

**Analysis of the AlphaStream™  
Decile Equity Investment Model**

**Investment Model Developed and Offered by  
ALPHASTREAM PORTFOLIOS, INC.**

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# ANALYSIS OF THE ALPHASTREAM™ DECILE MODEL

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## OVERVIEW

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Over a 15-year period beginning in April 1993, the AlphaStream™ Decile Model produces large and statistically significant abnormal returns, either on a gross return or a net of estimated fees and expenses basis. This report focuses on the net return of the model.

The magnitude of the abnormal performance is impressive. The strategy produces average risk-adjusted abnormal returns of approximately 23% per year. The strategy also consistently beats the performance of both a value- and equal-weighted index. The net return on the AlphaStream™ Decile Model exceeds the gross return on the value-weighted index in over 67% of the months examined.

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## OVERVIEW OF THE ALPHASTREAM™ DECILE MODEL

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The AlphaStream™ Decile Model is based on the premise that there are always some industries that produce returns in excess of the broader market. In general terms, the AlphaStream™ strategy ranks a list of industry groups at the end of each month and buys the top 10% of industry groups. The returns are equal-weighted and the portfolio is rebalanced on a monthly basis.

There is scholarly research to suggest that such a strategy has merits. Recent research suggests that a significant number of industry returns, including retail, services, commercial real estate, metal and petroleum, can forecast the overall stock market by up to two months.<sup>1</sup> Similar results are found for the eight largest stock markets outside the U.S. suggesting that the results are not the result of random chance.

An earlier research paper finds that industries exhibit significant momentum effects.<sup>2</sup> Specifically, researchers have found that investment strategies that buy stocks from past winning industries and sells stocks from past losing industries are highly profitable. Moreover, the strategies are profitable even after controlling for various market frictions, such as transaction costs. In fact, industry momentum profits remain strong even for the largest, most liquid stocks. The authors of the study conclude that industry-based momentum strategies are more profitable and are easier to implement than individual stock-based momentum strategies.

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<sup>1</sup> Hong, Harrison, Walter Torous, and Rossen Valkanov. 2007. "Do Industries Lead Stock Markets." *Journal of Financial Economics* 83: 367-396.

<sup>2</sup> Moskowitz, Tobias and Mark Grinblatt. 1999. "Do Industries Explain Momentum?" *Journal of Finance* 54: 1249-1290.

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## DATA DESCRIPTION

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The analysis presented in this report requires data from several sources. The net returns on the AlphaStream™ Decile Model for the period April 1993 to December 2007 were provided directly by Robert S. McWilliams, President of AlphaStream Portfolios, Inc. The gross returns from inception through December 2005 have been CPA-attested. Data for calendar years 2006 and 2007 have not yet been CPA-attested. The net returns are calculated based on a 1% annual management fee and 1% annual operating expenses. These fees coincide with the maximum expenses that an investor in the Retail shares of the AlphaStream Special Equity Fund can expect to pay. All of the returns to the Decile Model subsequently discussed are net of these transaction costs.

Data on monthly value-weighted market returns, risk free rates, and risk factors were obtained from Kenneth French's website, located at <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/>. This data has been used in numerous academic studies appearing in the top finance journals. Data on risk factors is available through November 2007.

Much of the following statistical evidence presented in the following sections compares the AlphaStream™ Decile Model to both a value-weighted and equal-weighted index of all stocks traded on the New York Stock Exchange, the NASDAQ Stock Market, and the American Stock Exchange. Value-weighted returns and equal-weighted returns are available through December 2007. These indices are computed using all stocks listed on the three exchanges, including stocks that are illiquid or traded infrequently. In addition, these index returns are gross returns – they do not reflect any transaction costs.

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## ANALYSIS OF PORTFOLIO RETURNS

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Initially, I compare the monthly net returns generated from the Decile Model to the monthly returns from a value weighted index consisting of all stocks listed on the New York Stock Exchange, the Nasdaq Stock Market, and the American Stock Exchange. In order to examine the robustness of the results across different time periods, I examine the returns prior to and after March 2000.

