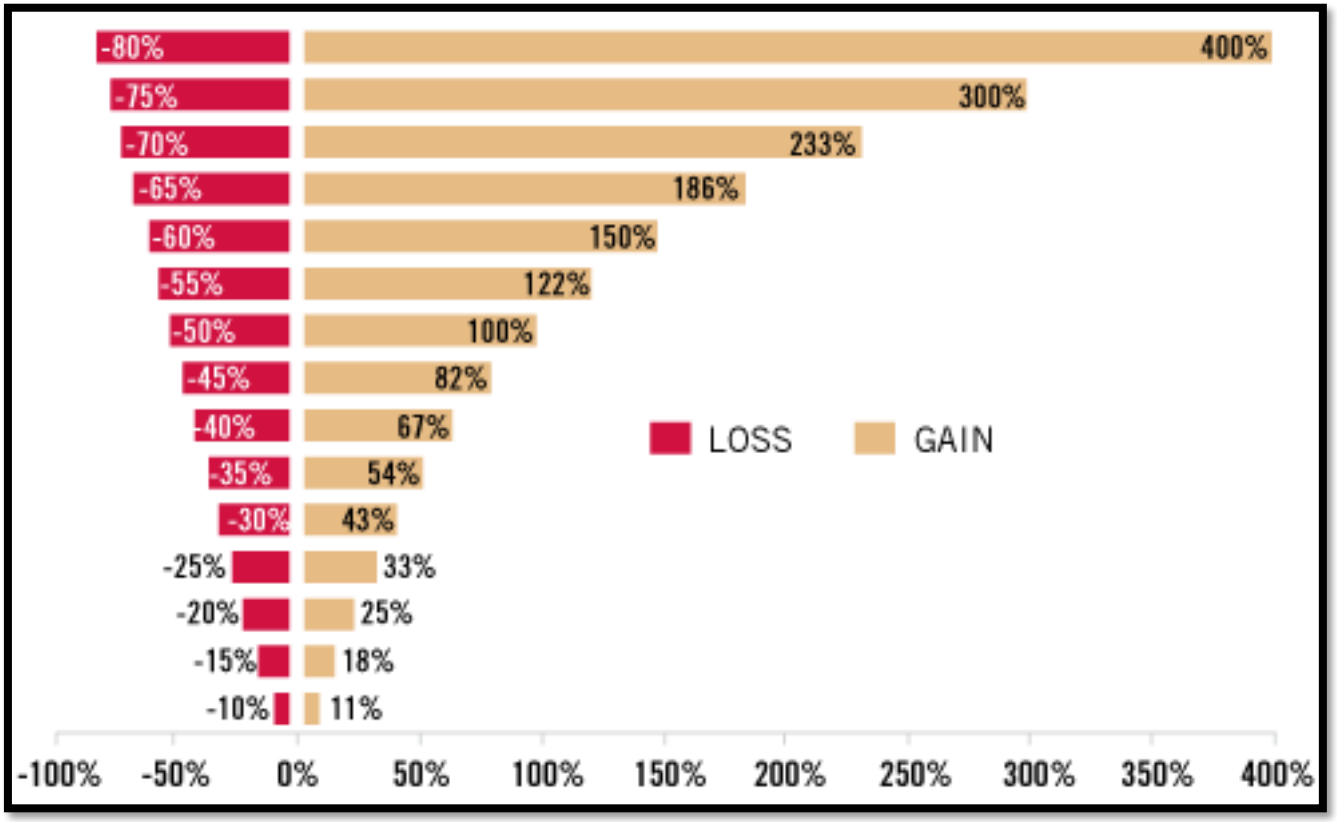
From Modern Portfolio Theory to a Non-Normal Risk Focus

Starting with the basics

Downside is much more destructive than upside is beneficial as is evident in this chart. If you go down red you need tan to get back to breakeven, down 50% requires a 100% return to get back to breakeven. Downside is very destructive. You must protect against it more than chasing performance.



Modern Portolio Theory (MPT)

Notice that MPT is a theory, not a theorem, in other words it is not proven. At Empirical we don't think it is necessarily wrong or broken, we think it is simply incomplete.

Paradigm Shift

Risk matters most during market selloffs when correlations spike. This is when investors are most prone to let their emotions dictate their investment activities. Controlling risk during these times, by and large, cannot be accomplished using an MPT focus. It requires something new – a **Non-Normal Risk focus**:

1. Fat Left Tails (Negative Skewness and Leptokurtosis)
2. Correlation Breakdown
3. Serial Correlation

Let's have a look at these three Non-Normal Risks

1. Fat Left Tails

Left Tail events (sizable market selloffs) happen over 5x more often than expected in a normally distributed bell curve.*

Why is this?

- Emotion
- Crowd think
- The media
- Increased speed of information flow through the internet
- The importance people put on wealth and money
- Egos
- Humans are built with a flight from danger hard coding

Given that tail events are the most dangerous periods of time for investors where they are prone to make investment mistakes, it is incumbent upon their Advisors to build risk controlling measures into their portfolios for protection during these inevitable events.

**the*hedgefundjournal, Issue 61, Tail Risk, About 5x worse than you may think, Patrick Welton and Christopher Keenan, Welton Investment Corporation, originally published in the October 2010 issue

2. Correlation Breakdown

Harry Markowitz developed Modern Portfolio Theory (MPT) in 1952. **It's not so Modern anymore** –yet the vast majority of investors still use it.

