

# 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	<b>\$365,429</b>
Savings account (“Cash”)	<b>\$823,677</b>
7-Asset Diversified Portfolio of Stock, Bonds, Cash, Real Estate, Commodities	<b>\$4,018,504</b>

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

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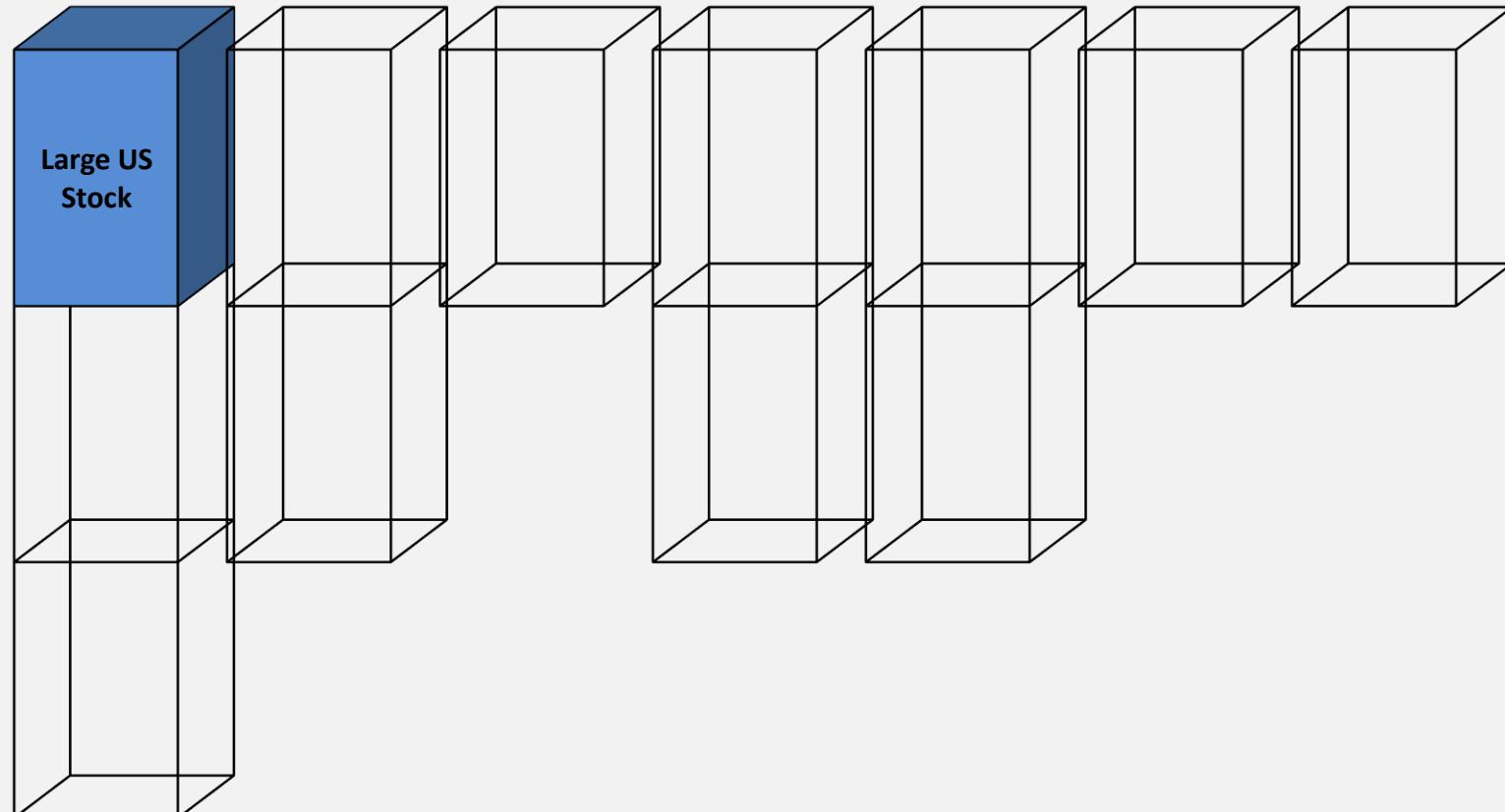
# *What's in a diversified portfolio?*

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



# Minimal Diversification

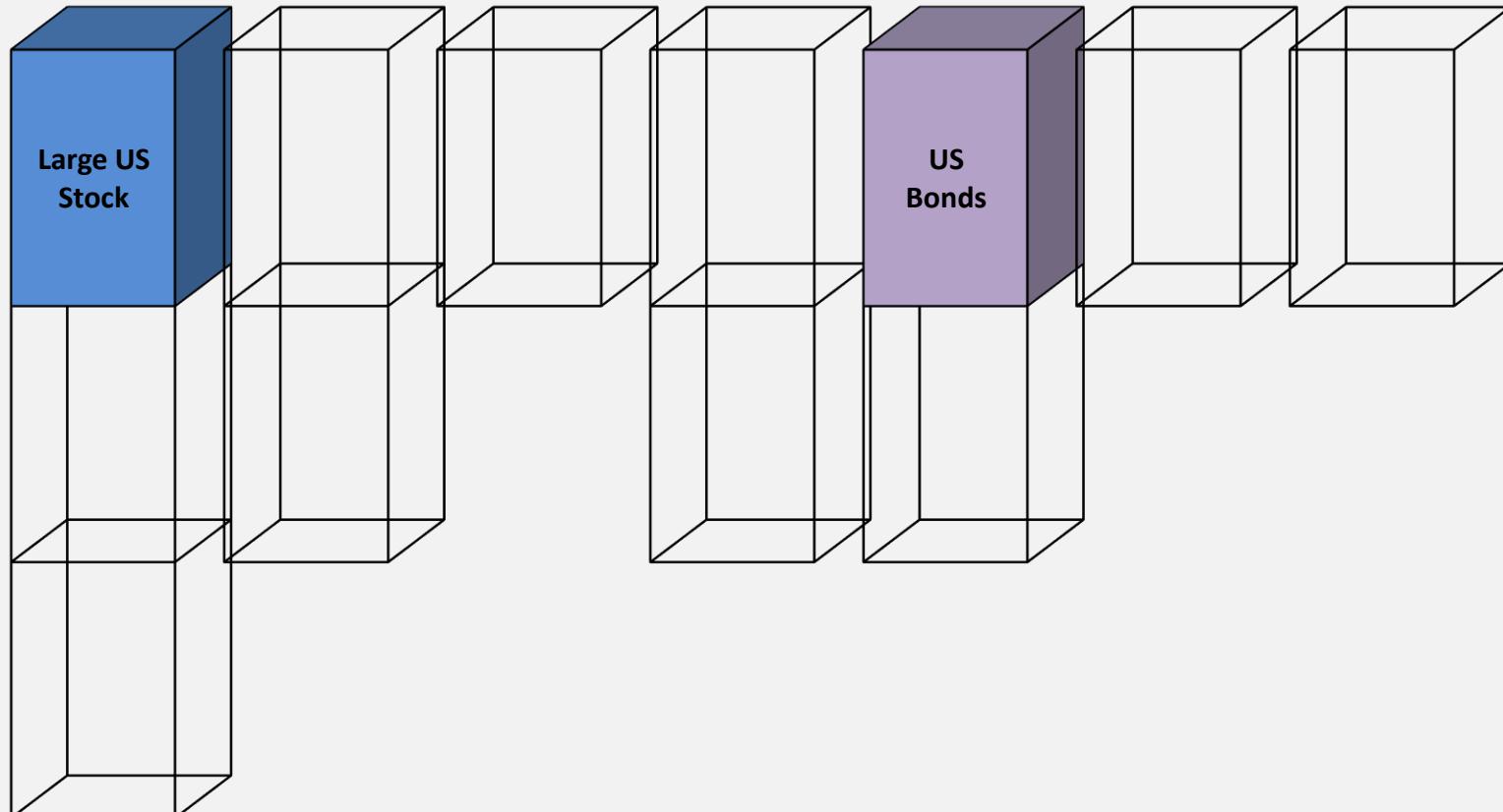
The S&P 500 Index



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# Two-Asset Diversification

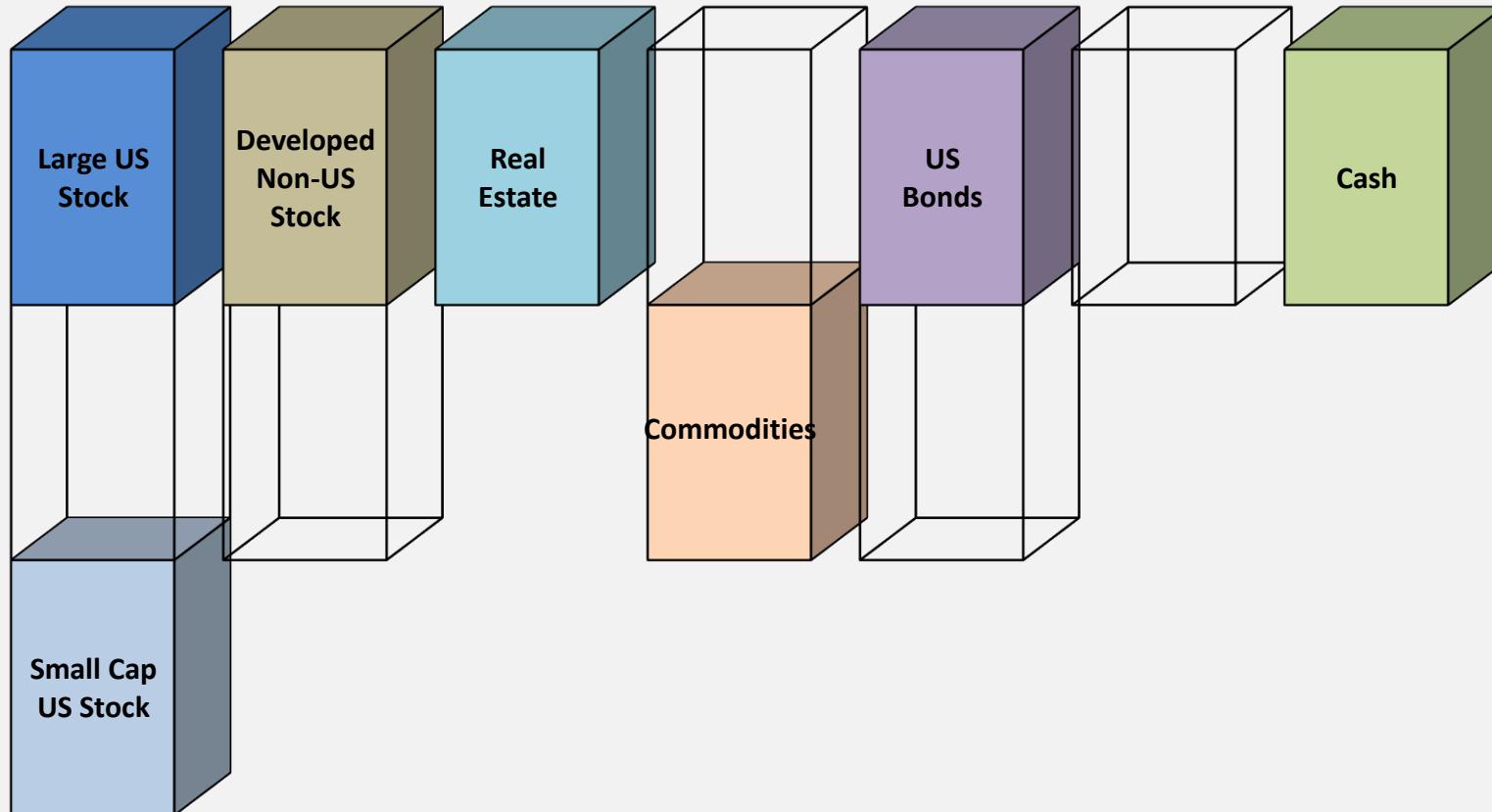
60/40 Portfolio



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# Diversified Portfolio

## 7-Asset Portfolio



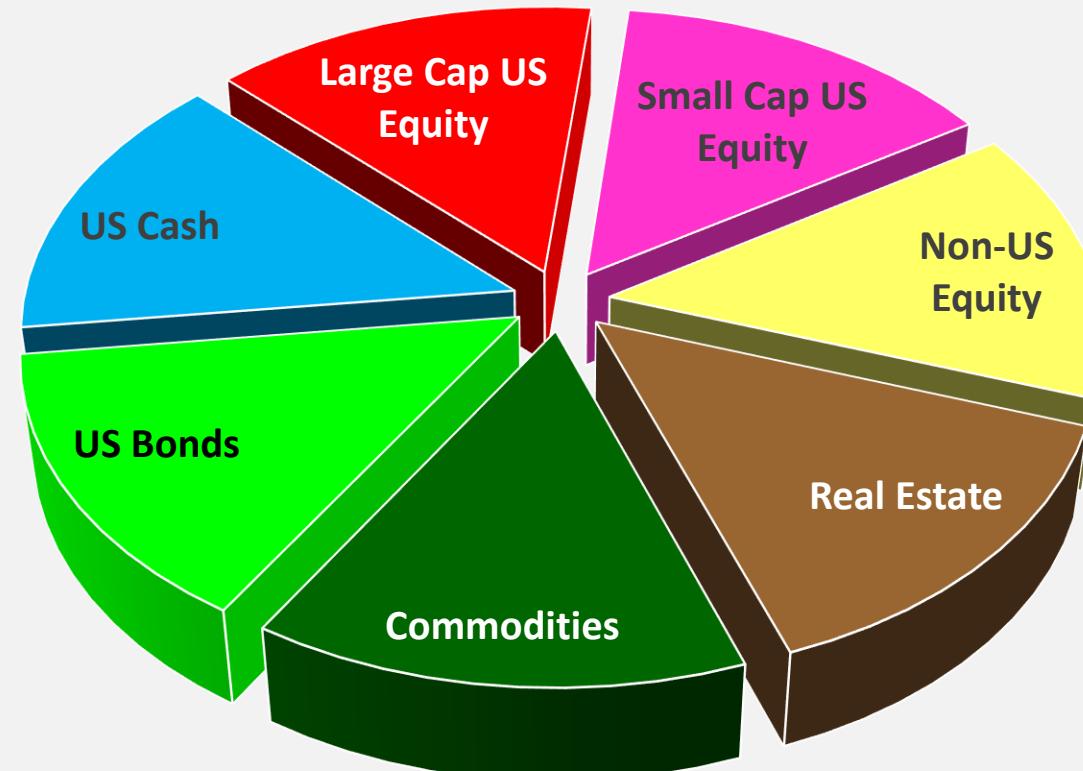
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# Asset Classes

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
48-Year Average Annualized % Return	10.54	11.10	8.94	7.53	4.86	11.76	6.99	9.84
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
48-Year Average Annualized % Return	10.54	11.10	8.94	7.53	4.86	11.76	6.99	9.84
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# Multi-Asset Portfolio

Lower volatility

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	9.84
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# Multi-Asset Portfolio

Fewer and smaller losses

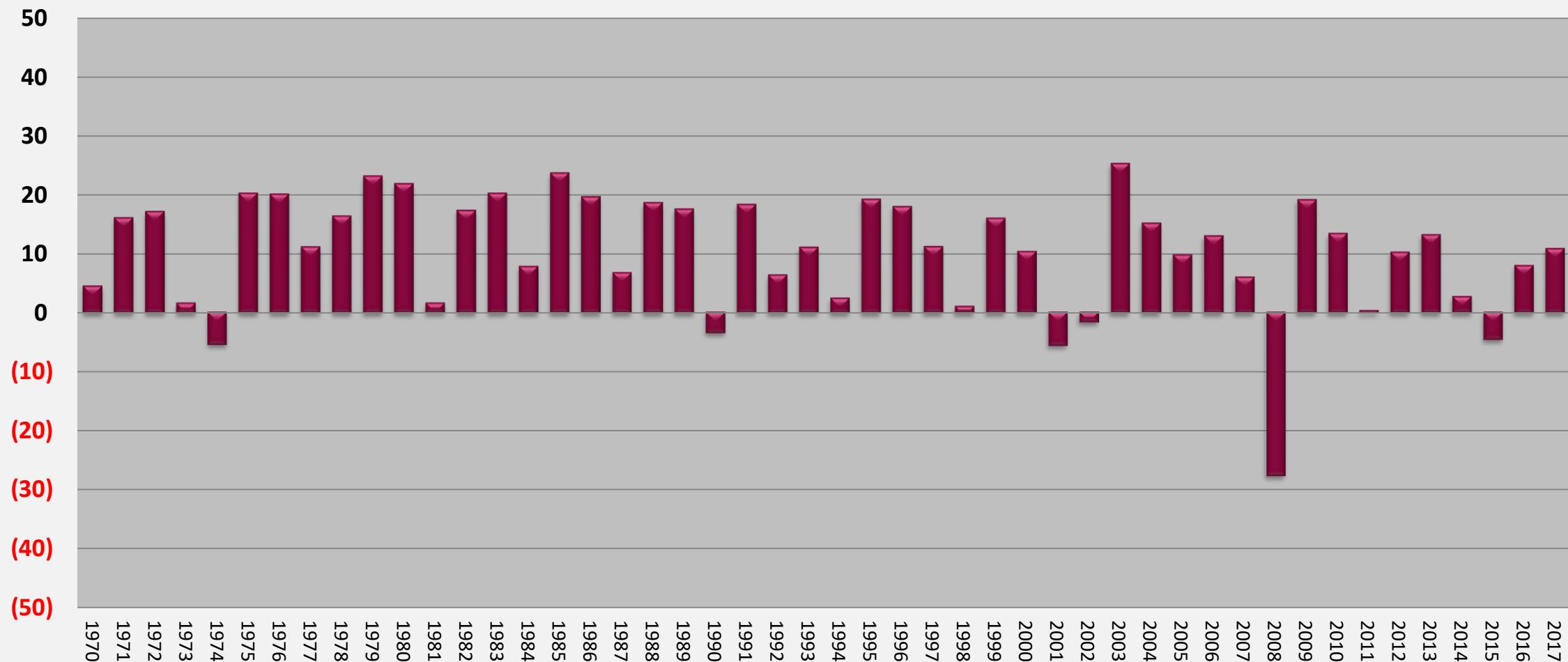
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**Will a diversified,  
multi-asset portfolio always win?**

**No.**

## Annual Returns for Multi-Asset Portfolio

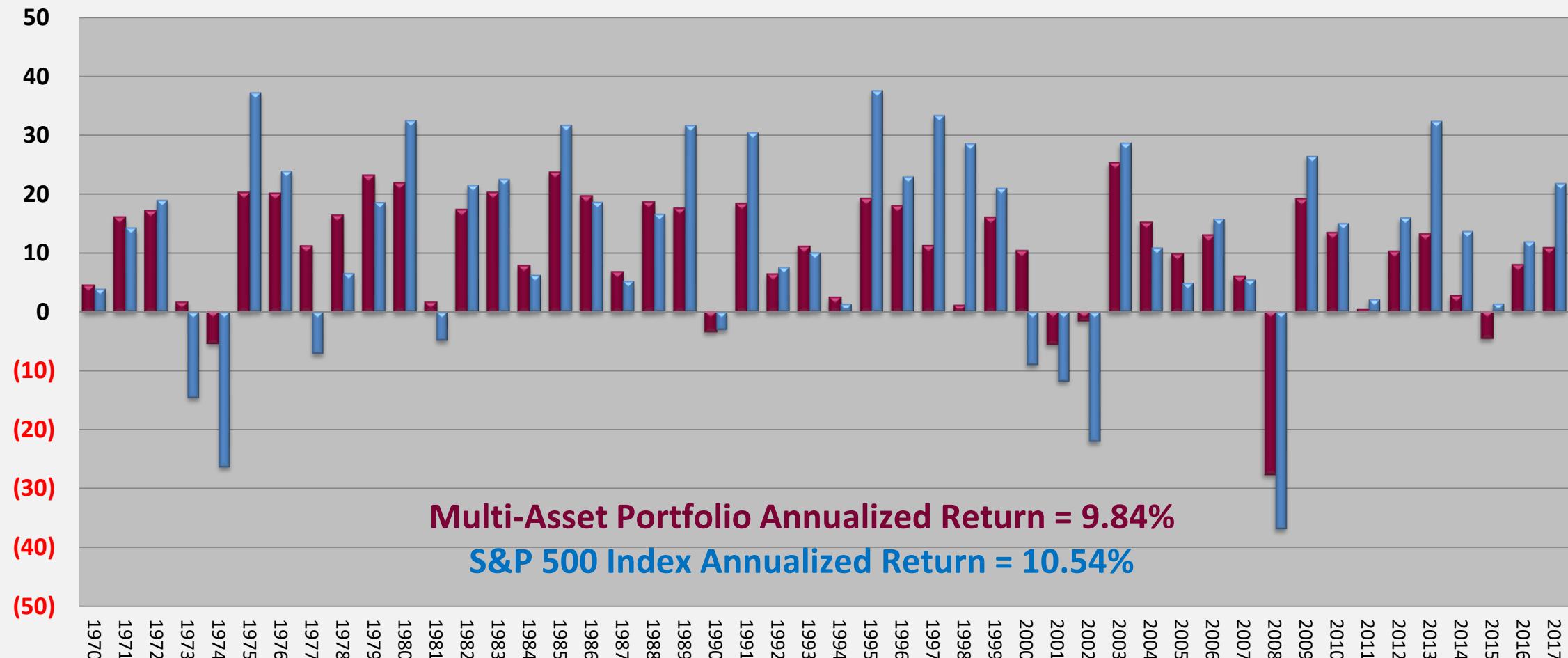
### 48-year Period: 1970-2017



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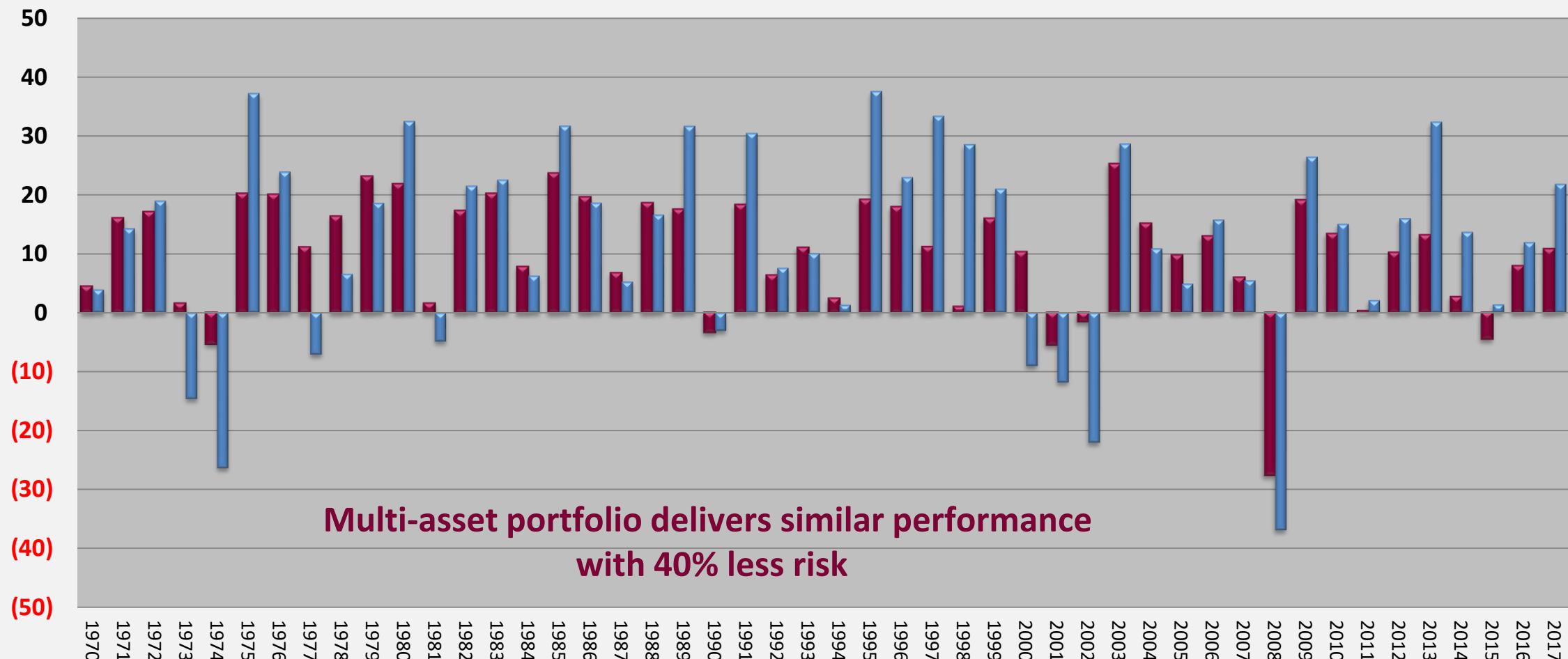
## Annual Returns for Multi-Asset Portfolio vs. S&P 500 Index

