A Modern Approach to Short-to – Intermediate Term Investing

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Overview

- ✓ Short-term investment programs often take a back seat to other Treasury programs.
- ✓ Financial assets deserve to be optimized, not just invested.
- ✓ This approach can add value for virtually any size of cash/short-term investment pool
- ✓ Predominant value added is found in asset allocation and portfolio risk management, not security selection and/or a focus on esoteric yield-based products.

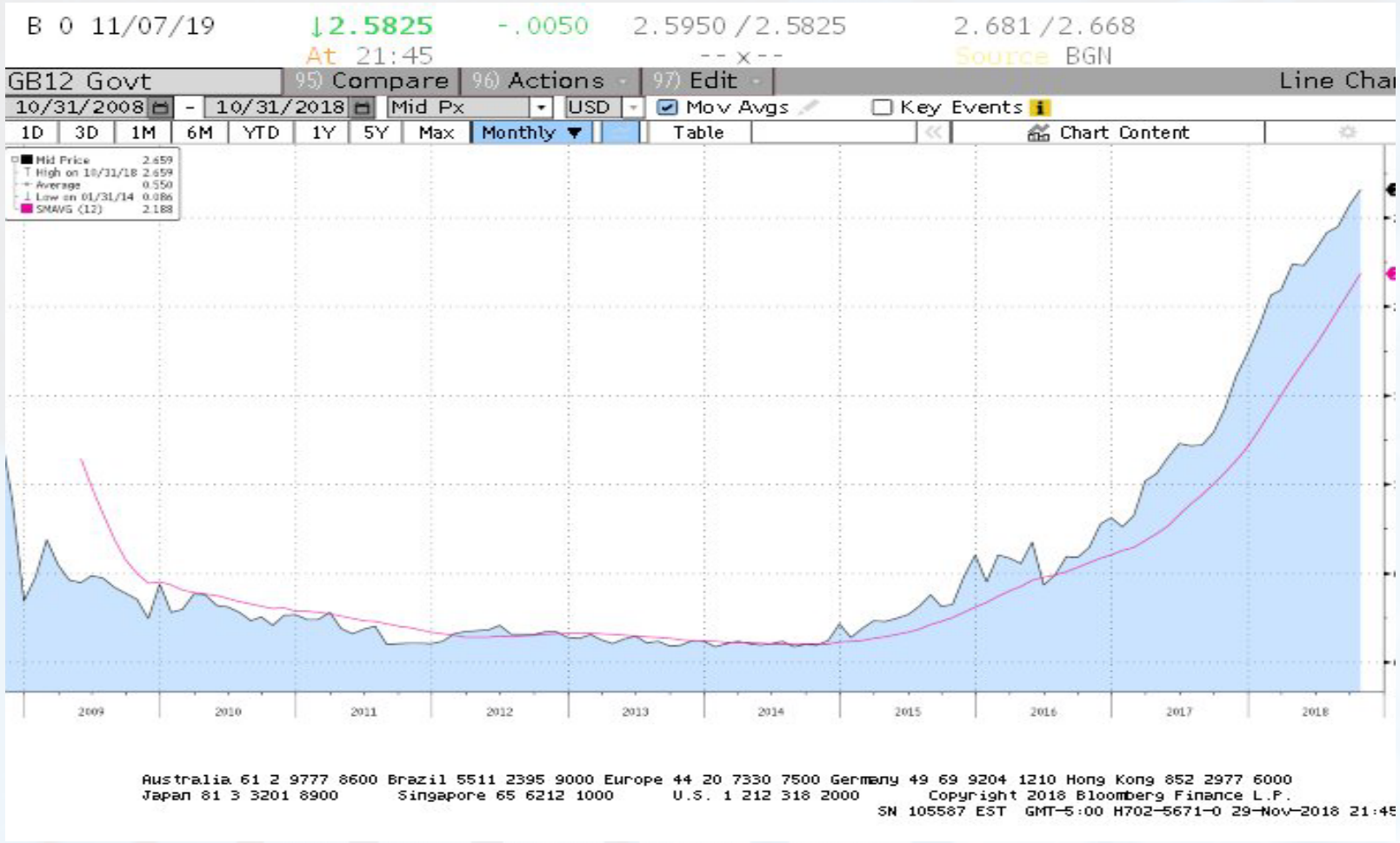
Key Takeaways ---

- ✓ Cash Management begins with understanding cash flows - Know what you really need on hand and invest the residual.
- ✓ Application of MPT to a Treasury investment program.
- ✓ Value proposition – appraisal, attribution, and value added vs. cost of implementation & management.

The Way Things Are…

- ✓ A investment officer/Treasurer/ Finance Director often wears many hats.
- ✓ Investment program often subordinated to working capital management, capital programs, and other Treasury operations.
- ✓ Chasing yield can cause us to neglect the risk/reward characteristics of the various sectors.
- ✓ Brokerage community often guides us toward a security-level focus on commission-rich, callable and exotic bonds like “step-ups” and others, none of which are ideal in a portfolio setting, offering asymmetric returns and rarely outperforming simple bond structures.
- ✓ Asset allocation is much more efficient than obsessing over the “best” investment, trade execution cost, and yield.
- ✓ As a result, we’re making investing more complicated than it needs to be. We should focus on fundamental portfolio perspective.

Last 10 Years – 1 Year Treasury Rates – Rates Change



The markets are off the floor and having a disciplined strategy will help in managing change.

Strategic Asset Allocation – Why?

How do I know, given my allowable sector universe, that I am receiving the optimal benefit for the amount of risk my organization is willing to assume?

