RAPA SCORE TRIUMPHS AS PERFORMANCE METRIC OF CHOICE

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INTRODUCTION

This paper describes the factor components of the RAPA[1] Score algorithm and its mathematical treatment of the data series. It then applies the "algorithm" to a grouping of USA mutual funds in a back-test environment to see whether the RAPA Score and its ranking approach outperform the conventional performance metrics. The results clearly demonstrate the superiority of the RAPA approach, which can be applied to any fund or trader equity curve analysis, and provide you with the insight of the most likely traders to continue producing superior risk-adjusted returns.

Before we take an empirical look at whether the RAPA Score© can outperform other performance metrics we first need to understand a little more about the algorithm and the factors involved in its construction. Once we have done that we will look at how we take the data and mathematically modify it to fit within a more natural state of being.

FACTORS INVOLVED

RAPA's most important value proposition is its ability to calculate an effective way of measuring traders[2] skill, and with that increase the odds of identifying traders who are likely to continue producing consistent above average returns.

The bedrock of the RAPA Score© algorithm is a risk-adjusted return framework. PSR (Probabilistic Sharpe ratio), invented by quantitative finance superstar Dr Marcos M. Lopez de Prado, lies at the centre of our equation. PSR is designed to work with non-normal returns applying the following four beneficial points; for those interested in the technical aspects we refer you to the paper here.

1. It allows us to establish the track record length needed to make an assessment.
2. It models the trade-off between track record length and undesirable statistical features (e.g. negative skewness with positive excess kurtosis).
3. It explains why track records with those undesirable traits would benefit from reporting performance with the highest sampling frequency.
4. It allows one to optimize a portfolio under non-normal, leveraged returns while incorporating the uncertainty derived from track record length.

In simple English, PSR is excellent for evaluating traders who write naked options and those that use martingale entry strategies, and in addition provides insight as to when a trader has a sufficient track record to make a fair judgment call.

A further feature of our Score algorithm is how it focuses on the drawdown characteristics of the traders account. Here the focus is on the probability of drawdown and also its probability of recovery. We have worked with a large database[3] to calibrate this measurement tool; the techniques we use for calibration across all components of the algorithm are the subject for another white paper. Essentially, once a trader

[1] RAPA = Risk and Performance Analyzer.
[2] Trader and manager are used interchangeably.
[3] See section on data later in the paper, however in addition to that data we have done a lot of calibration work using the http://www.managedfutures.eu/ database which is a CTA database with monthly data.

drops through what is considered a natural threshold for a maximum drawdown, our algorithm heavily penalizes the traders Score.

Our Score algorithm has built on the fact that the PSR formulae rewards longer track records, and our research leads us to believe that this is such an important factor that we have bolstered this factor with a progressive formulae that further rewards track record length.

Interestingly, a trader that is likely to produce consistent repeatable returns leaves behind a trail of identifiable DNA. Our Score algorithm is mindful of this and regards significant deviations from the trader's historic returns with alarm bells and penalties.

A final component of our algorithm is the 5% (5 point) subjective score towards the trader who clearly describes their philosophy, trading objectives and strategy (preferably) on their profile wall as well as providing typical examples of trade ideas and visual setups. This is an often neglected aspect of the score and can make a significant difference. For the purposes of back-testing and quantitative research like this paper, we assume no score for this component so that each trader is comparable, like for like.