48-year Period: 1970-2017



## Annual Returns for Multi-Asset Portfolio vs. S&P 500 Index

48-year Period: 1970-2017



# **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	<b>200 bps</b>	<b>\$124,320</b>	---

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

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

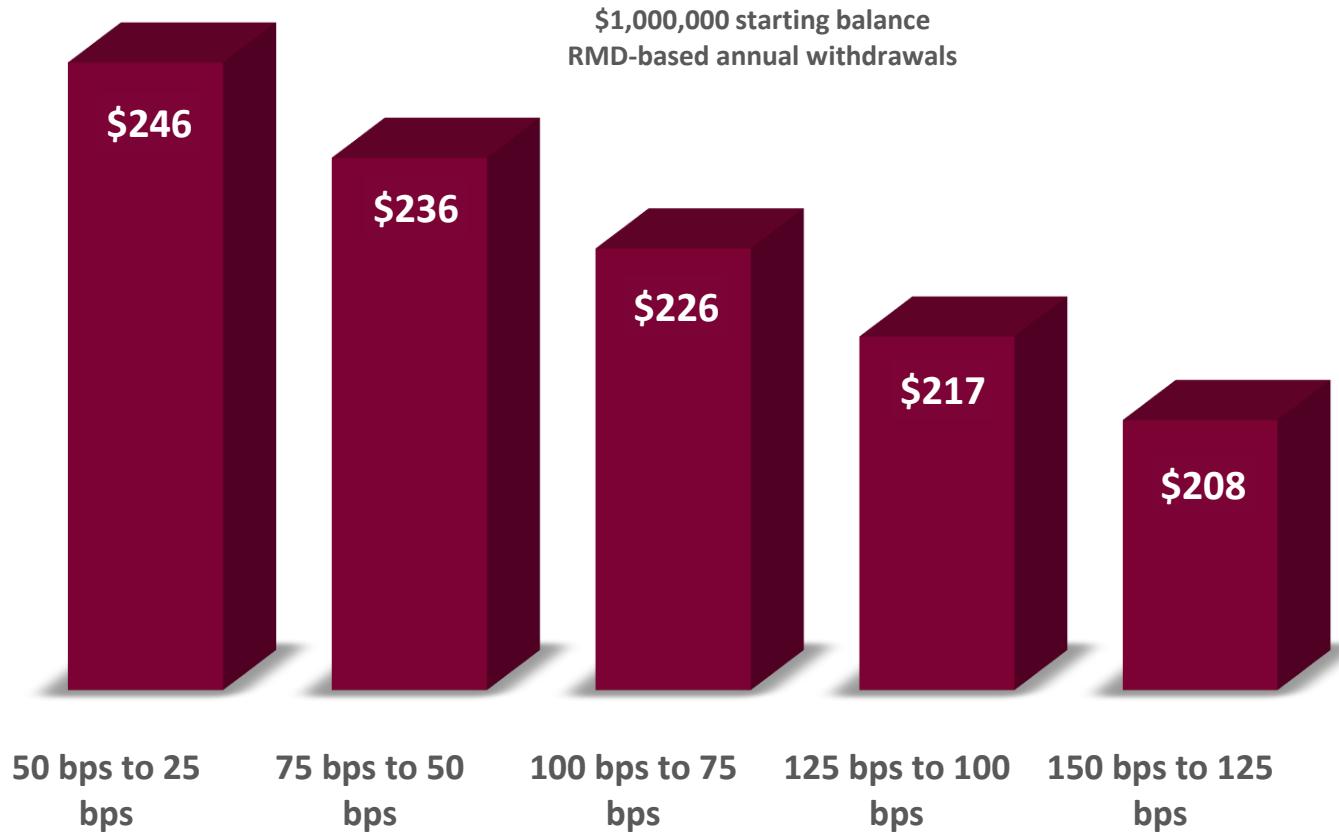
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**\$1,000,000 starting balance in retirement portfolio**

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
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Total fund expenses of 10 bps Advisory Fee of 90 bps	<b>100 bps</b>	<b>\$144,361</b>	<b>\$1,670</b>
Total Fund expenses of 10 bps Advisory fee of 40 bps	<b>50 bps</b>	<b>\$155,695</b>	<b>\$2,614</b>

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**Increase in Annual Retirement Income  
per 1 bps of Reduced Total Portfolio Cost**  
(Total Cost = Expense Ratio + Advisor Fee)

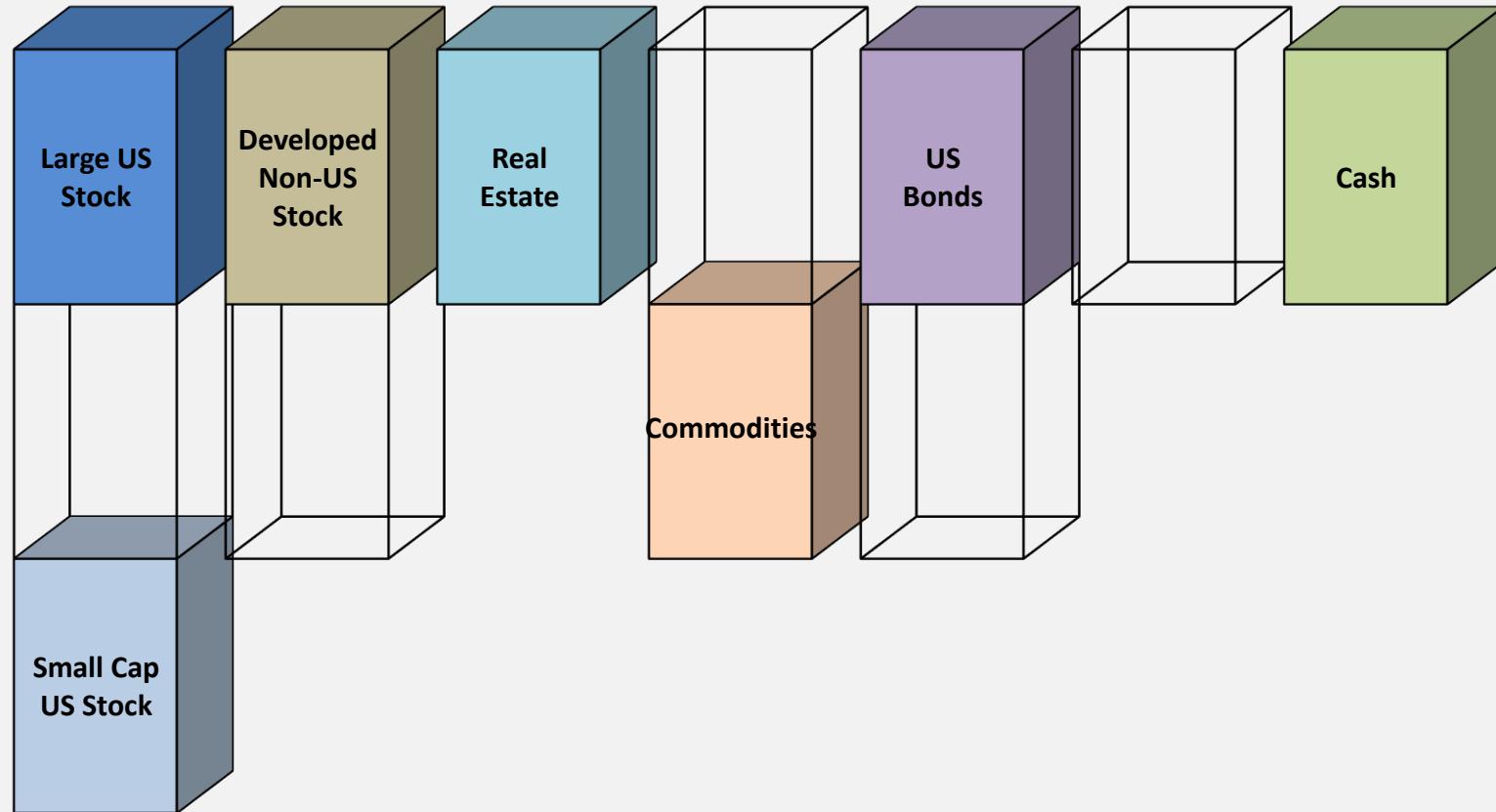


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# Moving from 7 assets to *Twelve* assets

# Good Diversification

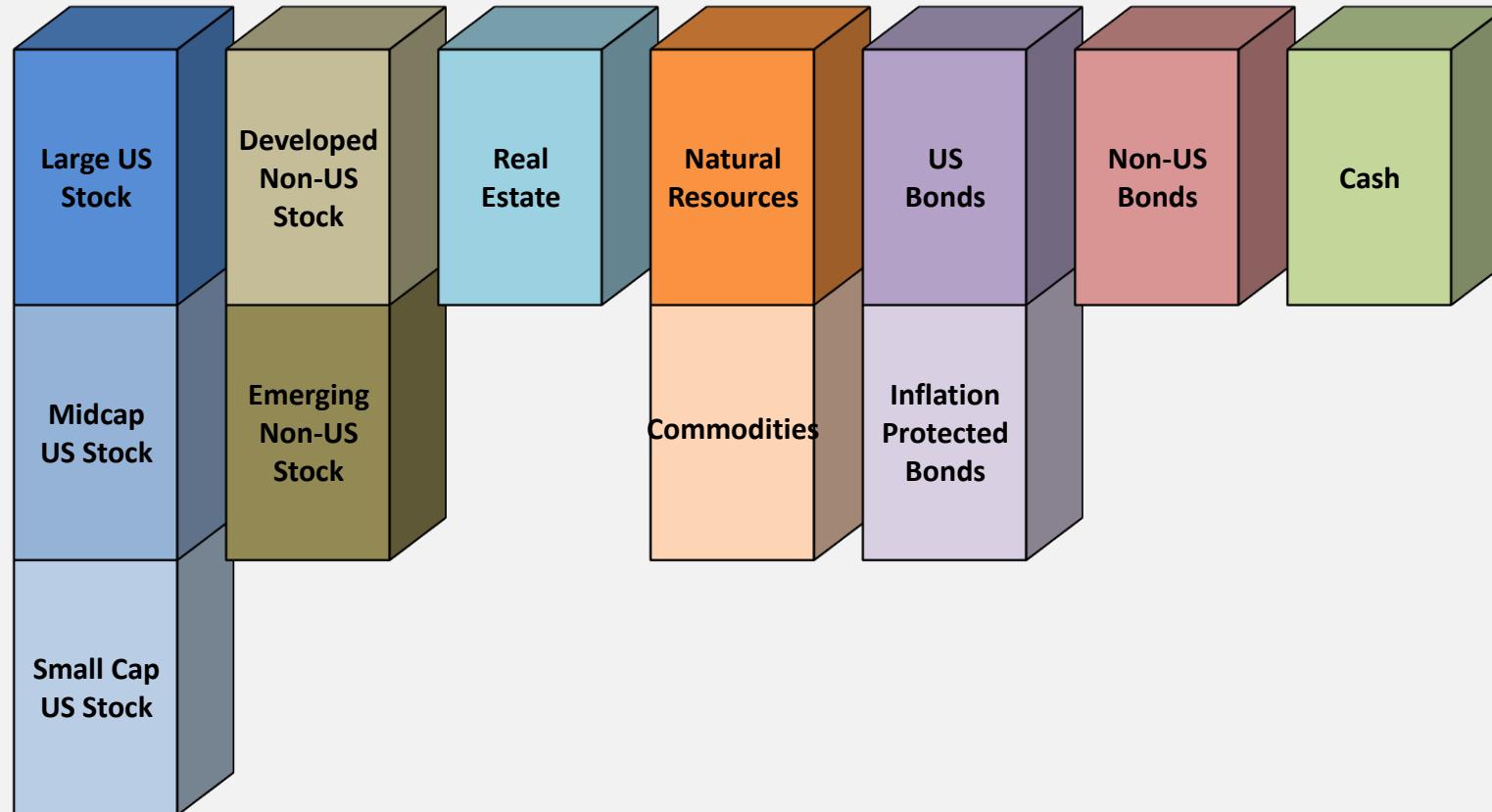
# 7-Asset Portfolio



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# Superior Diversification

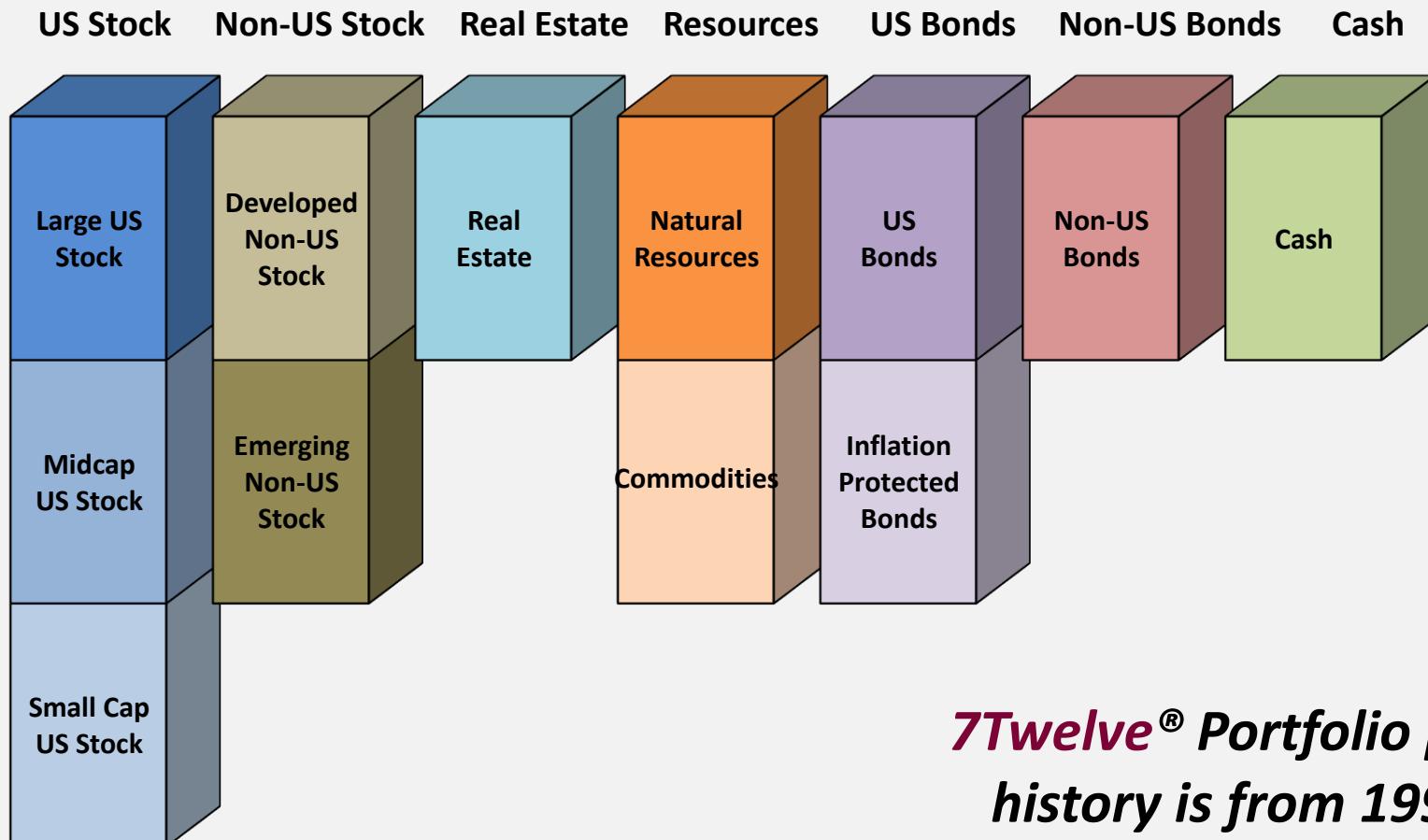
## 12-Asset Portfolio



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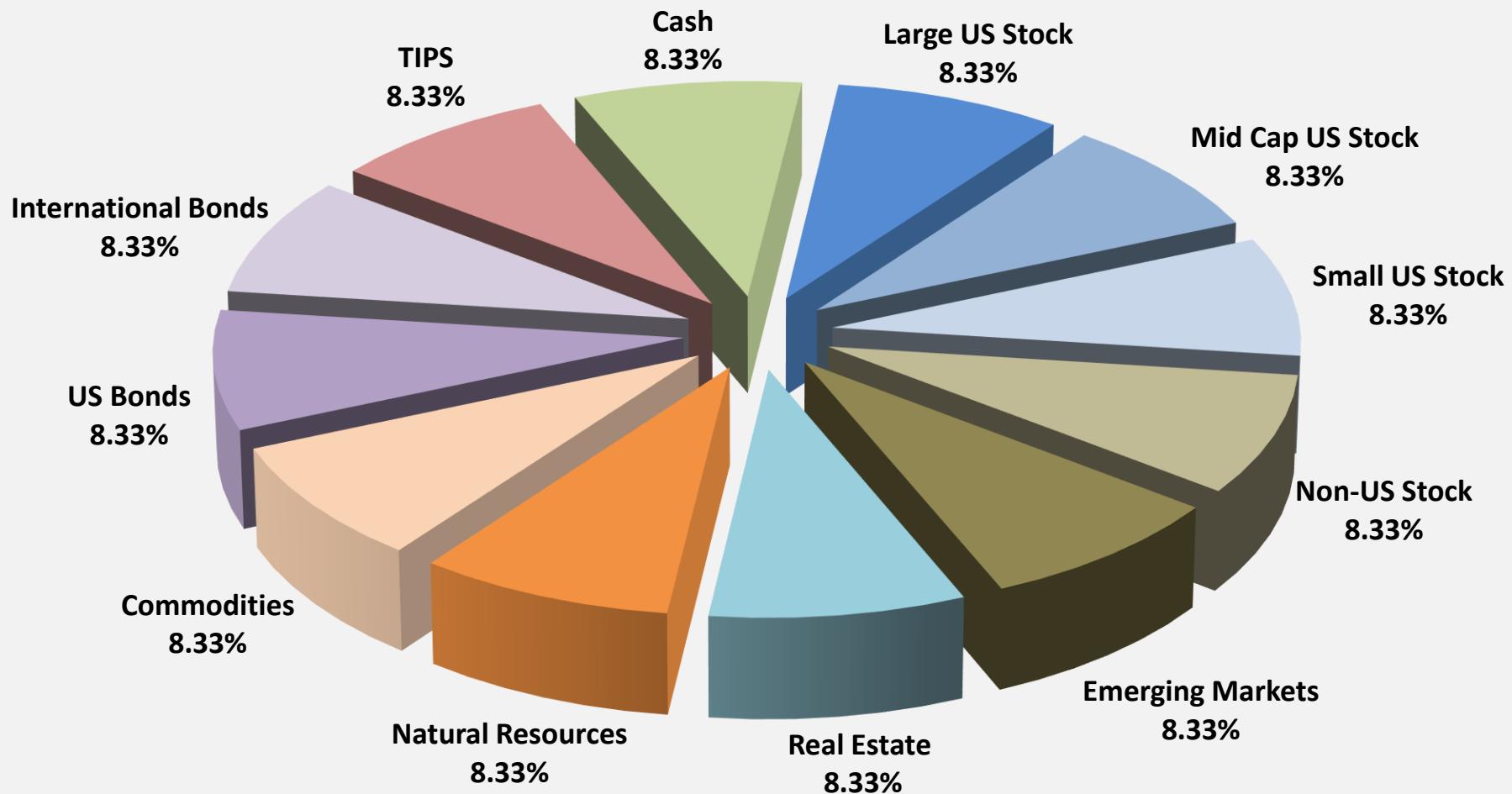
# 7Twelve®

## 7 Core Asset Classes      *Twelve* Actual Holdings



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

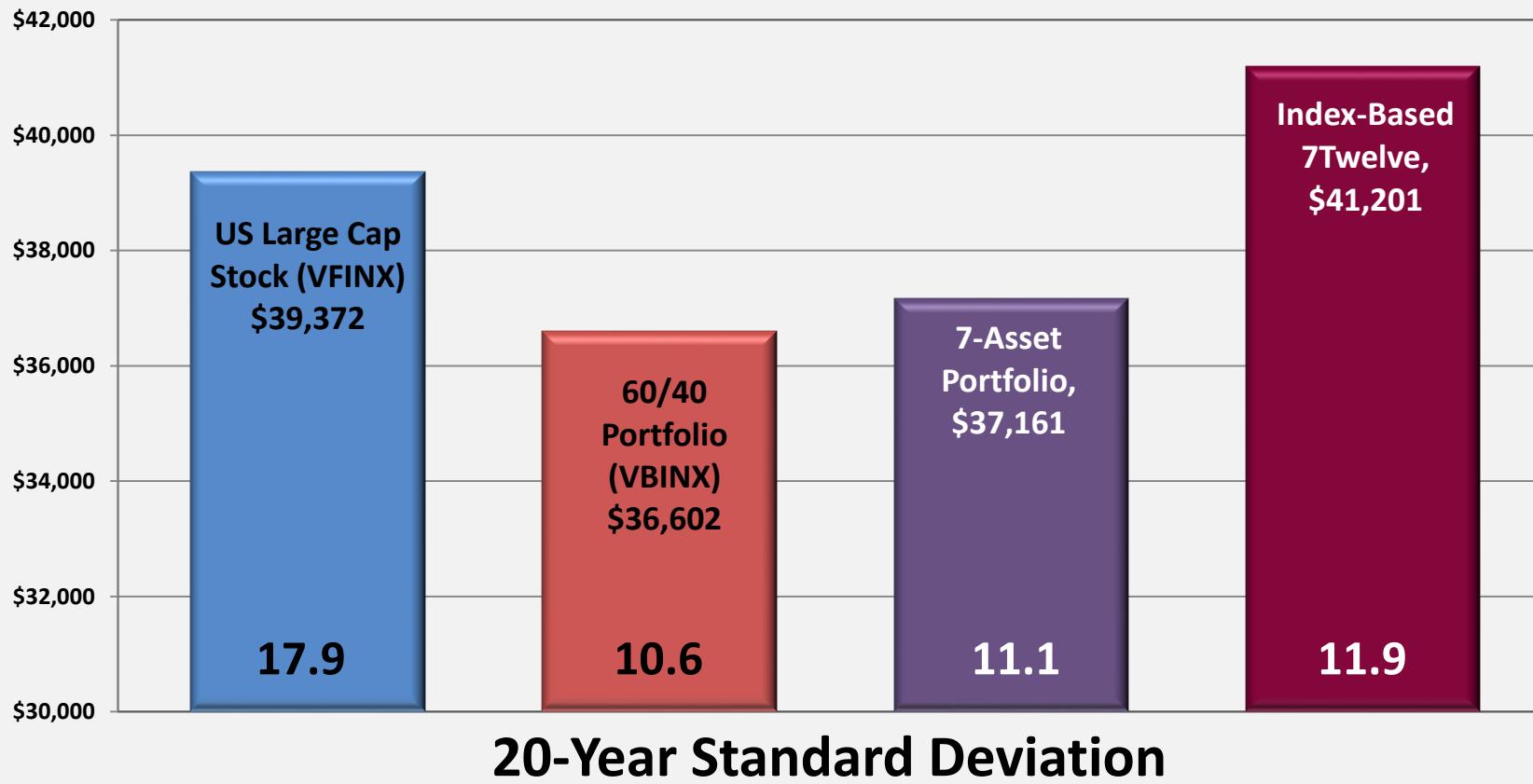
## Equally-weighted exposure to 12 asset classes



