



February 2008

The Optimal Structure For a Team-Led Portfolio: Manager Behaviour Under Tracking Error Constraints

An Approach to Constraining Tracking Error Without Constraining Excess Returns

Plan sponsors often classify fundamental, active managers by expected tracking error. There are low tracking error managers who attempt to provide excess returns while sticking closely to an index, and there are managers unconstrained by the index who try to offset high tracking errors with high excess returns. But for sponsors who seek the middle ground – tracking error neither too large nor small – an interesting dilemma emerges. Quite often the desire for modest tracking error constrains a fundamental manager's ability to use his stock picking skill, and, in turn, may lead to sub-optimal portfolios with inefficient tradeoffs of risk and return.

In this paper, we present a heuristic model to understand fundamental, active manager behaviour under tracking error constraints and the impact this can have on a portfolio's risk and return. We then present a potential solution to improve the efficiency and excess return of a portfolio for plan sponsors who are sensitive to tracking error and seek the middle ground.

ACKNOWLEDGEMENTS

This paper is the result of a collaborative effort among members of Janus' investment team and investment writers, and represents the collective expertise of the firm's portfolio managers and research analysts. The opinions expressed herein should not be construed as investment advice.

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An Approach to Constraining Tracking Error Without Constraining Excess Returns

A moderate tracking error, or active risk, is an important criterion for some plan sponsors. Many seek to outperform the index, but also require a reasonable level of predictability of relative returns to try to match assets to liabilities or meet other long-term goals. However, how one constrains tracking error is crucial. We believe that it is far more effective for fundamental active managers to control tracking error as the outcome of an investment process than as an input into the process. Otherwise, a number of risk- and return-related consequences arise, including:

- Plan sponsors may forgo risk-adjusted excess returns. Explicitly targeting tracking error constrains the skill of a fundamental active manager. In our opinion, a stock picker cannot practice his craft unabated; he must keep an eye on the index and make decisions on stock picks that he would not make under unconstrained conditions.
- Plan sponsors may take too much risk for the expected return. Fundamental portfolios managed to minimise tracking error may not be mean-variance efficient, meaning they do not maximise the potential returns at a given level of risk.¹

We offer a solution to these problems using a heuristic model that demonstrates how an explicit focus on tracking error changes manager behavior. We suggest a way to construct a portfolio that allows fundamental, active managers to take moderate risk and capitalise on their stock picking skills.

In essence, this approach divides the investment universe among several high-alpha seeking managers in such a way that the excess returns of one manager has a low correlation to those of other managers. Managers have the authority to attempt to maximise the return potential of their portion of the portfolio, indifferent to tracking error. When combined, the managers' portfolios offer an improved risk-return tradeoff and lower overall tracking error while maintaining expected excess return. While in theory this approach can be accomplished in a variety of multi-manager structures, we argue that a set of specialised sector teams independently managing concentrated sector portfolios is one efficient and effective structure.

¹Roll, Richard. 1992. "A Mean-Variance Analysis of Tracking Error." *Journal of Portfolio Management*, vol. 18, no. 4 (Summer):13-22.

The Constrained Manager Model

In this model, we explore the behaviour of a manager investing with tracking error constraints by:

- Breaking out the active part of the portfolio
- Incorporating a skill function for the manager
- Calculating the tracking error

The Active Portfolio

Assume a manager runs Portfolio P with the expectation of beating a certain benchmark by a minimum amount. The manager may view his portfolio as a combination of two portfolios: the benchmark, P_b , and an excess return portfolio, P_a . Our manager compiles his excess return investments in P_a .² Following this path, the excess return of Portfolio P can be written as:

$$1. R_p - R_b = w_a (R_a - R_b)$$

Where

- R_p = portfolio return
- R_b = benchmark return
- R_a = active portfolio return
- w_a = weight of the active portfolio

Put simply, the amount that a portfolio's return differs from a benchmark is the amount of return generated by the excess return portfolio, multiplied by the weight of that portfolio. See Appendix A for the derivation of this straightforward relationship.