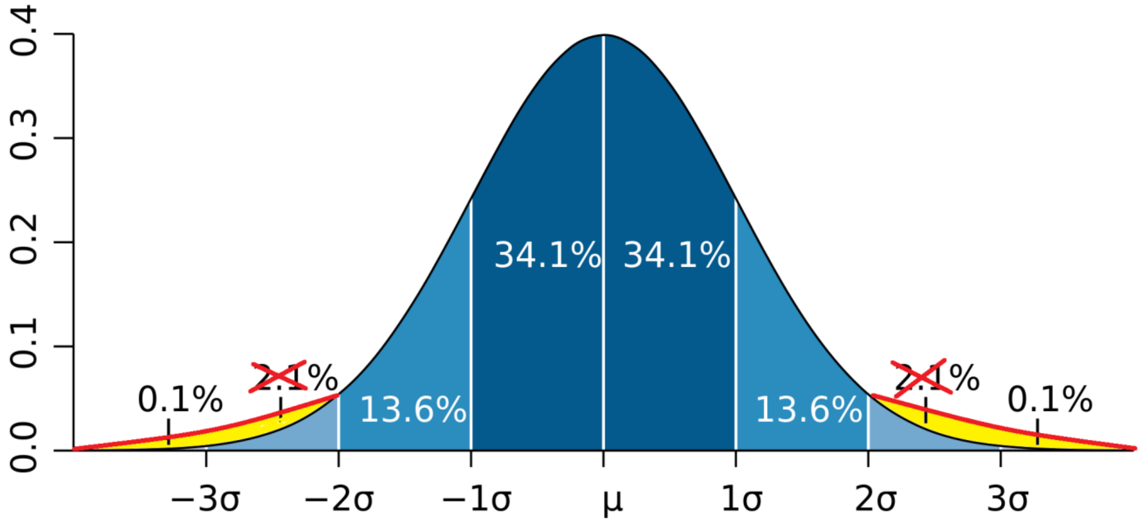
ALPHA STABLE DATA DISTRIBUTIONS

To get some context we need to go back a few centuries (1733) and touch on one of the great mathematical discoveries. We are referring to the Central Limit Theorem, the foundation for all statistical analysis. Simply put, the mean of a large enough number of independent random variables with a finite mean and variance will produce a normal distribution.

Beneath this elegant math is a typical philosophy that permeates society and our subconscious, and that is the need for closed-form expressions. Where solutions to everyday problems can have infinite permutations, we become uncomfortable, and to alleviate this discomfort we devise brilliant solutions. The Central Limit Theorem or Gaussian or Normal distribution (whichever name you prefer) provides one such solution. The problem is that one size does not fit all.

A favourite question to ask is whether the stock market movements are random. The entire edifice of modern finance was built on the assumption of randomness, and we have to admit that in many cases it is very difficult to prove otherwise. We cannot even imagine how many tens of thousands of academic papers have proved it, but have they?

A famous mathematician Mandelbrot in the 1960's brought to our attention the fact that stock market returns were fractal displaying fat tails, more recently Nassim Taleb has made the subject more widely known and understood. So what are these fat tails? (And no, they do not involve the animal variety).



If you recall, one of the key assumptions of the Central Limit Theorem was a finite variance; however fat tail distributions have "infinite sigma," technically meaning the variance does not exist. Most of the time in finance the distributions are mathematically well behaved, but every so often they encounter a trauma and when such a circumstance takes place the model housing the distribution becomes hopelessly inadequate.

We hope you have stayed with us until now, so that we can discuss the RAPA approach to these issues. There is a family of stable distribution models (including normal) that are able to deal with these issues, the one we have chosen as the superior one is the Levy process, an alpha-stable analog of the Brownian motion. To avoid getting too technical we will just highlight a key differentiating point. While the normal distribution formulae has two parameters, the alpha-stable formulae has four parameters which allow it to deal with beta and alpha[4] which are typical features of manager/trader returns.

[4] Alpha and beta in the context of alpha stable distributions have mathematically different meanings to the typical context traders refer to these terms.

Ok, we are now ready to look at how this impacts on the Score algorithm.

1. We have created an algorithm that fits historic returns to the alpha-stable family. This was no trivial exercise. The computational requirement for calculating our RAPA Score has increased exponentially.

2. We have researched our databases and found that accounts displaying low alpha (excess kurtosis) should be penalized. Alpha does not just measure kurtosis; more importantly it shows the tail behaviour of the distribution. When alpha=2 the distribution is Gaussian showing no fat tails but when it is less than 2 the distribution will always have infinite variance and fat tails. There are two types of low alpha funds: the ones that change their trading style during the course of their track-record (Type I) and those that sell options and deploy martingale strategies (Type II). We can distinguish between Type I and Type II strategies, and penalize Type II.

3. We further apply alpha-stable distributions to the analysis of divergence in trading DNA, i.e. traders veering off their historical chosen path.

In conclusion we have significantly enhanced our ability to evaluate a trader's performance using a model better calibrated to the reality of traders and investment manager's performance. When calculating the RAPA Score our model does not operate in isolation, relying solely on a mathematical equation. Rather, our theoretical framework adapts with Bayesian inferences to real live data, and calibrates our model and its subcomponents in a dynamic process.

WHAT IS THIS PAPER TRYING TO PROVE

We believe that using our RAPA Score as a ranking tool will outperform the conventional performance metrics across any grouping of traders or investment managers, in out-of-sample testing. This is a massive statement which needs to be tested. The experiment below will be one such test, and we will no doubt subject the algorithm to further testing in the future[5].

The Data

One of our criteria for choosing the data was the availability of daily data. Mutual funds have such data freely available, as do ETF’s, so we chose a sample of 100 manager’s equity curves, comprising: Money Magazine’s Top 70 mutual funds + ETF list and a list of Mutual fund CTA’s[6].

Methodology

These funds were analyzed for the period January 2008 to end of February 2013 (5yrs +2m). At the beginning of each calendar month we selected the top 20% of our data universe according to each performance metric and created an equal weight portfolio with each fund held for the duration of the month. The process was repeated each month and stepped through time.

The performance metrics chosen were:

1. Performance % – we took the average logarithmic return from January 2007.
2. % average recent return – we worked with the most recent month only.
3. Sharpe ratio.
4. Sortino ratio.
5. RAPA Score.