Risk is defined as volatility or price change over periods of time.

Analyze the funds liquidity requirements

Understand the purpose and time horizon of the cash management funds-

Based on the monthly ending balance a $500MM core portfolio level appears reasonable.

	HISTORICAL BALANCE
	FY 2018
July	$ 590,843,707
Aug	$ 594,392,230
Sep	$ 564,268,561
Oct	$ 561,653,190
Nov	$ 541,534,962
Dec	$ 541,724,780
Jan	$ 569,084,049
Feb	$ 570,501,513
Mar	$ 551,287,431
Apr	$ 630,616,621
May	$ 643,274,873
Jun	$ 680,838,902

Steps involved in creating an enhanced public funds investment strategy

1. Investment policy statement
2. Set aside sufficient liquidity
3. Determine Core Investment balances
4. Determine Your Entities Asset Class Universe
5. Determine the Optimal Strategic Asset Class Universe
6. Construct Portfolio
7. Tactical Asset Allocation
8. Report and monitor for transparency and accountability

Step 1: Investment Policy Statement

Purpose of a Policy:

1) Program Mandate
2) Return Objectives
3) Risk Tolerance
4) Asset Class/Sector Universe
5) Macro Constraints

Sample Objectives & Constraints

- ✓ **Return Objective – Achieve market total rate of return through interest rate cycles, measured in relation to a custom policy portfolio benchmark.**

- ✓ **Risk Objective – Target total volatility (measured as stnd. dev.) of 1.5% to 2.5%, and manage downside deviation (via duration controls) to no more than 10%.**

- ✓ **Constraints:**
  - ✓ **Liquidity – demands should be low.**
  - ✓ **Regulatory – securities & investment types must be permissible per governing law and IPS**
  - ✓ **Time horizon – intermediate, as Core Portfolio is a supplementary liquidity source.**
  - ✓ **Tax – Treatment of realized gains/losses could have a significant impact.**
  - ✓ **Unique circumstances – None.**

Major Components of Total Risk

Have specific guidelines to constrain various risk:

1. Duration Risk: Establish a maximum average maturity and maximum single maturity of the cash management program – Example: 2 years and 5 years.

