

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

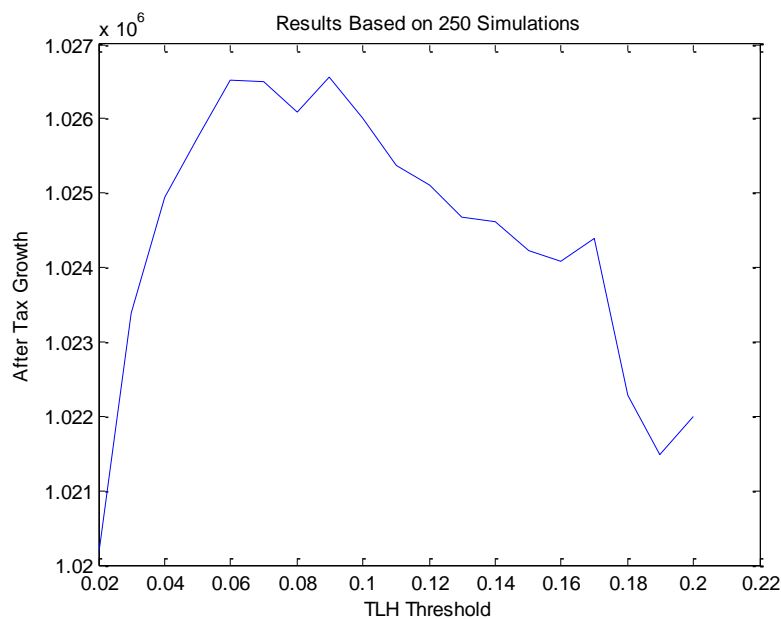
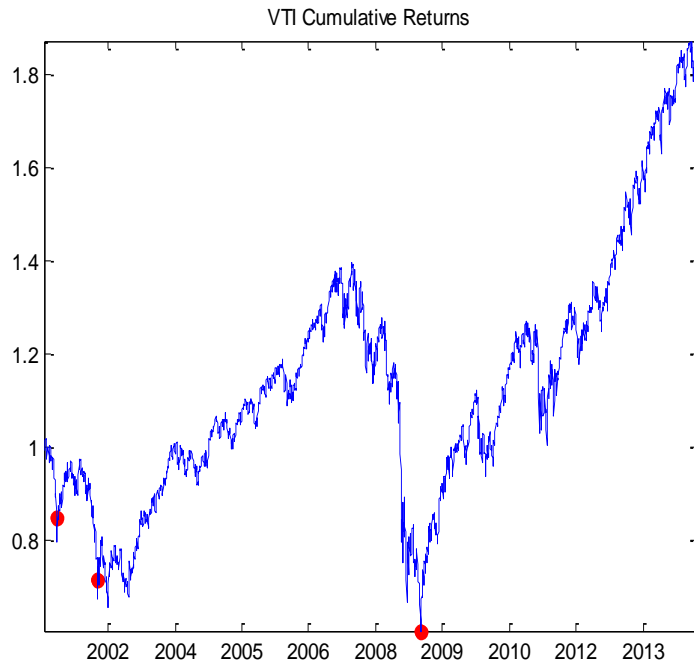
simple introduction to the model, see pages 4 to 6 of the following document:

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:

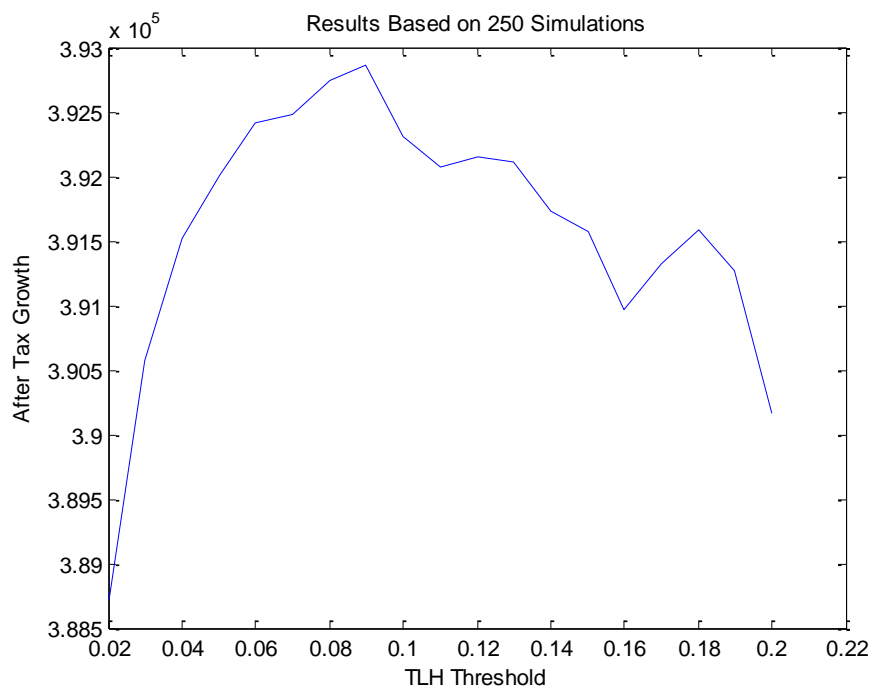
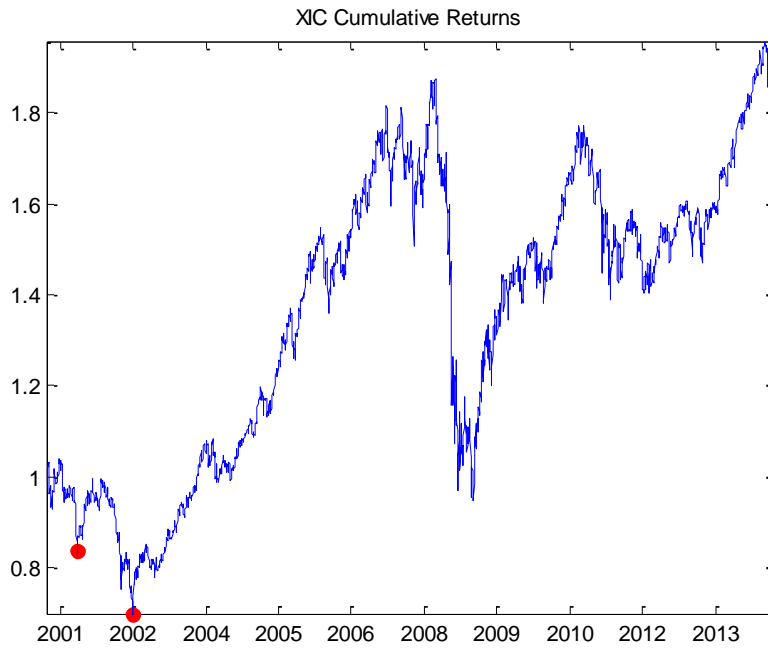
1. Vanguard Total Stock Market ETF ('VTI')

