NUVEEN
ASSET MANAGEMENT

How to Make Your Fixed Income Portfolio Work Harder for You!

September 18, 2018

2018 Public Pension Funding Forum

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Pension Risk Concepts

Demographic Leveraging – Impact of Negative Return

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Mature plan has a larger financial impact on the plan, which means higher risk

	Young Plan	Mature Plan
Total Liability	1,500	2,500
Assets	1,200	2,000
Funded Ratio	80%	80%
Deficit	300	500
Assets after -10% return	1,080	1,800
Funded Ratio	72%	72%
Increase in Deficit	120	200
Deficit	420	700
Annual Revenue	1,000	1,000
15-year amortization of deficit (% of revenue)	3.5%	5.8%

Pension Risk Overview

- Growth assets like equities may help assets keep up with inflation-sensitive liability
- Investment time horizon for retirees shorter; retiree payments are easily “matched” or “hedged” with bonds
- Large plan relative to tax base means investment shortfalls have bigger impact on government finances
- High benefits payment as percent of assets indicates mature plan with shorter time horizon
- Increasing payroll means contributions are increasing and new cash flow will mitigate impact of volatility

Higher risk investments OK ← → Lower risk investments advised

	Active & Retiree	Active Only	None
Inflation-sensitive			X
	< 40%	40 – 60%	> 60%
Retiree Liability			X
	< 150%	150% - 250%	> 250%
Size of Plan		X	
	< 5%	5% - 8%	> 8%
Total Cash Outflow		X	
	Steady	Slow	None
Increase in Payroll			X

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Example Pension Risk Assessment

Metric	City of ABC	High Risk	Public Fund Survey
Funding Metrics			
Funded ratio (market)	80%	< 70%	71%
Unfunded liability % of revenue	36%	> 50%	
Unfunded liability % of payroll	113%	> 250%	220%
Contribution % of revenue	6.7%	> 7.0%	
Plan Maturity Metrics			
Active to retiree ratio	0.95	< 1.00	1.44
Plan liability % of revenue	180%	> 200%	
Retiree liability % of total	63%	> 60%	
Net cash flow % of assets	-2.8%	< -3.0%	-2.3%
Other Metrics			
Discount rate	7.5%	> 7.0%	7.5%
Fixed income coverage of retiree liability	38%	< 50%	50%

Source: Nuveen Asset Management calculations based on data from City of ABC, National Association of State Retirement Administrators Public Plan Survey from FY 2015

Observations on Retirement Plan for City of ABC

- Level of plan risk is moderate since the plan liability is of manageable size
- No cost-of-living adjustments (COLA) allows for close asset-liability match
- Investment time horizon is relatively short, as indicated by number of retirees, negative cash flow and low anticipated payroll growth