The results are presented in Table 1. The performance of the AlphaStream™ Decile Model is striking. For the full sample period, the average monthly net return is 2.95% versus only 0.92% for the value-weighted index. The difference between these returns is a statistically significant 2.03% *per month*. Compounded over one year, this amounts to a yearly excess of return of approximately 27.27%. This result does not appear to be driven by outliers. An analysis of the model's median returns produces similar results. The Decile Model also outperforms the market index in 67.23% of the 177 months during the sample period.

The strategy is robust to different time periods. In the 83 months prior to March 2000, the Decile Model produced an average monthly excess return of 3.10% and exceeded the value-weighted market return in 74.70% of the months in the sub-period. In the 94 months following March 2000, the model produced excess returns of 1.07% and outperformed the value-weighted market index in 60.63% of the months in this time period.

**Table 1: Average monthly returns from the Decile Model relative to a value-weighted benchmark**

	Number of monthly returns	AlphaStream™ Decile Model net return	Value weighted gross market return	Difference	Proportion of cases where Decile Model net return exceeds value-weighted gross market return
Full sample period	177	2.95% (2.81%)	0.92% (1.52%)	2.03%*** (1.33%)***	67.23%
April 1993 to February 2000	83	4.68% (3.88%)	1.58% (2.04%)	3.10%*** (2.00%)***	74.70%
March 2000 to December 2007	94	1.42% (1.32%)	0.35% (1.12%)	1.07%** (0.87%)**	60.63%

Median values are reported in parentheses. \*\*\*\* indicate statistical significance at the 10%, 5% and 1% levels respectively.

Table 2 compares the net returns on the AlphaStream™ Decile Model to an equal-weighted market index. The results are similar to those presented in Table 1. For the full sample period, the average Decile Model return is 2.95% versus only 1.19% for the equal-weighted portfolio. The difference in returns is highly statistically significant. Returns over the April 1993 to February 2000 period indicate that the Decile Model significantly outperforms the market by 3.20%, on average. Over the March 2000 to December 2007, the Decile Model outperforms the market by 0.45% per month, on average. This difference is not statistically significant. However, the median difference of 0.39% per month is statistically significant at the 10% level.

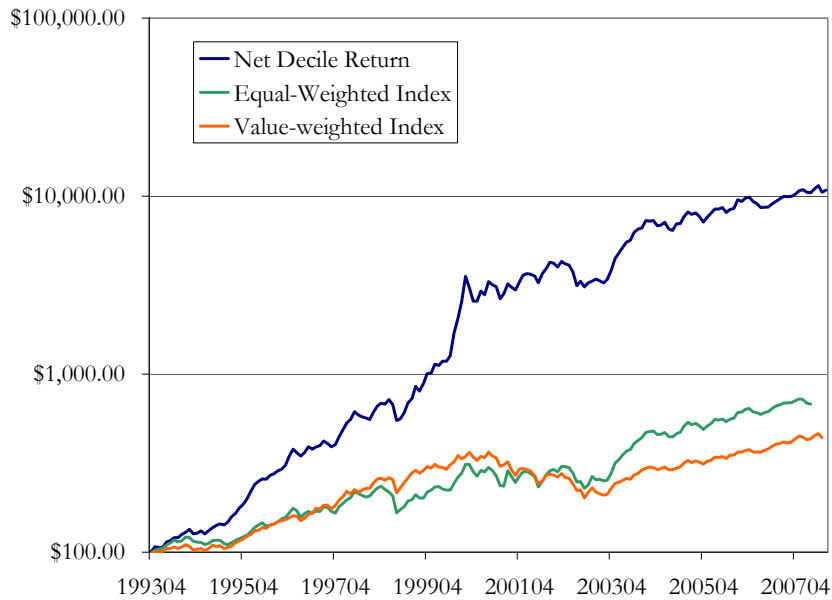
**Table 2: Average monthly returns from the Decile Model relative to an equally-weighted benchmark**

