September 2002

Northfield News

Quarterly Newsletter for the Friends and Clients of Northfield Information Services

PACO: Out with the Old, In with the New (and Improved!)

We recently released a "start from scratch" new version of our PACO asset allocation software system. The new system has been created to be the most sophisticated asset allocation product available for the investment community. It will be available in three versions, targeted to (a) wealth management practices, (b) general institutional use and (c) quantitative analysts.

The currently available Version 1.1 has all of the features of the old PACO, in a new form. The Windows interface is much easier to navigate, with better graphics and lots of new convenience features. It is also faster and more reliable as the result of converting to a client-server computer architecture. The new PACO can be used on a single laptop or distributed via the internet to thousands of users from a single server. Northfield is maintaining two servers, so that users will no longer have to deal with data updates. It will all be done for you.

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Asset Class Correlations from the Bottom Up Using the Northfield Everything Everywhere Model

By Dan diBartolomeo and Sandy Warrick

When we forecast the correlations between asset classes as part of an asset allocation exercise, investors would generally first examine the historical correlations between the subject asset classes. However, when we do this we really are not measuring correlations between the asset classes, we are really observing the past correlations of market index indices we use as representations of the behavior of the asset classes.

There is a very extensive finance literature on asset class correlations, and the evolution of this correlation structure through time. Most of this literature looks at the time series properties of market index returns or how trends in business conditions such as industrial globalization, and trade policies impact the correlations of markets. Little of this literature has considered the distinction between measuring asset class correlations in the past and measuring the correlations of market indices we use as proxies for the actual asset classes.

Market indices are generally made up of hundreds or thousands of individual securities, representing a wide range of issuers. It is often convenient for us to think of such a diverse group of securities as an object with properties that are highly consistent through time. This is a very poor assumption.

For example, the Standard & Poor's 500 stock index of on December 31st, 1999 would

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Inside this Issue

- PACO– New and Improved version now available
- New Research by Northfield's Dan diBartolomeo and Sandy Warwick
- Northfield Staff speaking engagements
- Northfield's Global Presence Expanding

Special points of Interest:

- Upcoming Seminars: London, Amsterdam
- New Performance Attribution Beta
- New Run(0) Excel Add-in now available
- New Managed Accounts System Unveiled
- London Office Technical Support

2002 European Seminars

We are pleased to announce two 1 day seminars to be held in Europe. The St Martins Lane hotel, London will be host on October the 14th and The Grand, Amsterdam on October the 16th. Both events will cover a variety of topics currently facing both European investors and investors in Europe. The working sessions address both theoretical and operational issues. Particular attention is given to cutting edge techniques applied to improve the reliability and viability of regional international investment.

The agenda is still being finalized. Two Northfield client presentations will be added. Further updates will be posted to http://www.northinfo.com/events as they become available. The sessions that have been confirmed are listed below:

Subtleties of Risk Management for Long/Short Portfolios

Dan diBartolomeo, Northfield Information Services

Hedge fund portfolios differ from traditional portfolios in their risk management requirements in a variety of ways. Due to leverage and the generally higher frequency of transaction costs, long/short portfolios are very sensitive to non-linear risk factor effects, as well as skewness and kurtosis. In addition, these portfolios are more highly impacted by short-term risk effects and the asymmetrical influence of bad security selection on the long and short sides. We will review recently published papers such as those by Andrew Lo and Jarrod Wilcox and then proceed to discuss various aspects of Northfield's analytical research that is of particular importance to long/short portfolios

Risk Modeling of Convertible Bonds

Nick Wade, Northfield Information Services

Analyzing the risks of convertible bonds has been a long-standing difficulty for the asset management community. Despite the difficulties such instruments remain a popular investment vehicle, with particular growth in the area of convertible arbitrage related hedge funds. Combining elements of bonds, credit risk, equities and derivatives, the complexity of these instruments has caused them to be intractable for conventional factor models of security covariance. We will present a model that addresses all the major risk aspects of convertible bonds. Our model operates within a common framework with the analysis of regular equities and straight fixed income, so as to permit the risk analysis and optimization of mixed asset portfolios at the security level.

Just Because We Can Doesn't Mean We Should: the Fallacy of High Frequency Performance Attribution

Dan diBartolomeo, Northfield Information Services

Many investment firms are now attempting to do performance attribution on a daily basis because it allows closer conformity to accounting returns than do procedures based on periodic buy-and-hold assumptions. While systems have been created to do this (including Northfield's upcoming new system) there are powerful statistical problems that suggest that doing performance attribution on a higher frequency basis may actually be analytically inferior to the current approach of less frequent observations.