2. Credit Risk: Put limits on the % exposure of credit i.e.: 25% IG and 10% HY.

3. Currency Risk: Put limits on currency exposure.

4. Inflation Risk: This is the hidden risk and can be managed.

Step 2: Liquidity Assurance

- ✓ Predominant to investment management is assurance of sufficient liquidity to meet expected/forecasted obligations.
- ✓ Set aside sufficient cash in a Liquidity Portfolio. How much?
- ✓ Use historical, budgeted and purpose of the funds – if you know there is a big purchase in the works then you may need to hold higher liquidity.

Step 3: Determine Core Portfolio Balances

- ✓ Balances are extremely unlikely to be required for liquidity purposes.
- ✓ Treated as short/intermediate term fixed income portfolio (app. 2.5 to 3-year duration).
- ✓ As a contingent liquidity source, risk objective must supersede return objective.
- ✓ Clearly state portfolio mandate, return objective, risk tolerance, and investment constraints.
- ✓ Focus is on asset allocation among fixed income sectors.
- ✓ Semi-active management via over-/underweighting sectors, not security selection.
- ✓ Performance appraisal and attribution are key to measuring success.

Assessing Risk Tolerance

- ✓ Determining the investment oversight committee's risk tolerance not only drives total risk target, it also helps determine sector universe.
- ✓ Administer risk tolerance questionnaire to derive committee's collective relative acclimation/aversion to risk.
- ✓ Answers can be scored and quantified to an entity total risk target.
- ✓ This risk target in turn will primarily drive the entity's choice of its strategic asset allocation, or policy portfolio.
- ✓ Using IOC's composite risk aversion score, test various portfolios using:
  - ✓ Investor Expected Utility
  - ✓ Roy's Safety First
- ✓ Helps to determine government's volatility limits and targets

Modern Portfolio Theory

- ✓ Developed by Harry Markowitz in the 1950's (won the Nobel for this work).
- ✓ Sought to quantify the relationship between the returns, risks, and correlations of various asset classes.
- ✓ Believed that for any given risk target, a mathematical process will yield a combination of the contemplated asset classes offering the highest return. Likewise, for a given return target, the process will provide the mix offering the lowest total risk.
- ✓ This is very powerful, and permits us to achieve the highest risk-adjusted returns by focusing at the 30,000-foot, average asset class level, rather than on which bond offers the best yield today!
- ✓ First, let's define asset classes (fixed income sectors in our case), then look at how portfolio "optimization" works.

Step 4: Determine your Entity's Asset Class Universe

- ✓ Asset Class: a group of securities that exhibit similar characteristics (a correlation study, discussed later, will help to determine these).
- ✓ Common asset classes: Equities, Fixed Income, Real Estate, Commodities.
- ✓ We're focused on the short/intermediate-term Fixed Income universe, so we'll define our asset classes as fixed income sectors, such as:
  - ✓Treasuries
  - ✓Agencies
  - ✓A-AAA Corporates
  - ✓A-AAA Municipals
  - ✓High-Yield Securities
  - ✓Treasury Inflation-Protected Securities (TIPS)
  - ✓Developed Markets Global Securities

- ✓ **To model and track the performance of these sectors, 1-5 year index historical data available for these sectors from Barclays (included with Bloomberg subscription) and Merrill Lynch.**

- ✓ **This data (which can be adjusted for capital market expectations) can be used in the MPT “optimization” process.**

- ✓ **The entity may decide to exclude one or more sectors from the optimization due to its risk tolerance.**

5. Choosing the Strategic Asset Allocation

- ✓ Begin with volatility target, stated as a range, i.e., +/- 50bps of a target standard deviation.
- ✓ Analyze efficient portfolios in that risk segment, considering inclusion of desired sectors and their mix.
- ✓ Select the Policy Portfolio (SAA).
- ✓ Implement. Consider a Tactical Asset Allocation mix.

