

Introduction to Diversification

Craig L. Israelsen, Ph.D.

**Presentation at Houston AAll Chapter
January 20, 2018**

Based on research by Craig L. Israelsen, Ph.D.
This section updated annually
Performance as of December 31, 2017

In 1970 you started investing:

For 48 years you invested money into...	In Jan 2018 your account balance was... <i>(you saved 10% of your income each year)</i>
Bucket in your room earning 0% interest	\$365,429
Savings account ("Cash")	\$823,677
7-Asset Diversified Portfolio of Stock, Bonds, Cash, Real Estate, Commodities	\$4,018,504

\$35,000 starting salary in 1970, 3% annual increase over 48 years

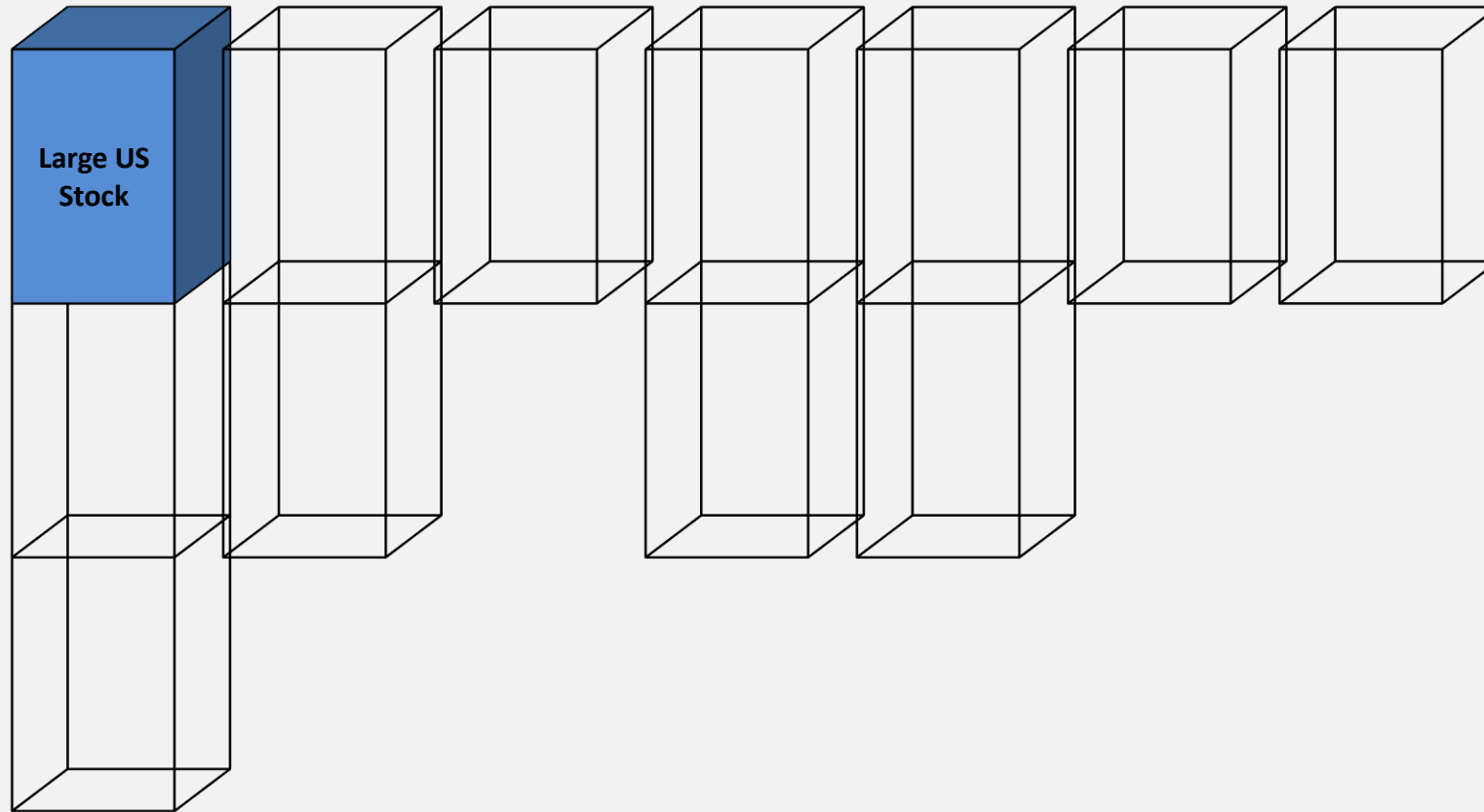
What's in a diversified portfolio?

Building an
investment
portfolio is
like making
salsa...we
add different
ingredients
together.



Minimal Diversification

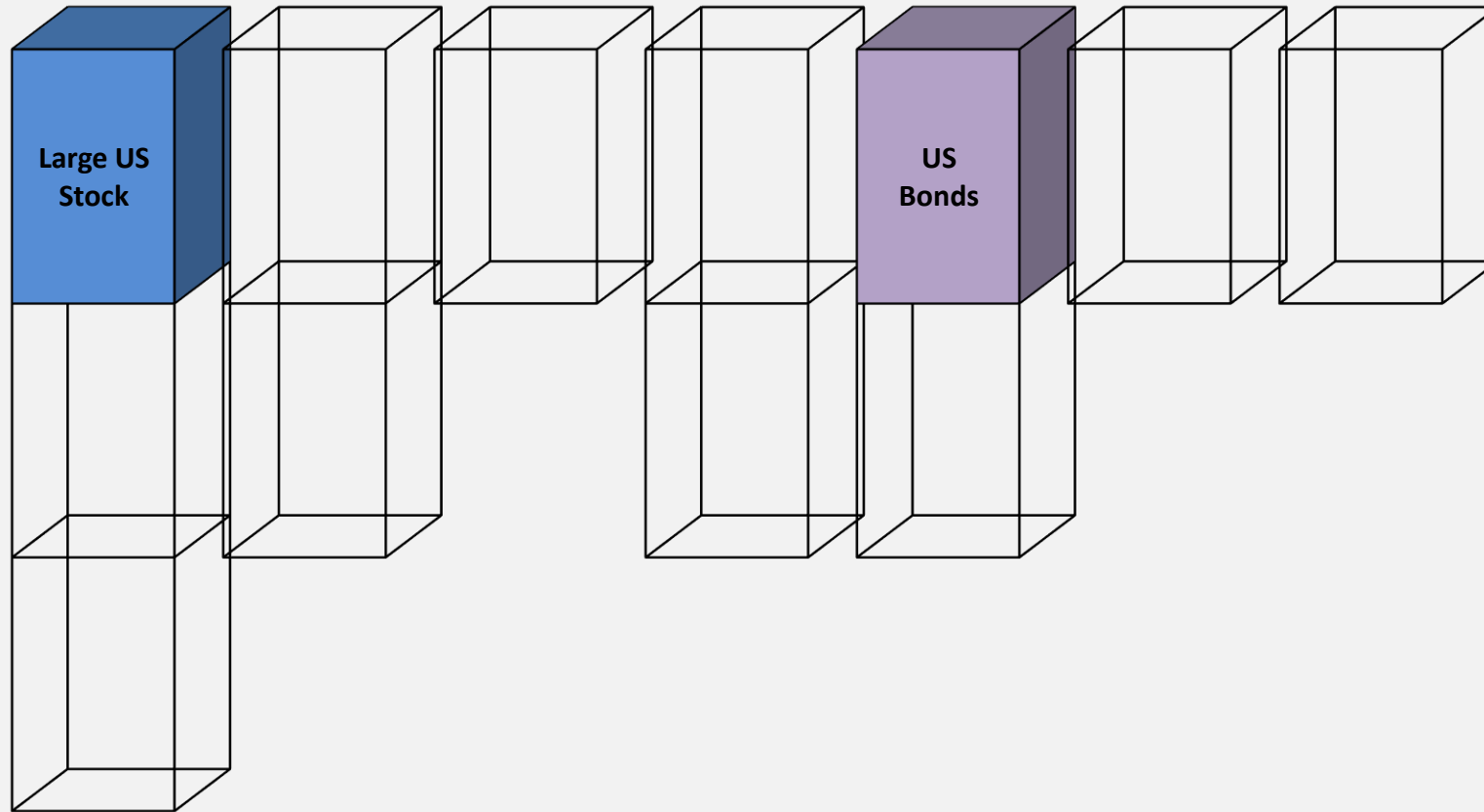
The S&P 500 Index



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Two-Asset Diversification

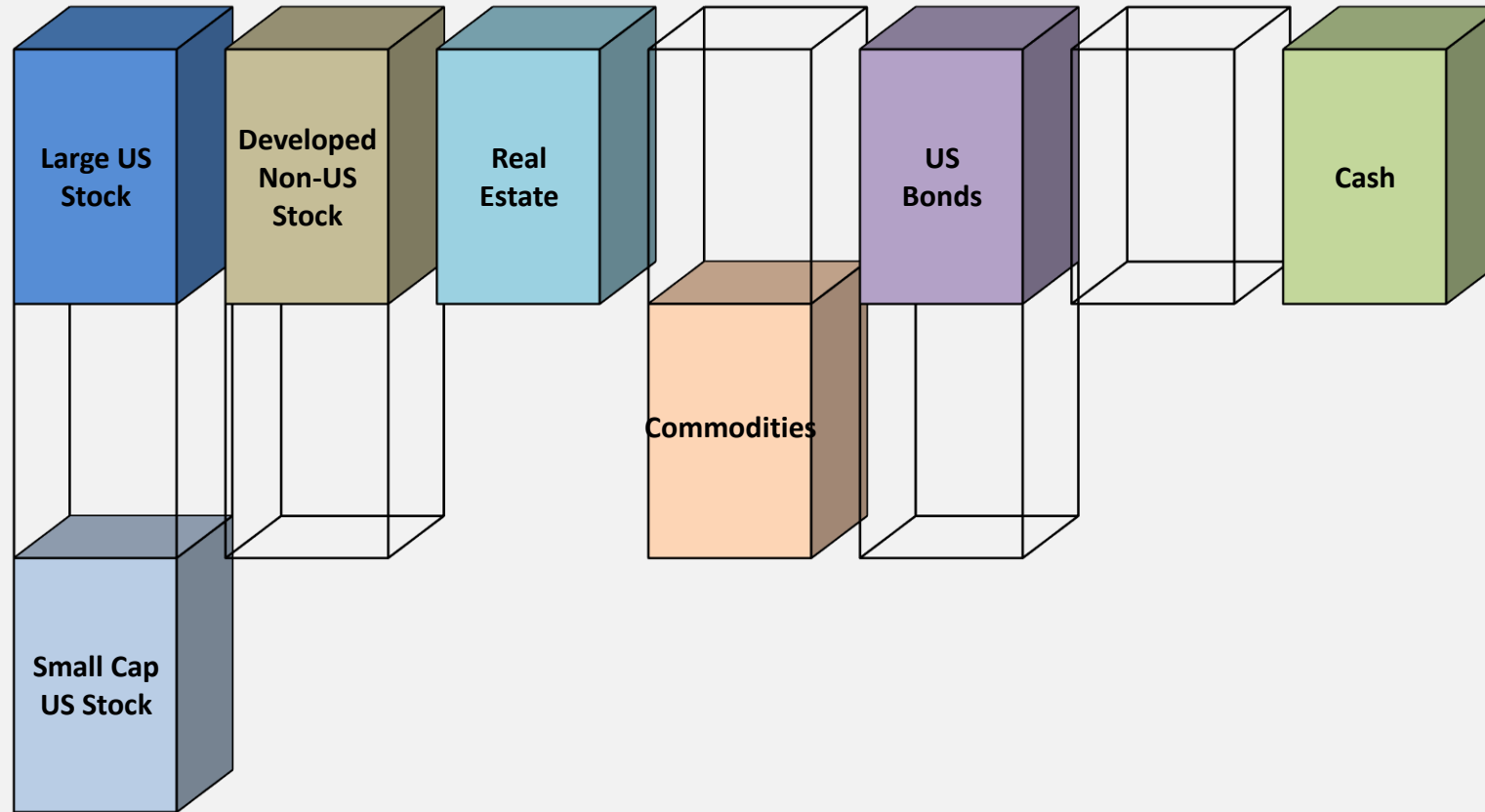
60/40 Portfolio



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Diversified Portfolio

7-Asset Portfolio



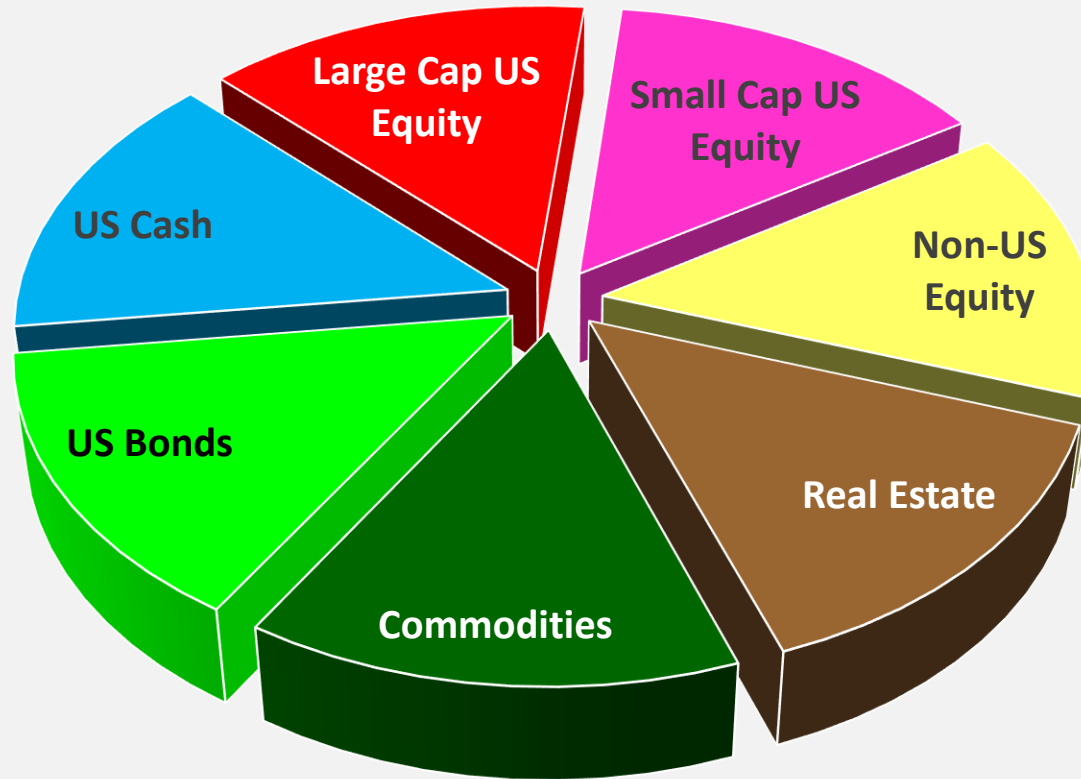
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Asset Classes

1970-2017	Large US Equity	Small US Equity	Non-US Equity	US Bonds	Cash	Real Estate	Commodities	Equally Weighted 7-Asset Portfolio
48-Year Average Annualized % Return	10.54	11.10	8.94	7.53	4.86	11.76	6.99	
48-Year Standard Deviation of Annual Returns	17.00	21.35	21.68	6.52	3.54	18.61	24.95	
Number of Years with Negative Returns	9	14	14	3	0	8	14	
Worst Three-Year Cumulative % Return	(37.61)	(42.24)	(43.32)	4.39	0.14	(35.61)	(55.60)	

Multi-Asset Portfolio

7 Asset Classes – Equally Weighted – Rebalanced Annually



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7-Asset Portfolio

1970-2017	Large US Equity	Small US Equity	Non-US Equity	US Bonds	Cash	Real Estate	Commodities	Equally Weighted 7-Asset Portfolio
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48-Year Standard Deviation of Annual Returns	17.00	21.35	21.68	6.52	3.54	18.61	24.95	10.05
Number of Years with Negative Returns	9	14	14	3	0	8	14	6
Worst Three-Year Cumulative % Return	(37.61)	(42.24)	(43.32)	4.39	0.14	(35.61)	(55.60)	(13.37)

Indexes Used in Performance Calculations

(Indexes have no cost, but all mutual funds and ETFs have annual expenses)

Data Source: Steele Mutual Fund Expert

- **Large-cap US equity** represented by the S&P 500 Index.
- **Small-cap US equity** represented by the Ibbotson Small Companies Index from 1970-1978, and the Russell 2000 Index starting in 1979.
- **Non-US equity** represented by the MSCI EAFE Index.
- **Real estate** represented by the NAREIT Index from 1972-1977 and the Dow Jones US Select REIT Index starting in 1978. (1970 and 1971 returns from research by Chan, Erickson, and Wang in “Real Estate Investment Trusts: Structure, Performance, and Investment Opportunities”, Table 2.2)
- **Commodities** represented by the Goldman Sachs Commodities Index (GSCI). As of February 6, 2007, the GSCI became the S&P GSCI Commodity Index.
- **U.S. Aggregate Bonds** represented by the Ibbotson Intermediate Term Bond Index from 1970-75 and the Barclays Capital Aggregate Bond index starting in 1976.
- **Cash** represented by 3-month Treasury Bills.

Correlation to Large Cap US Equity

1970-2017	Large US Equity	Small US Equity	Non-US Equity	US Bonds	Cash	Real Estate	Commodities	Equally Weighted 7-Asset Portfolio
48-Year Correlation to US Large Cap Equity	--	0.78	0.66	0.20	0.05	0.47	-0.05	0.81

1.00 = High positive correlation

0.00 = Low, random correlation (the goal)

-1.00 = High negative correlation

Why invest in a diversified, multi-asset portfolio?

Why invest in a diversified, multi-asset portfolio?

**Because we don't know the future.
If we did, we would certainly NEVER diversify.**

(The real answer)

Why invest in a diversified, multi-asset portfolio?

**To achieve equity-like returns with less
volatility than an all-equity portfolio**

(The technical answer)

Multi-Asset Portfolio

Equity-like return

1970-2017	Large US Equity	Small US Equity	Non-US Equity	US Bonds	Cash	Real Estate	Commodities	Equally Weighted 7-Asset Portfolio
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Multi-Asset Portfolio

Lower volatility

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Multi-Asset Portfolio

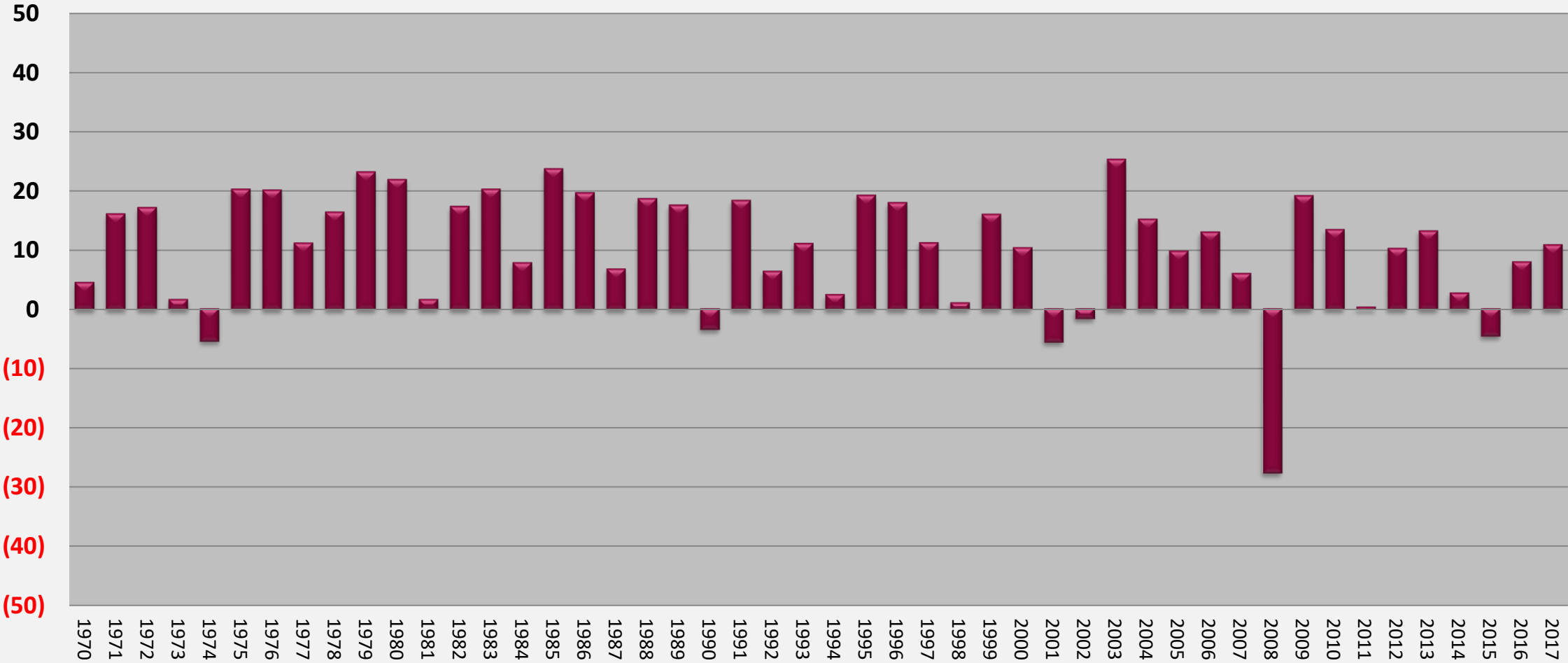
Fewer and smaller losses

1970-2017	Large US Equity	Small US Equity	Non-US Equity	US Bonds	Cash	Real Estate	Commodities	Equally Weighted 7-Asset Portfolio
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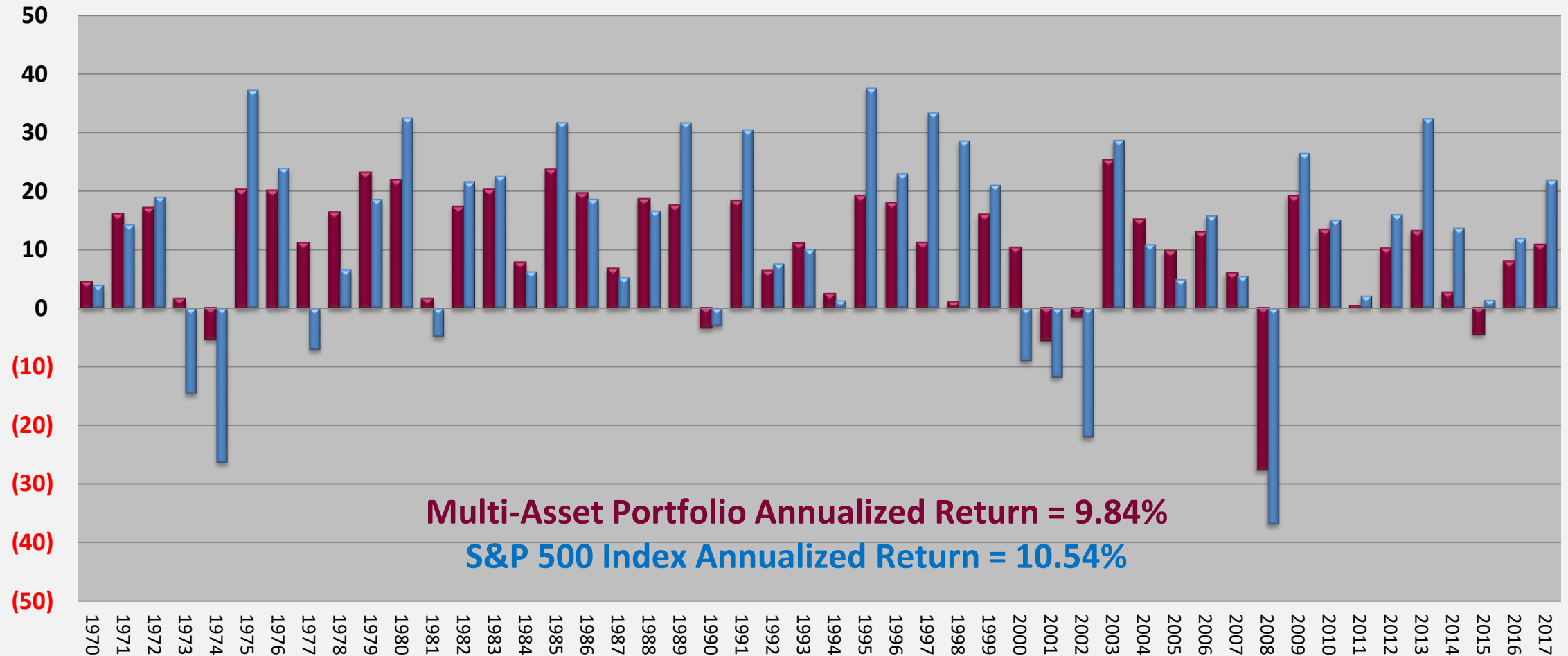
**Will a diversified,
multi-asset portfolio always win?**

No.