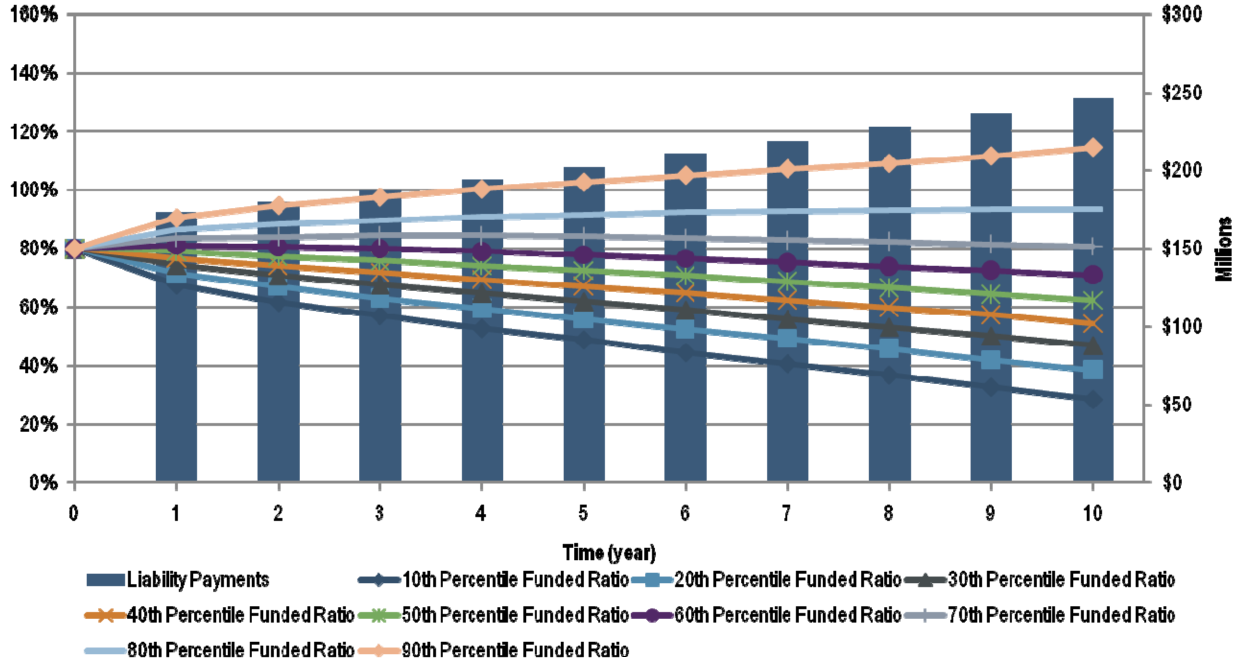
Pension Time Horizon May Be Frontloaded

Time Period	% of Pension Liability
0-10 years	43%
10-20 years	30%
20-30 years	17%
30-40 years	8%
40+ years	2%

Sample plan based on 7.50% discounting.

10-Year Potential Funded Ratio Scenarios

Assuming future contributions equal the normal cost, the hypothetical plan has a 70% probability of a declining funded ratio and a 50% probability of a decline greater than 20%.



Source: Nuveen Asset Management, City of ABC

The hypothetical "black hole" scenario was constructed using return and volatility assumptions for ABC's target asset allocation, assumed future liability values, assumed future contributions, and assumed benefit payments. Changes in the assumptions may change the results. Different examples and market conditions will result in different outcomes. Data is provided for illustrative purposes only and has been obtained from sources believed to be reliable, but is not guaranteed for accuracy or completeness and should not be relied upon for investment advice. The reader should not assume that an investment and/or the strategies identified were or will be profitable or will meet its investment objectives. Data reflects hypothetical, or simulated, performance results of a fictional account managed in part by a proprietary quantitative model. It does not reflect the results of an actual client account. Hypothetical results are no guarantee of future results. This presentation contains no recommendations to buy or sell any specific securities and should not be considered investment advice of any kind.

Impact of Investment Loss on Required Returns to Breakeven

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Lower funded status and negative cash flow make it harder to recover

Rate of return required to regain funded status in 10 years after -15% return in year 1

Original Funded Status	Net cash flow % of assets			
	-4%	-2%	0%	2%
60%	12.60%	11.40%	10.30%	9.50%
80%	11.80%	11.00%	10.30%	9.80%
100%	10.90%	10.60%	10.30%	10.10%

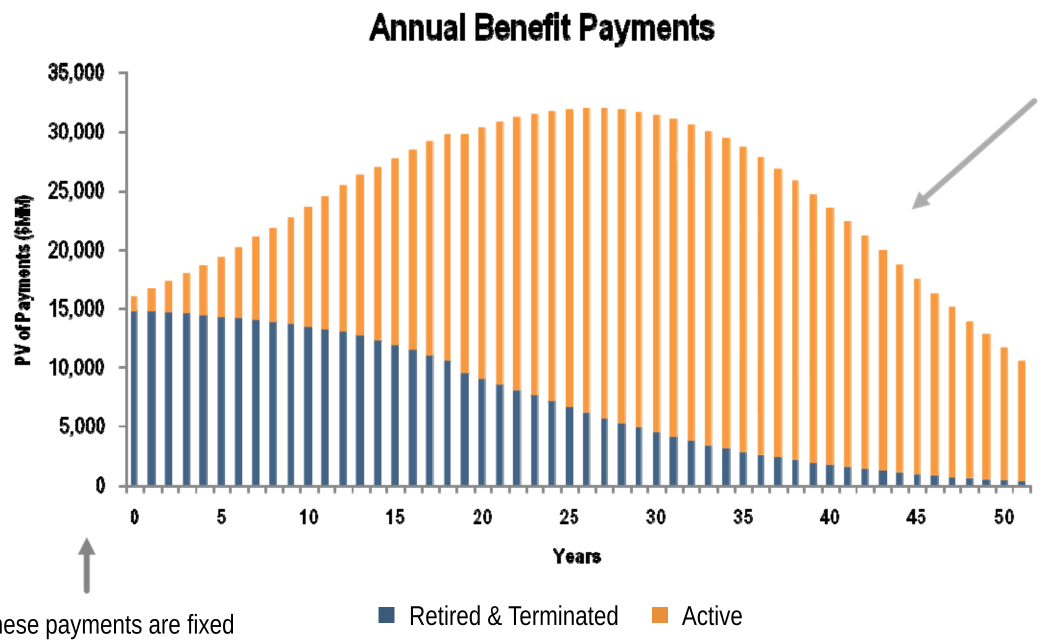
Source: Nuveen Asset Management. Contributions assumed to cover normal cost only

