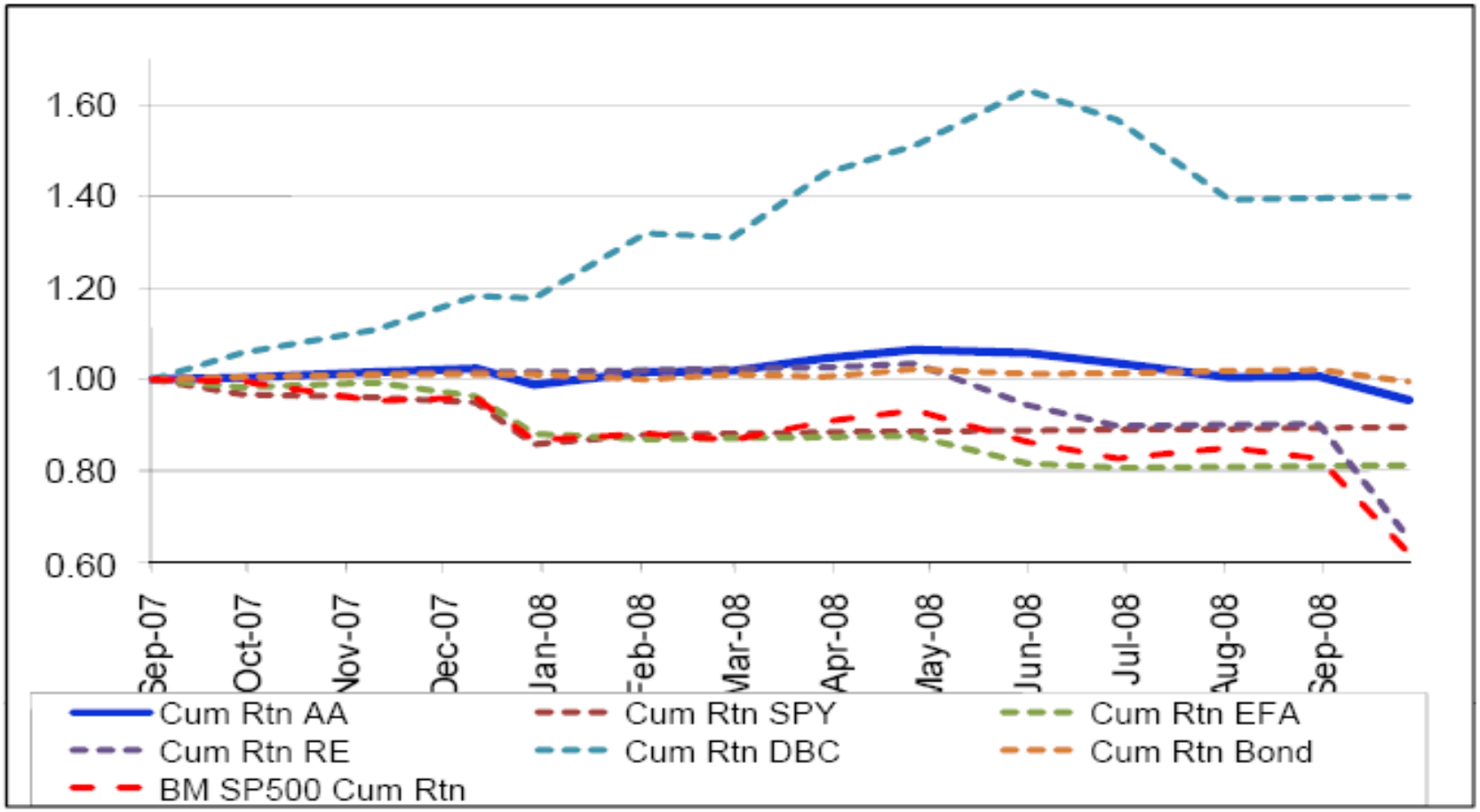
Quantitative Technical Asset Allocation

- Results Over the Last Year
- The Base Algorithm
- Why Does This Work?
- QTAA Updates, Studies, Enhancements
- Robustness of EMAs & Other Techniques
- Boosting Returns with Stock Selection
- Tying it All Together
- Q&A

QTAA:
Results Over the Last Year

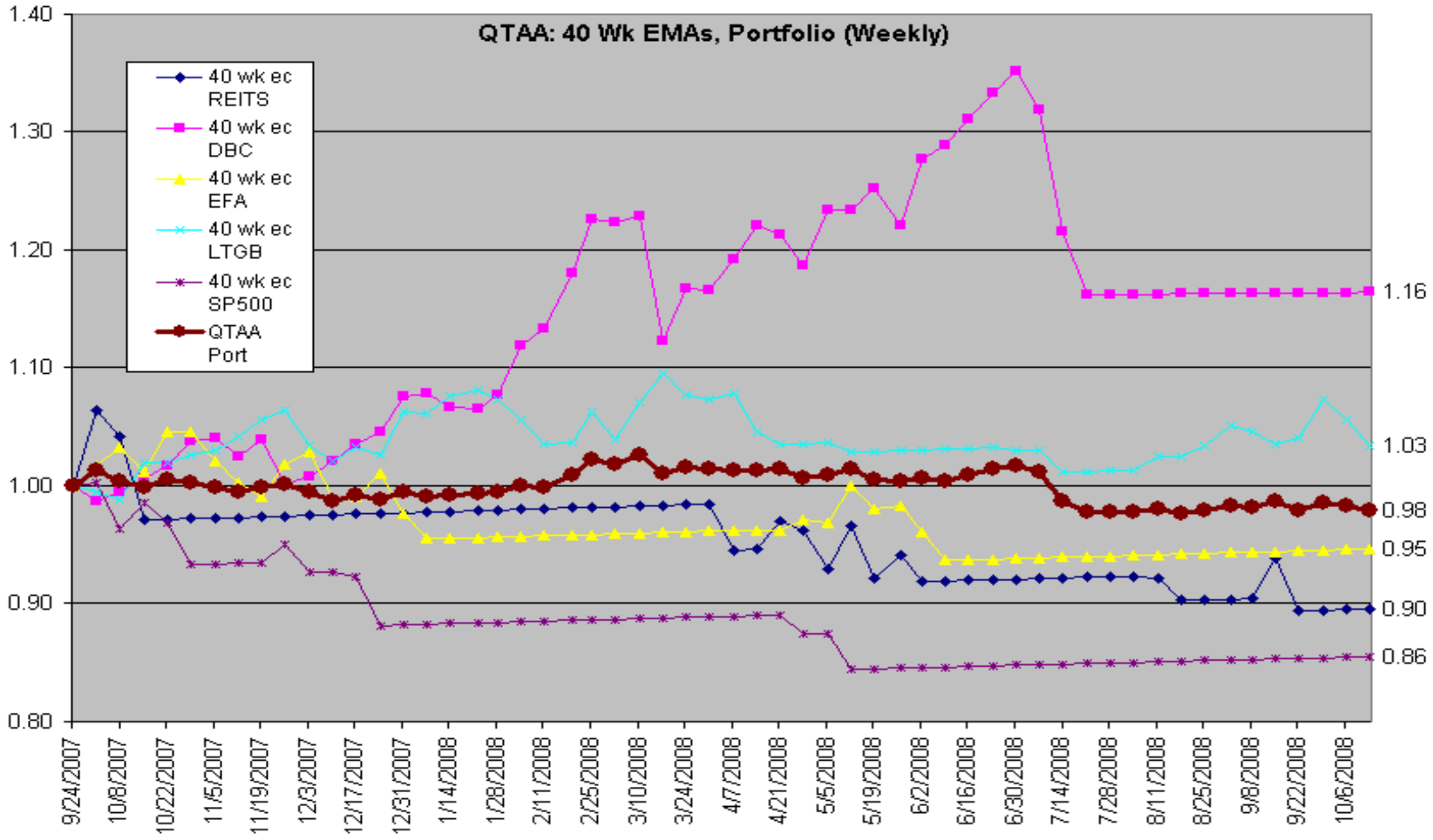
QTAA: Real World Results

Below is a real-time, real-money results of a modified QTAA algorithm being implemented on a monthly basis. It has lost 4.5% as of mid-October. Not great, but not bad for the worst market (by some metrics) in 30 years.



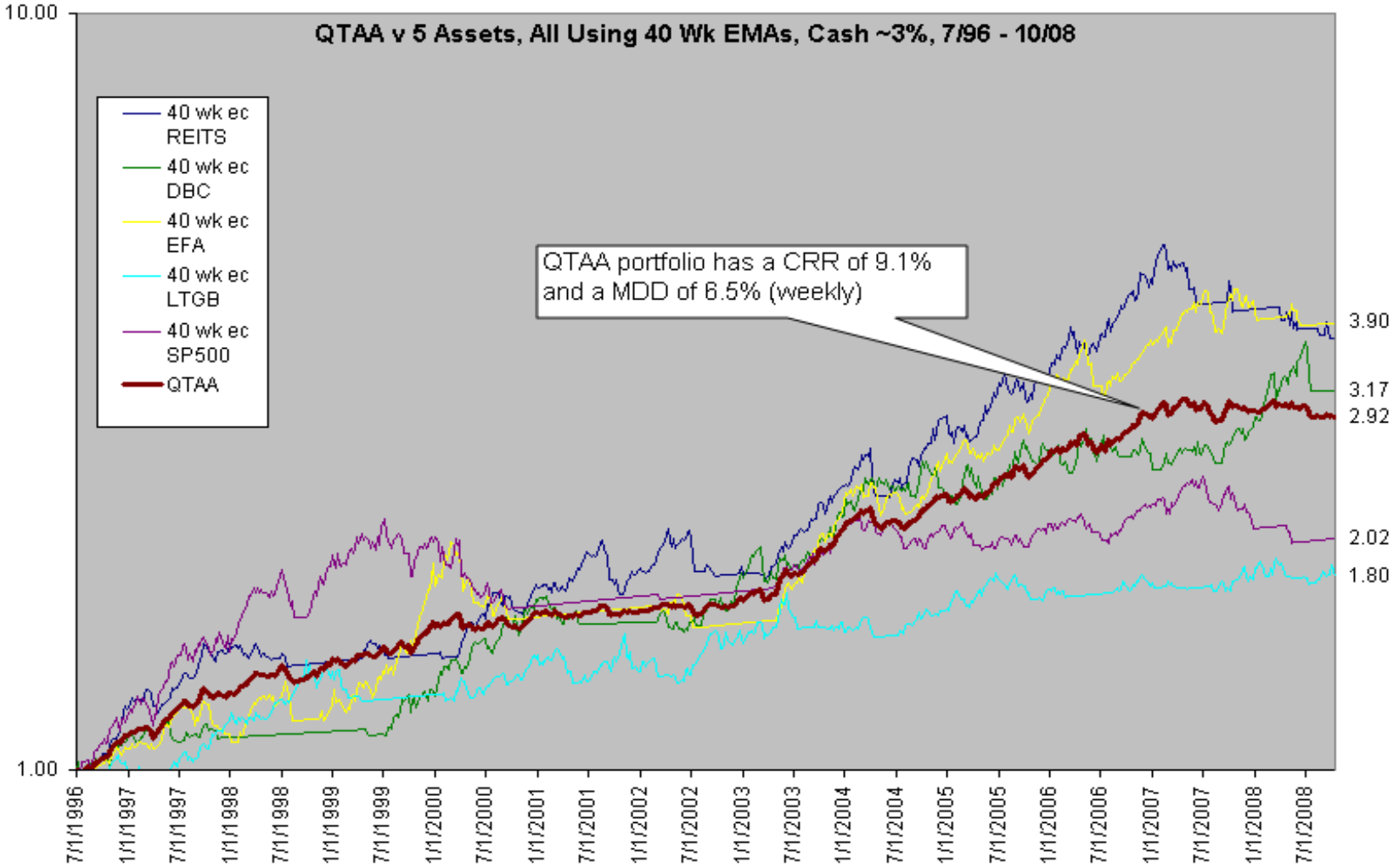
QTAA: Simulated (Weekly) Results

Below is the simulated result for a QTAA portfolio over a similar time period (9/M/07-10/M/08). This can easily be implemented with ETFs. ~5% MDD,



QTAA: Simulated Results from 7/96

Just to let you know that this approach provides reasonable risks/rewards…



QTAA: The Base Algorithm

AKA: The Faber Asset Allocation Scheme

(Portions adapted from an informal presentation by Michael Begley)

QTAA: Overview

There are three parts to this scheme:

- Allocate assets with equal weight to:
  - Large Cap Stocks (SPX)
  - Foreign-EAFE Stocks (EAFE)
  - Long Term Government Bonds (LTGB)
  - Real Estate Investment Trusts (REIT)
  - Commodity Index (DJAIG, SPGSCI)
- Market timing
  - Go long when an asset's index is above its 10 month simple moving average (SMA)
  - Go to cash when index drops below its 10 month SMA
- Cash: Commercial paper return

QTAA Results on the S&P 500

- Faber found the SMA timing robust across various values

S&P 500 vs. various moving average timing lengths.

	S&P 500	6 month	8 month	10 month	12 month	14 month
CAGR	9.75%	10.02%	10.60%	10.66%	**10.80%**	10.55%
Stdev	19.91%	**15.08%**	15.37%	15.37%	15.57%	15.81%
Sharpe	0.29	0.40	0.43	0.43	**0.44**	0.41
MaxDD	-83.66%	**-44.65%**	-56.09%	-49.98%	-47.74%	-51.35%
MAR	0.14	**0.25**	0.21	0.23	**0.25**	0.23
%TimeinMkt	100%	69.00%	70.00%	70.00%	71.00%	72.00%
UlcerIndex	20.33%	**11.55%**	13.35%	11.70%	11.76%	12.86%

- CAGR are similar, usually slightly better, than B&H
- Biggest benefit is low MaxDD and Ulcer Index (UI)
- Note:
  - All statistics are based on monthly time periods
  - Trading & ETF management costs were ignored in the study

QTAA Results Across Asset Classes

- These results carried over to other asset classes.

Asset class total returns vs. timing total returns, 1972-2005

	SP500	TIMING	EAFE	TIMING	10Yr Bond	TIMING	GSCI	TIMING	NAREIT	TIMING	
CAGR	11.24%	11.18%	11.34%	12.02%	8.35%	8.73%	12.03%	12.46%	10.60%	12.33%	
Stdev	17.47%	14.00%	22.19%	18.17%	11.24%	10.87%	24.58%	20.44%	20.21%	12.92%	
Sharpe	0.41	0.51	0.33	0.44	0.39	0.44	0.33	0.41	0.33	0.64	
MaxDD	(44.73%)	(23.26%)	(47.47%)	(23.23%)	(18.79%)	(11.18%)	(48.25%)	(37.98%)	(58.10%)	(16.42%)	
MAR	0.25	0.48	0.24	0.52	0.44	0.78	0.25	0.33	0.18	0.75	
UlcerIndex	12.85%	6.30%	15.00%	7.48%	4.13%	3.29%	16.64%	13.92%	13.93%	4.43%	
Best Year	37.58%	37.58%	69.94%	69.94%	44.28%	44.28%	74.96%	74.96%	48.97%	48.97%	
Worst Year	(26.47%)	(15.02%)	(23.20%)	(13.74%)	(7.51%)	(4.96%)	(35.75%)	(21.98%)	(42.23%)	(14.34%)	Averages
%TimeinMkt	-	75.79%	-	72.13%	-	77.26%	-	69.44%	-	74.02%	73.73%
RT Trades/Year	-	0.59	-	0.71	-	0.76	-	0.79	-	0.62	0.69
% + Trades	-	63.00%	-	56.00%	-	52.00%	-	44.00%	-	59.00%	54.80%
Avg win trade	-	25.35%	-	27.22%	-	17.96%	-	38.90%	-	30.02%	27.89%
Avg win trade length	-	19.20	-	16.53	-	20.92	-	20.27	-	20.46	19.48
Avg lose trade	-	(5.06%)	-	(5.17%)	-	(1.91%)	-	(3.67%)	-	(3.66%)	(3.90%)
Avg lose trade length	-	1.89	-	3.42	-	3.17	-	3.4	-	4.11	3.20

- Note
  - Trades per year averaged 0.69 across all asset classes
  - GSCI total return commodity index beat all other asset classes on both a buy and hold basis and on a timed basis

QTAA Results: Asset Allocation (AA) Portfolio

Asset allocation buy-and-hold vs. asset allocation timing, 1972-2005

	AA	TIMING		AA	TIMING
1972	21.92%	21.11%	1989	19.25%	18.15%
1973	1.03%	7.67%	1990	(1.10%)	4.92%
1974	(11.80%)	13.35%	1991	18.19%	6.33%
1975	20.16%	1.40%	1992	3.88%	4.73%
1976	15.04%	15.95%	1993	11.90%	12.81%
1977	8.24%	7.17%	1994	1.76%	2.49%
1978	13.65%	11.94%	1995	22.74%	21.72%
1979	17.89%	14.63%	1996	19.32%	19.26%
1980	18.95%	12.69%	1997	9.96%	9.94%
1981	(3.34%)	4.57%	1998	(0.49%)	7.44%
1982	21.34%	22.10%	1999	14.16%	13.12%
1983	17.97%	15.74%	2000	12.73%	13.76%
1984	9.43%	6.92%	2001	(9.74%)	3.10%
1985	26.58%	26.17%	2002	2.09%	3.33%
1986	25.50%	21.52%	2003	25.70%	20.52%
1987	8.53%	11.86%	2004	17.44%	15.08%
1988	18.46%	11.83%	2005	11.74%	8.21%

	AA	TIMING	S&P 500	10Yr Bond
CAGR	11.57%	11.92%	11.24%	8.35%
Stdev	10.04%	6.61%	17.47%	11.24%
Sharpe	0.75	1.20	0.41	0.39
MaxDD	(19.62%)	(9.51%)	(44.73%)	(18.79%)
MAR	0.59	1.25	0.25	0.44
UlcerIndex	4.04%	1.70%	12.85%	4.13%
Best Year	26.58%	26.17%	37.58%	44.28%
Worst Year	(11.80%)	1.40%	(26.47%)	(7.51%)

Comparison of asset allocation with and without timing.