	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



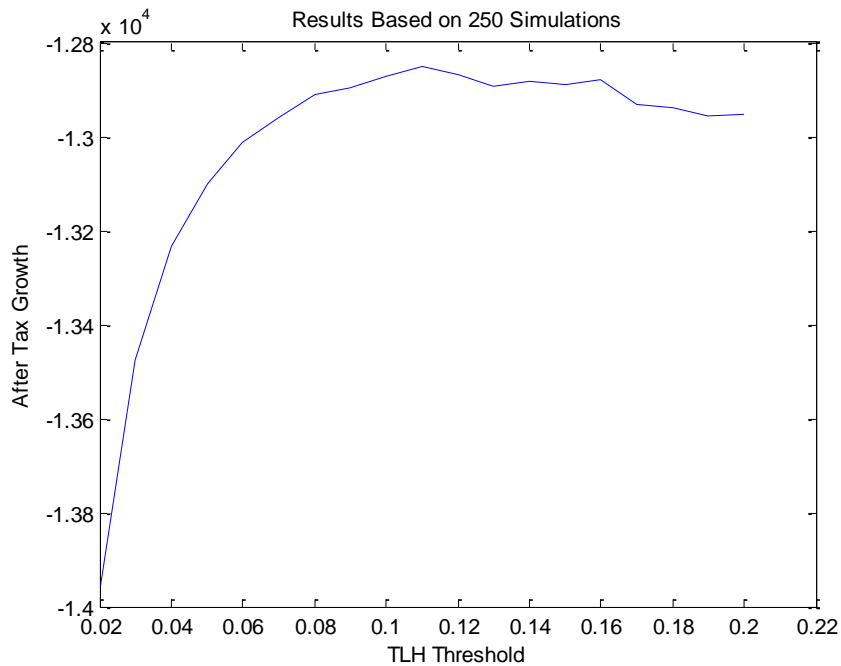
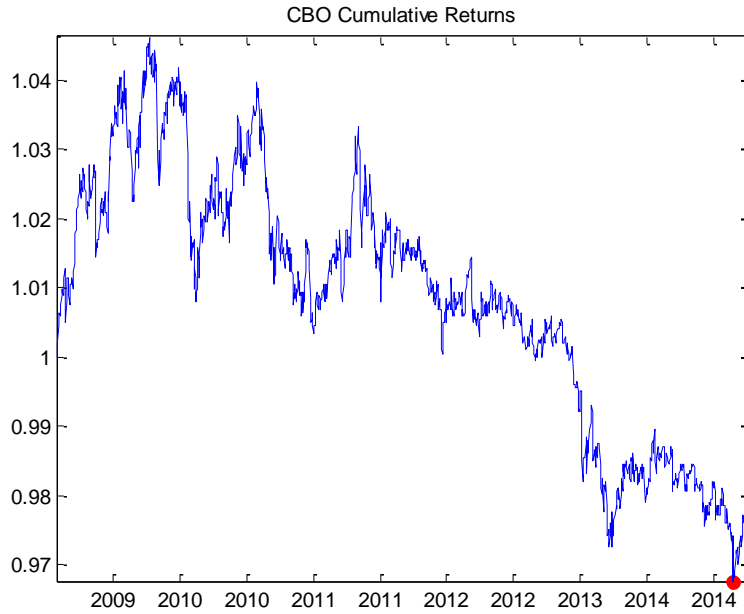
2. *iShares Core S&P/TSX Capped Composite Index ETF ('XIC')*

	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



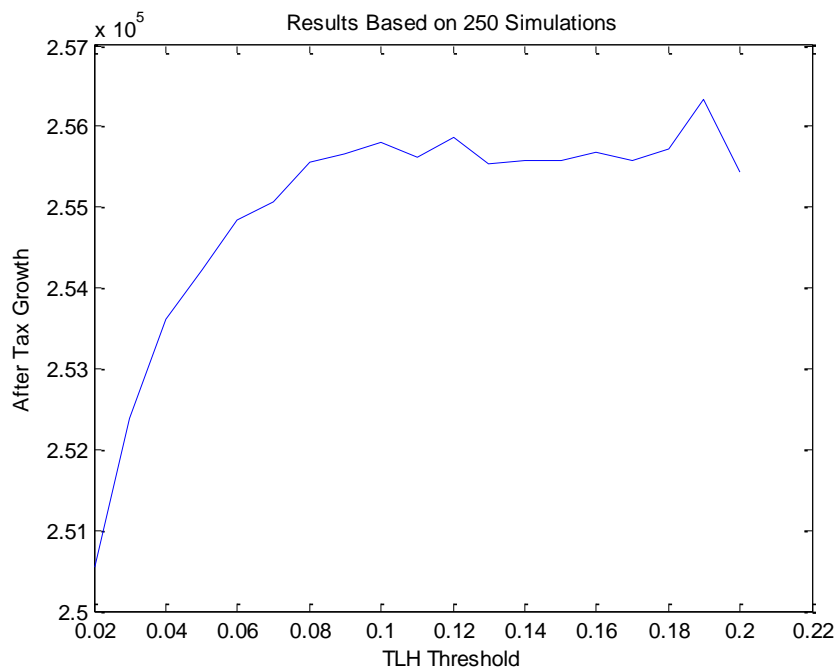
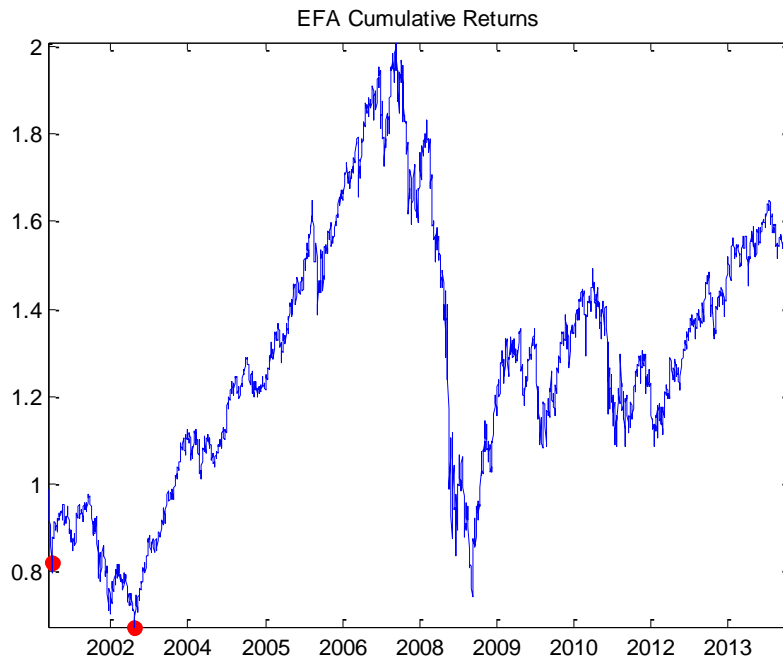
3. iShares 1-5 Year Laddered Corporate Bond Index ETF ('CBO')