Manager Skill

We are discussing fundamental, actively managed portfolios where managers select securities they believe will outperform an index. Active managers, and plan sponsors who hire them, believe in stock picking ability. Therefore, we introduce a skill measure, S , to account for a manager's ability to successfully pick stocks that will outperform the benchmark.³ We assume managers are insightful but

not omniscient, so each incremental stock pick is less likely to add excess return, denoted as α . Expected excess performance for the i^{th} stock is S_i multiplied by α . We denote this product as K_i , which has a variance of σ_K^2 . We define the function of S_i such that as i increases, the summation of K_i goes toward 0, or:

$$2. \sum_{i=1}^{\infty} S_i \alpha = \sum_{i=1}^{\infty} K_i \rightarrow 0$$

Where

- α = a constant expected excess return
- S_i = a skill coefficient, declining with each successive selection
- i = each stock selection or investment decision

If we have N number of names in portfolio P , the expected excess return is determined by the size of the excess return portfolio and a manager's skill, or:

$$3. R_p - R_b = w_a \sum_{i=1}^N S_i \alpha = w_a \sum_{i=1}^N K_i$$

Where

- N = number of holdings in the portfolio

The excess return of the manager's portfolio is the summation of the expected excess returns of all the non-index investments multiplied by the weight of the excess return portion of the portfolio.⁴ We are assuming that each subsequent stock pick has a lower impact on the portfolio's excess return as the incremental skill level, S , declines.⁵

Interestingly, equation 2 suggests that managers at some point are selecting stocks with a negative expected excess return instead of just buying the index. A manager would only do this if he were unaware of his own skill function, that is, he thought too highly of his talent. We do not feel this assumption is overreaching for many managers. Another explanation is that each new idea presented takes a manager's attention away from other stocks in the

² Cremers, Martijn and Antti Petajisto. 2007. "How Active is Your Fund Manager? A New Measure that Predicts Performance." Yale International Center for Finance Working Paper. The authors introduce the concept of active share where one looks at the differences in portfolio weights from the benchmark to measure the level of active management. P_a is a similar concept.

³ Dybvig, Philip H. 2003. "The Fallacy of Large Numbers and a Defense of Diversified Active Managers." Washington University in St. Louis, Draft March 27, 2003. He assumes that excess return potential of stock pickers does not decline on each new stock pick. Our analysis incorporates the notion of diminishing marginal success.

⁴ We assume for simplicity that each position is equally weighted in the excess return portfolio. One could also use $w_i K_i$.

⁵ Neither S_i for the i^{th} stock nor α varies over time so $K_i \times \alpha$ is the same in any timeframe. We do this to avoid introducing into the model an assumption surrounding portfolio adjustments made based on the manager's near-term market outlook. S is based on the manager's skill, which should be time invariant. Along the same lines, we assume w_a for a specific manager is constant. It reflects his belief he can select stocks that will do better than the market. Assuming a manager without crises of confidence, w_a should not change over time.

portfolio, thereby reducing total expected excess return in the portfolio. One could also look at our model another way and reach the same results. Rather than skill, S could measure conviction. Higher conviction creates a higher chance of excess return, but conviction also declines with each stock pick. A manager continues to build an active portfolio until his conviction level falls to the point that he prefers to own the index. In either case—measuring skill or conviction—each subsequent stock pick has a lower expected excess return.

