SHENANDOAH
ASSET
MANAGEMENT, L.L.C.
alternative investment strategies

Research Brief

December, 2003

Summary

Shenandoah's quantitative investment discipline is based on purely fundamental factors. Continuous research remains at the heart of our process.

- The Shenandoah Midcap (long-only) strategy offers excess return potential (2-3% p.a.) in a tightly risk-controlled environment (tracking error < 4%). Return and tracking error targets can be adjusted to reflect the needs of individual clients.

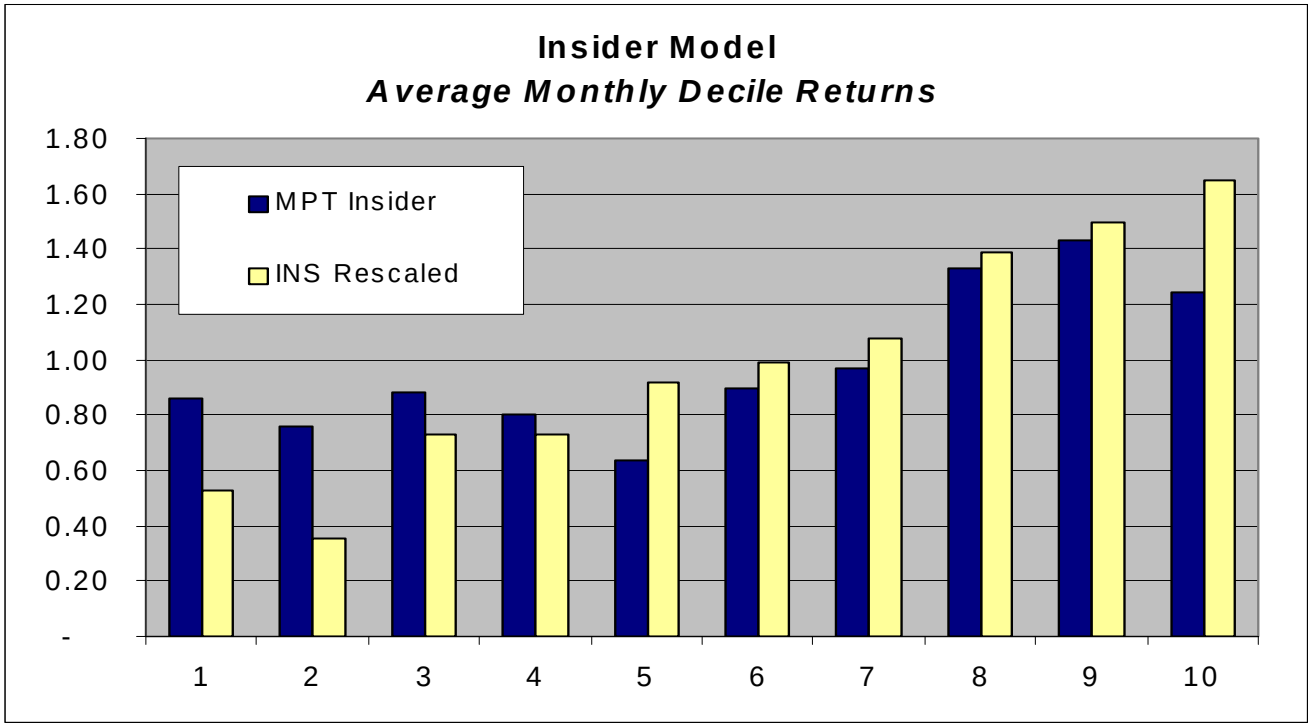
- ***Style consistency:*** While our research effort is constant, all resulting improvements should be viewed as enhancements to our methodology. Our process continues to be driven by the combination of earnings, cashflow, valuation and insider transactions.

- ***Insider Transaction Model:*** We have enhanced the performance contribution potential of the Insider Transaction model by developing a proprietary algorithm that compares current insider transaction data to historical patterns on a stock-by-stock basis. Observations:
  - This enhancement reduces the possibility of false buy or sell signals driven by insider transactions by viewing each stock's Insider profile in the context of the longer-term trading activity of insiders.
  - The enhancement is particularly helpful in industries where officers are compensated with stock (tech and biotech). Over time, these insiders tend to be net sellers of their stock as they seek to diversify their holdings; this selling activity is not necessarily a sell signal for the stock.

