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An Approach to Testing Price Based Timers

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3/3/2016

Timer Problems/How to Fix

- Problem: Timers may have been fit to the SP500 series or any other series they are timing. So the timers may be curve fit to that ONE set of data
- How to Fix: Use many (1000+) synthetically generated series that “approximate” the original series.
 - How do the timers hold up to these similar but different time series?
 - Compute metrics for all – CAGR, SD, Sharpe, Sortino, and MaxDD to see which hold up with slight deviations from the original
 - Test over different periods to see if date ranges make a difference

How Are Synthetic Series Generated?

- For the entire period, repeat the following 1000+ times:
 - Pick a random block length – 63 days (3 months) to 126 days (6 months)
 - For each day return in the block, pick a random return from the block of Δ GSPC returns. (This preserves the SD and average return of the block BUT changes the returns each day from the original).
 - Repeat for the next random block until the period is covered

How Are Timers Tested?

- Test each timer on all 1000+ synthetically generated ECs and collect metrics – CAGR, SD, Sharpe, Sortino, and MaxDD for each.
 - When timer says be out, invest in FGOVX (intermediate treasuries 7-10 year) or some other cash like investment, e.g. ^IRX (3 month T-Bill) or VUSTX (long term treasuries).
 - When timer says be in, invest in the synthetic stock.
- Compare the distributions of each timer to see which does the best

Timers & Periods Tested

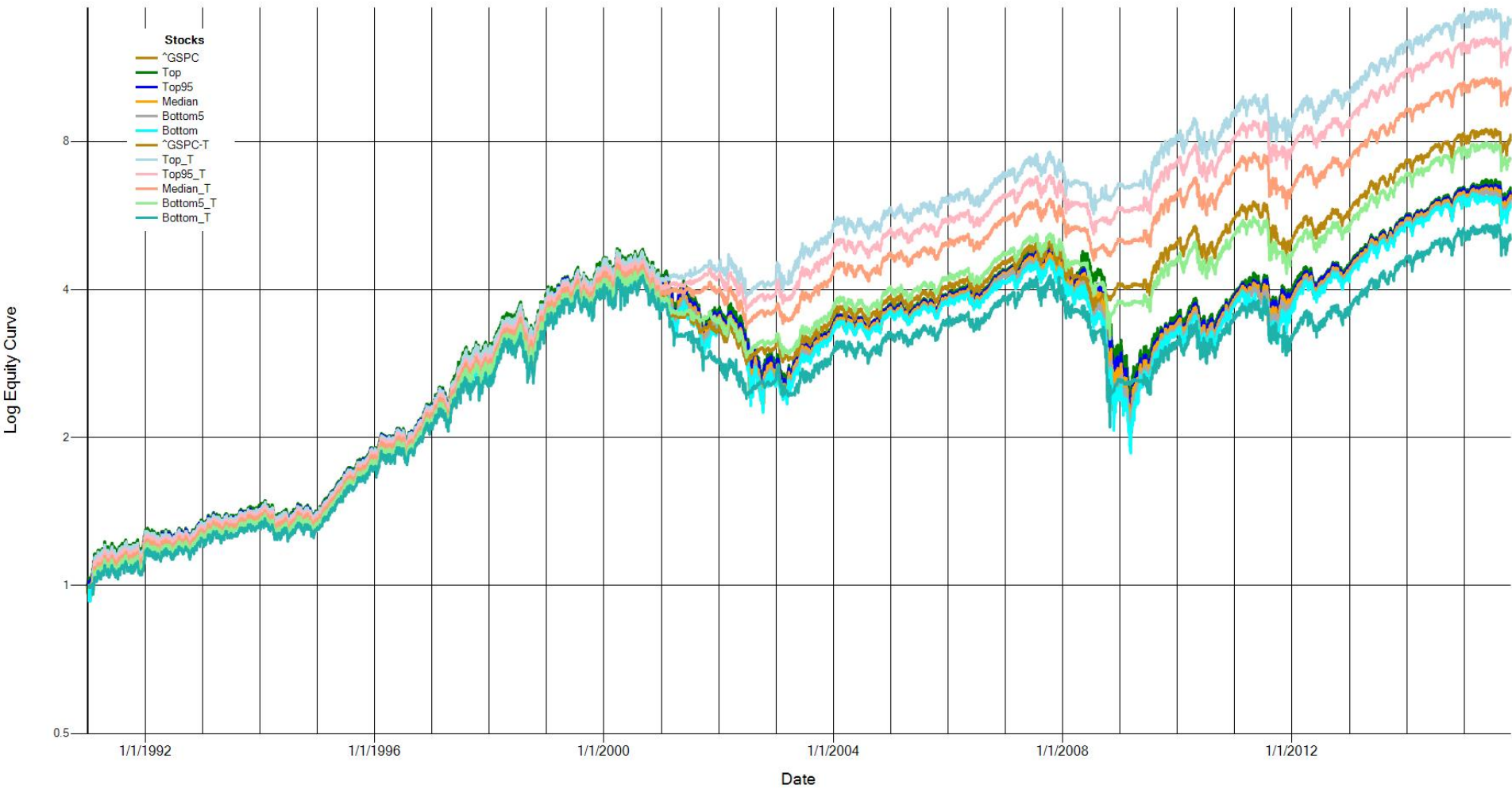
- Timers Tested
 - DEMA50(21day, offset =0%, 0.3%, 0.6%, 0.9%)
 - DEMA50(22day, offset =0%, 0.3%, 0.6%, 0.9%)
 - DEMA (10,20,...,100; 22dayMth; 0% offset)
 - Abs Momentum (5Mth, ^IRX)
 - SMA200
 - SMA Group (6-10Mth)
 - Golden Cross – SMA(50,200)
 - EMA Cross – EMA(50,200)
- Periods Tested (runs a while back)
 - 12/30/1994 – 10/23/2015 - 20.8 years
 - 12/31/1990 – 10/23/2015 – 24.8 years
 - 1/29/1960 – 10/23/2015 – 55.7 years

Timer Test 1

- Period 12/31/1990 – 10/23/2015 – 24.8 years
- Base Series
 - SPY
- Timers
 - DEMA (50)
 - DEMA50(21day, offset =0%, 0.3%, 0.6%, 0.9%)
 - DEMA50(22day, offset =0%, 0.3%, 0.6%, 0.9%)
 - Abs Momentum (5Mth, ^IRX)
 - SMA200
 - SMA Group (6-10Mth)
 - SMA50_200 Golden Cross
 - EMA50_200 Cross
- Cash
 - FGOVX(7-10 year Treasuries)
- Results
 - SMA50_200 best CAGR
 - SMA50_200 & EMA50_200 best Sharpe
 - Abs Mom lowest MaxDD

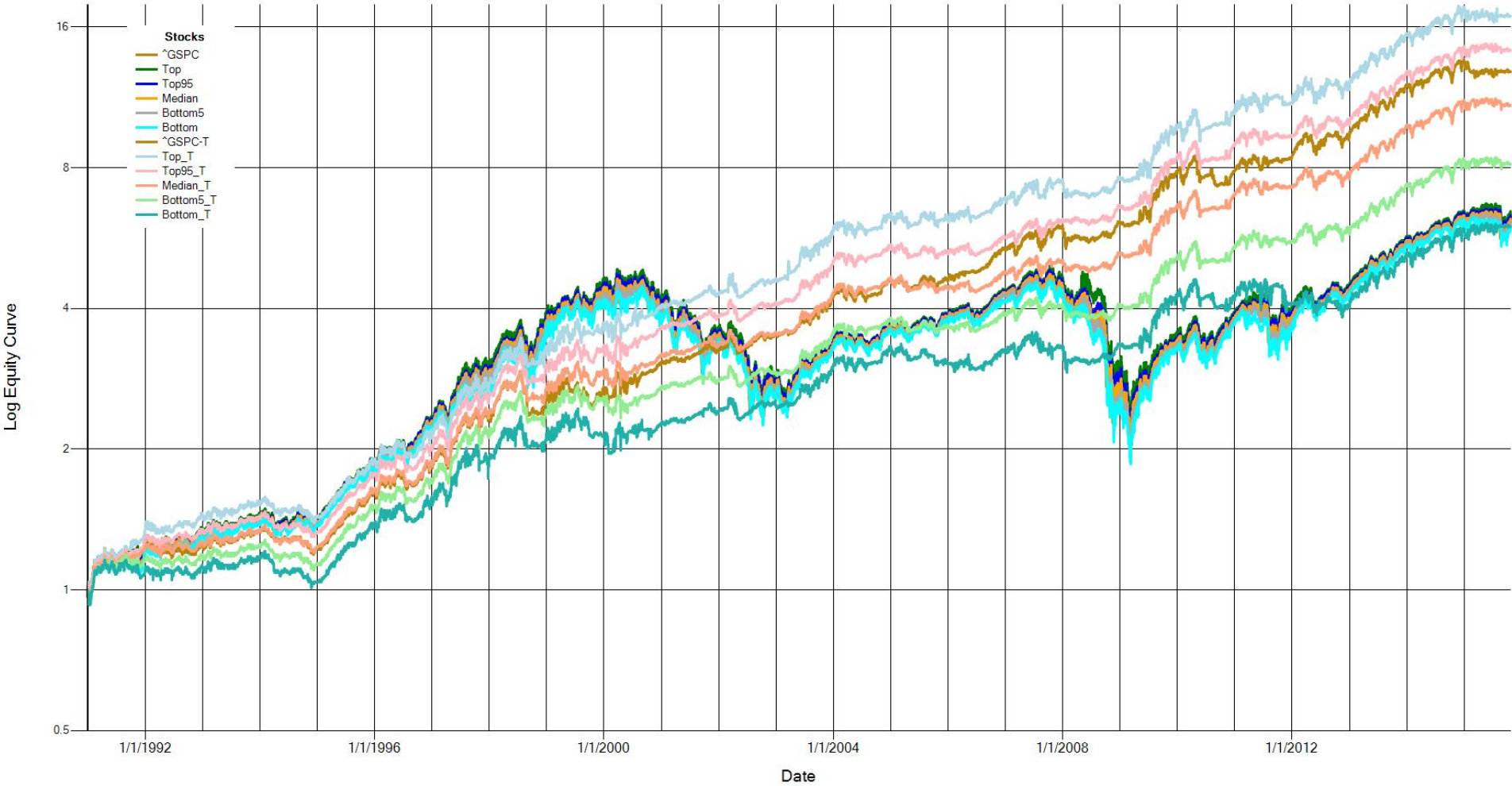
1000 Synthetic ^GSPC EC Ranges & DEMA Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA Timer Results



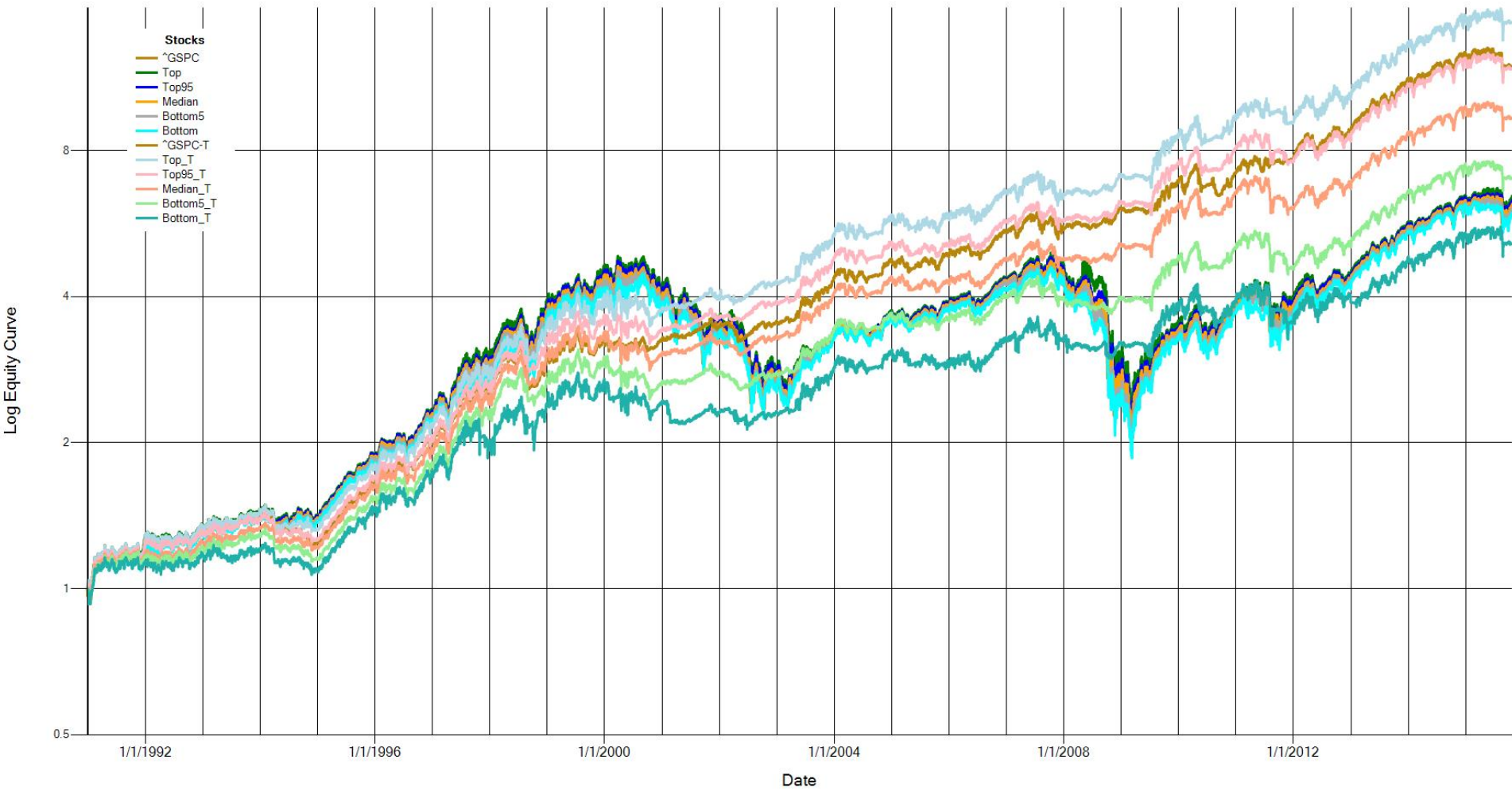
1000 Synthetic ^GSPC EC Ranges & AMom Timer Results

1000 Synthetic ^GSPC EC Ranges & AMom Timer Results



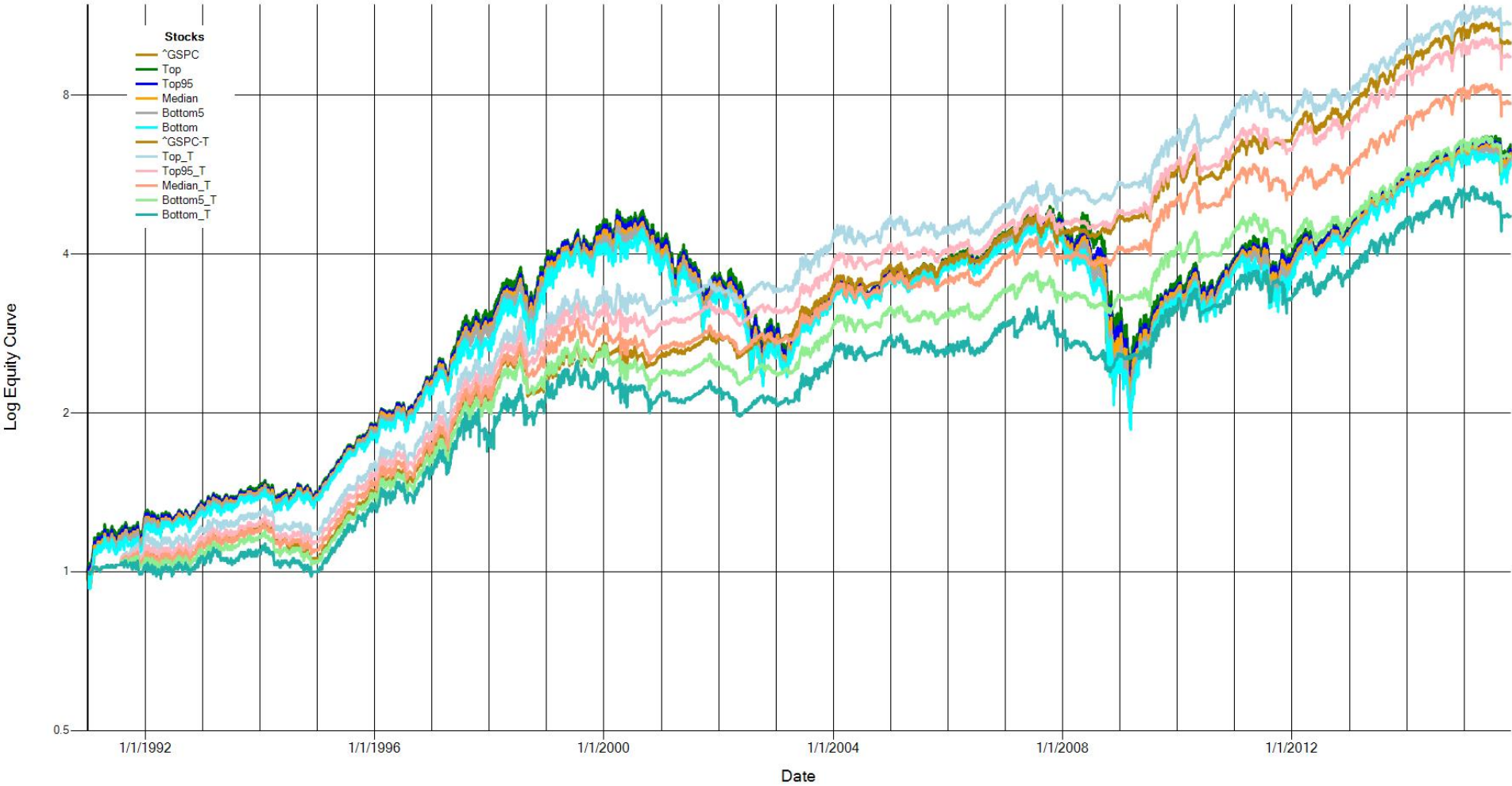
1000 Synthetic ^GSPC EC Ranges & SMA200 Timer Results

1000 Synthetic ^GSPC EC Ranges & SMA200 Timer Results



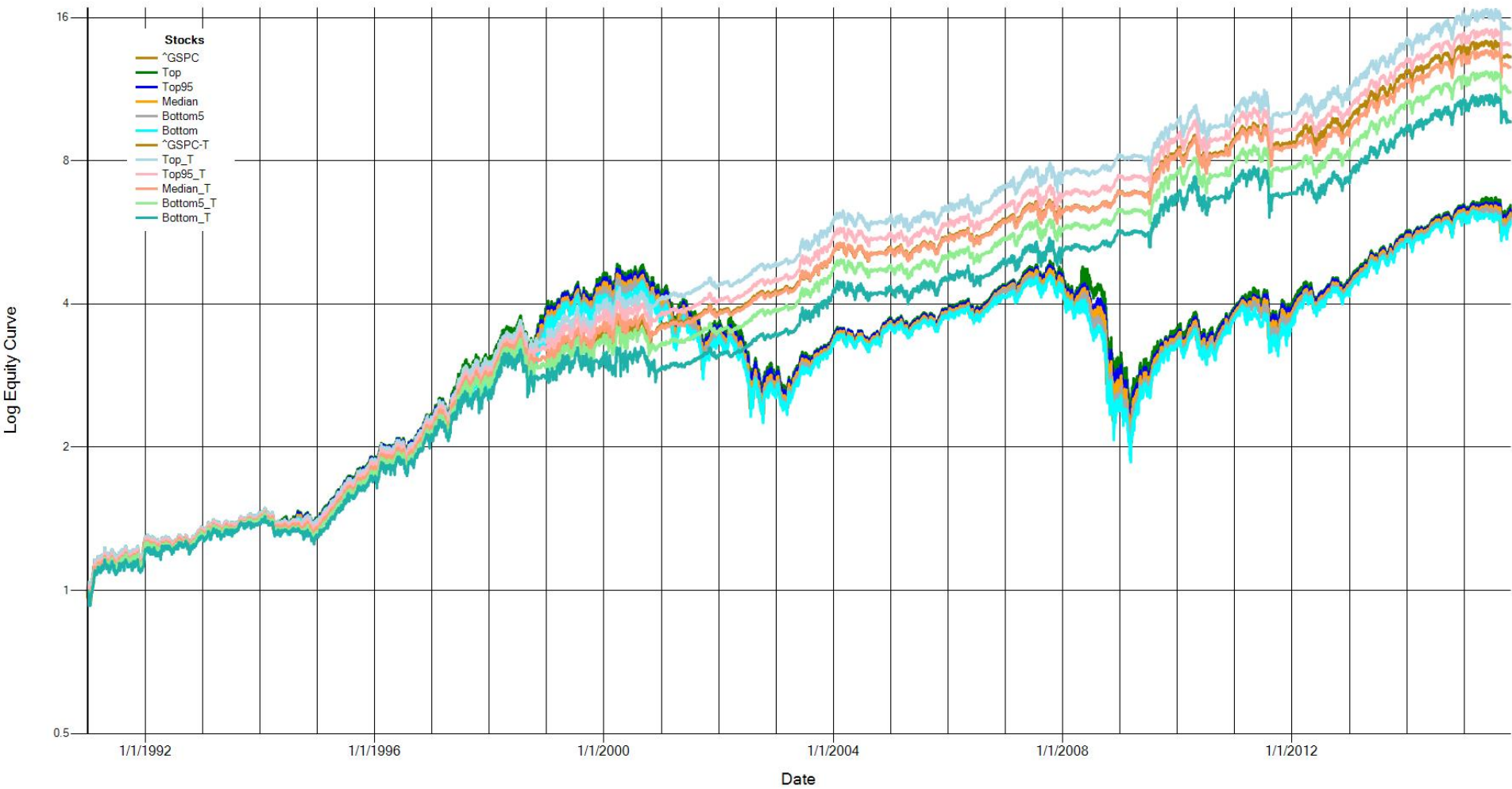
1000 Synthetic ^GSPC EC Ranges & SMA6_10 Timer Results

1000 Synthetic ^GSPC EC Ranges & SMA6_10 Timer Results



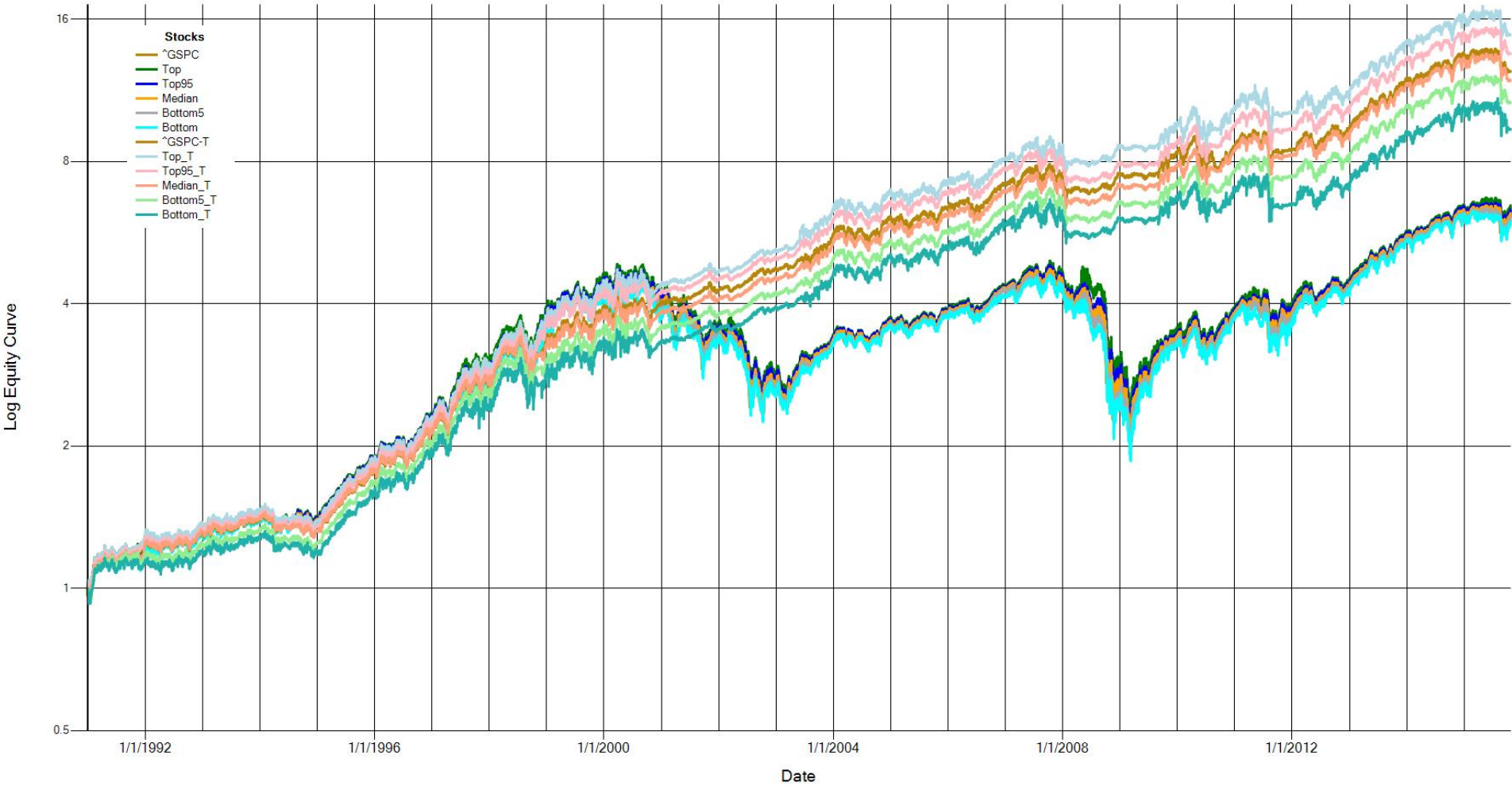
1000 Synthetic ^GSPC EC Ranges & SMA50_200 Timer Results

1000 Synthetic ^GSPC EC Ranges & SMA50_200 Timer Results



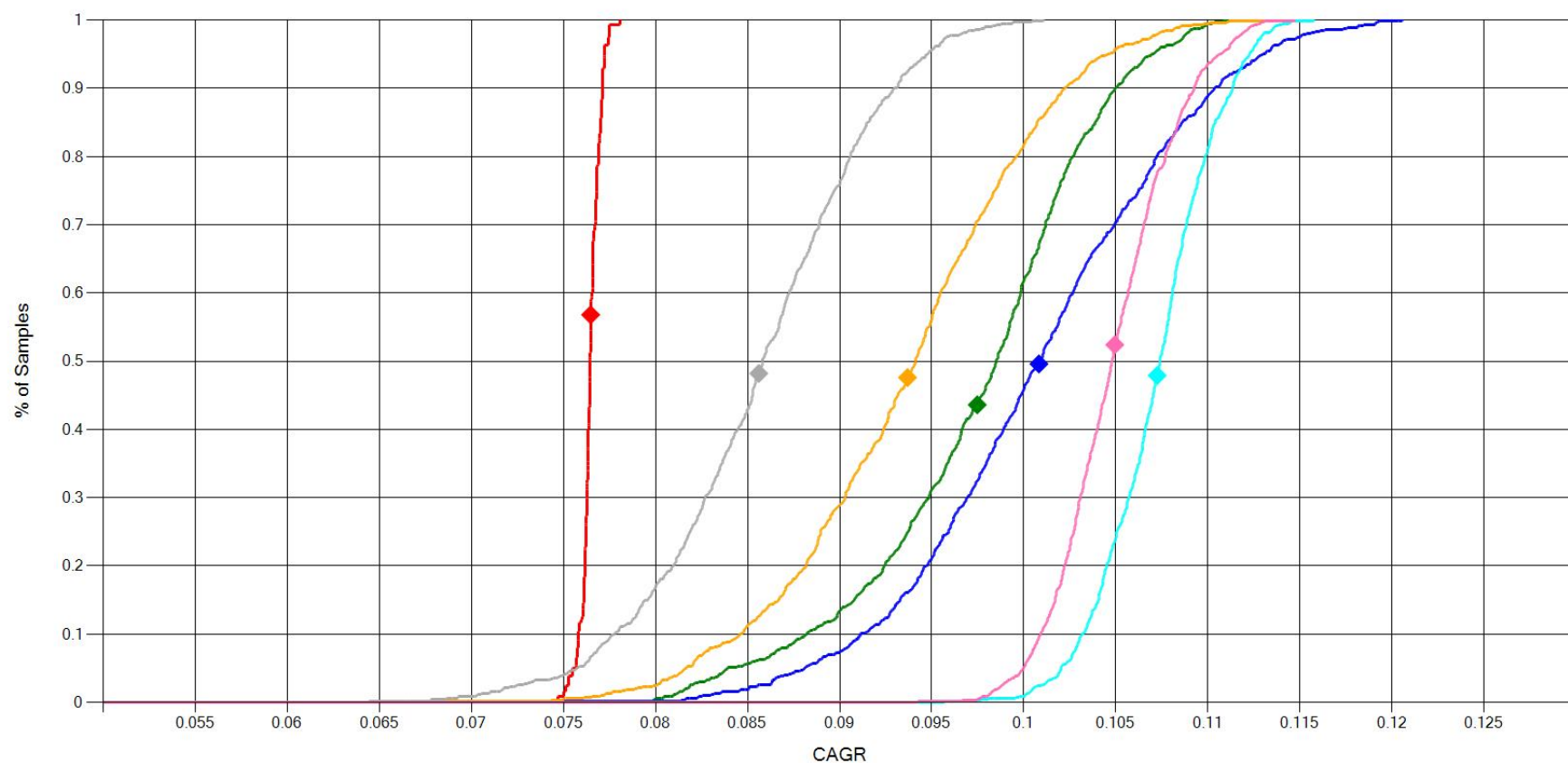
1000 Synthetic ^GSPC EC Ranges & EMA50_200 Timer Results

1000 Synthetic ^GSPC EC Ranges & EMA50_200 Timer Results



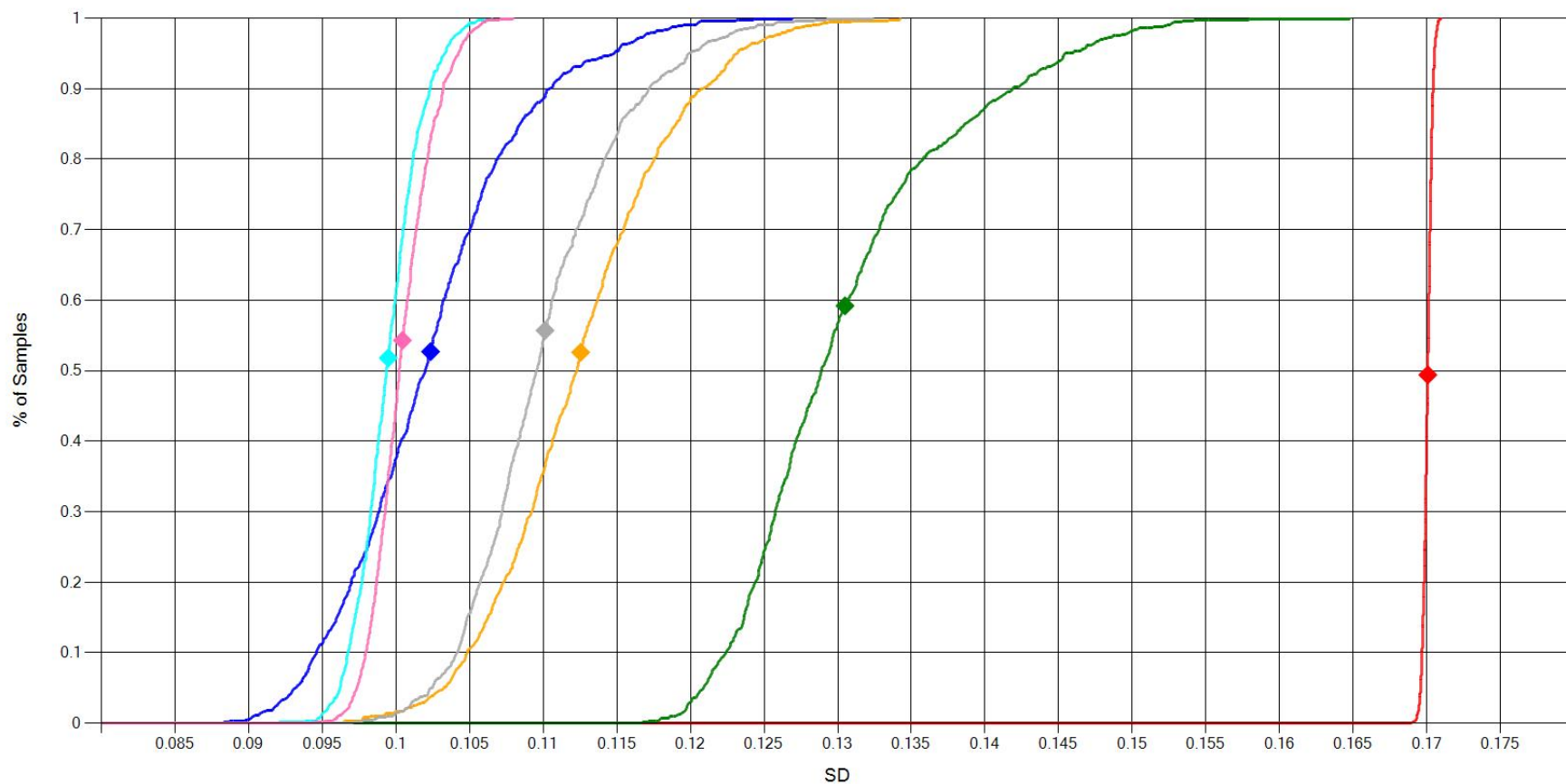
CAGR ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-CAGR	1000	7.6%	0.1%	7.5%	7.5%	7.6%	7.6%	7.7%	7.7%	7.8%
DEMA_Timed-CAGR	1000	9.7%	0.7%	6.8%	8.2%	9.1%	9.8%	10.4%	10.9%	11.3%
AMom_Timed-CAGR	1000	10.1%	0.7%	7.5%	8.6%	9.4%	10.1%	10.8%	11.5%	12.1%
SMA200_Timed-CAGR	1000	9.4%	0.7%	6.8%	8.0%	8.7%	9.4%	10.1%	10.7%	11.4%
SMA6_10_Timed-CAGR	1000	8.6%	0.6%	6.4%	7.2%	8.0%	8.6%	9.1%	9.6%	10.1%
SMA50_200_Timed-CAGR	1000	10.7%	0.3%	9.6%	10.1%	10.4%	10.7%	11.0%	11.3%	11.6%
EMA50_200_Timed-CAGR	1000	10.5%	0.3%	9.4%	9.9%	10.2%	10.5%	10.8%	11.2%	11.5%



SD ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

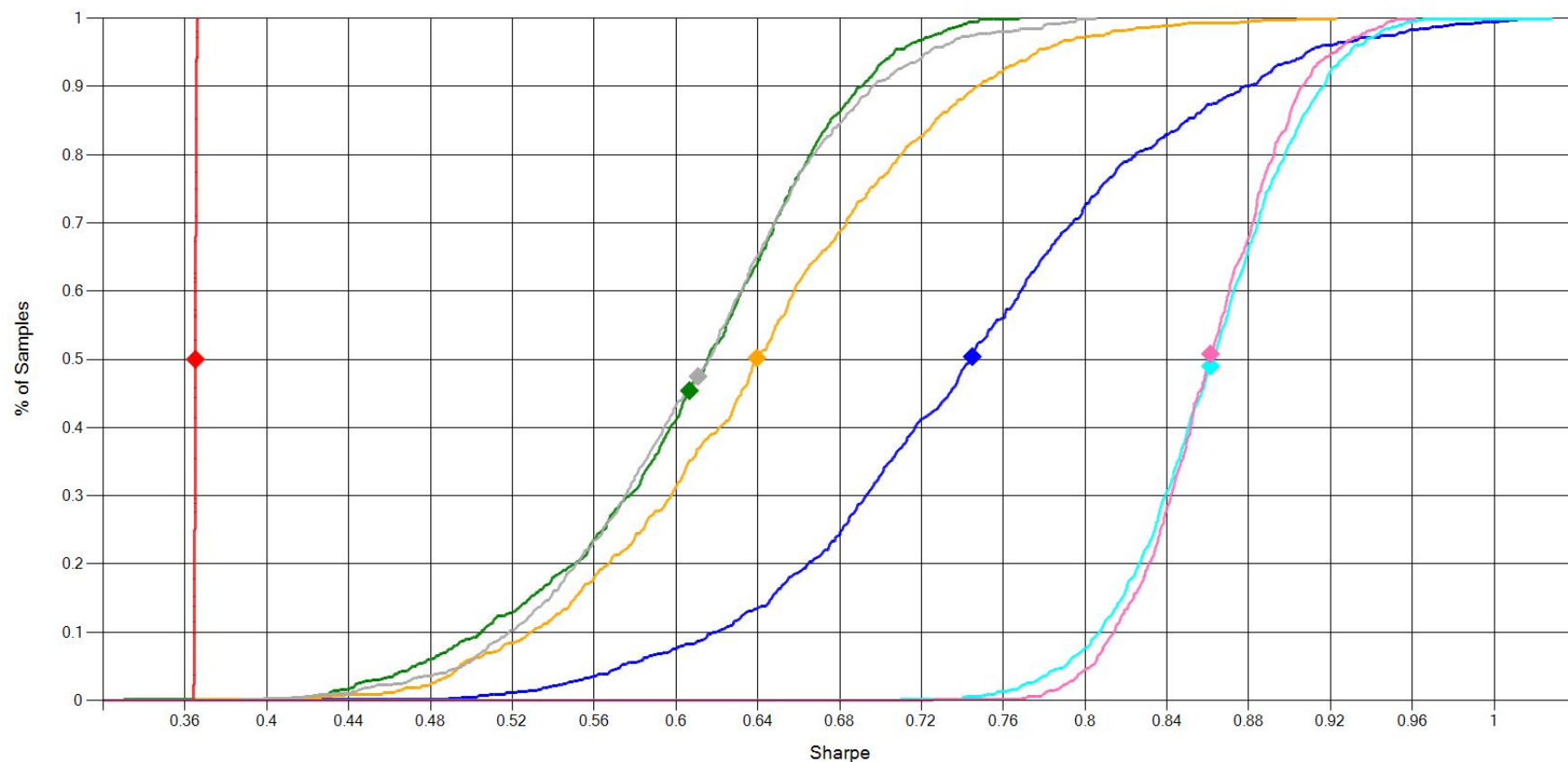
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-SD	1000	17.0%	0.0%	16.9%	16.9%	17.0%	17.0%	17.0%	17.1%	17.1%
DEMA_Timed-SD	1000	13.0%	0.8%	11.7%	12.0%	12.4%	12.9%	13.8%	14.9%	16.5%
AMom_Timed-SD	1000	10.2%	0.6%	8.8%	9.2%	9.6%	10.2%	10.8%	11.7%	12.7%
SMA200_Timed-SD	1000	11.3%	0.6%	9.6%	10.1%	10.7%	11.2%	11.9%	12.6%	13.4%
SMA6_10_Timed-SD	1000	11.0%	0.5%	9.7%	10.1%	10.5%	11.0%	11.5%	12.3%	13.2%
SMA50_200_Timed-SD	1000	9.9%	0.2%	9.2%	9.5%	9.7%	9.9%	10.1%	10.4%	10.7%
EMA50_200_Timed-SD	1000	10.0%	0.2%	9.4%	9.7%	9.8%	10.0%	10.2%	10.5%	10.8%



Base-SD-ECDF DEMA_Timed-SD_Avg SMA200_Timed-SD-ECDF SMA6_10_Timed-SD_Avg EMA50_200_Timed-SD-ECDF
 Base-SD_Avg AMom_Timed-SD-ECDF SMA200_Timed-SD_Avg SMA50_200_Timed-SD-ECDF EMA50_200_Timed-SD_Avg
 DEMA_Timed-SD-ECDF AMom_Timed-SD_Avg SMA6_10_Timed-SD-ECDF SMA50_200_Timed-SD_Avg

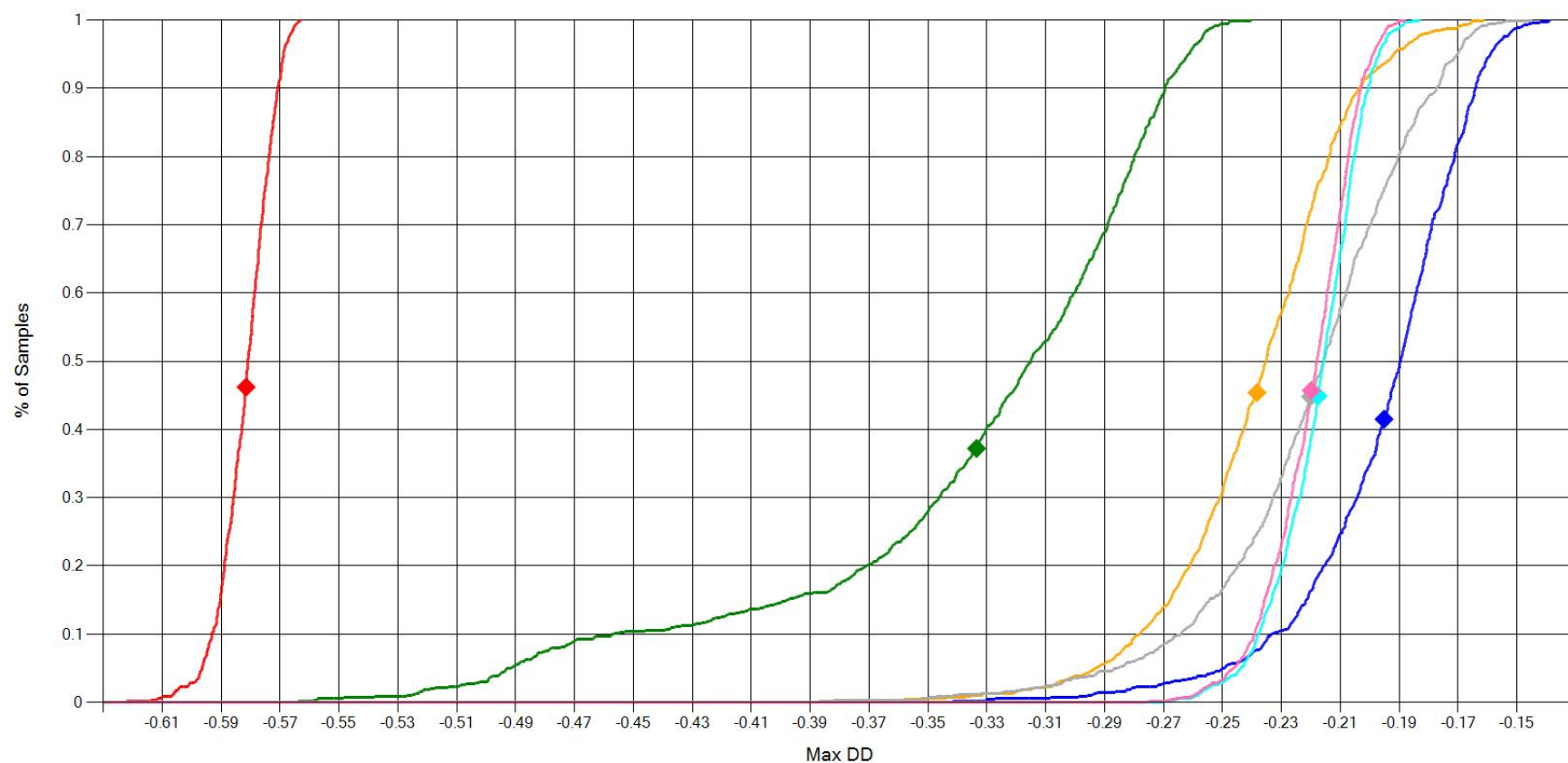
Sharpe ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sharpe	1000	36.5%	0.0%	36.4%	36.4%	36.5%	36.5%	36.5%	36.6%	36.6%
DEMA_Timed-Sharpe	1000	60.7%	7.0%	33.0%	44.3%	53.3%	61.6%	67.4%	72.8%	76.8%
AMom_Timed-Sharpe	1000	74.5%	9.9%	42.7%	54.5%	64.9%	74.4%	84.6%	95.3%	101.7%
SMA200_Timed-Sharpe	1000	64.0%	8.5%	36.5%	48.0%	55.4%	63.9%	72.5%	81.0%	92.3%
SMA6_10_Timed-Sharpe	1000	61.1%	7.1%	38.7%	46.2%	54.0%	61.6%	67.9%	74.8%	80.5%
SMA50_200_Timed-Sharpe	1000	86.1%	4.3%	71.0%	77.1%	82.0%	86.3%	90.4%	94.3%	102.8%
EMA50_200_Timed-Sharpe	1000	86.1%	3.6%	72.6%	79.1%	82.6%	86.1%	89.8%	93.5%	96.1%