Tracking Error

We can now move to calculate the tracking error by looking at the variance of the excess return from equations 1 and 3. We present two expressions for the tracking error, both explained fully in Appendix B:

$$4. \text{ Tracking Error} = w_a \sigma_a$$

Where

σ_a = standard deviation of the return in the active portfolio, P_a

Furthermore, as the excess return of each stock in P_a is independent with a variance of σ_k^2 , we can rewrite equation 4 as:

$$5. \text{ Tracking Error} = w_a \frac{\sigma_k}{\sqrt{N}}$$

Where

σ_k = standard deviation of individual excess returns

Therefore, the tracking error increases as the weight of the excess return portfolio rises and decreases as the weight falls. In addition, portfolio P 's tracking error increases as the standard deviation of the active portfolio, σ_a , increases, but falls as the number of stocks, N , increases.

Interestingly, equation 5 has no terms for total portfolio variance or risk. A manager looking at tracking error does not directly focus on total portfolio variance. The variance of

the excess return portfolio, σ_a^2 , matters but not σ_p^2 , the total portfolio variance.⁶

Reducing total portfolio variance for a given return level requires a lower active portfolio variance, σ_a^2 , and a lower correlation of returns of the portfolios, P_b and P_a . If one assumes the benchmark is an inefficient portfolio, as w_a increases, the portfolio risk-return tradeoff should improve, all else equal. But we see that the tracking error-focused portfolio manager has the incentive to *reduce* his active investments. The result is a less efficient portfolio from the client's perspective.⁷

Now, we can use our simplified framework to analyse how fundamental managers attempt to control tracking error. We can then identify better ways to manage a portfolio with a goal of moderate tracking error.

Equation 5 shows that the manager who wants to control tracking error has two tools, as the standard deviation of excess returns, σ_k , is independent and constant. He can:

- Increase the number of stocks, N
- Reduce the active weighting, w_a

Exhibit 1

The Tradeoff Between Maximising Returns and Minimising Tracking Error

Minimise Tracking Error	Maximise Excess Return
Raise N	Lower N
Lower w_a	Raise w_a
Lower σ_a	— ⁸

Solution: Control Tracking Error, Not Excess Return

Source: Janus.

From equations 2 and 3, we know the cumulative excess return falls as the number of stocks, N , increases. Equation 1, however, suggests that reducing w_a means the manager looks more like the index and therefore limits the chance for excess return.

⁶Roll (1992) and Joiron, Phillippe. 2003. "Portfolio Optimisation with Tracking-Error Constraints." *Financial Analysts Journal*, September/October 2003: 70-82, offer more rigorous and comprehensive theoretical frameworks for this assertion.

⁷Chow, George. 1995. "Portfolio Selection Based on Return, Risk and Relative Performance." *Financial Analysts Journal*, March/April 1995: 54-60. One must assume that the benchmark is not an efficient portfolio. Yet this assumption underlies the rationale for selecting active managers. Chow looks at utility functions for plan sponsors that incorporate terms of total risk and tracking error risk. For a plan sponsor without infinite tolerance for tracking error risk, the portfolio may not be inefficient but it would still have a less favorable risk-return tradeoff than if the plan sponsor ignored tracking error risk.

⁸Variance of excess return portfolio, under efficient market theory, should be higher if the expected return is higher. We leave it as an open (and non-essential) question here.

As Exhibit 1 highlights, this is the dilemma for a manager and a plan sponsor who seek to constrain tracking error without constraining excess returns. One solution to this conundrum is to find a way to increase the number of stocks without diluting stock picking skill.

A Solution: Control Tracking Error, Not Excess Return

Managers who are indifferent to the benchmark and tracking error can potentially provide strong risk-adjusted returns. The challenge is to maintain excess return potential while having

Active Risk Declining Among Managers

Our model has implications for manager behaviour, which we address here but requires further empirical work.

We would expect that as tracking error becomes a more important metric of performance, more managers will structure their portfolios with strict benchmark constraints. Portfolio weights will remain within a band of the benchmark weight for each stock. The number of holdings, N , will increase and the active portfolio weighting, w_a will decrease. Thus, portfolios, even those run by self-described active managers, will look more like the index. Managers will seek to limit the σ_a by increasing the number of names or reducing the w_a of their portfolios. Either step diminishes the excess return potential.

