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*Confluence Research Update*

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The Confluence product in our Excel addin was conceived as a way to include all of the significant Parallax signal forecasts on multiple time scales at the same time, in a big bang approach to produce one forecast. To achieve this, two weighting methods were introduced to rank the resulting composite forecast. The first was based on my own hypothesis that the crowd effect has four manifestations that can be identified using the proper tools:

1. **Stochastics Pursuit** (chasing price), is the tendency of investor agents to buy securities that are moving up or sell those moving down, resulting in measurable positive feedback in both price and volume behavior.
2. **Emergent Geometry**, such as trendlines and channels, that are produced through feedback from the tendency for investor agents to be attracted or repulsed from certain key price levels
3. **Quasiperiodic Cycles**, caused by the introduction of new market moving information at regular (monthly, quarterly) intervals
4. **Self-organized Criticality**, caused when extreme levels of positive or negative feedback are reached across many time scales

This method takes the largest positive edge and nets it against the largest negative edge for all four scales within each of the four categories. The results from each category were then added together, under the assumption that the categories are independent of one another. These edge numbers are listed in the spreadsheet for the run date, as well as for subsequent offsets in the future. Future edges are based on the edge decay of each component and are displayed at 1 to 20 bar intervals forward. I should stress here that there are more than a few if's with this method. If the four categories exist, and if they are truly independent of each other, and if no other signals show up during the forecast period, then it should work well.

The second method used to gauge the composite forecast utilizes a neural net that was trained using 15k (out of nearly 400k) random examples taken from a 10-year daily scale backtest of Confluence on the S&P 900 stock list. The neural net generates a rank between 0 (best down forecast) and 100 (best up forecast). So it's my own theory against the AI surrogate.

To test Confluence, I ran two large backtests, both on the S&P 900 stocks over 11 years, one with a daily base period which did contain the neural net training data, and the other

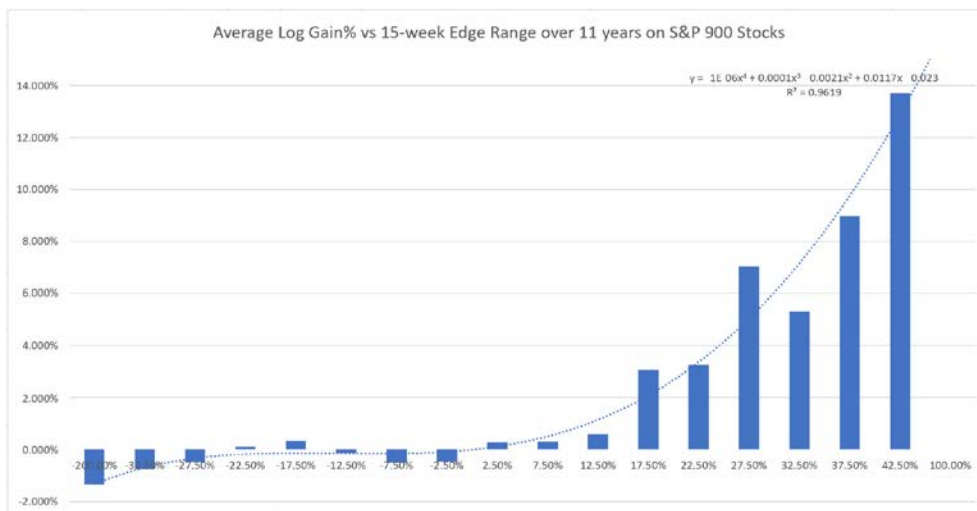
with a weekly base period that was completely out-of-sample. Since Confluence uses scales from 1 to 5 times the base, a daily scale Confluence actually samples daily to weekly scales, while the weekly base sampling includes monthly.

The data that follows covers the weekly backtest, but I should note that the daily test did just as well. The summary table below lists the log percent change average of stocks held from 1 to 15 weeks based on various edge% ranges estimated at 15 weeks. For example, the 261 stocks that had a remaining edge of between 37.5% and 42.5% at 15 weeks returned 9.996% over the next 15 weeks following the forecast, for an annualized return potential of 34.654%.