Regardless, it was based on a false premise, that correlations and volatility are static. Nothing could be further from the truth.

In market selloffs correlation of risk assets spike toward 100%, converging and rendering diversification fairly useless.

The Tale of Two Tails

Most asset allocation modeling is incorrectly done using average correlations.

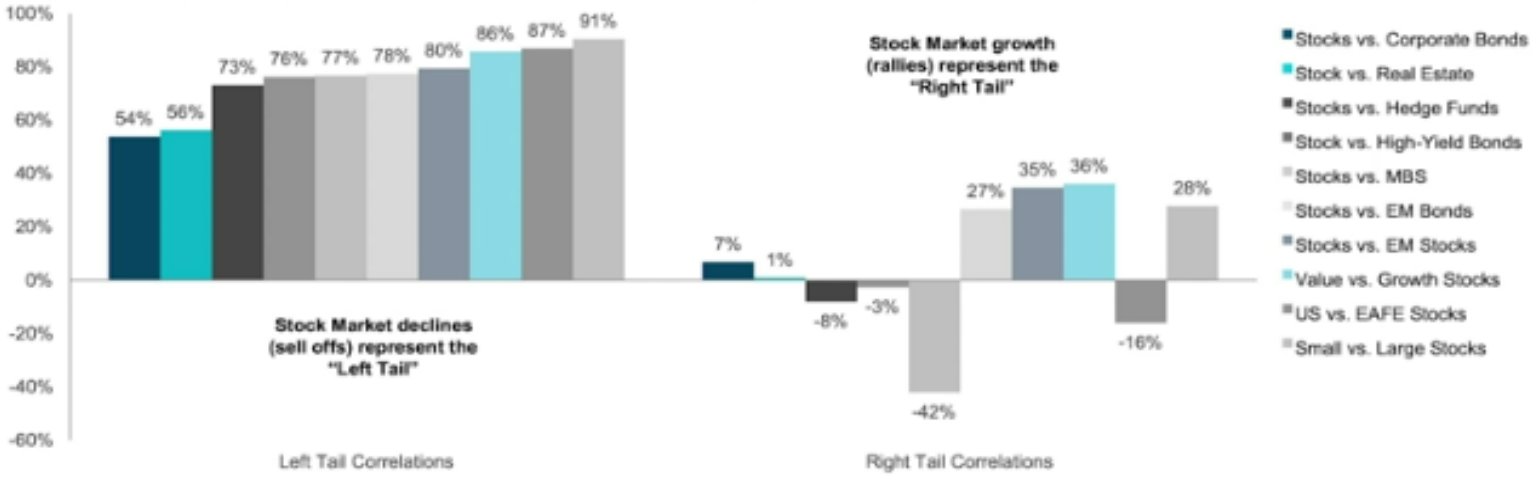
Correlations are Quite Different for Each of the Tails