# 20-Year Growth of \$10,000

1998-2017

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

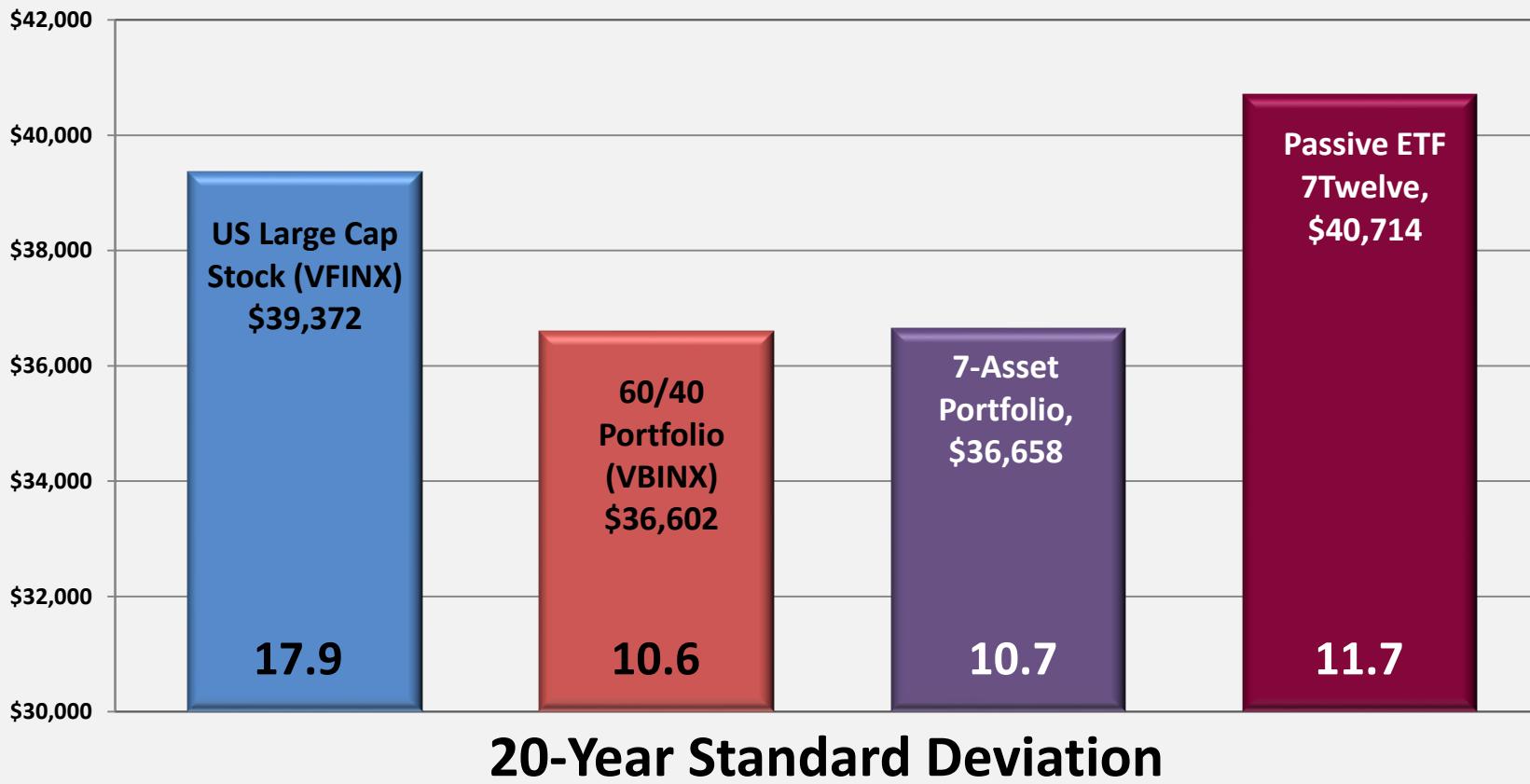


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# 20-Year Growth of \$10,000

1998-2017

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



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# 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
Conservative	50% Cash 50% Bonds		3.34
Moderate	60% US Stock 40% Bonds		6.70
Moderate	Diversified ETF-Based <i>7Twelve</i> ® Portfolio		7.27
Aggressive	100% US Stock		7.09
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)
<b>HARE:</b> Performance Chasing by Investing 100% in Last Year's <b>BEST</b> ETF	<b>4.59</b>	<b>4.84</b>
<b>HARE II:</b> Performance Chasing by Investing 100% in Last Year's <b>WORST</b> ETF	<b>5.44</b>	<b>2.86</b>
<b>TORTOISE:</b> Invest in the <b>equally weighted</b> 12-asset <b>7Twelve</b> ETF model	<b>8.38</b>	<b>7.27</b>

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# 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

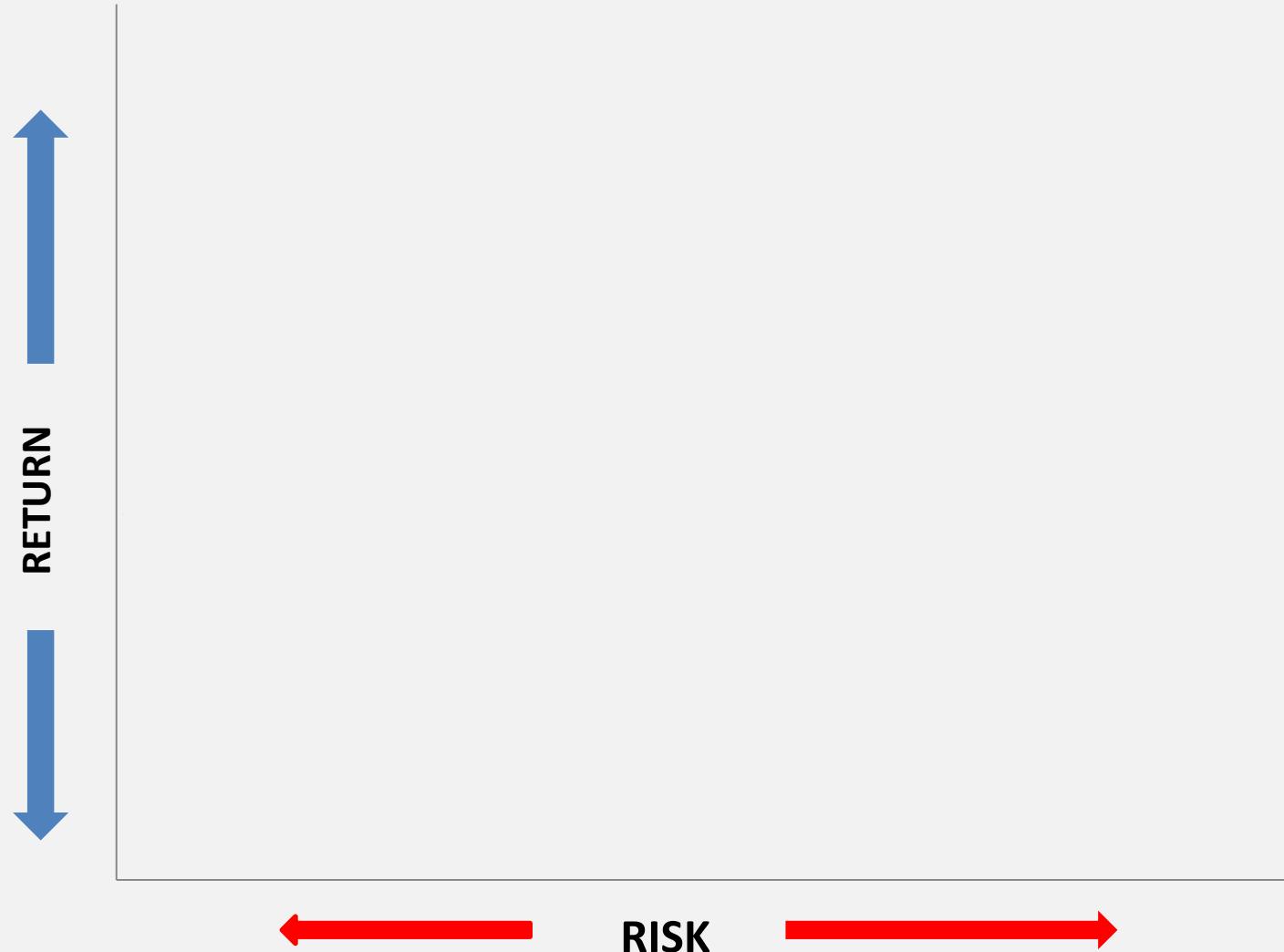
20-Year Period from 1998-2017

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

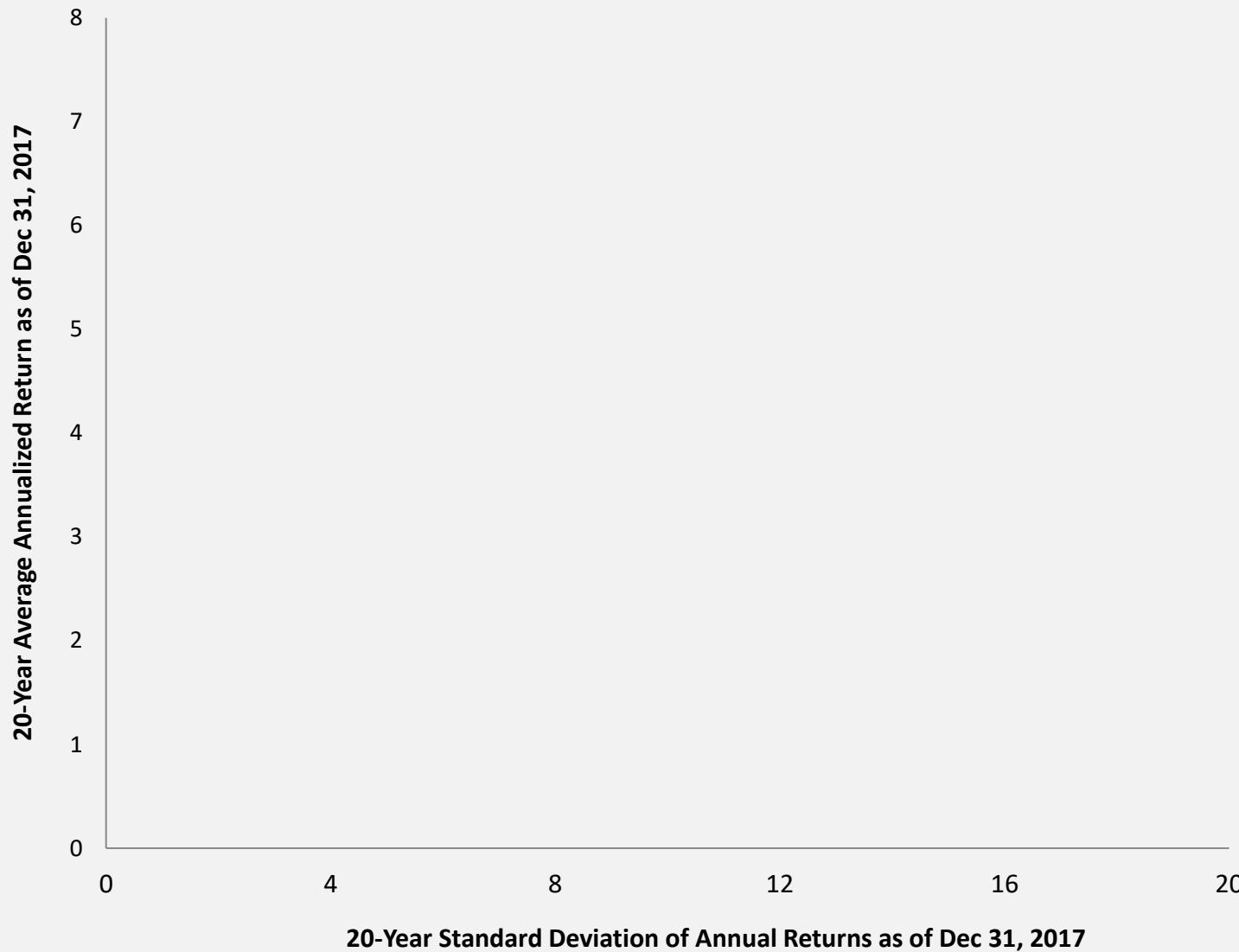
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# A Primer on the Efficient Frontier

