## **Building and Managing a Diversified Portfolio**

#### Craig L. Israelsen, Ph.D. Designer of the *7Twelve*® Portfolio

Presentation AAII Silicon Valley Chapter April 14, 2018

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

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

For 48 years you invested money into	In Jan 2018 your account balance was (you saved 10% of your income each year)
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	

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7-Asset Diversified Portfolio of Stock, Bonds, Cash, Real Estate, Commodities	\$4,018,504

# 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



## **Two-Asset Diversification**

#### 60/40 Portfolio



## **Diversified Portfolio**

#### 7-Asset Portfolio



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#### 7 Asset Classes – Equally Weighted – Rebalanced Annually



## 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)

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
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)

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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Fewer and smaller losses

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#### **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.

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



#### 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



## 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 (you saved 10% of your income each year)			
	No portfolio cost			
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			

## The impact of annual portfolio costs:

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

## The impact of annual portfolio costs:

For 48 years you invested money into	In Jan 2018 your account balance was (you saved 10% of your income each year)				
	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	\$ <b>3,388,114</b> Over \$526.00	\$2,861,645		
Estate, commodities		100 bps compared to 50 bps			

Combinations of fund expenses and advisory fee	<b>Total Portfolio Cost</b> (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>	\$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	<b>150 bps</b>	\$133,927	\$800
Total fund expenses of 10 bps Advisory Fee of 90 bps	100 bps	\$144,361	\$1,670

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Total fund expenses of 50 bps Advisory Fee of 100 bps	<b>150 bps</b>	\$133,927	\$800
Total fund expenses of 10 bps Advisory Fee of 90 bps	<b>100 bps</b>	\$144,361	\$1,670
Total Fund expenses of 10 bps Advisory fee of 40 bps	50 bps	\$155,695	\$2,614

## Moving from 7 assets to *Twelve* assets

## **Good Diversification**

#### 7-Asset Portfolio



## **Superior Diversification**

#### 12-Asset Portfolio



## 7Twelve<sup>®</sup>



## 7Twelve<sup>®</sup>

#### **Equally-weighted exposure to 12 asset classes**



## 20-Year Growth of \$10,000

1998-2017

[------Using Indexes------] \$42,000 **Index-Based** \$40,000 7Twelve, \$41,201 **US Large Cap** \$38,000 Stock (VFINX) \$39,372 7-Asset \$36,000 Portfolio, 60/40 \$37,161 **Portfolio** (VBINX) \$34,000 \$36,602 \$32,000 11.1 11.9 17.9 10.6 \$30,000

**20-Year Standard Deviation**
### 20-Year Growth of \$10,000

1998-2017



**20-Year Standard Deviation** 

#### 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	Commod- ities	US Bonds	TIPS	Non-US Bonds	Cash	<b>7Twelve Portfolio</b> 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%



Investment Approach	15-Year Annualized Performance (2003-2017)	
HARE: Performance Chasing by Investing 100% in Last Year's BEST ETF	4.59	
HARE II: Performance Chasing by Investing 100% in Last Year's WORST ETF		
<b>TORTOISE</b> : Invest in the equally weighted 12-asset 7Twelve ETF model		



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TORTOISE: Invest in the equally weighted 12-asset 7Twelve ETF model	8.38	



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
<b>TORTOISE</b> : 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 <u>Analysis</u>

#### Ending Balance After 20 Years as of Dec 31, 2017

**7Twelve**<sup>®</sup> 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 Allocat	ion Models	20-Year Annualized IRR (%)	Remaining Balance After 20-Years Starting balance of \$250,000 Total Withdrawal of \$335,880
Very Conservative	100% Cash		2.41	9,054
Conservative	50% Cash 50% Bonds		3.72	72,094
Moderate	60% US Stock 40% Bonds		6.07	246,160
Moderate	Diversified ETF- Based 77welve <sup>®</sup> Portfolio		7.25	374,565
Aggressive	100% US Stock		5.60	203,847

#### **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	
Very Conservative	100% Cash		2.41	9,054	18,108	
Conservative	50% Cash 50% Bonds		3.72	72,094	144,188	
Moderate	60% US Stock 40% Bonds		6.07	246,160	492,320	
Moderate	Diversified ETF- Based <i>7Twelve</i> <sup>®</sup> Portfolio		7.25	374,565	749,131	
Aggressive	100% US Stock		5.60	203,847	407,694	

#### **Retirement Portfolio Survival Analysis**

20-Year Period from 1998-2017

Risk Level	Asset Allocat	ion 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 77welve <sup>®</sup> 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**























## Let's explore the Multi-Asset <u>Effective</u> Frontier

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	TIPS Barclays U.S. Treasury US TIPS Index		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)

















						Mid	UIS Stock 10 25%
						Real Esta	te 9 80%
_						Small LIS Stock	0.14%
					Empreira Ch		5.14%
						JCK, 7.33%	
					7Twelve Port	folio, 7.27%	
					Large US Stock, 7	.10%	
					Nat Resources, 6.80	%	
			Non-U	IS Stock, 5.2	24%		
			TIPS, 5.0	0%			
			Non-US B	onds, 4.94%	6		
			US Bonds, 4.5	5%			
		Com	modities 3.48%		20-Year Per	formance: 1998-	-2017
	1		10011103, 314070		Passive ETF 7Twel	ve Portfolio and Indivi	dual ETFs
		Cash, 2.09%					
0.0%	2.0%	4.	0% 6	.0%	8.0%	10.0%	12.0%





#### **Eight Equity and Diversifying Holdings** The **"Engines"** 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

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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<sup>®</sup> 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



## 7Twelve<sup>®</sup>

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



Annualized Return as of December 31, 2017



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

# Low-Cost 7Twelve® Models

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

# Low-Cost 7Twelve® Models

12-Asset Class 7Twelve <sup>®</sup> Portfolio	12 Actively Managed Mutual Funds (Active 7Twelve)	12 ETFs from various fund families (Passive 7Twelve)	12 Vanguard Mutual Funds	12 Vanguard ETFs	<i>12 Fidelity</i> Mutual funds	12 ETFs available at Schwab
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

Research reports available that outline the funds used to build each of these **7Twelve** models

#### 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**<sup>®</sup> Portfolio

Craig L. Israelsen, Ph.D.

Email: <a href="mailto:craig@7TwelvePortfolio.com">craig@7TwelvePortfolio.com</a>

Web: www.7TwelvePortfolio.com