Note there were no losing years.

Performance of the timed portfolio is only slightly better but MaxDD and UI are less than ½ the untimed portfolio

QTAA: Why Does This Work?

QTAA: Volatility & Returns

In 2 sentences: "Avoiding periods when volatility is high dramatically reduces downside risk/losses. Even the simplest trend detection methods provide this benefit."

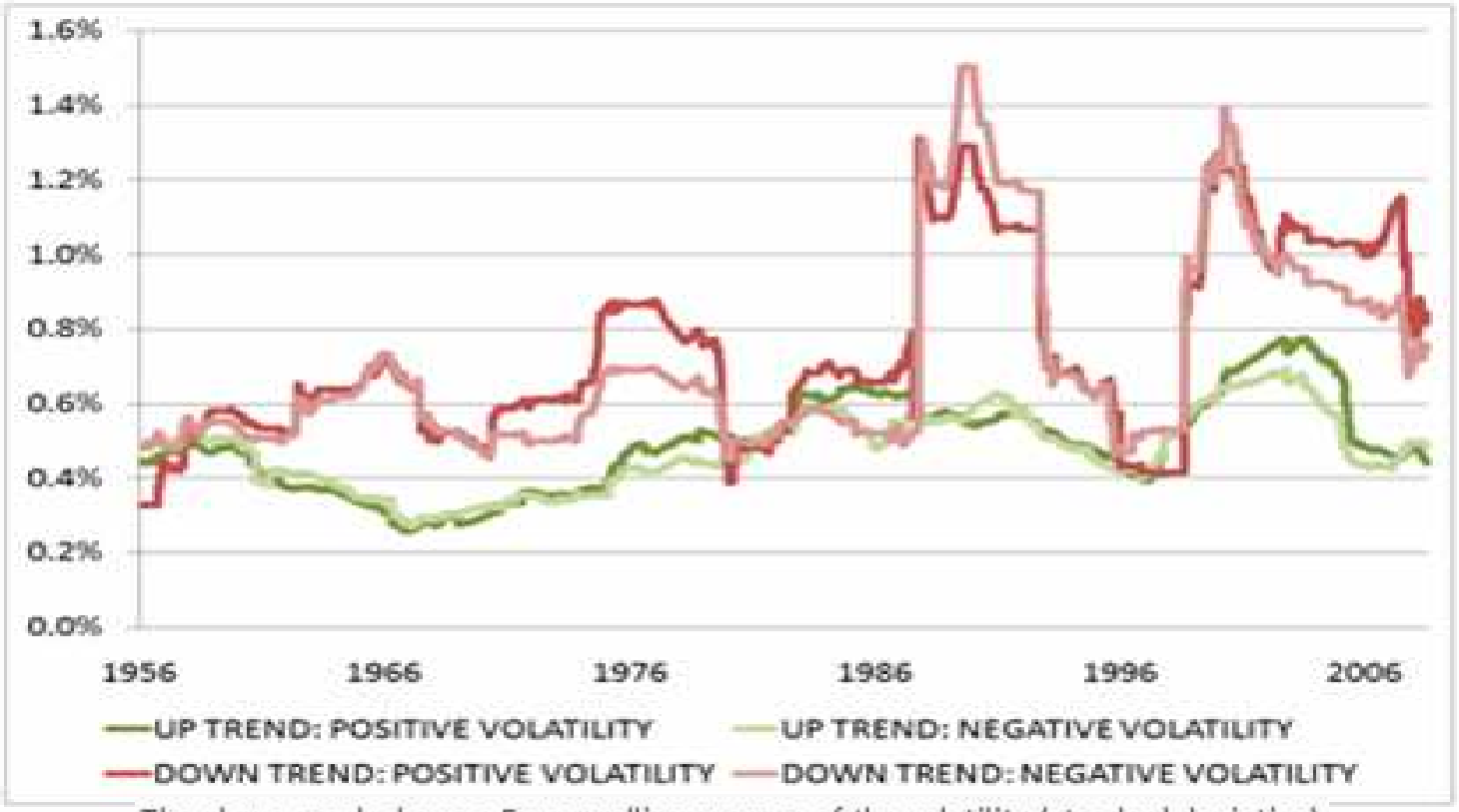
DJIA 7/1929-8/2008	Above 200 Day SMA	Below 200 Day SMA
Average Return	0.04%	0.00%
Median Return	0.05%	0.00%
Volatility	0.87%	1.50%
Days < -2.5%	30.49%	69.51%
Days > 2.5%	26.04%	73.96%

Key points from the above chart:

- Market returns are (on average) much higher in an up trend
- Volatility (on average) is much higher in a down trend (above numbers annualize to 13.8% and 23.8%, respectively)

The largest moves in both directions tend to occur when the market is in a down trend

QTAA: Volatility Clustering



The above graph shows a 5-year rolling average of the volatility (standard deviation) of daily returns during uptrends (green) versus downtrends (red) from 1956 to the present on the S&P 500. I've defined up/down trends as whether or not the S&P 500 is above/below its 200-day moving average.

These rolling averages have been further divided into positive (dark) and negative (light) volatility. By positive/negative volatility I mean the volatility of up days versus down day returns in each period.

Volatility & Returns Across Asset Classes

S&P500 1900-2007	Market > 10m SMA	Market < 10m SMA
Number of months	908 (67%)	380
Average Return	1.13%	0.38%
Median Return	1.31%	0.37%
Volatility	4.12%	6.98%

GSCI 1972-2007	Market > 10m SMA	Market < 10m SMA
Number of months	292 (68%)	140
Average Return	1.36%	0.50%
Median Return	1.15%	0.28%
Volatility	5.80%	4.90%

EAFE 1972-2007	Market > 10m SMA	Market < 10m SMA
Number of months	313 (72%)	119
Average Return	1.24%	0.52%
Median Return	1.44%	0.60%
Volatility	4.23%	5.92%

NAREIT 1972-2007	Market > 10m SMA	Market < 10m SMA
Number of months	321 (74%)	111
Average Return	1.19%	0.13%
Median Return	1.31%	0.34%
Volatility	3.80%	5.92%

10yr 1972-2007	Market > 10m SMA	Market < 10m SMA
Number of months	328 (76%)	105
Average Return	0.75%	0.52%
Median Return	0.69%	0.09%
Volatility	2.45%	2.91%

AVG 5 mkts 1972-2007	Market > 10m SMA	Market < 10m SMA
Number of months	316 (73%)	116
Average Return	1.12%	0.47%
Median Return	1.19%	0.36%
Volatility	4.04%	5.00%

- 4 of 5 asset classes make most of their gains, are less volatile, when above their 200d SMA
  - Note GSCI/commodities are **MORE** volatile in an uptrend
- All asset classes spend ~70% of their time above the 200d SMA

The worst (and best) days tend to occur when asset classes are below their 200d SMAs

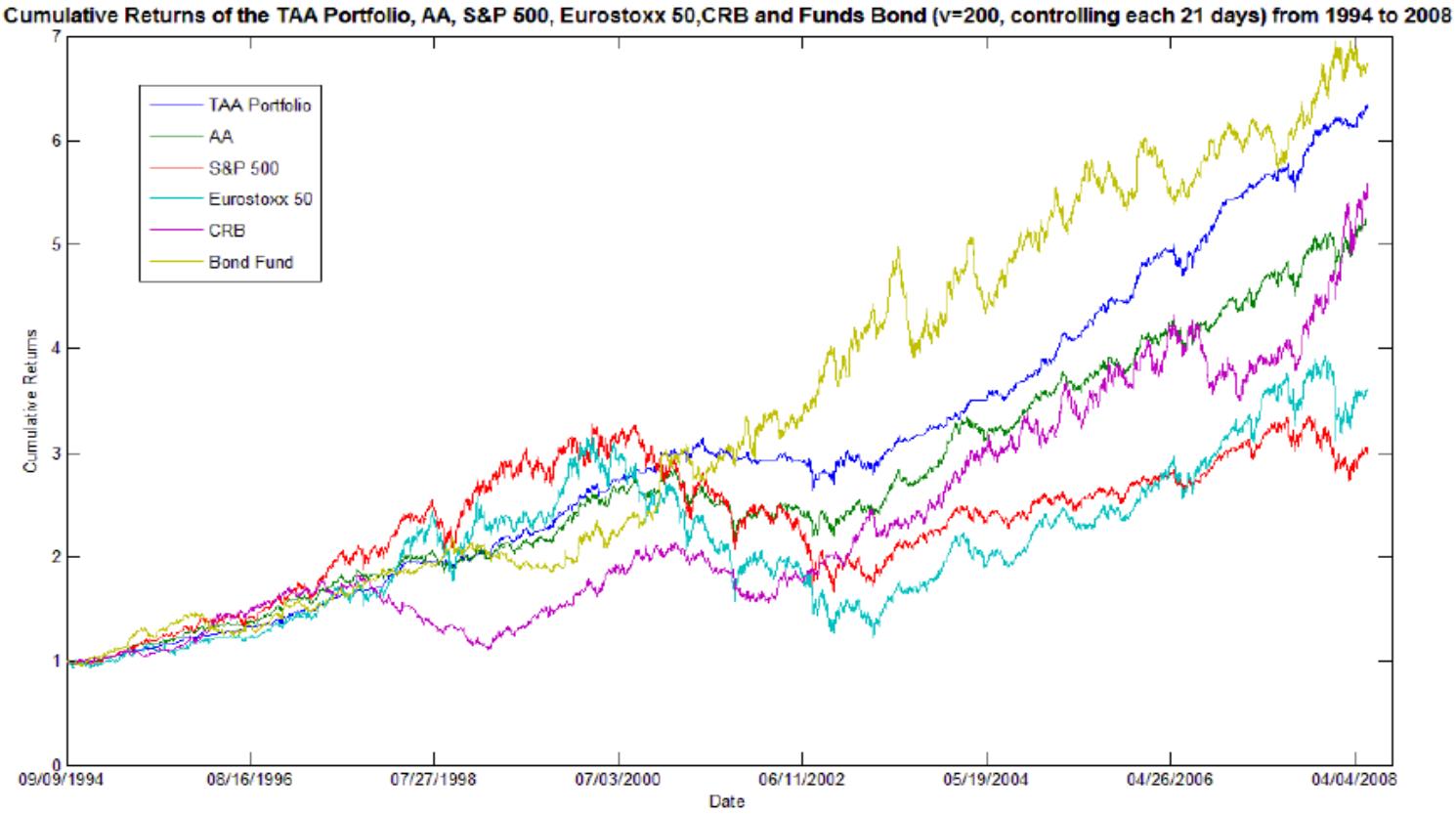
QTAA: Updates, Studies, Enhancements to the Base Algorithm

- 21 Different Daily Portfolios
- The 5 & 10 ETF Portfolio
- Asset Class Rotation

QTAA: 21 Daily Portfolios

- One study, **Technical Asset Allocation Using Daily Data**, studies the impact of starting a QTAA portfolio on all possible days (21 days = 1 month)
- They start with repeating Faber's study as a baseline:

Figure 1: Comparison among Portfolio and the other assets



The authors then calculate performance and risk metrics for the base case

Table II: Performance of the Portfolio and the different assets

PERFORMANCE STATISTICS*	TAA Port	AA	S&P500	BondF	CRB	Eurostoxx50
Total Cumulative Return	529.52%	423.53%	198.30%	574.07%	459.77%	258.21%
Annualized Rate of Return	14.21%	12.70%	8.21%	14.77%	13.24%	9.65%
Average Daily Return	0.05%	0.05%	0.04%	0.06%	0.05%	0.04%
Median Daily Return	0.02%	0.06%	0.04%	0.03%	0.04%	0.06%
Best Day	3.78%	3.83%	5.73%	13.52%	4.65%	7.60%
Worst Day	-2.37%	-2.59%	-6.87%	-4.15%	-5.24%	-8.23%
% of Positive Days	61.78%	54.56%	53.60%	53.65%	53.31%	53.14%
Average Daily Gain	0.27%	0.46%	0.74%	0.63%	0.70%	0.93%
% of Negative Days	38.22%	45.44%	46.40%	46.35%	46.69%	46.86%
Average Daily Loss	-0.30%	-0.44%	-0.77%	-0.60%	-0.68%	-0.96%

Sortino: Sharpe w/Downside Deviations

Omega: Probability weighted gain vs. loss (Profit Factor)

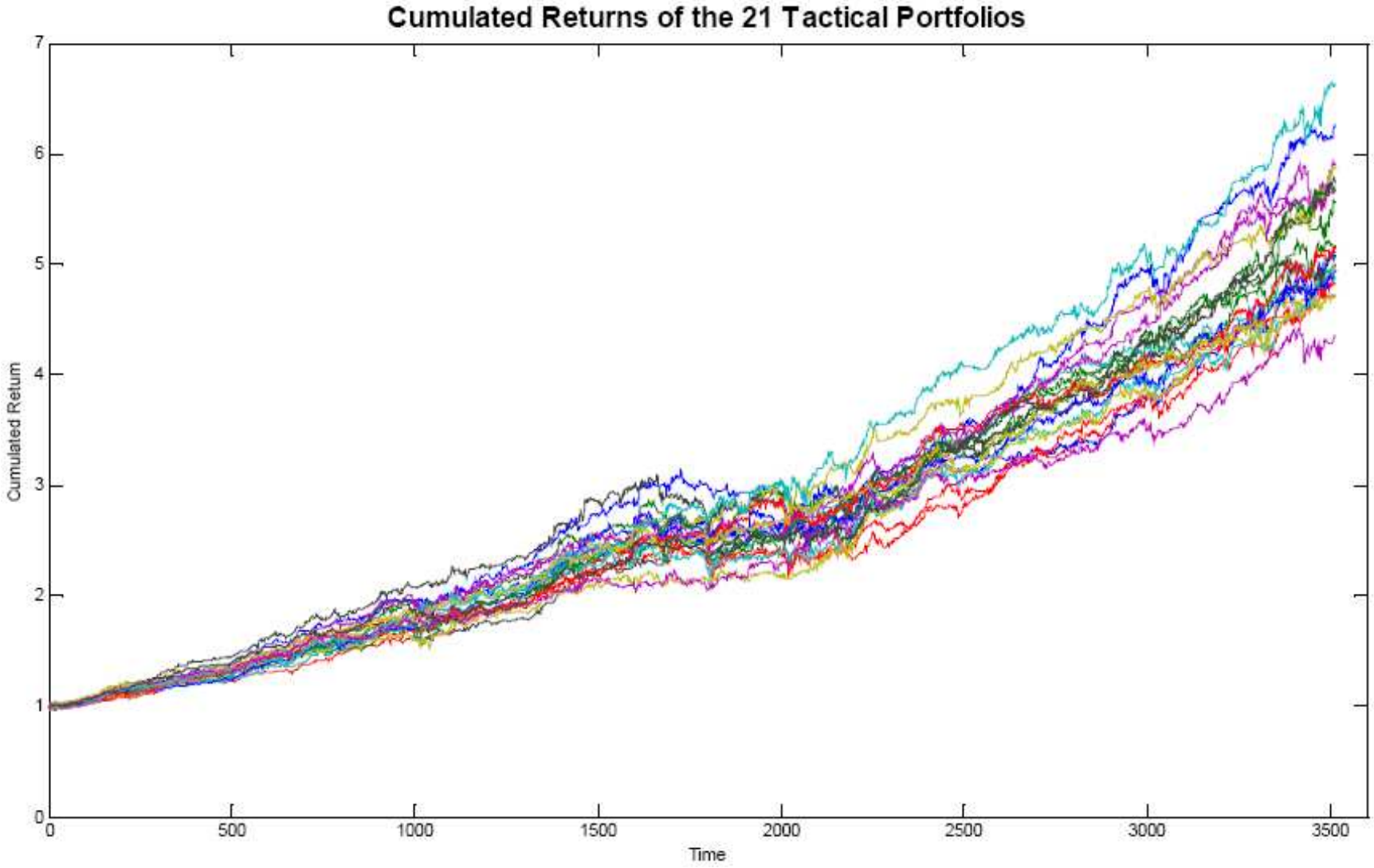
RISK STATISTICS	TAA port	AA	S&P500	BondF	CRB	Eurostoxx50
Maximum Drawdown (MDD)	-15.78%	-22.89%	-49.15%	-21.69%	-38.67%	-61.16%
Duration of the MDD (in days)	303	165	656	873	347	778
Time to Recovery (in days)	229	445	1195	978	320	951
Annualized Standard Deviation	6.74%	9.57%	16.98%	14.26%	14.46%	21.09%
Annualized Downside Deviation	6.53%	9.62%	17.02%	12.97%	14.27%	21.27%
Daily Modified VaR α=5%	-0.53%	-0.92%	-1.65%	-0.37%	-1.45%	-2.05%

