

Simulating Loss Harvesting Opportunities Under Different Tax Environments

Research Brief

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In previous papers, Parametric has estimated loss harvesting opportunities based on Monte Carlo simulations.¹ In this paper, we expand on this work to examine how the value added from loss harvesting depends on the tax rate environment.

In general, we expect that tax alpha increases with the tax rate (loss harvesting and gain deferral is more valuable when taxes are higher) and decreases with return (opportunities for loss harvesting are lower when returns are higher).

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¹ Stein, D.M. and P. Narasimhan, See "Of Passive and Active Equity Portfolios in the Presence of Taxes" by Stein and Narasimhan (Journal of Private Portfolio Management, Fall 1999); "Simulating Loss Harvesting Opportunities Over Time" (PPA White Paper, 1999, 2004).

SIMULATION METHODOLOGY

It is important to understand the simulations underlying our results. In each case, we are simulating the average return (or what we might *expect* to achieve each year) from a loss harvesting program starting with \$100 in cash. Given the average return environment and using 15% as our approximation to typical market volatility, we randomly generate a 10-year scenario of market-average movements from a normal distribution (with the specified mean and volatility). Then, for each scenario, we simulate a portfolio of stocks, each having a sequence of returns with the appropriate volatility of excess return around the market average. We assume each universe—in this case we are looking at an S&P 500-like universe—has a “natural” turnover per year. We simulate the portfolio management over a ten-year period and harvest losses four times a year. For each column of each table, we perform 1000 such scenario simulations. The 1000 simulations give us a *distribution* of harvesting opportunities, i.e., a *mean* and a *standard deviation*. We measure these returns after taxes relative to an investment in a passive benchmarked portfolio.

Please note that the simulations are designed to give a sense of the harvesting opportunity and how it changes under different conditions. The experience of any one scenario is different than the mean shown. There is a great deal of variability among the scenarios. An investor’s individual experience will depend on their particular cash flows and the market movements those investments experience. We have made approximations in the simulations for modeling purposes and endeavored to be conservative in estimating the harvesting opportunity.²

HIGHER TAXES ARE ON THE HORIZON

Unless Congress intervenes, tax rates will revert to their pre-2002 levels at the end of 2010 due to a sunset provision in current legislation.

Table 1: Tax Rate Sunset Provision

	Current Rate	Sunset Rate
Dividends	15.0%	39.6%
Long-Term Capital Gains	15.0%	20.0%
Short-Term Capital Gains	35.0%	39.6%
Ordinary Income and Interest	35.0%	39.6%

Tables A1 and A2 in the appendix show detailed simulation results using current and the sunset rates in a variety of market environments. The results here are similar to previous work: a loss harvested portfolio realizes higher after-tax returns than a pure passive portfolio in both bull and bear markets. To isolate the value added from tax management we use the concept of *tax alpha*, which is defined as the after-tax excess return minus any pre-tax excess return.

Table 2 (top, next page) shows that tax alpha is higher using the sunset tax rates for all market return environments. The tax benefit is higher in the bear markets than in the bull markets: overall losses in the portfolio are much higher in a lower market rate environment and an increase in the tax rates will have a greater effect in a bear market environment.

² For example, there is a slight cash drag in these simulations.

Table 2: Tax Alpha for Current Tax Rates and Sunset Tax Rates

	Market Return								
	-2%	0%	2%	4%	6%	8%	10%	12%	14%
Tax alpha in the current tax rate environment	2.11%	1.88%	1.70%	1.52%	1.38%	1.25%	1.14%	1.05%	0.98%
Tax alpha in the sunset rate environment	2.44%	2.17%	1.95%	1.74%	1.57%	1.41%	1.28%	1.17%	1.08%
Difference	0.33%	0.29%	0.25%	0.22%	0.19%	0.16%	0.14%	0.12%	0.10%

OTHER POSSIBLE TAX RATE ENVIRONMENTS

In any market environment, the tax benefit realized in a loss-harvesting portfolio comes from two sources: 1) active realization of short and long term losses, and 2) deferring realization of short and long term gains. In any given environment, the amount of losses and gains realized do not depend on the tax rate. It is their after-tax value (or tax alpha) that will depend on the tax rate.

We ran additional simulations to measure the tax benefit in different tax rate environments. In our simulations, we work with tax rates on dividends, short-term gains and long-term gains. How is loss-harvesting sensitive to changes in each of these rates?

Sensitivity to Tax on Dividend Rate

The simulations construct portfolios with the same dividend yield as the underlying benchmark, so the value added from the active tax management process is not particularly sensitive to changes in the dividend tax rate. We ran a number of simulations for different market environments and dividend tax rates, but there was little impact on tax alpha. For the following analysis, we hold the dividend tax rate constant at 15%.