		Ave Log% Changes					Annualized Ave Log% Changes				
		<L%chg1>	<L%chg3>	<L%chg5>	<L%chg10>	<L%chg15>	<L%chg1>	<L%chg3>	<L%chg5>	<L%chg10>	<L%chg15>
427	-200.00%	0.040%	-0.003%	0.128%	-0.129%	-1.261%	0.139%	-0.010%	0.445%	-0.448%	-4.370%
9419	-32.50%	-0.078%	-0.271%	-0.385%	-0.544%	-0.779%	-0.270%	-0.938%	-1.334%	-1.884%	-2.700%
15259	-27.50%	-0.069%	-0.222%	-0.321%	-0.561%	-0.484%	-0.239%	-0.771%	-1.111%	-1.944%	-1.679%
17210	-22.50%	-0.048%	-0.052%	-0.011%	0.096%	0.122%	-0.167%	-0.181%	-0.038%	0.333%	0.422%
17880	-17.50%	-0.021%	0.024%	0.025%	-0.034%	0.036%	-0.074%	0.084%	0.087%	-0.119%	0.124%
26850	-12.50%	-0.038%	-0.150%	-0.164%	-0.300%	-0.371%	-0.130%	-0.521%	-0.568%	-1.042%	-1.286%
91634	-7.50%	-0.043%	-0.120%	-0.176%	-0.352%	-0.522%	-0.149%	-0.414%	-0.610%	-1.222%	-1.808%
73147	-2.50%	-0.010%	-0.083%	-0.171%	-0.364%	-0.500%	-0.033%	-0.288%	-0.592%	-1.262%	-1.732%
39792	2.50%	0.011%	0.062%	0.052%	0.174%	0.258%	0.037%	0.216%	0.182%	0.603%	0.894%
24298	7.50%	-0.015%	0.025%	0.077%	0.295%	0.480%	-0.053%	0.086%	0.269%	1.024%	1.665%
15277	12.50%	0.140%	0.153%	0.230%	0.431%	0.673%	0.486%	0.529%	0.797%	1.494%	2.335%
8893	17.50%	0.333%	0.994%	1.539%	2.613%	3.168%	1.155%	3.447%	5.335%	9.058%	10.981%
6835	22.50%	0.104%	0.635%	1.106%	2.334%	3.184%	0.362%	2.200%	3.835%	8.091%	11.037%
2729	27.50%	0.814%	2.555%	3.502%	5.336%	6.744%	2.823%	8.856%	12.141%	18.497%	23.379%
556	32.50%	0.253%	1.309%	2.083%	4.172%	5.304%	0.876%	4.537%	7.221%	14.463%	18.386%
261	37.50%	1.509%	3.451%	5.109%	8.602%	9.996%	5.229%	11.963%	17.712%	29.822%	34.654%
89	42.50%	0.266%	3.861%	6.634%	11.701%	15.107%	0.923%	13.386%	22.996%	40.564%	52.372%
	100.00%										

Average log gain% results for 15-week edge ranges from a weekly Confluence test on 10 years of S&P 900 stocks

Graphing the 15-week average column from the table above, we get the very consistent performance graph below. Note that almost all the average returns are below zero when our composite edge is below zero and positive when it's above zero.



Daily scale results were similar, but the turnover rate of 15 days was a bit high for constructing a reasonable strategy.

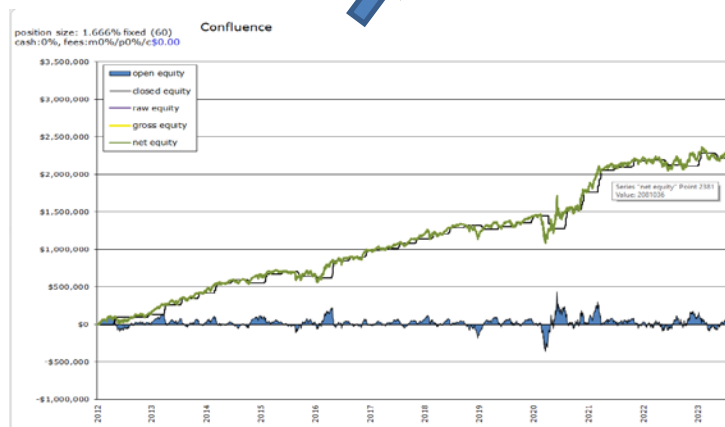
The competition between the edge method and AI rank method is summarized in this experiment. I found the minimum rank and edge combinations that yielded a fixed number of selections and logged the results. So if you had wanted ~200 stock picks over the 11 years, then a minimum rank of 98 and minimum edge15 was 29% was the right filter.