RISK ADJUSTED PERFORMANCE	TAA port	AA	S&P500	BondF	CRB	Eurostoxx50
Sharpe Ratio	1.66	1.01	0.31	0.83	0.71	0.32
Sortino Ratio	1.72	1.01	0.31	0.91	0.72	0.31
Omega Ratio	1.44	1.23	1.09	1.19	1.16	1.09
Calmar Ratio	0.90	0.55	0.17	0.68	0.34	0.16

* The period goes from 12-Sep-1994 to 21-May-2008
MAR=3% annual

QTAA: The 21 Possible Portfolios

Figure 5: The 21 different TAA portfolios



The authors then calculate performance and risk metrics for the 21 cases

Summary

- Relatively robust

- Base case probably benefits from end of month effects

Table VI: The performance of the 21 TAA portfolios

	PERFORMANCE STATISTICS*			
	Average	Standard Dev.	Minimum (1)	Maximum (1)
Total Cumulative Return	529.55%	56.70%	435.85%	663.06%
Annualized Rate of Return	12.83%	0.860%	11.28%	14.72%
Average Daily Return	0.05%	0.003%	0.04%	0.05%
Median Daily Return	0.02%	0.004%	0.02%	0.03%
Best Day	3.28%	0.43%	2.45%	3.88%
Worst Day	-2.24%	0.19%	-2.59%	-1.81%
% of Positive Days	60.89%	1.14%	59.25%	63.44%
Average Daily Gain	0.27%	0.013%	0.25%	0.29%
% of Negative Days	39.11%	1.14%	36.56%	40.75%
Average Daily Loss	-0.29%	0.013%	-0.32%	-0.26%

	RISK STATISTICS			
	Average	Standard Dev.	Minimum (1)	Maximum (1)
Maximum Drawdown	-11.67%	2.97%	-16.76%	-7.35%
Annualized Standard Deviation	6.45%	0.32%	5.65%	6.92%
Annualized Downside Deviation	6.44%	0.32%	5.70%	7.02%
Daily Modified VaR α=-5%	-0.56%	0.03%	-0.63%	-0.51%

	RISK ADJUSTED PERFORMANCE			
	Average	Standard Dev.	Minimum (1)	Maximum (1)
Sharpe Ratio	1.52	0.13	1.32	1.74
Sortino Ratio	1.53	0.15	1.32	1.78
Omega Ratio	1.40	0.03	1.35	1.45
Calmar Ratio	1.17	0.32	0.75	1.93

* The whole period goes from 1994 to 2008

MAR=3% annual

(1) Maximum and minimum respect to the 21 portfolios

QTAA: The 5 & 10 ETF Portfolio

A simple 5 asset class allocation with ETFs could be:

Domestic Stocks	20%	VTI
Foreign Stocks	20	VEU
Bonds	20	BND
Real Estate	20	VNQ
Commodities	20	DBC

A simple 10 asset class allocation with ETFs could be:

Domestic Large Cap	10%	VTI
Domestic Small Cap	10	VB
Foreign Developed Stocks	10	VEU
Foreign Emerging Stocks	10	VWO
Domestic Bonds	10	BND
TIPS	10	TIP
Real Estate	10	VNQ
Foreign Real Estate	10	RWX
Commodities	10	DBC
Commodities	10	GSG

Since VB and VWO are very volatile they can give "unusual" results and may need special handling. Careful!

ETFs tracking 2 different indices. You may be better off creating your own index from constituent ETFs – e.g., optimizing for minimum Std. Dev.

QTAA: Asset Class Rotation

The system uses the same five asset classes as before - US Stocks, Foreign Stocks, US Bonds, REITs, and Commodities.

Each month, the 3, 6, and 12 month total returns are recorded for each asset class (and then averaged for the combo). The actual time frame selected does not matter much as the 3, 6, and 12 month time frames all produce similar results. I prefer using all three (combo) because it picks the asset classes that are outperforming in numerous time frames.

The investor then simply invests in the top X asset classes for the following month. For example, at the end of 2007 the order of returns from best to worst was Commodities, Foreign Stocks, Bonds, US Stocks, and Real Estate. The portfolio for the next month (January) in 2008 would be in that same order.

Below we show the results of taking the top one, two, and three asset classes, updated monthly, based on the rolling 3,6, and 12-month total returns. (Top 1 means you just take the top asset class each month. Top 2 means you select the top two asset classes each month and put 50% of the portfolio in each, Top 3 is the top three assets with 33% in each, etc).

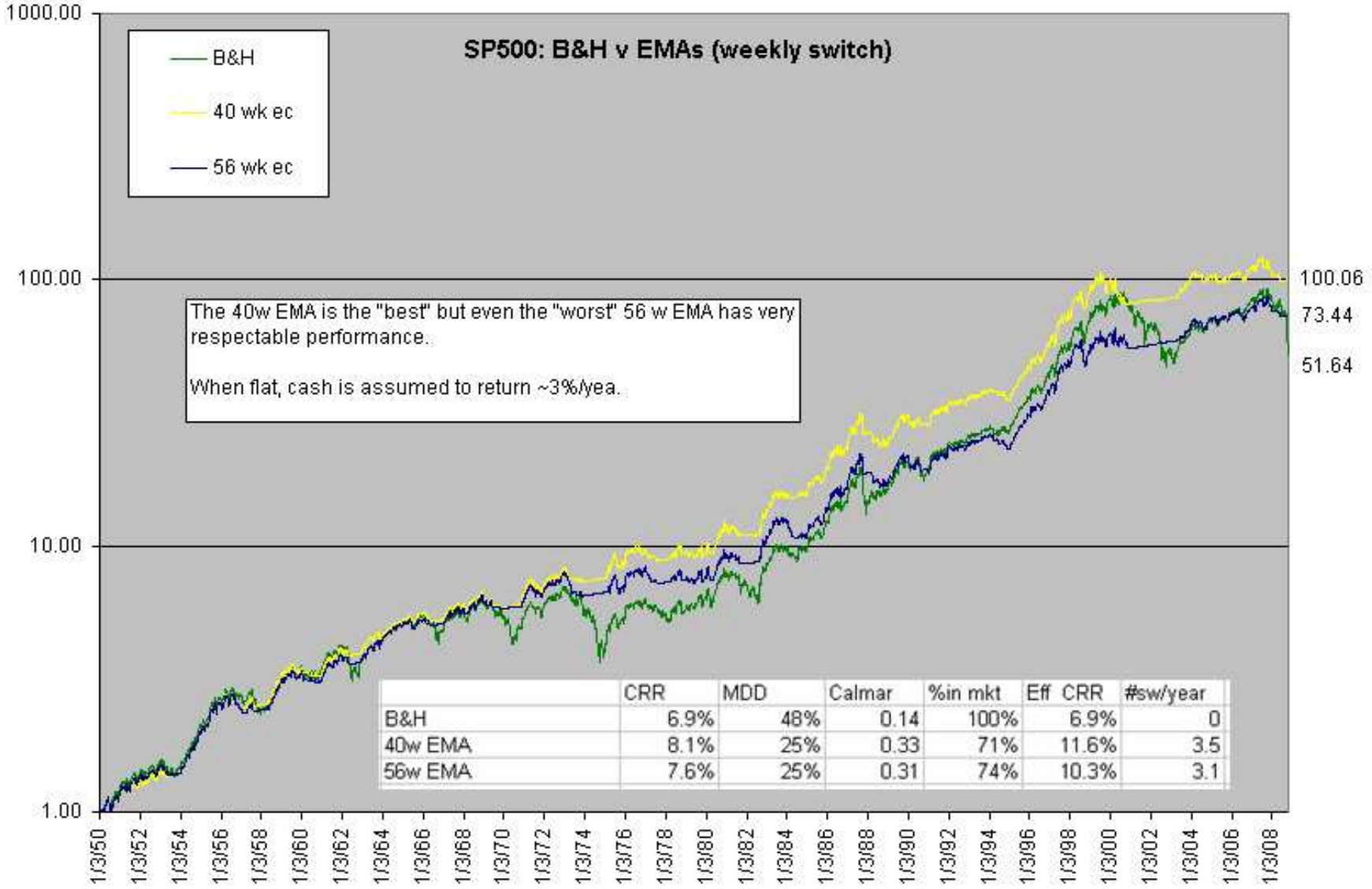
1973-2007	B&H	3month			6month			12month			Combo		
		Top1	Top2	Top3	top1	top2	top3	top1	top2	top3	top1	top2	top3
CAGR	11.20%	14.65%	13.83%	14.06%	14.58%	17.09%	13.96%	16.90%	16.14%	14.59%	17.61%	17.23%	15.27%
VOL	8.93%	18.05%	12.29%	10.04%	18.08%	11.85%	9.96%	18.06%	12.24%	10.19%	18.27%	12.02%	10.17%
TBILLS	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%	6.57%
Sharpe	0.52	0.45	0.59	0.75	0.44	0.89	0.74	0.57	0.78	0.79	0.60	0.89	0.85
Max DD	-19.62%	-27.03%	-20.16%	-18.34%	-39.91%	-15.18%	-14.80%	-45.62%	-26.78%	-14.50%	-33.90%	-19.31%	-13.16%

QTAA: Robustness of EMAs, Other Techniques

Robustness of EMAs, Other Techniques

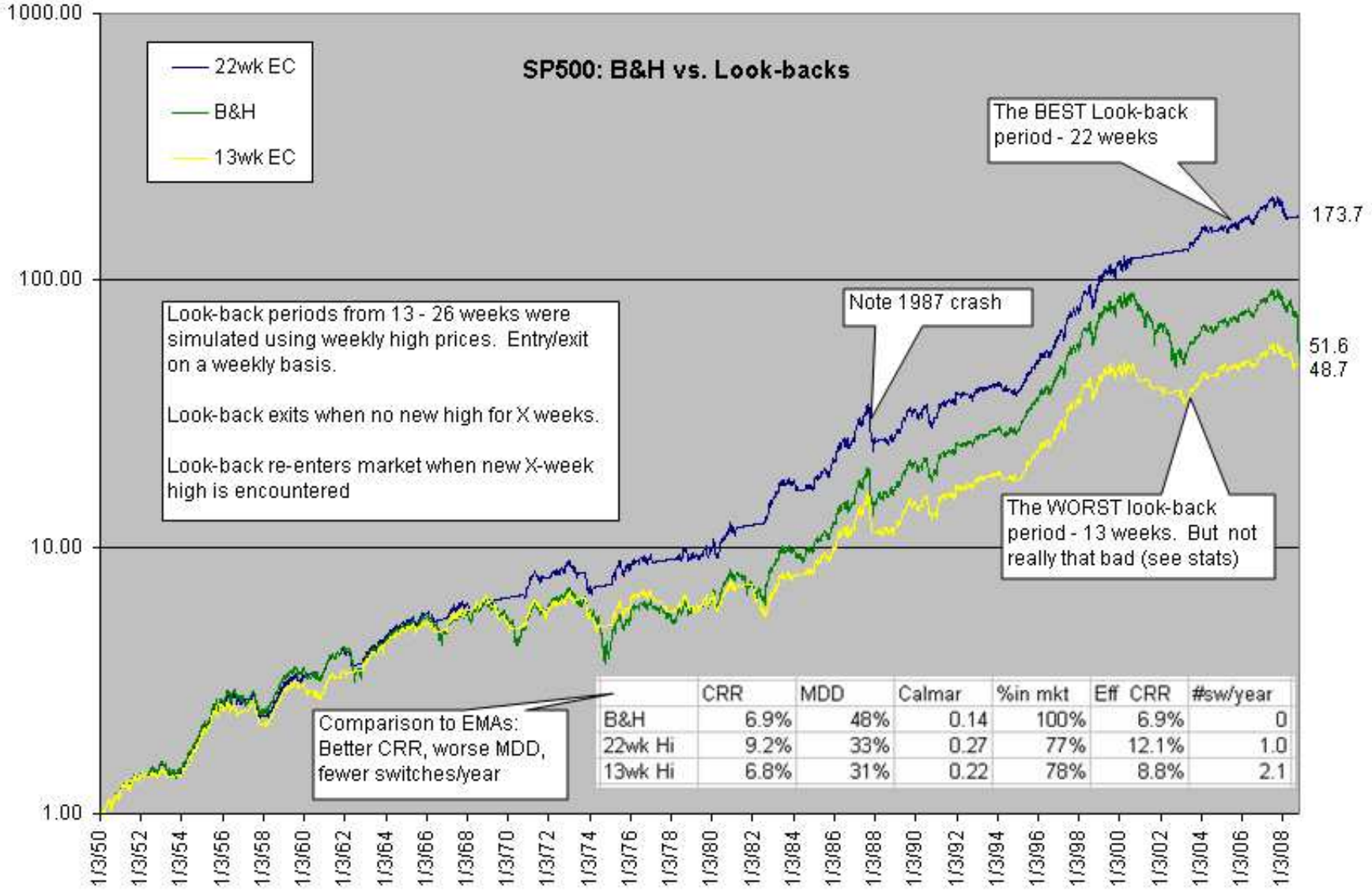
- Faber claims that 6-14 month SMAs work reasonably well
  - Faber uses the 10 mo/40 week/200 day SMA – is he cherry picking?
- Do other simple trend detection methods work as well?
- To investigate this, the following items were examined for the five asset classes:
  - The best and worst case EMA values (I prefer EMAs to SMAs)
  - The best and worst case look-back periods
    - Look-back: Stay long for x-weeks after a new high is set
  - The impact of monthly vs. weekly timing
  - The impact of voting and scoring schemes
- Following slides provide detailed look at the SP500, summary on the other asset classes

