

Dual Momentum Investing

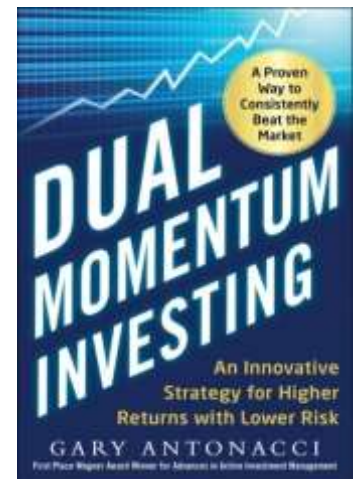
Gary Antonacci

Portfolio Management Consultants



Gary Antonacci

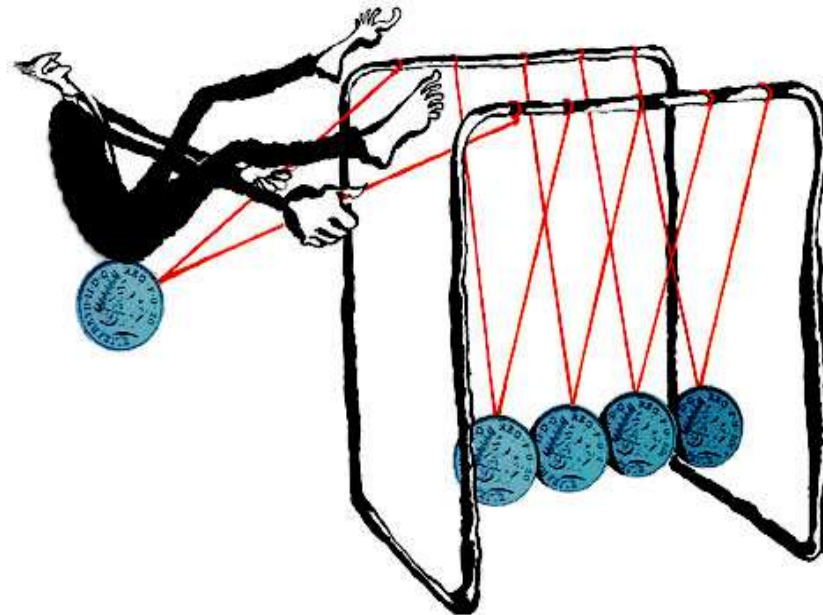
- Over 40 years' experience with underexploited investments
- 2012 first place winner of the NAAIM *Wagner Award*
- Author of *Dual Momentum Investing: An Innovative Approach to Higher Returns with Lower Risk*



Topics for Today

- **What is momentum?**
- **Why does it work?**
- **What are its issues?**
- **How to best use it?**

What is Momentum?



Sir Isaac Newton (1643-1727)

A body in motion tends to stay in motion.



**Isaac Newton's Nightmare
South Sea Stock
December 1718 – December 1721**



Isaac Newton's Nightmare South Sea Stock December 1718 – December 1721



Isaac Newton's Nightmare South Sea Stock December 1718 – December 1721



Isaac Newton's Nightmare South Sea Stock December 1718 – December 1721



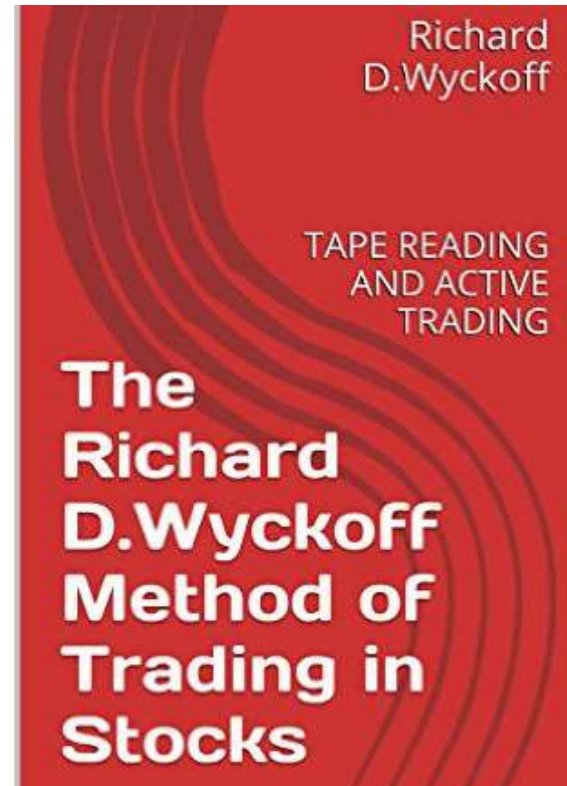
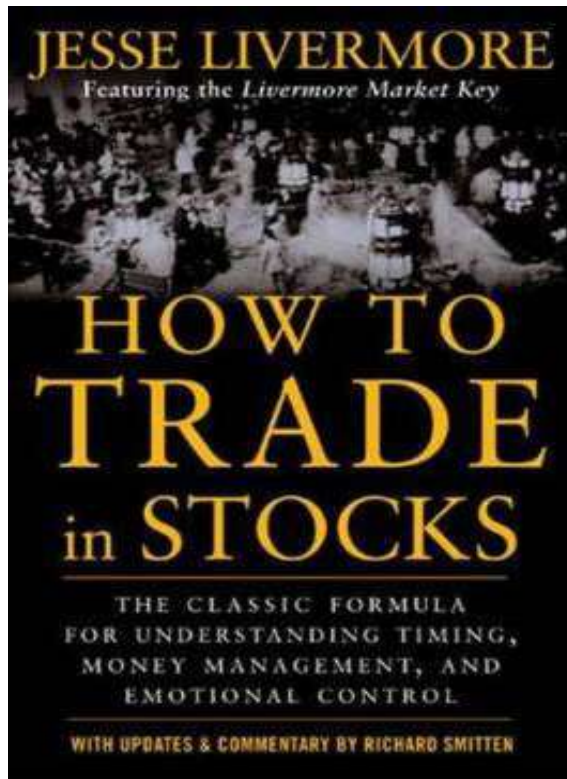
David Ricardo (1772-1823)

**Cut your losses short, and
let your profits run on.**

The Great Metropolis, 1838



Jesse Livermore and Richard Wyckoff



Modern Momentum

Alfred Cowles III & Herbert Jones

***Econometrica*, July 1937**

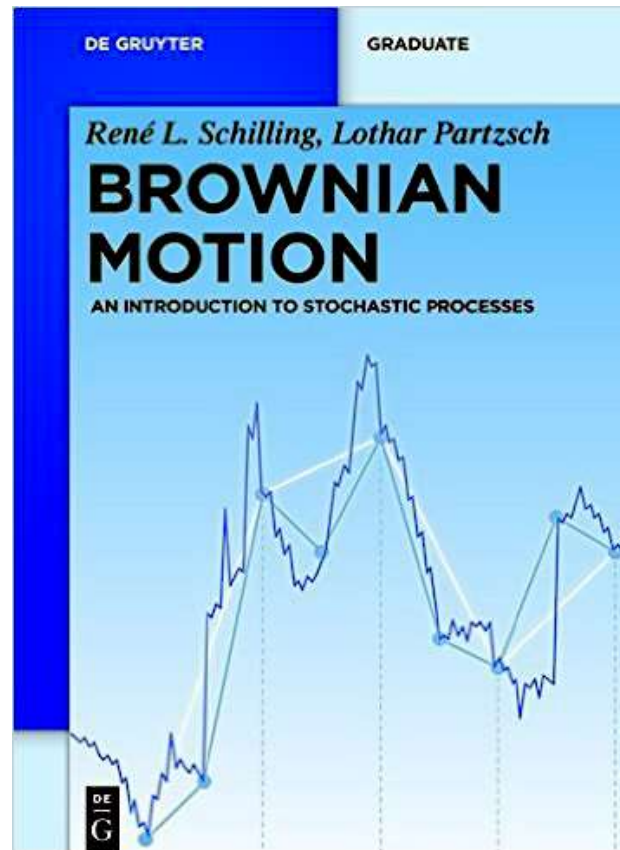
NYSE stocks from 1920-1935



Stocks that have exceeded the median in one year exceed it also in the following year.

- Cowles & Jones

Random Walk Hypothesis



Efficient Market Hypothesis



Academics Begin to See the Light



Behavioral finance - 1979

Behavioral finance - 1979

Mean reversion – 1988, 1990

Behavioral finance - 1979

Mean reversion – 1988, 1990

Value and size factors – 1992

Jegadeesh & Titman

**Seminal 1993 study using 1962 to
1989 US stock data**

Jegadeesh & Titman

Seminal 1993 study using 1962 to 1989 US stock data

Deciles ranked by momentum

Jegadeesh & Titman

Seminal 1993 study using 1962 to 1989 US stock data

Deciles ranked by momentum

3 to 12 month momentum works!

U.S. Stock Momentum

Top and bottom 10%, months 2-12 momentum
Jan 1927-Dec 2014, rebalanced monthly

	Winner	Loser	SP500
CAGR	17.0%	-1.5%	10.0%
Standard Deviation	22.6%	33.9%	19.1%
Downside Deviation	16.7%	22.0%	14.2%
Sharpe Ratio	0.66	-0.02	0.41
Worst Drawdown	-77.0%	-97.0%	-84.6%

