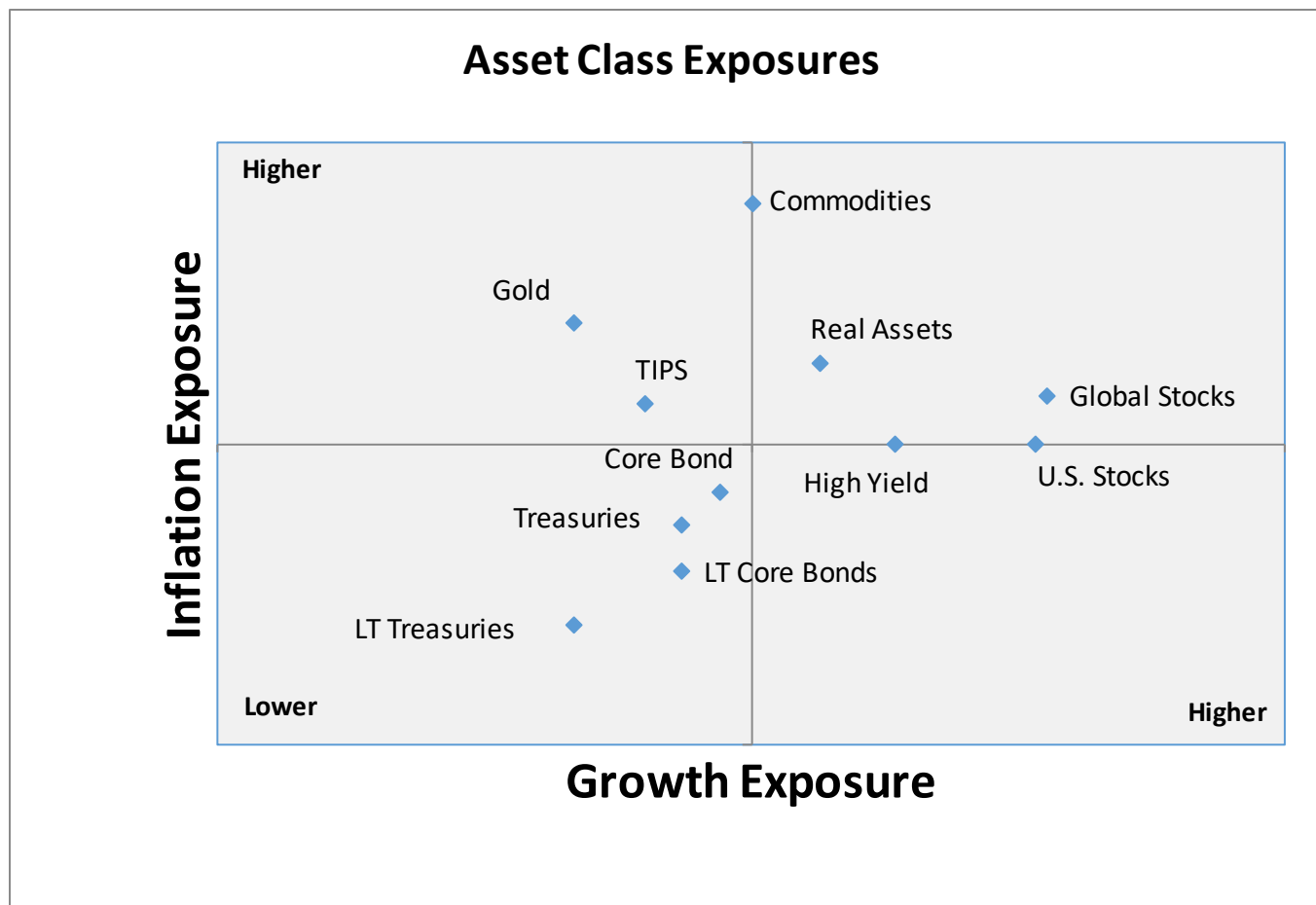
PERA RETURN VARIABILITY

Variability in the return of the PERA Total Fund is strongly linked to the equity market return variability.



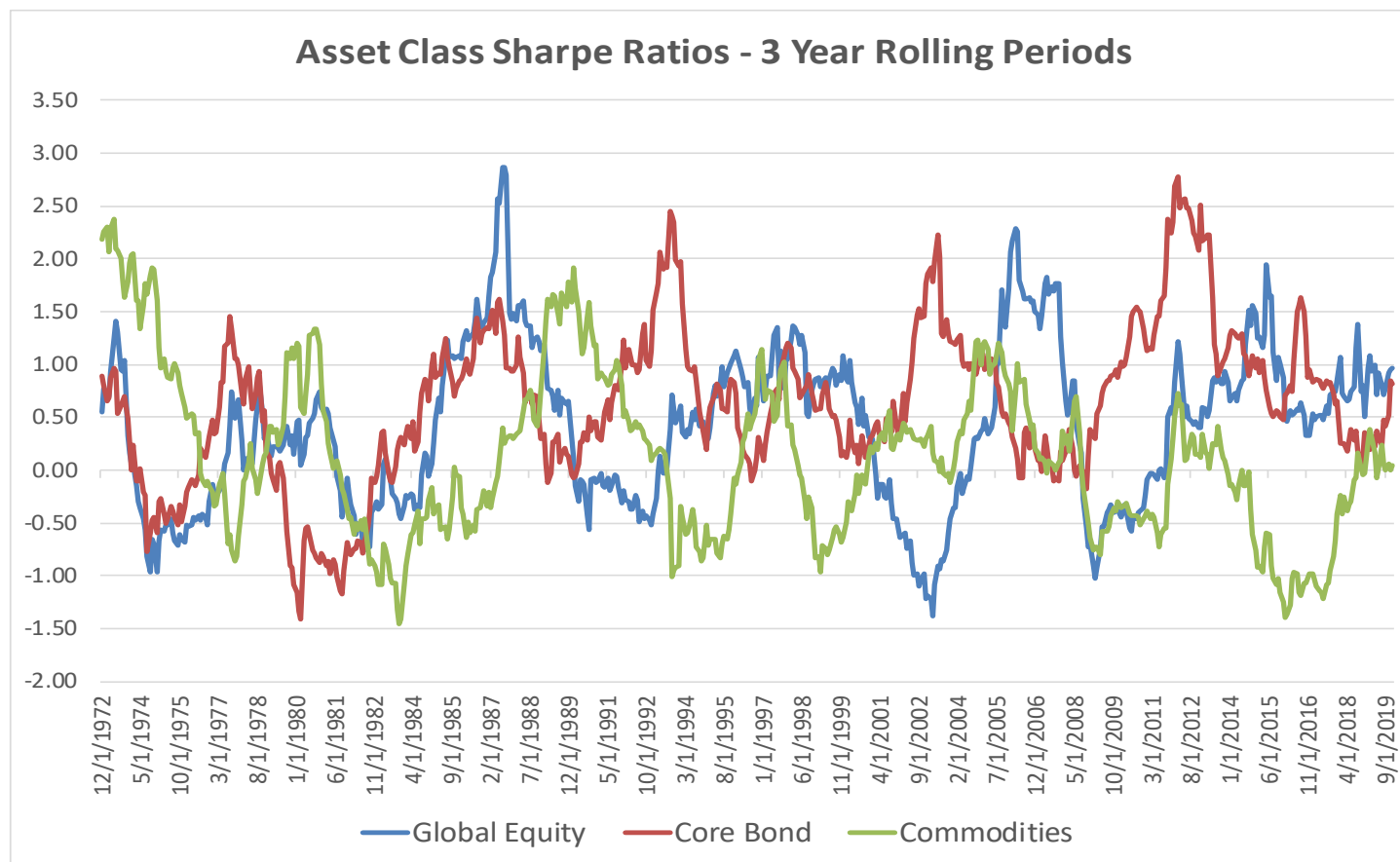
UNCERTAINTY AND DIVERSIFICATION

- If an investor knows with certainty that an asset class will outperform, a concentrated portfolio in that asset will produce the best results
- Portfolio diversification acknowledges that uncertainty is inherent in all investing



DIVERSIFICATION BENEFITS

- Because asset classes perform well at different times, diversification provides a benefit in smoothing out total return volatility



ENHANCED PORTFOLIO CONSTRUCTION: MULTI-RISK ALLOCATION

- Multi-Risk Allocation (also known as risk parity or risk balance) weights portfolio exposure by risk, not by dollars
- If, after balancing risk across the asset classes, portfolio expected return does not meet targets, investors have two courses of action:
 1. Get less diversified and more concentrated in the riskier asset classes to hit targeted return levels OR
 2. Apply leverage to maintain prudent diversification while improving absolute return expectations

THE “WHAT” OF RISK BALANCE

3 MAIN CHARACTERISTICS

BALANCE RISK ALLOCATION

- Identify common risk factors or buckets (growth, stability, inflation).
- Decide which asset class segments to use for each bucket (TIPS and commodities for inflation).
- Determine expected risk for each bucket and correlation between buckets.
- Determine a portfolio that is risk balanced across risk factors or buckets.

SCALE TO ACHIEVE TARGET

- Target can be set based on risk tolerance or target return.
- Risk can be set to target the average volatility of the PERA Reference Portfolio.
- Return target can be set equal to actuarial discount rate of 7.25%.

VOLATILITY BASED ADJUSTMENTS

- Volatility and correlations are inherently volatile over time.
- Research has shown that market returns are higher during lower volatility periods.
- Notional allocations are adjusted based on changes in expected risk for each bucket but also changes in expected correlation.

BALANCE RISK ALLOCATION

BALANCE RISK ALLOCATION

Lower risk assets typically offer a superior Sharpe Ratio (which measures the return generated per unit of risk) compared to higher risk assets over long time periods.

Historical Sharpe Ratios favor lower risk asset classes with core bonds contributing more return per unit of risk than global equities

0.52 versus 0.33 over last 40 years

1.09 versus 0.68 over last 10 years

Assume similar risk adjusted return expectations:

	Dollar Allocation	Risk Contribution		Dollar Allocation	Risk Contribution
Global Equity	58%	92%		16%	33%
Rates	42%	8%		59%	33%
Inflation	0%	0%		25%	34%
Expected Return	5.10%			3.76%	
Expected Risk	10.57%			5.82%	
Sharpe Ratio	0.31			0.33	

SCALE TO ACHIEVE TARGET



Through the utilization of leverage, we are able to efficiently scale our assets and ensure optimal diversification with enhanced return prospects

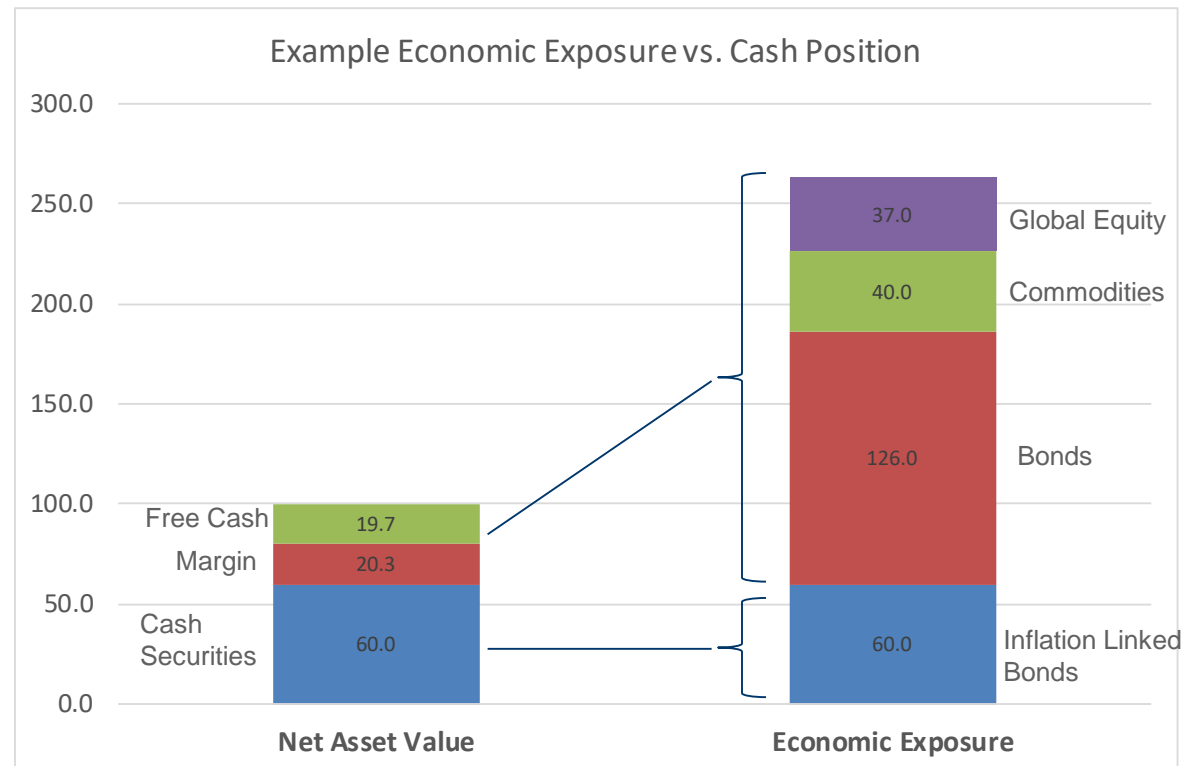
A risk parity portfolio utilizes leverage to achieve the target return that is not achievable along the traditional efficient frontier

Sharpe Ratio falls moderately because of the cost of leverage

	Dollar Allocation	Risk Contribution		Dollar Allocation	Risk Contribution
Global Equity	16%	33%		29%	33%
Rates	59%	33%		109%	34%
Inflation	25%	34%		47%	33%
Expected Return		3.76%			4.85%
Expected Risk		5.82%			10.59%
Sharpe Ratio		0.33			0.28

LEVERAGE IN RISK BALANCED PORTFOLIO

- Risk Balance portfolios utilize leverage to adjust the risk contribution and expected returns of asset classes
 - Engineer assets to have similar risk and return levels for use in constructing portfolios with more balanced economic factor exposures
 - Magnify correlation benefits and therefore diversification

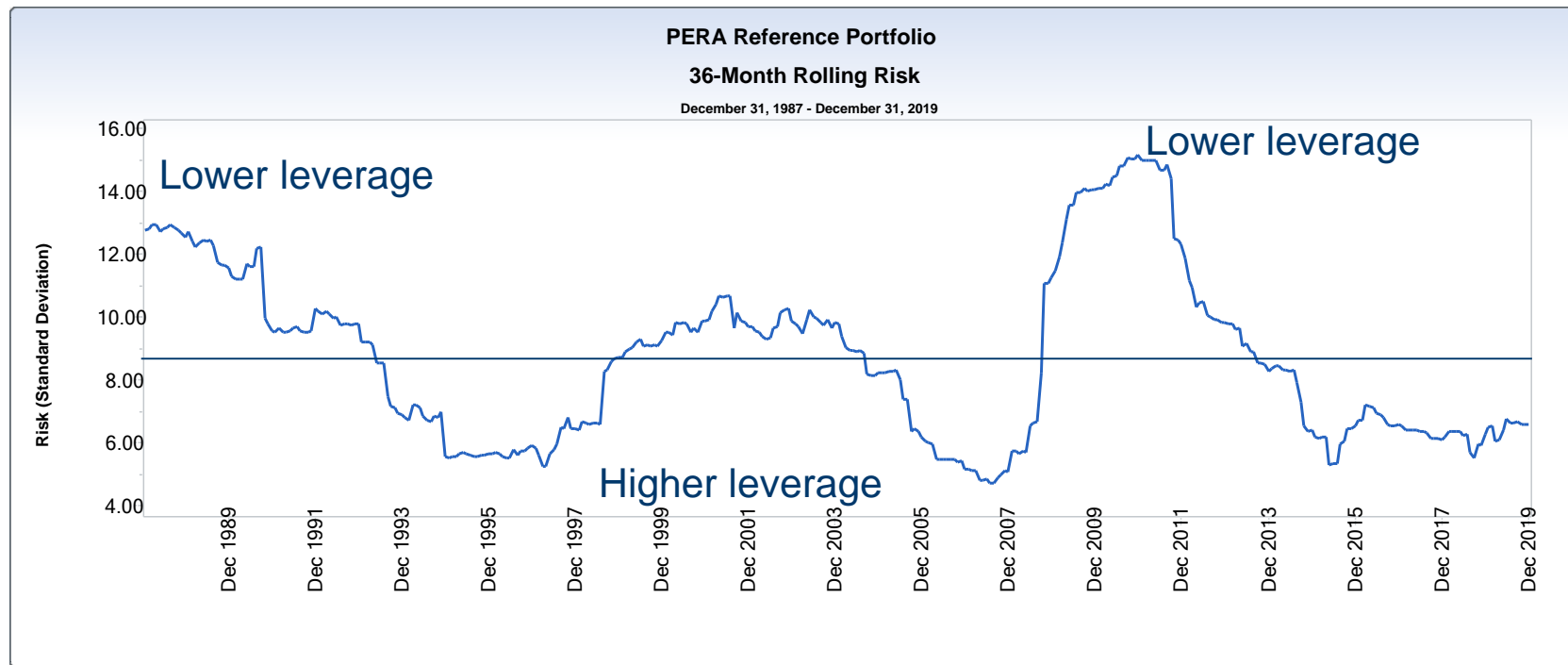


VOLATILITY BASED ADJUSTMENTS

VOLATILITY BASED ADJUSTMENTS

Risk parity strategies dynamically adjust the leverage since volatility and correlation are inputs in the portfolio construction process.

Active volatility rebalancing is expected to add to returns over time



MULTI RISK ALLOCATION



Three step construction process yields a portfolio with a higher expected return and similar risk, and higher risk adjusted return

	REFERENCE PORTFOLIO		MULTI RISK ALLOCATION	
	Dollar Allocation	Risk Contribution	Dollar Allocation	Risk Contribution
Global Equity	58%	92%	29%	34%
Rates	42%	8%	101%	33%
Inflation	0%	0%	39%	34%
Expected Return	5.10%		5.85%	
Expected Risk	10.57%		10.59%	
Sharpe Ratio	0.31		0.38	

THE “WHY” OF RISK BALANCE

- **Leverage Aversion**

- Many market participants are not willing or able to utilize leverage in their portfolio
 - » Explicit statutory restrictions
 - » Lack of expertise in managing leverage
- To meet return targets, those investors overweight riskier assets and bid up prices, reducing their expected returns going forward
- Less risky assets are underweight, increasing their expected returns going forward
 - » Opportunity for higher risk adjusted returns for those without leverage constraints

CYCLICAL CONSIDERATIONS

Deflationary environment

If global central bank actions do not have a lasting impact, economic growth and inflation remain low or fall further.

Risk Parity is likely to perform better than traditional portfolios as falling interest rates provide a tailwind for fixed income assets

‘Secular stagnation’ environment

Growth remains mired below historical norms and inflation remains subdued

Risk Parity could perform in-line with traditional portfolios as below average equity and commodity returns are offset by stable fixed income returns, which will benefit from yield curve roll down and regular coupons, and a low but stable interest rate environment

Higher economic growth environment

Interest rates rise due to improved economic outlook while inflation remains contained

Risk Parity would likely lag as strong equity performance would push traditional portfolios higher

Higher expected inflation environment

Interest rates rise because of higher inflation expectations

Risk Parity could outperform traditional portfolios as real assets provide inflation protection, while nominal bonds and stocks would struggle

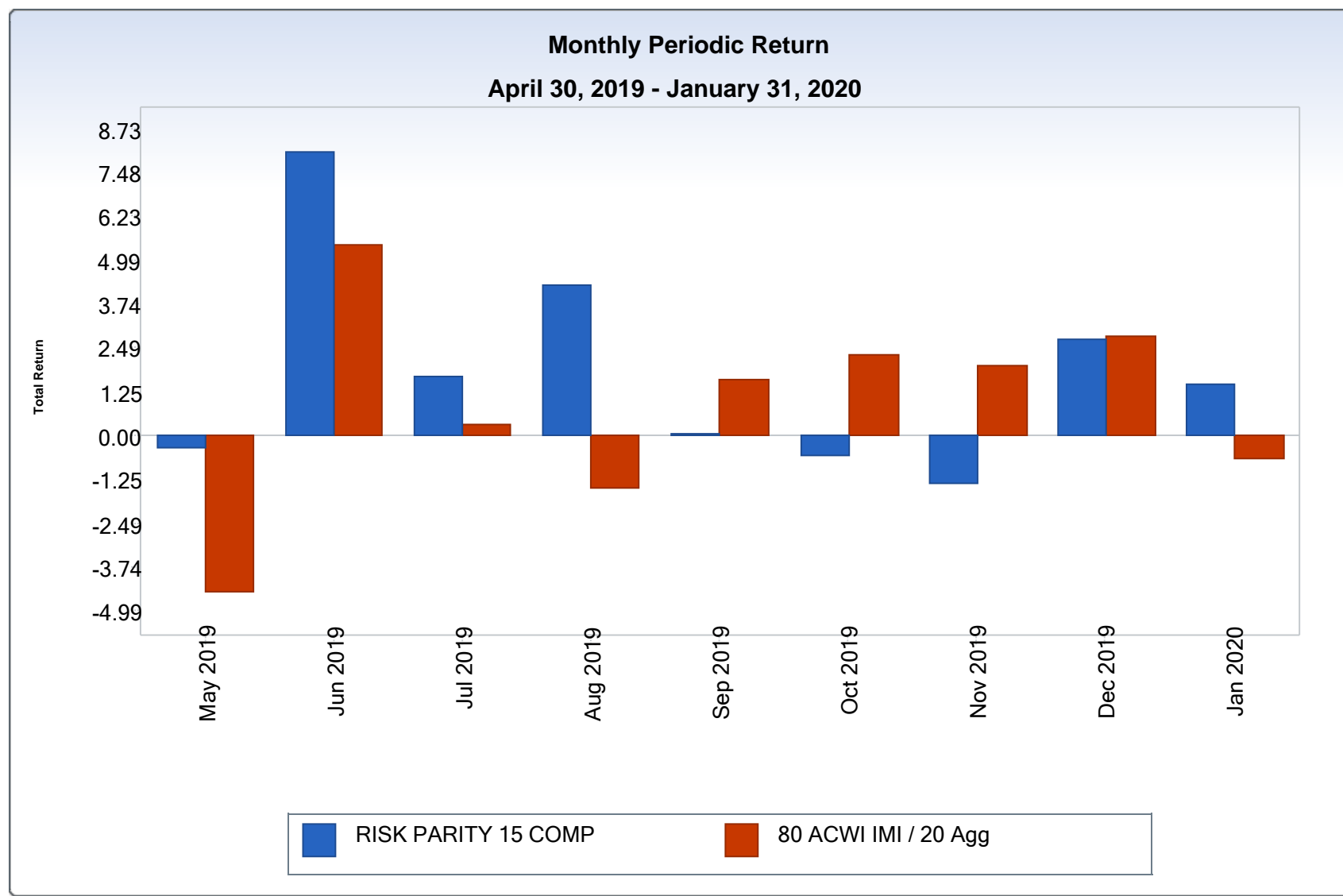
PERA IMPLEMENTATION

- Wilshire Risk Parity methodology includes Growth (Equities), Rates (Bonds), and Inflation (TIPS/Commodities)
 - Define a target ex-ante risk level (for example: 15%)
 - Equally weighted by risk (volatility) across asset classes
 - Securities within asset class “baskets” are equally weighted by risk (volatility)
- Investible indexes that utilize highly liquid futures within each asset class basket:

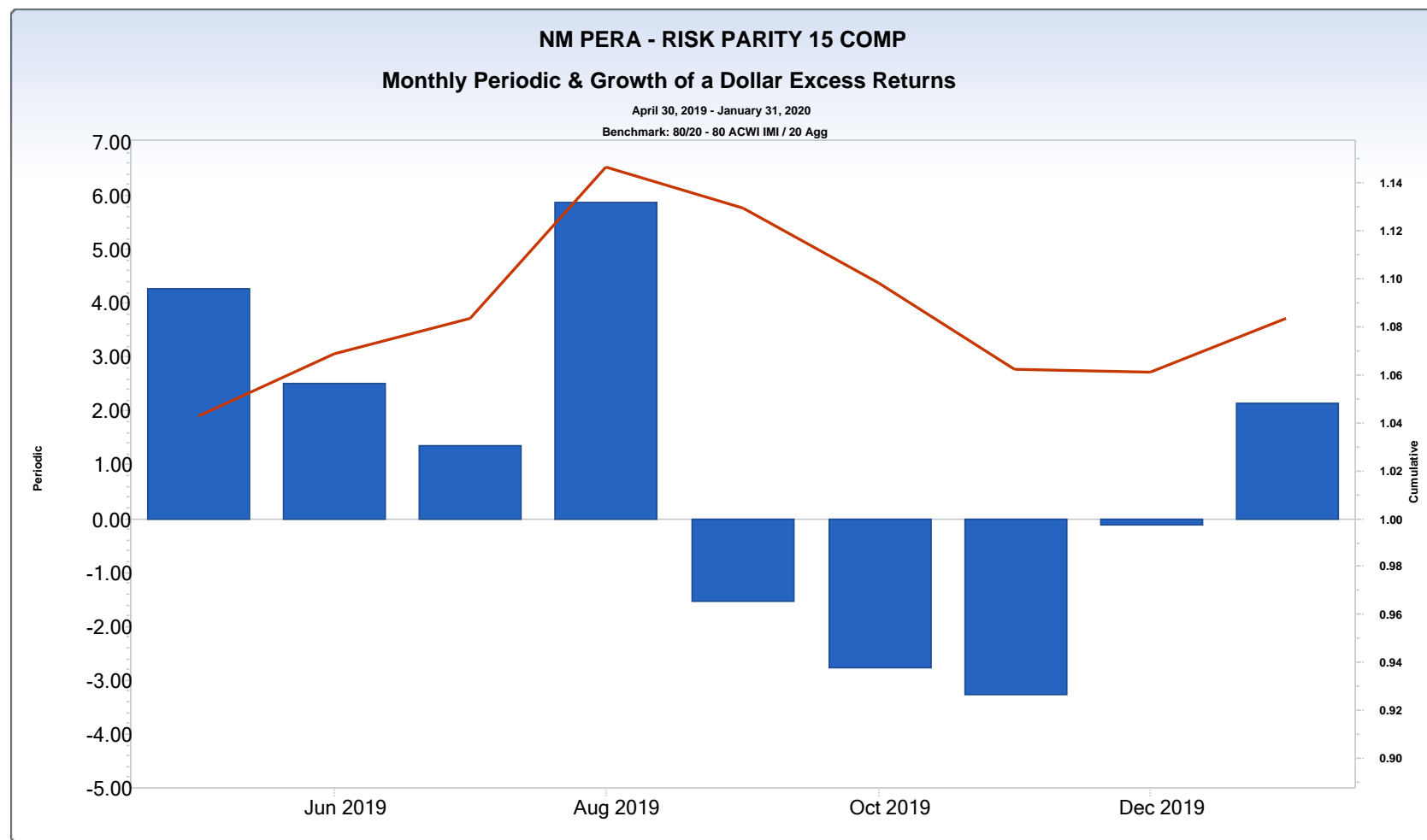
EQUITY FUTURES	FIXED INCOME FUTURES	FOUR COMMODITY FUTURES
US: S&P 500	US: T-Note (10-year)	Energy: WTI Crude Oil (CL)
UK: FTSE 100	UK: Gilts (10-year)	Agriculture: Soybeans (S)
Europe: EURO STOXX 50	Europe: Euro-Bund (10-year)	Industrial Metals: Copper (HG)
Asia: Nikkei 225	Asia: JGB (10-year)	Precious Metals: Gold (GC)

- TIPS exposure (capped at 50%) is split between rates (fixed income) and inflation baskets
- Volatility is calculated using a long term (15 year) and short term (3 month) measure, anchoring to the long-term target while maintaining short-term responsiveness
- Includes a cap on leverage and a VIX-based equity dampener

PERA IMPLEMENTATION: PERFORMANCE



PERA IMPLEMENTATION: PERFORMANCE



- Outperformed source of funds by over 8% since inception through January

PERA IMPLEMENTATION: PERFORMANCE

- PERA strategically sized monthly commitment pacing based on relative performance of risk balance strategy vs. the source of funds
 - Increased pace of investment in the last two months of 2019 as risk parity underperformed vs. the funding source
 - Profited from strong relative performance to start 2020
 - Estimated value add of over **\$42.5 million** as of February 25th, 2020

LOOKING BACK: 2018 PLANNING

- Increased multi-risk allocation exposure is in line with 2018 portfolio planning

July 2018 Board Retreat Materials

Wilshire Consulting

 **Wilshire**

NEXT STEPS IN STRATEGIC DIRECTION

- Step one of three. Note beta enhancement initiatives over the next three years

Asset Class	Option 5	
	Year End 2018	Year End 2019
Global Equity	35.50%	33.00%
Risk Reduction & Mitigation	19.50%	17.00%
Credit	15.00%	12.50%
Real Assets	20.00%	17.50%
Multi-Risk Allocation	10.00% → 20.00%	20.00%
Total Assets	100.0%	100.0%
Expected Return (Beta + Structure/Illiquidity)	6.85	6.90
Expected Selection Alpha	0.40	0.55
Expected Total Return (Beta + Structure/Illiquidity + Selection)	7.25	7.45
Sharpe Ratio	0.49	0.49

Note: Multi year forecast is subject to change, for illustrative purposes only

FINAL CONSIDERATIONS

Summary

- Implementation was innovative and reflects the benefit of the strong strategic partnership between Wilshire/PERA/BNY Mellon
- 10% SAA implementation will be completed as of April 1, 2020
- Results have been favorable relative to funding source
- Proposal to increase mandate from 10% to 20% of total fund
 - In accordance with 2018 education sessions and proposed paths to implementation

Considerations

- Increased peer mismatch, due to decreasing equity risk and enhanced diversification
- Prudent implementation path will be continually evaluated based on market conditions

Next Steps

- Return in March with formal Strategic Asset Allocation changes

IMPORTANT INFORMATION

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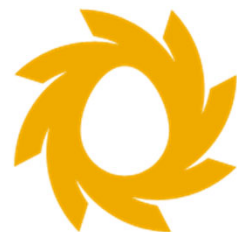
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P I M C O



PERA

Public Employees
Retirement Association
of New Mexico

Macroeconomic outlook and asset allocation considerations

February 2020

This material is to be used for separate account presentations to institutional investors only and not for any other purpose

Pacific Investment Management Company LLC, 650 Newport Center Drive,
Newport Beach, CA 92660, 949.720.6000

For Institutional Investor Use Only

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Agenda

1

Current macro backdrop and investment implications

2

Policy portfolio design considerations

3

Asset allocation considerations

4

Additional information

Current macro backdrop and investment implications



PIMCO's 2020 Cyclical Outlook

U.S.

GDP: 1.50%–2.00%

CPI: 1.75%–2.25%



U.K.

GDP: 0.75%–1.25%

CPI: 1.25%–1.75%



Japan

GDP: 0.25%–0.75%

CPI: 0.25%–0.75%

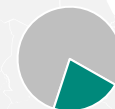
=



Eurozone

GDP: 0.75%–1.25%

HICP: 0.75%–1.25%



China

GDP: 5.00%–6.00%

CPI: 3.00%–4.00%



Mexico

GDP: 0.50%–1.50%

CPI: 3.50%–4.50%



Brazil

GDP: 1.00%–2.00%

CPI: 3.50%–4.50%



For illustrative purposes only.

