PRODUCT INSIGHTS

www.mscibarra.com

Converting Scores into Alphas

A Barra Aegis Case Study

May 2010

Ilan Gleiser
Dan McKenna

Abstract

The goal of this product insight is to illustrate to portfolio managers how to use the Barra Aegis System to convert scores from research analyst's recommendations and insights into the manager's quantifiable expected returns, or alphas, in connection with constructing portfolios that maximize those alphas while minimizing risk, i.e., optimal portfolios.

Introduction

Research Department recommendations and insights are often translated by portfolio managers into scores, as we will show in this case study.

However, the scores themselves are not sufficient to be considered alphas. The difference between scores and alphas is that scores are usually rankings that are calculated in a screening process or as a result of analyst recommendations. If scores are not converted into alphas, the portfolio constructed by the optimization process may end up ignoring the alphas, i.e, eating the alphas[1] in quant lingo.

Potential benefits of converting scores into alphas:

- Bring structure and intuition to the process
- Inputs can be in unit-less scores, but output is in units of return
- Relates score to alpha through two measurable quantities : Asset volatility and forecasting skill (Information Coefficient - IC)
- Consensus forecasts imply no alphas and lead to benchmark holdings
- Larger adjustments for assets with high volatility

1. Converting Scores into Alphas

In order to convert scores into alphas for robust inputs for the optimization process, Barra utilizes Richard Grinold's rule of thumb published in his 1994 article called "Alpha is Volatility Times IC Times Score".

$$\alpha = IC * Volatility_i * Score_i$$

Where:

***IC*: Information Coefficient**

Volatility$_i$*: Residual volatility of asset *i

Score$_i$*: Score of asset *i

Information Coefficient

The information coefficient is a measure of forecasting skill. It tells how forecasts align with actual returns. Information coefficients are typically bounded between –1 and +1, where higher numbers

[1]This effect is often referred to as "alpha eating." For more details, please refer to "Alpha is Volatility Times IC Times Score" by Richard C. Grinold, The Journal of Portfolio Management, Summer 1994, or "Active Portfolio Management", Richard C. Grinold and Ronald N. Kahn, Probus Publishing, Copyright 1995.

indicate better forecasting skill. This coefficient is mathematically defined as forecasted residual return divided by realized residual return. The residual return is the part of the return that is uncorrelated with the benchmark's return.

Generally speaking, many portfolio managers would view a "good" IC as 0.05 and a "very good" IC as 0.10. In practice, the most appropriate choice of IC is dependent on many other factors such as the market environment, specific strategies, etc. IC can also be understood as the correlation between signal and realized returns.

Residual Volatility

The residual volatility is defined as an asset's residual risk[2]. This component of the formula used to convert scores to alphas allows for alphas to be dependent on the fact that two assets that perform similarly (identical returns) may actually have very different risk characteristics and therefore different alphas. Portfolio managers expect to be compensated (in terms of higher expected returns) for taking on a higher amount of risk.

Score

The score is a standardized measure of an asset's forecast. Analysts' recommendations (Strong Buy/Buy/Neutral, e.g., 2, 1, 0) can be considered one type of signal, which is then standardized to obtain scores. It is necessary to standardize scores so that assets can be compared to one another. For missing scores, the signal can be set to zero. Another type of signals could be cardinal numbers from a momentum model (1 to n) or expected returns from a dividend discount model. The scores or raw forecasts contain information about future returns as well as noise. Refining the forecasts can result in a more successful optimization process.

2. Key Benefits of Using Barra Aegis in Portfolio Construction

- Leverage the insight provided by the Barra's risk models
  - Optimize across GICS®[3] sectors and industries
- Precisely align portfolios with your expectations
  - Constrain portfolios along style factors like Value, Growth, Momentum or Volatility or user-defined dimension, such as EV/EBITDA or Debt/Assets
- Convert your scores into alphas utilizing Richard Grinold's insights from "Active Portfolio Management"
  - Take advantage of a stock's residual volatilities provided by Barra's Risk model
- Evaluate optimal portfolios more efficiently
  - Easily evaluate the impact of constraints and optimization parameters on the optimal portfolio