	Number of monthly returns	AlphaStream™ Decile Model net return	Equal weighted gross market return	Difference	Proportion of cases where Decile Model net return exceeds equal-weight gross market return
Full sample period	177	2.95% (2.81%)	1.19% (1.47%)	1.76%*** (1.26%)***	67.23%
April 1993 to February 2000	83	4.68% (3.88%)	1.48% (2.03%)	3.20%*** (2.49%)***	77.11%
March 2000 to December 2007	94	1.42% (1.32%)	0.94% (0.96%)	0.48% (0.39%)*	60.64%

Median values are reported in parentheses. \*\*\*\* indicate statistical significance at the 10%, 5% and 1% levels respectively.

Figure 1 graphically illustrates the performance of the AlphaStream™ Decile Model. The figure considers the value of a \$100 investment in the AlphaStream™ portfolio, a value-weighted market index, and an equal-weighted market index in March 1993. By December 2007, the value of the \$100 invested in the Decile Model would have grown to \$10,790, while the investment in the value-weighted index would have grown to only \$440 dollars. An investment of \$100 in the equal-weighted index would have produced a gain of \$653 over the same time period.

**Figure 1: Cumulative returns for the AlphaStream™ Decile Model versus the equal- and value-weighted market index**



This chart shows the value over time of \$100 invested in the AlphaStream™ Decile Model versus both an equal- and value-weighted market index. The chart is plotted on a logarithmic scale.

As a final examination of the raw returns from the AlphaStream™ Decile Model, I construct funnel charts for the Decile Model, the equal-weighted index, and the value-weighted index. For each category, the average return reported is the average annual buy-and-hold return generated between 1994 and 2007. The standard deviation of returns is calculated over the same time period. Because a full year of data is not available for 1993, this year is excluded from the analysis. The results are reported in Table 3 for the 67<sup>th</sup>, 95<sup>th</sup>, and 99<sup>th</sup> percent confidence intervals for one year through ten year holding periods.

**Table 3: Forecasted probability distribution for AlphaStream™ Decile Model, value-weighted index, and equal-weighted index**

**Panel A: Forecasted probability distribution for AlphaStream™ Decile Model**

	1	2	3	4	5	6	7	8	9	10
Upper 67%	98.14%	83.10%	76.44%	72.47%	69.76%	67.76%	66.21%	64.96%	63.92%	63.04%
Average	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%
Lower 67%	-4.52%	10.51%	17.17%	21.14%	23.85%	25.85%	27.41%	28.66%	29.70%	30.58%
Upper 95%	147.41%	117.95%	104.89%	97.11%	91.80%	87.88%	84.83%	82.38%	80.34%	78.62%
Average	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%
Lower 95%	-53.80%	-24.33%	-11.28%	-3.49%	1.82%	5.74%	8.78%	11.24%	13.27%	14.99%
Upper 99%	177.19%	139.00%	122.08%	112.00%	105.11%	100.03%	96.09%	92.90%	90.27%	88.04%
Average	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%	46.81%
Lower 99%	-83.57%	-45.38%	-28.46%	-18.38%	-11.50%	-6.42%	-2.47%	0.71%	3.35%	5.58%

**Panel B: Forecasted probability distribution for equal-weighted index**

	1	2	3	4	5	6	7	8	9	10
Upper 67%	37.70%	31.28%	28.43%	26.73%	25.57%	24.72%	24.05%	23.52%	23.07%	22.70%
Average	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%
Lower 67%	-6.18%	0.25%	3.09%	4.79%	5.95%	6.80%	7.47%	8.00%	8.45%	8.82%
Upper 95%	58.77%	46.17%	40.59%	37.26%	34.99%	33.32%	32.01%	30.96%	30.10%	29.36%
Average	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%
Lower 95%	-27.24%	-14.65%	-9.07%	-5.74%	-3.47%	-1.80%	-0.49%	0.56%	1.43%	2.16%
Upper 99%	71.49%	55.17%	47.94%	43.63%	40.68%	38.51%	36.82%	35.46%	34.34%	33.38%
Average	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%	15.76%
Lower 99%	-39.97%	-23.65%	-16.42%	-12.10%	-9.16%	-6.99%	-5.30%	-3.94%	-2.82%	-1.86%

