Nonpariel Capital

Abstract

Nonpariel Capital was founded to give investors an alternative approach to capital markets. We build algorithmically managed investment vehicles for cryptocurrencies, giving investors access to markets and technologies they would've never had access to previously.

Our Angel series of portfolio management algorithms has earned clients hundreds of percents in returns just for opening an account, depositing the cryptocurrency of their choice, and waiting.

Our Entropy series of active management vehicles, paired with the state of the art Sensus sentiment analysis engine, will change cryptocurrency investing forever.

Motivation

Cryptocurrencies growing popularity and adoption have led to a massive influx of investors and traders. These traders, often inexperience techies, are ill prepared for the highly volatile and unforgiving cryptocurrency markets. The investors, also often inexperienced techies, are ill prepared for the tiring process of conducting due diligence. Not to mention the stress of holding investments through highly volatile market environments.

This leads to losses, missed opportunities, and slows the general public adoption of cryptocurrencies. We knew we could help these people, so we created Nonpariel Capital. An algorithmic trading fund for the future.

Due Diligence

Before we add a cryptocurrency to our portfolio we heavily vet it for market adoption, strong fundamental technology, active development, and world changing impact.

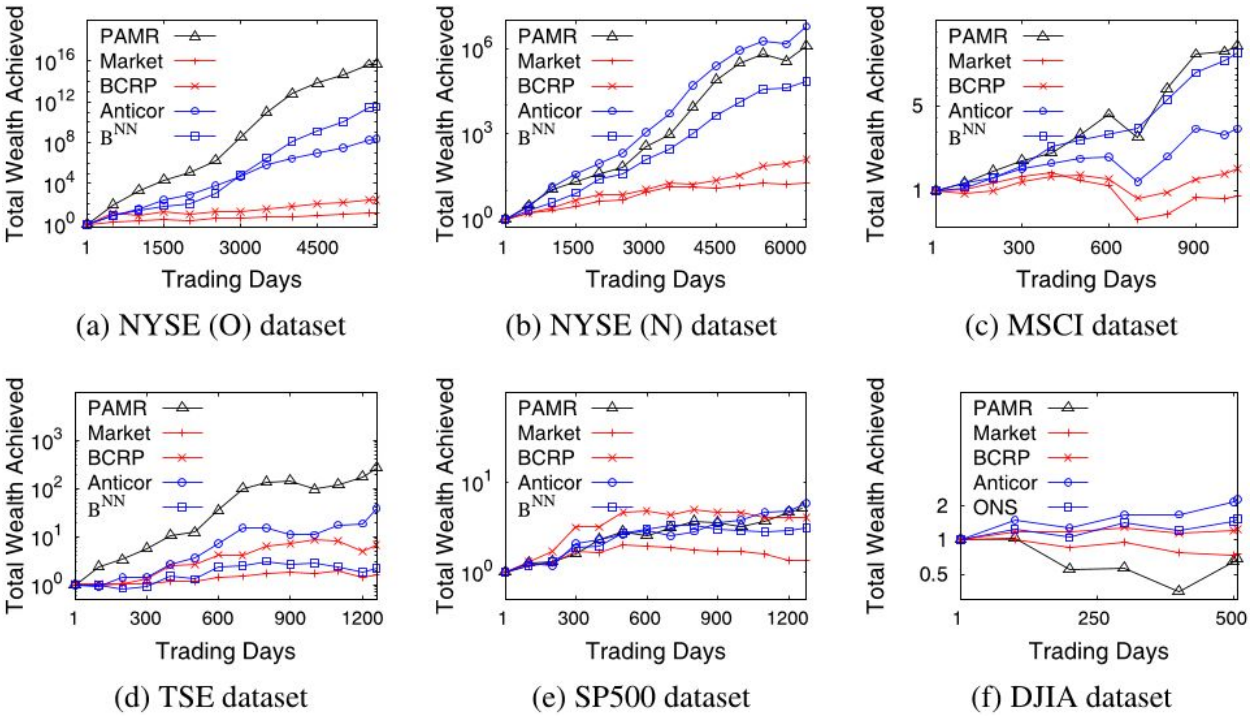
When possible we inspect the code of the projects we invest in by reading it on github and running it on our own machines. This gives us insight into the quality and quantity of active development by the team.

Being based in Silicon Valley we also have a unique opportunity to visit, talk, and sometimes interrogate, the developers and directors of the many local cryptocurrency projects. We get information impossible for non-locals to acquire, and that leads to extremely valuable investment and trading insights.