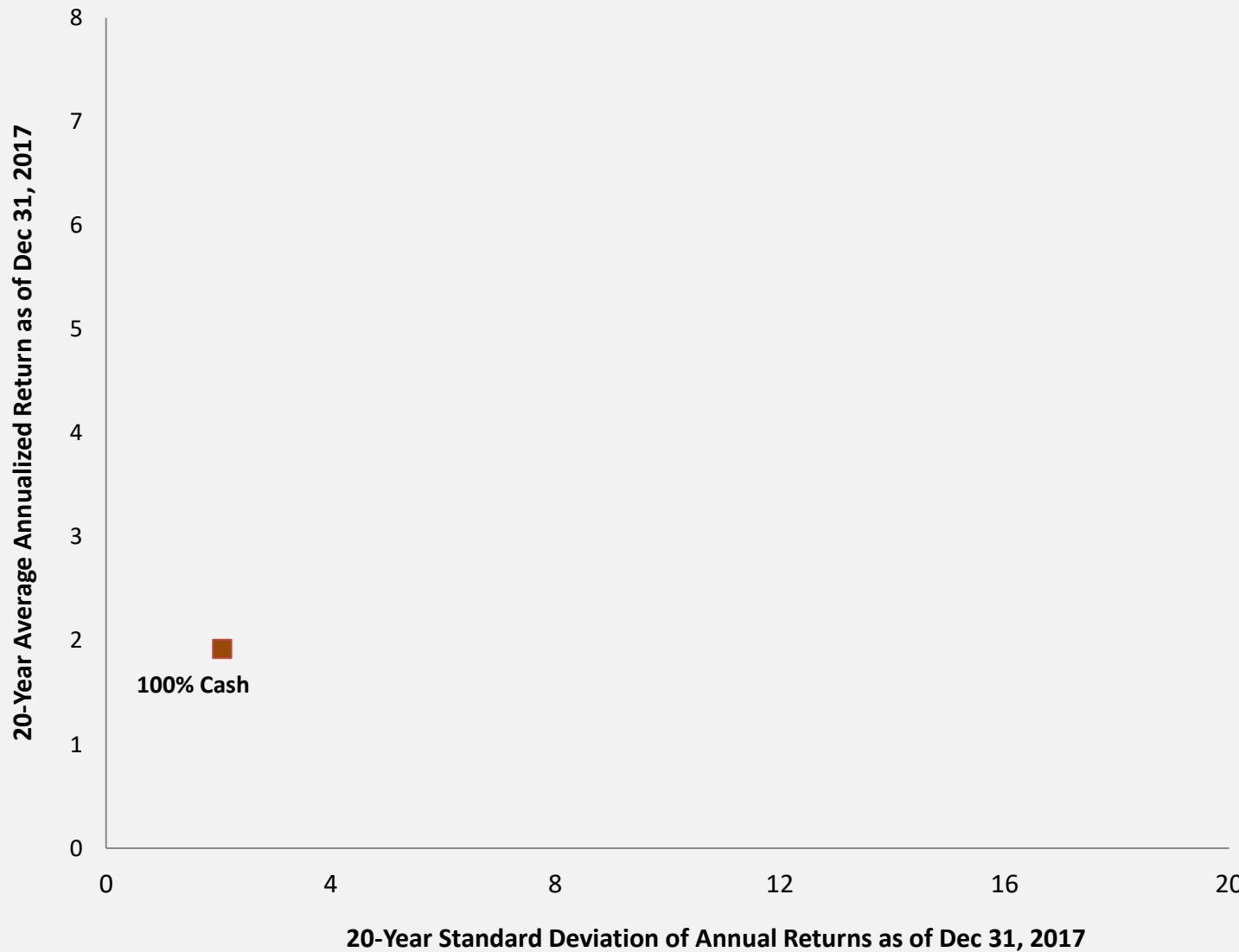
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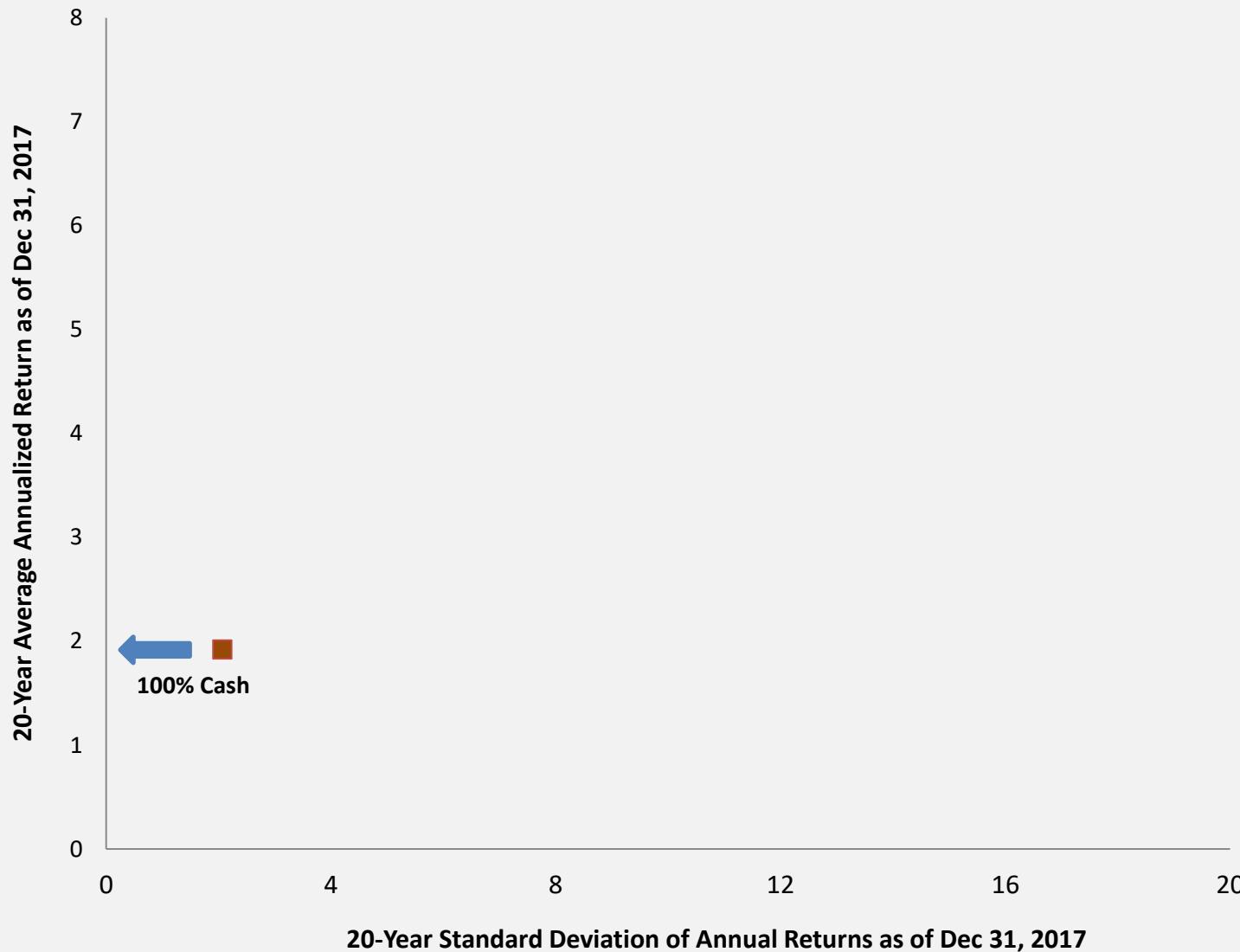
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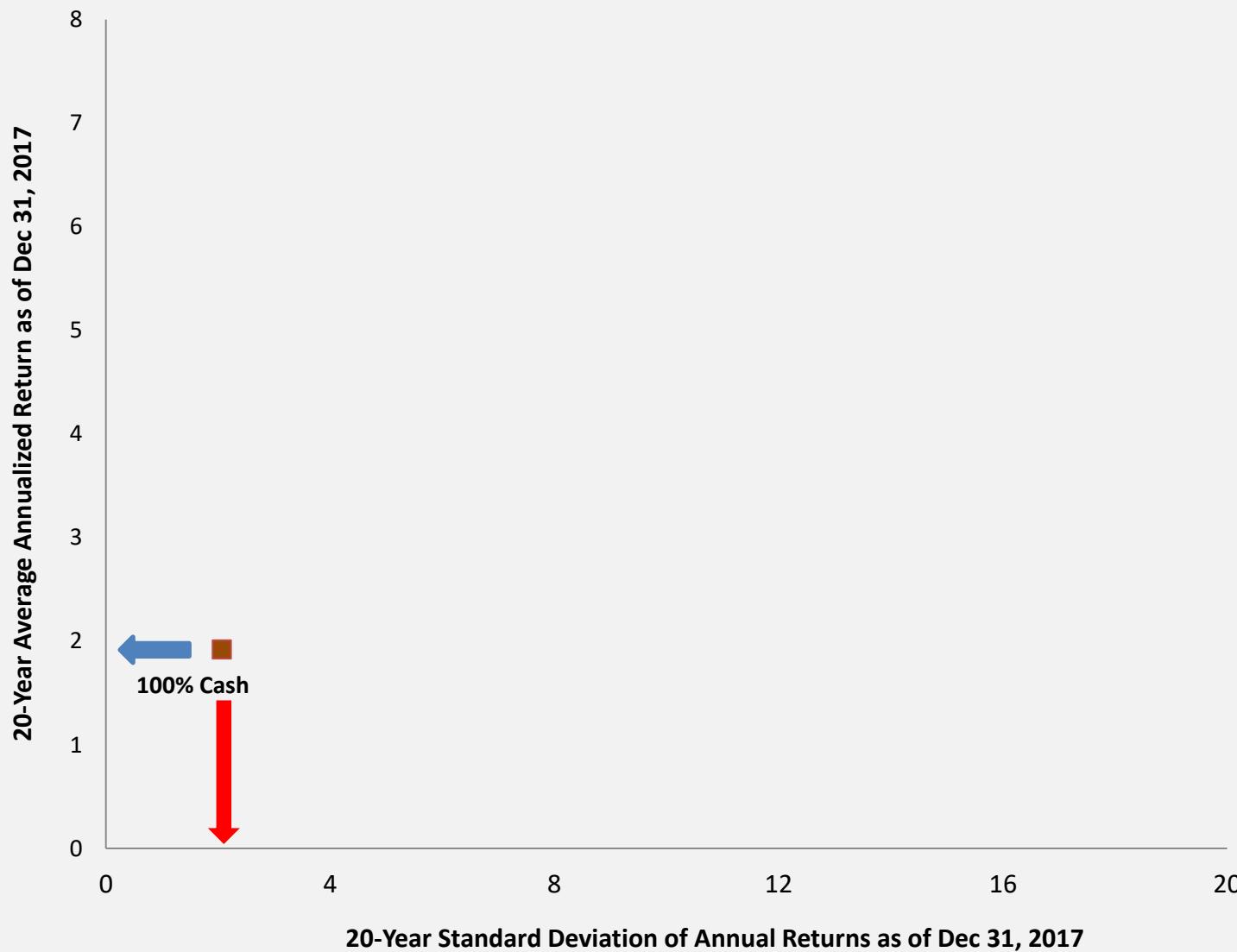
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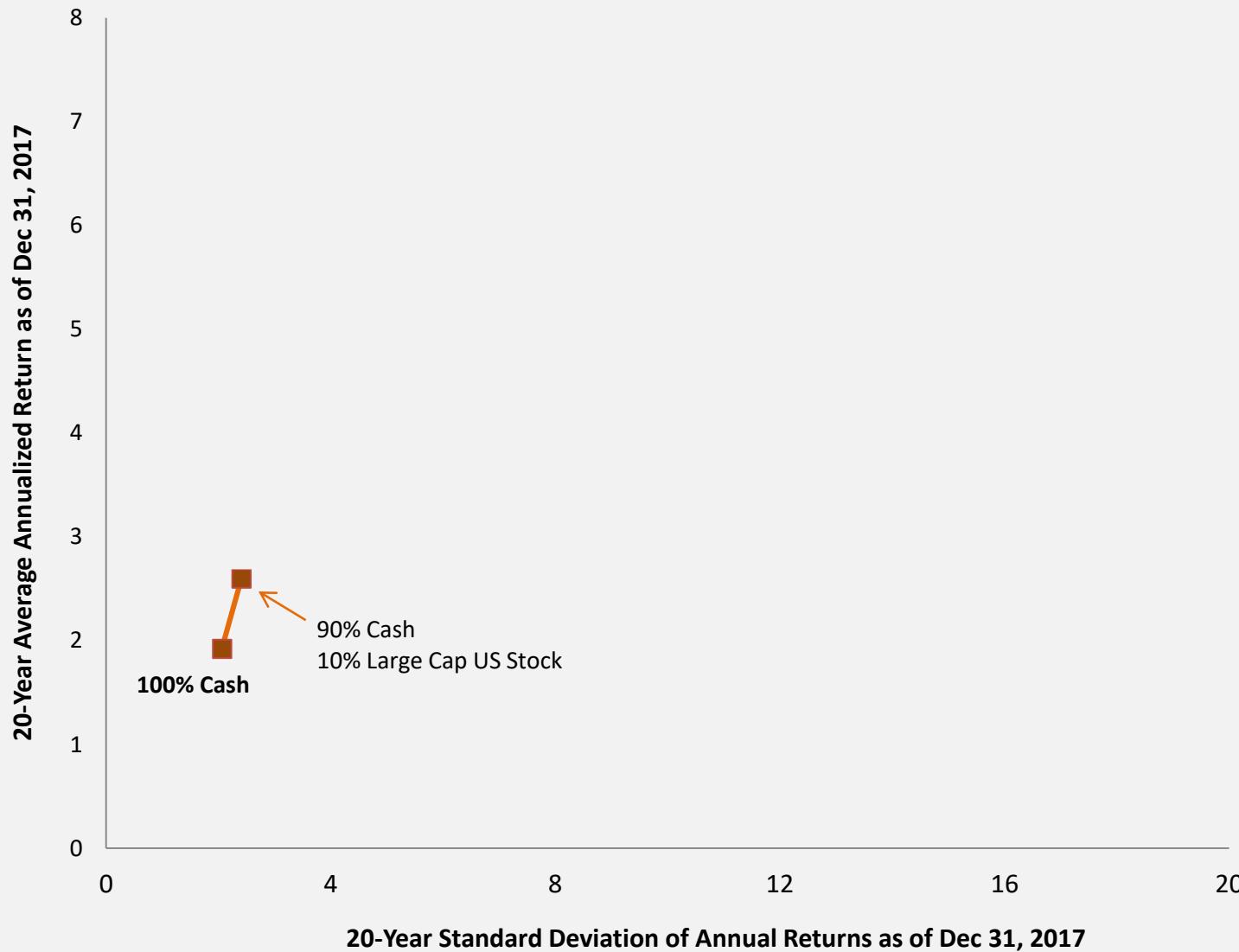
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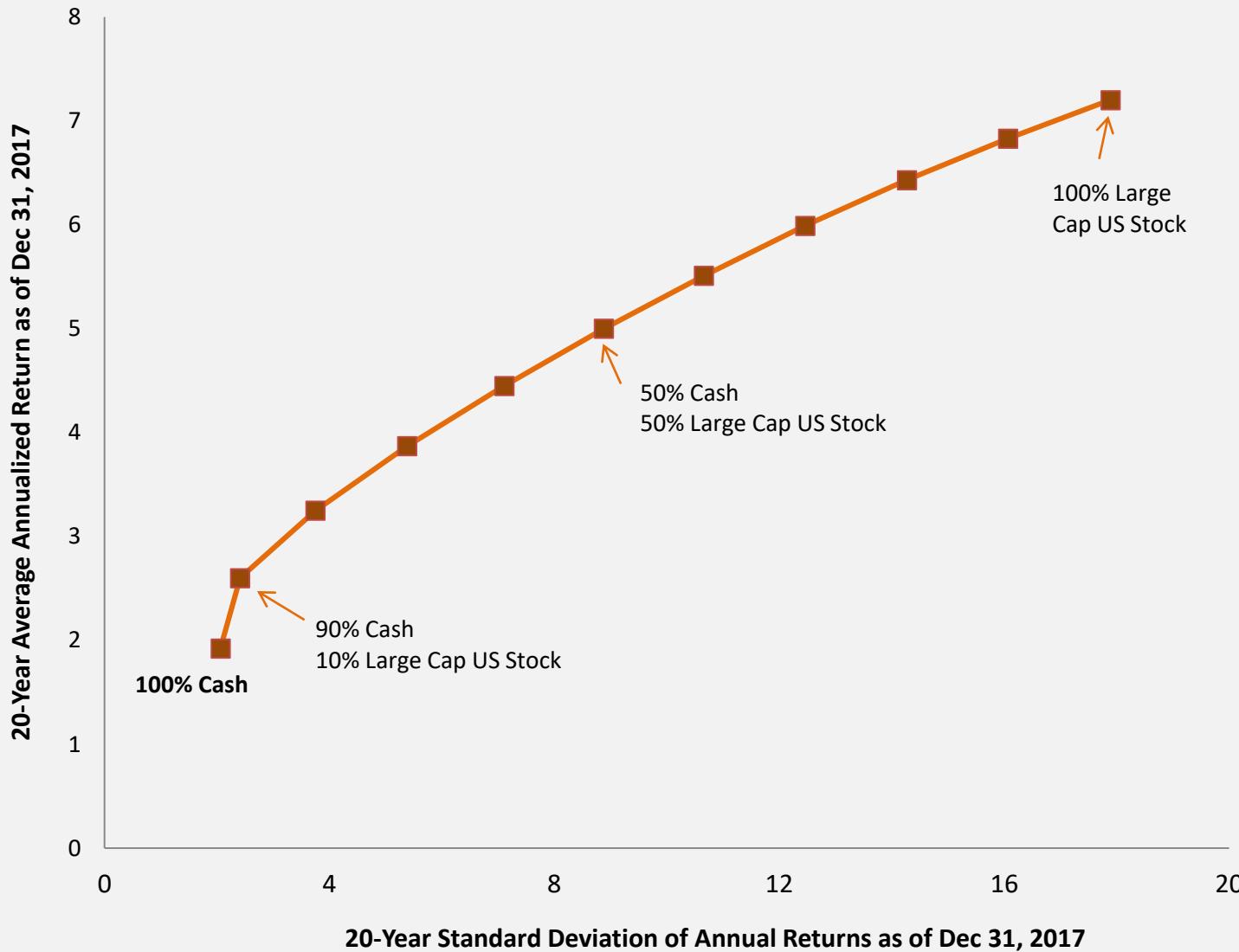
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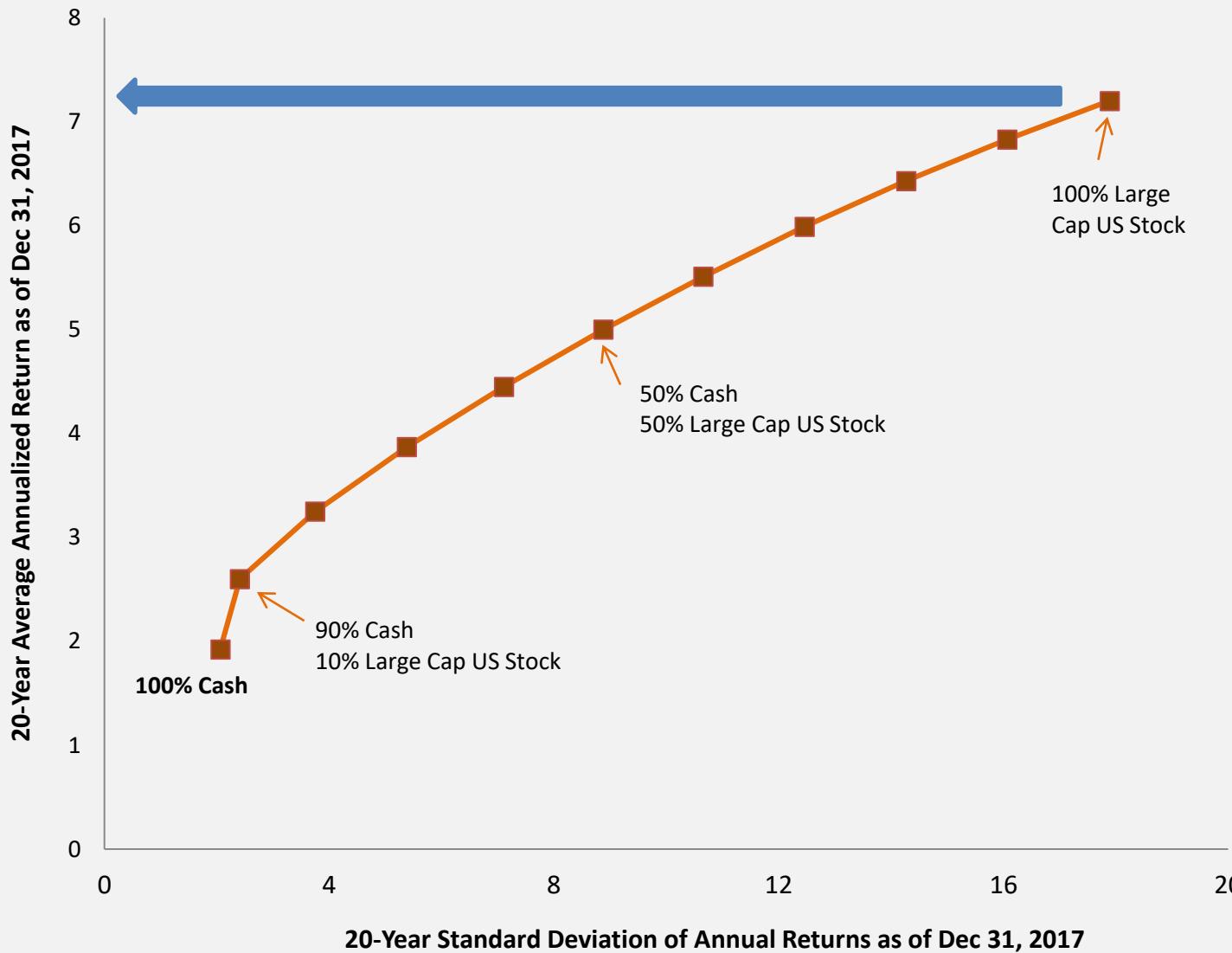
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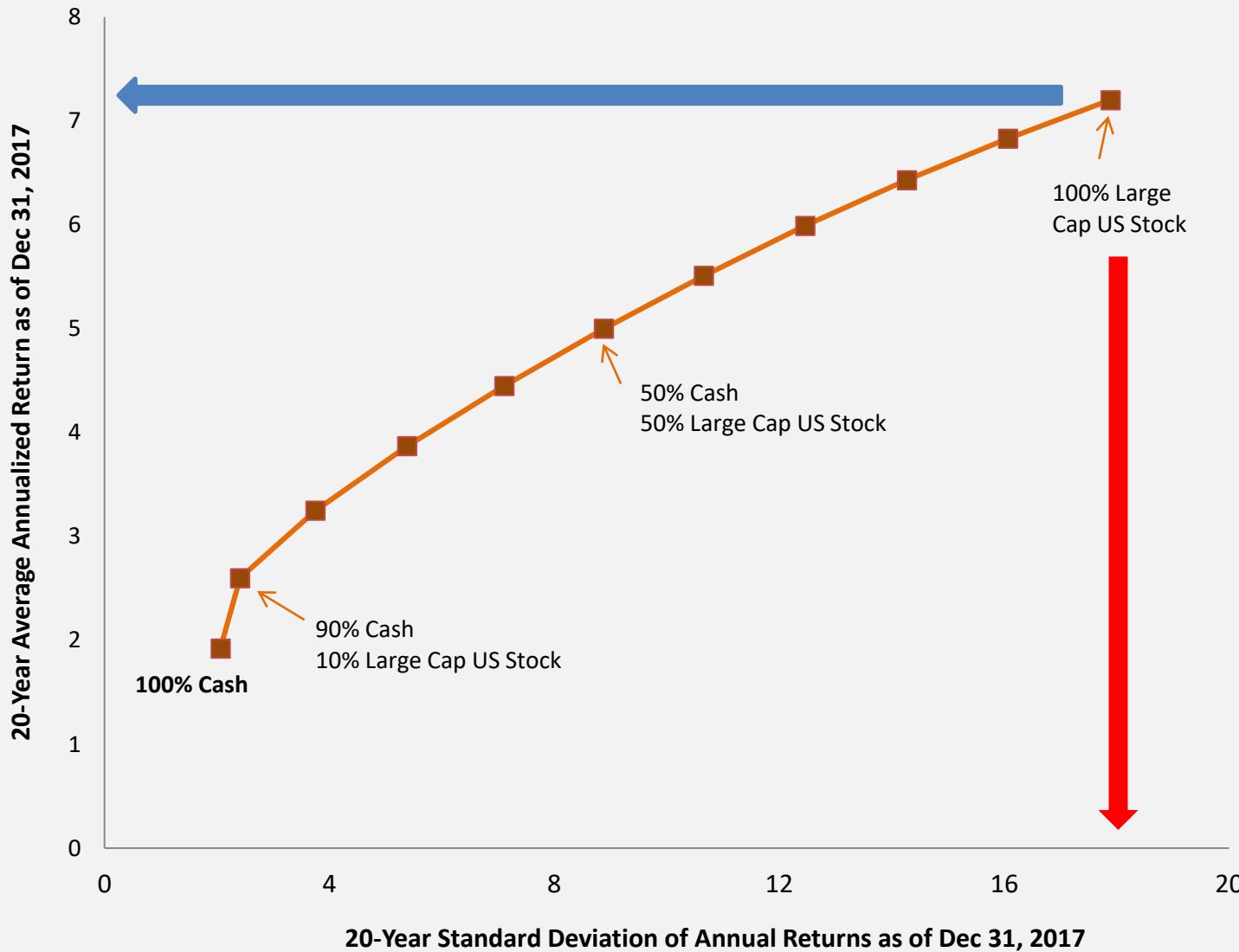
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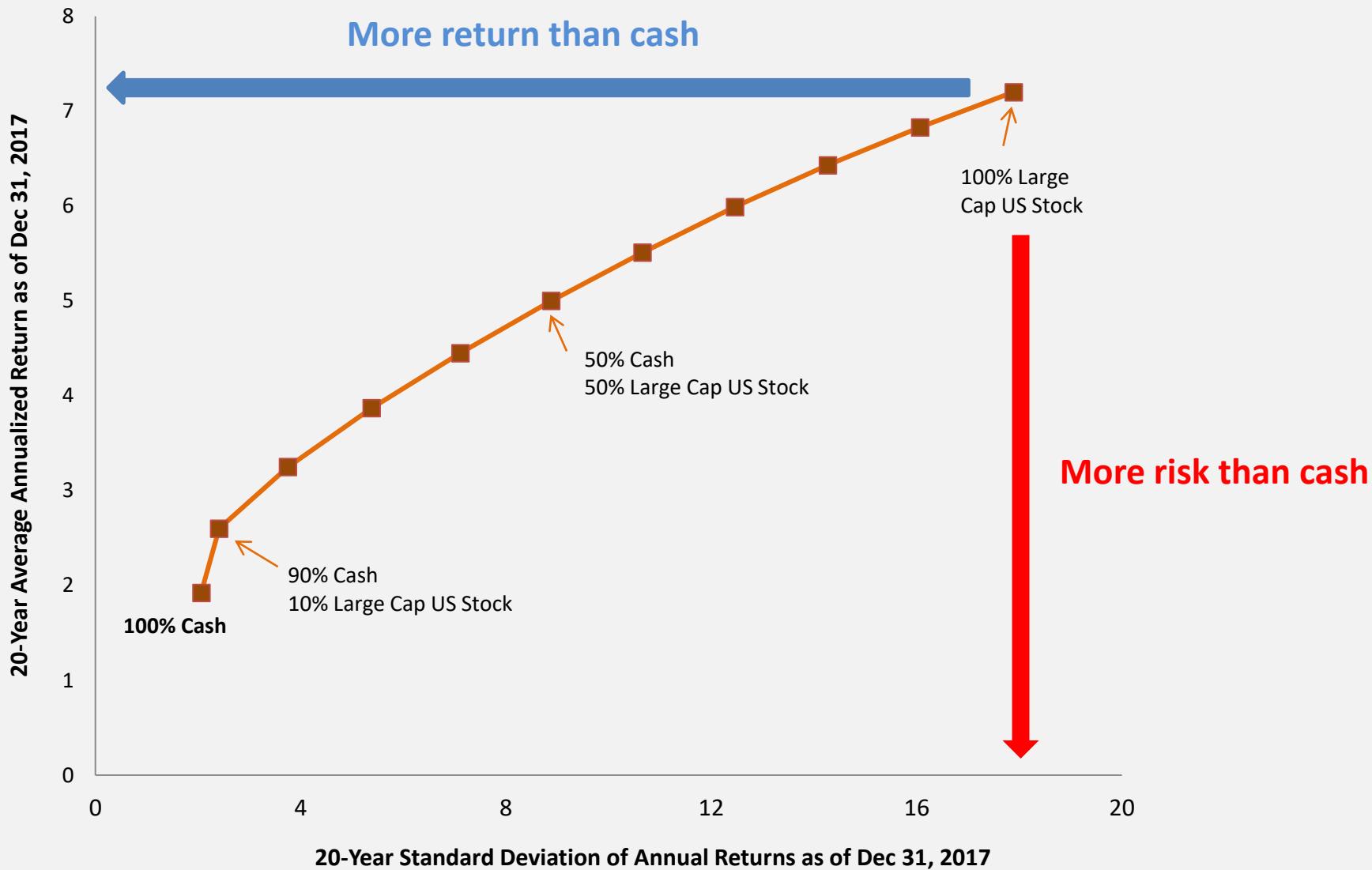
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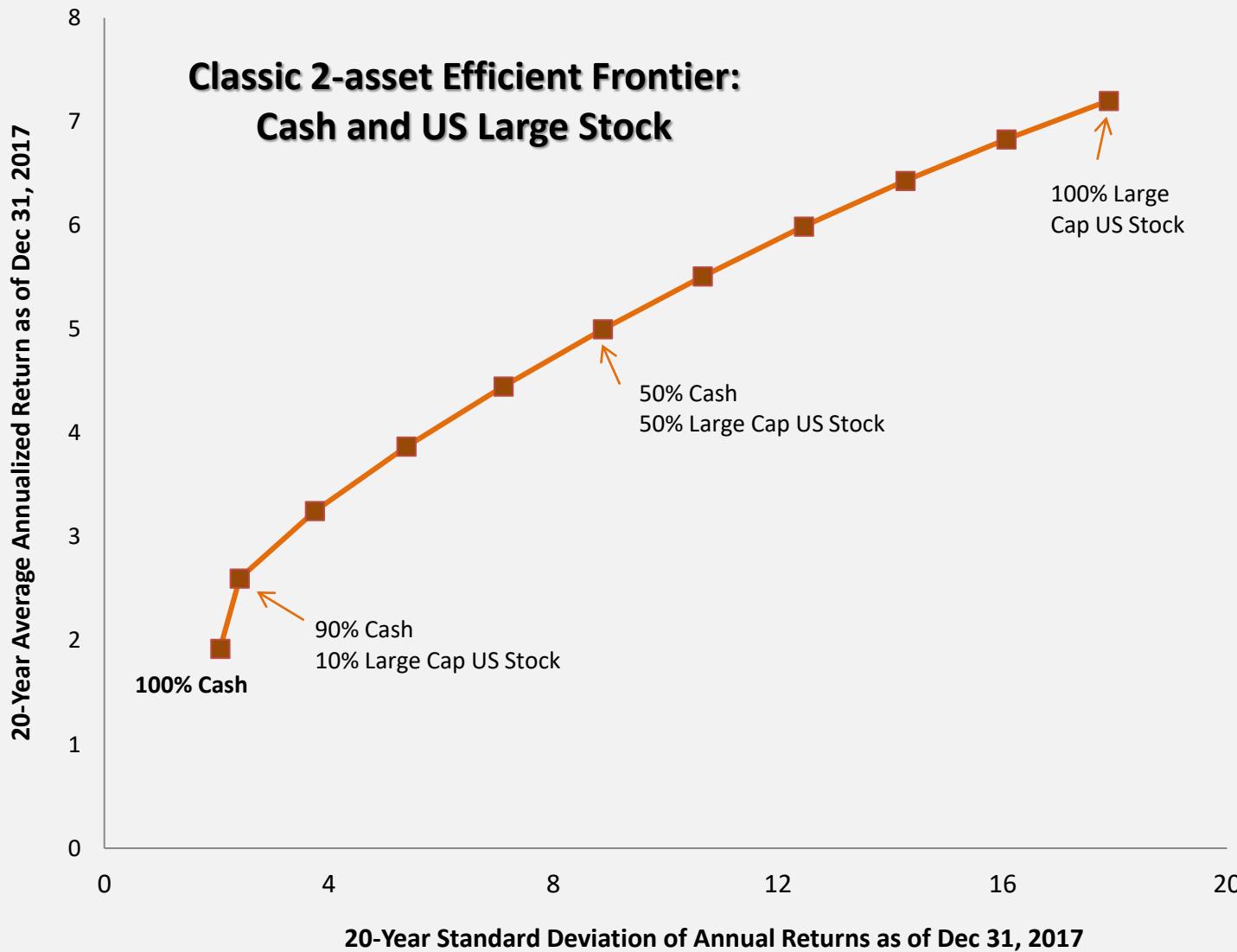
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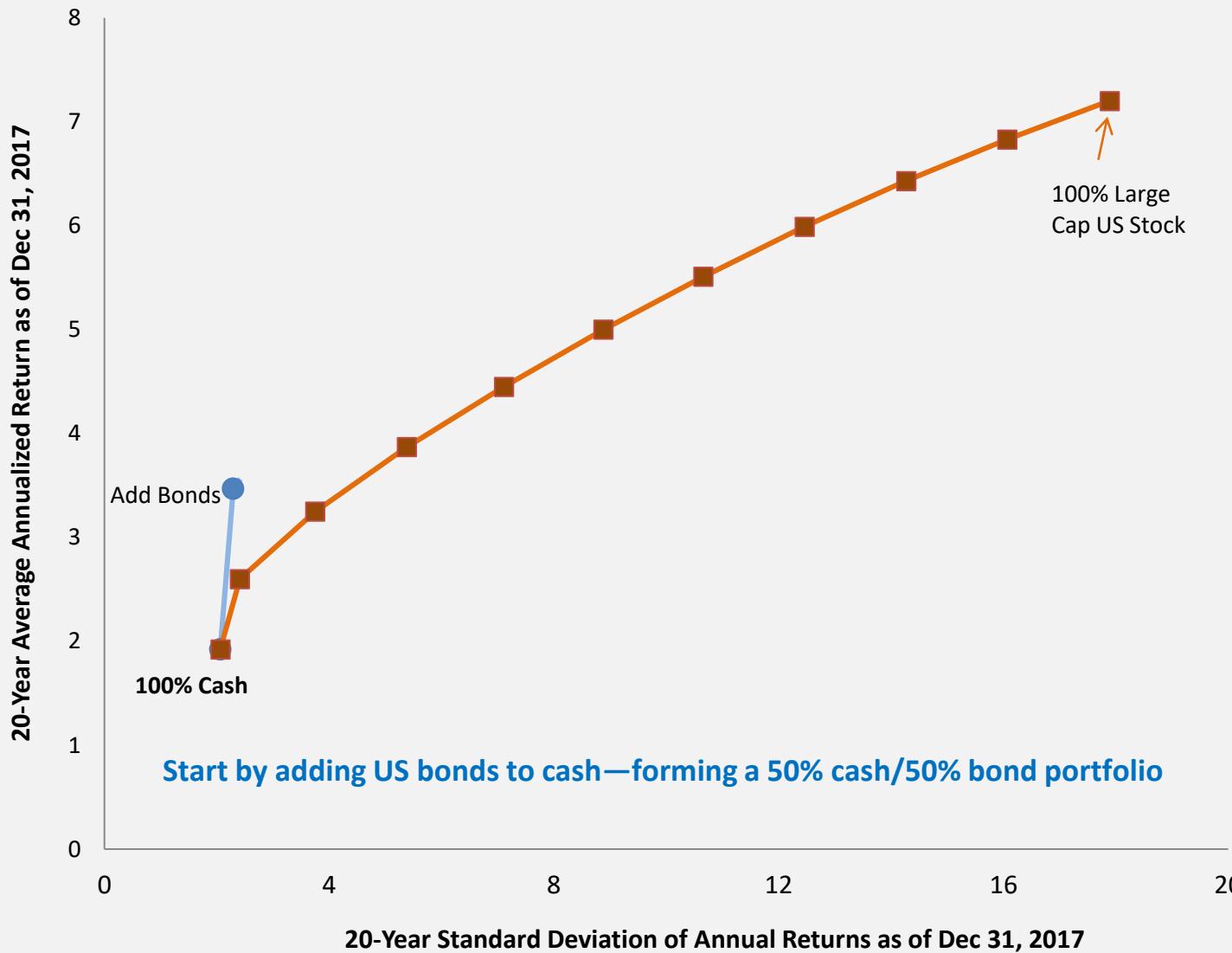
Let's explore the  
Multi-Asset *Effective* Frontier