Demographic-Based Investing

Benefits of Demographic-Based Investing (DBI)

- Focuses on creating the cash flow to pay benefits
- Brings assets & liabilities together in a single risk framework
- Adapts level of risk to plan demographics
- Risk is reduced as plan population ages because:
  - Investment time horizon decreases
  - Impact of negative returns increases with negative cash flow
  - Plan assets & liability are larger relative to revenue base – “demographic leveraging”
  - Liquidity becomes more important

Payment Obligation Profile



These payments are long-term, uncertain, related to economic growth, allow more time for funding

These payments are fixed and paid in the short-term

Source: Nuveen Asset Management, City of ABC

Potential DBI Solution – Including Contributions

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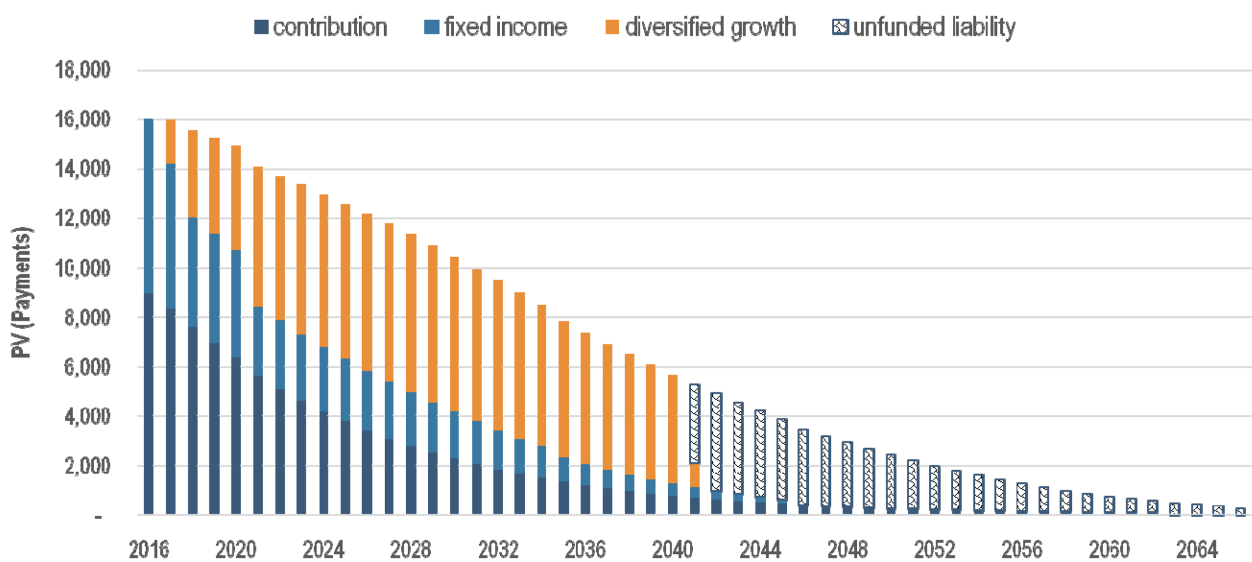
Funded Ratio at 80%:

- Allocation – 70% Diversified Growth/ 30% Matching Fixed Income
- 41% of net payment obligations matched; 69% of net retiree payment obligations matched



Note: PVB cash flows; only contributions attributable to current members are included.
Source: Calculations by Nuveen Asset Management based on data from City of ABC.

Fixed Income – Traditional v. DBI

Change in perspective on fixed income with demographic-based approach

- A matching bond cash flow eliminates asset and liability risk

	Traditional Fixed Income	DBI Fixed Income
Objective	Diversification	Align with payment obligation
Key risk	Interest rate sensitivity	Reinvestment risk
Risk Metric	Return volatility	Shortfall relative to payment obligation
Low risk fixed income	Short maturity	Maturity = payment time horizon
Impact of rate rise	Price loss	Higher yield

How Can We Keep Public Pension Plans Alive and Well?