Technology

Our angel series of portfolio management algorithms took their inspiration from the trusted hallmarks of online portfolio selection algorithms; Passive Aggressive Mean Reversion, Robust Mean Reversion, BCRP, and AntiCor.

Comparisons between PAMR, AntiCor, and BCRP on NYSE Data



(a) NYSE (O) dataset (b) NYSE (N) dataset (c) MSCI dataset

(d) TSE dataset (e) SP500 dataset (f) DJIA dataset

Angel Series Algorithm Inspirations

PAMR

Algorithm 1: Passive Aggressive Mean Reversion (**PAMR**)

INPUT: ϵ: sensitivity parameter; C: aggressiveness parameter

PROCEDURE

1: Initialize $\mathbf{b}_1 = (\frac{1}{m}, \ldots, \frac{1}{m})$

2: **for** $t = 1, 2, \ldots, n$ **do**

3: Receive stock price relatives: $\mathbf{x}_t = (x_{t1}, \ldots, x_{tm})$

4: Suffer loss: $\ell_\epsilon^t = \max\{0, \mathbf{b}_t \cdot \mathbf{x}_t - \epsilon\}$

5: Set parameters:

$$\tau_t = \begin{cases} \frac{\ell_\epsilon^t}{\|\mathbf{x}_t - \bar{x}_t \mathbf{1}\|^2} & \text{(PAMR)} \\ \min\left\{C, \frac{\ell_\epsilon^t}{\|\mathbf{x}_t - \bar{x}_t \mathbf{1}\|^2}\right\} & \text{(PAMR-1)} \\ \frac{\ell_\epsilon^t}{\|\mathbf{x}_t - \bar{x}_t \mathbf{1}\|^2 + \frac{1}{2C}} & \text{(PAMR-2)} \end{cases}$$

6: Update portfolio:

$$\mathbf{b}_{t+1} = \mathbf{b}_t - \tau_t (\mathbf{x}_t - \bar{x}_t \mathbf{1})$$

7: Normalize portfolio:

$$\mathbf{b}_{t+1} = \arg\min_{\mathbf{b} \in \Delta_m} \|\mathbf{b} - \mathbf{b}_{t+1}\|^2$$

8: **end for**

END

AntiCor

Algoritm ANTICOR$(w, t, X_t, \hat{\mathbf{b}}_t)$

Input:

1. w: Window size
2. t: Index of last trading day
3. $X_t = \mathbf{x}_1, \ldots, \mathbf{x}_t$: Historical market sequence
4. $\hat{\mathbf{b}}_t$: current portfolio (by the end of trading day t)

Output: $\mathbf{b}_{t+1}$: Next day's portfolio

1. Return the current portfolio $\hat{b}_t$ if $t < 2w$.
2. Compute LX_1 and LX_2 as defined in Equation (2), and μ_1 and μ_2, the (vector) averages of LX_1 and LX_2, respectively.
3. Compute $M_{cor}(i, j)$ as defined in Equation (3).
4. Calculate claims: for $1 \leq i, j \leq m$, initialize $\mathsf{claim}_{i \to j} = 0$
5. If $\mu_2(i) \geq \mu_2(j)$ and $M_{cor}(i, j) > 0$ then
   (a) $\mathsf{claim}_{i \to j} = \mathsf{claim}_{i \to j} + M_{cor}(i, j)$;
   (b) if $M_{cor}(i, i) < 0$ then $\mathsf{claim}_{i \to j} = \mathsf{claim}_{i \to j} - M_{cor}(i, i)$;
   (c) if $M_{cor}(j, j) < 0$ then $\mathsf{claim}_{i \to j} = \mathsf{claim}_{i \to j} - M_{cor}(j, j)$;
6. Calculate new portfolio: Initialize $\mathbf{b}^{t+1} = \hat{\mathbf{b}}^t$. For $1 \leq i, j \leq m$
   (a) Let $\mathsf{transfer}_{i \to j} = \mathbf{b}_i^t \cdot \mathsf{claim}_{i \to j} / \sum_j \mathsf{claim}_{i \to j}$;
   (b) $\mathbf{b}_i^{t+1} = \mathbf{b}_i^{t+1} - \mathsf{transfer}_{i \to j}$;
   (c) $\mathbf{b}_i^{t+1} = \mathbf{b}_i^{t+1} + \mathsf{transfer}_{j \to i}$;

RMR Optimization

Algorithm 2 RMR($\epsilon, \hat{x}_{t+1}, \mathbf{b}_t$)