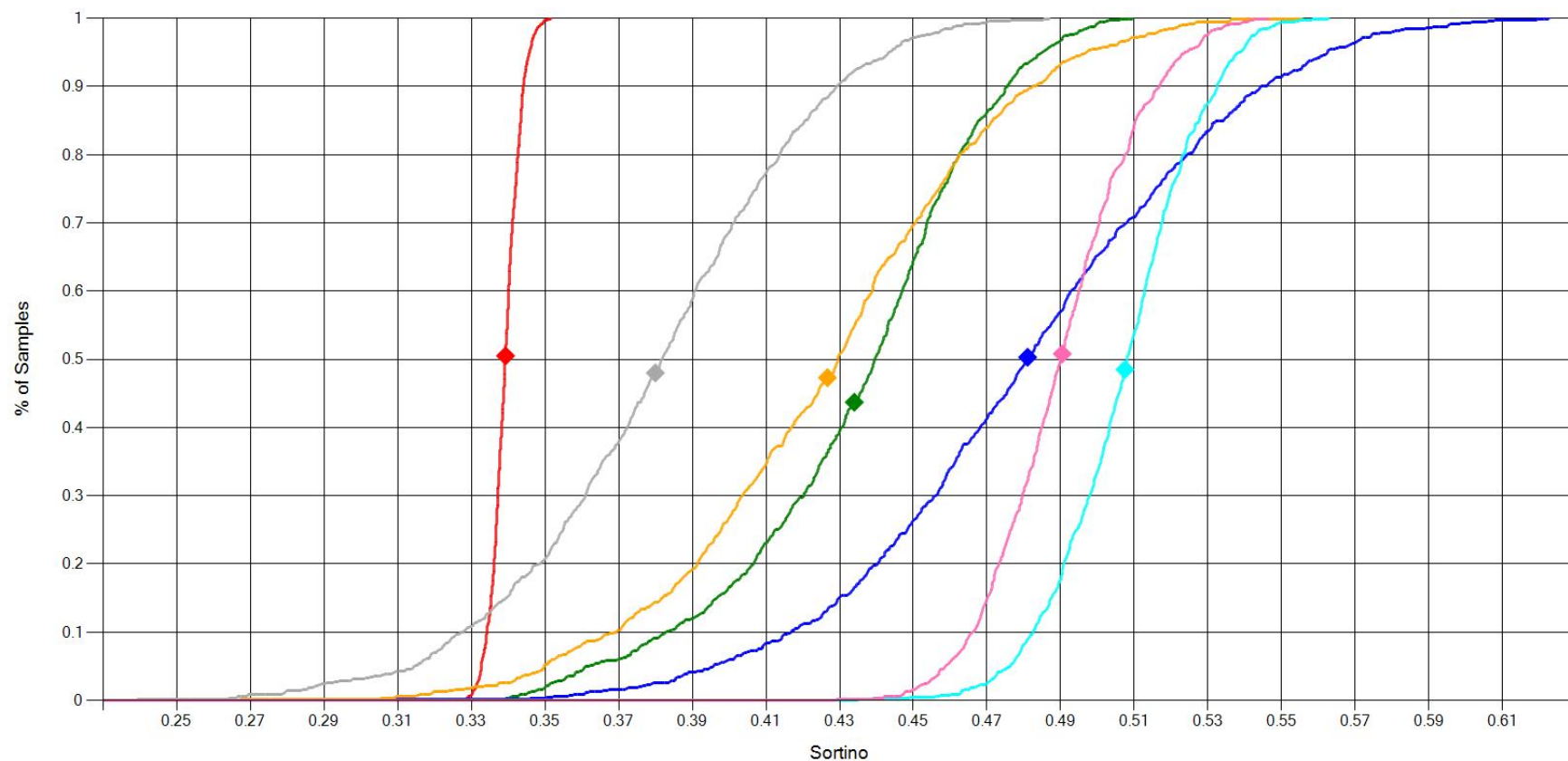
MaxDD ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-MaxDD	1000	-58.2%	0.9%	-62.2%	-60.1%	-59.0%	-58.1%	-57.3%	-56.7%	-56.3%
DEMA_Timed-MaxDD	1000	-33.4%	6.8%	-56.4%	-50.9%	-38.9%	-31.5%	-27.6%	-25.7%	-24.0%
AMom_Timed-MaxDD	1000	-19.5%	2.9%	-34.2%	-27.2%	-22.1%	-19.0%	-16.8%	-15.3%	-13.9%
SMA200_Timed-MaxDD	1000	-23.8%	3.1%	-37.1%	-30.8%	-26.7%	-23.5%	-21.0%	-18.3%	-16.1%
SMA6_10_Timed-MaxDD	1000	-22.0%	3.6%	-38.7%	-31.0%	-25.1%	-21.6%	-18.6%	-16.6%	-14.5%
SMA50_200_Timed-MaxDD	1000	-21.8%	1.5%	-27.0%	-25.4%	-23.3%	-21.6%	-20.4%	-19.4%	-18.3%
EMA50_200_Timed-MaxDD	1000	-22.0%	1.5%	-27.5%	-25.5%	-23.5%	-21.8%	-20.6%	-19.6%	-18.8%



Sortino ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sortino	1000	33.9%	0.4%	32.8%	33.1%	33.6%	33.9%	34.3%	34.7%	35.2%
DEMA_Timed-Sortino	1000	43.4%	3.5%	27.7%	35.1%	39.9%	44.0%	46.7%	49.4%	51.0%
AMom_Timed-Sortino	1000	48.1%	5.0%	30.9%	37.9%	43.3%	48.1%	53.1%	57.5%	62.3%
SMA200_Timed-Sortino	1000	42.7%	4.4%	26.7%	33.7%	38.4%	43.0%	47.0%	51.4%	55.6%
SMA6_10_Timed-Sortino	1000	38.0%	4.0%	23.9%	28.9%	34.1%	38.2%	41.9%	45.5%	48.7%
SMA50_200_Timed-Sortino	1000	50.7%	1.9%	43.5%	47.0%	48.9%	50.8%	52.7%	54.3%	56.3%
EMA50_200_Timed-Sortino	1000	49.0%	2.0%	42.9%	45.3%	47.1%	49.0%	51.0%	53.0%	54.7%

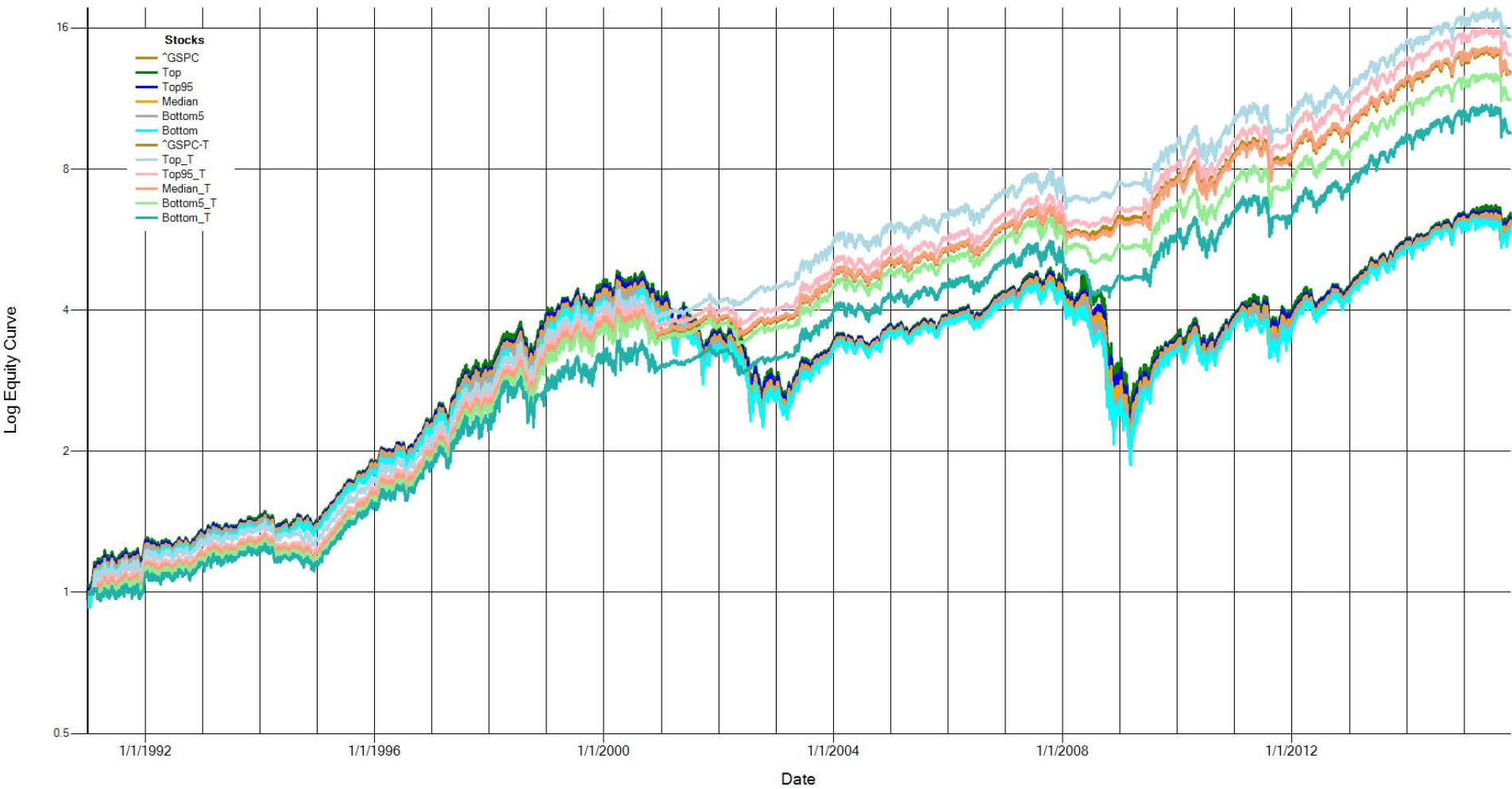


Timer Test 2

- Period 12/31/1990 – 10/23/2015 – 24.8 years
- Base Series
 - ^GSPC
- Timers
 - DEMA50(21day, offset =0%, 0.3%, 0.6%, 0.9%)
 - DEMA50(22day, offset =0%, 0.3%, 0.6%, 0.9%)
 - SMA50_200 Golden Cross
- Cash
 - FGOVX(7-10 year treasuries)
- Results
 - SMA50_200 & DEMA50(21,0%) & DEMA50(22,0%) best CAGR
 - SMA50_200 best Sharpe
 - SMA50_200 lowest MaxDD

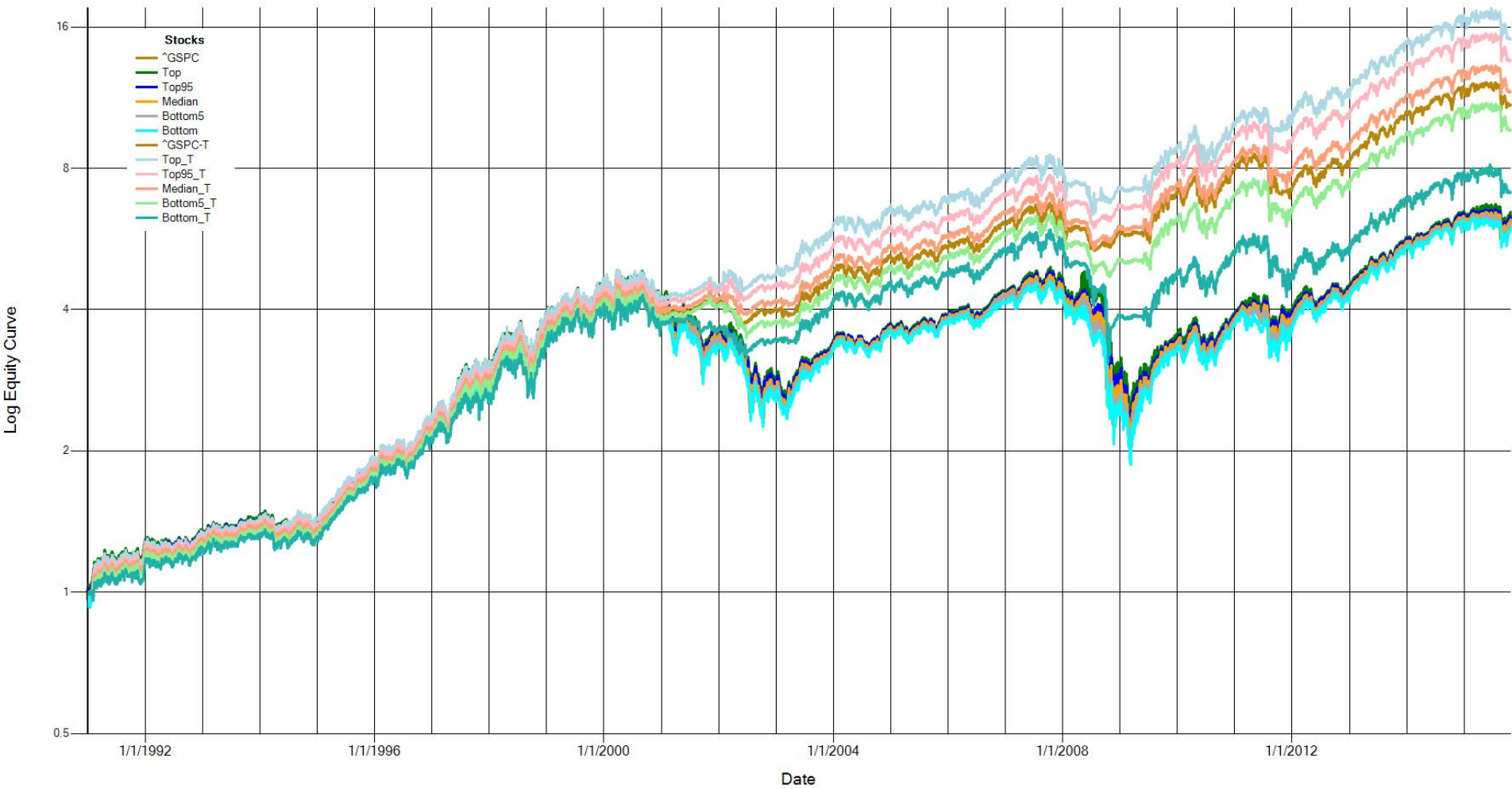
1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0%) Timer Results



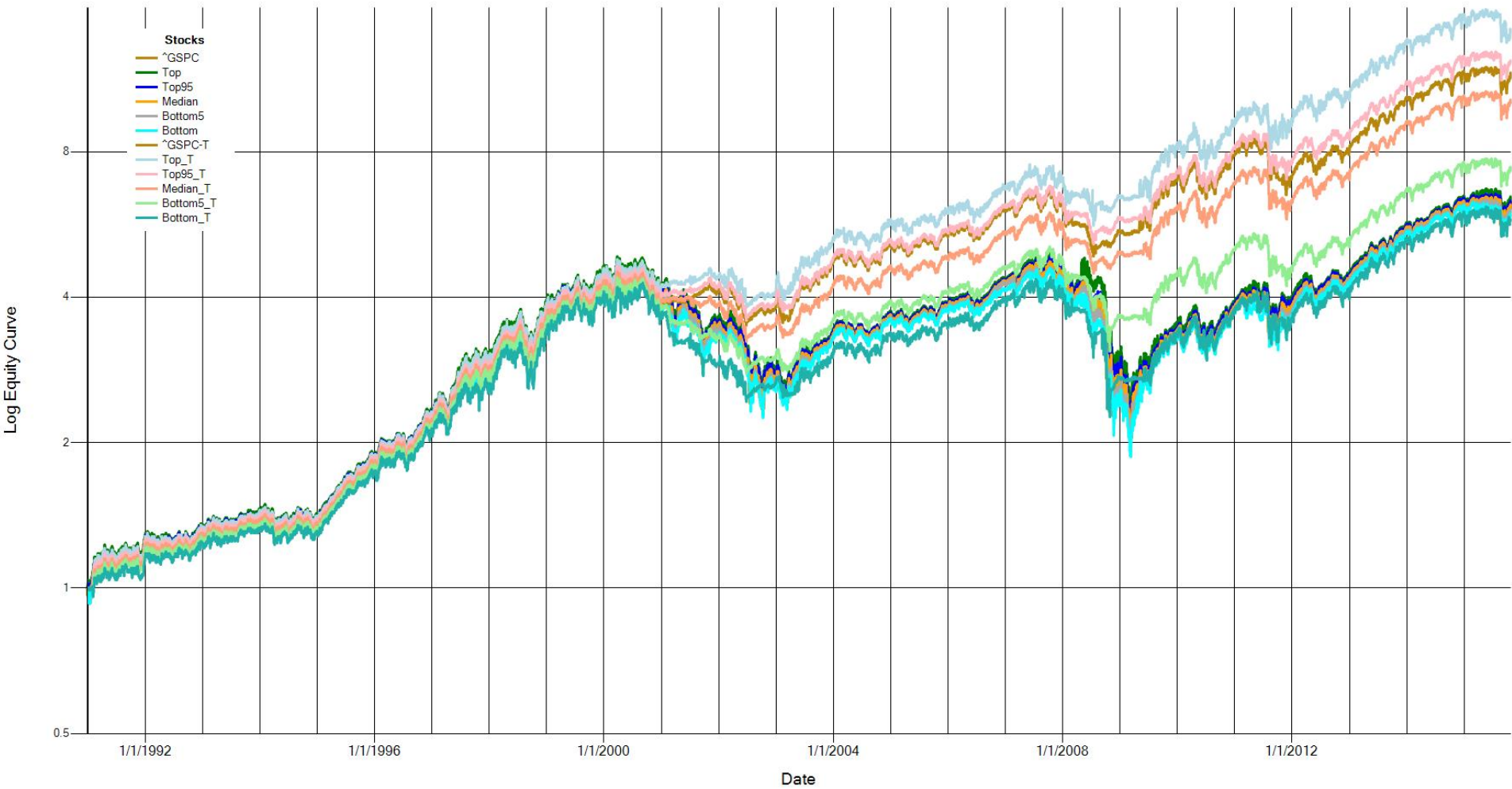
1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0.3%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0.3%) Timer Results



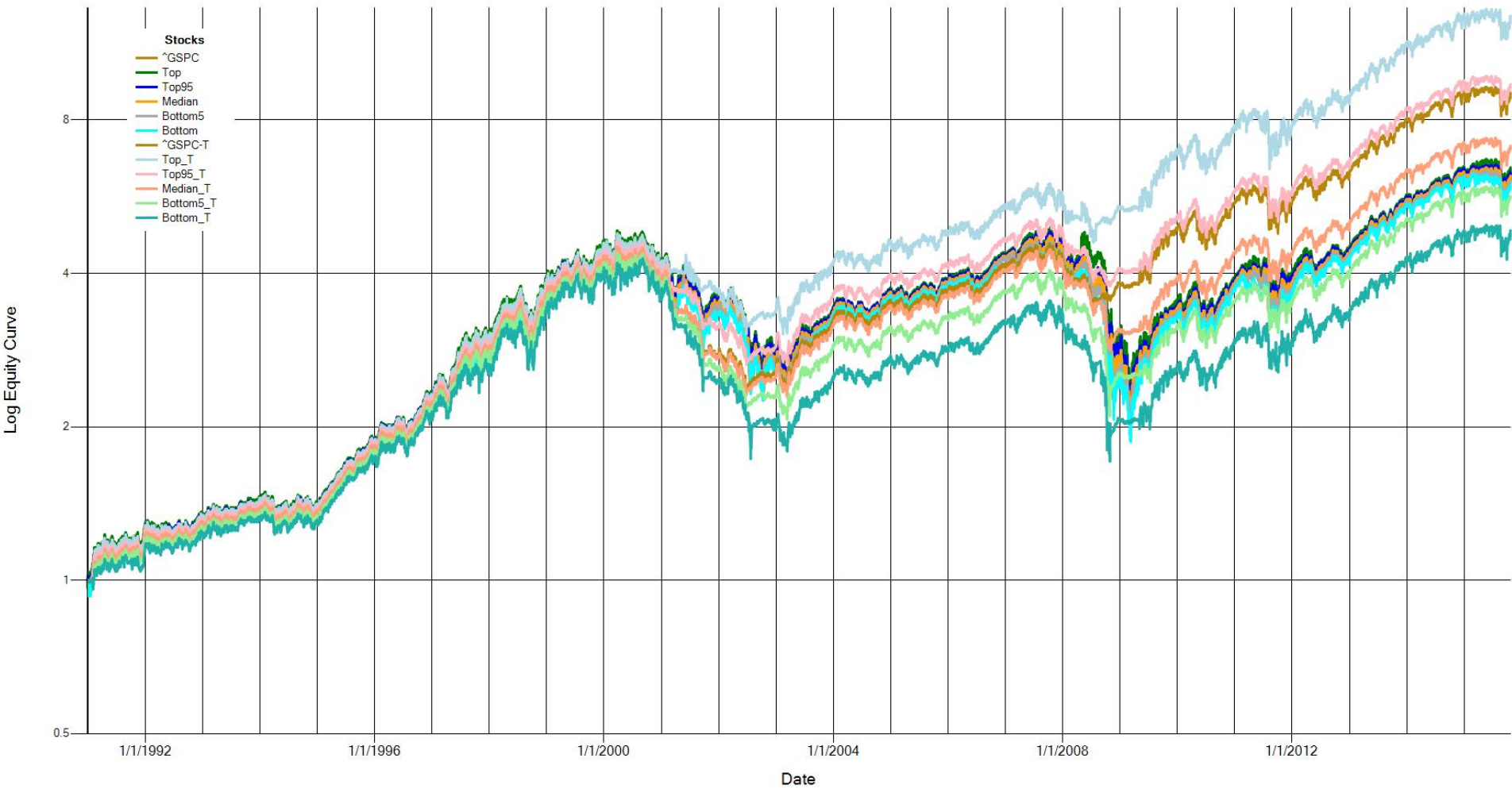
1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0.6%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0.6%) Timer Results



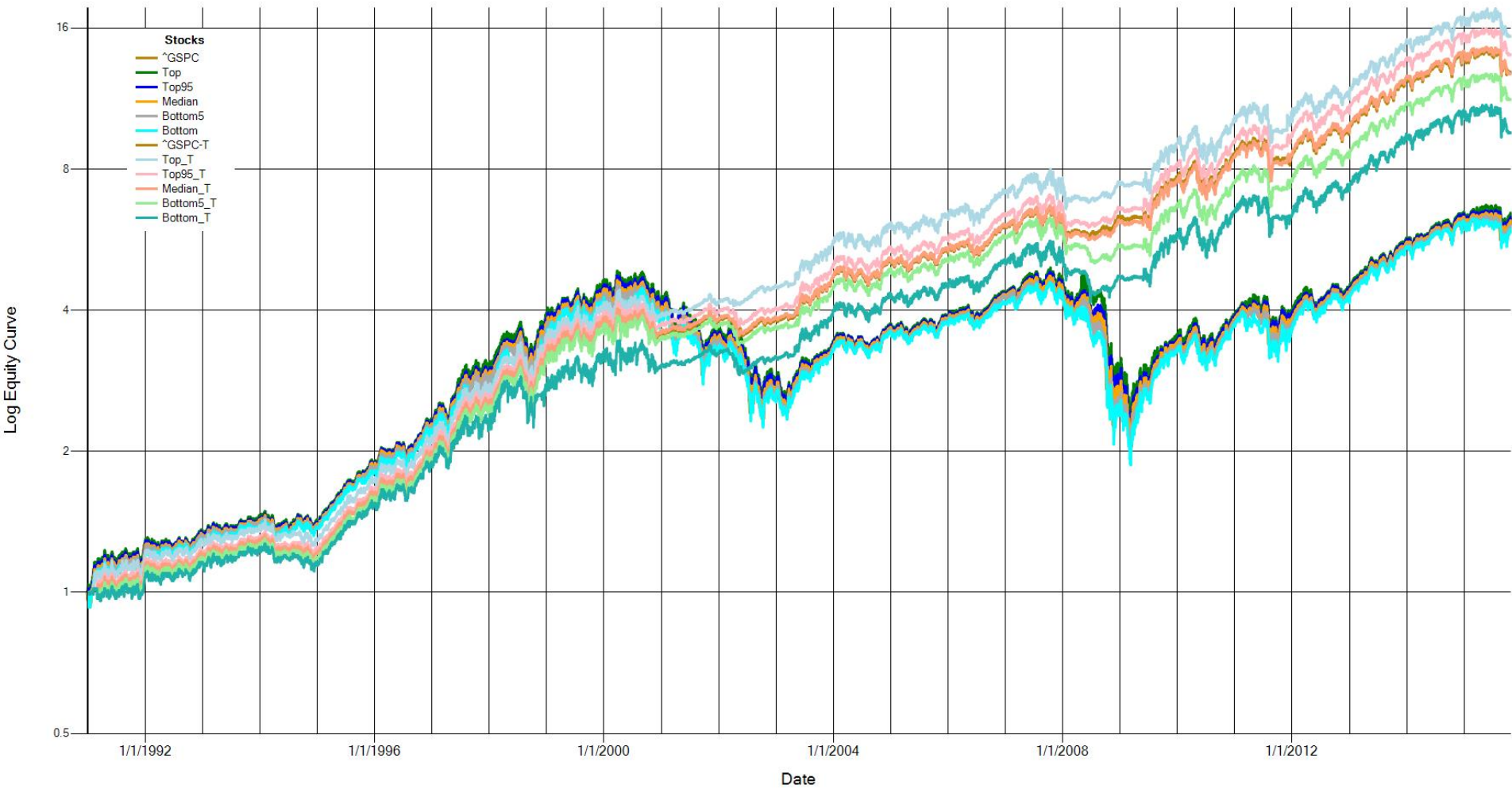
1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0.9%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(21,0.9%) Timer Results



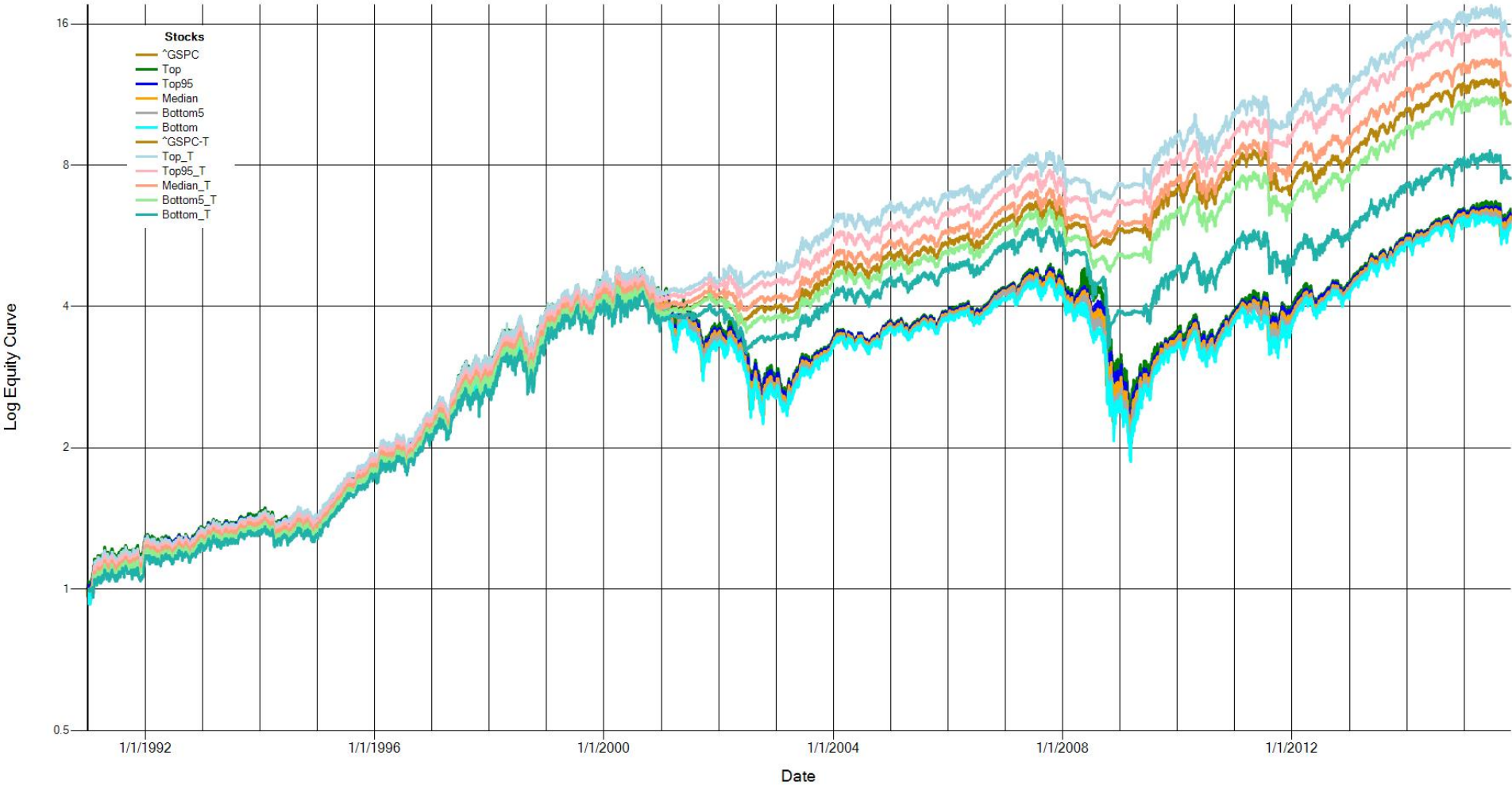
1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0%) Timer Results



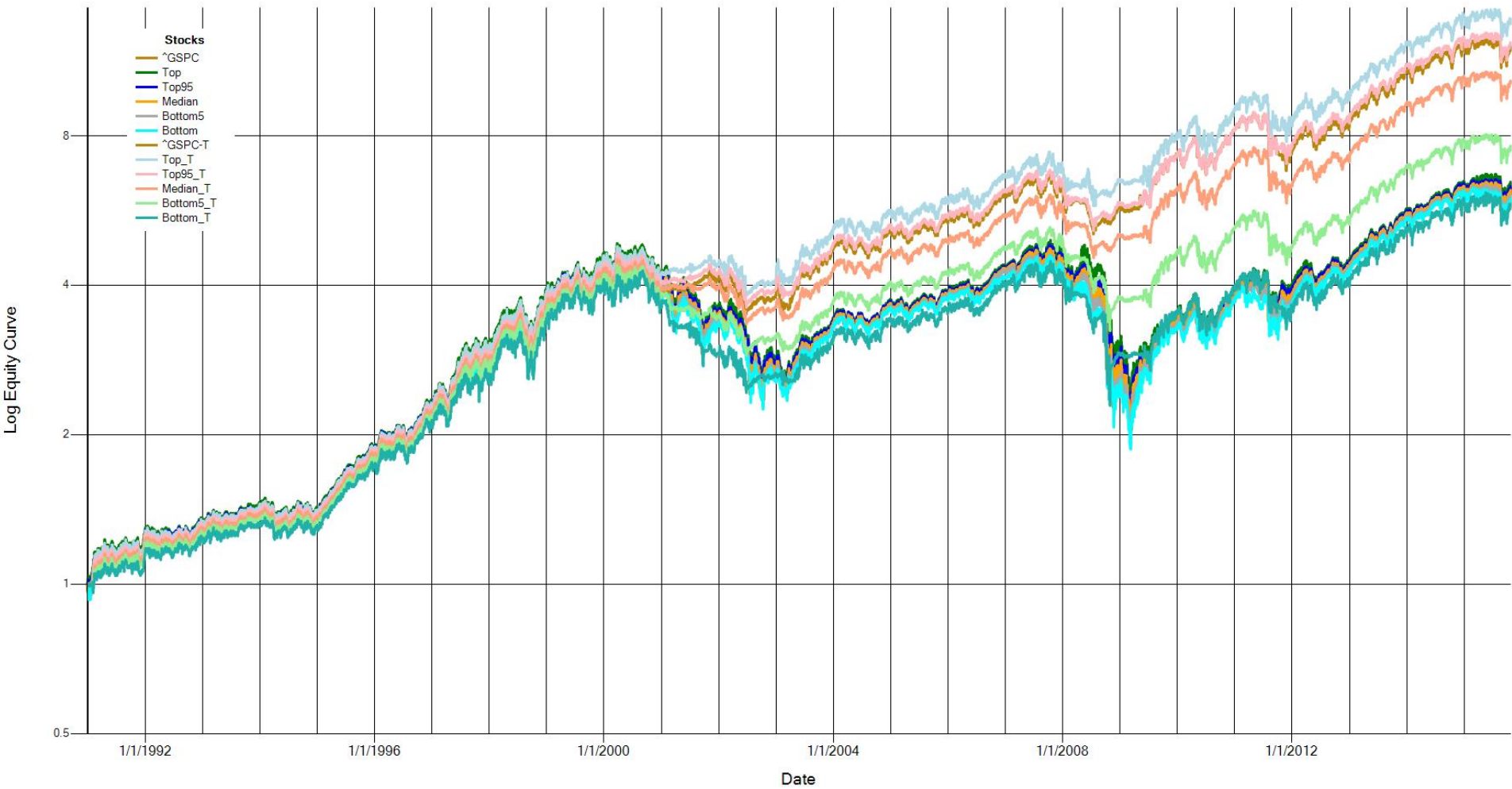
1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0.3%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0.3%) Timer Results



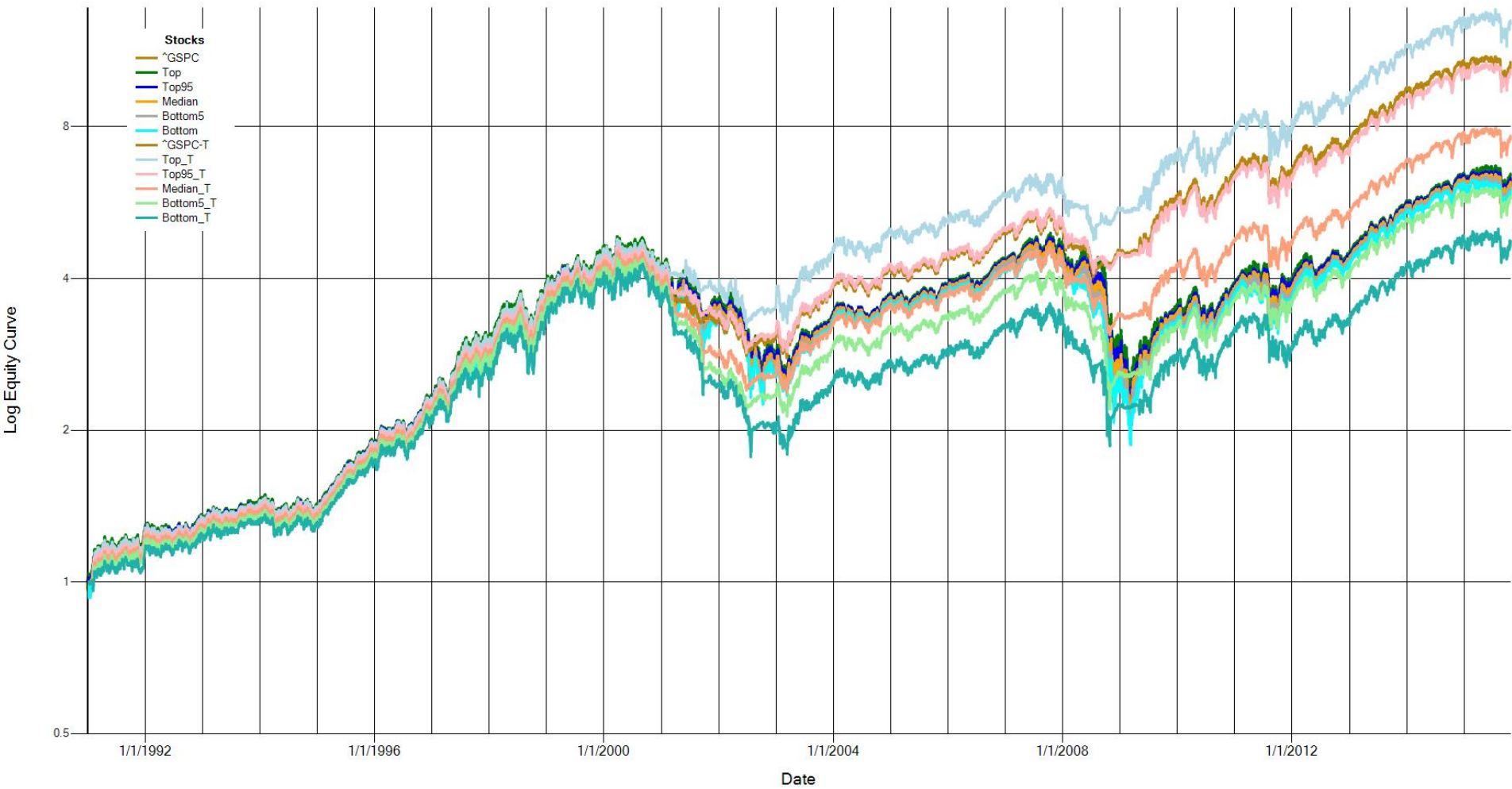
1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0.6%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0.6%) Timer Results



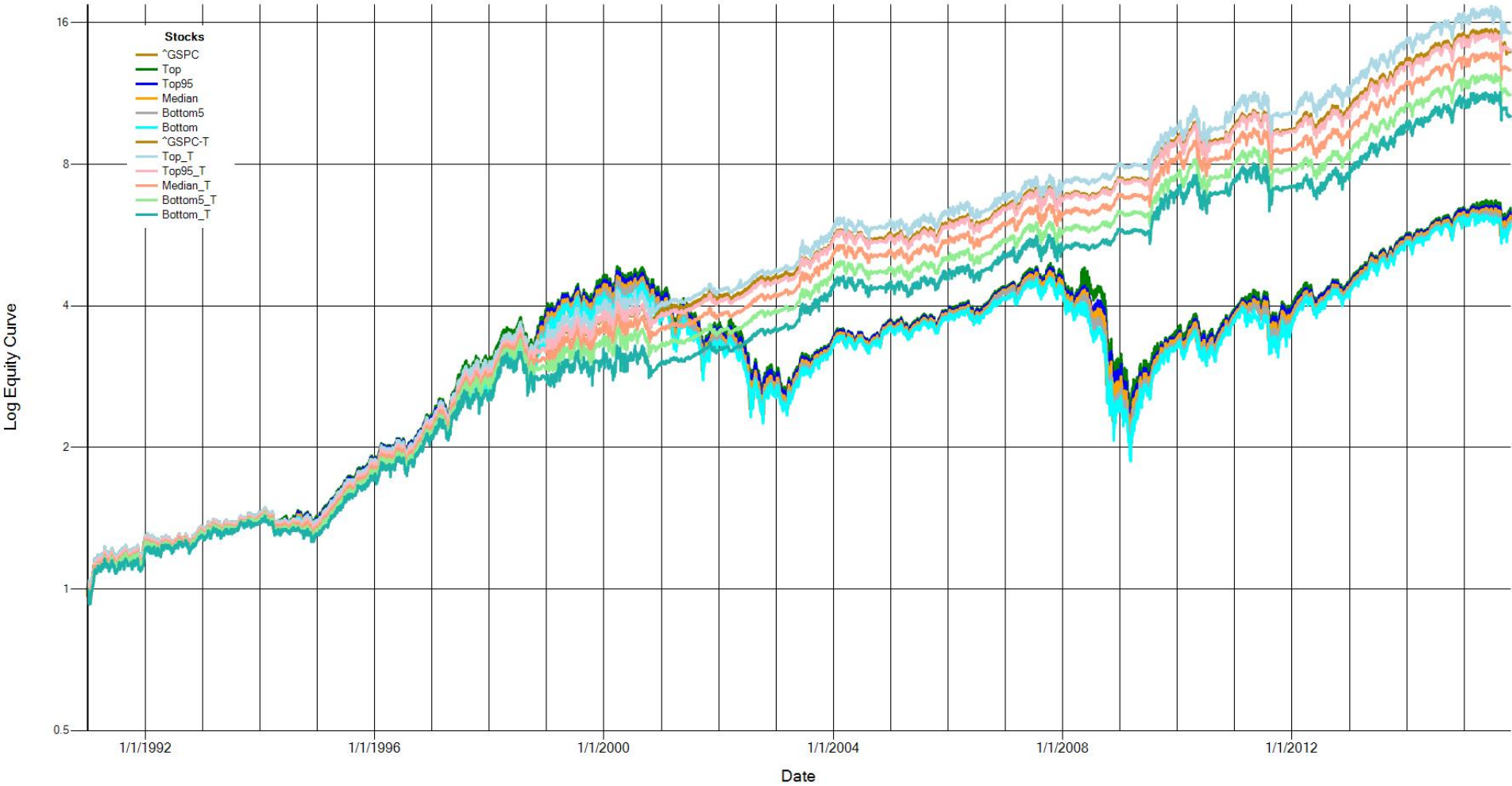
1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0.9%) Timer Results

1000 Synthetic ^GSPC EC Ranges & DEMA50(22,0.9%) Timer Results



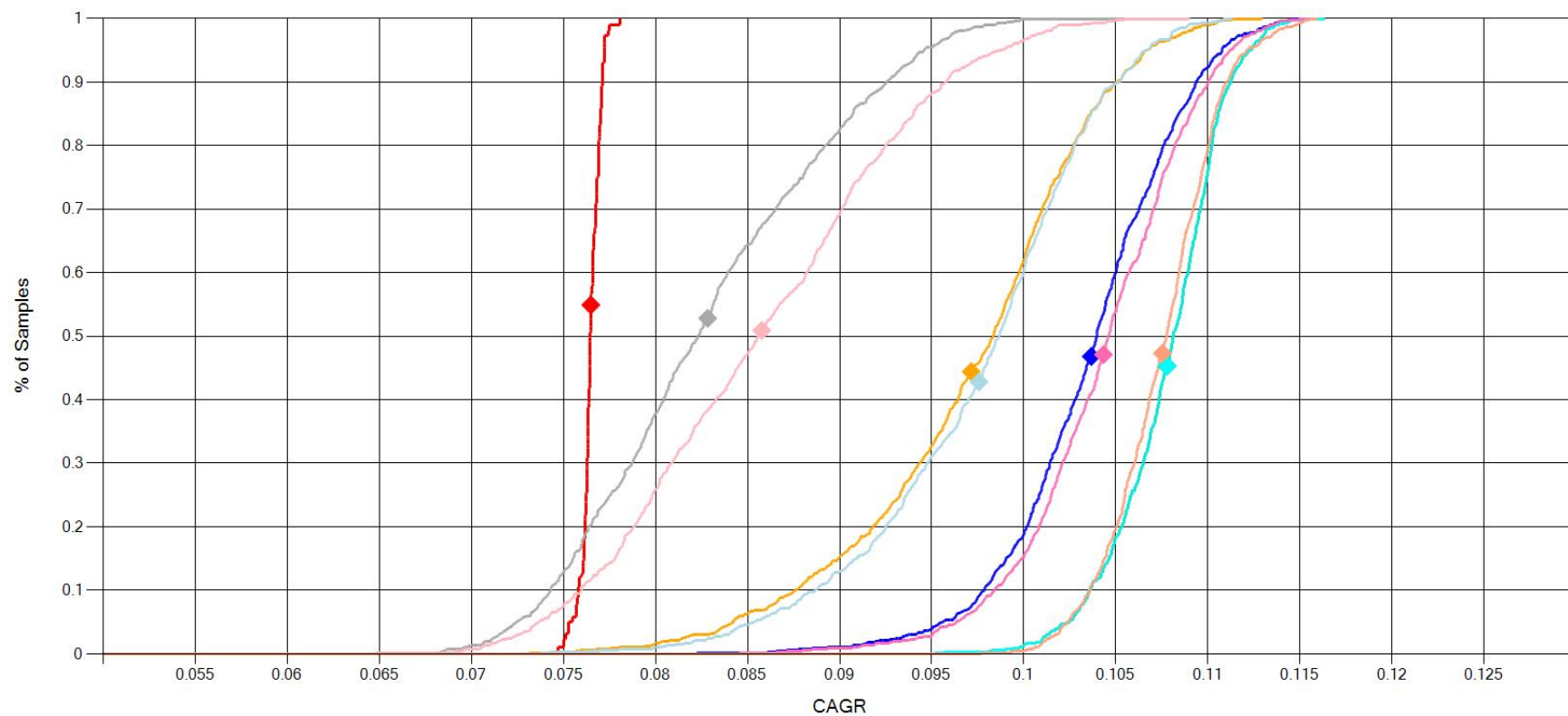
1000 Synthetic ^GSPC EC Ranges & SMA50_200 Timer Results