**Panel C: Forecasted probability distribution for value-weighted index**

	1	2	3	4	5	6	7	8	9	10
Upper 67%	29.51%	24.28%	21.96%	20.58%	19.64%	18.94%	18.40%	17.96%	17.60%	17.30%
Average	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%
Lower 67%	-6.22%	-0.98%	1.33%	2.72%	3.66%	4.35%	4.90%	5.33%	5.69%	6.00%
Upper 95%	46.67%	36.41%	31.87%	29.16%	27.31%	25.94%	24.88%	24.03%	23.32%	22.72%
Average	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%
Lower 95%	-23.37%	-13.11%	-8.57%	-5.86%	-4.01%	-2.65%	-1.59%	-0.73%	-0.02%	0.57%
Upper 99%	57.03%	43.74%	37.85%	34.34%	31.94%	30.17%	28.80%	27.69%	26.78%	26.00%
Average	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%	11.65%
Lower 99%	-33.73%	-20.44%	-14.55%	-11.04%	-8.65%	-6.88%	-5.50%	-4.40%	-3.48%	-2.70%

It's worth noting in Table 3 that both the lower bound and upper bound for the AlphaStream™ Decile Model are higher than the corresponding lower and upper bounds for the value-weighted and equal-weighted index after 10 years. For example, the lower 99<sup>th</sup> percentile range for the Decile Model is 5.58%, while the corresponding values for the equal- and value-weighted indices are -1.86% and -2.70% respectively. Similarly, the upper 99<sup>th</sup> percentile value for the Decile Model is 88.04%, while the corresponding values for the equal- and value-weighted indices are 33.38% and 26.00%.

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### ADJUSTING FOR RISK

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While the above results are compelling, they make no adjustment for the riskiness of the investment model. The AlphaStream™ Decile Model may produce higher expected returns because substantial risks are involved. The standard approach to adjust for risk is to use the Fama-French three-factor model. Since the Decile Model has a component based on industry momentum, I include a factor to capture momentum as used by Carhart (1997). A brief description of the model is given below.

Fama and French (1992, 1993) have argued that size and value represent two risk factors that are missing from the traditional capital asset pricing model (CAPM). Subsequent research by Jegadeesh and Titman (1993) suggests that momentum (as measured by performance over the previous 12 months) is an additional missing factor from the CAPM. In particular, current research advocates using regressions of the form:

$$R_{it}-R_{ft} = \alpha_i + \beta_i R_{mt}-R_{ft} + s_i \text{SMB}_t + h_i \text{HML}_t + m_i \text{UMD}_t + \varepsilon_{it} ,$$

to measure abnormal performance,  $\alpha_i$ .

In the above equation, SMB represents the difference between the returns to portfolios of small- and large-capitalization firms, holding constant the B/M ratios for these stocks; HML represents the difference between the returns to portfolios of high and low B/M ratio firms, holding constant the capitalization for these stock; and UMD is the average return on the two high prior return portfolios minus the average return on two low prior return portfolios. Thus, the regression coefficients  $s_i$ ,  $h_i$ , and  $m_i$  represent exposures to size, value, and momentum risk. The estimate of the intercept,  $\alpha_i$ , produces an estimate of the average monthly risk-adjusted performance. A significantly positive intercept indicates that the model has performed better than expected. The actual factors:  $R_{mt}-R_{ft}$ , SMB, HML, and UMD, are publicly available at <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/>. The factors are obtained for the full sample period from April 1993 to December 2007.