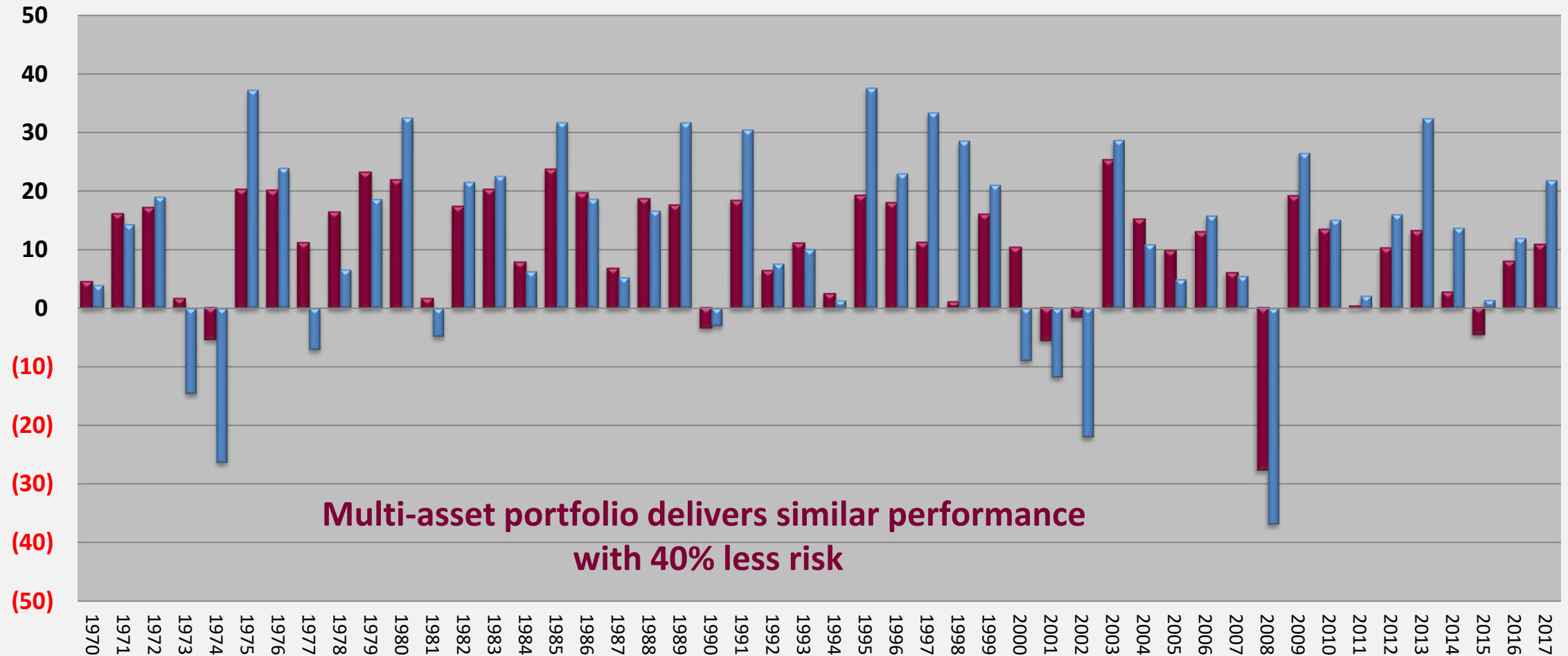
Annual Returns for **Multi-Asset Portfolio**
48-year Period: 1970-2017



Annual Returns for Multi-Asset Portfolio vs. S&P 500 Index 48-year Period: 1970-2017



Annual Returns for Multi-Asset Portfolio vs. S&P 500 Index 48-year Period: 1970-2017



**Multi-asset portfolio delivers similar performance
with 40% less risk**

The Impact of Annual Portfolio Costs

**The annual expense ratio of the funds
in your portfolio represents an
on-going annual cost.**

**Recall that raw indexes have no cost,
but actual funds do.**

The impact of annual portfolio costs:

For 48 years you invested money into...	In Jan 2018 your account balance was... <i>(you saved 10% of your income each year)</i>		
	No portfolio cost	50 basis points	100 basis points
Bucket in your room earning 0% interest	\$365,429	\$365,429	\$365,429
Savings account ("Cash")	\$823,677	\$716,026	\$625,029
7-Asset Diversified Portfolio of Stock, Bonds, Cash, Real Estate, Commodities	\$4,018,504	\$3,388,114	\$2,861,645

Over \$526,000 lost by paying 100 bps compared to 50 bps

\$35,000 starting salary in 1970, 3% annual increase over 48 years

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\$1,000,000 starting balance in retirement portfolio

Combinations of fund expenses and advisory fee	Total Portfolio Cost (aggregate expense ratio of funds and advisory fee)	Average Annual Withdrawal from a Retirement Portfolio between the ages of 70 to 95* (using RMD guidelines)	Increase in Monthly Retirement Income for Retiree
Total fund expenses of 100 bps Advisory Fee of 100 bps	200 bps	\$124,320	---


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Total fund expenses of 100 bps Advisory Fee of 100 bps	200 bps	\$124,320	---
Total fund expenses of 50 bps Advisory Fee of 100 bps	150 bps	\$133,927	\$800


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Total fund expenses of 50 bps Advisory Fee of 100 bps	150 bps	\$133,927	\$800
Total fund expenses of 10 bps Advisory Fee of 90 bps	100 bps	\$144,361	\$1,670



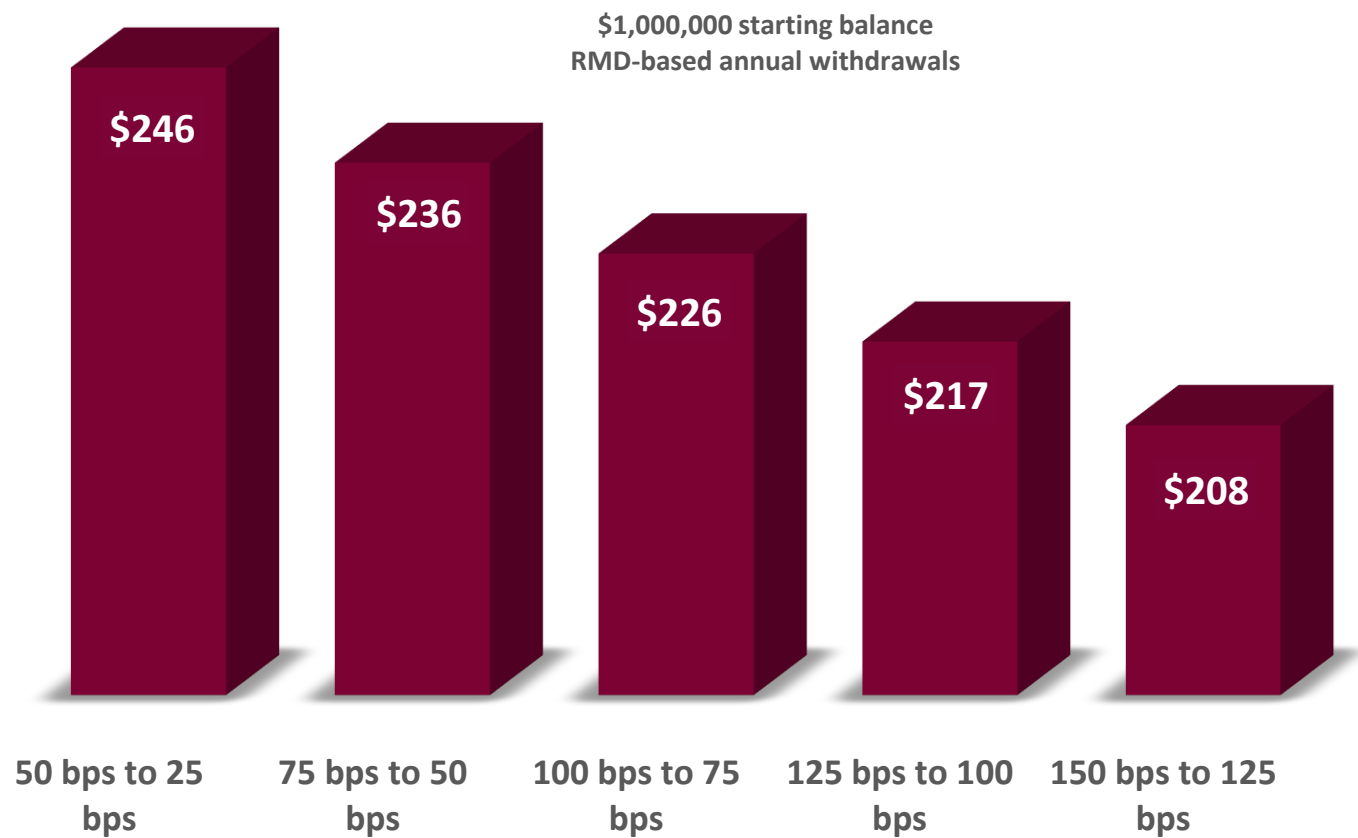
\$1,000,000 starting balance in retirement portfolio

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Total fund expenses of 100 bps Advisory Fee of 100 bps	200 bps	\$124,320	---
Total fund expenses of 50 bps Advisory Fee of 100 bps	150 bps	\$133,927	\$800
Total fund expenses of 10 bps Advisory Fee of 90 bps	100 bps	\$144,361	\$1,670
Total Fund expenses of 10 bps Advisory fee of 40 bps	50 bps	\$155,695	\$2,614



Increase in Annual Retirement Income per 1 bps of Reduced Total Portfolio Cost

(Total Cost = Expense Ratio + Advisor Fee)

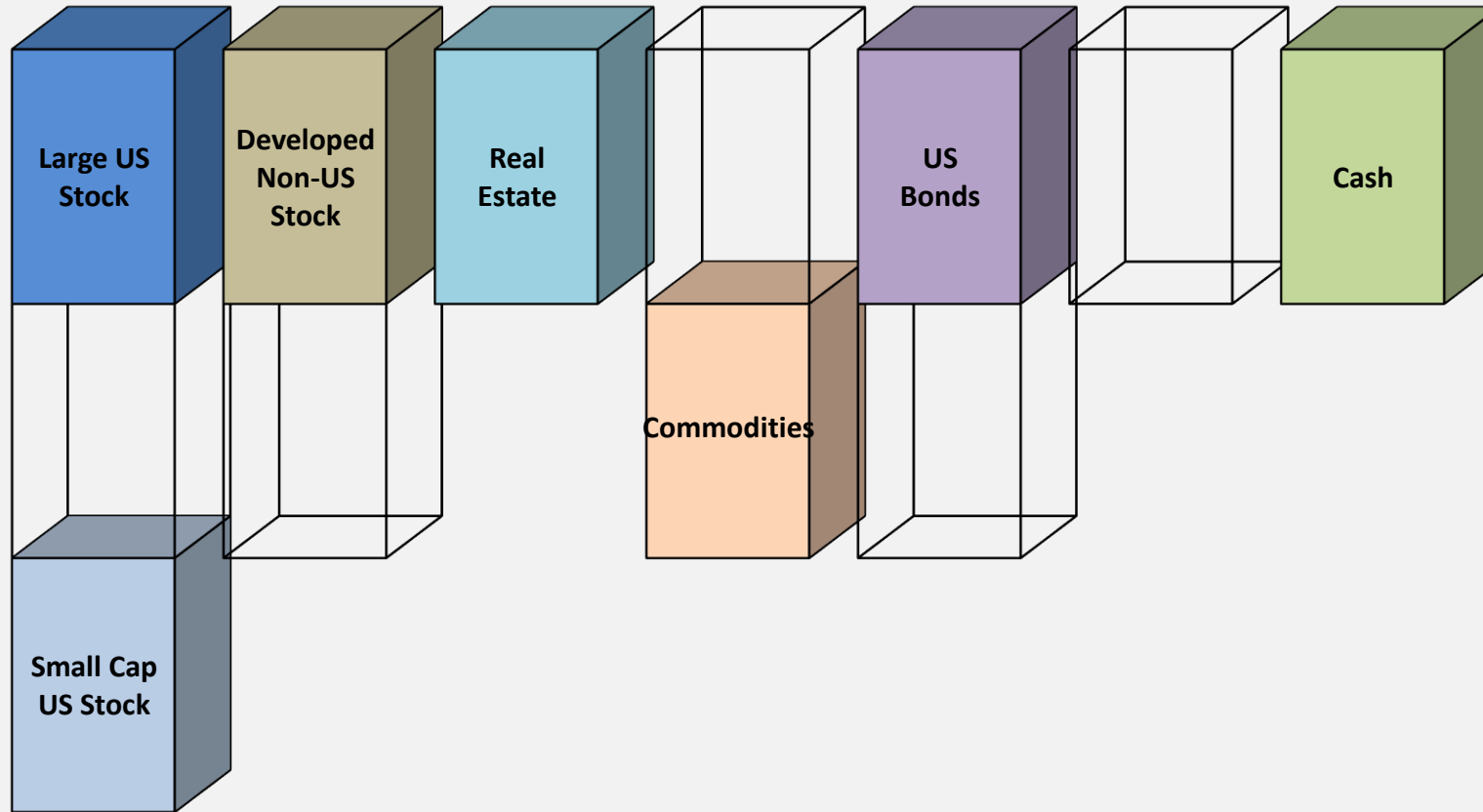


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Moving from 7 assets to *Twelve* assets

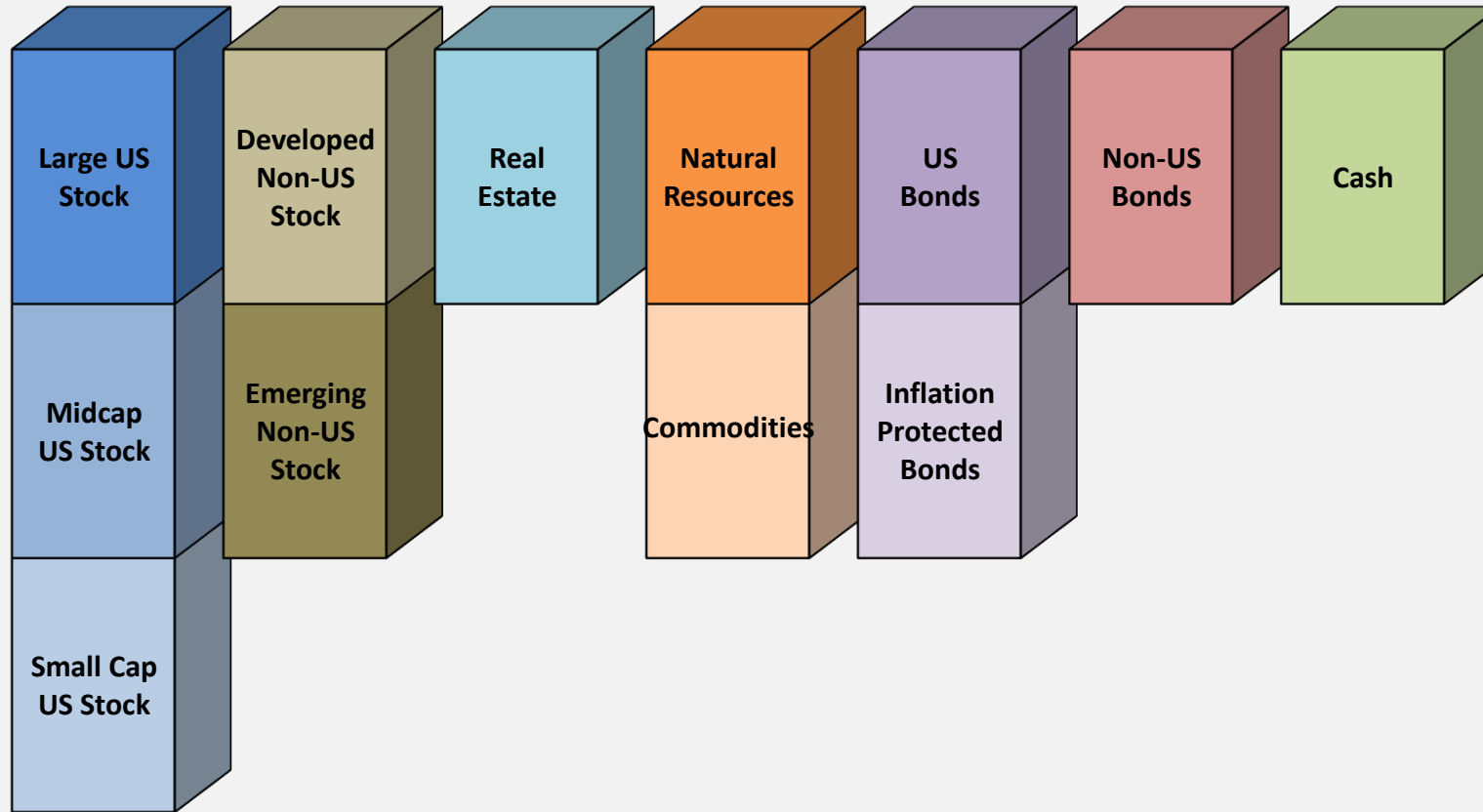
Good Diversification

7-Asset Portfolio



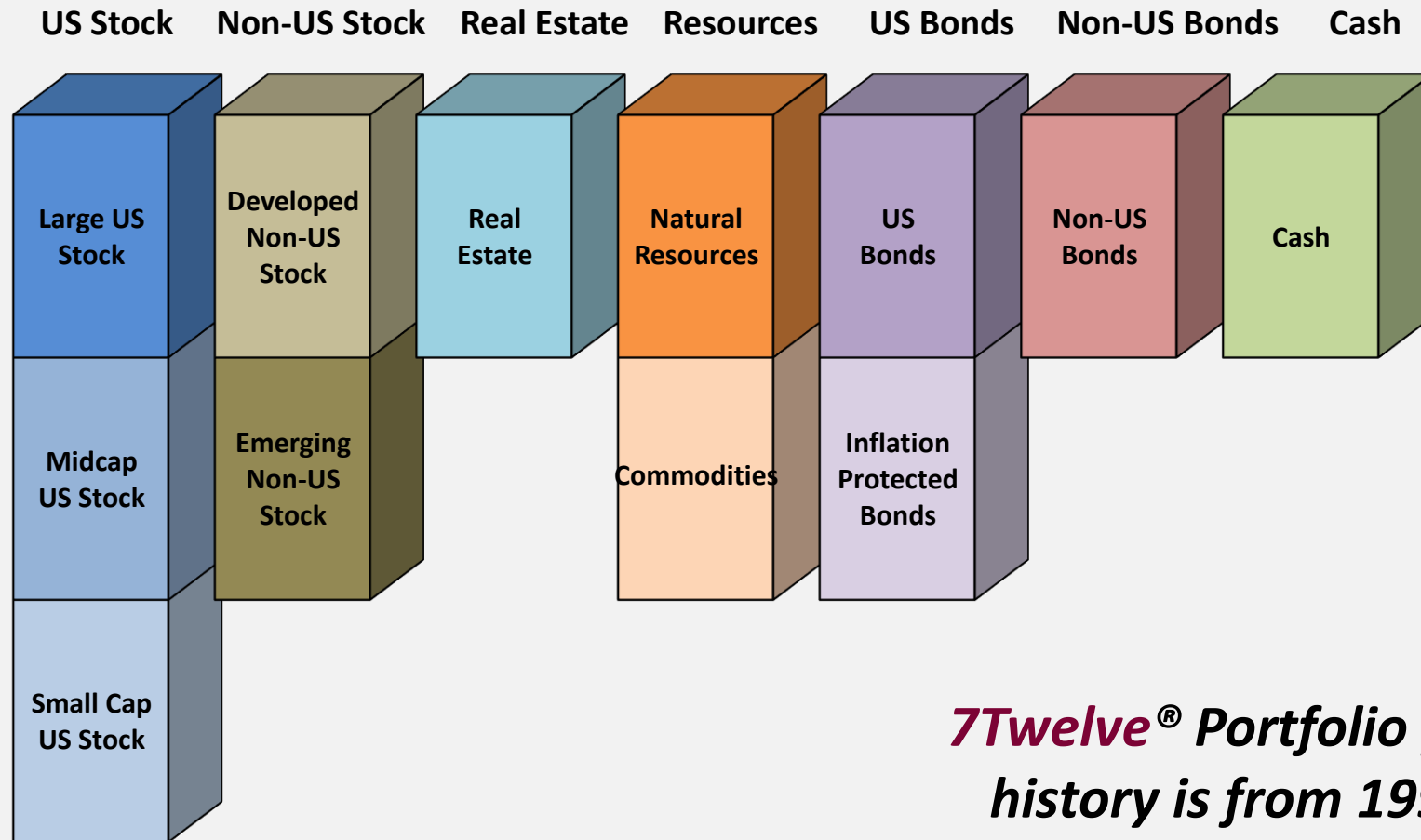
Superior Diversification

12-Asset Portfolio



7Twelve[®]

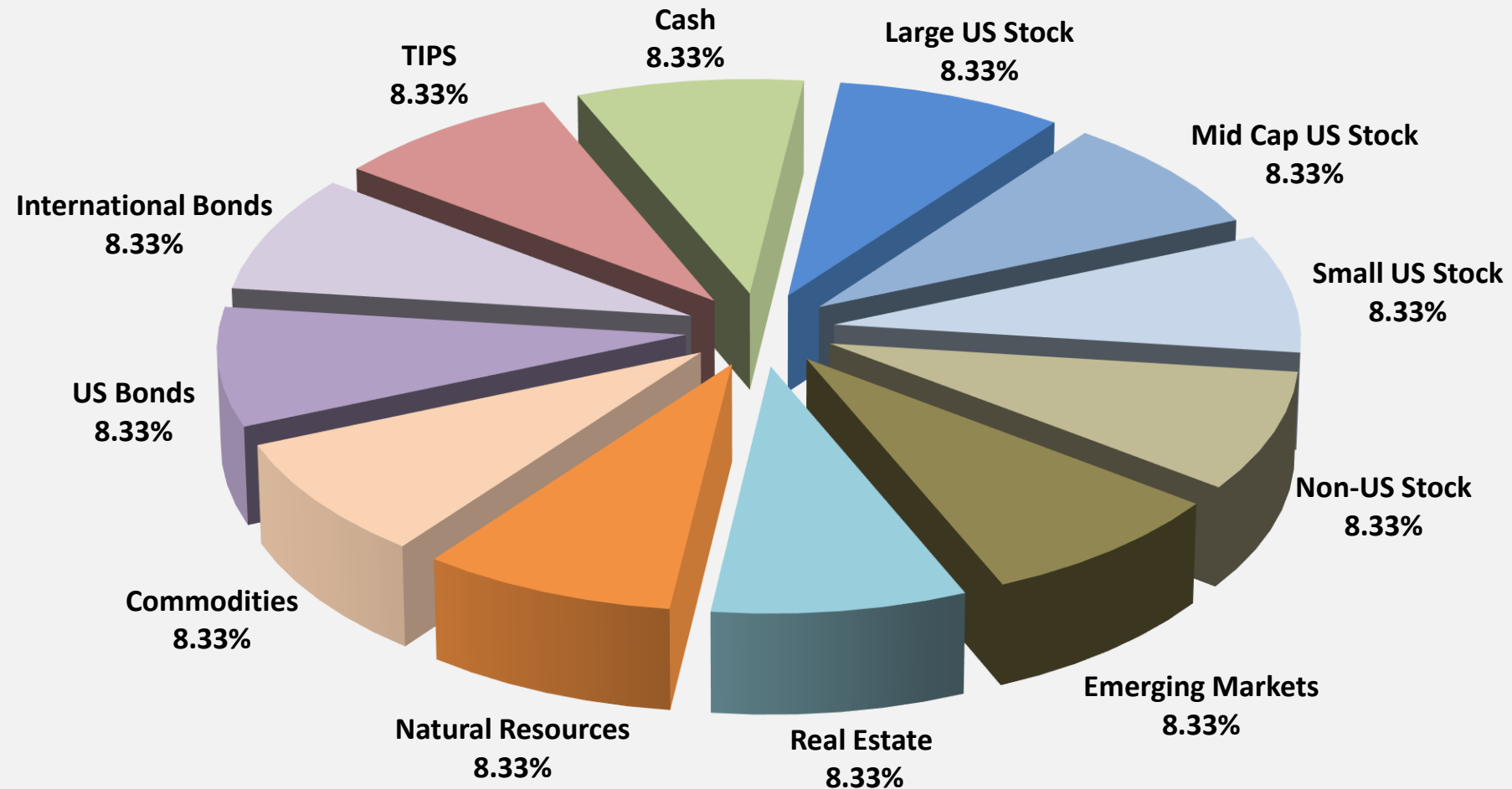
7 Core Asset Classes **Twelve** Actual Holdings