1000 Synthetic ^GSPC EC Ranges & SMA50_200 Timer Results



CAGR ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

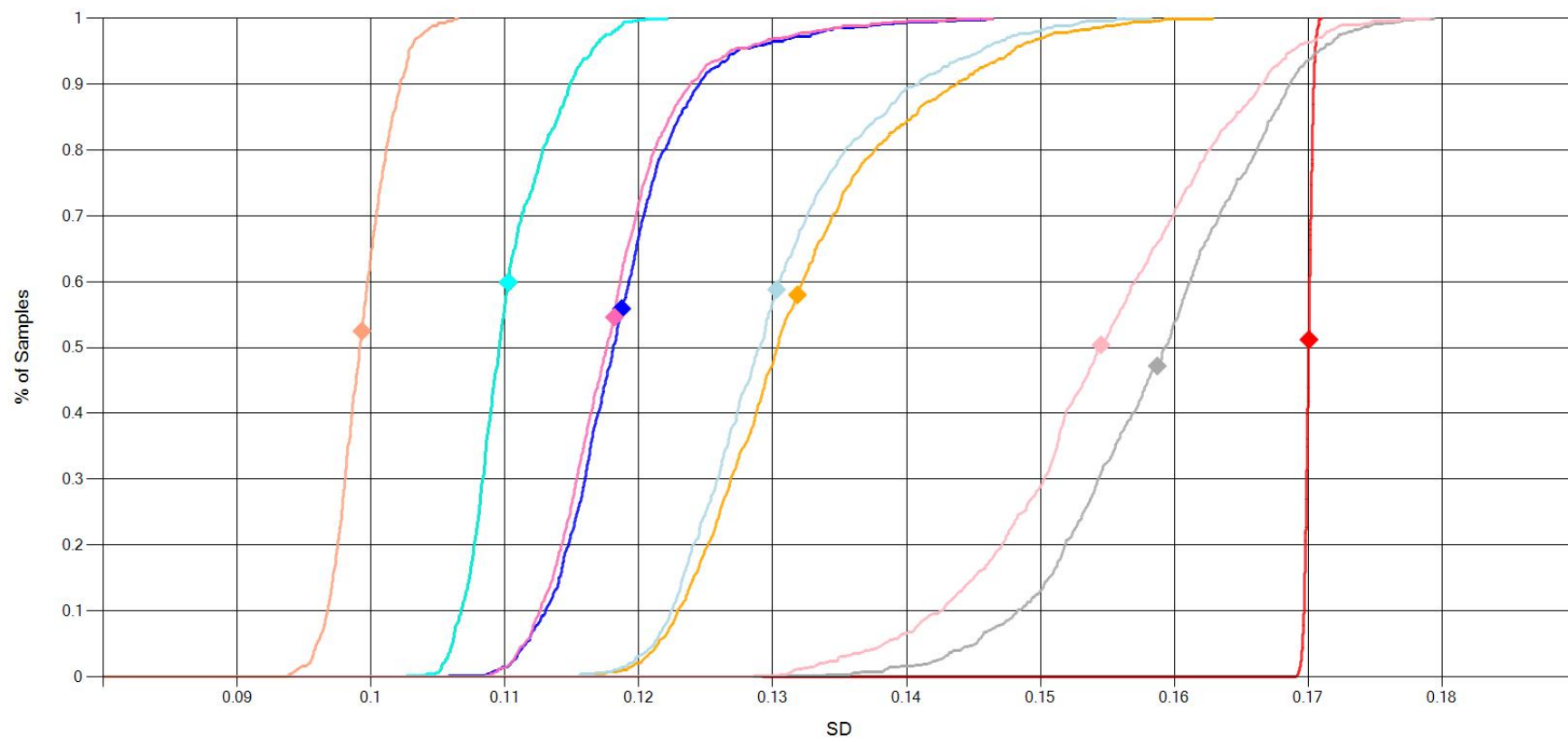
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-CAGR	1000	7.6%	0.1%	7.5%	7.5%	7.6%	7.6%	7.7%	7.7%	7.8%
DEMA50(21,0%)_Timed-CAGR	1000	10.8%	0.3%	9.5%	10.1%	10.5%	10.8%	11.1%	11.3%	11.6%
DEMA50(21,0.3%)_Timed-CAGR	1000	10.4%	0.5%	8.2%	9.3%	9.9%	10.4%	10.8%	11.2%	11.6%
DEMA50(21,0.6%)_Timed-CAGR	1000	9.7%	0.7%	7.3%	8.1%	9.0%	9.8%	10.3%	10.9%	11.3%
DEMA50(21,0.9%)_Timed-CAGR	1000	8.3%	0.7%	6.6%	7.1%	7.6%	8.2%	9.0%	9.6%	10.8%
DEMA50(22,0%)_Timed-CAGR	1000	10.8%	0.3%	9.5%	10.1%	10.5%	10.8%	11.1%	11.3%	11.6%
DEMA50(22,0.3%)_Timed-CAGR	1000	10.4%	0.5%	8.5%	9.4%	10.0%	10.5%	10.9%	11.3%	11.5%
DEMA50(22,0.6%)_Timed-CAGR	1000	9.8%	0.6%	7.4%	8.3%	9.1%	9.9%	10.3%	10.8%	11.1%
DEMA50(22,0.9%)_Timed-CAGR	1000	8.6%	0.8%	6.5%	7.2%	7.8%	8.6%	9.4%	10.1%	10.9%
SMA50_200_Timed-CAGR	1000	10.8%	0.3%	9.8%	10.1%	10.5%	10.8%	11.0%	11.4%	11.6%



- | | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------|
| — Base-CAGR-ECDF | — DEMA50(21,0.6%)_Timed-CAGR-ECDF | — DEMA50(22,0.3%)_Timed-CAGR-ECDF | — SMA50_200_Timed-CAGR-ECDF |
| ◆ Base-CAGR_Avg | ◆ DEMA50(21,0.6%)_Timed-CAGR_Avg | ◆ DEMA50(22,0.3%)_Timed-CAGR_Avg | ◆ SMA50_200_Timed-CAGR_Avg |
| — DEMA50(21,0%)_Timed-CAGR-ECDF | — DEMA50(21,0.9%)_Timed-CAGR-ECDF | — DEMA50(22,0.6%)_Timed-CAGR-ECDF | |
| ◆ DEMA50(21,0%)_Timed-CAGR_Avg | ◆ DEMA50(21,0.9%)_Timed-CAGR_Avg | ◆ DEMA50(22,0.6%)_Timed-CAGR_Avg | |
| — DEMA50(21,0.3%)_Timed-CAGR-ECDF | — DEMA50(22,0%)_Timed-CAGR-ECDF | — DEMA50(22,0.9%)_Timed-CAGR-ECDF | |
| ◆ DEMA50(21,0.3%)_Timed-CAGR_Avg | ◆ DEMA50(22,0%)_Timed-CAGR_Avg | ◆ DEMA50(22,0.9%)_Timed-CAGR_Avg | |

SD ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

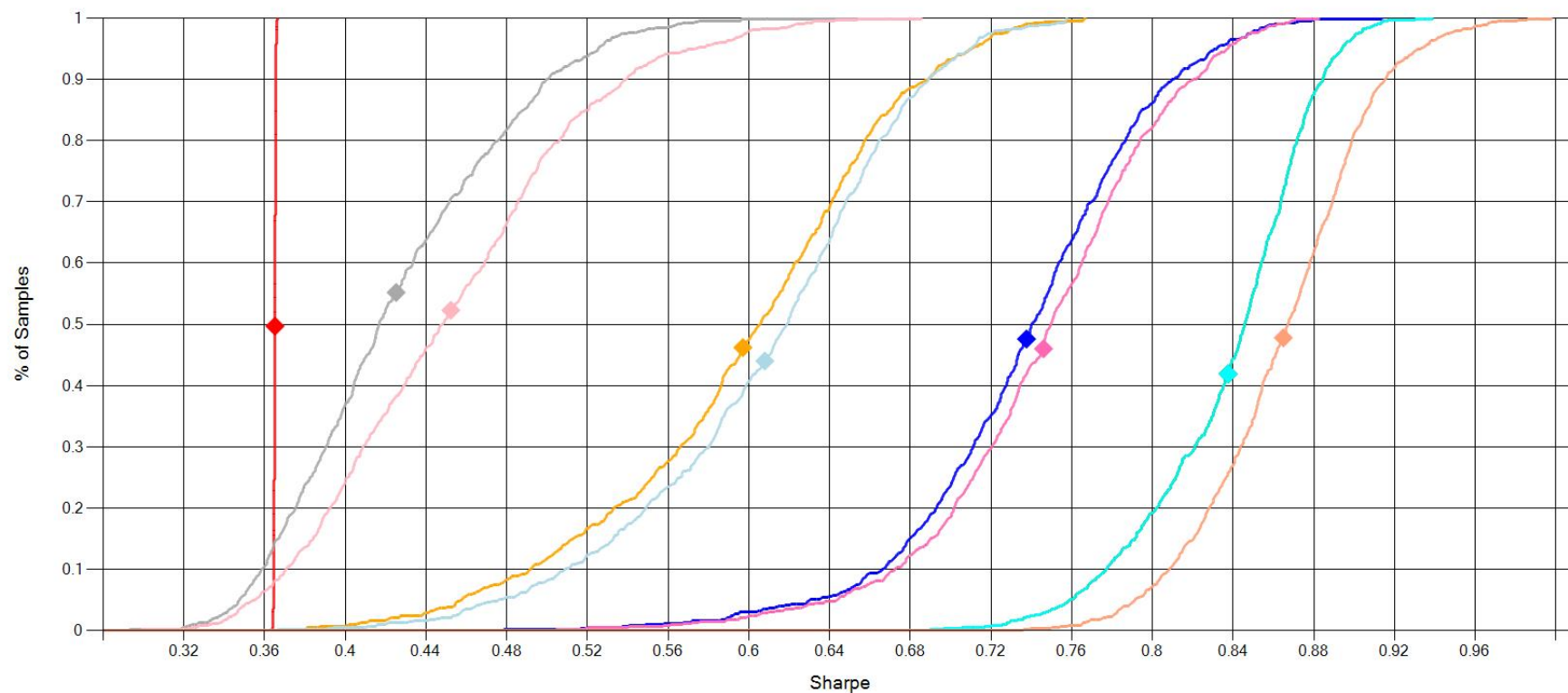
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-SD	1000	17.0%	0.0%	16.9%	16.9%	17.0%	17.0%	17.0%	17.1%	17.1%
DEMA50(21,0%)_Timed-SD	1000	11.0%	0.3%	10.3%	10.6%	10.7%	11.0%	11.4%	11.8%	12.2%
DEMA50(21,0.3%)_Timed-SD	1000	11.9%	0.5%	10.6%	11.1%	11.4%	11.8%	12.3%	13.3%	14.6%
DEMA50(21,0.6%)_Timed-SD	1000	13.2%	0.8%	11.6%	12.0%	12.4%	13.0%	14.0%	15.1%	16.3%
DEMA50(21,0.9%)_Timed-SD	1000	15.9%	0.8%	12.9%	14.2%	15.1%	15.9%	16.7%	17.3%	17.9%
DEMA50(22,0%)_Timed-SD	1000	11.0%	0.3%	10.3%	10.6%	10.7%	11.0%	11.4%	11.8%	12.2%
DEMA50(22,0.3%)_Timed-SD	1000	11.8%	0.5%	10.9%	11.1%	11.4%	11.8%	12.2%	13.2%	14.6%
DEMA50(22,0.6%)_Timed-SD	1000	13.0%	0.7%	11.6%	12.0%	12.3%	12.9%	13.7%	14.9%	15.8%
DEMA50(22,0.9%)_Timed-SD	1000	15.5%	0.9%	12.9%	13.5%	14.5%	15.4%	16.4%	17.1%	17.9%
SMA50_200_Timed-SD	1000	9.9%	0.2%	9.4%	9.5%	9.7%	9.9%	10.2%	10.4%	10.7%



Base-SD-ECDF
 Base-SD_Avg
 DEMA50(21,0.0%)_Timed-SD-ECDF
 DEMA50(21,0.0%)_Timed-SD_Avg
 DEMA50(21,0.3%)_Timed-SD-ECDF
 DEMA50(21,0.3%)_Timed-SD_Avg
 DEMA50(21,0.6%)_Timed-SD-ECDF
 DEMA50(21,0.6%)_Timed-SD_Avg
 DEMA50(21,0.9%)_Timed-SD-ECDF
 DEMA50(21,0.9%)_Timed-SD_Avg
 DEMA50(22,0.0%)_Timed-SD-ECDF
 DEMA50(22,0.0%)_Timed-SD_Avg
 DEMA50(22,0.3%)_Timed-SD-ECDF
 DEMA50(22,0.3%)_Timed-SD_Avg
 DEMA50(22,0.6%)_Timed-SD-ECDF
 DEMA50(22,0.6%)_Timed-SD_Avg
 DEMA50(22,0.9%)_Timed-SD-ECDF
 DEMA50(22,0.9%)_Timed-SD_Avg
 SMA50_200_Timed-SD-ECDF
 SMA50_200_Timed-SD_Avg

Sharpe ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

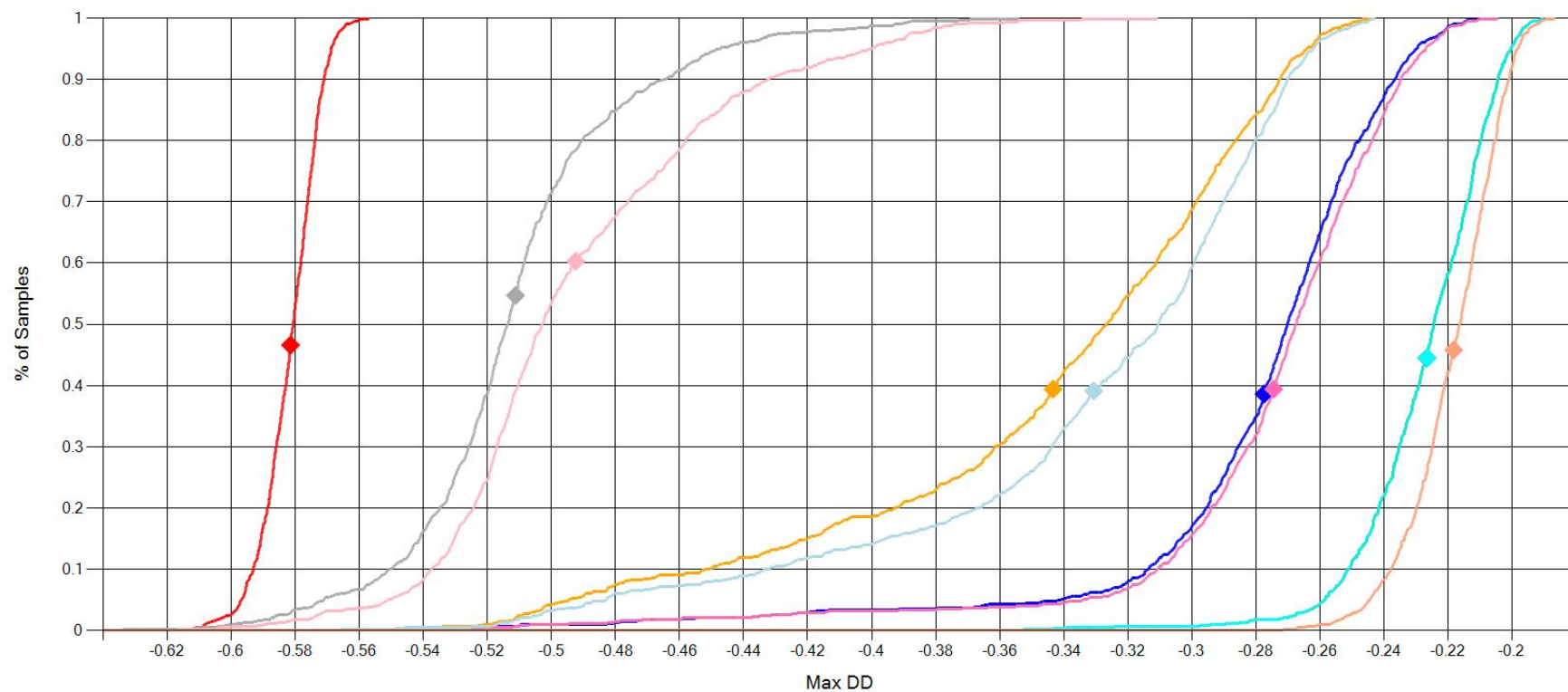
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sharpe	1000	36.5%	0.0%	36.4%	36.4%	36.5%	36.5%	36.5%	36.6%	36.6%
DEMA50(21,0%)_Timed-Sharpe	1000	83.8%	4.2%	69.0%	73.9%	79.2%	84.6%	87.6%	90.3%	93.9%
DEMA50(21,0.3%)_Timed-Sharpe	1000	73.8%	6.1%	47.9%	59.2%	68.3%	74.0%	79.3%	84.9%	91.4%
DEMA50(21,0.6%)_Timed-Sharpe	1000	59.7%	7.5%	36.8%	43.7%	51.9%	60.6%	66.6%	72.8%	76.7%
DEMA50(21,0.9%)_Timed-Sharpe	1000	42.5%	5.5%	29.3%	33.8%	36.8%	41.7%	48.5%	54.4%	67.0%
DEMA50(22,0%)_Timed-Sharpe	1000	83.8%	4.2%	69.0%	73.9%	79.2%	84.6%	87.6%	90.3%	93.9%
DEMA50(22,0.3%)_Timed-Sharpe	1000	74.6%	6.0%	50.4%	60.2%	69.4%	75.0%	80.4%	84.9%	88.2%
DEMA50(22,0.6%)_Timed-Sharpe	1000	60.8%	7.0%	36.7%	45.4%	53.5%	61.9%	67.4%	72.1%	75.8%
DEMA50(22,0.9%)_Timed-Sharpe	1000	45.2%	6.6%	29.9%	34.4%	38.6%	44.8%	51.6%	59.9%	68.6%
SMA50_200_Timed-Sharpe	1000	86.5%	4.2%	73.6%	78.1%	82.3%	86.7%	90.5%	94.8%	99.8%



- Base-Sharpe-ECDF
- ◆ Base-Sharpe_Avg
- DEMA50(21,0%)_Timed-Sharpe-ECDF
- ◆ DEMA50(21,0%)_Timed-Sharpe_Avg
- DEMA50(21,0.3%)_Timed-Sharpe-ECDF
- ◆ DEMA50(21,0.3%)_Timed-Sharpe_Avg
- DEMA50(21,0.6%)_Timed-Sharpe-ECDF
- ◆ DEMA50(21,0.6%)_Timed-Sharpe_Avg
- DEMA50(21,0.9%)_Timed-Sharpe-ECDF
- ◆ DEMA50(21,0.9%)_Timed-Sharpe_Avg
- DEMA50(22,0%)_Timed-Sharpe-ECDF
- ◆ DEMA50(22,0%)_Timed-Sharpe_Avg
- DEMA50(22,0.3%)_Timed-Sharpe-ECDF
- ◆ DEMA50(22,0.3%)_Timed-Sharpe_Avg
- DEMA50(22,0.6%)_Timed-Sharpe-ECDF
- ◆ DEMA50(22,0.6%)_Timed-Sharpe_Avg
- DEMA50(22,0.9%)_Timed-Sharpe-ECDF
- ◆ DEMA50(22,0.9%)_Timed-Sharpe_Avg
- SMA50_200_Timed-Sharpe-ECDF
- ◆ SMA50_200_Timed-Sharpe_Avg

MaxDD ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

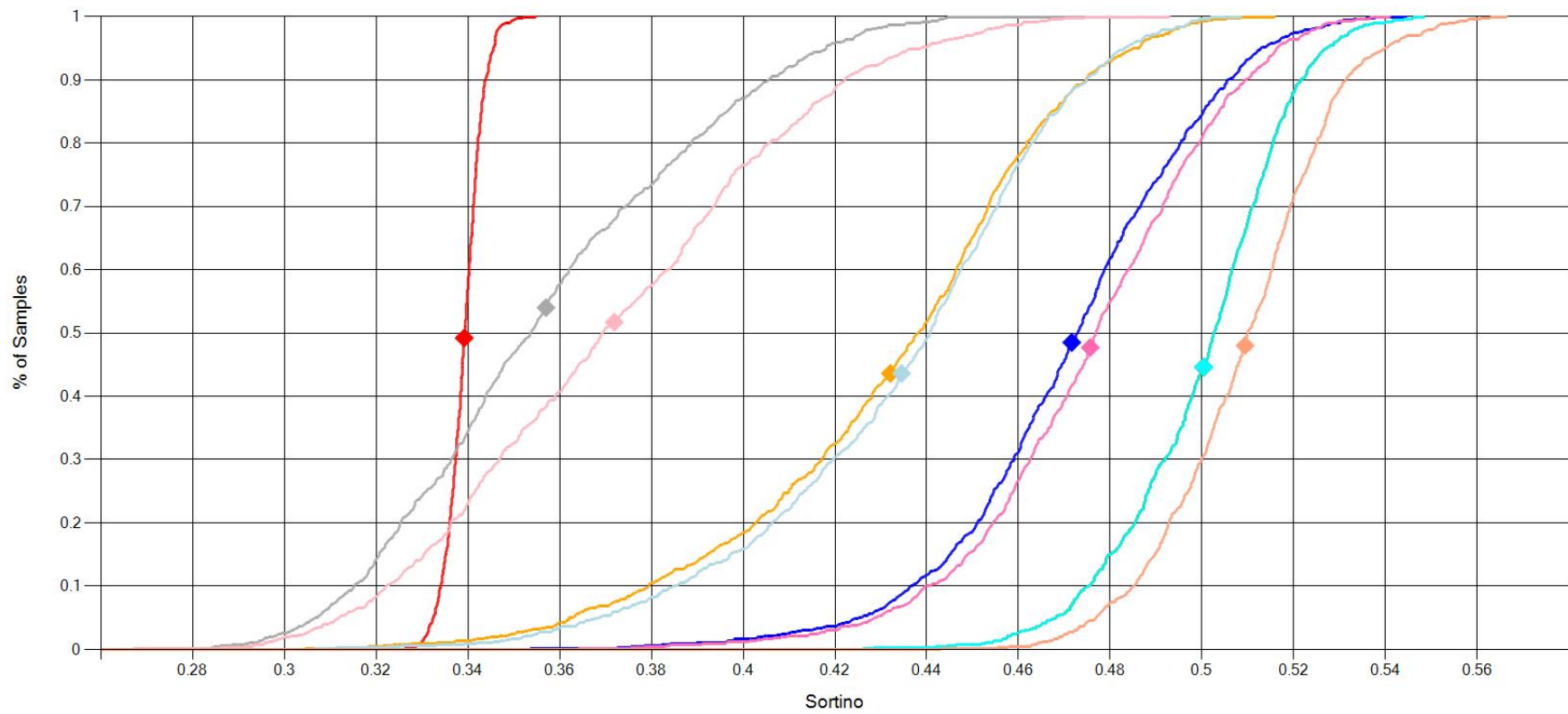
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-MaxDD	1000	-58.2%	0.9%	-61.4%	-60.1%	-59.0%	-58.1%	-57.3%	-56.7%	-55.7%
DEMA50(21,0%)_Timed-MaxDD	1000	-22.7%	2.0%	-35.3%	-26.8%	-24.4%	-22.4%	-20.8%	-19.7%	-19.0%
DEMA50(21,0.3%)_Timed-MaxDD	1000	-27.7%	4.5%	-53.7%	-43.1%	-30.1%	-27.0%	-24.3%	-22.2%	-20.6%
DEMA50(21,0.6%)_Timed-MaxDD	1000	-34.3%	6.8%	-56.6%	-51.0%	-41.5%	-32.7%	-28.0%	-25.8%	-24.3%
DEMA50(21,0.9%)_Timed-MaxDD	1000	-51.1%	3.6%	-63.4%	-58.6%	-54.0%	-51.4%	-48.2%	-42.4%	-35.4%
DEMA50(22,0%)_Timed-MaxDD	1000	-22.7%	2.0%	-35.3%	-26.8%	-24.4%	-22.4%	-20.8%	-19.7%	-19.0%
DEMA50(22,0.3%)_Timed-MaxDD	1000	-27.4%	4.5%	-53.2%	-43.1%	-29.9%	-26.7%	-24.0%	-22.1%	-20.5%
DEMA50(22,0.6%)_Timed-MaxDD	1000	-33.1%	6.5%	-56.6%	-50.5%	-38.7%	-31.0%	-27.6%	-25.5%	-24.3%
DEMA50(22,0.9%)_Timed-MaxDD	1000	-49.2%	4.5%	-61.7%	-57.4%	-53.0%	-50.3%	-45.0%	-38.8%	-31.1%
SMA50_200_Timed-MaxDD	1000	-21.8%	1.4%	-27.1%	-25.1%	-23.3%	-21.6%	-20.4%	-19.6%	-18.7%



- Base-MaxDD-ECDF
- ◆ Base-MaxDD_Avg
- DEMA50(21,0%)_Timed-MaxDD-ECDF
- ◆ DEMA50(21,0%)_Timed-MaxDD_Avg
- DEMA50(21,0.3%)_Timed-MaxDD-ECDF
- ◆ DEMA50(21,0.3%)_Timed-MaxDD_Avg
- DEMA50(21,0.6%)_Timed-MaxDD-ECDF
- ◆ DEMA50(21,0.6%)_Timed-MaxDD_Avg
- DEMA50(21,0.9%)_Timed-MaxDD-ECDF
- ◆ DEMA50(21,0.9%)_Timed-MaxDD_Avg
- DEMA50(22,0%)_Timed-MaxDD-ECDF
- ◆ DEMA50(22,0%)_Timed-MaxDD_Avg
- DEMA50(22,0.3%)_Timed-MaxDD-ECDF
- ◆ DEMA50(22,0.3%)_Timed-MaxDD_Avg
- DEMA50(22,0.6%)_Timed-MaxDD-ECDF
- ◆ DEMA50(22,0.6%)_Timed-MaxDD_Avg
- DEMA50(22,0.9%)_Timed-MaxDD-ECDF
- ◆ DEMA50(22,0.9%)_Timed-MaxDD_Avg
- SMA50_200_Timed-MaxDD-ECDF
- ◆ SMA50_200_Timed-MaxDD_Avg

Sortino ^GSPC Index vs. Multiple Timers 12/31/1990-10/23/2015 - 24.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sortino	1000	33.9%	0.4%	32.6%	33.1%	33.5%	33.9%	34.3%	34.6%	35.5%
DEMA50(21,0%)_Timed-Sortino	1000	50.0%	1.8%	42.6%	45.9%	48.2%	50.3%	51.8%	53.3%	54.8%
DEMA50(21,0.3%)_Timed-Sortino	1000	47.2%	2.8%	35.4%	40.8%	44.6%	47.3%	50.0%	52.2%	54.5%
DEMA50(21,0.6%)_Timed-Sortino	1000	43.2%	3.7%	30.4%	34.9%	39.4%	43.8%	46.6%	49.3%	51.6%
DEMA50(21,0.9%)_Timed-Sortino	1000	35.7%	3.4%	28.1%	29.9%	32.2%	35.4%	39.5%	42.7%	48.6%
DEMA50(22,0%)_Timed-Sortino	1000	50.0%	1.8%	42.6%	45.9%	48.2%	50.3%	51.8%	53.3%	54.8%
DEMA50(22,0.3%)_Timed-Sortino	1000	47.6%	2.7%	36.4%	41.4%	45.1%	47.7%	50.3%	52.4%	54.1%
DEMA50(22,0.6%)_Timed-Sortino	1000	43.5%	3.5%	30.6%	35.5%	40.1%	44.1%	46.6%	49.1%	50.9%
DEMA50(22,0.9%)_Timed-Sortino	1000	37.2%	3.9%	26.7%	30.4%	33.2%	36.9%	41.3%	45.3%	49.3%
SMA50_200_Timed-Sortino	1000	50.9%	1.9%	44.3%	47.0%	49.1%	51.0%	52.7%	54.9%	56.6%



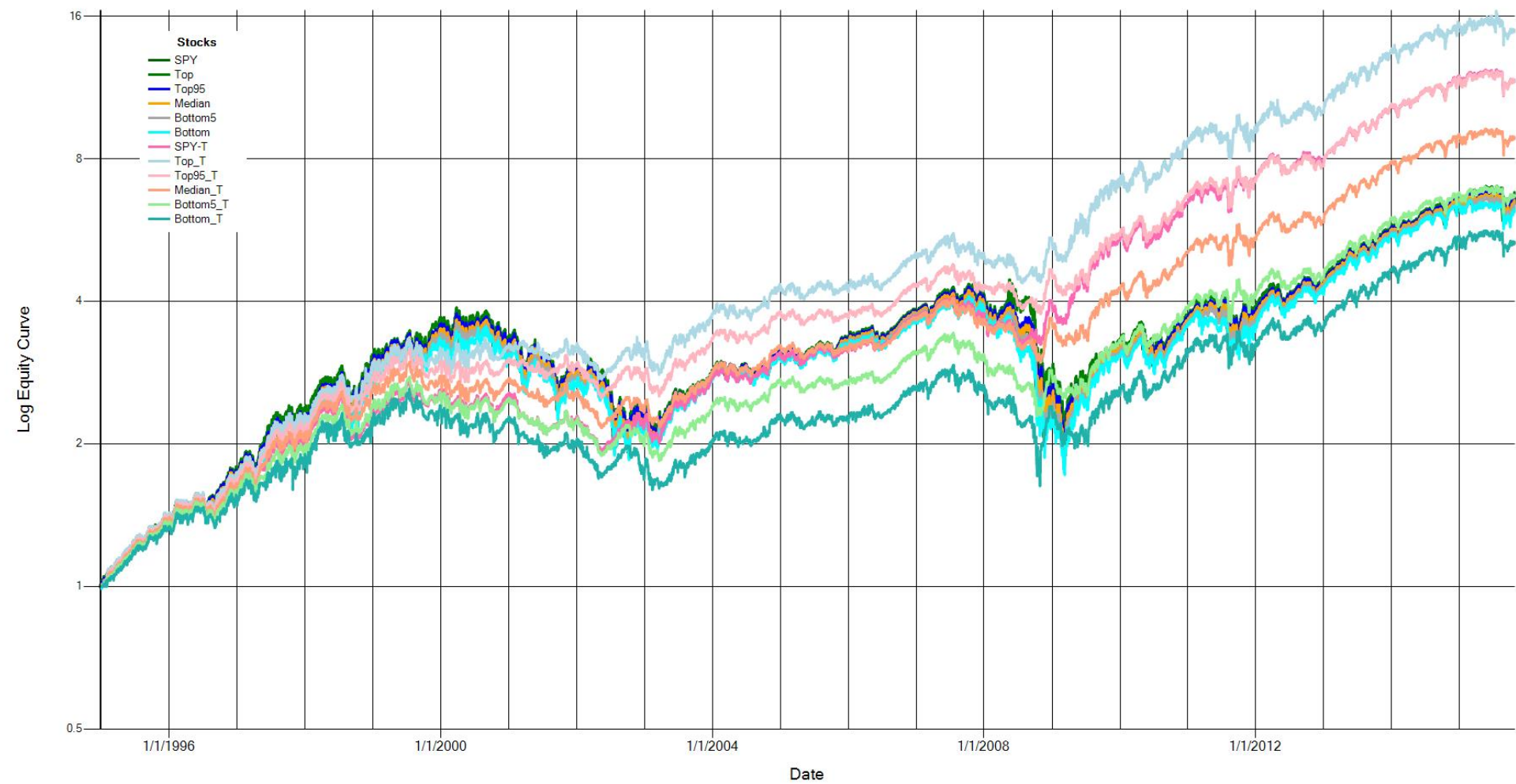
- | | | | |
|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------|
| — Base-Sortino-ECDF | — DEMA50(21,0.6%)_Timed-Sortino-ECDF | — DEMA50(22,0.3%)_Timed-Sortino-ECDF | — SMA50_200_Timed-Sortino-ECDF |
| ◆ Base-Sortino_Avg | ◆ DEMA50(21,0.6%)_Timed-Sortino_Avg | ◆ DEMA50(22,0.3%)_Timed-Sortino_Avg | ◆ SMA50_200_Timed-Sortino_Avg |
| — DEMA50(21,0%)_Timed-Sortino-ECDF | — DEMA50(21,0.9%)_Timed-Sortino-ECDF | — DEMA50(22,0.6%)_Timed-Sortino-ECDF | |
| ◆ DEMA50(21,0%)_Timed-Sortino_Avg | ◆ DEMA50(21,0.9%)_Timed-Sortino_Avg | ◆ DEMA50(22,0.6%)_Timed-Sortino_Avg | |
| — DEMA50(21,0.3%)_Timed-Sortino-ECDF | — DEMA50(22,0%)_Timed-Sortino-ECDF | — DEMA50(22,0.9%)_Timed-Sortino-ECDF | |
| ◆ DEMA50(21,0.3%)_Timed-Sortino_Avg | ◆ DEMA50(22,0%)_Timed-Sortino_Avg | ◆ DEMA50(22,0.9%)_Timed-Sortino_Avg | |

Timer Test 3

- Period 12/30/1994 – 10/23/2015 - 20.8 years
- Base Series
 - SPY
- Timers
 - DEMA(20,30,...,70 days; 22d Mth; offset =0%)
 - SMA50_200 Golden Cross
- Cash
 - VUSTX(20+ year treasuries)
- Results
 - DEMA70(22,0%) best CAGR
 - SMA50_200 best Sharpe
 - SMA50_200 lowest MaxDD

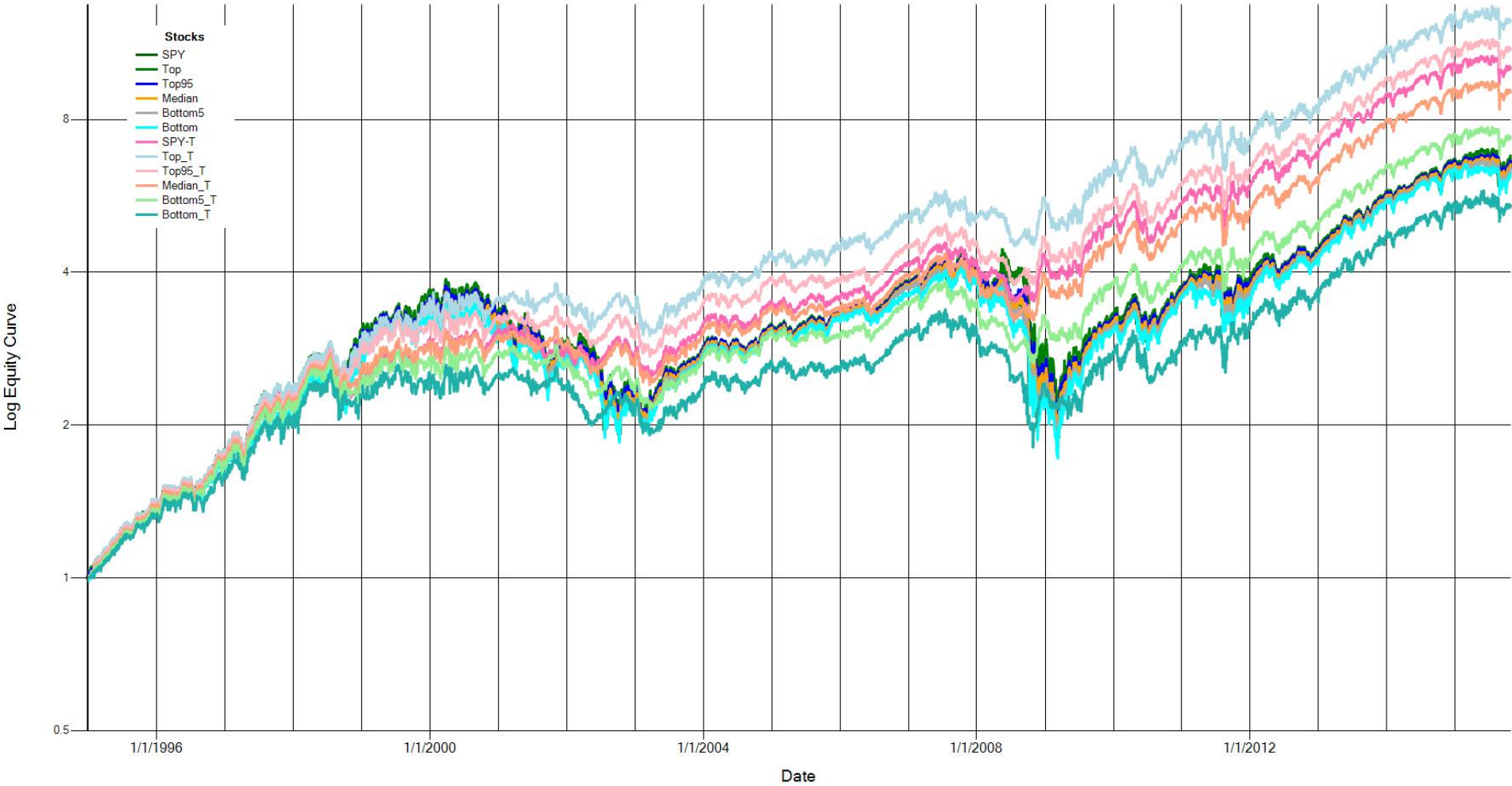
1000 Synthetic SPY EC Ranges & DEMA20(22,0%) Timer Results

1000 Synthetic SPY EC Ranges & DEMA20(22,0%) Timer Results



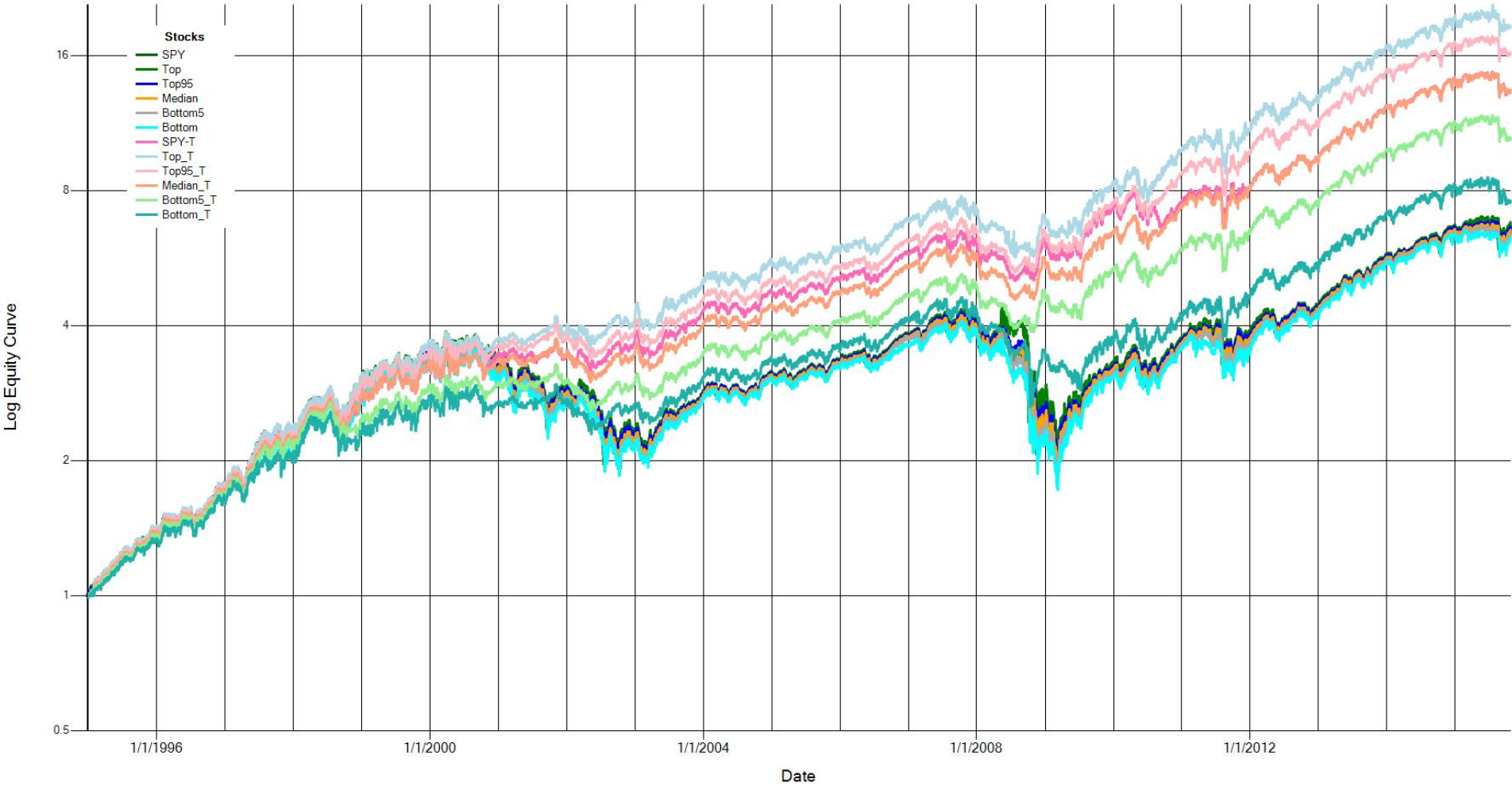
1000 Synthetic SPY EC Ranges & DEMA30(22,0%) Timer Results

1000 Synthetic SPY EC Ranges & DEMA30(22,0%) Timer Results



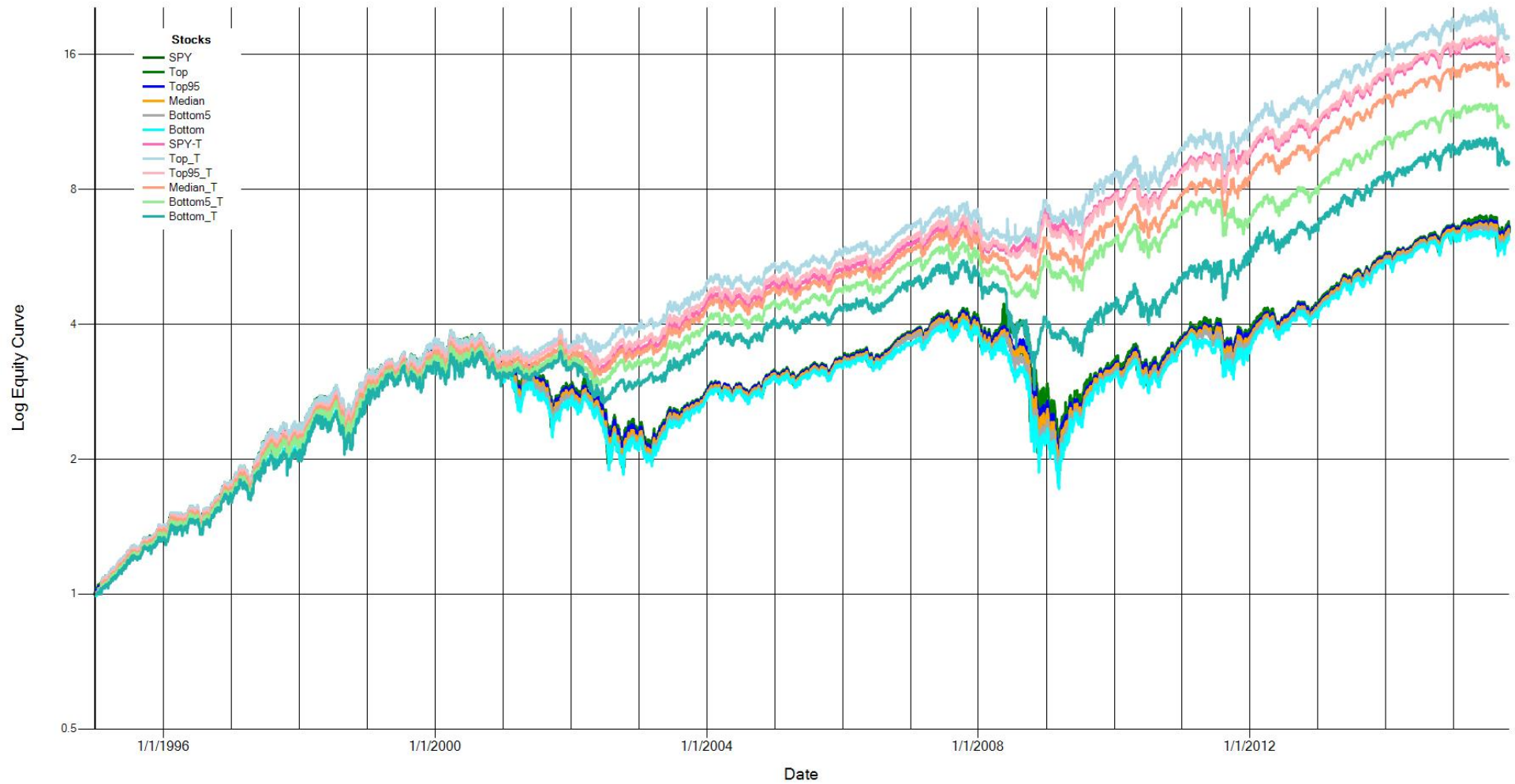
1000 Synthetic SPY EC Ranges & DEMA40(22,0%) Timer Results