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%

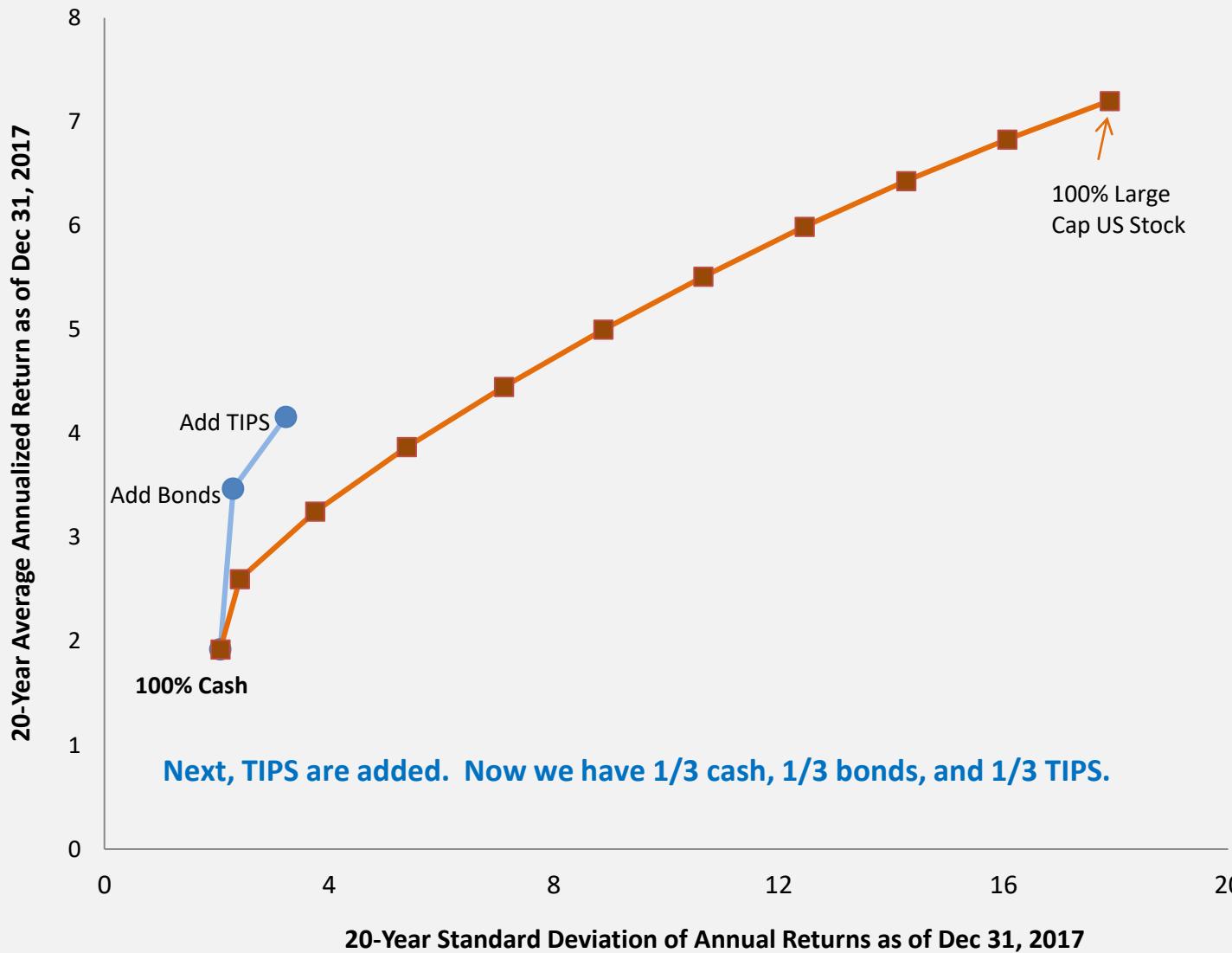
12 Asset Classes	Index used in this analysis	20-Year Standard Deviation of Annual Returns 1998-2017	20-Year Average Annualized Return 1998-2017
Cash	USTREAS Stat US T-Bill 90 Day	2.06%	1.92%
US Bonds	Barclays US Aggregate Bond Index	3.50%	4.98%
TIPS	Barclays U.S. Treasury US TIPS Index	6.11%	5.48%
Non-US 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%



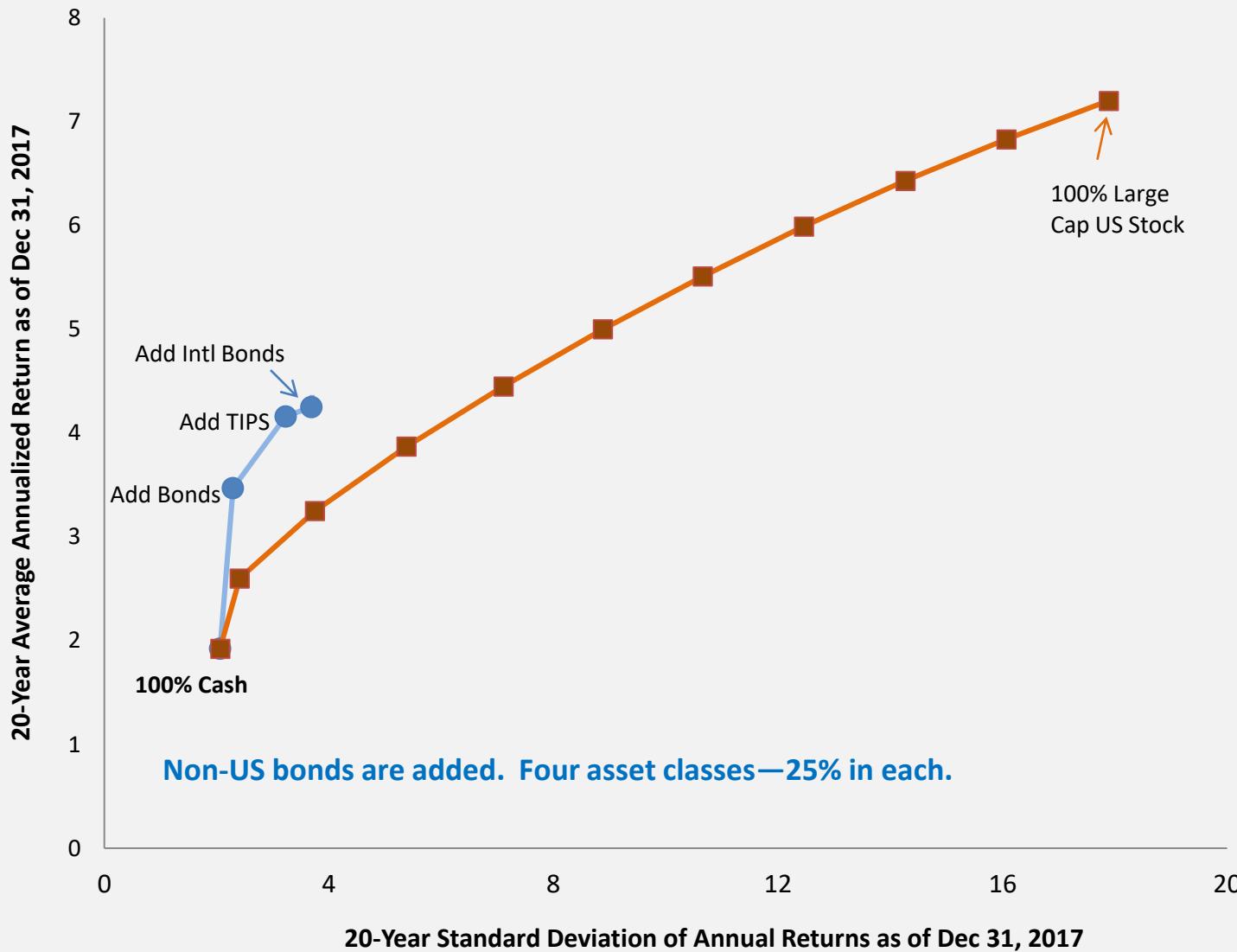
We will now build a 12-asset portfolio in order of standard deviation (lowest to highest)