***7Twelve[®] Portfolio performance
history is from 1998-present.
TIPS history is the limiting factor.***



Equally-weighted exposure to 12 asset classes

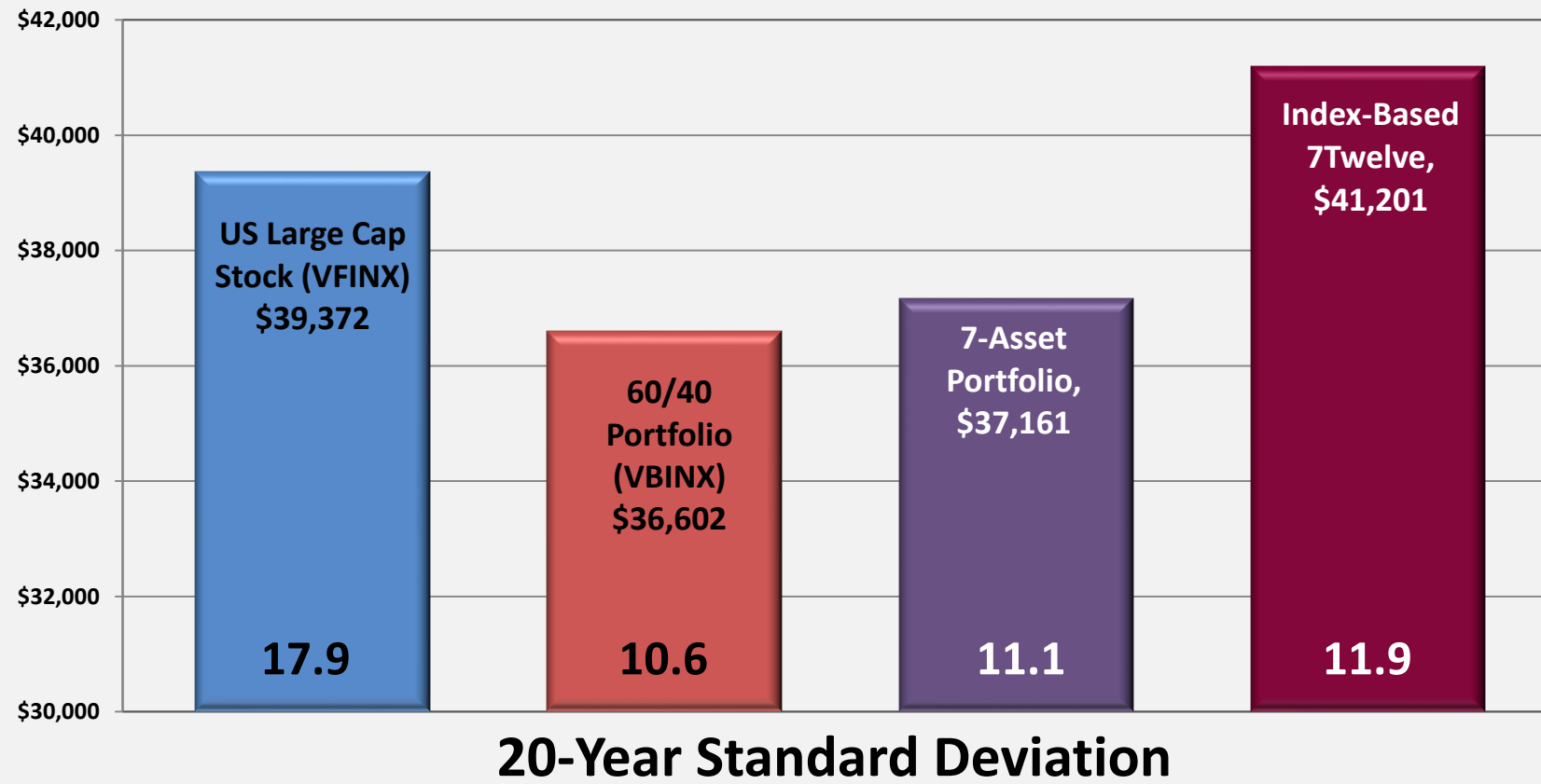


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20-Year Growth of \$10,000

1998-2017

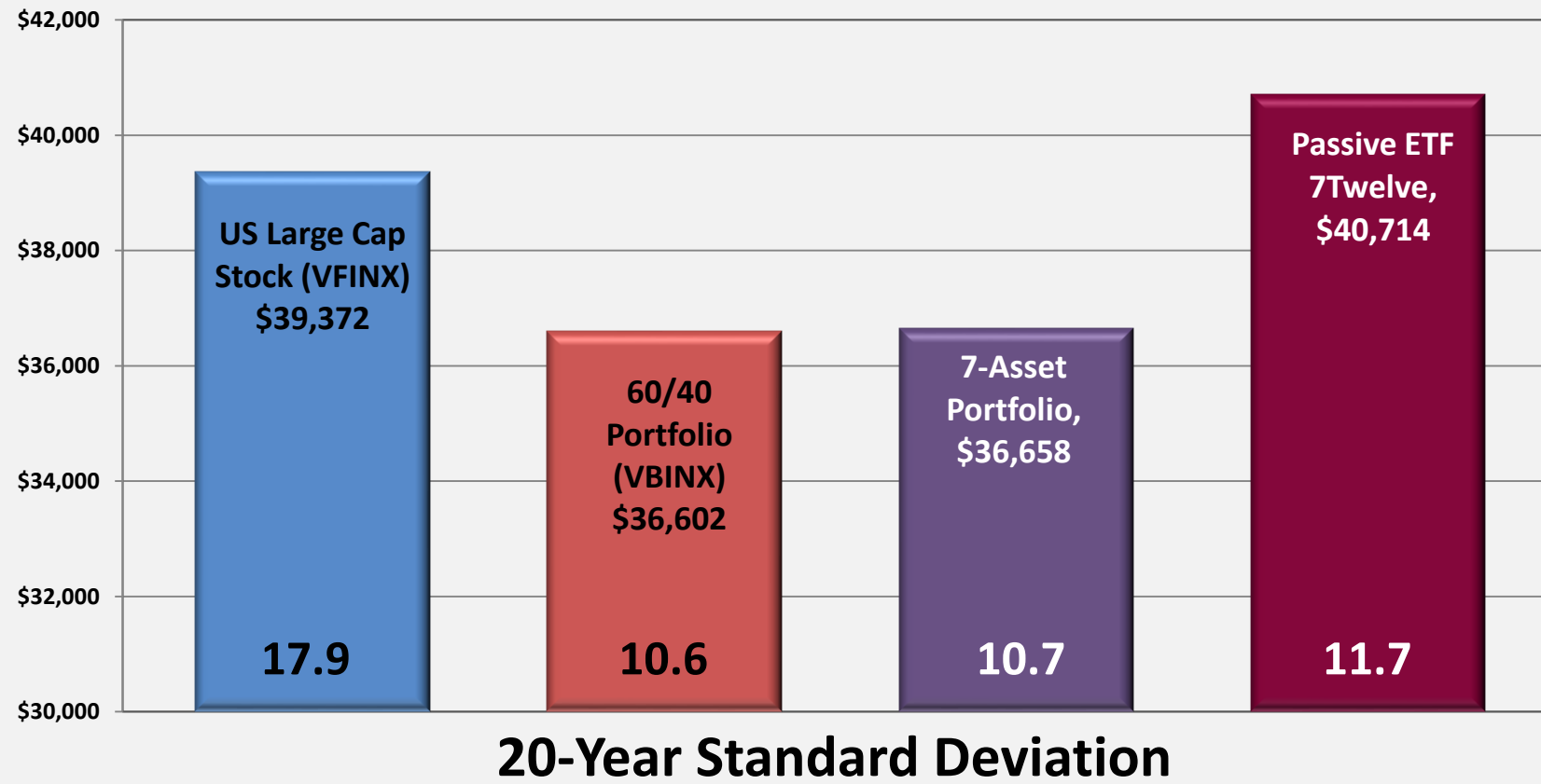
[-----Using Indexes-----]



20-Year Growth of \$10,000







1998-2017

[-----Using ETFs-----]



Accumulation Portfolio Analysis

20-Year Period from 1998-2017

Risk Level	Asset Allocation Models		20-Year Annualized Return (%)	20-Year Growth of \$10,000
Very Conservative	100% Cash		2.09	15,109
Conservative	50% Cash 50% Bonds		3.34	19,286
Moderate	60% US Stock 40% Bonds		6.70	36,602
Moderate	Diversified ETF-Based <i>7Twelve</i> [®] Portfolio		7.27	40,714
Aggressive	100% US Stock		7.09	39,372
Crazy	Chasing Last Year's Best Performing ETF		4.84	25,728

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Asset Classes Take Turns Being the Star (in yellow) Don't chase them!

Indexes in the *7Twelve* Portfolio

Year	Large US Stock	Midcap US Stock	Small Cap US Stock	Developed Non-US Stock	Emerging Non-US Stock	Real Estate	Natural Resources	Commodities	US Bonds	TIPS	Non-US Bonds	Cash	7Twelve Portfolio Equal Allocation to all 12. Annual rebalance.
2003	28.68	35.62	38.79	38.59	56.28	38.96	34.40	25.56	4.10	8.40	14.78	1.03	27.10
2004	10.88	16.48	22.65	20.25	25.95	33.80	24.59	36.38	4.34	8.46	10.33	1.44	17.96
2005	4.91	12.56	7.68	13.54	34.54	10.41	36.61	27.83	2.43	2.84	-6.66	3.25	12.49
2006	15.79	10.32	15.12	26.34	32.55	38.79	16.85	11.47	4.33	0.41	6.44	4.85	15.27
2007	5.49	7.98	-0.30	11.17	39.82	-11.13	34.44	26.83	6.97	11.64	10.57	4.44	12.33
2008	-37.00	-36.23	-31.07	-43.38	-53.18	-45.04	-42.55	-31.89	5.24	-2.35	10.23	1.39	-25.49
2009	26.46	37.38	25.57	31.78	79.02	33.68	37.54	16.16	5.93	11.41	2.63	0.16	25.64
2010	15.06	26.64	26.31	7.75	19.20	23.44	23.88	11.78	6.54	6.31	5.90	0.15	14.41
2011	2.11	-1.73	1.02	-12.14	-18.17	1.70	-7.35	-2.44	7.84	13.56	6.33	0.06	-0.77
2012	16.00	17.88	16.33	17.32	18.63	23.73	2.20	4.06	4.21	6.98	1.83	0.08	10.77
2013	32.39	33.50	41.31	22.78	-2.27	2.81	16.49	-6.58	-2.02	-8.61	-4.30	0.06	10.46
2014	13.69	9.77	5.75	-4.90	-1.82	22.81	-9.77	-26.44	5.97	3.64	-0.79	0.03	1.49
2015	1.38	-2.18	-1.97	-0.81	-14.60	0.59	-24.28	-26.71	0.55	-1.44	-3.29	0.05	-6.06
2016	11.96	20.74	26.56	1.00	11.60	6.90	30.87	19.14	2.65	4.68	1.65	0.32	11.51
2017	21.83	16.24	13.23	25.03	37.75	8.63	1.23	5.18	3.54	3.01	7.29	0.93	11.99
15-Year Ave Annualized % Return	9.92%	12.00%	12.27%	8.11%	12.68%	10.15%	8.74%	3.81%	4.15%	4.43%	4.02%	1.20%	8.46%
15-Year Std Dev of Annual Returns	16.35%	18.37%	18.23%	20.50%	32.61%	22.23%	24.37%	21.29%	2.56%	5.96%	6.18%	1.64%	12.99%

Stop Chasing Performance

Passive ETF **7Twelve** Portfolio with annual rebalancing



Investment Approach	15-Year Annualized Performance (2003-2017)	20-Year Annualized Performance (1998-2017)
HARE: Performance Chasing by Investing 100% in Last Year's BEST ETF	4.59	4.84
HARE II: Performance Chasing by Investing 100% in Last Year's WORST ETF	5.44	2.86
TORTOISE: Invest in the equally weighted 12-asset 7Twelve ETF model	8.38	7.27

Retirement Portfolio Survival Test 1998-2017

The Withdrawal Phase During Retirement

Assumptions

5% initial withdrawal rate

3% annual cost of living (COLA) increase in withdrawal






Analysis

Ending Balance After 20 Years as of Dec 31, 2017

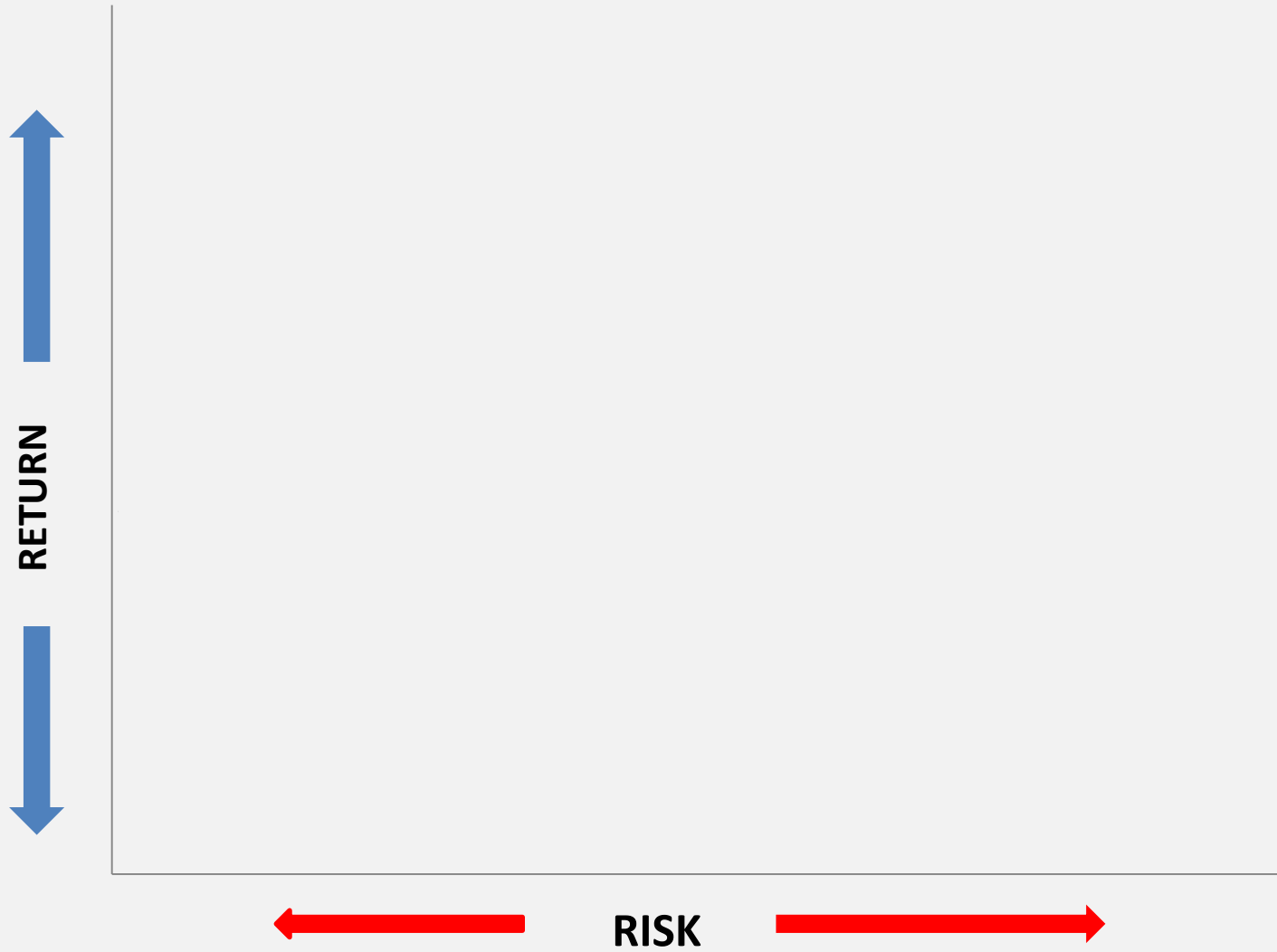
***7Twelve®** Portfolio cannot be evaluated prior to 1998 as some ingredients do not have performance history prior to that.*

Retirement Portfolio Survival Analysis

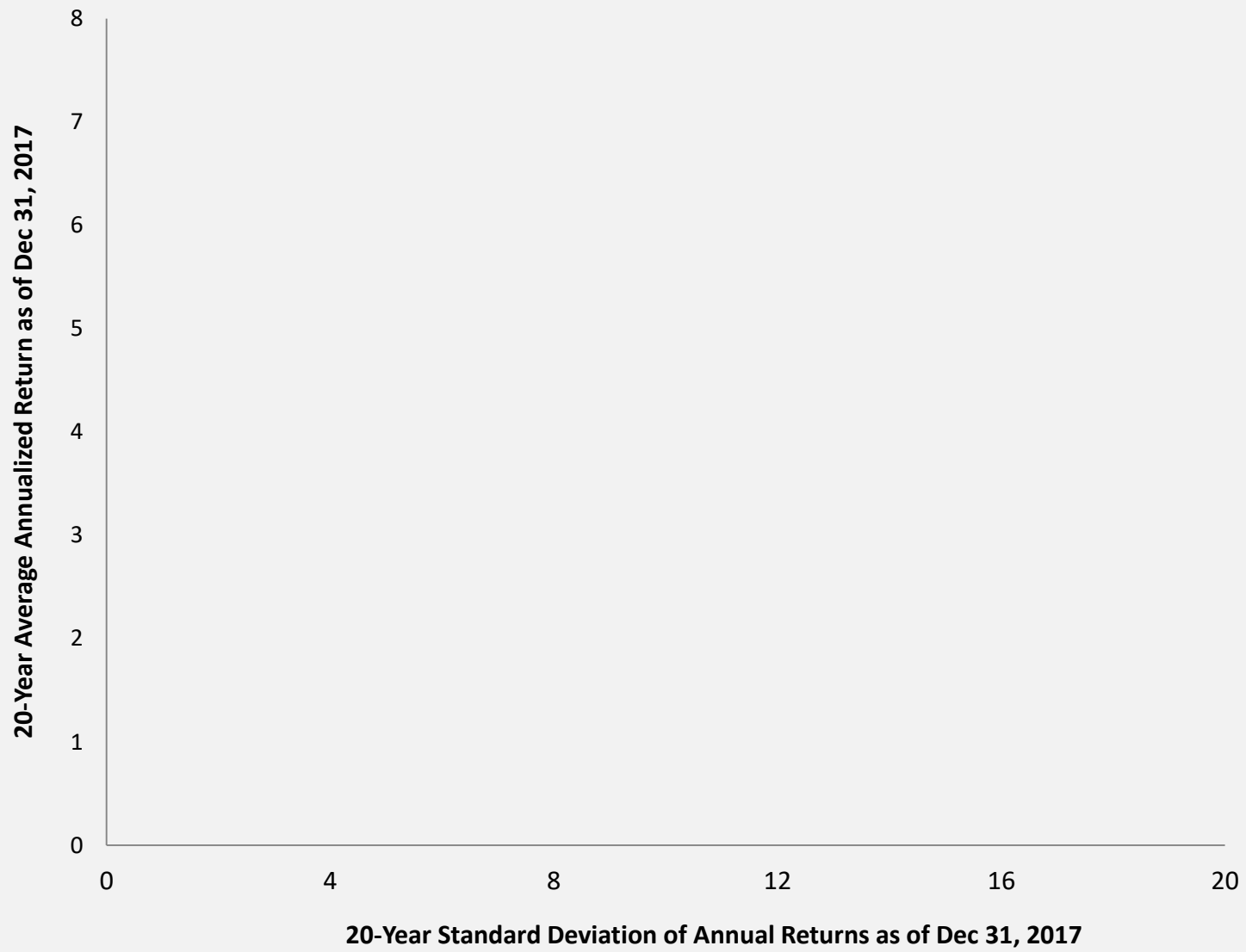
20-Year Period from 1998-2017

Risk Level	Asset Allocation Models		20-Year Annualized IRR (%)	Remaining Balance After 20-Years Starting balance of \$250,000 Total Withdrawal of \$335,880	Remaining Balance After 20-Years Starting balance of \$500,000 Total Withdrawal of \$671,760	Remaining Balance After 20-Years Starting balance of \$1,000,000 Total Withdrawal of \$1,343,520
Very Conservative	100% Cash		2.41	9,054	18,108	36,215
Conservative	50% Cash 50% Bonds		3.72	72,094	144,188	288,376
Moderate	60% US Stock 40% Bonds		6.07	246,160	492,320	984,640
Moderate	Diversified ETF-Based <i>7Twelve</i> ® Portfolio		7.25	374,565	749,131	1,498,261
Aggressive	100% US Stock		5.60	203,847	407,694	815,388