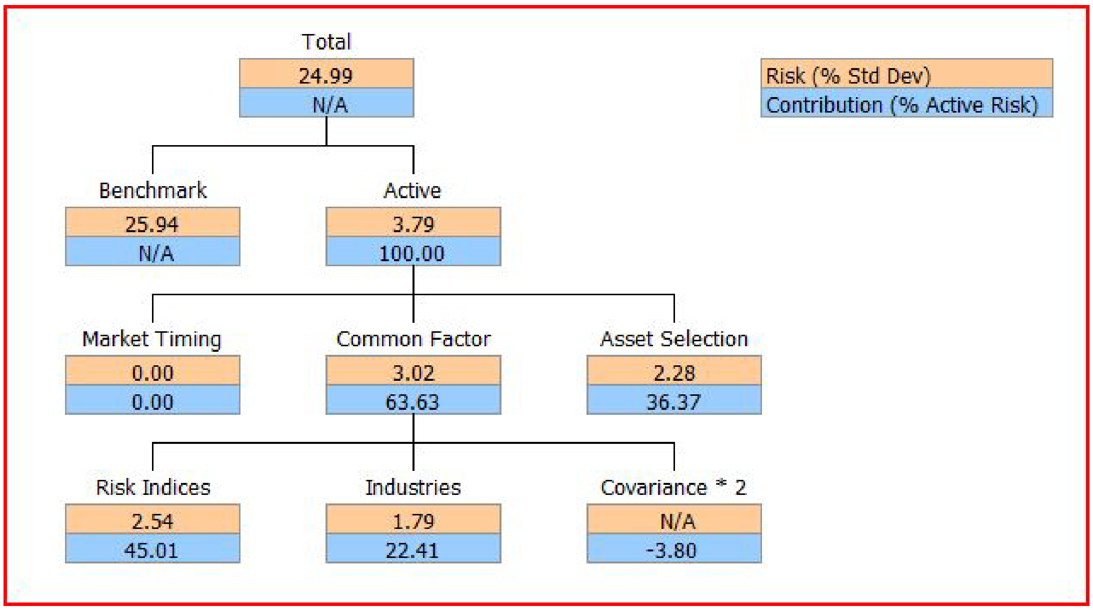
[2]The definition of residual risk is NOT the same as specific risk. Specific risk is the unsystematic risk found in Barra's Multi Factor Models. Residual risk is defined as the standard deviation of an asset's residual return from a Capital Asset Pricing Model (CAPM) framework. Mathematically, residual risk = square root [(total variance of asset) – (beta of asset with respect to the market)^2(total variance of the market)].

[3] Global Industry Classification Standard

3. Case Study: The Atlantis Portfolio

Mr. Cayce, a fundamental portfolio manager at Growing Capital Funds, is new to Barra Aegis and is interested in learning more about the ways in which both Barra Aegis and the Barra Optimizer can help his portfolio management process. Mr. Cayce's firm has analysts who cover the stocks in the MSCI US Prime Market 750 Index[4]. The analysts use fundamental analysis to select securities that they are comfortable owning. Currently 211 of the 750 securities have passed the analysts' screen. On top of deeming securities appropriate to purchase, the analysts' give strong buy, buy or neutral recommendations to each of the 211 securities depending on the quality of the fundamentals. They also give a cheap, fair or rich score, for each security as a function of the security price at the given time. Then, using the universe of 211 stocks Mr. Cayce selects between 50-80 stocks to construct his portfolio. Mr. Cayce tends to stay fairly close to the benchmark in regard to his sector weighting, relying on fundamental analysis to make his stock selection.
The first task at hand is to use Aegis Portfolio Manager to help better understand the risk of the current portfolio. Figure 1 is a screenshot of a Risk Decomposition Chart where Mr. Cayce can look at his portfolio's risk broken down across the Barra common factors and asset specific risk.

Figure 1: Risk Decomposition Chart



The Total Predicted Risk of Mr. Cayce's portfolio is 24.99%. This means that over the course of next year, the Atlantis portfolio should outperform or underperform its expected return by plus or minus 24.99%, approximately 68% of the time.

