USING THE SCIENCE OF INVESTING TO CREATE MORE EFFICIENT PORTFOLIOS AND REDUCE THE RISK OF BLACK SWANS

LARRY SWEDROE
DIRECTOR OF RESEARCH

BUCKINGHAM
STRATEGIC WEALTH

- Markets are highly efficient.
- All unique sources of systematic (non-diversifiable) risk should have similar risk-adjusted returns.
- Portfolios should be broadly diversified across unique/independent sources of risk.
- Traditional 60/40 portfolios dominated by single risk: market beta

TRADITIONAL PORTFOLIOS ARE DOMINATED BY SINGLE RISK: MARKET BETA

- Typical Portfolio: 60% Stocks/40% Bonds
- Equity Volatility 20%
- BAM Bond Portfolio (4-5 Year Average Maturity) Volatility 5%
- Equity Risk: 60 x 20 = 1200 + Bond Risk: 40 x 5 = 200
- Total Risk: 1200 + 200 = 1400
- Percentage Equity Risk: 1200/1400 = 86%

TRADITIONAL 60/40: THE HARSH REALITY

1928-2018: 60% S&P 500/40% 5-year Treasuries returned 8.4%.

1982 through 2018, returned 10.0%

"Golden Era": Three favorable tailwinds are not likely to recur

- Equity valuations rose sharply, CAPE 10 increased from 7 to 28.*
- Yield on 10-year Treasury fell from about 14% to less than 3%.**
- Corporate after-tax profits as percent of GNP about doubled from 5% to 9%.***

Based on current valuations/yields, expected returns: U.S. stocks about 6% and Treasury bonds about 3%, 60/40 portfolio expected return about 5%, less than half of the return prior 37 years.

Information from sources deemed reliable, but its accuracy cannot be guaranteed.
* www.econ.yale.edu/-shiller/data/htm
**fred.stlouisfed.org
*** fred.stlouisfed.org

HARSH REALITIES

1. Expected returns lower
2. Increased longevity
3. Increased need for long term care
4. Risks to Social Security

MOVING TOWARD A RISK PARITY PORTFOLIO
APRIL 1993 – DECEMBER 2018

- Portfolio A: 60% Vanguard Total (U.S.) Stock Market Index Fund (VTSMX)/ 40% Vanguard Intermediate-Term Treasury Fund (VFITX)
- Portfolio B: 40% DFA U.S. Small Value Fund (DFSVX)/60% Vanguard Intermediate-Term Treasury Fund (VFITX)

	Portfolio A*	Portfolio B*
Annualized Return (%)	7.8	8.1
Standard Deviation	9.0	7.7
Beta	0.60 (1.00)	0.41 (1.04)
Size	0.0	0.33 (0.82)
Value	0.0	0.26 (0.65)
Quality	0.0	0.02 (0.05)
Term	0.16 (0.40)	0.24 (0.40)
Lowest Calendar Year Return (%)	-19.5	-8.9
Highest Calendar Year Return (%)	29.5	24.1

*Figures in parentheses are the loadings of the mutual funds.

Annualized return information is provided to show the benefits of factor diversification and does not reflect the actual performance of any portfolios managed by Advisor. Therefore, return information is hypothetical as it does not reflect the results of an actual portfolio managed by Advisor and does not reflect any advisory fees or the trading cost incurred in the management of an actual portfolio. Information from sources deemed reliable, but its accuracy cannot be guaranteed. Performance is historical and does not guarantee future results. April 1993 was selected as the starting date because of the start date of the mutual funds shown above. All portfolios rebalanced quarterly for return and standard deviation purposes. Standard deviation annualized from quarterly data by multiplying the quarterly standard deviation by the square root of four. Regressions based on monthly data. Beta, Size, and Value based on French Data Library, and Quality based on AQR's Quality Minus Junk Factor. Term factor estimated as the difference between the return on the Long Term Government Bond Index less the return of one-month treasury bills.