1: **Input:** reversion threshold $\epsilon > 1$; predicted next price relative vector $\hat{\mathbf{x}}_{t+1}$; current portfolio $\mathbf{b}_t$;
2: **Output:** next portfolio $\mathbf{b}_{t+1}$
3: **Procedure:**
4: Calculate the following variable:

$$\alpha_{t+1} = \min\left\{0, \frac{\hat{\mathbf{x}}_{t+1}\mathbf{b}_t - \epsilon}{\|\hat{\mathbf{x}}_{t+1} - \overline{x}_{t+1} \cdot \mathbf{1}\|^2}\right\}$$

5: Update the portfolio:

$$\mathbf{b}_{t+1} = \mathbf{b}_t - \alpha_{t+1}(\hat{\mathbf{x}}_{t+1} - \overline{x}_{t+1} \cdot \mathbf{1})$$

6: Normalize $\mathbf{b}_{t+1}$: $\mathbf{b}_{t+1} = \text{argmin}_{\mathbf{b}\in\Delta_d} \|\mathbf{b} - \mathbf{b}_{t+1}\|^2$

RMR Portfolio Selection

Algorithm 3 Portfolio selection with RMR

1: **Input:** reversion threshold $\epsilon > 1$; iteration maximum m; window size $w \geq 2$; toleration level τ; market sequence $\mathbf{x}_1^n$
2: **Output:** S_n: Cumulative wealth after n^{th} periods
3: **Procedure:**
4: Initialization: $b_1 = \frac{1}{d}\mathbf{1}, S_0 = 1, \mathbf{p}_0 = \mathbf{1}$
5: **for** $i = 1$ **to** n **do**
6: $\quad \mathbf{p}_i = \mathbf{x}_i \cdot \mathbf{p}_{i-1}$
7: **end for**
8: **for** $t = 1, 2, \ldots, n$ **do**
9: $\quad$ Receive stock price: $\mathbf{x}_t$
10: $\quad$ Update cumulative return: $S_t = S_{t-1} \times (\mathbf{b}_t \cdot \mathbf{x}_t)$
11: $\quad$ Predict next price relative vector:

$$\hat{\mathbf{x}}_{t+1} = L_1 median(\mathbf{p}_t, \mathbf{p}_{t-1}, \ldots, \mathbf{p}_{t-w+1}, m, \tau)$$

12: $\quad$ Update the portfolio:

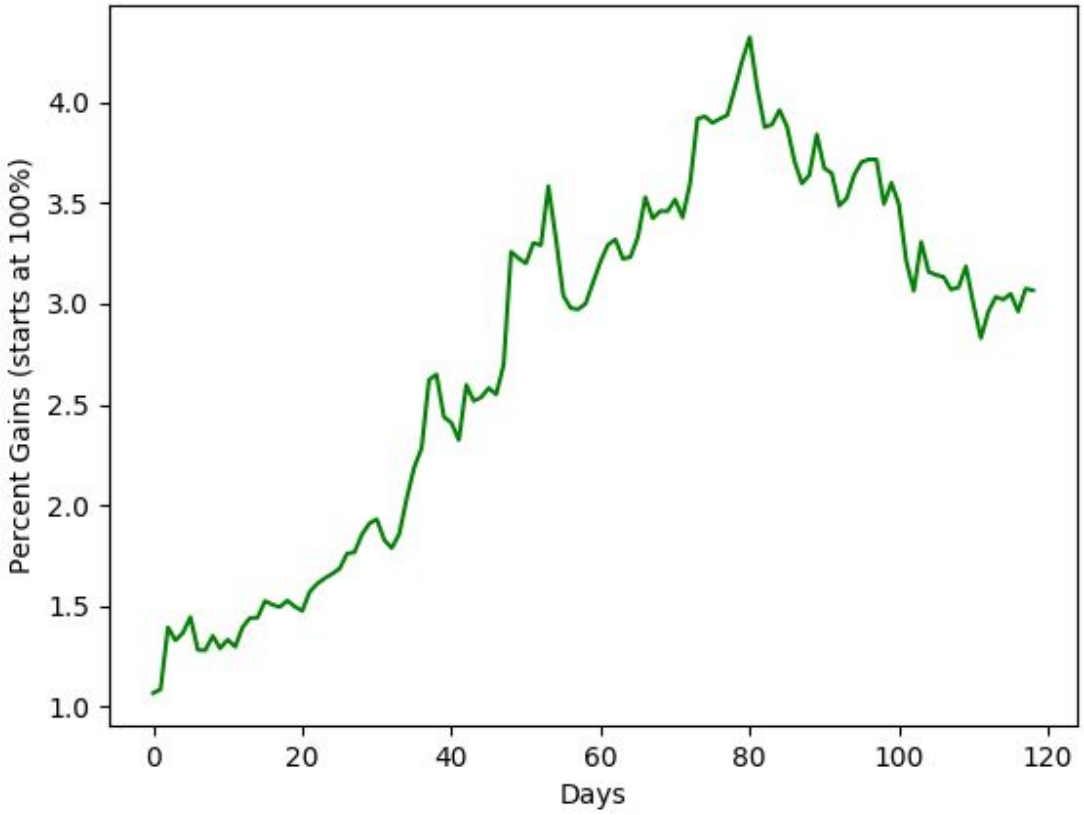
$$\mathbf{b}_{t+1} = RMR(\epsilon, \hat{\mathbf{x}}_{t+1}, \mathbf{b}_t)$$