Risk Asset's Correlations Typically **Converge** in the Left Tail

The Failure of Diversification Across Risk Assets

As of 30 June 2017

LEFT-TAIL VS. RIGHT-TAIL CORRELATIONS FOR KEY RISK ASSETS

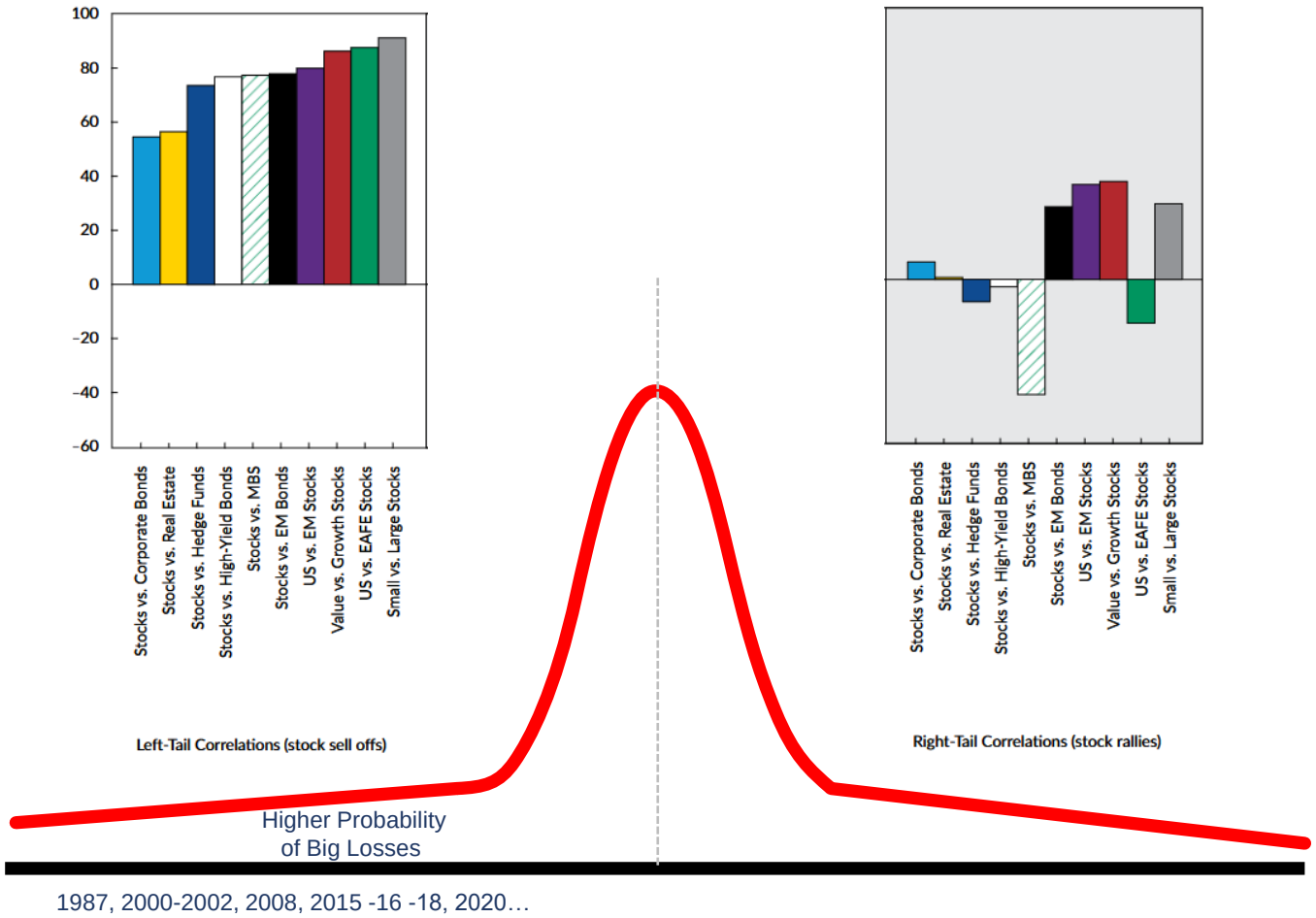


The table above illustrates that correlations (the degree to which two securities move in relation to each other) between different asset classes have tended to increase in down stock markets (sell offs) and decrease in rising stock markets (rallies). The Table reminds investors that what looks like a diversified portfolio during market rallies (right tail) may be much less diversified than generally thought during broad stock markets sell off (left tail). Past performance cannot guarantee future results.

All investments are subject to market risk, including the possible loss of principal. Again, all charts and tables are shown for illustrative purposes only.
EM is emerging market. Monthly data with start dates based on availability. Please refer to page 27 for data sources and start dates.
Left-tail and right-tail correlations are at the 1st and 99th percentiles but were adjusted by the data-augmentation methodology.
Analysis by Sébastien Page, CFA, head of Global Multi-Asset at T. Rowe Price, Baltimore and Robert A. Panariello, CFA, a portfolio manager and a quantitative analyst in the Multi-Asset Division at T. Rowe Price, Baltimore.

When Diversification Fails

Right when you need it, in left tail events, diversification benefits disappear.



Financial Analysts Journal | A Publication of CFA Institute, Third Quarter 2018, **When Diversification Fails,** Sébastien Page, CFA, and Robert A. Panariello, CFA

EAM

3. Serial Correlation

You would think that one period of returns would be independent of the prior periods return. Not so. This is commonly known as momentum.

The effect of this is that intrinsic and fundamental value gets pushed to the side and crowd think, which can be very stupid, takes center stage.

This allows for risk to build up and sometimes to enormous levels. *Think tulip bulbs, the dotcom era, 1929, and the GFC of 2008.*

Protection against this expanding beast must be built into asset allocation models. *Think some form of mean regression analysis.*

Falling Interest Rates helped MPT

Modern Portfolio Theory (MPT) got lucky. Just as the financial world began to adopt MPT modeling en masse, around 1980, it benefited from high starting interest rates (US 10 Y Treasury Yield at 16%) and an extended period (39 years) of falling rates from there *(regime 2 on the next slide).* That had a double effect on returns for investors:

- a high or at least reasonable yield for decades
- as rates dropped, a consistent appreciation of bonds as well

Over time, MPT investors made money on stocks and made money on their hedge (bonds). That's truly a golden age.

Add to that, every time stocks melted investors dove for bonds *(a true hedge to boot)*.

This was the perfect elixir for MPT and the 60/40 portfolio.

The pandemic and rates being dropped to 0% in March of 2020 changed all that.

Empirical does not believe investors are prepared for regime 3 on the next slide, investors got to used to regime 2.

10Y U.S. Treasury Note Yields

80 Years

Source: Strategas Securities LLC

EAM

Paradigm Shift

Without developing this new **Non-Normal Risk** focus that provides a process investors can hang on to in the tough markets and offers real world results that match *(see slides 17 and 18)*, investors would be doomed to let their emotions dictate a problematic, yet all too common, sell-low and buy-high methodology.