FACTOR RETURN AND RISK (%)
1927–2018

	Mean Return	Standard Deviation	Sharpe Ratio
Beta	8.3	20.4	0.41
Size	3.2	13.7	0.23
Value	4.7	14.2	0.33
Momentum	9.2	15.7	0.59
Profitability*	3.3	9.5	0.35
Quality**	4.7	9.6	0.50
P1	**6.4**	**8.8**	**0.72**
P2*	**5.1**	**5.5**	**0.93**
P3**	**5.6**	**4.9**	**1.14**

Data for Market (Beta), Size, Value, Momentum, and Profitability is based on annual premiums from the Ken French Data Library. Quality is based on monthly data from AQR, and compounded to approximate an annual premium. Indices are not available for direct investment. Their performance does not reflect the expenses associated with the management of an actual portfolio nor do indices represent results of actual trading. Information from sources deemed reliable, but its accuracy cannot be guaranteed. Performance is historical and does not guarantee future results. Total return includes reinvestment of dividends. See "Portfolio Factor Allocations" slide for constructions. *1964-2018 & **1958-2018 time frames are used for P2 & P3 respectively due to availability of data.

HISTORICAL CORRELATIONS
1964–2018

Factor	Beta	Size	Value	Momentum	Profitability	Quality
Beta	1.00	0.27	-0.23	**-0.18**	-0.26	-0.60
Size	0.27	1.00	0.03	**-0.12**	-0.20	-0.49
Value	-0.23	0.03	1.00	**-0.20**	0.07	-0.03
Momentum	**-0.18**	**-0.12**	**-0.20**	1.00	0.05	0.28
Profitability	-0.26	-0.20	0.07	0.05	1.00	**0.67**
Quality	-0.60	-0.49	-0.03	0.28	**0.67**	1.00

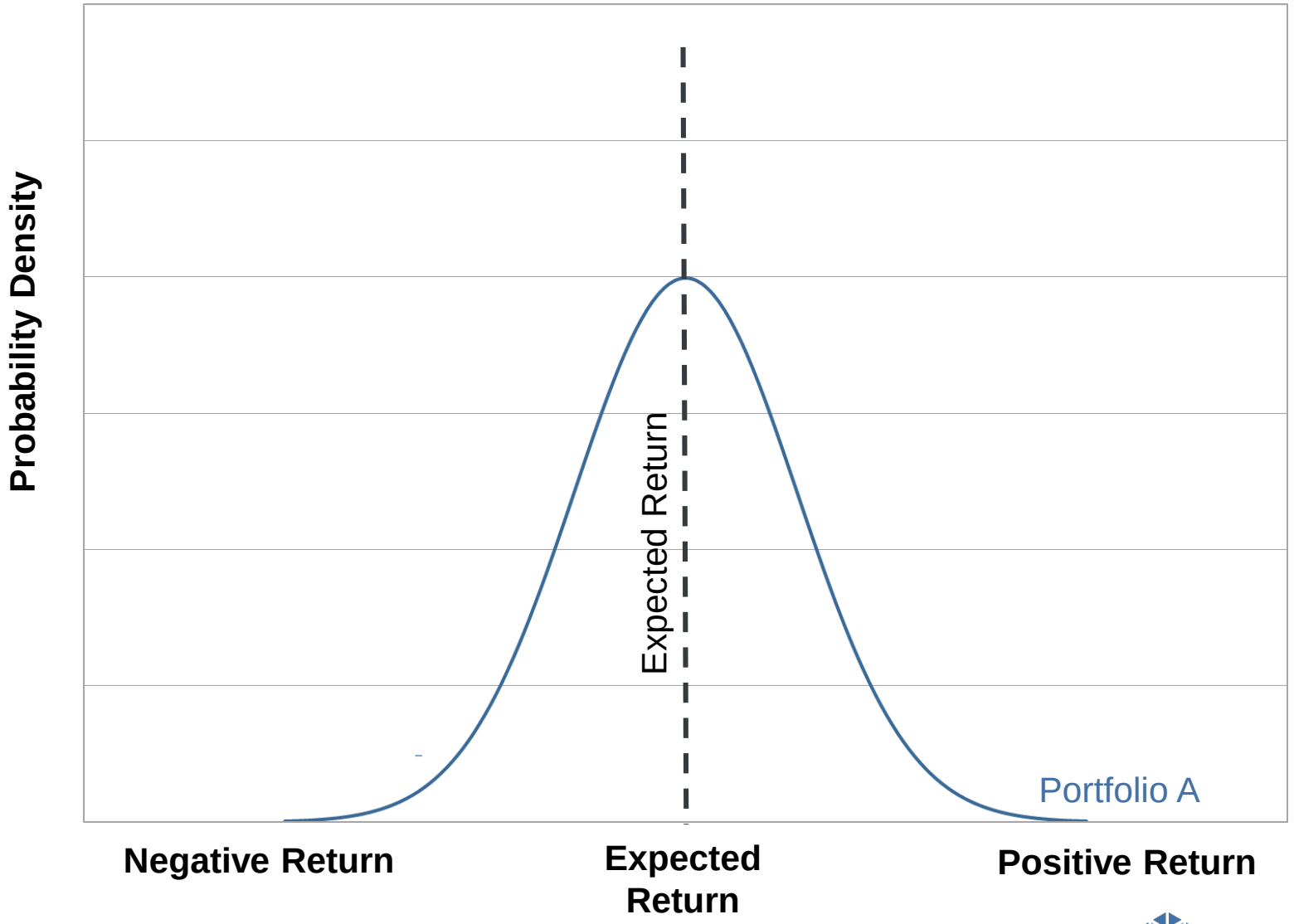
Data for Market (Beta), Size, Value, Momentum, and Profitability is based on annual premiums from the Ken French Data Library. Quality is based on monthly data from AQR, and compounded to approximate an annual premium. Indices are not available for direct investment. Their performance does not reflect the expenses associated with the management of an actual portfolio nor do indices represent results of actual trading. Information from sources deemed reliable, but its accuracy cannot be guaranteed. Performance is historical and does not guarantee future results.

