Nov 7th 2014 – Tax Loss Harvesting (TLH) Results

It was decided that we run the TLH model on individual ETFs, instead of multiple ETFs. In total, 6 ETFs used by Wealthsimple and 2 major stock indices (DOW Jones and S&P/TSX) are considered. Both historical daily returns and simulated future daily returns are considered.

The model makes the following simplifying assumptions:

1. The client makes an initial deposit of $100,000. No subsequent deposits or withdrawals during the investment horizon. At the end of the investment horizon, the client liquidates her entire portfolio.
2. The investment horizon using historical daily returns is the period at which data is available. Investment horizon for simulated future returns is 30 years.
3. When TLH is executed, the primary ETF is replaced by an alternative ETF that has the exact same daily returns for the entire investment horizon.
4. Harvested losses are re-invested immediately, earning a return identical to that of the primary ETF for the investment horizon.
5. Tax losses are harvested at the capital tax gain rate of 20.18% during the investment horizon. After the investment horizon, the client liquidates her entire portfolio and incurs a capital tax gain rate of 10%.
6. The client incurs a cost of 0.2% (bid-ask spread) each time TLH is executed.
7. Gains from dividends are not considered.

Simulated returns are generated from a statistical model. To capture market upswings and downswings in a long horizon, a statistical model that switches between two regimes is desired. A fairly simple 2-state Markov Regime Switching Model model is used in this study. This model allows 2 sets of means and variances (one for bull market, one for bear market) be estimated, along with transition probabilities between states.

Someone has done a Matlab implementation to estimate this model. See this page: <https://sites.google.com/site/marceloperlin/matlab-code/ms_regress---a-package-for-markov-regime-switching-models-in-matlab/About%20the%20MS_Regress_Package.pdf?attredirects=0&d=1> For a simple introduction to the model, see pages 4 to 6 of the following document: <https://sites.google.com/site/marceloperlin/matlab-code/ms_regress---a-package-for-markov-regime-switching-models-in-matlab/About%20the%20MS_Regress_Package.pdf?attredirects=0&d=1>

**Results**:

1. *Vanguard Total Stock Market ETF (‘VTI’)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical | 14.4 years | 14.5% | $ 91,768 | $ 78,181 | $ 13,587 |
| Simulated | 30 years | 9% | $ 1,026,600 | $ 989,440 | $ 37,160 |





2. *iShares Core S&P/TSX Capped Composite Index ETF (‘XIC’)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical | 14.7 years | 14.9% | $ 83,569 | $ 74,217 | $ 9,352 |
| Simulated | 30 years | 9.0% | $ 392,860 | $ 375,070 | $ 17,790 |





3. *iShares 1-5 Year Laddered Corporate Bond Index ETF* (‘CBO’)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical | 8.5 years | 2.8% | $ -2,665 | $ - 2,820 | $ 155 |
| Simulated | 30 years | 11% | $ --12,850 | $ -13,761 | $ 911 |





4. *iShares MSCI EAFE ETF (‘EFA’)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical | 14 years | 17.1% | $ 52,450 | $ 44,370 | $ 8,080 |
| Simulated | 30 years | 19% | $ 256,340 | $ 233,430 | $ 22,910 |





5. *iShares MSCI Emerging Markets ETF (‘EEM’)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical | 14.5 years | NA | $ 248,030 | $ 248,030 | $ 0 |
| Simulated | 30 years | 19% | $ 507,150 | $ 434,920 | $ 72,230 |





6. *iShares Canadian Universe Bond Index ETF (‘XBB’)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical | 14 years | 4.8% | $ 15,502 | $ 15,085 | $ 417 |
| Simulated | 30 years | 7% | $ 44,487 | $ 43,574 | $ 913 |





7. *Dow-Jones Industrial Stock Price Index for United States*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical (1970 – Present[[1]](#footnote-1)) | 44 years | 14.7% | $ 1,976,900 | $ 1,844,200 | $ 132,700 |
| Historical (1990 – Present) | 24 years | 14.4% | $ 485,410 | $ 466,960 | $ 18,450 |
| Historical (2000 –Present) | 14 years | 15.5% | $ 59,568 | $ 47,807 | $ 11,761 |
| Historical (2005 –Present) | 10 years | 17.7% | $ 66,877 | $ 55,874 | $ 11,003 |
| Historical (2010 –Present) | 5 years | 8.1% | $ 59,500 | $ 57,879 | $ 1,621 |
| Simulated with Model using 1970 – Present Data | 30 years | 7.0% | $ 565,470 | $ 549,730 | $ 15,740 |
| Simulated with Model using 1990 – Present Data | 30 years | 9.0% | $ 573,520 | $ 551,290 | $ 22,230 |
| Simulated with Model using 2000 – Present Data | 30 years | 11.0% | $ 256,480 | $ 239,520 | $ 16,960 |
| Simulated with Model using 2005 – Present Data | 30 years | 11.0% | $ 390,110 | $ 372,740 | $ 17,370 |
| Simulated with Model using 2010 – Present Data | 30 years | 6.0% | $ 898,970 | $ 879,590 | $ 19,380 |











8. *S&P/TSX Composite index*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time Period | Optimal Threshold | After-tax Growth | After-tax Growth without TLH | Net Benefit |
| Historical (1980 – Present) | 34 years | 13.4% | $ 679,240 | $ 638,200 | $ 41,040 |
| Historical (1990 – Present) | 24 years | 12.8% | $ 254,980 | $ 238,440 | $ 16,540 |
| Historical (2000 – Present) | 14 years | 15.6% | $ 76,052 | $ 66,314 | $ 9,738 |
| Historical (2005 – Present) | 10 years | 18.0% | $ 56,505 | $ 52,234 | $ 4,271 |
| Historical (2010 – Present) | 5 years | 5.0% | $ 21,514 | $ 20,829 | $ 685 |
| Historical (2011 – Present) | 4 years | 16.4% | $ 9,950 | $ 7,834 | $ 2,116 |
| Simulated with Model using 1980 – Present Data | 30 years | 9.0% | $ 518,280 | $ 499,680 | $ 18,600 |
| Simulated with Model using 1990 – Present Data | 30 years | 6.0% | $ 410,570 | $ 394,350 | $ 16,220 |
| Simulated with Model using 2000 – Present Data | 30 years | 6.0% | $ 946,170 | $ 918,560 | $ 27,610 |
| Simulated with Model using 2005 – Present Data | 30 years | 10% | $ 386,130 | $ 369,710 | $ 16,420 |
| Simulated with Model using 2010 – Present Data | 30 years | 10% | $ 292,060 | $ 282,350 | $ 9,710 |
| Simulated with Model using 2011 – Present Data | 30 years | 11% | $ 122,290 | $ 115,810 | $ 6,480 |













1. Present as of Oct/31st/2014. [↑](#footnote-ref-1)