- Align risk with size of plan and plan maturity
- Adapt investments to plan demographics and sponsor's ability to take risk
- Tailor investment strategy relative to pension liability payouts
- Regularly assess risk at a strategic level

Important Information for Demographic-Based Investing

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The hypothetical portfolio illustrates the risk profile of securities NAM would expect to own. Actual holdings depend upon valuations and market availability at the time of purchase. The hypothetical characteristics and performance information represents the investment results, unless otherwise stated, that the hypothetical strategy would have received if invested on9/12/2016. Please note that market yields have changed since those dates. Hypothetical characteristics and returns have many limitations. No representation has been 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 actual results achieved. Hypothetical returns may not reflect the impact that material economic and market factors may have had on the decision-making process if client portfolios were actually managed in the manner shown. The impact of fees, inflows and outflows are not taken into consideration. Hypothetical returns are constructed and presented with the benefit of hindsight, and no assurances are provided regarding future results. The results of the underlying securities of the hypothetical strategy do not reflect the deduction of any fees or expenses, and assume reinvestment of all distributions.

Investing in securities involves risk of loss that investors should be prepared to bear. There is no assurance that any investment will provide positive performance over any period of time. Past performance is no guarantee of future results and different periods and market conditions may result in significantly different outcomes.

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153048-INST-AN-04/18

Wells Capital Management

Analytic Investors – Factor Based Investing

September 18, 2018

NCPERS Public Pension Funding Forum

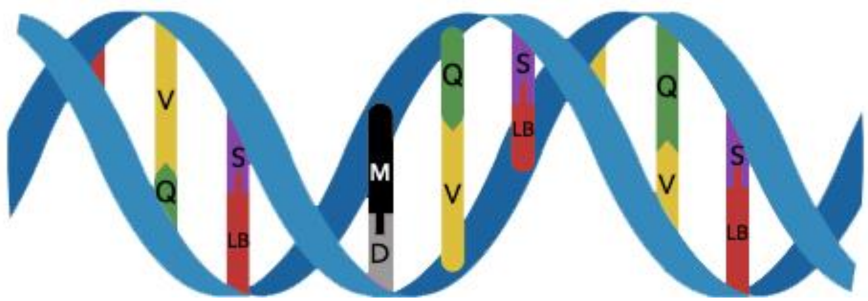
Robb Ruhr, CFA

Together we'll go far

Factor-based investing

What is factor-based investing?

- Like DNA, a factor is a primary characteristic of a portfolio that explains its behavior over long periods of time.



- Factor-based strategies target exposure to intuitive, well understood, well researched investment ideas such as:

Small Size	Value	Momentum	Quality	Low Volatility
Smaller companies	Inexpensive stocks	Trending stocks	Financially healthy firms	Lower risk stocks

Factor-based strategies – Active or passive?

Factor-based strategies include many of the benefits of passive management, such as high transparency, low turnover, and low fees, while preserving the ability to add value over the market benchmark like more traditional active products

Passive → **Active**

	Traditional cap-weighted Index	Factor-based Investing	Traditional active management
Transparency	High	High	Low
Performance attribution	Simple	Simple	Complex
Turnover and trading costs	Low	Low	Moderate to high
Capacity	High	High	Low to moderate
Fees	Low	Low	Moderate to high
Exposure to style factors	None	Moderate	Moderate
Potential for outperformance	None	Moderate	Moderate to high

Smart Beta Continues to Gain in Popularity

Smart Beta Adoption Survey

- A recent survey of major investors reports that almost three-quarters of asset owners are already using or are actively evaluating smart beta (FTSE Russell [2017])