Additional Arrows in the Diversification Quiver

Given that fixed income presents the challenges of historically low yields and a difficult environment for appreciation, investors need to use, and need to continue to search for, risk control and returns in other places to add to their asset allocation template. Some examples we utilize at Empirical include:

- TIPS
- Managed Duration Fixed Income
- Tactical Fixed Income
- Alternatives
  - Commodities
  - REITS
  - Gold
  - Silver
  - Hedge Fund Replication
  - Managed Futures

A Non-Normal Risk Focus Creates More Granulation and More Equal Weights Between Equity, Fixed Income, and Alternatives

January 2025

	Conservative	Moderate Conservative	Moderate	Moderate Aggressive	Aggressive
Equity	**24%**	**38%**	**52%**	**63%**	**71%**
Large Cap	8%	12%	15%	18%	19%
Mid Cap	5%	8%	11%	14%	16%
Small Cap	3%	6%	10%	12%	13%
International (Developed)	5%	8%	10%	12%	14%
International (Emerging Markets)	3%	4%	6%	7%	9%
Fixed Income	**44%**	**33%**	**21%**	**12%**	**6%**
T-Bills	0%	0%	0%	0%	0%
Short Term Treasury	10%	8%	4%	2%	0%
Medium Term Treasury	10%	7%	3%	1%	1%
Long Term Treasury	3%	2%	2%	2%	1%
Interest Rate Hedged	4%	3%	3%	1%	0%
International	5%	4%	3%	2%	1%
TIPS (Domestic and International)	4%	3%	2%	0%	0%
Tactical FI	6%	4%	2%	2%	1%
CASH	2%	2%	2%	2%	2%
Alternatives	**32%**	**29%**	**27%**	**25%**	**23%**
REITs	4%	4%	4%	4%	4%
Commodities	9%	8%	8%	7%	7%
Hedge Funds	4%	3%	3%	3%	2%
Gold and Silver	12%	11%	10%	9%	8%
Managed Futures	3%	3%	2%	2%	2%

We are not Alone

A recent study by KKR found that a simple 40/30/30 portfolio had a higher annual return than a 60/40 portfolio from 1927 to 2021, including in both high-inflation and low-inflation conditions. The 40/30/30 portfolio showed a reduced correlation to the performance of stock and bond markets. As a result, it delivered more diversification, greater resilience to downturns and better returns.

Eric Satz, Forbes Councils Member, for Forbes Finance Council, The Half-Life Of Portfolio Diversification: Why 60/40 Is Now 40/30/30, Forbes April 24,2024

Example of a Non-Normal Risk Controlling Activity Inside the Asset Allocation Template

Controlling risk is not only done in the building of the allocation template it is also done with activities inside the template. Such as the use of gold. Below is a correlation chart between gold and stocks. Gold does something most other asset classes don't do. Gold diverges when stocks go down. See the red circles. In all of those cases gold dropped to a negative 50% correlation to stocks at the exact right time. In other words when stocks go down, gold goes up. Most other asset classes do the opposite - they converge with stocks and correlations spike toward 100%. Therefore, gold is a critical diversifier.

Gold performs as a convex macro asset market hedge, resilient during ongoing risk market rallies but a better hedge during sell-offs and volatility spikes.

Eric Bush blog post, Gavekal Capital

Non-Normal Risk Focus Benefits

Asset Allocation Portfolios

2022	Index	Gross	Difference	Net	Difference
EAM Conservative	-14.30%	-8.43%	**5.87%**	-8.79%	**5.51%**
EAM Moderate Conservative	-14.97%	-8.96%	**6.01%**	-9.33%	**5.64%**
EAM Moderate	-15.77%	-9.80%	**5.97%**	-10.16%	**5.61%**
EAM Moderate Aggressive	-16.19%	-10.60%	**5.59%**	-10.96%	**5.23%**
EAM Aggressive	-16.28%	-11.90%	**4.38%**	-12.25%	**4.03%**

Please refer to slide 22 for 1,3,5,7,10 year and since inception performance and related analytics.

Past performance is not necessarily indicative of future returns. Please see additional explanatory notes and disclosures starting on Page 23 of this presentation.

Non-Normal Risk Focus Benefits

Asset Allocation Portfolios

2008	Index	Gross	Difference	Net	Difference
EAM Conservative	-9.26%	0.77%	**10.03%**	0.37%	**9.63%**
EAM Moderate Conservative	-18.31%	-10.76%	**7.55%**	-11.12%	**7.19%**
EAM Moderate	-26.06%	-19.75%	**6.31%**	-20.09%	**5.97%**
EAM Moderate Aggressive	-34.21%	-30.42%	**3.79%**	-30.71%	**3.50%**
EAM Aggressive	-38.90%	-34.49%	**4.41%**	-34.77%	**4.13%**

*Hypothetical performance is based on performance of actual portfolios. However, under GIPS compliance rules the performance of these portfolios must be labled as hypothetical

Considered hypothetical because this performance includes Supplemental model performance data (live accounts but not all accounts in the composites).

Please refer to slide 22 for 1,3,5,7,10 year and since inception performance and related analytics.

The Future of Asset Allocation

Empirical believes that with a focus on **Non-Normal Risk** as opposed to the naïve diversification offered in Modern Portfolio Theory (60/40) we can produce lower risk, higher return, and better risk adjusted portfolios for our clients.

See slides 17, and 18 for evidence of such and slides 20 and 21 of Empirical's Asset Allocation Conservative model performance and specifically Beta, Alpha, Standard Deviation, Sharpe Ratio, Downside Deviation, and Sortino Ratio.