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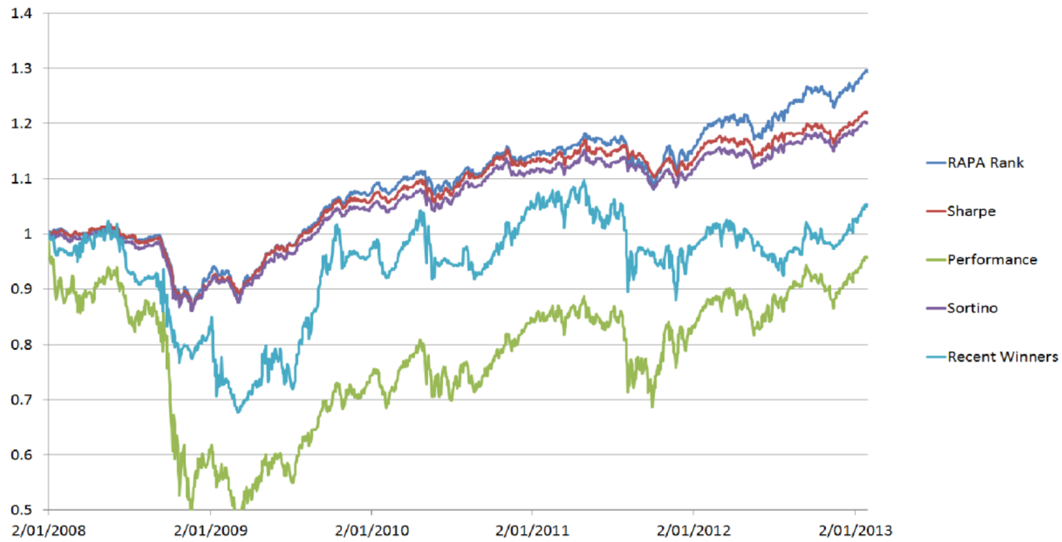
[5] We welcome suggestions for data sets to be tested against. One thing to keep in mind is the data must be daily.

[6] http://money.cnn.com/magazines/moneymag/bestfunds/index.html http://money.usnews.com/funds/mutual-funds/rankings/managed-futures

AMFQX, EVOAX, MCRAX, MFTAX, AQMIX, MFTFX, MFBPX, CCNAX, CSAAX, DXMAX, EABIX, EMEIX, EQCHX, EQCAX, EECIX, EJLIX, EQQCX,EQTVX, FCMLX, FUTCX, GMSAX, GPFAX, GISQX, RYLBX, RYMTX, HMFAX, LCSAX, LFMAX, WAVIX, MMFAX, MHBAX, MHFAX, AMFAX, NGSAX, HATAX, HTFAX, QMFAX, RTSRX, SARIX, EFSAX, SFCEX, TMFAX, TFSHX, WKFAX, WCSIX, AMRMX, SSHFX, PRFDX, VWNFX, FMIHX, SLASX, AMCPX, JENSX, TRBCX, DEFIX, CAAPX, WEHIX, FAMVX, FPPFX, POAGX, PRDMX, BERWX, PENNX, RYTRX, PRSVX, WAAEX, CSRSX, PRNEX, AEPGX, DODFX, OAKIX, UMBWX, VWIGX, PRIDX, NEWFX, PRMSX, DODIX, HABDX, FRNIX, LSBRX, MWHYX, VIPSX, VWITX, TPINX, SWPPX, SWTSX, VBISX, VIMSX, NAESX, PRWCX,FSIIX, VGTSX, VWELX, VFSVX, VEIEX, TRRBX, VGSIX, VBMFX, VTTHX

THE RESULTS



Statistics	RAPA	Sharpe	Performance	Sortino	Recent winners
CAGR	5.36%	4.08%	-0.70%	3.81%	0.97%
Total Return	28.84%	21.43%	-3.35%	19.89%	4.81%
Max DD	6.97%	7.13%	34.39%	6.91%	18.00%
DD Recovery	396	404	0	406	551
Volatility	5.52%	4.43%	25.20%	4.47%	18.33%
Sharpe (Rf=0)	0.96	0.92	-0.04	0.85	0.06

CONCLUSION

The RAPA Score outperforms the gold standard in performance measurement, the Sharpe ratio, in all aspects except for displaying marginally more volatility. However, this volatility is more than compensated for with excess return to deliver a better returning back-tested portfolio on both an absolute and risk-adjusted basis.

ABOUT RAPA CAP INTRO

RAPA (Risk and Profit Analyzer) Cap Intro is an online portal that matches trading talent with emerging manager capital. The portal uses a number of analytical and social networking tools to provide a community where traders of all levels can participate. Traders featured at the top of the RAPA Leaderboard are able to raise capital and earn fees from the RAPA investor community. Founded in November 2012, the company gives investors an opportunity to verify returns and assess trader skill. For more information please visit www.RapaCapIntro.com.

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