- ***Cashflow Model:*** We have enhanced the return potential of the Cashflow model by incorporating stock-specific accuracy scores by this model. Observations:
  - Incorporating model accuracy greatly enhances performance of the Cashflow factor.
  - Incorporating accuracy improves the alpha forecasting process by focusing the Cashflow alpha component on the subset of stocks where the model is most effective.

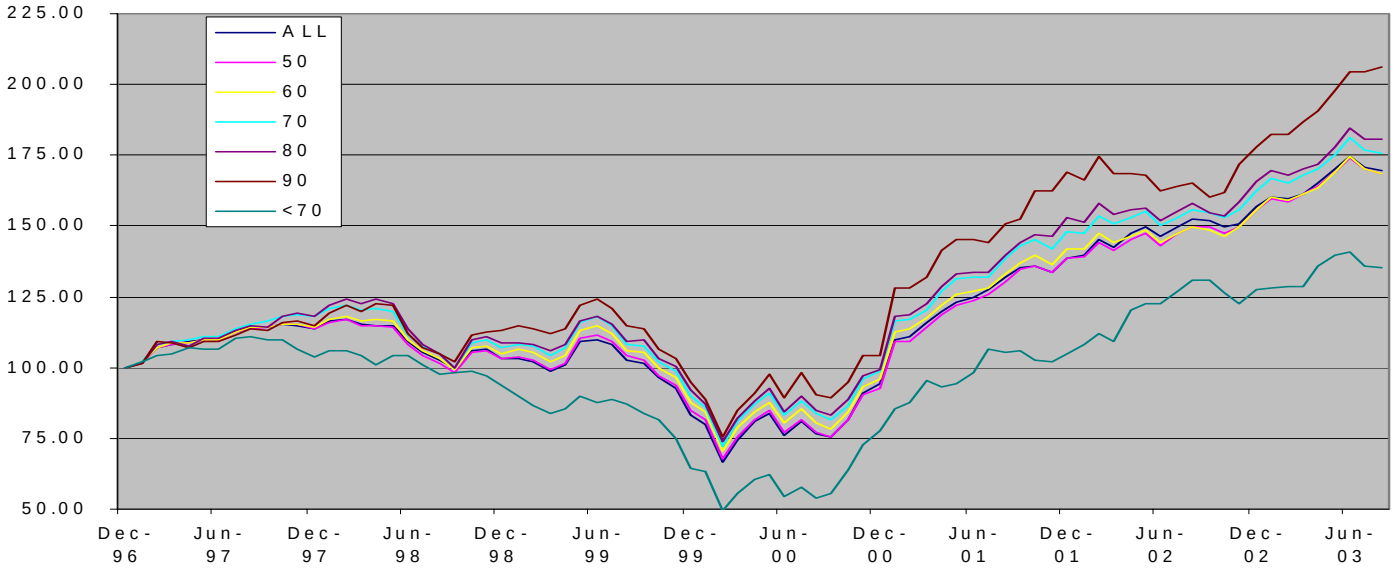
- Results: These model enhancements add approximately 80 bps to the historical (backtested) returns of the Midcap strategy and 120 bps to the Market Neutral potential returns. The volatility of excess returns decreases in both cases.