PIMCO forecast ranges as of December 2019

Real GDP and inflation projections reflect the midpoints of PIMCO's forecast ranges.

Refer to Appendix for additional forecast, outlook and risk information.



% of
world
GDP

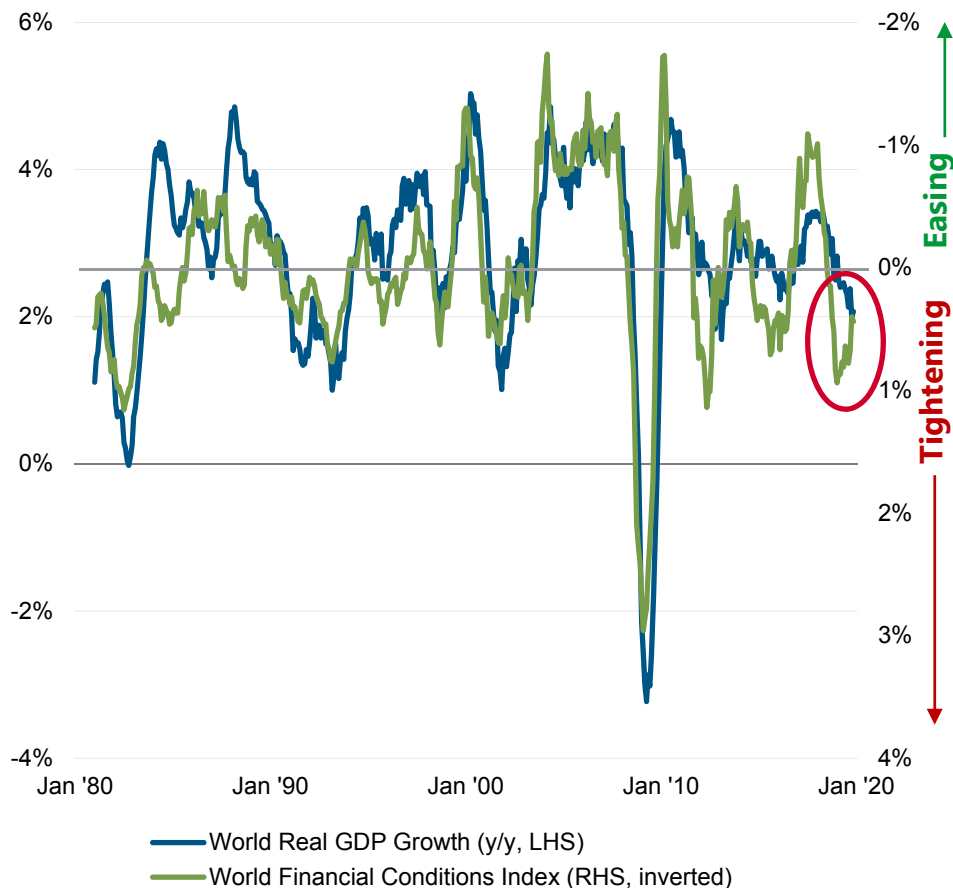
Change
relative to
2019 data

1) Time to recession has increased

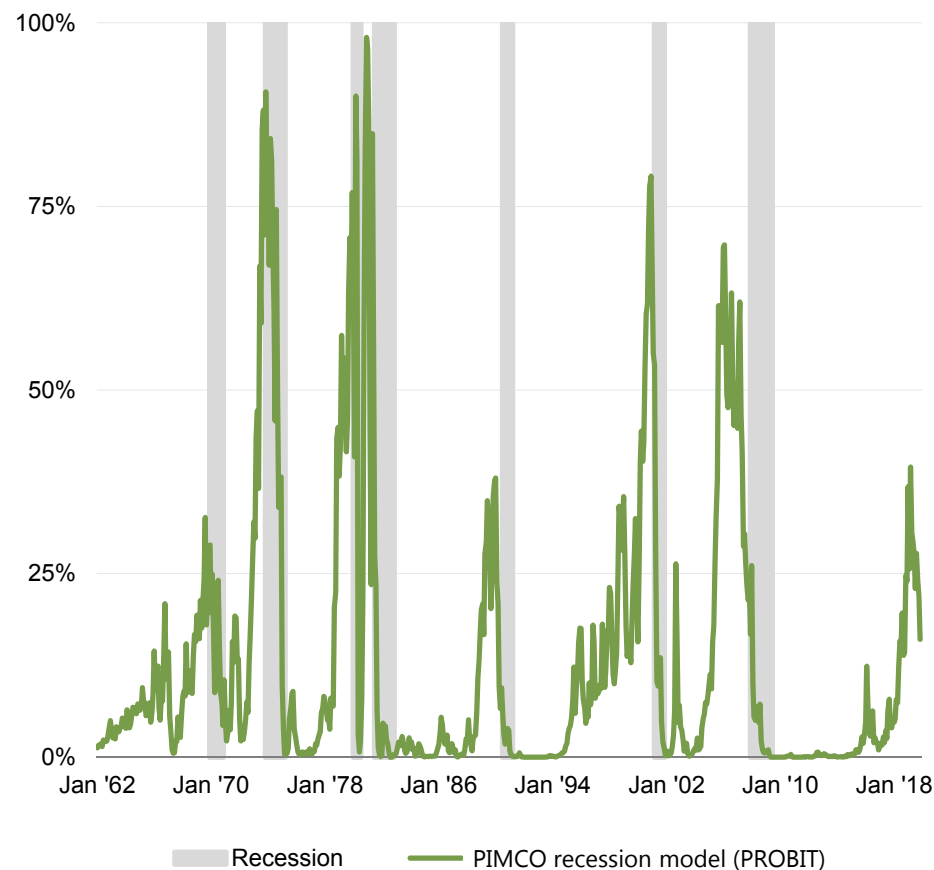
Central bank actions helped ease global financial conditions...

...and reduce the risk of recession in the near term

World GDP Growth and Financial Conditions



U.S. Probit Recession Model (12m)



For illustrative purposes only. Source: Haver Analytics, PIMCO calculations as of 30 November 2019. Left chart: World includes approximately 240 countries. Data is interpolated where unavailable. Note: The PIMCO World Financial Conditions Index (FCI) is a proprietary index that summarizes the likely impact on growth from a range of financial variables, including bond yields, equity prices, currency rates, house prices and money supply. In this inverted depiction, an increase in the FCI indicates an easing of financial conditions. Right chart: Recession probability models are only 1 input into PIMCO's overall assessment of recession risk. Refer to Appendix for additional forecast, outlook and risk information.

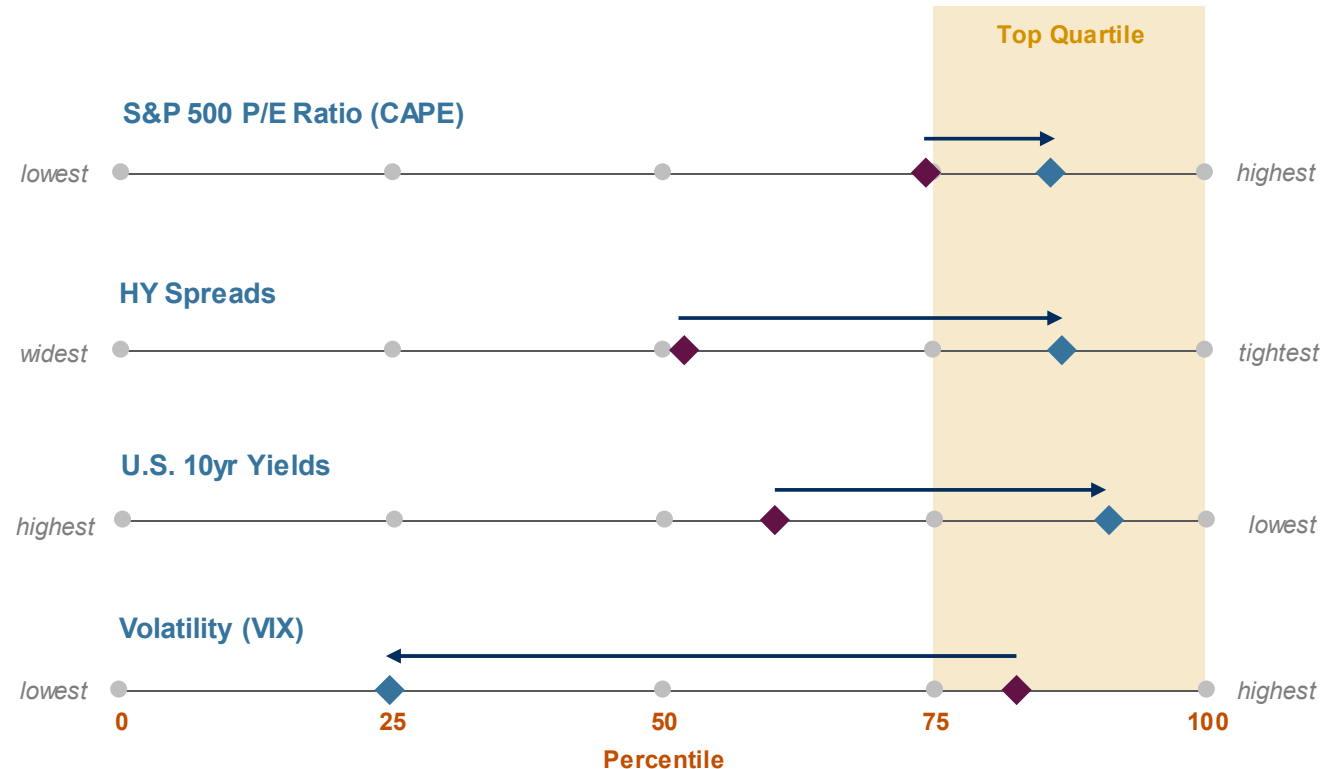
Investment implication: More constructive, but starting points matter

Highlights

- Positive carry from more diversified sources, biased toward higher-quality
- Overall duration closer to flat
- Less generic corporate credit exposure given valuations
- Modest overweight to equities

Rank relative to past 20 years

◆ Current (31 Dec '19) ◆ 1 year ago (31 Dec '18)



As of 31 December 2019.

Source: Bloomberg

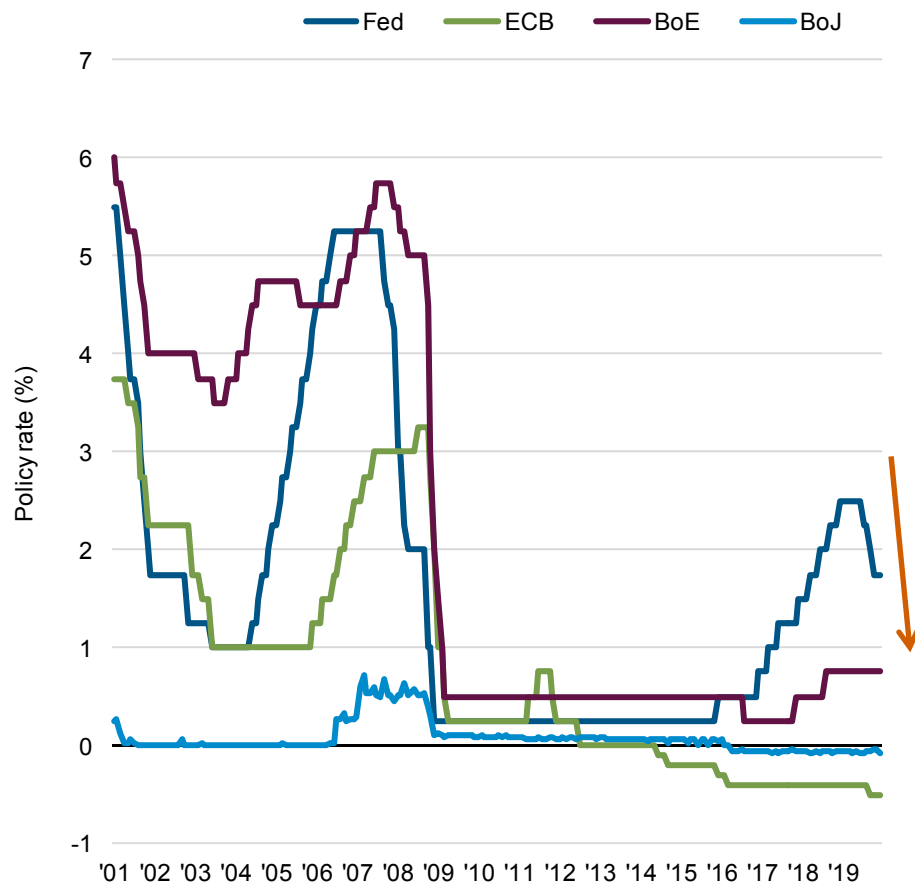
High Yield (HY) spreads are represented by the Bloomberg Barclays US Corporate High Yield Avg OAS index.

Refer to Appendix for additional index, investment strategy, outlook and risk information.

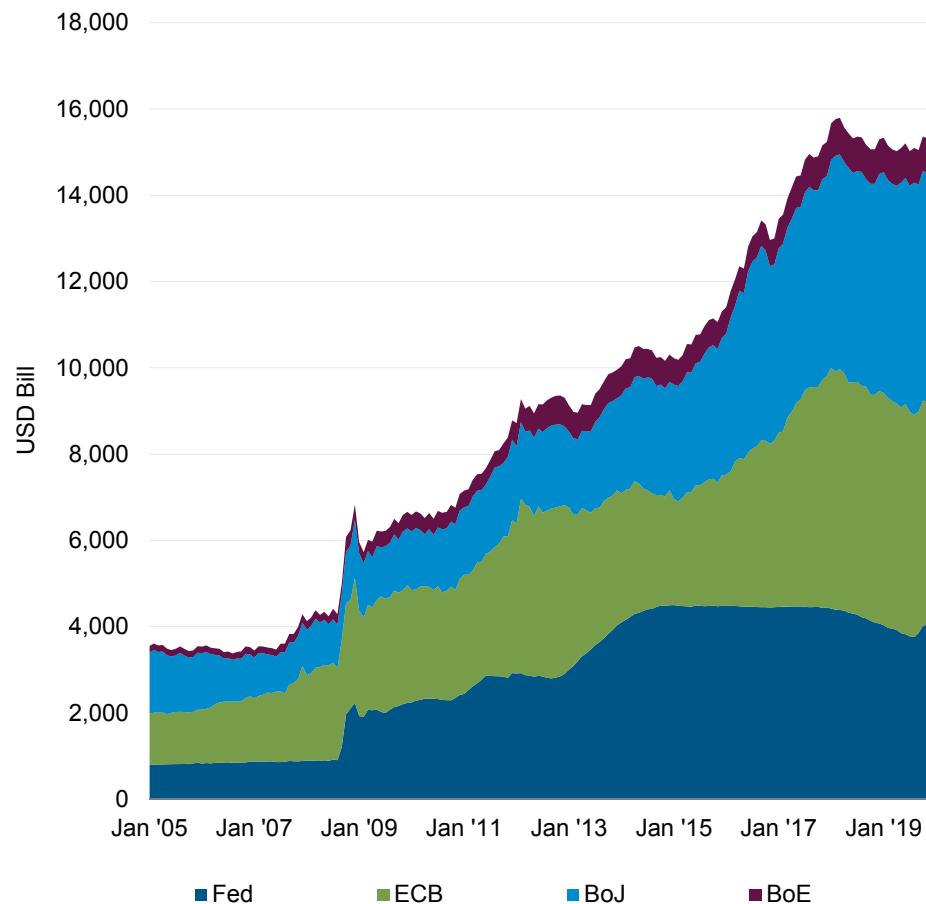
2) Loss given recession has risen

Central banks have exhausted more of their toolkit, leaving less policy space for future action

Developed Market Central Bank Policy Rates



Developed Market Central Bank Balance Sheets



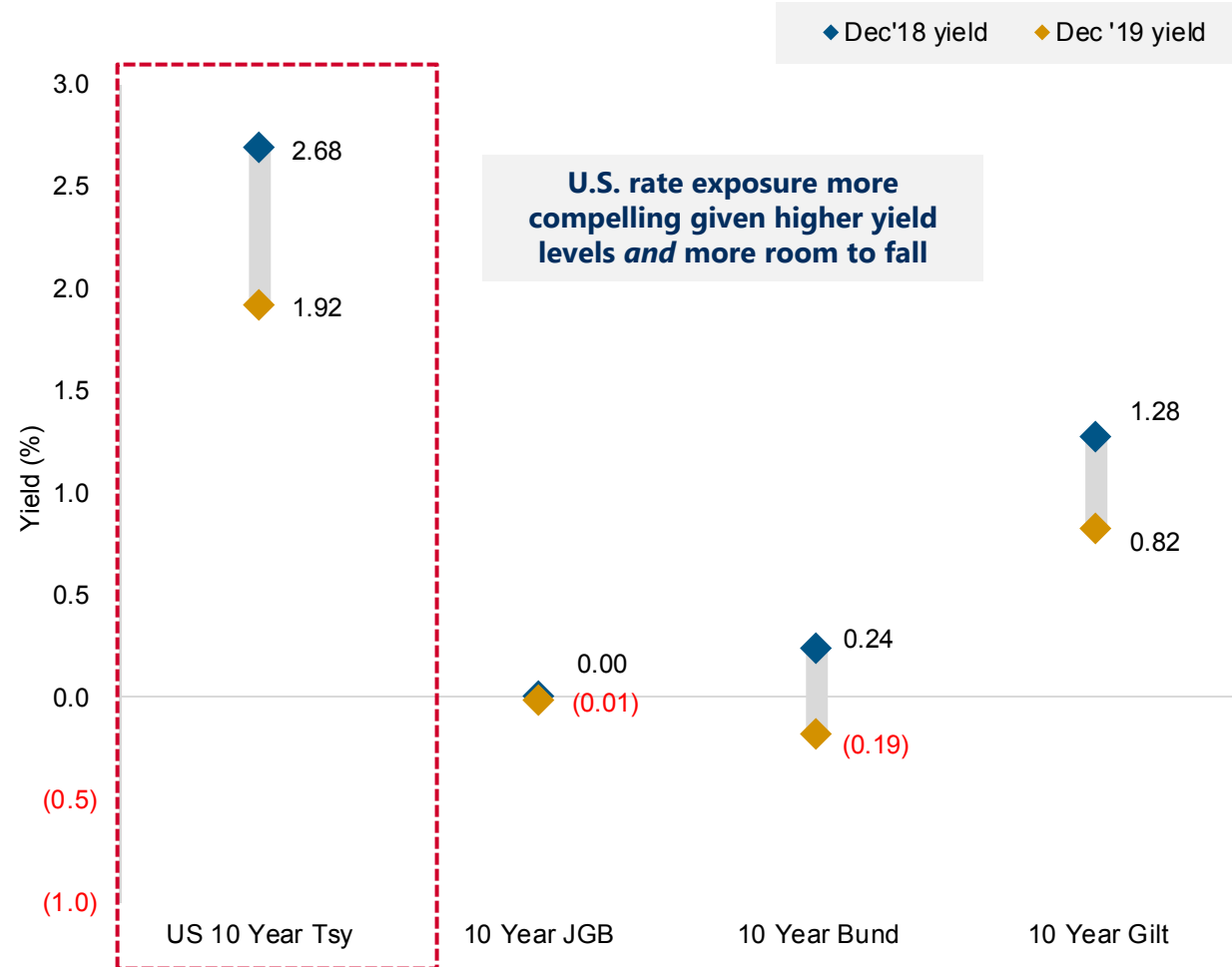
Source: Haver, PIMCO, as of 31 December 2019.

Investment implication: Favor US duration, with less generic risk beta

Highlights

- Favor US duration over global alternatives given relative value and more potential for capital gains
- Long Japanese yen positions given risk-off exposure (and as proxy for duration)
- Cautious stance on generic credit risk

Comparison of current global yields to their respective lowest historic levels



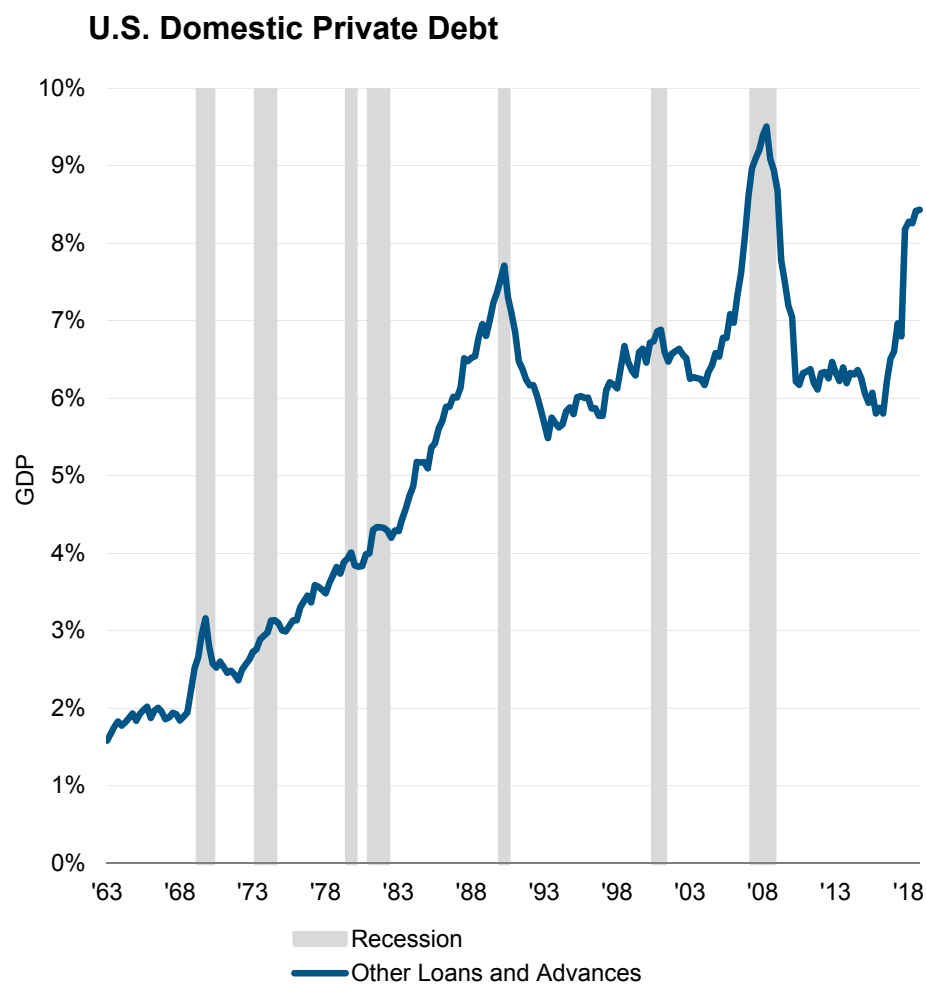
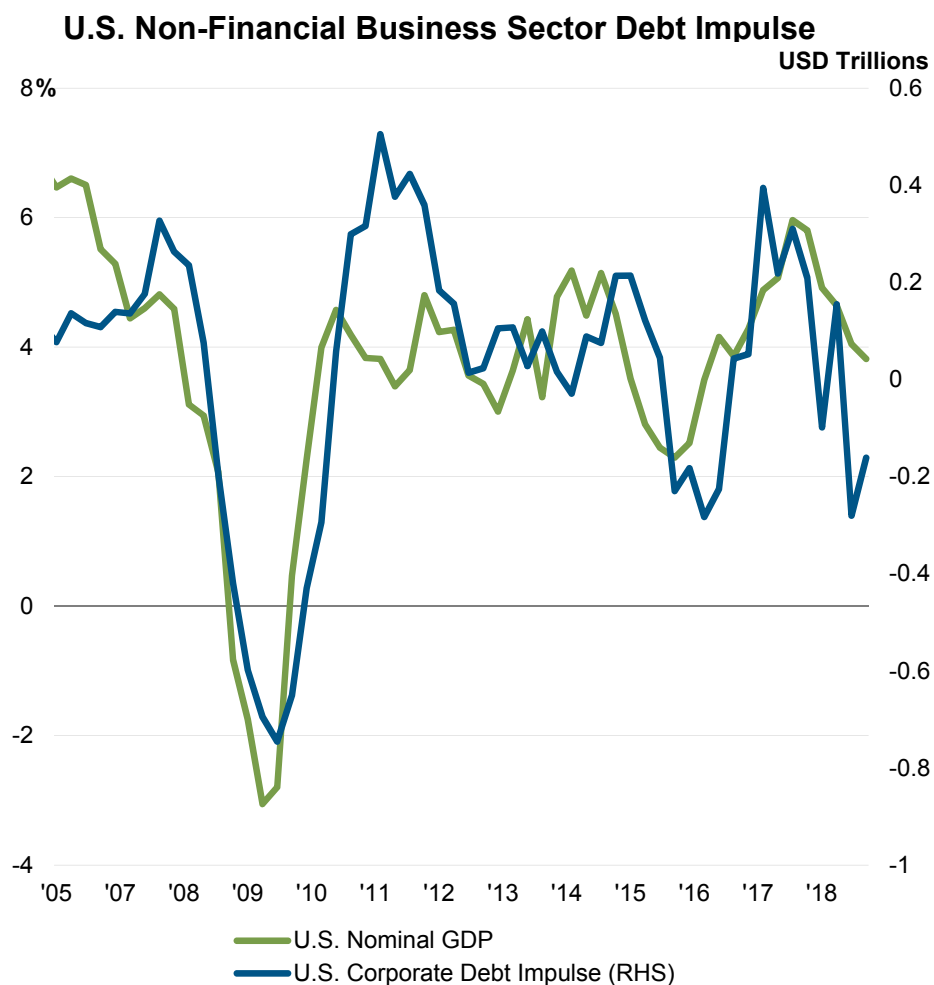
As of 31 December 2019

SOURCE: PIMCO, Bloomberg.

Refer to Appendix for additional investment strategy, outlook and risk information

3) Cracks in the corporate credit cycle

Riskier segments of the credit market may be more vulnerable to pronounced growth slowdowns

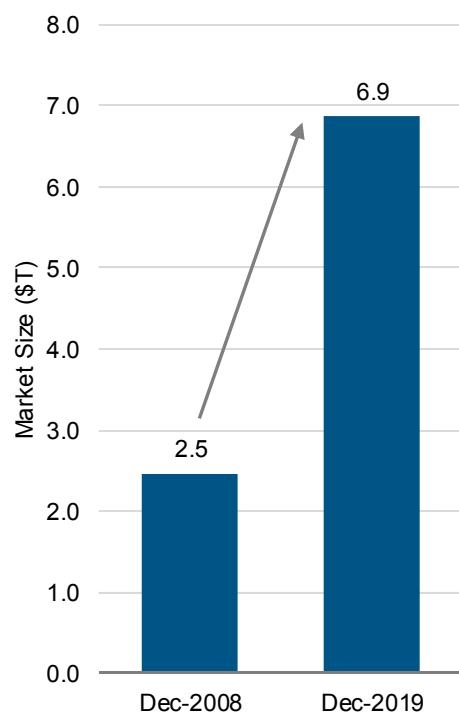


Source: Haver Analytics, U.S. Federal Reserve, PIMCO calculations as of 30 September 2019. Left chart: shows the close correlation between GDP and the ebb and flow of overall credit to the corporate sector. The debt impulse is the dollar change in overall corporate debt flows, including bank loans, corporate bond issuance and private credit from the Federal Reserve's flow of funds data. Right chart: other loans and advances is a proxy for private financing.