Sensitivity to Tax on Short-Term Rate

If we hold the long-term gain rate constant at 15% and vary the short-term gain rate, we find that tax alpha increases as the tax rate increases, regardless of market environment. Again, because there are more losses in a weak market, a high short-term tax rate provides a particularly high tax alpha in these markets. Table 3 shows variation in the tax alpha in various market environments with variation in the short term tax rate.

Table 3: Varying the Short-Term Tax Rate

Short-Term Tax Rate (%)	Long-Term Tax Rate (%)	Tax Alpha Market Return (%) -2%	Tax Alpha Market Return (%) 6%	Tax Alpha Market Return (%) 14%
15	15	1.05	0.67	0.47
20	15	1.32	0.84	0.59
25	15	1.58	1.02	0.72
30	15	1.84	1.20	0.85
35	15	2.11	1.38	0.98
40	15	2.37	1.56	1.11
45	15	2.63	1.73	1.24
50	15	2.90	1.91	1.36

Sensitivity to Tax on Long-Term Rate

If we hold the short-term gain rate constant at 35% and vary the long-term gain rate, we find that tax alpha increases as the tax rate increases, regardless of market environment. Because, again there are more losses in a weak market, a high long-term tax rate provides a high tax alpha in these markets. Table 4 shows variation in the tax alpha in different market environments with variation in the long-term tax rate.

Table 4: Varying the Long-Term Tax Rate

Short-Term Tax Rate (%)	Long-Term Tax Rate (%)	Tax Alpha Market Return (%) -2%	Tax Alpha Market Return (%) 6%	Tax Alpha Market Return (%) 14%
35	15	2.11	1.38	0.98
35	20	2.19	1.42	1.01
35	25	2.28	1.47	1.04
35	30	2.36	1.52	1.07
35	35	2.44	1.56	1.11

The tax benefit is more sensitive to a short-term rate change than a long-term rate change. This is due to the fact that, at any point during the portfolio life, realized short-term losses are larger than realized long-term losses.

CONCLUSION

It appears quite likely that taxes on capital gains will change in the near future. An increase in both short-term and long-term gain tax rates gives active tax management more opportunity to add value, while an increase in only the short-term rate will yield a larger tax benefit than a similar increase in only the long-term rate. Any increase in tax rates will have a greater effect in weaker market environments.

DISCLOSURES

Parametric is a majority owned subsidiary of Eaton Vance Corporation. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. References to specific securities and their issuers are for illustrative purposes only and are not intended to be, and should not be interpreted as, recommendations to purchase or sell such securities. Parametric does not provide tax advice. Prospective investors should seek their own tax advice prior to entering into any investment strategy. It is not possible to invest directly in an Index. Past performance does not predict future results.