Lunch will be served at midday. Following the end of the seminar, there will be an evening cocktail reception at the hotel. The venues are as follows:

Monday, October 14th
St. Martins Lane Hotel
45 St. Martins Lane
London, CW2N 4HX

Wednesday, October 16th
The Grand • Amsterdam
Oudezijds Voorburgwal 197
1021 EX Amsterdam
The Netherlands

If you would like to attend, contact Kathy Prasad at 617.208.2020, kathy@northinfo.com, or download a registration form from http://www.northinfo.com/events and fax to 617.451.2122. There is no cost of participation, but the number of attendees will be strictly limited to just 30, so a prompt RSVP is suggested. Registrations must be received by Friday, October 4, 2002

Newport Summer Seminar Wrap Up

Tennis Hall of Fame • Newport, RI • June 7, 2002

International Tennis Hall of Fame

Northfield's annual summer seminar took place at the International Tennis Hall of Fame, in Newport, RI on June 7th. The seminar presented recent research and technical advances to a packed audience of Northfield clients and friends.

The agenda consisted of 6 presentations. Topics included high frequency performance attribution, management of separate accounts for high net worth individuals, integrating mutual funds into an equity risk framework, quantifying tax efficiency, the source of value, and trading cost control as an exercise in portfolio risk management.

As is customary, the seminar coincided with the USA Professional Championship of Court Tennis. Following the seminar, attendees viewed a court tennis demonstration, and then a Semi-Final Match of the US Pro Court Tennis Championships. Court Tennis, or "real tennis" is the medieval sport that is the progenitor of all modern racquet sports.

After tennis on Friday evening, everyone enjoyed a relaxing oceanfront dinner party held at the nearby Castle Hill Inn & Resort. Complete seminar proceedings have been posted to our website at http://www.northinfo.com/papers.

Calendar of Speaking Engagements

Northfield staff members continue to be highly sought after speakers at financial industry events. Recent and upcoming presentations are listed below:

Northfield's Russ Hovanec, gave two presentations entitled "Managing Taxable Accounts" at the Money Management Institute's regional conference in Boston on June 19, 2002.

Northfield's Nick Wade, gave a well received speech at the QWAFAFEW meeting in Boston on July 16th. The topic was on convertible bonds and titled "A unified approach to equity risk, credit risk, and convertibility using dual binomial trees. This finds immediate application in our Everything Everywhere model." This presentation has been posted to the Northfield website at www.northinfo.com/papers.

Northfield President Dan diBartolomeo, will be speaking at the Alpha Strategies conference, Sept 8-10 in London. He will be presenting a paper titled "Making Covariance-Based Portfolio Risk Models Sensitive to the Rate at which Markets Reflect New Information" which was co written with Northfield's Sandy Warrick. Dan will also be presenting this paper at the Southern Finance Association Conference in Key West, Florida, November 21-23. This paper has been posted to the Northfield website at www.northinfo.com/papers.

At the M-Cubed Conference in Johannesburg, South Africa, September 12-14, Dan will be conducting an all day seminar on investment policy issues for pension funds. Dan will also be speaking in Hong Kong on September 26th about Northfield's new China Risk model at the Alpha Neural Network Finance Conference, go to www.alphaneural.com for more information.

Lastly, Dan will be speaking at the second annual Factset PMW User Conference, in Atlanta Georgia, November 6-8. The topic will be "Managing Firm-Wide Global Risks Using a Model of Northfield's Everything Everywhere Model." Further information is available at http://www.factset.com/pmw2002.

Northfield's' Sandy Warrick will be speaking at the SRI Summit in Vermont on September 8th, the topic is "Risk Management of Socially Screened Portfolios." He will also be speaking at the Investment Management Consultants Association Conference in Chicago, on November 7th. The topic will be on the Management of Taxable Accounts.

Managed Accounts System Unveiled

We will be exhibiting and doing showcased demonstrations of Northfield's new Managed Accounts Reporting System (MARS) at the Managed Accounts Summit in New York on September 18-19, 2002 and the Managed Accounts Solutions conference on October 16-17, 2002. MARS is jointly developed and marketed by Northfield and Softpak Financial Systems and is a straight through processing solution that streamlines the investment process for managed accounts. It takes holdings for many accounts from your portfolio accounting system and rebalances them against model portfolios taking into account tax impacts and then sends back the resulting trades to your order management system for execution. It currently supports links to CheckFree APL's portfolio accounting and order management system and is capable of scaling to support large numbers of accounts across many processors.