One recent study confirms this trend. Active share measure highlights this evolution by measuring how much a portfolio looks like an index. The less a manager mimics his benchmark, the higher his active share.⁹ Overall active share has been declining among mutual funds; in other words, fewer managers are willing to take on greater active risk by straying too far from the index. Measured by assets under management, portfolios with active shares above 60%—truly non-benchmark sensitive managers—fell from

98.5% of assets in 1980 to about 60% in 2003.

Furthermore, managers with a high active share tended to create value for their shareholders while those making factor (sector) bets and tracking closely to an index tended to destroy value.¹⁰ It is unclear to what extent these changes reflect a change in the direction of assets or changes in the behaviour of individual managers. Is a manager who was indifferent to the index in 1980 still indifferent today? And if that manager has changed his process, is he constraining his skill?

This issue may be more important as assets under management with one manager or one firm grow. Increasing cash flows into a portfolio logically will eliminate less liquid names from the opportunity set of the excess return portfolio. Eventually, at very high asset levels, managers will be forced to lower the size of the excess return portfolio in favor of the benchmark. More money will go to the larger capitalisation names, which tend to be index holdings. The dynamic also is consistent with a manager's effort to maximise his income. As a portfolio gets closer to capacity, the risk of losing clients outweighs the benefit of gaining new ones. The manager has more to lose by being wrong than to gain by being right. For smaller and start up portfolios, the reverse is true.

⁹Cremers, Petajisto (2007),

¹⁰Cremers, Petajisto (2007),

reasonable expectations of modest tracking error. Our model demonstrates that the challenge is to increase the number of stocks, N , to the point that it reduces the active portfolio variance, σ_a^2 , but still maximise the stock picking skill. One could solve this equation by precisely defining the function for K , or the expected cumulative excess returns for all stock picks. But K is elusive. Intuition only tells us that as N grows, K declines, probably at an increasing rate.

To reduce σ_a^2 for any level of N and independent of our estimate of K , one should seek the lowest correlation of returns within the active portfolio, P_a . Lowering the standard deviation of returns for the active portfolio, σ_a , and adding more stocks in an efficient way allows the manager to increase the weight of the active portfolio, w_a , without raising tracking error. One proven way to accomplish this is to divide the universe by sectors.¹¹ We have found that many managers picking a few stocks in segregated universes may provide higher returns with less tracking error than a few managers picking many stocks from anywhere.

The most important and consistent sources of tracking error are sector/industry exposures, beta and, to a lesser extent, country weights relative to the index.¹² Other sources are the size of the active portfolio and the correlations of excess returns among the underlying active exposures. Therefore to reduce tracking error, one must address these sources. Maintaining sector/country neutrality relative to the benchmark and a beta of 1 will reduce two primary sources of tracking error. Both can be fairly easily addressed by a manager's portfolio design assuming the manager remains fully invested and refrains from using cash balances to reflect his short-term market view. We view beta often as a function of cash balances and the manager's current opinion on the near-term direction of the market rather than a result of specific stock allocation. A diversified, fully invested portfolio, while not certain to have a beta of 1, should offset much of the beta impact on tracking error.

The more subtle step—yet one quite important to maximise the risk-adjusted returns—is increasing the weight of the active portfolio, w_a , and decreasing the correlation of excess returns. One potential solution is to pick several active managers with differing styles, seemingly low correlations of excess returns relative to one another,

and small weights in index holdings. One would not impose any tracking error constraint on these managers to avoid adverse behaviour. Practically speaking, however, it is difficult to ensure that the resulting portfolio would not have overlap. Using sector funds or managers with strict guidelines, such as on capitalisation, might work if the plan sponsor is willing to dedicate the monitoring resources to many managers, and if the managers are compliant.