	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



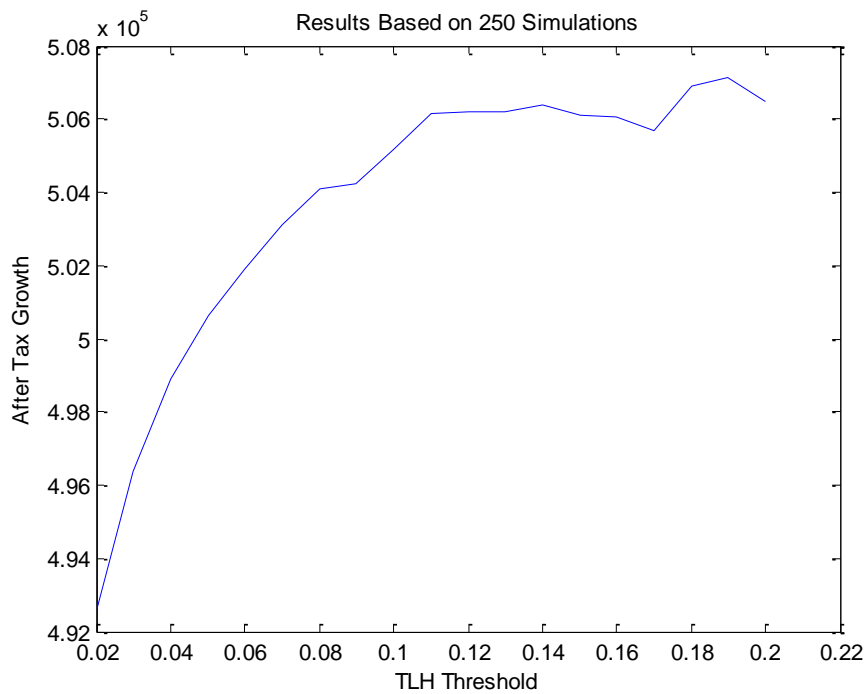
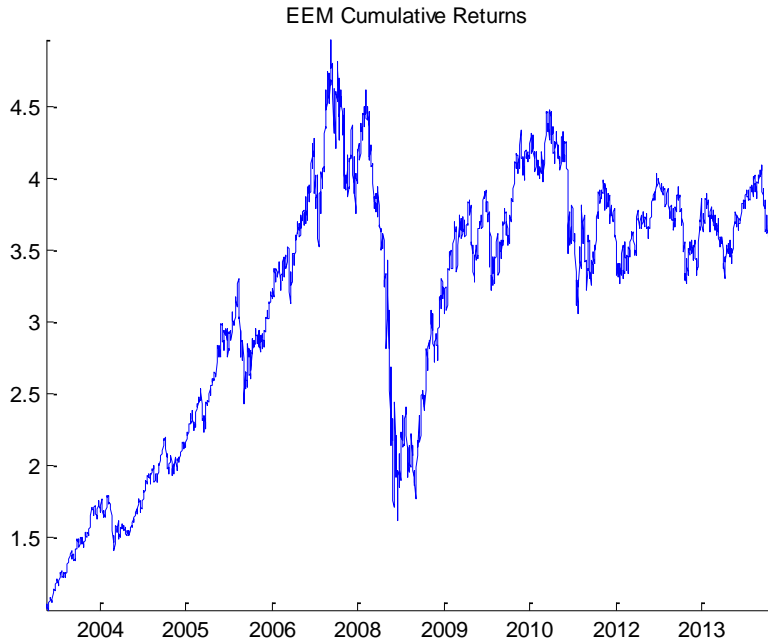
4. iShares MSCI EAFE ETF ('EFA')

