



At 33.6%, Harvard posted the second lowest Ivy league return for FY 2021, possibly due to a lower risk appetite than its smaller peers.

See our research note from 10/27/2021 (<https://www.markovprocesses.com/category/blog/endowments/>)

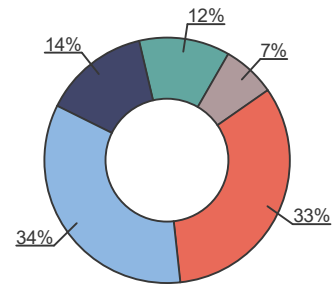
Key Management: Rick Slocum, CIO
Size: \$53.2 billion

Policy benchmark: unknown
Benchmarks used in analysis: Ivy Average & 70/30 Balanced

Investment office: <https://www.hmc.harvard.edu/>

Reported Allocations

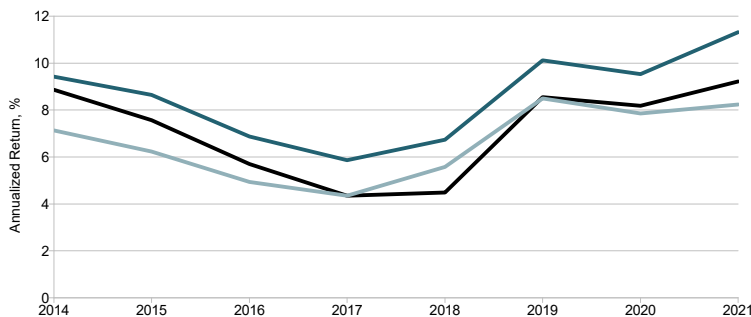
FY 2021



■ Cash & Bonds
 ■ Public Equity
 ■ Private Equity
■ Absolute Return
 ■ Real Assets

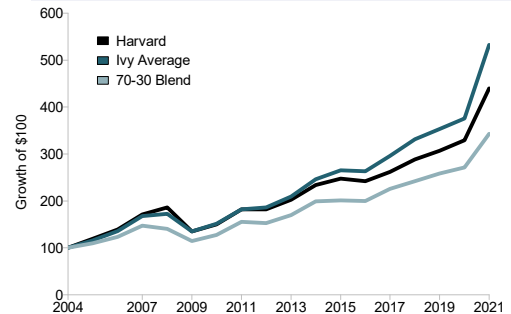
Rolling 10Y Annualized Performance

FY 2014 to FY 2021



Cumulative Performance

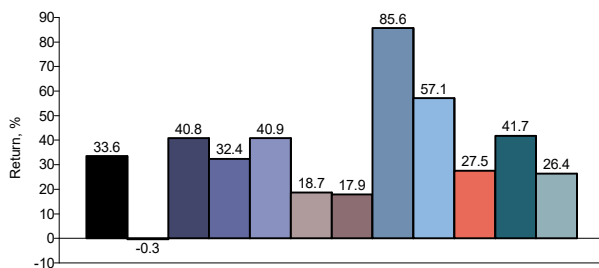
FY 2004 to FY 2021



10Y Ann. Performance Ending	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Harvard	8.9	7.6	5.7	4.4	4.5	8.6	8.2	9.2
Ivy Average	9.4	8.6	6.9	5.9	6.7	10.1	9.5	11.3
70-30 Blend	7.1	6.2	4.9	4.4	5.6	8.5	7.9	8.2