In addition Mr. Cayce is taking 3.79% of Active Risk, or Predicted Annualized Tracking Error, meaning, that it is expected that the portfolio will outperform or underperform the benchmark by plus or minus 3.79%, approximately 68% of the time. Of the Active Risk, approximately two thirds

[4] The MSCI US Prime Market 750 Index represents the aggregation of the MSCI US Large Cap 300 and the MSCI US Mid Cap 450 Indices.

is coming from the Barra Common Factors[5] and one third from Asset Selection or Company Specific Risk. Within the Common Factors 45% of his portfolio's Active Risk is coming from Risk Indices or Barra's Style Factors such as, Value, Growth, Momentum and Size.

The next step is for Mr. Cayce to take a deeper look into the risks coming from Risk Indices, or Style Factors (Figure 2). Mr. Cayce expected his portfolio to have an active exposure to growth, due to the nature of his firms' fundamental process having a growth bias; however, one interesting take away is that within the Risk Indices most of the risk is coming from Volatility and Momentum as shown in the Contribution to Active Risk Column.

Figure 2: Risk Decomposition by Risk Indices

RISK DECOMPOSITION

	Risk (% Std Dev)	Contribution (% Active Risk)
Market Timing	0.00	0.00
- Risk Indices	2.54	45.01
Volatility	1.23	10.58
Momentum	1.33	12.27
Size	0.63	2.80
Size Non-Linearity	0.10	0.07
Trading Activity	0.03	0.01
Growth	0.40	1.11
Earnings Yield	0.14	0.14
Value	0.59	2.42
Earnings Variation	0.45	1.44
Leverage	0.09	0.06
Currency Sensitivity	0.20	0.27
Yield	0.30	0.61
Non-Est Universe	0.10	0.07
RI Covariance*2	N/A	13.17
+ Industries	1.79	22.41
Covariance * 2	N/A	-3.80
Asset Selection	2.28	36.37
Active	3.79	
Benchmark	25.94	
Total	24.99	

Barra

Now that we have gone through the risk decomposition of the portfolio and identified both the intended and some unintended sources of risk, we will take a look at optimizing the portfolio.

5 Stock movements are influenced by various common factors. These factors allow a portfolio's risk to be predicted and decomposed into meaningful terms. The Barra multi-factor models compute an asset's sensitivities to factors such as industry groups, market characteristics and fundamental data.

3.1 Converting Scores into Alphas

Mr. Cayce is interested in creating optimal portfolios using the Barra Optimizer in Aegis Portfolio Manager. Mr. Cayce is hoping that by using an Optimizer, he will come up with ideas on different ways to optimally weight the portfolio, as well as different combinations of securities using his approved list. One thing that is important to Mr. Cayce is to utilize his general portfolio construction framework and his analyst's views on the securities in this process. Mr. Cayce's has used his analysts' fundamental qualitative rankings to produce a 0, 1, 2 scoring system for the analysts' opinions on both the price and the fundamentals of each security in his available to buy universe (Figure 3). Then, he weights both measures equally to create a 5 level ranking system for the stocks in the available to buy universe (Figure 4).