Insider Transaction Model Enhancement



- **Research Scope:** The goal is to enhance the performance of the Insider model by identifying companies with chronic buying/selling by insiders. The result is a stronger model that focuses attention on "actionable" insider buying/selling.
- **Market Profile Theorems (MPT) Insider Transaction Model:** MPT monitors all insider transactions registered with the SEC; data is cleaned, seasonally-adjusted and compared to a historical matrix for each company. Factors include: Rank of insider, trade date and size; open-market transactions are more heavily weighted than options trades.
- **Shenandoah Insider Transaction Model:** Shenandoah buys data from multiple external sources but maintains an internal research effort in order to use each factor in a more efficient manner within our process. With respect to the Insider model, we have been able to enhance the model's performance by further adjusting, or normalizing, insider transaction data in an effort to focus on "abnormal" trades.
  - ✓ Individual stocks have chronic insider transaction biases:
    - Chronic Selling: Many companies within high-growth industries, particularly in the small- and mid-cap arena, pay their executives with stock; as a result, these insiders are net sellers over time as they seek to diversify their holdings. Technology and Biotech companies are prime examples of such industries. Chronic selling of this kind is not necessarily a sell signal.
    - Chronic Buying: Some companies exhibit aggressive buying by insiders consistently over time, especially in the Financial sector. Chronic purchases by insiders are not necessarily buy signals.
  - ✓ Shenandoah has enhanced the performance of the MPT Insider model through a proprietary algorithm that compares current insider trading activity to historical patterns on a stock-by-stock basis.
  - ✓ Our enhancement improves the performance of the Insider model significantly.

