The Quest for Beta: Balancing Risks with Costs and Returns

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Executive Summary

As more institutional investors seek to diversify their sources of beta, effective beta management that balances costs, risks and return is a key consideration. While many investors still perceive beta exposure as easy to access and cheap to provide, beta management is in fact a challenging and increasingly complex task as you move down the market capitalization spectrum and go beyond developed markets. In this article, Mellon Beta Management looks at the growing range of instruments available for replicating and managing beta exposures and describes the potential risks that must be balanced to achieve client objectives. Deciding on the appropriate beta instruments to meet those objectives will involve both art and science as investors consider how much tracking error they are willing to tolerate to save a certain amount in trading costs. Just as an investor's desired beta is the product of an optimized asset allocation design, selecting the appropriate investment vehicle for expressing that beta exposure requires a rigorous cost-benefit analysis.

Much has been written over the last decade about alpha — the risk-adjusted return beyond a given benchmark. The challenge of identifying, harvesting, and ultimately sustaining multiple sources of uncorrelated alpha has become, in many ways, the Holy Grail for institutional investors. By contrast, beta, or the risk and return of the benchmark itself is often overlooked as easy to obtain, inexpensive, and essentially commoditized.[1] With the proliferation of instruments such as index funds, exchange-traded funds (ETFs), and listed and over-the-counter derivatives, the modern investor ideally ought to be able to obtain a given beta easily and cheaply. For this reason, investors occasionally take for granted that allocating to beta and perfectly tracking it are one and the same. Whether run as a core portfolio exposure or as part of a portable alpha program, whether intended as a dedicated allocation or as an interim investment designed to hedge risks, managing beta is not as simple a task as it may seem.

Many Plan Sponsors allocate risk budget to active managers so that they may generate alpha. From their beta exposures, however, investors demand predictability. If the benchmark returns X, the investor normally wants X, not 0.95 X or even 1.05 X. Consequently, the beta manager's job is to manage

1 Mark Anson, in an essay describing the evolution of beta, defines it broadly as, "the systematic risk exposure associated with the equity markets, bond duration, exposure to commodities, credit exposure, and even the systematic returns associated with volatility embedded within stock options. Beta should be acquired cheaply because active management is not necessary to capture the systematic risk premium associated with an asset class."; "The Beta Continuum: From Classic Beta to Bulk Beta"; *Journal of Portfolio Management*; Winter 2008, Vol. 34, No. 2 p. 53.

active risk, not to spend it. For large capitalization equity, beta managers have it relatively easy, as market efficiencies have created a virtuous scenario where a wide range of instruments make this a straightforward assignment. Even so, variables such as trading costs, management fees, and index turnover mean the investor must always be willing to assume at least modest tracking error vs. the benchmark that they are looking to mimic. As the investor moves down the capitalization ladder, away from large cap equity, into emerging markets, or toward alternative asset classes, tracking risk tends to grow to the point where beta management may not be appropriate or even feasible. If nothing else, investors need to be attuned to the possibility that what they believe to be a passive allocation may, in fact, be an unintended form of active management.

As one moves toward smaller cap securities and away from the most liquid markets, either the size of the index universe or liquidity constraints (or both) may make full replication untenable and sector or factor optimized portfolios become the vehicle of choice.

Beta Instruments: A Review

Once the investor decides to seek a passive exposure, the question then becomes how best to obtain it. The vast array of innovative beta vehicles available can make this a difficult question to answer.

Index Funds

Using physical securities to create a beta exposure has long been the traditional approach, and it is quite common for an institutional investor to have a passive allocation to an index fund for at least part of his overall allocation. Traditionally, index funds have been popular in large cap equity where evidence suggests that committing active risk may be sub-optimal. Given the liquidity in this space, transaction costs tend to be quite manageable which means that a fully replicated approach to the asset class is the norm and tracking error vs. the benchmark is commensurately quite low.[2]

But as one moves toward smaller cap securities and away from the most liquid markets, either the size of the index universe or liquidity constraints (or both) may make full replication untenable and sector or factor optimized portfolios become the vehicle of choice.

Exchange Traded Funds (ETFs)

The recent proliferation of ETFs has been remarkable. Once viewed primarily as mutual fund substitutes for retail investors, ETFs have increasingly been embraced by the institutional asset owner community as well to the point where about 14% of U.S. pension funds, endowments and foundations now employ ETFs in some fashion.[3] ETFs are viewed as convenient vehicles for tactical adjustments or as part of core-satellite approaches. On the one hand, the large number of ETFs currently available would seem to grant investors easy access to a wide range of betas; on the other hand, the structural limitations of portfolio construction demand vigilant oversight from the beta manager and the client to ensure that unintended risks are

2 In our observation, institutional commingled funds that use a fully replicating approach to passively track the U.S. Large Cap Equity market tend to track within 1-2 bps of their respective index.
3 Source: Greenwich Associates, "ETFs Gain Foothold in Institutional Market," April 6, 2010.