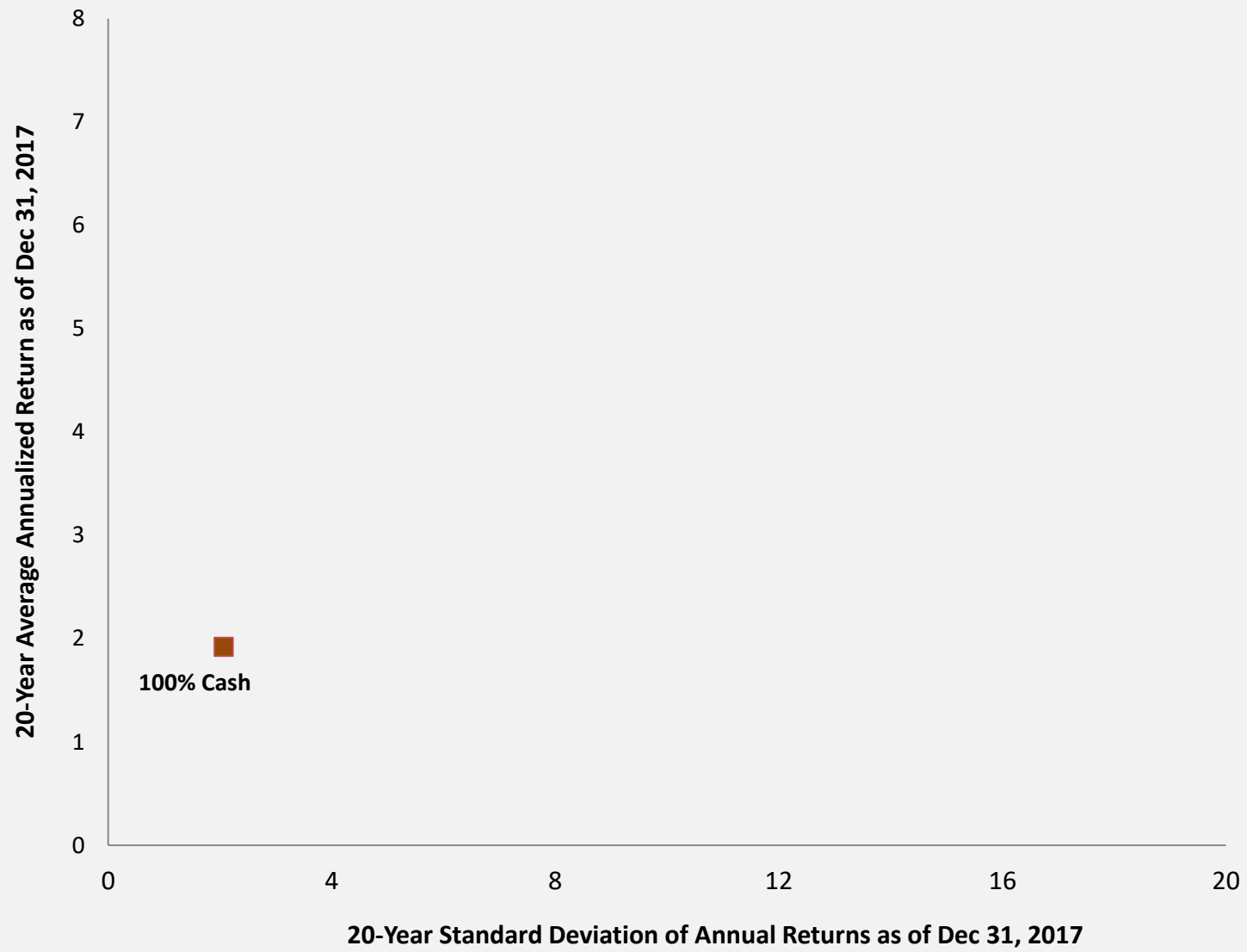
A Primer on the Efficient Frontier



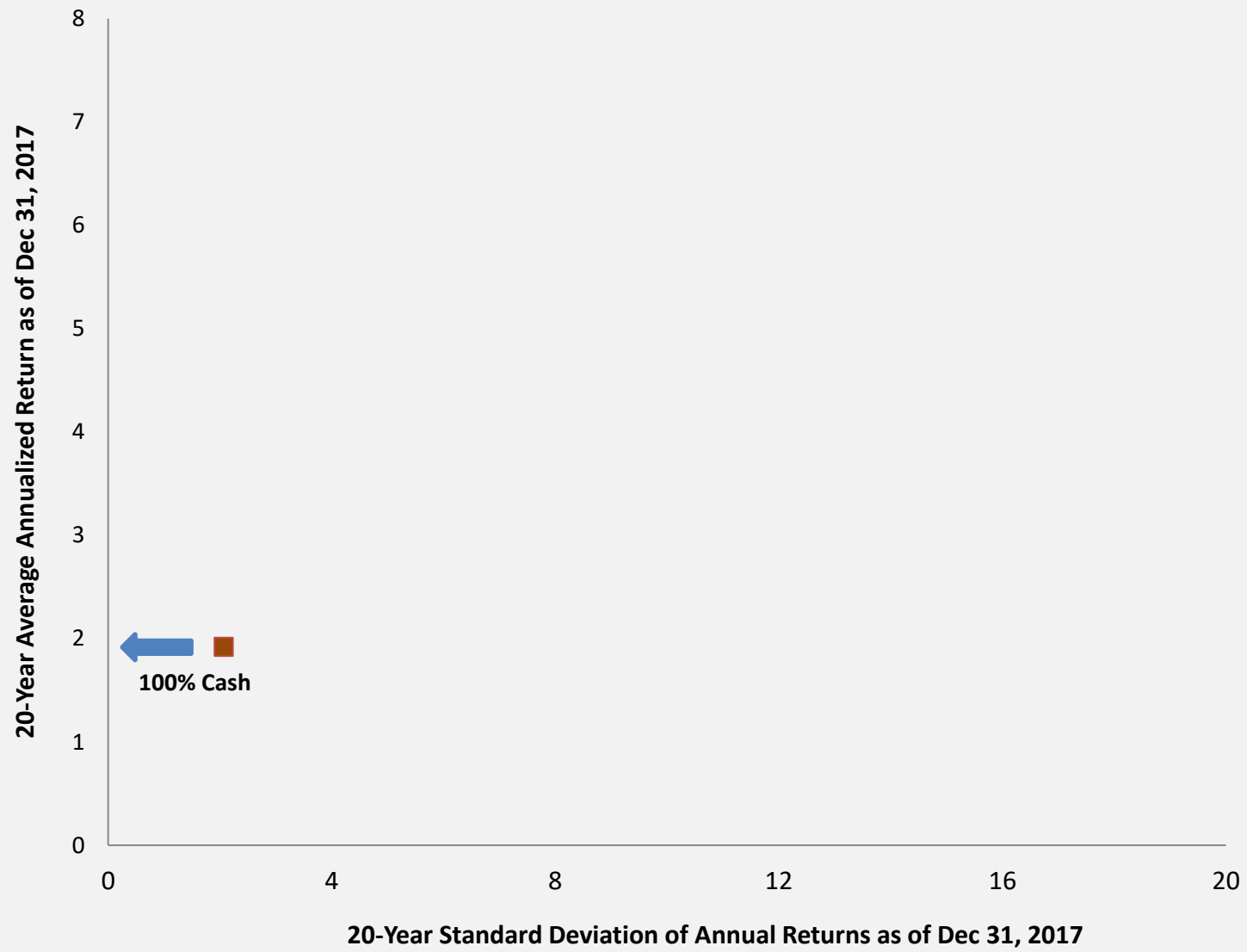
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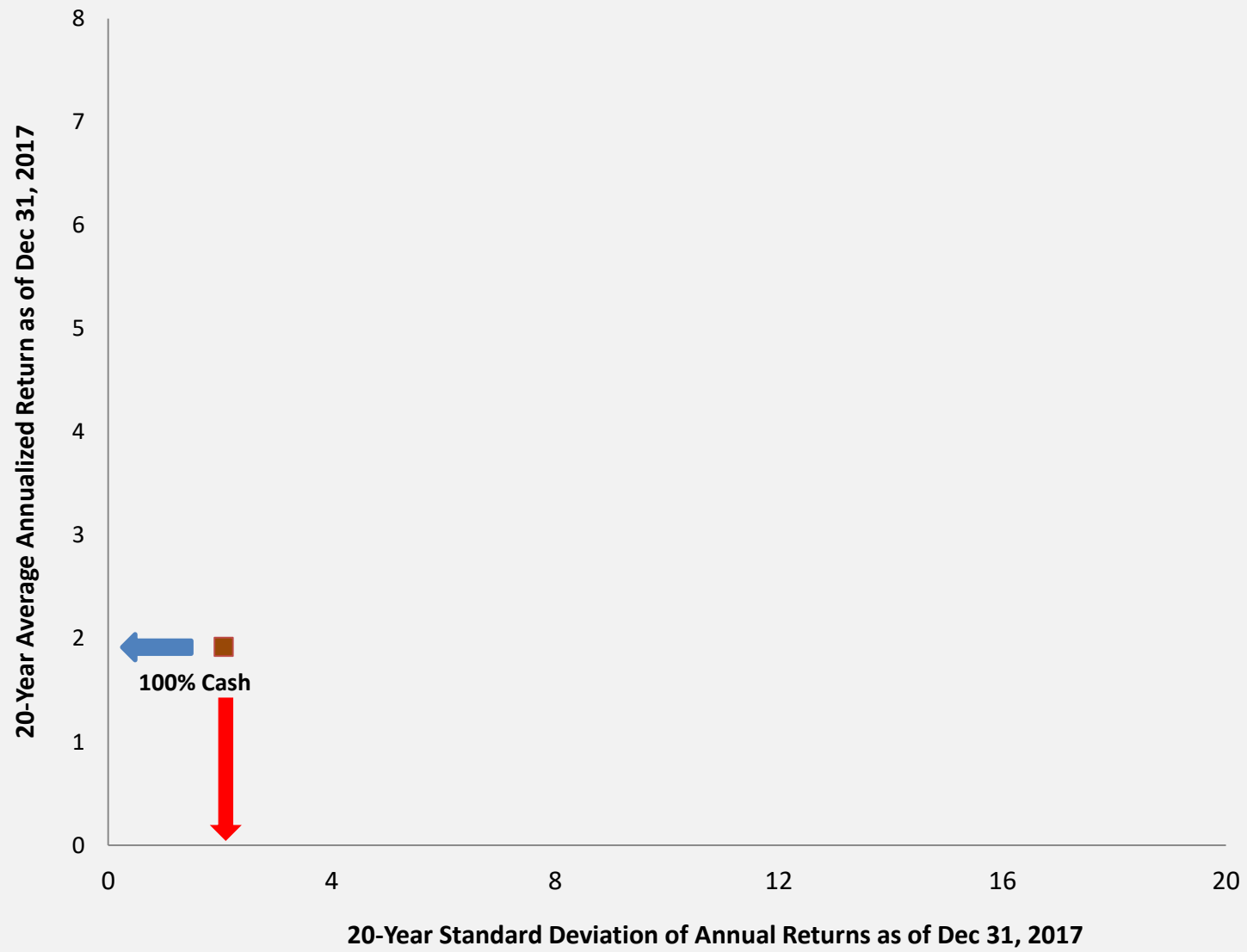


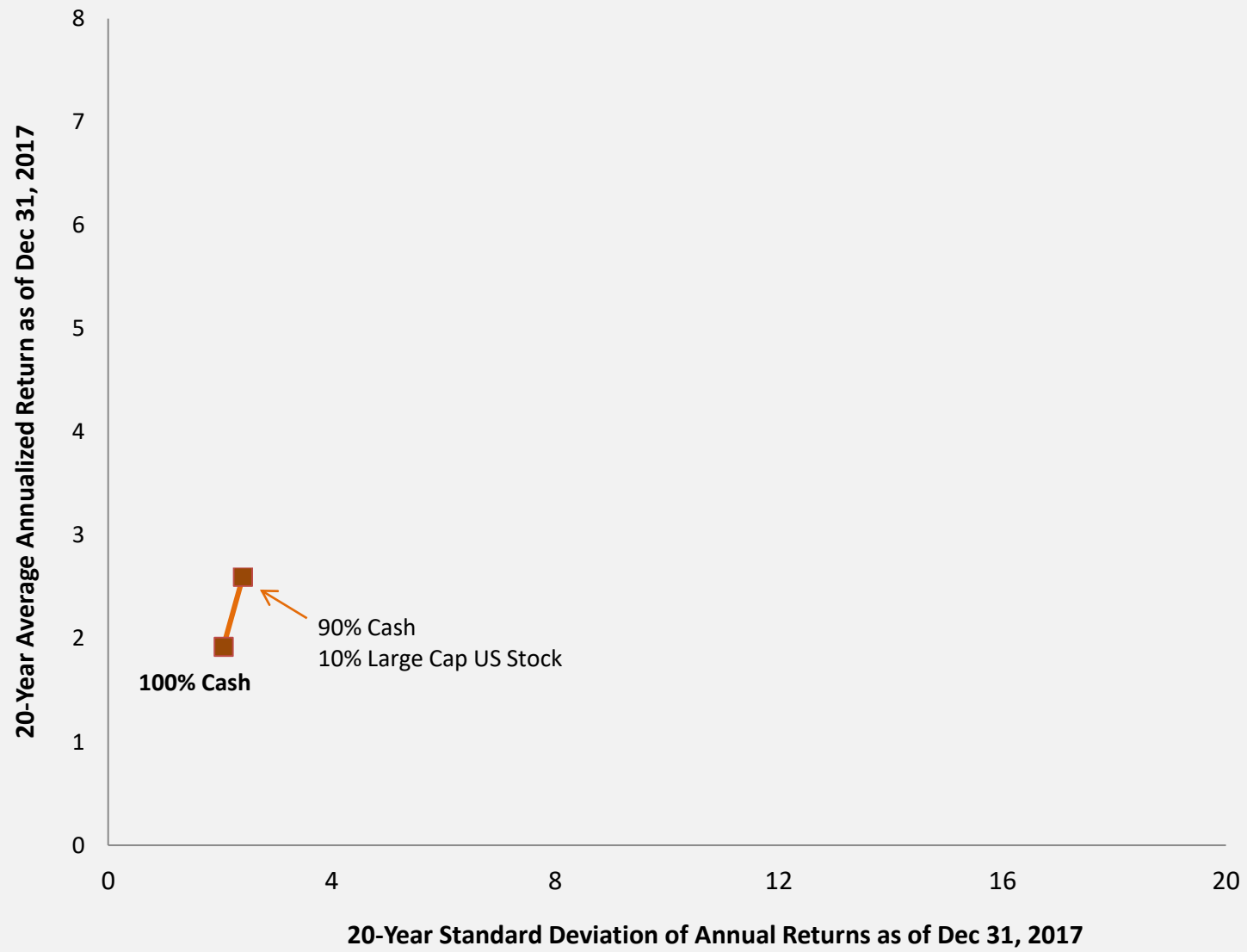
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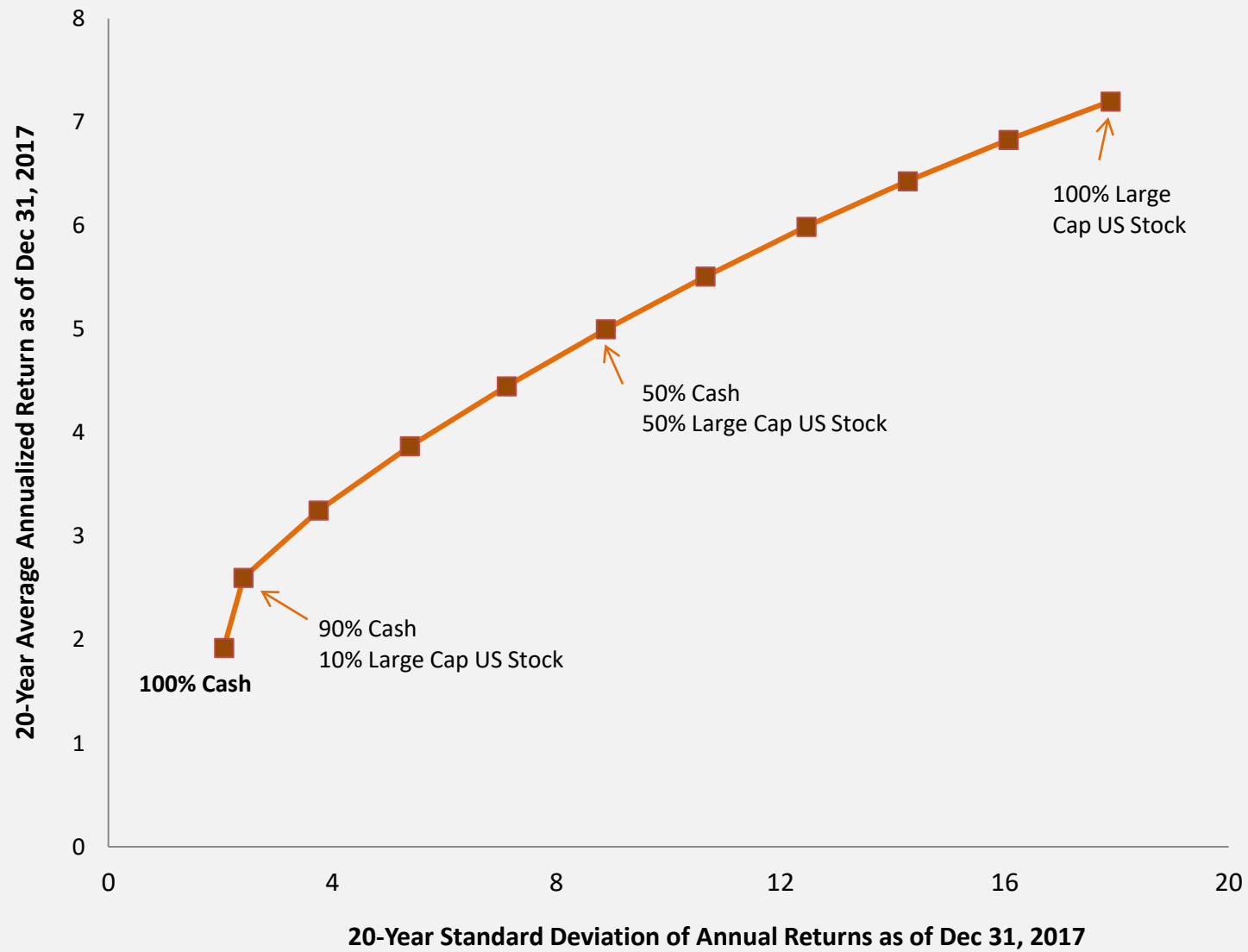


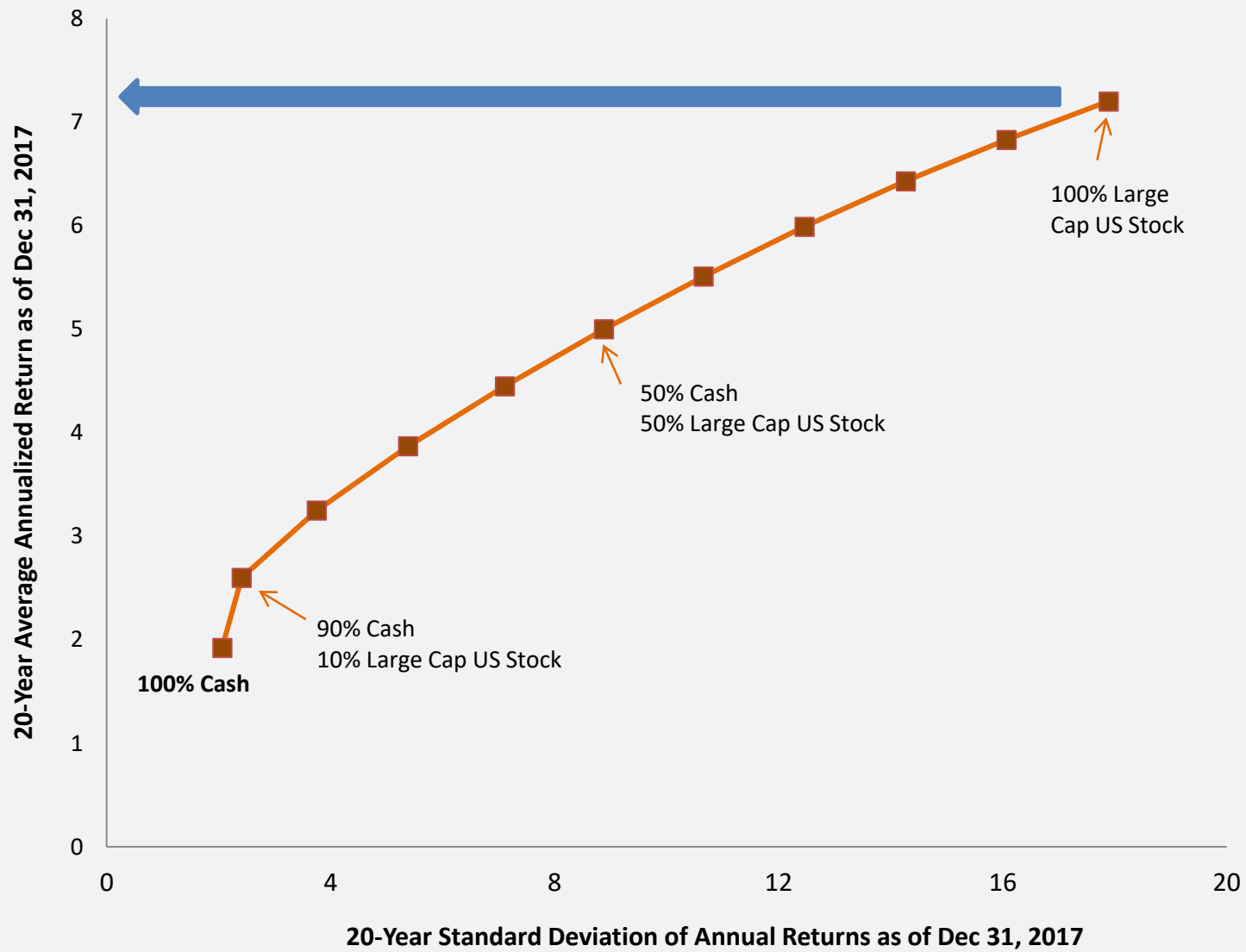
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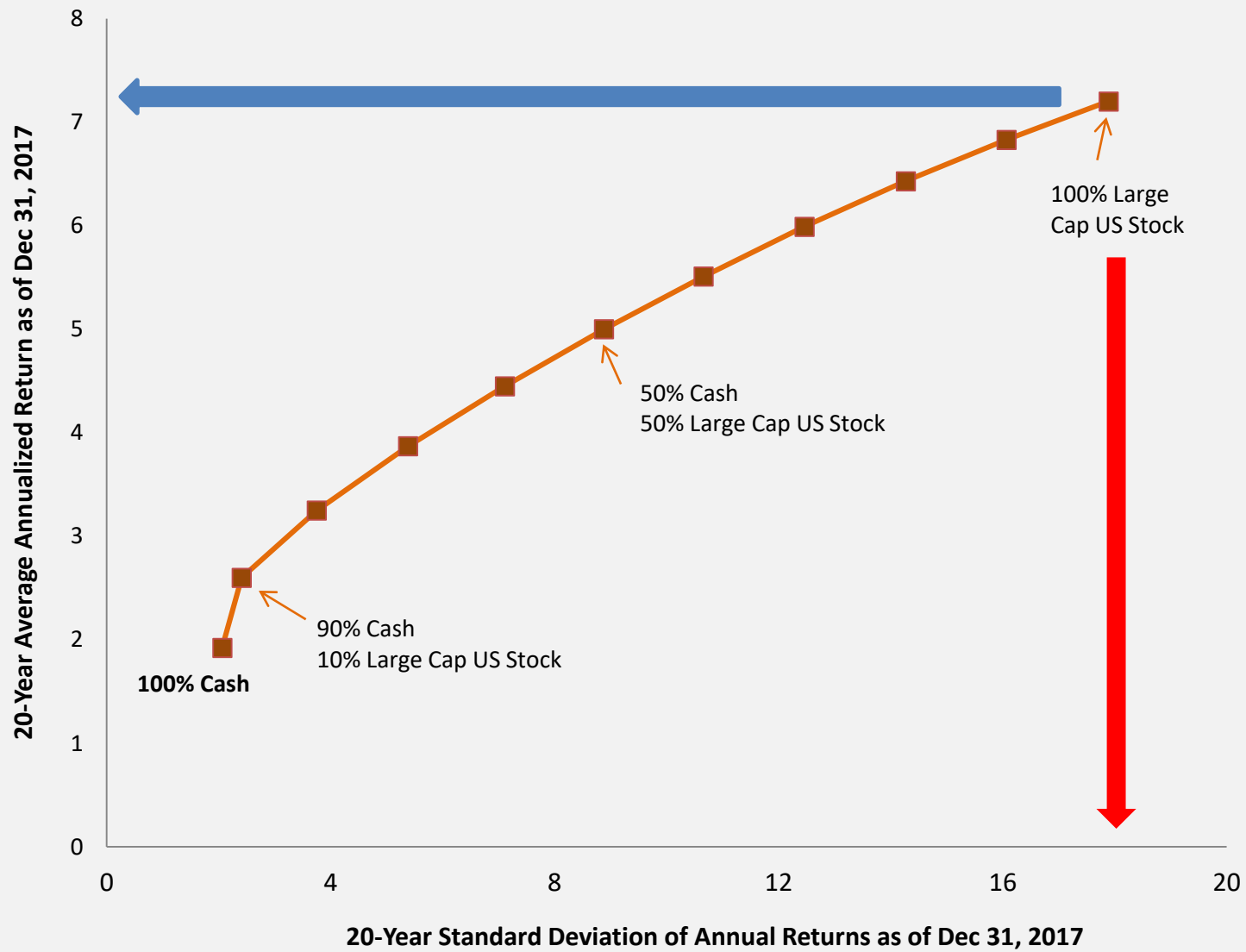