Investment implication: Cautious on generic corporate credit

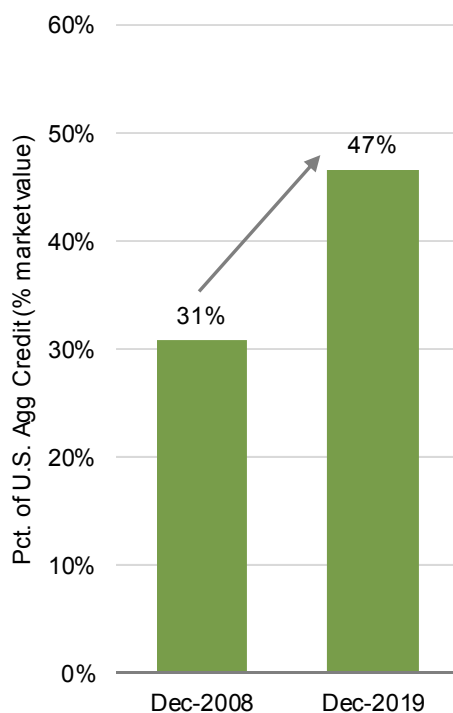
GROWING MARKET

The investment grade credit market has more than doubled since 2008



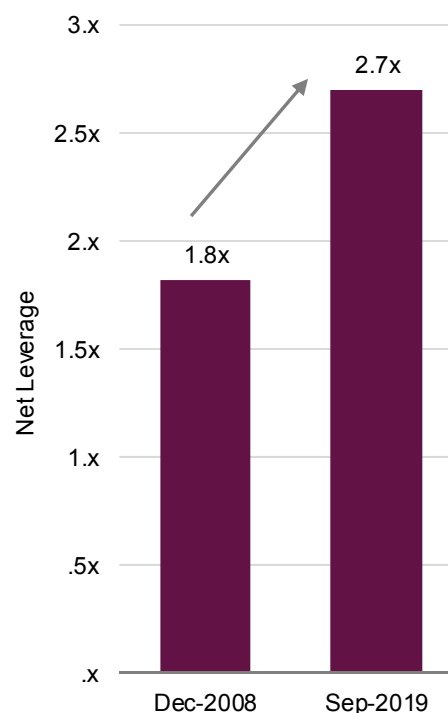
INCREASED CREDIT RISK

The share of BBBs in the U.S. Credit market has increased 16% since 2008. BBBs now make up twice the size of the high yield market vs. 1x in 2008



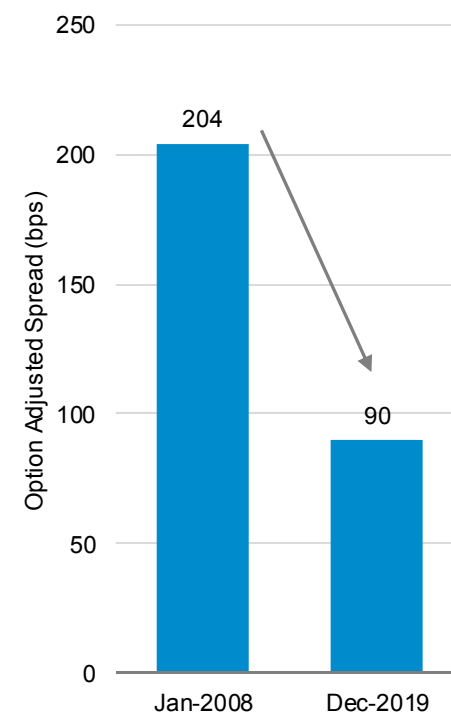
HIGHER LEVERAGE

Companies are taking on more debt and leverage in the investment grade credit market has increased 0.9x



REDUCED COMPENSATION FOR RISK

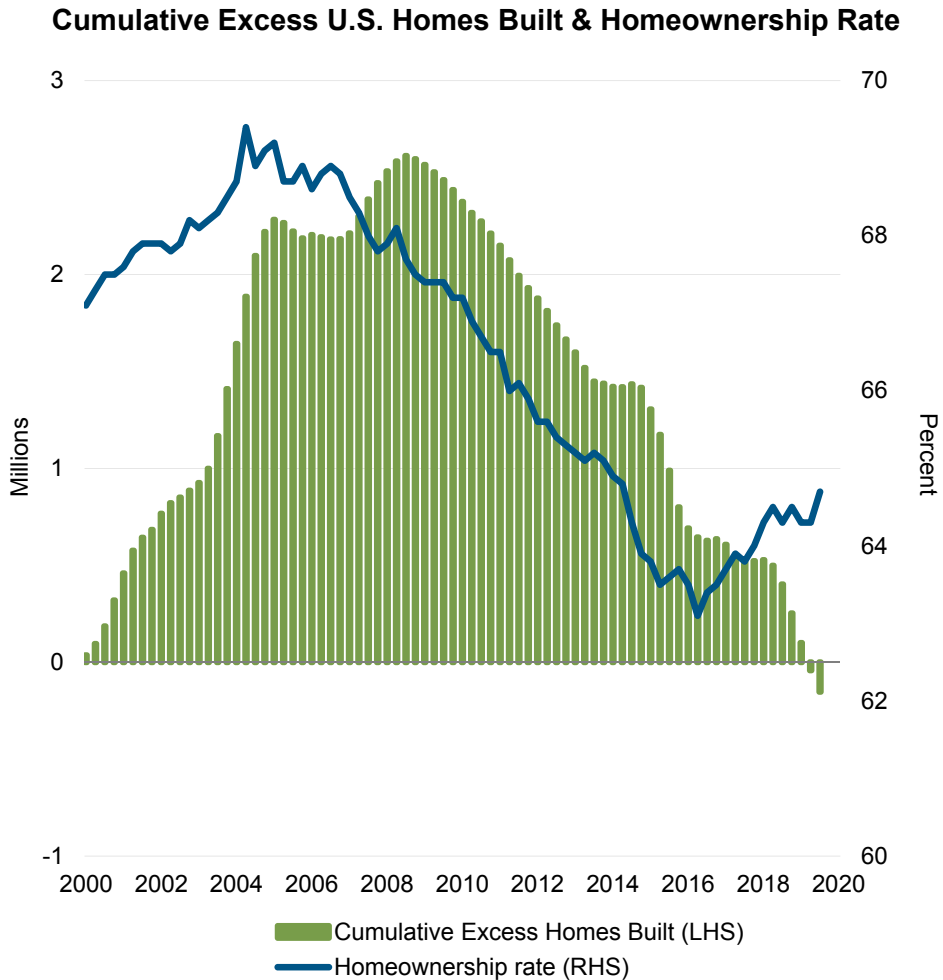
Companies can borrow at lower rates as credit spreads have come down over 100 basis points since the start of 2008



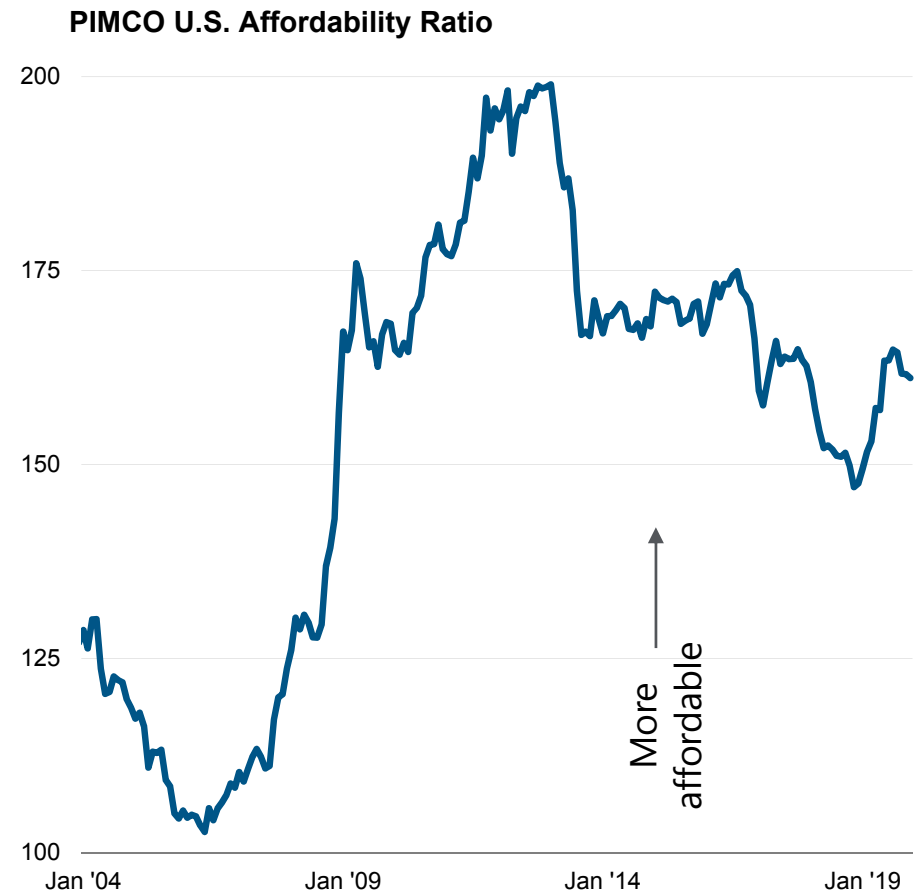
As of 31 December 2019. Leverage as of most recently available. Source: PIMCO, Bloomberg, Barclays
Market size, market value, and OAS based on Bloomberg Barclays U.S. Credit Index. Leverage based on IG CDX 32
Refer to Appendix for additional index, investment strategy, OAS, outlook, and risk information.

4) U.S. housing fundamentals remain strong

U.S. Housing supply has fallen while demand remains robust



U.S. Housing affordability measures appear favorable



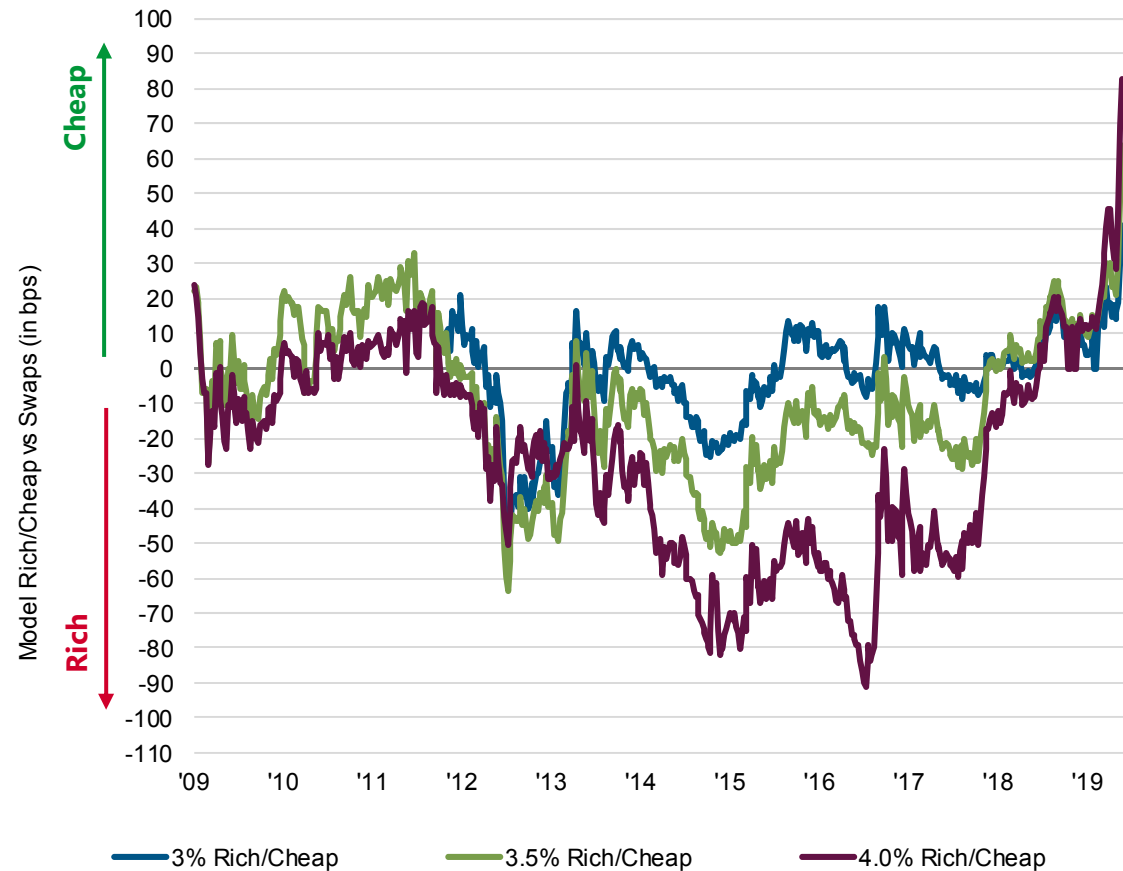
Source: Haver Analytics, Bloomberg, PIMCO calculations as of 30 September 2019. Left chart: Cumulative excess homes built is the cumulative difference between housing starts and household formations. Right chart: The PIMCO Affordability ratio is a seasonally adjusted measure of the affordability of a median priced home, based on median income and prevailing mortgage rates.

Investment implication: Preference for housing-related assets

Highlights

- Favor Agency MBS given compelling valuations, reasonable carry, and attractive liquidity profile
- Non-Agency MBS attractive as a more defensive source of credit and carry
- Select opportunities in other securitized (CMBS, U.K. residential assets)

Agency MBSSpread Valuation



As of 31 December 2019

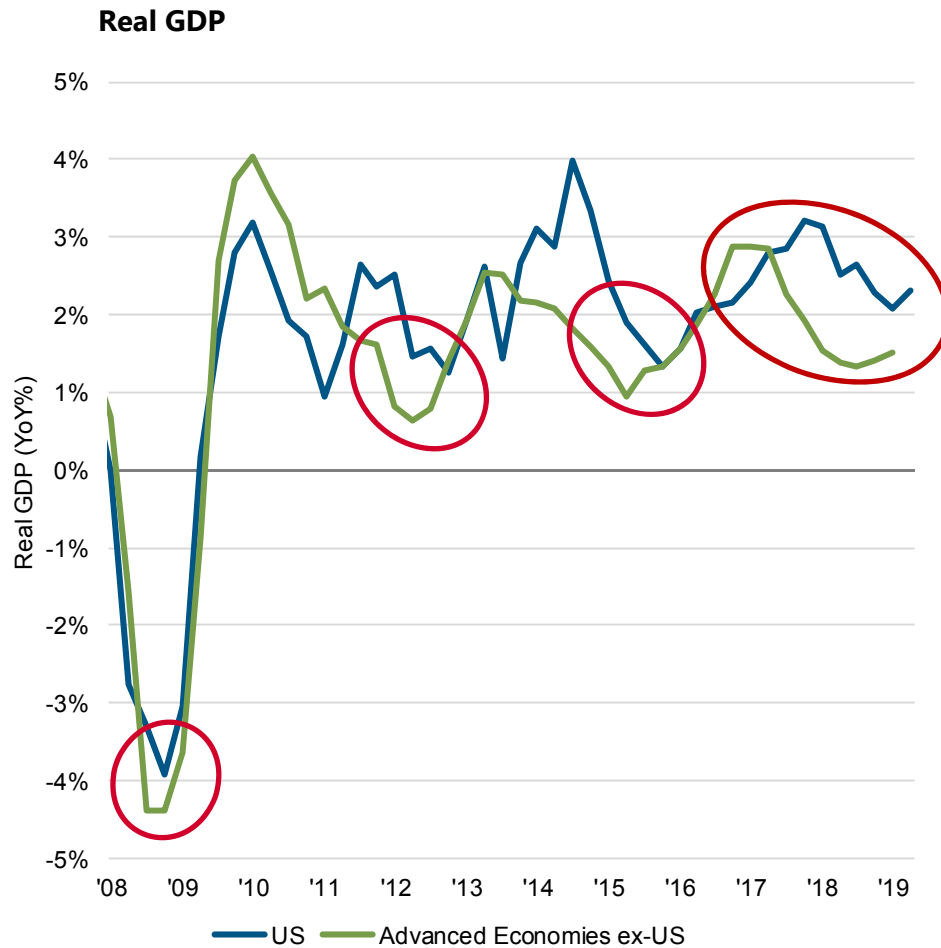
SOURCE: PIMCO

Rich/Cheap valuations are intended to represent the relative level of Agency MBS spread valuations. This represents our empirical spread which relies on a combination of rates, shape of the curve, interest rate volatility, and the refinancability of the mortgage market.

Refer to Appendix for additional investment strategy, outlook and risk information

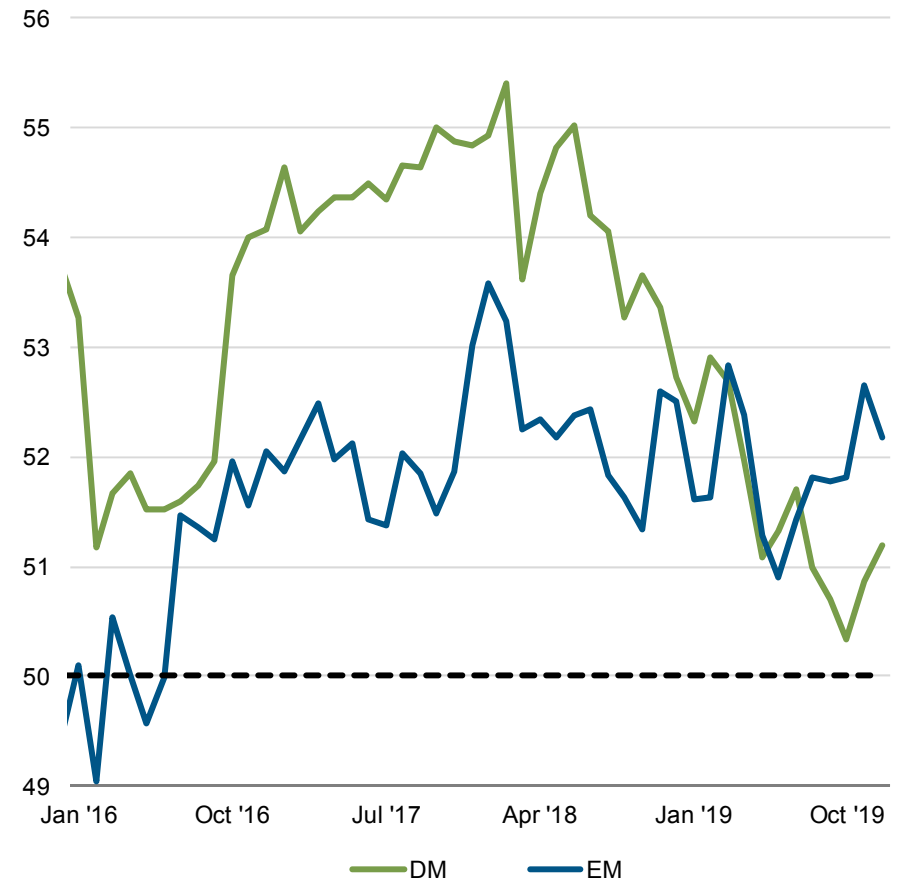
5) The world leads, the U.S. lags

U.S. growth momentum slowed later – and less – than the rest of the world



Signs of a rebound have already begun to emerge

Composite PMI



As of 31 December 2019.

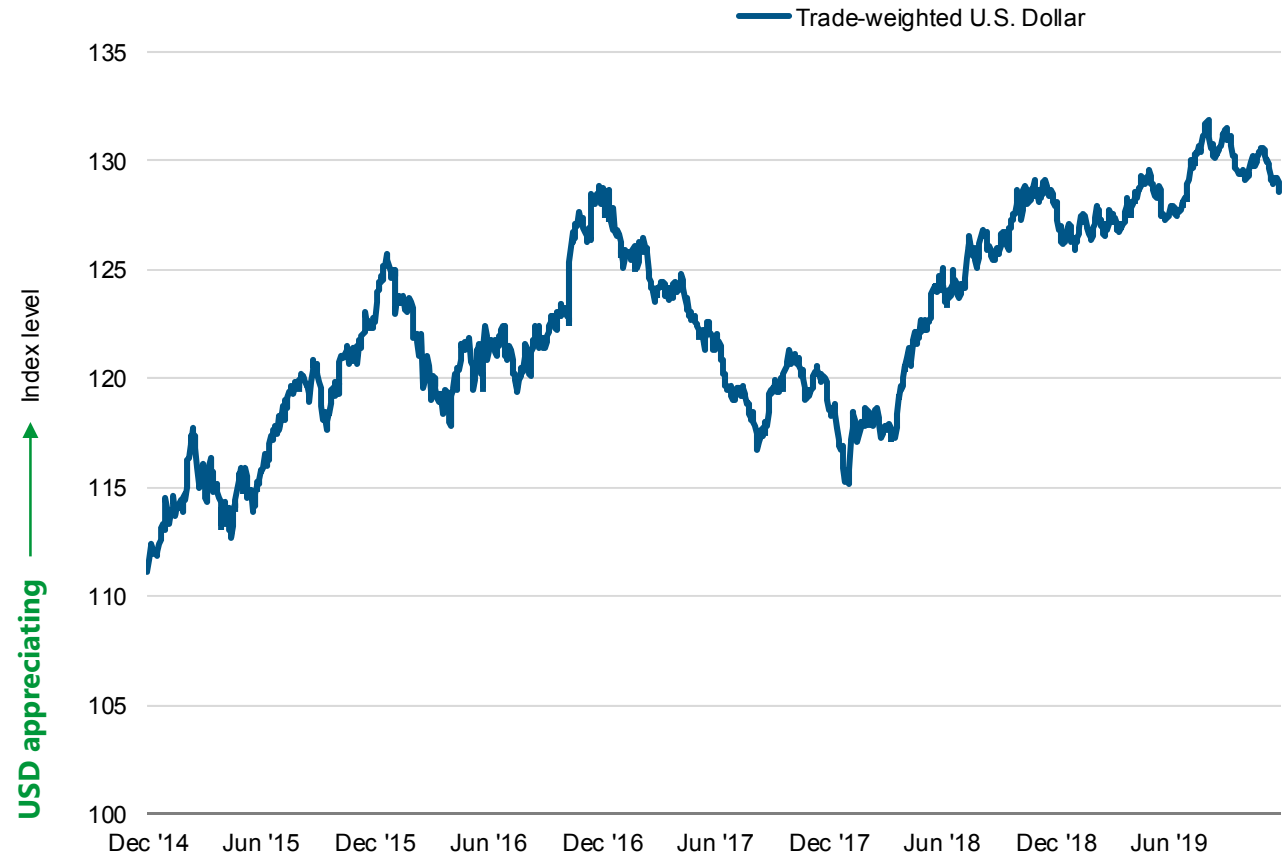
Source: Haver, PIMCO. DM: Developed Markets. EM: Emerging Markets.

Investment implication: Seek opportunities in select currencies

Highlights

- Expect an overweight to a basket of EM currencies against the US dollar
- Seek opportunities in G10 currencies against the U.S. dollar if more evident divergence in growth momentum
- Favor US duration over other regions

US dollar (trade-weighted)



As of 31 December 2019

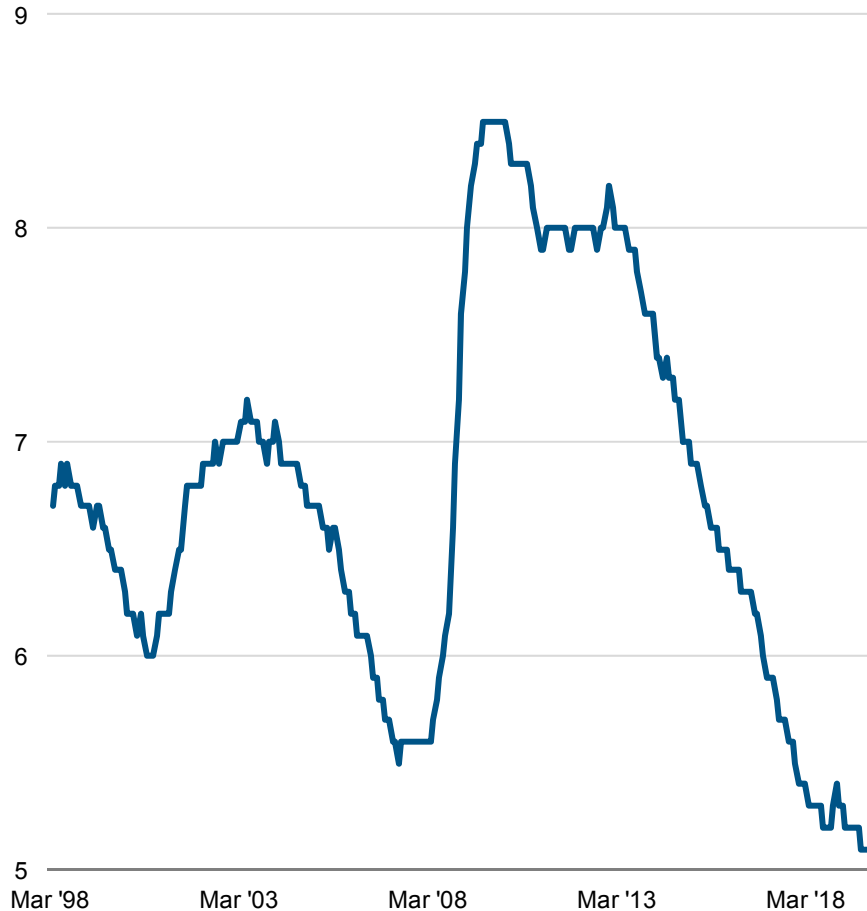
SOURCE: Bloomberg, PIMCO

Refer to Appendix for additional investment strategy, outlook and risk information

6) Inflation: Distribution of outcomes is fat tailed

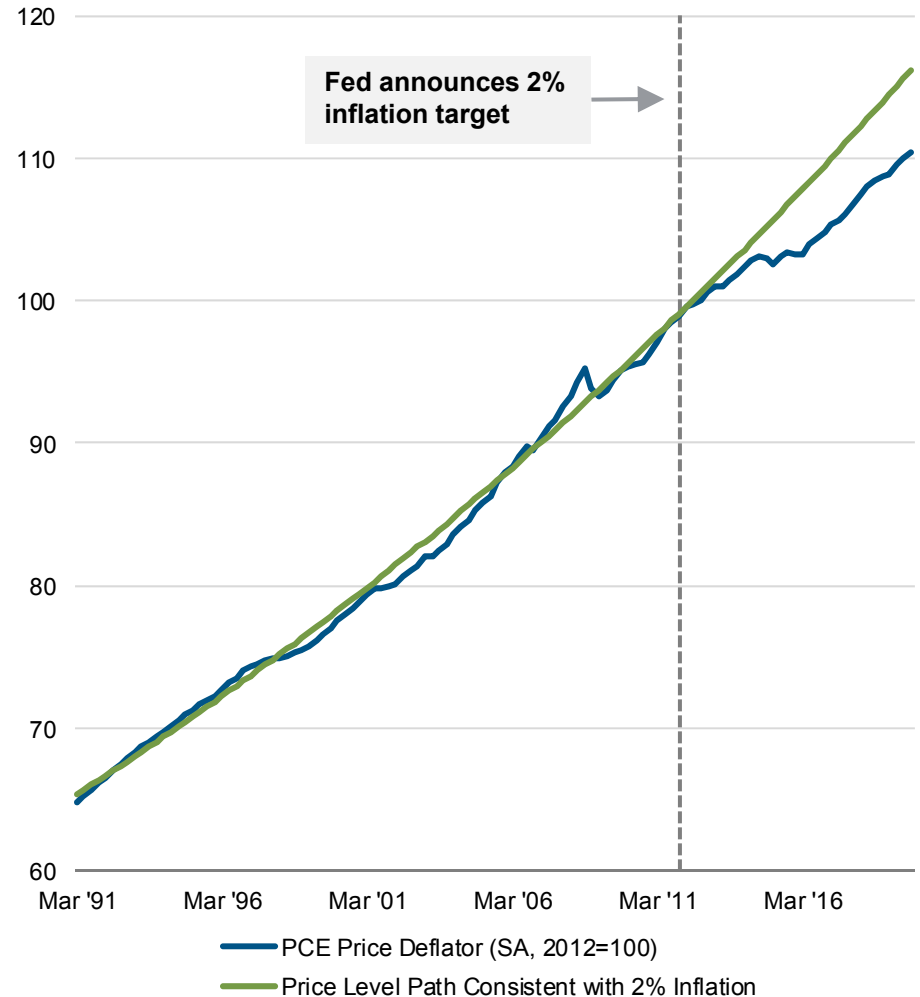
Wage pressures from tight labor markets could cause an inflation surprise

OECD Unemployment Rate



Given extent of undershooting, U.S. Fed may allow inflation to overshoot

PCE Price Level



Source: Haver, PIMCO calculations, as of 31 December 2019.

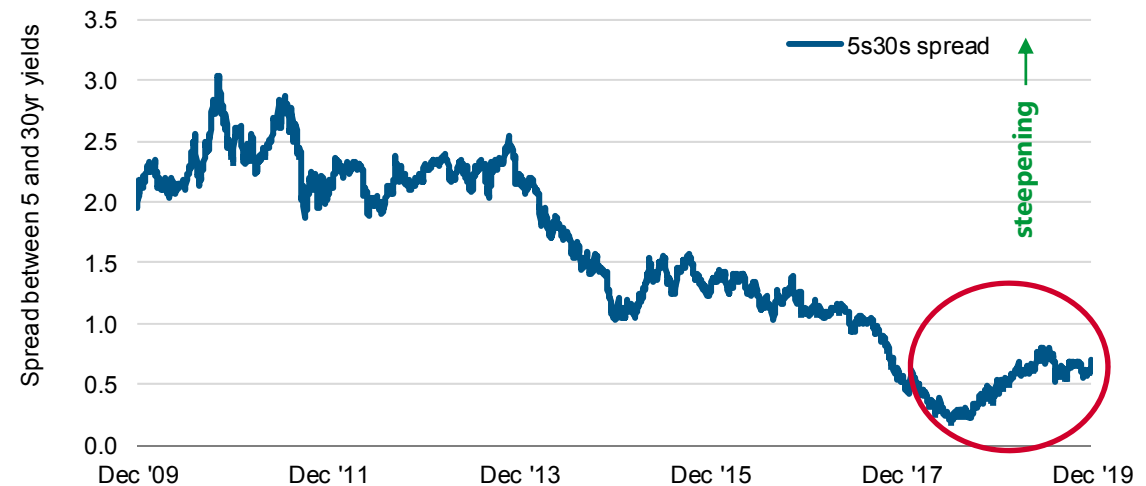
The Organisation for Economic Co-operation and Development is an intergovernmental economic organisation with 36 member countries, founded in 1961 to stimulate economic progress and world trade. The personal consumption expenditures (PCE), or the PCE Index, measures price changes in consumer goods and services. Expenditures included in the index are actual U.S. household expenditures. Data that pertains to services, durables and non-durables are measured by the index.

Investment implication: Bias for curve steepeners and inflation protection

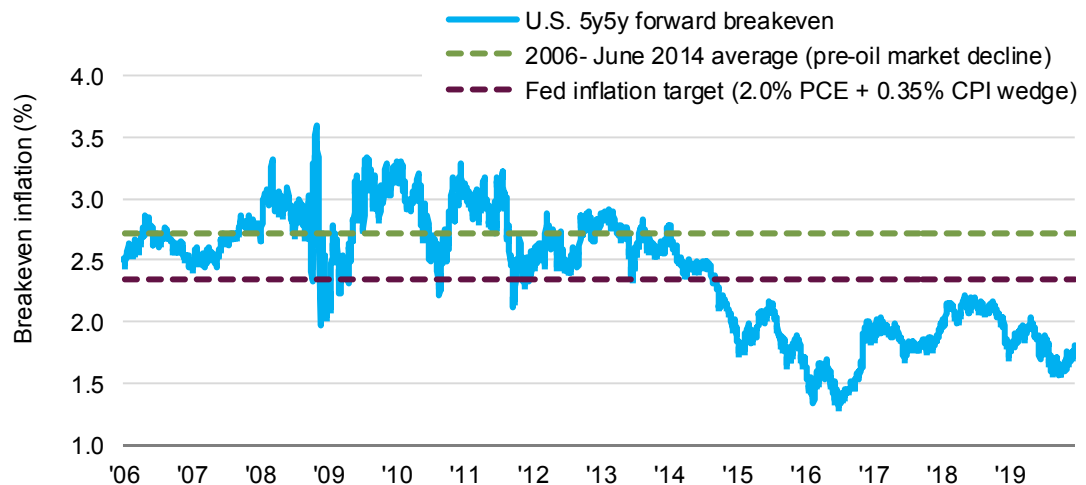
Highlights

- Favor curve steepening positions given
 - Front-ends anchored by central banks
 - Potential for higher U.S. inflation expectations
 - Potential return of term premia
- TIPS valuations attractive given balance of risks skew toward higher U.S. inflation

Change in shape of U.S. yield curve between 5- and 30yr



U.S. Inflation expectations in markets appear low



As of 31 December 2019

SOURCE: Bloomberg, PIMCO.