We believe an efficient and effective solution—in terms of portfolio implementation and performance—is a team-led approach, where the portfolio *by design* segregates the universe. To ensure low correlations of excess returns, the portfolio would be divided among dedicated analyst teams, each constrained to one sector. Each team or manager, however, should be unconstrained by the index holdings within that sector and by tracking error to the sector index. They should remain fully invested with each segment reflecting the top ideas of the experts within an investment firm. While idiosyncratic (or stock-specific) risk might be predominant, the total diversified portfolio should produce higher expected excess returns, a better risk-reward tradeoff and a similar tracking error to a portfolio with explicit (and inefficient) constraints on tracking error. In summary, tracking error is constrained, not manager skill

We examine the Janus U.S. Research Core Equity portfolio as an example. The typical research portfolio has about 100 holdings, with each position representing an active stock pick, where the analyst is using proprietary insights about the company. The goal is to maximise the skill function by taking the top ideas of each analyst. Each sleeve of the portfolio is sector neutral relative to its benchmark. The sector teams do not consider index weights when building their sleeves, or sector portfolios, which are essentially concentrated, mini-portfolios. The average sleeve has about 15 holdings and the largest positions at times can exceed 15% of the sector portfolio. When the sleeves are integrated into the portfolio, the expected excess returns generated by the individual teams are not diminished, and the result is sector neutral.¹³ Furthermore, as a result of the segregated universes, the correlation of excess returns of each sector portfolio to one another is low.

¹¹In global and non-U.S.-only portfolios, one could argue that dividing by country is sensible. The decision comes down to the assessment of importance between country factors and global industry factors in influencing stock prices. Country risk has played a smaller role in the last 10 years than industry factors. Some risk models do not include it as a factor, except for perhaps emerging markets.

¹²Lin, Wenling. (2000). "Controlling Risk in Global Multimanager Portfolios." *Financial Analysts Journal*, vol. 56, no.1 (January/February 2000): 44-53. On global accounts, country bets are important but the author suggests the data may be influenced by the large weight of Japan in global indices. Also country factor may be diminishing in importance. See note 11.

Exhibit 2 and Exhibit 3 show the correlation matrix of returns and excess returns, respectively, of each sector portfolio. Because a correlation analysis of overall returns does not strip out the systemic risk of the market, looking at the correlations of excess returns may be more powerful. Here the systemic risk is filtered and one looks only at the active portfolio, P_a , where the non-index investments exist. One sees the expected and desired low correlations of excess returns that can lead to a lower tracking error for the overall

portfolio, P . In most cases, these correlations are well below 1.0.

In this portfolio structure, there are no constraints on tracking error for each sector portfolio, and each sector portfolio's tracking error is relatively high compared to its sector benchmark as Exhibit 4 shows. However, as the sleeves are combined into the portfolio, the overall tracking error falls because of the low correlation of excess returns.

Exhibit 2

Correlation of Returns by Sector

	Communications	Energy	Financials	Health	Industrials	Consumer	Technology
Communications	1.00						
Energy	0.23	1.00					
Financials	0.46	0.19	1.00				
Health	0.21	0.19	0.20	1.00			
Industrials	0.53	0.28	0.51	0.21	1.00		
Consumer	0.55	0.33	0.38	0.23	0.50	1.00	
Technology	0.54	0.47	0.37	0.32	0.57	0.59	1.00

Source: Janus. August 2004 - December 2007. Past performance is no guarantee of future results.

Exhibit 3

Correlation of Excess Returns by Sector

	Communications	Energy	Financials	Health	Industrials	Consumer	Technology
Communications	1.00						
Energy	0.13	1.00					
Financials	(0.18)	0.06	1.00				
Health	(0.04)	0.07	0.18	1.00			
Industrials	0.04	0.05	0.05	(0.04)	1.00		
Consumer	0.18	0.22	0.17	0.21	(0.04)	1.00	
Technology	0.21	0.39	(0.03)	0.08	0.00	0.26	1.00

Source: Janus. March 2004 - December 2007. Past performance is no guarantee of future results.