1000 Synthetic SPY EC Ranges & DEMA40(22,0%) Timer Results



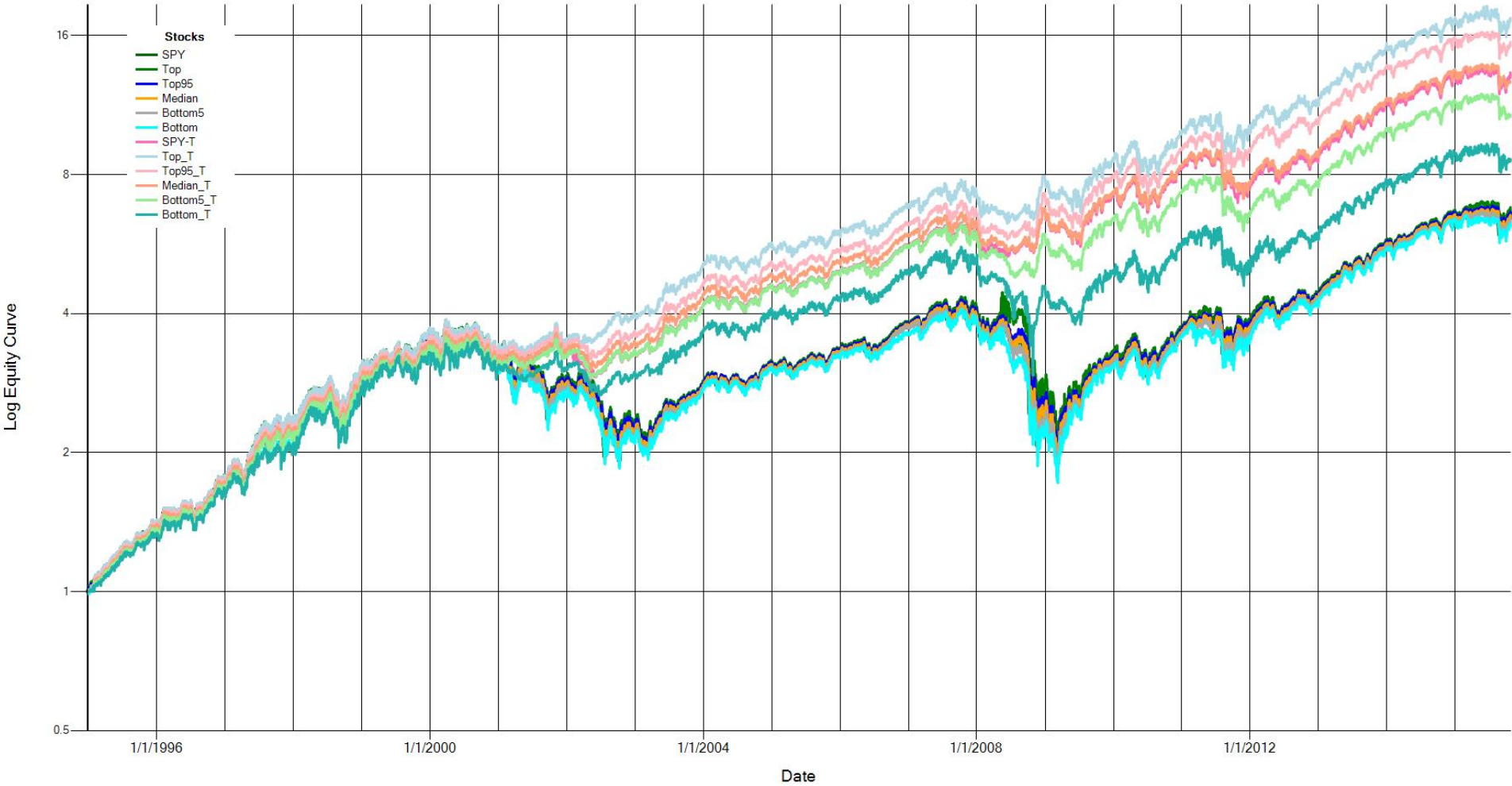
1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results

1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results



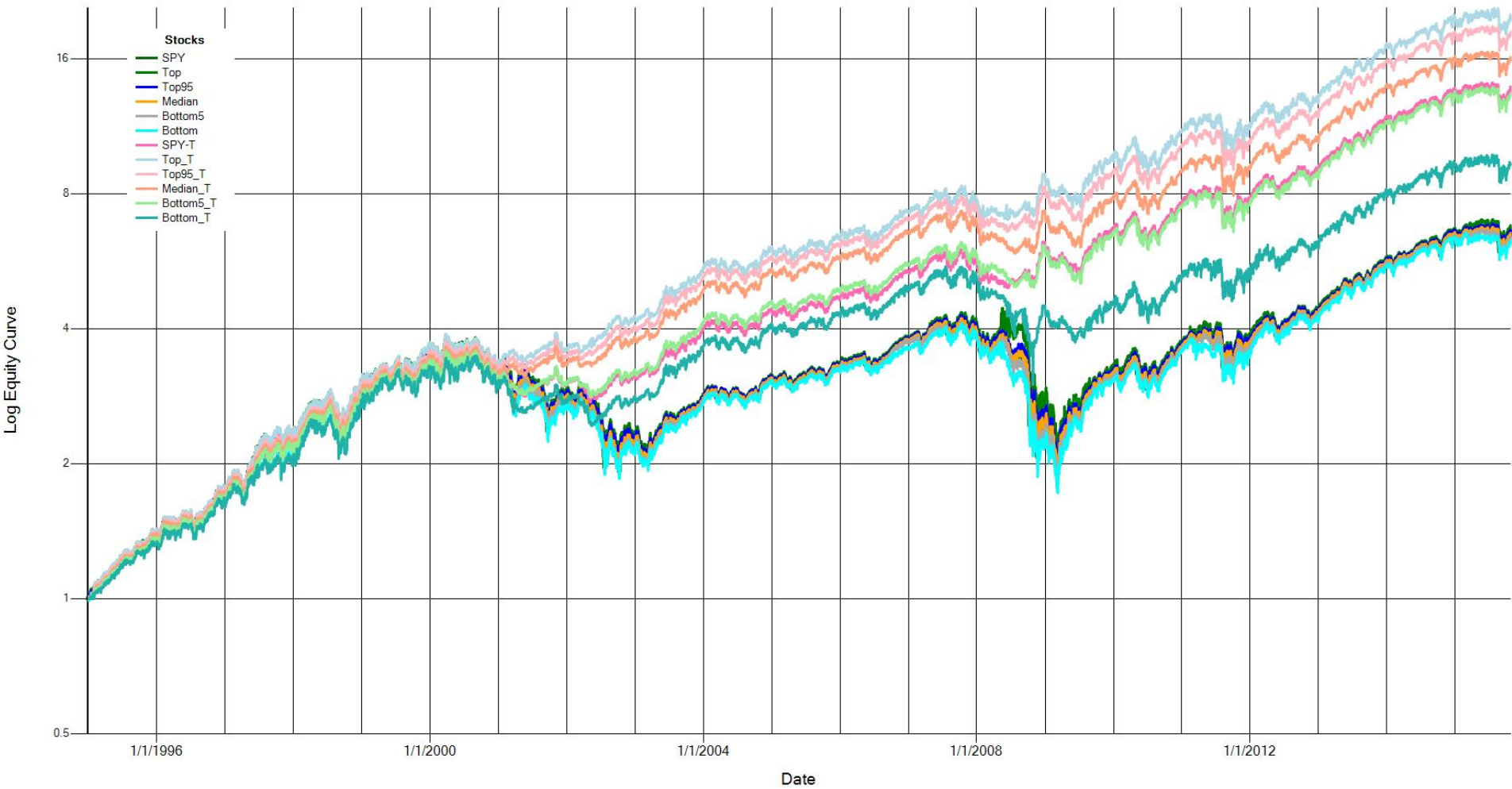
1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results

1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results



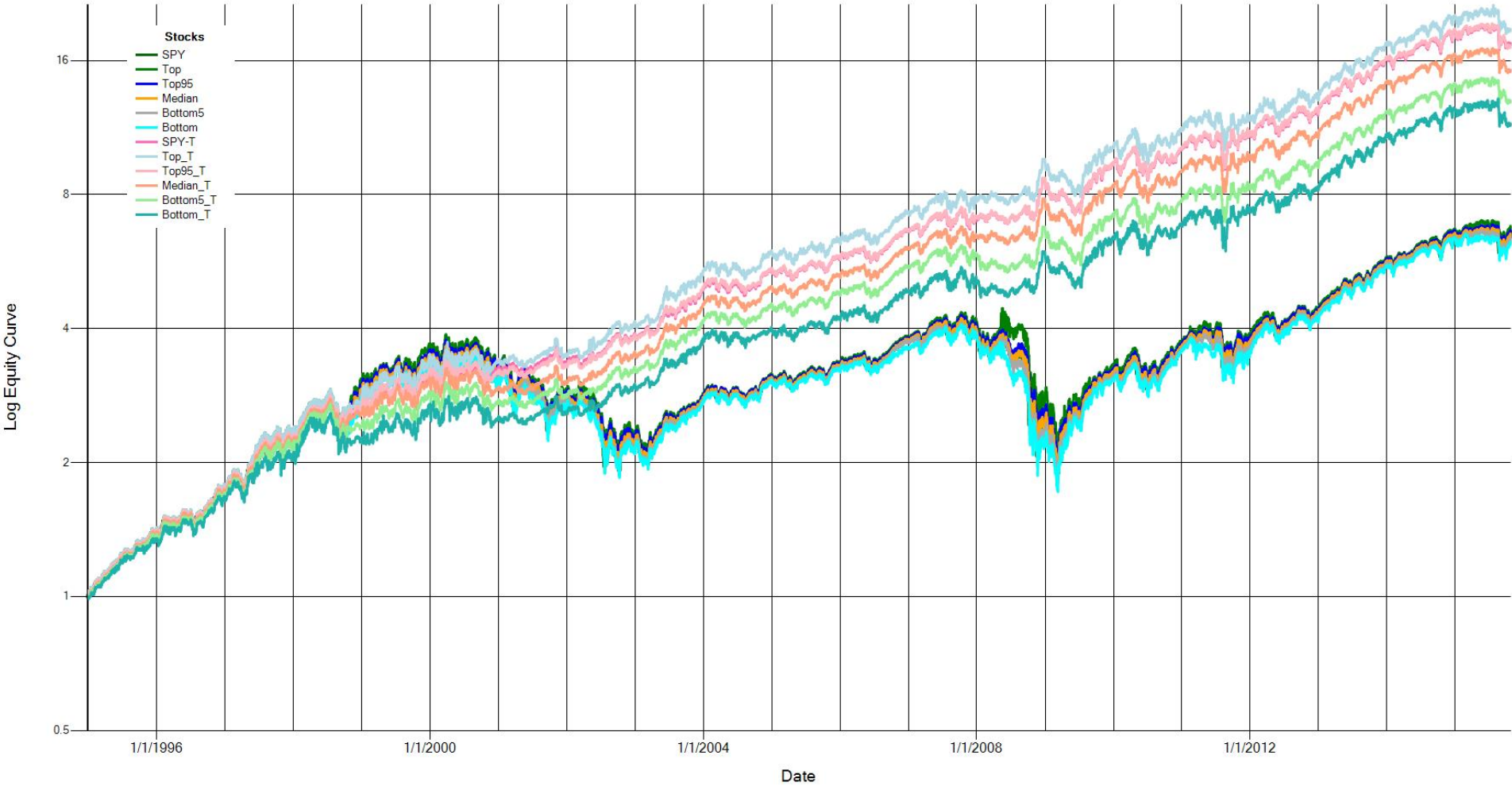
1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results

1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results



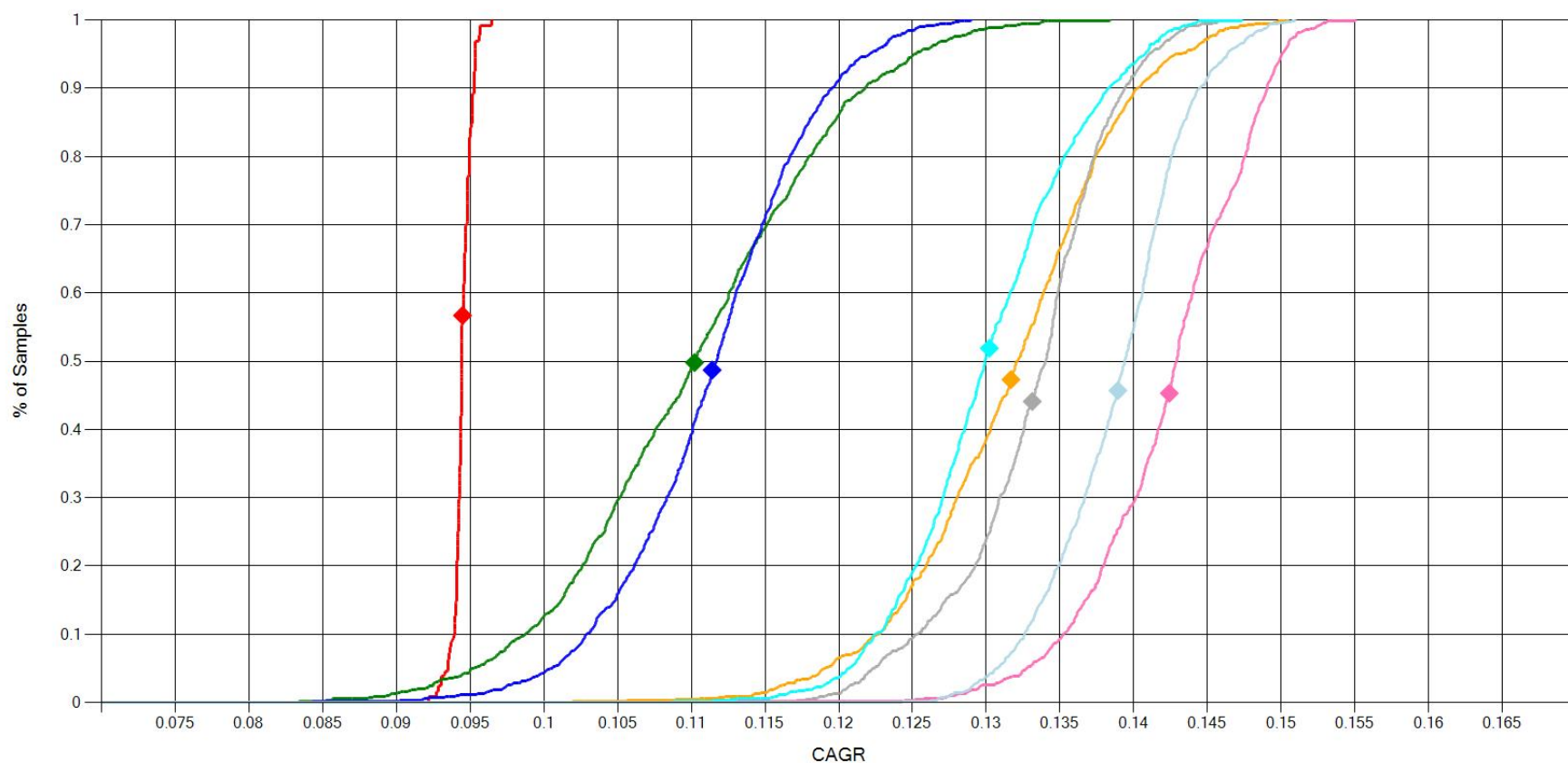
1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results

1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results



CAGR SPY Index vs. Multiple Timers 12/30/1994-10/23/2015 - 20.8 Yrs.

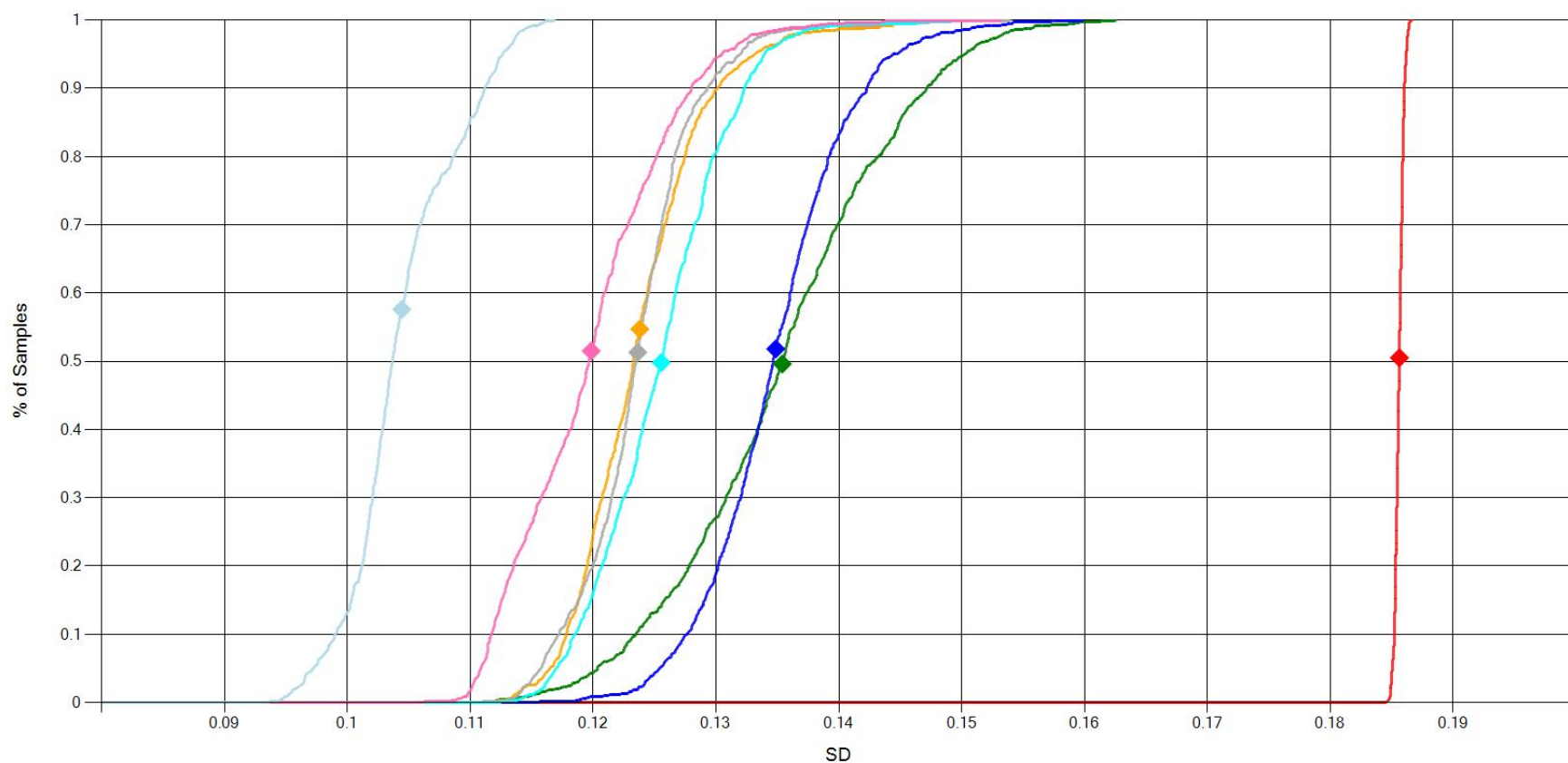
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-CAGR	1000	9.4%	0.1%	9.2%	9.3%	9.4%	9.4%	9.5%	9.6%	9.6%
DEMA20(22,0%)_T-CAGR	1000	11.0%	0.9%	8.3%	9.2%	10.1%	11.0%	11.9%	12.8%	13.8%
DEMA30(22,0%)_T-CAGR	1000	11.1%	0.7%	8.4%	9.7%	10.5%	11.2%	11.8%	12.4%	12.9%
DEMA40(22,0%)_T-CAGR	1000	13.2%	0.7%	10.2%	11.6%	12.5%	13.2%	13.9%	14.5%	15.0%
DEMA50(22,0%)_T-CAGR	1000	13.3%	0.5%	11.2%	12.1%	12.8%	13.4%	13.8%	14.3%	14.7%
DEMA60(22,0%)_T-CAGR	1000	13.0%	0.6%	10.9%	11.9%	12.4%	13.0%	13.6%	14.2%	14.7%
DEMA70(22,0%)_T-CAGR	1000	14.2%	0.5%	11.3%	13.0%	13.7%	14.3%	14.8%	15.1%	15.5%
SMA50_200_T-CAGR	1000	13.9%	0.5%	12.4%	12.9%	13.4%	13.9%	14.3%	14.8%	15.1%



— Base-CAGR-ECDF
 ◆ Base-CAGR_Avg
 — DEMA20(22,0%)_T-CAGR-ECDF
 ◆ DEMA20(22,0%)_T-CAGR_Avg
 — DEMA30(22,0%)_T-CAGR-ECDF
 ◆ DEMA30(22,0%)_T-CAGR_Avg
 — DEMA40(22,0%)_T-CAGR-ECDF
 ◆ DEMA40(22,0%)_T-CAGR_Avg
 — DEMA50(22,0%)_T-CAGR-ECDF
 ◆ DEMA50(22,0%)_T-CAGR_Avg
 — DEMA60(22,0%)_T-CAGR-ECDF
 ◆ DEMA60(22,0%)_T-CAGR_Avg
 — DEMA70(22,0%)_T-CAGR-ECDF
 ◆ DEMA70(22,0%)_T-CAGR_Avg
 — SMA50_200_T-CAGR-ECDF
 ◆ SMA50_200_T-CAGR_Avg

SD SPY Index vs. Multiple Timers 12/30/1994-10/23/2015 - 20.8 Yrs.

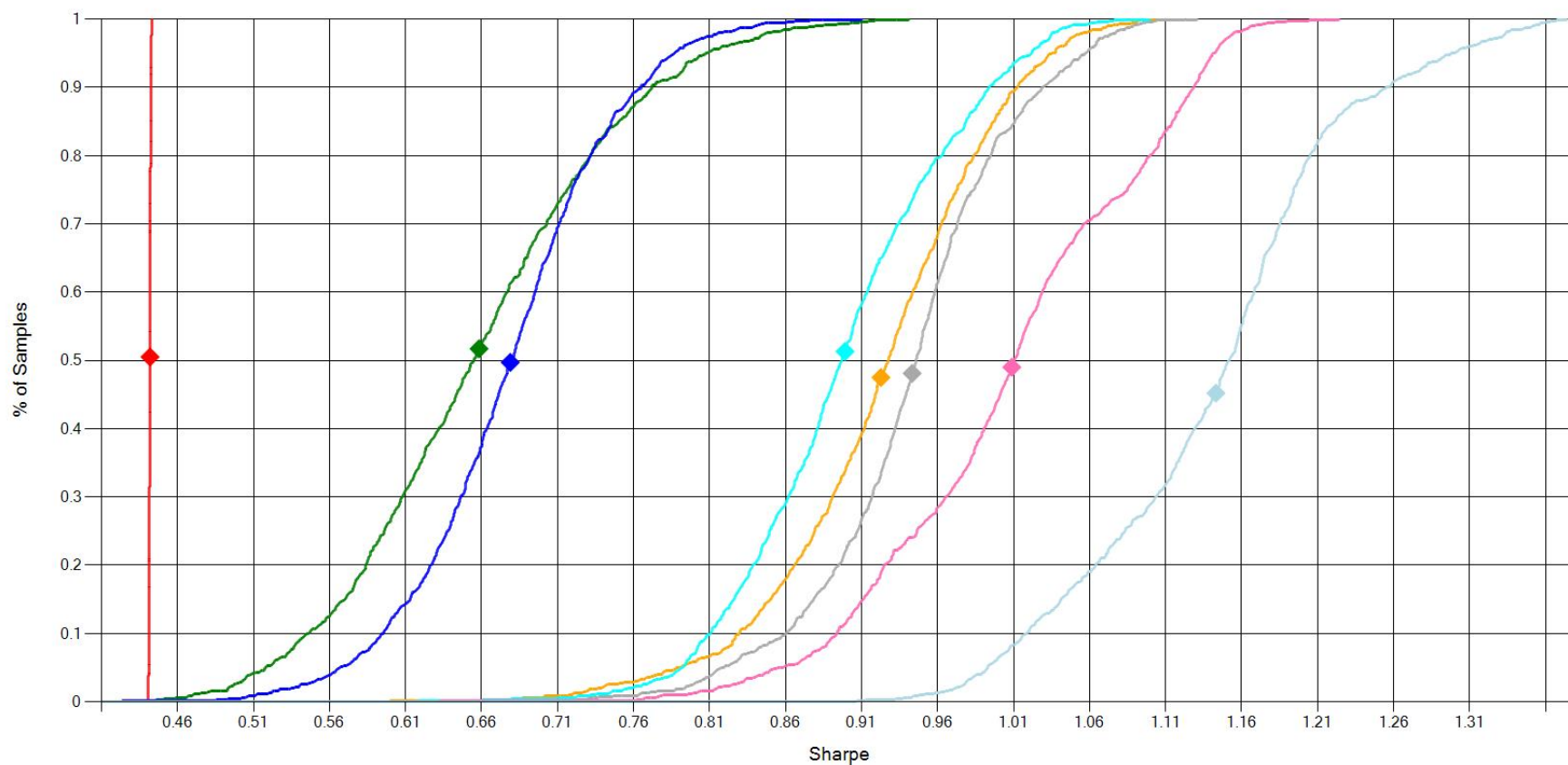
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-SD	1000	18.6%	0.0%	18.5%	18.5%	18.5%	18.6%	18.6%	18.6%	18.7%
DEMA20(22,0%)_T-SD	1000	13.5%	0.9%	11.2%	11.8%	12.6%	13.6%	14.5%	15.3%	16.3%
DEMA30(22,0%)_T-SD	1000	13.5%	0.6%	11.6%	12.4%	12.9%	13.5%	14.0%	14.8%	16.0%
DEMA40(22,0%)_T-SD	1000	12.4%	0.5%	11.1%	11.5%	11.9%	12.3%	12.8%	13.6%	15.3%
DEMA50(22,0%)_T-SD	1000	12.4%	0.5%	11.1%	11.4%	11.9%	12.4%	12.7%	13.4%	15.4%
DEMA60(22,0%)_T-SD	1000	12.6%	0.5%	11.3%	11.6%	12.0%	12.6%	13.1%	13.6%	15.3%
DEMA70(22,0%)_T-SD	1000	12.0%	0.6%	10.6%	11.0%	11.3%	12.0%	12.6%	13.3%	15.3%
SMA50_200_T-SD	1000	10.4%	0.4%	9.4%	9.6%	10.0%	10.4%	11.0%	11.4%	11.7%



— Base-SD-ECDF — DEMA30(22,0%)_T-SD-ECDF ◆ DEMA40(22,0%)_T-SD_Avg — DEMA60(22,0%)_T-SD-ECDF ◆ DEMA70(22,0%)_T-SD_Avg
 ◆ Base-SD_Avg ◆ DEMA30(22,0%)_T-SD_Avg — DEMA50(22,0%)_T-SD-ECDF ◆ DEMA60(22,0%)_T-SD_Avg — SMA50_200_T-SD-ECDF
 — DEMA20(22,0%)_T-SD-ECDF — DEMA40(22,0%)_T-SD-ECDF ◆ DEMA50(22,0%)_T-SD_Avg — DEMA70(22,0%)_T-SD-ECDF ◆ SMA50_200_T-SD_Avg
 ◆ DEMA20(22,0%)_T-SD_Avg

Sharpe SPY Index vs. Multiple Timers 12/30/1994-10/23/2015 - 20.8 Yrs.

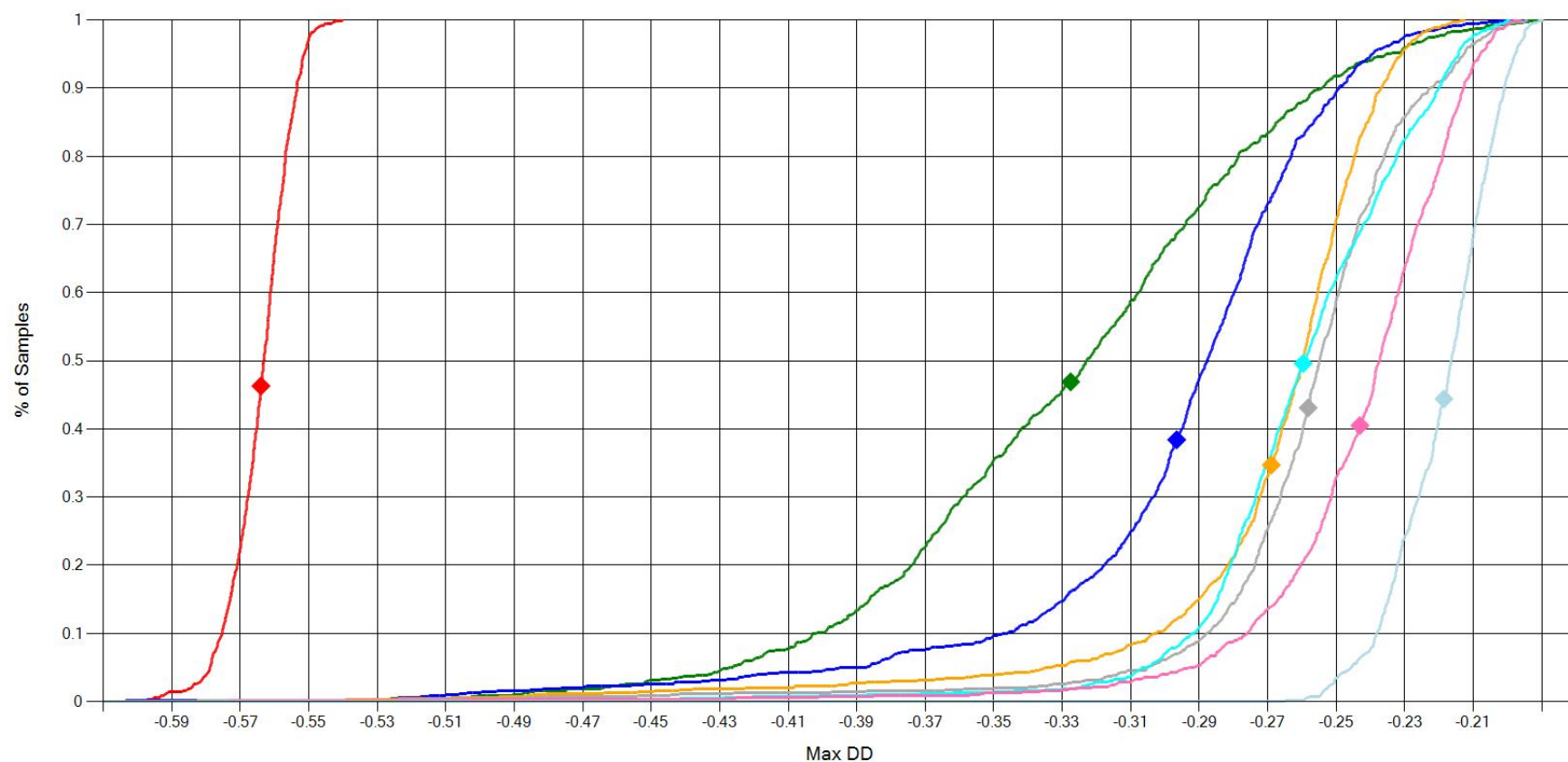
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sharpe	1000	44.2%	0.1%	44.0%	44.1%	44.1%	44.2%	44.2%	44.3%	44.4%
DEMA20(22,0%)_T-Sharpe	1000	65.8%	8.8%	42.5%	49.7%	57.3%	65.5%	74.5%	84.5%	94.1%
DEMA30(22,0%)_T-Sharpe	1000	67.9%	6.6%	42.4%	54.0%	61.5%	68.0%	74.4%	81.2%	91.0%
DEMA40(22,0%)_T-Sharpe	1000	92.3%	7.4%	60.0%	74.2%	85.4%	92.8%	99.5%	105.1%	111.6%
DEMA50(22,0%)_T-Sharpe	1000	94.3%	6.7%	65.0%	79.7%	88.1%	94.6%	100.8%	107.3%	113.1%
DEMA60(22,0%)_T-Sharpe	1000	89.9%	7.1%	61.8%	76.6%	82.9%	89.7%	97.7%	103.4%	110.0%
DEMA70(22,0%)_T-Sharpe	1000	100.9%	9.0%	63.2%	82.4%	91.4%	101.1%	111.1%	115.3%	122.4%
SMA50_200_T-Sharpe	1000	114.3%	8.8%	90.7%	97.7%	104.6%	115.2%	121.6%	133.2%	137.4%



— Base-Sharpe-ECDF — DEMA30(22,0%)_T-Sharpe-ECDF — DEMA50(22,0%)_T-Sharpe-ECDF — DEMA70(22,0%)_T-Sharpe-ECDF
 ◆ Base-Sharpe_Avg ◆ DEMA30(22,0%)_T-Sharpe_Avg ◆ DEMA50(22,0%)_T-Sharpe_Avg ◆ DEMA70(22,0%)_T-Sharpe_Avg
 — DEMA20(22,0%)_T-Sharpe-ECDF — DEMA40(22,0%)_T-Sharpe-ECDF — DEMA60(22,0%)_T-Sharpe-ECDF — SMA50_200_T-Sharpe-ECDF
 ◆ DEMA20(22,0%)_T-Sharpe_Avg ◆ DEMA40(22,0%)_T-Sharpe_Avg ◆ DEMA60(22,0%)_T-Sharpe_Avg ◆ SMA50_200_T-Sharpe_Avg

MaxDD SPY Index vs. Multiple Timers 12/30/1994-10/23/2015 - 20.8 Yrs.

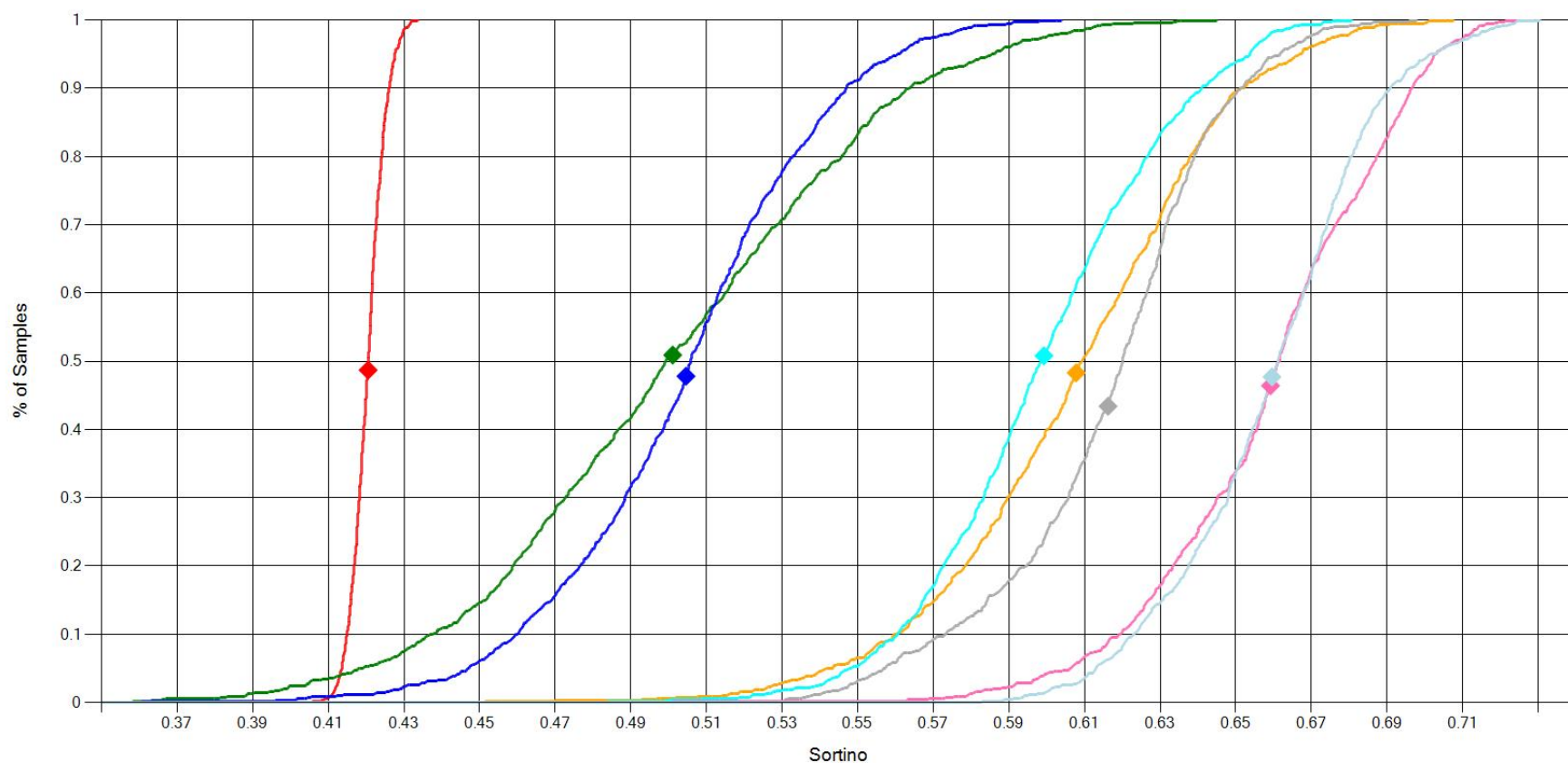
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-MaxDD	1000	-56.4%	0.9%	-60.2%	-58.4%	-57.3%	-56.3%	-55.5%	-55.0%	-54.0%
DEMA20(22,0%)_T-MaxDD	1000	-32.8%	5.9%	-55.0%	-45.9%	-38.4%	-32.3%	-26.8%	-22.0%	-19.0%
DEMA30(22,0%)_T-MaxDD	1000	-29.7%	5.1%	-60.3%	-45.6%	-32.8%	-28.7%	-25.8%	-23.0%	-19.4%
DEMA40(22,0%)_T-MaxDD	1000	-26.9%	4.2%	-58.3%	-39.6%	-28.9%	-26.0%	-24.2%	-22.6%	-21.3%
DEMA50(22,0%)_T-MaxDD	1000	-25.8%	3.7%	-58.3%	-33.4%	-27.8%	-25.5%	-23.3%	-20.6%	-19.4%
DEMA60(22,0%)_T-MaxDD	1000	-26.0%	3.3%	-57.4%	-32.3%	-28.4%	-25.9%	-22.8%	-21.0%	-19.9%
DEMA70(22,0%)_T-MaxDD	1000	-24.3%	3.3%	-57.4%	-31.6%	-26.6%	-23.7%	-21.7%	-20.4%	-19.6%
SMA50_200_T-MaxDD	1000	-21.9%	1.5%	-26.5%	-25.2%	-23.4%	-21.7%	-20.4%	-19.5%	-19.0%



— Base-MaxDD-ECDF
 ◆ Base-MaxDD_Avg
 — DEMA20(22,0%)_T-MaxDD-ECDF
 ◆ DEMA20(22,0%)_T-MaxDD_Avg
 — DEMA30(22,0%)_T-MaxDD-ECDF
 ◆ DEMA30(22,0%)_T-MaxDD_Avg
 — DEMA40(22,0%)_T-MaxDD-ECDF
 ◆ DEMA40(22,0%)_T-MaxDD_Avg
 — DEMA50(22,0%)_T-MaxDD-ECDF
 ◆ DEMA50(22,0%)_T-MaxDD_Avg
 — DEMA60(22,0%)_T-MaxDD-ECDF
 ◆ DEMA60(22,0%)_T-MaxDD_Avg
 — DEMA70(22,0%)_T-MaxDD-ECDF
 ◆ DEMA70(22,0%)_T-MaxDD_Avg
 — SMA50_200_T-MaxDD-ECDF
 ◆ SMA50_200_T-MaxDD_Avg

Sortino SPY Index vs. Multiple Timers 12/30/1994-10/23/2015 - 20.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sortino	1000	42.0%	0.4%	40.6%	41.2%	41.6%	42.1%	42.5%	42.9%	43.4%
DEMA20(22,0%)_T-Sortino	1000	50.1%	5.0%	35.8%	40.0%	45.3%	49.9%	55.1%	60.0%	64.5%
DEMA30(22,0%)_T-Sortino	1000	50.5%	3.4%	36.1%	43.0%	47.0%	50.6%	53.9%	57.2%	60.4%
DEMA40(22,0%)_T-Sortino	1000	60.8%	3.7%	45.1%	52.7%	57.2%	60.9%	64.3%	67.7%	70.8%
DEMA50(22,0%)_T-Sortino	1000	61.6%	3.0%	50.0%	54.8%	58.7%	62.0%	64.2%	67.0%	69.8%
DEMA60(22,0%)_T-Sortino	1000	59.9%	3.1%	48.4%	53.9%	56.8%	59.9%	63.1%	65.9%	68.1%
DEMA70(22,0%)_T-Sortino	1000	65.9%	3.1%	50.1%	59.1%	62.9%	66.2%	69.1%	71.0%	72.8%
SMA50_200_T-Sortino	1000	66.0%	2.6%	58.3%	60.4%	63.3%	66.1%	68.4%	71.2%	73.1%



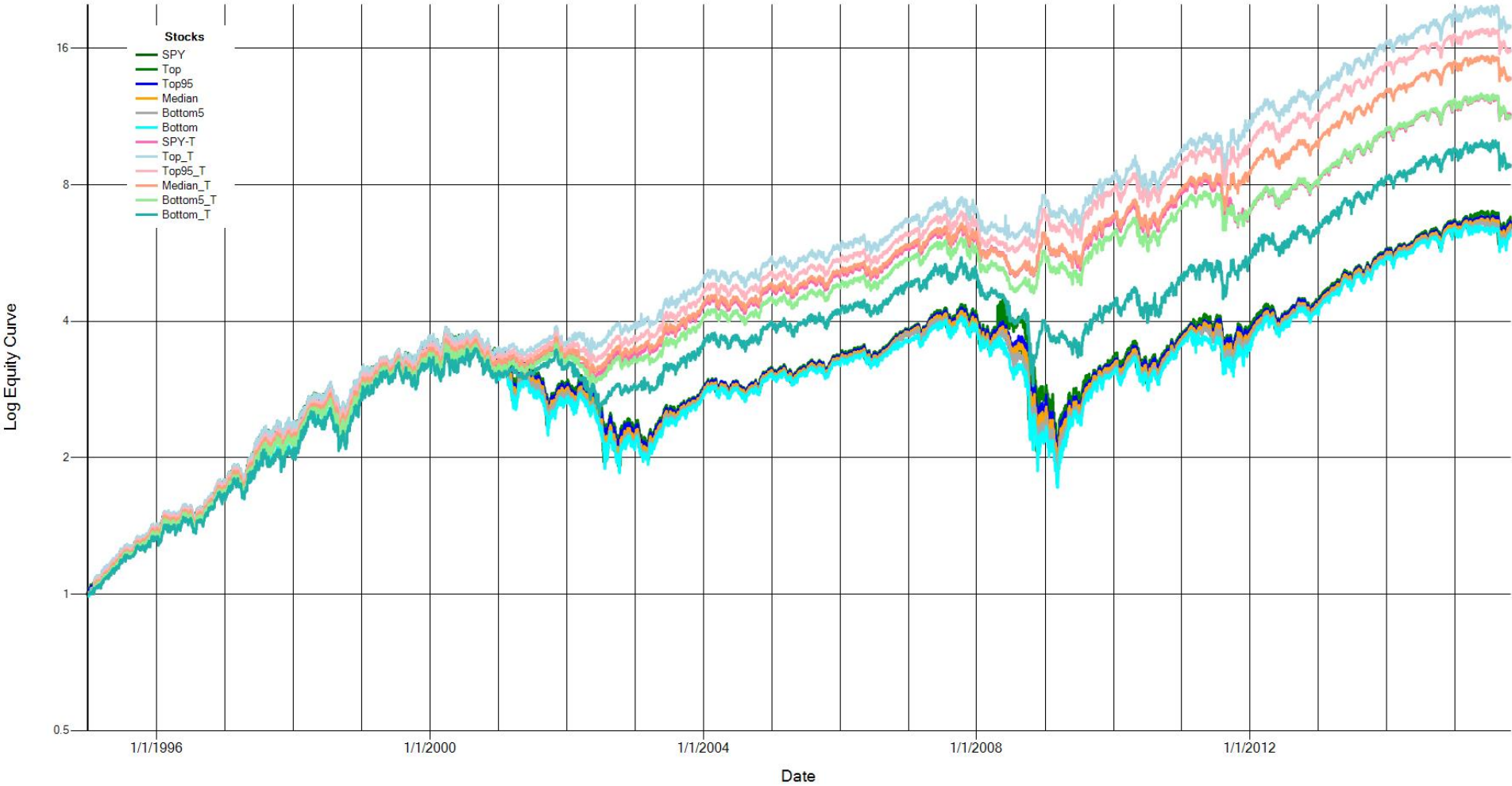
— Base-Sortino-ECDF — DEMA30(22,0%)_T-Sortino-ECDF — DEMA50(22,0%)_T-Sortino-ECDF — DEMA70(22,0%)_T-Sortino-ECDF
 ◆ Base-Sortino_Avg ◆ DEMA30(22,0%)_T-Sortino_Avg ◆ DEMA50(22,0%)_T-Sortino_Avg ◆ DEMA70(22,0%)_T-Sortino_Avg
 — DEMA20(22,0%)_T-Sortino-ECDF — DEMA40(22,0%)_T-Sortino-ECDF — DEMA60(22,0%)_T-Sortino-ECDF — SMA50_200_T-Sortino-ECDF
 ◆ DEMA20(22,0%)_T-Sortino_Avg ◆ DEMA40(22,0%)_T-Sortino_Avg ◆ DEMA60(22,0%)_T-Sortino_Avg ◆ SMA50_200_T-Sortino_Avg

Timer Test 4

- Period 12/30/1994 – 10/23/2015 – 20.8 years
- Base Series
 - SPY
- Timers
 - DEMA(50,60,...,100, 22d Mth, offset =0%)
 - SMA50_200 Golden Cross
 - EMA50_200 Cross
- Cash
 - VUSTX(20+ year treasuries)
- Results
 - EMA50_200 best CAGR
 - EMA50_200 best Sharpe
 - SMA50_200 lowest MaxDD