	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



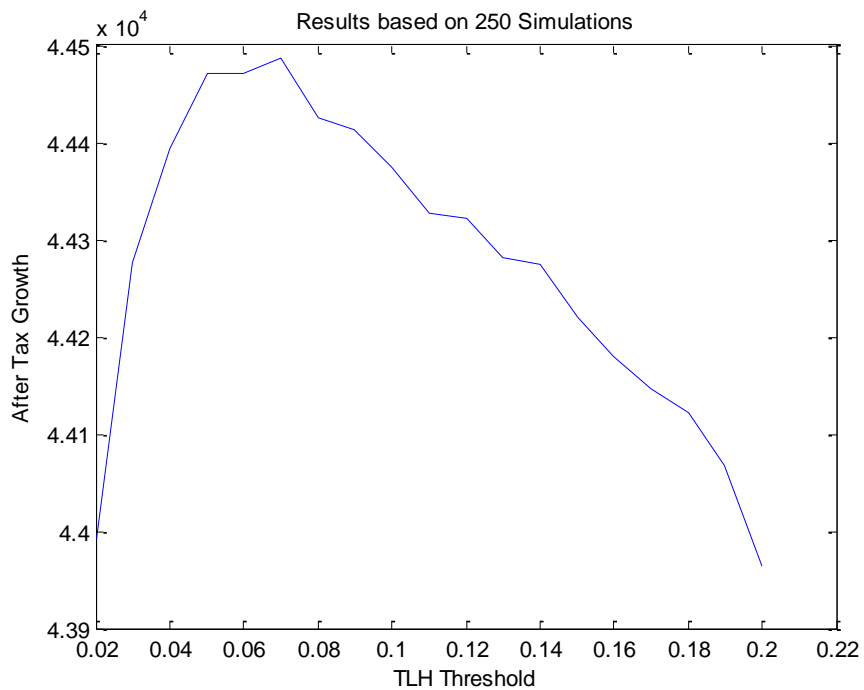
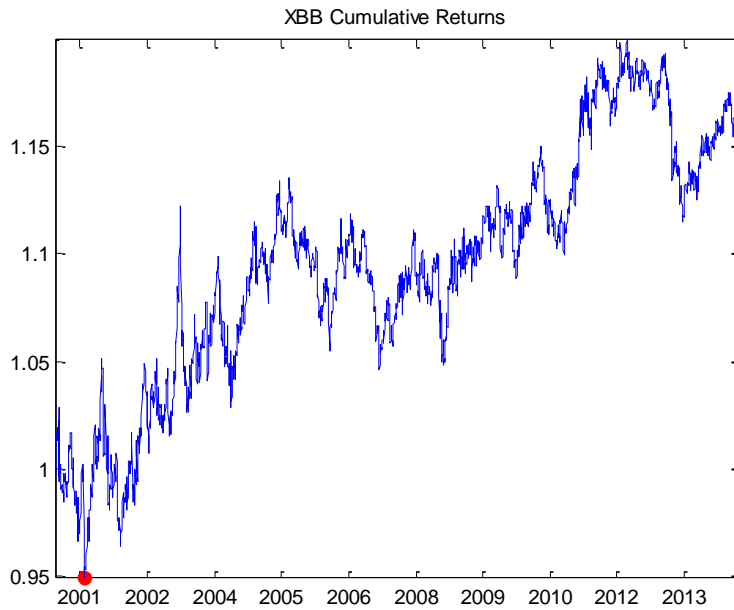
5. iShares MSCI Emerging Markets ETF ('EEM')