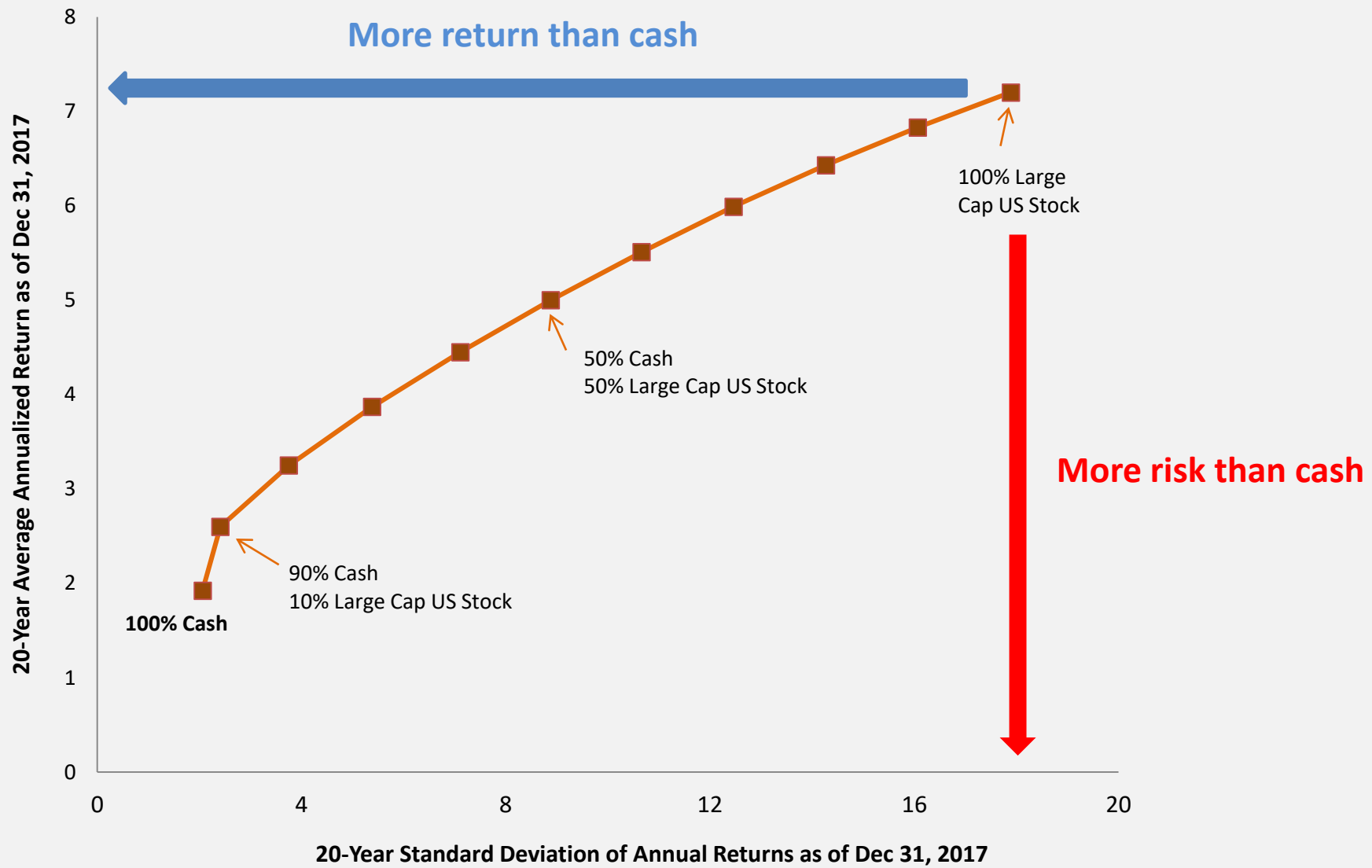


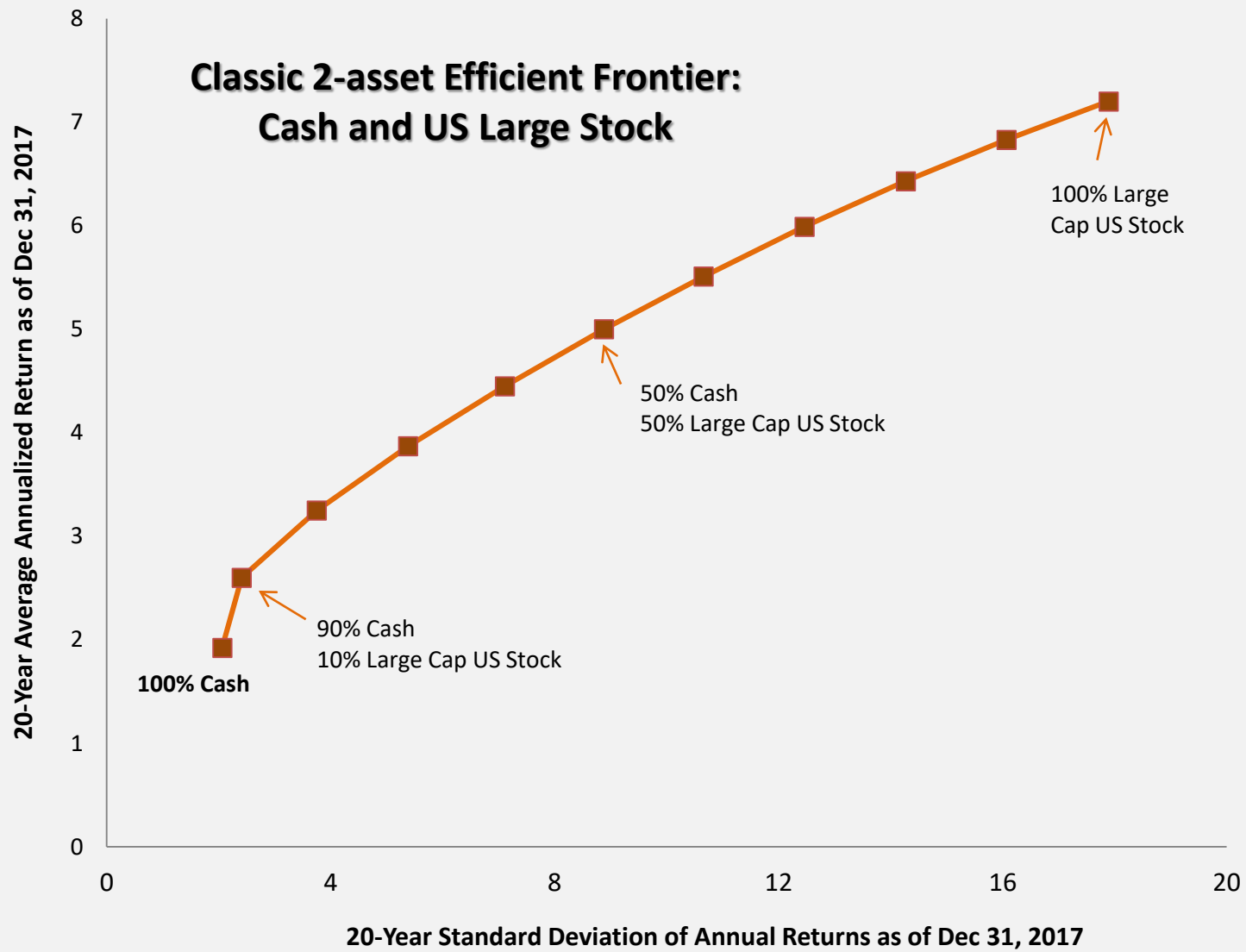












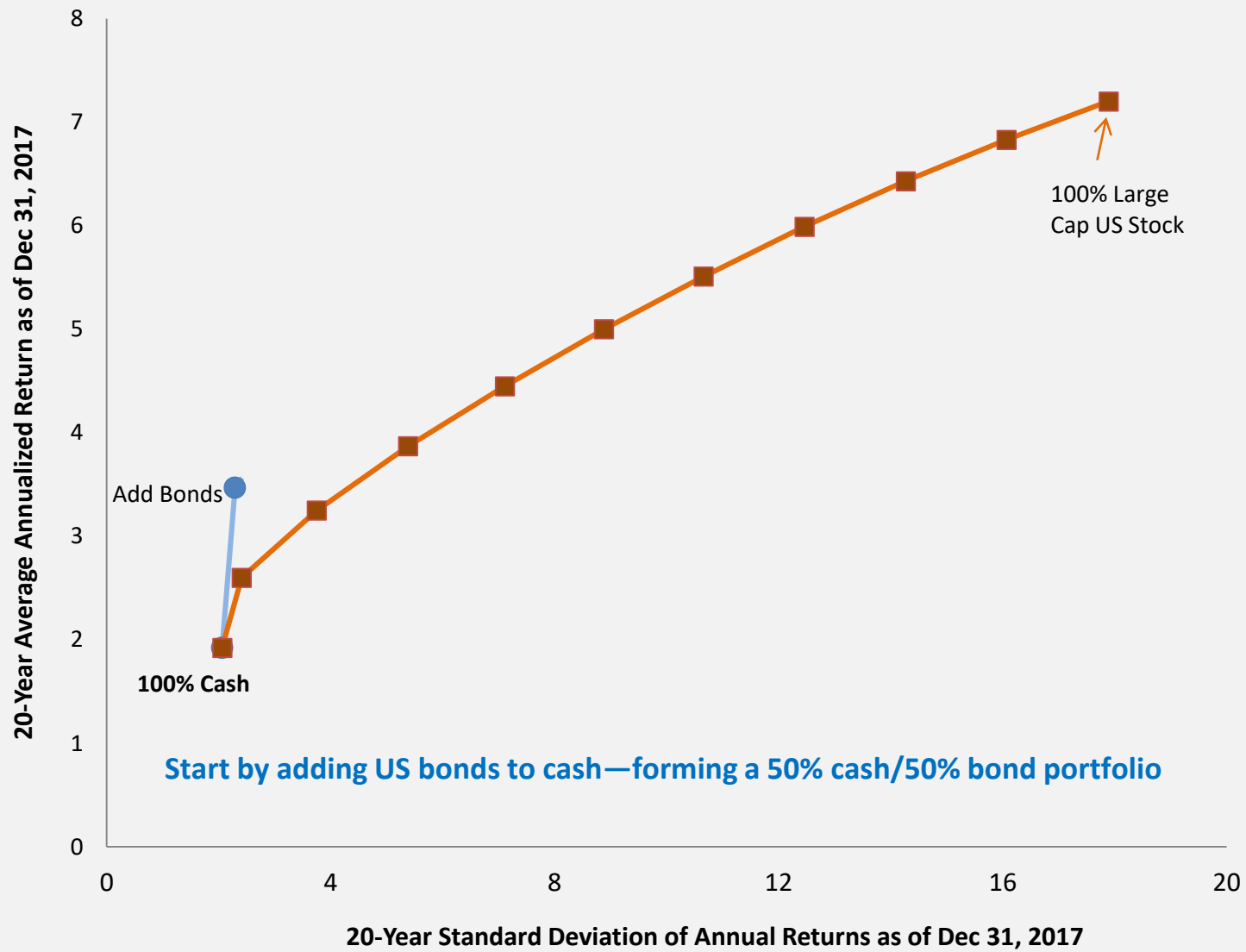
Let's explore the
Multi-Asset Effective Frontier

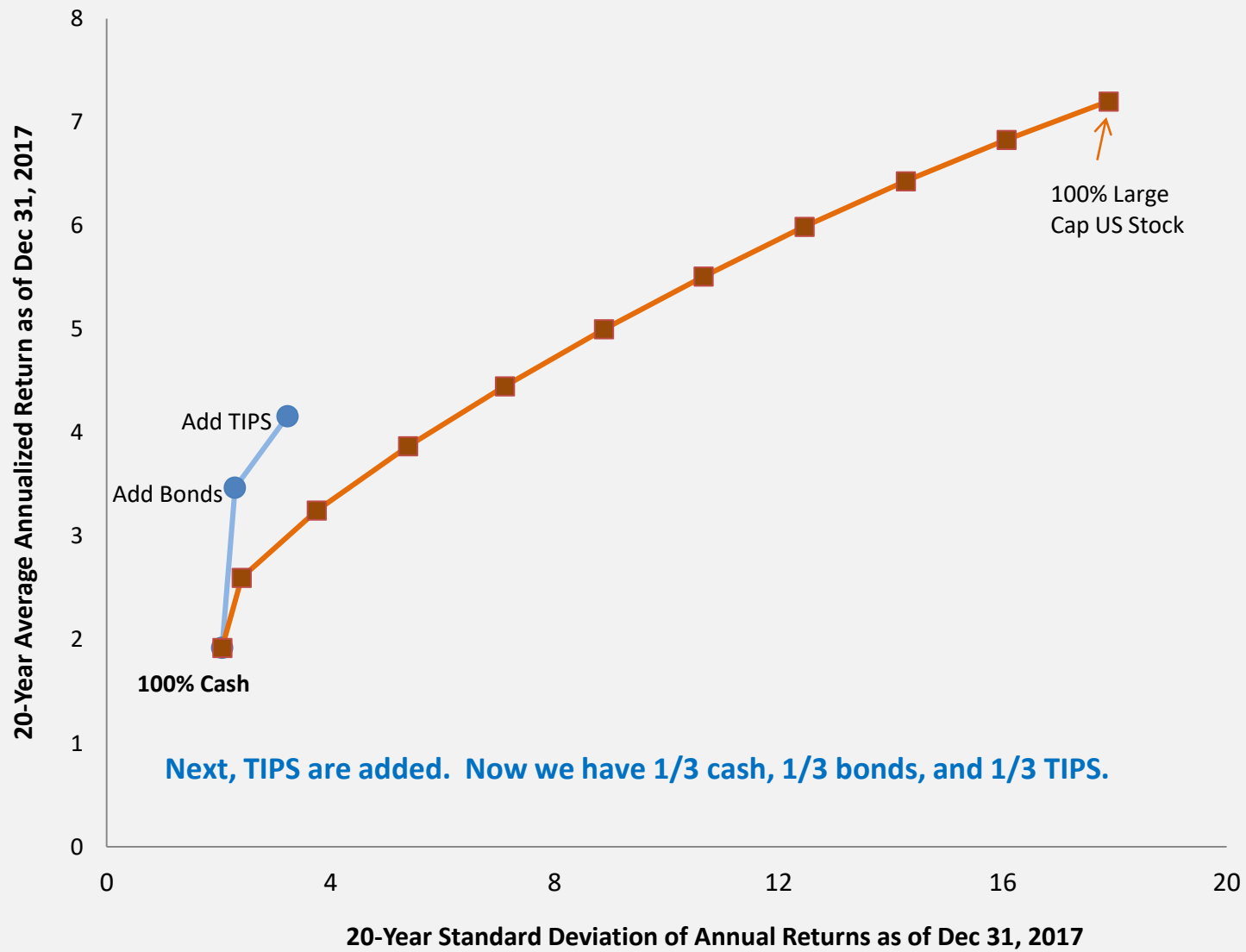
12 Asset Classes	Index used in this analysis	20-Year Average Annualized Return 1998-2017
Cash	USTREAS Stat US T-Bill 90 Day	1.92%
US Bonds	Barclays US Aggregate Bond Index	4.98%
TIPS	Barclays U.S. Treasury US TIPS Index	5.48%
Non-US Bonds	Barclays Global Treasury Index	4.39%
Small Cap stock	S&P Small Cap 600 Index	9.73%
Midcap stock	S&P Midcap 400 Index	10.58%
Large cap stock	S&P 500 Index	7.20%
REIT	S&P Global REIT Index	8.88%
Developed Non-US stock	MSCI EAFE Index NR	5.25%
Commodities	Deutsche Bank Liquid Commodity Optimum Yield Diversified Commodity Index Total Return	3.94%
Natural Resources	S&P North American Natural Resources Index	6.09%
Emerging stock	MSCI EM Index GR	8.10%

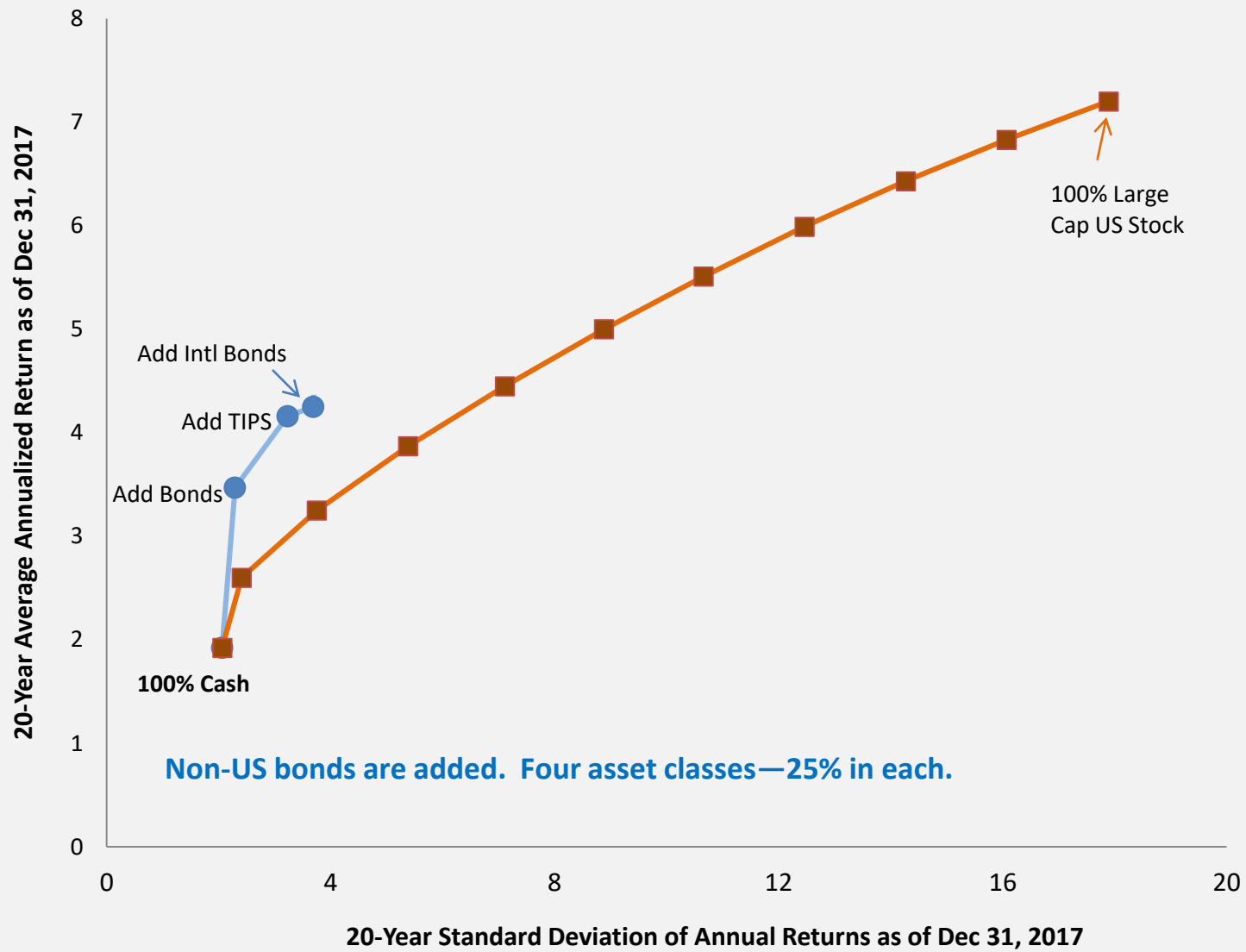
12 Asset Classes	Index used in this analysis	20-Year Standard Deviation of Annual Returns 1998-2017	20-Year Average Annualized Return 1998-2017
Cash	USTREAS Stat US T-Bill 90 Day	2.06%	1.92%
US Bonds	Barclays US Aggregate Bond Index	3.50%	4.98%
TIPS	Barclays U.S. Treasury US TIPS Index	6.11%	5.48%
Non-US Bonds	Barclays Global Treasury Index	7.32%	4.39%
Small Cap stock	S&P Small Cap 600 Index	17.17%	9.73%
Midcap stock	S&P Midcap 400 Index	17.35%	10.58%
Large cap stock	S&P 500 Index	17.89%	7.20%
REIT	S&P Global REIT Index	20.30%	8.88%
Developed Non-US stock	MSCI EAFE Index NR	21.02%	5.25%
Commodities	Deutsche Bank Liquid Commodity Optimum Yield Diversified Commodity Index Total Return	22.28%	3.94%
Natural Resources	S&P North American Natural Resources Index	23.42%	6.09%
Emerging stock	MSCI EM Index GR	34.06%	8.10%

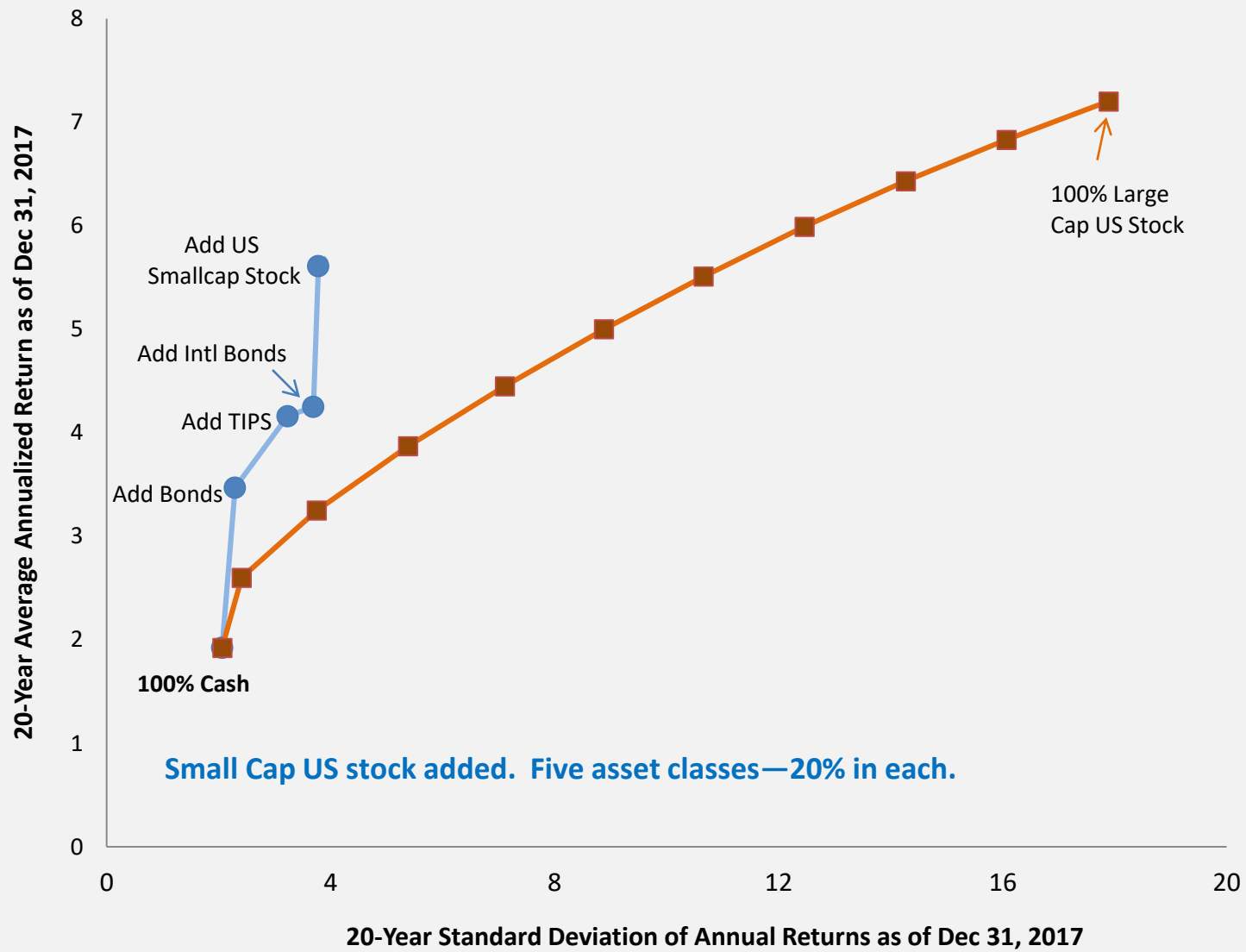


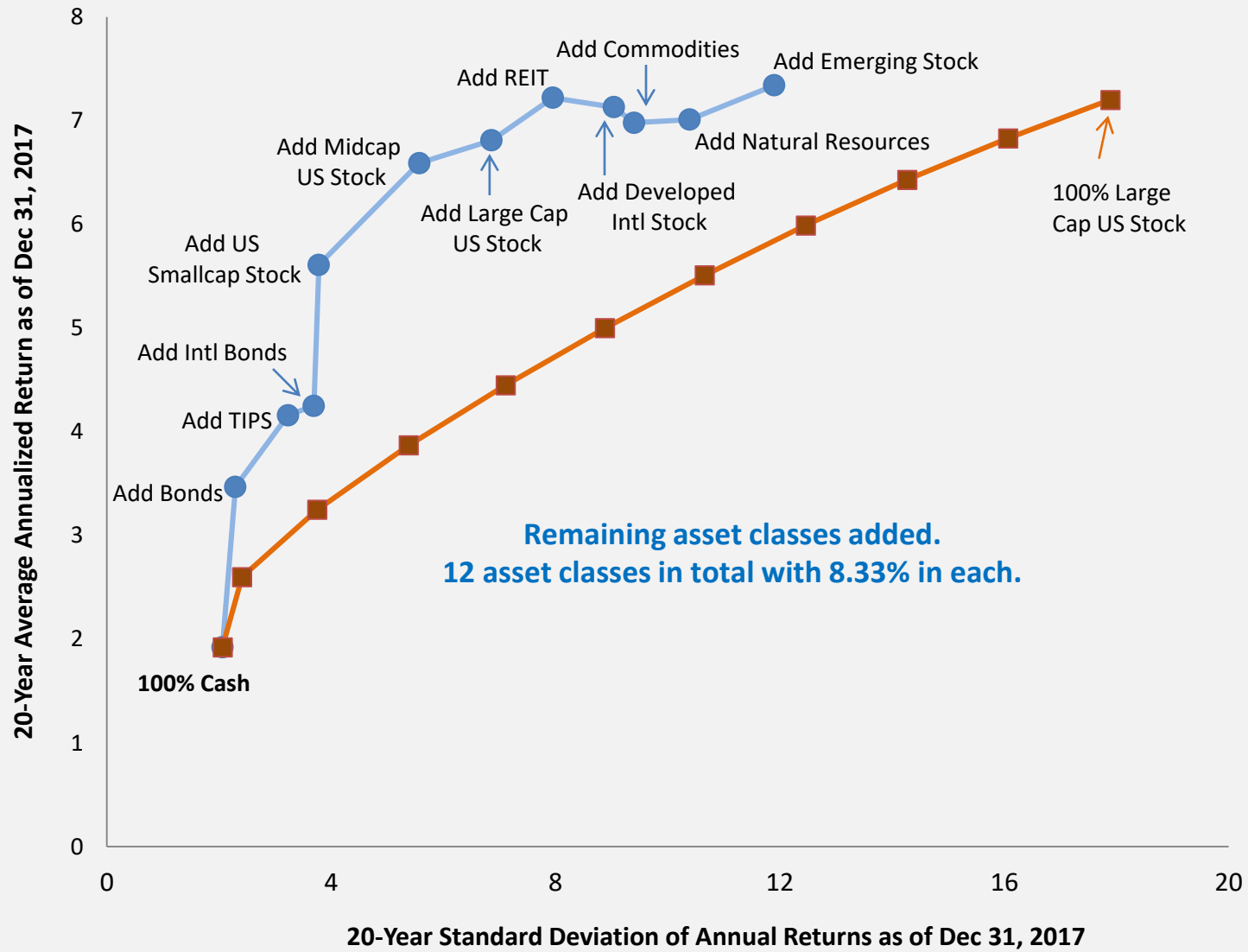
We will now build a 12-asset portfolio in order of standard deviation (lowest to highest)

