REVELATION
INVESTMENT RESEARCH, INC.

Piotroski Score vs Downside Risk Alert

Model Features

The Piotroski Score (PS) utilizes nine financial statement indicators to differentiate future relative market performance of individual stocks. The PS input variables are fundamentally intuitive, can be calculated for almost any stock, change slowly through time, and combine into a simple 0 – 9 "score" for each stock. PS is available at little cost, and historically has worked well on less-followed small and mid-cap stocks.

However, PS inputs are not optimal for their proposed purpose (Piotroski's own admission), ignore magnitude information in their Boolean (i.e., 1/0) construction, and limited in scope (i.e., omit information such as valuation, growth, momentum, and sentiment). PS was published 18 years ago and has not been updated to reflect changing markets, accounting rules, corporate business models, or the widespread adoption of quantitative equity strategies. Furthermore, PS was presented as a tool to discriminate winners and losers among the 20% of stocks with the high Book/Market ratios (i.e., potentially distressed value stocks), not across the entire stock market. PS historical performance on large cap stocks has been marginal.

By contrast, Downside Risk Alert is an up-to-date, proprietary model designed to discriminate relative returns and risk on all types of stocks. DRA's inputs are comprehensive, selected for their independent predictive power and to complement one another in the "DRA" composite score. Like PS, DRA scores are fully transparent, easy to interpret and turn into actionable rules, low in turnover, and available on almost all stocks (including international markets). DRA historical performance has been strong on stocks of all sizes, including on large cap stocks.

Model Performance Testing Approach

We ran our model comparison tests on a broad universe of large, mid, and small caps stocks over the period 11/2001 – 3/2019. Specifically, we used MSCI IMI historical membership, which is defined as 99% of the U.S. market capitalization at each point in time. The IMI contains an average of about 2400 stocks, essentially all stocks with market caps > $250M. We excluded REITs from our testing.

Each month we calculated PS using the most recently available quarterly financial data (an important enhancement to the original model that used annual financials). PS scores are close to normally distributed from 0-9, but since there are few stocks at either extreme, we grouped stocks with PS of 0-3 and 8-9 into separate cohorts to aid statistical comparability. We also grouped DRA scores into six cohort portfolios to approximately correspond with the PS score groupings.

We evaluated each model's ability to forecast relative 12-month returns on an equal weighted, buy-and-hold basis. Our summary statistics include Information Coefficients (correlation of model scores to subsequent returns), average cohort returns, and standard deviation of returns (i.e., return volatility).

Performance Testing Results

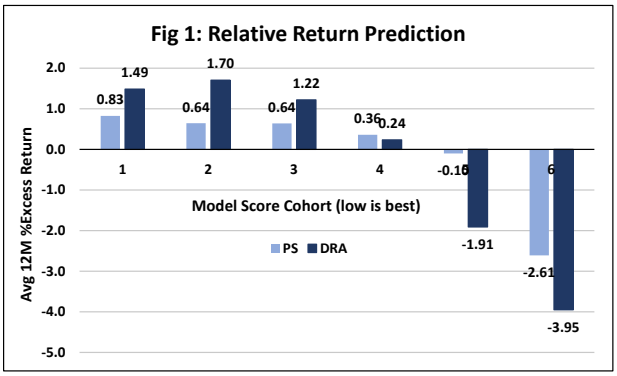
Table 1 shows that the scores generated by both models have had statistically significant correlation with subsequent annual returns. DRA is the much stronger model (higher avg IC), while PS has been somewhat more consistent through time (lower IC Stdev). DRA's overall signal strength is significantly higher than PS (higher IR and T-stat)

Table 1: Comparative Statistical Predictive Power

Model	Avg IC	Stdev IC	Info Ratio	IC T-Stat
Piotroski Score	0.067	0.070	0.96	3.3
Downside Risk Alert	0.127	0.107	1.19	6.2

Information Ratio is Average IC / Standard deviation of IC.

Figures 2 & 3 show that stocks scored favorably by either model (cohorts 1-3) have historically outperformed and been less volatile than the average stock. Perhaps more importantly given these models' objective of helping investors avoid "losers", stocks scored unfavorably by either model (cohorts 4-6) have historically underperformed and been far more volatile than the average stock. DRA provides greater discrimination of future returns and volatility (especially in cohorts 5-6), making DRA a significantly stronger alpha predictor.



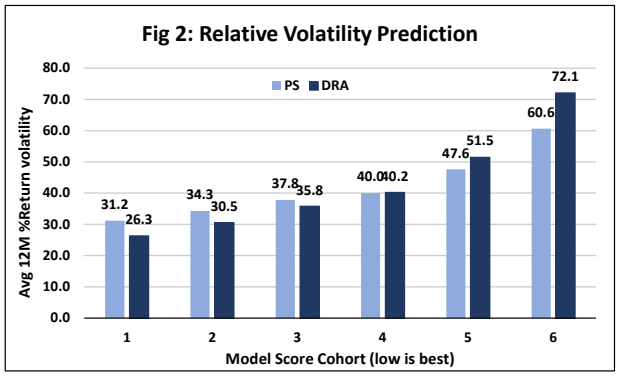


Table 2 shows the how PS and DRA interrelate. The bottom panel shows that PS and DRA are positively correlated, but the model scores infrequently assign a given stock into the same cohort, which suggests the two models could be complementary to one another. However, the top panel shows that DRA is the dominant prediction signal, as the return differences within columns (same PS, different DRA) are far wider than return differences across rows (same DRA, different PS).

Table 2: PS and DRA Interaction

DRA Score	Piotroski Score 8-9	7	6	5	4	0-3
	Average 12-Month % Excess Returns					
Decile 1	0.79	1.44	1.22	1.50	0.06	-1.29
Decile 2-3	1.36	0.78	1.27	1.72	1.58	1.69
Decile 4-5	0.23	0.98	0.51	0.72	1.05	1.11
Decile 6-7	0.79	0.24	0.67	0.42	-0.51	0.20
Decile 8-9	-8.34	-3.61	-2.24	-0.81	-1.75	-4.69
Decile 10	-8.66	-11.23	-5.47	-6.02	-3.31	-6.51
	Average # of Stocks by Joint Model Scores					
Decile 1	35	60	64	49	24	7
Decile 2-3	47	94	125	109	64	27
Decile 4-5	32	80	113	120	85	46
Decile 6-7	21	63	100	122	103	71
Decile 8-9	10	39	78	109	114	119
Decile 10	1	6	16	34	56	124

Table 3 shows that combining PS and DRA into an equally weighted composite model improves performance over using PS alone, but the composite model falls a bit short of DRA alone.

Table 3: Comparative Statistical Predictive Power

	Return Prediction Statistics				Avg 12M %Excess Returns				Avg 12M %Return Volatility			
Model	Avg IC	Stdev IC	Info Ratio	IC T-Stat	Cohort 1	Cohort 2	Cohort 5	Cohort 6	Cohort 1	Cohort 2	Cohort 5	Cohort 6
PS alone	0.067	0.070	0.96	3.3	0.83	0.64	-0.16	-2.61	31.2	34.3	47.6	60.6
PS + DRA	0.117	0.098	1.19	5.7	1.48	1.38	-0.52	-3.49	28.5	32.4	49.5	66.0
DRA alone	0.127	0.107	1.19	6.2	1.49	1.70	-1.91	-3.95	26.3	30.5	51.5	72.1

Summary

PS is a good predictor of future return and risk in spite of several potential shortcomings. PS is simple and cheap, but Downside Risk Alert is clearly the superior tool for predicting absolute and risk-adjusted returns.