Cashflow Accuracy Enhancement

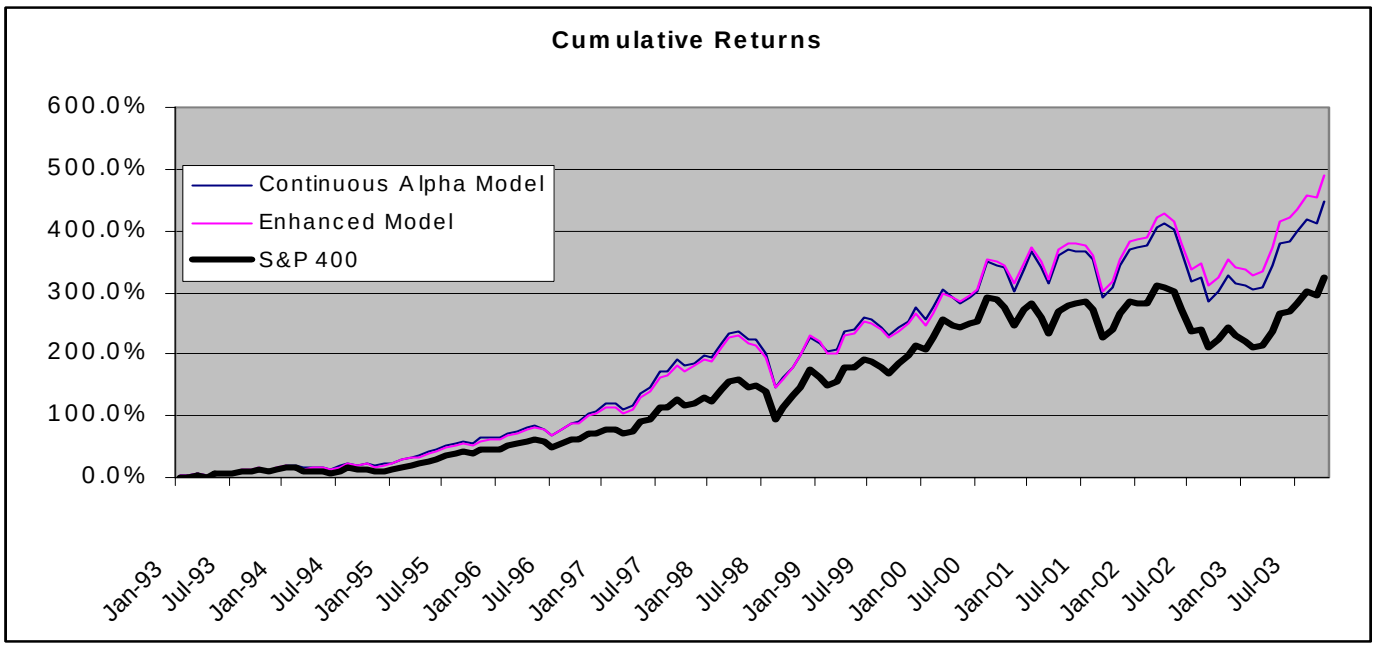


	Minimum Cashflow Accuracy %						
	All Stocks	50	60	70	80	90	<70
avg rtn spread	0.77	0.76	0.76	0.82	0.85	1.04	0.53
stdev	4.67	4.72	4.65	4.75	4.78	5.20	5.53
ratio	0.16	0.16	0.16	0.17	0.18	0.20	0.10
%pos mo	60%	63%	63%	61%	60%	60%	54%
max spread	16.35	17.67	17.52	18.02	19.09	22.83	15.73
min spread	-16.92	-17.29	-16.05	-15.99	-15.33	-14.97	-21.80
Avg # Q5s	228	207	195	172	140	89	55
Avg # Q1s	228	207	188	166	131	83	61
annl spread	8.2%	8.1%	8.1%	8.8%	9.3%	11.5%	4.7%
2003 YTD	8.1%	8.2%	8.0%	8.0%	9.1%	15.9%	6.3%
2002	13.2%	12.4%	10.0%	9.9%	8.2%	5.4%	21.4%
2001	46.5%	49.6%	48.0%	49.8%	54.1%	61.9%	35.1%
2000	13.9%	9.5%	9.5%	10.1%	7.6%	9.9%	20.6%
1999	-19.7%	-18.0%	-16.7%	-16.0%	-15.1%	-16.0%	-31.2%
1998	-9.2%	-9.3%	-8.0%	-9.4%	-8.1%	-1.7%	-9.7%
1997	13.8%	13.7%	14.1%	17.9%	18.3%	14.9%	3.8%

- Research Scope: Shenandoah has stock-by-stock accuracy scores for the Cashflow model based on the accuracy of price targets generated by this model over rolling twelve-month periods. The goal of this project is to enhance the performance of the Cashflow model by adjusting the resulting alpha specific to this model based on historical model accuracy (stock-by-stock).
- Results: Historical model accuracy clearly improves the performance of the model going forward.
  - ✓ Quintile return spreads (return of best 20% by Cashflow minus return of worst 20% monthly) improve from 53 bps where accuracy < 70% to 104 bps where accuracy > 90%.
  - ✓ Annualized quintile return spreads improve sequentially as accuracy increases: 11.5% at 90% accuracy (versus 4.7% at < 70% accuracy).
  - ✓ Risk-adjusted returns improve with higher model accuracy.
- Implementation: The alpha contribution of the Cashflow model within the Shenandoah process is adjusted for the accuracy of that model on a stock-by-stock basis.
  - ✓ Low Accuracy: The alpha contribution of the Cashflow model is reduced or eliminated for those stocks where the "accuracy" of the model is historically low (less predictable).
  - ✓ High Accuracy: The alpha contribution of the Cashflow model is increased based on high historical accuracy of the model on a stock-by-stock basis.