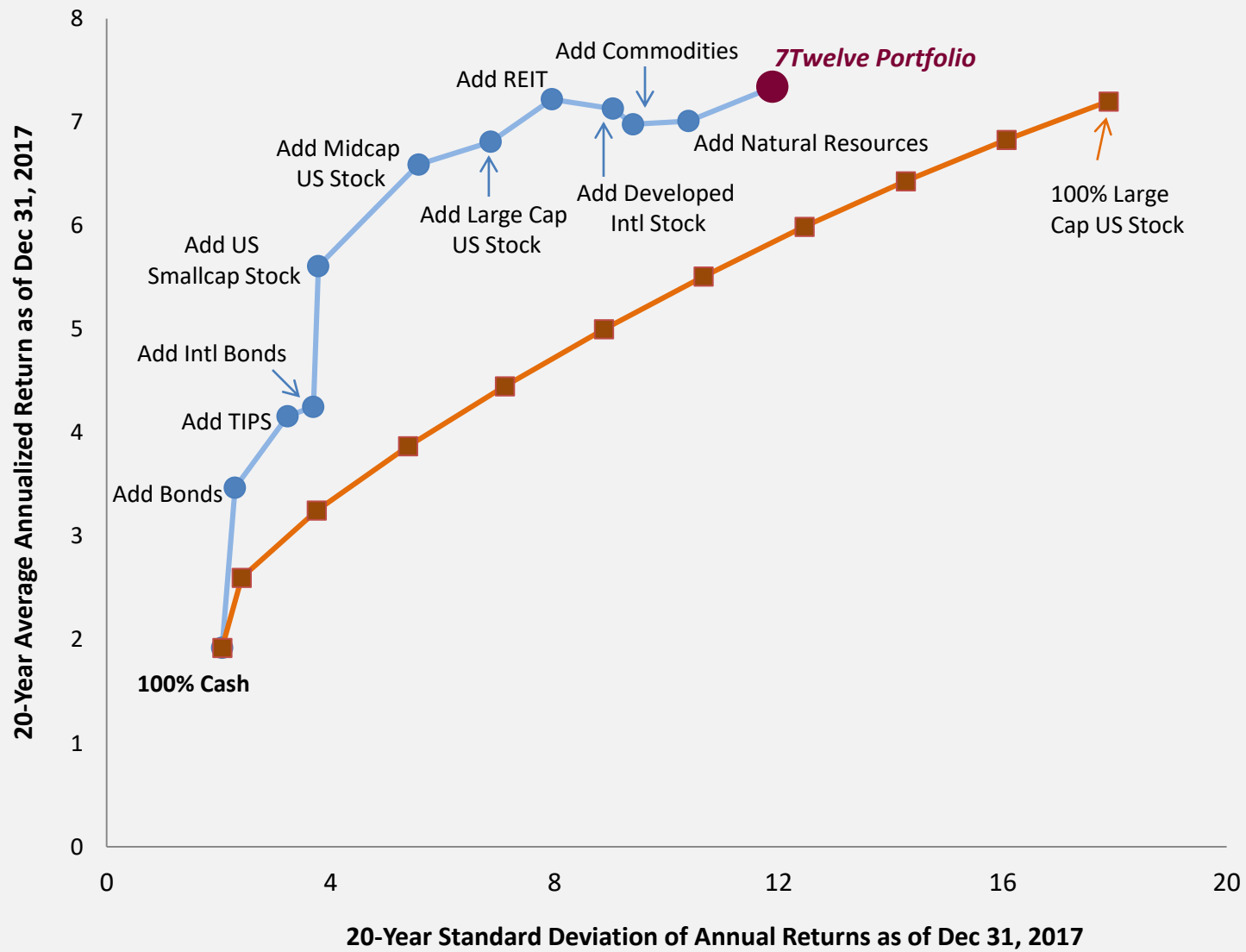


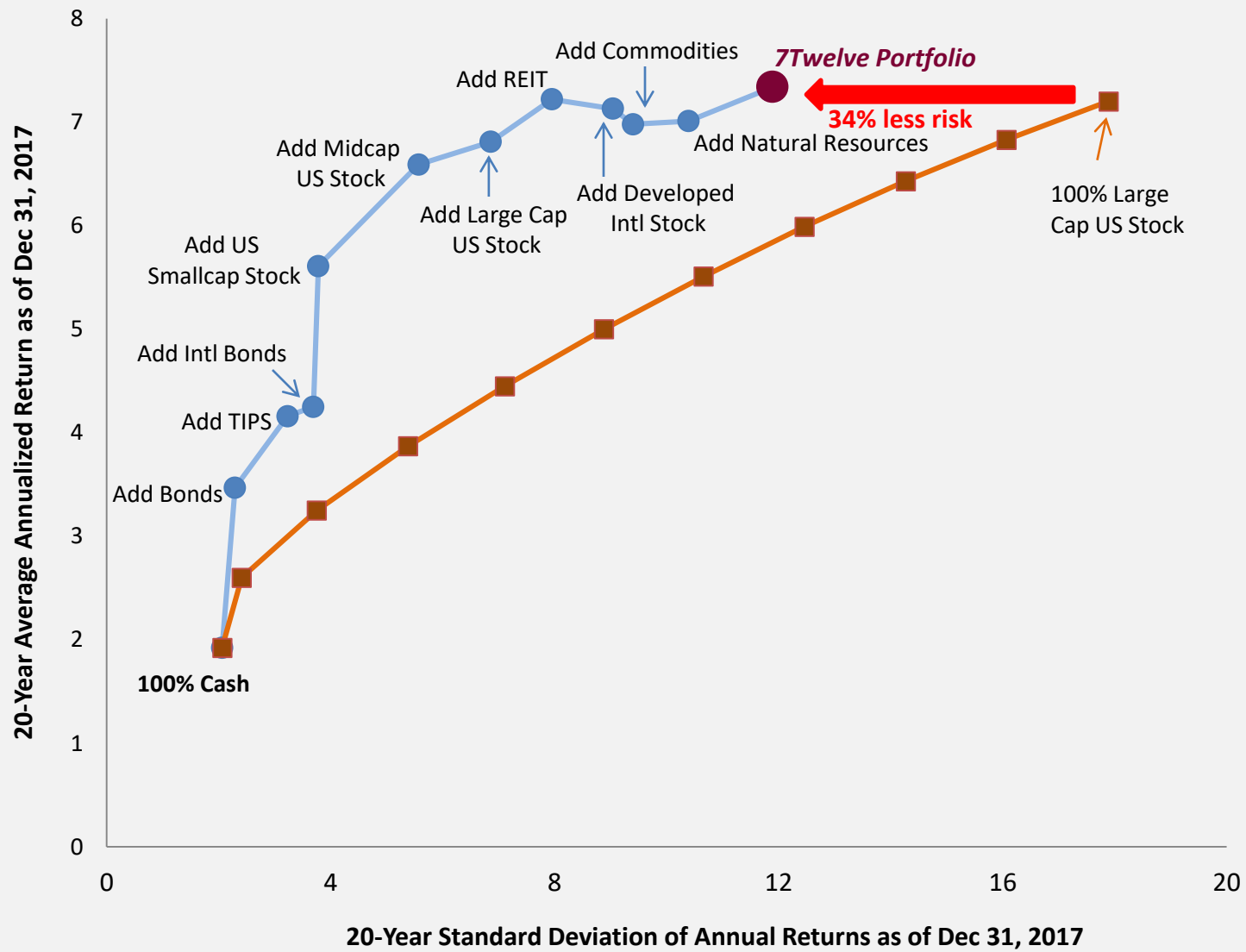


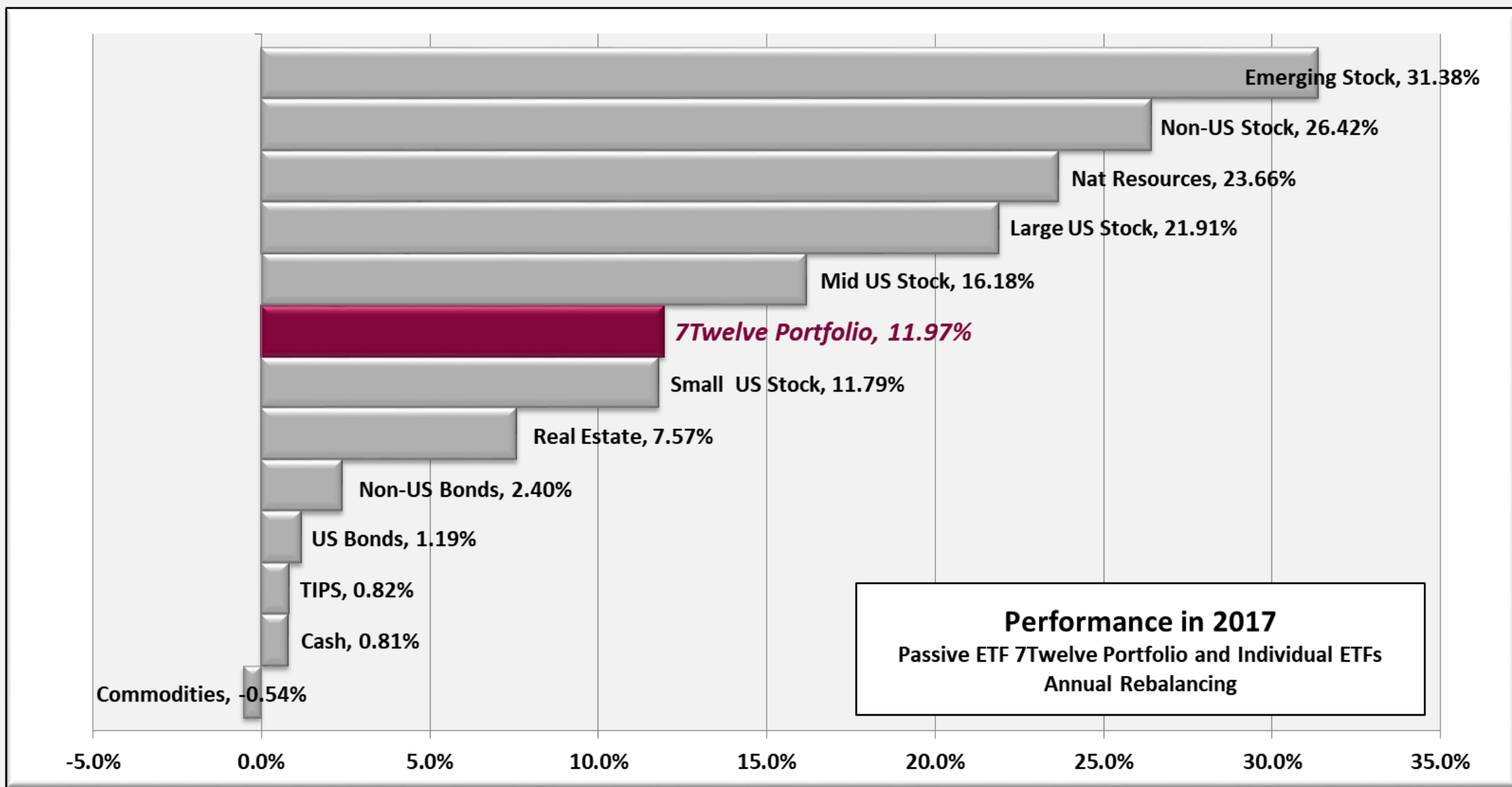


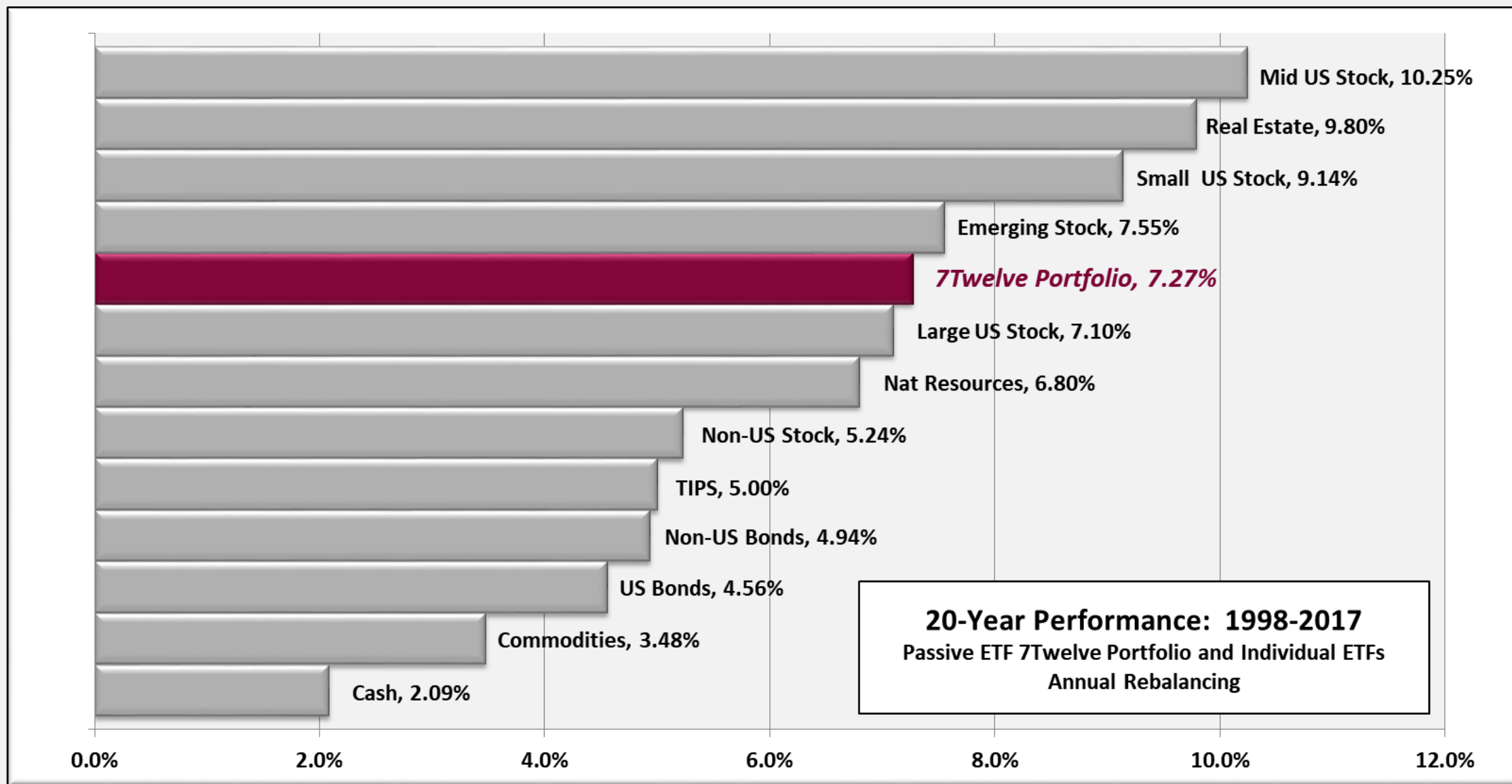


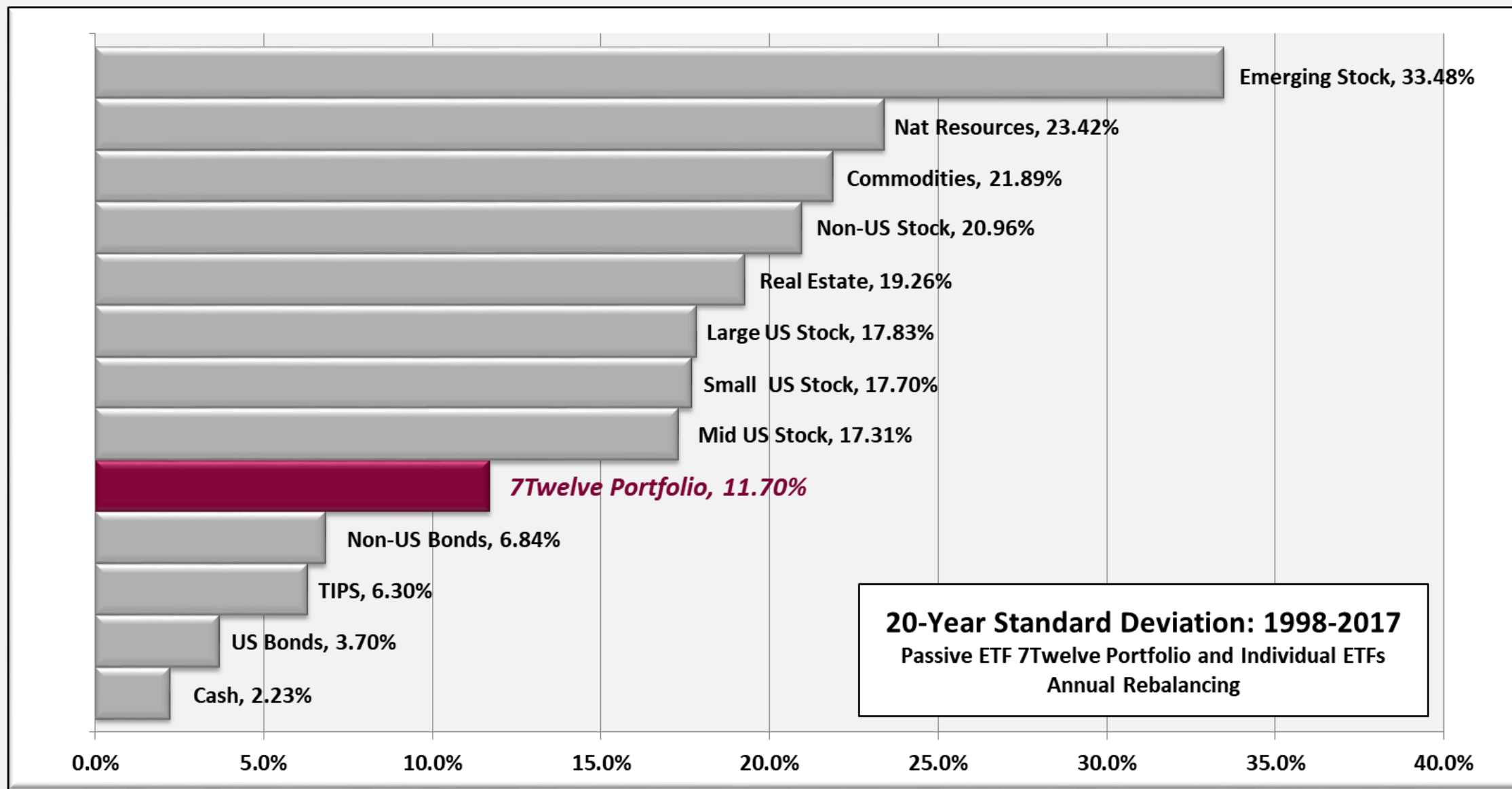






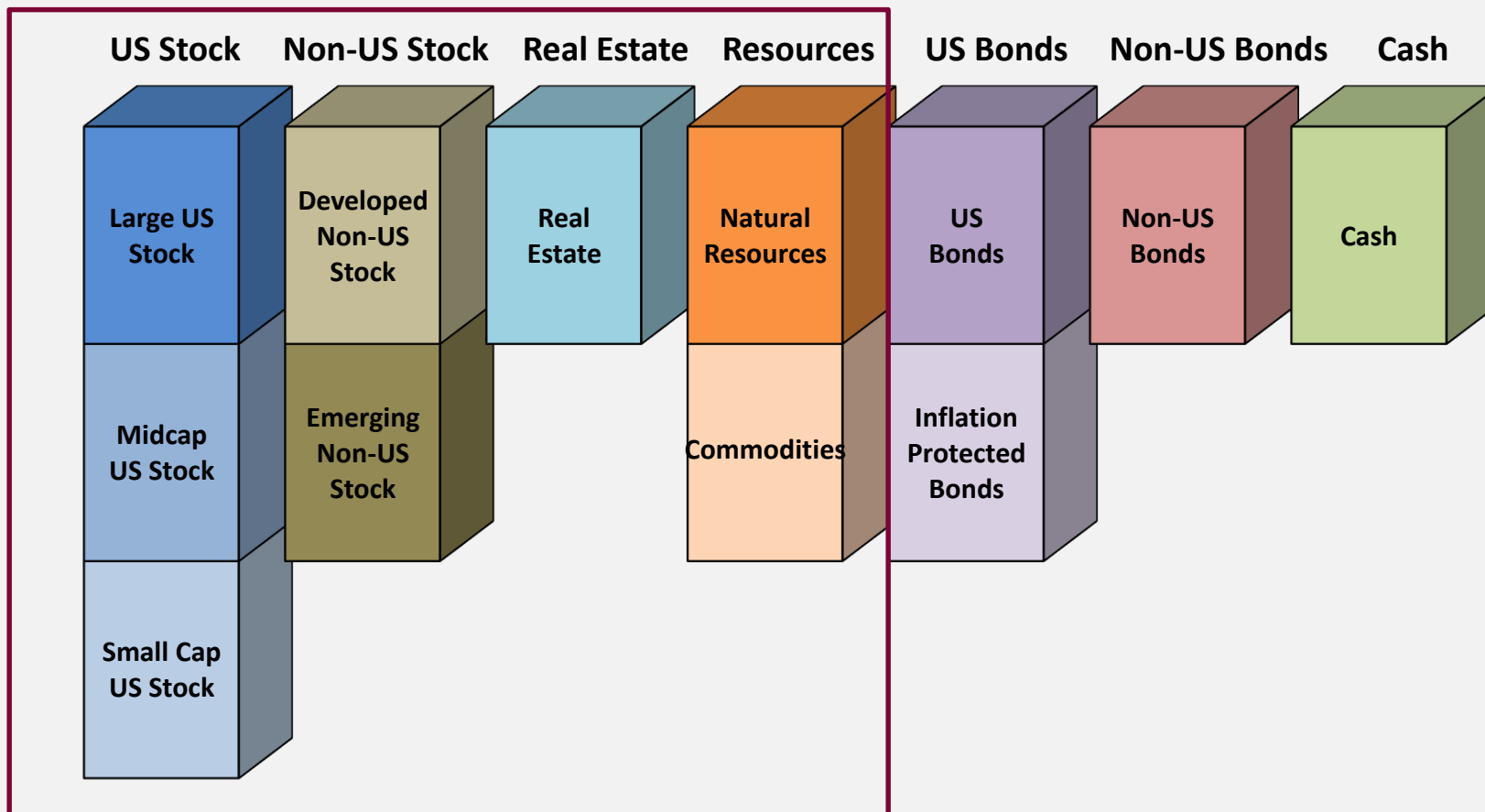






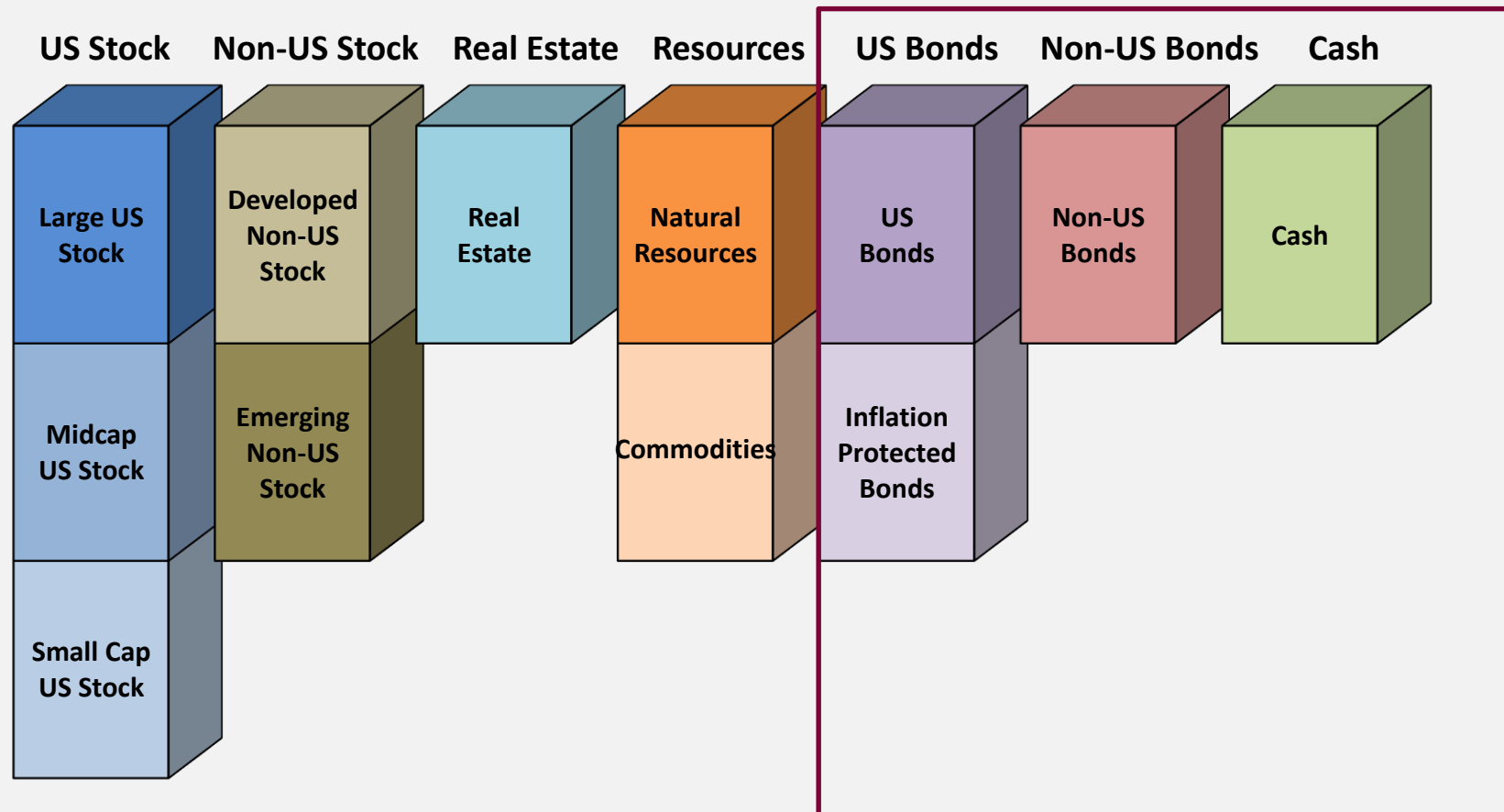
Eight Equity and Diversifying Holdings

The “Engines” of the Portfolio



7Twelve[®]

Four Fixed Income Holdings
The “**Safety Brakes**” of the Portfolio



Year	7Twelve Brakes (4 ETFs)	7Twelve Engines (8 ETFs)
1998	8.33	(1.85)
1999	0.33	25.06
2000	8.13	4.06
2001	4.78	(5.30)
2002	12.02	(6.96)
2003	7.05	36.91
2004	6.00	23.71
2005	0.36	18.34
2006	3.99	20.45
2007	8.53	13.11
2008	2.46	(38.98)
2009	6.11	35.41
2010	4.20	19.51
2011	6.19	(4.59)
2012	4.18	13.87
2013	(3.61)	16.28
2014	2.25	2.62
2015	0.48	(7.85)
2016	2.28	14.07
2017	1.31	17.30
20-Year Ave. Annualized Return	4.21	8.22
20-Year Standard Deviation	3.7	17.6

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Brakes have outperformed
35% of the time

Year	7Twelve Brakes (4 ETFs)	7Twelve Engines (8 ETFs)
1998	8.33	(1.85)
1999	0.33	25.06
2000	8.13	4.06
2001	4.78	(5.30)
2002	12.02	(6.96)
2003	7.05	36.91
2004	6.00	23.71
2005	0.36	18.34
2006	3.99	20.45
2007	8.53	13.11
2008	2.46	(38.98)
2009	6.11	35.41
2010	4.20	19.51
2011	6.19	(4.59)
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20-Year Ave. Annualized Return	4.21	8.22
20-Year Standard Deviation	3.7	17.6

Brakes have outperformed
35% of the time

Engines have outperformed
65% of the time



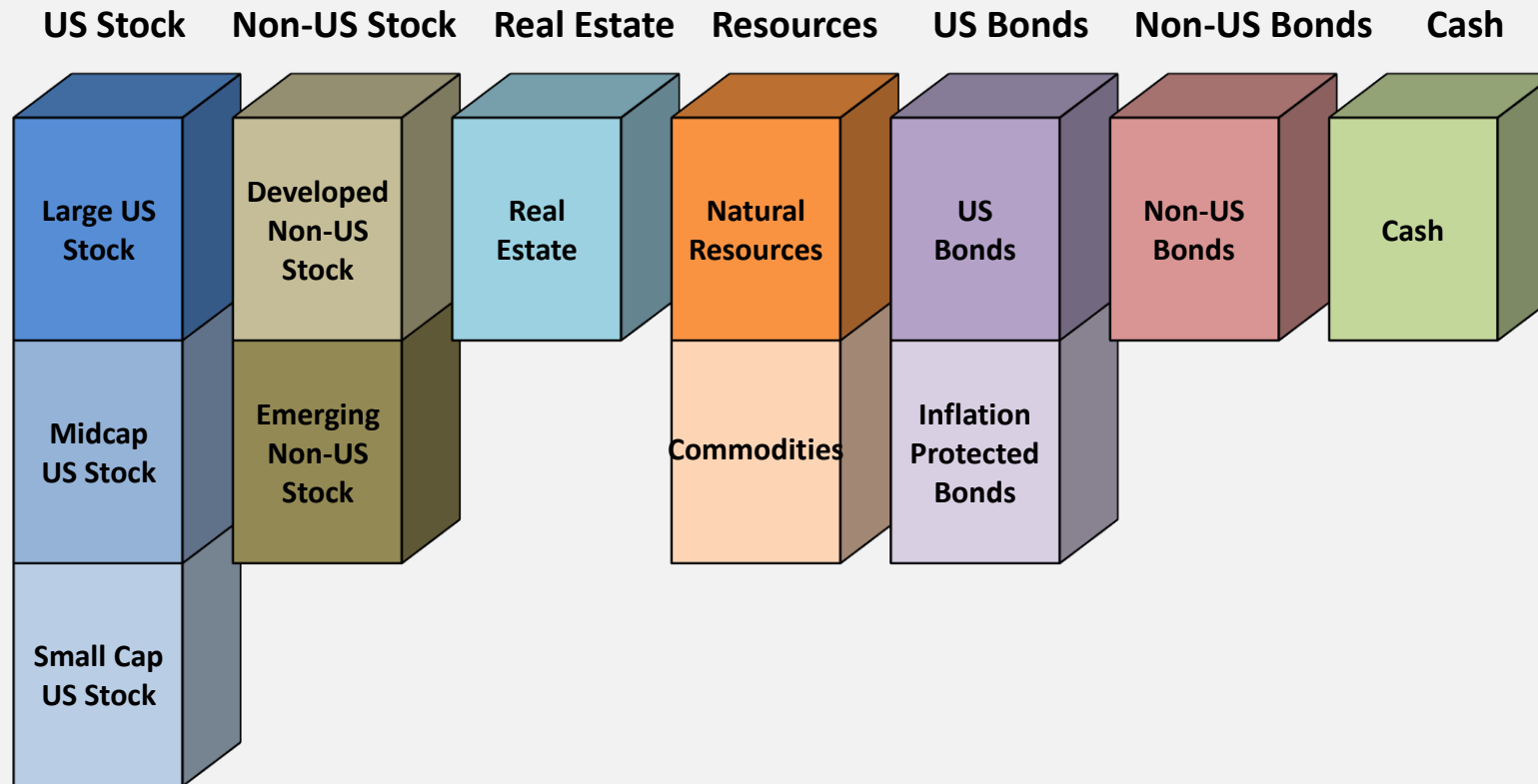
A Multi-Asset Balanced Strategy

Equities and Diversifiers: 8 ENGINES

65% of Overall Portfolio Allocation

Fixed Income: 4 BRAKES

35% of Overall Portfolio Allocation



Year	7Twelve Brakes (4 ETFs)	7Twelve Engines (8 ETFs)	Full 7Twelve Model (12 ETFs)
1998	8.33	(1.85)	1.54
1999	0.33	25.06	16.82
2000	8.13	4.06	5.42
2001	4.78	(5.30)	(1.94)
2002	12.02	(6.96)	(0.64)
2003	7.05	36.91	26.95
2004	6.00	23.71	17.80
2005	0.36	18.34	12.34
2006	3.99	20.45	14.96
2007	8.53	13.11	11.58
2008	2.46	(38.98)	(25.16)
2009	6.11	35.41	25.64
2010	4.20	19.51	14.41
2011	6.19	(4.59)	(1.00)
2012	4.18	13.87	10.64
2013	(3.61)	16.28	9.65
2014	2.25	2.62	2.50
2015	0.48	(7.85)	(5.07)
2016	2.28	14.07	10.14
2017	1.31	17.30	11.97
20-Year Ave. Annualized Return	4.21	8.22	7.27
20-Year Standard Deviation	3.7	17.6	11.7

Full **7Twelve** model delivers
88% of the performance of the engines
with only **66%** of the risk—thanks to the
brakes.