B&H vs. EMAs on the SP500



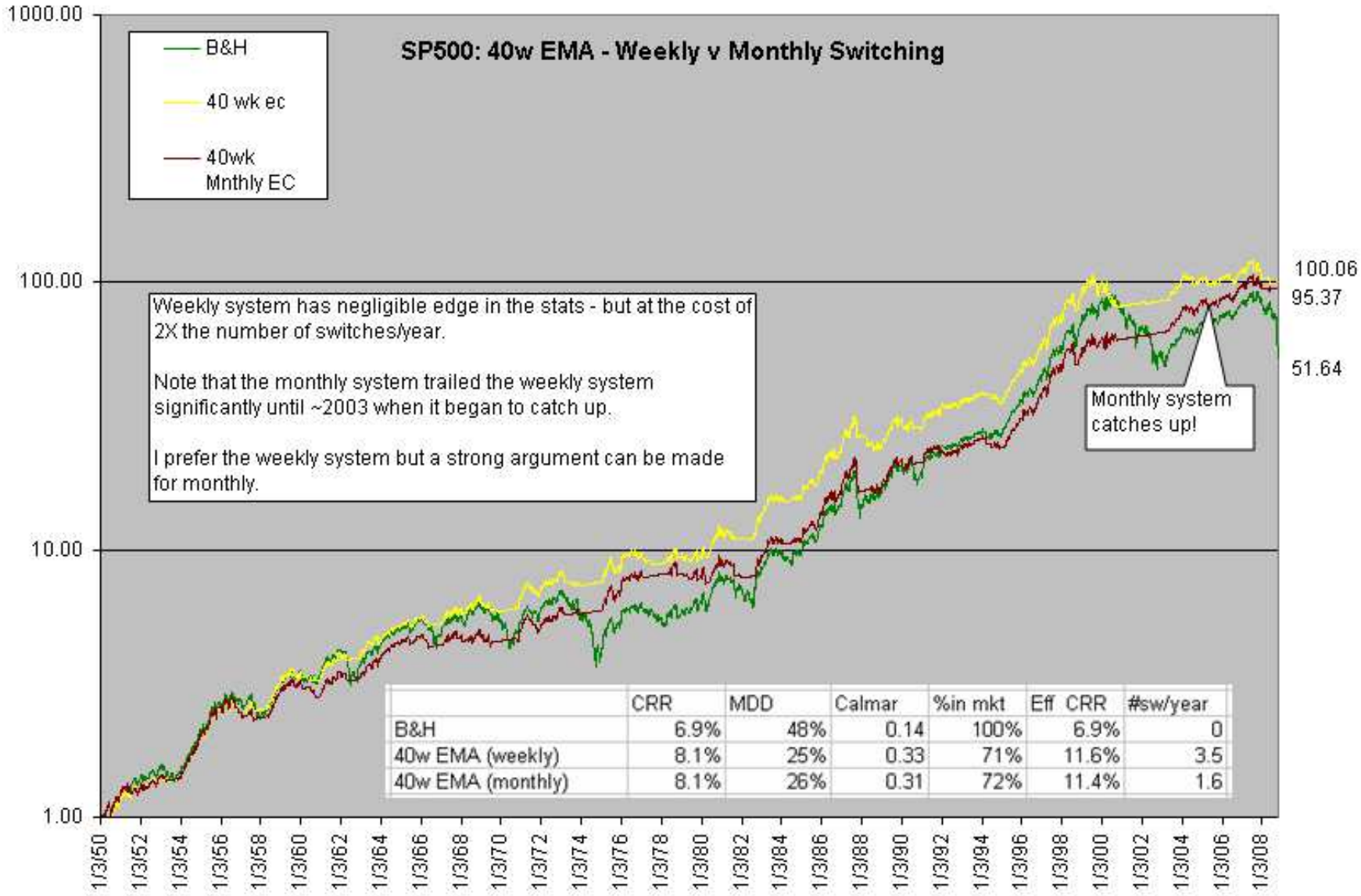
	CRR	MDD	Calmar	%in mkt	Eff CRR	#sw/year
B&H	6.9%	48%	0.14	100%	6.9%	0
40w EMA	8.1%	25%	0.33	71%	11.6%	3.5
56w EMA	7.6%	25%	0.31	74%	10.3%	3.1

B&H vs. Look-back on the SP500



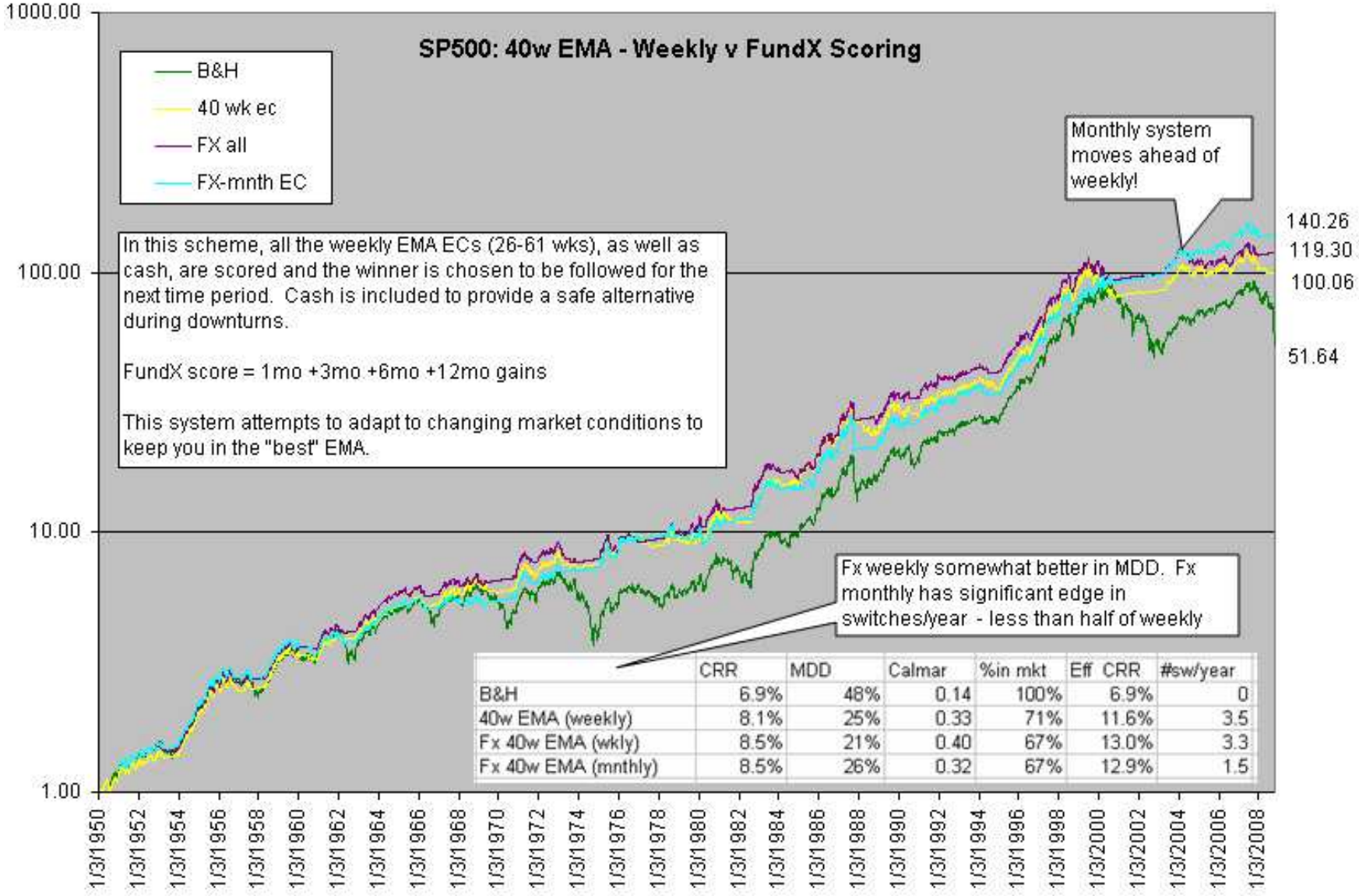
	CRR	MDD	Calmar	%in mkt	Eff CRR	#sw/year
B&H	6.9%	48%	0.14	100%	6.9%	0
22wk Hi	9.2%	33%	0.27	77%	12.1%	1.0
13wk Hi	6.8%	31%	0.22	78%	8.8%	2.1

Weekly vs. Monthly 40w EMA on the SP500



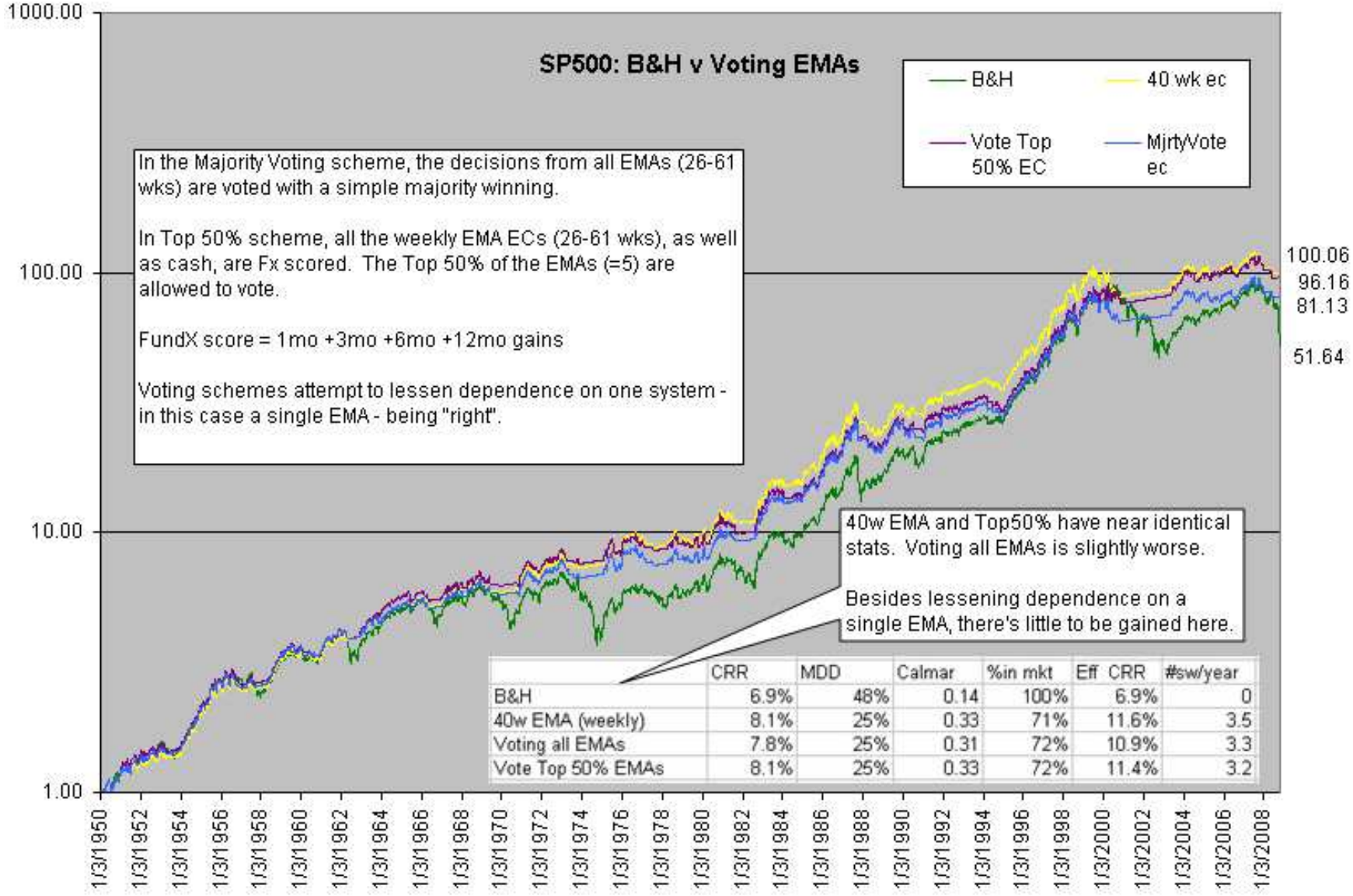
	CRR	MDD	Calmar	%in mkt	Eff CRR	#sw/year
B&H	6.9%	48%	0.14	100%	6.9%	0
40w EMA (weekly)	8.1%	25%	0.33	71%	11.6%	3.5
40w EMA (monthly)	8.1%	26%	0.31	72%	11.4%	1.6

FundX Scoring of EMAs on the SP500



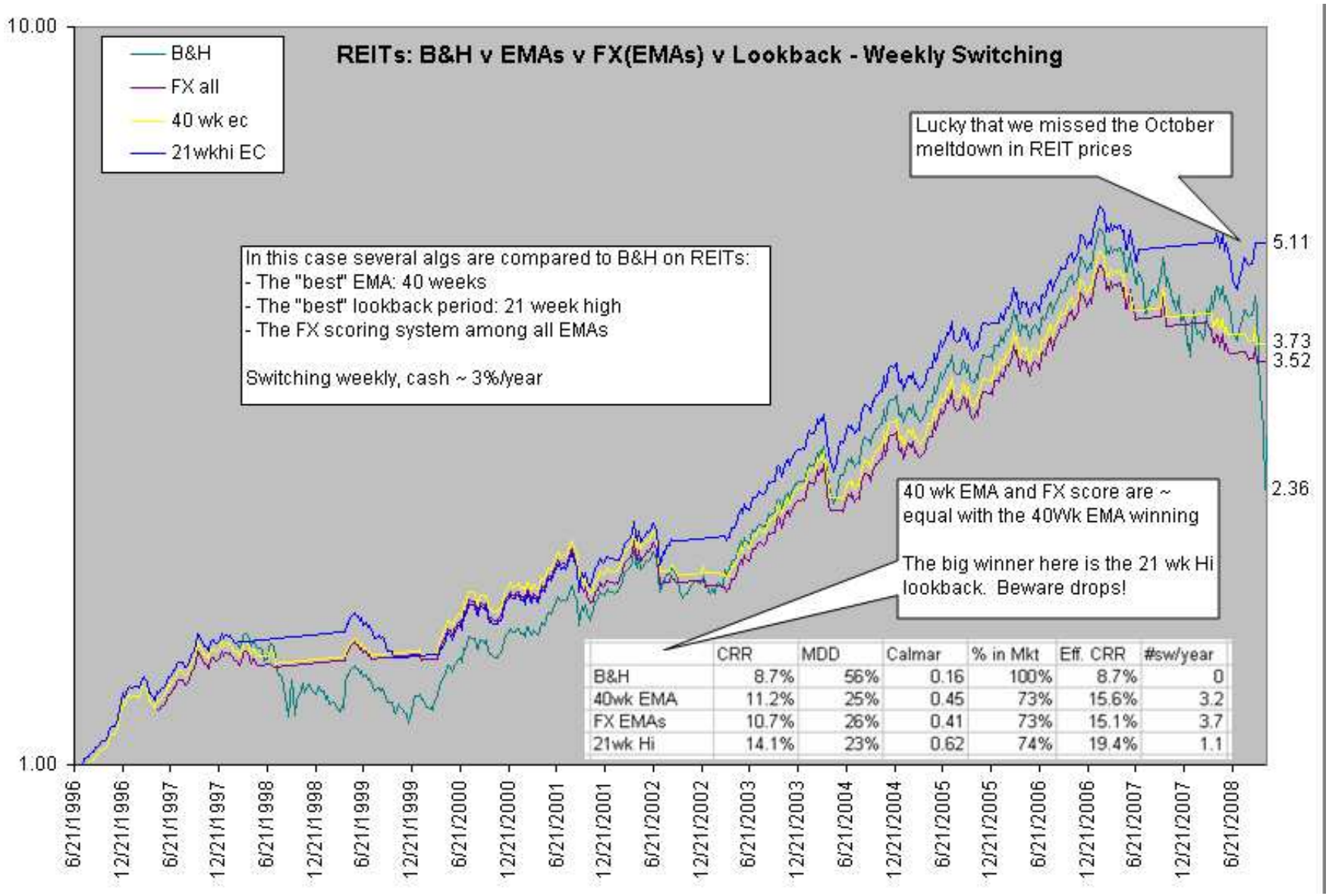
	CRR	MDD	Calmar	%in mkt	Eff CRR	#sw/year
B&H	6.9%	48%	0.14	100%	6.9%	0
40w EMA (weekly)	8.1%	25%	0.33	71%	11.6%	3.5
Fx 40w EMA (wkly)	8.5%	21%	0.40	67%	13.0%	3.3
Fx 40w EMA (mnthly)	8.5%	26%	0.32	67%	12.9%	1.5