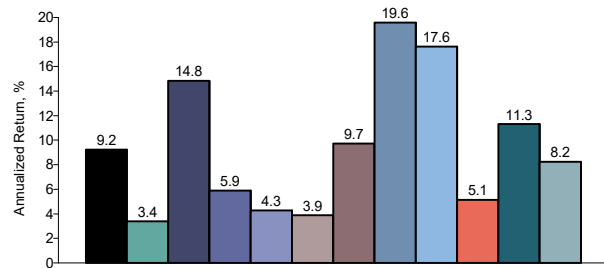
Current Year Performance

FY 2021



10-Year Annualized Performance

FY 2012 to FY 2021



Annual Performance	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Harvard	-0.1	11.3	15.4	5.8	-2.0	8.1	10.0	6.5	7.3	33.6
US Bonds	7.5	-0.7	4.4	1.9	6.0	-0.3	-0.4	7.9	8.7	-0.3
US Equity	5.4	20.6	24.6	7.4	4.0	17.9	14.4	10.4	7.5	40.8
Developed Equity	-13.8	18.6	23.6	-4.2	-10.2	20.3	6.8	1.1	-5.1	32.4
Emerging Equity	-16.0	2.9	14.3	-5.1	-12.1	23.7	8.2	1.2	-3.4	40.9
Natural Resources	3.0	5.5	17.5	-8.0	-7.1	12.6	7.0	3.0	-8.8	18.7
Real Estate	4.8	12.0	15.4	13.4	8.1	10.3	11.6	6.8	-1.7	17.9
Venture Capital	5.9	9.0	29.7	26.8	-1.8	8.3	17.4	21.4	11.9	85.6
Private Equity	6.1	17.3	23.4	13.5	5.8	17.8	19.9	13.6	9.1	57.1
Hedge Funds	-4.3	7.9	9.1	2.3	-2.4	7.9	5.7	1.3	-0.5	27.5
Ivy Average	2.3	12.2	17.7	7.8	-0.8	12.5	11.8	6.7	6.3	41.7
70-30 Blend	-1.7	11.2	17.2	1.1	-0.7	12.8	7.3	6.7	5.2	26.4

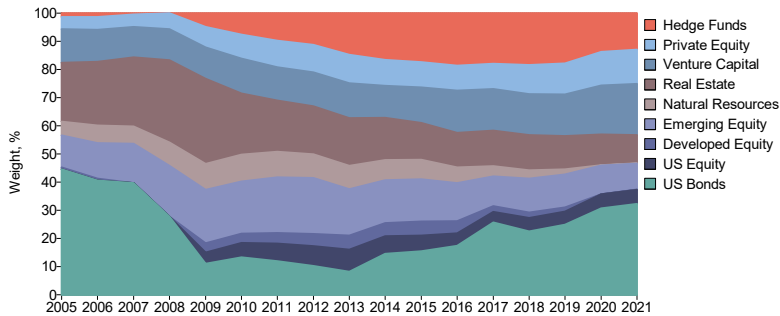
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Harvard: Effective Mix & Contribution