Call Russ Hovanec, 617.208.2053, russ@northinfo.com for more information.

New Excel Run(0) Add-In Available

Northfield is pleased to announce the launch of an Excel add-in which allows users to run basic risk analysis (Run0) on your portfolio(s) relative to the benchmarks of your choice.

This new tool is ideal for managers who typically keep portfolio and benchmark holdings in an Excel spreadsheet. You can now quickly monitor the risk of a portfolio or conduct "what if" analysis on a single stock basis, without the need to leave the familiar Excel environment. The output is entirely consistent with that from the main Northfield system.

The Risk Analysis, Marginal Contributions to Variance, Main Table and Exceptions output reports from a standard Northfield risk analysis are displayed in an elegant format within your Excel workbook, on four new sheets. You can create your own formulae to reference the data as well as develop graphs of your preference within Excel to display the analysis output in the manner and fashion of your choice.

More detailed information on this new feature is available at http://www.northinfo.com/papers/pdf/run0.pdf or speak to your Northfield contact for further details.

Northfield: Truly a Global Company

Northfield's list of global customers is continually expanding. There should be several new additions in China in the near future. In addition, sales in Europe are starting to show consistent success since the opening of our London office.

Northfield's Dan diBartolomeo and Russ Hovanec have made two recent trips to Asia. In May, they visited The Peoples Republic of China where they met with several prospective new clients. In August, they made a second highly successful 10-day long trip to China and Japan where they visited prospective clients, and ran a one-day training seminar in Shenzhen China.

New Performance Attribution Beta

A "built from scratch" new version of our Performance Attribution system is about to enter beta testing. Unlike the old system that was limited to US equities, the new system can handle any of the Northfield models covering equities or fixed income securities anywhere in the world.

ASCII data files are shared with our Open optimizer software making it simple to jointly operate the two systems, and to do data maintenance tasks. Risk reporting has also been enhanced and the new system is much faster in operation. In the near future, the system will include a new analytical technique that has received substantial interest from finance journals.

Any clients interested in participating in the beta test process are encouraged to contact Northfield.

Northfield Technical Support

Northfield's primary technical support desk is in Boston, the hours are 8:00-6:00 EST. If you need Technical Support, or would like to schedule an online training session, call 617-208-2080 or e-mail to howard@northfinfo.com, or jennifer@northinfo.com.

European clients who need technical support assistance when the Boston office is closed can call the London office, at +44-(0)-20-7801-6260, or e-mail to Rupert Goodwin, rupert@northinfo.com.

If you have any suggestions of what you would like to see covered in upcoming issues, please e-mail your ideas to staff@northinfo.com

(Asset Class Correlations, continued from page 1)

have a had a vastly different make up of companies and sector weights than that same index would have had on December 31st, 1982 or will have on December 31st, 2005. At the height of the technology stock "bubble" a much higher-than-normal fraction of capitalization weighted indices such as the S&P 500 was comprised of Internet and other technology stocks. Just recently S&P removed several major foreign stocks from the index that traded in the US in ADR form, and replaced them with firms seemingly more purely American. Is it any wonder that the correlation of the S&P 500 with a global stock index such as MSCI World would change?

Similarly, MSCI and other index vendors are involved in a process to convert their indices from simple market capitalization weights to free float capitalization basis. While this has little impact in the US, the impact in some countries such as Japan is very profound. Again, it should be intuitive that future correlations of Japanese market indices to other markets should change.

On the fixed income side, US Treasury bonds are an important constituent of many bond indices both US and globally. To the extent that the Treasury has dramatically cut back on issuance of long term bonds, the nature of the bond market is itself changing and there is no reason we should expect that the correlations of bond market indices should stay the same through time.

Investors who wish to investigate this issue may do so using the Northfield Everything Everywhere model and the Composite Asset function in our optimization software. The EE model is a factor covariance model covering stocks, bonds, convertible bonds and currencies across forty-eight world markets. Coverage is approximately 125,000 individual security issues. For more information on the EE model, you can refer to our documentation at http://www.northinfo.com/products/riskmodels/docs/eemodel.pdf.