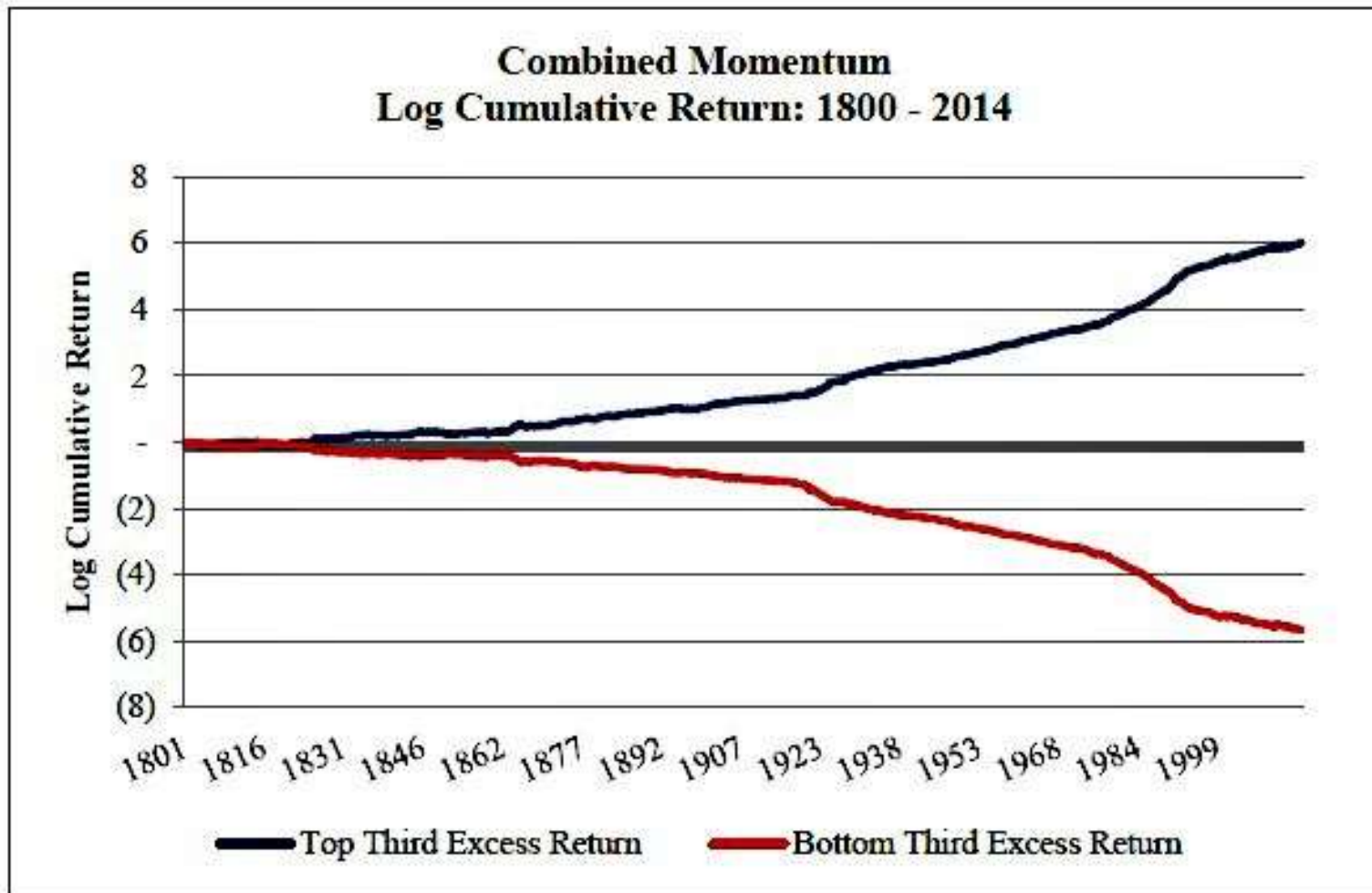
Source: Ken French Data Library and Standard & Poor's. Results are hypothetical, and are NOT an indicator of future results, and do NOT represent returns that any investor actually attained.

**Momentum works well with
stocks, stock indices, sectors,
bonds, commodities, and
currencies from 1800 until now!**

Multi-Asset Class Momentum by Decade

<i>Decade</i>	Equities	Currencies	Bonds	Commodities	Global Sectors	US Stocks	Cross-Asset	Combined
12/31/1810	-4%	-1%	2%	4%	1%	3%	1%	1%
12/31/1820	1%	-8%	-3%	-8%	1%	0%	4%	-1%
12/31/1830	3%	1%	1%	1%	0%	6%	4%	3%
12/31/1840	-1%	-1%	-2%	4%	1%	4%	1%	1%
12/31/1850	-6%	0%	-1%	-3%	-4%	6%	5%	0%
12/31/1860	-2%	-3%	1%	-1%	6%	1%	0%	1%
12/31/1870	-2%	-2%	3%	-3%	8%	7%	7%	3%
12/31/1880	6%	0%	3%	0%	4%	6%	2%	4%
12/31/1890	1%	1%	2%	8%	3%	-3%	3%	2%
12/31/1900	3%	2%	2%	11%	2%	-4%	2%	3%
12/31/1910	2%	2%	0%	12%	3%	1%	2%	3%
12/31/1920	6%	14%	-4%	10%	3%	-2%	12%	6%
12/31/1930	12%	24%	7%	9%	7%	15%	3%	12%
12/31/1940	0%	1%	3%	15%	3%	0%	6%	5%
12/31/1950	5%	14%	1%	5%	2%	6%	8%	6%
12/31/1960	18%	2%	2%	4%	8%	11%	6%	7%
12/31/1970	9%	8%	0%	8%	7%	10%	5%	7%
12/31/1980	40%	18%	0%	-7%	7%	15%	13%	12%
12/31/1990	70%	51%	2%	7%	8%	11%	20%	23%
12/31/2000	26%	16%	0%	4%	5%	13%	2%	10%
12/31/2010	11%	1%	1%	11%	6%	4%	8%	6%

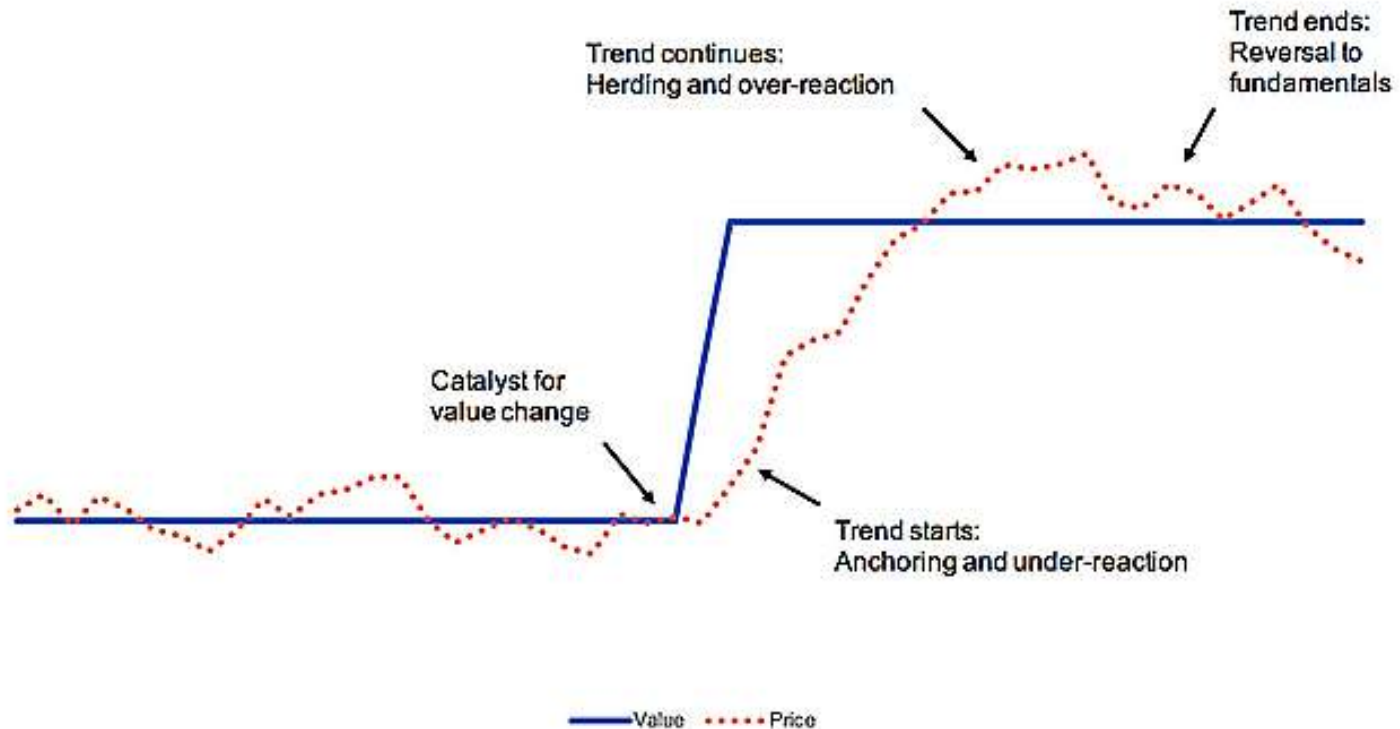
Source: Geczy and Samonov (2015), "215 years of Global Multi-Asset Momentum: 1800-2014"



Source: Geczy and Samonov (2015), "215 years of Global Multi-Asset Momentum: 1800-2014"

WHY MOMENTUM WORKS

Underreaction and Overreaction



Initial Underreaction

Anchoring/Conservatism

Initial Underreaction

Anchoring/Conservatism

Slow diffusion of information

Initial Underreaction

Anchoring/Conservatism

Slow diffusion of information

Disposition effect

Later Overreaction

Herding

Later Overreaction

Herding

Recency bias

Later Overreaction

Herding

Recency bias

Overconfidence

Systematic Momentum

- **High and consistent returns**
- **Has persisted over time**
- **Works with all assets**
- **Good reasons for it**

Fama & French

The premier market anomaly
is momentum.



“Dissecting Anomalies”
Journal of Finance, July 2008

Want To Do Stock Momentum?



Stock momentum is
persistent, pervasive,
robust, and intuitive...

but is it *investable*?

Scalability

	50 Stock Portfolio	100 Stock Portfolio	150 Stock Portfolio	200 Stock Portfolio	250 Stock Portfolio	300 Stock Portfolio	500 Stock Universe
1 month hold	17.0%	14.4%	13.6%	12.7%	12.1%	11.5%	9.8%
2 month hold	16.1%	14.2%	13.2%	12.6%	12.0%	11.4%	9.8%
3 month hold	15.2%	13.8%	12.9%	12.3%	11.7%	11.2%	9.8%
4 month hold	14.5%	13.5%	12.8%	12.1%	11.6%	11.2%	9.8%
5 month hold	14.4%	13.3%	12.6%	12.0%	11.6%	11.2%	9.8%
6 month hold	13.9%	13.1%	12.4%	11.9%	11.5%	11.1%	9.8%
7 month hold	13.7%	12.8%	12.1%	11.7%	11.3%	11.0%	9.8%
8 month hold	13.4%	12.6%	11.9%	11.5%	11.2%	10.9%	9.8%
9 month hold	12.9%	12.2%	11.6%	11.2%	11.0%	10.8%	9.8%
10 month hold	12.6%	11.9%	11.4%	11.0%	10.9%	10.7%	9.8%
11 month hold	12.2%	11.6%	11.1%	10.8%	10.7%	10.5%	9.8%
12 month hold	11.8%	11.3%	10.8%	10.6%	10.5%	10.4%	9.8%

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“... the abnormal returns associated with these trading strategies creates an illusion of profit opportunities when, in fact, none exists.”

-Lesmond, Schill & Zhou (2002)

“The Illusionary Nature of Momentum Profits”

“... the abnormal returns associated with these trading strategies creates an illusion of profit opportunities when, in fact, none exists.”

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“The Illusionary Nature of Momentum Profits”

“... as much as \$5 billion...may be invested in some momentum-based strategies before the opportunity profit vanishes.”

-Korajczyk & Sadka (2004)

“Are Momentum Profits Robust to Trading Costs?”

Table 7. Anomaly strategy capacities

The table reports the amount of new capital each strategy could attract before the latest executing trader finds the strategies unprofitable. Net Sharpe ratios (SR) are estimated over the entire sample (starting July 1963 or July 1973, as per Table 2), and calculated accounting for effective spreads. Sharpe ratio reductions from new capital are calculated over the period January 1993 to December 2012, dates determined by the availability of the TAQ data used to estimate the stock-level price impact parameters. Maximal capacities are listed for the end of the sample, December 2012, and are one-sided (i.e., are the capacities of each the long and short sides).