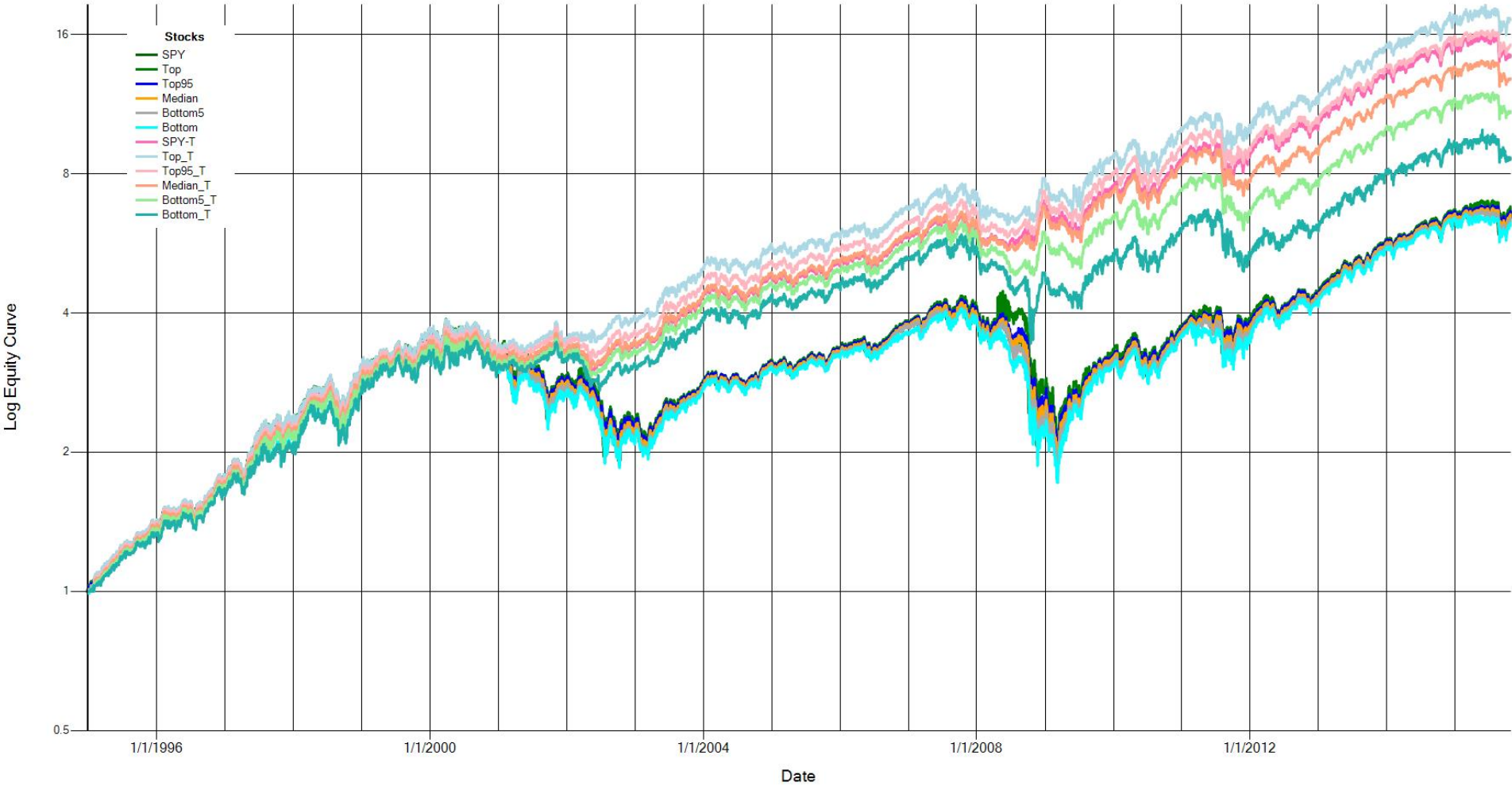
1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results, VUSTX Cash



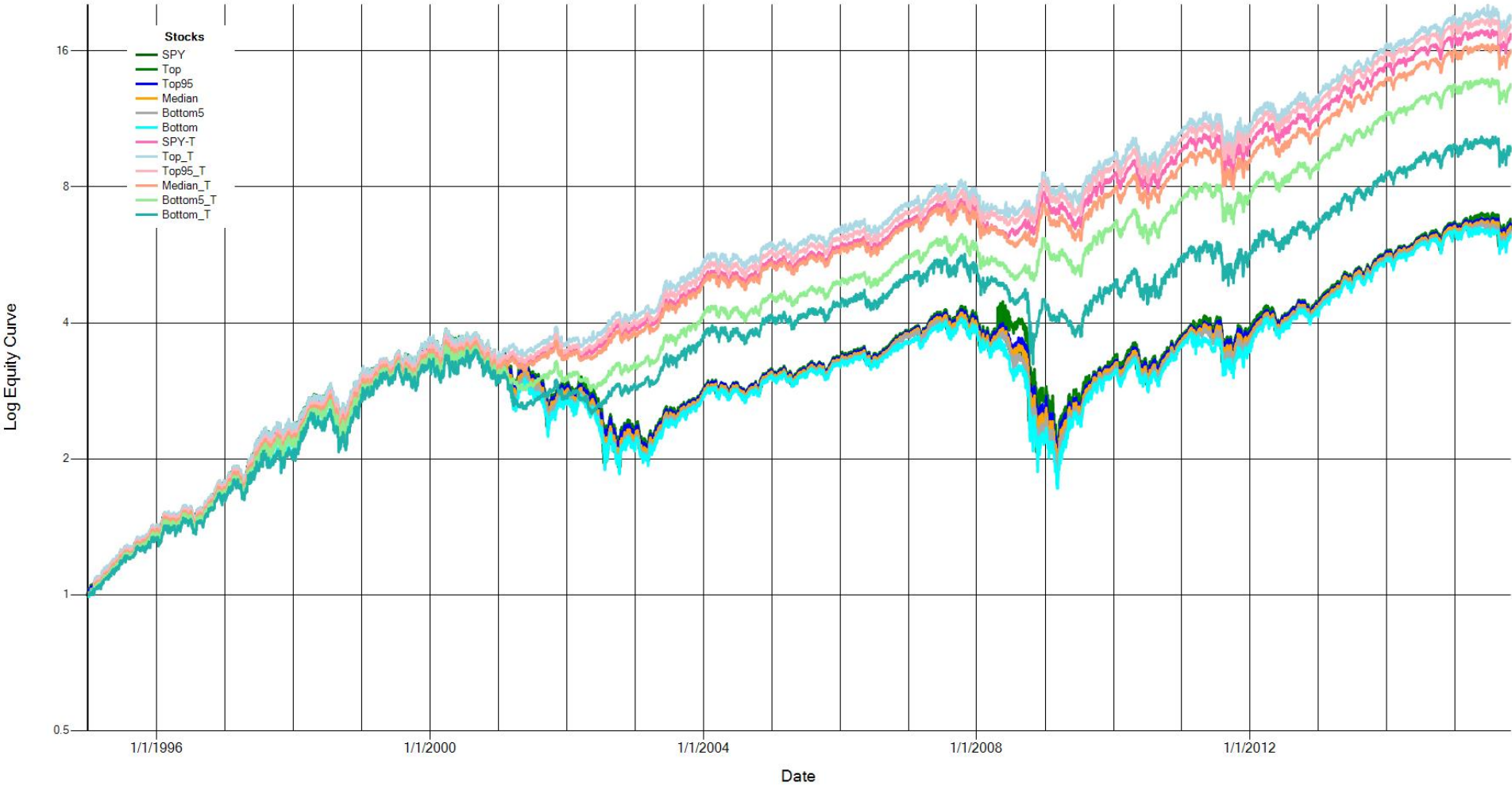
1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results, VUSTX Cash



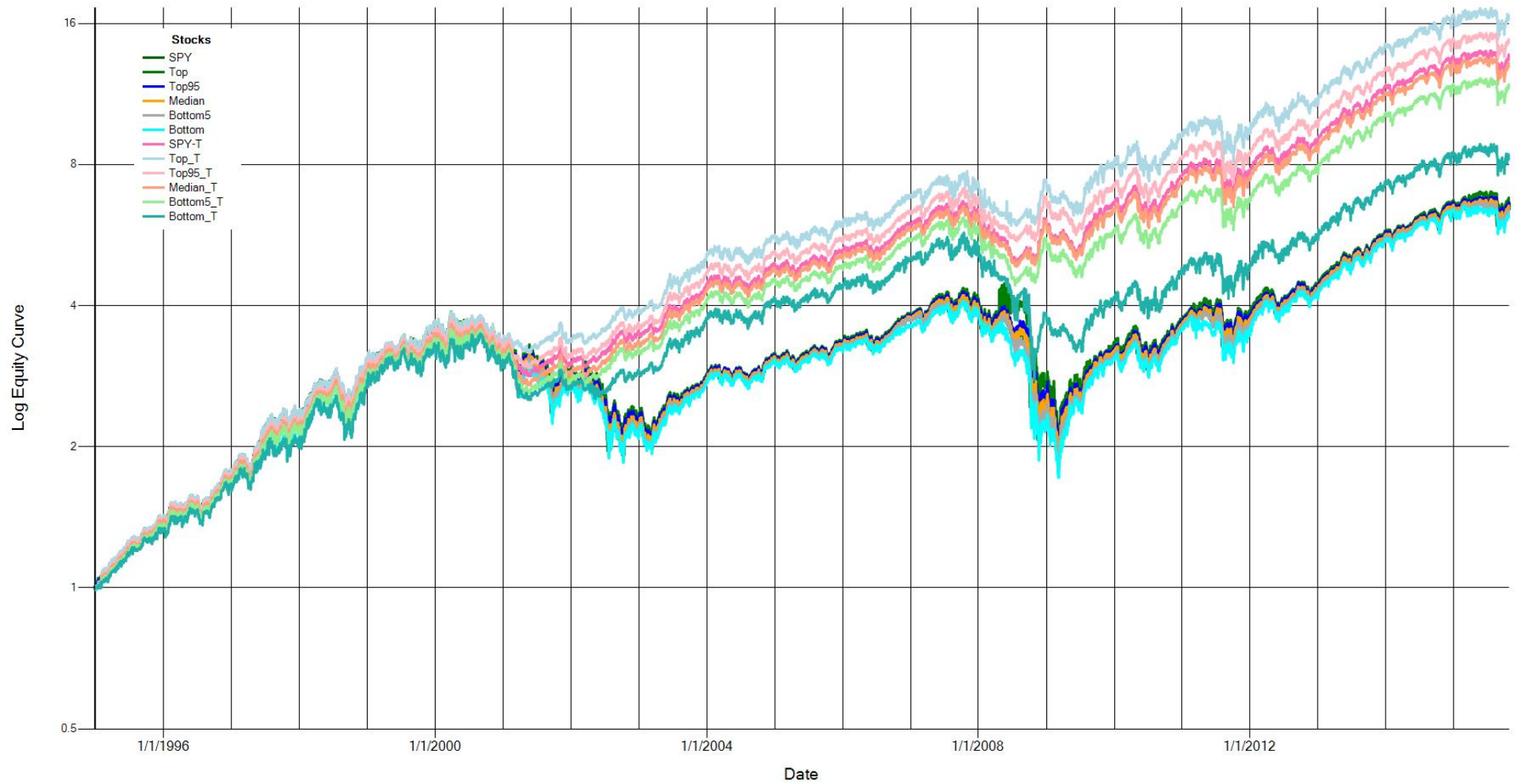
1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results, VUSTX Cash



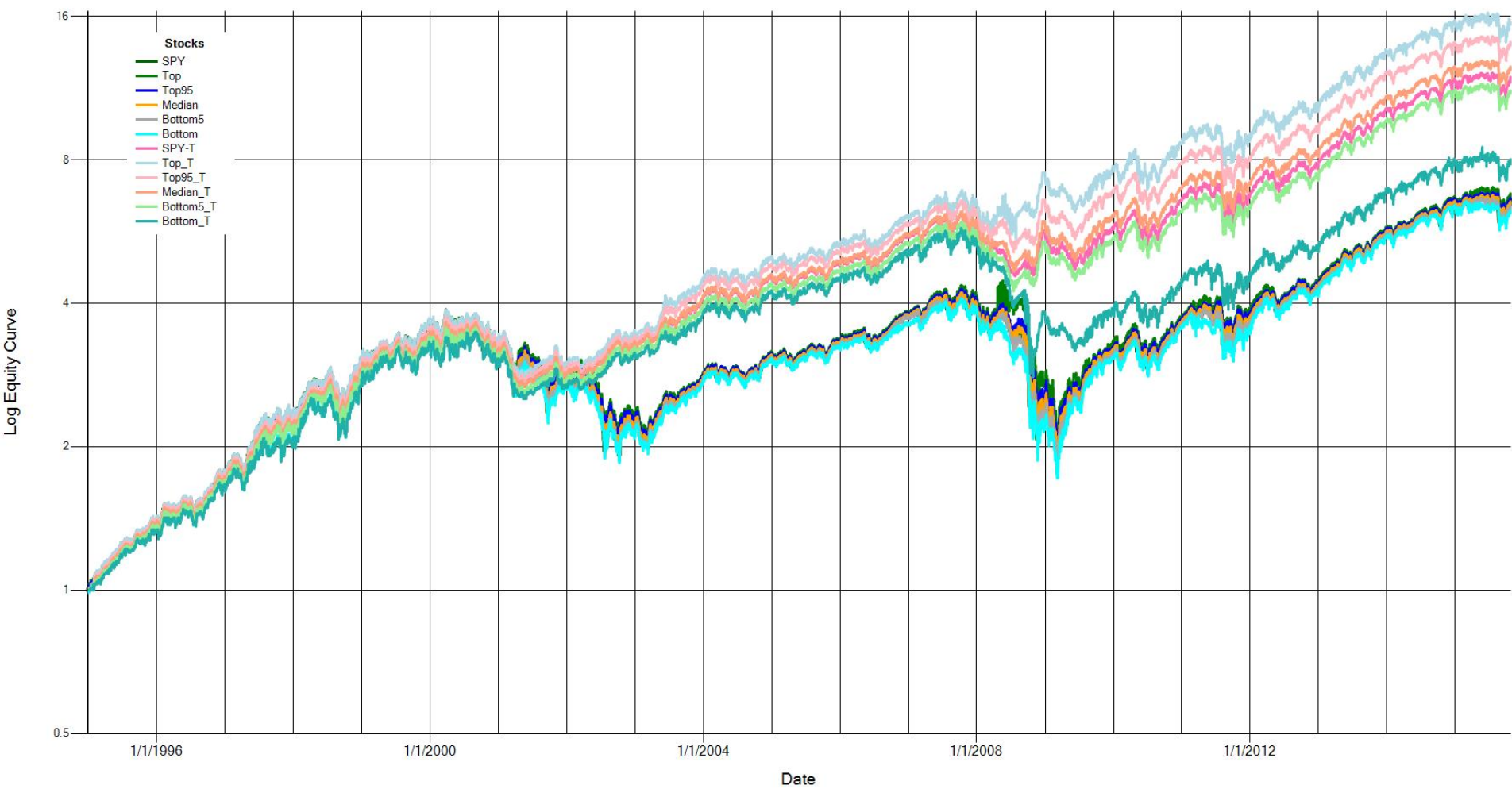
1000 Synthetic SPY EC Ranges & DEMA80(22,0%) Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & DEMA80(22,0%) Timer Results, VUSTX Cash



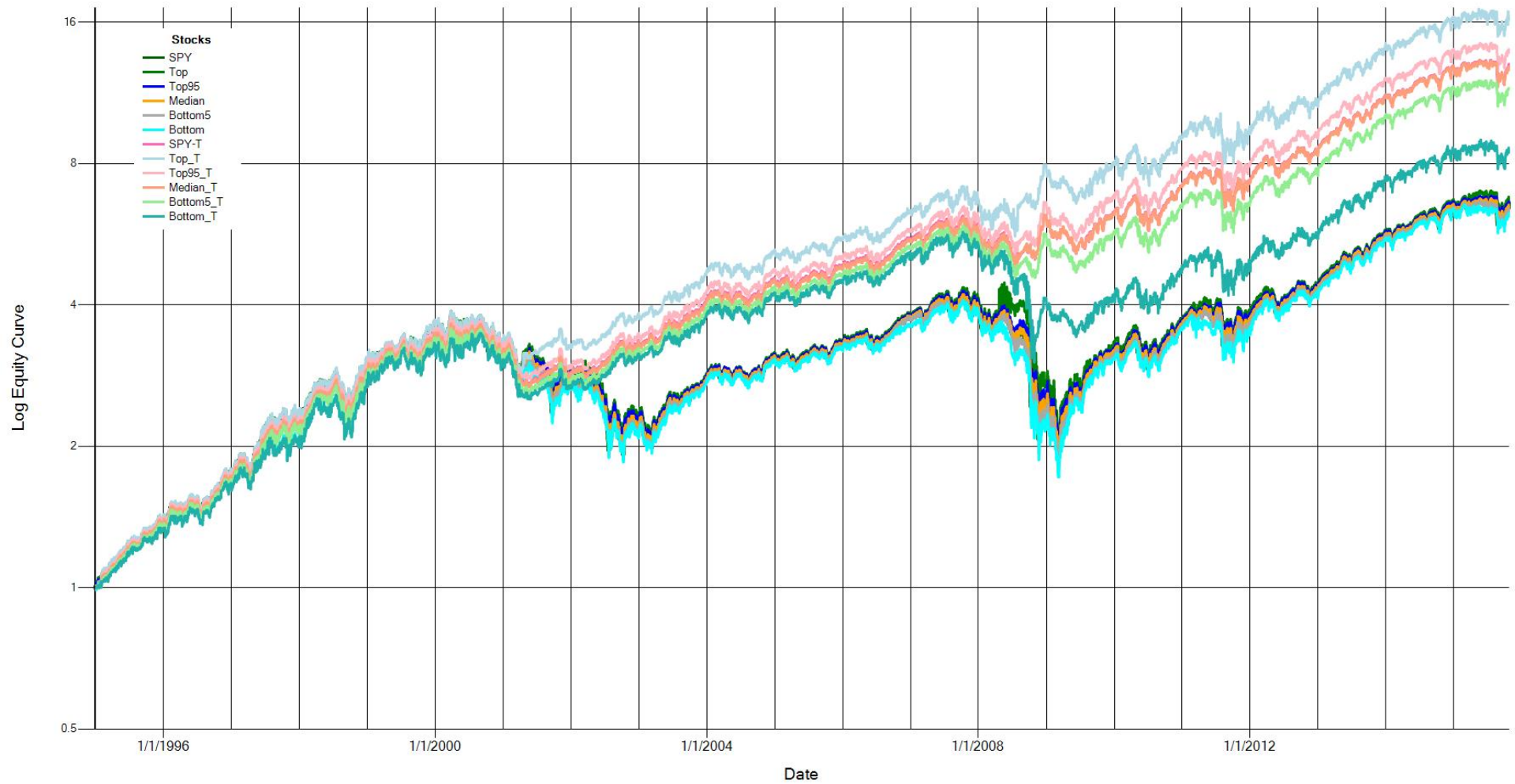
1000 Synthetic SPY EC Ranges & DEMA90(22,0%) Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & DEMA90(22,0%) Timer Results, VUSTX Cash



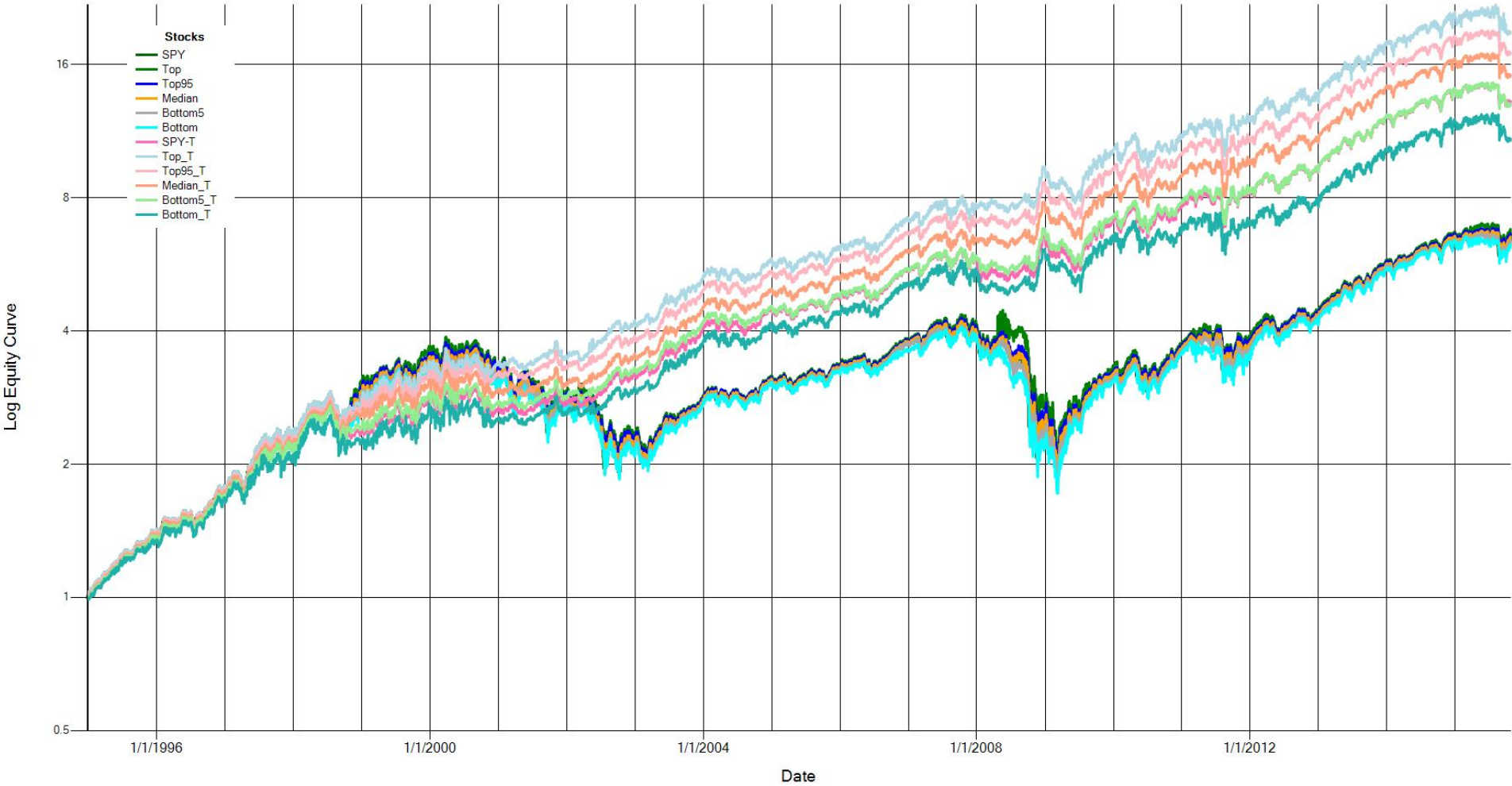
1000 Synthetic SPY EC Ranges & DEMA100(22,0%) Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & DEMA100(22,0%) Timer Results, VUSTX Cash



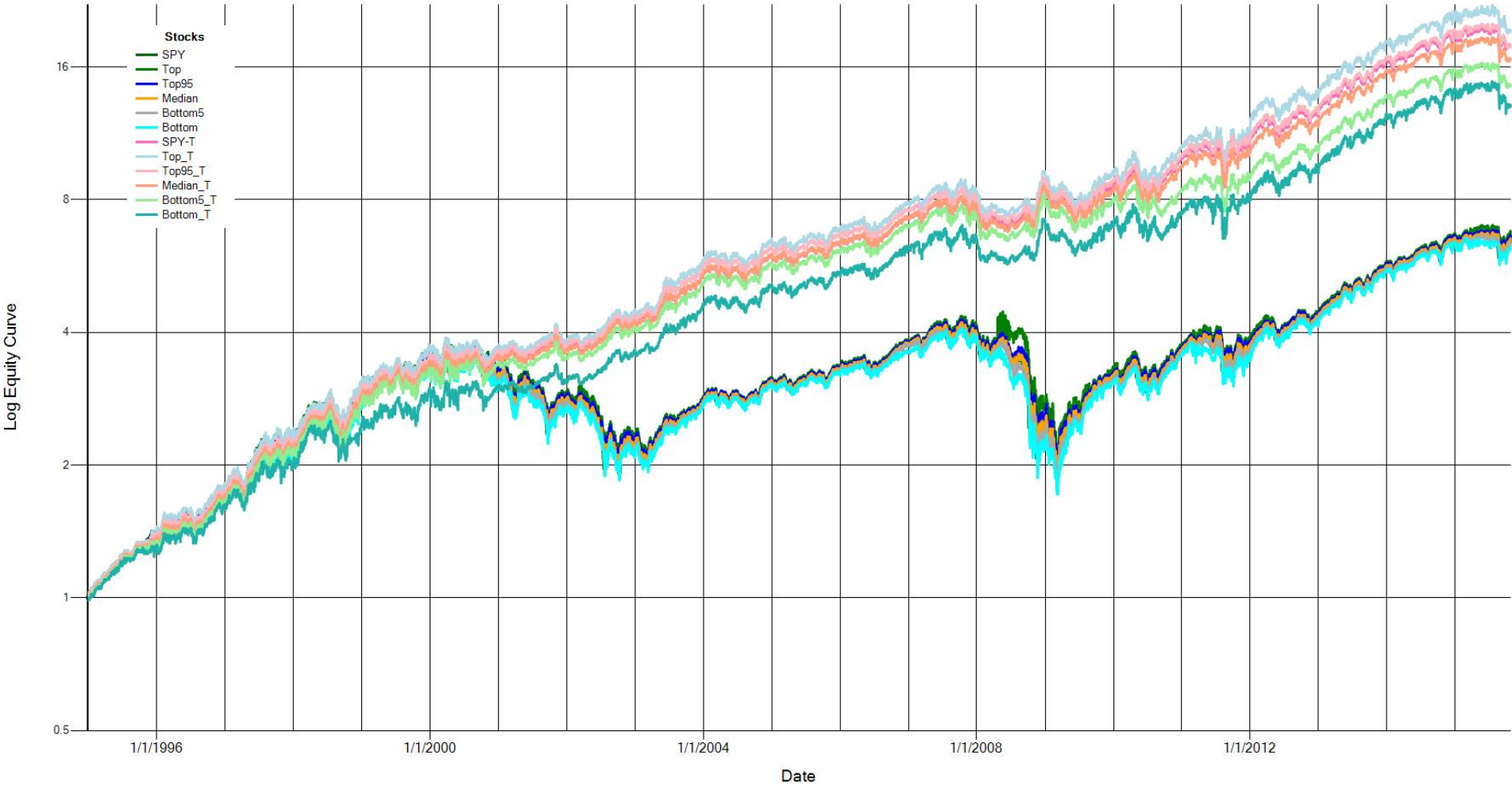
1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results, VUSTX Cash



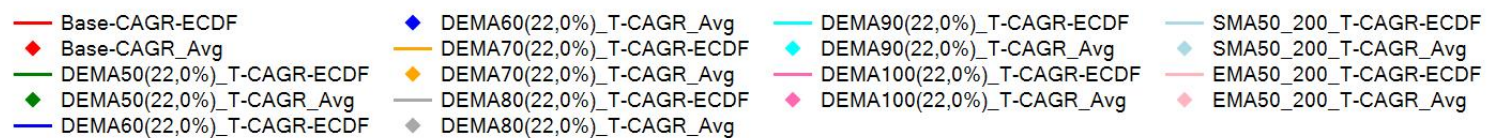
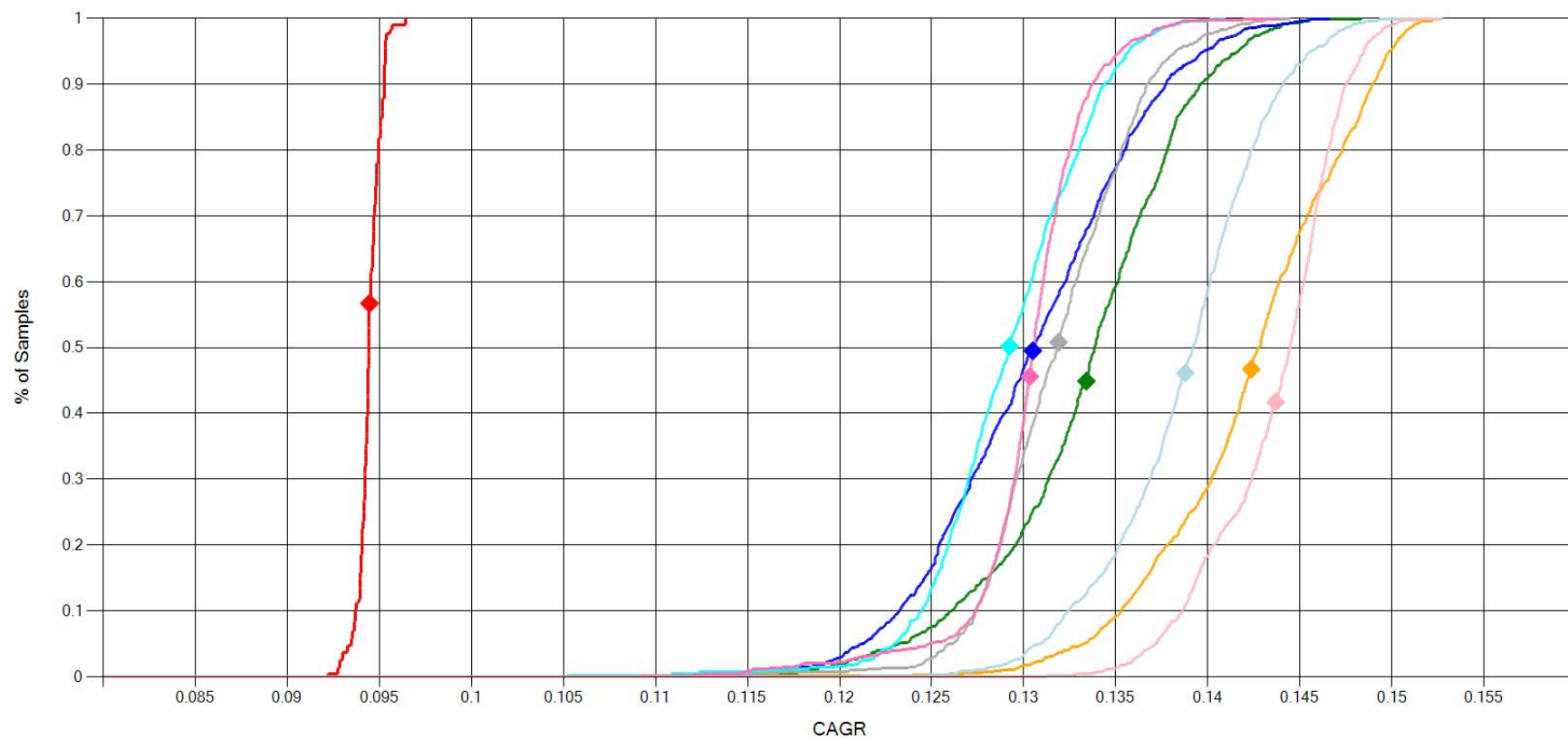
1000 Synthetic SPY EC Ranges & EMA50_200 Timer Results, VUSTX Cash

1000 Synthetic SPY EC Ranges & EMA50_200 Timer Results, VUSTX Cash



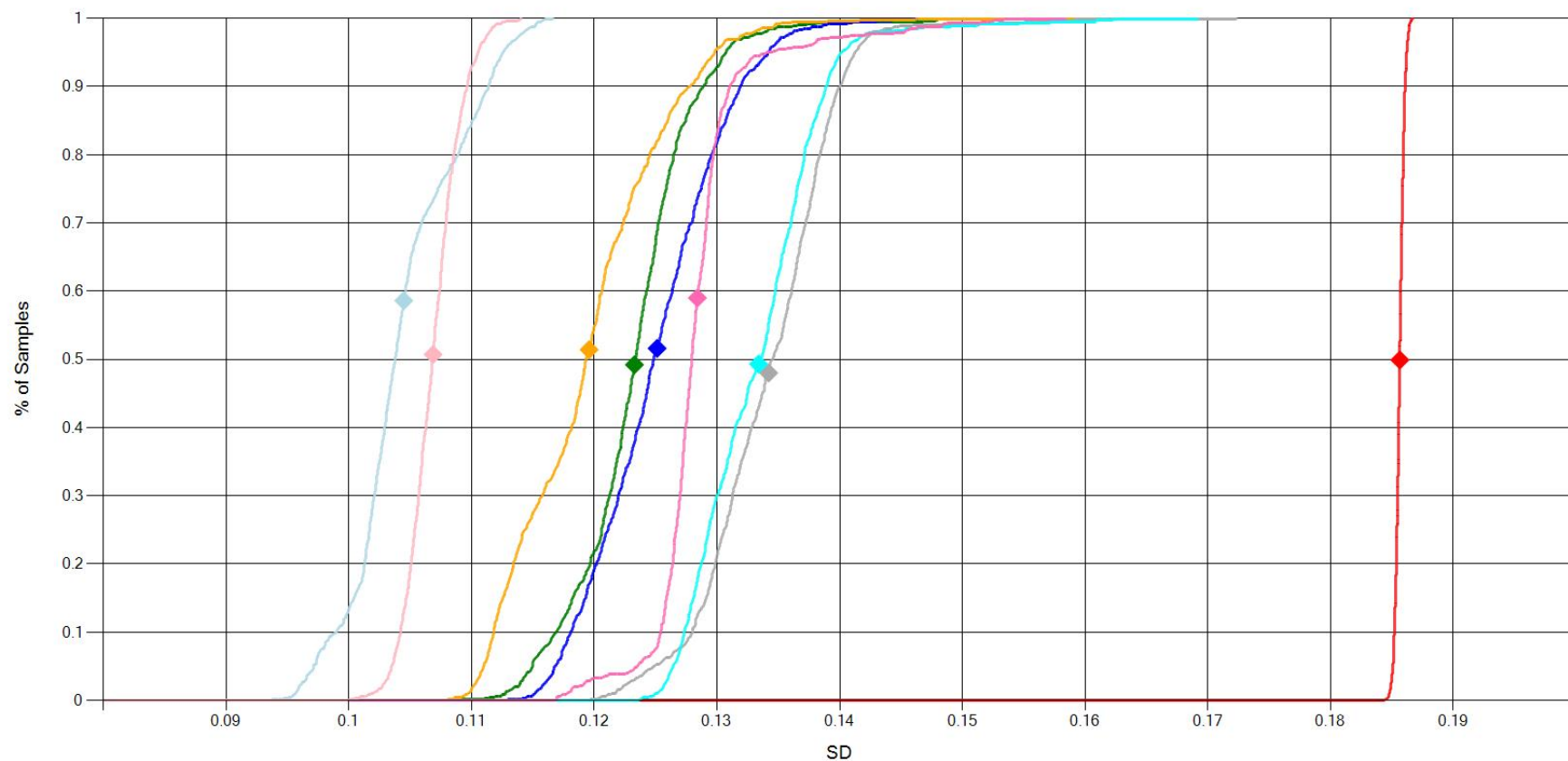
CAGR SPY Index vs. Multiple Timers, VUSTX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-CAGR	1000	9.4%	0.1%	9.2%	9.3%	9.4%	9.4%	9.5%	9.6%	9.6%
DEMA50(22,0%)_T-CAGR	1000	13.3%	0.5%	11.0%	12.0%	12.8%	13.4%	13.8%	14.3%	14.8%
DEMA60(22,0%)_T-CAGR	1000	13.0%	0.6%	10.9%	11.9%	12.5%	13.1%	13.6%	14.2%	14.7%
DEMA70(22,0%)_T-CAGR	1000	14.2%	0.5%	11.5%	13.1%	13.7%	14.3%	14.8%	15.1%	15.2%
DEMA80(22,0%)_T-CAGR	1000	13.2%	0.4%	10.6%	12.5%	12.8%	13.2%	13.6%	14.0%	14.4%
DEMA90(22,0%)_T-CAGR	1000	12.9%	0.4%	10.5%	12.1%	12.5%	12.9%	13.4%	13.7%	14.1%
DEMA100(22,0%)_T-CAGR	1000	13.0%	0.4%	10.9%	12.0%	12.8%	13.1%	13.3%	13.7%	14.4%
SMA50_200_T-CAGR	1000	13.9%	0.4%	12.1%	12.9%	13.4%	13.9%	14.3%	14.7%	15.2%
EMA50_200_T-CAGR	1000	14.4%	0.4%	13.1%	13.6%	14.0%	14.4%	14.7%	14.9%	15.3%



SD SPY Index vs. Multiple Timers, VUSTX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

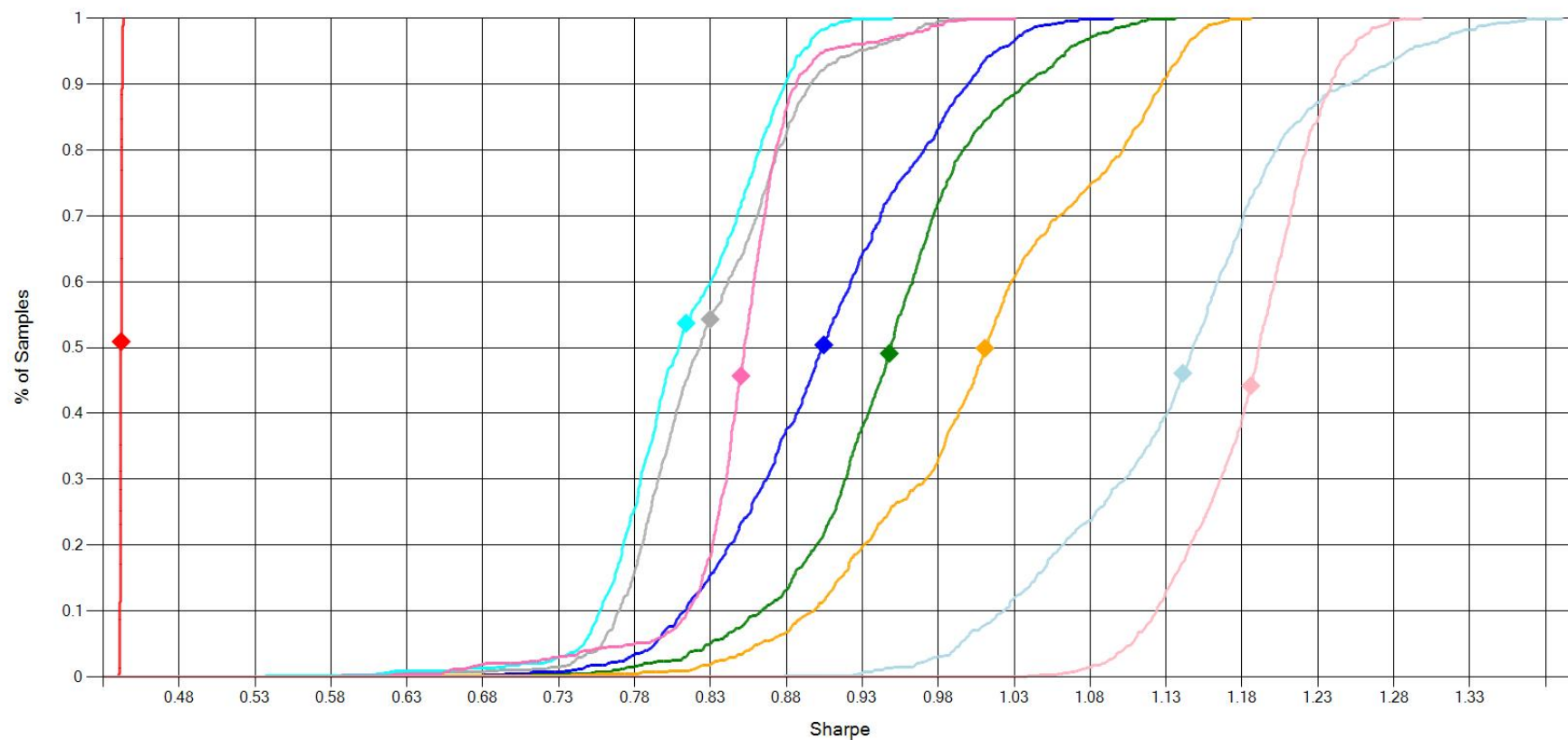
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-SD	1000	18.6%	0.0%	18.4%	18.5%	18.5%	18.6%	18.6%	18.6%	18.7%
DEMA50(22,0%)_T-SD	1000	12.3%	0.5%	10.9%	11.4%	11.8%	12.3%	12.7%	13.3%	16.0%
DEMA60(22,0%)_T-SD	1000	12.5%	0.5%	11.3%	11.6%	11.9%	12.5%	13.0%	13.6%	15.1%
DEMA70(22,0%)_T-SD	1000	12.0%	0.6%	10.8%	11.0%	11.3%	11.9%	12.6%	13.2%	16.2%
DEMA80(22,0%)_T-SD	1000	13.4%	0.5%	12.0%	12.3%	12.9%	13.5%	13.9%	14.3%	17.2%
DEMA90(22,0%)_T-SD	1000	13.3%	0.5%	12.4%	12.6%	12.8%	13.4%	13.8%	14.2%	16.9%
DEMA100(22,0%)_T-SD	1000	12.8%	0.4%	11.7%	11.9%	12.6%	12.8%	13.0%	14.2%	15.8%
SMA50_200_T-SD	1000	10.4%	0.5%	9.4%	9.6%	10.1%	10.4%	11.0%	11.4%	11.7%
EMA50_200_T-SD	1000	10.7%	0.2%	10.0%	10.3%	10.5%	10.7%	10.9%	11.1%	11.4%



— Base-SD-ECDF — DEMA60(22,0%)_T-SD-ECDF — DEMA80(22,0%)_T-SD-ECDF — DEMA100(22,0%)_T-SD-ECDF ◆ SMA50_200_T-SD_Avg
 ◆ Base-SD_Avg ◆ DEMA60(22,0%)_T-SD_Avg ◆ DEMA80(22,0%)_T-SD_Avg ◆ DEMA100(22,0%)_T-SD_Avg — EMA50_200_T-SD-ECDF
 — DEMA50(22,0%)_T-SD-ECDF — DEMA70(22,0%)_T-SD-ECDF — DEMA90(22,0%)_T-SD-ECDF — SMA50_200_T-SD-ECDF ◆ EMA50_200_T-SD_Avg
 ◆ DEMA50(22,0%)_T-SD_Avg ◆ DEMA70(22,0%)_T-SD_Avg ◆ DEMA90(22,0%)_T-SD_Avg

Sharpe SPY Index vs. Multiple Timers, VUSTX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

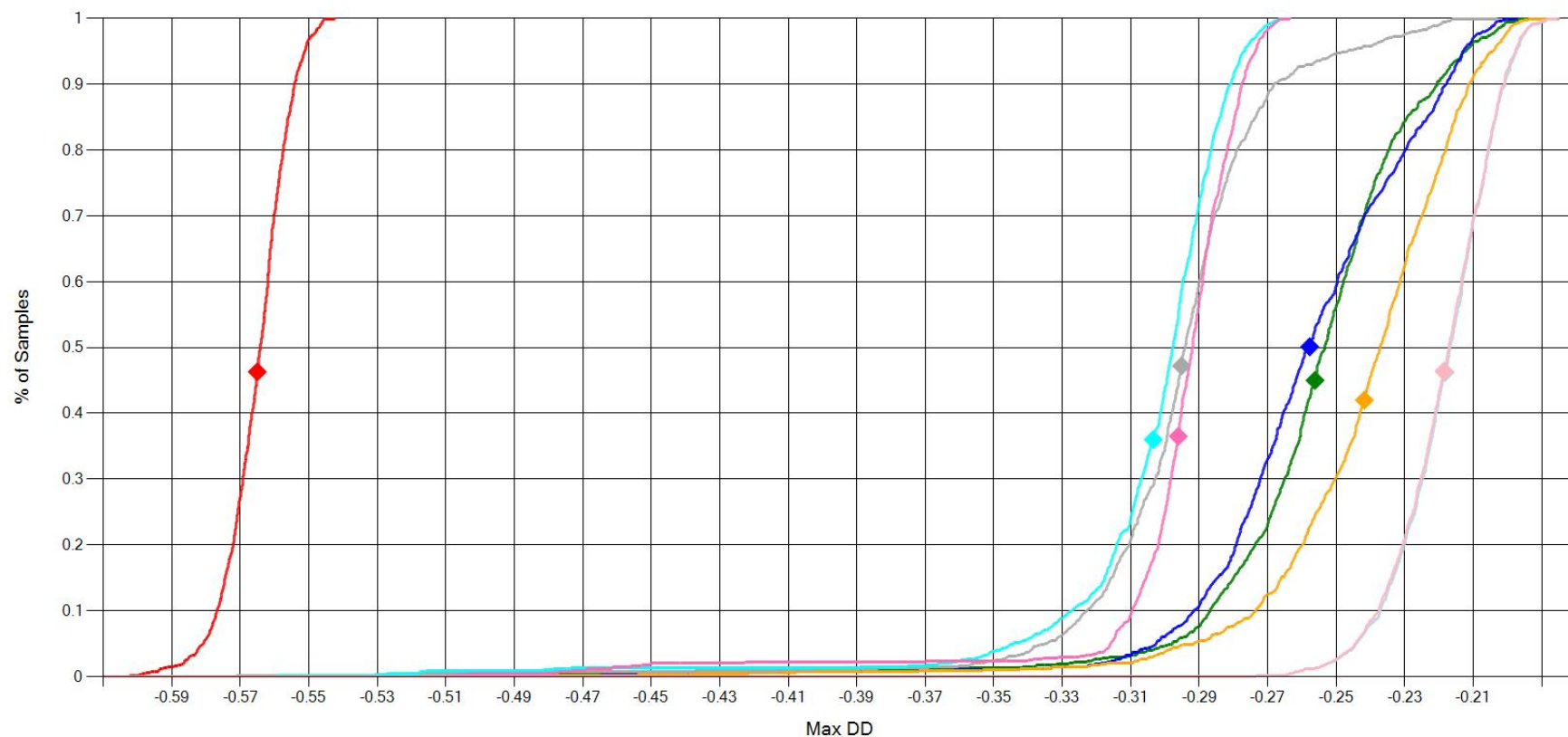
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sharpe	1000	44.2%	0.1%	44.0%	44.1%	44.1%	44.2%	44.2%	44.3%	44.3%
DEMA50(22,0%)_T-Sharpe	1000	94.8%	6.8%	62.1%	79.9%	88.6%	94.9%	100.9%	108.7%	113.6%
DEMA60(22,0%)_T-Sharpe	1000	90.5%	7.1%	64.7%	77.1%	83.2%	90.4%	98.2%	103.6%	109.6%
DEMA70(22,0%)_T-Sharpe	1000	101.1%	8.7%	62.7%	83.6%	91.9%	101.1%	111.3%	115.1%	118.6%
DEMA80(22,0%)_T-Sharpe	1000	83.0%	5.6%	54.7%	74.0%	78.0%	82.3%	88.2%	96.3%	99.9%
DEMA90(22,0%)_T-Sharpe	1000	81.4%	5.1%	53.6%	72.4%	76.8%	80.9%	87.0%	90.1%	95.0%
DEMA100(22,0%)_T-Sharpe	1000	85.0%	4.7%	58.6%	71.5%	82.6%	85.2%	87.8%	96.1%	103.1%
SMA50_200_T-Sharpe	1000	114.1%	8.6%	87.8%	97.2%	104.8%	114.8%	121.5%	131.7%	139.1%
EMA50_200_T-Sharpe	1000	118.6%	4.4%	103.9%	109.1%	113.7%	119.1%	122.9%	126.3%	129.8%