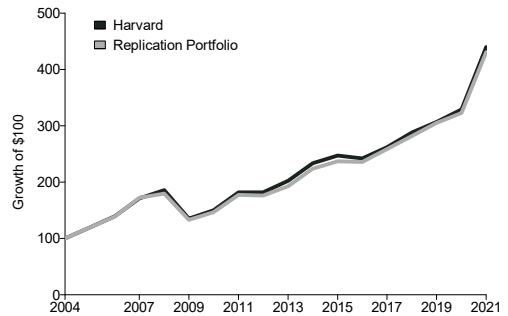
Historical Exposure Estimates

FY 2005 to FY 2021



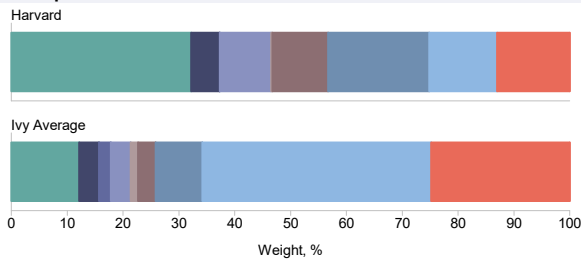
In-Sample Tracking

FY 2004 to FY 2021



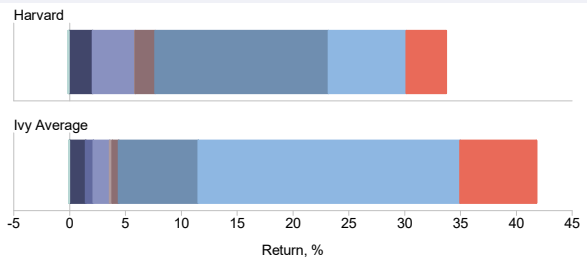
Current Exposure Estimates

FY 2021



Current Contribution Estimates

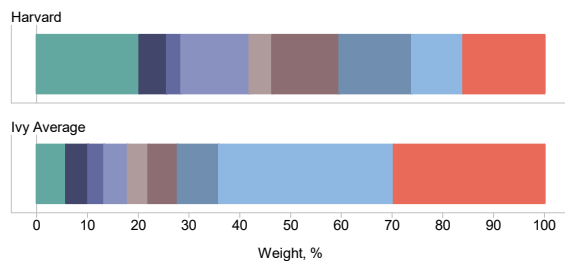
FY 2021



2021 Weight vs Contribution	US Bonds	US Equity	Developed Equity	Emerging Equity	Natural Resources	Real Estate	Venture Capital	Private Equity	Hedge Funds	Selection
Harvard Exposure Estimate	32.2	5.1	0.1	9.2	0.2	10.0	18.1	12.1	13.0	NA
Harvard Contribution Estimate	-0.1	2.1	0.0	3.8	0.0	1.8	15.5	6.9	3.6	0.0
Ivy Average Exposure Estimate	12.1	3.6	2.1	3.5	1.3	3.2	8.3	41.0	24.8	NA
Ivy Average Contribution Estimate	0.0	1.4	0.7	1.4	0.2	0.6	7.1	23.4	6.8	0.0

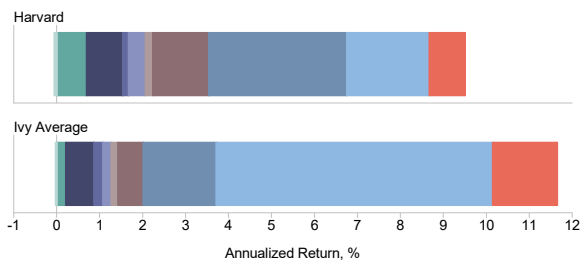
10Y Avg Exposure Estimates

FY 2012 to FY 2021



10Y Avg Contribution Estimates

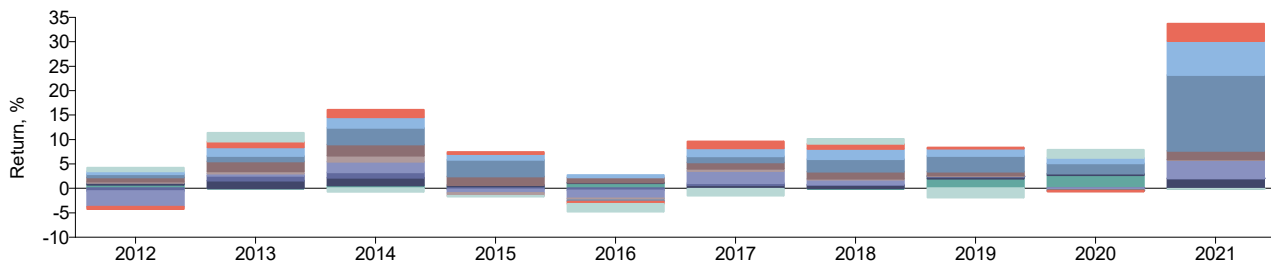
FY 2012 to FY 2021



10Y Weight vs Contribution	US Bonds	US Equity	Developed Equity	Emerging Equity	Natural Resources	Real Estate	Venture Capital	Private Equity	Hedge Funds	Selection
Harvard Exposure Est.	20.2	5.4	2.9	13.4	4.5	13.2	14.3	10.1	16.0	NA
Harvard Ann. Contribution Est.	0.7	0.8	0.1	0.4	0.2	1.3	3.2	1.9	0.8	-0.1
Ivy Average Exposure Est.	5.8	4.4	3.2	4.6	4.0	5.8	8.1	34.4	29.7	NA
Ivy Average Ann. Contribution Est.	0.2	0.7	0.2	0.2	0.2	0.6	1.7	6.4	1.5	0.0