	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



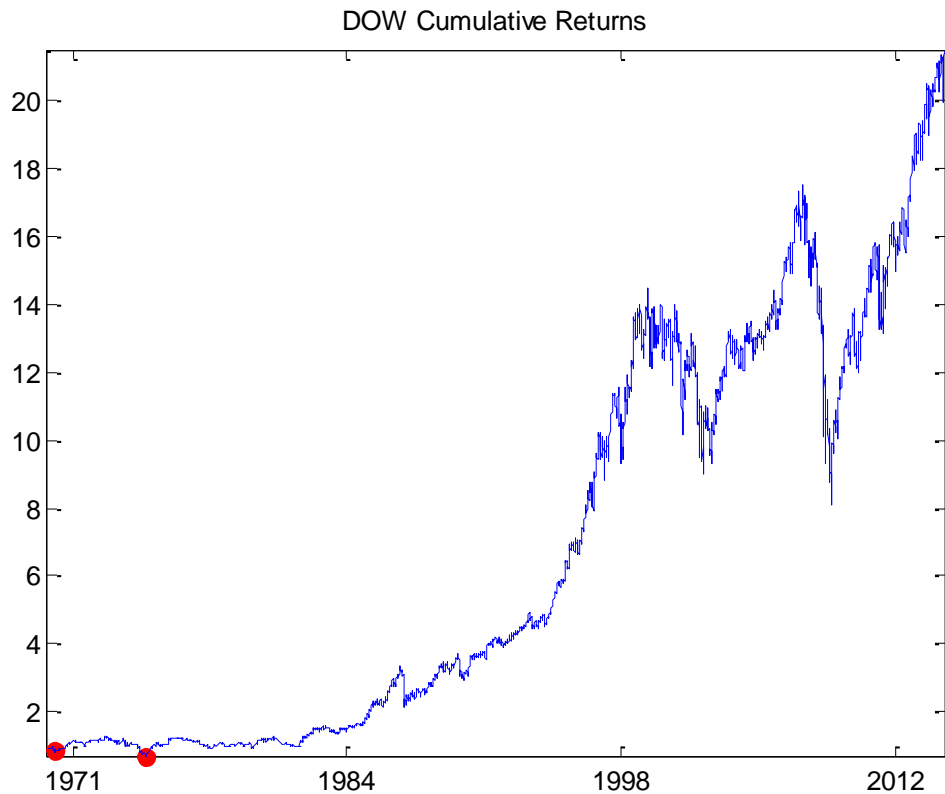
6. iShares Canadian Universe Bond Index ETF ('XBB')