— Base-Sharpe-ECDF
 ◆ Base-Sharpe_Avg
 — DEMA50(22,0%)_T-Sharpe-ECDF
 ◆ DEMA50(22,0%)_T-Sharpe_Avg
 — DEMA60(22,0%)_T-Sharpe-ECDF
 ◆ DEMA60(22,0%)_T-Sharpe_Avg
 — DEMA70(22,0%)_T-Sharpe-ECDF
 ◆ DEMA70(22,0%)_T-Sharpe_Avg
 — DEMA80(22,0%)_T-Sharpe-ECDF
 ◆ DEMA80(22,0%)_T-Sharpe_Avg
 — DEMA90(22,0%)_T-Sharpe-ECDF
 ◆ DEMA90(22,0%)_T-Sharpe_Avg
 — DEMA100(22,0%)_T-Sharpe-ECDF
 ◆ DEMA100(22,0%)_T-Sharpe_Avg
 — SMA50_200_T-Sharpe-ECDF
 ◆ SMA50_200_T-Sharpe_Avg
 — EMA50_200_T-Sharpe-ECDF
 ◆ EMA50_200_T-Sharpe_Avg

MaxDD SPY Index vs. Multiple Timers, VUSTX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

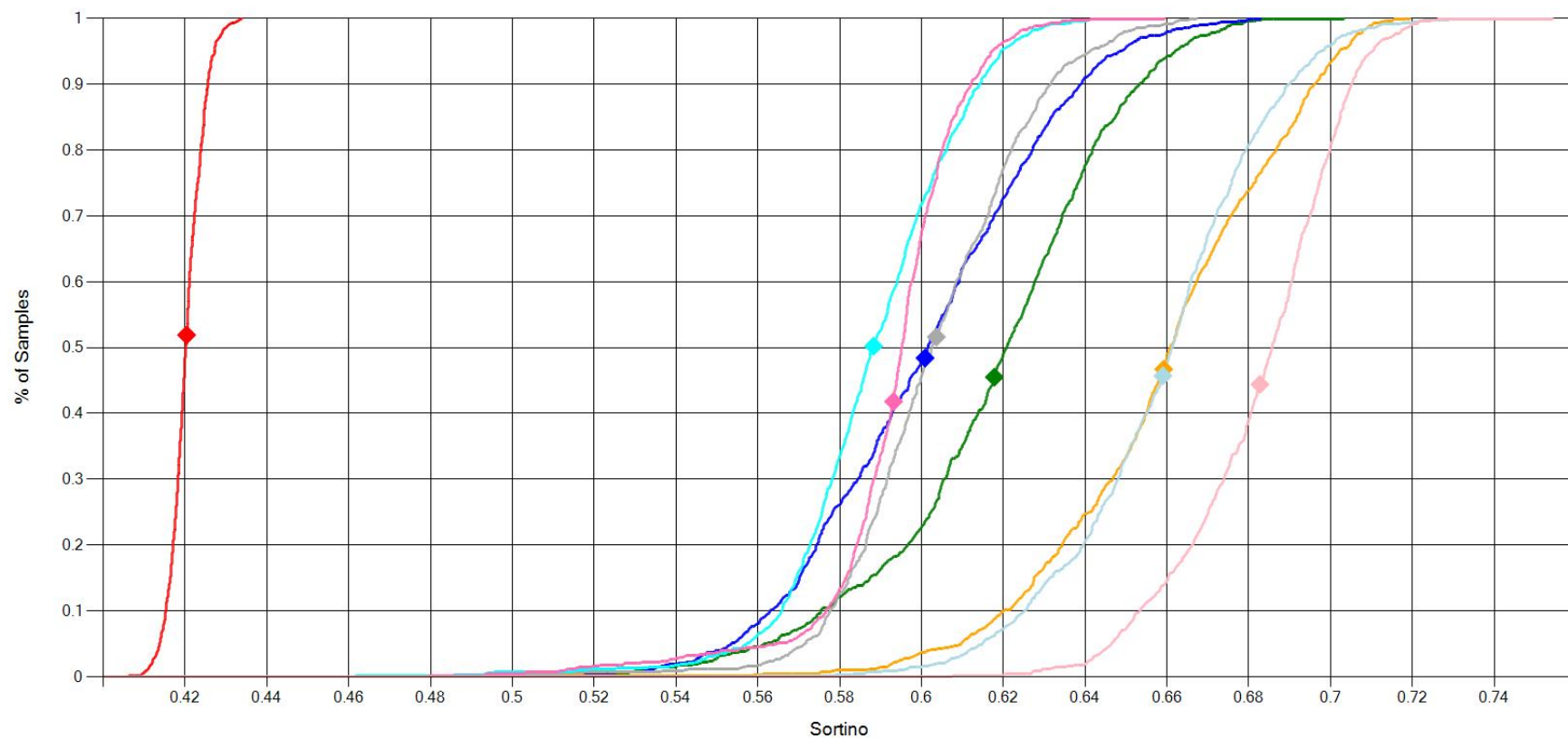
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-MaxDD	1000	-56.5%	0.9%	-60.2%	-58.6%	-57.4%	-56.4%	-55.6%	-54.8%	-54.2%
DEMA50(22,0%)_T-MaxDD	1000	-25.6%	3.5%	-56.9%	-32.2%	-27.9%	-25.3%	-23.0%	-20.4%	-18.5%
DEMA60(22,0%)_T-MaxDD	1000	-25.8%	3.2%	-48.1%	-31.6%	-28.3%	-25.8%	-22.5%	-20.9%	-19.7%
DEMA70(22,0%)_T-MaxDD	1000	-24.2%	3.2%	-55.4%	-30.9%	-26.4%	-23.7%	-21.6%	-20.1%	-18.8%
DEMA80(22,0%)_T-MaxDD	1000	-29.5%	3.2%	-57.1%	-35.0%	-31.5%	-29.4%	-27.5%	-22.9%	-20.3%
DEMA90(22,0%)_T-MaxDD	1000	-30.3%	3.0%	-55.9%	-36.0%	-31.7%	-29.8%	-28.4%	-27.3%	-26.4%
DEMA100(22,0%)_T-MaxDD	1000	-29.6%	2.9%	-51.0%	-34.6%	-30.5%	-29.2%	-28.0%	-27.1%	-26.4%
SMA50_200_T-MaxDD	1000	-21.8%	1.4%	-27.4%	-25.1%	-23.3%	-21.7%	-20.4%	-19.5%	-18.8%
EMA50_200_T-MaxDD	1000	-21.9%	1.4%	-27.4%	-25.1%	-23.3%	-21.7%	-20.4%	-19.5%	-18.5%



— Base-MaxDD-ECDF	◆ DEMA60(22,0%)_T-MaxDD_Avg	— DEMA90(22,0%)_T-MaxDD-ECDF	— SMA50_200_T-MaxDD-ECDF
◆ Base-MaxDD_Avg	— DEMA70(22,0%)_T-MaxDD-ECDF	◆ DEMA90(22,0%)_T-MaxDD_Avg	◆ SMA50_200_T-MaxDD_Avg
— DEMA50(22,0%)_T-MaxDD-ECDF	◆ DEMA70(22,0%)_T-MaxDD_Avg	— DEMA100(22,0%)_T-MaxDD-ECDF	— EMA50_200_T-MaxDD-ECDF
◆ DEMA50(22,0%)_T-MaxDD_Avg	— DEMA80(22,0%)_T-MaxDD-ECDF	◆ DEMA100(22,0%)_T-MaxDD_Avg	◆ EMA50_200_T-MaxDD_Avg
— DEMA60(22,0%)_T-MaxDD-ECDF	◆ DEMA80(22,0%)_T-MaxDD_Avg		

Sortino SPY Index vs. Multiple Timers, VUSTX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sortino	1000	42.0%	0.4%	40.6%	41.2%	41.7%	42.0%	42.5%	42.9%	43.4%
DEMA50(22,0%)_T-Sortino	1000	61.8%	3.0%	48.8%	54.8%	59.0%	62.1%	64.6%	67.1%	70.3%
DEMA60(22,0%)_T-Sortino	1000	60.1%	3.0%	48.1%	54.4%	57.1%	60.2%	63.1%	65.9%	68.3%
DEMA70(22,0%)_T-Sortino	1000	65.9%	2.9%	50.8%	59.4%	62.9%	66.1%	69.1%	70.7%	72.0%
DEMA80(22,0%)_T-Sortino	1000	60.4%	2.3%	47.0%	56.3%	58.3%	60.3%	62.6%	64.9%	66.7%
DEMA90(22,0%)_T-Sortino	1000	58.8%	2.1%	46.2%	54.6%	57.0%	58.8%	60.9%	62.6%	64.8%
DEMA100(22,0%)_T-Sortino	1000	59.3%	1.9%	47.9%	53.7%	58.2%	59.5%	60.7%	62.3%	65.9%
SMA50_200_T-Sortino	1000	65.9%	2.5%	56.0%	60.6%	63.3%	66.1%	68.3%	70.5%	73.0%
EMA50_200_T-Sortino	1000	68.3%	2.0%	60.8%	64.1%	66.2%	68.6%	70.2%	71.7%	75.4%



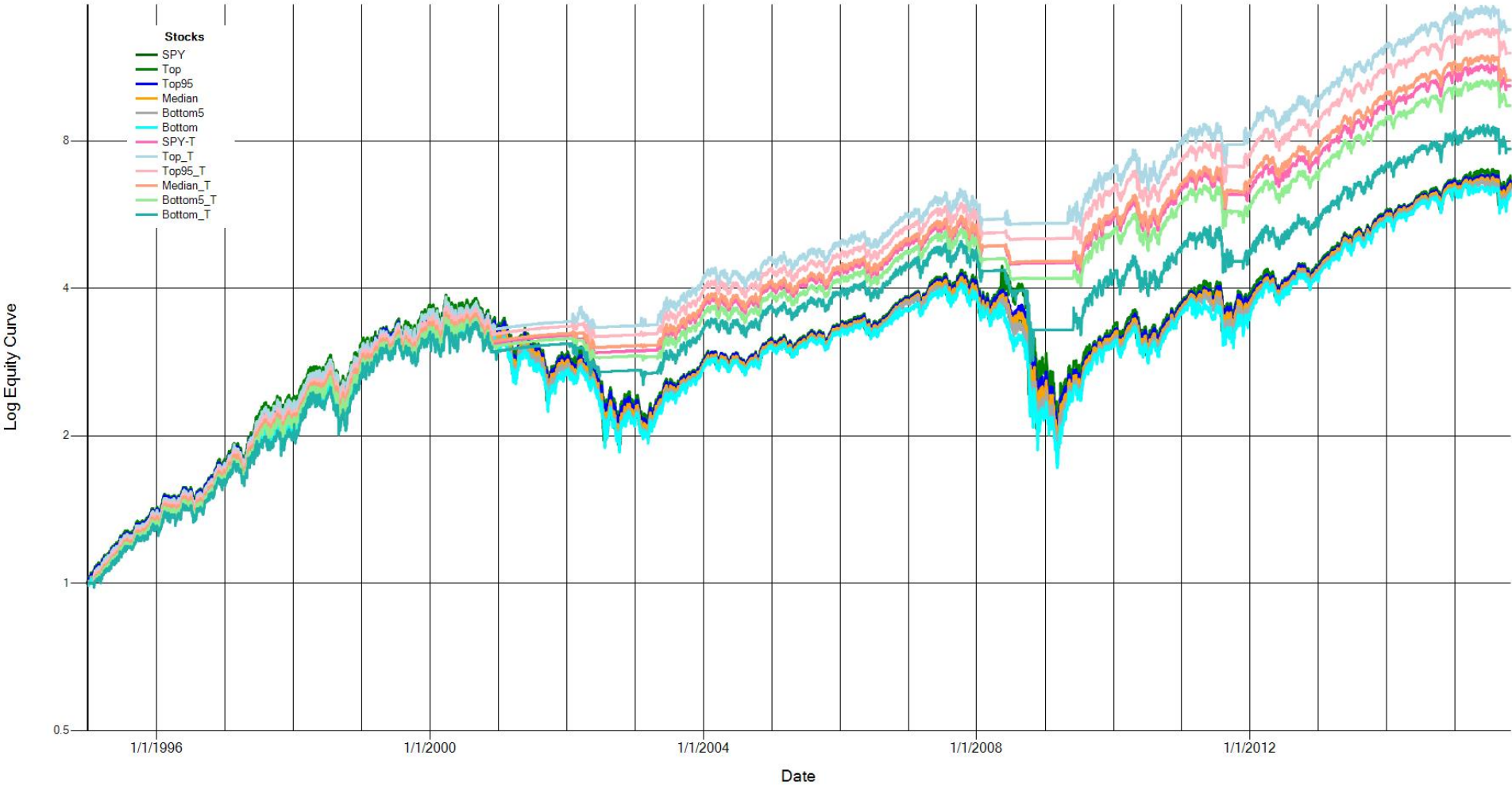
— Base-Sortino-ECDF
 ◆ Base-Sortino_Avg
 — DEMA50(22,0%)_T-Sortino-ECDF
 ◆ DEMA50(22,0%)_T-Sortino_Avg
 — DEMA60(22,0%)_T-Sortino-ECDF
 ◆ DEMA60(22,0%)_T-Sortino_Avg
 — DEMA70(22,0%)_T-Sortino-ECDF
 ◆ DEMA70(22,0%)_T-Sortino_Avg
 — DEMA80(22,0%)_T-Sortino-ECDF
 ◆ DEMA80(22,0%)_T-Sortino_Avg
 — DEMA90(22,0%)_T-Sortino-ECDF
 ◆ DEMA90(22,0%)_T-Sortino_Avg
 — DEMA100(22,0%)_T-Sortino-ECDF
 ◆ DEMA100(22,0%)_T-Sortino_Avg
 — SMA50_200_T-Sortino-ECDF
 ◆ SMA50_200_T-Sortino_Avg
 — EMA50_200_T-Sortino-ECDF
 ◆ EMA50_200_T-Sortino_Avg

Timer Test 5

- Period 12/30/1994 – 10/23/2015 – 20.8 years
- Base Series
 - SPY
- Timers
 - DEMA (50,60,...,100; 22dayMth; 0% offset)
 - SMA50_200 Golden Cross
 - EMA50_200 Cross
- Cash
 - ^IRX (3 Mth T-Bill)
- Results
 - DEMA70(22,0%) best CAGR
 - EMA50_200 best Sharpe
 - SMA50_200 & EMA50_200 lowest MaxDD

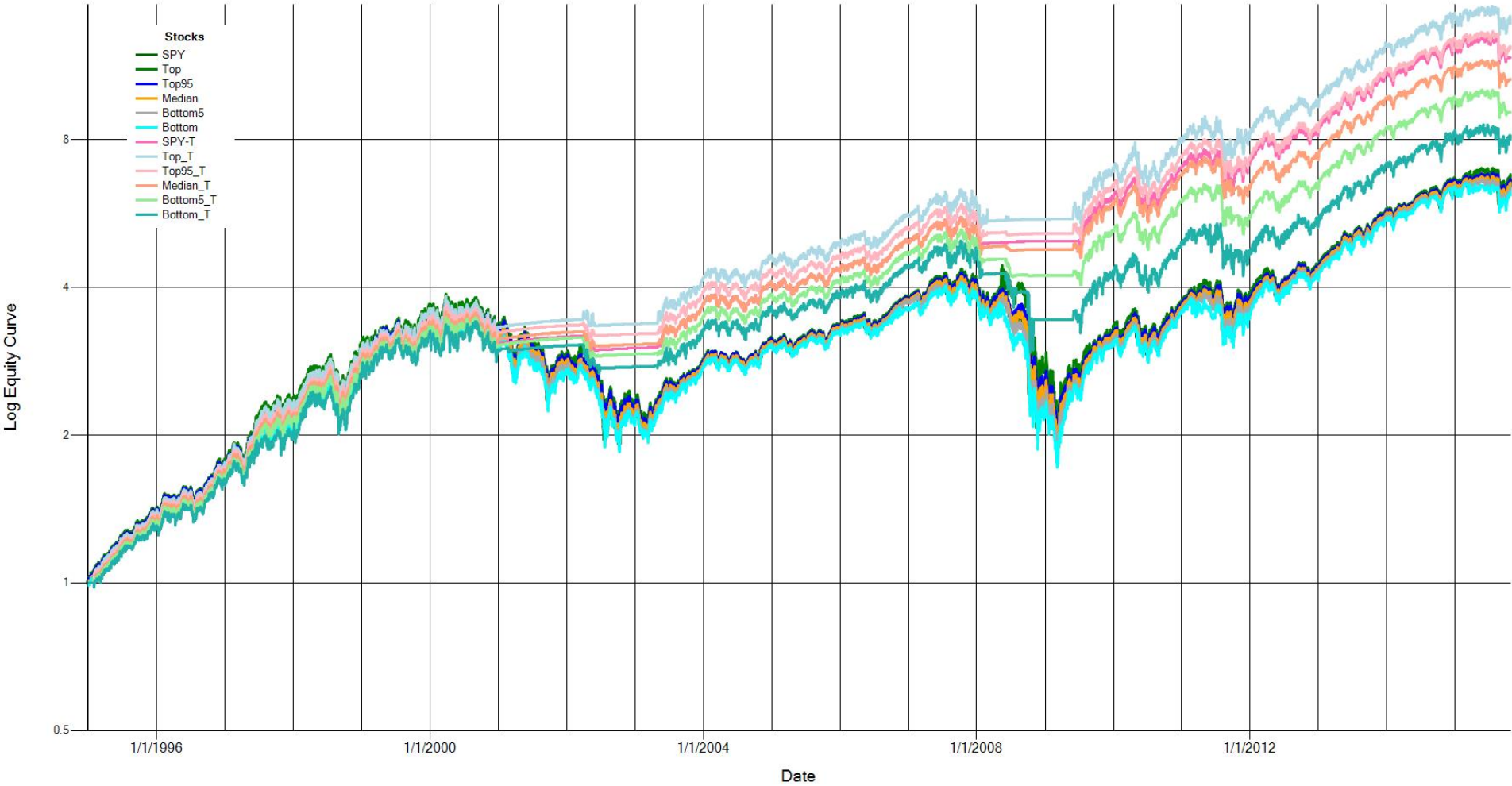
1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results, ^IRX Cash



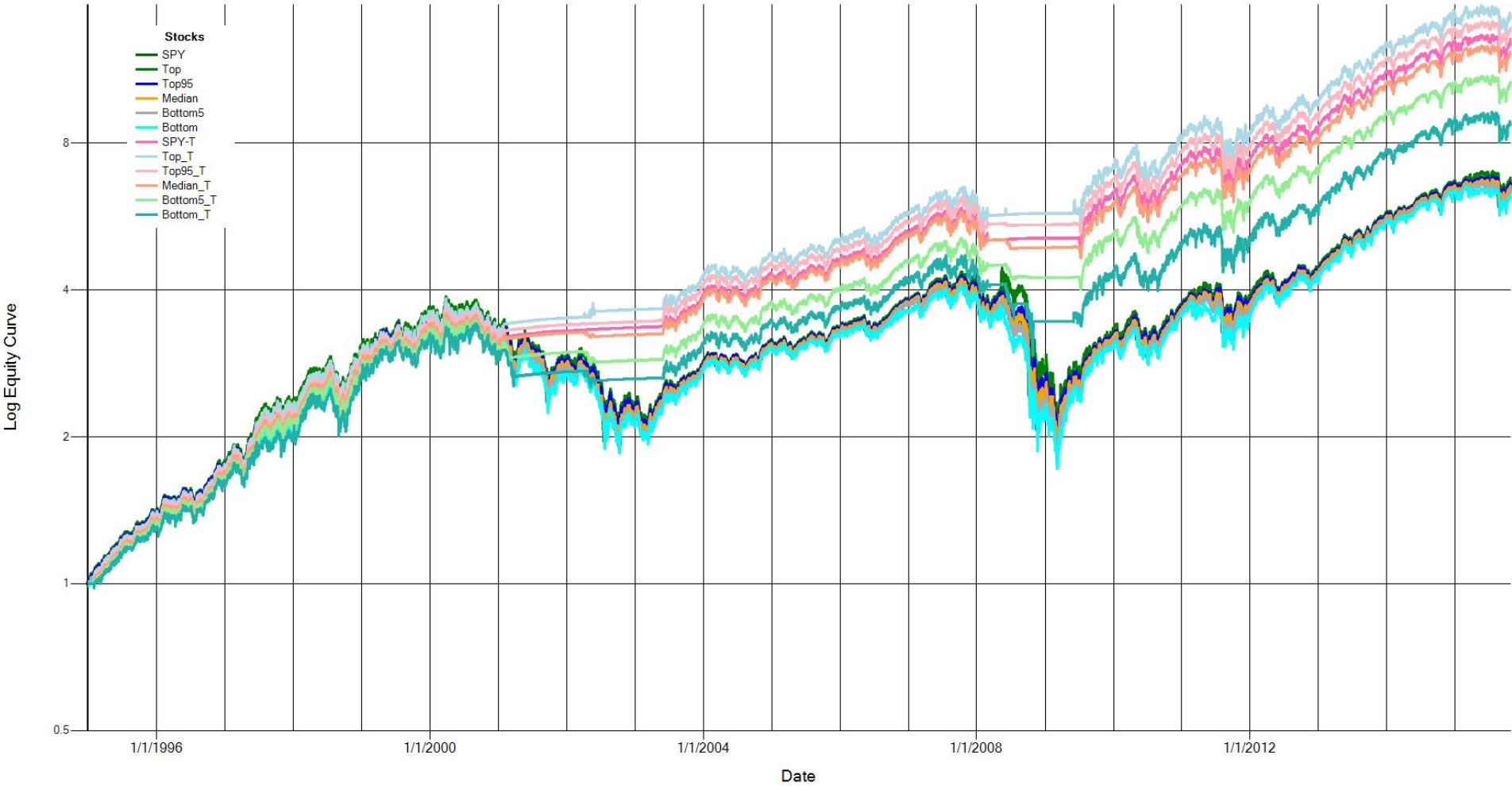
1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results, ^IRX Cash



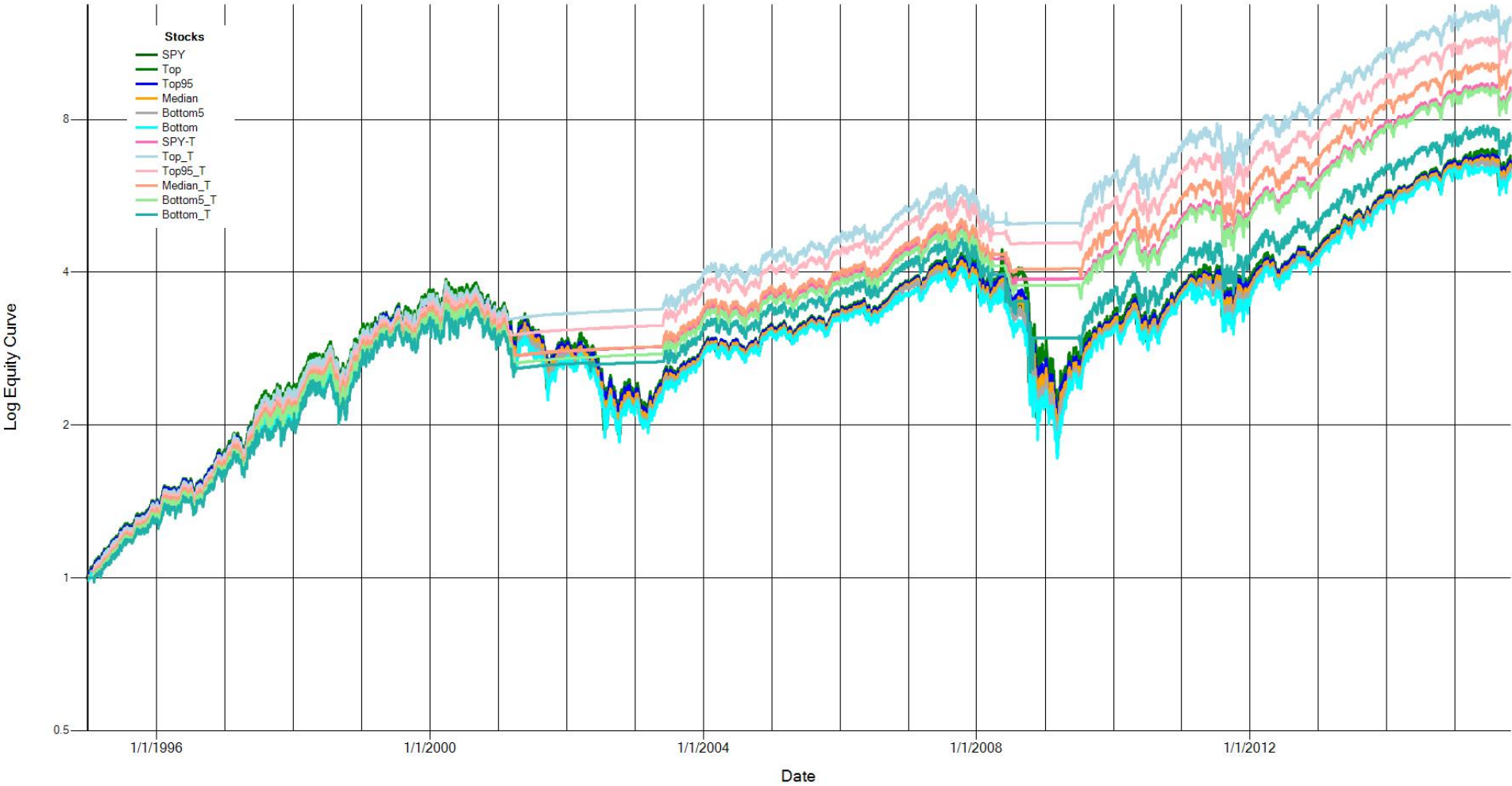
1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results, ^IRX Cash



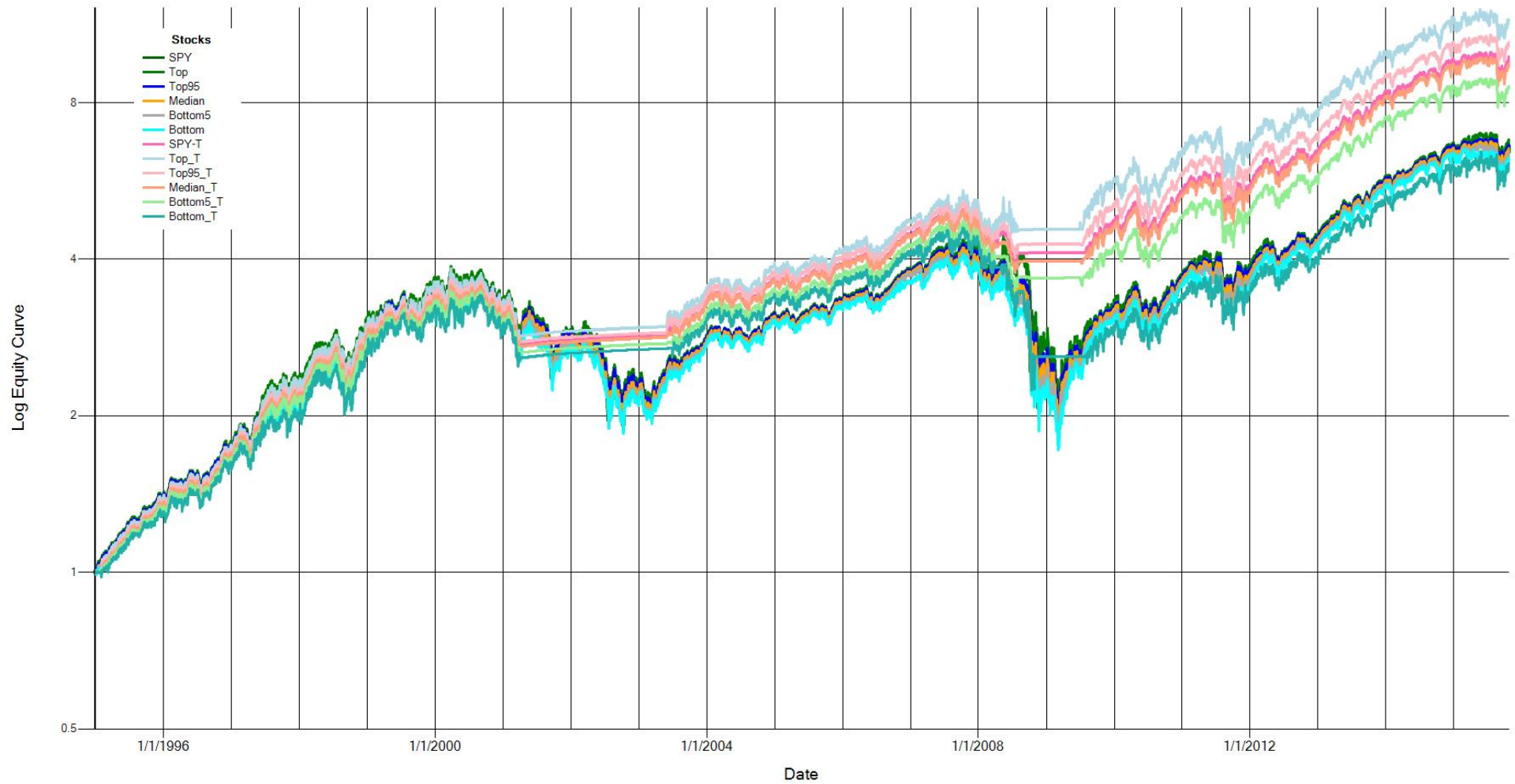
1000 Synthetic SPY EC Ranges & DEMA80(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA80(22,0%) Timer Results, ^IRX Cash



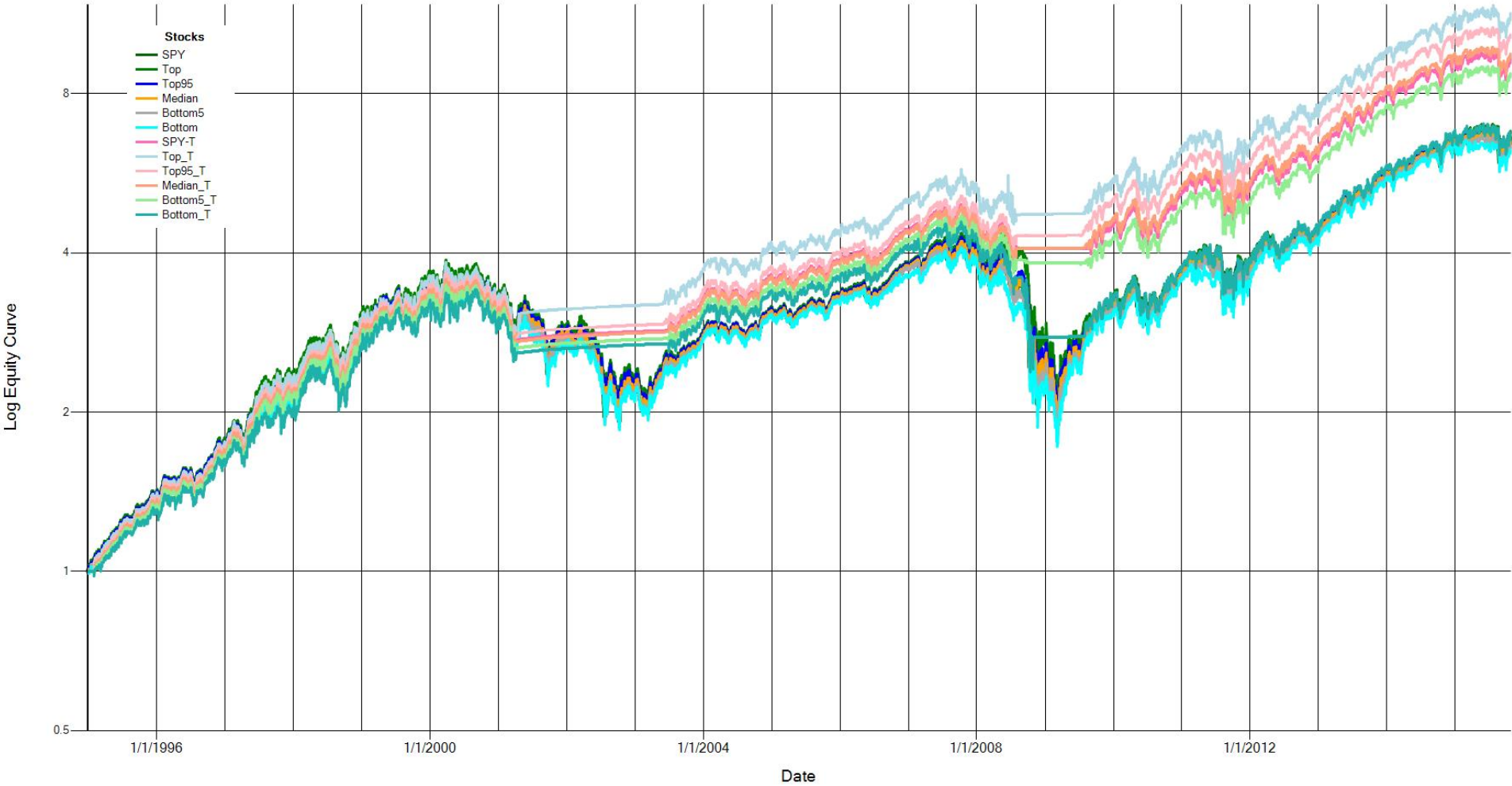
1000 Synthetic SPY EC Ranges & DEMA90(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA90(22,0%) Timer Results, ^IRX Cash



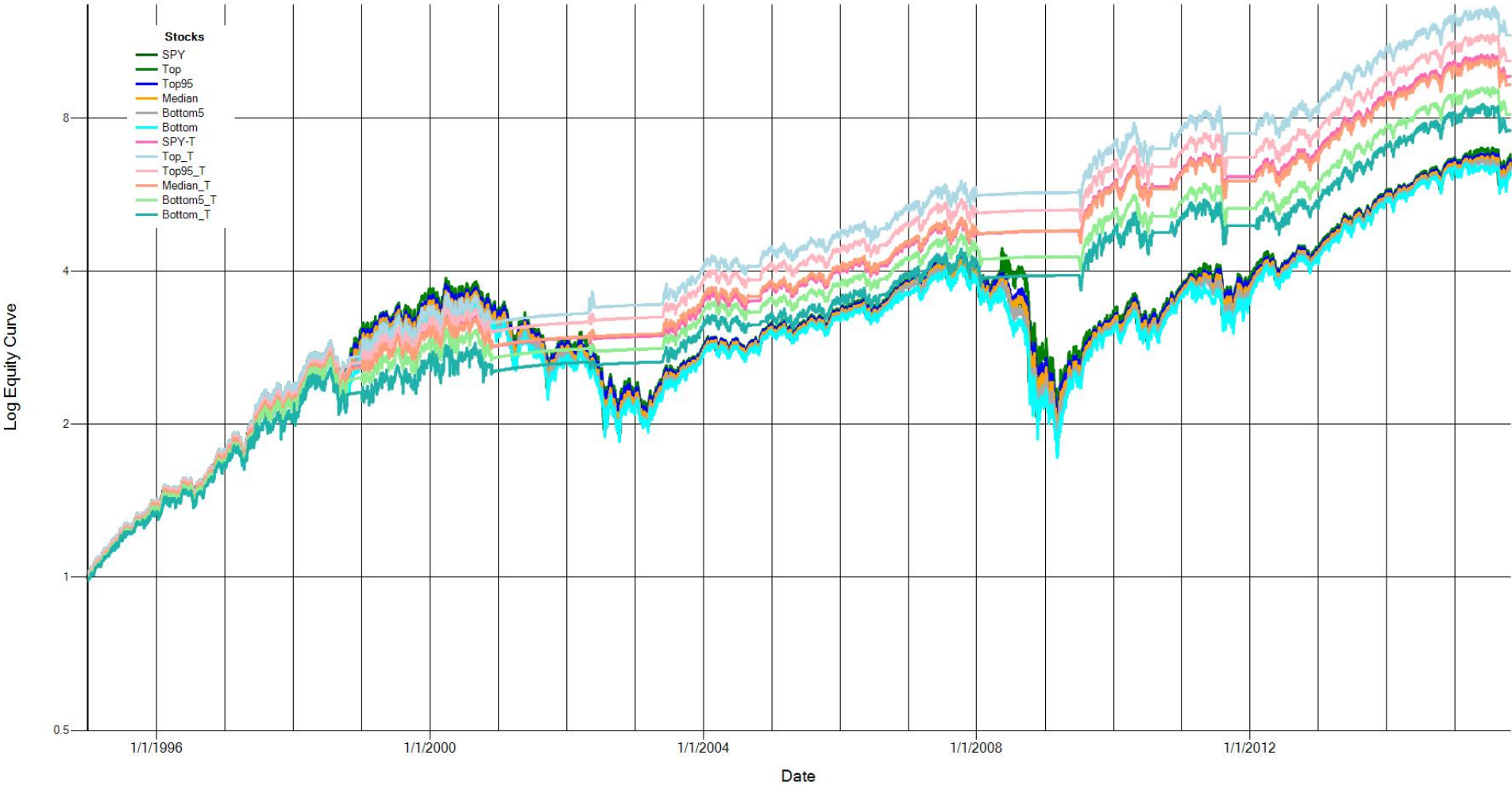
1000 Synthetic SPY EC Ranges & DEMA100(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA100(22,0%) Timer Results, ^IRX Cash



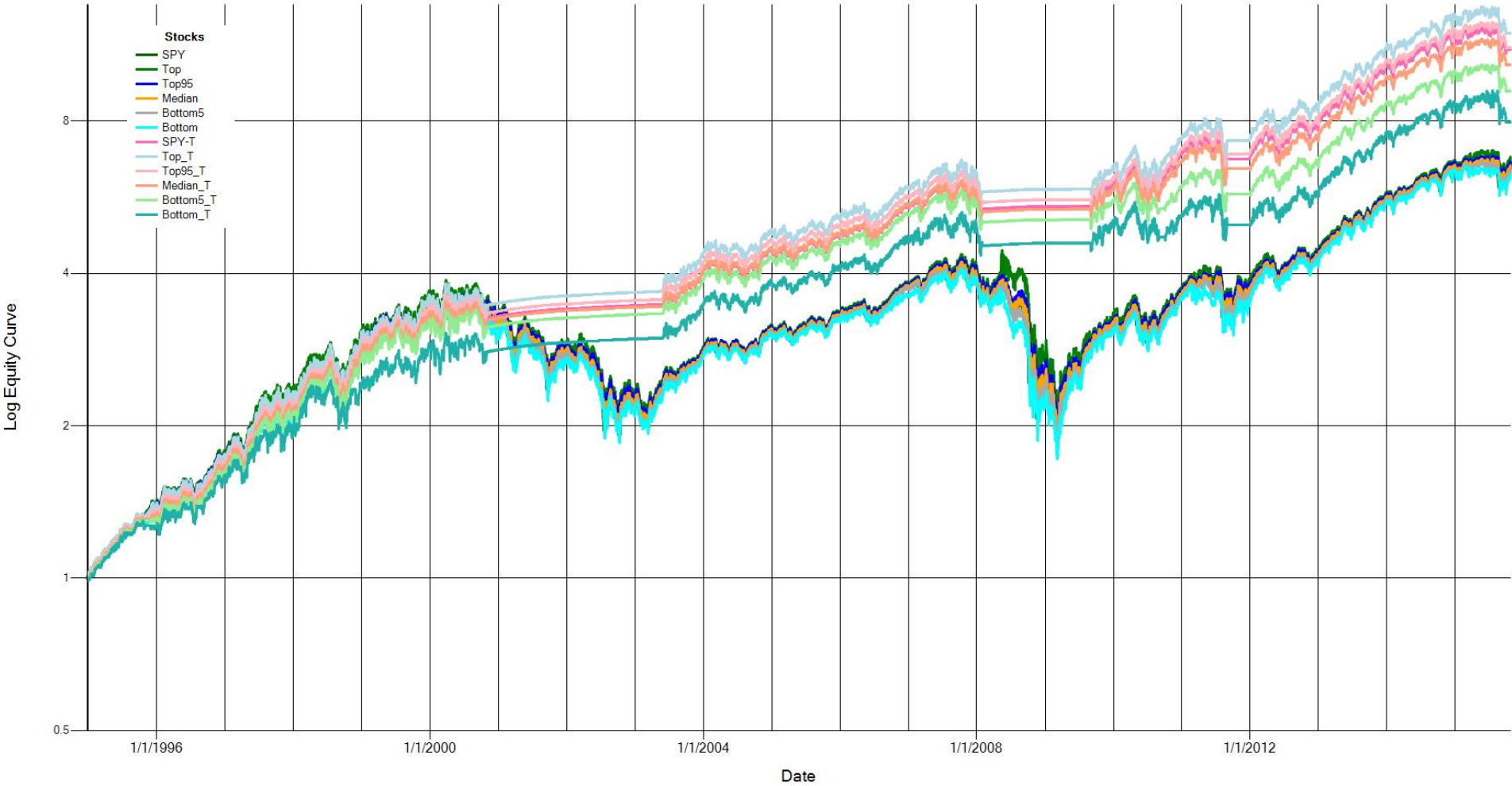
1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results, ^IRX Cash



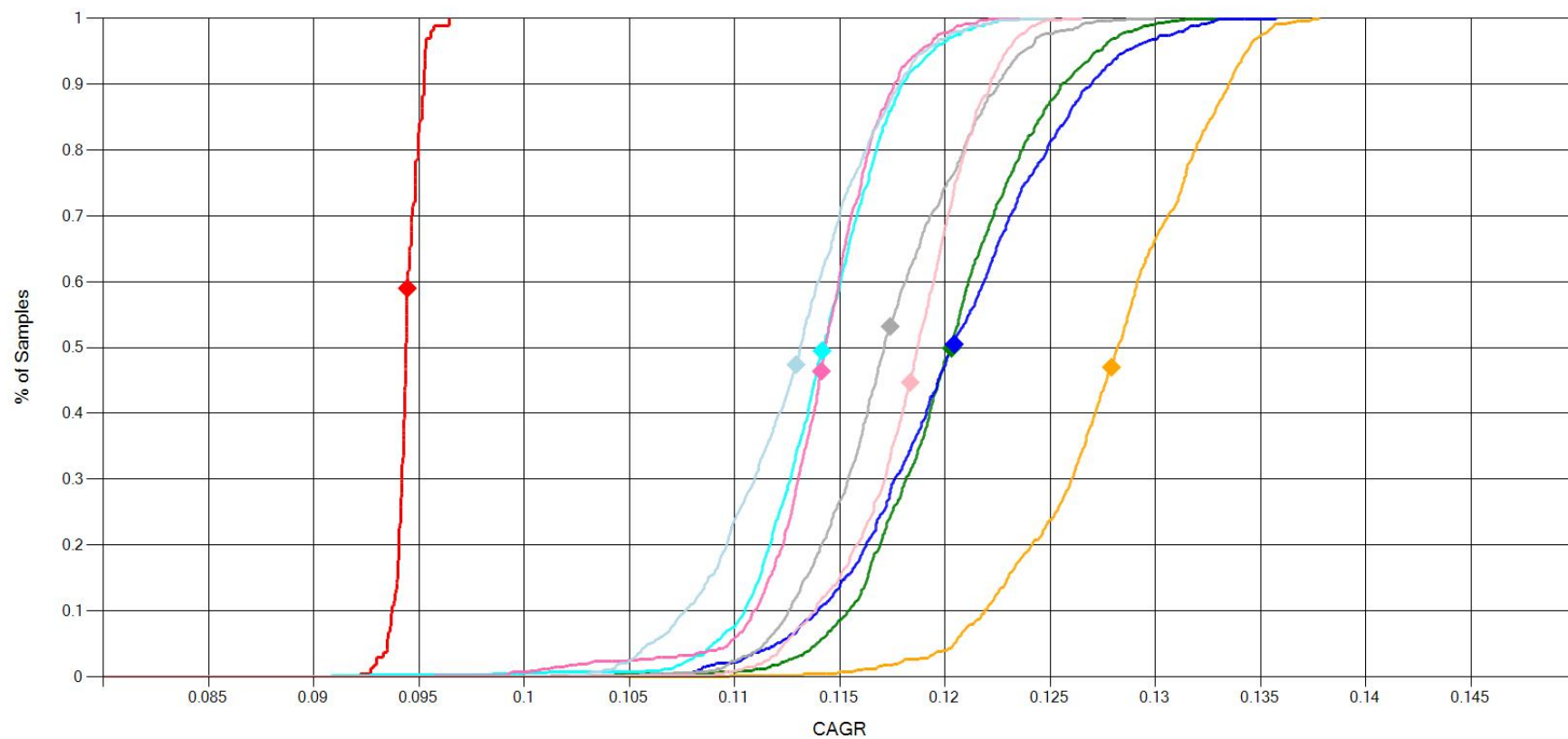
1000 Synthetic SPY EC Ranges & EMA50_200 Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & EMA50_200 Timer Results, ^IRX Cash