Annual Contribution Estimates

FY 2012 to FY 2021

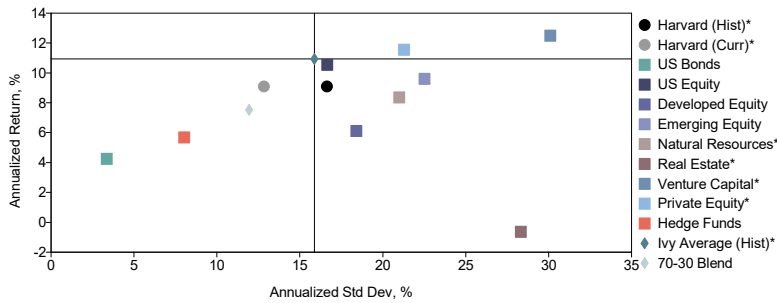


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Std Dev/Return

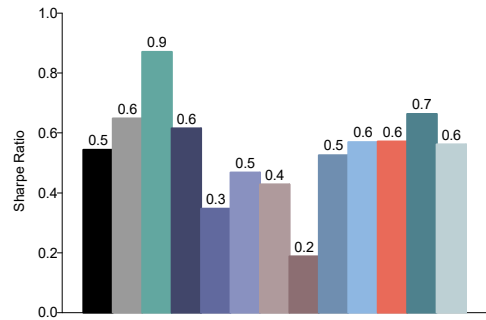
FY 2005 to FY 2021



*uses proxied performance history

Sharpe Ratio

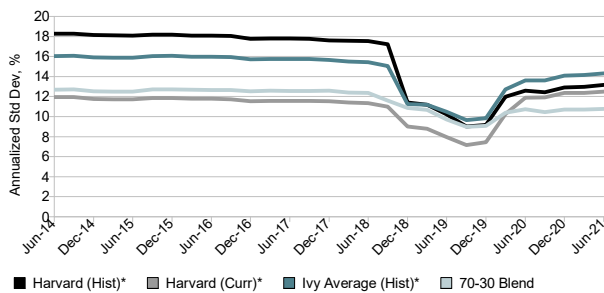
FY 2005 to FY 2021



All Available FY 2005 to FY 2021	Annualized Return, %	Annualized StdDev, %	Annualized Semi Stdev, %	Max Drawdown	VaR (95% CVaR)	Sharpe Ratio
● Harvard (Hist)*	9.10	16.63	11.93	-53.46	17.15	0.54
● Harvard (Curr)*	9.10	12.84	7.86	-36.60	13.24	0.65
◆ Ivy Average (Hist)*	10.93	15.88	10.62	-47.54	16.38	0.66
◇ 70-30 Blend	7.52	11.95	7.42	-35.26	12.33	0.56