Exhibit 4

Annualised Tracking Error of Sector Portfolios Versus Sector Benchmarks (Gross of Fees)

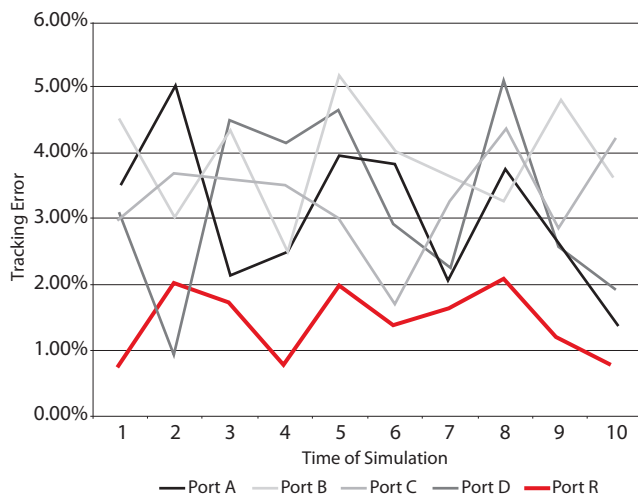
	Communications	Energy	Financials	Health	Industrials	Consumer	Technology	Portfolio
Tracking Error	10.22	11.39	6.32	11.44	8.34	8.61	8.30	3.77

Source: Janus. August 2004 - December 2007. Past performance is no guarantee of future results.

¹³In the Global Research Portfolio, the balance between U.S. and non-U.S. tends to be close to the index weights.

A simulation of several concentrated portfolios with randomly generated returns confirms this approach. The results, summarised in Exhibit 5, show that over multiple time periods, tracking error as these portfolios are combined is generally lower than those for its component portfolios. The simulation is explained in more detail in Appendix C.

Exhibit 5
Simulated Tracking Error on Portfolio R (Combination of Portfolios A, B, C and D) Lower than the Tracking Error of Each Sub-Portfolio



Source: Janus.

Conclusion

Plan sponsors may have a variety of tracking error requirements depending upon their investment policies, constraints and portfolio structures. For those plans seeking moderate tracking error, we have shown that an approach with specialised sector teams independently managing portions of a portfolio may be an optimal solution. It can allow stock pickers to make full use of their stock-picking skills, and the sector team-based approach can improve the risk-return tradeoff when tracking error is a consideration. We acknowledge our model has some limitations. For instance, we could include a term for sector bets and apply a skill function for it. Certain benchmark indifferent managers have success with these tools, but they do not fit within a plan structure that seeks a moderate annualised tracking error. As it stands, the model provides a framework for viewing how a rational manager might behave when given explicit controls on tracking error.

Such controls are reasonable in many cases. But when controlling tracking error becomes an explicit input into the investment process rather than an outcome of the process, problems arise. The examples shown attempt to illustrate that plan sponsors sacrifice return and undermine managers' skill levels when either player pursues explicit tracking error controls. This doesn't need to be the case if one finds a portfolio that stresses the excess return generation potential of several managers in a structure that minimises the correlations of these excess returns among managers. Our model demonstrates how a portfolio that maximises stock-picking skill while constraining tracking error may provide an effective solution for plan sponsors seeking the middle ground.

See back cover for important disclosures

APPENDIX A

The return is simply the weighted return of the benchmark portfolio and the active portfolio, or:

$$1. \quad R_p = (1 - w_a)R_b + w_a R_a \\ = R_b - w_a R_b + w_a R_a$$

Where

w_a = weight of the active portfolio

R_p, R_b and R_a = returns on the total portfolio, P , and the sub-portfolios P_b and P_a

Because we assume no leverage or uninvested cash, the weight of the non-active or benchmark piece is $(1-w_a)$. Equation 1 assumes that P_a is a self-financing portfolio representing long and short positions in stocks relative to the holdings in the benchmark.¹⁴ For example, if the benchmark has two equally weighted stocks, X and Y, yet the manager holds only X, we can consider that he owns the benchmark plus a short position in Y and a long position in X.¹⁵ The short in Y effectively finances the extra stake in X. If half of P_b is "sold" to buy non-index holdings or to increase the weight on the other half of P_b , then w_a equals 0.5.