Empirical Asset Allocation Conservative

Performance: January 1 2011 through March 31 2025

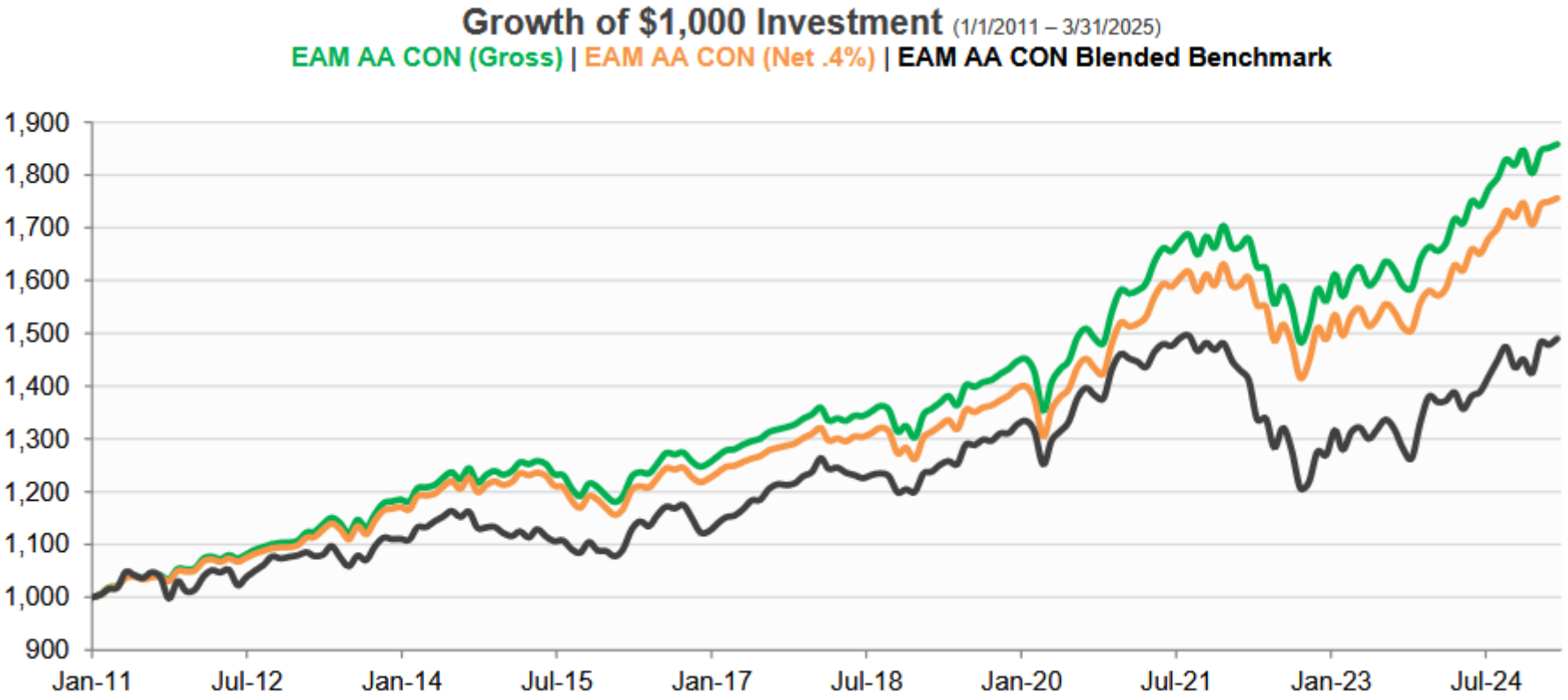
	Gross	Net .4%	Index
Year-to-Date	3.06%	2.96%	4.61%
1 Year	8.25%	7.82%	7.34%
3 Year*	3.77%	3.36%	1.81%
5 Year*	6.77%	6.35%	3.55%
10 Year*	4.13%	3.71%	2.96%
Since Inception*	4.52%	4.10%	2.84%
Since Inception	87.66%	77.33%	49.02%
Std. Deviation	5.43%		6.22%
Downside-Deviation	3.42%		4.11%
Sortino Ratio	0.21		0.06
Sharpe	0.46		0.15
Beta	0.78		1.00
Alpha	2.25%		
Up-Capture	95.57%		100.00%
Down-Capture	70.28%		100.00%

Year	Gross	Net of .4%	Index
2011	5.48%	5.06%	1.48%
2012	4.99%	4.57%	6.38%
2013	7.01%	6.59%	2.89%
2014	3.96%	3.55%	0.98%
2015	-3.24%	-3.63%	-3.05%
2016	5.26%	4.84%	3.52%
2017	7.30%	6.88%	9.96%
2018	-3.26%	-3.65%	-3.06%
2019	11.14%	10.70%	10.68%
2020	9.26%	8.83%	10.04%
2021	7.77%	7.34%	1.37%
2022	-8.43%	-8.79%	-14.30%
2023	6.56%	6.14%	8.72%
2024	8.37%	7.94%	3.20%
YTD 2025	3.06%	2.96%	4.61%

*Annualized

Up and Down Capture based on Gross performance Jan 1, 2011 through March 31, 2025 and is calculated arithmetically. Geometric Up and Down Capture are available upon request. Beta calculated from the earlier of January 1, 2011 or inception date. **Benchmark Index – Blend as described on page 2.** The information on this page is qualified in its entirety by attached footnotes and disclosures. Past performance is not a guarantee of future returns.