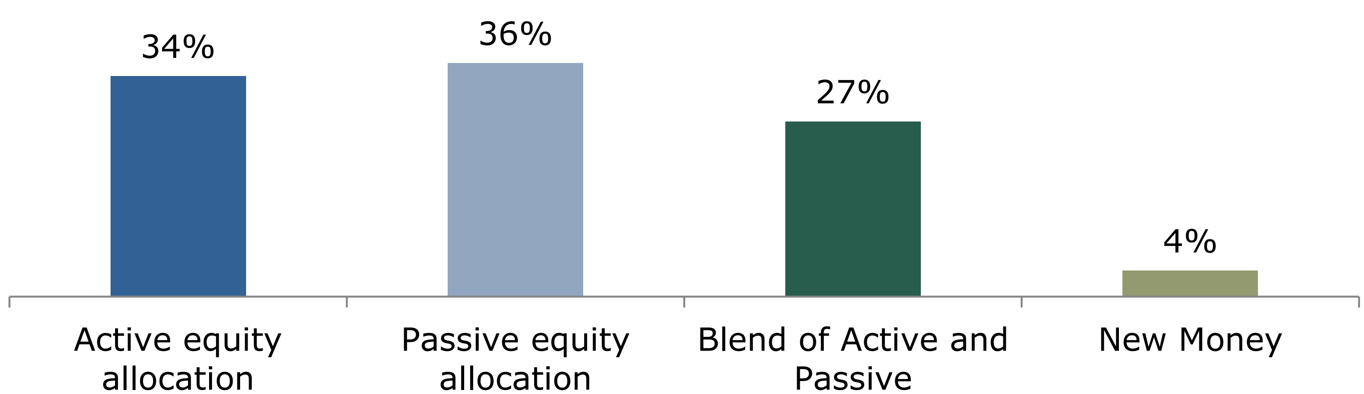
- Of those with an allocation to smart beta, nearly two-thirds are evaluating additional allocations

- These market participants, with over USD 2 trillion in assets, include corporations, governments, pension plans and nonprofit organizations, and they have adopted factor investing as an integral part of their strategy.

How are these investors using Smart Beta?

✓ Enhance Returns
✓ Reduce Risk
✓ Improve Diversification
✓ Reduce Cost

Where are the funds coming from?



Source: FTSE Russell, "Smart Beta: 2017 Global Survey Findings From Asset Owners", 2017.

Case Study – Portfolio impact

Investors can apply factor-based investing in various ways

Replacement for passive management

- Exposure to proven sources of return increases the odds of outperforming the market

Strategic allocation to a multifactor strategy

- Disciplined, targeted exposures to desired factors can improve returns and/or lower risk.
- For example, including the low volatility factor can help lower volatility and improve downside protection, which helps investors stick with their plans