Anomaly	10/50 strategies, NYSE breaks			30/50 strategies, capitalization breaks		
	Net SR, first \$1	Δ SR/\$B ($\times 100$)	Capacity, \$B	Net SR, first \$1	Δ SR/\$B ($\times 100$)	Capacity, \$B
Panel A: Low Turnover Strategies						
Size	0.22	-1.11	20.1	0.20	-0.12	169.2
Gross Profitability	0.19	-0.15	131.0	0.21	-0.17	124.7
Value	0.37	-1.78	20.7	0.20	-0.40	50.6
ValProf	0.69	-1.89	36.3	0.66	-1.19	55.3
Accruals	0.25	-3.94	6.46	0.20	-1.88	10.5
Asset Growth	0.34	-6.03	5.61	0.18	-2.36	7.60
Investment	0.35	-4.72	7.38	0.12	-2.59	4.50
Piotroski's F-score	0.08	-12.0	0.70	0.26	-6.11	4.20
Panel B: Mid Turnover Strategies						
Net Issuance	0.40	-3.87	10.3	0.17	-3.20	5.44
Return-on-book equity	0.33	-7.23	4.50	0.30	-4.06	7.41
Failure Probability	0.13	-3.04	4.12	0.12	-2.73	4.53
ValMomProf	0.76	-6.24	12.1	0.53	-4.24	12.6
ValMom	0.51	-5.49	9.35	0.38	-3.83	10.0
Idiosyncratic Volatility	0.03	-2.05	1.51	< 0		
Momentum	0.48	-9.36	5.16	0.31	-5.34	5.81
PEAD (SUE)	0.40	-19.9	2.00	0.39	-13.1	2.95

Source: Novy-Marx and Velikov (2015), "A Taxonomy of Anomalies and their Trading Costs"

Table 8. Factors' Added Value and Sharpe Ratios before and after Trading Costs

Factor/Definition	\$10 Billion Large-Cap Portfolio		\$1 Billion Small-Cap Portfolio	
	Added Value vs. Market before Transaction Costs	Added Value vs. Market after Transaction Costs	Added Value vs. Market before Transaction Costs	Added Value vs. Market after Transaction Costs
<i>Factor's added value before and after trading costs</i>				
Market-cap weight	0.0%	0.0%	0.0%	-0.1%
<i>Value</i>				
Book to price	2.8%	1.8%	3.9%	1.7%
Earnings to price	3.0	1.6	3.3	0.6
Cash flow to price	2.6	1.7	4.3	1.7
Dividends to price	2.3	1.9	2.7	1.3
Average	2.7%	1.7%	3.6%	1.3%
<i>Momentum</i>				
-2 to -12 Months	2.7%	-3.4%	5.2%	0.4%
-2 to -12 Months, 3-month hold	2.0	-1.6	3.7	0.7
-2 to -12 Months, 1-year hold	0.8	-1.0	2.0	0.6
-2 to -6 Months	0.0	-9.7	2.7	-5.2
-1 to -12 Months	2.1	-3.5	3.8	-0.6
Average	1.5%	-3.8%	3.5%	-0.8%

Source: Beck, Hsu, Kalesnik & Kostka (2016), "Will Your Factor Deliver? An Examination of Factor Robustness and Implementation Costs?"

Oldest Momentum Funds



PowerShares DWA Momentum



AQR Large Cap Momentum

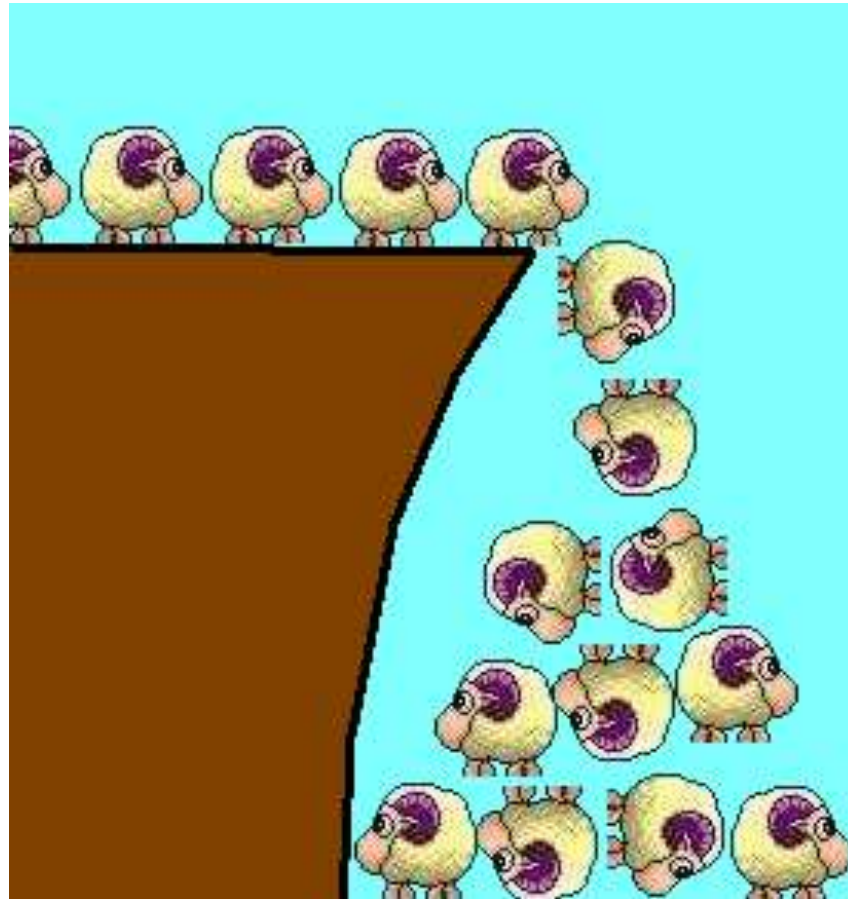


Stock Momentum Fund Performance

Annual Returns from Inception to Jan 2017

PowerShares DWA Momentum	6.3%
Russell 3000 Growth Index	8.4%
Difference	-2.1%
AQR Large Cap Momentum	14.3%
Russell 1000 Growth Index	15.8%
Difference	-1.5%

Want To Do Stock Momentum?

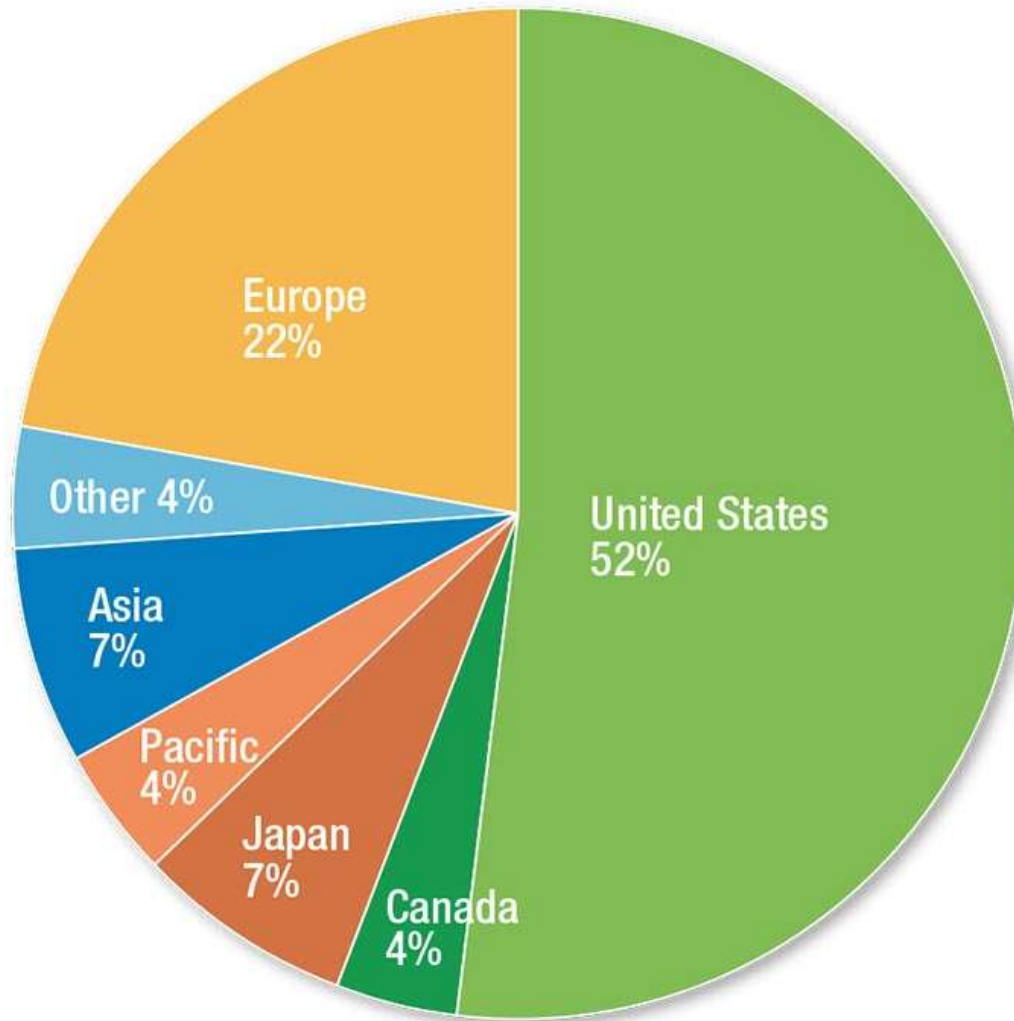


So What To Do?