Empirical Asset Allocation Conservative



EAM

Empirical All Strategies Fact Sheet

Performance

Inception through March 31, 2025. All returns are time weighted with net of a .40% fee.

Equity Strategies (AI Driven)	YTD	1 Year	3 Year*	5 Year*	7 Year*	10 Year*	Since Inception*	Cumulative SI	Standard Deviation	Downside-Deviation	Sortino Ratio	Sharpe Ratio	Beta	Alpha vs Bench
Sustainable Equity – ESG (Gross)	-6.65%	0.68%	5.20%	14.86%	11.56%	12.01%	11.87%	253.29%	14.00%	8.14%	36.33%	0.73	0.84	1.46%
Sustainable Equity – ESG (Net)	-6.74%	0.27%	4.79%	14.41%	11.12%	11.57%	11.43%	237.97%	13.99%					
S&P 500 TR Index	-4.27%	8.24%	9.06%	18.59%	13.25%	12.50%	12.41%	272.72%	14.83%	9.27%	33.81%	0.73	1.00	
S&P 500 Value TR Index	0.28%	4.21%	9.32%	17.21%	10.85%	10.11%	10.01%	192.37%	15.01%	9.50%	26.45%	0.58	0.94	
EAM Bayesian Portfolio (Gross)	-8.99%	1.68%					14.74%	36.25%	16.87%	9.06%	41.59%	0.77	0.81	3.96%
EAM Bayesian Portfolio (Net)	-9.07%	1.27%					14.28%	35.03%	16.88%					
EAM Bayesian Index	-6.48%	0.80%					13.21%	32.21%	17.18%	9.00%	37.72%	0.68	1.00	
EAM High Quality Portfolio (Gross)	-2.76%	4.35%					21.50%	54.99%	14.76%	6.98%	76.67%	1.26	0.74	11.24%
EAM High Quality Portfolio (Net)	-2.85%	3.93%					21.02%	53.62%	14.77%					
EAM High Quality Index	-6.57%	0.25%					12.74%	30.97%	17.52%	9.21%	35.68%	0.65	1.00	
EAM Reinforced Value Portfolio (Gross)	-9.69%	-2.80%					4.72%	7.99%	18.44%	11.82%	10.04%	0.22	0.78	1.10%
EAM Reinforced Value Portfolio (Net)	-9.77%	-3.19%					4.34%	7.34%	18.46%					
EAM Reinforced Value Index	-8.03%	-1.81%					4.69%	7.93%	20.56%	12.09%	10.62%	0.22	1.00	
Equity Strategies														
All Cap Equity (Gross)	-6.58%	1.49%	8.06%	19.72%	10.36%	9.14%	11.13%	349.81%	17.43%	10.81%	26.76%	0.57	1.03	0.84%
All Cap Equity (Net)	-6.66%	1.08%	7.63%	19.25%	9.92%	8.71%	10.69%	325.18%	17.42%					
All Cap Equity Index	-4.12%	2.80%	5.73%	16.02%	9.09%	9.11%	10.17%	297.80%	15.51%	10.00%	25.54%	0.57	1.00	
Equity Income (Gross)	0.91%	1.08%	5.74%	14.73%	8.50%	8.98%	10.76%	277.51%	14.42%	9.50%	28.62%	0.65	0.90	0.70%
Equity Income (Net)	0.81%	0.68%	5.33%	14.28%	8.08%	8.55%	10.32%	258.62%	14.41%					
S&P 500 Value TR Index	0.28%	4.21%	9.32%	17.21%	10.85%	10.11%	11.30%	302.00%	14.48%	9.10%	31.43%	0.68	1.00	
Asset Allocation														
Conservative (Gross)	3.06%	8.25%	3.77%	6.77%	4.94%	4.13%	4.52%	87.66%	5.43%	3.42%	21.02%	0.46	0.78	2.25%
Conservative (Net)	2.96%	7.82%	3.36%	6.35%	4.52%	3.71%	4.10%	77.33%	5.41%					
Conservative Index	4.61%	7.34%	1.81%	3.55%	2.59%	2.96%	2.84%	49.02%	6.22%	4.11%	6.39%	0.15	1.00	
Moderate Conservative (Gross)	2.21%	8.32%	4.29%	8.23%	5.46%	4.92%	5.63%	118.19%	6.94%	4.39%	23.96%	0.52	0.84	2.11%
Moderate Conservative (Net)	2.11%	7.90%	3.88%	7.80%	5.05%	4.50%	5.21%	106.20%	6.91%					
Moderate Conservative Index	2.92%	7.01%	2.70%	6.19%	4.09%	4.25%	4.12%	77.82%	7.75%	5.10%	12.79%	0.29	1.00	
Moderate (Gross)	1.42%	8.01%	4.47%	10.06%	5.88%	5.59%	6.37%	141.17%	8.92%	5.78%	22.51%	0.51	0.90	1.46%
Moderate (Net)	1.32%	7.58%	4.06%	9.62%	5.46%	5.17%	5.95%	127.95%	8.89%					
Moderate Index	1.56%	6.94%	3.72%	8.73%	5.54%	5.50%	5.40%	111.44%	9.46%	6.21%	16.86%	0.38	1.00	
Moderate Aggressive (Gross)	0.68%	6.98%	4.43%	11.83%	6.03%	5.87%	7.02%	162.97%	11.26%	7.45%	20.74%	0.48	0.94	0.66%
Moderate Aggressive (Net)	0.58%	6.56%	4.02%	11.39%	5.61%	5.45%	6.60%	148.57%	11.23%					
Moderate Aggressive Index	0.53%	7.40%	5.02%	11.81%	7.22%	6.90%	6.74%	153.26%	11.44%	7.53%	19.59%	0.45	1.00	
Aggressive (Gross)	0.32%	6.15%	4.21%	13.18%	6.23%	6.22%	7.34%	174.53%	12.63%	8.45%	19.91%	0.46	0.96	0.15%
Aggressive (Net)	0.23%	5.73%	3.80%	12.74%	5.81%	5.80%	6.92%	159.50%	12.60%					
Aggressive Index	0.06%	7.86%	5.95%	13.75%	8.27%	7.74%	7.55%	182.18%	12.63%	8.32%	20.87%	0.48	1.00	
Tactical Strategies														
Sector Rotation (Gross)	-1.87%	5.71%	3.39%	11.42%	6.86%	7.17%	7.77%	99.80%	11.39%	7.03%	24.76%	0.53	0.63	0.69%
Sector Rotation (Net)	-1.97%	5.29%	2.98%	10.98%	6.44%	6.77%	7.34%	92.59%	11.39%					
S&P 500 Min Vol TR Index	2.59%	11.53%	7.51%	15.06%	11.08%	10.61%	11.52%	174.06%	13.46%	8.55%	32.86%	0.72	1.00	