Refer to Appendix for additional investment strategy, outlook and risk information

Policy portfolio design considerations

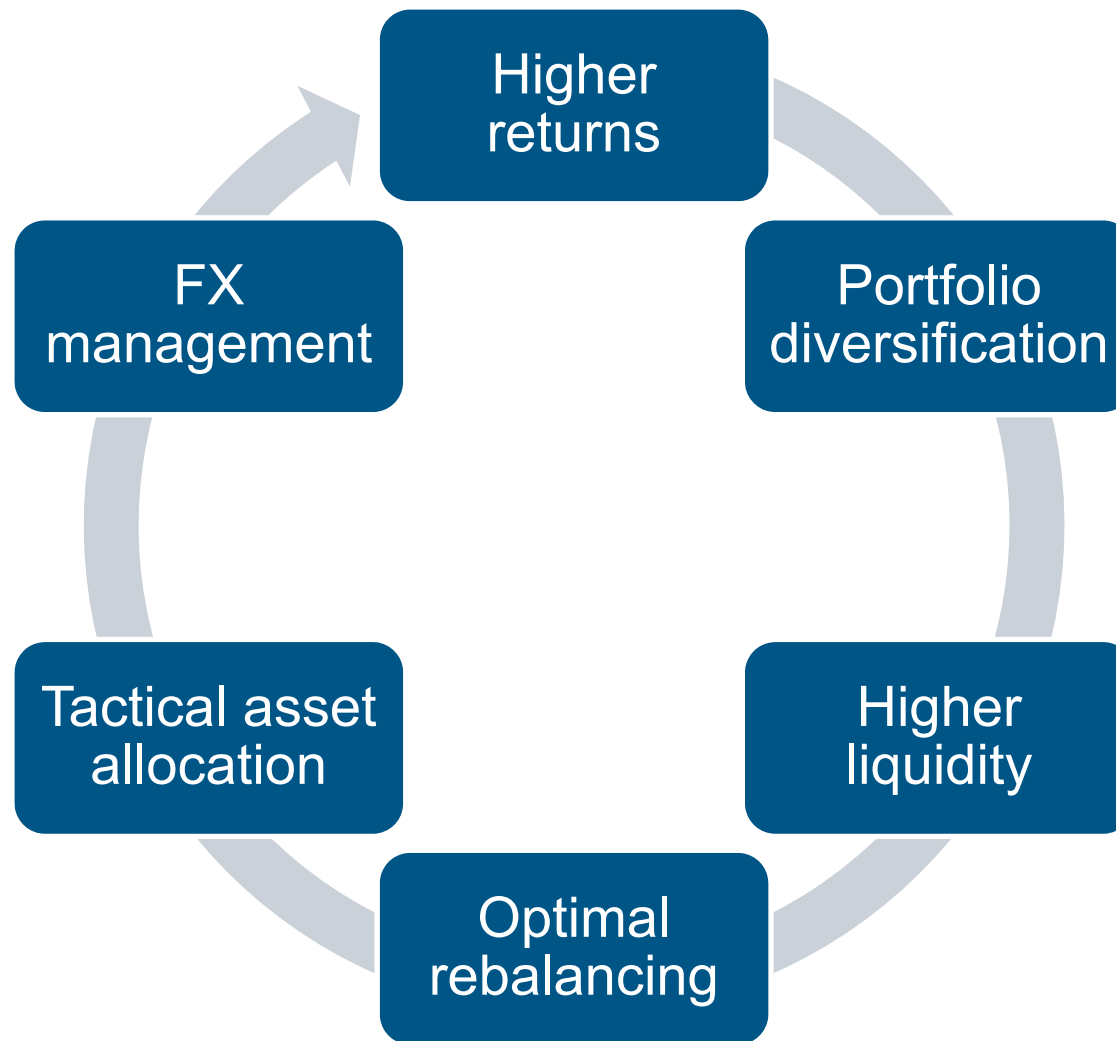


Considerations for institutional investors

- Assets are priced for low prospective returns: achieving targets is going to be tough
- Policy needs to be diversified across risk factors; can't put all eggs in the equity basket
- Alpha will need to play a bigger role and has to be separated from beta decisions
- Search for alpha sources that are consistent, cost-efficient, and have capacity
- Prudent use of leverage at the plan-level can serve as a key tool to achieve goals

Capital efficiency should be a policy-wide theme

Capital efficient overlays can be used to achieve a range of objectives



As of February 1, 2020

SOURCE: PIMCO. Hypothetical example for illustrative purposes only.

Refer to Appendix for additional investment strategy and risk information.

Recent examples of capital efficient combinations

Goal	Physical Exposure (Collateral)	Overlay
Risk mitigation	High quality fixed income / treasuries	Defensive risk premia
Lower equity beta and reduce loss potential	Absolute return / fixed Income	Alternative risk premia
Protect against a pick up in inflation	U.S. TIPS	Equities

As of February 1, 2020

SOURCE: PIMCO. Hypothetical example for illustrative purposes only.

Refer to Appendix for additional investment strategy and risk information.

Investors have a plethora of choices for structuring capital efficient solutions

Exposures can be gained to virtually any liquid asset class or sector

Equities

S&P 500
Russell 1000 Value/Growth
Russell 2000 Value/Growth
MSCI U.S. Minimum Volatility
MSCI U.S. Diversified Multi-Factor
MSCI EAFE Value/Growth
MSCI Emerging Markets
MSCI World ex-US
Nikkei 225
Eurostoxx50
MSCI ACWI
Research Affiliates Enhanced Equity
Custom Equity Basket
...

Fixed Income

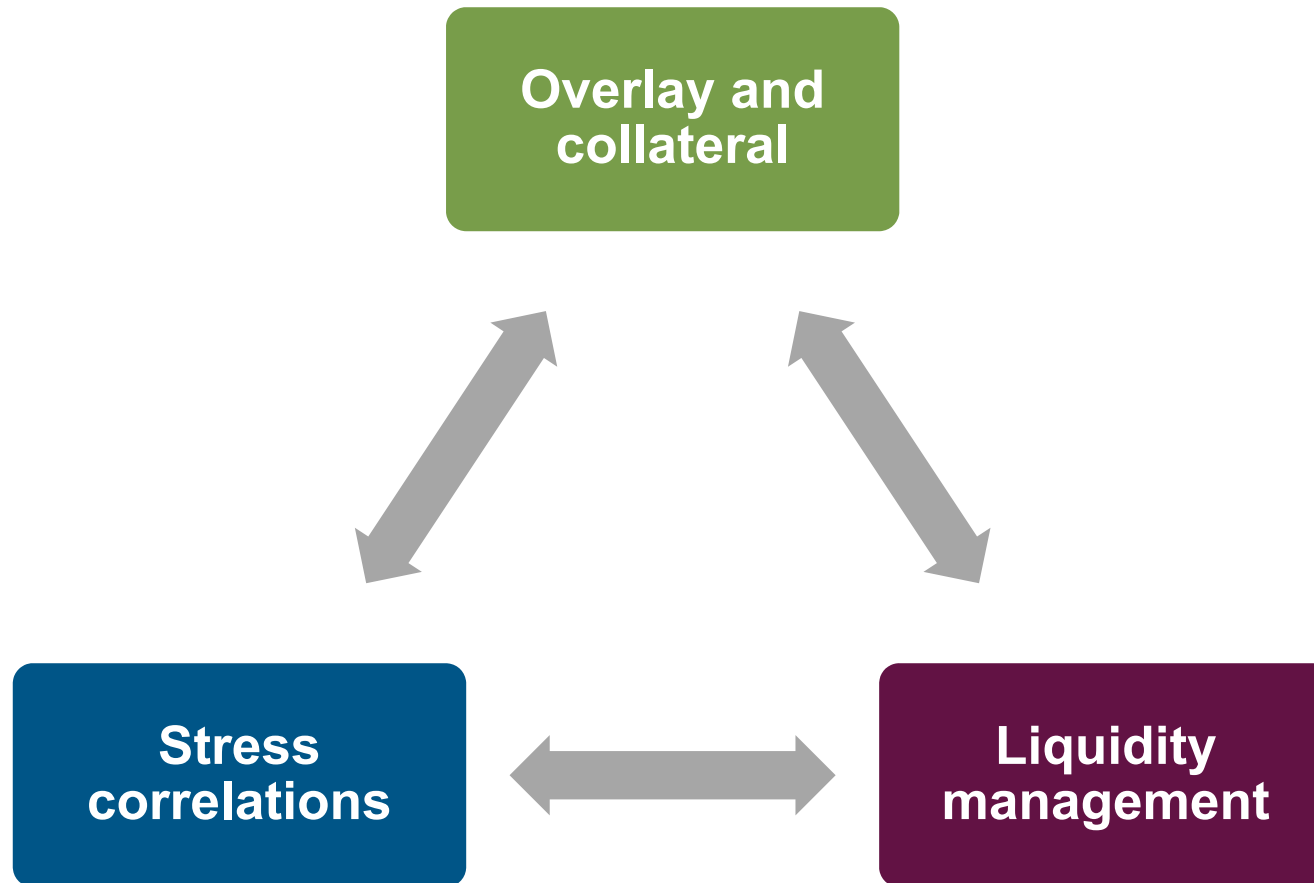
Treasury Futures
Bond Market Index Swaps
Mortgage TBAs
CDX (High Yield)
CDX (IG)
TIPS
...

Real Assets

DJ US Real Estate (REIT)
Enhanced/Active REITs
BBG Commodity
CS Commodity
GSCI Commodity
Active Commodity
...

SOURCE: PIMCO. Hypothetical example for illustrative purposes only.
Refer to Appendix for additional investment strategy and risk information.

Key considerations for robust design



Hypothetical example for illustrative purposes only.

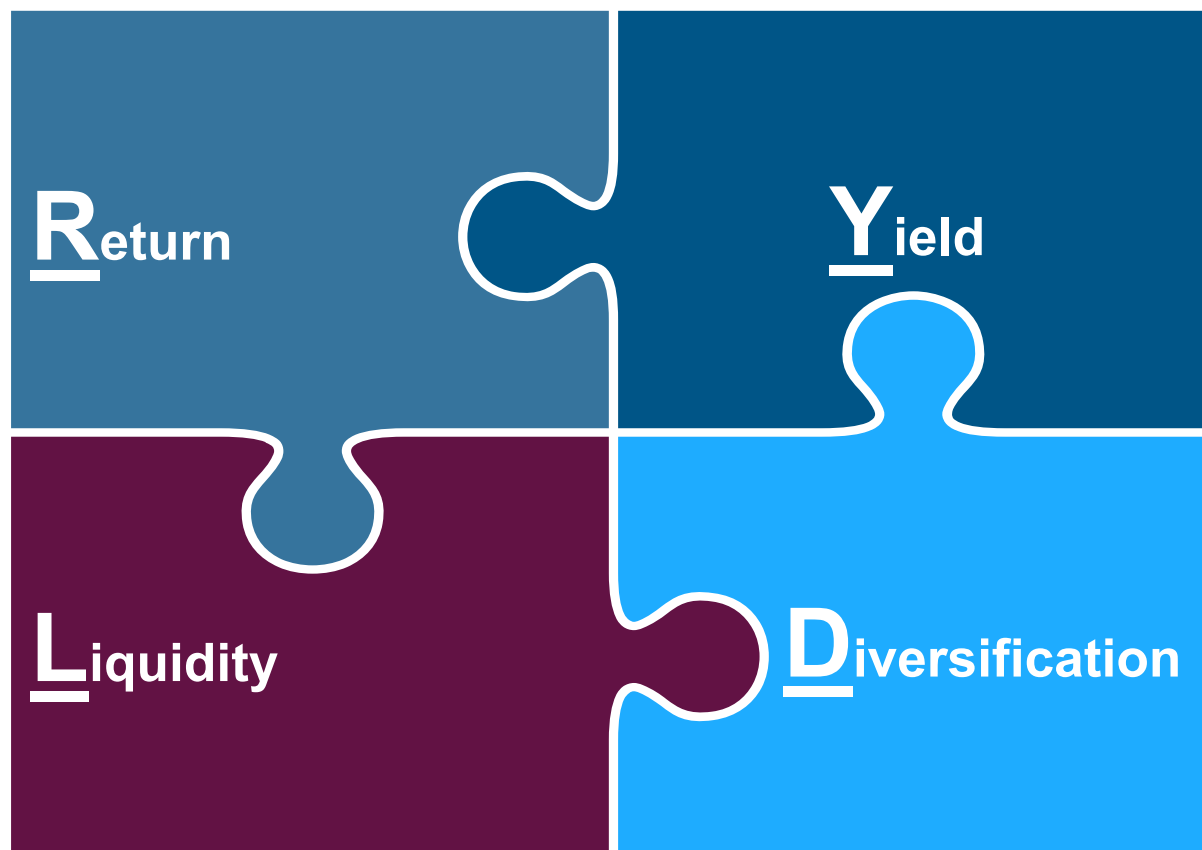
Refer to Appendix for additional hypothetical example, investment strategy, portfolio structure and risk information.

Asset allocation considerations

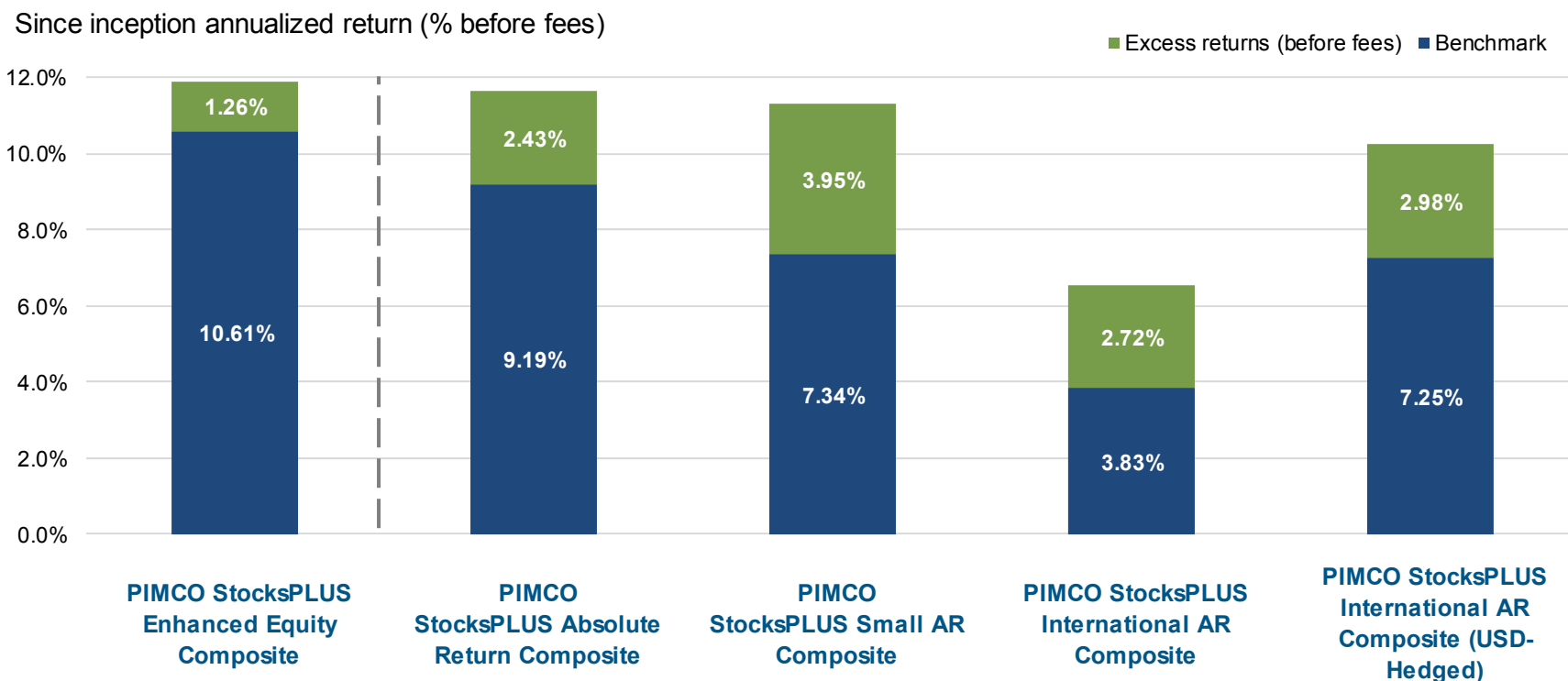


The allocation models presented here are based on what PIMCO believes to be generally accepted investment theory. They are for illustrative purposes only and may not be suitable for all investors. The allocation models are not based on any particularized financial situation, or need, and are not intended to be, and should not be construed as, a forecast, research, investment advice or a recommendation for any specific PIMCO or other strategy, product or service. Individuals should consult with their own financial advisors to determine the most appropriate allocations for their financial situation, including their investment objectives, time frame, risk tolerance, savings and other investments. Volatility is historical and is likely to change over time. Other fixed income allocations may be less volatile. Fixed income is only one possible portion of an investor's portfolio, which can also include equities and other products. Investors should speak to their financial advisors regarding the investment mix that may be right for them based on their financial situation and investment objectives.

Asset allocation decisions need to address all four quadrants



Combine equity beta with fixed-income alpha



Inception date	31 Jul '86	30 Jun '02	30 Apr '06	31 Jan '06	30 Nov '03
Composite vs. benchmark monthly rolling 5-year periods outperformance	96%	93%	100%	100%	98%
Benchmark	S&P 500 Index	S&P 500 Index	Russell 2000 Index	MSCI EAFE Net Dividend Index	MSCI EAFE Net Dividend USD-Hedged Index
Bond Alpha Strategy	Short-term	Absolute return	Absolute return	Absolute return	Absolute return

Past performance is not a guarantee or a reliable indicator of future results.

As of 31 December 2019. Performance shown are before fees.

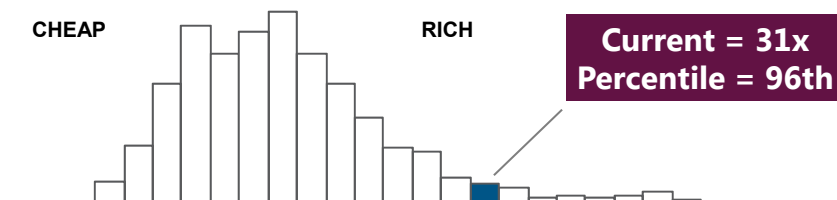
Refer to Appendix for additional performance and fee, chart, composite, index, and risk information.

Tilt towards regions with a lot more runway

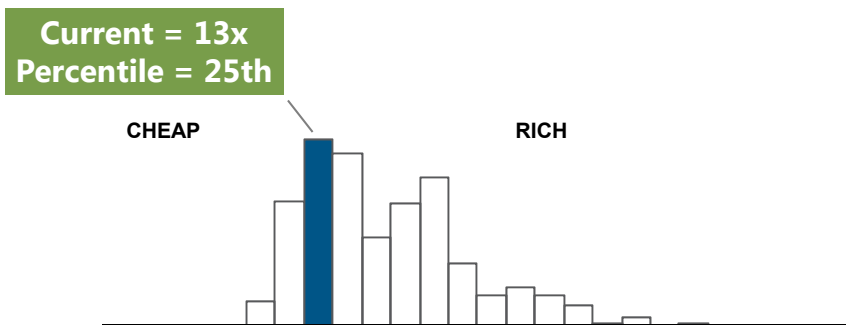
EM equity valuations are at historic lows and EM real yields are much higher vs. DM

EM and U.S. valuation: Cyclically-adjusted P/E

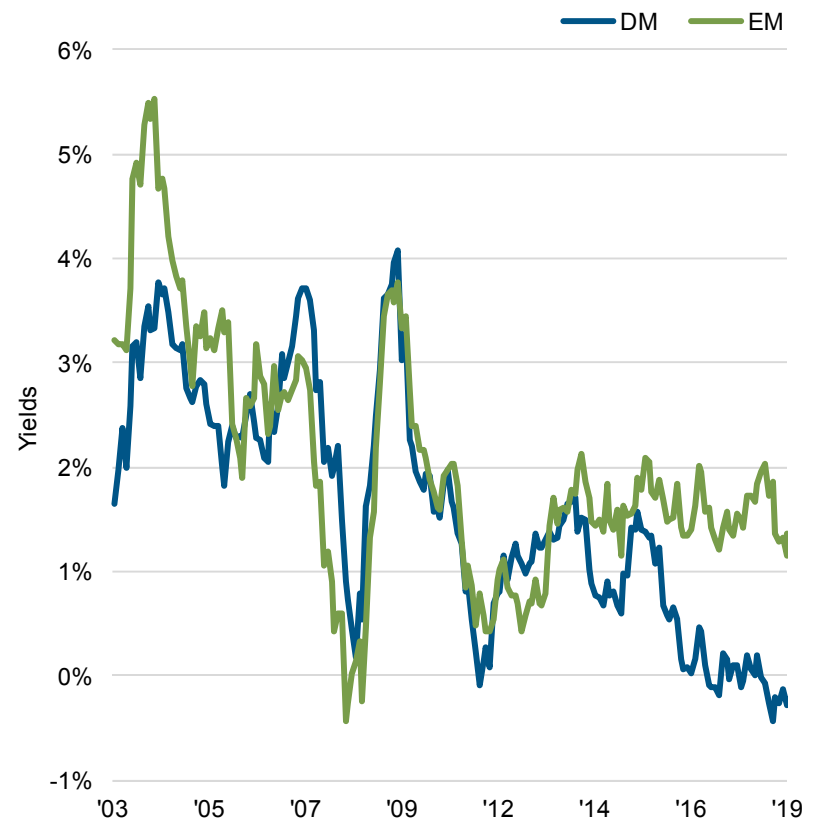
U.S. Equities



Emerging Market Equities

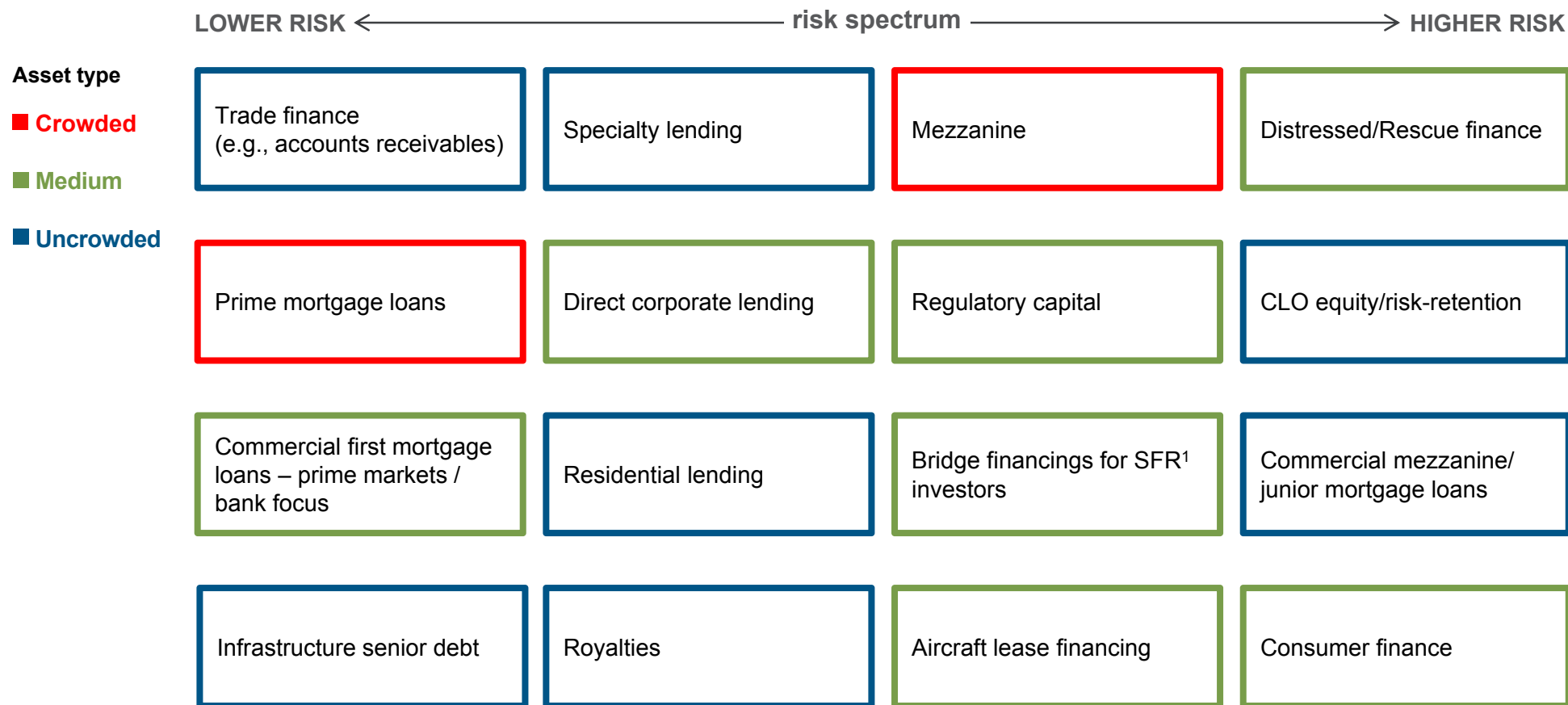


Real yields



As of 31 December 2019. SOURCE: PIMCO, Research Affiliates, Bloomberg. U.S. represented by S&P 500; EM represented by MSCI EM Index
For historical real yield data construction see, "Emerging and Developed Markets: So the Last Shall be First?" (April 2019).
Refer to Appendix for additional index, investment strategy and risk information

Increase exposure to liquidity and complexity premia









SOURCE: PIMCO

¹Single-Family Rental

Refer to Appendix for additional investment strategy and risk information.

Diversify your diversifiers

	Most effective when...	Least effective when...	Estimated Return ¹	Estimated Volatility ²	Risk- Adjusted Returns	Equity Beta ³
Long Duration	 Sudden Drawdown	 Rising rates	0.6%	11.4%	-0.12	-0.3
Trend Following	 Trending Markets	 Trend reversal	6.3%	10.0%	0.44	-0.2
Alternative Risk Premia	 Non-trending Markets	 Coincident Premia Drawdown	8.9%	9.9%	0.71	0.0

As of 31 December 2019. SOURCE: PIMCO. **Hypothetical example for illustrative purposes only.** Refer to additional information section for more info on proxies, models and assumptions used.

¹Unless otherwise specified, return estimates are an average annual return over a 5-year horizon. Please refer to the appendix for additional information on estimated returns. Trend following is the Managed Futures Model, Alternative Risk Premia is the Multi-asset Alternative Risk Premia Model (8-10% Volatility). Long Duration is the BBG Barclays Long Treasury Index.

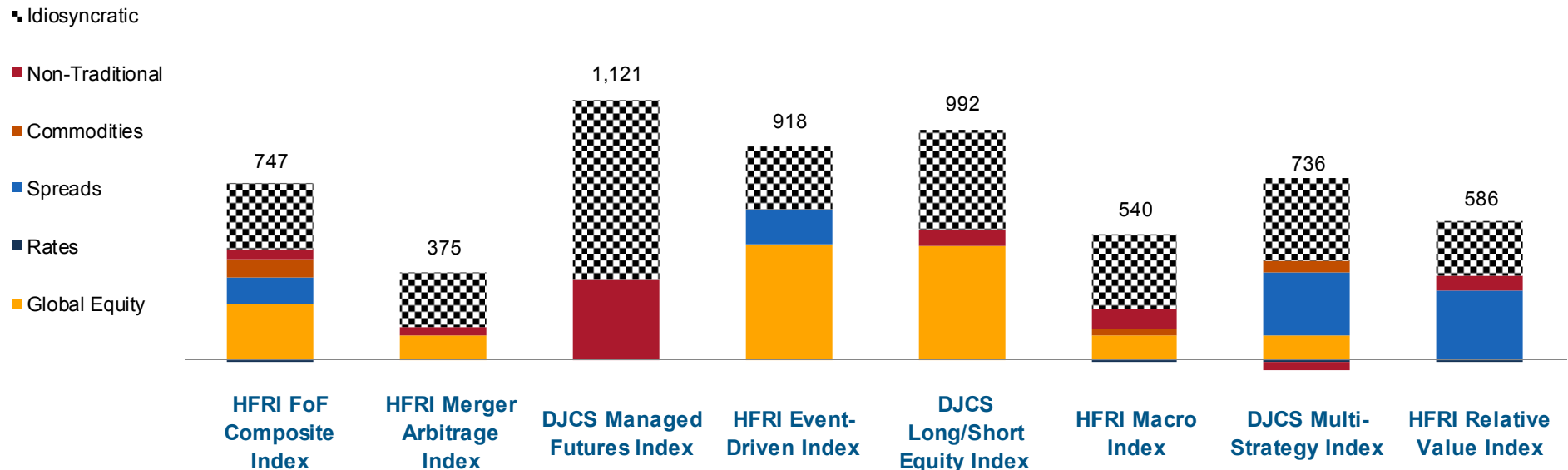
²See Appendix for additional information regarding volatility estimates.

³Equity beta is versus the S&P 500

Refer to Appendix for additional performance and fee, hypothetical example, investment strategy, model, portfolio analysis, return assumption and risk information.

Consider allocating out of equity beta heavy hedge funds

Contribution to Estimated Volatility (bps)²



	HFRI FoF Composite Index	HFRI Merger Arbitrage Index	DJCS Managed Futures Index	HFRI Event-Driven Index	DJCS Long/Short Equity Index	HFRI Macro Index	DJCS Multi-Strategy Index	HFRI Relative Value Index
Estimated Return ¹	5.1%	3.8%	6.0%	5.9%	6.3%	4.4%	5.4%	4.5%
Estimated Volatility ²	7.5%	3.7%	11.2%	9.2%	9.9%	5.4%	7.4%	5.9%
Sharpe Ratio ³	0.43	0.50	0.36	0.43	0.44	0.46	0.47	0.44
CVaR (95%) ²	12.1%	4.4%	17.4%	16.4%	15.4%	7.0%	12.2%	9.8%
Equity Beta vs. S&P500	0.39	0.16	0.03	0.54	0.51	0.14	0.30	0.23
Duration	0.68	0.00	0.00	0.00	0.00	1.43	0.71	1.47

As of 31 December 2019. SOURCE: PIMCO. Hypothetical example for illustrative purposes only.

¹Return estimates are an average annual return over a 5-year horizon based on the product of risk factor exposures and projected risk factor premia. The projections of risk factor premia rely on historical data, valuation metrics and qualitative inputs from senior PIMCO investment professionals.

²See Appendix for additional information regarding volatility estimates. Conditional Value-at-Risk (CVaR) is the estimate of the average expected loss at a desired level of significance. It is shown as positive percentages

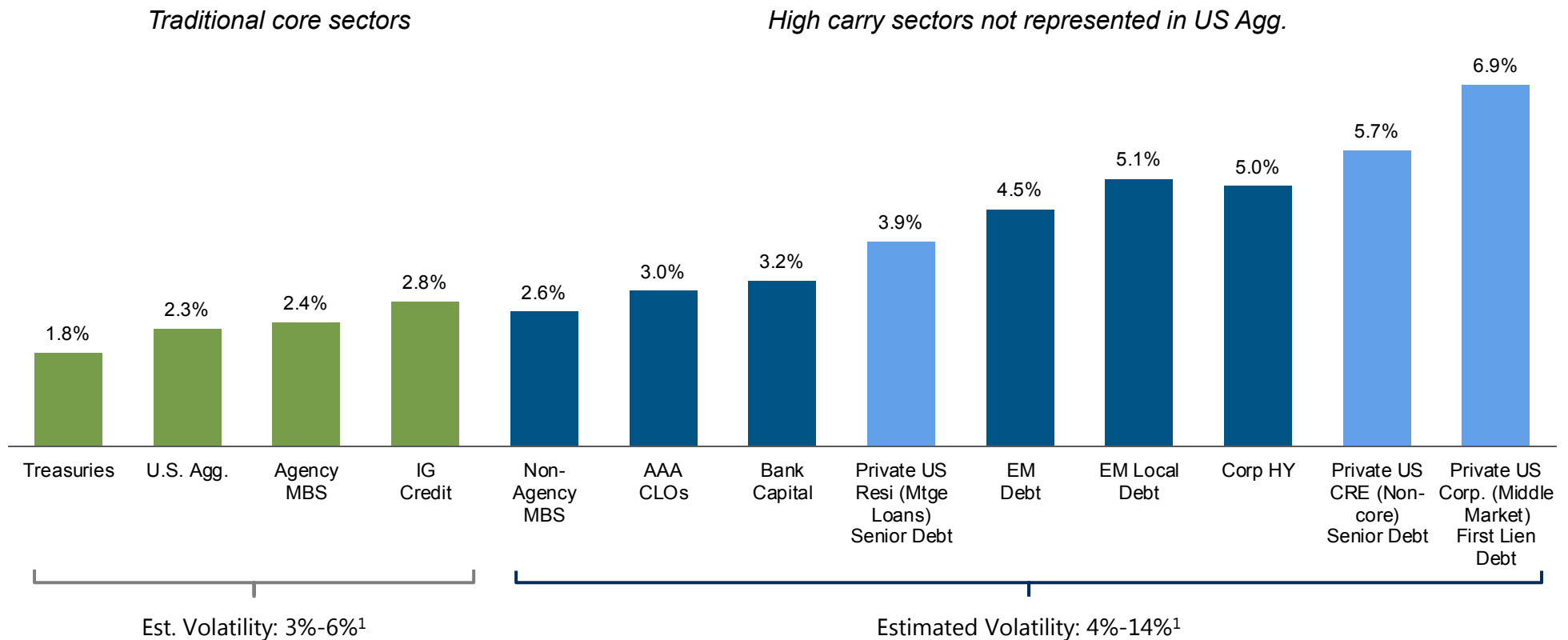
³Sharpe ratio is calculated as estimated return minus the return estimate for cash, 2.17%, divided by estimated total volatility

Refer to Appendix for additional hypothetical example, investment strategy, portfolio analysis, return assumption, risk and VaR/CVaR information.