Appendix Table: A1

\$100 initial portfolio value

Ave. Standard Deviation of stocks: 35%

Universe Turnover: 4%

Short-term tax rate: 35%, Long-term: 15%, Dividend: 15%

Return	-2%	0%	2%	4%	6%	8%	10%	12%	14%
After-tax Alpha %	2.09	1.88	1.67	1.51	1.38	1.26	1.12	1.03	0.98
Pre-tax Alpha %	-0.01	0	-0.03	-0.01	0	0.01	-0.02	-0.02	0.01
Tax Alpha %	2.11	1.88	1.7	1.52	1.38	1.25	1.14	1.05	0.98
Tracking Error %	0.98	0.98	0.96	0.95	0.93	0.92	0.91	0.9	0.89
After-tax Return %	-0.2	1.58	3.37	5.21	7.08	8.95	10.82	12.72	14.67
After-tax Benchmark %	-2.3	-0.3	1.7	3.7	5.7	7.7	9.7	11.69	13.69
Pre-tax Return %	-2.07	-0.03	1.97	4.02	6.06	8.1	10.1	12.13	14.19
Pre-tax Benchmark %	-2.06	-0.03	2	4.03	6.06	8.09	10.12	12.15	14.18
After-tax Alpha %									
Year 1	4.99	4.83	4.56	4.46	4.31	4.23	3.9	3.79	3.67
2	2.78	2.62	2.35	2.22	2.05	1.83	1.68	1.64	1.51
3	2.29	2	1.83	1.68	1.49	1.32	1.24	1.06	1
4	1.91	1.77	1.5	1.26	1.18	1.1	0.94	0.77	0.76
5	1.8	1.57	1.32	1.22	1.07	0.89	0.83	0.74	0.65
6	1.62	1.37	1.19	1	0.86	0.8	0.62	0.61	0.57
7	1.53	1.28	1.16	0.88	0.77	0.71	0.58	0.54	0.54
8	1.39	1.16	0.94	0.87	0.76	0.66	0.47	0.44	0.43
9	1.41	1.16	0.93	0.74	0.67	0.53	0.49	0.43	0.33
10	1.26	1.09	0.95	0.81	0.65	0.53	0.48	0.35	0.41
Net Gains \$									
Year 1	-14.52	-13.83	-13.22	-12.59	-11.95	-11.42	-11.01	-10.4	-9.97
2	-9.93	-9.24	-8.62	-8.03	-7.41	-6.82	-6.28	-5.77	-5.25
3	-8.06	-7.41	-6.81	-6.23	-5.7	-5.14	-4.52	-4.01	-3.53
4	-6.97	-6.33	-5.71	-5.19	-4.64	-4.14	-3.6	-2.94	-2.5
5	-6.13	-5.58	-5.1	-4.52	-4.02	-3.47	-2.92	-2.26	-1.79
6	-5.61	-5.03	-4.65	-3.98	-3.56	-2.88	-2.38	-1.88	-1.34
7	-4.95	-4.57	-4.28	-3.68	-3.19	-2.66	-1.99	-1.55	-0.94
8	-4.56	-4.23	-3.9	-3.45	-3.02	-2.43	-1.78	-1.32	-0.66
9	-4.17	-3.89	-3.64	-3.13	-2.8	-2.26	-1.64	-1	-0.28
10	-3.88	-3.75	-3.45	-3.02	-2.7	-2.06	-1.52	-1.01	-0.07
Portfolio Value \$									
Year 1	97.9	99.99	101.93	104.06	106.13	108.24	110.05	112.15	114.18
2	95.89	100.03	103.97	108.29	112.6	116.96	121.14	125.82	130.38
3	93.95	99.97	106.04	112.67	119.42	126.39	133.43	141.05	148.85
4	91.95	99.98	108.13	117.09	126.62	136.63	146.91	158.07	169.95
5	90.07	99.98	110.25	121.85	134.33	147.66	161.83	177.34	194.08
6	88.17	99.9	112.4	126.71	142.4	159.66	178.11	198.9	221.66
7	86.34	99.85	114.67	131.72	150.97	172.59	196.13	223.06	253.23
8	84.52	99.76	116.85	137.02	160.12	186.6	215.83	250.05	289.14
9	82.82	99.75	119.14	142.46	169.8	201.57	237.66	280.39	329.96
10	81.08	99.72	121.54	148.27	180.08	217.85	261.74	314.25	376.85
Cost Basis / Mkt. Value									
Year 1	0.91	0.91	0.9	0.89	0.88	0.87	0.86	0.85	0.85
2	0.84	0.83	0.81	0.79	0.77	0.76	0.74	0.73	0.71
3	0.79	0.77	0.74	0.72	0.7	0.68	0.66	0.63	0.61
4	0.75	0.72	0.69	0.67	0.64	0.61	0.59	0.56	0.54
5	0.72	0.68	0.65	0.62	0.59	0.56	0.53	0.51	0.48
6	0.69	0.65	0.62	0.58	0.55	0.52	0.49	0.46	0.43
7	0.66	0.63	0.59	0.55	0.52	0.48	0.45	0.42	0.39
8	0.64	0.6	0.56	0.52	0.49	0.45	0.42	0.39	0.36
9	0.62	0.58	0.54	0.5	0.46	0.42	0.39	0.36	0.33
10	0.61	0.57	0.52	0.48	0.44	0.4	0.37	0.34	0.31