FORWARD-LOOKING ODDS OF UNDERPERFORMANCE: A NEGATIVE RETURN (%)

	1-Year	3-Year	5-Year	10-Year	20-Year
Beta	34	24	18	10	3
Size	41	34	30	23	15
Value	37	28	23	15	7
Momentum	28	15	9	3	0
Profitability*	36	27	22	14	6
Quality**	31	19	13	6	1
P1	23	11	5	1	0
P2*	18	5	2	0	0
P3**	13	2	1	0	0

Data for Market (Beta), Size, Value, Momentum, and Profitability is based on annual premiums from the Ken French Data Library. Quality is based on monthly data from AQR, and compounded to approximate an annual premium. Indices are not available for direct investment. Their performance does not reflect the expenses associated with the management of an actual portfolio nor do indices represent results of actual trading. Information from sources deemed reliable, but its accuracy cannot be guaranteed. Performance is historical and does not guarantee future results. Total return includes reinvestment of dividends. See "Portfolio Factor Allocations" slide for constructions. *1964-2018 & **1958-2018 time frames are used for P2 & P3 respectively due to availability of data. Odds of underperformance assume a normal distribution.

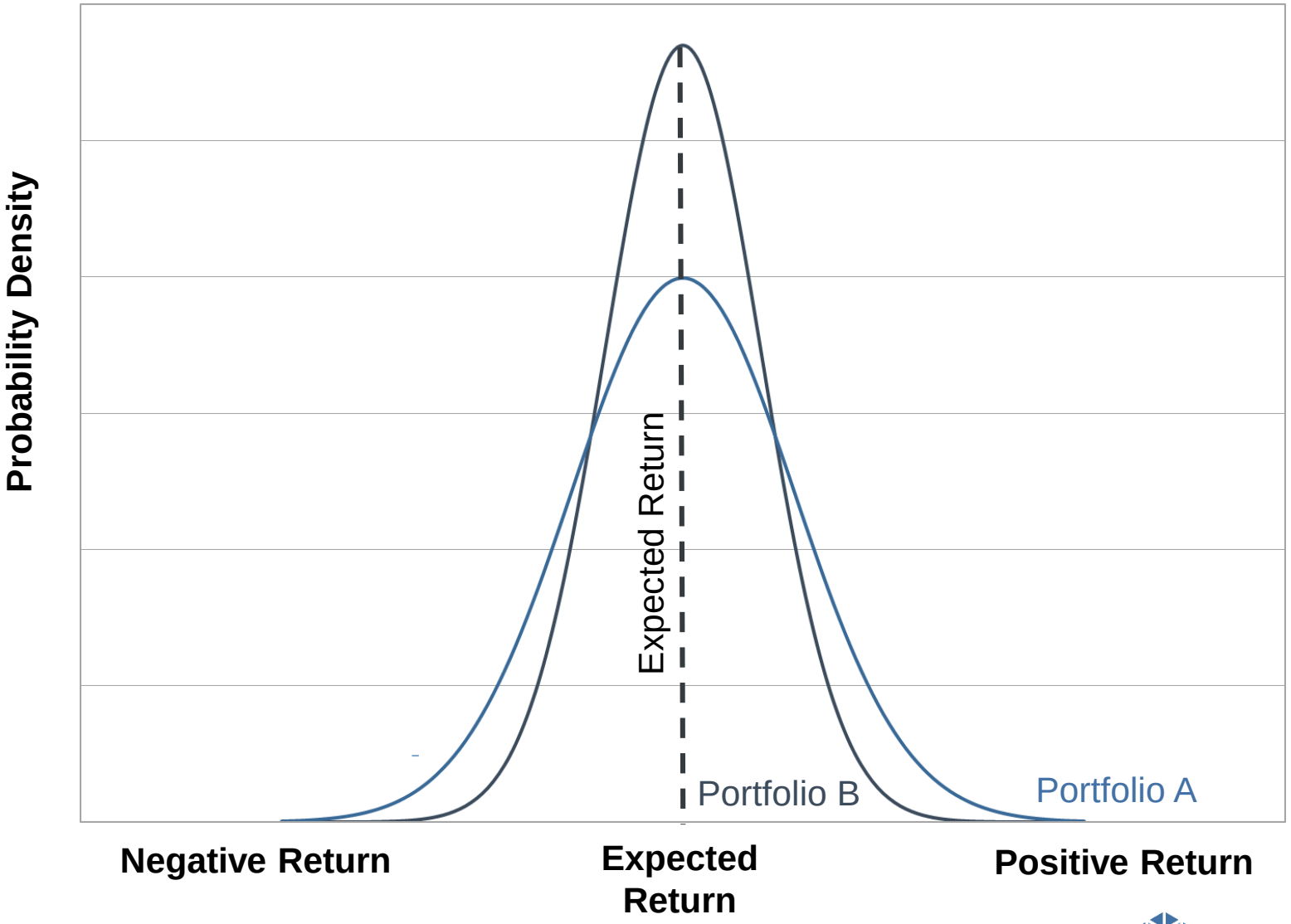
WHICH DISTRIBUTION WOULD YOU CHOOSE?



The above example is for illustrative purposes only and is not intended to represent actual portfolios or actual returns.

BUCKINGHAM STRATEGIC WEALTH

WHICH DISTRIBUTION WOULD YOU CHOOSE?



The above example is for illustrative purposes only and is not intended to represent actual portfolios or actual returns.