CAGR SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

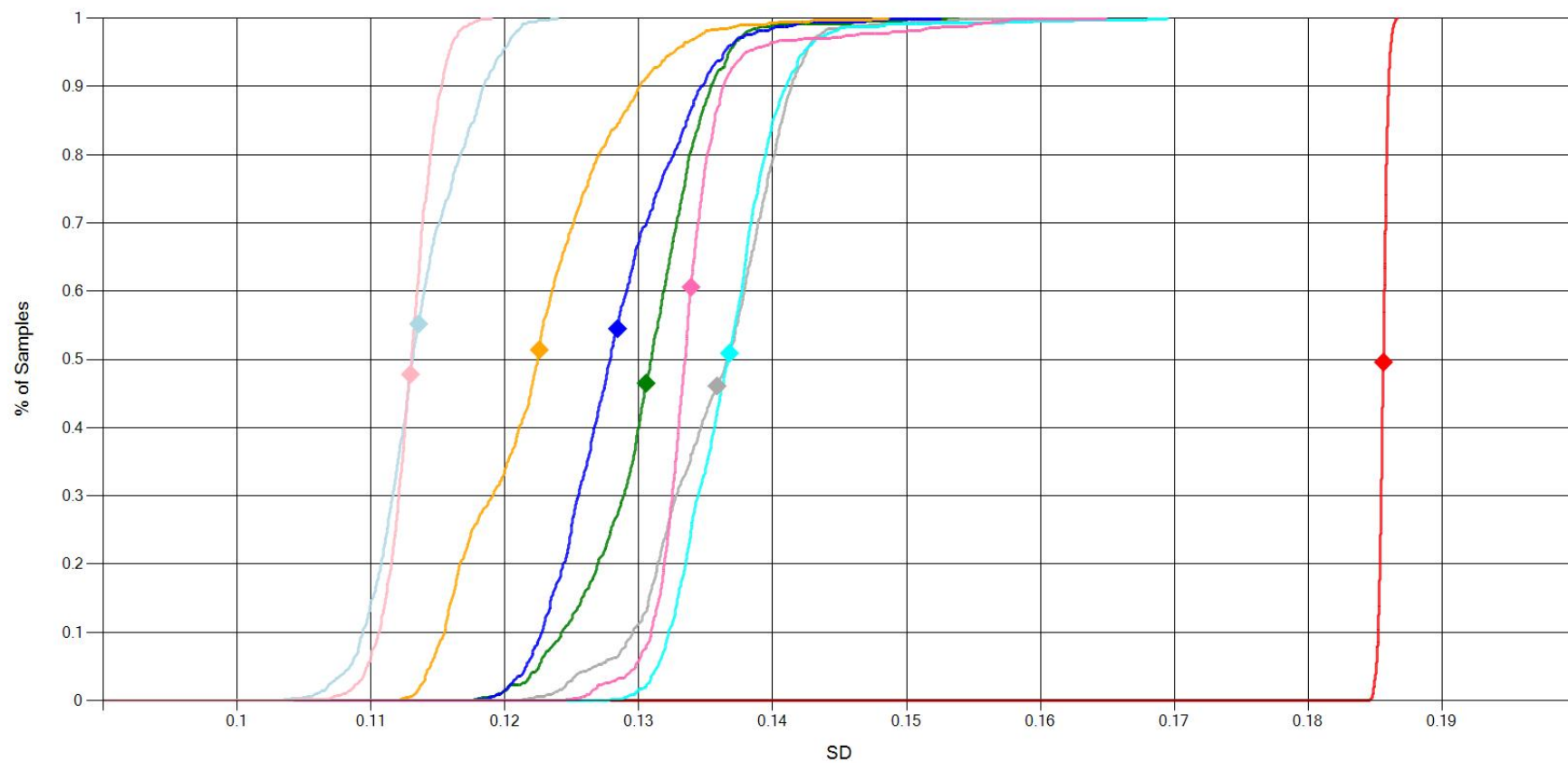
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-CAGR	1000	9.4%	0.1%	9.2%	9.3%	9.4%	9.4%	9.5%	9.6%	9.6%
DEMA50(22,0%)_T-CAGR	1000	12.0%	0.4%	10.3%	11.2%	11.6%	12.0%	12.4%	12.8%	13.3%
DEMA60(22,0%)_T-CAGR	1000	12.0%	0.5%	10.6%	11.0%	11.6%	12.0%	12.6%	13.1%	13.6%
DEMA70(22,0%)_T-CAGR	1000	12.8%	0.4%	11.0%	11.8%	12.3%	12.8%	13.2%	13.5%	13.8%
DEMA80(22,0%)_T-CAGR	1000	11.7%	0.4%	10.1%	11.0%	11.4%	11.7%	12.1%	12.5%	13.0%
DEMA90(22,0%)_T-CAGR	1000	11.4%	0.3%	9.1%	10.8%	11.1%	11.4%	11.7%	12.1%	12.5%
DEMA100(22,0%)_T-CAGR	1000	11.4%	0.3%	9.6%	10.4%	11.2%	11.4%	11.7%	12.0%	12.4%
SMA50_200_T-CAGR	1000	11.3%	0.4%	10.2%	10.5%	10.9%	11.3%	11.7%	12.0%	12.5%
EMA50_200_T-CAGR	1000	11.8%	0.3%	10.5%	11.1%	11.5%	11.9%	12.1%	12.4%	12.6%



— Base-CAGR-ECDF
 ◆ Base-CAGR_Avg
 — DEMA50(22,0%)_T-CAGR-ECDF
 ◆ DEMA50(22,0%)_T-CAGR_Avg
 — DEMA60(22,0%)_T-CAGR-ECDF
 ◆ DEMA60(22,0%)_T-CAGR_Avg
 — DEMA70(22,0%)_T-CAGR-ECDF
 ◆ DEMA70(22,0%)_T-CAGR_Avg
 — DEMA80(22,0%)_T-CAGR-ECDF
 ◆ DEMA80(22,0%)_T-CAGR_Avg
 — DEMA90(22,0%)_T-CAGR-ECDF
 ◆ DEMA90(22,0%)_T-CAGR_Avg
 — DEMA100(22,0%)_T-CAGR-ECDF
 ◆ DEMA100(22,0%)_T-CAGR_Avg
 — SMA50_200_T-CAGR-ECDF
 ◆ SMA50_200_T-CAGR_Avg
 — EMA50_200_T-CAGR-ECDF
 ◆ EMA50_200_T-CAGR_Avg

SD SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

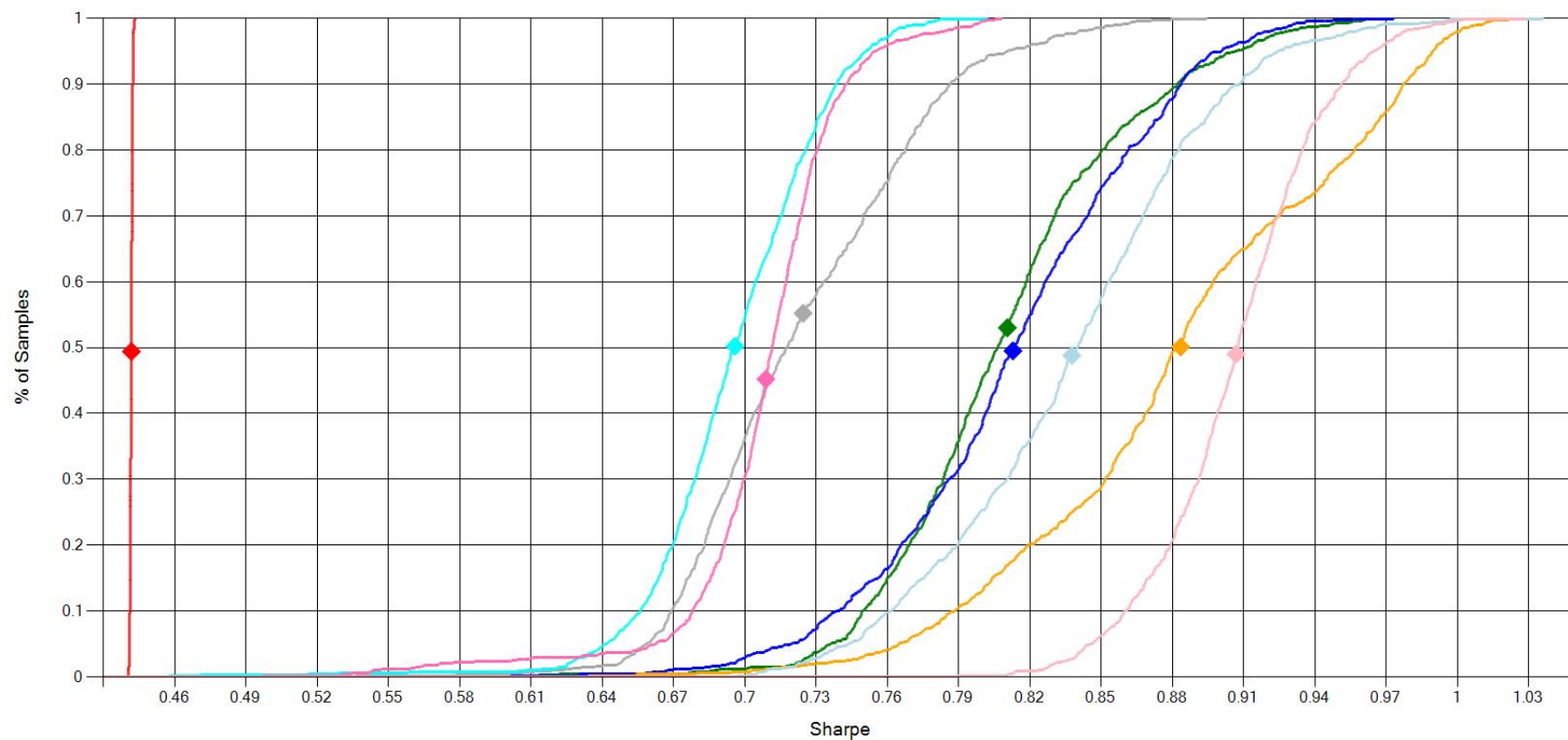
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-SD	1000	18.6%	0.0%	18.5%	18.5%	18.5%	18.6%	18.6%	18.6%	18.7%
DEMA50(22,0%)_T-SD	1000	13.1%	0.5%	11.8%	12.1%	12.6%	13.1%	13.4%	13.8%	15.9%
DEMA60(22,0%)_T-SD	1000	12.8%	0.5%	11.8%	12.0%	12.4%	12.8%	13.3%	13.9%	15.3%
DEMA70(22,0%)_T-SD	1000	12.3%	0.6%	11.2%	11.4%	11.6%	12.2%	12.8%	13.5%	14.9%
DEMA80(22,0%)_T-SD	1000	13.6%	0.5%	12.1%	12.5%	13.1%	13.7%	14.1%	14.4%	16.4%
DEMA90(22,0%)_T-SD	1000	13.7%	0.4%	12.8%	13.1%	13.3%	13.7%	14.0%	14.4%	17.0%
DEMA100(22,0%)_T-SD	1000	13.4%	0.4%	12.5%	12.7%	13.2%	13.3%	13.6%	14.6%	16.5%
SMA50_200_T-SD	1000	11.4%	0.3%	10.3%	10.7%	11.0%	11.3%	11.7%	12.1%	12.4%
EMA50_200_T-SD	1000	11.3%	0.2%	10.4%	10.9%	11.1%	11.3%	11.5%	11.6%	11.9%



— Base-SD-ECDF — DEMA60(22,0%)_T-SD-ECDF — DEMA80(22,0%)_T-SD-ECDF — DEMA100(22,0%)_T-SD-ECDF ◆ SMA50_200_T-SD_Avg
 ◆ Base-SD_Avg ◆ DEMA60(22,0%)_T-SD_Avg ◆ DEMA80(22,0%)_T-SD_Avg ◆ DEMA100(22,0%)_T-SD_Avg — EMA50_200_T-SD-ECDF
 — DEMA50(22,0%)_T-SD-ECDF — DEMA70(22,0%)_T-SD-ECDF — DEMA90(22,0%)_T-SD-ECDF — SMA50_200_T-SD-ECDF ◆ EMA50_200_T-SD_Avg
 ◆ DEMA50(22,0%)_T-SD_Avg ◆ DEMA70(22,0%)_T-SD_Avg ◆ DEMA90(22,0%)_T-SD_Avg

Sharpe SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

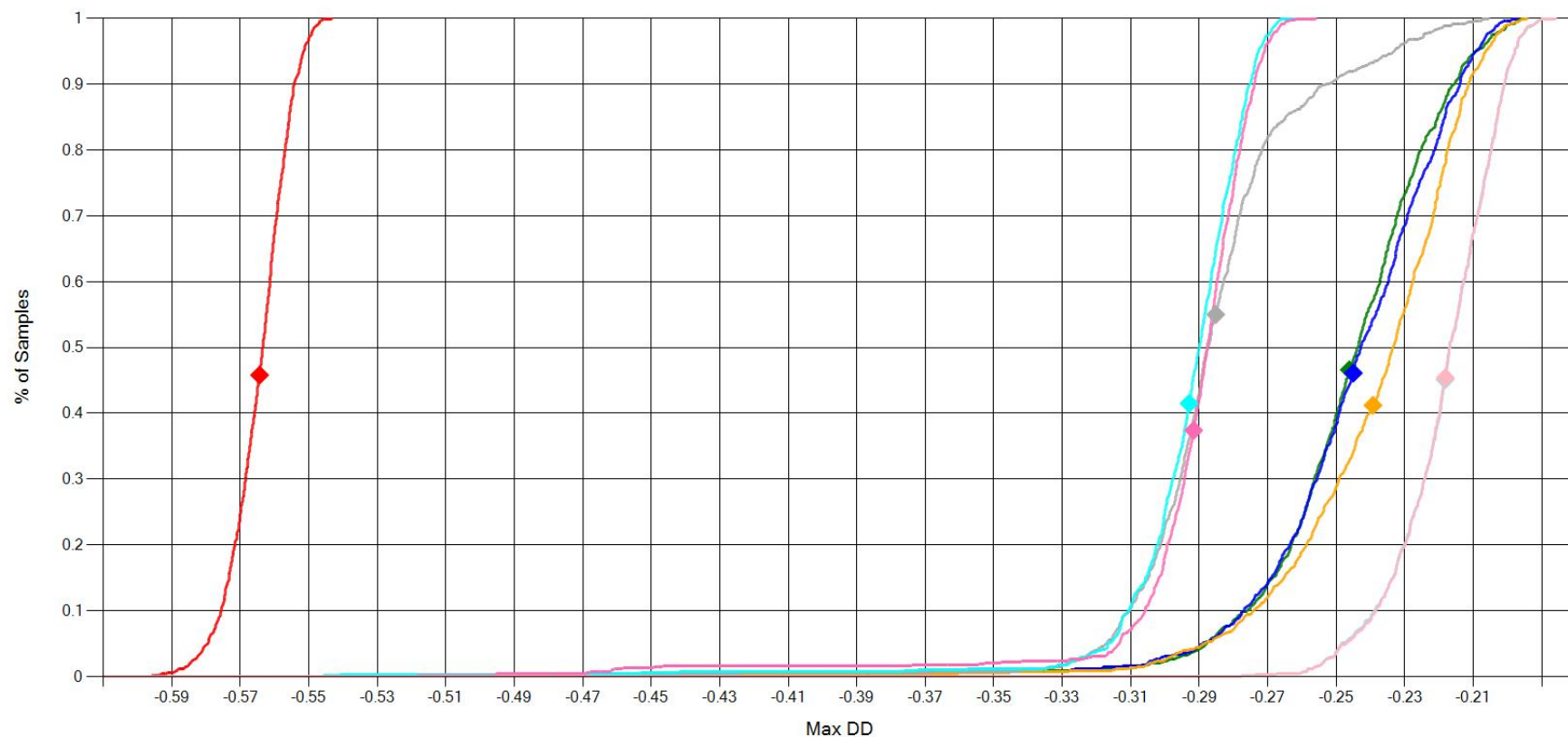
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sharpe	1000	44.2%	0.0%	44.0%	44.1%	44.1%	44.2%	44.2%	44.3%	44.3%
DEMA50(22,0%)_T-Sharpe	1000	81.1%	5.2%	57.9%	72.4%	76.3%	80.7%	86.2%	92.4%	97.0%
DEMA60(22,0%)_T-Sharpe	1000	81.3%	5.6%	59.6%	69.7%	75.8%	81.4%	87.2%	91.7%	97.3%
DEMA70(22,0%)_T-Sharpe	1000	88.4%	7.1%	63.4%	74.1%	80.8%	88.2%	96.6%	99.8%	102.8%
DEMA80(22,0%)_T-Sharpe	1000	72.5%	4.9%	53.6%	64.9%	67.8%	71.8%	77.4%	83.7%	89.4%
DEMA90(22,0%)_T-Sharpe	1000	69.6%	3.6%	45.8%	62.8%	66.5%	69.5%	73.0%	76.2%	80.2%
DEMA100(22,0%)_T-Sharpe	1000	70.9%	3.6%	49.7%	60.1%	68.7%	71.2%	73.4%	77.9%	80.9%
SMA50_200_T-Sharpe	1000	83.8%	5.6%	69.7%	72.8%	77.8%	84.0%	89.4%	95.3%	103.6%
EMA50_200_T-Sharpe	1000	90.7%	3.5%	78.9%	83.4%	87.2%	90.8%	94.0%	97.6%	102.9%



- | | | | |
|-------------------------------|-------------------------------|--------------------------------|---------------------------|
| — Base-Sharpe-ECDF | ◆ DEMA60(22,0%)_T-Sharpe_Avg | — DEMA90(22,0%)_T-Sharpe-ECDF | — SMA50_200_T-Sharpe-ECDF |
| ◆ Base-Sharpe_Avg | — DEMA70(22,0%)_T-Sharpe-ECDF | ◆ DEMA90(22,0%)_T-Sharpe_Avg | ◆ SMA50_200_T-Sharpe_Avg |
| — DEMA50(22,0%)_T-Sharpe-ECDF | ◆ DEMA70(22,0%)_T-Sharpe_Avg | — DEMA100(22,0%)_T-Sharpe-ECDF | — EMA50_200_T-Sharpe-ECDF |
| ◆ DEMA50(22,0%)_T-Sharpe_Avg | — DEMA80(22,0%)_T-Sharpe-ECDF | ◆ DEMA100(22,0%)_T-Sharpe_Avg | ◆ EMA50_200_T-Sharpe_Avg |
| — DEMA60(22,0%)_T-Sharpe-ECDF | ◆ DEMA80(22,0%)_T-Sharpe_Avg | | |

MaxDD SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

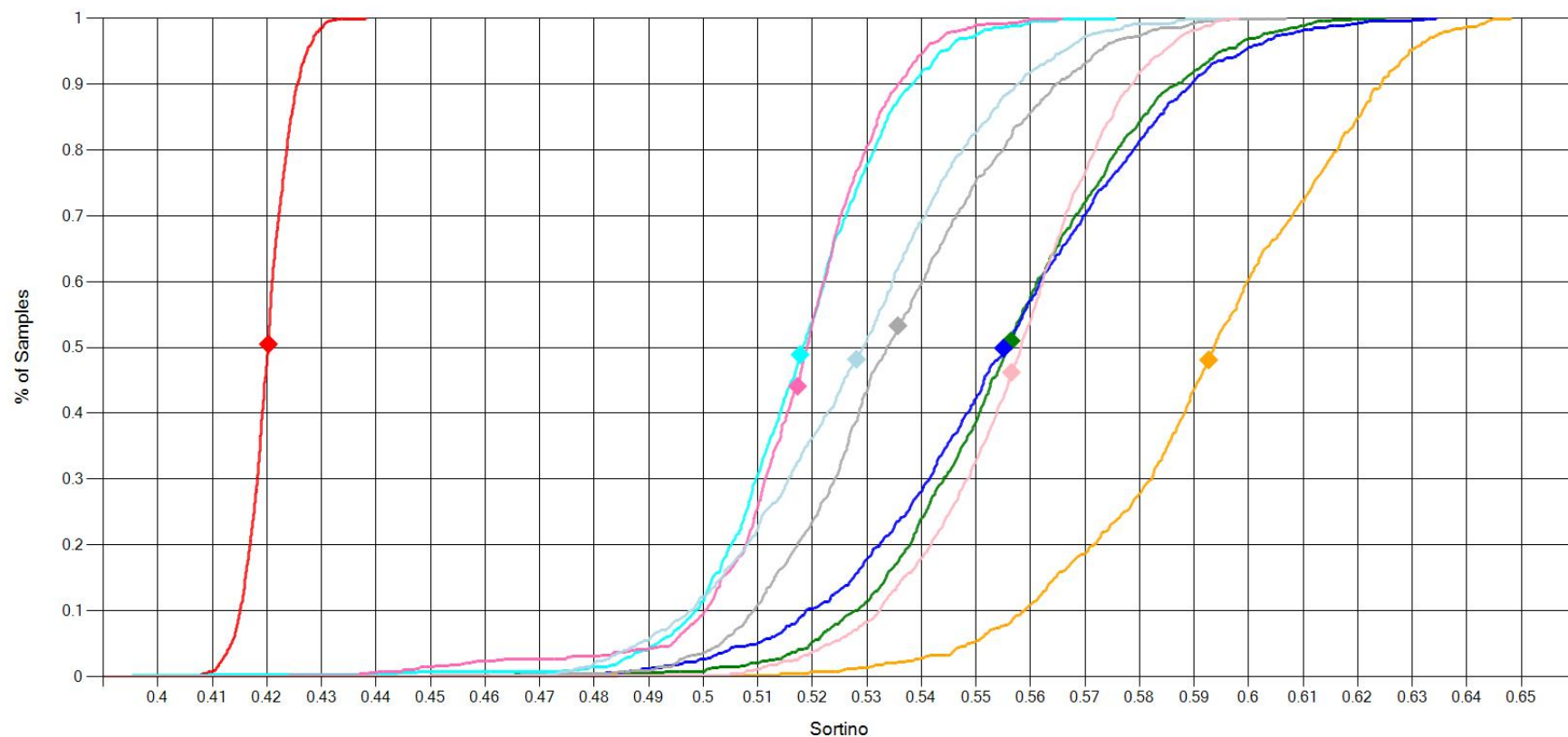
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-MaxDD	1000	-56.4%	0.9%	-59.6%	-58.4%	-57.3%	-56.3%	-55.6%	-54.9%	-54.3%
DEMA50(22,0%)_T-MaxDD	1000	-24.6%	2.9%	-50.9%	-30.0%	-26.7%	-24.4%	-22.1%	-20.4%	-19.5%
DEMA60(22,0%)_T-MaxDD	1000	-24.5%	2.8%	-47.0%	-30.4%	-26.8%	-24.3%	-21.9%	-20.5%	-19.7%
DEMA70(22,0%)_T-MaxDD	1000	-23.9%	2.8%	-44.6%	-30.0%	-26.4%	-23.3%	-21.5%	-20.3%	-19.4%
DEMA80(22,0%)_T-MaxDD	1000	-28.5%	2.7%	-54.6%	-32.8%	-30.4%	-28.8%	-26.6%	-22.3%	-20.6%
DEMA90(22,0%)_T-MaxDD	1000	-29.3%	2.3%	-54.6%	-32.6%	-30.5%	-29.0%	-27.8%	-26.9%	-26.0%
DEMA100(22,0%)_T-MaxDD	1000	-29.2%	2.6%	-51.8%	-33.2%	-30.1%	-28.8%	-27.7%	-26.8%	-25.6%
SMA50_200_T-MaxDD	1000	-21.8%	1.5%	-27.8%	-25.3%	-23.3%	-21.7%	-20.3%	-19.5%	-18.6%
EMA50_200_T-MaxDD	1000	-21.8%	1.5%	-27.8%	-25.3%	-23.3%	-21.7%	-20.3%	-19.5%	-18.6%



— Base-MaxDD-ECDF
 ◆ Base-MaxDD_Avg
 — DEMA50(22,0%)_T-MaxDD-ECDF
 ◆ DEMA50(22,0%)_T-MaxDD_Avg
 — DEMA60(22,0%)_T-MaxDD-ECDF
 ◆ DEMA60(22,0%)_T-MaxDD_Avg
 — DEMA70(22,0%)_T-MaxDD-ECDF
 ◆ DEMA70(22,0%)_T-MaxDD_Avg
 — DEMA80(22,0%)_T-MaxDD-ECDF
 ◆ DEMA80(22,0%)_T-MaxDD_Avg
 — DEMA90(22,0%)_T-MaxDD-ECDF
 ◆ DEMA90(22,0%)_T-MaxDD_Avg
 — DEMA100(22,0%)_T-MaxDD-ECDF
 ◆ DEMA100(22,0%)_T-MaxDD_Avg
 — SMA50_200_T-MaxDD-ECDF
 ◆ SMA50_200_T-MaxDD_Avg
 — EMA50_200_T-MaxDD-ECDF
 ◆ EMA50_200_T-MaxDD_Avg

Sortino SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sortino	1000	42.0%	0.4%	40.6%	41.2%	41.6%	42.0%	42.4%	42.9%	43.8%
DEMA50(22,0%)_T-Sortino	1000	55.6%	2.3%	45.9%	51.2%	53.4%	55.6%	58.0%	60.3%	62.5%
DEMA60(22,0%)_T-Sortino	1000	55.5%	2.7%	47.7%	49.9%	52.8%	55.5%	58.3%	60.7%	63.4%
DEMA70(22,0%)_T-Sortino	1000	59.3%	2.5%	48.3%	53.8%	56.6%	59.4%	61.9%	63.5%	64.8%
DEMA80(22,0%)_T-Sortino	1000	53.6%	2.2%	45.0%	49.5%	51.4%	53.4%	55.9%	58.1%	60.7%
DEMA90(22,0%)_T-Sortino	1000	51.8%	1.8%	39.5%	48.5%	50.3%	51.8%	53.3%	55.0%	57.6%
DEMA100(22,0%)_T-Sortino	1000	51.7%	1.8%	42.4%	46.0%	50.5%	51.9%	53.2%	54.5%	56.6%
SMA50_200_T-Sortino	1000	52.8%	2.3%	46.1%	48.1%	50.4%	52.9%	55.1%	57.2%	59.8%
EMA50_200_T-Sortino	1000	55.6%	1.8%	48.4%	51.5%	53.8%	55.8%	57.4%	58.9%	59.8%



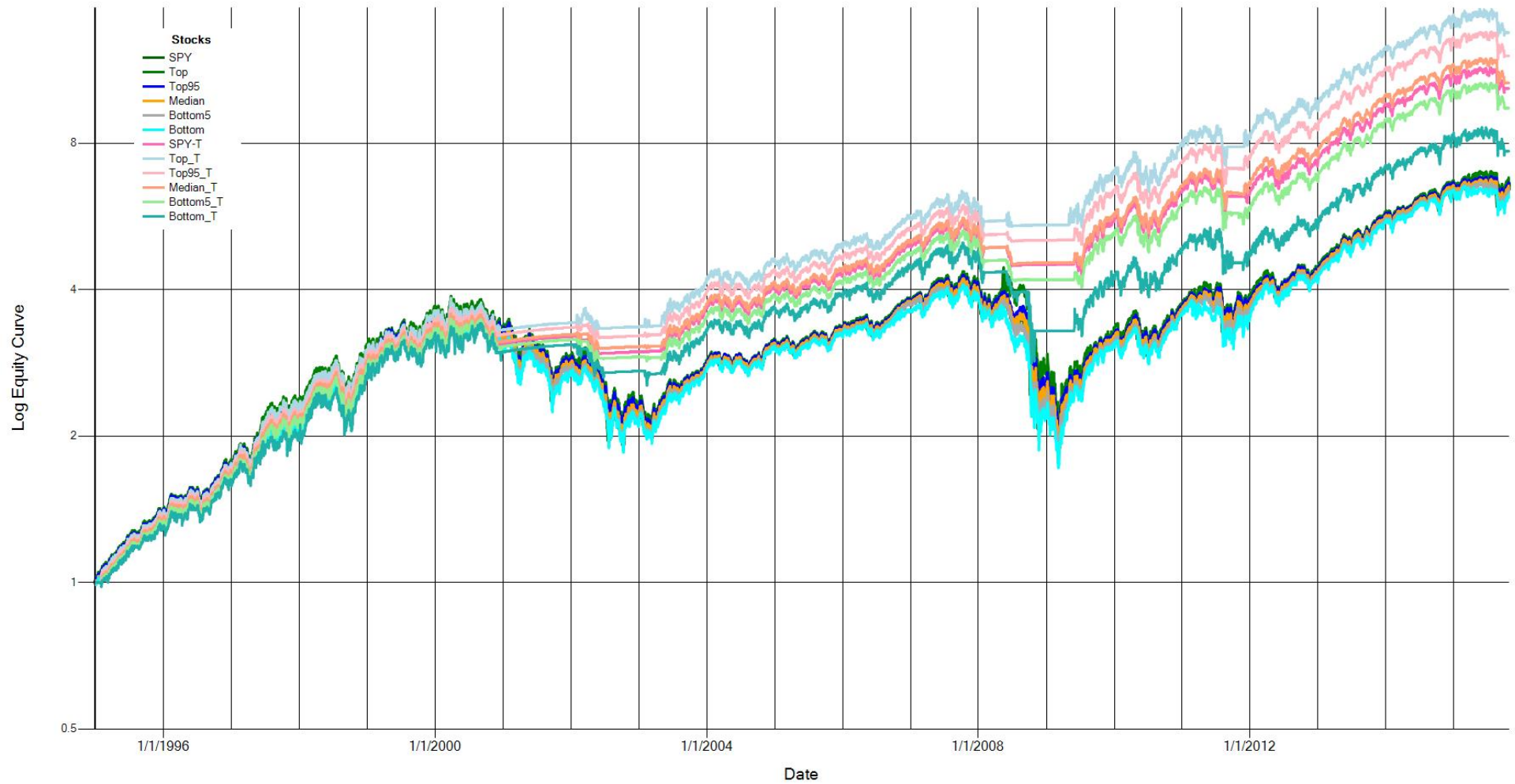
— Base-Sortino-ECDF	◆ DEMA60(22,0%)_T-Sortino_Avg	— DEMA90(22,0%)_T-Sortino-ECDF	— SMA50_200_T-Sortino-ECDF
◆ Base-Sortino_Avg	— DEMA70(22,0%)_T-Sortino-ECDF	◆ DEMA90(22,0%)_T-Sortino_Avg	◆ SMA50_200_T-Sortino_Avg
— DEMA50(22,0%)_T-Sortino-ECDF	◆ DEMA70(22,0%)_T-Sortino_Avg	— DEMA100(22,0%)_T-Sortino-ECDF	— EMA50_200_T-Sortino-ECDF
◆ DEMA50(22,0%)_T-Sortino_Avg	— DEMA80(22,0%)_T-Sortino-ECDF	◆ DEMA100(22,0%)_T-Sortino_Avg	◆ EMA50_200_T-Sortino_Avg
— DEMA60(22,0%)_T-Sortino-ECDF	◆ DEMA80(22,0%)_T-Sortino_Avg		

Timer Test 6

- Period 1/29/1960 – 10/23/2015 – 55.7 years
- Base Series
 - ^GSPC
- Timers
 - DEMA (10,20,...,100; 22dayMth; 0% offset)
 - SMA50_200 Golden Cross
 - EMA50_200 Cross
- Cash
 - ^IRX (3 Mth T-Bill)
- Results
 - DEMA40(22,0%) & DEMA70(22,0%) best CAGR
 - DEMA40(22,0%) best Sharpe
 - DEMA40(22,0%) lowest MaxDD

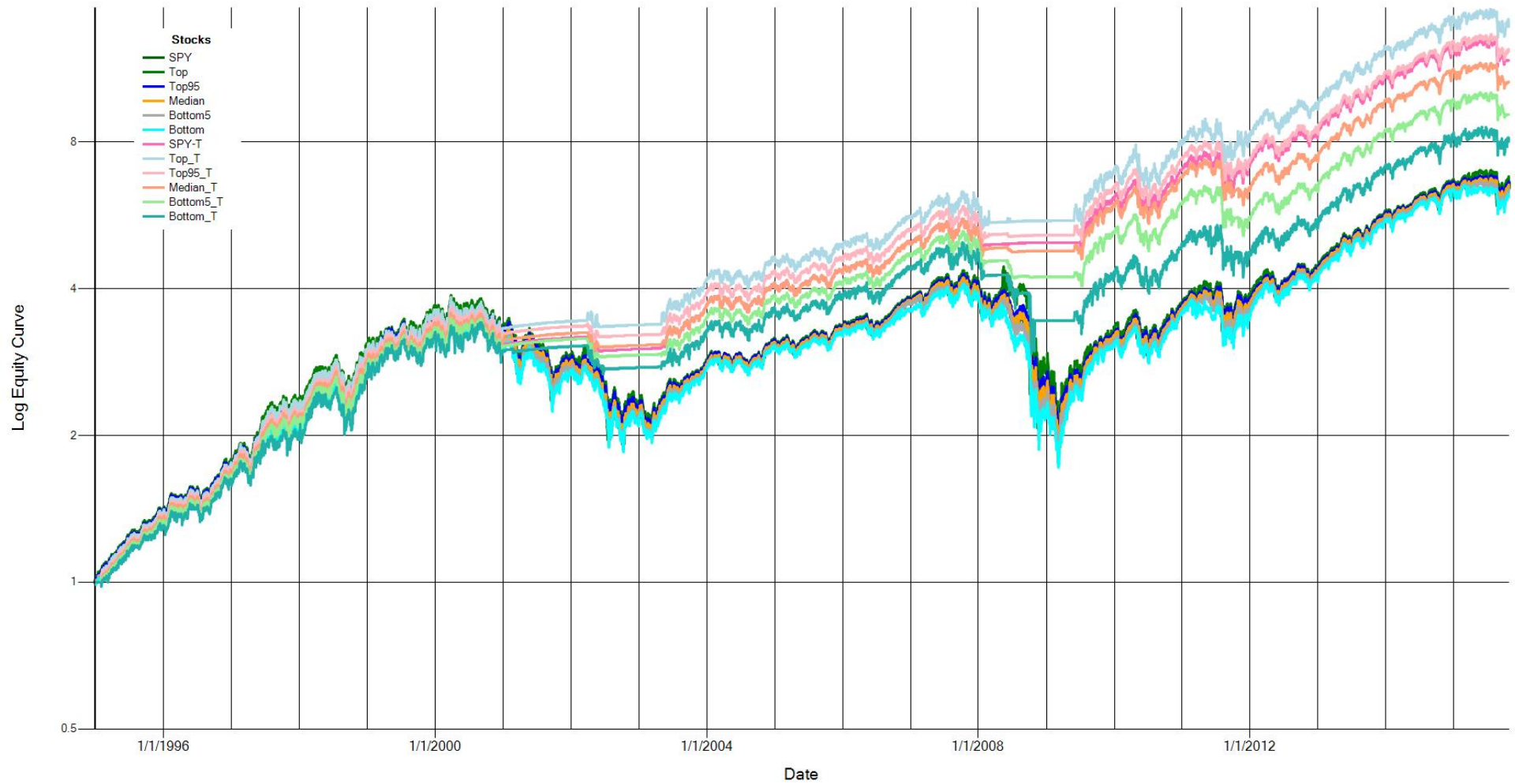
1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA50(22,0%) Timer Results, ^IRX Cash



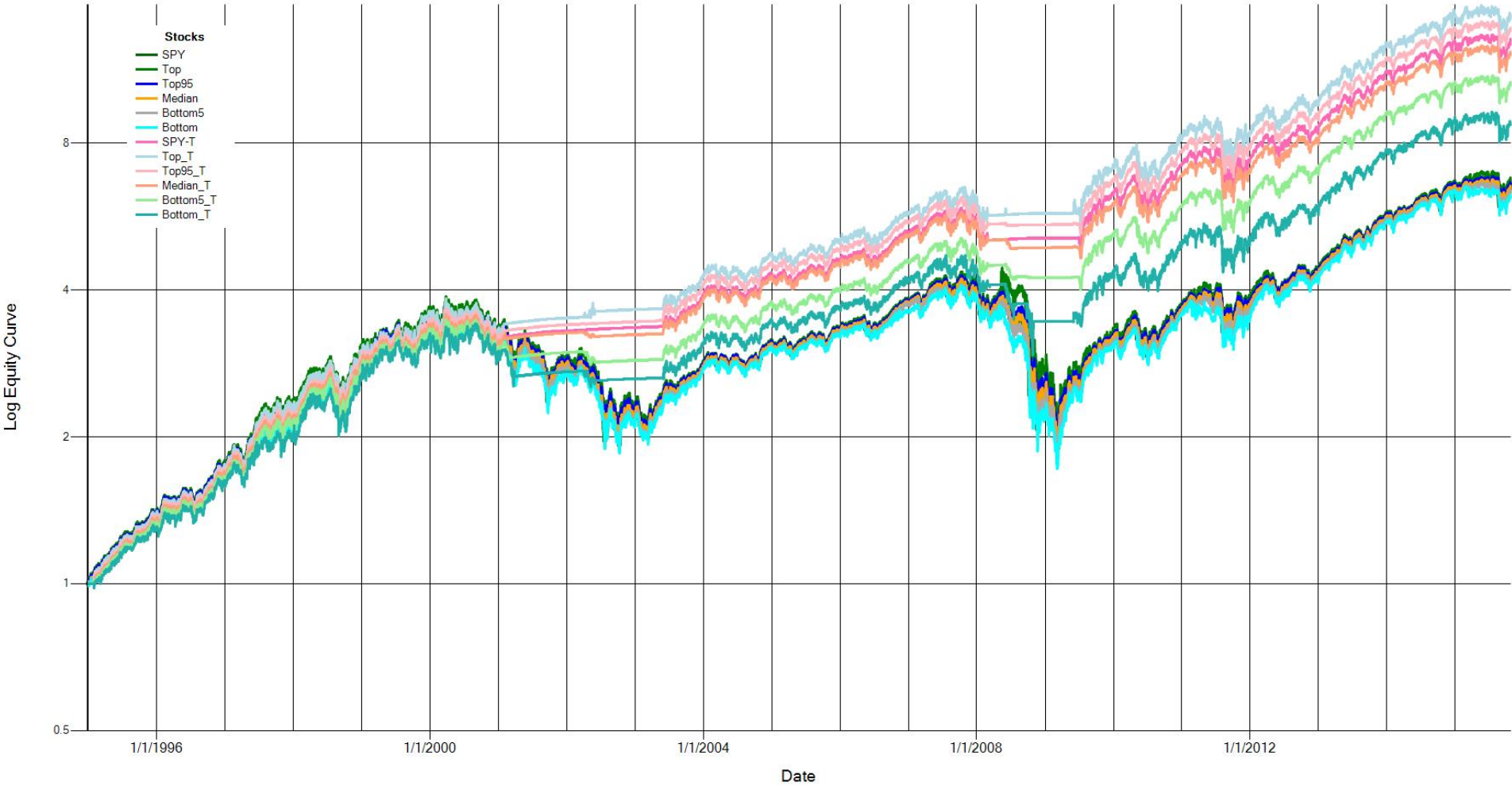
1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA60(22,0%) Timer Results, ^IRX Cash



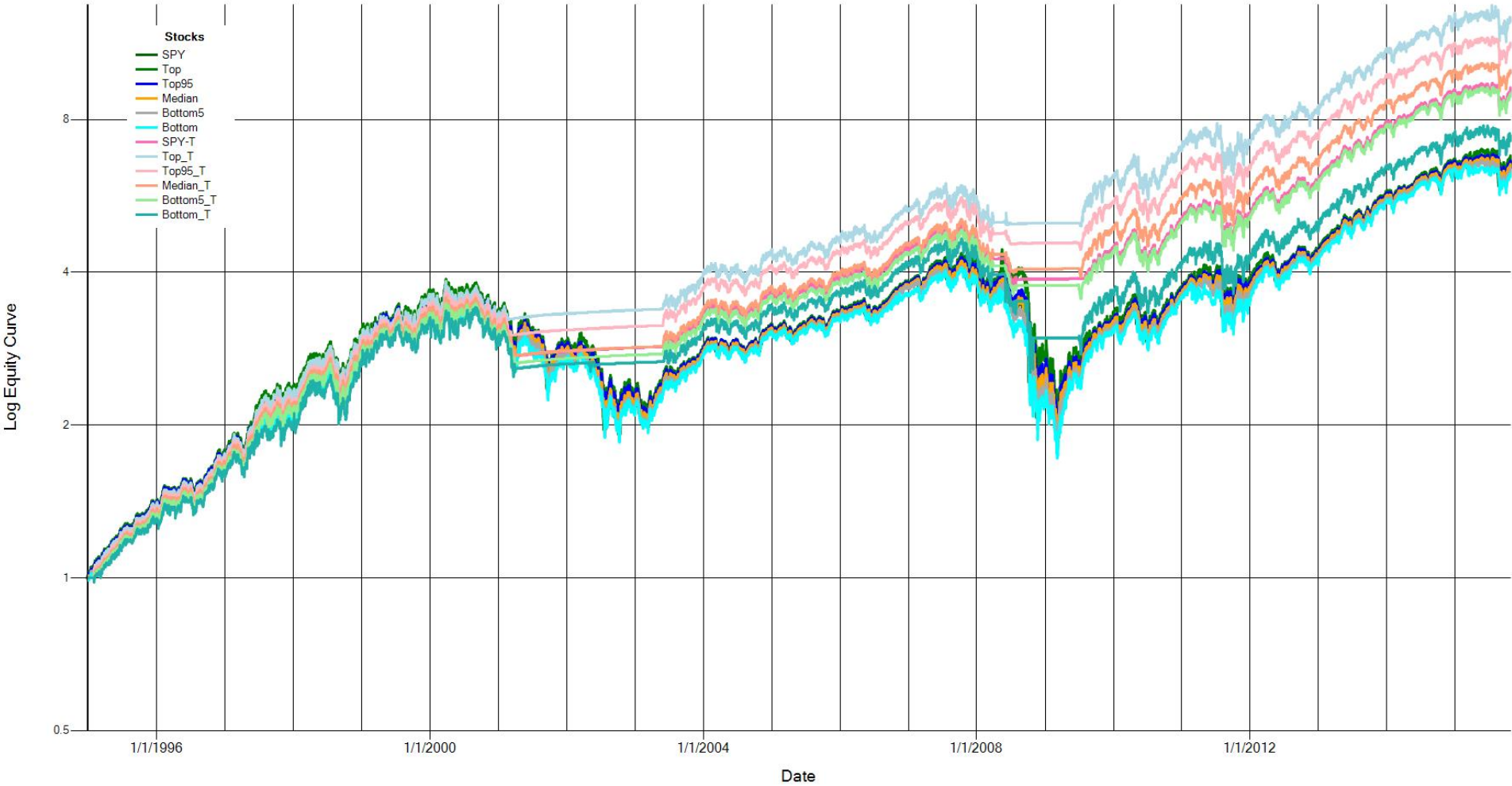
1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA70(22,0%) Timer Results, ^IRX Cash