	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

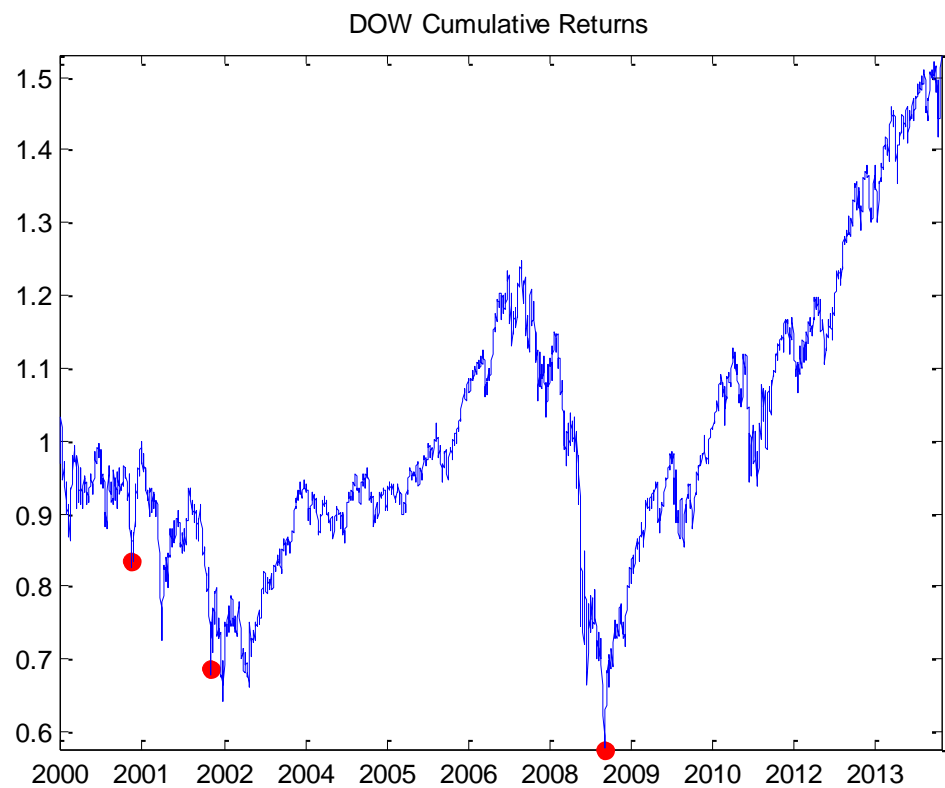
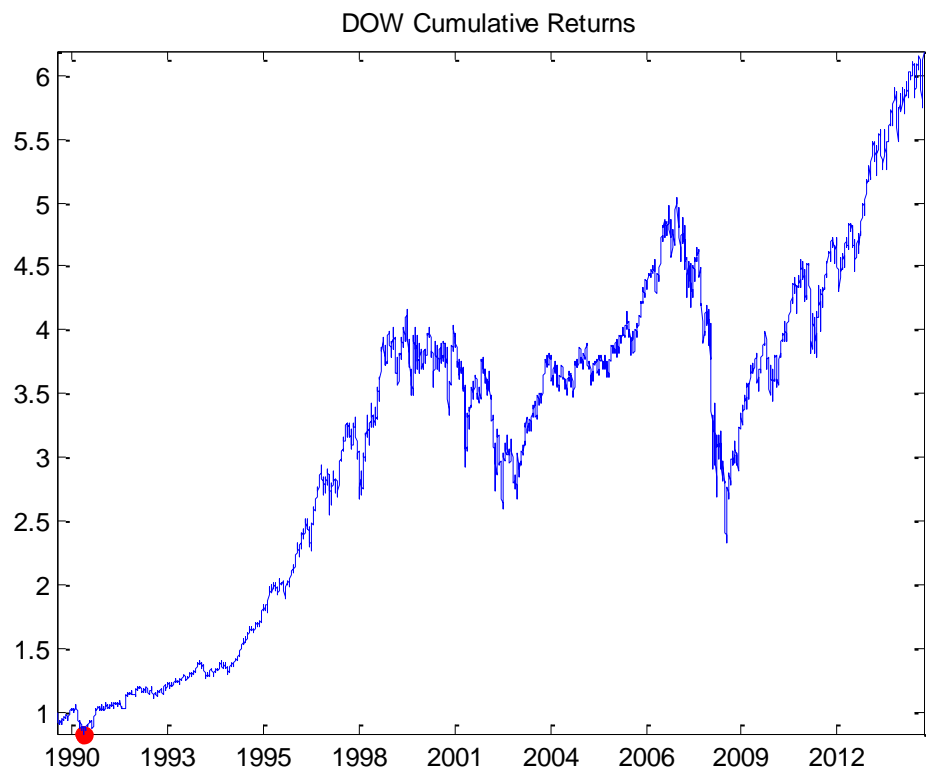