BUCKINGHAM STRATEGIC WEALTH

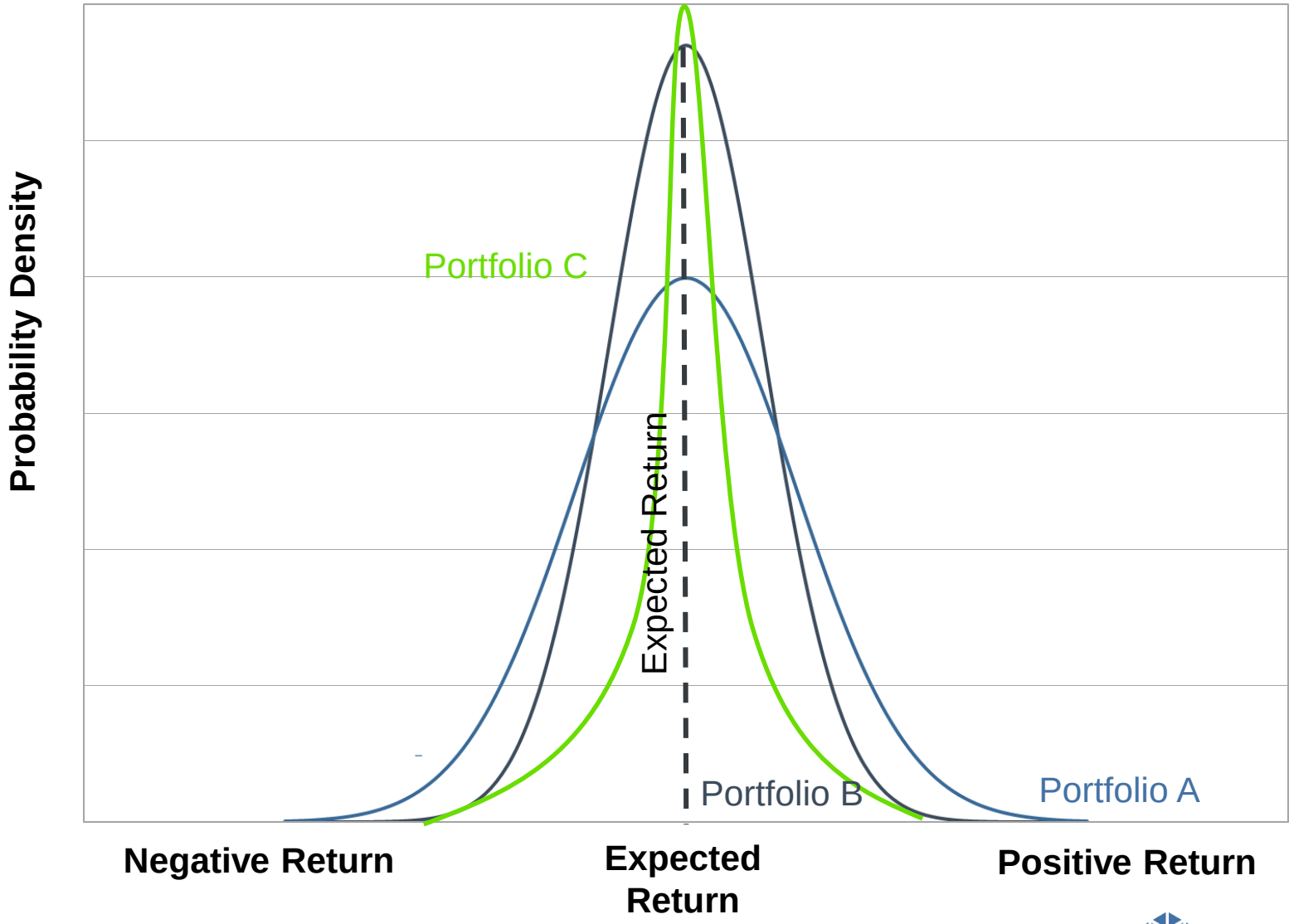
MONTE CARLO ANALYSIS
MARKET PORTFOLIO VERSUS RISK TARGET 3

Improved Odds of Success

Probability of Having $1 Left for 30-Year Horizon

Allocation	Withdrawal Rate			
	3.0%	3.5%	4.0%	5.0%
RT3 20/80 – Market 20/80	0%	7%	14%	6%
RT3 40/60 – Market 40/60	1%	6%	13%	18%
RT3 60/40 – Market 60/40	3%	7%	11%	18%
RT3 80/20 – Market 80/20	4%	8%	11%	17%
RT3 100/0 – Market 100/0	6%	8%	11%	15%

WHICH DISTRIBUTION WOULD YOU CHOOSE?