If the manager holds nothing that is in the index, then $w_a = 1$ and all the return comes from non-index holdings in P_a . Conversely, a pure index manager has a w_a that equals 0.

Rearranging equation 1 and subtracting R_b from both sides results in the equation for excess return, the difference in returns between this portfolio and the benchmark, or

$$2. \quad R_p - R_b = w_a (R_a - R_b)$$

APPENDIX B

The tracking error, or more formally tracking error volatility, is the standard deviation of the differences of time period returns for the portfolio and its benchmark index. We calculate the variance here and then take the square root to express it in terms of standard deviation.

From equations 1 and 3, we get expressions for the variance in terms of the skill function:

$$\begin{aligned} \text{Var}(R - R_b) &= \text{Var}[w_a(R_a - R_b)] \\ &= w_a^2 \text{Var}(\sum_i^N K_i) \\ &= w_a^2 \sum_i^N \text{Var}(K_i) \\ &= w_a^2 \sigma_a^2 \end{aligned}$$

σ_a^2 is simply by definition the variance of the active portfolio. The tracking error, as standard deviation of the excess return, is therefore:

$$w_a \sigma_a$$

We assume that the returns in P_a are independent, with a variance of σ_k^2 , so it follows that:

$$\sigma_a^2 = \frac{\sigma_k^2}{N}$$

Substituting the active portfolio's variance, σ_a^2 , with the above equation and the tracking error calculation becomes:

$$w_a \frac{\sigma_k}{\sqrt{N}}$$

¹⁴Roll (1992) uses this approach to derive the efficient frontier in a mean-tracking error space and then shows that this frontier lies to the southeast (less efficient) of a mean-variance frontier.

¹⁵There is a simplifying assumption that the returns in the long position of the benchmark equal the returns on the short position in the benchmark.

APPENDIX C

We generated random returns for 500 stocks (the index) over 250 trading days. We created five portfolios. Portfolios A, B, C and D each had 40 stocks with none in common. Portfolio R represented the combination of Portfolios A through D, with, therefore, 160 stocks. We then looked at the tracking error of the five portfolios over a five-year period (i.e., five one-year results). In Exhibit 5, we chart the results from 10 of these five-year periods.

We recognise that this simulation is limited. Because the daily returns are random, by definition correlations are close to zero, an optimal situation (see Exhibit C1). Any excess return versus the index in portfolios A through D is random. If we added a skill factor, tracking error might increase, although the relationship between the tracking errors for Portfolio R and Portfolios A, B, C and D that appear in Exhibit 5 should remain the same. The simulation is purely to illustrate the central point supported formulaically and by example with the Janus U.S. Research Core Equity portfolio.

Exhibit C1

Correlations Matrix for Portfolios In Simulation

	Portfolio A	Portfolio B	Portfolio C	Portfolio D
Portfolio A	1.00			
Portfolio B	(0.15)	1.00		
Portfolio C	(0.09)	(0.02)	1.00	
Portfolio D	0.03	(0.09)	(0.07)	1.00

Source: Janus.

Selected Research Publications

Global Real Estate: Is There Still Opportunity Ahead?

Original Publication Date: January 2008

Many institutional investors have included an allocation to real estate for quite some time. With the emergence of real estate as a relatively mainstream asset class, more and more investors continue to look beyond domestic borders. The recent growth in global real estate has been largely due to funds flowing from both institutional investors and private equity concerns. However, there are a number of challenges to navigate, one of the most significant being the sizeable capitalisation rate compression that has resulted from escalating amounts of capital flowing into the sector. Despite these challenges, we believe there are numerous compelling reasons for an allocation to global real estate. In our view, an understanding of regional drivers coupled with a continued commitment to disciplined, bottom-up research can help uncover the most attractive real estate opportunities around the globe.