Historical Returns of Asset Classes

Asset Class	Effective Duration	5 Yr Annualized (6/13 - 6/18)	One Year (6/17 - 6/18)	Annualized Standard Deviation	Maximum Monthly Return	Minimum Monthly Return	Range
1-5 Year US Treasuries	2.58	0.81%	-0.35%	1.94%	2.19%	-1.58%	3.76%
1-5 Year Agency Bullets	2.00	0.97%	0.03%	1.86%	2.55%	-1.59%	4.14%
1-5 Year Municipals	2.72	1.20%	0.19%	1.94%	2.04%	-1.42%	3.45%
1-5 Year A-AAA Corporates	2.80	2.03%	0.15%	3.11%	2.99%	-6.35%	9.35%
1-5 Year High Yield	2.26	4.60%	3.71%	7.51%	9.99%	-14.26%	24.25%
1-5 Year TIPS	2.52	0.71%	1.39%	2.99%	2.72%	-5.15%	7.87%

Portfolio optimization elements and formula

- ✓ For each asset class, we'll need a representative set of historical data:
  - ✓ Annual Total Returns
  - ✓ Annual standard deviations

- ✓ From this data, one can compute correlation coefficients for each asset class with each of the others.

- ✓ Then the total returns, standard deviations, and correlations are processed through an optimization formula to produce a set of "efficient" mixes, or portfolios that offer:
  - ✓ The highest total return for a given risk level, or
  - ✓ The lowest total risk for a given total return.

- ✓ The keys to the power of optimization for corporate Treasurers:
  - ✓ Including credit sectors to boost returns, while
  - ✓ Combining assets that don't move in tandem through various market cycles (lower correlations) to mitigate risk.

- ✓ Let's take a look at the correlations of the sectors listed on the previous slide.

Correlation Table

- ✓ **Sectors with correlations of 0.50 or less are considered great diversifiers, as their volatilities will tend to offset.**
- ✓ **Note that High Yield is the best diversifier of these, tending to behave more like Equities.**
- ✓ **Sectors with very high correlations (i.e., Treasuries and Agencies) may compel one to eliminate one of them from the optimization (or treat them as one asset class), as they're not mutually exclusive.**

From 6/30/13 to 6/30/18

		Correlation						
Asset Class	Sharpe Ratio	1-5 Year US Treas	1-5 Year Agency Bullets	1-5 Year Munis	1-5 Year A-AAA Corps	1-5 Year High Yield	1-5 Year TIPS	RIY Russell 1000
1-5 Year US Treasuries	0.94	1.00						
1-5 Year Agency Bullets	1.10	0.92	1.00					
1-5 Year Municipals	0.99	0.39	0.41	1.00				
1-5 Year A-AAA Corporates	0.84	0.65	0.72	0.55	1.00			
1-5 Year High Yield	0.93	(0.15)	(0.12)	(0.09)	0.16	1.00		
1-5 Year TIPS	0.74	0.50	0.55	0.44	0.67	0.24	1.00	
RIY Russell 1000	0.67	-0.36	-0.26	-0.11	-0.04	0.55	0.165	1.00

Optimization Results – the "Efficient Frontier"

- ✓ Portfolios on the frontier line are those the entity will want to select from.
- ✓ One would not select any portfolio below the frontier, because for the same risk exposure the portfolio on the line just above will offer a higher return, or for the same return the portfolio mix on the line just to the left will have less risk.
- ✓ Notice the power of diversifying and adding credit sectors:
  - ✓ The mix directly above muni's and Treasuries on the frontier, which contains most of the optimized sectors, has the same volatility of about 1.88%, but offers approx. 50bps higher return annually
  - ✓ A-AAA Corporates offer about a 3.10% annual return, around 50bps higher than the referenced efficient mix, but annual volatility increases by 60% (from 1.95% to 3.1%)
  - ✓ The referenced efficient portfolio has a 10% HY allocation. HY has over 7% volatility, but because of its low correlation with other sectors it significantly boosts return while controlling risk.