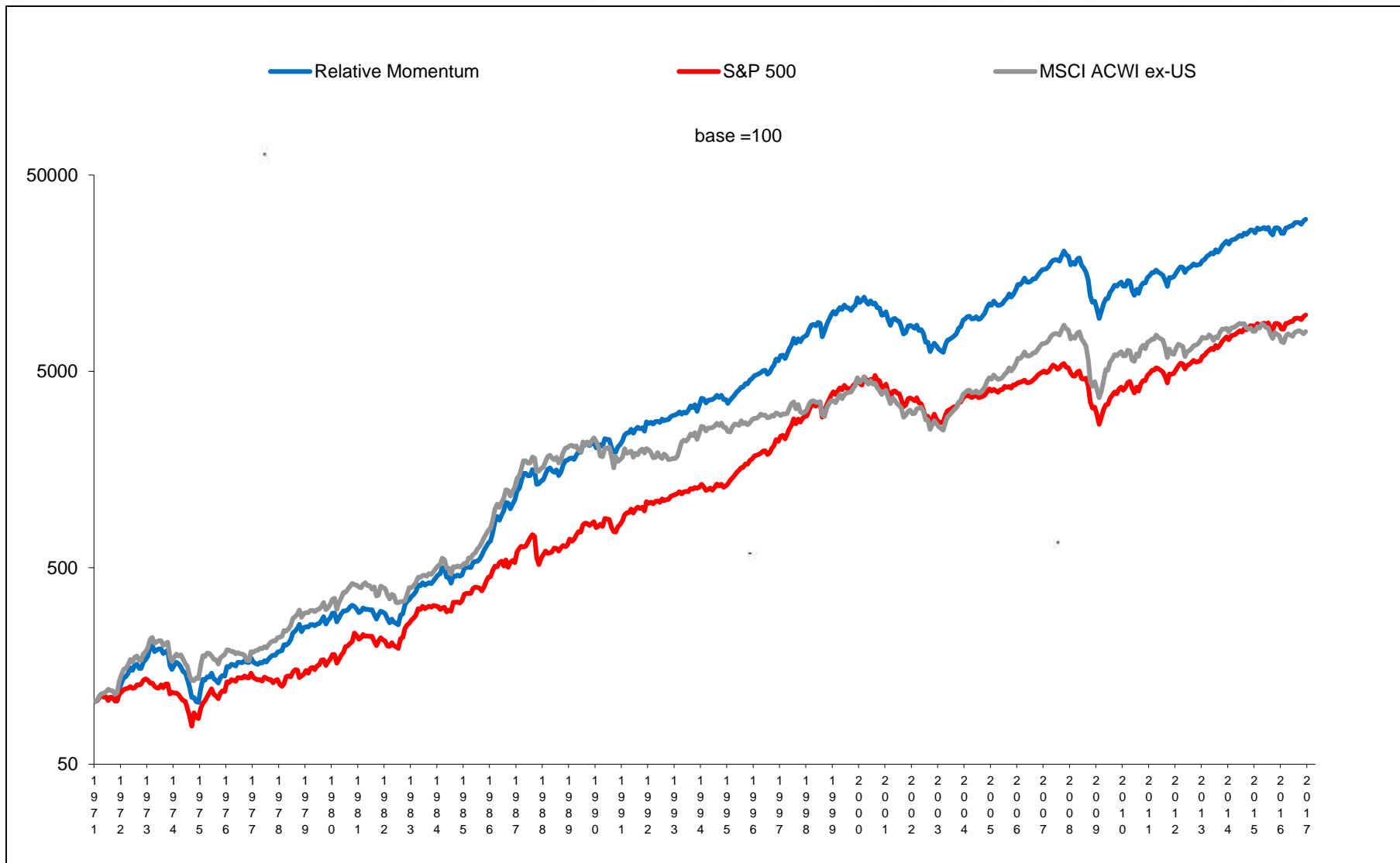
World Stock Market Capitalization



Relative Momentum

Switch between the S&P 500 and the MSCI All Country World Index (ACWI) ex-US

Monthly rebalancing, 12-month look back



Vertical Diversification

S&P 500

55% always



MSCI ACWI ex-US

45% always

Horizontal Diversification

S&P 500

MSCI ACWI ex-US



55% of the time

45% of the time

Global Macro Strategy

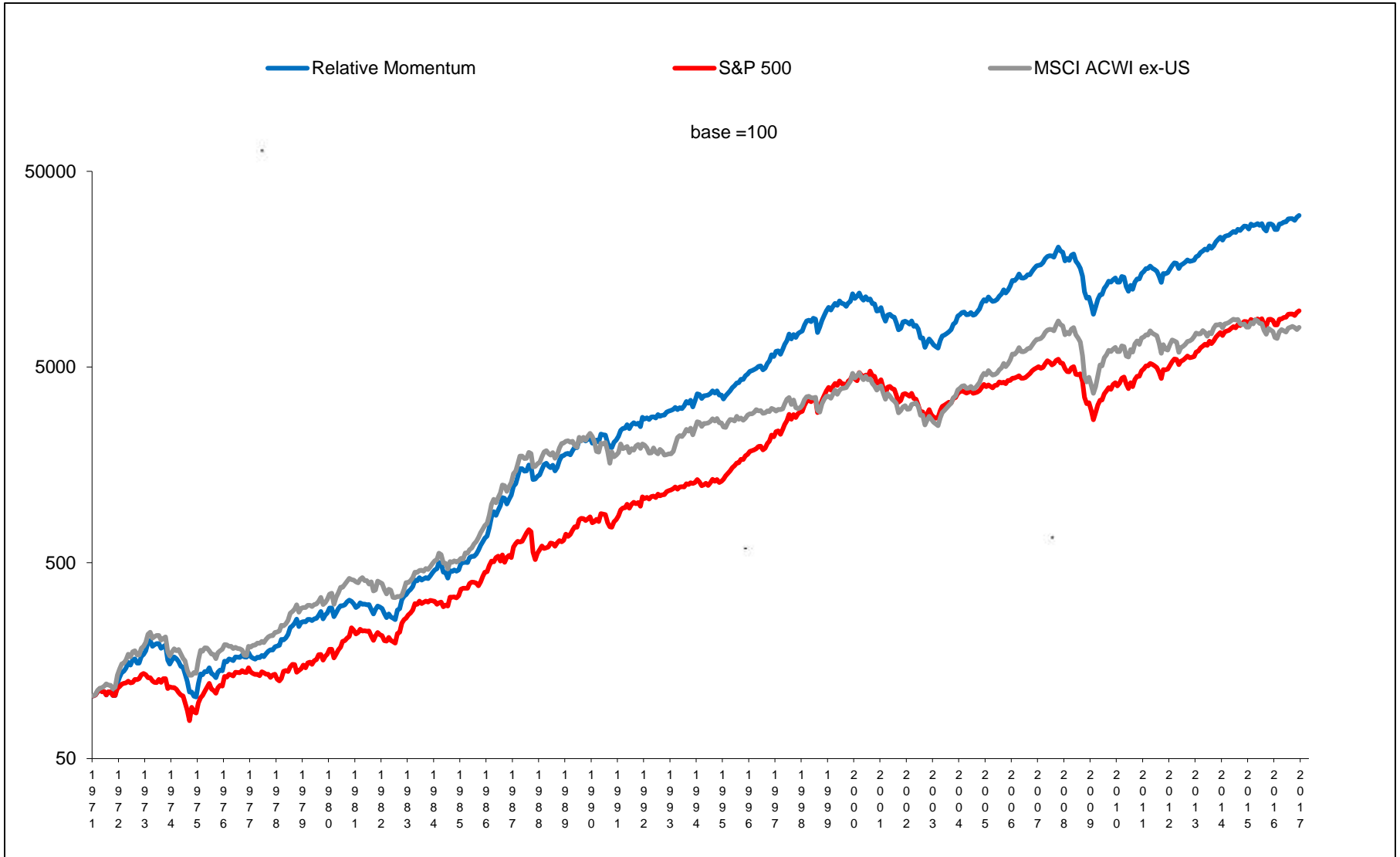


Global Macro Strategy

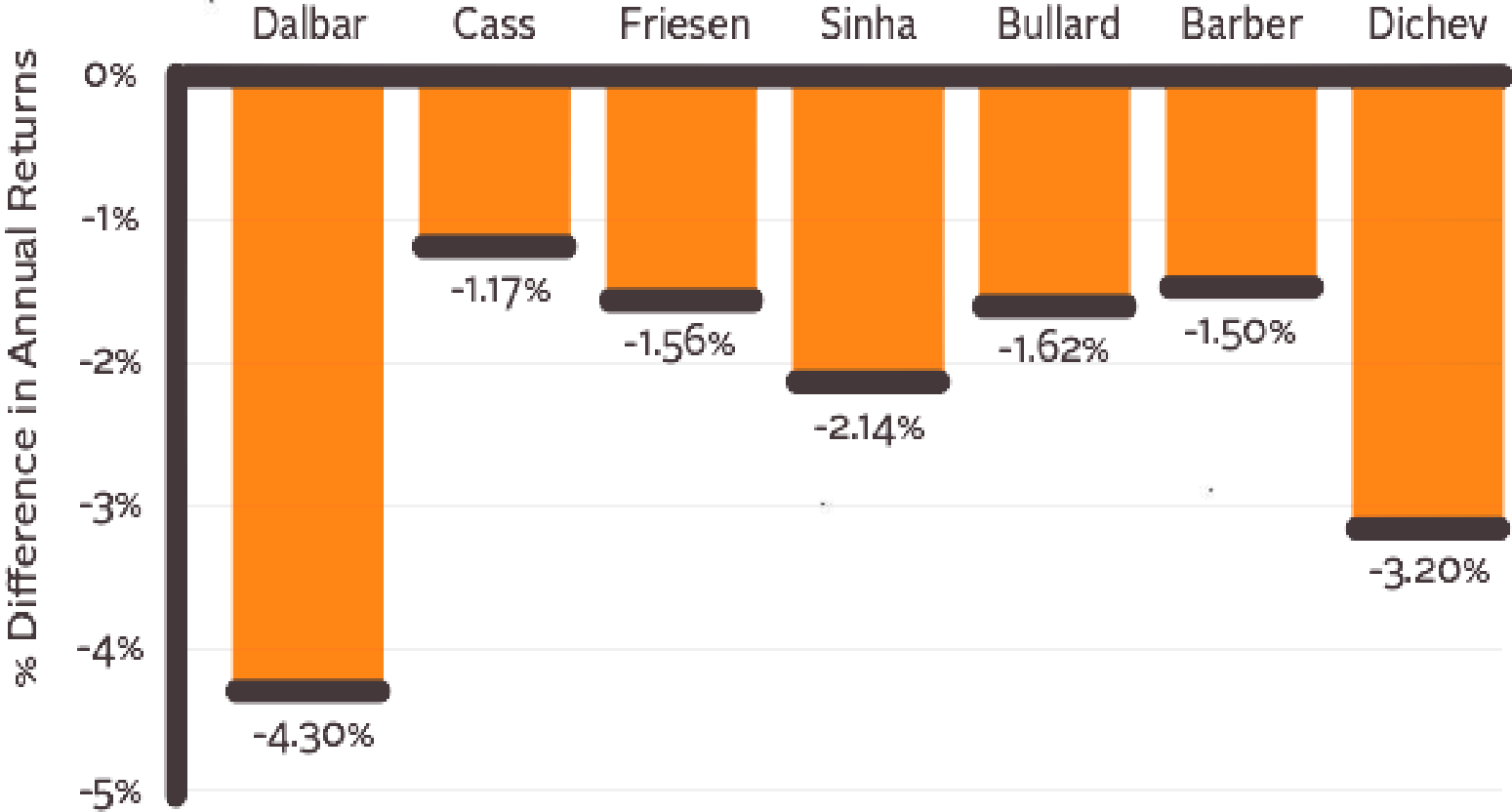
Major USD Cycles	Approximate USD % Gain/Loss	Wilshire 5000 TR*	MSCI World ex-USA GR*
10/31/1978 - 02/28/1985	52%	17.88%	8.87%
02/28/1985 - 12/31/1987	-38%	13.28%	48.45%
02/28/1991 - 06/30/2001	25%	14.34%	5.44%
06/30/2001 - 04/30/2008	-36%	4.69%	7.75%
04/30/2008 - 01/31/2016	32%	8.27%	0.55%

*annualized

Sources: FRED; Morningstar



Behavioral Gaps



Investor Performance Over Time



Source: Dalbar, Inc, "Quantitative Analysis of Investor Behavior"

We don't have people
with investment
problems. We have
investments with
people problems.