In fixed-income, step out of the core, or consider employing leverage

Account for higher equity beta in low-quality spread sectors

Yield to Worst across various fixed income sectors (unlevered)



As of 31 December 2019. SOURCE: PIMCO, Bloomberg, JPMorgan. **Hypothetical example for illustrative purposes only.**

¹See appendix for additional information regarding volatility estimates.

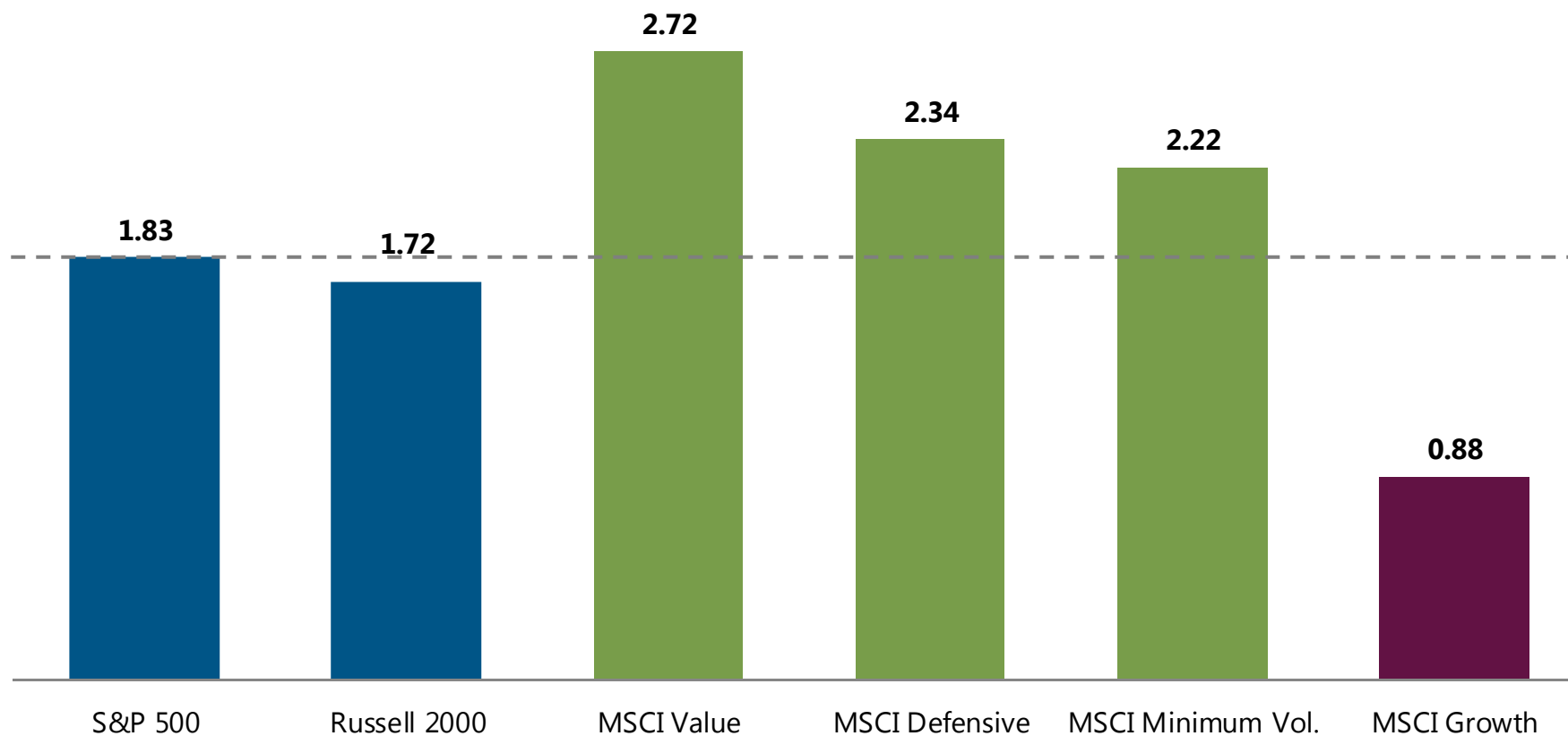
Treasuries: Bloomberg Barclays U.S. Treasury Index, U.S. Agg.: Bloomberg Barclays U.S. Aggregate Index, Agency MBS: Bloomberg Barclays Fixed-Rate MBS Index, IG Credit: Bloomberg Barclays U.S. Credit Index, Non-Agency MBS: ICE BofAML ABS, Home Equity Fixed, AAA CLOs: JPMorgan AAA CLO Index, Bank Capital: ICE ML 70%ConstPfd&JrSub 30%Coco HdgUSD, Private US Resi Senior Debt: market estimates for yield, EM Debt: JPMorgan EMBI Global Index, Corp HY: ICE BofAML US High Yield Index, EM Local Debt: JP Morgan GBI-EM Global Div Unhdg USD Index, Private US CRE Senior Debt: market estimates for yield, Private US Corp. First Lien Debt: market estimates for yield.

Refer to Appendix for additional hypothetical example, index, investment strategy and risk information.

Within equities, consider tilting towards defensive factors

Defensive sectors also tend to have higher yields

Dividend yield for various equity factor indices (%)

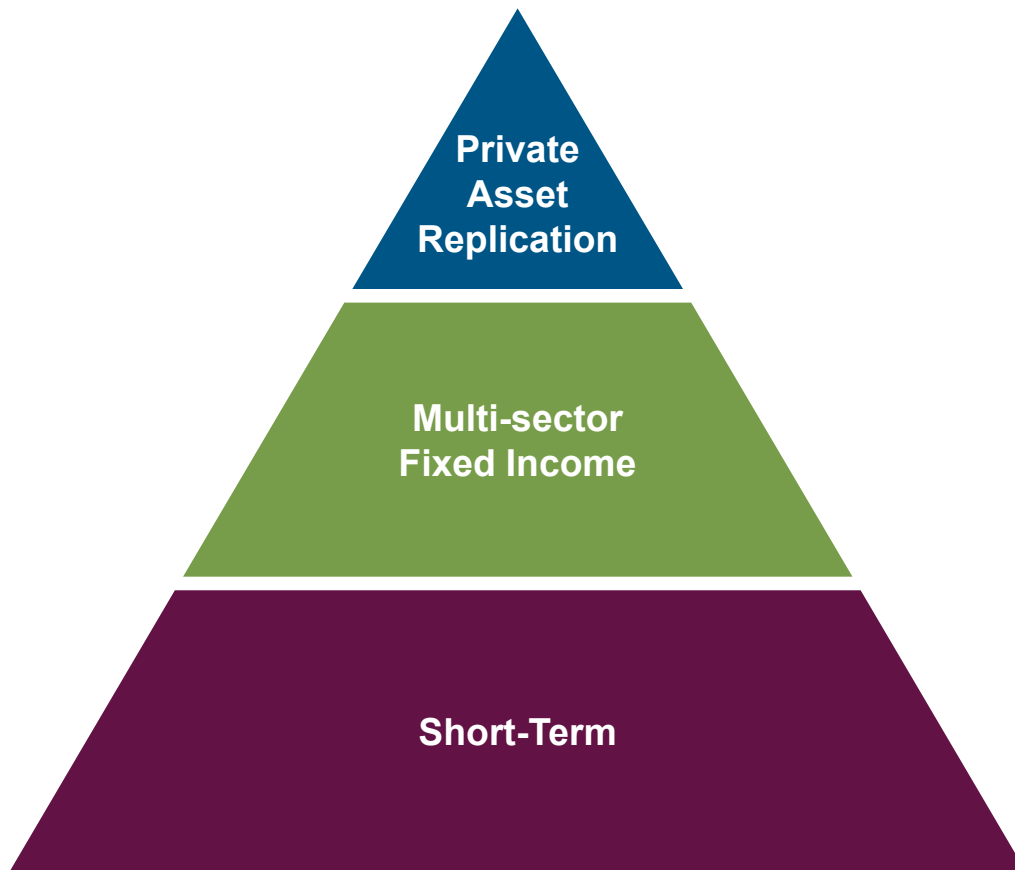


As of 31 December 2019. SOURCE: Bloomberg, PIMCO.

Unless otherwise noted all indices are MSCI US Factor Indices.

Refer to Appendix for additional index, investment strategy and risk information

Consider managing uncalled capital to liquidity tiers



TIER III

Primary objective: Longer-term allocation

Primary Objective: Mimic exposures to private assets

Typical Strategy: Small cap equities (PE), High Yield/bank loans (private credit)

TIER II

Time Horizon: Capital calls over next 1-2 years

Primary objective: Grow assets, while maintaining moderate equity sensitivity

Typical Strategy: Core Bonds or Multi-sector Fixed Income

TIER I

Time Horizon: Near-term capital calls within next few quarters

Primary objective: Principal preservation, liquidity

Typical Strategy: High quality, short duration strategy

SOURCE: PIMCO. For illustrative purposes only.
Refer to Appendix for additional investment strategy and risk information.

Key conclusions

- Consider making capital efficiency a plan-level theme to ensure capital is working as hard as it could and alpha decisions are not hostage to beta decisions
- Decisions have to be made in totality: return and yield are critical, but can't ignore diversification and liquidity
- With betas priced for lower returns, alpha needs to play a much bigger role
- With low or negative yields on “safe” assets, blending traditional and non-traditional diversifiers is going to be key

SOURCE: PIMCO.
Refer to Appendix for additional investment strategy and risk information.

Additional information



Replication quality can vary a lot...

Comparison of estimated trading costs and basis risk for select strategies

	Barclays Aggregate	U.S. Long Credit
Commonly used derivative instrument	Bond futures, TBAs, swaps, and CDX (credit default swap indexes)	Bond futures and CDX (credit default swap indexes)
Estimated trading cost for physical portfolio	25bps – 50bps	60bps – 100bps
Estimated trading cost for derivatives	2bps – 3bps	4bps – 6bps
Estimated basis risk	Low to medium	Medium to high

Replication induced tracking error



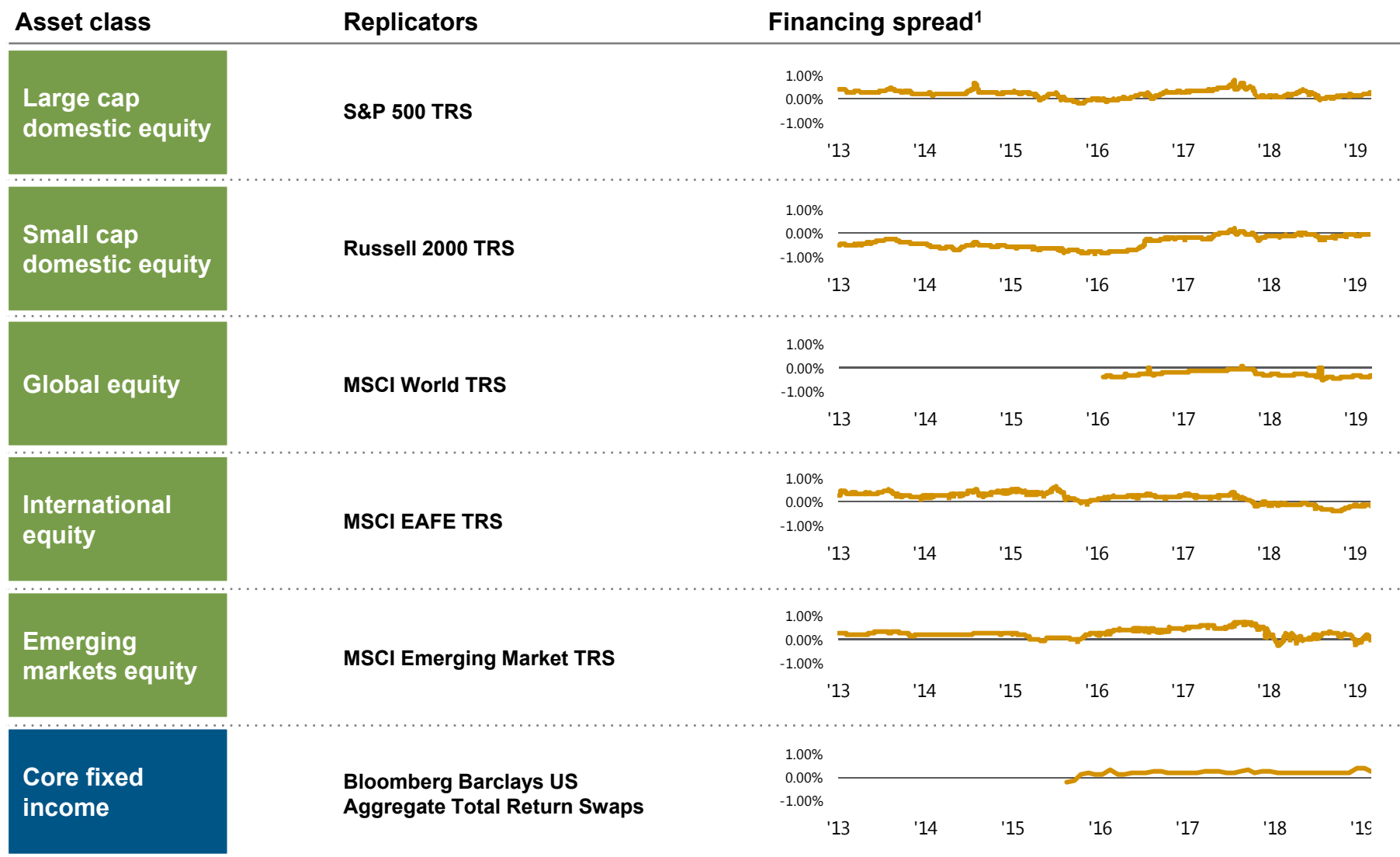
SOURCE: PIMCO. Hypothetical example for illustrative purposes only.

Trading costs are based on PIMCO trade floor estimates for an average institutional portfolio. Barclays U.S. Aggregate accounts for estimated costs associated with treasuries, corporates, and MBS. Barclays U.S. Long Credit accounts for estimated costs associated with corporates.

Refer to Appendix for additional investment strategy and risk information.

...replication costs can also vary meaningfully

Historical replication costs for TR swaps on major indices



As of 31 July 2019. SOURCE: PIMCO, Bloomberg. **Hypothetical example for illustrative purposes only.**

¹Replicator assumes collateral is invested in 3M LIBOR. Estimated on daily equity spreads and monthly bond spreads. For equities, estimated based on mid-point spread. Refer to Appendix for additional investment strategy, index and risk information.

Composite performance overview

Composite Performance (after fees)	10 Years	5 Years	3 Years	1 Year
PIMCO StocksPLUS Enhanced Equity Composite	14.3%	11.6%	15.2%	32.7%
PIMCO StocksPLUS Absolute Return Composite	15.6%	11.9%	15.8%	33.1%
PIMCO StocksPLUS Small AR Composite	14.1%	8.9%	9.5%	26.9%
PIMCO StocksPLUS International AR Composite	-	5.8%	10.0%	23.2%
PIMCO StocksPLUS International AR Composite (USD-Hedged)	9.8%	8.3%	10.5%	26.4%

As of 31 December 2019

Past performance is not a guarantee or a reliable indicator of future results.

Refer to Appendix for additional performance and fee, chart, composite, index and risk information.

Appendix: Risk factor definitions

PIMCO employs highly granular holdings-based models to generate risk factor exposures. In our analysis, we may display aggregated risk factor data for ease of interpretation, but the granularity of the underlying models is maintained. For Alternatives/Illiquids and in selected cases where holdings information is unavailable or unreliable, PIMCO may use returns-based regression models to generate risk factor exposures.

EQUITY

- Equity risk factors are based on the MSCI Barra Global Equity Model (GEM3). The exposure to each equity country or industry factor is the market value weight of stocks categorized in that country or industry. Style factors (such as size, value, and momentum) are standardized to have a mean of 0 and a standard deviation of 1. Please refer to Barra GEM3 documentation for more details.
- PIMCO disaggregates the Barra world equity factor into additive country exposures. Thus, the risk contribution from a certain country's equity exposure includes contributions from both the world equity factor and the country equity factor in the original Barra model.

INTEREST RATE DURATION

- Measured in years, interest rate duration is the price sensitivity to a change in interest rates (e.g. the price of a bond with a duration of 5 years will fall by approximately 5% if interest rates instantaneously rise by 1%).
- PIMCO calculates both real and nominal durations – sensitivities to real and nominal interest rates, respectively – as well as duration exposures to interest rates in different currencies.
- The duration risk factor exposure measures a security's price sensitivity to a parallel shock of the par yield curve. PIMCO's systems use a scenario-based duration calculation by re-pricing securities under different rate shock scenarios. For securities with embedded options, effective duration is estimated by taking into account the potential impact of yield changes on future cash flows.

SLOPE DURATION

- Interest rate duration reflects sensitivity to a parallel shift of the yield curve. However, parallel shifts rarely occur; the yield curve typically steepens or flattens as interest rates move.
- Measured in years, slope duration is the price sensitivity to steepening or flattening of the yield curve. PIMCO employs a 2-10 slope factor, which reflects sensitivity to the slope of the front end of the par yield curve, and a 10-30 slope factor, which reflects sensitivity to the slope of the long end of the par yield curve.
- The 2-10 slope risk factor exposure measures the sensitivity to a steepening or flattening of the 2-year yield relative to the 10-year yield (e.g. the price of a bond with a 2-10 slope duration of 3 years will increase by approximately 3% if the difference between 10-year and 2-year yields widens by 1% while the 10-year yield remains constant).

Appendix: Risk factor definitions (cont'd)

- The 10-30 slope risk factor exposure measures the sensitivity to a steepening or flattening of the 30-year yield relative to the 10-year yield (e.g. the price of a bond with a 10-30 slope duration of 6 years will increase by approximately 6% if the difference between 30-year and 10-year yields narrows by 1% while the 10-year yield remains constant)

SPREAD DURATION

- Measured in years, spread duration is the price sensitivity to a change in spread.
- For some spread factors, we calculate spread duration for a security based on the price sensitivity to a change in its own spread.
- For other spread factors, we measure credit spread duration relative to a common reference set of securities, in order to normalize spread duration exposures across securities with different risk levels. For these factors, credit spread duration is estimated in two steps:
 1. Calculate the sensitivity of the security's price to its own spread.
 2. Translate this sensitivity into spread duration relative to a reference spread using a proprietary model. This process utilizes the security's OAS and the OAS of the reference set of securities.

CURRENCY

- Currency risk factors capture a portfolio's percent exposure to any currency other than the base currency.

COMMODITY

- Commodity risk factor exposures are measured in percentage weights.
- PIMCO decomposes commodity exposure to specific commodity sub-baskets such as energy, precious metal, and livestock.

ALTERNATIVES/ILLIQUIDS

- Risk factor exposures in this category are regression-based measures of the sensitivity of a portfolio to changes in risk factors that are relevant to alternative strategies or illiquid assets, such as volatility, liquidity, and trend-following.

IDIOSYNCRATIC

- Idiosyncratic risk is generally asset-specific and accounts for volatility that is not attributable to broad market factors.
- In analyses involving PIMCO strategies, idiosyncratic risk describes non-factor risk and may account for the potential overlap of idiosyncratic risk across PIMCO strategies. In these instances, idiosyncratic risk will account for 1) common sources of non-factor risks between PIMCO strategies and 2) residual idiosyncratic risk (which may account for residual correlation between PIMCO strategies).

Appendix

PERFORMANCE AND FEE

Past performance is not a guarantee or a reliable indicator of future results. Gross returns do not reflect the deduction of investment advisory fees (for Pacific Investment Management Company LLC described in Part 2 of its Form ADV) in the case of both separate investment accounts and mutual funds; but they do reflect commissions, other expenses (except custody), and reinvestment of earnings. Such fees that a client may incur in the management of their investment advisory account may reduce the client's return. For example, over a five-year period, annual advisory fees of 0.425% would reduce compounding at 10% annually from 61.05% before fees to 57.96% after fees. The "net of fees" performance figures reflect reinvestment of earnings and dividends and the deduction of actual investment advisory fees and brokerage commissions but, typically, do not reflect the deduction of custodial fees. All periods longer than one year are annualized. Separate account clients may elect to include PIMCO sector funds in their portfolio; sector funds may be subject to additional terms and fees. For a copy of net of fees performance, unless included otherwise, please contact your PIMCO representative.

CHART

Performance results for certain charts and graphs may be limited by date ranges specified on those charts and graphs; different time periods may produce different results. Charts are provided for illustrative purposes and are not indicative of the past or future performance of any PIMCO product.

COMPOSITE

Composite performance is preliminary until the 12th business day of the month.

CORRELATION

The correlation of various indexes or securities against one another or against inflation is based upon data over a certain time period. These correlations may vary substantially in the future or over different time periods that can result in greater volatility.

CVaR

Conditional Value at Risk (CVaR) estimates the risk of loss of an investment or portfolio over a given time period under normal market conditions in terms of an average of loss after a specific percentile threshold of loss (i.e., for a given threshold of X%, under the specific modeling assumptions used, the portfolio will incur an average loss in excess of the CVAR X percent of the time. Different CVAR calculation methodologies may be used. CVAR models can help understand what future return or loss profiles might be. However, the effectiveness of a CVAR calculation is in fact constrained by its limited assumptions (for example, assumptions may involve, among other things, probability distributions, historical return modeling, factor selection, risk factor correlation, simulation methodologies). It is important that investors understand the nature of these limitations when relying upon CVAR analyses.

EQUITY FACTORS DESCRIPTIONS

Factor investing is the process of constructing portfolios with exposure to factors that help explain the differences in returns between securities. **Momentum:** Using price trends to forecast returns or buying stocks with strong recent performance and selling stocks with weak recent performance based on trends. **Quality:** Companies exhibiting "high quality" metrics such as high earnings, ROE, strong profitability, stable cash flows, tend to outperform lower quality stocks over time. **Size:** Stocks of small companies outperform stocks of large companies over time. **Value:** Tendency of cheap stocks to outperform expensive stocks over time.

FORECAST

Forecasts, estimates and certain information contained herein are based upon proprietary research and should not be interpreted as investment advice, as an offer or solicitation, nor as the purchase or sale of any financial instrument. Forecasts and estimates have certain inherent limitations, and unlike an actual performance record, do not reflect actual trading, liquidity constraints, fees, and/or other costs. In addition, references to future results should not be construed as an estimate or promise of results that a client portfolio may achieve.

HYPOTHETICAL EXAMPLE

HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM.

ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR TO ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING RESULTS.

Appendix

INDEX

It is not possible to invest directly in an unmanaged index.

INVESTMENT STRATEGY

There is no guarantee that these investment strategies will work under all market conditions or are suitable for all investors and each investor should evaluate their ability to invest for a long-term especially during periods of downturn in the market. No representation is being made that any account, product, or strategy will or is likely to achieve profits, losses, or results similar to those shown.

MODELS

PIMCO TRENDS MANAGED FUTURES MODEL

The PIMCO Trends model is designed to capture price trends, or momentum, across four major asset classes: equities, interest rates, currencies and commodities. It does not represent the portfolio characteristics or performance of an actual account. An actual account would be informed by PIMCO market insight. The model, in its current form, was created on 29 October 2013 and back tested to 29 January 1999. Futures data prior to 29 January 1999 is limited. The model is constructed of futures contracts on a basket of 44 indexes. The model assumes a 100 percent cash allocation day one then creates a basket of futures based on a proprietary equal risk weighting across asset classes and a series of signals from a PIMCO proprietary analytics tool. The model may take both long and short exposure to an asset class based on quantitative signals. The tool produces quantitative signals to identify market trends and determine when to purchase or sell a security if the price is detected on an upward trend, or when to short a security if the price is detected to be trending lower. The model imposes a proprietary constraint on commodity and equity exposure to help balance the sources of risk to the model portfolio. The model does not represent actual trading and does not reflect the impact that economic and market factors might have on management of the portfolio. The model was in effect during an unusually volatile historic period and results may not be repeated. Clients may have realized investments results materially different than the model. Model performance is net of fees. No representation is being made that any account, product, or strategy will or is likely to achieve profits, losses, or results similar to those shown.

MULTI-ASSET ALTERNATIVE RISK PREMIA MODEL

The multi-asset risk premium model is constructed by combining underlying risk factor models across asset classes and scaling the overall portfolio to a target volatility and does not represent the portfolio characteristics or performance of an actual account. The model portfolio was created on June 30, 2017 and was created utilizing underlying risk factor models to target equal risk contributions and scaling the overall portfolio to target 8-10% volatility. The model portfolio does not represent actual trading and does not reflect the impact that economic and market factors might have on management of the portfolio. Results are presented gross of fees and transaction costs and performance would be lower if applied. No representation is being made that any account, product, or strategy will or is likely to achieve profits, losses, or results similar to those shown. **Past performance is not a guarantee or reliable indicator of future results.**

OUTLOOK

Statements concerning financial market trends are based on current market conditions, which will fluctuate. There is no guarantee that these investment strategies will work under all market conditions or are suitable for all investors and each investor should evaluate their ability to invest for the long term, especially during periods of downturn in the market. Outlook and strategies are subject to change without notice.

PORTFOLIO ANALYSIS

The portfolio analysis is based on indices, proxies and models. No representation is being made that the structure of the average portfolio or any account will remain the same or that similar returns will be achieved. The analysis may not be attained and should not be construed as the only possibilities that exist. Real results will vary and are subject to change with market conditions. Different weightings in the asset allocation illustration will produce different results. Actual results will vary and are subject to change with market conditions. There is no guarantee that results will be achieved. No fees or expenses were included in the estimated results and distribution. The scenarios assume a set of assumptions that may, individually or collectively, not develop over time. The sample analysis reflected in this information is based upon data at time of analysis. Forecasts, estimates, and certain information contained herein are based upon proprietary research and should not be considered as investment advice or a recommendation of any particular security, strategy or investment product.

PIMCO routinely reviews, modifies, and adds risk factors to its proprietary models. Due to the dynamic nature of factors affecting markets, there is no guarantee that simulations will capture all relevant risk factors or that the implementation of any resulting solutions will protect against loss. All investments contain risk and may lose value. Simulated risk analysis contains inherent limitations and is generally prepared with the benefit of hindsight. Realized losses may be larger than predicted by a given model due to additional factors that cannot be accurately forecasted or incorporated into a model based on historical or assumed data.

RETURN ASSUMPTIONS

Return assumptions are for illustrative purposes only and are not a prediction or a projection of return. Return assumption is an estimate of what investments may earn on an annual average over a 5-year horizon, unless otherwise specified. Actual returns may be higher or lower than those shown and may vary substantially over shorter time periods.

Appendix

RISK

All Investments contain risk and may lose value. Investing in the **bond** market is subject to risks, including market, interest rate, issuer, credit, inflation risk, and liquidity risk. The value of most bonds and bond strategies are impacted by changes in interest rates. Bonds and bond strategies with longer durations tend to be more sensitive and volatile than those with shorter durations; bond prices generally fall as interest rates rise, and the current low interest rate environment increases this risk. Current reductions in bond counterparty capacity may contribute to decreased market liquidity and increased price volatility. Bond investments may be worth more or less than the original cost when redeemed. **Commodities** contain heightened risk including market, political, regulatory, and natural conditions, and may not be suitable for all investors. **Equities** may decline in value due to both real and perceived general market, economic and industry conditions. Investing in **foreign denominated and/or domiciled securities** may involve heightened risk due to currency fluctuations, and economic and political risks, which may be enhanced in emerging markets. **High yield, lower-rated securities** involve greater risk than higher-rated securities; portfolios that invest in them may be subject to greater levels of credit and liquidity risk than portfolios that do not. **Inflation-linked bonds (ILBs)** issued by a government are fixed income securities whose principal value is periodically adjusted according to the rate of inflation; ILBs decline in value when real interest rates rise. **Treasury Inflation-Protected Securities (TIPS)** are ILBs issued by the U.S. government. **Mortgage and asset-backed securities** may be sensitive to changes in interest rates, subject to early repayment risk, and while generally supported by a government, government-agency or private guarantor there is no assurance that the guarantor will meet its obligations. The value of **real estate** and portfolios that invest in real estate may fluctuate due to: losses from casualty or condemnation, changes in local and general economic conditions, supply and demand, interest rates, property tax rates, regulatory limitations on rents, zoning laws, and operating expenses. **Derivatives** may involve certain costs and risks, such as liquidity, interest rate, market, credit, management and the risk that a position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested.

The Managed Futures model strategy may utilize quantitative models as part of implementing its investment strategies. The models evaluate securities or securities markets based on certain assumptions concerning the interplay of market factors. Models used may not adequately take into account certain factors, may not perform as intended, and may result in a decline in the value of your investment, which could be substantial.

SHARPE RATIO

The Sharpe Ratio measures the risk-adjusted performance. The risk-free rate is subtracted from the rate of return for a portfolio and the result is divided by the standard deviation of the portfolio returns.

VOLATILITY (ESTIMATED)

We employed a block bootstrap methodology to calculate volatilities. We start by computing historical factor returns that underlie each asset class proxy from January 1999 through the present date. We then draw a set of 12 monthly returns within the dataset to come up with an annual return number. This process is repeated 25,000 times to have a return series with 25,000 annualized returns. The standard deviation of these annual returns is used to model the volatility for each factor. We then use the same return series for each factor to compute covariance between factors. Finally, volatility of each asset class proxy is calculated as the sum of variances and covariance of factors that underlie that particular proxy. For each asset class, index, or strategy proxy, we will look at either a point in time estimate or historical average of factor exposures in order to determine the total volatility. Please contact your PIMCO representative for more details on how specific proxy factor exposures are estimated.