Voting EMAs on the SP500



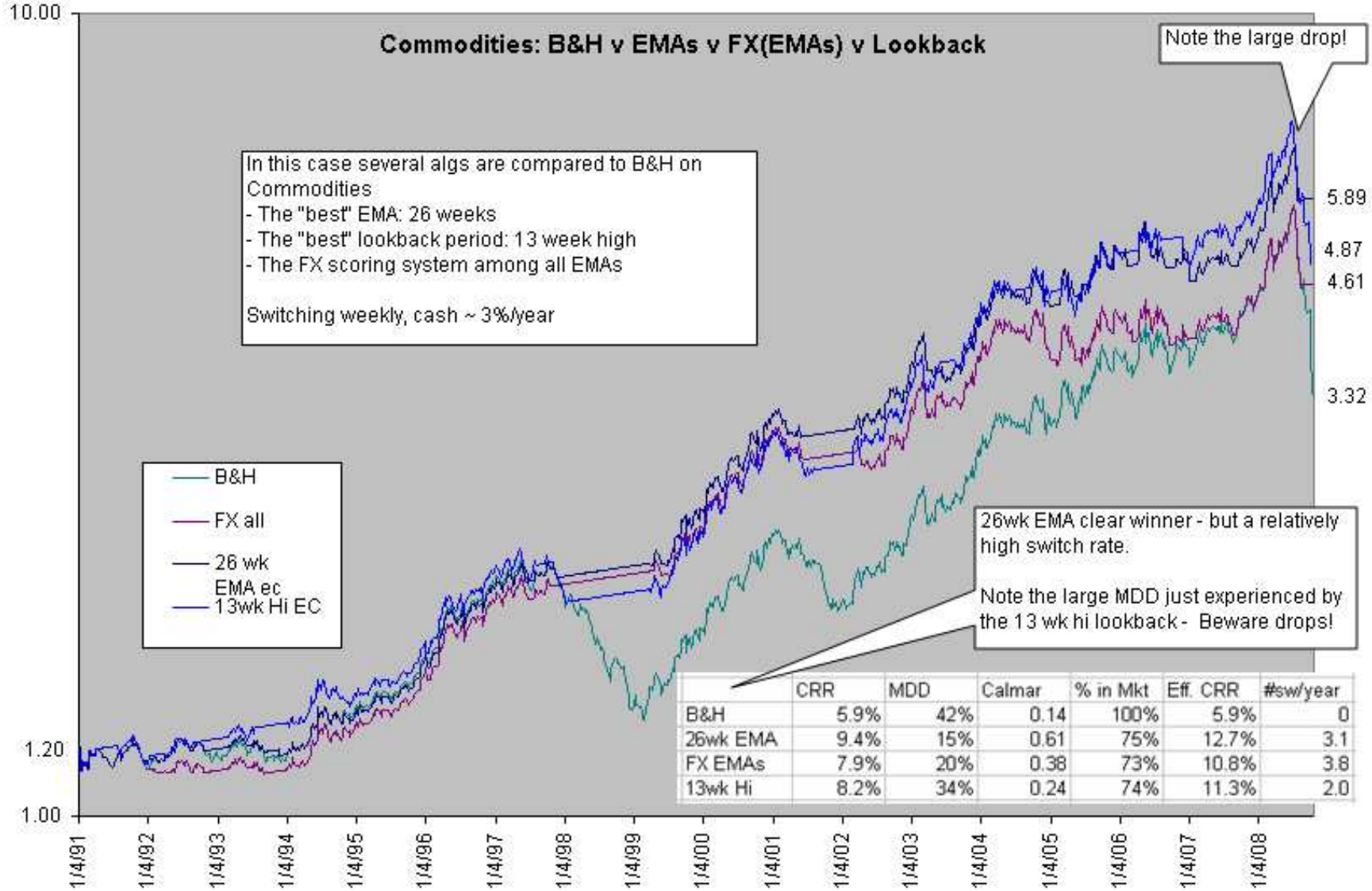
	CRR	MDD	Calmar	%in mkt	Eff CRR	#sw/year
B&H	6.9%	48%	0.14	100%	6.9%	0
40w EMA (weekly)	8.1%	25%	0.33	71%	11.6%	3.5
Voting all EMAs	7.8%	25%	0.31	72%	10.9%	3.3
Vote Top 50% EMAs	8.1%	25%	0.33	72%	11.4%	3.2

B&H vs. EMAs on REITs



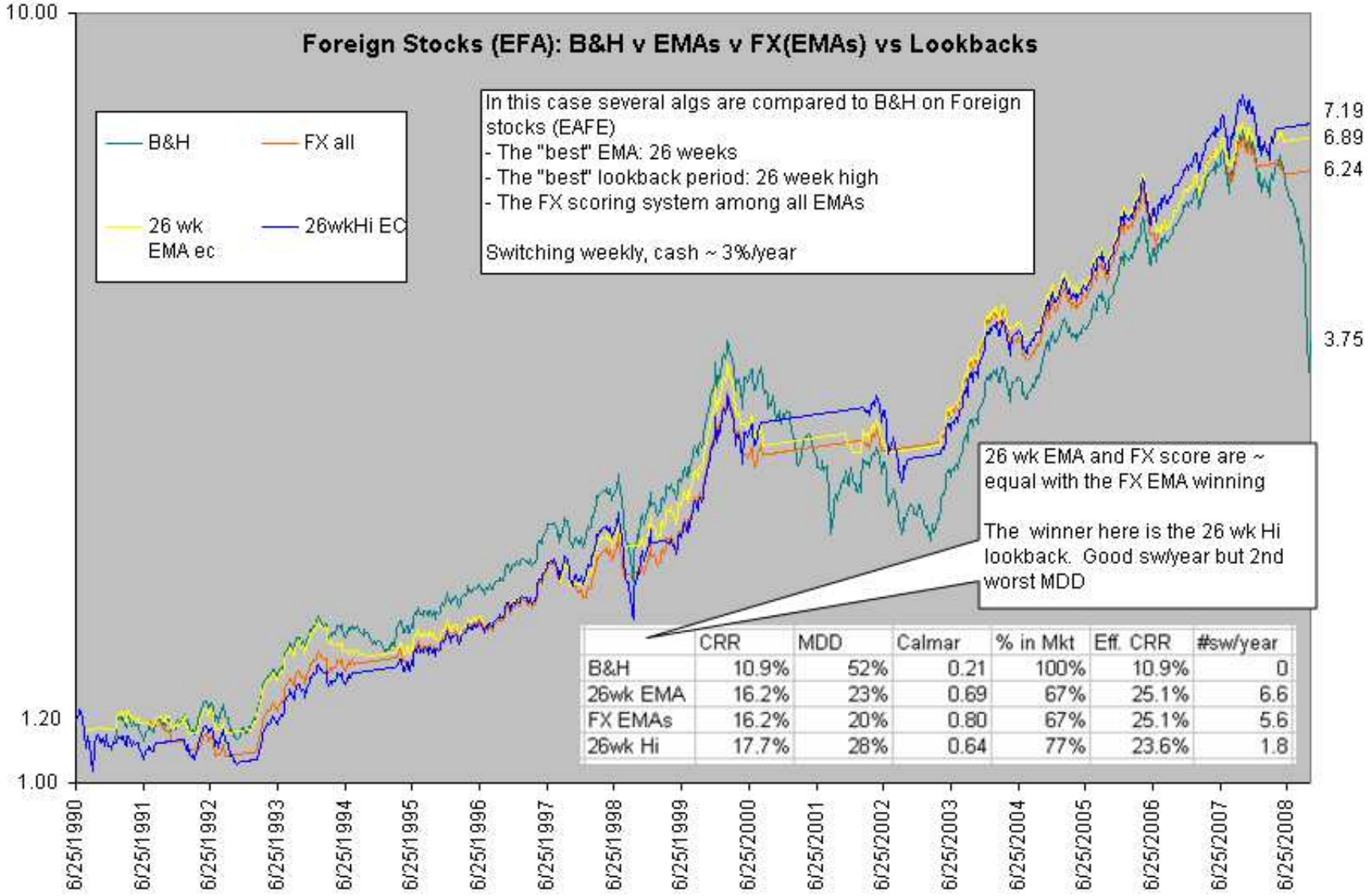
	CRR	MDD	Calmar	% in Mkt	Eff. CRR	#sw/year
B&H	8.7%	56%	0.16	100%	8.7%	0
40wk EMA	11.2%	25%	0.45	73%	15.6%	3.2
FX EMAs	10.7%	26%	0.41	73%	15.1%	3.7
21wk Hi	14.1%	23%	0.62	74%	19.4%	1.1

B&H vs. EMAs on Commodities



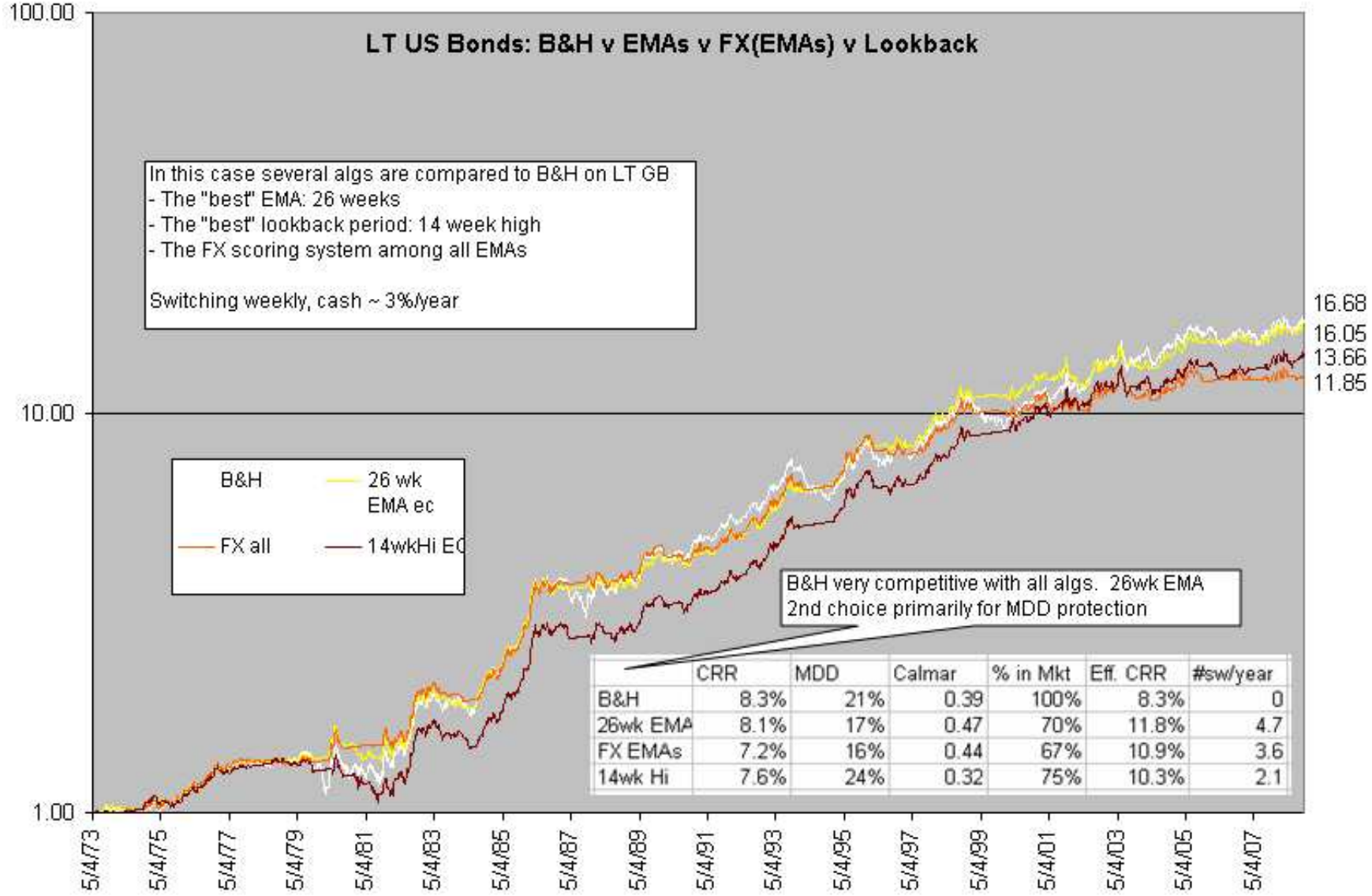
	CRR	MDD	Calmar	% in Mkt	Eff. CRR	#sw/year
B&H	5.9%	42%	0.14	100%	5.9%	0
26wk EMA	9.4%	15%	0.61	75%	12.7%	3.1
FX EMAs	7.9%	20%	0.38	73%	10.8%	3.8
13wk Hi	8.2%	34%	0.24	74%	11.3%	2.0

B&H vs. EMAs on Foreign Stocks



	CRR	MDD	Calmar	% in Mkt	Eff. CRR	#sw/year
B&H	10.9%	52%	0.21	100%	10.9%	0
26wk EMA	16.2%	23%	0.69	67%	25.1%	6.6
FX EMAs	16.2%	20%	0.80	67%	25.1%	5.6
26wk Hi	17.7%	28%	0.64	77%	23.6%	1.8

B&H vs. EMAs on LT Gov't Bonds



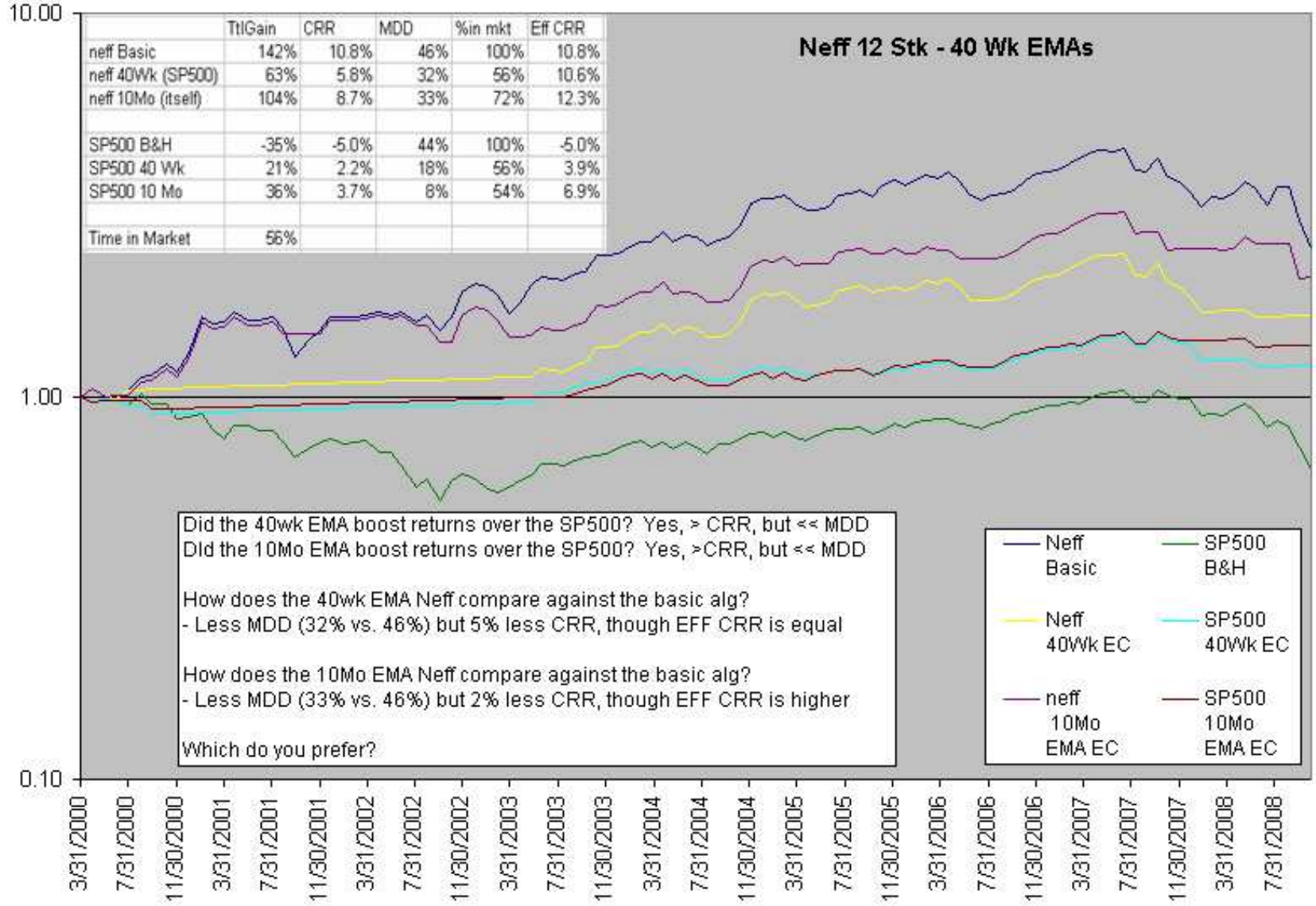
	CRR	MDD	Calmar	% in Mkt	Eff. CRR	#sw/year
B&H	8.3%	21%	0.39	100%	8.3%	0
26wk EMA	8.1%	17%	0.47	70%	11.8%	4.7
FX EMAs	7.2%	16%	0.44	67%	10.9%	3.6
14wk Hi	7.6%	24%	0.32	75%	10.3%	2.1