The above factor model is used to examine the average monthly abnormal returns produced by the AlphaStream™ Decile Model after adjusting for risk. The results are presented in Table 4. The key term is the intercept, which produces a measure of the average monthly risk-adjusted performance. For the full sample period, the average monthly risk-adjusted performance is 1.76%, which is highly statistically significant. Compounded over one year, this amounts to annual abnormal performance of approximately 23%.

An analysis of the two sub-periods indicates that the Decile Model seems to perform better in bull markets. During the 1993 to February 2000 period, the model produced average monthly risk-adjusted returns of 2.94%. During the sample period beginning in March 2000 and running through December 2007, the average monthly abnormal return falls to 0.72%, which is statistically significant at the 5% level. Compounded over one year, however, this still amounts to an annual abnormal return of approximately 9.00%.

**Table 4: Regressions of AlphaStream™ returns on the Fama-French factors**

Specification	Intercept	Mkt – R <sub>f</sub>	HML	SMB	UMD	Number of Obs.	R <sup>2</sup>
Full sample period	1.76 (0.00)	1.03 (0.00)	-0.15 (0.18)	0.97 (0.00)	0.17 (0.01)	177	0.74
April 1993 to February 2000	2.94 (0.00)	0.82 (0.00)	-0.58 (0.02)	1.02 (0.00)	0.10 (0.50)	83	0.72
March 2000 to December 2007	0.72 (0.03)	1.13 (0.00)	0.16 (0.14)	0.91 (0.00)	0.11 (0.06)	94	0.81

The dependent variable in each regression is the monthly return from the AlphaStream™ Decile Model minus the risk free rate. Mkt-R<sub>f</sub> is the return on a portfolio formed by subtracting the one-month Treasury bill rate from the value-weighted market return. SMB is the difference each month between the return on small firms and big firms. HML is the difference each month between the return on a portfolio of high book-to-market stocks and the return on a portfolio of low book-to-market stocks. UMD is the difference each month between returns on firms with high and low prior year returns. The intercept is a measure of the average monthly risk-adjusted abnormal performance. P-values are reported in parentheses.

In sum, evidence from Fama-French regressions indicates that the AlphaStream™ Decile Model produces positive and significant monthly abnormal performance of between 0.69 and 2.94%. On an annual basis, this amounts to abnormal performance of between 8.6% and 42% depending on the time period examined.

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#### SUMMARY

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The magnitude of the abnormal performance produced by the AlphaStream™ Decile Model is striking. For the full fourteen year time period examined and after adjusting for risk, abnormal returns are a statistically significant 1.76% per month. Compounded over one year, this implies that the AlphaStream™ Decile Model outperforms the market by as much as 23% on a risk-adjusted basis. Moreover, this result is robust to different time periods and to different benchmarks for measuring abnormal returns.

## Appendix One

### Analysis of the Downside Standard Deviation of Returns

#### I. Description of the Downside standard deviation of returns

The statistical analysis of the AlphaStream™ Decile Model discussed in the main text focuses on the mean and standard deviation of the strategy's return. An alternative measure of risk that has received support from both academics and practitioners is the downside standard deviation of returns, or semi-deviation for short, which for any benchmark return B is given by:

$$S_B = \sqrt{\left(\frac{1}{T}\right) \times \sum_{t=1}^T \text{Min}\{(R_t - B), 0\}^2}$$

where R denotes the returns, t indexes time, and T is the number of returns in the sample. The semi-deviation gives positive weight only to the deviations below the benchmark. In other words, returns below B increase the semi-deviation, but returns above B do not. Essentially, the semi-deviation defines risk as volatility below the benchmark. In this study, the benchmark is the average return. For example, the semi-deviation for the AlphaStream™ Decile Model is calculated as the standard deviation of returns below the average return for the model.

The semi-deviation is a useful measure of risk for a number of reasons. First, investors do not dislike upside volatility; they only dislike downside volatility. Second, the semi-deviation is more useful than the standard deviation when the underlying distribution of returns is asymmetric and just as useful when the underlying distribution is symmetric. That is, the semi-deviation is at least as useful a measure of risk as the standard deviation. Finally, the semi-deviation combines into one measure the information provided by variance and skewness.