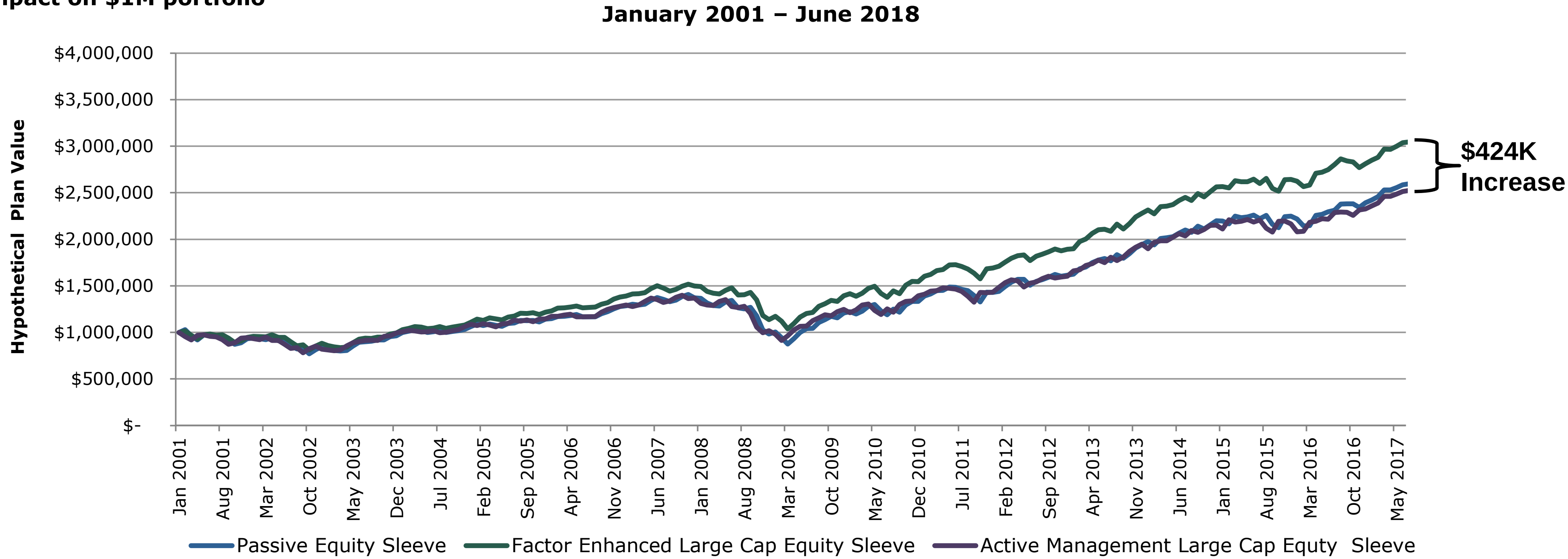
Replacement for active management

- Preserves the potential for outperformance, however offers a more disciplined, transparent, and less expensive option than traditional active management

Case Study 1: Simple Portfolio impact

Multifactor Strategies can improve returns and lower risk

Impact on $1M portfolio



	Passive Index 70% Russell 1000 30% Barclays U.S. Aggregate	Active Management 70% Median Manager 30% Barclays U.S. Aggregate	Factor Enhanced 70% Wells Fargo Large Cap[1] 30% Barclays U.S. Aggregate
Return	6.18%	5.99%	7.02%
Risk	10.03%	9.71%	9.12%
Return / Risk	0.62	0.62	0.77

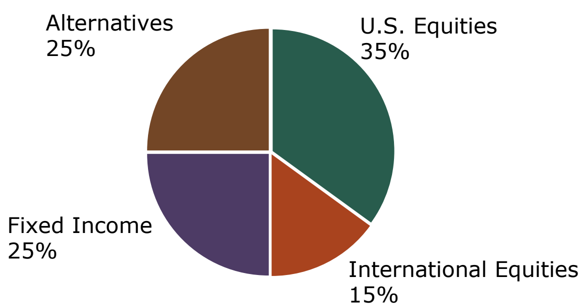
Source: eVestment

1 The Wells Fargo Factor Enhanced Large Cap Index went live 4/12/2017. Index data prior to this is data has been back-tested and provided by the index calculation agent. Solactive AG uses its best efforts to ensure that the Index is calculated correctly. Irrespective of its obligations towards the Issuer, Solactive AG has no obligation to point out errors in the Index to third parties including but not limited to investors and/or financial intermediaries of the financial instrument. Neither publication of the Index by Solactive AG nor the licensing of the Index or Index trade mark for the purpose of use in connection with the financial instrument constitutes a recommendation by Solactive AG to invest capital in said financial instrument nor does it in any way represent an assurance or opinion of Solactive AG with regard to any investment in this financial instrument. Fees are taken from the eVestment database and are computed as 50bps for active, 10bps for Russell 1000, and 15bps for Factor Enhanced Index.

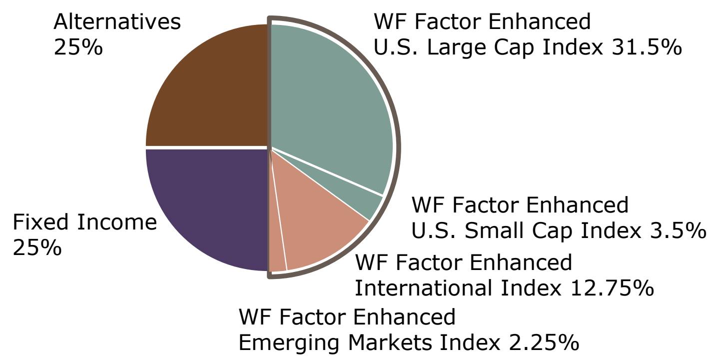
Past performance is not indicative of future results.

Case Study 2: Replacing mediocre active managers

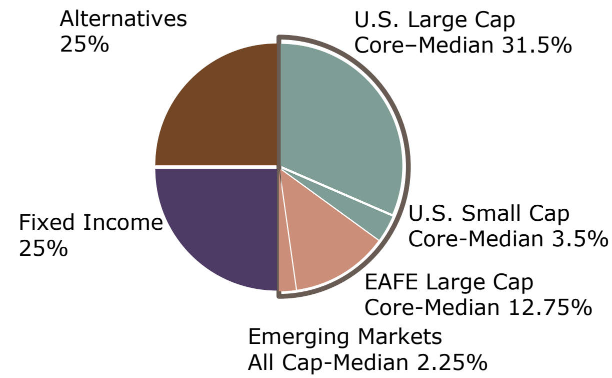
Base Case (all passive)