Just like your car, **7Twelve** maintains a
constant commitment to engines
AND brakes.

7Twelve® Age-Based Models

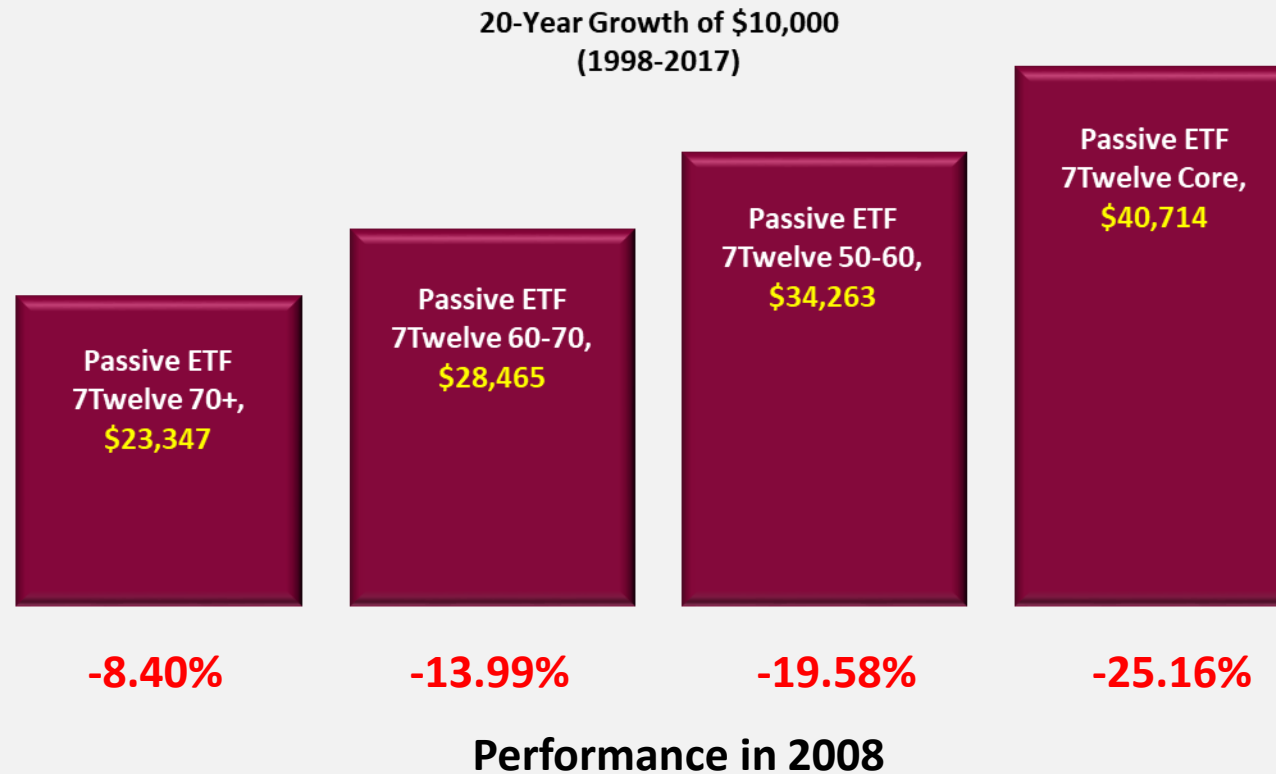
Portfolio Allocations

	7Twelve Core Model	7Twelve Age-Based 50-60	7Twelve Age-Based 60-70	7Twelve Age-Based 70+
Large US Stock	8.33%	6.67%	5.00%	3.33%
Mid Cap US Stock	8.33%	6.67%	5.00%	3.33%
Small US Stock	8.33%	6.67%	5.00%	3.33%
Non-US Stock	8.33%	6.67%	5.00%	3.33%
Emerging Markets	8.33%	6.67%	5.00%	3.33%
Real Estate	8.33%	6.67%	5.00%	3.33%
Natural Resources	8.33%	6.67%	5.00%	3.33%
Commodities	8.33%	6.67%	5.00%	3.33%
US Bonds	8.33%	6.67%	5.00%	3.33%
Inflation Protected Bonds	8.33%	6.67%	5.00%	3.33%
International Bonds	8.33%	6.67%	5.00%	3.33%
Cash	8.33%	26.67%	45.00%	63.33%



Growth of \$10,000 over 20 Years from 1998-2017

Core 7Twelve model and Age-Based Models



20-Year Retirement Portfolio Analysis: 1998-2017

\$250,000 Initial Account Value on Jan 1, 1998 in Passive ETF 7Twelve Models

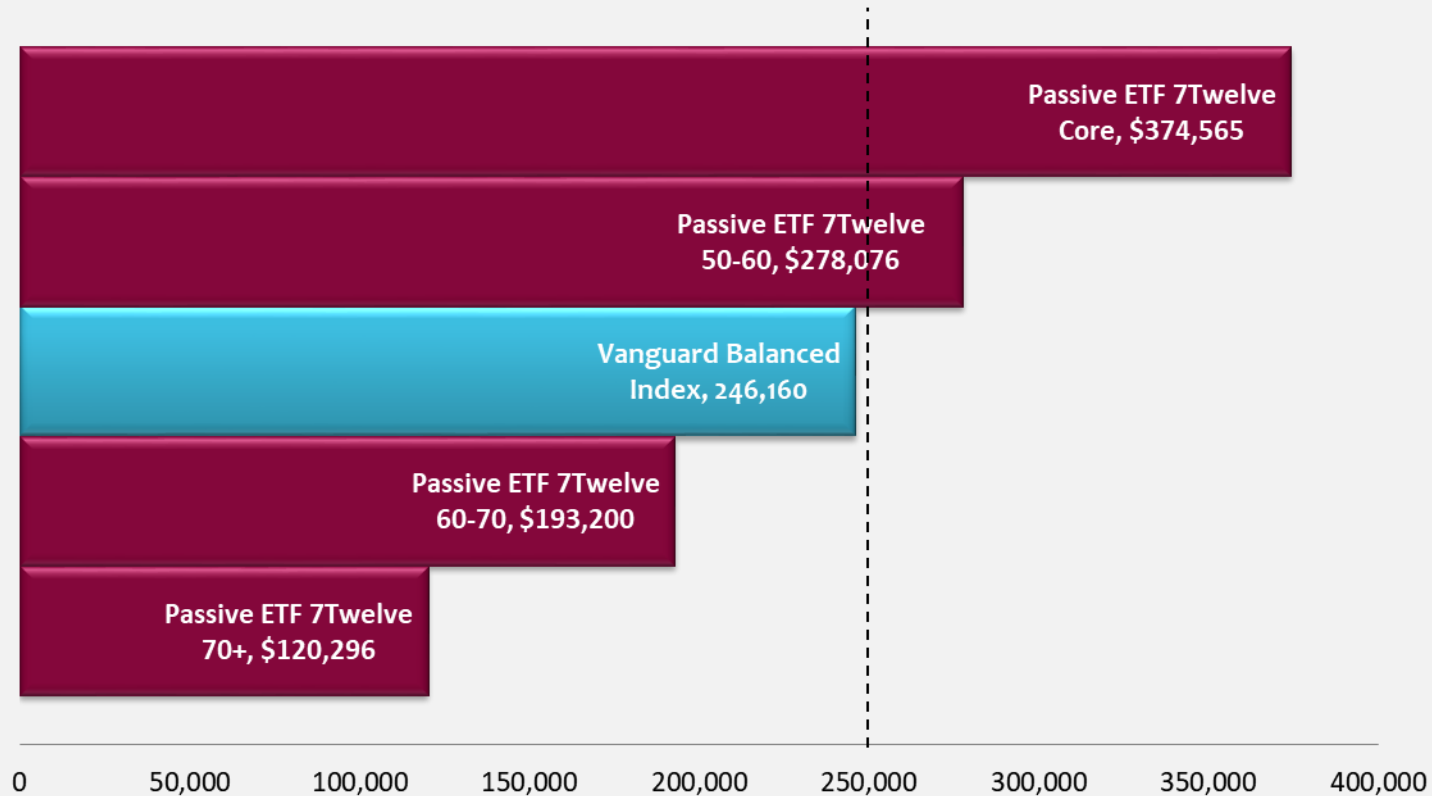
5% Initial Withdrawal

3% Annual Increase in Annual Withdrawal

Total Withdrawal of \$335,880

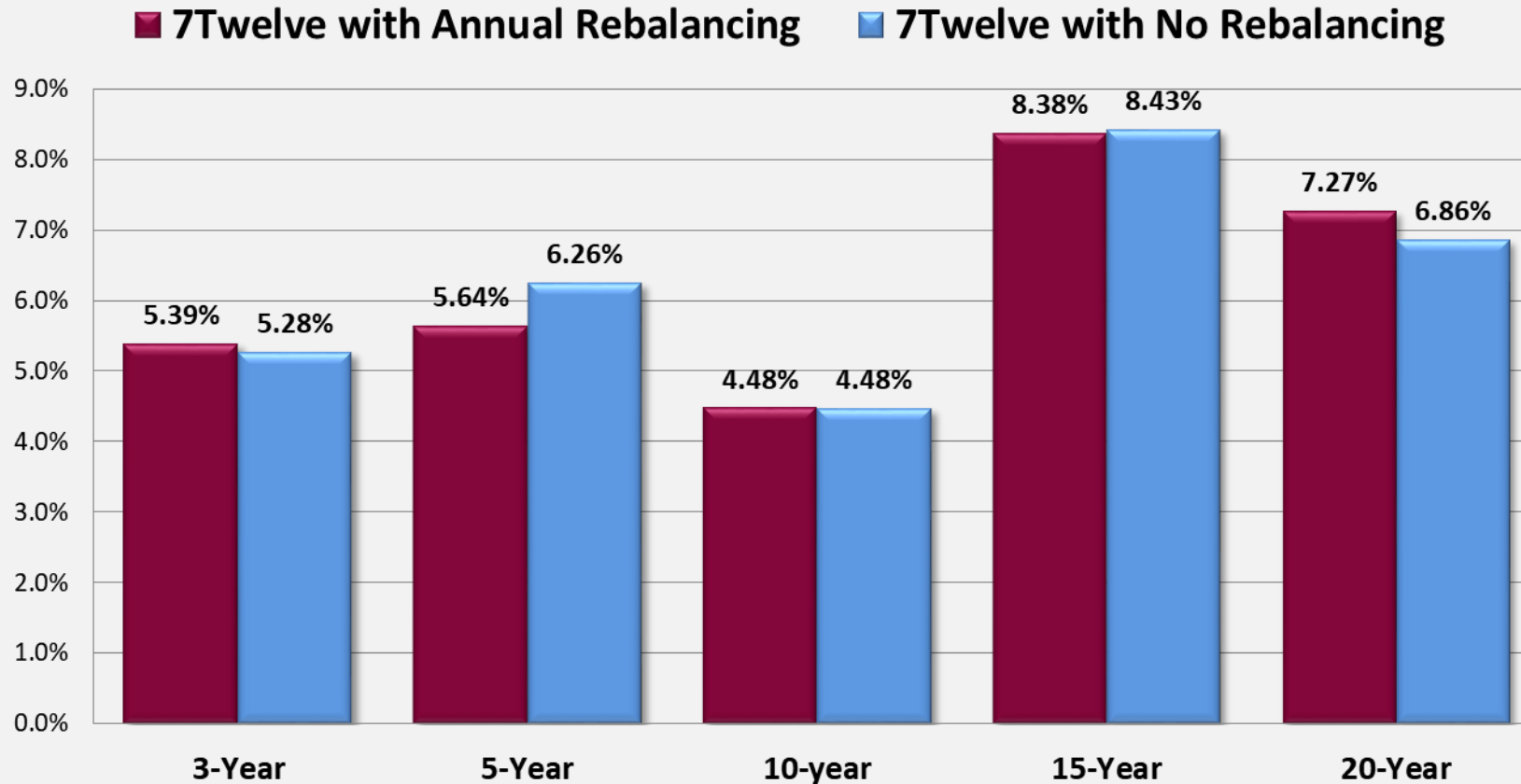
20-Year Period

Ending Account Balance on December 31, 2017





Rebalancing Comparison as of Dec 31, 2017 using Passive ETF 7Twelve Model



Annualized Return as of December 31, 2017



Passive ETF 7Twelve model

Rebalancing Frequency

20-Year Annualized Return

No
Rebalancing

6.86

Monthly
Rebalancing

7.05

Quarterly
Rebalancing

7.19

Semi-annual
Rebalancing

7.14

Annual
Rebalancing

7.27

Low-Cost *7Twelve*[®] Models

12-Asset Class <i>7Twelve</i> [®] Portfolio	12 Actively Managed Mutual Funds (Active <i>7Twelve</i>)	12 ETFs from various fund families (Passive <i>7Twelve</i>)	12 Vanguard Mutual Funds	12 Vanguard ETFs	12 Fidelity Mutual funds	12 ETFs available at Schwab
Portfolio Aggregate Annual Expense Ratio	0.55	0.16	0.23	0.09	0.38	0.16

[Click in lower right corner to return to Main Menu](#)

Low-Cost **7Twelve®** Models

12-Asset Class 7Twelve® Portfolio	<i>12 Actively Managed Mutual Funds (Active 7Twelve)</i>	<i>12 ETFs from various fund families (Passive 7Twelve)</i>	<i>12 Vanguard Mutual Funds</i>	<i>12 Vanguard ETFs</i>	<i>12 Fidelity Mutual funds</i>	<i>12 ETFs available at Schwab</i>
Portfolio Aggregate Annual Expense Ratio	0.55	0.16	0.23	0.09	0.38	0.16
20-Year Average Annualized Return (1998-2017)	7.98	7.27	7.67	7.77	7.90	7.42

Click in lower right corner to return to Main Menu

Disclosures

Performance in the past is not a guarantee of performance in the future.

Raw data source: Steele Mutual Fund Expert

Calculations: Craig Israelsen, Ph.D.

Performance of the individual ETFs and the Passive ETF 7Twelve Portfolio in the prior slides in this section generally reflects the performance of the following indexes.

The actual performance of the indexes below is shown on the following slide.

US Large cap	S&P 500 Index (TR)
US Mid Cap	S&P Midcap 400 Index (TR)
US Small Cap	S&P Small Cap 600 Index (TR)
Non-US Developed	MSCI EAFE Index NR USD
Emerging	MSCI EM Index GR USD
Real Estate	S&P Global REIT Index TR USD
Natural Resources	S&P North American Natural Resources Index TR
Commodities	Deutsche Bank Liquid Commodity Optimum Yield Diversified Commodity Index Total Return
US Bonds	Barclays US Aggregate Bond Index TR USD
TIPS	Barclays U.S. Treasury US TIPS Index TR USD
Non-US Bonds	Barclays Global Treasury Index TR
Cash	USTREAS Stat US T-Bill 90 Day TR

The **7Twelve**[®] Portfolio

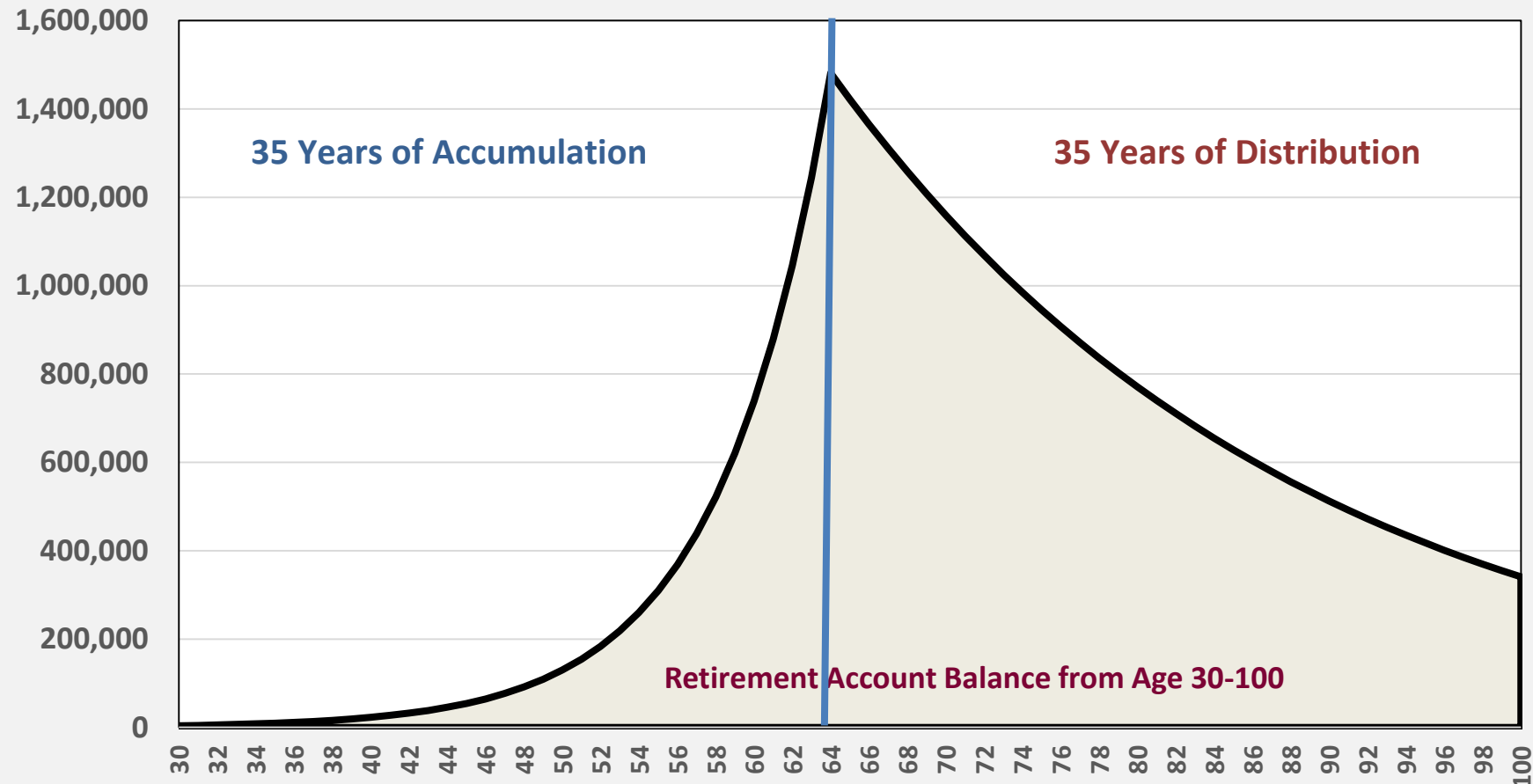
Craig L. Israelsen, Ph.D.

Email: craig@7TwelvePortfolio.com

Web: www.7TwelvePortfolio.com

To purchase 7Twelve Portfolio Research Reports click below:
<http://www.7TwelvePortfolio.com/Downloads/Web7TwelveReport.pdf>

The General Idea of Retirement Planning



Accumulation Portfolio Analysis

Annual rebalancing for all multi-asset portfolios

92-Years from 1926 – 2017
58 35-Year Rolling Periods Analyzed

10 Investment Models	Ave 35-Yr Return / Ave 35-Yr Std Dev / Worst 1-Yr Return
100% Cash	4.40 / 2.64 / -0.02
50% Bonds/50% Cash	5.15 / 3.51 / -0.98
100% Bonds	5.83 / 5.74 / -2.92
25/75 Conservative 4-Asset Model	7.59 / 6.37 / -12.54
40% Large US Stock/60% Bonds	8.32 / 8.37 / -18.73
50/50 Equal-Weighted 4-Asset Model	9.44 / 11.08 / -23.59
60% Large US Stock/40% Bonds	9.37 / 11.32 / -26.93
65/35 Growth 4-Asset Model	10.37 / 13.60 / -30.25
80% Large US Stock/ 20% Bonds	10.29 / 14.60 / -35.14
100% Large US Stock	11.08 / 18.02 / -43.34

Indexes used in the analysis:

Cash: 90-day US T Bills

Bonds: SBBI US Intermediate Govt Bonds from 1926-1975, Barclay's Capital Aggregate Bonds Index from 1976-2017

Small US Stock: Ibbotson Small Stock from 1926-1978, Russell 2000 Index from 1979-2017