The above example is for illustrative purposes only and is not intended to represent actual portfolios or actual returns.

BUCKINGHAM STRATEGIC WEALTH

THE INVESTMENT WORLD IS GETTING FLATTER

- While there are still important diversification benefits from adding international equities, as world becomes more integrated and technology benefits spread quickly correlations are rising, reducing the benefit.

- In crises the correlation of all equity asset classes tends to rise towards one.

- Increases the importance of adding unique sources of risk and return.

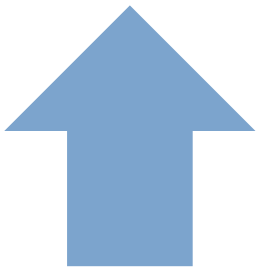
HOW TO CREATE EVEN MORE EFFICIENT PORTFOLIOS, FURTHER REDUCING TAIL RISK

Adding alternative investments: unique sources of risk/return

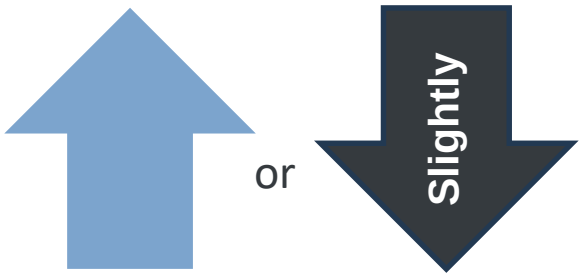
- Reinsurance
- Alternative lending
- Variance risk premium
- Long/short alternative style premium
- Managed futures

EXPECTED IMPACT OF ALTERNATIVES

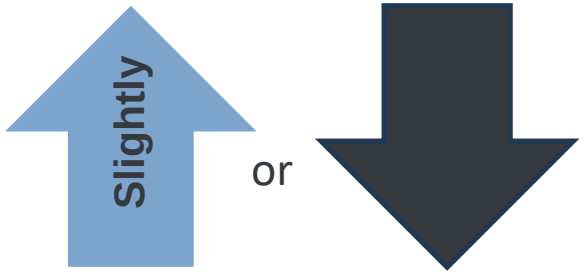
Sharpe Ratio



Return



Volatility



Bonds in blue arrow, stocks in black arrow

True when used in either taxable or tax-advantaged accounts.

BUCKINGHAM STRATEGIC WEALTH

BENEFIT OF ADDING PORTFOLIO OF ALTERNATIVES WITH UNIQUE RISKS

	Expected Return (%)	Expected S.D. (%)
Reinsurance (SRRIX)	7.5	12.5
Alternative Lending (LENDX)	6	5
Variance Risk Premium (AVRPX)	9.5	10
Long-Short Alternative Style Premium (QSPRX)	7	10
Equal-Weighted Portfolio	**7.5**	**5**

Please see Important Disclosure for Expected Return/Forward Looking Annual Return Expectation Assumptions

MONTE CARLO ANALYSIS – MARKET PORTFOLIO VERSUS RISK TARGET 3 WITH 25% ALTERNATIVES

Improved Odds of Success

Probability of Having $1 Left for 30-Year Horizon

Allocation	Withdrawal Rate			
	3.0%	3.5%	4.0%	5.0%
20/25/55 – Market 20/80	1%	14%	37%	34%
35/25/40 – Market 40/60	3%	11%	23%	34%
45/25/30 – Market 60/40	6%	13%	19%	26%
55/25/20 – Market 80/20	9%	15%	18%	22%
75/25/0 – Market 100/0	11%	15%	19%	21%

Diversifying across unique sources of risk factors and alternative investments:

- Creates more efficient portfolios
- Reduces portfolio volatility
- Narrows the potential dispersion of returns
- Reduces tail risks