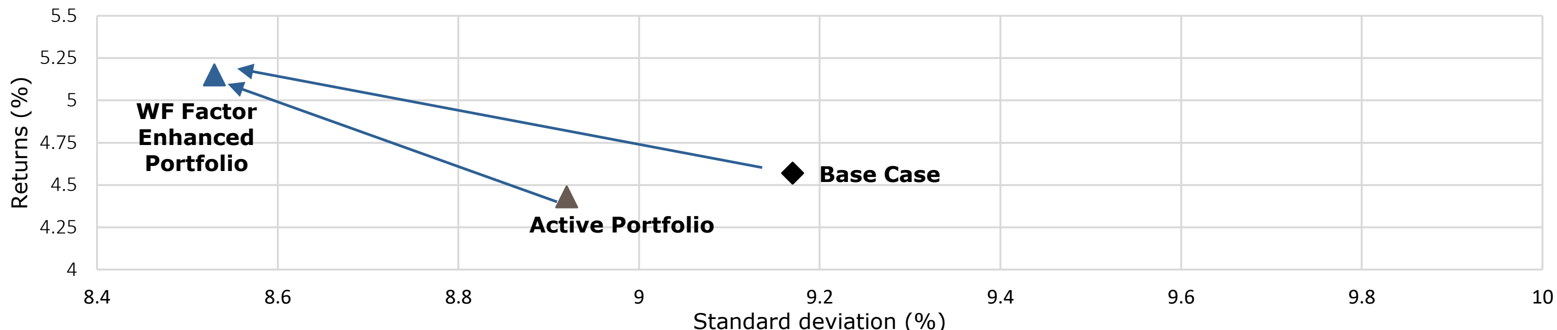
Hypothetical 2 (WF Factor Enhanced)



Hypothetical 3 (Median Active Manager)