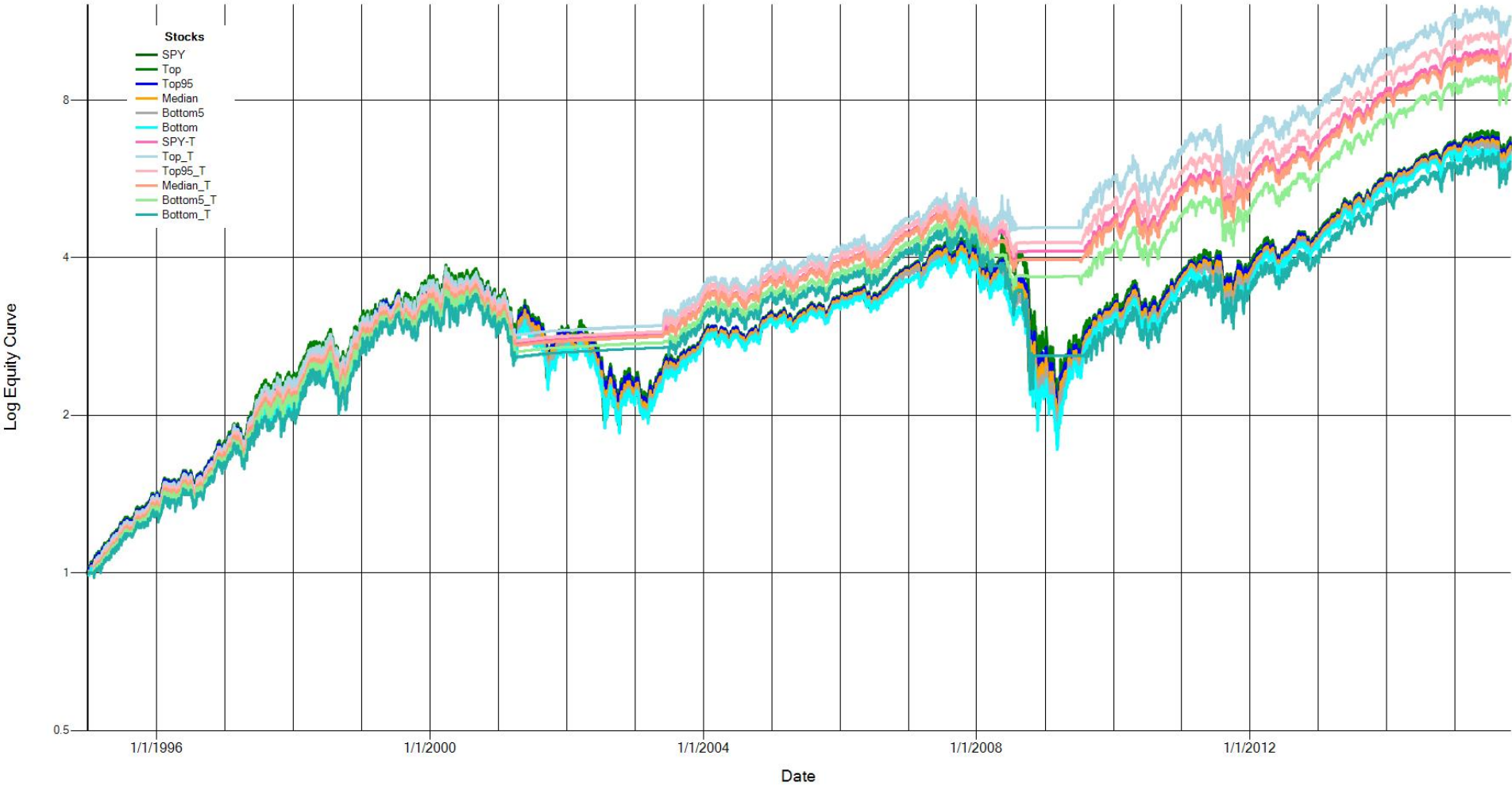
1000 Synthetic SPY EC Ranges & DEMA80(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA80(22,0%) Timer Results, ^IRX Cash



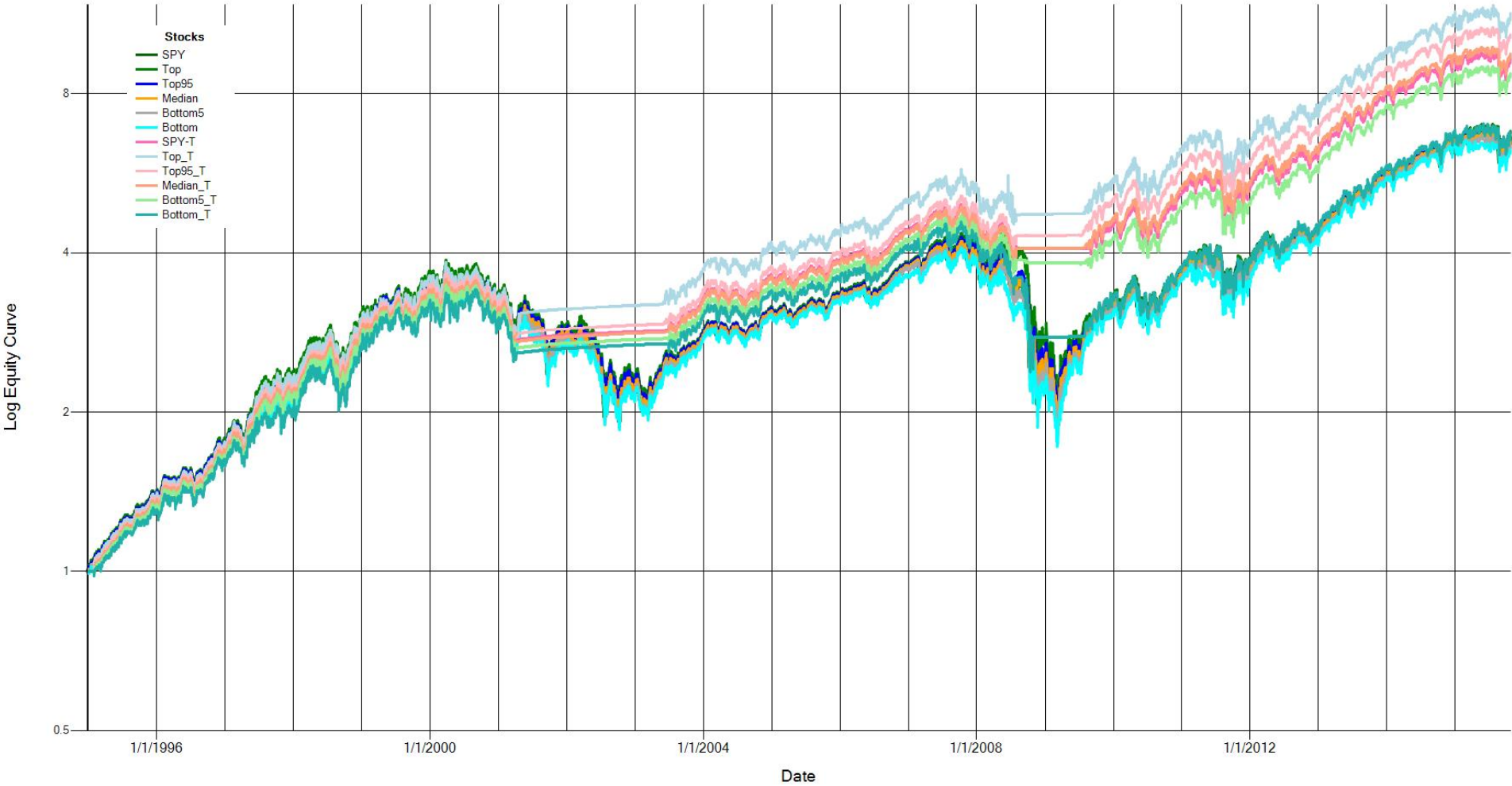
1000 Synthetic SPY EC Ranges & DEMA90(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA90(22,0%) Timer Results, ^IRX Cash



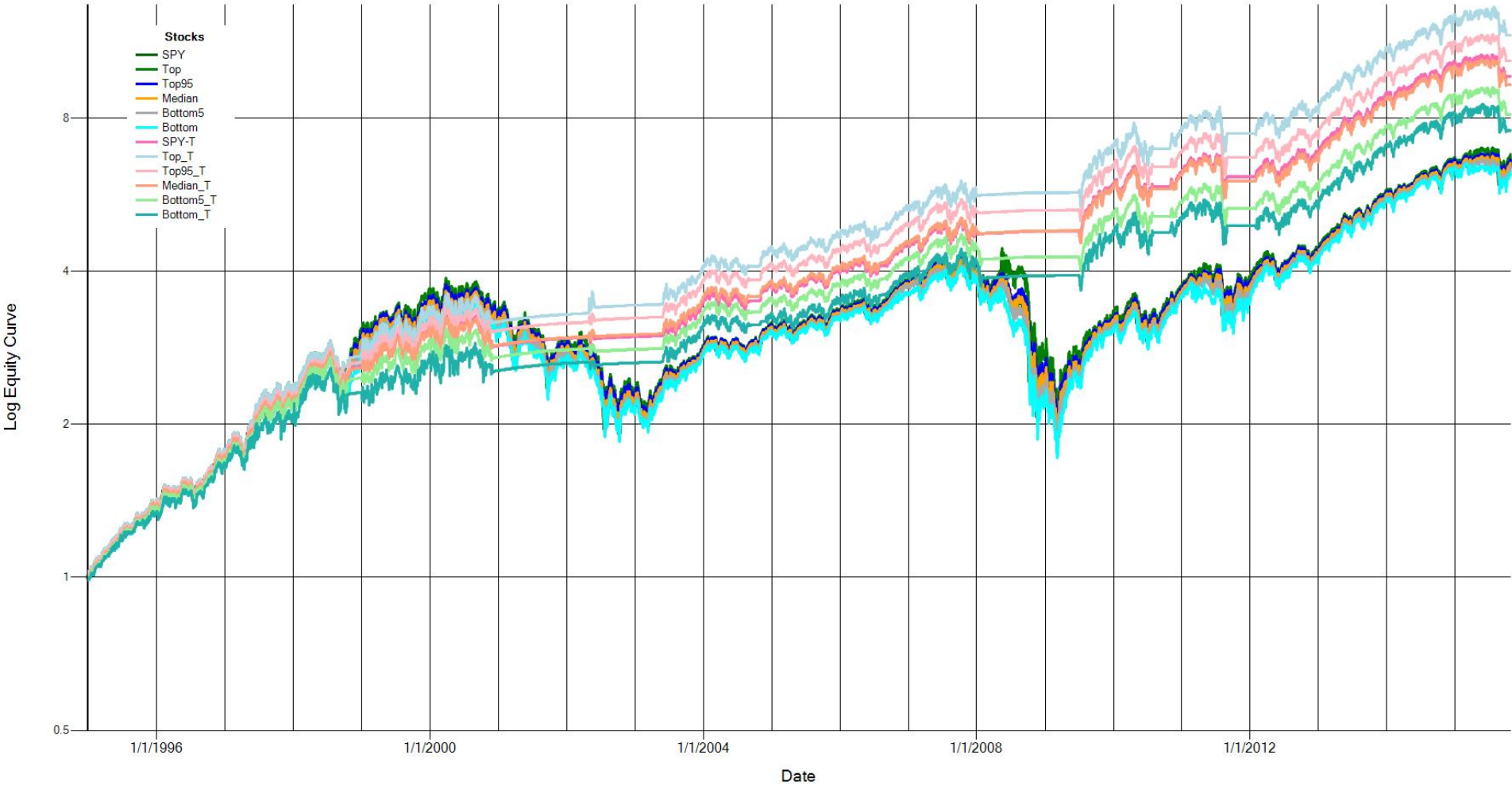
1000 Synthetic SPY EC Ranges & DEMA100(22,0%) Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & DEMA100(22,0%) Timer Results, ^IRX Cash



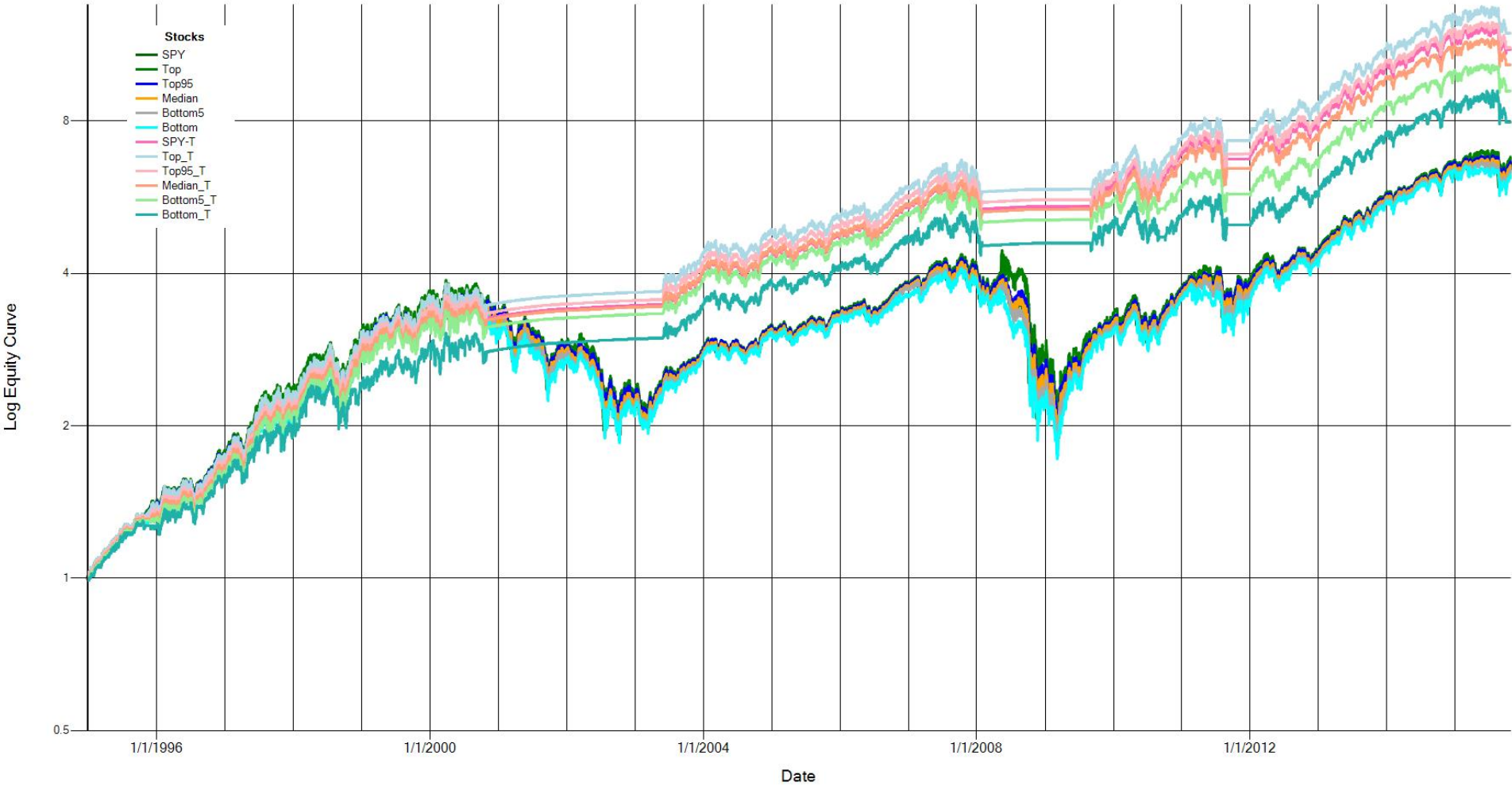
1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & SMA50_200 Timer Results, ^IRX Cash



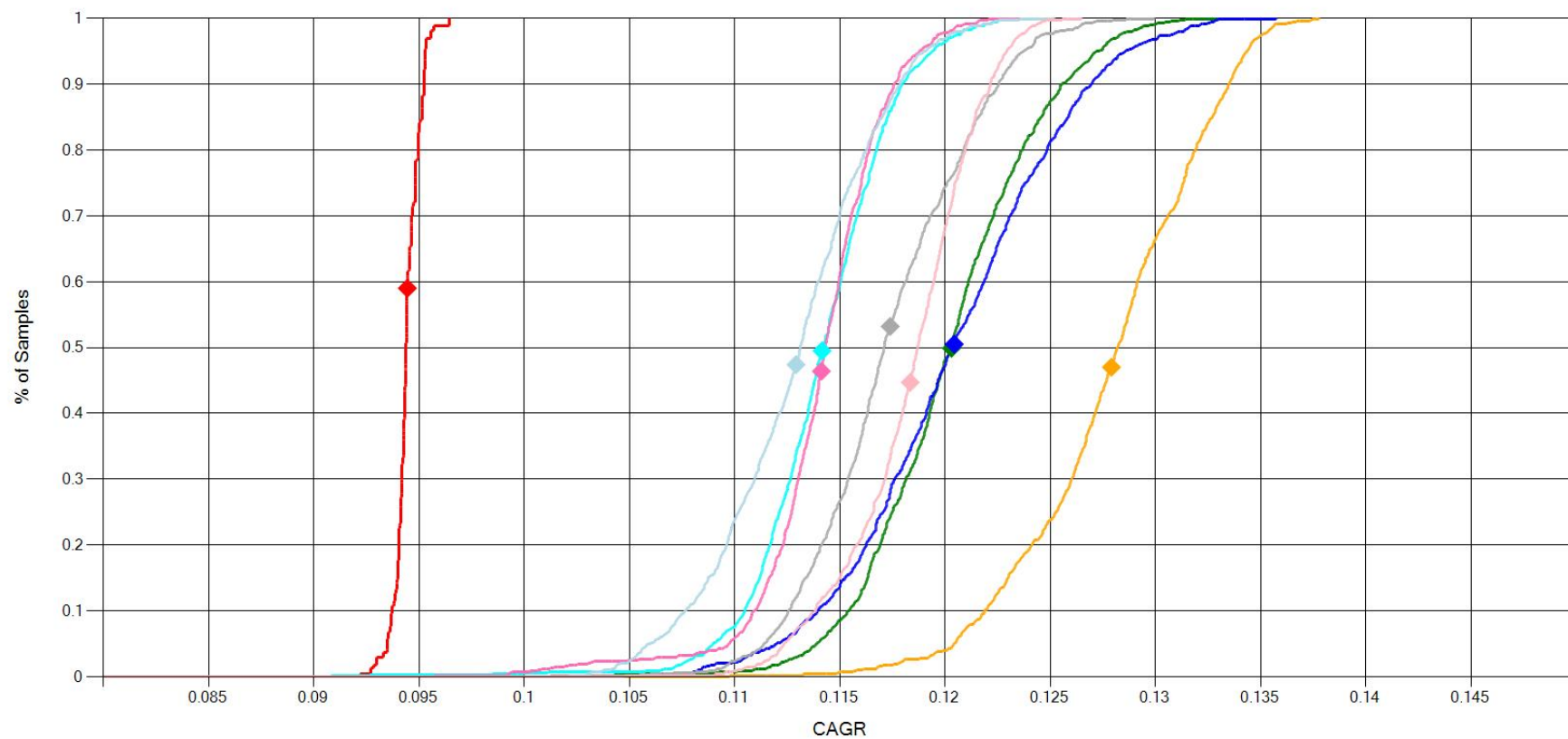
1000 Synthetic SPY EC Ranges & EMA50_200 Timer Results, ^IRX Cash

1000 Synthetic SPY EC Ranges & EMA50_200 Timer Results, ^IRX Cash



CAGR SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

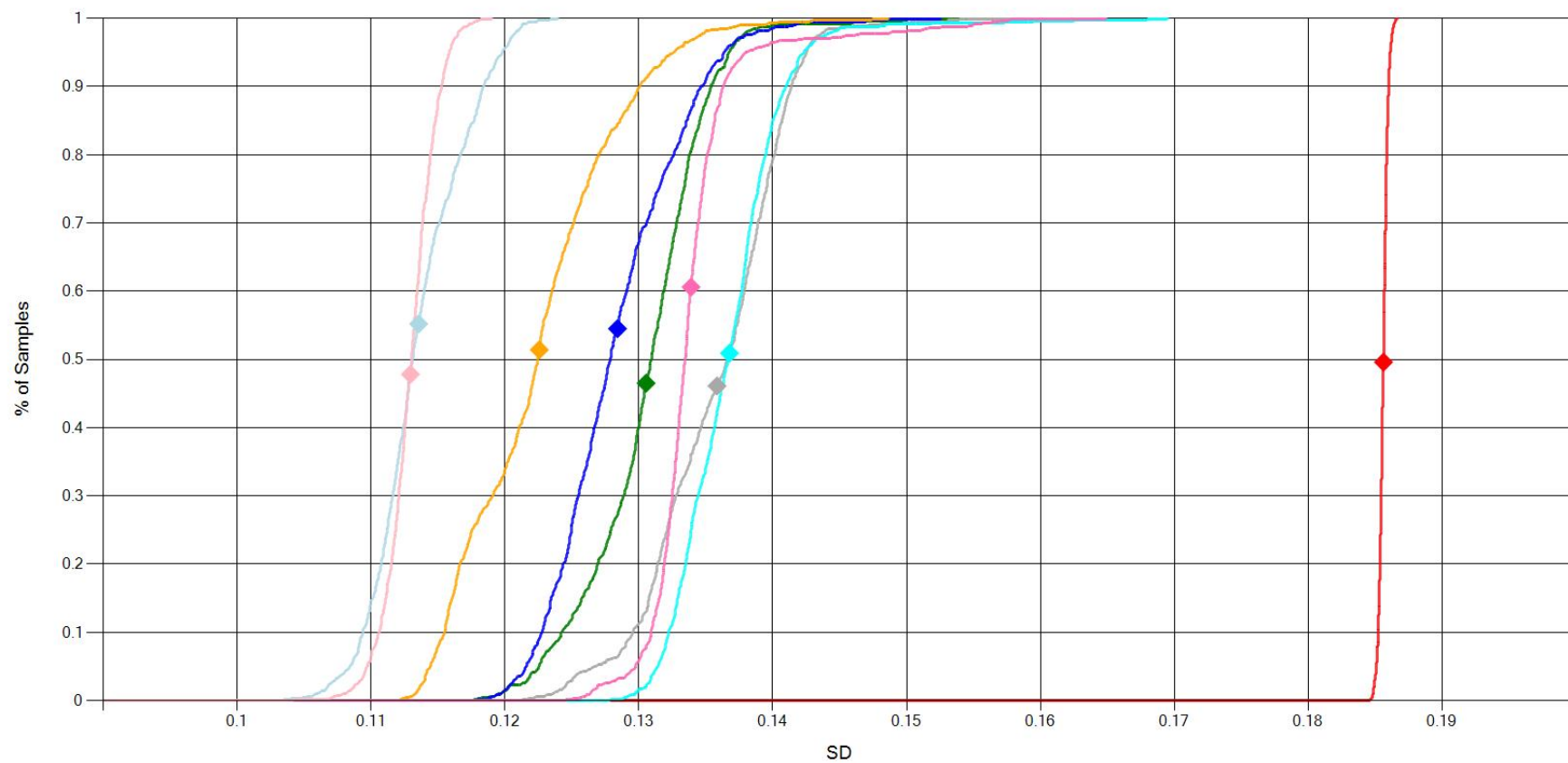
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-CAGR	1000	9.4%	0.1%	9.2%	9.3%	9.4%	9.4%	9.5%	9.6%	9.6%
DEMA50(22,0%)_T-CAGR	1000	12.0%	0.4%	10.3%	11.2%	11.6%	12.0%	12.4%	12.8%	13.3%
DEMA60(22,0%)_T-CAGR	1000	12.0%	0.5%	10.6%	11.0%	11.6%	12.0%	12.6%	13.1%	13.6%
DEMA70(22,0%)_T-CAGR	1000	12.8%	0.4%	11.0%	11.8%	12.3%	12.8%	13.2%	13.5%	13.8%
DEMA80(22,0%)_T-CAGR	1000	11.7%	0.4%	10.1%	11.0%	11.4%	11.7%	12.1%	12.5%	13.0%
DEMA90(22,0%)_T-CAGR	1000	11.4%	0.3%	9.1%	10.8%	11.1%	11.4%	11.7%	12.1%	12.5%
DEMA100(22,0%)_T-CAGR	1000	11.4%	0.3%	9.6%	10.4%	11.2%	11.4%	11.7%	12.0%	12.4%
SMA50_200_T-CAGR	1000	11.3%	0.4%	10.2%	10.5%	10.9%	11.3%	11.7%	12.0%	12.5%
EMA50_200_T-CAGR	1000	11.8%	0.3%	10.5%	11.1%	11.5%	11.9%	12.1%	12.4%	12.6%



— Base-CAGR-ECDF
 ◆ Base-CAGR_Avg
 — DEMA50(22,0%)_T-CAGR-ECDF
 ◆ DEMA50(22,0%)_T-CAGR_Avg
 — DEMA60(22,0%)_T-CAGR-ECDF
 ◆ DEMA60(22,0%)_T-CAGR_Avg
 — DEMA70(22,0%)_T-CAGR-ECDF
 ◆ DEMA70(22,0%)_T-CAGR_Avg
 — DEMA80(22,0%)_T-CAGR-ECDF
 ◆ DEMA80(22,0%)_T-CAGR_Avg
 — DEMA90(22,0%)_T-CAGR-ECDF
 ◆ DEMA90(22,0%)_T-CAGR_Avg
 — DEMA100(22,0%)_T-CAGR-ECDF
 ◆ DEMA100(22,0%)_T-CAGR_Avg
 — SMA50_200_T-CAGR-ECDF
 ◆ SMA50_200_T-CAGR_Avg
 — EMA50_200_T-CAGR-ECDF
 ◆ EMA50_200_T-CAGR_Avg

SD SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

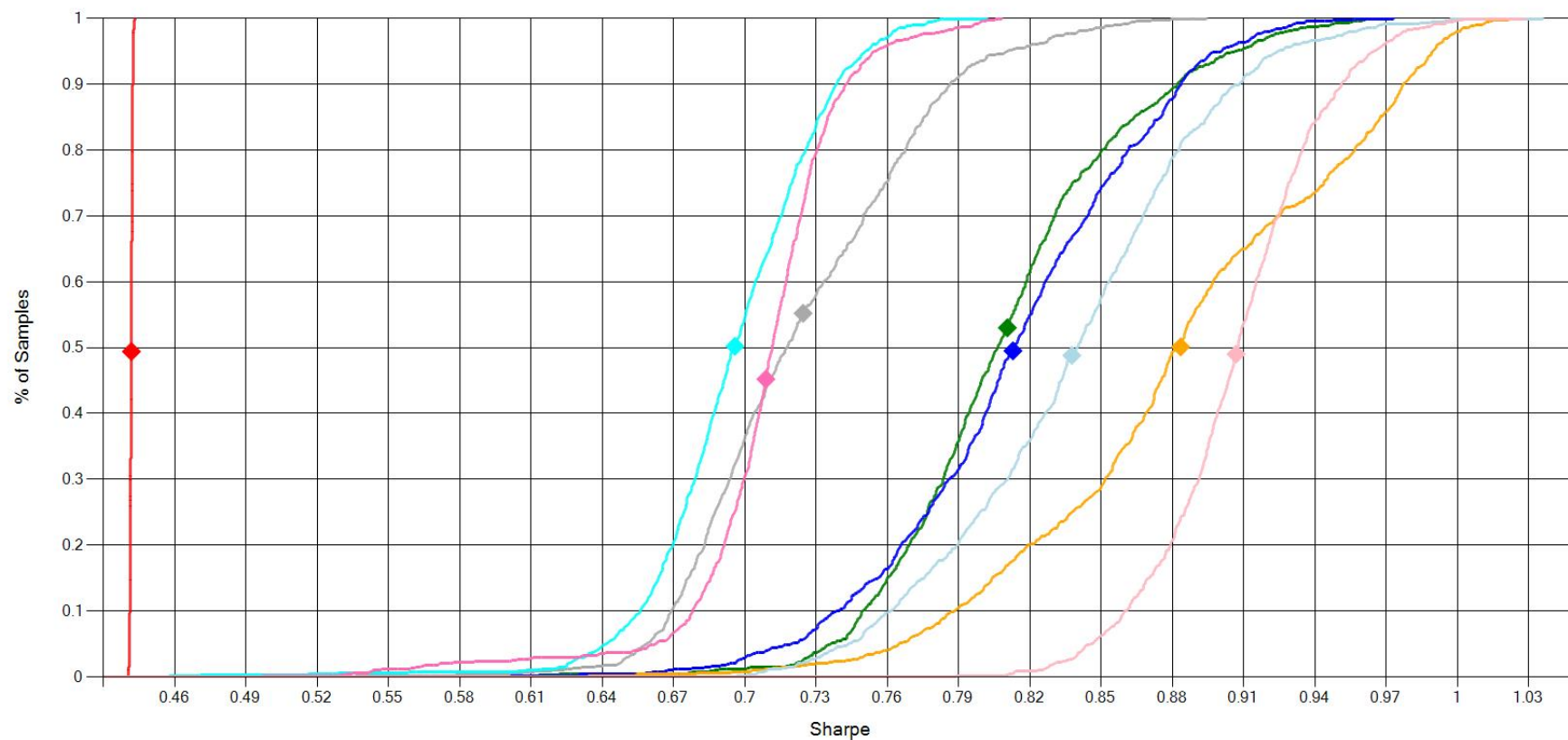
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-SD	1000	18.6%	0.0%	18.5%	18.5%	18.5%	18.6%	18.6%	18.6%	18.7%
DEMA50(22,0%)_T-SD	1000	13.1%	0.5%	11.8%	12.1%	12.6%	13.1%	13.4%	13.8%	15.9%
DEMA60(22,0%)_T-SD	1000	12.8%	0.5%	11.8%	12.0%	12.4%	12.8%	13.3%	13.9%	15.3%
DEMA70(22,0%)_T-SD	1000	12.3%	0.6%	11.2%	11.4%	11.6%	12.2%	12.8%	13.5%	14.9%
DEMA80(22,0%)_T-SD	1000	13.6%	0.5%	12.1%	12.5%	13.1%	13.7%	14.1%	14.4%	16.4%
DEMA90(22,0%)_T-SD	1000	13.7%	0.4%	12.8%	13.1%	13.3%	13.7%	14.0%	14.4%	17.0%
DEMA100(22,0%)_T-SD	1000	13.4%	0.4%	12.5%	12.7%	13.2%	13.3%	13.6%	14.6%	16.5%
SMA50_200_T-SD	1000	11.4%	0.3%	10.3%	10.7%	11.0%	11.3%	11.7%	12.1%	12.4%
EMA50_200_T-SD	1000	11.3%	0.2%	10.4%	10.9%	11.1%	11.3%	11.5%	11.6%	11.9%



— Base-SD-ECDF — DEMA60(22,0%)_T-SD-ECDF — DEMA80(22,0%)_T-SD-ECDF — DEMA100(22,0%)_T-SD-ECDF ◆ SMA50_200_T-SD_Avg
 ◆ Base-SD_Avg ◆ DEMA60(22,0%)_T-SD_Avg ◆ DEMA80(22,0%)_T-SD_Avg ◆ DEMA100(22,0%)_T-SD_Avg — EMA50_200_T-SD-ECDF
 — DEMA50(22,0%)_T-SD-ECDF — DEMA70(22,0%)_T-SD-ECDF — DEMA90(22,0%)_T-SD-ECDF — SMA50_200_T-SD-ECDF ◆ EMA50_200_T-SD_Avg
 ◆ DEMA50(22,0%)_T-SD_Avg ◆ DEMA70(22,0%)_T-SD_Avg ◆ DEMA90(22,0%)_T-SD_Avg

Sharpe SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

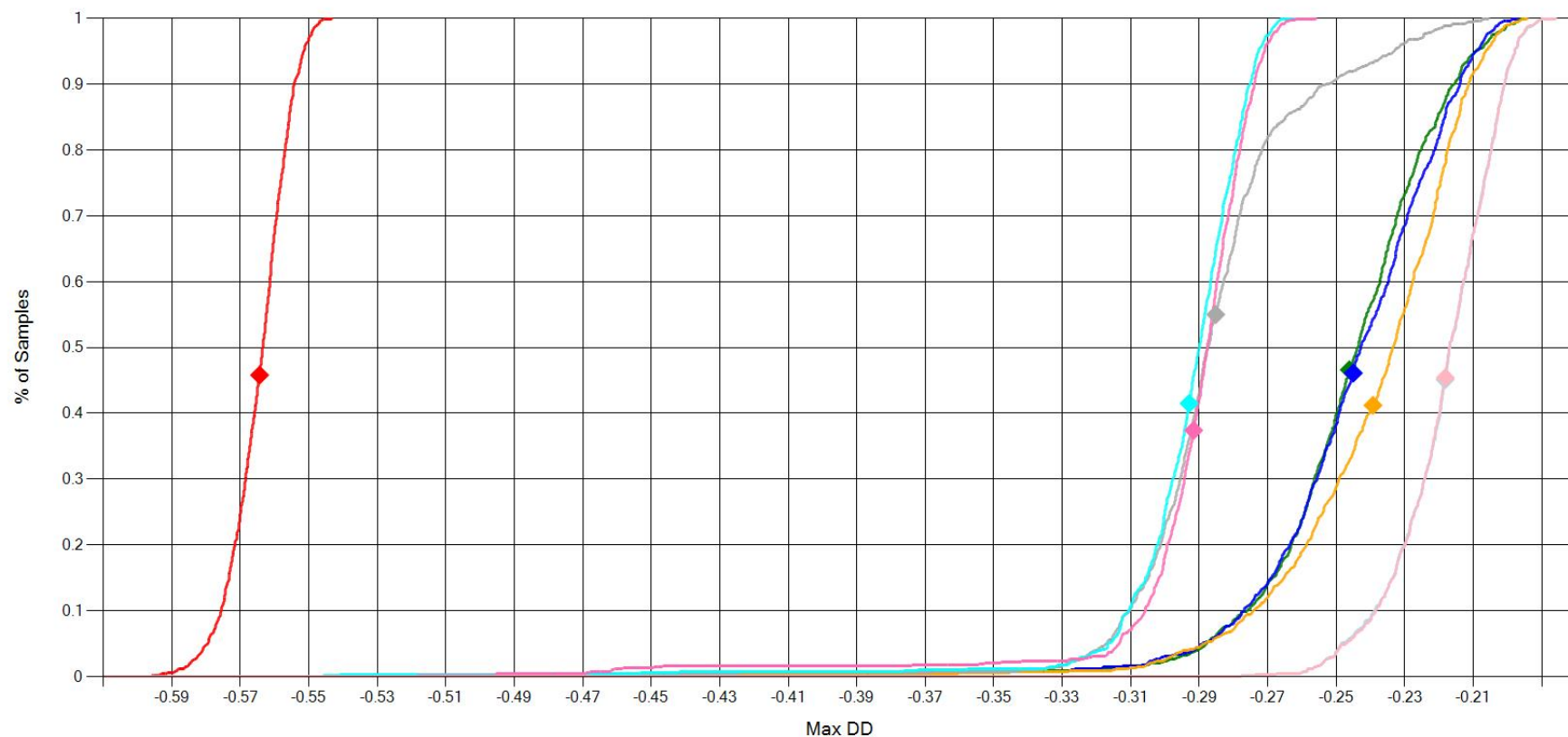
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sharpe	1000	44.2%	0.0%	44.0%	44.1%	44.1%	44.2%	44.2%	44.3%	44.3%
DEMA50(22,0%)_T-Sharpe	1000	81.1%	5.2%	57.9%	72.4%	76.3%	80.7%	86.2%	92.4%	97.0%
DEMA60(22,0%)_T-Sharpe	1000	81.3%	5.6%	59.6%	69.7%	75.8%	81.4%	87.2%	91.7%	97.3%
DEMA70(22,0%)_T-Sharpe	1000	88.4%	7.1%	63.4%	74.1%	80.8%	88.2%	96.6%	99.8%	102.8%
DEMA80(22,0%)_T-Sharpe	1000	72.5%	4.9%	53.6%	64.9%	67.8%	71.8%	77.4%	83.7%	89.4%
DEMA90(22,0%)_T-Sharpe	1000	69.6%	3.6%	45.8%	62.8%	66.5%	69.5%	73.0%	76.2%	80.2%
DEMA100(22,0%)_T-Sharpe	1000	70.9%	3.6%	49.7%	60.1%	68.7%	71.2%	73.4%	77.9%	80.9%
SMA50_200_T-Sharpe	1000	83.8%	5.6%	69.7%	72.8%	77.8%	84.0%	89.4%	95.3%	103.6%
EMA50_200_T-Sharpe	1000	90.7%	3.5%	78.9%	83.4%	87.2%	90.8%	94.0%	97.6%	102.9%



— Base-Sharpe-ECDF	◆ DEMA60(22,0%)_T-Sharpe_Avg	— DEMA90(22,0%)_T-Sharpe-ECDF	— SMA50_200_T-Sharpe-ECDF
◆ Base-Sharpe_Avg	— DEMA70(22,0%)_T-Sharpe-ECDF	◆ DEMA90(22,0%)_T-Sharpe_Avg	◆ SMA50_200_T-Sharpe_Avg
— DEMA50(22,0%)_T-Sharpe-ECDF	◆ DEMA70(22,0%)_T-Sharpe_Avg	— DEMA100(22,0%)_T-Sharpe-ECDF	— EMA50_200_T-Sharpe-ECDF
◆ DEMA50(22,0%)_T-Sharpe_Avg	— DEMA80(22,0%)_T-Sharpe-ECDF	◆ DEMA100(22,0%)_T-Sharpe_Avg	◆ EMA50_200_T-Sharpe_Avg
— DEMA60(22,0%)_T-Sharpe-ECDF	◆ DEMA80(22,0%)_T-Sharpe_Avg		

MaxDD SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

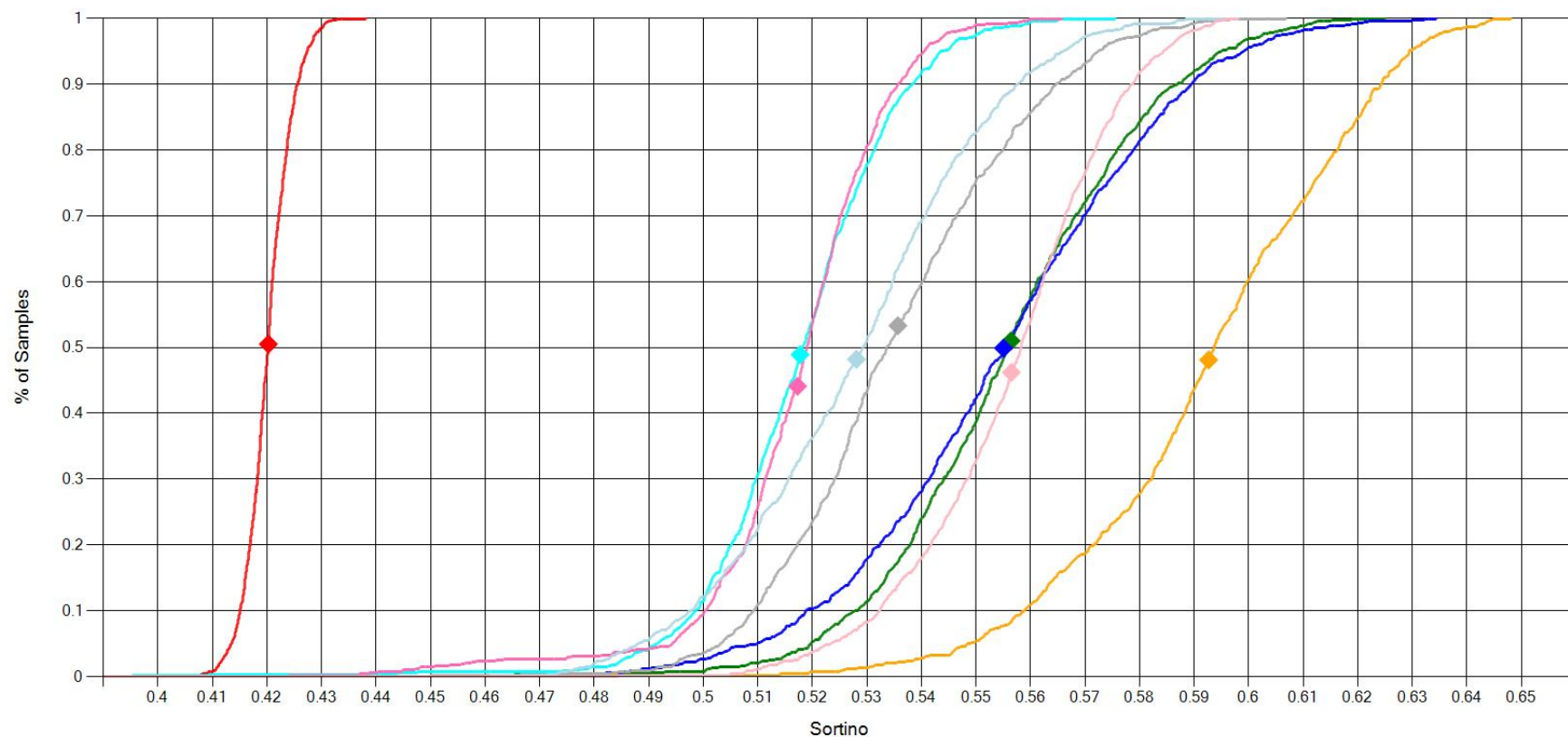
Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-MaxDD	1000	-56.4%	0.9%	-59.6%	-58.4%	-57.3%	-56.3%	-55.6%	-54.9%	-54.3%
DEMA50(22,0%)_T-MaxDD	1000	-24.6%	2.9%	-50.9%	-30.0%	-26.7%	-24.4%	-22.1%	-20.4%	-19.5%
DEMA60(22,0%)_T-MaxDD	1000	-24.5%	2.8%	-47.0%	-30.4%	-26.8%	-24.3%	-21.9%	-20.5%	-19.7%
DEMA70(22,0%)_T-MaxDD	1000	-23.9%	2.8%	-44.6%	-30.0%	-26.4%	-23.3%	-21.5%	-20.3%	-19.4%
DEMA80(22,0%)_T-MaxDD	1000	-28.5%	2.7%	-54.6%	-32.8%	-30.4%	-28.8%	-26.6%	-22.3%	-20.6%
DEMA90(22,0%)_T-MaxDD	1000	-29.3%	2.3%	-54.6%	-32.6%	-30.5%	-29.0%	-27.8%	-26.9%	-26.0%
DEMA100(22,0%)_T-MaxDD	1000	-29.2%	2.6%	-51.8%	-33.2%	-30.1%	-28.8%	-27.7%	-26.8%	-25.6%
SMA50_200_T-MaxDD	1000	-21.8%	1.5%	-27.8%	-25.3%	-23.3%	-21.7%	-20.3%	-19.5%	-18.6%
EMA50_200_T-MaxDD	1000	-21.8%	1.5%	-27.8%	-25.3%	-23.3%	-21.7%	-20.3%	-19.5%	-18.6%



— Base-MaxDD-ECDF
 ◆ Base-MaxDD_Avg
 — DEMA50(22,0%)_T-MaxDD-ECDF
 ◆ DEMA50(22,0%)_T-MaxDD_Avg
 — DEMA60(22,0%)_T-MaxDD-ECDF
 ◆ DEMA60(22,0%)_T-MaxDD_Avg
 — DEMA70(22,0%)_T-MaxDD-ECDF
 ◆ DEMA70(22,0%)_T-MaxDD_Avg
 — DEMA80(22,0%)_T-MaxDD-ECDF
 ◆ DEMA80(22,0%)_T-MaxDD_Avg
 — DEMA90(22,0%)_T-MaxDD-ECDF
 ◆ DEMA90(22,0%)_T-MaxDD_Avg
 — DEMA100(22,0%)_T-MaxDD-ECDF
 ◆ DEMA100(22,0%)_T-MaxDD_Avg
 — SMA50_200_T-MaxDD-ECDF
 ◆ SMA50_200_T-MaxDD_Avg
 — EMA50_200_T-MaxDD-ECDF
 ◆ EMA50_200_T-MaxDD_Avg

Sortino SPY Index vs. Multiple Timers, ^IRX Cash, 12/30/1994-10/23/2015 - 20.8 Yrs.

Name	# Samples	Avg	SD	Min	2.3% (-2SD)	15.9% (-1SD)	50%	84.1% (+1SD)	97.7% (+2SD)	Max
Base-Sortino	1000	42.0%	0.4%	40.6%	41.2%	41.6%	42.0%	42.4%	42.9%	43.8%
DEMA50(22,0%)_T-Sortino	1000	55.6%	2.3%	45.9%	51.2%	53.4%	55.6%	58.0%	60.3%	62.5%
DEMA60(22,0%)_T-Sortino	1000	55.5%	2.7%	47.7%	49.9%	52.8%	55.5%	58.3%	60.7%	63.4%
DEMA70(22,0%)_T-Sortino	1000	59.3%	2.5%	48.3%	53.8%	56.6%	59.4%	61.9%	63.5%	64.8%
DEMA80(22,0%)_T-Sortino	1000	53.6%	2.2%	45.0%	49.5%	51.4%	53.4%	55.9%	58.1%	60.7%
DEMA90(22,0%)_T-Sortino	1000	51.8%	1.8%	39.5%	48.5%	50.3%	51.8%	53.3%	55.0%	57.6%
DEMA100(22,0%)_T-Sortino	1000	51.7%	1.8%	42.4%	46.0%	50.5%	51.9%	53.2%	54.5%	56.6%
SMA50_200_T-Sortino	1000	52.8%	2.3%	46.1%	48.1%	50.4%	52.9%	55.1%	57.2%	59.8%
EMA50_200_T-Sortino	1000	55.6%	1.8%	48.4%	51.5%	53.8%	55.8%	57.4%	58.9%	59.8%



— Base-Sortino-ECDF	◆ DEMA60(22,0%)_T-Sortino_Avg	— DEMA90(22,0%)_T-Sortino-ECDF	— SMA50_200_T-Sortino-ECDF
◆ Base-Sortino_Avg	— DEMA70(22,0%)_T-Sortino-ECDF	◆ DEMA90(22,0%)_T-Sortino_Avg	◆ SMA50_200_T-Sortino_Avg
— DEMA50(22,0%)_T-Sortino-ECDF	◆ DEMA70(22,0%)_T-Sortino_Avg	— DEMA100(22,0%)_T-Sortino-ECDF	— EMA50_200_T-Sortino-ECDF
◆ DEMA50(22,0%)_T-Sortino_Avg	— DEMA80(22,0%)_T-Sortino-ECDF	◆ DEMA100(22,0%)_T-Sortino_Avg	◆ EMA50_200_T-Sortino_Avg
— DEMA60(22,0%)_T-Sortino-ECDF	◆ DEMA80(22,0%)_T-Sortino_Avg		

Summary/Future Work

- For most timer tests, SMA50_200 and/or EMA50_200 did best for Sharpe and MaxDD
- Only Timer Test 6 of 55.7 years gives DEM40 as better but only slightly.
- SMA50_200 and EMA50_200 also remain the most closely clustered on the EC Ranges charts which indicates timer insensitive to series jittering.
- Might later run more periods to see if results stay consistent.
- Might test more recent periods since some timers failed around 9/2015.
- Might test differences for statistical significance with Wilcoxon.