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CMR2020-0220-439862

PIMCO STOCKSPUS ENHANCED EQUITY COMPOSITE

	COMPOSITE RETURN (%) BEFORE FEES	COMPOSITE RETURN (%) AFTER FEES	BENCHMARK RETURN (%)*	COMPOSITE DISPERSION BEFORE FEES	COMPOSITE 3-YR STD DEV BEFORE FEES	BENCHMARK 3-YR STD DEV	NUMBER OF PORTFOLIOS	TOTAL ASSETS (USD) MILLIONS	TOTAL FIRM ASSETS (USD) BILLIONS	STOCKSPUS SEPARATE ACCOUNT FEE SCHEDULE:
2018	-5.32	-5.66	-4.38	0.08	11.26	10.80	8	5,552.6	1,664.6	1st \$150 Million 0.350%
2017	22.78	22.24	21.83	0.15	10.54	9.92	6	4,590.4	1,755.7	Next \$150 Million 0.300%
2016	13.10	12.70	11.96	0.20	11.19	10.59	6	3,834.6	1,467.0	Thereafter 0.250%
2015	0.65	0.29	1.38	0.21	11.04	10.47	7	4,098.6	1,435.0	
2014	14.96	14.42	13.69	0.67	9.39	8.97	8	4,762.0	1,680.4	
2013	33.70	32.96	32.39	1.07	13.17	11.94	12	4,310.4	1,919.6	
2012	21.45	20.78	16.00	1.11	16.31	15.09	13	4,550.4	2,003.8	
2011	1.73	1.22	2.11	0.60	20.33	18.71	13	4,688.0	1,357.2	
2010	20.17	18.38	15.06	1.00	24.77	21.85	18	6,389.1	1,242.1	
2009	43.25	42.30	26.46	5.39	22.52	19.63	22	7,529.6	931.6	

* S&P 500 Index

The composite creation date is December 2017

Pacific Investment Management Company LLC (PIMCO) is an investment adviser registered with the Securities and Exchange Commission that provides global investment solutions to institutions, individuals, and government entities worldwide. For GIPS compliance purposes, PIMCO has been defined to include its investment management activities as well as those of its affiliate PIMCO Deutschland GmbH and the following subsidiaries: PIMCO Australia Pty Ltd, PIMCO Canada Corp., PIMCO Europe Ltd, PIMCO Japan Ltd, PIMCO Asia Pte Ltd, and PIMCO Asia Limited. In March 2012, the firm was redefined to include assets managed by PIMCO on behalf of Allianz's affiliated companies. In addition, in January 2010, the firm definition was expanded to include fixed income assets managed in collaboration with Allianz Global Investors using the PIMCO investment process. Prior to 2010, country-specific limitations restricted the full implementation of the PIMCO investment process for these assets.

PIMCO claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. PIMCO has been independently verified for the period January 1987 through December 2018. Verification assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and (2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards. The StocksPLUS Enhanced Equity Composite has been examined for the period January 2017 through December 2018. The verification and performance examination reports are available upon request.

The PIMCO StocksPLUS Enhanced Equity Composite includes all discretionary, fee-paying, USD-based, StocksPLUS accounts managed to the S&P 500 Index that allow below investment grade securities. PIMCO's StocksPLUS Enhanced Equity Strategy seeks to consistently deliver attractive excess returns relative to a given equity index. The strategy uses equity index derivatives to achieve passive stock market exposure and the collateral backing the derivatives is actively managed, in a short-term fixed income portfolio, in an attempt to provide returns higher than the interest rate embedded in the index. Equity index futures generally comprise the vast majority of an account's equity exposure, but most accounts may also hold equity index options, options on futures, swaps, and individual stocks. Aggregate equity exposures are managed to remain approximately equal to their underlying market values. Portfolios in the composite may include institutional accounts or pooled vehicles. Prior to June 2018, the composite was named the PIMCO StocksPLUS Enhanced Equity - S&P 500 - Full Authority Composite.

The S&P 500 Index is an unmanaged market index generally considered representative of the stock market as a whole. The index focuses on the large-cap segment of the U.S. equities market.

Valuations are computed and performance is reported in U.S. dollars. Returns are presented gross and net of management fees and include the reinvestment of all income. Net results reflect the deduction of actual management fees, including performance based fees, and, in some instances, custodial and administrative fees. Actual fees incurred by client accounts may vary. When applicable, composite performance is net of any actual withholding tax paid and not reclaimable. Index returns are gross of withholding tax.

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The strategy uses equity index derivatives to gain exposure to the benchmark index, including futures, options, options on futures, and swaps. The use of derivatives may involve certain costs and risks such as liquidity, interest rate, market, credit, management and the risk that a position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested.

Past performance is not a guarantee or a reliable indicator of future results.

PIMCO STOCKSPPLUS ABSOLUTE RETURN COMPOSITE

	COMPOSITE RETURN (%) BEFORE FEES	COMPOSITE RETURN (%) AFTER FEES	BENCHMARK RETURN (%)*	COMPOSITE DISPERSION BEFORE FEES	COMPOSITE 3-YR STD DEV BEFORE FEES	BENCHMARK 3-YR STD DEV	NUMBER OF PORTFOLIOS	TOTAL ASSETS (USD) MILLIONS	TOTAL FIRM ASSETS (USD) BILLIONS	STOCKSPPLUS ABSOLUTE RETURN SEPARATE ACCOUNT FEE SCHEDULE:
2018	-5.14	-5.73	-4.38	N/A	11.67	10.80	Five or Fewer	1,701.7	1,664.6	1st \$150 Million
2017	24.63	23.89	21.83	N/A	11.92	9.92	Five or Fewer	1,774.0	1,755.7	Thereafter
2016	15.54	14.93	11.96	N/A	12.57	10.59	Five or Fewer	1,663.4	1,467.0	0.450%
2015	-1.48	-2.03	1.38	N/A	12.31	10.47	Five or Fewer	1,705.2	1,435.0	0.400%
2014	15.12	14.45	13.69	N/A	9.87	8.97	Five or Fewer	1,641.1	1,680.4	
2013	31.19	30.39	32.39	N/A	13.74	11.94	Five or Fewer	1,393.1	1,919.6	
2012	27.39	26.50	16.00	N/A	16.36	15.09	Five or Fewer	1,031.6	2,003.8	
2011	3.34	2.55	2.11	N/A	22.02	18.71	Five or Fewer	424.5	1,357.2	
2010	26.71	25.71	15.06	N/A	27.12	21.85	Five or Fewer	519.5	1,242.1	
2009	42.31	41.57	26.46	N/A	25.12	19.63	Five or Fewer	356.0	931.6	

* S&P 500 Index

The composite creation date is September 2002

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PIMCO claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. PIMCO has been independently verified for the period January 1987 through December 2018. Verification assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and (2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards. The StocksPLUS Absolute Return Composite has been examined for the period July 2002 through December 2018. The verification and performance examination reports are available upon request.

The PIMCO StocksPLUS Absolute Return Composite includes all discretionary, fee-paying, USD-based, StocksPLUS Absolute Return accounts benchmarked to the S&P 500 Index. PIMCO's StocksPLUS Absolute Return Strategy seeks to consistently deliver attractive excess returns relative to a given equity index over three- to five-year time horizons. The strategy uses equity index derivatives to achieve passive stock market exposure and the collateral backing the derivatives is actively managed, in an absolute return oriented fixed income portfolio, in an attempt to provide returns higher than the interest rate embedded in the index. Equity index futures generally comprise the vast majority of an account's equity exposure, but most accounts may also hold equity index options, options on futures, swaps, and individual stocks. Aggregate equity exposures are managed to remain approximately equal to their underlying market values. Portfolios in the composite may include institutional accounts or pooled vehicles.

The S&P 500 Index is an unmanaged market index generally considered representative of the stock market as a whole. The index focuses on the large-cap segment of the U.S. equities market.

Valuations are computed and performance is reported in U.S. dollars. Returns are presented gross and net of management fees and include the reinvestment of all income. Net results reflect the deduction of actual management fees, including performance based fees, and, in some instances, custodial and administrative fees. Actual fees incurred by client accounts may vary. When applicable, composite performance is net of any actual withholding tax paid and not reclaimable. Index returns are gross of withholding tax.

Composite dispersion presented is the equal-weighted standard deviation of annual returns for all portfolios in the composite for the full year. Dispersion is not statistically meaningful for periods shorter than a year or for years in which five or fewer portfolios were included for the full year. The three-year annualized ex-post standard deviation measures the variability of the composite and the benchmark returns over the preceding 36-month period. The three-year annualized ex-post standard deviation is not presented if 36 monthly returns are not available. A complete list of composite descriptions and policies for valuing portfolios, calculating performance, and preparing compliant presentations are available upon request.

The strategy uses equity index derivatives to gain exposure to the benchmark index, including futures, options, options on futures, and swaps. The use of derivatives may involve certain costs and risks such as liquidity, interest rate, market, credit, management and the risk that a position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested.

Past performance is not a guarantee or a reliable indicator of future results.

PIMCO STOCKSPPLUS SMALL AR COMPOSITE

	COMPOSITE RETURN (%) BEFORE FEES	COMPOSITE RETURN (%) AFTER FEES	BENCHMARK RETURN (%)*	COMPOSITE DISPERSION BEFORE FEES	COMPOSITE 3-YR STD DEV BEFORE FEES	BENCHMARK 3-YR STD DEV	NUMBER OF PORTFOLIOS	TOTAL ASSETS (USD) MILLIONS	TOTAL FIRM ASSETS (USD) BILLIONS	STOCKSPPLUS ABSOLUTE RETURN SEPARATE ACCOUNT FEE SCHEDULE:
2018	-11.53	-12.14	-11.01	N/A	16.54	15.79	Five or Fewer	1,428.7	1,664.6	1st \$150 Million
2017	18.44	17.63	14.65	N/A	15.36	13.91	Five or Fewer	1,386.8	1,755.7	Thereafter
2016	25.96	25.11	21.31	N/A	17.13	15.76	Five or Fewer	963.5	1,467.0	0.450%
2015	-5.87	-6.50	-4.41	N/A	15.08	13.96	Five or Fewer	1,159.8	1,435.0	0.400%
2014	6.94	6.22	4.89	N/A	13.43	13.12	Five or Fewer	1,407.9	1,680.4	
2013	38.67	37.83	38.82	N/A	17.99	16.45	Five or Fewer	1,620.3	1,919.6	
2012	28.78	27.39	16.35	N/A	21.15	20.20	Five or Fewer	775.5	2,003.8	
2011	-4.03	-5.00	-4.18	N/A	27.20	24.99	Five or Fewer	470.1	1,357.2	
2010	39.32	37.94	26.85	N/A	29.77	27.69	Five or Fewer	453.5	1,242.1	
2009	43.41	42.45	27.16	N/A	27.18	24.83	Five or Fewer	291.8	931.6	

* Russell 2000 Index

The composite creation date is August 2006

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The PIMCO StocksPLUS Small AR Composite includes all discretionary, fee-paying, USD-based, StocksPLUS Small AR accounts benchmarked to the Russell 2000 Index. PIMCO's StocksPLUS Small AR strategy seeks to consistently deliver attractive excess returns relative to a given equity index over three- to five-year time horizons. The strategy uses equity index derivatives to achieve passive stock market exposure and the collateral backing the derivatives is an actively managed fixed income portfolio with an absolute return orientation in an attempt to provide returns higher than the interest rate embedded in the index. Equity index futures generally comprise the vast majority of an account's equity exposure, but most accounts may also hold equity index options, options on futures, swaps, and individual stocks. Aggregate equity exposures are managed to remain approximately equal to their underlying market values. Portfolios in the composite may include institutional accounts or pooled vehicles. Prior to June 2018, the composite was named the PIMCO U.S. Small Cap StocksPLUS AR Composite.

The Russell 2000 Index is an unmanaged index composed of 2,000 of the smallest companies in the Russell 3000 Index and is considered to be representative of the small cap market in general.

Valuations are computed and performance is reported in U.S. dollars. Returns are presented gross and net of management fees and include the reinvestment of all income. Net results reflect the deduction of actual management fees and, in some instances, custodial and administrative fees. Actual fees incurred by client accounts may vary. When applicable, composite performance is net of any actual withholding tax paid and not reclaimable. Index returns are gross of withholding tax.

Composite dispersion presented is the equal-weighted standard deviation of annual returns for all portfolios in the composite for the full year. Dispersion is not statistically meaningful for periods shorter than a year or for years in which five or fewer portfolios were included for the full year. The three-year annualized ex-post standard deviation measures the variability of the composite and the benchmark returns over the preceding 36-month period. The three-year annualized ex-post standard deviation is not presented if 36 monthly returns are not available. A complete list of composite descriptions and policies for valuing portfolios, calculating performance, and preparing compliant presentations are available upon request.

The strategy uses equity index derivatives to gain exposure to the benchmark index, including futures, options, options on futures, and swaps. The use of derivatives may involve certain costs and risks such as liquidity, interest rate, market, credit, management and the risk that a position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested.

Past performance is not a guarantee or a reliable indicator of future results.

PIMCO STOCKSPUS INTERNATIONAL AR COMPOSITE

	COMPOSITE RETURN (%) BEFORE FEES	COMPOSITE RETURN (%) AFTER FEES	BENCHMARK RETURN (%)*	COMPOSITE DISPERSION BEFORE FEES	COMPOSITE 3-YR STD DEV BEFORE FEES	BENCHMARK 3-YR STD DEV	NUMBER OF PORTFOLIOS	TOTAL ASSETS (USD) MILLIONS	TOTAL FIRM ASSETS (USD) BILLIONS	STOCKSPUS ABSOLUTE RETURN SEPARATE ACCOUNT FEE SCHEDULE:
2018	-14.54	-15.09	-13.79	N/A	12.38	11.24	Five or Fewer	1,355.0	1,664.6	1st \$150 Million
2017	27.93	27.12	25.03	N/A	13.79	11.83	Five or Fewer	1,873.6	1,755.7	Thereafter
2016	4.42	3.76	1.00	N/A	14.62	12.46	Five or Fewer	1,261.0	1,467.0	0.450%
2015	-3.51	-4.13	-0.81	N/A	14.61	12.46	Five or Fewer	1,142.3	1,435.0	0.400%
2014	-4.26	-4.87	-4.90	N/A	13.98	13.03	Five or Fewer	1,112.1	1,680.4	
2013	21.24	20.47	22.78	N/A	17.46	16.25	Five or Fewer	1,404.0	1,919.6	
2012	30.18	29.36	17.32	N/A	20.85	19.37	Five or Fewer	1,116.7	2,003.8	
2011	-10.19	-10.75	-12.14	N/A	27.78	22.43	Five or Fewer	474.8	1,357.2	
2010	17.17	16.42	7.75	N/A	32.73	26.23	Five or Fewer	311.5	1,242.1	
2009	43.77	42.87	31.78	N/A	30.09	23.58	Five or Fewer	64.2	931.6	

* MSCI EAFE Net Dividend Index (USD Unhedged)

The composite creation date is June 2016

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The PIMCO StocksPLUS International AR Composite includes all discretionary, fee-paying, USD-based, StocksPLUS International accounts benchmarked to the MSCI EAFE Net Dividend Index. PIMCO's StocksPLUS AR International strategy seeks to consistently deliver attractive excess returns relative to a given equity index over three- to five-year time horizons. The strategy uses equity index derivatives to achieve passive stock market exposure and the collateral backing the derivatives is an actively managed fixed income portfolio with an absolute return orientation in an attempt to provide returns higher than the interest rate embedded in the index. Equity index futures generally comprise the vast majority of an account's equity exposure, but most accounts may also hold equity index options, options on futures, swaps, and individual stocks. Aggregate equity exposures are managed to remain approximately equal to their underlying market values. Portfolios in the composite may include institutional accounts or pooled vehicles.

The MSCI EAFE Index Net Dividend Index (USD Unhedged) is an equity index which captures large- and mid-cap representation across developed markets countries around the world, excluding the U.S. and Canada. The index covers approximately 85% of the free float-adjusted market capitalization in each country. The index reflects the views and practices of the international investment community by striking a balance between a country's economic development and the accessibility of its market while preserving index stability.

Valuations are computed and performance is reported in U.S. dollars. Returns are presented gross and net of management fees and include the reinvestment of all income. Net results reflect the deduction of actual management fees and, in some instances, custodial and administrative fees. Actual fees incurred by client accounts may vary. When applicable, composite performance is net of any actual withholding tax paid and not reclaimable. Index returns are net of withholding tax.

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PIMCO STOCKSPLUS INTERNATIONAL AR USD-HEDGED COMPOSITE

	COMPOSITE RETURN (%) BEFORE FEES	COMPOSITE RETURN (%) AFTER FEES	BENCHMARK RETURN (%)*	COMPOSITE DISPERSION BEFORE FEES	COMPOSITE 3-YR STD DEV BEFORE FEES	BENCHMARK 3-YR STD DEV	NUMBER OF PORTFOLIOS	TOTAL ASSETS (USD) MILLIONS	TOTAL FIRM ASSETS (USD) BILLIONS	STOCKSPLUS ABSOLUTE RETURN SEPARATE ACCOUNT FEE SCHEDULE:
2018	-9.42	-10.10	-8.96	N/A	10.95	9.63	Five or Fewer	2,634.3	1,664.6	1st \$150 Million 0.450%
2017	19.73	18.84	16.84	N/A	13.42	11.22	Five or Fewer	3,217.3	1,755.7	Thereafter 0.400%
2016	10.06	9.24	6.15	N/A	13.80	11.52	Five or Fewer	2,378.1	1,467.0	
2015	1.93	1.17	5.02	N/A	13.19	11.24	Five or Fewer	2,290.7	1,435.0	
2014	6.43	5.64	5.67	N/A	10.01	9.60	Five or Fewer	775.6	1,680.4	
2013	23.54	22.62	26.67	N/A	12.57	12.19	Five or Fewer	717.3	1,919.6	
2012	29.12	28.16	17.54	N/A	14.10	13.49	Five or Fewer	258.1	2,003.8	
2011	-9.90	-10.57	-12.10	N/A	19.22	16.03	Five or Fewer	217.9	1,357.2	
2010	16.30	15.42	5.60	N/A	25.42	20.39	Five or Fewer	154.6	1,242.1	
2009	47.91	46.83	25.67	N/A	24.25	19.21	Five or Fewer	231.0	931.6	

* MSCI EAFE Net Dividend USD-Hedged Index
The composite creation date is October 2013

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The PIMCO StocksPLUS International AR USD-Hedged Composite includes all discretionary, fee-paying, USD-based, StocksPLUS International Absolute Return accounts benchmarked to the MSCI EAFE Net Dividend USD-Hedged Index. PIMCO's StocksPLUS International strategy seeks to consistently deliver attractive excess returns relative to a given equity index over three- to five-year time horizons. The strategy uses equity index derivatives to achieve passive stock market exposure and the collateral backing the derivatives is an actively managed fixed income portfolio with an absolute return orientation in an attempt to provide returns higher than the interest rate embedded in the index. Equity index futures generally comprise the vast majority of an account's equity exposure, but most accounts may also hold equity index options, options on futures, swaps, and individual stocks. Aggregate equity exposures are managed to remain approximately equal to their underlying market values. Portfolios in the composite may include institutional accounts or pooled vehicles.

The MSCI EAFE Net Dividend (USD Hedged) Index represents a close estimation of the performance that can be achieved by hedging the currency exposures of its parent index, the MSCI EAFE Index, to the USD, the "home" currency for the hedged index. The index is 100% hedged to the USD by selling each foreign currency forward at the one-month Forward weight. The parent index is composed of large and mid cap stocks.

Valuations are computed and performance is reported in U.S. dollars. Returns are presented gross and net of management fees and include the reinvestment of all income. Net results reflect the deduction of actual management fees and, in some instances, custodial and administrative fees. Actual fees incurred by client accounts may vary. When applicable, composite performance is net of any actual withholding tax paid and not reclaimable. Index returns are net of withholding tax.

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Introduction to Portable Alpha

Prepared for New Mexico PERA

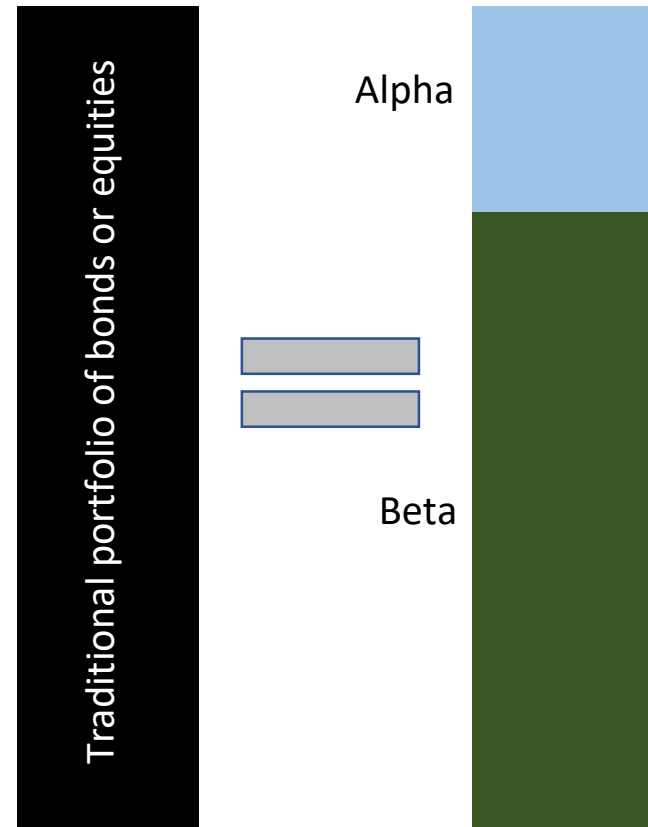
27 February 2020

Why use Portable Alpha

- Generate excess return v policy portfolio
- Separates:
 - Beta, which is cheap
 - Alpha, which is costly to access but diversifying
- Increase excess return per unit of risk, i.e. is a very efficient use of active risk
- Ultimately builds better risk balanced and higher return total portfolio

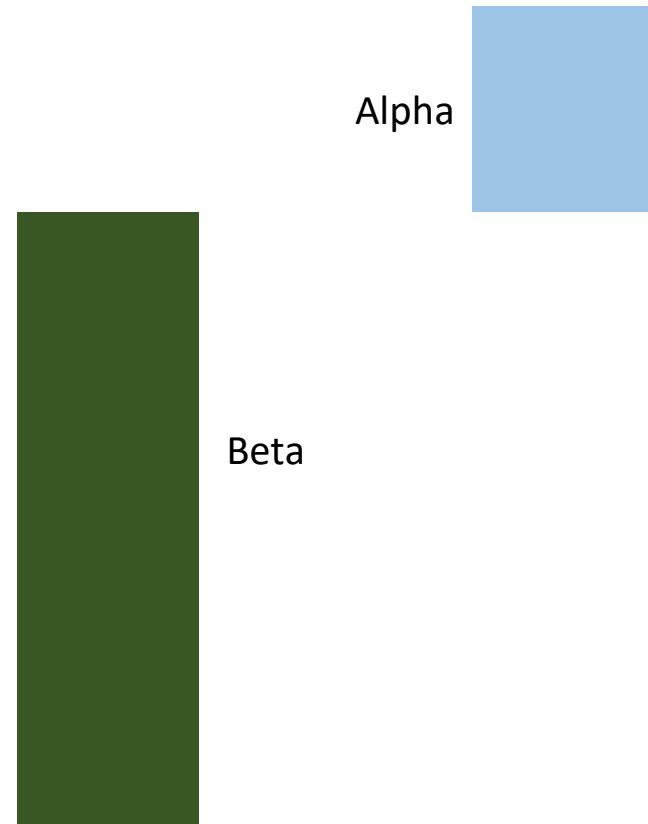
Understanding portable alpha

- Alpha and beta are “bundled” when accessing most investment products
 - e.g. an active bond manager will deliver a beta to a benchmark plus alpha
- Alpha is often constrained by long only constraint
- Where the beta can be accessed independently and cheaply you can unbundle alpha from beta



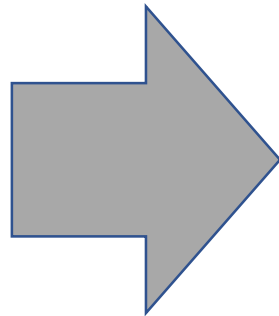
Unbundling alpha and beta

- Beta is cheap
 - US Global Aggregates benchmark costs 5bp
 - S&P500 costs 4bp
- Accessing alpha is harder
 - Skill is scarce
 - Cost of search
 - Capacity is limited
- Traditional portfolio managers can usually only access alpha within their asset class
- Unbundling alpha also untethers it from the underlying asset

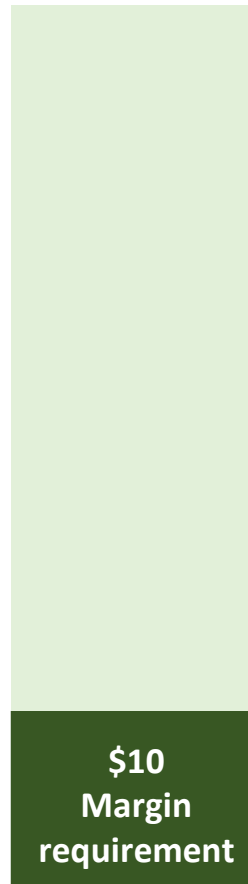


Mechanics* of separating alpha from beta - I

Physical exposure



Exposure to bonds through futures or swap



\$100 economic exposure

Synthetic exposure plus cash

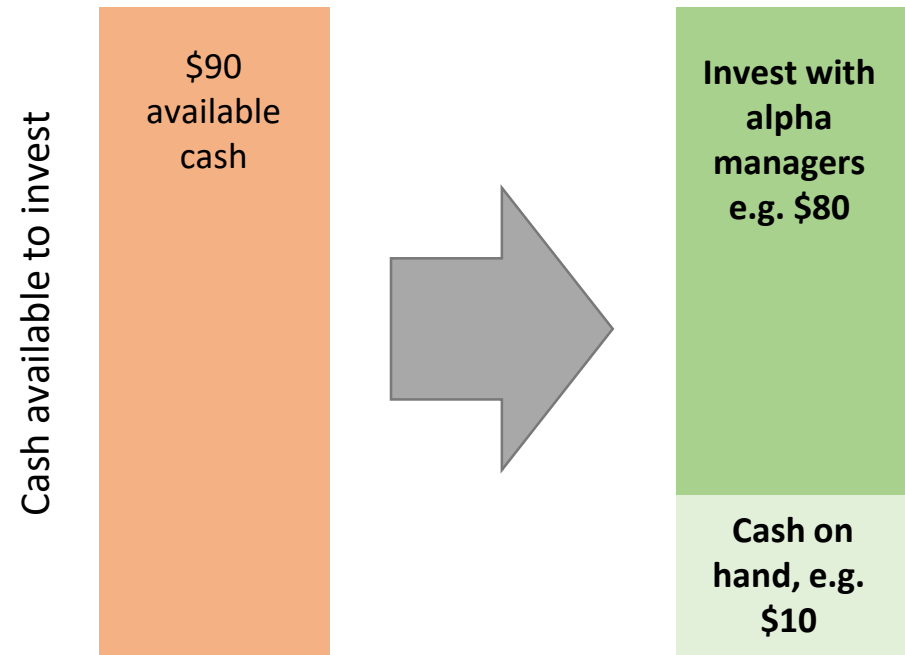
Cash available to invest



* Note this is a stylized example

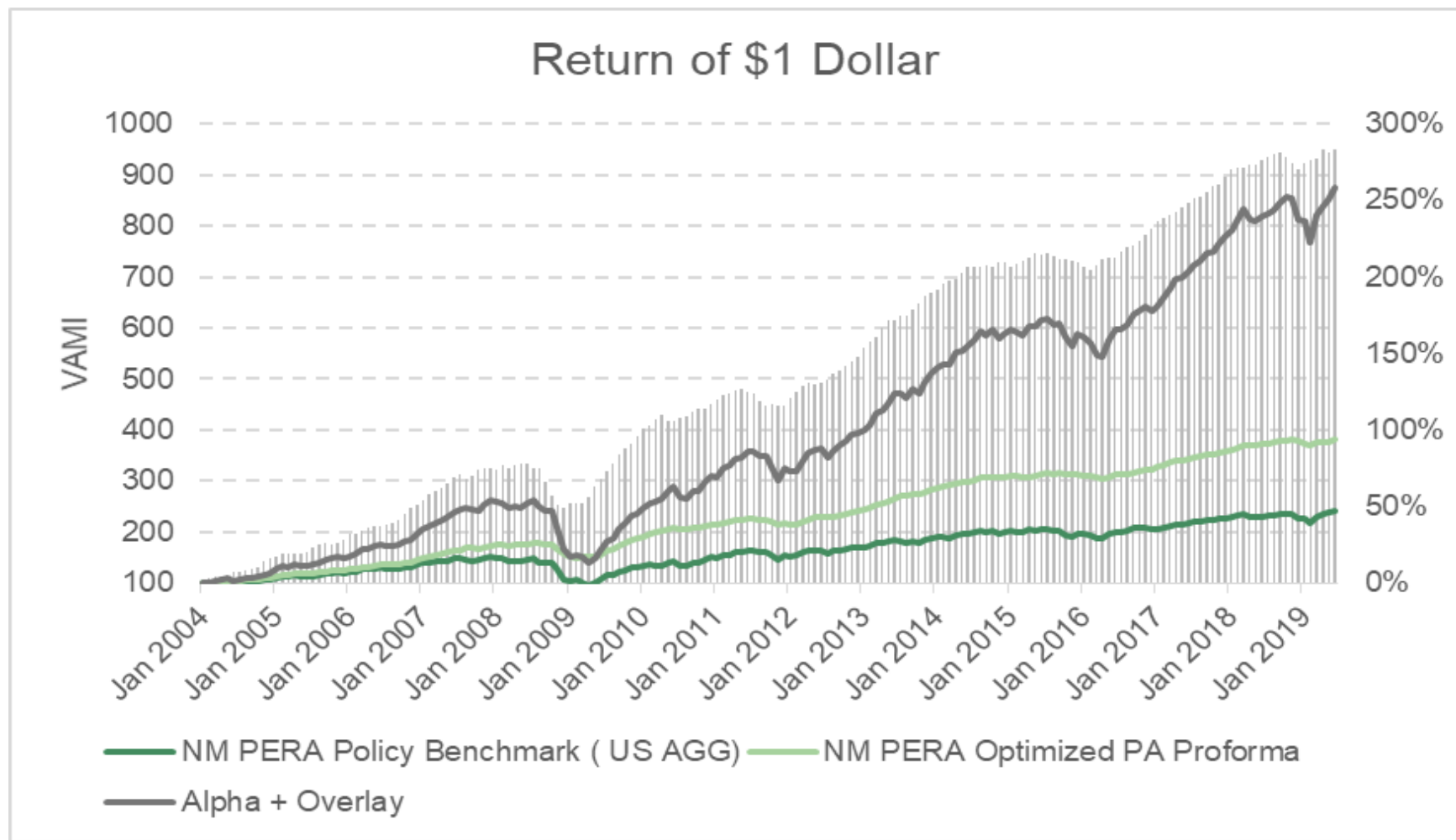
Mechanics* of separating alpha from beta - II

- Instead of \$100 invested with a traditional bond or equity manager:
 - Beta exposure is achieved synthetically which requires \$10 of margin
 - Remaining \$90 is split between alpha managers and cash on hand



* Note this is a stylized example

Alpha + Beta Has Powerful Compounding Properties



Why building an alpha engine is efficient

- Finding alpha in traditional managers is hard, especially in large cap equities and Treasuries, both areas that pension funds have traditionally had large exposures
- An alpha engine can capture skill across multiple asset classes, not just the underlying asset class
- Diversification is our friend: utilizing strategies which have low or negative correlations dampens return volatility
- Utilize balanced risk approach to enhance diversification

Key considerations

- Liquidity risk: necessary to maintain sufficient liquidity
 - When beta sells off, cash is required to maintain exposure
 - Options: maintain cash buffer; ensure manager liquidity; access cash from elsewhere in plan (likely do all three!)
- Increased complexity
 - Need to make margin calls, roll beta positions etc.
 - Some of this can be outsourced
- Leverage risk: by investing part of the cash underpinning the synthetic exposure, there is a degree of leverage
 - Can be mitigated by building diversified portfolio
- Correlation risk: beta and alpha could move together in crisis
 - Much less of a risk if beta is not equities alone
 - Can be mitigated by monitoring the manager exposures
- Manager risk: alpha managers may disappoint
 - Requires ongoing monitoring
 - Important to be well diversified

NM PERA History

- Portable Alpha 1.0: Consultant hedge fund portfolio + S&P Futures
- Portable Alpha 2.0: AQR Style Premium + Russell 3000 Futures
- Portable Alpha 3.0 (Bonds Plus): Diversified hedge fund portfolio + US aggregate bond total return SWAP

Enhancements

- NMPERA team & Albourne hedge fund selection
- Focus on diversity of hedge fund return streams
- Focus on higher moment risk
 - When all markets are down
 - Correlation increases (left tail, skew and kurtosis)
- Hedge fund selection
 - Monthly beta and margin rebalancing, reviewed in house across multiple teams in conjunction with overlay provider

Bonds Plus: Going Forward

1. Alpha strategy

- a. Phase 1: Establish portfolio with existing managers (~\$430 million)
- b. Phase 2: Expand portfolio to 10% total fund allocation overtime
 - i. Increase diversification
 - ii. Improve Sharpe ratio
 - iii. Reduce downside risk
 - iv. Improve liquidity
 - v. Be mindful of expanding portfolio further, i.e. to \$1.6bn

2. Beta exposure

3. Liquidity

4. Risk Management

Bonds Plus: Capital Allocation

Phase 1: Portfolio established with current managers

Existing Portfolio (as of Jan 31)	\$ Capital Allocation	%of Total Fund
Bond Plus Total	435,752,203	2.72
ANCHORAGE L/S Credit	139,878,680	0.87
AQR SPF Primary Premia	68,236,952	0.43
ELLIOTT L/S Equity	53,278,270	0.33
NAPIER PARK CLASS A L/S Credit	146,863,910	0.92
PARAMETRIC BNDS PLUS Synthetic Overlay (Margin)	27,494,391	0.17

*The Parametric BNDS PLUS Synthetic Overlay position of \$27,494,391 is a ~5% cash margin position backing \$435,752,203 exposure to Bloomberg Barclays US AGG index (the Risk Mitigation policy portfolio), such that the total Bonds Plus Composite shown above has a Beta of 1 to the policy portfolio + Alpha (in the form of Active Return & Active Risk via the 4 long/short strategies).