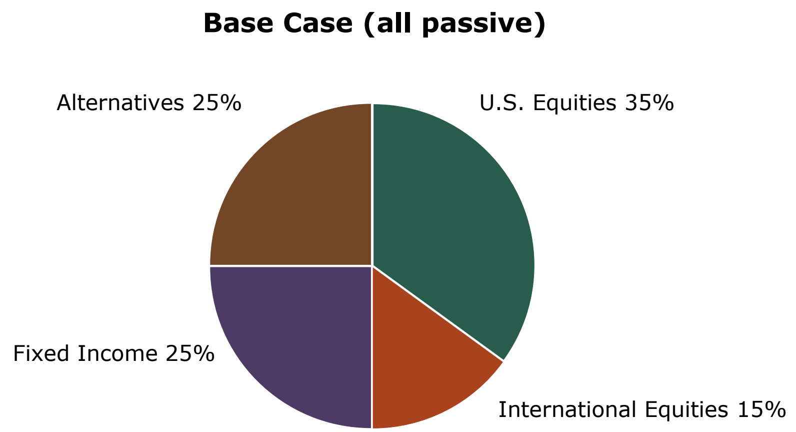
10-year risk and return

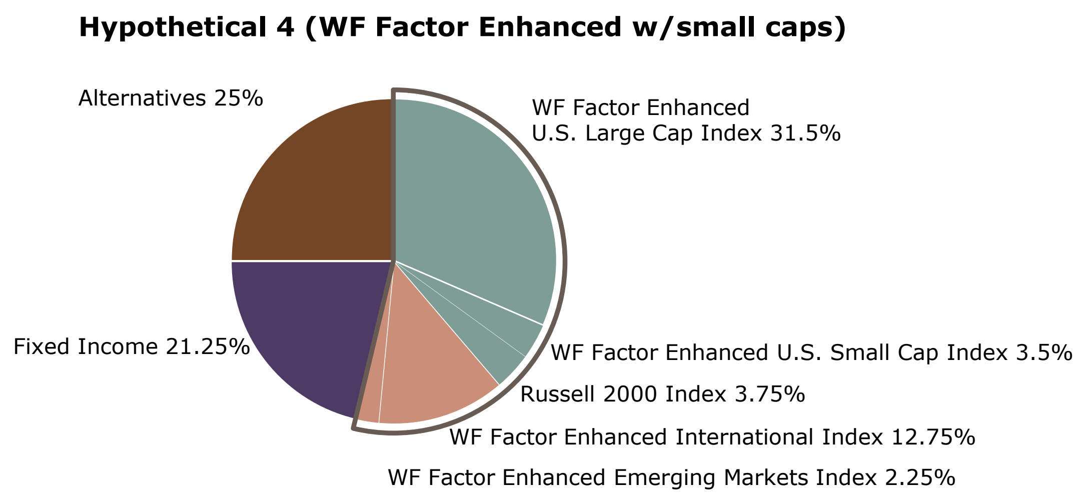


	Base Case	WF Factor Enhanced Portfolio	Active Portfolio
Sharpe ratio	0.49	0.58	0.48
Tracking error	--	1.10	0.46
Information ratio	--	0.52	-0.30
Downside capture	100.00%	88.99%	97.56%
Up Market Capture	100.00%	95.73%	97.12%

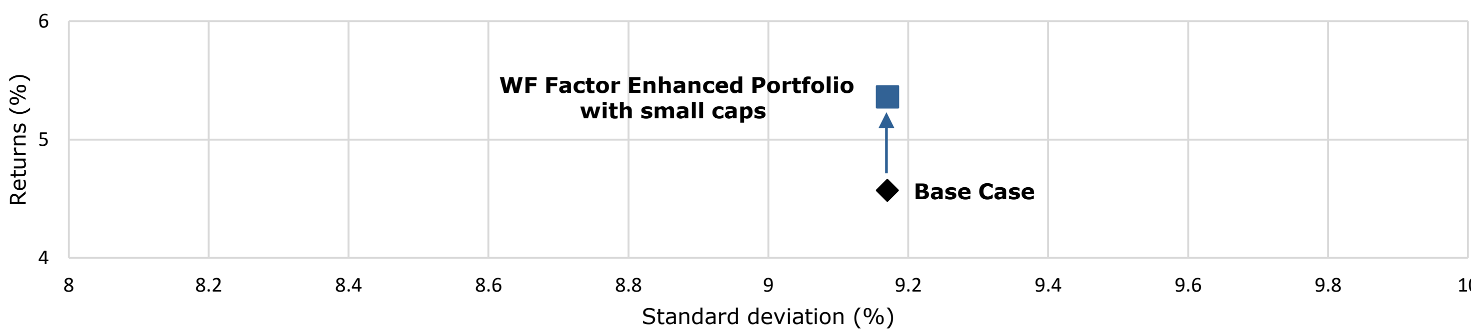
As of March 31, 2018. The hypothetical model is not maintained as a live composite or portfolio at Wells Capital Management. It is for illustrative purposes only. Hypothetical data does not represent actual performance and should not be interpreted as an indication of such. This data is based on knowledge that was available after the fact and thus with the benefit of hindsight.
Source: Wells Capital Management.
To calculate the median active manager net of fees, we found the average fee for each of the four eVestment universes based on a $400 million account level. We deducted 42 bps for U.S. large cap core, 72 bps for U.S. small cap core, 50 bps for EAFE large cap core, and 77 bps for Emerging Markets All Cap. We deducted 12 bps from the Wells Fargo Factor Enhanced indices.

Case Study 3: Getting more out of your risk budget





10-year risk and return



	Base Case	WF Factor Enhanced Portfolio with Small Caps
Sharpe ratio	0.49	0.57
Tracking error	--	0.90
Information ratio	--	0.87
Downside capture	100.00%	96.94%
Up Market Capture	100.00%	103.34%

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Source: Wells Capital Management.

Factor investing summary

1) Factors drive stock returns

Factors help explain stock behavior and are important drivers of risk and return

2) Factor-based strategies are a blend of active and passive

Factor-based strategies include many of the benefits of passive management, such as high transparency, low turnover, and low fees, while preserving the ability to add value over the market benchmark like more traditional active products

3) Factor-based strategies continue to grow in popularity

As the market place grows more crowded with factor-based strategies, investors should consider asset managers with decades of experience managing factors.

4) Factor-based strategies can serve many purposes

- ✓ **Enhance Returns**
- ✓ **Reduce Risk**
- ✓ **Improve Diversification**
- ✓ **Reduce Cost**

Simulated performance disclosure

Simulated 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 simulated performance results and the actual performance results subsequently achieved by any particular trading program.

One of the limitations of simulated performance results is that they are generally prepared with the benefit of hindsight. In addition, simulated trading does not involve financial risk, and no simulated 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 simulated performance results and all of which can adversely affect actual trading results.

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