*Annualized

EAM

All Analytics are Since Inception.

The information on this page is qualified in its entirety by attached footnotes and disclosures. Past performance is not a guarantee of future returns

Appendix: Additional Explanatory Notes and Disclosures

Asset Allocation & All Cap Equity

- Gross-of-fees returns are presented before management and custodial fees but after all trading expenses. Gross-of-fees returns do not reflect the deduction of investment advisory fees. A client's return will be reduced by investment advisory fees and any other expenses the client may incur in the management of its investment advisory account. EAM's investment advisory fees are detailed below and described in Part II of our Form ADV. The collection of fees produces a compounding effect on the total rate of return net of management fees. As an example, the effect of investment management fees on the total value of a client's portfolio assuming (a) quarterly fee assessment, (b) $100,000 investment, (c) portfolio return of 8% a year, and (d) 2% annual investment advisory fee would be $2,806 in the first year, with cumulative effects of $11,781 over five years and $27,618 over ten years.
- Net-of-fees returns are calculated by deducting ¼ of the highest stated management fee from the monthly gross composite return the first month of each quarter.
- Supplemental net performance is reduced by the highest investment management fee EAM could charge at the time (2.25%) which includes bundled transaction costs and in every case was higher than the client's actual fees.
- The performance portrayed reflects the reinvestment of dividends, interest, and other earnings (total return).
- The minimum portfolio size for inclusion in the composite is $100,000 except in January of 2011 for Moderate Aggressive where it was $80,000.

Equity Income, Sustainable Equity and Sector Rotation

- Gross-of-fees returns are presented before management and custodial fees but after all trading expenses. Gross-of-fees returns do not reflect the deduction of investment advisory fees. A client's return will be reduced by investment advisory fees and any other expenses the client may incur in the management of its investment advisory account. EAM's investment advisory fees are detailed below and described in Part II of our Form ADV. The collection of fees produces a compounding effect on the total rate of return net of management fees. As an example, the effect of investment management fees on the total value of a client's portfolio assuming (a) quarterly fee assessment, (b) $100,000 investment, (c) portfolio return of 8% a year, and (d) 2% annual investment advisory fee would be $2,806 in the first year, with cumulative effects of $11,781 over five years and $27,618 over ten years.
- Net-of-fees returns are calculated by deducting ¼ of the highest stated management fee from the monthly gross composite return the first month of each quarter.
- The minimum portfolio size for inclusion in the composite is $100,000 for Equity Income and Sector Rotation and $250,000 for Sustainable Equity.

Appendix: Additional Explanatory Notes and Disclosures

Indices

- The composition of a benchmark index may not reflect the manner in which an EAM portfolio is constructed in relation to expected or achieved returns, investment holdings, portfolio guidelines, restrictions, sectors, correlations, concentrations, volatility or tracking error targets, all of which are subject to change over time. References to market or composite indices, benchmarks, or other measures of relative market performance over a specified period of time are provided for your information only. Index returns were obtained from Bloomberg. Index returns do not reflect any deduction of management fees and include the reinvestment of dividends. You cannot invest directly in an index.
- The benchmark for EAM All Cap Equity is a monthly rebalanced blend of 37.35% S&P 500 TR, 23.75% S&P MidCap 400 TR, 22.60% Russell 2000 W/Div, 12.65% MSCI EAFE NR, 3.15% MSCI Emerging Markets NR, 0.50% ML 3 Month Treasury Bill.
- The benchmark for EAM Equity Income is the DJ Industrial Average TR.
- The benchmark for EAM Sector Rotation is the S&P 500 Total Return Index.
- The benchmarks for the EAM Asset Allocation Series are as follows:
  - EAM Asset Allocation Conservative: 30% MSCI ACWI NR, 70% Barclay's Global Aggregate Bond Index
  - EAM Asset Allocation Moderate Conservative: 45% MSCI ACWI NR, 55% Barclay's Global Aggregate Bond Index
  - EAM Asset Allocation Moderate: 60% MSCI ACWI NR, 40% Barclay's Global Aggregate Bond Index
  - EAM Asset Allocation Moderate Aggressive: 80% MSCI ACWI NR, 20% Barclay's Global Aggregate Bond Index
  - EAM Asset Allocation Aggressive: 85% MSCI ACWI NR, 15% Barclay's Global Aggregate Bond Index