Bonds Plus: Active Risk Budgeting

Asset Class	Active Selection				
	Weight	Active Return	Active Risk	Active Return Contribution	Active Risk Contribution
Global Equity	0.00%	0.59%	5.00%	0.00%	0.00%
Global Low Volatility Equity	0.00%	0.59%	5.00%	0.00%	0.00%
US - Large Cap	0.00%	0.30%	3.00%	0.00%	0.00%
US - Small Cap	3.00%	1.34%	4.00%	0.04%	0.04%
Non-US Large Cap	3.00%	1.35%	4.00%	0.04%	0.04%
Non-US Small Cap	1.00%	1.96%	5.00%	0.02%	0.01%
Emerging Markets	2.00%	1.06%	4.00%	0.02%	0.02%
Core Fixed Income	17.00%	0.18%	0.30%	0.03%	0.01%
Global Core Fixed Income	0.00%	0.45%	0.75%	0.00%	0.00%
High Yield	1.25%	0.36%	3.00%	0.00%	0.02%
Alternative Liquid Credit	2.25%	0.48%	4.00%	0.01%	0.04%
EMD	2.00%	0.97%	4.00%	0.02%	0.03%
TIPS	0.00%	0.04%	0.40%	0.00%	0.00%
Global TIPS	0.00%	0.20%	0.40%	0.00%	0.00%
Commodities	0.00%	3.16%	5.50%	0.00%	0.00%
Public Real Estate	2.00%	0.49%	2.75%	0.01%	0.02%
Public Real Assets (10% TIPS, 45% Commodit	0.00%	2.11%	4.50%	0.00%	0.00%
Equity Event Driven Hedge Funds	0.00%	2.29%	6.00%	0.00%	0.00%
Credit Oriented Hedge Funds	0.00%	2.94%	8.50%	0.00%	0.00%
Portable Alpha Components (Market Neutral	10.00%	3.38%	4.50%	0.34%	0.35%
Private Equity	0.0%	0.00%	10.00%	0.00%	0.00%
Private Credit	0.0%	0.00%	10.00%	0.00%	0.00%
Private Real Estate (Core, Value Add, Opport	0.0%	0.00%	7.50%	0.00%	0.00%
Private Real Assets (Oil and Gas Partnerships,	0.0%	0.00%	10.00%	0.00%	0.00%
Cash (adjusted for borrowing rate)	0.0%	0.00%	0.00%	0.00%	0.00%
Risk Parity (15% Volatility)	0.0%	0.00%	3.25%	0.00%	0.00%
Total Portfolio	43.5%			0.53%	0.57%

Assuming a 3.375% real return (over cash) with 4.5% volatility, a 10% allocation to Portable Alpha adds 34 bps to Total Fund return estimates, with standalone tracking error of 35 bps.

The incremental active return per unit of active risk (at .75) is among the most efficient “risk spends” among all active risk opportunities.

2020 Implementation Plan

Request approval of active risk budget

Create long-list of funds

- Identify fund universe
- Quantify portfolio fit
- Strategy Analyst input
- Manager calls with shorter list

Manage Shortlist

- Undertake fee analysis
- Visit shortlist manager(s)
- Write proposal

PRISM proposal

- Present proposal
- PERA to review ODD

2020 Implementation Continued

- Continue researching additive strategies
- Start work on Global Macro / CTAs
- Review alpha overlay portfolio structure to identify broad risk balance allocation to each sub-strategy
- Grow sub-strategy risk balance accordingly, and to approximately 4-6 new strategies during 2020.
- Get to approximately ~\$1 billion by end-of- year
- Continue Quant and Qualitative risk monitoring of existing (and growing) portfolio of strategies.

Summary: Building Blocks for a Successful Program

- Efficient replication and management of beta
 - Disciplined rebalancing and re-set mechanisms
 - Long-term focused; eliminating emotional short-term intervention
 - Prudent liquidity management for margin maintenance
- Skilled manager selection and ongoing monitoring
 - Find diversified, true alpha streams that are resilient to market and liquidity disruptions.
 - Test alpha for high moment properties (skew and kurtosis); seek resilience and convexity.
- Dynamic risk management
 - Regularly test pairwise correlation of each strategy (alpha stream) in the portfolio.
 - Regularly test risk balance and marginal contribution of each strategy to total volatility and value at risk (consider rebalancing when necessary).

Conclusion and Key Takeaways

- Portable alpha is expected to improve overall return with growing importance in active risk budget
- Building an alpha engine is an efficient method of utilizing long/short breadth, manager skill, and alpha opportunities unconstrained by beta/systematic risk
- Alpha engine can be combined with any asset class where the beta can be accessed synthetically, independently and cheaply
- Increased complexity and limited liquidity need to be carefully managed

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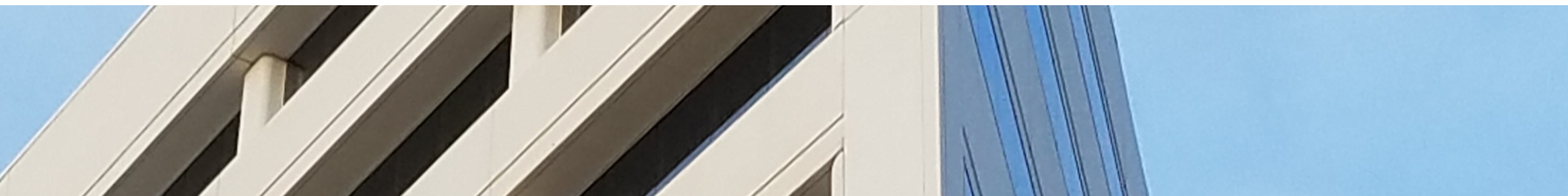


PERA

Public Employees
Retirement Association
of New Mexico

WILSHIRE ASSOCIATES

Board Interim Investment Retreat



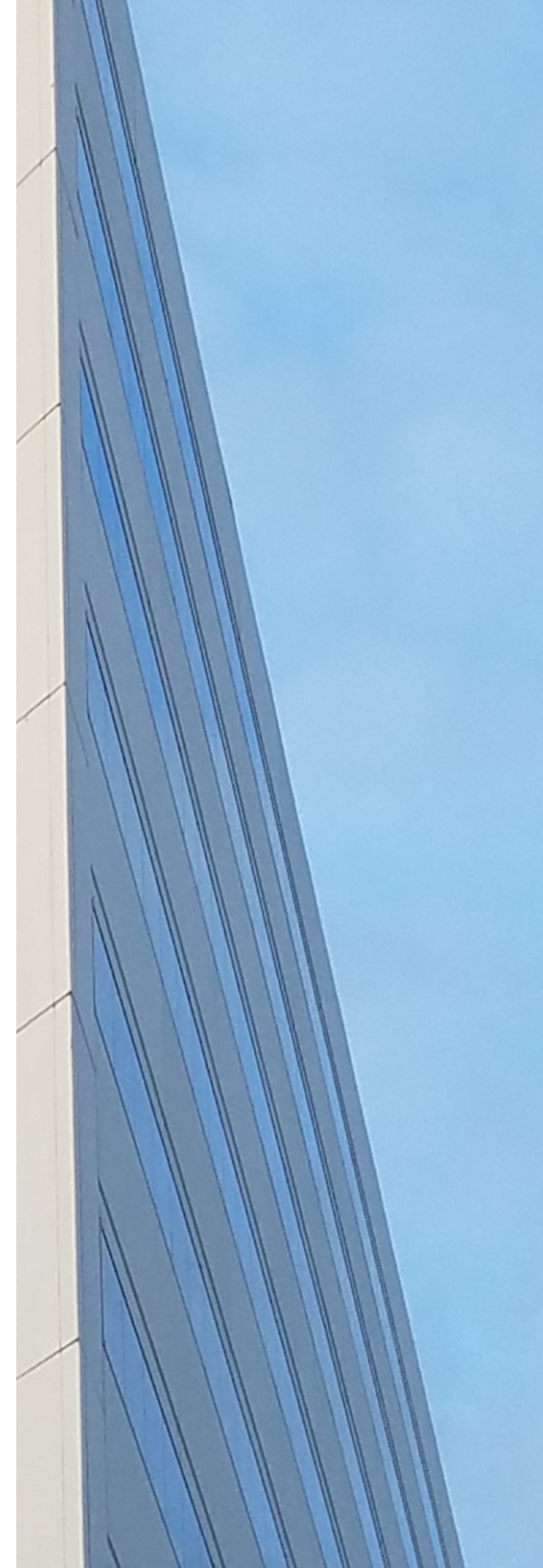
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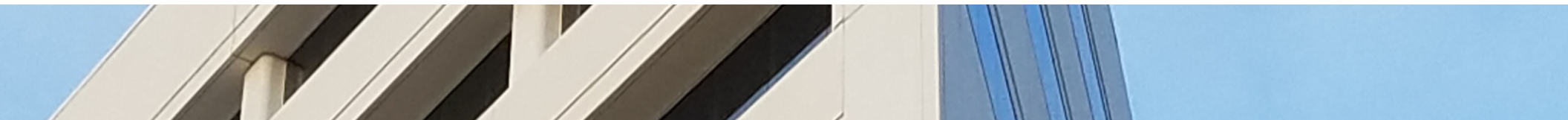
Wilshire Associates

AGENDA

Beta Modeling

Active Risk Modeling





BETA MODELING

CUSTOMIZED ASSET ASSUMPTIONS

Standard ACA (10 Years)	Expected Return	Risk	Cash Yield	Sharpe Ratio (Arithmetic)	Notes on assumption building
Global Public Equity	6.20	17.10	2.30	0.33	Standard
Global Low Volatility Equity	6.22	13.58	2.83	0.38	Standard
Private Equity (Blend)	8.10	29.94	0.00	0.34	45% US Buyout / 25% Venture / 30% non-US Buyout
Core US Fixed Income	2.85	5.15	3.10	0.22	Standard
Global Core Fixed Income	1.80	3.82	2.27	0.00	Standard
Global High Yield	4.57	9.75	7.65	0.32	Standard
Emerging Market Debt	4.49	6.98	6.13	0.41	Standard
Alternative Liquid Credit (Blend)	4.46	5.88	5.38	0.47	New - reduced Event Driven proxy for Credit Oriented HF to 0% , 50% Bank Loans, 100% Securitized minus 50% Cash Borrow to proxy leveraged securitized mandate.
Private Credit (Blend)	6.50	15.55	1.46	0.37	40% Distressed and 40% Mezz to capture high return seeking private credit, and 20% Direct Lending (reduced from 40% to reflect assumption uncertainty)
Global Real Estate Securities	5.20	15.80	3.70	0.28	Standard
Public Real Assets (Blend)	4.59	12.40	2.88	0.28	New - 10% TIPS / 45% Commodities / 45% Global Listed Infrastructure
US TIPS	2.15	6.00	2.45	0.08	Standard
Commodities	3.60	15.00	1.85	0.19	Standard
Global Listed Infrastructure	5.30	17.00	4.00	0.28	Standard
Master Limited Partnerships	7.70	19.00	6.40	0.39	Standard
Private Real Estate (Blend)	7.36	15.97	1.98	0.42	50% Core, 20% Value Add, 30% Opportunistic
Private Real Assets (Blend)	7.80	16.60	2.60	0.43	50% Private Infrastructure / 25% Timber-Agg / 25% Energy Partnerships
Risk Parity (15% Volatility)	6.75	15.00	3.71	0.39	Standard
Cash Borrowing	2.10	1.25	2.10	0.20	Standard

Note: Sharpe Ratio arithmetic calculation converts multi-period geometric return assumption to 1 period calculation for use in risk adjusted return calculation

BETA MODELING

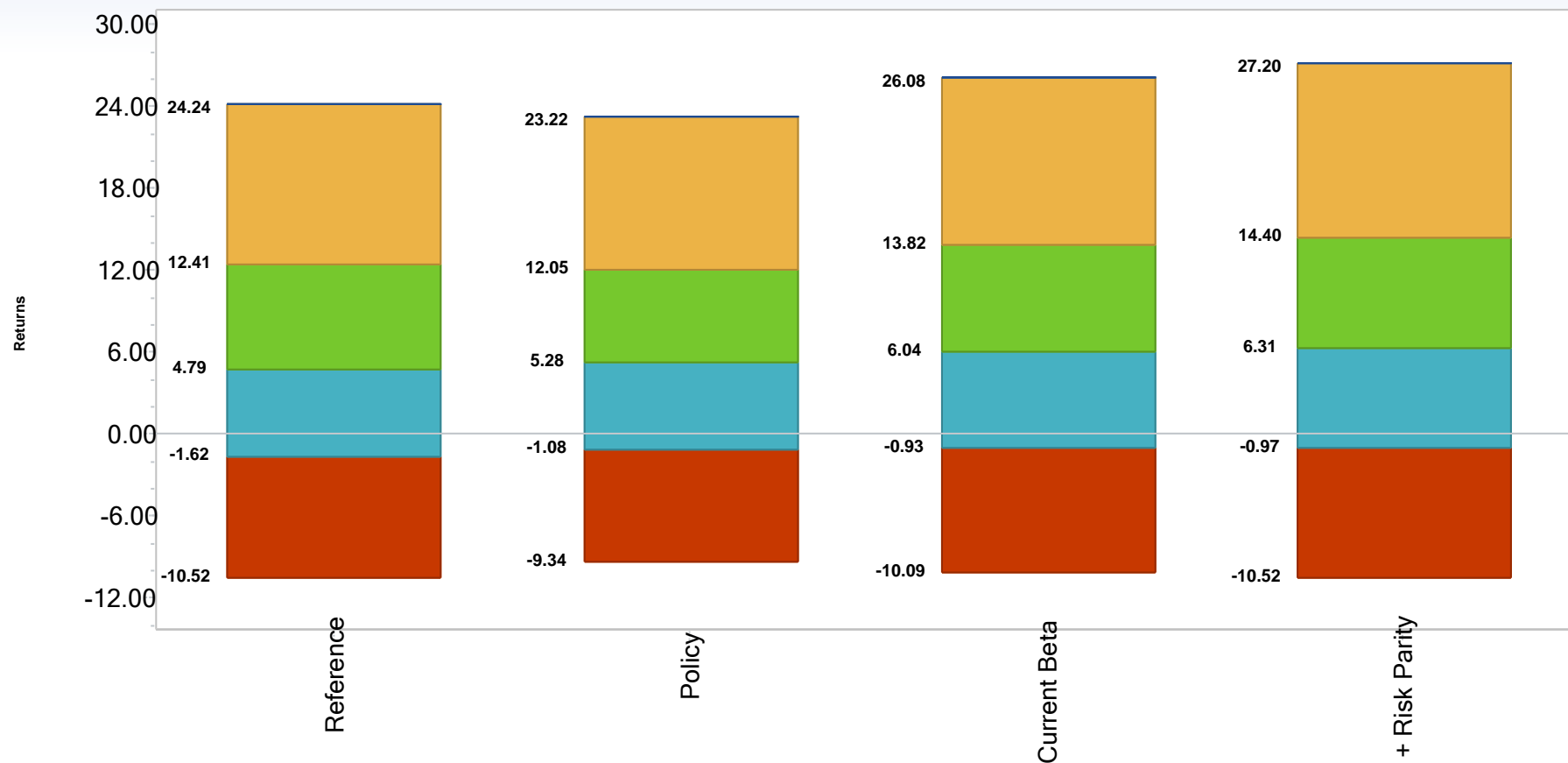
	Reference Portfolio	Policy	Current Beta	+ Risk Parity (10%)
Global Public Equity	58.00	28.50	19.50	16.00
Global Low Volatility Equity		7.00	7.00	7.00
Private Equity (Blend)			9.00	9.00
Core US Fixed Income	42.00	17.00	17.00	17.00
Global Core Fixed Income		2.50	2.50	
Global High Yield		12.00	6.00	1.00
Emerging Market Debt		3.00	3.00	3.00
Alternative Liquid Credit (Blend)				3.00
Private Credit (Blend)			6.00	6.00
Global Real Estate Securities		7.00	2.00	2.00
Public Real Asset (Basket)				
US TIPS		3.00	3.00	1.00
Commodities		5.00		
Global Listed Infrastructure		3.00		
Master Limited Partnerships		2.00	2.00	2.00
Private Real Estate (Blend)		0.00	5.00	5.00
Private Real Assets (Blend)			8.00	8.00
Risk Parity (15% Volatility)		10.00	10.00	20.00
Cash Borrowing				
	100.00	100.00	100.00	100.00
Return	5.10	5.39	6.23	6.49
Risk	10.57	9.91	11.10	11.60
Sharpe Ratio (Geometric)	0.31	0.36	0.39	0.40
Yield	2.64	3.58	2.91	2.88
Market Level Liquidity	94.2%	90.5%	65.8%	66.1%
Stressed Liquidity	37.6%	28.2%	24.3%	23.0%
Note: Geometric calculations accounts for compounding impact over multiple time periods				

BETA MODELING: DISTRIBUTIONS

Distribution of Returns

1 Year Time Horizon

Return Distribution Input: Log Normal Median Percentiles: 5, 25, 50, 75, 95

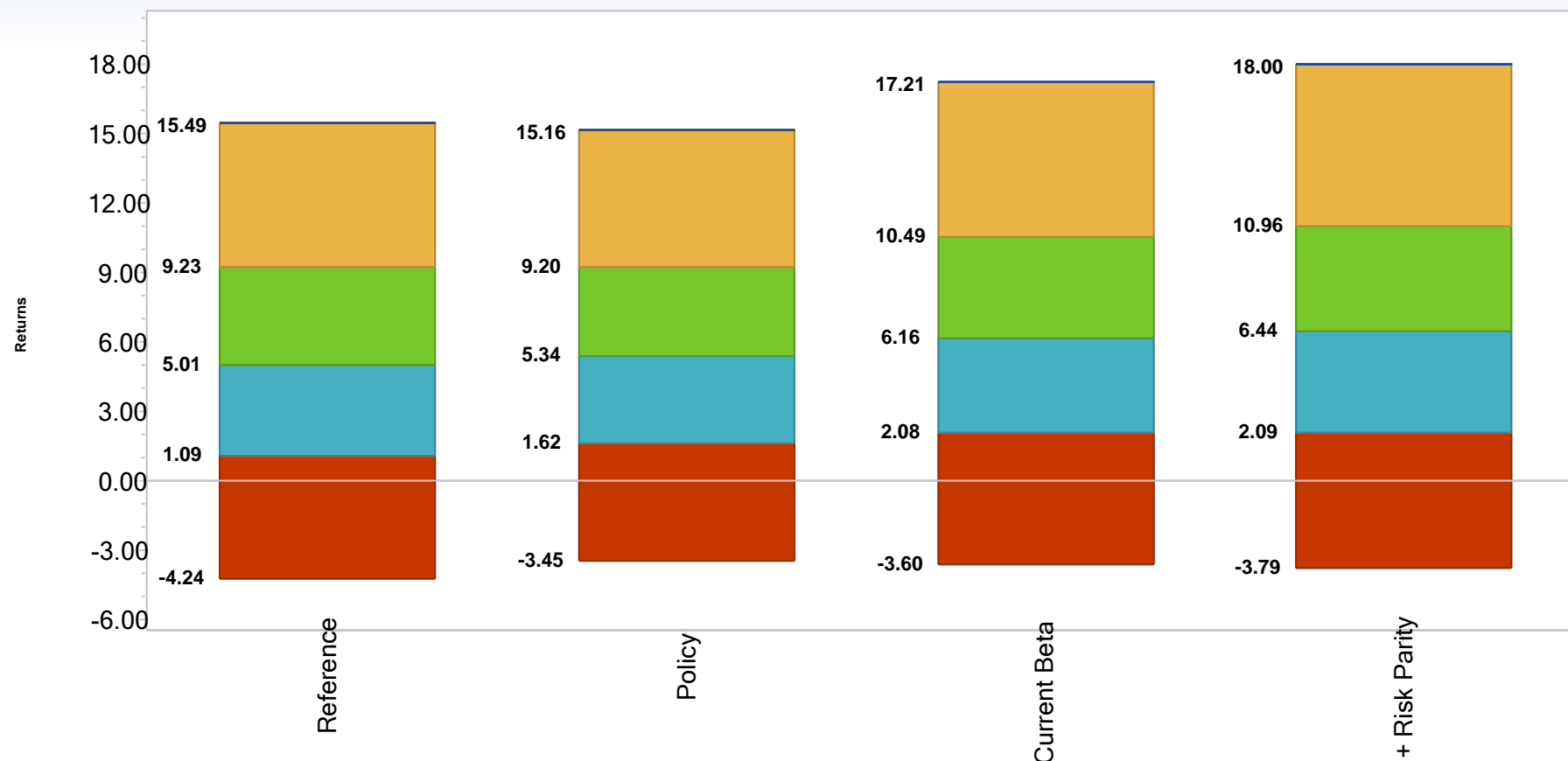


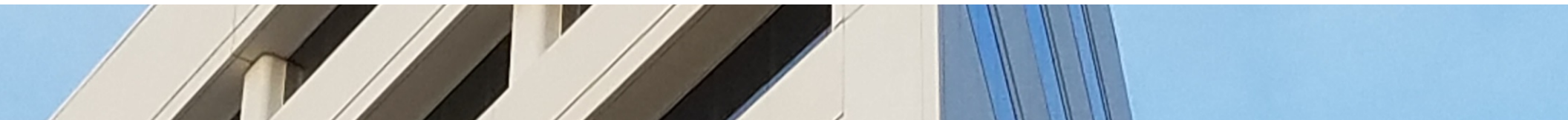
BETA MODELING: DISTRIBUTIONS

Distribution of Returns

3 Year Time Horizon

Return Distribution Input: Log Normal Median Percentiles: 5, 25, 50, 75, 95





ACTIVE RISK MODELING

RISK INTRODUCTION

- Investment Risk is the uncertainty associated with achieving an expected level of return over a certain time horizon
- Risk is the currency we use to “pay” for return at each level of the investment process
- Just like anything in life there is a limit to what we can afford to spend and how we can best deploy that capital
- Process of setting and allocating active risk to enhance and produce value added returns available from market exposure (Beta)
- Risk Budgeting formalizes the expectation to compare the efficacy of utilizing active management

SOURCES OF ACTIVE RISK

Active manager risk is not only source of active risk (also known as tracking error) for asset owners.

Total Fund Active Risk – aggregate active risk of all investments versus the strategic policy but can and should be split up amongst the various stakeholders



Allocation – active risk from allocation differences, intentional or not, as compared to the Board approved benchmark portfolio

- Liquid Active Structural tilts within asset classes
- Illiquid investments

Selection – active risk from asset managers (irrespective of style biases versus their benchmark or truly idiosyncratic risk).

- Manager skill or unique return stream – Alpha

ACTIVE RISK BUDGETING ROLES

Board Roles and Responsibilities

- Articulates Board philosophy with respect to ability to achieve alpha across the total fund and what Board considers acceptable level of active risk
- Active returns will have meaningful variability due to manager value-add and the challenges of private markets implementation
- Active risk management through incorporating a range around a target level of active risk

Staff Roles and Responsibilities

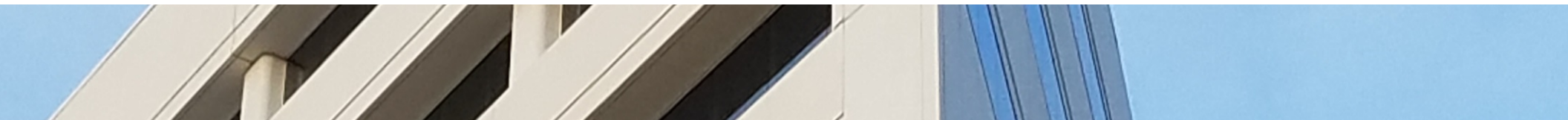
- Provides mechanism for evaluating changes to asset class structure or strategies
- Identify manager structure which provides broadest asset class exposure
- Select managers with non-overlapping and complementary styles
- Balance between manager fees and their specific risks
 - Too many managers:
 - Expensive
 - Higher probability of overlap in portfolio holdings; less diversification
 - Too few managers:
 - Elevated exposure to manager specific risk

ACTIVE RISK ENHANCEMENTS: PORTABLE ALPHA

- Untangling the framework for pursuing Alpha from the Beta decisions derived through the asset allocation process can **enhance Total Fund returns**
- **Alpha portfolio construction process** is paramount to produce an uncorrelated, market neutral return stream
- **Implementation complexity is material**, requiring the use of derivatives and regular cash movement for targeted Beta exposure
- Need to understand the **leverage implicit in porting alpha** streams on top of market Beta exposures
- **Risk monitoring needs to be robust** to examine unanticipated changes in alpha manager risk positioning and underlying Beta exposures

ACTIVE RISK ENHANCEMENTS: PORTABLE ALPHA

- Modeled a 10% Portable alpha target
 - Portable alpha expected return assumed at 3.375% over LIBOR which adds 35 bps of active return to the Total Fund with a marginal contribution to active risk of 35 bps
 - Liquidity profile should be incorporated into liquidity management framework discussed earlier
- Traditional active management contributes 20 bps of active return with active risk of 22 bps
 - Concentrate efforts on areas of the capital markets with a higher probability of achieving alpha
- Total active return increases to 54 bps with approximately 57 bps of active selection risk



APPENDIX ACTIVE RISK MODELING INPUTS

CURRENT ASSUMPTIONS METHODOLOGY

Risk / Return / Information Ratio (IR) Calculations:

- Utilizing Wilshire manager database, we created a manager universe for each asset class (ex private investments and HFs) with a minimum 10 year data constraint.
- For this manager universe, we determine a percentile distribution and emphasize the 50th percentile Information Ratio. The rationale is more conservative compared to the prior average of the 25th and 50th percentile, although the implementation goal would be to pick more successful managers for the alpha portfolio.
- Once the IR's are identified, we determine the 50th percentile active risk estimate for our manager universe and back into an alpha assumption for each asset class. E.g.: The calculated IR estimate for global equity is 0.10 and the calculated active risk estimate is 5.50%. Based on this we can imply an net of fee alpha for global equity to be 0.55%.
- Once the alpha/active risk estimates are identified, we do a qualitative check to determine if the IR assumptions pass the reasonableness check. If necessary, we make qualitative adjustments
- For Private investments, Wilshire's beta (forward looking risk/return) estimates capture successful implementation of the strategy. As a result we exclude private investments from our alpha portfolio optimizer and assign an Information Ratio of 0 to these investments in the alpha model. The rationale here is that we believe the beta portfolio for private investments has the desired alpha accounted for in the forward looking estimates.
- High Yield and EMD IR estimates over the past 10 years have been subdued when compared to a longer time horizon. Based on this, we have qualitatively adjusted these estimates to be more representative of our forward looking assumptions.

Alpha Correlations:

- For each asset class, we use a truncated manager universe (25th to 50th percentile managers) to build an equal weighted composite with 10 years of monthly returns. Using these asset class representative composites, we build an alpha correlation matrix. These ex-post correlations are then subjected to qualitative adjustments (constrained between -0.3 and +0.3) to ensure reliable future correlation expectations.
- These Risk/Return/Correlation estimates are then fed into an optimizer to build an efficient frontier for an active risk portfolio.

ENHANCING THE ASSUMPTIONS

- Current Assumptions rely on universe data and historical returns for the Information Ratio and Active Risk Estimates
- While Information Ratios can be relatively stable, historical active risks aren't necessarily representative of a "normal risk" environment
- How can we enhance the process?
 - Incorporate forward looking modeling into the process for the risk estimates
 - Merge the ex-post and ex-ante risk estimates using an equal weighted average of the risk estimates
 - Weighting can be adjusted to infuse more of a forward looking view
 - Managers used could be existing PERA managers or potentially use a pool of active managers
 - Ex-ante risk could be estimated with different matrix options: Recent, or "Normal Environment"
 - Risk Estimates could also be stress tested with matrices from different historical events to provide bands on the risk budgeting process
- Any enhancements would be discussed with staff, leveraging Wilshire analytical systems to get more forward looking risk into estimates should provide more robust assumptions

DEFINITIONS

- Alpha – idiosyncratic return relative to a benchmark index after accounting for systematic risk factors. Positive alpha indicates that an investment has outperformed on a risk-adjusted basis.
- Active Risk – measure of a portfolio’s deviation from a benchmark index; and is calculated as the standard deviation of the difference between the portfolio return and the benchmark index return. It is also referred to as “tracking error.”
- Beta – measure of the systematic risk of a portfolio relative to the market as a whole. A Beta below 1 indicates a tendency to rise or fall less than the market and vice versa for a Beta higher than 1.
- Allocation Active Return – measure of a portfolio’s deviation from a benchmark index driven by differences in actual versus target weights or differences in the structure of a portfolio relative to the market as a whole.
- Selection Active Return – measure of a portfolio’s deviation from a benchmark index driven by differences in manager performance relative to a specified index.
- Illiquid Implementation Risk – measure of a portfolio’s deviation from a benchmark index driven by differences in actual versus target weights due to the inherent uncertainty over the timing of non publicly traded investment cash flows.