The Composite Asset function is a facility in the optimizer that allows a portfolio of securities (such as the constituents of a market index) to be exactly represented in a factor risk model as a single security while still correctly including the risks of cross-holdings between the constituents of each composite asset and other assets within the investor's holdings.

To compute the expected correlation of any set of market indices from the "bottom-up" according to the EE model, the user creates should create each market index as a composite asset within the optimizer using the EE model. Standard optimization reports can provide the expected absolute volatility of each market index, and the tracking error between any two market indices. To convert this information into an expected correlation coefficient, we can use the following formula (equation 1):

$$Q_{ab} = \frac{\sigma_a^2 + \sigma_b^2 - TE_{ab}^2}{2\sigma_a\sigma_b}$$

where:

Q_{ab} = implied correlation between asset A and asset B

σ_a^2 = variance of asset A

TE_{ab} = The tracking error: the standard deviation of a portfolio of asset A and minus asset B

This method is derived in "Optimization of Composite Assets Using Implied Covariance Matrices" (http://www.northinfo.com/papers/pdf/19981227_imp_corr_composites.pdf.)

An Example

We have created a number of country indices that represent both a substantial portion of the market capitalization of each country's equity sector and equity indices for which these indices are an exact (i.e. the S&P 500 and Russell 2000) or reasonable (Nikkei vs. MSCI Japan) proxy. We then use the Northfield Optimizer and the EE model (or Global model for this all equity index example) to estimate the volatility of each country index and its pairwise tracking error with each other asset. We then used equation 1 to compute the implied correlation between each of the pairs of asset classes shown in Table 1, which shows the volatility as calculated using several different approaches.

Table 1 (next page) shows that different approaches to estimating volatility produce significantly different results. Much of this difference is due to the fact that the proxy and the index are not identically constituted, even for "exact matches" like the S&P 500 and the Russell 2000. This difference arose because the index members and weight change dramatically over time, hence the current mix of assets is not a perfect proxy for the past mix of assets. However, since the object of our efforts is to forecast the future, the information based on the current nature of the index may well be more important than the historic index behavior. Column 1 represents the observed index volatilities for the sixty months ended July 31, 2002. Column 2 represents the expected volatilities from our EE model as of July 31, 2002.

Table 1: Asset Class Annualized Volatility

ID	Volatility 1	Volatility 2
SP500	17.4	14.6
R2000	22.1	16.2
AsiaExJap	22.0	29.6
Nikkei	22.5	21.8
UK	13.7	12.9
CAC40	19.3	18.4
DAX30	22.1	20.9

In Table 2 we show the tracking error between the different asset classes, as calculated by the EE risk model; applying equation [1] to the tracking errors and the volatility shown in column 2 of Table 1 gives the correlations shown in Table 3.

Table 2: Asset Class Tracking Error, EE Model

ID	SP500	R2000	AsiaExJap	Nikkei	UK	CAC40	DAX30
SP500	0	7.3	23.5	18.9	8.8	10.9	10.5
R2000	7.3	0	21.3	17.1	9	12.5	12.2
AsiaExJap	23.5	21.3	0	17.7	25	25.3	25.3
Nikkei	18.9	17.1	17.7	0	17.7	20	22.5
UK	8.8	9	25	17.7	0	11.5	13
CAC40	10.6	12.5	25.3	20	11.5	0	10.8
DAX30	10.9	12.2	25.3	22.5	13	10.8	0

Table 3: Correlation of Asset Classes as Computed Using the EE model

ID	SP500	R2000	AsiaExJap	Nikkei	UK	CAC40	DAX30
SP500	100%	89%	62%	52%	80%	81%	88%
R2000	89%	100%	72%	63%	83%	74%	81%
AsiaExJap	62%	72%	100%	80%	55%	53%	54%
Nikkei	52%	63%	80%	100%	58%	52%	45%
UK	80%	83%	55%	58%	100%	79%	81%
CAC40	82%	74%	53%	52%	79%	100%	86%
DAX30	87%	81%	54%	45%	81%	86%	100%

Table 4 shows the correlations as computed using the last 60-month index return data; Table 5 shows the difference in correlations between Table 3 and Table 4.