QTAA: Boosting Returns with Stock Selection

Boosting QTAA Returns with Stocks

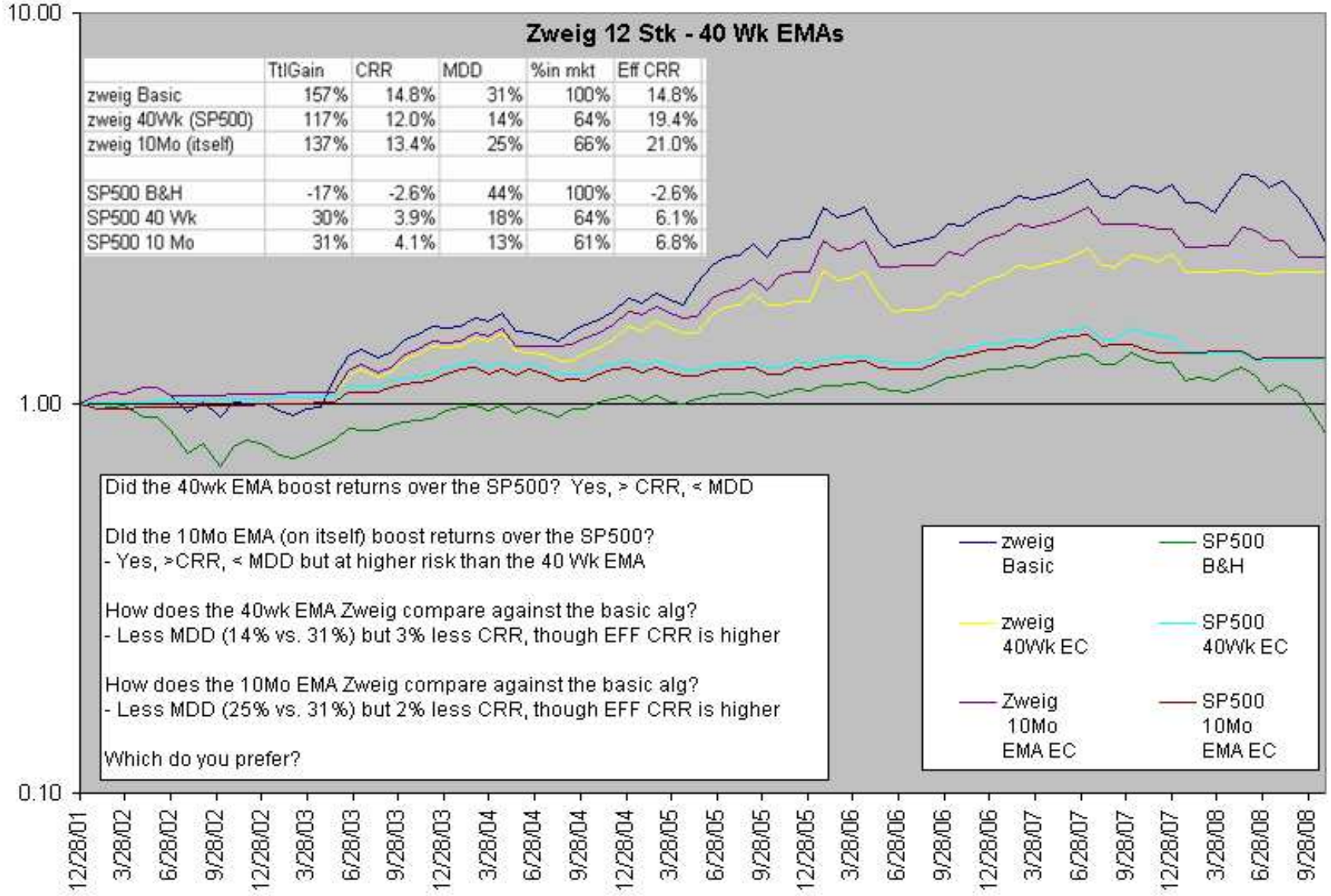
- The Idea: Use SIPro to select a basket of stocks that will boost returns and count on QTAA to limit risk
- The Implementation
  - Use modified AAII SIPro Neff and Zweig screens
    - Modifications include holding 12 stocks, holding a percentage of cash if < 12 stocks pass the screen, refreshing the portfolio every 4 weeks and requiring a $1M daily trading volume liquidity check
  - Back-tested using the Keelix simulator
    - Simulation from 3/31/00 (Neff) and 12/28/01 (Zweig) due to Keelix/SIPro data limitations
  - Use 40-week EMA on the SP500 to make long/cash decision
  - Use 10-month EMA on the Neff and Zweig ECs to make the long/cash decision
  - Use AAII Neff, Zweig performance statistics to check 10-month EMA long/cash decision

Neff 12 Stock 40 Week EMA

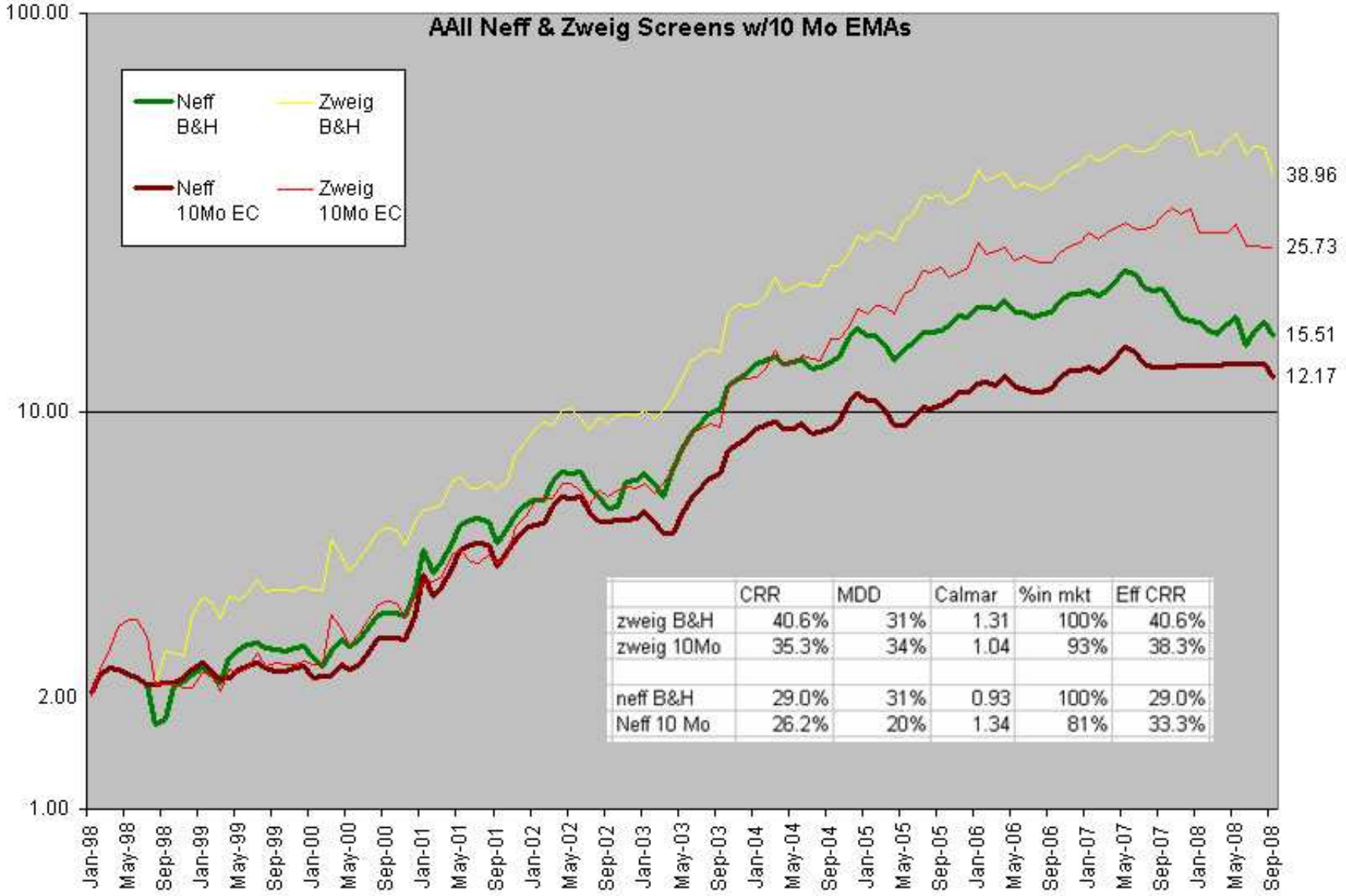


	TtlGain	CRR	MDD	%in mkt	Eff CRR
neff Basic	142%	10.8%	46%	100%	10.8%
neff 40Wk (SP500)	63%	5.8%	32%	56%	10.6%
neff 10Mo (itself)	104%	8.7%	33%	72%	12.3%
SP500 B&H	-35%	-5.0%	44%	100%	-5.0%
SP500 40 Wk	21%	2.2%	18%	56%	3.9%
SP500 10 Mo	36%	3.7%	8%	54%	6.9%
Time in Market	56%				

Zweig 12 Stock 40 Week EMA



AAII Neff, Zweig w/10 Mo EMAs



	CRR	MDD	Calmar	%in mkt	Eff CRR
zweig B&H	40.6%	31%	1.31	100%	40.6%
zweig 10Mo	35.3%	34%	1.04	93%	38.3%
neff B&H	29.0%	31%	0.93	100%	29.0%
Neff 10 Mo	26.2%	20%	1.34	81%	33.3%

QTAA: Tying it All Together

So Where Does This Leave Us?

Summary points:

- Robustness
  - QTAA works reasonably well across a wide range of EMAs
  - QTAA is insensitive to starting day
  - Asset classes can be sub-divided for further diversification (US & foreign versions for: bonds, real estate, large and small cap stocks)
- Performance
  - Base alg performance is competitive with SP500 returns (over long periods)
  - Can boost performance using ETFs via asset class rotation (Top 3 assets, combo rating) – with higher MDD, SD
  - Stock selection can boost US, Foreign, REIT returns – again with higher MDD, SD
  - May get a boost from selecting the “best” timing system
    - Stay within reasonable ranges, don’t “over-time”

So How Do I Implement This?

Implementation points:

- General comments: (my preferences – your decision)
  - Be sure to include dividends when computing EMAs, ECs
  - Prefer weekly system, more sub-asset classes (e.g., 10 ETFs)
  - Re-balance when outside pre-determined tolerance band, e.g., 20% - providing a range of 16-24% for each asset class
  - Prefer implementing alg in tax-deferred account (lower taxes, less record keeping problems)
    - Can use "twin" ETFs to avoid wash sales if in taxable account
- ETFs: By far the easiest implementation
  - Keep It Simple: Go with suggested ETFs or their "twins"
  - Commodities: General index ETFs (e.g., DBC) may be too heavily weighted toward oil, energy. May want to construct your own "index" from commodity sub-category ETFs (e.g., OIL, GLD)
    - Bob's optimization program may be helpful on deciding a good mix

So How Do I Implement This?

- Mutual Funds (MFs): Focusing in on 401Ks
  - Suggest doing an EMA study against MFs of your choice to ensure robustness and to review/understand performance history
  - Problem: Lack of choice in some asset classes (e.g., commodities)
    - Solution: Use ETFs in IRAs to invest in this asset class
    - Solution: Use sector MFs (e.g., FSENX, FSNGX) as closest match
  - Problem: Can't use weekly (or monthly!) timing system due to MF switching rules
    - Solution: Choose MFs with 30 day switch capability (if available)
    - Solution: Hedge MF position with Contra-ETFs in IRA. Requires ~50% of your 401k $$$ being mirrored in an IRA
      - Example: For $1 of FLCSX (Beta=1.25, R**2=.95) need ~$0.60 of SDS
    - Solution: Hedge using Put options or LEAPs (preferred)

So How Do I Implement This?

- Stocks:
  - Implement SIPro portfolios in an efficient, low-cost way to trade and track large numbers of stocks easily (Fidelity baskets, Foliofn)
  - Suggest doing EMA study against portfolios of your choice to ensure robustness, review/understand performance history
  - Warning: SIPro portfolios can and do buy illiquid stocks which result in unrealistic performance gains, trading problems
    - Suggest back-testing of SIPro portfolios to modify screens and get a better sense of realistic performance
  - Can use hedging strategies to reduce intra-month trading/slippage
    - Will need to calculate beta, R-squared (create a scatter plot in Excel)
- Asset Class Rotation
  - Can be implemented in any of the instruments discussed
  - Consider using different weighting schemes for Top 3, Bottom 2
    - Top 1,2,3,4,5 = 33%, 27%, 20%, 13%, 7% (sum of digits)
    - Top 1,2,3,4,5 = 25%, 25%, 25%, 12.5%, 12.5% (2x Top assets)

How Does QTAA Tie in with the Previous Topics?

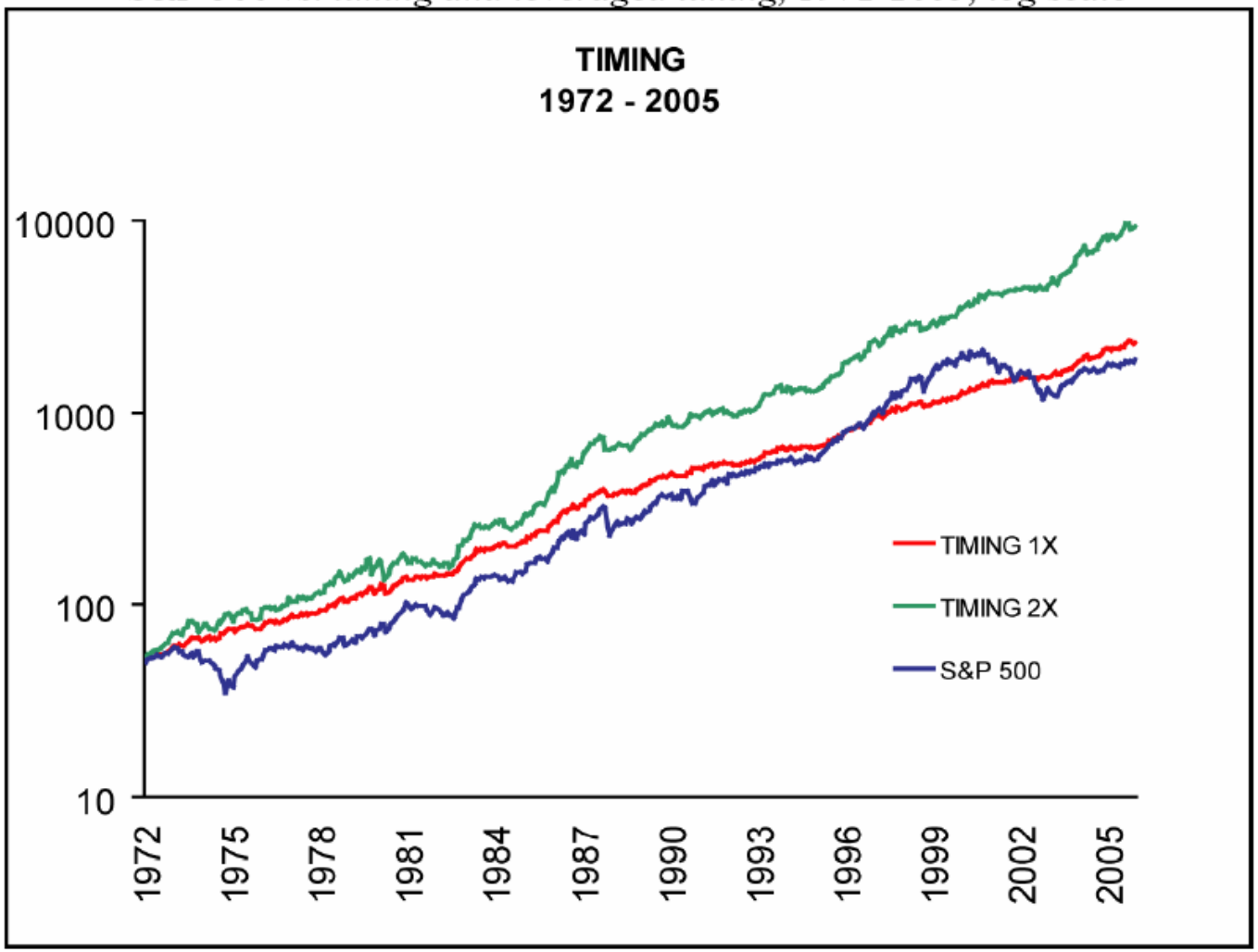
- How does QTAA fit into your asset allocation scheme?
  - QTAA has stock-like returns with bond-like drawdowns. QTAA fits into the general class of "alternative" or "absolute return" investments
  - QTAA is not highly correlated with the asset classes. Ex: Since 6/97 QTAA has a Beta ~0.16, R-squared ~21%, Correl ~0.46 WRT the SP500
  - You may want to review your portfolio from a QTAA perspective:
    - How many $$ do you have invested in each asset class? Should you be moving $$ into under-funded asset classes?
- Are there tools that can enhance the basic QTAA approach?
  - All the general tools Bob discussed – SIPro, VV, Yahoo!,… - as well as Bob's tools can be used to implement, enhance QTAA portfolios
- What Excel macros can be written to automate this approach?
  - Virtually everything presented could be automated using Excel macros: EMAs, FX scoring, performance stats, …
- Can you use SIPro to implement this scheme?
  - SIPro screens – and your variations! – can be used in several asset classes