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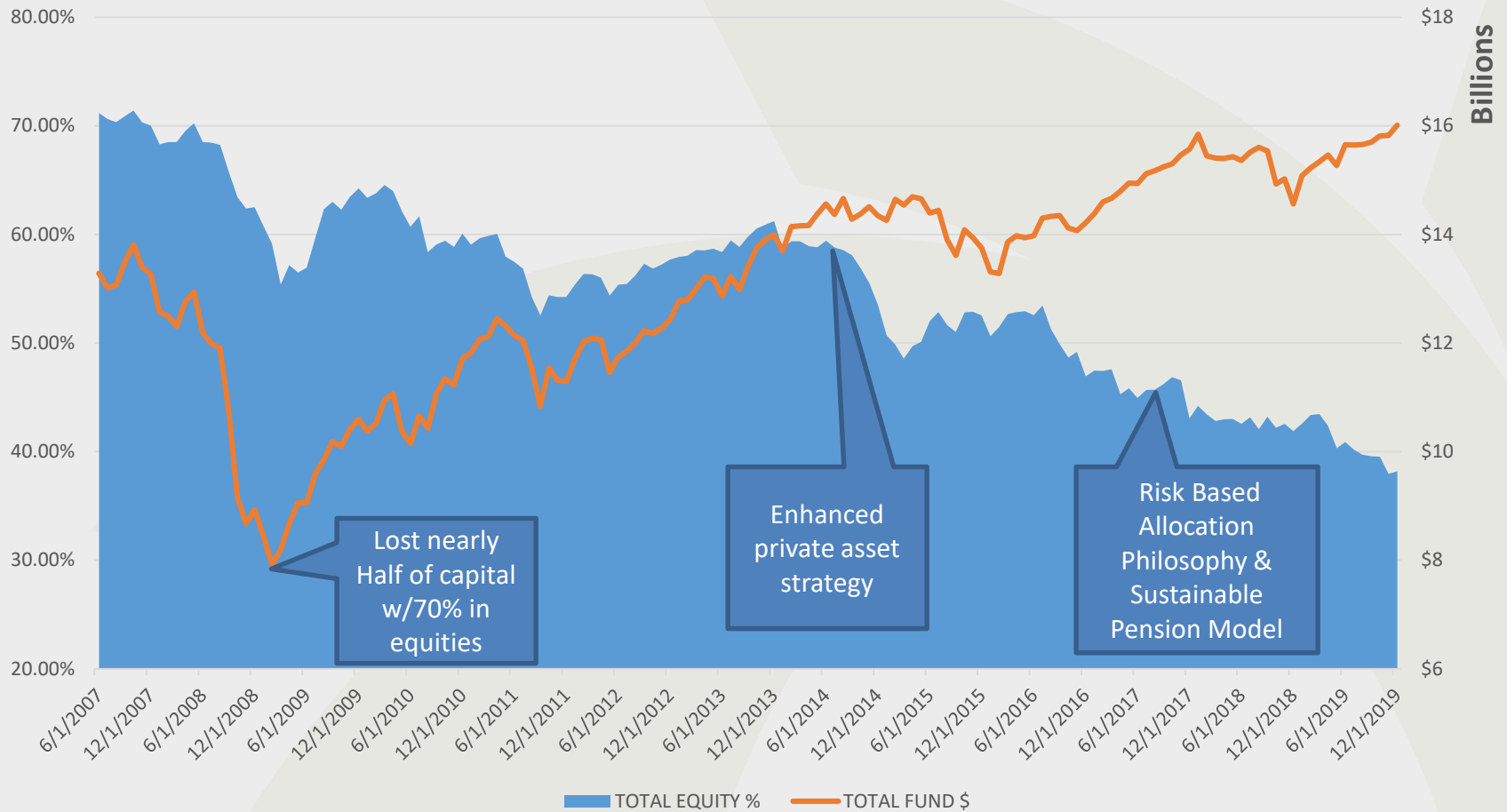
PERA

Recap & Potential Recommendations

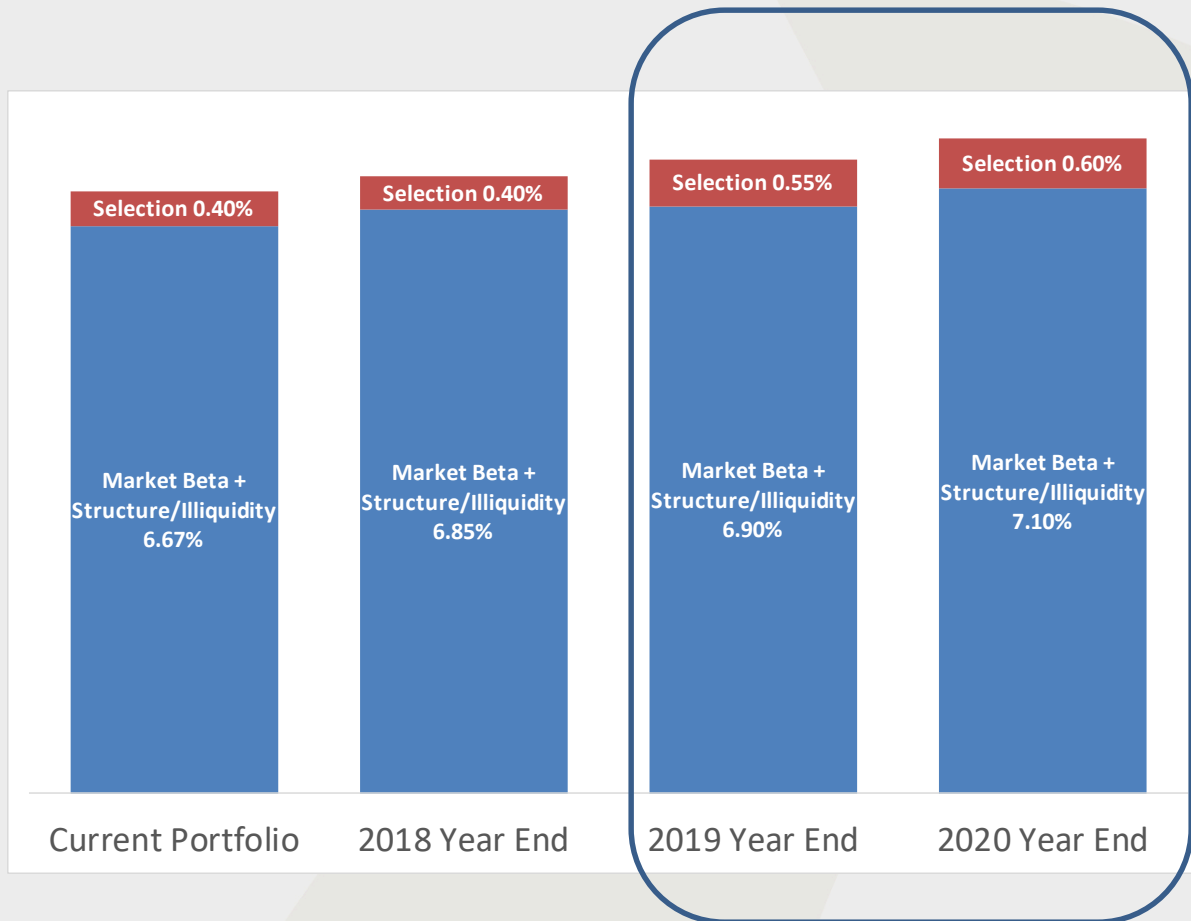
Dominic Garcia, Chief Investment Officer

Tom Toth, Managing Director, Wilshire

PERA 10-Year Strategy Evolution: Diversification into Private Assets and Risk Balance



Board Retreat in July 2018...

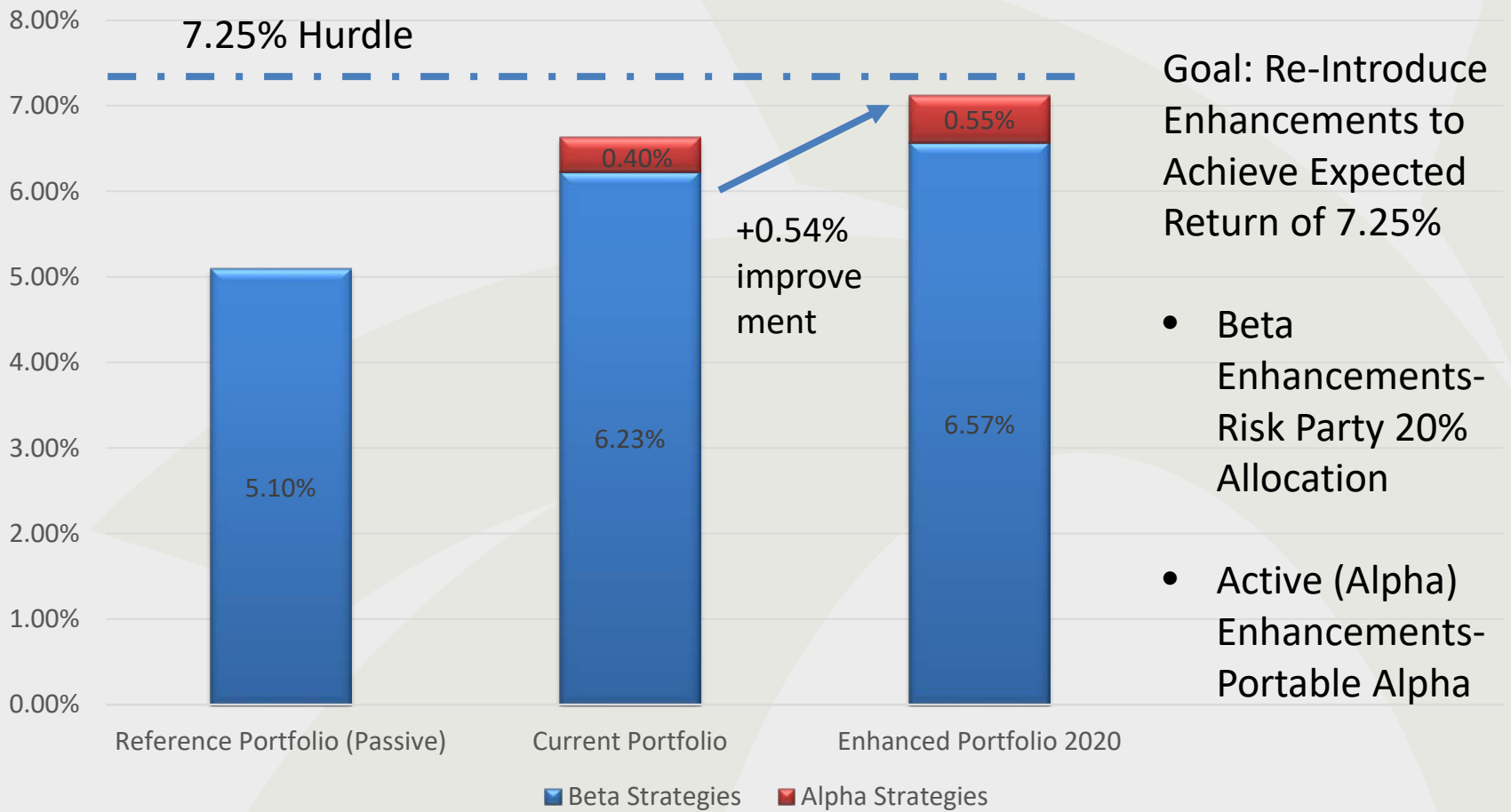


Beta Enhancements:
Risk Parity Allocation
20%-30% in 2020

Alpha Enhancements:
Portable Alpha in 2019
& 2020

Where Are We Today?

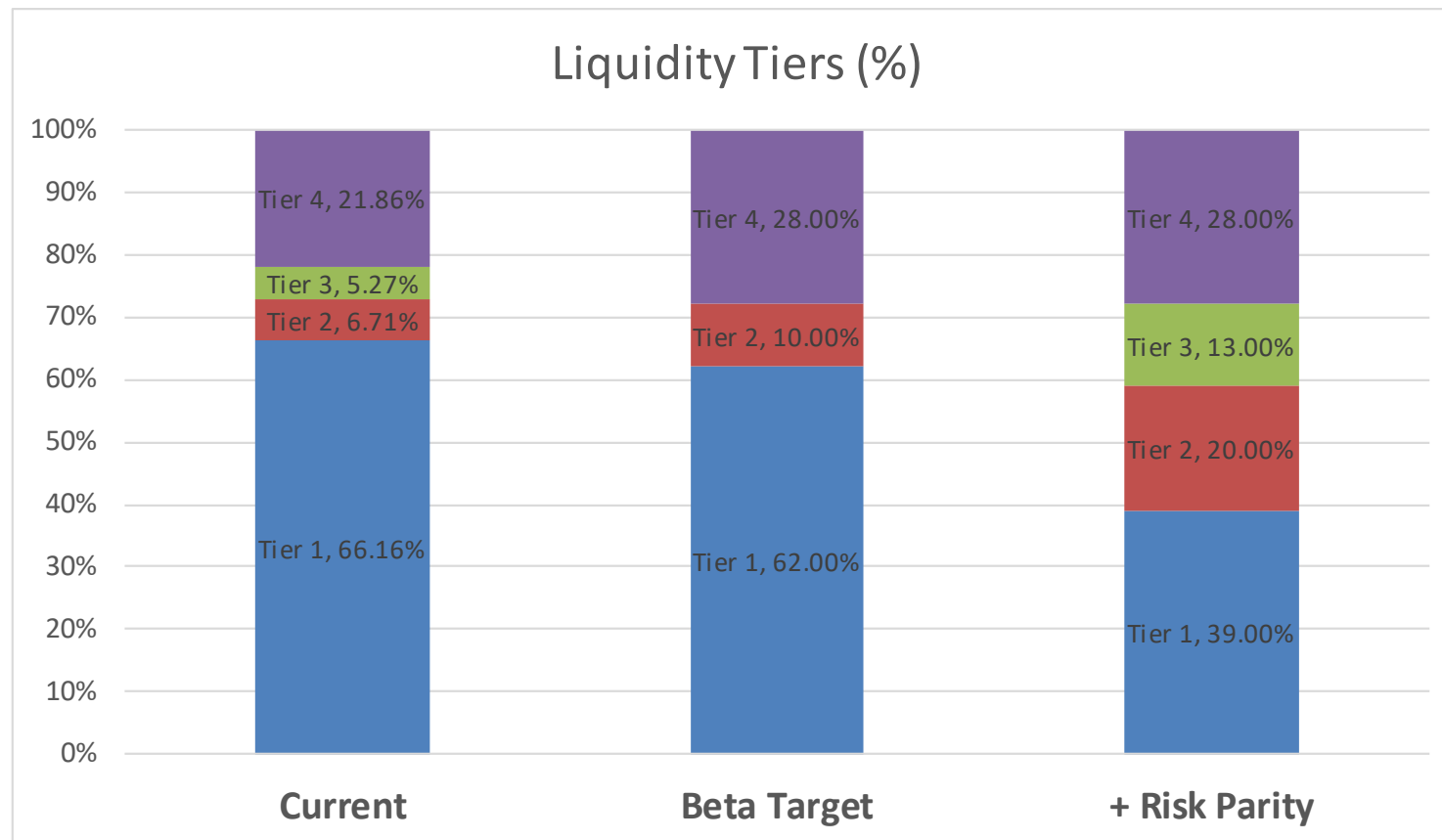
Less Rosy Market Expectations



RECOMMENDATION SUMMARY


- Today's Focus:
 - Direct Liquidity Management
 - Increased Risk Parity Allocation
 - Active Risk Budget (Portable Alpha Integration)

DIRECT LIQUIDITY MANAGEMENT



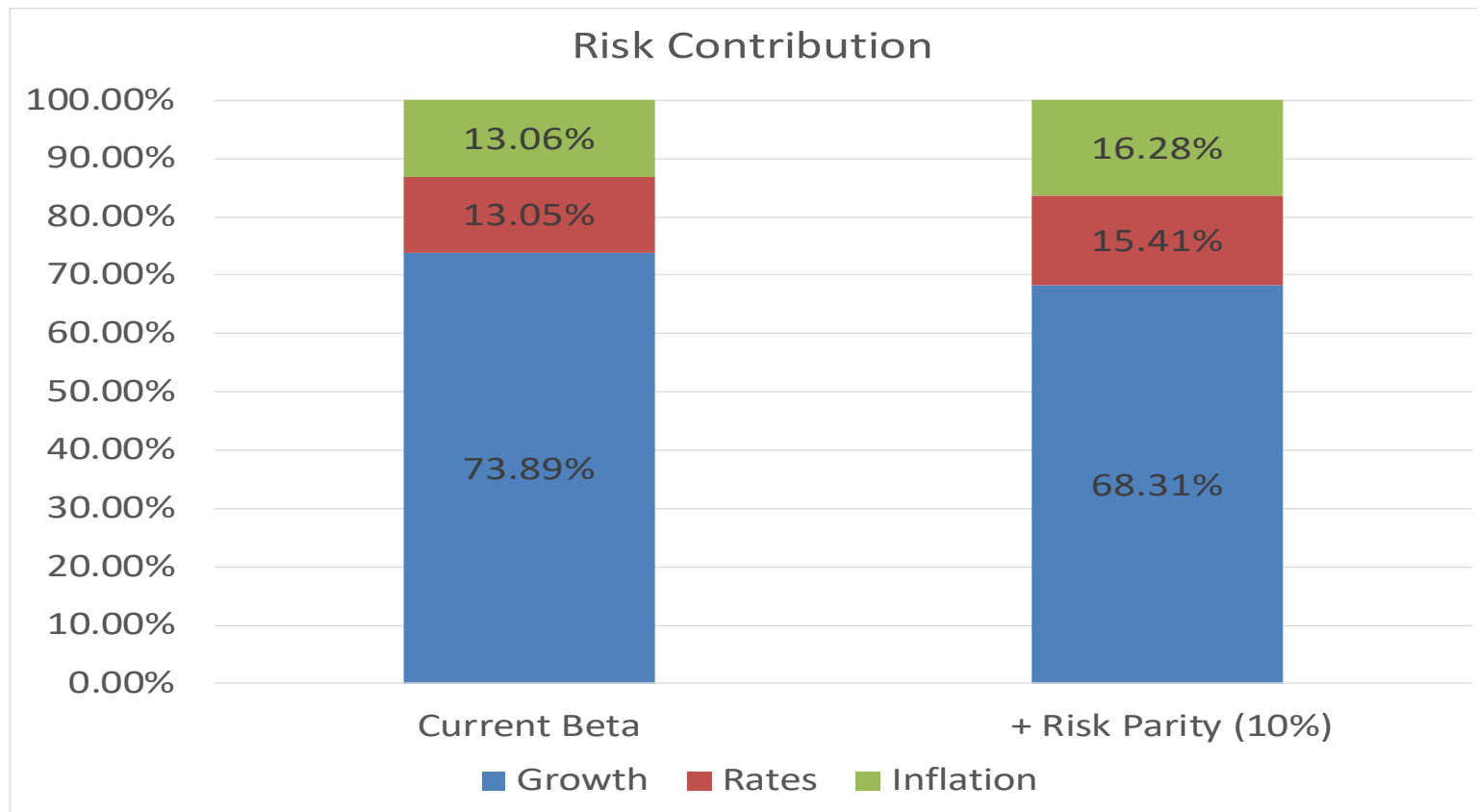
- Tier 3 includes 10% allocation to Portable Alpha
- Tier 3 also includes specific 3% allocation to Alternative Liquid Credit which is expected to have more limited liquidity terms

INCREASED RISK PARITY

Asset Class	Current Beta	+ Risk Parity (10%)
Global Equity	35.50%	32.00%
Risk Mitigation	19.50%	17.00%
Credit	15.00%	13.00%
Real Assets	20.00%	18.00%
Multi Risk Allocation	10.00% 	20.00%
Total Assets	100.0%	100.0%
Expected Beta Return - 10 Years (%)	6.23	6.49
+ Portable Alpha at 10% Target	0.35	0.35
+ Traditional Active Return	0.20	0.20
= Total Expected Return - 10 Years (%)	6.78	7.04
Total Standard Deviation of Return (%)	11.11	11.61
Sharpe Ratio (Geometric)	0.44	0.45

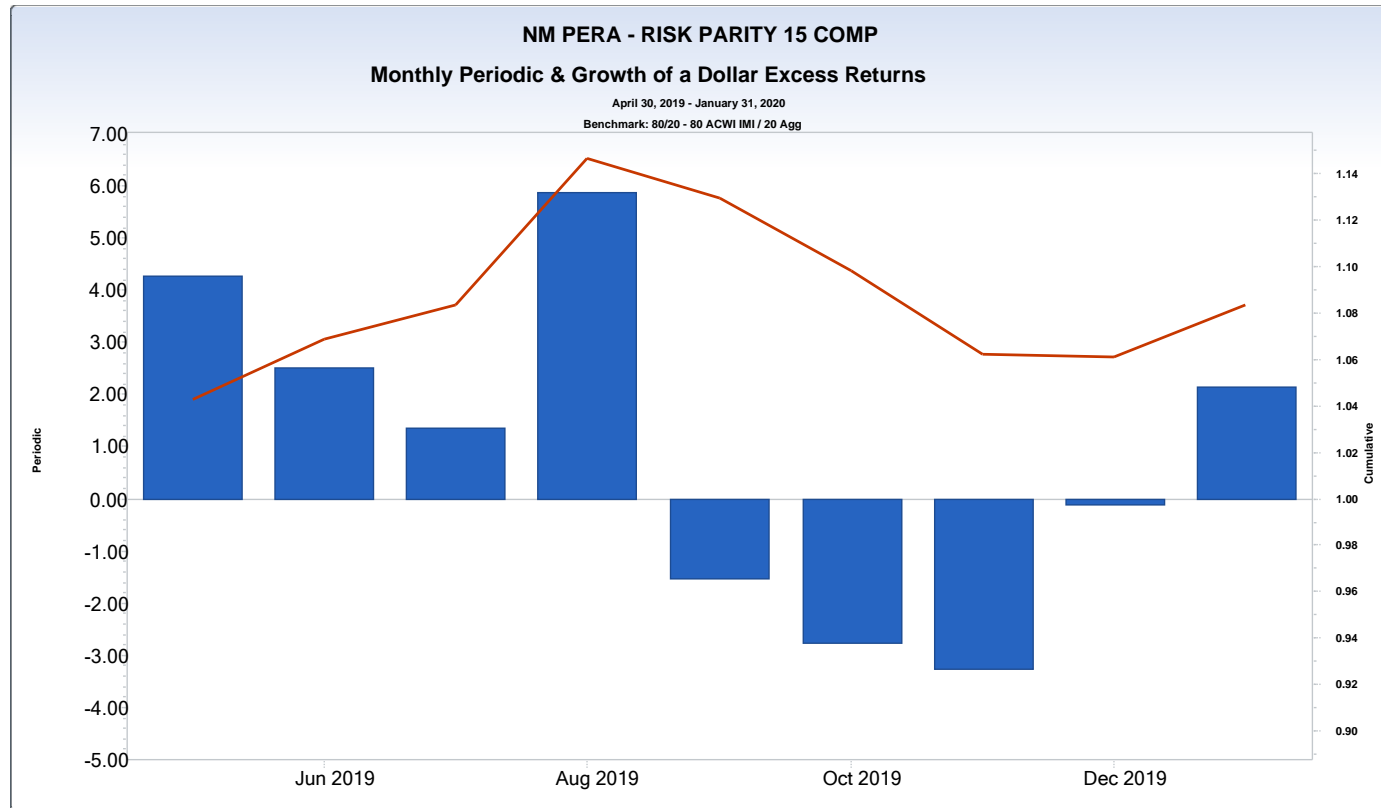
Note: Long-term forecast. Actual results may vary.

INCREASED RISK PARITY



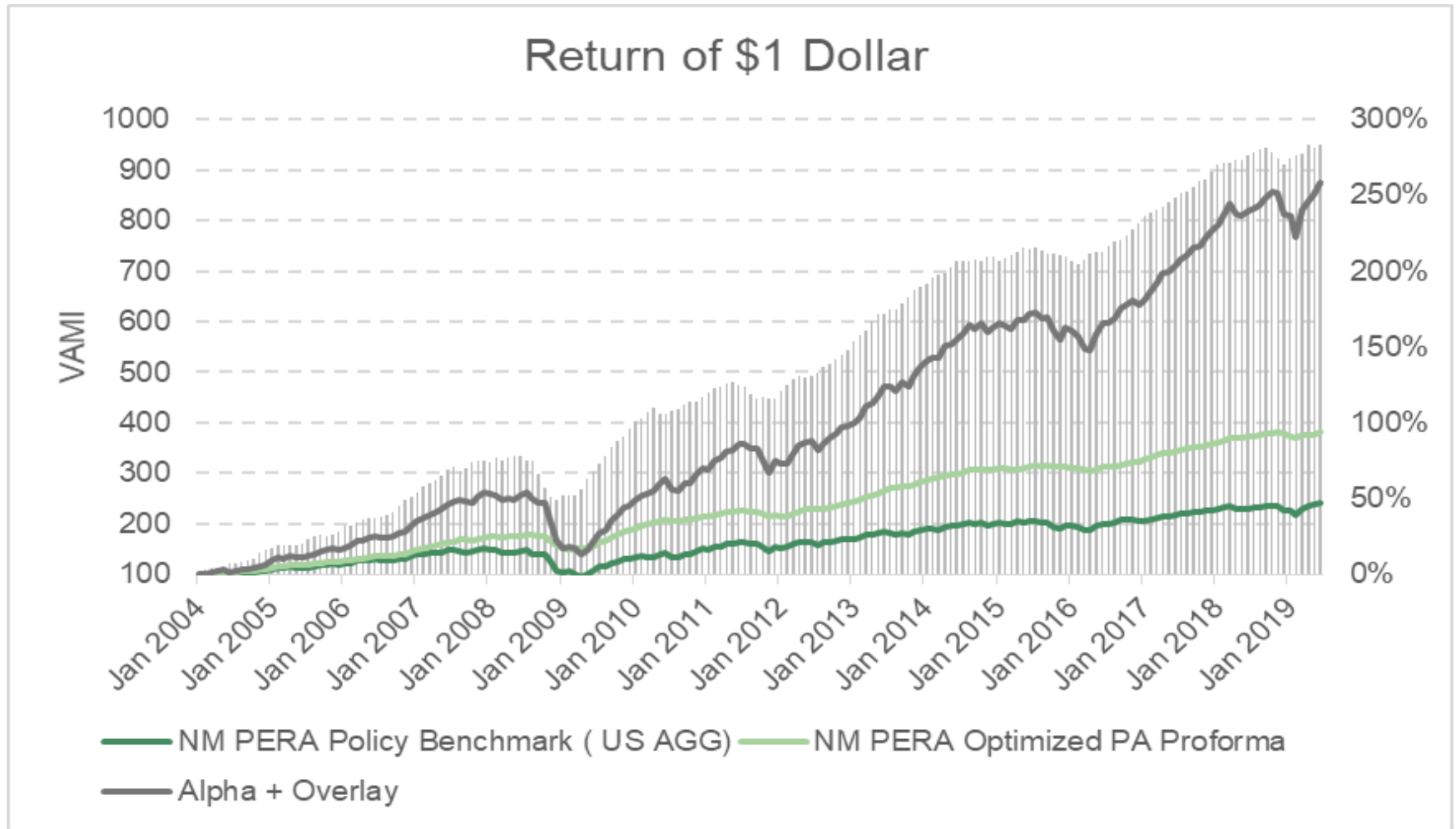
- Increased Risk Parity allocation aligns with strategic discussion from 2018
 - Reduces growth risk concentration

INCREASED RISK PARITY



- PERA implemented utilizing a unique, passive approach based on Wilshire's index methodology
 - Efficient execution at low cost
 - Outperformed source of funds by over 8% since inception through January

UNDERSTANDING THE BENEFITS OF PORTABLE ALPHA



CURRENT ACTIVE RISK BUDGET

Liquid Active Risk – Manager

(ex. MFS outperforms benchmark)

Selection

Selection – driven by manager selection and idiosyncratic risk in publicly traded asset classes

- Liquidity allows for more granular management of risk exposures

Liquid Active Risk – Structure

(ex. Small cap equity tilt)

Allocation

Illiquid/Implementation Risk

(ex. Private equity underweight vs. target)

Allocation or Implementation Decisions – the decision to take out of benchmark allocations in order to drive value through more efficient or higher returning assets classes

Total Active Risk Budget target of 1.5% (range of 1.0% to 2.0%)

POTENTIAL ACTIVE RISK BUDGET

Liquid Active Risk – Manager

(ex. MFS outperforms benchmark)

Selection

- Incorporate 10% target to Portable Alpha strategies to optimize return impact of increased active risk
- Continue to evaluate ways to enhance traditional active management exposure

Liquid Active Risk – Structure

(ex. Small cap equity tilt)

Structure

- Reduce liquid structural risk through overlay implementation

Illiquid/Implementation Risk

(ex. Private equity underweight vs. target)

Illiquid Implementation

- Moderately increase exposure to Private Equity (+1%) and Private Real Assets (+2%)

Increase Total Active Risk Budget target to 2.0% (range of 1.5% to 2.5%)

TOTAL PORTFOLIO MODELING

Asset Class	Reference Portfolio	Policy	Current Beta	+ Risk Parity (10%)
Global Public Equity	58.00%	28.50%	19.50%	16.00%
Global Low Volatility Equity		7.00%	7.00%	7.00%
Private Equity (Blend)			9.00%	9.00%
Core US Fixed Income	42.00%	17.00%	17.00%	17.00%
Global Core Fixed Income		2.50%	2.50%	
Global High Yield		12.00%	6.00%	1.00%
Emerging Market Debt		3.00%	3.00%	3.00%
Alternative Liquid Credit (Blend)				3.00%
Private Credit (Blend)			6.00%	6.00%
Global Real Estate Securities		7.00%	2.00%	2.00%
Public Real Asset (Basket)				
US TIPS		3.00%	3.00%	1.00%
Commodities		5.00%		
Global Listed Infrastructure		3.00%		
Master Limited Partnerships		2.00%	2.00%	2.00%
Private Real Estate (Blend)			5.00%	5.00%
Private Real Assets (Blend)			8.00%	8.00%
Risk Parity (15% Volatility)		10.00%	10.00%	20.00%
Cash Borrowing				
Total Assets	100.0%	100.0%	100.0%	100.0%
Expected Beta Return - 10 Years (%)	5.10	5.39	6.23	6.49
+ Portable Alpha at 10% Target	0.00	0.35	0.35	0.35
+ Traditional Active Return	0.00	0.20	0.20	0.20
= Total Expected Return - 10 Years (%)	5.10	5.94	6.78	7.04
Total Standard Deviation of Return (%)	10.57	9.93	11.11	11.61
+ /(-) in Expected Return - 10 Years (bps)		84	168	194
+ /(-) in SD of Return (bps)		(64)	54	104
Sharpe Ratio (Geometric)	0.31	0.41	0.44	0.45

- Modeling includes first three 2020 focus initiatives
 - Increase risk parity
 - Portable alpha target of 10%
 - Enhanced liquidity governance
- Assumes no correlation between active returns and beta returns

- July Board Retreat
 - Increased illiquidity
 - » Sharpe Ratio trade off
 - » Further liquidity management discussion
 - Leverage allowance
 - » Core bond enhancements
 - » Leverage governance