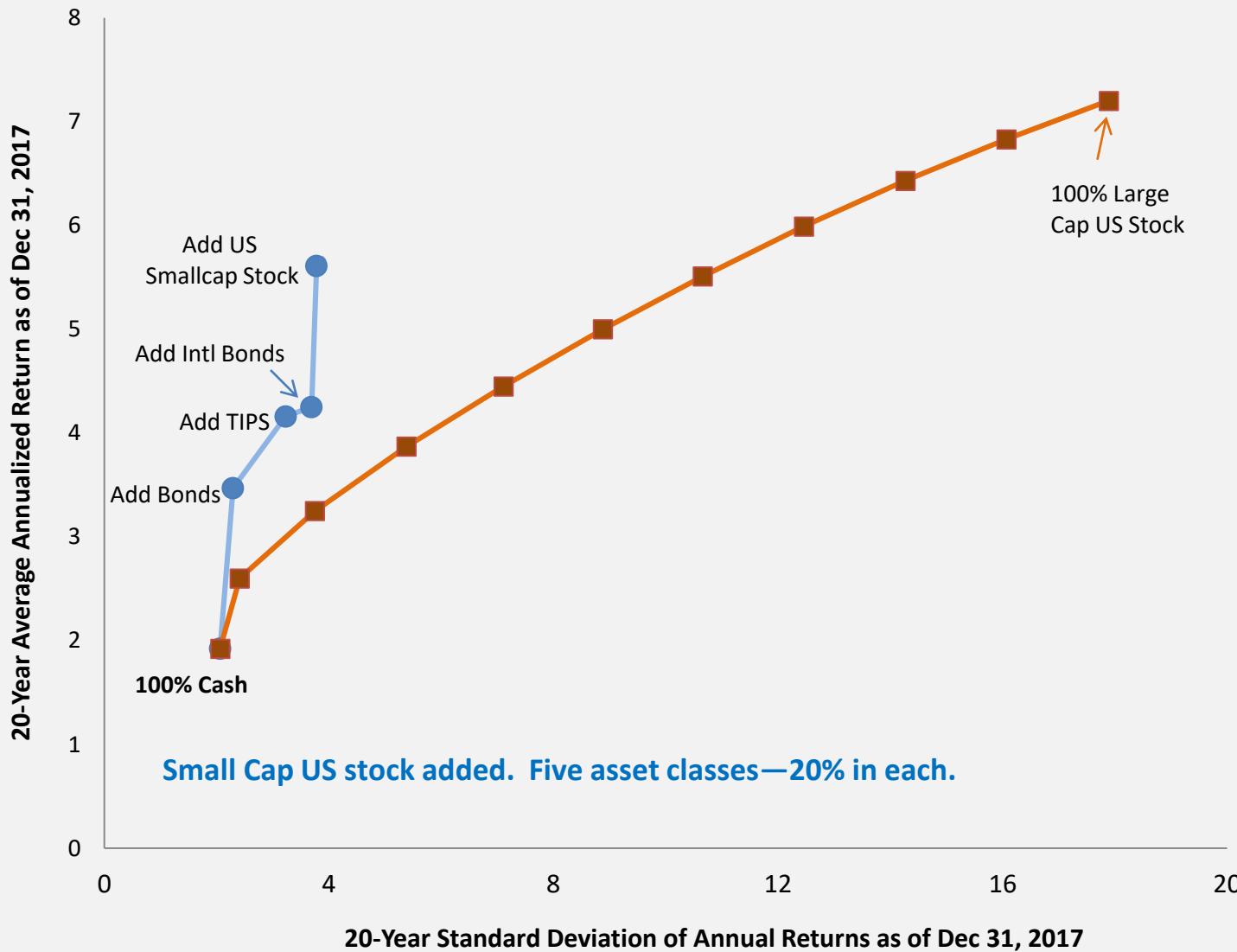
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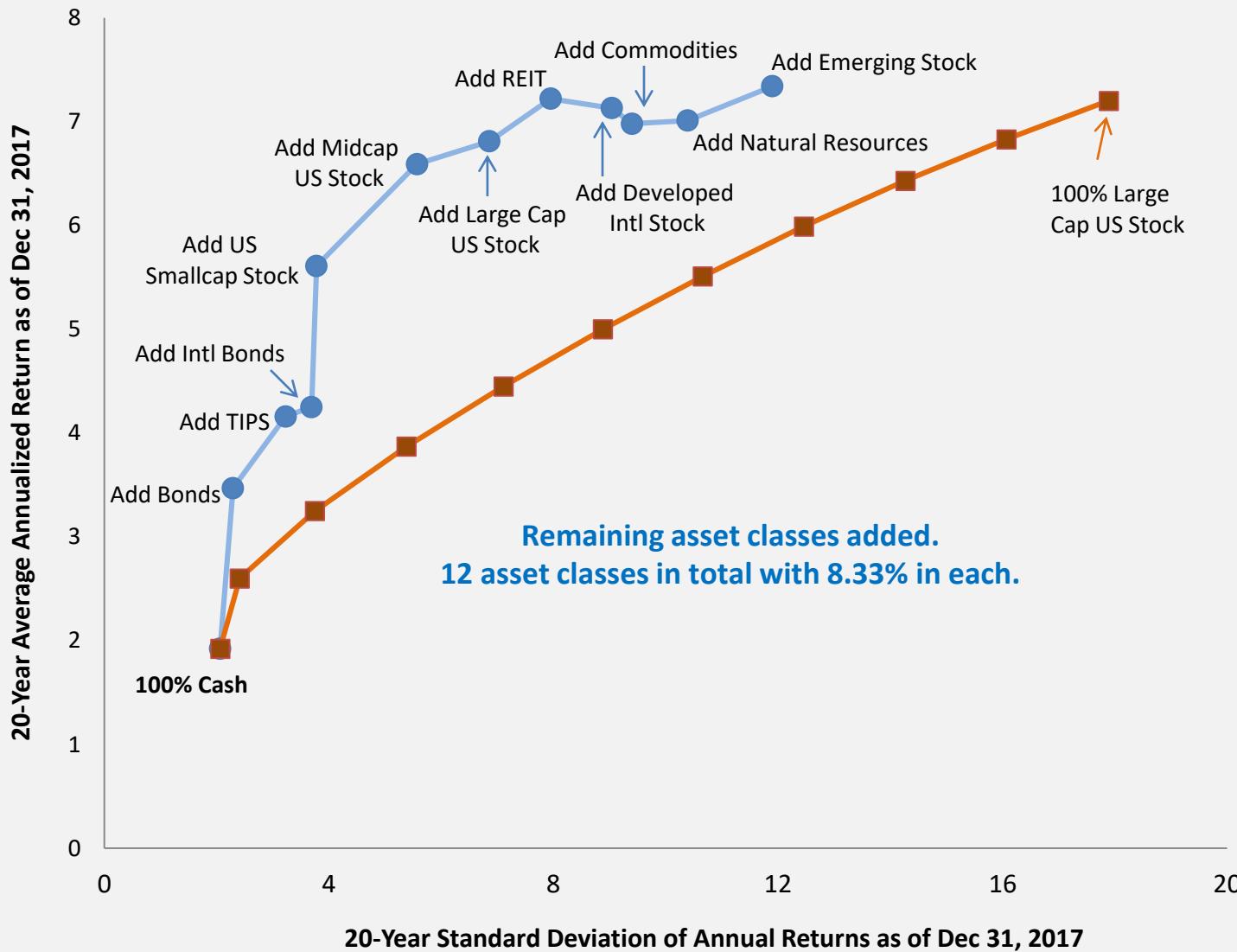
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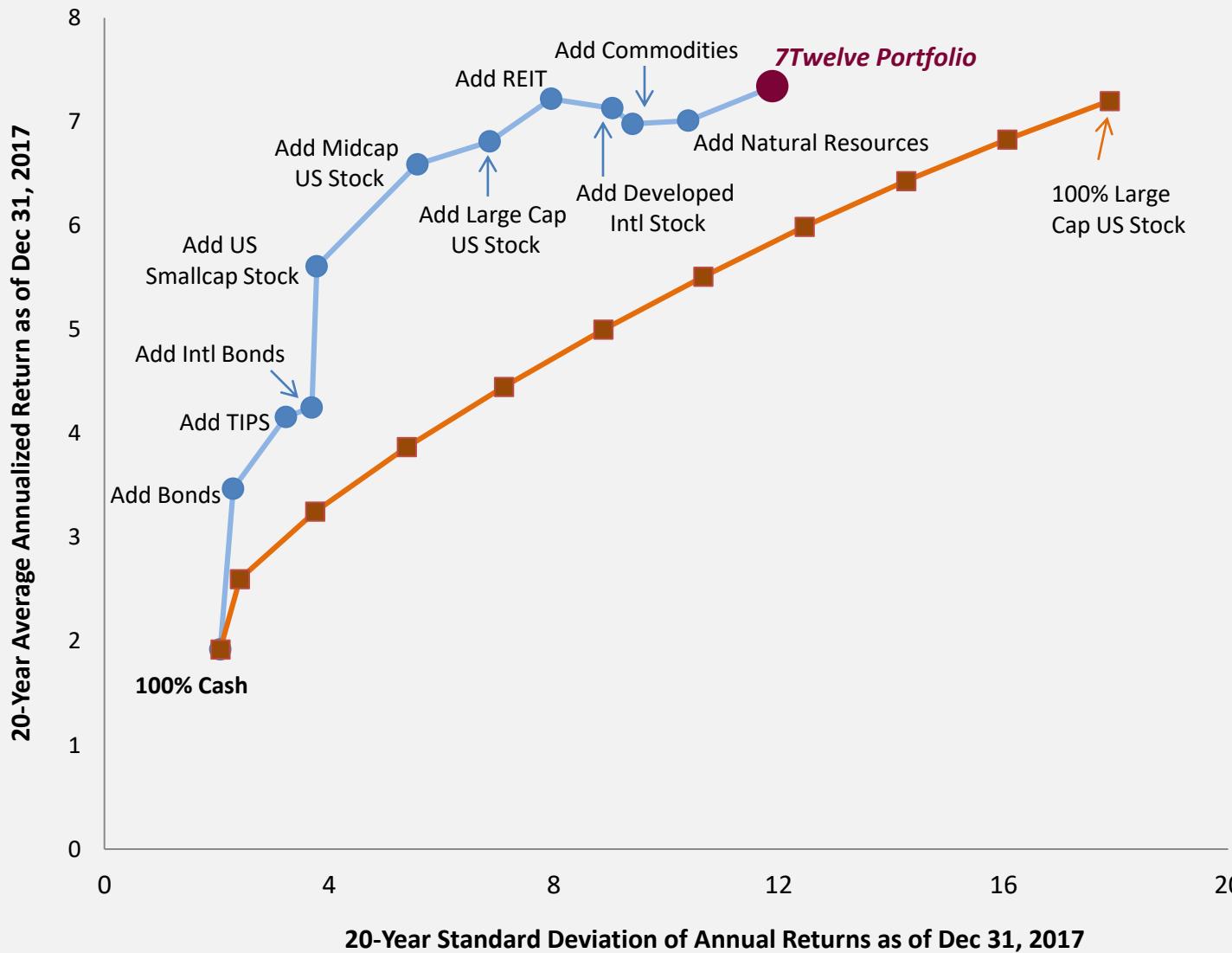
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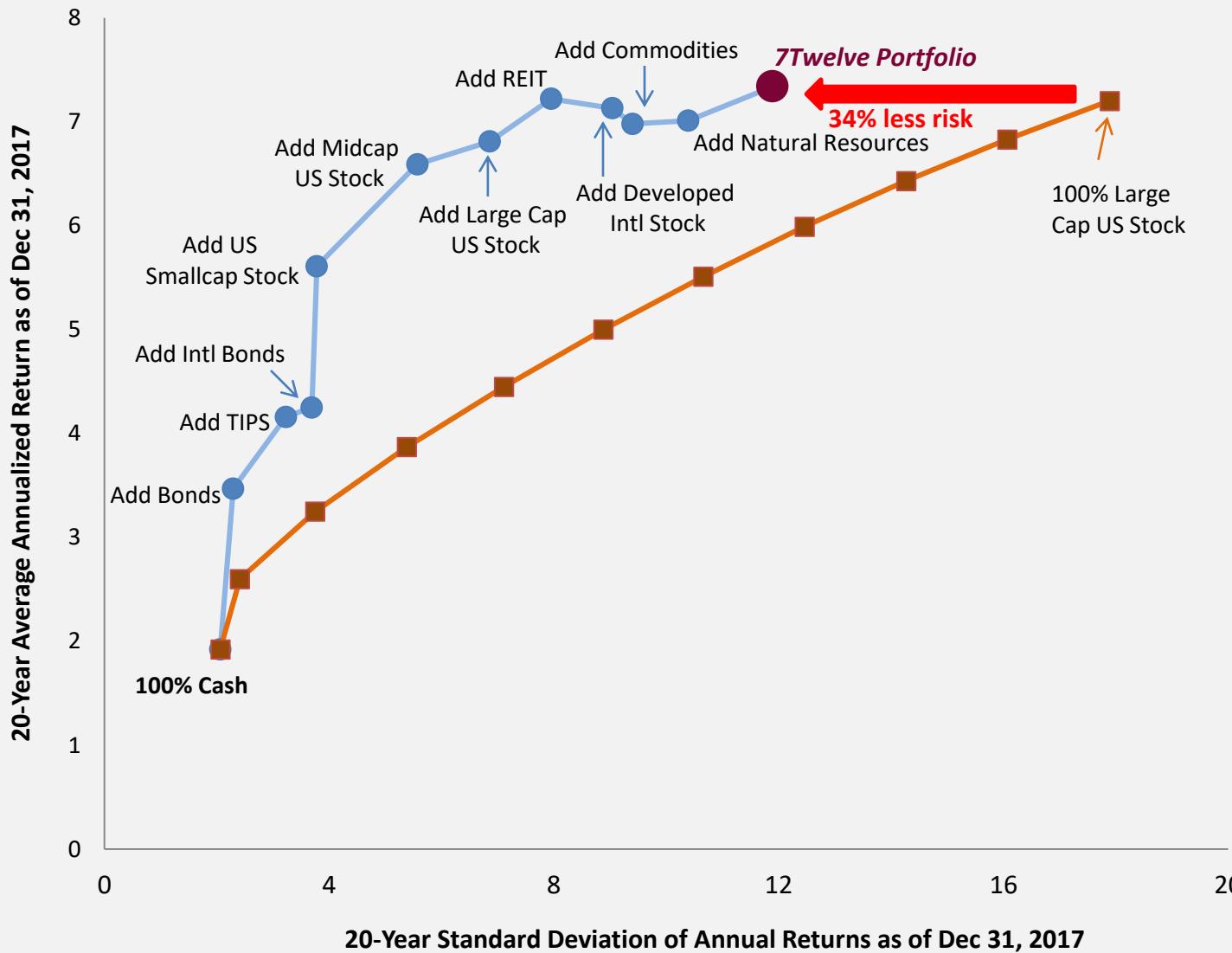
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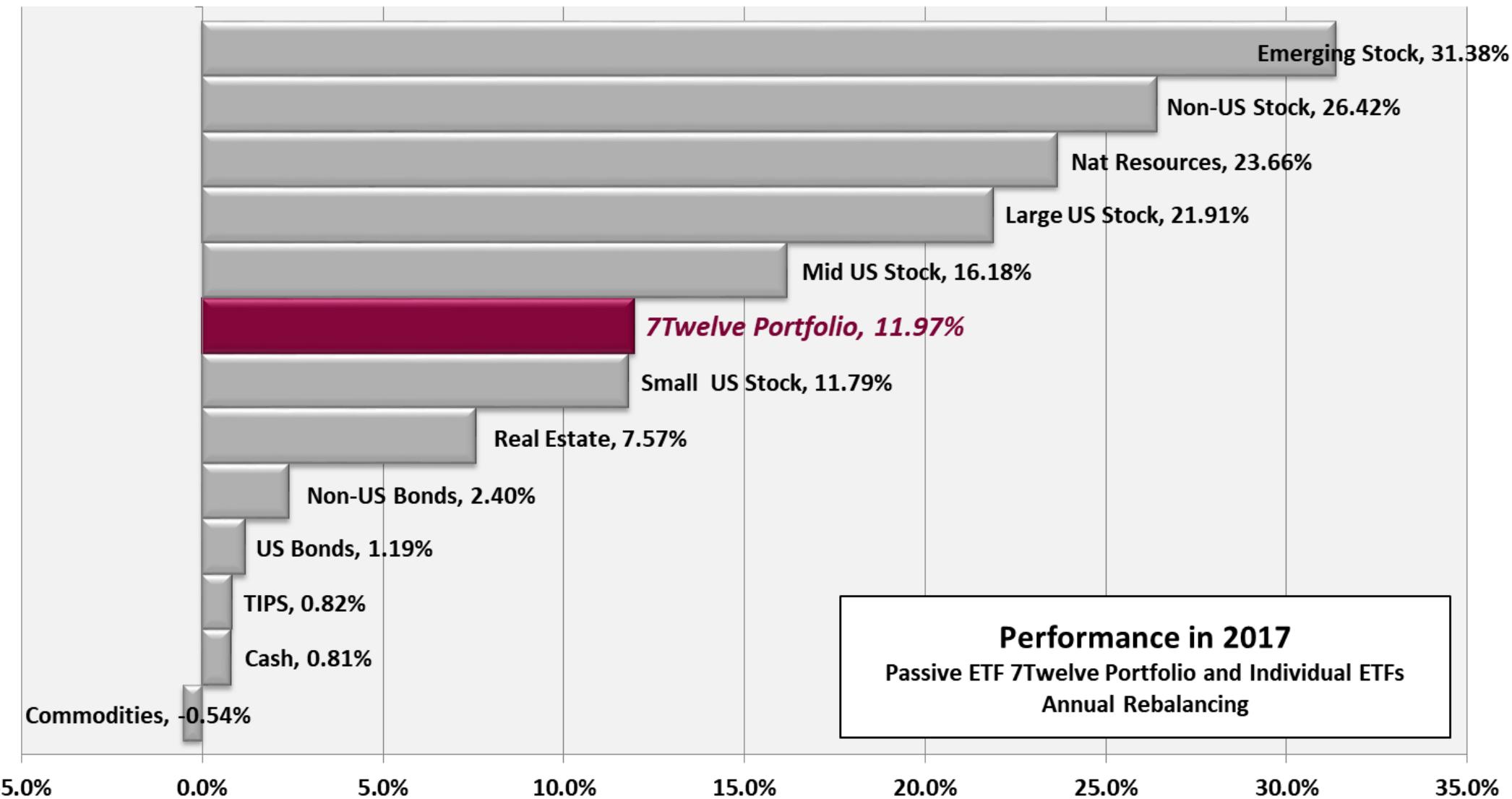
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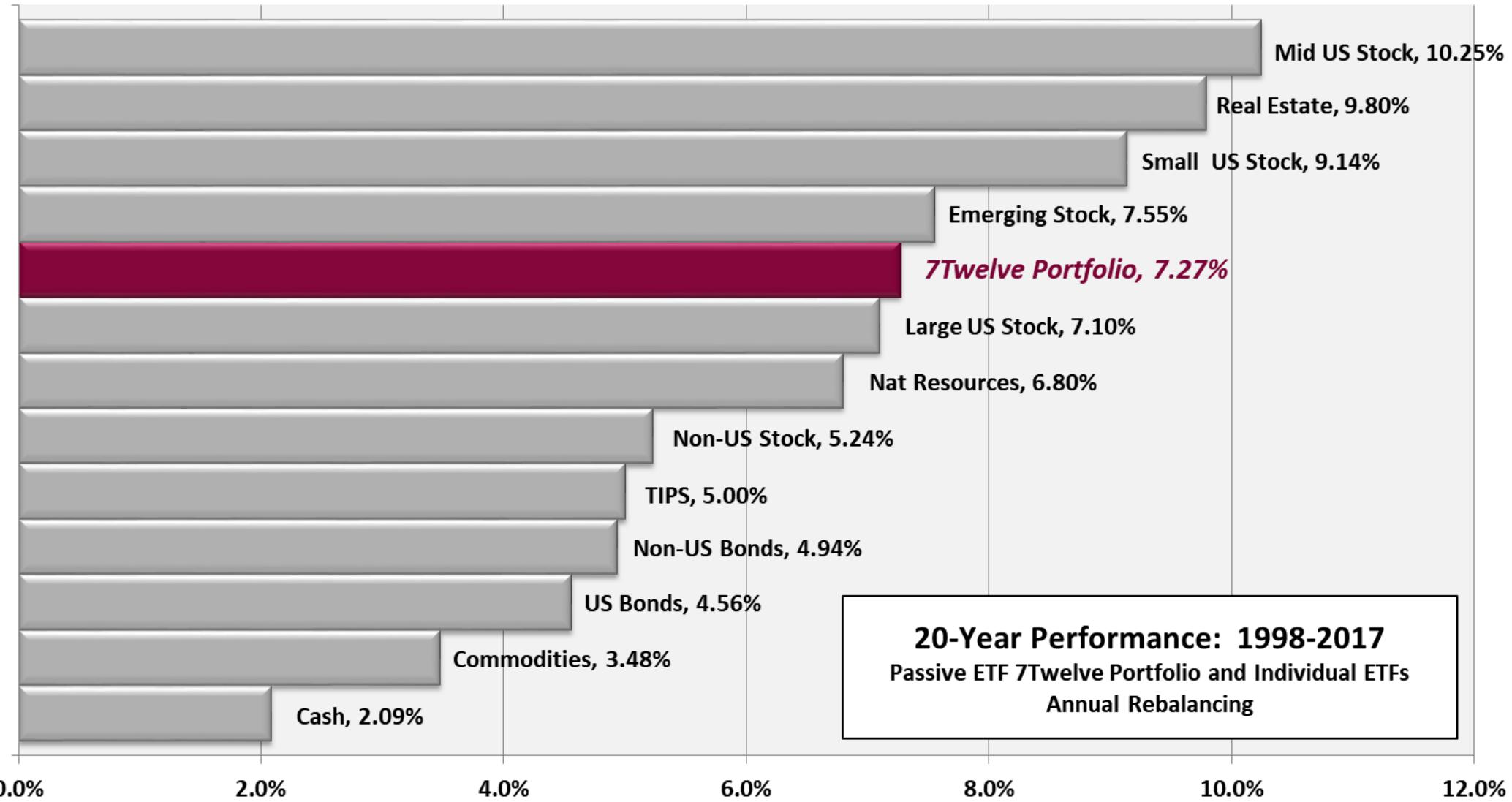


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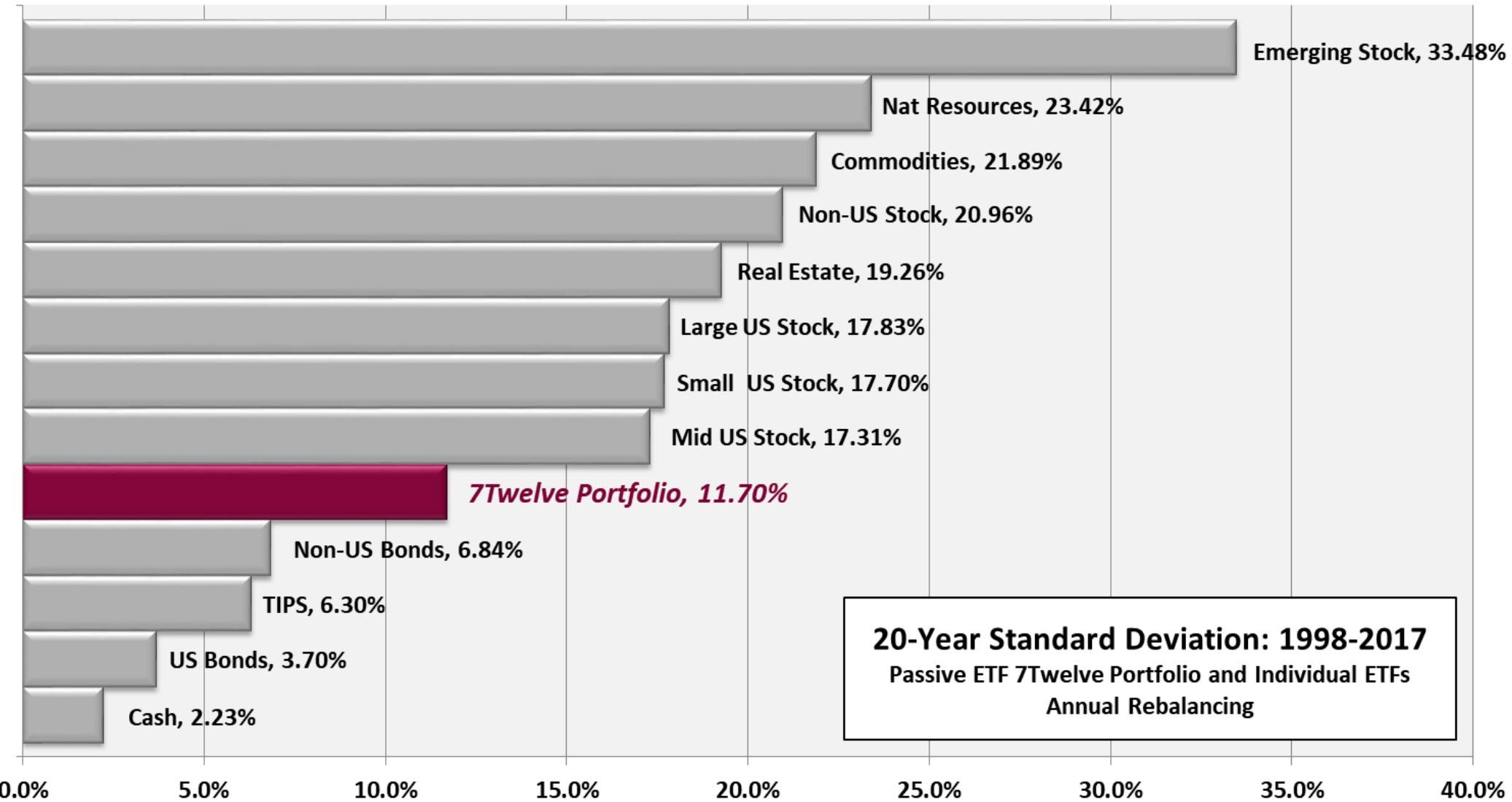


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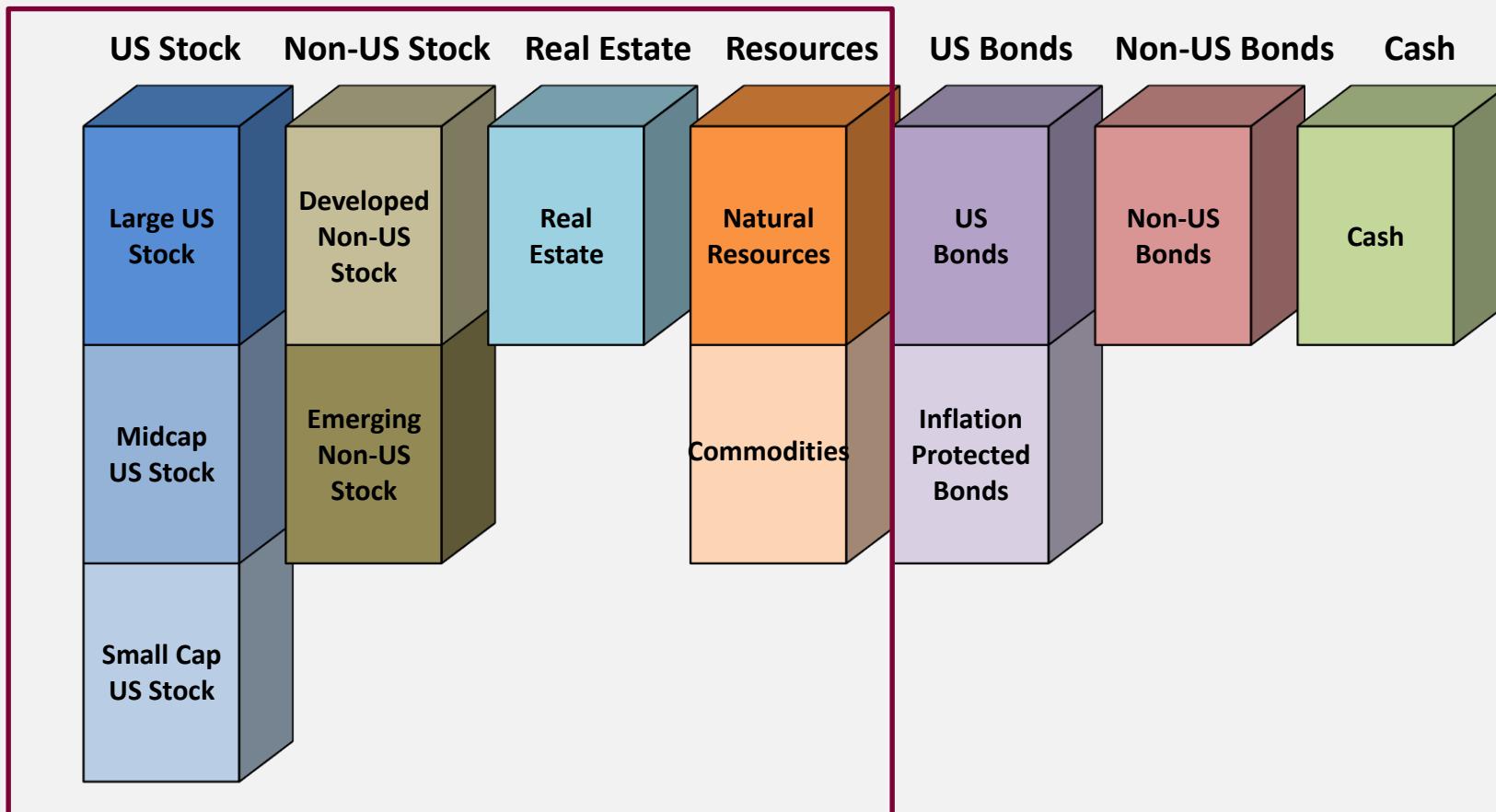




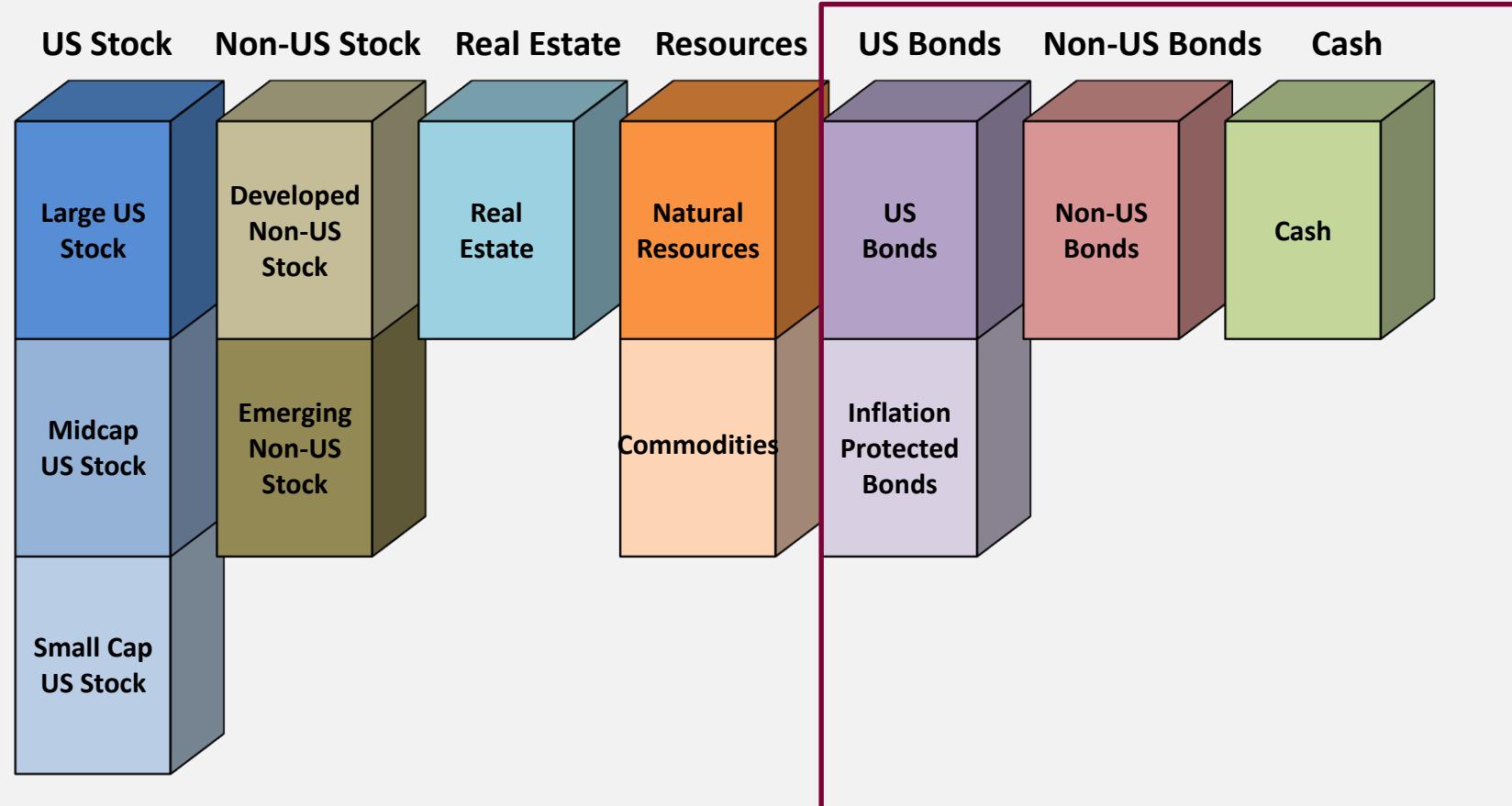
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## Eight Equity and Diversifying Holdings The “Engines” of the Portfolio