Appendix: Additional Explanatory Notes and Disclosures

Analytics

- Cumulative Return: The aggregate amount of return an investor would obtain if invested on the date of inception through the last reported date of performance.
- Compound Annual Return: The percentage that an investment would need to increase each year over a multi-year period in order to reach its corresponding cumulative return.
- Standard Deviation: Measures the degree of variation of returns around the average return. The higher the volatility of the investment returns, the higher the standard deviation will be and thus the risk of the investment.
- Sharpe Ratio: Measures the risk adjusted return (portfolio returns less the risk free rate) obtained for each unit of risk as defined by standard deviation.
- Information Ratio: Measures the return above the benchmark for the level of tracking risk (standard deviation of the difference between the portfolio and benchmark returns).
- Beta: Measures the risk of a particular investment relative to a benchmark. The benchmark's beta is 1.0. If an investment has a Beta of 0.5, it will tend to participate in similar market movements but only half as much as the benchmark. If an investment has a Beta of 2, it will tend to participate in 2x the market movement of the benchmark.
- Alpha: Measures the difference between a fund's actual returns and its expected performance given the level of market risk.
- Maximum drawdown: Measures the percent decline from the highest to the lowest market value of an investment between two periods of time.

Disclosures

Investing involves risk, including the possible loss of principal. Past performance is no guarantee of future results. This presentation is neither an offer to sell nor a solicitation of an offer to buy any securities. Opinions expressed are current opinions as of the date appearing in this material only. Empirical Asset Management's (EAM) portfolio risk management process includes an effort to monitor and manage risk but does not imply low risk. This material is not intended to be used as a general guide to investing or as a source of any specific investment recommendations and makes no implied or express recommendations concerning the manner in which an investment should or would be handled, as appropriate strategies depend upon the investor's specific circumstances and investment objectives. EAM is registered with the Securities and Exchange Commission. However, please note that in no way has the Securities and Exchange Commission approved or endorsed EAM, its strategies or any of its marketing materials. Any representation to the contrary is a criminal offense. Please refer to EAM's ADV Part 2A for more information including a schedule of fees. The benchmark for EAM Asset Allocation model are a monthly rebalanced blend of 80% MSCI ACWI NR Index, 1% Bloomberg Barclay's Global Aggregate Bond USD Unhedged Index, 2% Bloomberg Barclay's 1-3 Month Treasury Bill USD Unhedged Index, 5% MSCI US REIT NTR Index, 3.2% Bloomberg Commodity TR Index, and 8.8% HFRX Global Hedge Fund Index. Returns presented are asset-weighted returns. Valuations are computed and performance is reported in US dollars. The benchmark for EAM All Cap Equity is a monthly rebalanced blend of 37.35% S&P 500 TR, 23.75% S&P MidCap 400 TR, 22.60% Russell 2000 w/ Div, 12.65% MSCI EAFE NR, 3.15% MSCI Emerging Markets NR, 0.50% ML 3 Month Treasury Bill. Returns presented are asset-weighted returns. Valuations are computed and performance is reported in US dollars. The benchmark for EAM Equity Income is the S&P 500 Value TR Index. Returns presented are asset-weighted returns. Valuations are computed and performance is reported in US dollars. The benchmark for EAM Sector Rotation is the S&P 500 Minimum Volatility TR Index. Returns presented are asset-weighted returns. Valuations are computed and performance is reported in US dollars. The benchmark for EAM Sustainable Equity is the S&P 500 Total Return Index. Returns presented are asset-weighted returns. Valuations are computed and performance is reported in US dollars. Gross-of-fees returns are presented before management and custodial fees but after all trading expenses. Composite and benchmark returns are presented net of non-reclaimable withholding taxes. Net-of-fees returns are calculated by deducting the highest annual fee of .40% charged quarterly in the amount of 0.10% in the months of January, April, July, and October. Net-of-fees performance also reflects the costs of brokerage or other commissions and other expenses an investor would have paid. Actual fees may vary depending on, among other things, the applicable fee schedule and portfolio size. The advertised performance from January 1, 2011 forward represents a composite of all discretionary fee paying and non-fee-paying accounts. Accounts that are no longer invested in a manner consistent with the composite description will remain in the composite for all prior months. Gross-of-fees returns are presented before management and custodial fees but after all trading expenses. Composite and benchmark returns are presented net of non-reclaimable withholding taxes. The performance portrayed reflects the reinvestment of dividends, interest, and other earnings (total return). The minimum portfolio size for inclusion in the composite is $100,000. Additional important disclosures and explanations of ranking and award criteria please visit our website empiricalam.com/disclosures.