The use of semi-deviation has been well accepted in the academic community. Nobel prize winner Harry Markowitz noted "Semi-variance seems more plausible than variance as a measure of risk, since it is concerned only with adverse deviations."<sup>3</sup>

I also examine several other measures to capture the downside risk of the AlphaStream™ Decile Model. These include the gain (loss) deviation, which measures the standard deviation of only the positive (negative) returns, the Sharpe ratio, and the Sortino ratio, which is defined as the excess return relative to the risk-free rate divided by the semi-deviation. I also consider the Up (Down) Capture Ratio, which is calculated as the average return divided by the benchmark, considering only periods where the benchmark was up (down). I use the value-weighted return as the benchmark in this portion of the analysis.

#### II. Analysis

The results of this analysis are presented in Table A2.1. The results presented utilize data from the period April 1993 to December 2007. As discussed previously, the average monthly net return for the Decile Model is 2.95%, which greatly exceeds the return on the equal-weighted market index and the value-weighted market index. The standard deviation of the AlphaStream™ Decile Model is also significantly higher. The Decile Model has a monthly standard deviation of 7.73% as compared to

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<sup>3</sup> See Markowitz, Harry (1991). "Foundations of Portfolio Theory." *Journal of Finance* 46, 469-477.

the 5.23% and 4.16% of the equal-weighted and value-weighted strategies respectively. An analysis of the gain and loss deviation for the AlphaStream™ Decile Model, indicates that the volatility of the upside performance is greater than the volatility of the downside performance. This indicates that much of the volatility of the Decile Model is on the upside, which is generally less of a concern to an investor.

**Table A.1 Analysis of Downside Risk and Efficiency**

<b>Variable</b>	<b>AlphaStream™ Decile Model</b>	<b>Equal-weighted market Index</b>	<b>Value-weighted market index</b>
Average monthly return	2.95%	1.19%	0.92%
Monthly standard deviation of returns	7.73%	5.23%	4.16%
Gain Deviation	6.11%	3.32%	2.15%
Loss Deviation	4.21%	3.54%	3.01%
Semi-deviation	4.30%	3.27%	2.78%
Up capture ratio	1.88	1.14	Nmf
Down capture ratio	0.85	0.97	Nmf
Monthly Sharpe Ratio	0.36	0.19	0.15
Monthly Sortino Ratio	0.64	0.30	0.23

The up capture ratio for the AlphaStream™ Decile Model, calculated using the value-weighted index as the benchmark, is 1.88 implying that the Decile Model captures 188% of the market increase. This is substantially higher than the corresponding number for the equal-weighted index. The down capture ratio indicates that the Decile Model captures 85% of the market decline. This is lower than the 97% of the decline captured by the equal-weighted index.

An analysis of the Sharpe Ratios indicates that the AlphaStream™ Decile Model produces a higher return per unit of volatility than either the equal-weighted market index or the value-weighted index. Similar conclusions can be drawn by considering the Sortino Ratio, which replaces the standard deviation of returns in the previous calculation of the Sharpe ratio with the semi-deviation. The Sortino ratio is substantially higher for the Decile Model than either the equal-weighted index or the value-weighted index. In other words, the AlphaStream™ Decile Model provides the highest reward per unit of downside volatility.

### **III. Conclusion**

In the appendix, I examine the risk of the AlphaStream™ Decile Model by decomposing volatility into an upside component and a downside component. The loss deviation for the Decile Model is substantially smaller than the gain deviation. In other words, much of the volatility of the Decile Model is on the upside, which is less of a concern to the investors. A comparison of the Sharpe and Sortino ratios indicates that AlphaStream™ Decile Model produces significantly better performance than either the equal-weighted market index or the value-weighted market index.

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**Areas of Specialization:** Market Microstructure, Corporate Finance

### **Education**

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