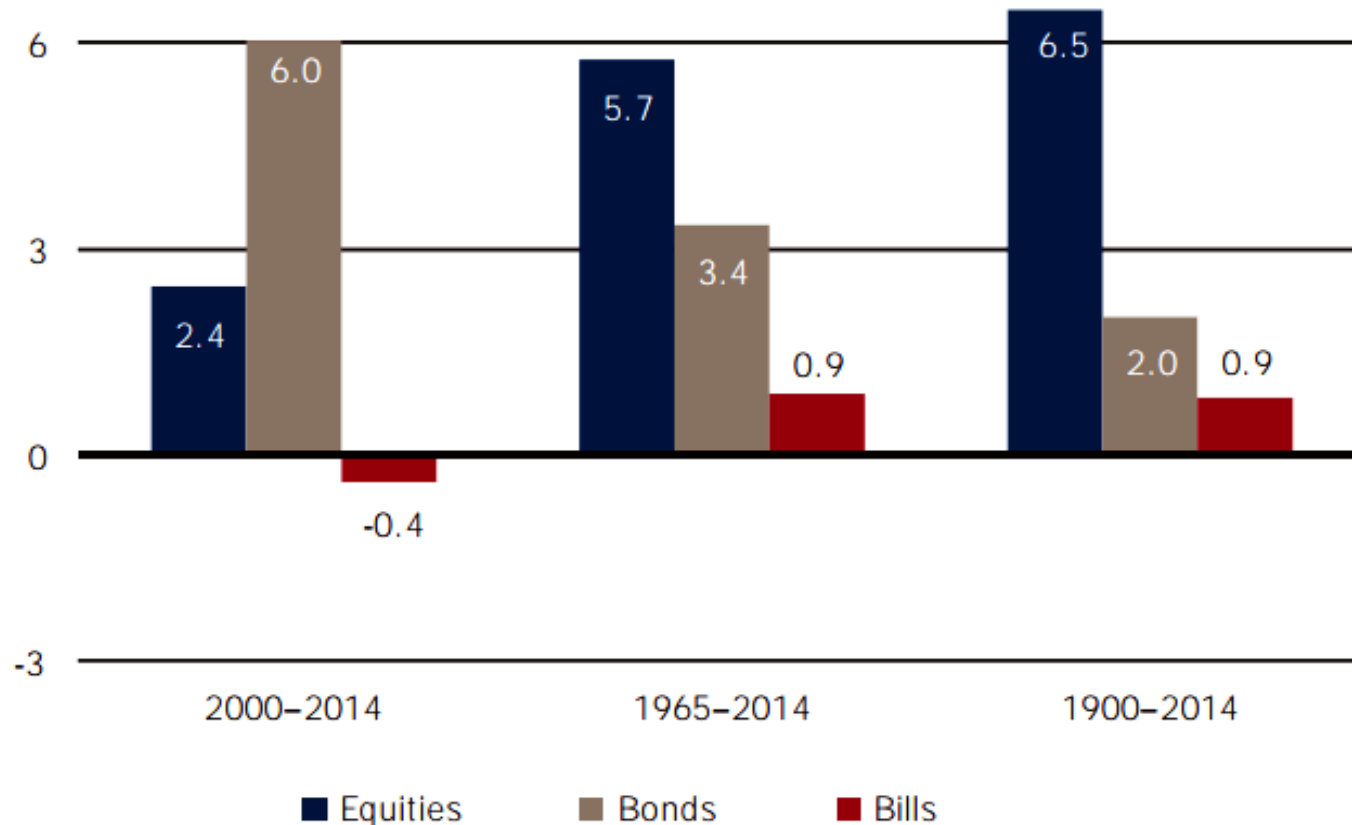
-Gregg Fisher



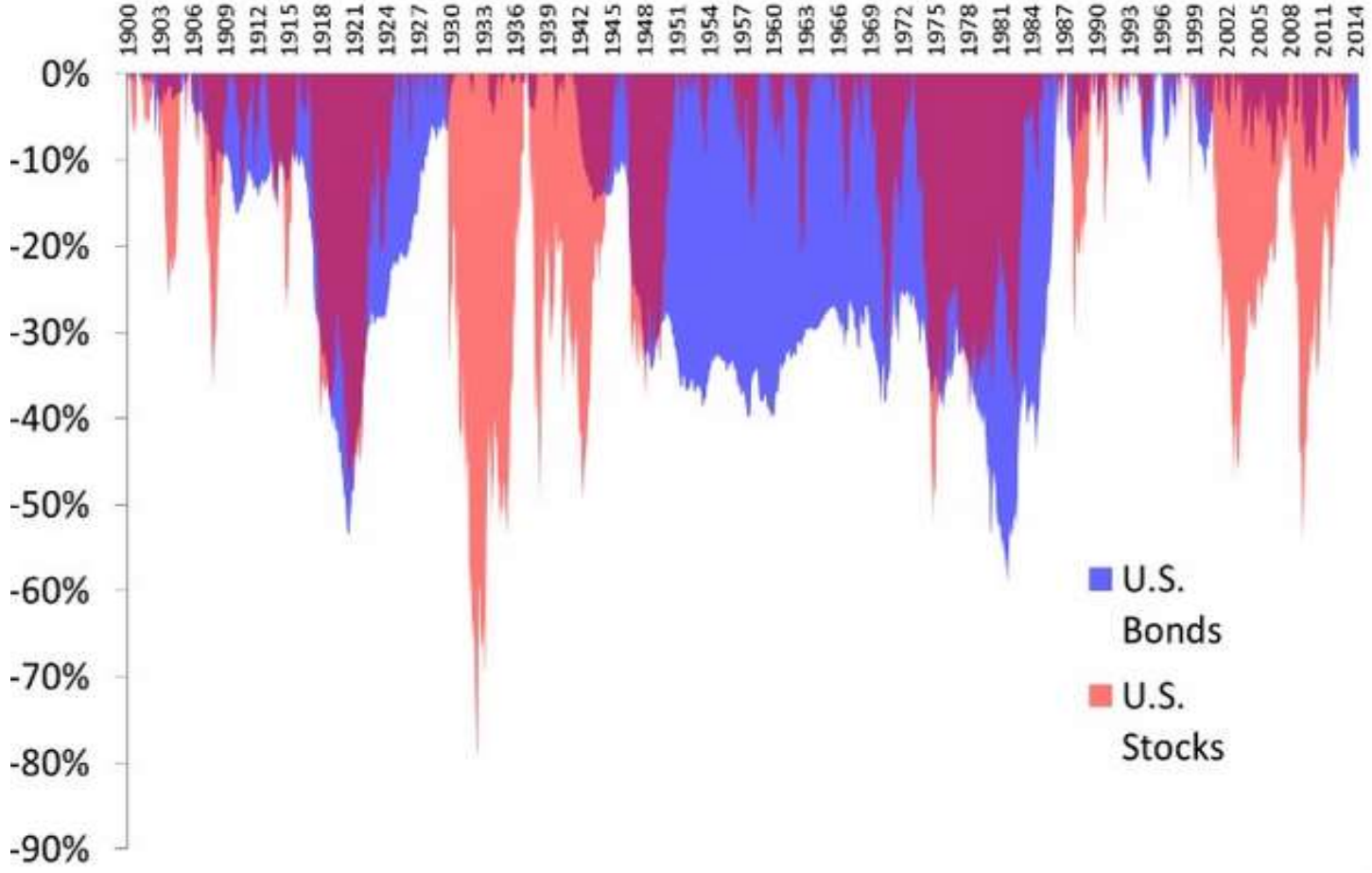
Bonds



Annualized real returns on major asset classes (%)



Stock and Bond Risks



Source: *Credit Suisse Global Investment Returns Yearbook 2015*

Two Types of Momentum

- **Relative (cross-sectional)**
 - compare performance to our peers
- **Absolute (time-series)**
 - compare performance to our self

Absolute Momentum

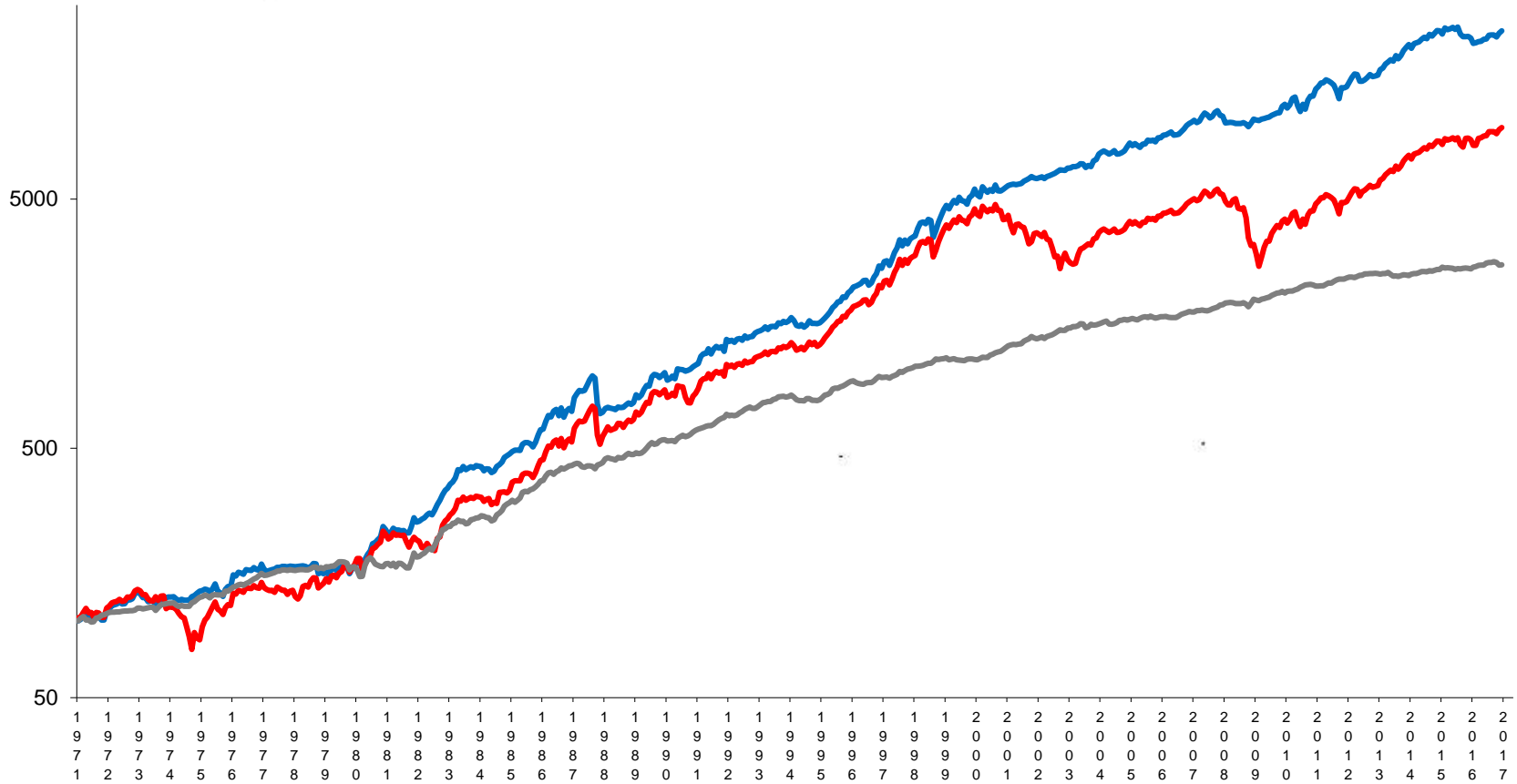
- **Switch between the S&P 500 and the Barclays US Aggregate Bond index**
- **Monthly rebalancing, 12-month look back**