Count	Rank Min	Edge15% Min	Ave Log% Changes					Annualized Ave Log% Changes				
			<L%chg1>	<L%chg3>	<L%chg5>	<L%chg10>	<L%chg15>	<L%chg1>	<L%chg3>	<L%chg5>	<L%chg10>	<L%chg15>
105	0	42.0%	0.406%	3.863%	7.187%	11.967%	16.138%	1.407%	13.391%	24.916%	41.487%	55.945%
101	99	29.0%	0.037%	1.165%	5.230%	6.892%	10.484%	0.127%	4.037%	18.131%	23.894%	36.343%
205	98	29.0%	0.586%	1.421%	3.026%	6.285%	8.817%	2.033%	4.925%	10.489%	21.788%	30.564%
309	97	27.8%	0.757%	1.407%	2.262%	4.712%	6.506%	2.625%	4.877%	7.841%	16.337%	22.555%
405	93	29.9%	0.186%	1.358%	2.081%	4.234%	6.239%	0.644%	4.708%	7.216%	14.679%	21.628%
504	85	31.5%	0.358%	1.717%	3.027%	5.215%	6.320%	1.243%	5.952%	10.492%	18.079%	21.910%

We then proceeded to build a long only strategy (entry and exit) from the weekly test data by first sorting the results by rank (the edge method was equally good), and then buying the top 60 and holding for 15 weeks, before selling all holdings and buying the next set. It was always invested. No other filters were applied, which leaves open some manager discretion to throw out some picks based on other criteria.

Here is the monthly performance grid, de-compounded equity curve and associated statistics. This test produced an annual average gain of 20.3% with a risk of 18.4%

year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	annual
2012	2.9	3.4	4.2	-0.3	-5.9	1.9	0.6	2.5	2.4	0.2	1.4	1.4	14.8
2013	5.6	2.4	4.7	0.9	1.3	-0.4	5.9	-3.5	5.0	4.4	1.8	2.8	31.1
2014	1.6	5.7	2.2	0.0	1.3	2.8	-4.3	5.2	-3.3	4.7	3.2	1.5	20.8
2015	-3.3	7.2	-0.3	-0.5	0.5	-1.1	1.2	-6.2	-2.9	8.0	1.3	-3.4	0.5
2016	-3.0	3.7	12.2	5.8	-0.4	-0.5	4.7	-0.1	0.9	-2.9	9.2	1.2	31.0
2017	0.2	4.0	-0.3	0.8	0.2	4.3	1.6	-1.6	6.0	0.3	5.4	0.6	21.5
2018	3.8	-3.6	0.0	0.1	5.8	3.2	3.3	2.5	-1.8	-5.8	2.6	-10.8	-0.8
2019	9.6	3.3	-0.2	5.1	-9.0	9.3	1.1	-6.0	4.5	1.4	4.5	2.5	26.1
2020	-2.3	-9.2	-14.6	17.1	4.4	6.9	1.6	5.8	-5.3	2.9	21.4	5.5	34.3
2021	2.1	16.2	8.1	3.7	2.8	-0.3	1.2	2.2	-1.7	4.7	-3.2	6.5	42.2
2022	-3.5	1.3	2.6	-6.1	-0.2	-8.2	11.8	-3.9	-8.4	12.4	10.0	-7.8	0.0
2023	10.9	-2.9	-3.7	-1.1	-6.2	8.2	8.2						13.4
		month average		1.7	month stdev		5.3						
		annual average		20.3	annualized stdev		18.4						



Statistics:

- Sharpe ratio = 0.83
- Sortino ratio = 1.46
- Information Ratio = 0.71
- Profit Factor = 2.54
- Optimal F% = 38.7%
- %Winning Trades 64%

**Parallax Financial Research, Inc.**

7345 164<sup>th</sup> Ave NE

Suite 145-147

Redmond, WA 98052

Phone (425) 868-2486

Cell (425) 753-2308

Fax (978) 383-8369

Email [kkaufman@pfr.com](mailto:kkaufman@pfr.com)

Web [www.pfr.com](http://www.pfr.com)

Skype s.kris.kaufman

Twitter: @ParallaxFR