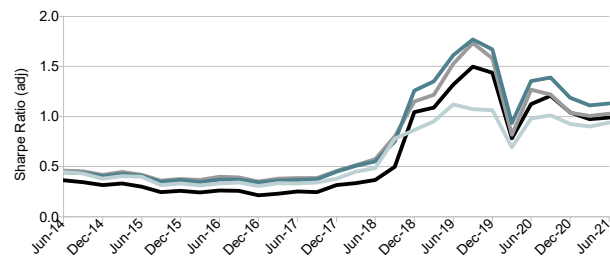
10Y Rolling Std Dev

FY 2014 to FY 2021

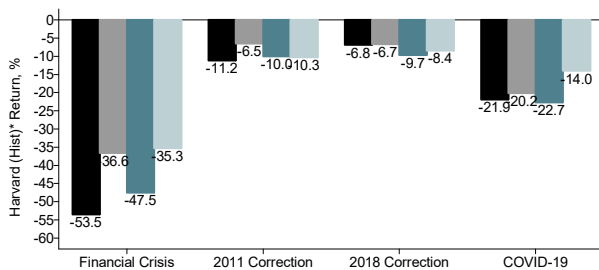


10Y Rolling Sharpe Ratio

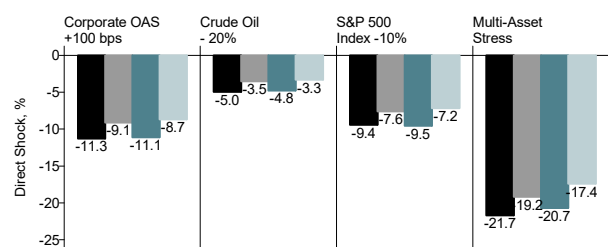
FY 2014 to FY 2021



Historical Stress Tests - US Bear Markets

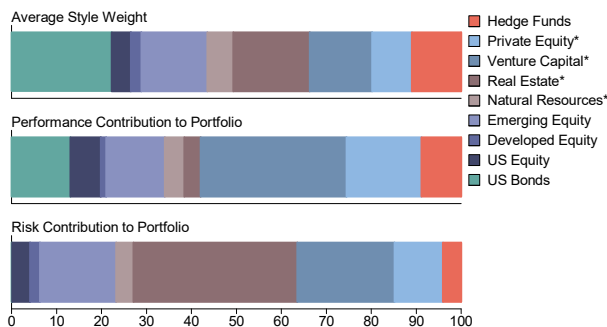


Hypothetical Shocks



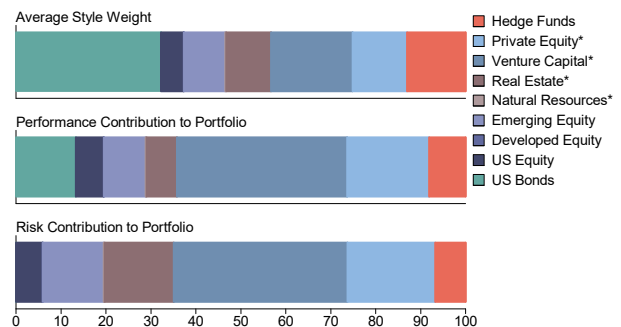
Analysis of Historical Style Portfolio

FY 2005 to FY 2021



Analysis of Current Style Portfolio

FY 2005 to FY 2021



Created in MPI Stylus Pro. Performance numbers are based on annual investment performance information reported by or about endowments, used to derive asset exposure estimates using the Dynamic Style Analysis (DSA) model, with resulting asset exposures and their quarterly returns (proxied with public indices for private assets) then used to calculate risk and efficiency estimates. Estimates do not reflect actual holdings. © 2022 Markov Processes International Inc. All Rights Reserved. Neither MPI nor its content providers are responsible for any damages or losses arising from any use of this information.



Mimicking endowment portfolios: We use annual endowment performance data to construct factor-mimicking portfolios via our patented Dynamic Style Analysis (DSA) model, which is also supplied with a set of published market indices corresponding to the asset classes typically disclosed in endowment reports. Because these factor portfolios closely replicate observed endowment performance, we can then use them as proxy series to achieve a sufficient number of data points to produce meaningful corresponding risk, drawdown, and efficiency estimates.

Accounting for illiquid investments: Some factors, such as private equity, venture capital, and real assets, are artificially smooth and would cause us to underestimate risk; to address this, we substitute a public proxy for each.

Data

Endowment: Annual fiscal year (usually ending June 30th) returns are obtained from public information reported by or about individual endowments.

Endowment (Hist): A synthetic portfolio created using historical (annual) weight estimates of the endowment to the investment indices and the investment indices' quarterly returns. The private asset series used in the historical portfolio construction use public proxies. This portfolio changes over time, and is used as representative of how the endowment behaved in the past for risk and efficiency analysis.

Endowment (Curr): A synthetic portfolio created using the most recent weight estimates of the endowment to the investment indices and the investment indices' quarterly returns. The private asset series used in the portfolio construction use public proxies. This portfolio is constantly rebalanced to maintain the current estimated weights and is used as representative of how the endowment's present composition would have behaved in the past and for risk & efficiency analysis.

Investment Indices:

- Cash - 3-month Tbills
- US Bonds - BB US Aggregate Index
- US Equity - S&P 500 Index
- Developed Equity – MSCI EAFE USD Index
- Emerging Equity – MSCI EM USD Index
- Natural Resources – Preqin Natural Resources Index
- Real Estate – Cambridge Associates Real Estate Index
- Private Equity – Cambridge Associates Private Equity Index
- Venture Capital – Cambridge Associates Venture Capital Index
- Hedge Funds – HFRI Fund Weighted Composite Index

Peer Benchmark: A set of endowments of similar size and/or approach are selected for comparison purposes. The average value is displayed when used as a benchmark.