Table 4: Historic Correlation of Market Indices as Computed Using PACO

ID	SP500	R2000	AsiaExJap	Nikkei	UK	CAC40	DAX30
SP500	100%	67%	56%	51%	73%	66%	68%
R2000	67%	100%	46%	39%	53%	60%	68%
AsiaExJap	56%	46%	100%	98%	57%	47%	40%
Nikkei	51%	39%	98%	100%	52%	42%	34%
UK	73%	53%	57%	52%	100%	73%	68%
CAC40	66%	60%	47%	42%	73%	100%	87%
DAX30	68%	68%	40%	34%	68%	87%	100%

Table 5: Difference between Correlations Calculated by EE Model and PACO

ID	SP500	R2000	AsiaExJap	Nikkei	UK	CAC40	DAX30
SP500	0%	22%	6%	1%	7%	15%	20%
R2000	22%	0%	26%	24%	30%	14%	13%
AsiaExJap	6%	26%	0%	-18%	-2%	6%	14%
Nikkei	1%	24%	-18%	0%	6%	10%	11%
UK	7%	30%	-2%	6%	0%	6%	13%
CAC40	16%	14%	6%	10%	6%	0%	-1%
DAX30	19%	13%	14%	11%	13%	-1%	0%

The approximate standard error of a correlation coefficient is given by:

$$SE_r = \frac{(1-r^2)}{(n-2)^{1/2}}$$

Given sample period of sixty observations, one can easily compute the values of the difference levels that would statistically significant at a given confidence interval.

Conclusion

The volatility and expected correlations for asset classes may be derived in a bottom-up fashion from a factor model of the individual securities constituting the asset classes. The correlations and volatilities derived from the "bottom-up" method may be intrinsically superior to using historically observed values, as these values represent the asset class as it exists today, not as it existed on average over the historic period of our observations.

(New PACO, Continued from page 1)

Upcoming versions of the system will have a host of new and unique features. Here are a few of the major enhancements in store for users:

PACO is being entirely globalized so that the entire system will be indifferent to the base currency of the investor. Data on indices and US mutual funds will still be included as standard, with a database of non-US funds being optional.

The simulation function has been expanded into a full blown "back-testing" environment for tactical asset allocation strategies. Users will be able to simulate strategies back through time, doing complete optimization processes at each time point in a fully automated fashion. Detailed breakdowns of the simulated performance, complete with transaction costs and taxes will be output.

For users active in the management of portfolios for individual investors, we are bringing forward what we believe to be an important breakthrough in asset allocation technology. We are incorporating our Analytical Hierarchy Process module into PACO. This process uses expert system technology to analyze an on-screen financial planning questionnaire (income, net worth, investment experience, etc.) and create a preliminary asset allocation.

The proposed asset allocation is then further refined using traditional optimization to fine tune the allocation to current market views and any constraints imposed by the particular investor. Most importantly, the system can be used successfully and in a time efficient fashion by individual investors, financial planners and investment sales personnel who are not typically experts in optimization, and hence have a hard time rationally defining all the parameters of such a process. The methodology behind the AHP methods is described in a paper by Paul Bolster and Sandy Warrick available on our website at http://www.northinfo.com/papers/pdf/19990901_ahp.pdf.

Another feature of the new PACO will be a module for Sharpe's method of returns based style analysis. While there are a number of packages commercially available, ours will have to two unique analytical features. First, it will incorporate explicit confidence intervals on the style weights. Our research has shown that correlations among the "spanning set" of indices can make the confidence intervals for some style analysis problems are so large as to render the results meaningless. This issue is described in a paper by Dan diBartolomeo and Angelo Lobosco that appeared in Financial Analysts Journal in September, 1997. It is available on our website at http://www.northinfo.com/papers/pdf/19970700_faj.pdf.

Our system will also incorporate a new method of using Kalman filter analysis to more quickly detect changes in manager style. This new approach was first presented in a paper by Laurens Swinkels and P.J. Van der Sluis at our recent research conference at Yosemite. Their paper is downloadable from our website at http://www.northinfo.com/papers/pdf/vandersluis_paper.pdf.

Finally, we are continuing to refine the optimization procedure itself with respect to the issue of estimation error. The new version of PACO continues to have the Bayesian adjustment technology adapted from Philippe Jorion (Journal of Financial and Quantitative Analysis, 1985), but will also have some form of resampling technology. We are currently researching whether to include NFA resampling (as used in our Open Optimizer application) in PACO, or use bootstrap resampling as described in Dan diBartolomeo's 1993 Prudential Securities conference presentation, available at http://www.northinfo.com/papers/pdf/19931221_optimization_robust.pdf.

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