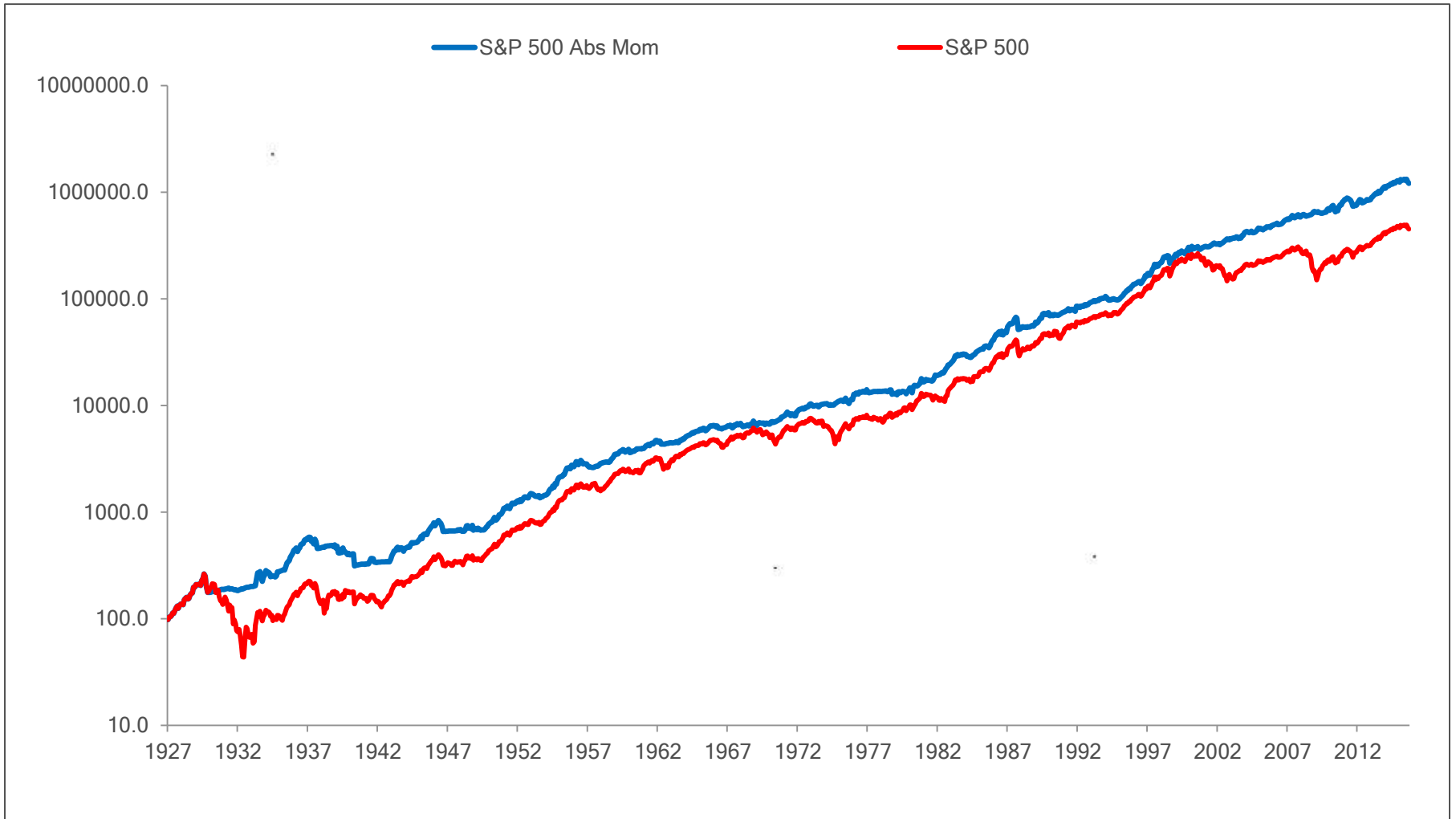
— S&P 500 Absolute Momentum

— S&P 500

— Aggregate Bonds

base = 100





Data is from Standard and Poor's and Ibbotson Associates. Results are hypothetical, and are NOT an indicator of future results, and do NOT represent returns that any investor actually attained.

Worst S&P 500 Drawdowns

January 1929 – December 2016

Date	S&P 500	S&P 500 Abs Mom
Jul 2007-Feb 2009	-50.9%	+5.0%
Apr 2000-Sep 2002	-43.8%	+17.4%
Jan 1973-Sep 1974	-41.8%	+2.0%
Mar 1937-Mar 1938	-50.0%	-20.4%
Sep 1929-Jun 1932	-83.4%	-27.2%

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S&P 500 Trend Up versus Trend Down

Jan 1927-Dec 2016	All Months	Trend Up	Trend Down
Average Annual Return	12.0%	14.2%	7.7%
Standard Deviation	18.8%	14.8%	24.9%
% of Months	100%	66%	34%

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Momentum Since 1223, Really!

TABLE 1.1 Performance statistics for buy-and-hold and trend following portfolios from 1223 to 2013.

	Buy-and-Hold Portfolio	Trend Following Portfolio
Average Return (annual)	4.8%	13.0%
Standard Deviation (annual)	10.3%	11.2%
Sharpe Ratio	0.47	1.16

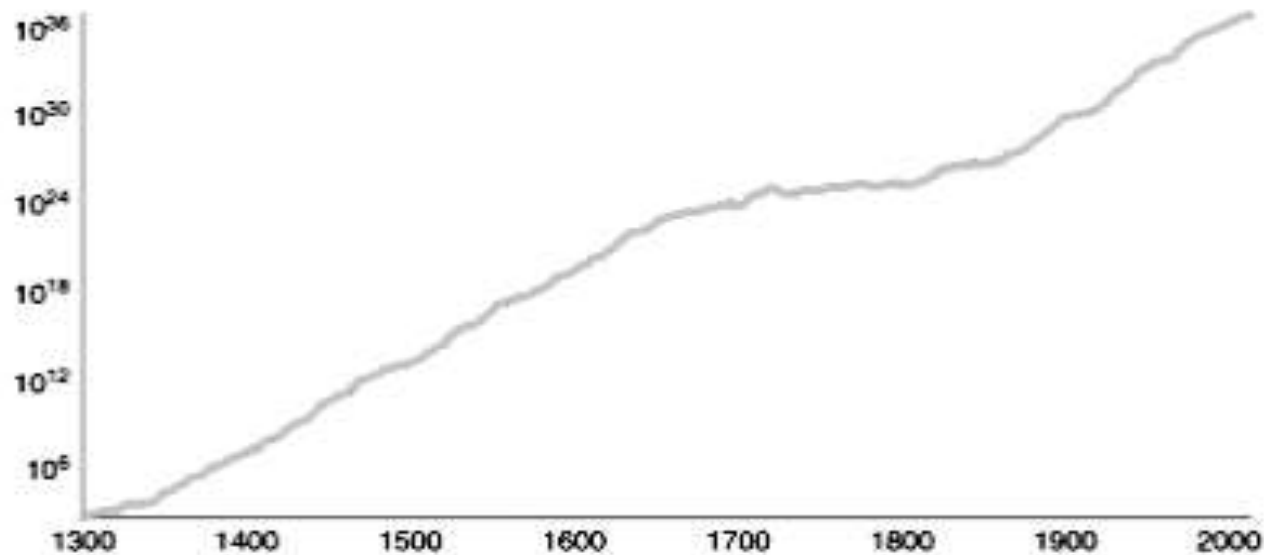


FIGURE 1.4 Cumulative (log) performance of the representative trend following portfolio from 1300 to 2013.

Absolute Momentum and Moving Averages

Zakamulin study on 155 years of S&P data:

- **Absolute Momentum (MOM)**
- **Simple Moving Average (SMA)**
- **Reverse Exponential Moving Average (REMA)**
- **Double EMA Crossover Method (DCM)**

Absolute Momentum and Moving Averages

CONCLUSIONS:

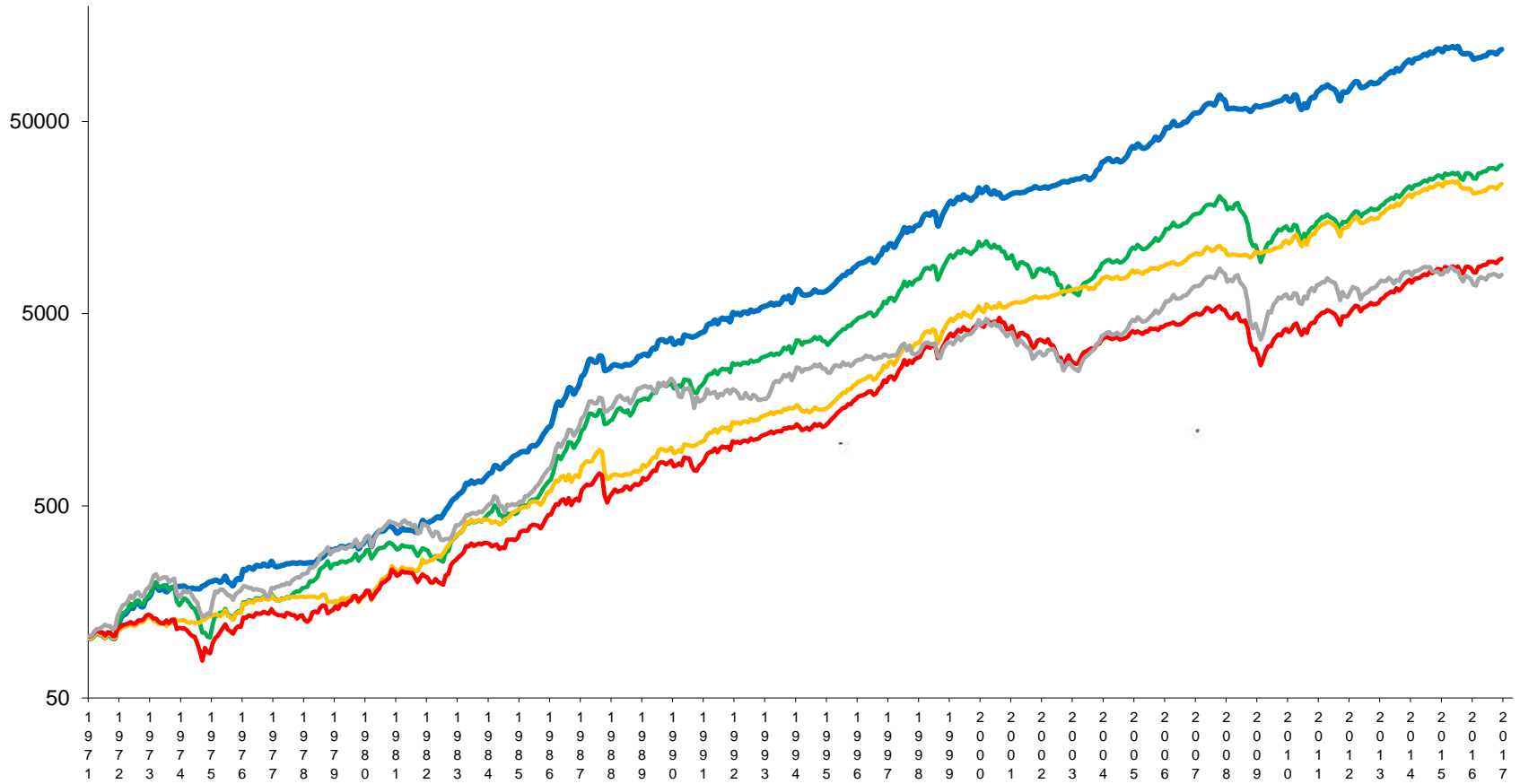
- **Best performing method: MOM**
- **Worst performing method: DCM**
- **Only MOM & REMA are statistically significant**

Dual Momentum

- **Absolute momentum switches between stocks and bonds**
- **Relative momentum switches between the S&P 500 and the ACWI ex-US**
- **Monthly rebalancing, 12-month look back**

Dual Momentum Relative Momentum Absolute Momentum S&P 500 MSCI ACWI ex-US

base =100



Dual Momentum

Jan 1971 - Dec 2016	CAGR	Standard Deviation	Sharpe Ratio	Worst Drawdown
Dual Momentum	17.0%	12.5%	0.92	-17.8%
Absolute Momentum	12.9%	11.9%	0.66	-29.6%
Relative Momentum	13.5%	15.9%	0.56	-54.6%
S&P 500 Index	10.7%	15.1%	0.42	-51.0%
MSCI ACWI ex-U.S.	10.2%	17.2%	0.37	-57.4%

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Bull Markets

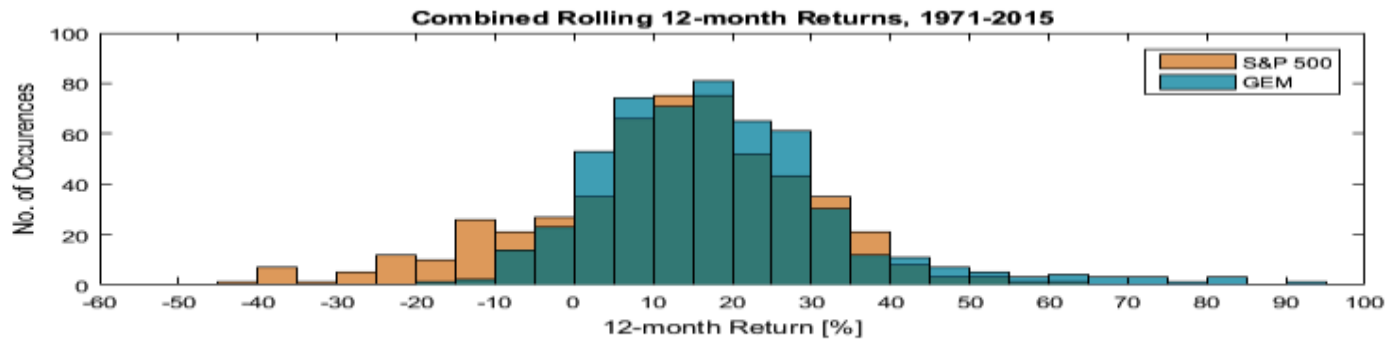
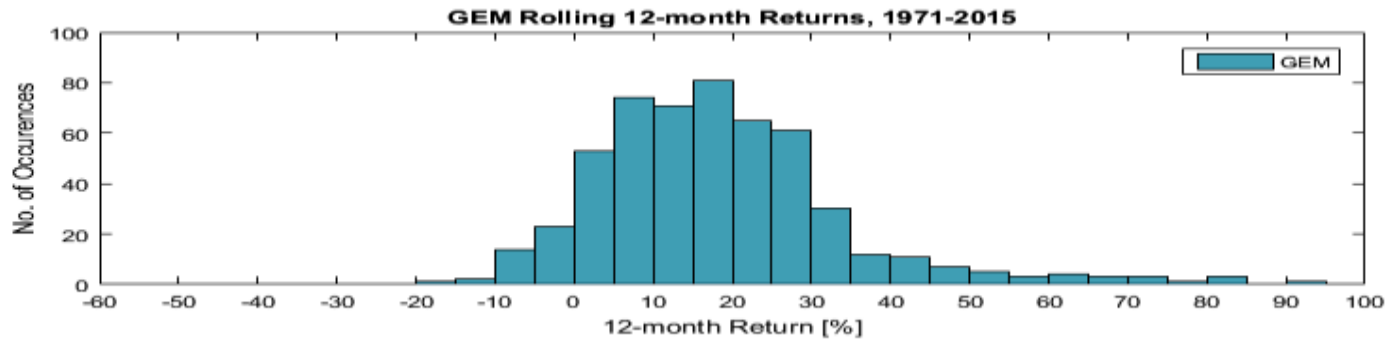
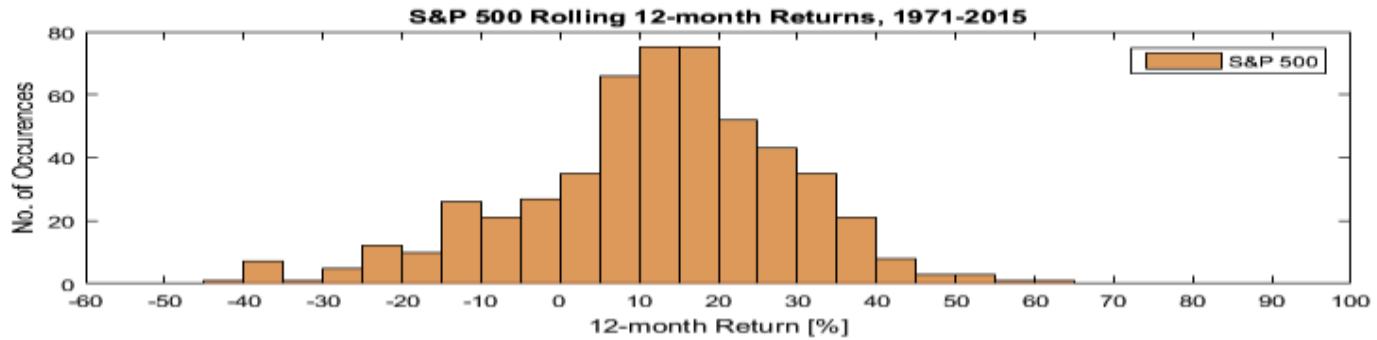
Bull Markets	S&P 500	Abs Mom	Dual Mom
Jan 71-Dec 72	36.0%	32.6%	65.6%
Oct 74-Nov 80	198.3%	91.6%	103.3%
Aug 82-Aug 87	279.7%	246.3%	569.2%
Dec 87-Aug 00	816.6%	728.4%	730.5%
Oct 02-Oct 07	108.3%	72.4%	181.6%
Mar 09-Jul15	227.7%	136.8%	106.4%
Average	277.7%	218.1%	292.7%

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Bear Markets

Bear Markets	S&P 500	Rel Mom	Dual Mom
Jan 73-Sep 74	-42.6%	-35.6%	15.1%
Dec 80-Jul 82	-16.5%	-16.9%	16.0%
Sep 87-Nov 87	-29.6%	-15.1%	-15.1%
Sep 00-Sep 02	-44.7%	-43.4%	14.9%
Nov 07-Feb 09	-50.9%	-54.6%	-13.1%
Average	-36.9%	-33.1%	3.6%

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Advantages of Dual Momentum

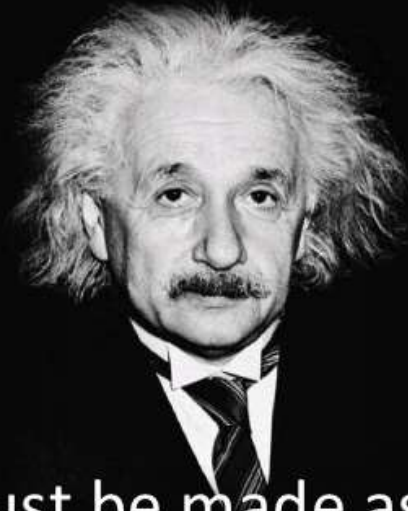
- **Extensively Researched**
- **High Expected Returns**
- **High Scalability**
- **Low Trading Costs**
- **Low Drawdowns**

Why Isn't Everyone Doing It?