Figure 3: Scoring system for Fundamentals and Price

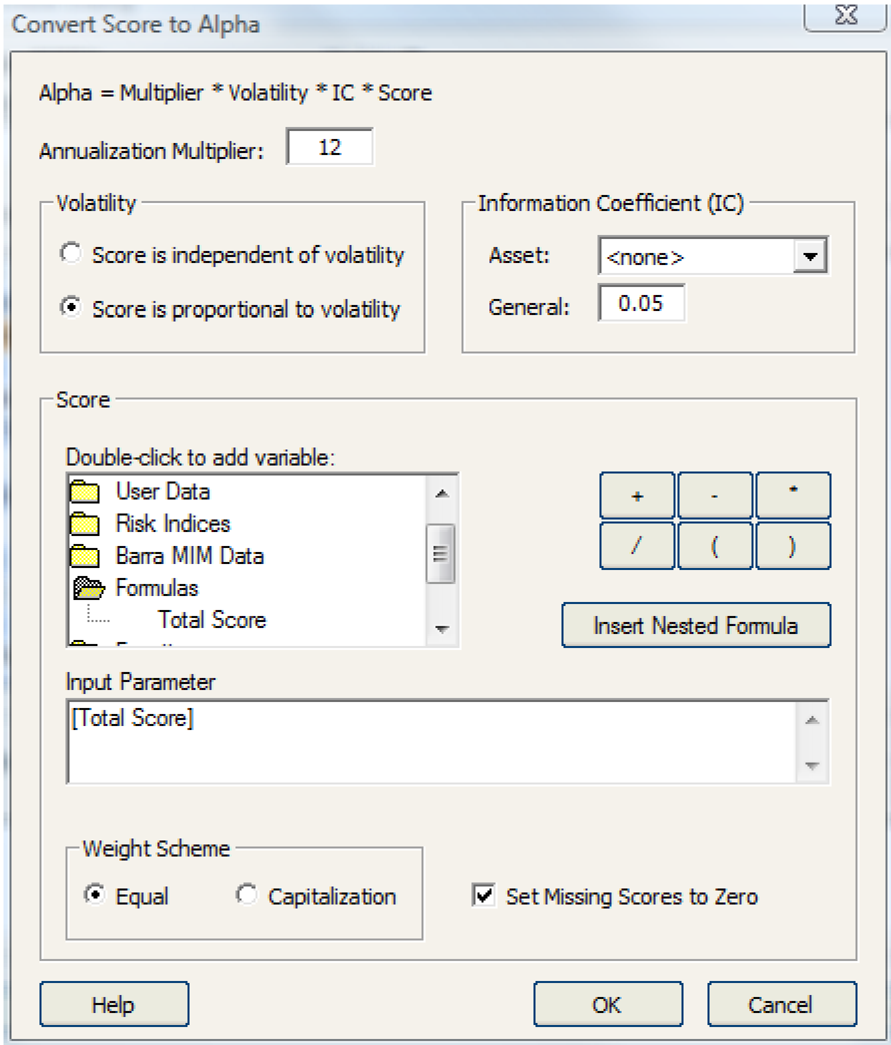
Fundamentals/Price	**2 Cheap**	**1 Fair**	**0 Rich**
2 Strong Buy	4	3	2
1 Buy	3	2	1
0 Neutral	2	1	0

Figure 4: Weighted Score System

	Total Score
Cheap \Strong Buy	4
Cheap \Buy or Fair\Strong Buy	3
Cheap \Neutral or Fair \Buy or Rich\ Strong Buy	2
Fair \Neutral or Rich \Buy	1
Rich \Neutral	0

Once he has used the analysts' qualitative rankings to create scores for the securities in the available to buy universe, he converts those scores into alphas to use them as inputs for the Optimizer (Figure 5).

Figure 5: Converting Scores into Alphas in Barra Aegis



3.2 Same Scores Different Alphas

An important takeaway from converting the scores into alphas is that assets with the same total score can have different alphas as a result of having different residual volatilities. For instance, in this hypothetical example, both Costco (COST) and Wal-Mart (WMT) are in the same industry and both have total scores of 4. However, after converting the scores into alphas, we can see that by taking into account the residual volatility of each asset they have slightly different alphas (Figure 6).