Q & A

QTAA Appendices:
Look-Back Periods, Keelix Screens, Scatter Plot, References, Performance Stats

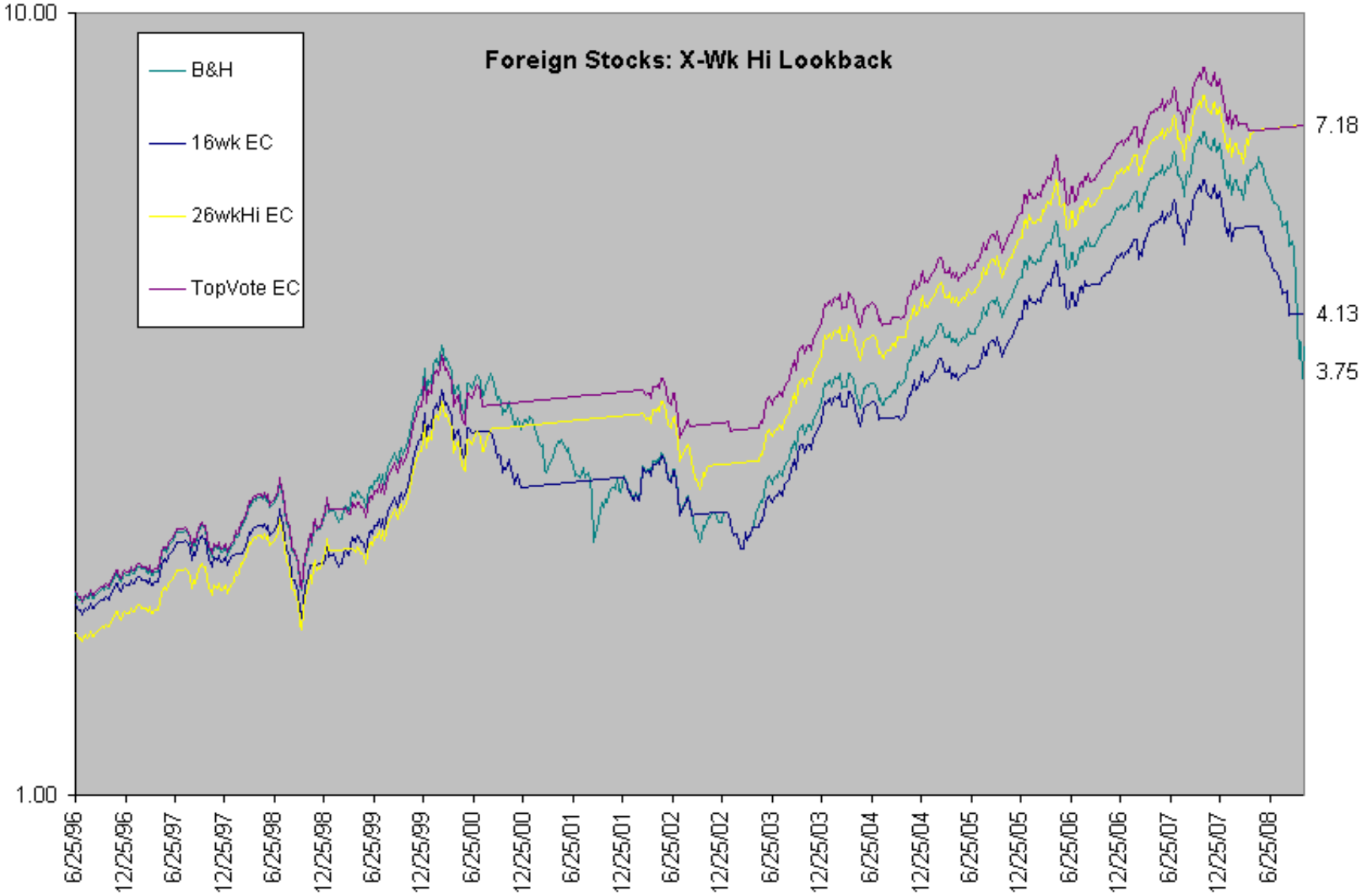
Faber Results: ECs and Leverage

S&P 500 vs. timing and leveraged timing, 1972-2005, log scale

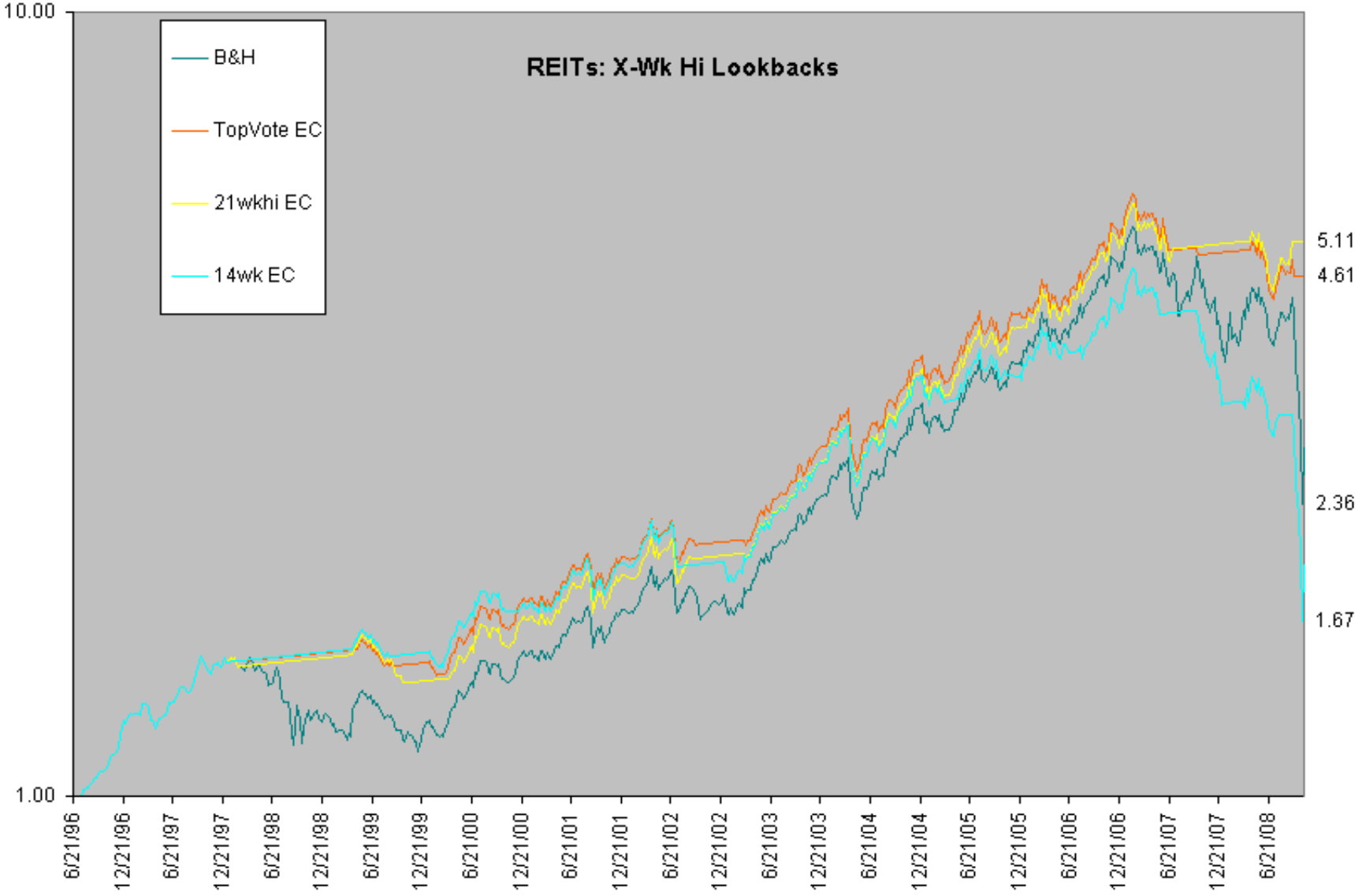


Red line, the timed unleveraged portfolio, is a "sleep at night" portfolio.