Too Simple





Things must be made as simple as possible – but never simpler

Counter Intuitive



Other Behavioral Biases

- **Familiarity Bias**
- **Anchoring/Conservatism**
- **Slow diffusion of information**
- **Preference for stocks not indices**

WHY WE NEED TO OVERCOME

Investment Allocations

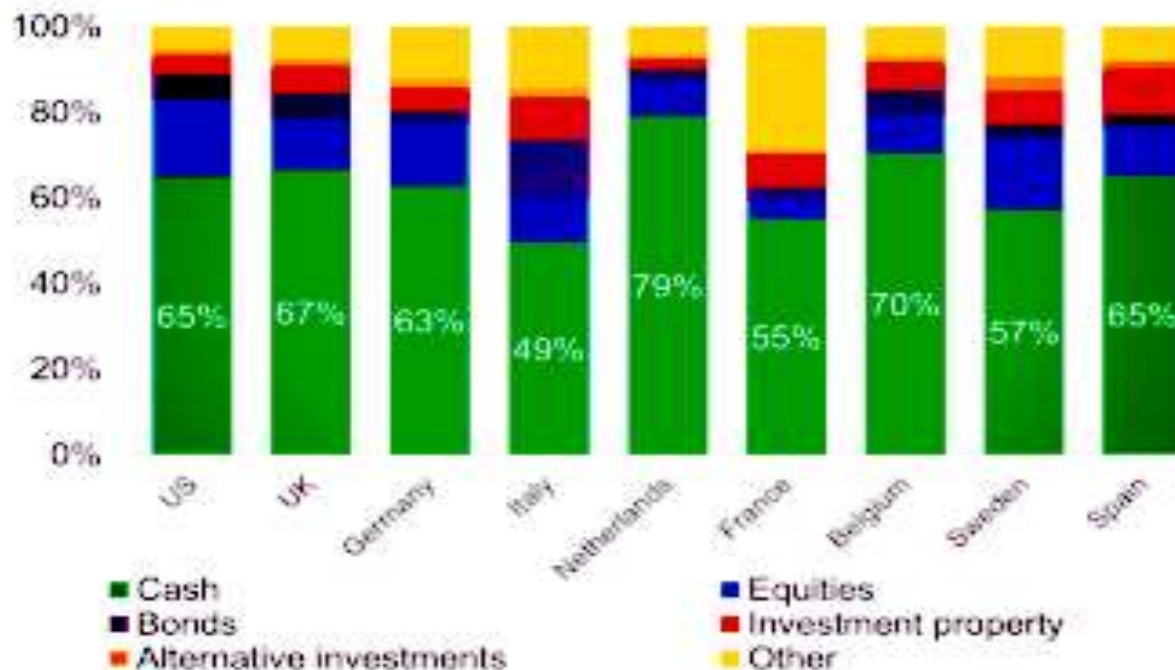
	MILLENNIALS	GENERATION X	BABY BOOMERS	SILENT GENERATION
Cash	70%	68%	60%	53%
Equities	14	17	20	22
Bonds	7	5	5	9
Real estate	4	3	3	4
Alternatives	2	1	1	1
Other	1	3	8	8

Note: Silent generation, boomer and Gen X respondents with at least \$100,000 in household assets and millennial respondents with at least \$50,000 in household assets.

Source: BlackRock Global Investor Pulse

Investment Allocations

Exhibit 1: AVERAGE ASSET ALLOCATIONS AS A PERCENTAGE OF TOTAL SAVINGS AND INVESTMENTS



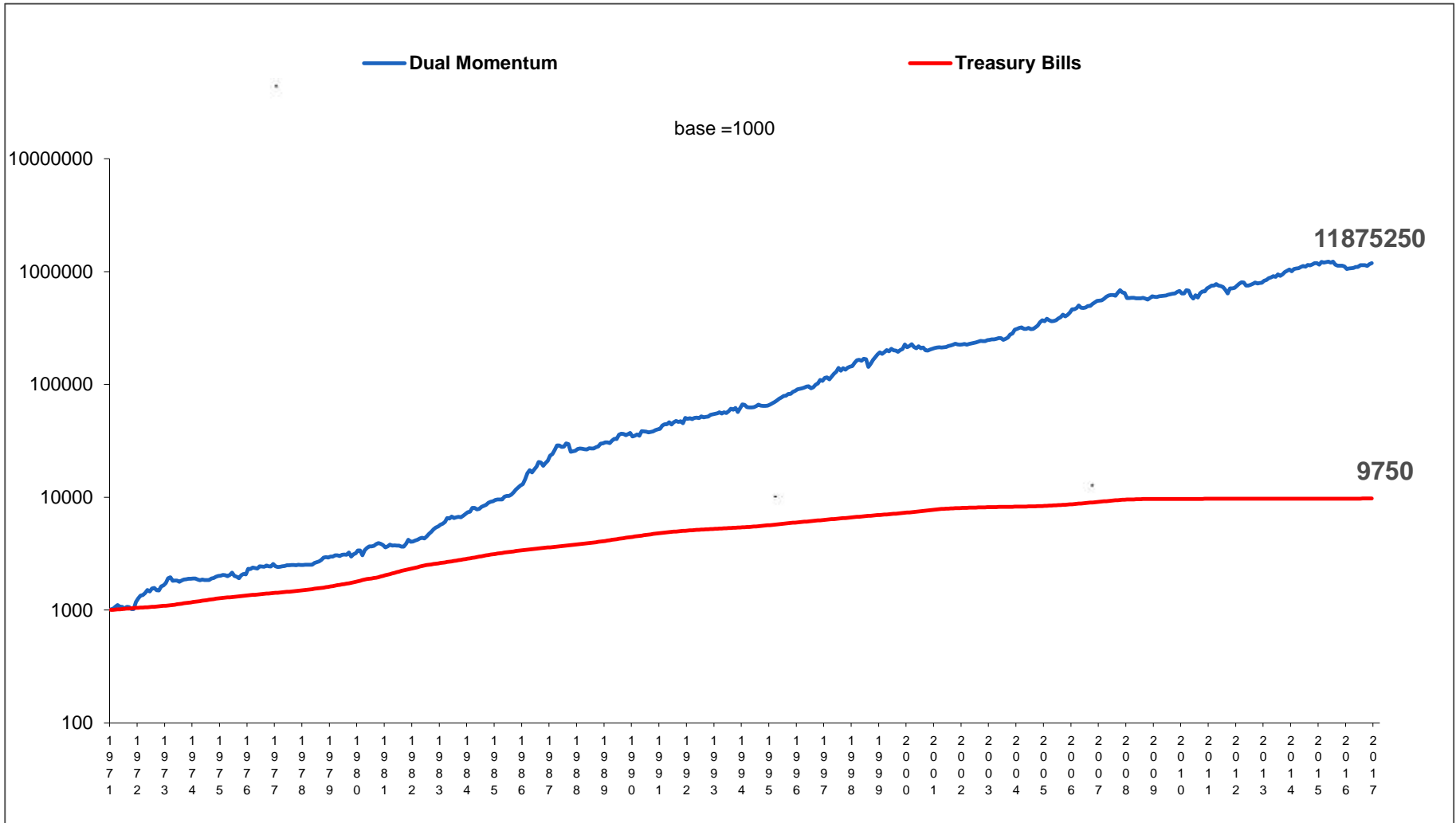
Source: BlackRock Global Investor Pulse Survey 2015 (Investor Pulse).

Compound Annual Returns (1926-2014)



Sources: BlackRock; Morningstar; Tax Foundation. Past performance is no guarantee of future results. Assumes reinvestment of income and no transaction costs. This is for illustrative purposes only and not indicative of any investment. Federal income tax is calculated using the historical marginal and capital gains tax rates for a single taxpayer earning \$110,000 in 2013 dollars every year. This annual income is adjusted using the Consumer Price Index in order to obtain the corresponding income level for each year. Income is taxed at the appropriate federal income tax rate as it occurs. Capital gains for stocks are assessed every five years when there is a cumulative gain from the last high and assume a five year holding period to determine the long-term capital gains rate. Bonds are assumed to be held to maturity. No state income taxes are included. Stocks are represented by the S&P 500 Index. Bonds are represented by the Morningstar/Ibbotson Intermediate-Term Government Bond Index. Cash is represented by the Morningstar/Ibbotson 30-Day US Treasury Bill Index. Inflation is represented by the Consumer Price Index. It is not possible to invest directly in an index.

Which Do You Want?



Risks ?



Tracking Error



Whipsaws







THE 3 SECRETS OF
SUCCESS

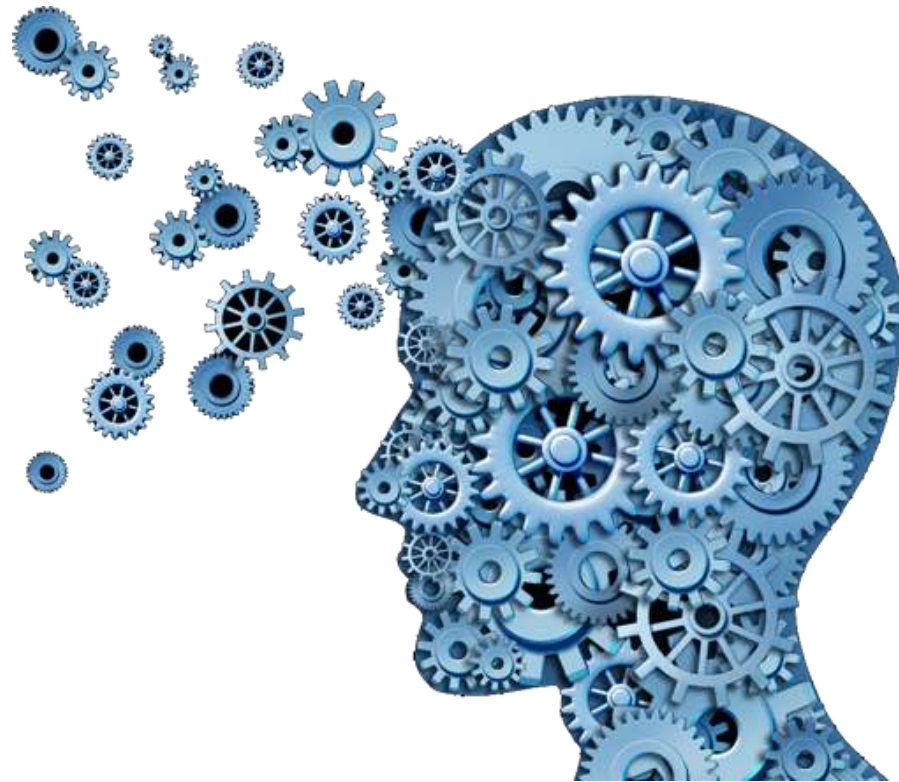
Patience



Discipline



Understanding

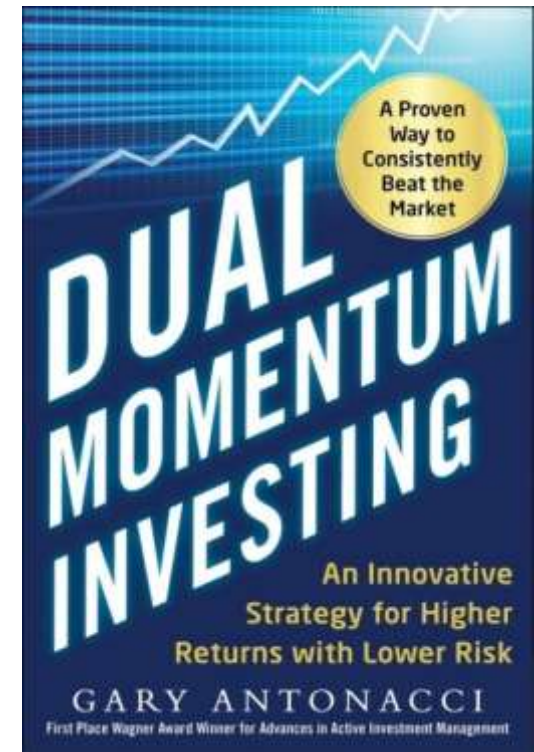


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The most important metric is not the returns achieved but the returns weighed against the risks incurred.

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-Seth Klarman



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Gary Antonacci

twitter: @GaryAntonacci

**Portfolio Management
Consultants**

website: optimalmomentum.com

blog: dualmomentum.net