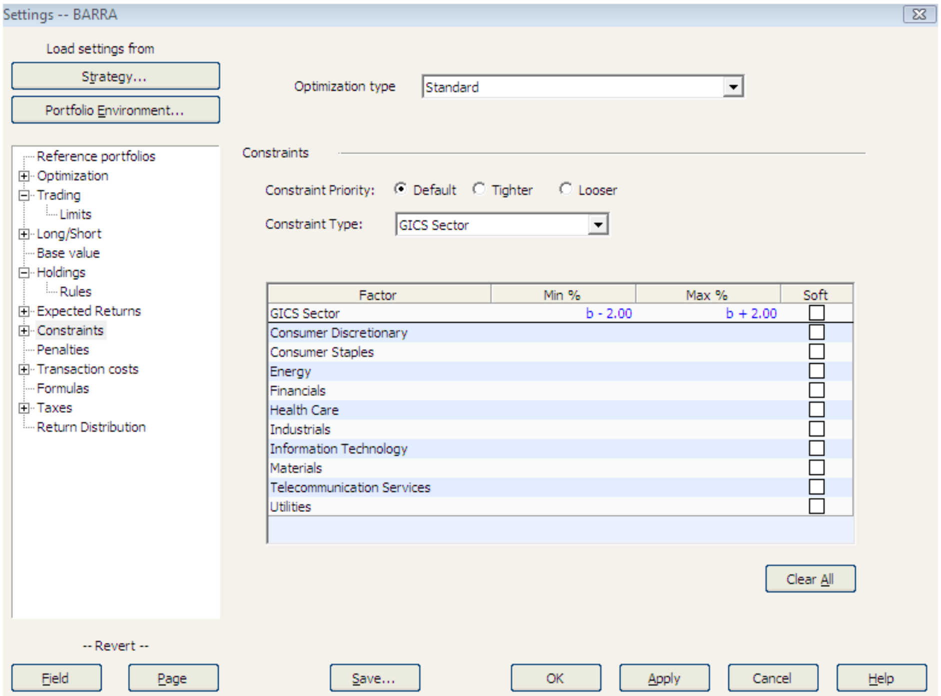
Figure 6: COST and WMT: Same Scores, Different Alphas

Asset	Information Coefficient	Residual Volatility	Total Score	Alpha
ABT	0.05	19.78 %	4	7.70 %
COST	0.05	22.77 %	4	7.00 %
T	0.05	20.79 %	4	7.46 %
HPQ	0.05	18.00 %	4	8.11 %
SLB	0.05	32.90 %	4	4.66 %
HON	0.05	16.51 %	3	5.38 %
IBM	0.05	17.58 %	4	8.21 %
HD	0.05	21.78 %	4	7.23 %
MS	0.05	28.81 %	4	5.61 %
DOV	0.05	19.79 %	3	4.62 %
FFIV	0.05	31.19 %	1	-4.16 %
JNJ	0.05	18.81 %	4	7.92 %
TIF	0.05	26.95 %	3	2.97 %
EMR	0.05	18.74 %	4	7.94 %
CELG	0.05	27.85 %	3	2.76 %
PBG	0.05	21.49 %	2	1.16 %
ADP	0.05	15.89 %	4	8.60 %
ACN	0.05	20.87 %	4	7.44 %
WMT	0.05	21.60 %	4	7.28 %
MDT	0.05	21.46 %	4	7.31 %
BBY	0.05	27.37 %	2	-0.20 %

4. Setting up Optimization Constraints in Barra Aegis

Now that Mr. Cayce has converted his scores into alphas he can set up his case in Barra Aegis to run the optimization. Mr. Cayce would like to set a number of constraints for his optimization, because he wants the optimal portfolio to roughly follow the parameters of his mandate and his investment style. Mr. Cayce would like to limit his GICS sector weights to plus or minus 2% of the benchmark weights, as can be seen in Figure 7 below.

Figure 7: Setting up Sector Constraints



He typically invests in 50-80 assets so he would like the optimal portfolio to have approximately that many assets and limit the position size in any one security to 3.5%. He will use the 211 securities that his analysts' have deemed appropriate for purchase as his investable universe. After Mr. Cayce has set up the constraints in Barra Aegis, he runs the optimization.

Figure 8 is an executive summary which shows some high level statistics on the initial portfolio and the optimal portfolio.