Model Enhancement: Historical Returns

Midcap Strategy

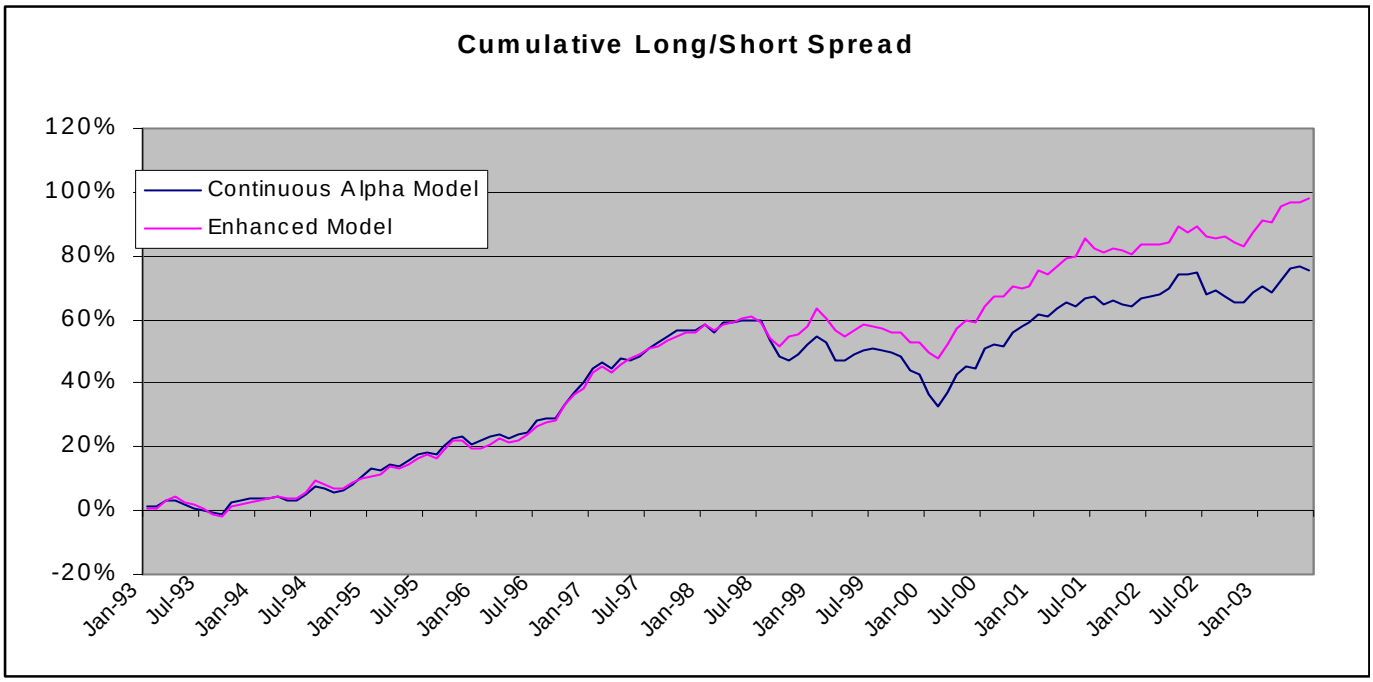


	Continuous Alpha Model	Enhanced Model
Median XS Rtn	0.22%	0.39%
Avg XS Rtn	0.20%	0.25%
stdev (XS Rtn)	1.20%	1.10%
ratio	0.16	0.23
% mo. Pos rtn	57%	62%
max	4.45%	4.04%
min	-4.04%	-3.80%
cuml rtn	446.7%	488.6%
annl rtn	17.0%	17.8%
Ann XS Rtn	2.7%	3.5%

- Definitions:
  - ✓ "Continuous Alpha Model" corresponds to the alpha scoring methodology presented in July, 2003, and implemented September 1, 2003.
  - ✓ "Enhanced Model" includes the Insider model and Cashflow model enhancements described on the previous pages.
  - ✓ The chart and table outline performance data for the two models in a long-only framework.
- Results:
  - ✓ The Enhanced Model clearly dominates the original Continuous Alpha Scoring model.
  - ✓ Annual excess returns over the test period improved by80 bps (from 2.7% to 3.5% p.a.).
  - ✓ The monthly standard deviation of those excess returns decreases from 1.20% to 1.10%.
  - ✓ The ratio of monthly excess returns to monthly standard deviation improves from 0.16 to 0.23.

Model Enhancement: Historical Returns

Market Neutral Strategy



	Continuous Alpha Model	Enhanced Model
median return	0.58%	0.54%
avg return	0.46%	0.55%
stdev	1.62%	1.46%
ratio	0.28	**0.38**
% mo. Pos rtn	61%	63%
max	4.24%	4.13%
min	-4.41%	-3.09%
cuml rtn	75.2%	97.7%
annl rtn	5.5%	6.7%

- Definitions:
  - ✓ "Continuous Alpha Model" corresponds to the alpha scoring methodology presented in July, 2003, and implemented September 1, 2003.
  - ✓ "Enhanced Model" includes the Insider model and Cashflow model enhancements described on the previous pages.
  - ✓ The chart and table outline performance data for the two models in a long/short (market neutral) framework.
- Results:
  - ✓ The Enhanced Model clearly dominates the original Continuous Alpha Scoring model in a long/short framework. This long/short analysis gives the best indication of the performance-discrimination ability of the two models.
  - ✓ Annual returns over the test period improved by 120 bps (from 5.5% to 6.7% p.a.).
  - ✓ The monthly standard deviation of those excess returns decreases from 1.62% to 1.46%.
  - ✓ The ratio of monthly excess returns to monthly standard deviation improves from 0.28 to 0.38.