13: **end for**

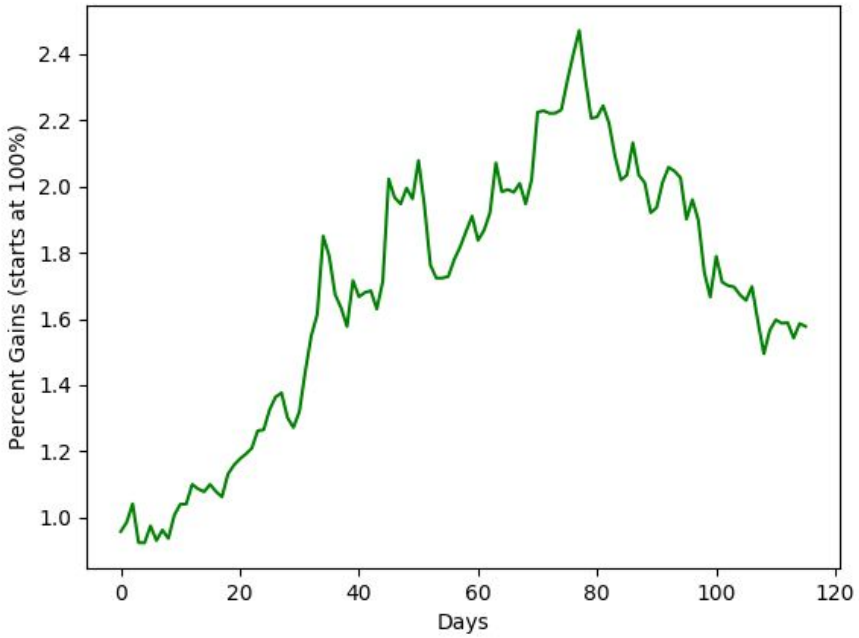
Angel1.3 vs PAMR

The PAMR algorithm, Passive Aggressive Mean Reversion, is the most successful OLPS algorithm known to academia. Our Angel series, especially the Angel1.3 derivatives, are vastly superior in every possible metric. We demonstrate this below with a simulation done on a portfolio of popular cryptocurrencies for 120 days.

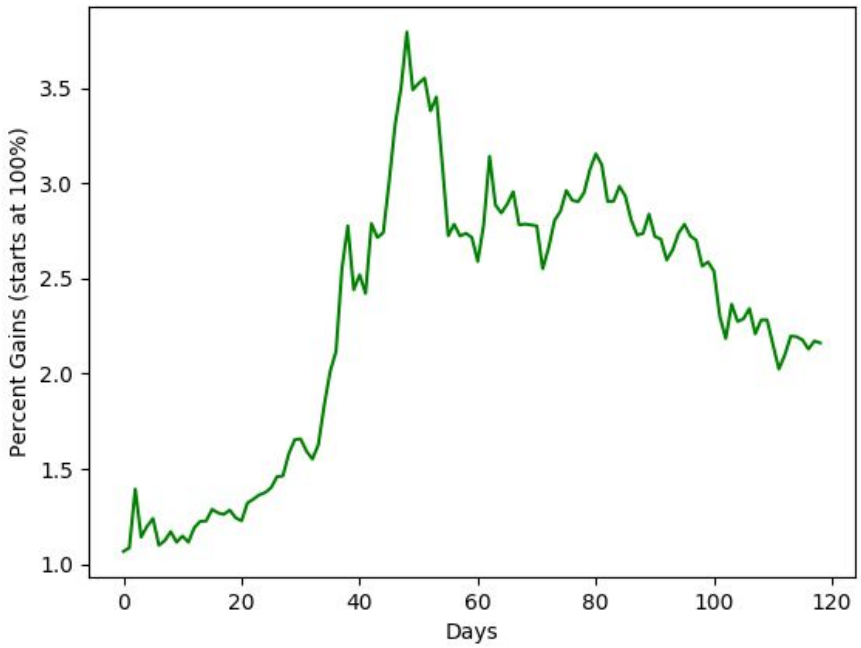
Angel1.3:



PAMR:



Buy and Hold:



Entropy Series Algorithm Inspirations
&
Integration w/ Sensus Sentiment Analysis Engine

The entropy series of algorithms will trade cryptocurrencies based on market sentiment information provided by Sensus. Sensus is a bay area local sentiment analysis company building a sentiment analysis engine that continually scours social media, news feeds and forums to define current and historical sentiment for a cryptocurrency.

In their whitepaper they say “By using state-of-the-art Neural Network/Deep Learning technology along with Natural Language Processing techniques, social media and news feeds will be used to characterize market sentiment on the Internet. The resulting feature vectors can be used as inputs to Deep Learning Neural Networks. In addition, trending analysis will be done with a back-end database.”

Sentiment analysis has long been used in traditional markets like stocks, FOREX, ETF’s, etc.. for algorithmic trading. It has been proven in multiple papers like;
“STOCK TREND PREDICTION USING NEWS SENTIMENT ANALYSIS”
By Kalyani Joshi , Prof. Bharathi, and Prof. Jyothi Rao of KJSCE
which concluded:

“-- Random Forest worked very well for all test cases ranging from 88% to 92% accuracy. Accuracy followed by SVM is also considerable around 86%. Naive Bayes algorithm performance is around 83%. Given any news article, it would be possible for the model to arrive on a polarity which would further predict the stock trend.”

The entropy algorithms will couple our range of existing trading algorithms with the power of the Sensus sentiment analysis engine. We believe it will be more profitable than any of the angel series algorithms, with little additional volatility or risk.

Nonpariel Team

Skilled and hungry, our team is led by CEO/CTO Duncan Socrates Lemp. Our front-end user experience is architected and built by our CUX (Chief of User Experience) David Nguy. Multi-processing and low level language programming is done by our resident hardware acceleration expert Logan Brentzel, and our server and testing environment management is handled by Nathan Bond. Our machine learning interns include Dipti Chaudhari, Punya Sirigiri, and Raminder Singh, and our Community Liaison Officer Tsolmandorj Natsagdorj keeps us updated and in tune with the needs of our community.

Most of us met at the 42 US/Silicon Valley campus and immediately constructed the plans for Nonpariel Capital. Duly toying with the french administrators by adapting the french word “nonpareil” (meaning unparalleled) for our own purposes.
The rest were on boarded as the company grew.

Left to Right, Logan Brentzel, Duncan Lemp, David Nguy, Nathan Bond

Sensus Executive Team

Andrew Segal

Andrew is a Professor of Computer Science at University of San Francisco and has been in several startups involving artificial intelligence, machine learning, neural networks and is currently working on block chaining systems. He has over 20 years experience in technology development for several markets and a PhD from University of Illinois-Urbana/Champaign. • https://www.usfca.edu/faculty/andrew-segal

Patrik Wijkstrom

Patrik brings brings over two decades of application development, process re-engineering, sales, marketing and team building. He has over 8 years experience with sentiment analysis across social media, including development of social media listening command centers. • https://www.linkedin.com/in/wijkstrom/

Christian Ferri

Christian has over 15 years of operations and system implementation experience for digital marketing and analysis tools as part of the industry as well as of Big 4 consulting. Christian graduated from Cornell University and is a certified Scrum Master and Six Sigma Black Belt professional. • https://www.linkedin.com/in/ironsferri/

Plans

While we monitor and develop our Angel series, and take care of our existing clients, we will also start work on our entropy series shortly.

Unlike the Angel series which manage portfolios and take advantage of market inefficiencies in correlated sets of assets the Entropy series will trade individual assets based on data given to it by the Sensus sentiment analysis engine. We predict the Entropy series will be many times more profitable than the Angel series, without much additional risk and volatility.

ICO

In order to fund the development of the Entropy series, and the Sensus sentiment analysis engine, we will be adopting a new investment model based on our “Nonpariel Coin” (NPC). We will begin taking deposits and remitting withdrawals through Nonpariel Coin after our ICO.

Nonpariel Coin will be a traditional ERC20 token on the ethereum blockchain, and we will be taking investments and conducting the ICO on the ethereum blockchain also.