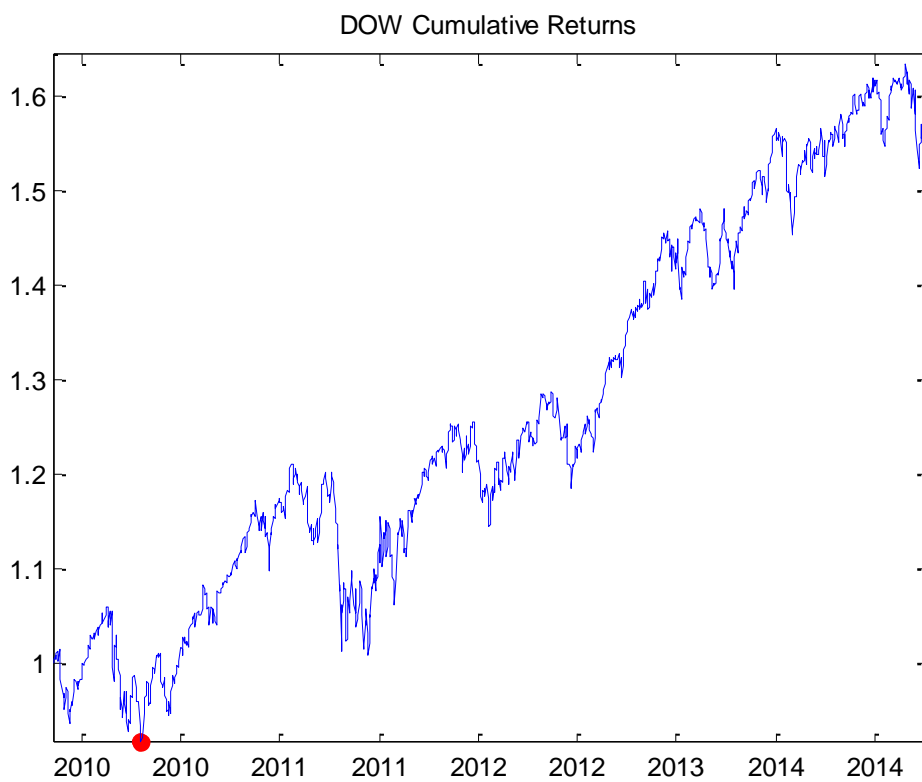
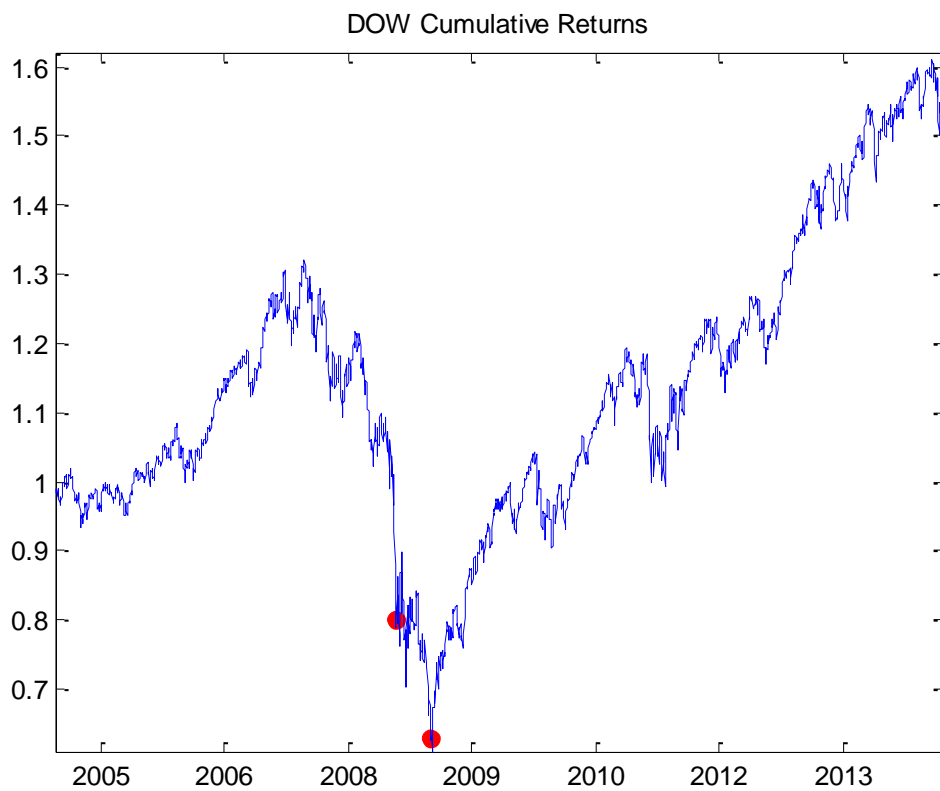
7. Dow-Jones Industrial Stock Price Index for United States

	Time Period	Optimal Threshold	After-tax Growth	After-tax Growth without TLH	Net Benefit
Historical (1970 – Present ¹)	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



¹ Present as of Oct/31st/2014.





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