Optimizing the Asset Mix

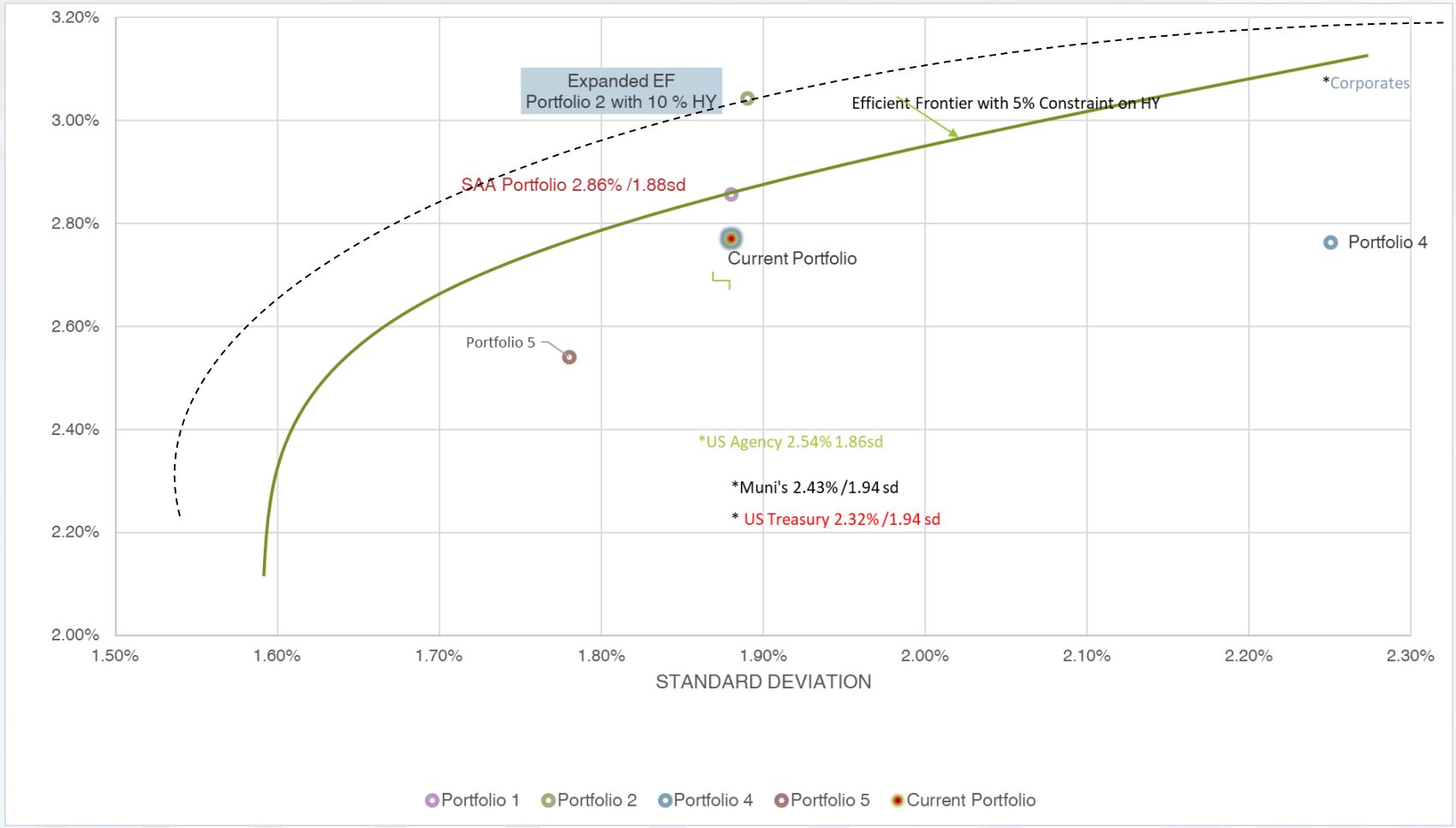
Best returns for constrained portfolio to 5% HY