The Quest for Quality: Identifying Sustainable Long-Term Growth Opportunities Using ROIC Analysis

Original Publication Date: September 2007

Portfolio managers, investment analysts and even corporate executives turn to various financial metrics when analysing and forming an opinion about an investment opportunity. Some metrics reveal more about an enterprise's growth; some direct attention toward the operating efficiency of a company. While many investors are familiar with common financial metrics like return on assets and return on equity, fewer may be familiar with return on invested capital (ROIC)—a measure that combines elements of growth with a company's operating efficiency. At Janus, the study of ROIC is an important component of our rigorous research process and historically has been a key contributor in our quest to create value for our clients over time.

Reevaluating Investment Correlations for Today's Dynamic Markets

Original Publication Date: September 2007

As more institutional portfolios are managed with an objective of generating alpha, interest in the concept of asset correlation continues to grow. In recent years, this concept has emerged from an obscure place in Modern Portfolio Theory to provide analytical support for investment allocation decisions. By successfully combining pairs of low-correlating asset classes or investments, portfolio managers theoretically could temper the volatility of returns and enhance risk-adjusted performance. Janus recently conducted a correlation analysis of 21 indexes using data reported by FactSet. This white paper provides a summary of the findings and a comparison of the correlation of certain asset classes using different time periods. Additionally, the white paper highlights the value of rolling period analysis and discusses the dynamics of certain correlation relationships.

Where Janus is Finding Opportunities: Five Global Themes

Original Publication Date: February 2007

Strong economic growth rates appear to be driving more convergence at both ends of the wealth spectrum. This is exemplified by the dramatic growth of the BRIC economies within emerging countries as well as escalating wealth levels seen in developed countries. This convergence seems to be fueling growth for many companies across a number of leading industries. This white paper identifies opportunities that are poised to capitalise on these trends, organised according to five global themes: infrastructure; agriculture; lifestyle spending; wealth management and commercial real estate.

Where Janus is Finding Growth Opportunities: Janus Analysts Uncover Five Promising Growth Themes

Original Publication Date: September 2006

Growth markets may go in and out of favour, but companies that offer the potential for solid growth never completely recede. Through varying market environments' adherence to rigorous fundamental research—which focuses on free cash flow growth, returns on invested capital and disciplined valuation—helps to uncover opportunities. Input from Janus' seven global sector analyst teams has yielded five investment themes that we believe offer a clear path to growth: capital reallocation; emerging middle class; fragmentation of mass market; aging population and disruptive technologies.

Beyond the Box: Challenging the Convention of Constrained Investing

Original Publication Date: May 2006

New research shows that portfolio managers with higher levels of drift outperform those who are constrained to a box in the traditional nine-box style grid. According to the research, the style grid does not provide the significant diversification or risk control that investors expect; in fact, constraining a manager has historically resulted in impaired performance and added virtually nothing from a risk reduction perspective. This suggests that some fresh thinking about building portfolios and manager categorisation could help to generate greater alpha and improve risk management for investors.

Financial Markets Review

Published Quarterly

This quarterly publication provides insight into the key drivers of global financial markets from the perspective of the Janus investment team. Covered topics include quarterly performance of global equity and fixed income markets,

significant macroeconomic developments and their impact on financial markets during the period and key factors to watch going forward. Also included is a summary of global investment themes that underpin some of the highest-conviction investments of the Janus investment team.

Fixed Income Report

Published Quarterly

This quarterly publication provides the Janus fixed income team's perspective on important developments in the global fixed income markets over the preceding three months. Highlights include events influencing the level and direction of interest rates and credit spreads, as well as other macro developments.

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