Peer Benchmark (Hist): A synthetic portfolio created using historical (annual) weight estimates of the peer benchmark to the investment indices and the investment indices' quarterly returns. The private asset series used in the historical portfolio construction use public proxies. This portfolio changes over time, and is used as representative of how, on average, comparable endowments behaved in the past for risk and efficiency analysis.

Market Benchmark: A simple blended market benchmark is included for comparison purposes. Composition and weights match those used internally by the endowment if known, or a blend of 70% MSCI ACWI Index and 30% US Bonds, if unknown.

Frequency: Performance and exposure estimates on pages 1&2 are calculated using annual reported data. Performance, risk and efficiency estimates on page 3 are calculated using style portfolios, proxied private indices and quarterly data.

Glossary

Conditional Value at Risk (CVaR): A measure of investment risk, presented as the expected, or average, loss over a specified time period, once the VaR threshold has been breached. In this report, CVaR is estimated on a quarterly basis.

De-smoothing: The returns of private assets (Private Equity, Real Estate, Venture Capital) often have a downward bias in variance, due to infrequent trading and appraisal-based valuations. The de-smoothing technique (described [here](#)) may be applied to transform the quarterly returns of these assets in the case where public proxy results are unavailable.

Dynamic Style Analysis (DSA): MPI's proprietary [method](#) for dynamic factor analysis.

Historical Stress Test: The performance of a fund or portfolio during a specific historical time period, such as the great financial crisis.

Hypothetical Shock: The estimated immediate effect on a fund or portfolio in response to a specific external stress, such as a sudden drop in equity prices.



Portfolio Analysis: Portfolio contributions to performance (or risk) decompose a Portfolio's return (or risk) over a given time period into the contributions made by each of the Portfolio's holdings. The individual contributions of portfolio holdings sum to the total portfolio return (or risk). Assets that detract from performance produce negative contributions, as do assets which reduce volatility.

Public Proxy: The returns of private assets often have a downward bias in variance, due to infrequent trading and appraisal-based valuation. To eliminate this "staleness" we use DSA to estimate the exposures of each respective private index to lagged public index returns as factors, and allowing for leverage to adjust for higher betas. The aggregate return of these factor exposures is used as the public proxy for each private index.

Sharpe Ratio: The Sharpe Ratio is a risk-return ratio that measures a manager's return per unit of risk. It is calculated as the manager's return in excess of the risk-free rate divided by the standard deviation of the same.

Standard Deviation: A measure of the extent to which a series of returns deviates from its arithmetic mean. It is used to assess the risk and uncertainty involved in investing in the asset.

Style Portfolio: The style portfolio is a synthetic portfolio consisting of the investment indices, dynamically weighted by their historically estimated exposures in the endowment.

Value at Risk (VaR): A measure of risk, presented as a loss threshold over a specified time period, below which there is a small, pre-defined probability (usually 1% or 5%) of a greater loss.

Style Attribution: A basic decomposition of the estimated sources of return to a fund or portfolio. It is calculated as the product of an asset's estimated weight in the portfolio and the return of the asset. Selection return is often included, representing the portion of the portfolio return not explained by systematic factors. Note that return attribution is only additive to the portfolio's return when calculated for a single period. Over multiple periods, an interaction term can be added in order for the sum to be equivalent to the portfolio return.

References

1. Fragkiskos, Apollon and Ryan, Sean and Markov, Michael, Alpha and Performance Efficiency of Ivy League Endowments: Evidence from Dynamic Exposures (January 8, 2018). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3098198
2. Getmansky, Mila, Andrew W Lo, and Igor Makarov, 2004, An econometric model of serial correlation and illiquidity in hedge fund returns, *Journal of Financial Economics*, 74(3), 529–609.
3. Li, D., Markov, M., and Wermers, R. "Monitoring Daily Hedge Fund Performance When Only Monthly Data is Available." *Journal of Investment Consulting*, Vol. 14, No. 1, 57-68, 2013.