	Asset Class	Weight	Standard Deviation	Expected Return	Convexity	
1	1-5 Year US Treasuries	15%	1.94%	2.32%	0.09	
2	1-5 Year Agency Bullets	40%	1.86%	2.54%	0.08	
3	1-5 Year Municipals	15%	1.94%	2.43%	0.09	
4	1-5 Year A-AAA Corporates	20%	3.11%	3.10%	0.08	
5	1-5 Year High Yield	5%	7.51%	7.49%	(0.34)	
6	1-5 Year TIPS	5%	2.99%	2.70%	0.04	Roy's SF
	Portfolio 1	100%	1.88%	2.86%	0.06	**0.46**

Constrained portfolio to 10% HY- Not doing because of the higher exposure to high yield

	Asset Class	Weight	Standard Deviation	Expected Return	Convexity	
1	1-5 Year US Treasuries	30%	1.94%	2.32%	0.09	
2	1-5 Year Agency Bullets	25%	1.86%	2.54%	0.08	
3	1-5 Year Municipals	15%	1.94%	2.43%	0.09	
4	1-5 Year A-AAA Corporates	15%	3.11%	3.10%	0.08	
5	1-5 Year High Yield	10%	7.51%	7.49%	(0.34)	
6	1-5 Year TIPS	5%	2.99%	2.70%	0.04	Roy's SF
	Portfolio 2	100%	1.89%	3.04%	0.04	**0.55**

Efficient Frontier- Combined Portfolio Generates higher return for less risk with a 5% Constraint on HY – 5 year data 6/30/13 to 6/30/18



Historical returns do not guarantee future returns

6. Constructing the Portfolio

- ✓ Select a benchmark. While legacy Treasury/Agency benchmarks are popular, they aren't really appropriate for this type of strategy.

- ✓ Characteristics of a good benchmark (SAMURAI is acronym);
  - ✓ Specified in Advance
  - ✓ Appropriate (perhaps most important)
  - ✓ Measurable
  - ✓ Unambiguous
  - ✓ Reflective (PM understands the components)
  - ✓ Accountable
  - ✓ Investable

- ✓ Best benchmark may be the SAA itself!

Constructing the Portfolio (continued)

- ✓ Use index mutual funds or ETF's, mandated to mimic the indices used in the optimization, to build the sector positions.
- ✓ This will reduce tracking error (divergence between price behavior of the investment and its benchmark).
- ✓ Although it will result in some tracking error, compile the Treasury/Agency allocation with direct bond purchases. This will serve as lever for overall portfolio duration control.
- ✓ Buy wisely, seeking best execution.
- ✓ Mutual fund tip – ensure you buy the institutional class, as expense ratio is usually lower.
- ✓ ETF tip – for larger purchases, seek offers from AP's as opposed to placing market order with a broker.

7. Tactical Asset Allocation

- ✓ The SAA strategy will, over economic cycles, produce higher risk-adjusted returns than a legacy Treasury/Agency approach, as well as a non-optimized strategy using the same sectors.

- ✓ However, assuming the SAA is used as the primary benchmark (we suggest using the legacy benchmark as a secondary yardstick), your entity may have a return objective to achieve a certain level of alpha, or excess return, relative to the benchmark.

- ✓ To achieve alpha over the upcoming quarterly or annual horizon, rather than rely on manager skill in security selection, the PM can look to more macro factors such expected changes in economic conditions, spreads, and other relationships.

Tactical Asset Allocation

- ✓ Then the PM can simply vary the target mix of sectors from the SAA mix, rebalancing the portfolio to the desired mix.

- ✓ We can add a Duration play, setting the portfolio duration short or long of the benchmark duration, based on our expectations of short-term market interest rate movements.