Appendix Table: A2

\$100 initial portfolio value

Ave. Standard Deviation of stocks: 35%

Universe Turnover: 4%

Short-term tax rate: 39.6%, Long-term: 20%, Dividend: 39.6%

Return	-2%	0%	2%	4%	6%	8%	10%	12%	14%
After-tax Alpha %	2.43	2.17	1.92	1.73	1.57	1.42	1.26	1.15	1.09
Pre-tax Alpha %	-0.01	0	-0.03	-0.01	0	0.01	-0.02	-0.02	0.01
Tax Alpha %	2.44	2.17	1.95	1.74	1.57	1.41	1.28	1.17	1.08
Tracking Error %	0.98	0.98	0.96	0.95	0.93	0.92	0.91	0.9	0.89
After-tax Return %	-0.34	1.39	3.14	4.93	6.77	8.61	10.45	12.33	14.26
After-tax Bench %	-2.77	-0.78	1.21	3.21	5.2	7.19	9.19	11.18	13.17
Pre-tax Return %	-2.07	-0.03	1.97	4.02	6.06	8.1	10.1	12.13	14.19
Pre-tax Bench %	-2.06	-0.03	2	4.03	6.06	8.09	10.12	12.15	14.18
Excess After-tax Return %									
Year 1	5.65	5.46	5.16	5.04	4.86	4.76	4.41	4.27	4.13
2	3.25	3.05	2.75	2.58	2.38	2.14	1.96	1.89	1.74
3	2.69	2.35	2.14	1.95	1.73	1.53	1.42	1.22	1.13
4	2.26	2.06	1.74	1.47	1.36	1.25	1.07	0.87	0.85
5	2.11	1.83	1.54	1.4	1.22	1.01	0.92	0.81	0.71
6	1.91	1.6	1.38	1.15	0.98	0.9	0.69	0.66	0.61
7	1.78	1.49	1.34	1.01	0.88	0.79	0.63	0.58	0.56
8	1.63	1.35	1.1	0.99	0.85	0.73	0.52	0.47	0.45
9	1.63	1.33	1.07	0.84	0.75	0.59	0.53	0.46	0.34
10	1.47	1.26	1.08	0.9	0.73	0.58	0.52	0.37	0.41
Net Gains \$									
Year 1	-14.52	-13.83	-13.22	-12.59	-11.95	-11.42	-11.01	-10.4	-9.97
2	-9.93	-9.24	-8.62	-8.03	-7.41	-6.82	-6.28	-5.77	-5.25
3	-8.06	-7.41	-6.81	-6.23	-5.7	-5.14	-4.52	-4.01	-3.53
4	-6.97	-6.33	-5.71	-5.19	-4.64	-4.14	-3.6	-2.94	-2.5
5	-6.13	-5.58	-5.1	-4.52	-4.02	-3.47	-2.92	-2.26	-1.79
6	-5.61	-5.03	-4.65	-3.98	-3.56	-2.88	-2.38	-1.88	-1.34
7	-4.95	-4.57	-4.28	-3.68	-3.19	-2.66	-1.99	-1.55	-0.94
8	-4.56	-4.23	-3.9	-3.45	-3.02	-2.43	-1.78	-1.32	-0.66
9	-4.17	-3.89	-3.64	-3.13	-2.8	-2.26	-1.64	-1	-0.28
10	-3.88	-3.75	-3.45	-3.02	-2.7	-2.06	-1.52	-1.01	-0.07
Portfolio Value \$									
Year 1	97.9	99.99	101.93	104.06	106.13	108.24	110.05	112.15	114.18
2	95.89	100.03	103.97	108.29	112.6	116.96	121.14	125.82	130.38
3	93.95	99.97	106.04	112.67	119.42	126.39	133.43	141.05	148.85
4	91.95	99.98	108.13	117.09	126.62	136.63	146.91	158.07	169.95
5	90.07	99.98	110.25	121.85	134.33	147.66	161.83	177.34	194.08
6	88.17	99.9	112.4	126.71	142.4	159.66	178.11	198.9	221.66
7	86.34	99.85	114.67	131.72	150.97	172.59	196.13	223.06	253.23
8	84.52	99.76	116.85	137.02	160.12	186.6	215.83	250.05	289.14
9	82.82	99.75	119.14	142.46	169.8	201.57	237.66	280.39	329.96
10	81.08	99.72	121.54	148.27	180.08	217.85	261.74	314.25	376.85
Cost Basis / Mkt. Value									
Year 1	0.91	0.91	0.9	0.89	0.88	0.87	0.86	0.85	0.85
2	0.84	0.83	0.81	0.79	0.77	0.76	0.74	0.73	0.71
3	0.79	0.77	0.74	0.72	0.7	0.68	0.66	0.63	0.61
4	0.75	0.72	0.69	0.67	0.64	0.61	0.59	0.56	0.54
5	0.72	0.68	0.65	0.62	0.59	0.56	0.53	0.51	0.48
6	0.69	0.65	0.62	0.58	0.55	0.52	0.49	0.46	0.43
7	0.66	0.63	0.59	0.55	0.52	0.48	0.45	0.42	0.39
8	0.64	0.6	0.56	0.52	0.49	0.45	0.42	0.39	0.36
9	0.62	0.58	0.54	0.5	0.46	0.42	0.39	0.36	0.33
10	0.61	0.57	0.52	0.48	0.44	0.4	0.37	0.34	0.31

*After-tax Alpha = Portfolio after-tax return – Benchmark after-tax return

Pre-tax Alpha = Portfolio pre-tax return – Benchmark pre-tax return

Tax Alpha = After-tax Alpha – Pre-tax Alpha

Net gains = (Short-term Gains – Short-term Losses) + (Long-term Gains – Long-term Losses)