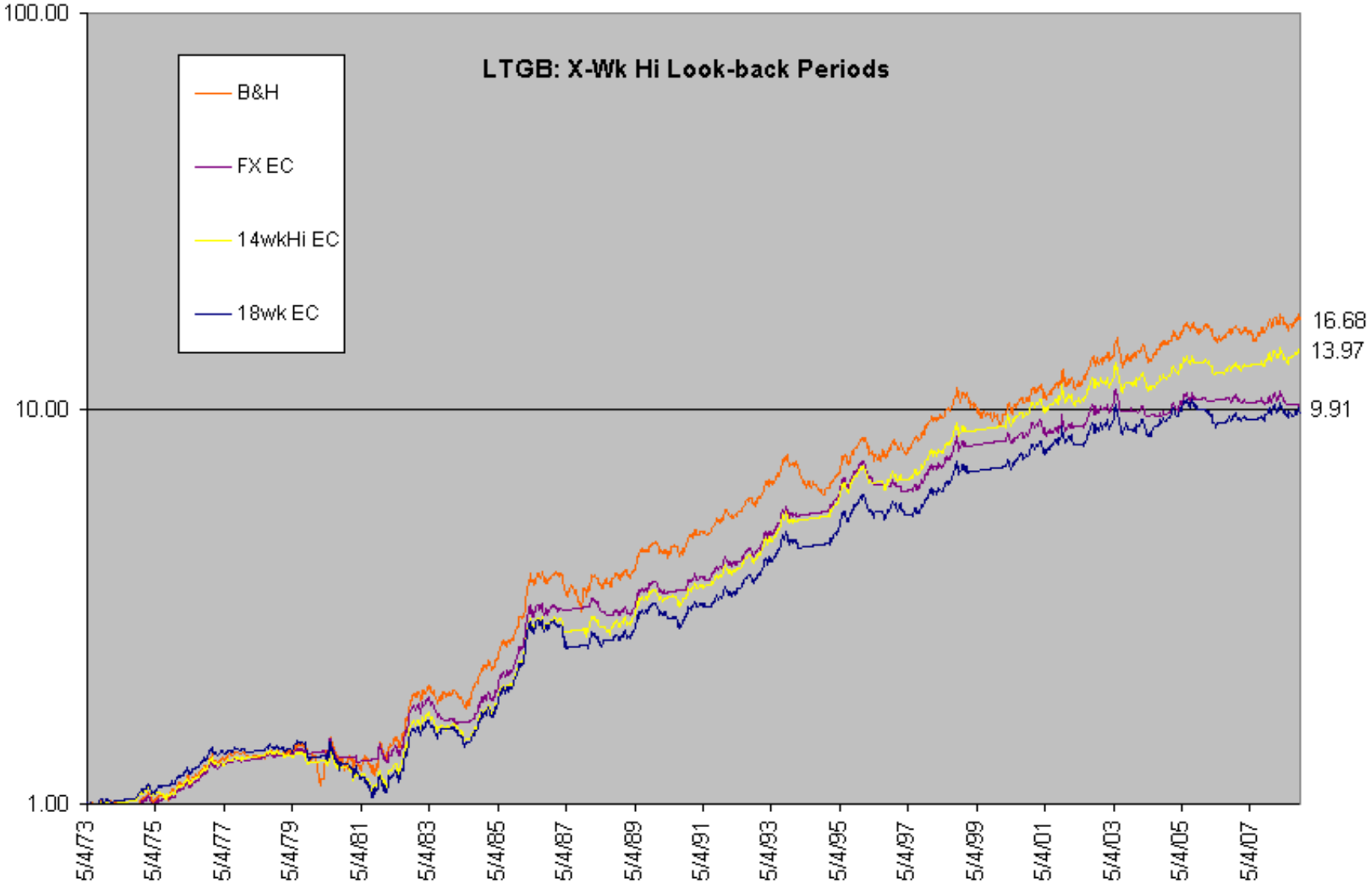
Foreign Stocks: Look-back Periods



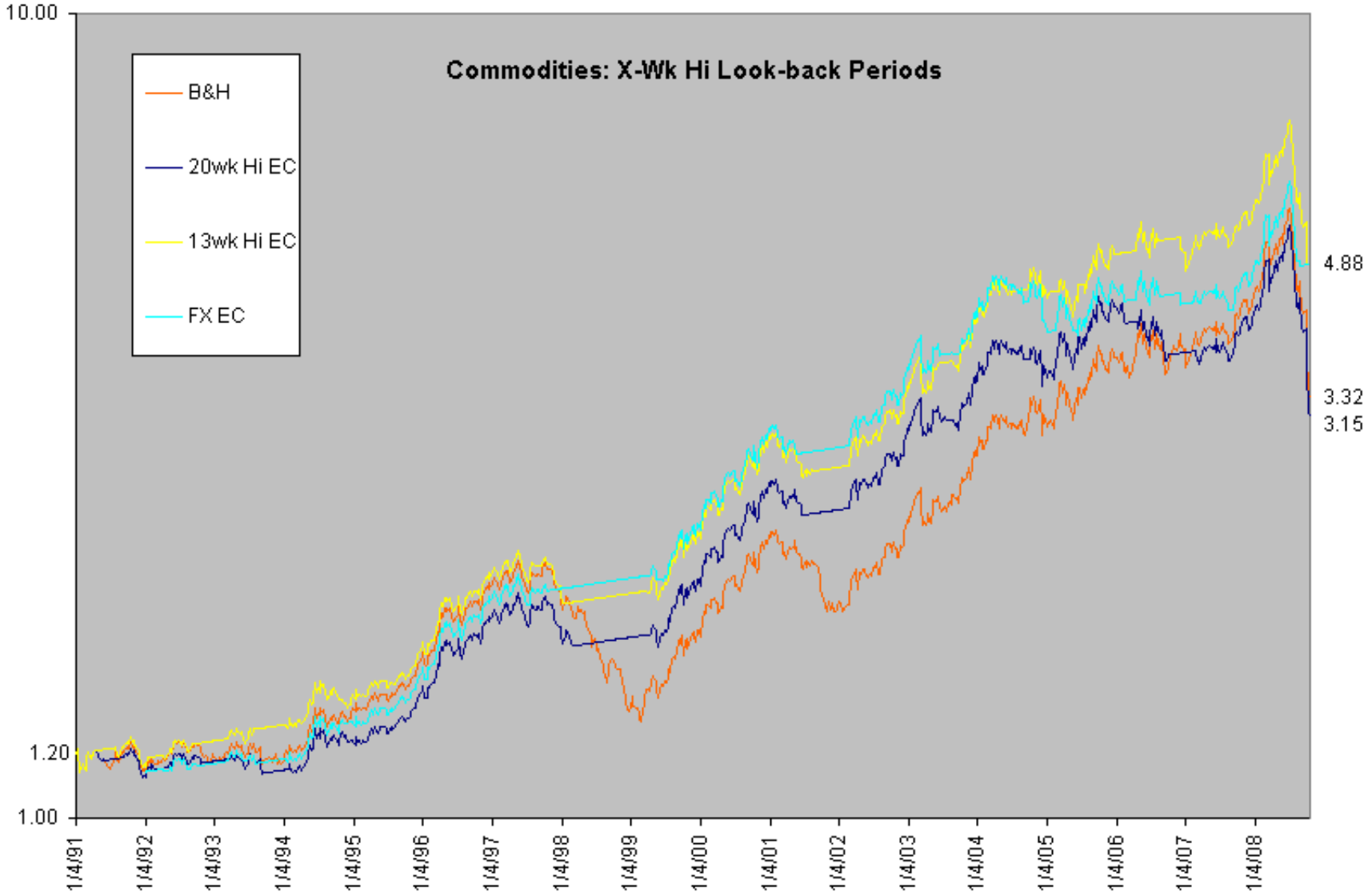
REITs: Look-back Periods



LTGB: Look-back Periods



Commodities: Look-back Periods



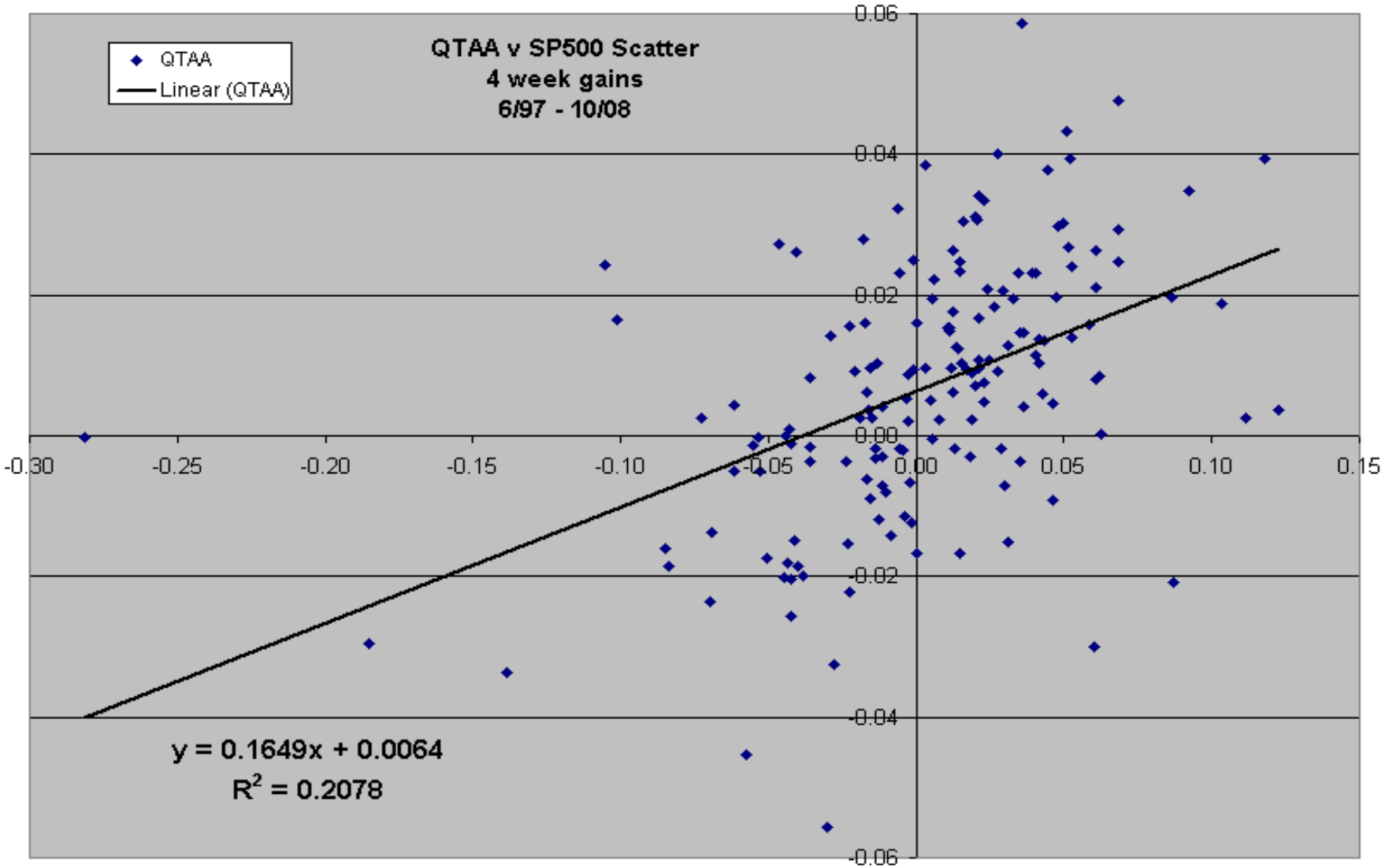
Keelix: Neff Screen

```
Define {Neff}
;
;definition and blanking
;
Deblank [SI EPS Growth Est] [SI PE to Div adj EPS Est growth] [SI Sales-Growth 5yr] [SI Free
cash flow/share 12m]
[SI Free cash flow/share Y1] [SI Operating margin 12m] [SI Operating margin Y1]  [SI Ind
Operating margin Y1] [SI
Ind Operating margin 12m] [SI Price] [SI Volume--Average Monthly 3m]
;
;screen
;
Set [Median NeffPE] : MEDIAN([[SI PE to Div adj EPS Est growth]])
Keep : [SI PE to Div adj EPS Est growth] <= 0.5 * [Median NeffPE]
Keep : [SI EPS Growth Est] >= 7
Keep : [SI EPS Growth Est] <= 20
Keep : [SI Sales-Growth 5yr] >= 7
Keep : [SI Sales-Growth 5yr] <= 20
Keep : [SI Free cash flow/share 12m] > 0
Keep : [SI Free cash flow/share Y1] > 0
Keep : [SI Operating margin 12m] >= [SI Ind Operating margin 12m]
Keep : [SI Operating margin Y1] >= [SI Ind Operating margin Y1]
Keep : ([SI Price] * [SI Volume--Average Monthly 3m] / 20) >= 1000
Sort Descending [SI EPS Growth Est]
Top :25
End
```

Keelix: Zweig Screen

```
Define {Zweig-26}
Uses [SI EPS Dil Cont-Growth from Q5 to Q1] [SI EPS Dil Cont-Growth from Q6 to Q2] [SI EPS Dil Cont-Growth from
Q7 to Q3] [SI EPS Dil Cont-Growth from Q8 to Q4] [SI Sales-Growth from Q5 to Q1] [SI Sales-Growth from Q6 to Q2]
[SI EPS-Diluted Continuing 12m] [SI EPS-Diluted Continuing Y1] [SI EPS-Diluted Continuing Y2] [SI EPS-Diluted
Continuing Y3] [SI EPS Dil Cont-Growth 3yr] [SI Sales-Growth 3yr] [SI EPS Dil Cont-Growth from Q5 to Q1] [SI EPS
DC-Growth from Q6-Q8 to Q2-Q4] [SI PE] [SI Relative Strength 26 week] [SI ADR/ADS Stock] [SI Industry] [SI %
Rank-Volume--Average Monthly 3m] [SI Price Change 26 week] [SI Price] [SI Volume--Average Monthly 3m]
Keep : [SI EPS 12m] >= 0
Set [Median PE] :MEDIAN([[SI PE]])
Deblank [SI EPS Dil Cont-Growth from Q5 to Q1] [SI EPS Dil Cont-Growth from Q6 to Q2] [SI EPS Dil Cont-Growth
from Q7 to Q3] [SI EPS Dil Cont-Growth from Q8 to Q4] [SI Sales-Growth from Q5 to Q1] [SI Sales-Growth from Q6 to
Q2] [SI EPS-Diluted Continuing 12m] [SI EPS-Diluted Continuing Y1] [SI EPS-Diluted Continuing Y2] [SI EPS-Diluted
Continuing Y3] [SI EPS Dil Cont-Growth 3yr] [SI Sales-Growth 3yr] [SI EPS Dil Cont-Growth from Q5 to Q1] [SI PE]
[SI Relative Strength 26 week] [SI ADR/ADS Stock] [SI Industry] [SI % Rank-Volume--Average Monthly 3m] [SI Price
Change 26 week]
;
; screen begins
;
Keep :[SI EPS Dil Cont-Growth from Q5 to Q1]>0
Keep :[SI EPS Dil Cont-Growth from Q6 to Q2]>0
Keep :[SI EPS Dil Cont-Growth from Q7 to Q3]>0
Keep :[SI EPS Dil Cont-Growth from Q8 to Q4]>0
Keep :[SI Sales-Growth from Q5 to Q1]>0
Keep :[SI Sales-Growth from Q5 to Q1]>[SI Sales-Growth from Q6 to Q2]
Keep :[SI EPS-Diluted Continuing 12m]>=[SI EPS-Diluted Continuing Y1]
Keep :[SI EPS-Diluted Continuing Y1]>[SI EPS-Diluted Continuing Y2]
Keep :[SI EPS-Diluted Continuing Y2]>[SI EPS-Diluted Continuing Y3]
Keep :[SI EPS Dil Cont-Growth 3yr]>=15
Keep :[SI Sales-Growth 3yr]>=15
Keep :OR([SI EPS Dil Cont-Growth from Q5 to Q1]>[SI EPS DC-Growth from Q6-Q8 to Q2-Q4],[SI EPS Dil Cont-Growth
from Q5 to Q1]>=30)
Keep :[SI EPS Dil Cont-Growth from Q5 to Q1]>=[SI EPS Dil Cont-Growth 3yr]
Keep :[SI PE]>5
Keep :[SI PE]<1.5*[Median PE]
Keep :[SI Relative Strength 26 week]>0
Keep :[SI ADR/ADS Stock]="F"
Keep :AND([SI Industry]<>"0721-Misc.FinancialServices",[SI Industry]<>"0933-RealEstateOperations")
Keep :[SI % Rank-Volume--Average Monthly 3m]>=25
Keep : ([SI Price] * [SI Volume--Average Monthly 3m] / 20) >= 1000
Sort Descending [SI Price Change 26 week]
; Top :5
End
```

QTAA v SP500: Scatter Plot



Appendix: References - Books

- James P. O'Shaugnessy's **What Works on Wall Street** can form the basis of many passive portfolios
- Bill Matson's **Data Driven Investing** performs studies similar to O'Shaugnessy's
- Ralph Vince's **The Mathematics of Money Management: Risk Analysis Techniques for Traders** is a good general text on money management techniques
- Tom Stridsman's **Trading Systems that Work** is an excellent trading system development text covering a number of topics touched on in these talks (e.g., exit design, money management)

Appendix: References – Web Sites/URLs

URLs specific to the Faber/QTAA scheme:

- URL for Faber Asset Allocation paper
  - http://trendfollowing.com/whitepaper/CMT-Simple.pdf
- URL for QTAA Using Daily Data paper
  - http://www.econ-pol.unisi.it/risso/opinions/PortfolioArt15072008.pdf
- URLs for Faber's blog entries on volatility clustering
  - http://worldbeta.blogspot.com/2008/08/dow-300-point-days.html
  - http://worldbeta.blogspot.com/2008/03/more-on-volatility-clustering.html
- URL for marketsci blog entry on volatility clustering
  - http://marketsci.wordpress.com/2008/08/10/market-volatility-in-up-vs-down-trends/
- URL for Faber's blog entry on the 10 asset class portfolio
  - http://worldbeta.blogspot.com/search?updated-max=2008-09-29T11%3A11%3A00-07%3A00&max-results=10
- URL for Faber's blog entry on asset class rotation
  - http://worldbeta.blogspot.com/search?updated-max=2008-08-21T10%3A50%3A00-07%3A00&max-results=10

Appendix: References – Web Sites/URLs

Good sites for general information, tools. As always, take discussions on general bulleting boards with caution!

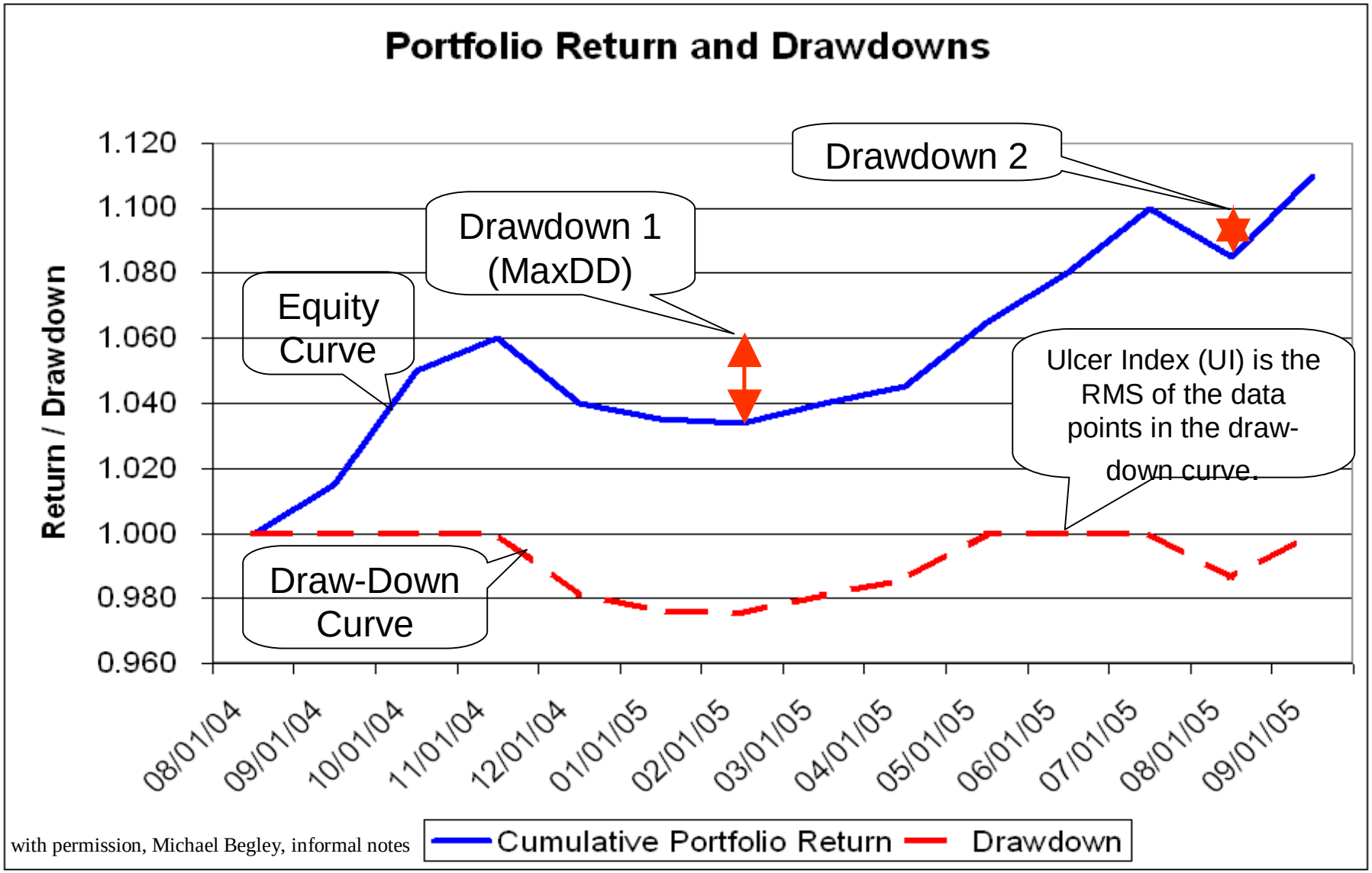
- URL for SIPro information:
  - http://www.aaii.com/stockinvestor/
- URL for Keelix backtesting tool
  - http://keelix.com/j/
- URL for VectorVest (a back testing tool)
  - http://www.vectorvest.com/
- URL for portfolio123 (another back testing tool/advisory firm)
  - http://www.portfolio123.com/
- URL for foliofn (an inexpensive way to buy large baskets of stocks)
  - http://www.foliofn.com/index.jsp
- URL for Motley Fool Mechanical Investing board
  - http://boards.fool.com/Messages.asp?bid=100093

Performance Metrics

EC	Equity Curve	Portfolio Value plotted against time
CRR	Compound Rate of Return	Reward Measurement -- Annualized compound, or geometric, rate of return
DD	Drawdown	Percentage difference in portfolio value on a given date from the maximum portfolio value on all prior dates
MDD	Maximum Drawdown	Risk Measurement - Maximum observed DD over all portfolio valuation dates
UI	Ulcer Index	Risk Measurement - Root Mean Square of the DD measurements for all portfolio evaluation dates. For each date, measure DD and square it. Then take the square root of the average of all the DD^2 measurements. The result is the Ulcer Index where a high number means the portfolio has large drawdowns that take a long time to recover to a new portfolio high value.
UPI	Ulcer Performance Index	Reward to Risk Measure -- CRR / UI
CR	Calmar Ratio	Reward to Risk Measure -- CRR / MDD This measure is inferior to the UPI because a single large DD will result in a low Calmar Ratio forever

with permission, Michael Begley, informal notes

Performance Metrics: Examples



with permission, Michael Begley, informal notes