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



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

Click in lower right corner to return to Main Menu

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

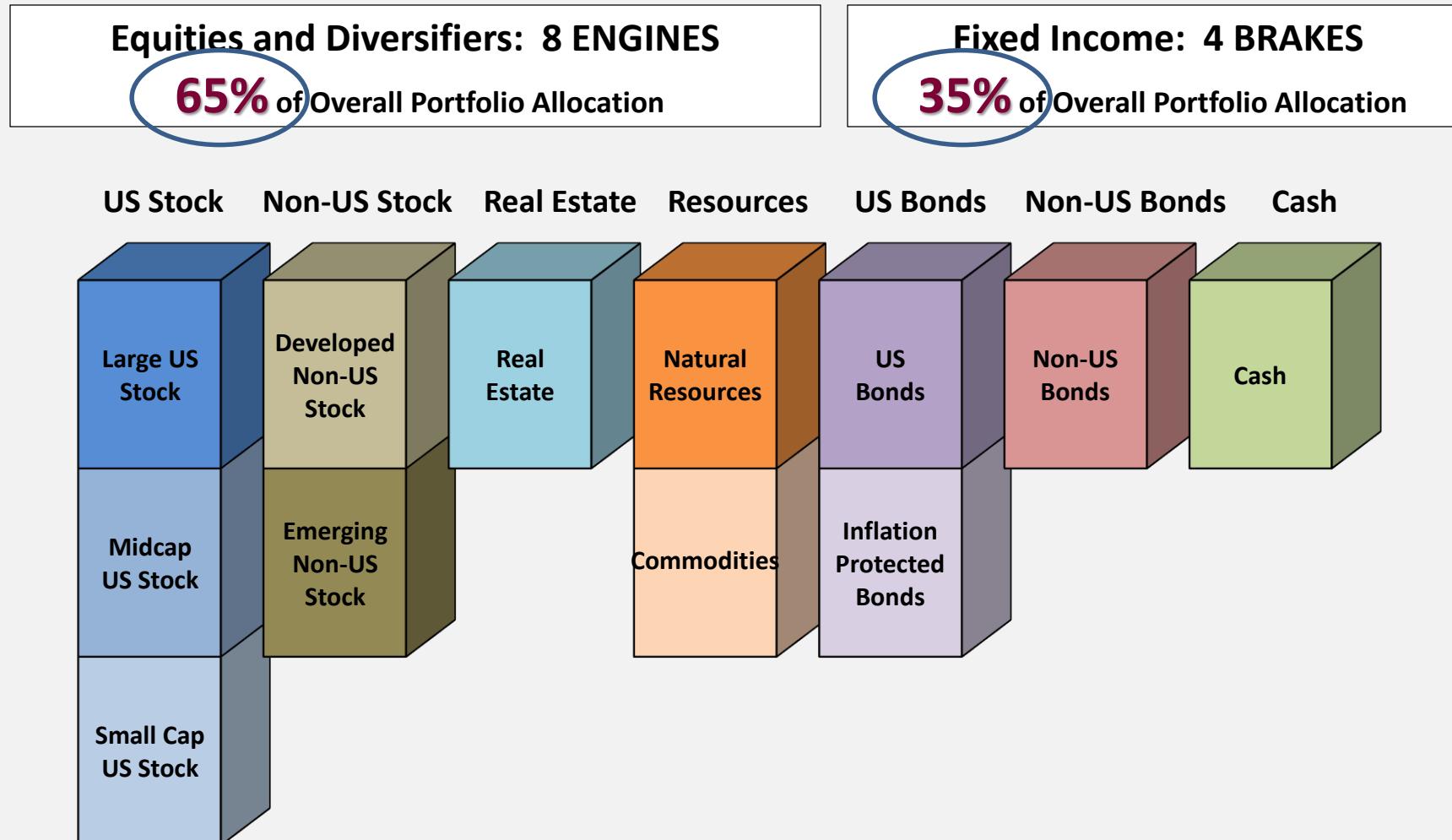
**Brakes have outperformed  
35% of the time**

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

**Brakes** have outperformed  
35% of the time

**Engines** have outperformed  
65% of the time

## A Multi-Asset Balanced Strategy



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

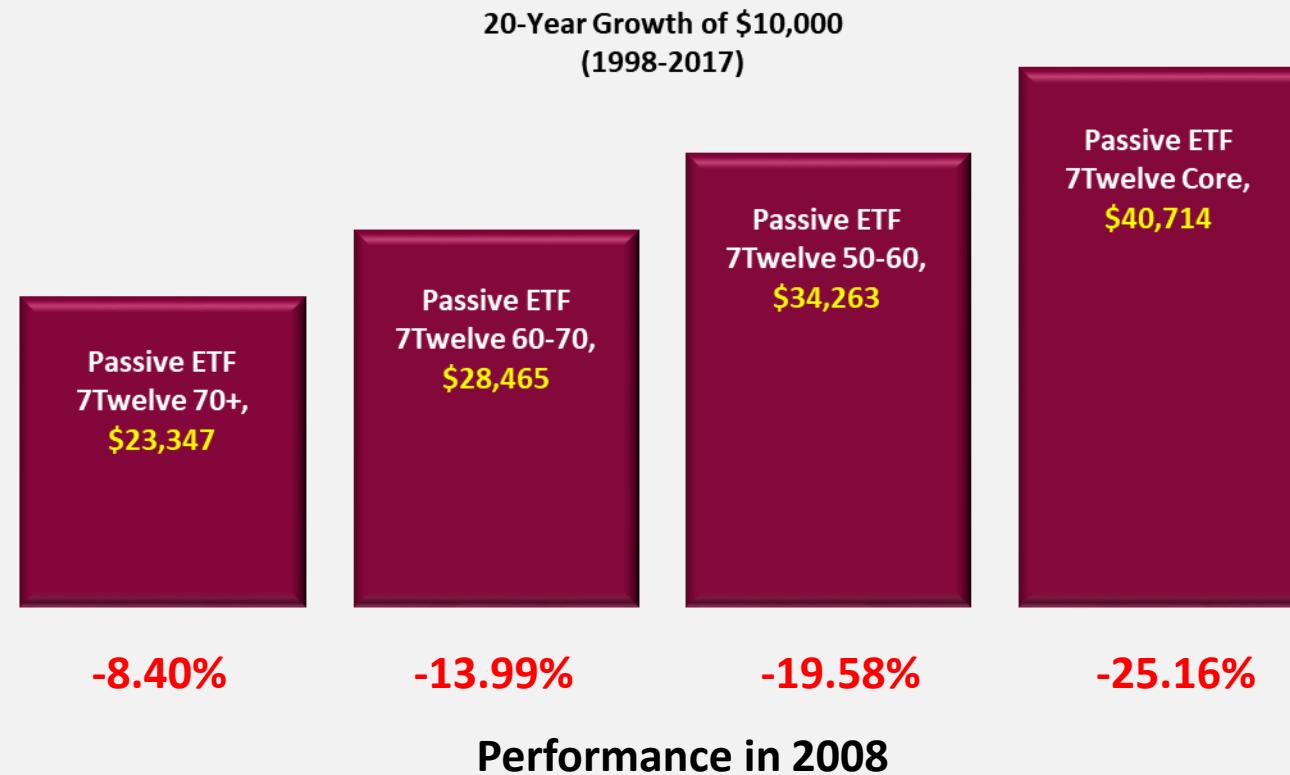
	7Twelve Core Model	7Twelve Age-Based 50-60	7Twelve Age-Based 60-70	7Twelve Age-Based 70+
<b>Large US Stock</b>	<b>8.33%</b>	<b>6.67%</b>	<b>5.00%</b>	<b>3.33%</b>
<b>Mid Cap US Stock</b>	<b>8.33%</b>	<b>6.67%</b>	<b>5.00%</b>	<b>3.33%</b>
<b>Small US Stock</b>	<b>8.33%</b>	<b>6.67%</b>	<b>5.00%</b>	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

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

### Core 7Twelve model and Age-Based Models



# 20-Year Retirement Portfolio Analysis: 1998-2017

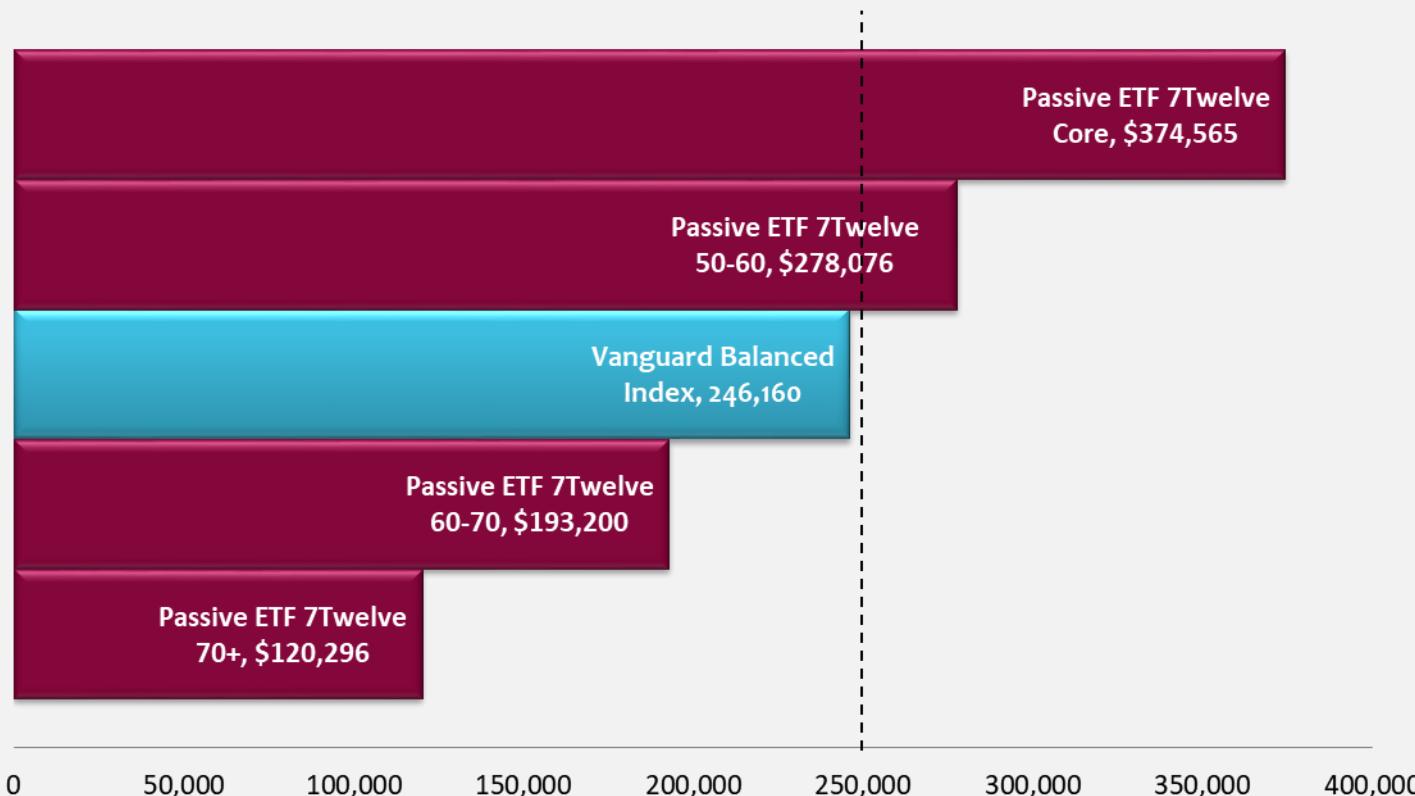
\$250,000 Initial Account Value on Jan 1, 1998 in Passive ETF 7Twelve Models

5% Initial Withdrawal

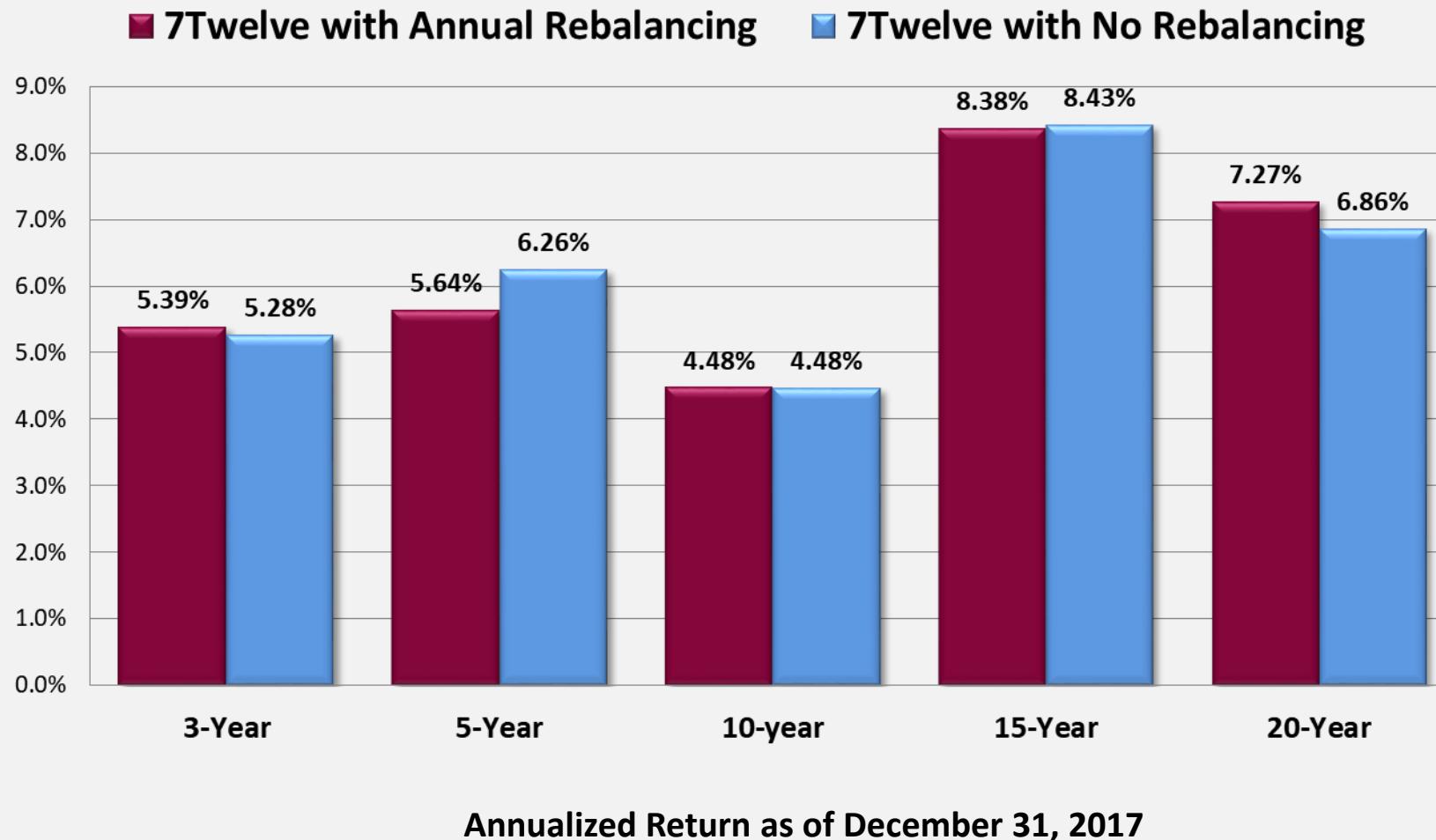
3% Annual Increase in Annual Withdrawal

**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



# 7Twelve®

Passive ETF 7Twelve model

<b>Rebalancing Frequency</b> 20-Year Annualized Return				
<b>No Rebalancing</b>	<b>Monthly Rebalancing</b>	<b>Quarterly Rebalancing</b>	<b>Semi-annual Rebalancing</b>	<b>Annual Rebalancing</b>
<b>6.86</b>	<b>7.05</b>	<b>7.19</b>	<b>7.14</b>	<b>7.27</b>

# Low-Cost *7Twelve*® Models

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

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# Low-Cost *7Twelve*® Models

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

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

# The *7Twelve*<sup>®</sup> Portfolio

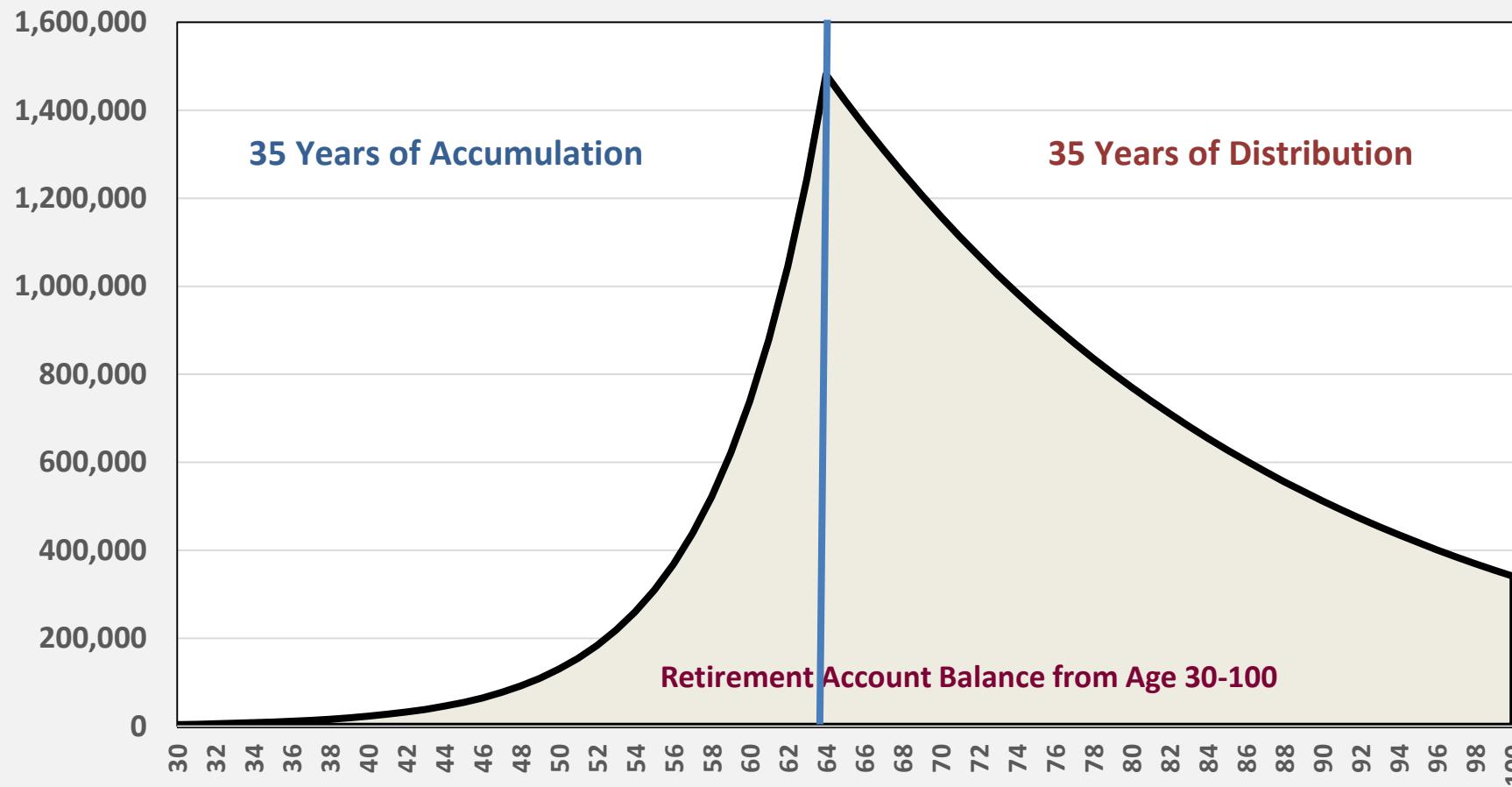
**Craig L. Israelsen, Ph.D.**

Email: [craig@7TwelvePortfolio.com](mailto:craig@7TwelvePortfolio.com)

Web: [www.7TwelvePortfolio.com](http://www.7TwelvePortfolio.com)

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# 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
<b>25/75 Conservative 4-Asset Model</b>	7.59 / 6.37 / -12.54
40% Large US Stock/60% Bonds	8.32 / 8.37 / -18.73
<b>50/50 Equal-Weighted 4-Asset Model</b>	9.44 / 11.08 / -23.59
60% Large US Stock/40% Bonds	9.37 / 11.32 / -26.93
<b>65/35 Growth 4-Asset Model</b>	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