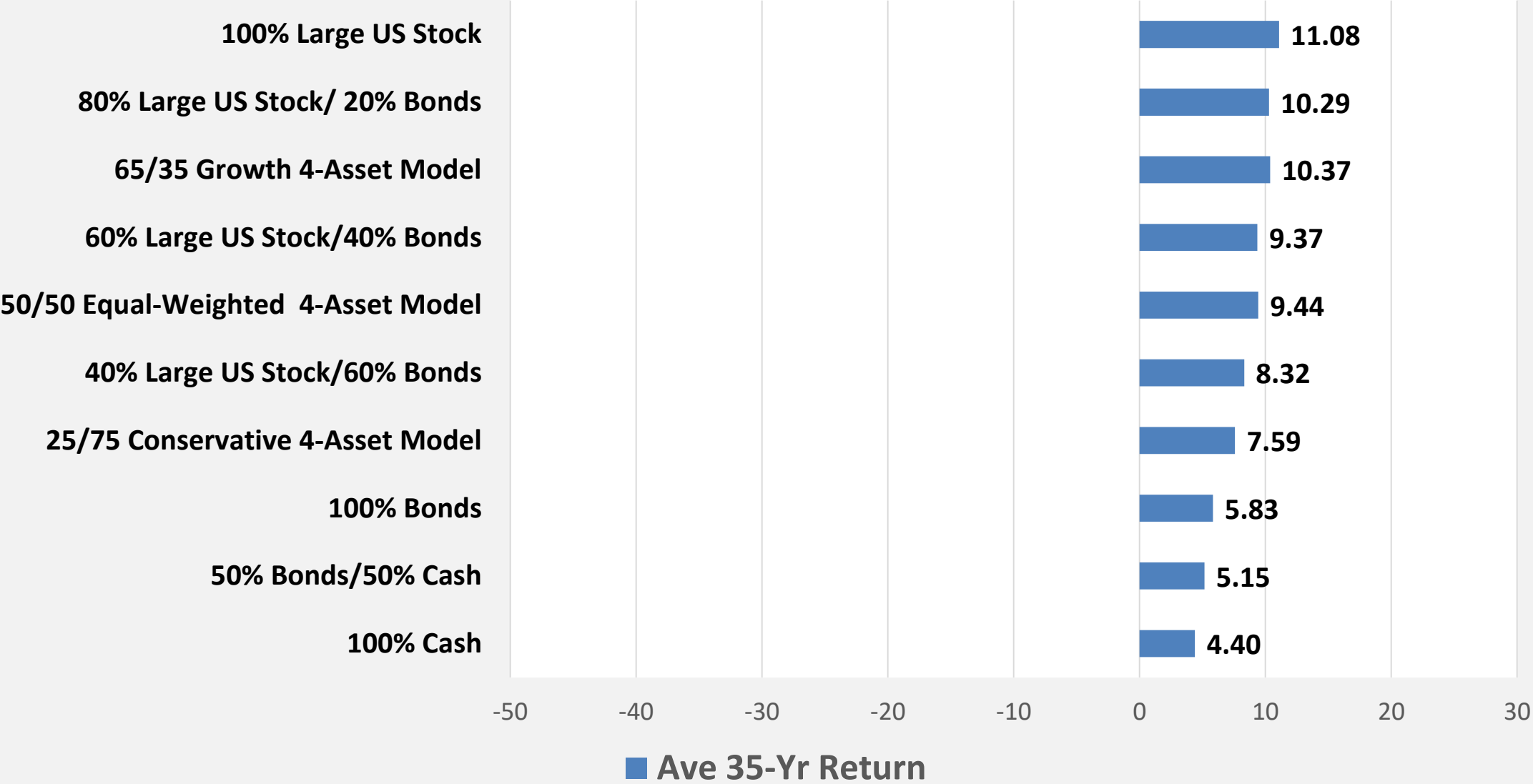
Large US Stock: S&P 500 Index

25/75 4-Asset Model: 20% Cash, 55% Bonds, 10% Small US Stock, 15% Large US Stock

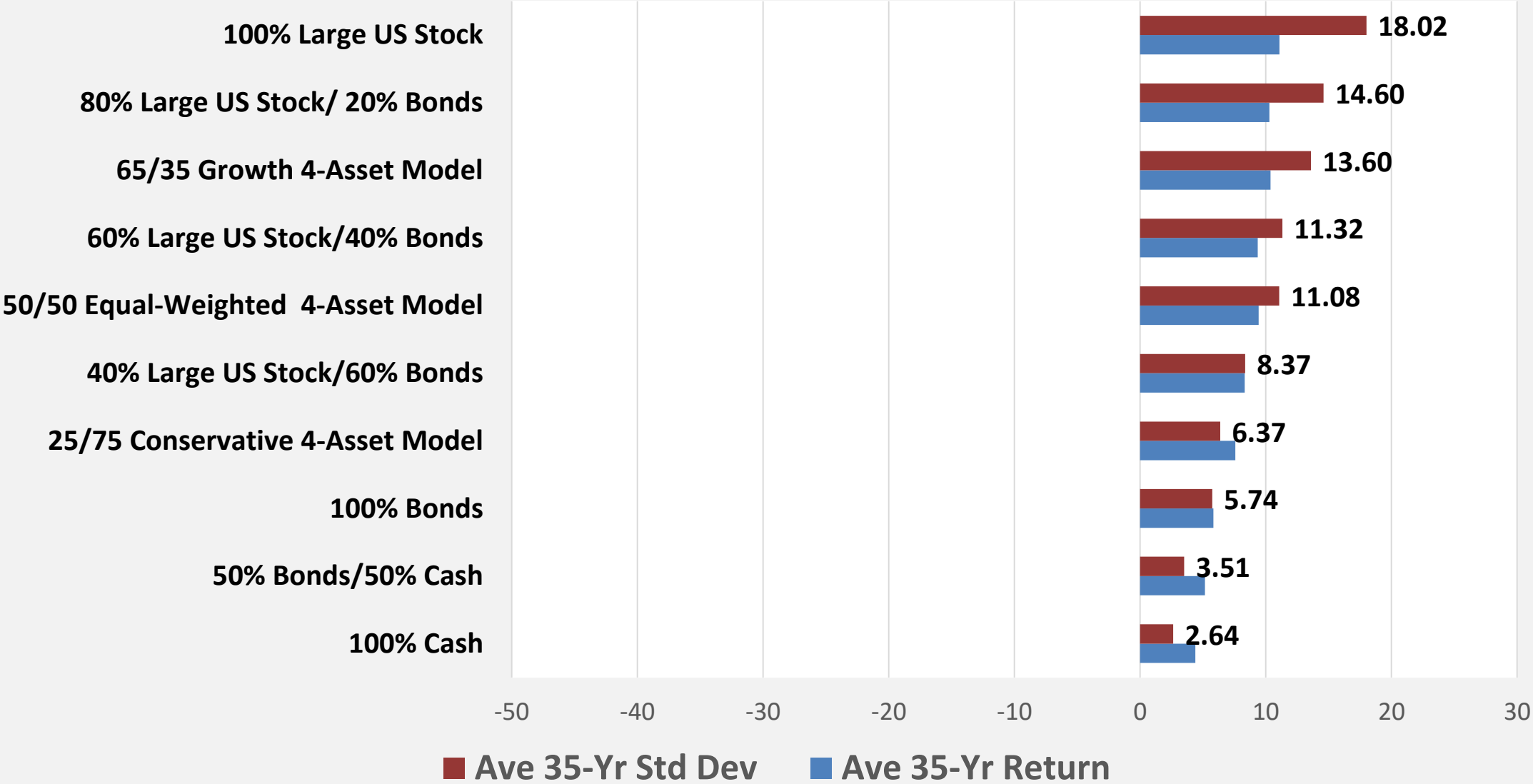
50/50 4-Asset Model: 25% Cash, 25% Bonds, 25% Small US Stock, 25% Large US Stock

65/35 4-Asset Model: 10% Cash, 25% Bonds, 25% Small US Stock, 40% Large US Stock

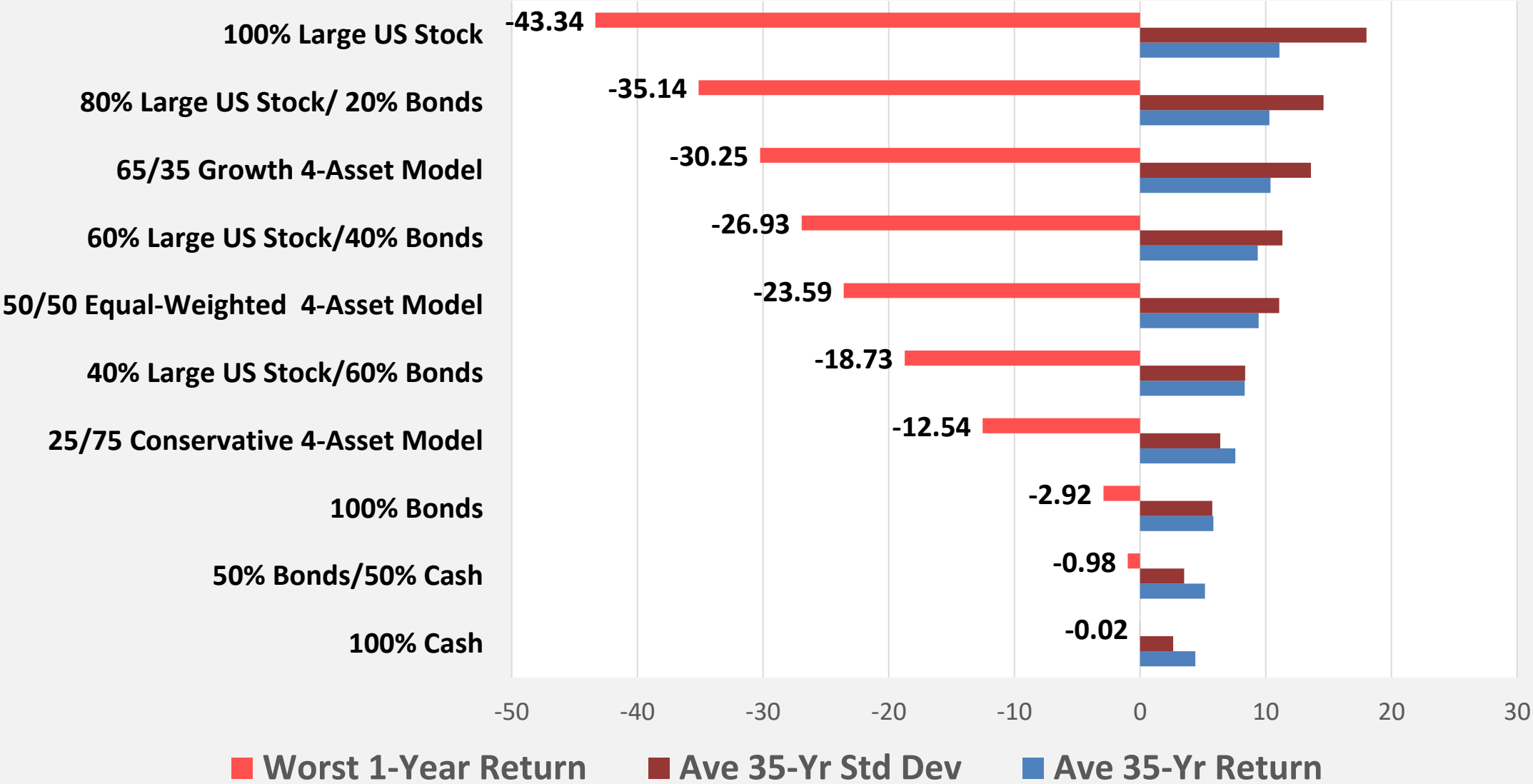
10 Investment Models over 92-Year History: 1926-2017



10 Investment Models over 92-Year History: 1926-2017



10 Investment Models over 92-Year History: 1926-2017



Logic of **12x** Final Income as Retirement Account Target Balance

A retirement portfolio equal to 12 times your final salary allows you to withdraw $\frac{1}{2}$ your final salary each year assuming a 4% initial withdraw rate.

Logic of **12x** Final Income as Retirement Account Target Balance

\$35,000 starting salary for 30-year old
x 3% increase in annual salary through age 65
= \$95,617 final salary at age 65

Logic of **12x** Final Income as Retirement Account Target Balance

\$35,000 starting salary for 30-year old

x 3% increase in annual salary through age 65

= \$95,617 final salary at age 65

x 12

= \$1,147,400 target retirement account balance at age 65

Logic of **12x** Final Income as Retirement Account Target Balance

\$35,000 starting salary for 30-year old

x 3% increase in annual salary through age 65

= \$95,617 final salary at age 65

x 12

= \$1,147,400 target retirement account balance at age 65

x 4% annual withdraw rate in first year of retirement

= \$46,000 withdrawal in year 1 (approx. 50% of final salary)

(Subsequent withdrawals increase by chosen COLA)

Accumulation Portfolio Analysis

(Assuming 3% increase in annual income over the 35 years from age 30-65)

92-Years from 1926 – 2017
58 35-Year Rolling Periods Analyzed

Success Rates in the Box over 58 35-Year Periods from 1926-2017

Success = Achieving Retirement Portfolio Equal to
12X Final Annual Income

90% and higher success rates highlighted in **green** background
50% or below success rates highlighted with **pink** background

10 Investment Models	Ave 35-Yr Return / Ave 35-Yr Std Dev / Worst 1-Yr Return	Annual Savings Rate										
		5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
100% Cash	4.40 / 2.64 / -0.02	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
50% Bonds/50% Cash	5.15 / 3.51 / -0.98	0%	0%	0%	0%	0%	0%	0%	0%	12%	24%	33%
100% Bonds	5.83 / 5.74 / -2.92	0%	0%	0%	0%	0%	2%	22%	29%	36%	47%	48%
25/75 4-Asset Model	7.59 / 6.37 / -12.54	0%	0%	0%	3%	17%	31%	40%	43%	50%	55%	57%
40% Stock/60% Bonds	8.32 / 8.37 / -18.73	0%	0%	9%	21%	31%	40%	52%	53%	60%	62%	69%
50/50 4-Asset Model	9.44 / 11.08 / -23.59	0%	5%	17%	36%	48%	53%	76%	88%	93%	98%	100%
60% Stock/40% Bonds	9.37 / 11.32 / -26.93	3%	9%	22%	31%	43%	62%	79%	88%	91%	98%	100%
65/35 4-Asset Model	10.37 / 13.60 / -30.25	7%	19%	41%	62%	76%	91%	98%	98%	100%	100%	100%
80% Stock/ 20% Bonds	10.29 / 14.60 / -35.14	9%	22%	41%	62%	83%	91%	97%	100%	100%	100%	100%
100% Large US Stock	11.08 / 18.02 / -43.34	28%	47%	59%	81%	97%	100%	100%	100%	100%	100%	100%

Accumulation Portfolio Analysis

(Assuming 3% increase in annual income over the 35 years from age 30-65)

92-Years from 1926 – 2017
58 35-Year Rolling Periods Analyzed

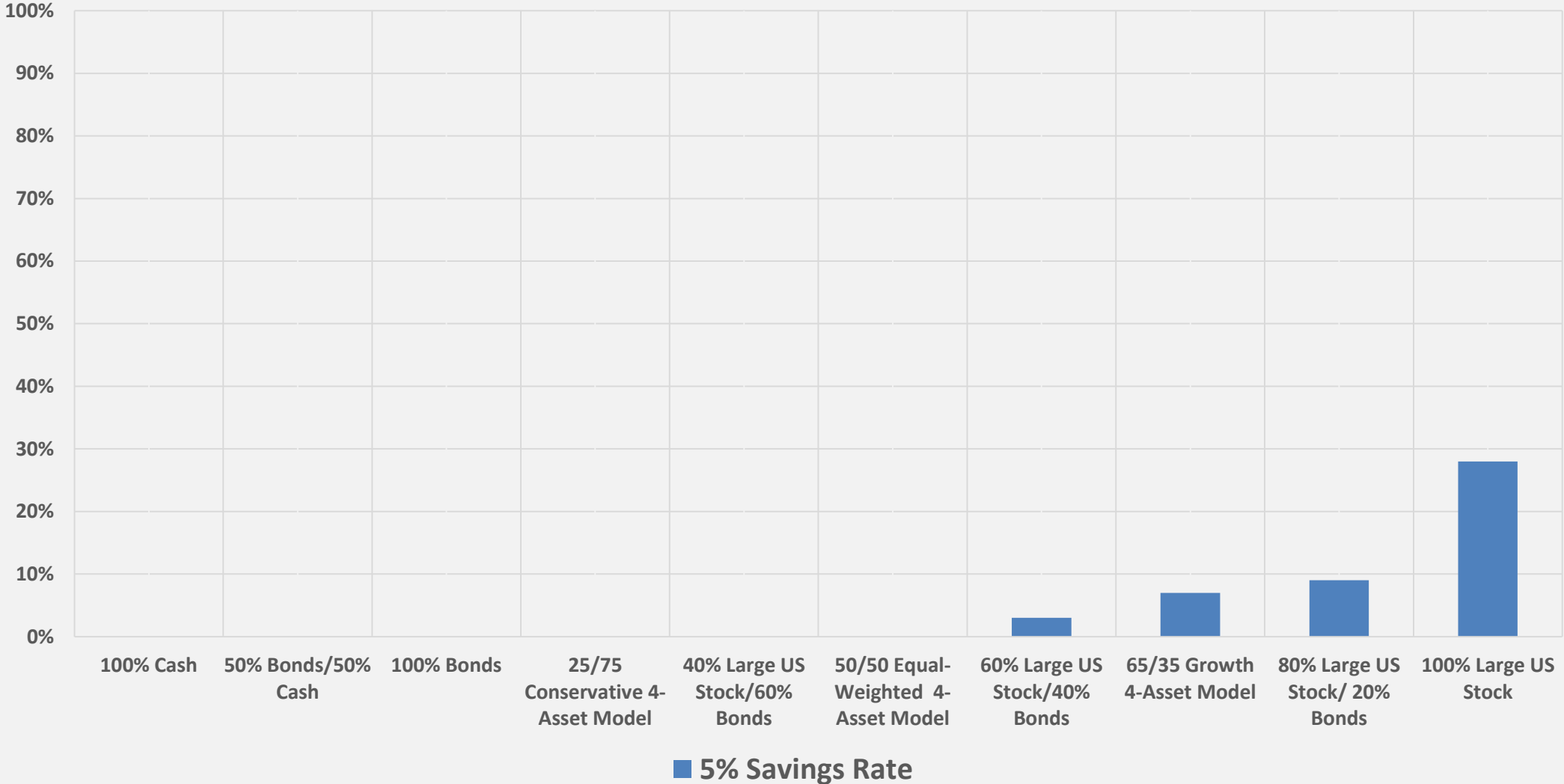
Success Rates in the Box over 58 35-Year Periods from 1926-2017

Success = Achieving Retirement Portfolio Equal to
12X Final Annual Income

90% and higher success rates highlighted in **green** background
50% or below success rates highlighted with **pink** background

10 Investment Models	Ave 35-Yr Return / Ave 35-Yr Std Dev / Worst 1-Yr Return	Annual Savings Rate										
		5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
100% Cash	4.40 / 2.64 / -0.02	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
50% Bonds/50% Cash	5.15 / 3.51 / -0.98	0%	0%	0%	0%	0%	0%	0%	0%	12%	24%	33%
100% Bonds	5.83 / 5.74 / -2.92	0%	0%	0%	0%	0%	2%	22%	29%	36%	47%	48%
25/75 4-Asset Model	7.59 / 6.37 / -12.54	0%	0%	0%	3%	17%	31%	40%	43%	50%	55%	57%
40% Stock/60% Bonds	8.32 / 8.37 / -18.73	0%	0%	9%	21%	31%	40%	52%	53%	60%	62%	69%
50/50 4-Asset Model	9.44 / 11.08 / -23.59	0%	5%	17%	36%	48%	53%	76%	88%	93%	98%	100%
60% Stock/40% Bonds	9.37 / 11.32 / -26.93	3%	9%	22%	31%	43%	62%	79%	88%	91%	98%	100%
65/35 4-Asset Model	10.37 / 13.60 / -30.25	7%	19%	41%	62%	76%	91%	98%	98%	100%	100%	100%
80% Stock/ 20% Bonds	10.29 / 14.60 / -35.14	9%	22%	41%	62%	83%	91%	97%	100%	100%	100%	100%
100% Large US Stock	11.08 / 18.02 / -43.34	28%	47%	59%	81%	97%	100%	100%	100%	100%	100%	100%

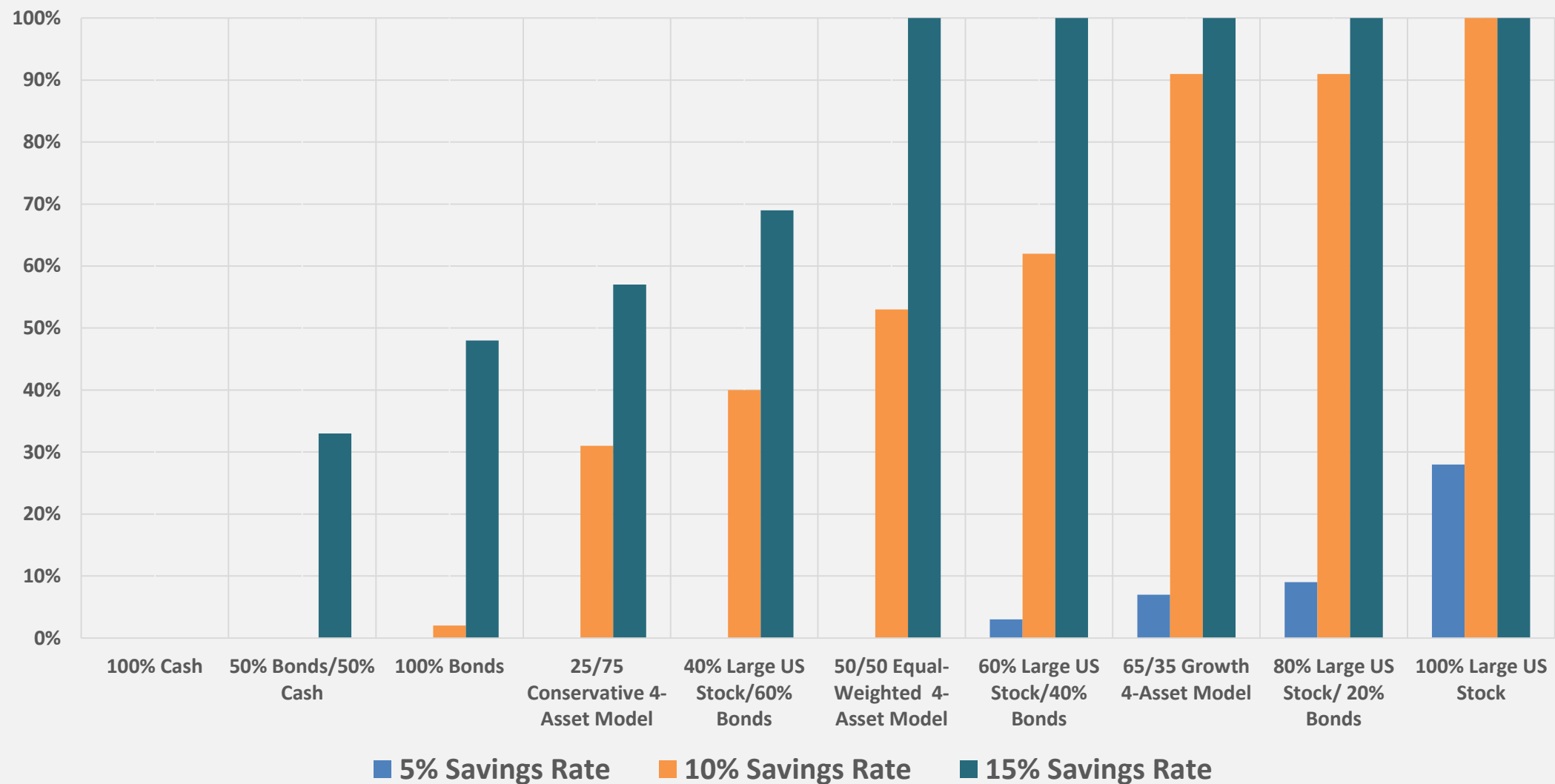
Probability of Having 12x Final Income In Retirement Portfolio
at Various Savings Rates Across 10 Portfolio Designs



**Probability of Having 12x Final Income In Retirement Portfolio
at Various Savings Rates Across 10 Portfolio Designs**



Probability of Having 12x Final Income In Retirement Portfolio at Various Savings Rates Across 10 Portfolio Designs



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Retirement Portfolio Survival

**Analysis of 58 Rolling 35-Year Periods
from 1926-2017**

Retirement Portfolio Survival Grid

Percentage of Time Portfolio Lasted **35 Years** assuming a **3%** annual COLA

1926-2017 92-Year Period	3% Withdraw Rate	4% Withdraw Rate	5% Withdraw Rate	6% Withdraw Rate
100% Cash Portfolio	58.6%	44.8%	29.3%	0%
100% Bond Portfolio	70.7%	46.6%	34.5%	27.6%
"Age-in-Bonds" Portfolio Balance in Large US stock	100%	82.8%	56.9%	29.3%
25/75 4-Asset Portfolio 15% Large Stock, 10% Small Stock, 55% Bonds, 20% Cash	100%	93.1%	60.3%	36.2%
60% Stock/40% Bonds	100%	96.6%	89.7%	70.7%
50/50 4-Asset Portfolio 25% Large Stock, 25% Small Stock, 25% Bonds, 25% Cash	100%	98.3%	89.7%	84.5%
65/35 4-Asset Portfolio 40% Large Stock, 25% Small Stock, 25% Bonds, 10% Cash	100%	98.3%	91.4%	87.9%

Click in lower right corner to return to Main Menu

Retirement Portfolio Survival Grid and Average Balance

Assuming 4% Initial Withdrawal

1926-2017 92-Year Period	Average Rolling 35-Year Return 1926-2017	3% COLA	
		Percentage of Time Portfolio Lasted Until Age 100 (35 years)	Average Ending Balance at Age 100 <small>(assuming starting balance of \$250,000 at retirement)</small>
25/75 4-Asset Portfolio 15% Large Stock, 10% Small Stock, 55% Bonds, 20% Cash	7.59	93.1	1,145,850
60% Stock/40% Bond Portfolio	9.37	96.6	2,561,348
50/50 4-Asset Portfolio 25% Large Stock, 25% Small Stock, 25% Bonds, 25% Cash	9.44	98.3	2,730,830
65/35 4-Asset Portfolio 40% Large Stock, 25% Small Stock, 25% Bonds, 10% Cash	10.37	98.3	4,039,937

Overall Summary: 1926-2017

Pre-Retirement Accumulation assuming 3% annual salary increase

Diversified 50/50 portfolio + 13% savings rate achieves a 12x nest egg

or

Diversified 65/35 portfolio + 10% savings rate achieves a 12x nest egg

Overall Summary: 1926-2017

Pre-Retirement Accumulation assuming 3% annual salary increase

Diversified 50/50 portfolio + 13% savings rate achieves a 12x nest egg
or

Diversified 65/35 portfolio + 10% savings rate achieves a 12x nest egg

Post-Retirement Distribution

Diversified 50/50 and 65/35 portfolios survived at
4% withdraw rate and 3% COLA survived
98% of the rolling 35-year periods

Diversified 65/35 portfolio survived for 35 years at a
6% withdraw rate 88% of the time

Indexes used in calculations

1926-2017

- **Large-cap US equity** represented by the S&P 500 Index.
- **Small-cap US equity** represented by the Ibbotson Small Companies Index from 1926-1978 and the Russell 2000 Index starting in 1979.
- **U.S. Bonds** represented by SBBI US Intermediate Government Bonds from 1926-1975 and the Barclay's Capital Aggregate Bonds Index from 1976-2017.
- **Cash** represented by 3-month Treasury Bills.
- **25/75 4-Asset Model**: 20% Cash, 55% Bonds, 10% Small US Stock, 15% Large US Stock
- **50/50 4-Asset Model**: 25% Cash, 25% Bonds, 25% Small US Stock, 25% Large US Stock
- **65/35 4-Asset Model**: 10% Cash, 25% Bonds, 25% Small US Stock, 40% Large US Stock

The **7Twelve**[®] Portfolio

Craig L. Israelsen, Ph.D.

Email: craig@7TwelvePortfolio.com

Web: www.7TwelvePortfolio.com

To purchase 7Twelve Portfolio Research Reports click below:
<http://www.7TwelvePortfolio.com/Downloads/Web7TwelveReport.pdf>