Figure 8: Initial vs. Optimized Portfolio

EXECUTIVE SUMMARY			
	Initial Portfolio	Managed Portfolio	Change
Total Risk	24.99	23.53	-1.46
Active Risk	3.79	4.54	0.75
Active-return-at-risk (%)	-6.33	-7.37	-1.04
Active-return-at-risk (Value)	-6,328,701.74	-7,371,764.97	-1,043,063.23
Probability Level (%)	5.00	5.00	N/A
Predicted Beta	0.95	0.90	-0.06
Active Predicted Beta	N/A	N/A	N/A
Coefficient of Determination	0.00	0.00	0.00
Active Coefficient of Determination	0.00	0.00	0.00
Forecasted Information Ratio	0.01	1.33	1.32
Implied Information Ratio	-0.07	-0.16	-0.10
Sharpe Ratio	0.00	0.26	0.25
Turnover			44.28
Transfer Coefficient	-0.09	0.60	0.69
Objective Summary			
	Initial Portfolio	Managed Portfolio	Change
Expected Return	0.05	6.04	5.99
Risk Cost	0.11	0.15	0.05
Risk Adjusted Expected Return	-0.06	5.88	5.94
Amortized Transaction Cost		0.17	
Penalties		0.00	
Utility		5.71	

The optimization process, by taking into account the correlations between the securities selected by the manager, has vastly improved many portfolio measures that Mr. Cayce focuses on every day. The optimal portfolio has a higher expected return, as well as a better Sharpe Ratio and Forecasted Information Ratio. Also the Predicted Beta[6] on the portfolio has decreased.

[6] Predicted beta, the beta derived from the Barra risk models and the beta that appears throughout Barra Aegis, is a forecast of a stock's sensitivity to the market. Predicted beta is also known as fundamental beta, because the Barra risk models are based on fundamental risk factors. These risk factors include industry exposures as well as various 'style' attributes called Risk Indices, such as Size, Volatility, Momentum and Value. Because we frequently re-estimate a company's exposure to these risk factors, the predicted beta reflects changes in that company's underlying risk structure immediately, unlike historical beta. Many studies have demonstrated that predicted betas significantly outperform historical betas as predictors of future stock behavior.

Conclusion

The goal of this paper is to demonstrate how to use the tools in the Barra Aegis system to help capture and apply investment insights in a systematic fashion in order to build portfolios that reflect the manager's forecasts with no unintended risks. We illustrated how a manager can use the Barra Optimizer as a tool to help him chose the best available opportunities, given his preferences, expressed in terms of alphas. Further, we demonstrated that by converting scores into alphas in the Barra Optimizer, managers may reduce the undesired effect of "alpha eating".

Contact Information

clientservice@mscibarra.com

Americas	
Americas	1.888.588.4567 (toll free)
Atlanta	+ 1.404.551.3212
Boston	+ 1.617.532.0920
Chicago	+ 1.312.675.0545
Montreal	+ 1.514.847.7506
Monterrey	+ 52.81.1253.4020
New York	+ 1.212.804.3901
San Francisco	+ 1.415.836.8800
Sao Paulo	+ 55.11.3706.1360
Stamford	+1.203.325.5630
Toronto	+ 1.416.628.1007

Europe, Middle East & Africa	
Amsterdam	+ 31.20.462.1382
Cape Town	+ 27.21.673.0100
Frankfurt	+ 49.69.133.859.00
Geneva	+ 41.22.817.9777
London	+ 44.20.7618.2222
Madrid	+ 34.91.700.7275
Milan	+ 39.02.5849.0415
Paris	0800.91.59.17 (toll free)
Zurich	+ 41.44.220.9300

Asia Pacific	
China North	10800.852.1032 (toll free)
China South	10800.152.1032 (toll free)
Hong Kong	+ 852.2844.9333
Seoul	+ 822.2054.8538
Singapore	800.852.3749 (toll free)
Sydney	+ 61.2.9033.9333
Tokyo	+ 81.3.5226.8222

www.mscibarra.com

Notice and Disclaimer

About MSCI Barra

MSCI Barra is a leading provider of investment decision support tools to investment institutions worldwide. MSCI Inc. products include indices and portfolio risk and performance analytics for use in managing equity, fixed income and multi-asset class portfolios.

The company's flagship products are the MSCI International Equity Indices, which include over 120,000 indices calculated daily across more than 70 countries, and the Barra risk models and portfolio analytics, which cover 59 equity and 48 fixed income markets. MSCI Barra is headquartered in New York, with research and commercial offices around the world.