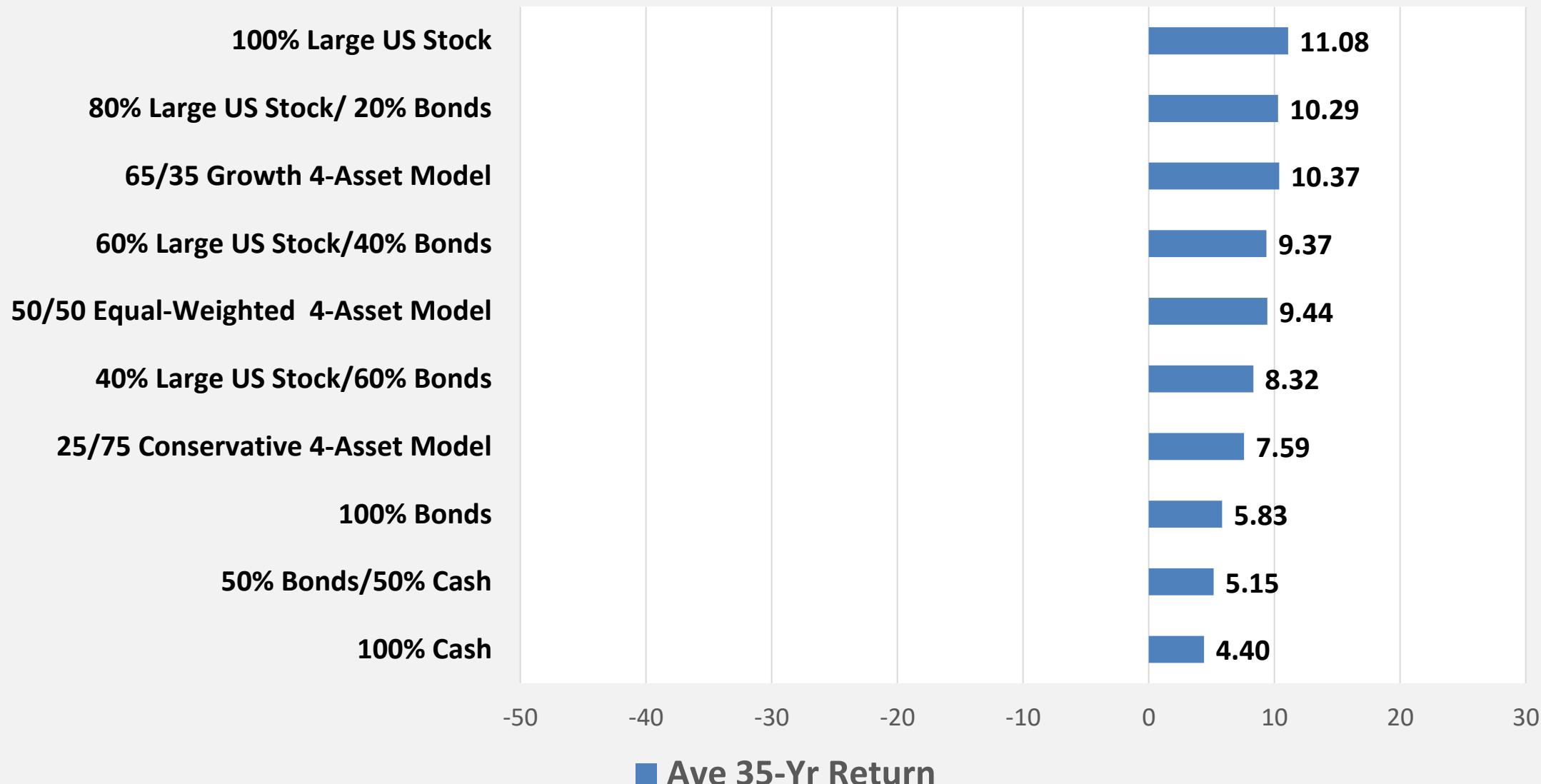
**Large US Stock:** S&P 500 Index

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

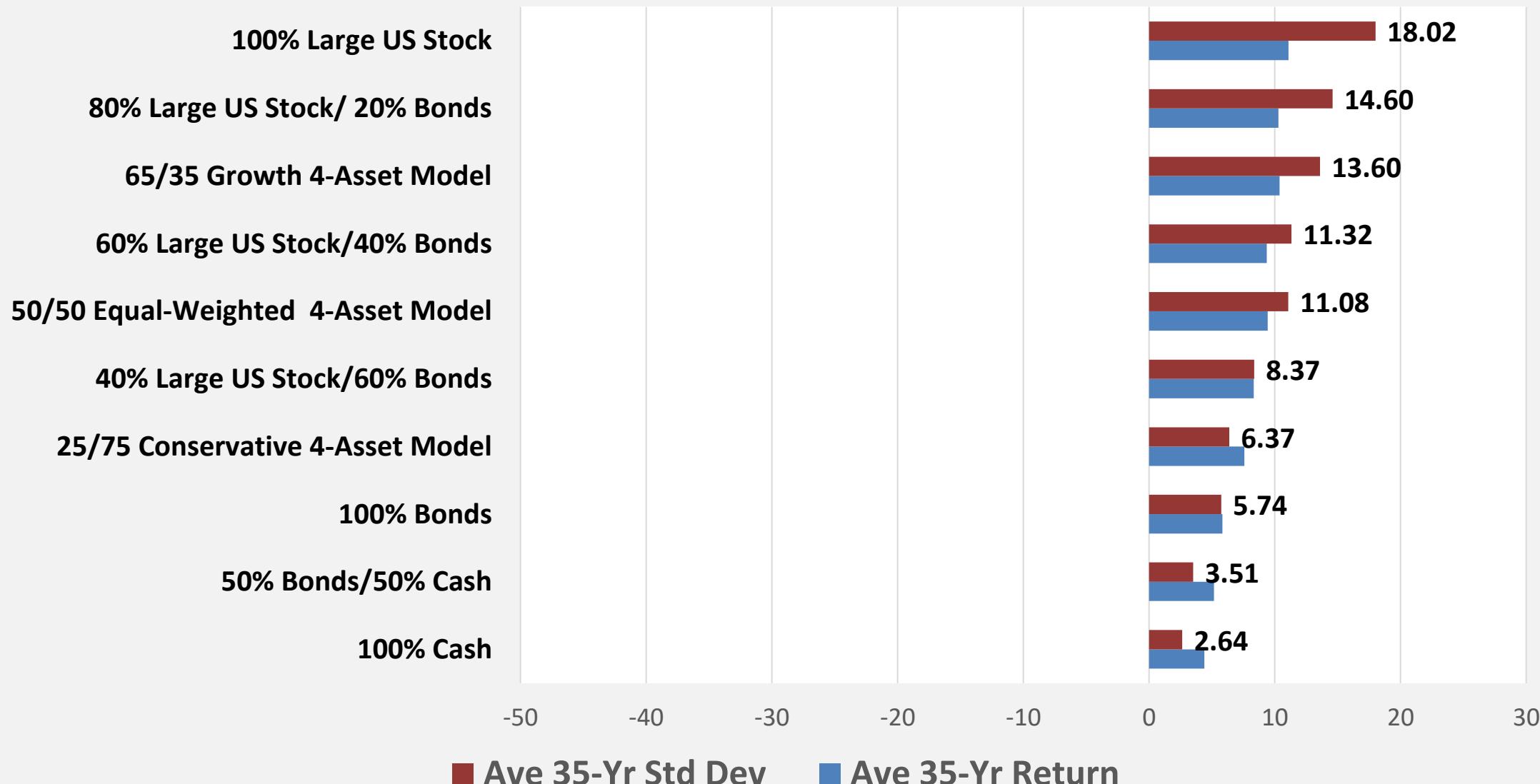
**50/50 4-Asset Model:** 25% Cash, 25% Bonds, 25% Small US Stock, 25% Large US Stock

**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

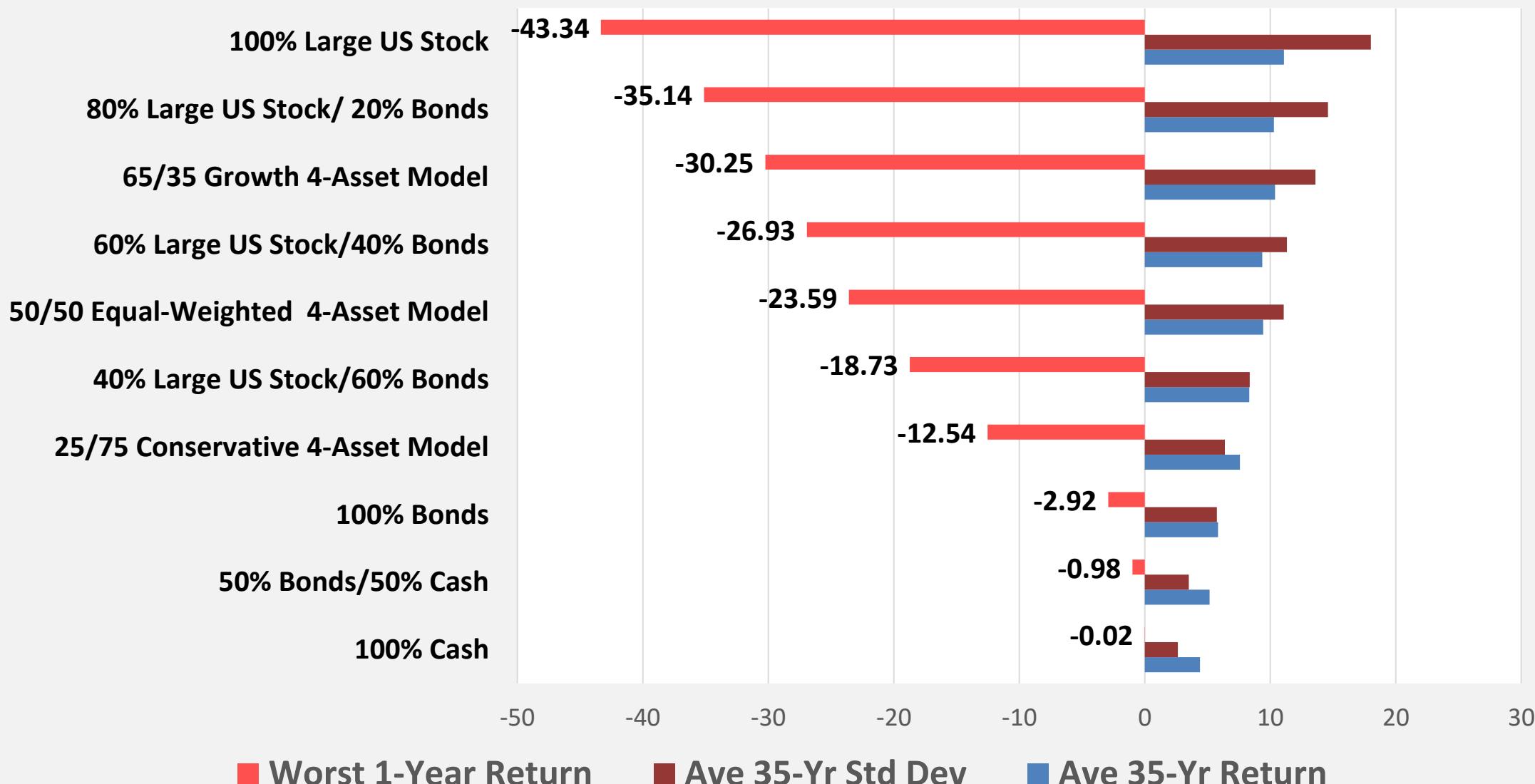


## 10 Investment Models over 92-Year History: 1926-2017



Click in lower right corner to return to Main Menu

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



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# 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

× 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

× 3% increase in annual salary through age 65

= \$95,617 final salary at age 65

× 12

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

× 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

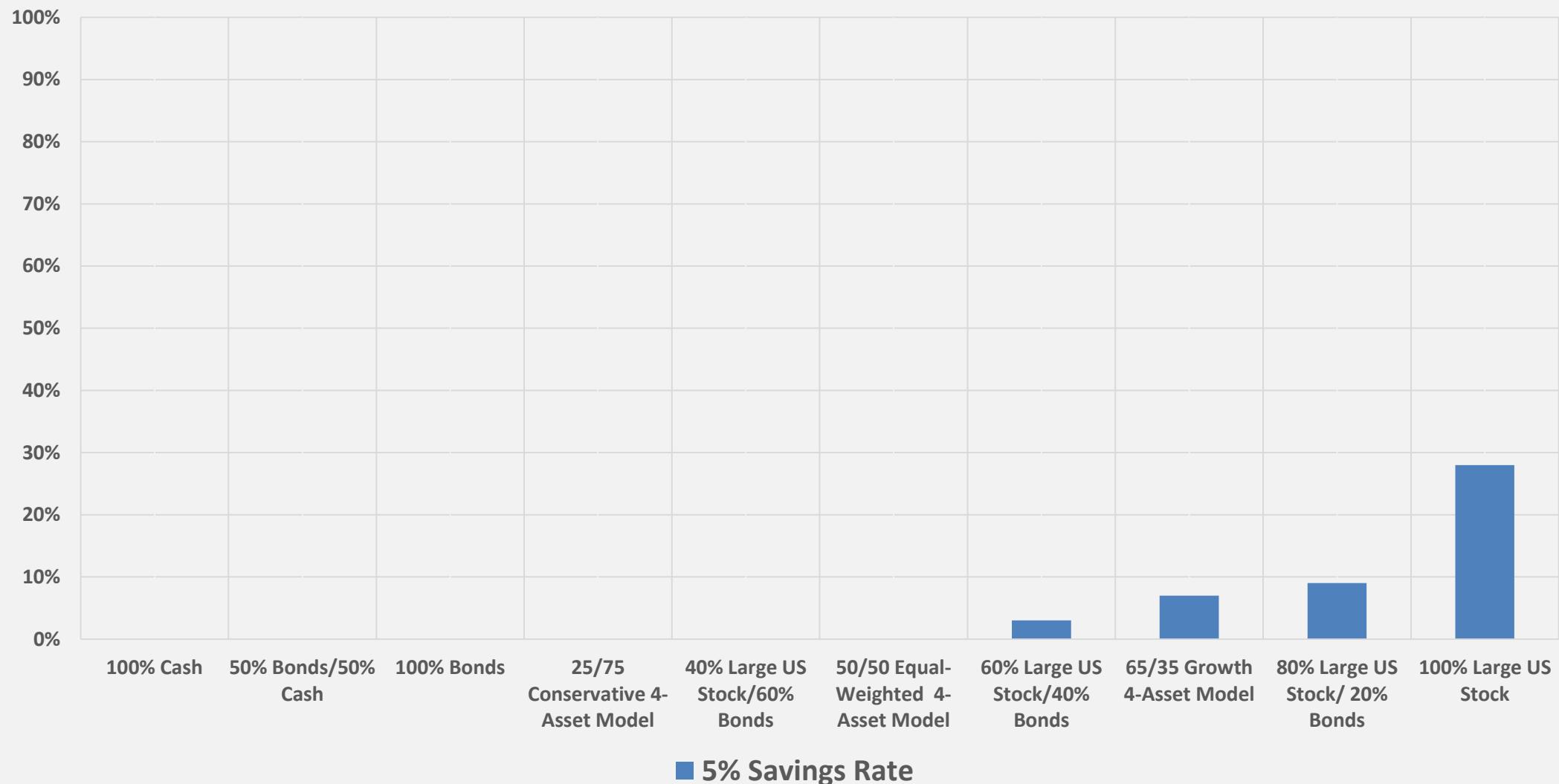
Success = Achieving Retirement Portfolio Equal to  
12x Final Annual Income

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%	

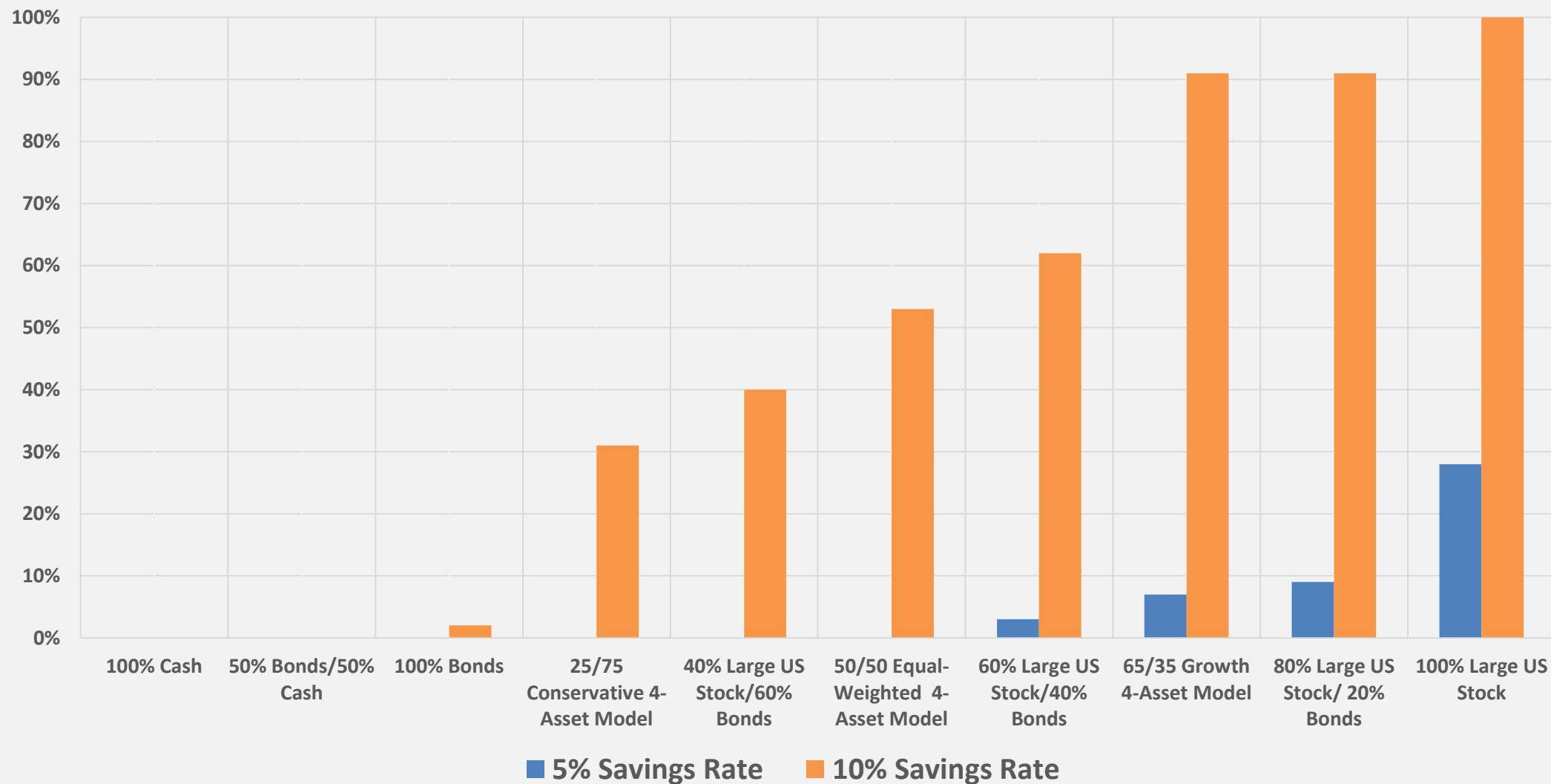
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## Probability of Having 12x Final Income In Retirement Portfolio at Various Savings Rates Across 10 Portfolio Designs



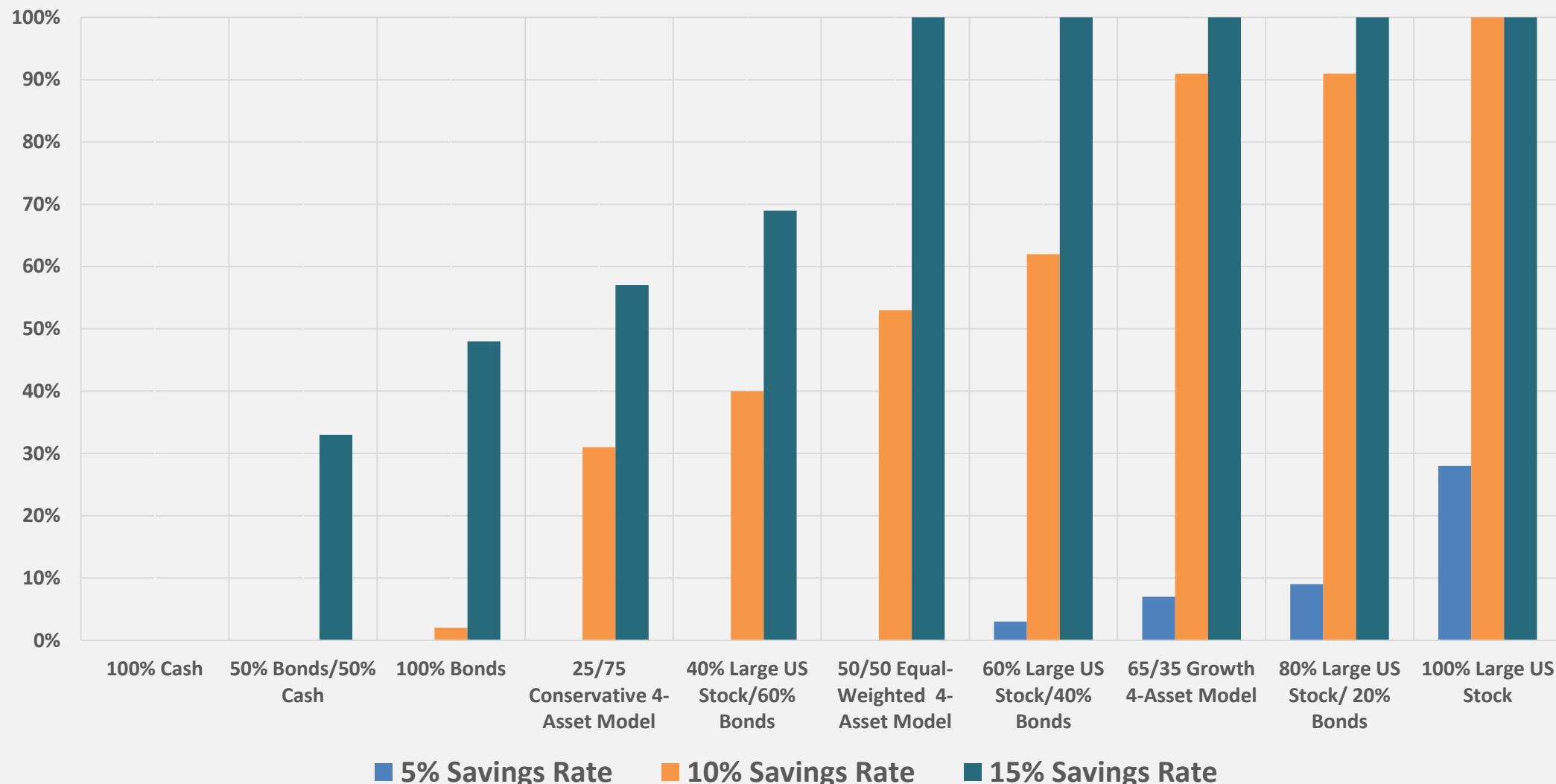
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# Retirement Portfolio Survival

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
<b>100% Cash Portfolio</b>	<b>58.6%</b>	<b>44.8%</b>	<b>29.3%</b>	<b>0%</b>
<b>100% Bond Portfolio</b>	<b>70.7%</b>	<b>46.6%</b>	<b>34.5%</b>	<b>27.6%</b>
<b>“Age-in-Bonds” Portfolio</b> Balance in Large US stock	<b>100%</b>	<b>82.8%</b>	<b>56.9%</b>	<b>29.3%</b>
<b>25/75 4-Asset Portfolio</b> 15% Large Stock, 10% Small Stock, 55% Bonds, 20% Cash	<b>100%</b>	<b>93.1%</b>	<b>60.3%</b>	<b>36.2%</b>
<b>60% Stock/40% Bonds</b>	<b>100%</b>	<b>96.6%</b>	<b>89.7%</b>	<b>70.7%</b>
<b>50/50 4-Asset Portfolio</b> 25% Large Stock, 25% Small Stock, 25% Bonds, 25% Cash	<b>100%</b>	<b>98.3%</b>	<b>89.7%</b>	<b>84.5%</b>
<b>65/35 4-Asset Portfolio</b> 40% Large Stock, 25% Small Stock, 25% Bonds, 10% Cash	<b>100%</b>	<b>98.3%</b>	<b>91.4%</b>	<b>87.9%</b>

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# 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 (assuming starting balance of \$250,000 at retirement)
<b>25/75 4-Asset Portfolio</b> 15% Large Stock, 10% Small Stock, 55% Bonds, 20% Cash	<b>7.59</b>	<b>93.1</b>	<b>1,145,850</b>
<b>60% Stock/40% Bond Portfolio</b>	<b>9.37</b>	<b>96.6</b>	<b>2,561,348</b>
<b>50/50 4-Asset Portfolio</b> 25% Large Stock, 25% Small Stock, 25% Bonds, 25% Cash	<b>9.44</b>	<b>98.3</b>	<b>2,730,830</b>
<b>65/35 4-Asset Portfolio</b> 40% Large Stock, 25% Small Stock, 25% Bonds, 10% Cash	<b>10.37</b>	<b>98.3</b>	<b>4,039,937</b>

# 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*<sup>®</sup> Portfolio

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