Step 8: Performance Appraisal & Attribution

- ✓ This is the value proposition – does the new strategy produce value-added relative to the previous approach, net of costs to implement and manage?
- ✓ Appraisal Metrics:
  - ✓ Total Return % and $ out-performance vs. the SAA benchmark portfolio and the legacy portfolio
  - ✓ Sharpe Ratio – risk-adjusted return statistic. It's the risk-exposed return, per the level of risk exposure. The higher the Sharpe, the better. Compare to benchmark's and other relevant Sharpe Ratios.
  - ✓ Cumulative $ out-performance. Calculate new strategy inception-to-date $ total return and compare to legacy benchmark. $ return should be net of any advisory fees and other costs, if any.
- ✓ Attribution: We not only want to know if we out-/under-performed established standards, but why? Was it TAA over-/under-weighting of sectors? Was it our Duration tactic? Was it luck?

Performance Appraisal & Attribution

Attribution Analyses:

- **Sector weighting (TAA)** – Analyze return of each sector, focusing on how over-/under-weighting vs. benchmark weighting impacted portfolio return.
- **Tracking error** – Analyze sector-level returns of portfolio and benchmark. Determine reason for any tracking error (MF/ETF fees, portfolio instrument composition vs. benchmark composition, other).
- **Rebalance timing** – impact of lag between TAA portfolio rebalancing and/or SAA benchmark change decisions and portfolio implementation.
- **Duration** – impact of either defensive (short) or proactive (long) duration positioning vs. the benchmark duration.

These exercises inform us of how we're performing (appraisal) and why, to inform us of how we may improve future risk-adjusted performance.

Performance Appraisal & Attribution Alpha Analysis

Total Return Since Incepton 7/31/14 to 1/31/19 - Asset Allocation Strategy

Portfolio	Average Balance	Dollar Growth	Average Duration	Sharpe Ratio	Return Annualized	Standard Deviation	Raw Return
City of Albuquerque	$496,842,140	$28,816,844.12	2.37	0.77	1.26	0.98	5.80
Prior 0-3 Govt Benchmark		$22,407,580.51	1.45	0.89	0.98	0.54	4.51
Increase in Earnings over Previous Benchmark		$6,409,263.61					

City of Albuquerque Results & Lessons Learned

- ✓ Our SAA program has been in effect for just over 4 ½ years.
- ✓ Relative to our legacy program, which was benchmarked to a 0-3 year, 70%/30% Agency/Treasury index, we've created approximately $6.5mm of value added on a total return basis, net of advisory fees, even with the recent market rate hikes.
- ✓ Over several measurement periods, the portfolio's Sharpe Ratio has exceeded that of a 100% Treasury portfolio!
- ✓ Education of oversight committee, and clear determination of its risk tolerance, are key to successful implementation and sustenance.
- ✓ Gaining relative value from semi-active management (TAA sector weighting) and even duration management is very difficult.
- ✓ We believe retaining an advisor is critical to build oversight body trust, assist with implementation, and provide required reporting.

Conclusion

- ✓ Parsing the cash portfolio into Liquidity and Core components dramatically reduces the effort involved in matching investments' cash flow timing to obligations. Core money can be invested on a value-added total return basis.

- ✓ Diversified index-based exposure to credit asset classes such as corporate bonds, when combined with traditionally used asset classes (Treasuries & Agencies), can dramatically improve returns over long investment horizons while meeting entities' risk tolerance objectives.

- ✓ Once implemented, it's a much less time-consuming approach than traditional security selection tactics. Focus is shifted to consideration of asset class allocation shifts based on forward-looking capital markets expectations.

- ✓ Duration management and asset constraints (bands) help to ensure that excessive risk is not taken.

- ✓ Even for moderate-sized cash portfolios, the Core/Liquidity portfolio bifurcation approach helps to ensure the most optimal use of funds.

Questions?

Disclosure: This presentation if informational only and is not a recommendation. Each organization must complete their own risk analysis to determine if an investment strategy is appropriate for the dedicated funds.