Transactions costs in the listed derivatives markets are generally a fraction of the costs incurred trading stocks and bonds. For this reason, particularly over shorter horizons, using futures to obtain a given beta may be preferable to index funds, tracking baskets, or ETFs.

not borne. Morgan Stanley recently summarized both the explosion in the number and type of ETFs now available but also the significant increase in the range of tracking error — from 10-95 bps in 2002 to 54-194 bps in 2009.[4]

Index Futures

Because the level of transaction costs is a key determinant in beta management decisions, many managers employ listed futures contracts as a means to obtain the desired index exposure. Transactions costs in the listed derivatives markets are generally a fraction of the costs incurred trading stocks and bonds. For this reason, particularly over shorter horizons, using futures to obtain a given beta may be preferable to index funds, tracking baskets, or ETFs. For longer timeframes, however, the cost of rolling contracts begins to accrue —eroding the appeal of these derivatives as a source of beta for more permanent allocations. The limited selection of tradable futures contracts as well as the limited liquidity for all but the broadest based contracts also presents a significant drawback when compared to ETFs and Index Funds.

Swaps & Structured Notes

For benchmarks lacking active listed derivative or ETF markets, investors can consider off-market agreements with counterparties to provide the return profile of an asset class assuming such agreements meet client risk tolerances, suitability, and investment objectives. Highly customizable for esoteric exposures, over-the-counter instruments such as swaps can be prohibitively expensive for shorter time periods. At the same time, swaps demand onerous documentation, require significant administrative efforts, create counterparty exposure risk and may be hard to exit due to rigid reset dates and break covenants.

In general, without factoring in efficiencies of scale, it is often the case that the lower the tracking error for the given beta instrument, the higher the expected transaction costs.

Managing Fixed Income Beta Exposures

Physicals: Benchmark Exposure through Managing a Portfolio of Bonds

The Barclay's Capital U.S. Aggregate Bond Index™, a widely recognized benchmark, generally consists of more than 8,000 individual bonds, many of which are thinly traded. For these logistical reasons, the trade-off between tracking error and transaction costs most often guides the index manager towards some kind of optimized tracking basket to proxy this benchmark.[5] This is also the general approach adopted by ETF providers for this benchmark where a representative sampling may construct a portfolio comprised of less than 5% of the benchmark universe. While an optimization of this type is designed to mimic the risk exposure of the benchmark, the iShares Barclays Aggregate Bond Fund™, which holds fewer than 300 securities, found itself

4 Source: Morgan Stanley Research, Exchange-Traded Funds, February 12, 2009.
5 Our colleagues at our affiliate Mellon Capital Management Corporation, for example, employ a "stratified sampling" to manage bond index portfolios.

80 basis points behind its bogey in 2009.[6] Clearly, an investor needs to be careful with the selection of such a beta vehicle.

As credit spreads widened in early 2009, many investors sought exposure to high yield bonds and looked to the ETF market as a proxy. Ease of use and flexibility for tactical allocations are much touted features of ETFs as the intra-day trading and high levels of transparency they offer make them more versatile than mutual funds and pooled index funds.

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To exacerbate the issue around tracking error, a sharp rise in demand for bond ETFs in 2009 and into 2010 have pushed these shares to frequently trade at premiums to their net asset values (NAVs). Such pricing differences tend to be arbitraged away in the relatively liquid equity markets, where managers can simply create or redeem enough of the underlying shares to capture the pricing difference. Limited liquidity in the fixed income market makes this unfeasible. Unlike a typical index fund, the NAV of a fixed income ETF is typically calculated at the bid price struck at 3 PM ET even though the market continues to trade for another hour.[8] While the NAV represents the underlying value of the portfolio calculated using the last published price of each bond in the basket, the trading cost that the investor must consider includes both the end-of-day valuation as well as the actionable price reflecting current market sentiment.

Several factors affect the ongoing price discovery that may result in a deviation between the level recorded as the closing price and the NAV of the fund shares calculated at the end of the day. Whenever a bond does not trade, the last trade is carried forward. During the throes of the crisis in late 2008 and early 2009, it was not uncommon for 70% or less of a portfolio to trade on any given day. At times, many ETF trades are placed in rapid succession. At other times, little or no trading activity takes place, particularly for the less liquid ETFs. This disconnect between the NAV and the market can introduce an element of trading risk to the already substantial tracking error risk of bond ETFs.

High Tracking Error has typified the experience of fixed income ETFs since the onset of the Global Financial Crisis in 2007.

Synthetics: Benchmark Exposure Through Bond Derivatives

Synthetic solutions available for beta exposure to the broad fixed income

6 Source: www.ishares.com
7 Source: www.spdrs.com
8 Source: iShares, Fixed Income Fundamentals. Performance and Tracking in a Fixed Income ETF.

market do not seem to be too much better. These instruments present, among other challenges, a combination of liquidity issues, imperfect tracking solutions, and high administrative complexity. Again starting with the Barclays Capital U.S. Aggregate Bond Index™, the futures based market for this index is so illiquid as to be untradeable.[9] There is also inefficiency in translating index component changes to the underlying future. Futures basis risk for broad bond futures, or the tracking error derived from the pricing relationship between an index future and its benchmark, is arguably the highest of any asset class due to the opaque nature of bond prices.

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As an alternative to the one-size-fits-all approach, an investor may attempt to disaggregate and synthetically replicate the risk factors of the bond market, such as interest rate, inflation, and credit exposures. While the highly liquid treasury futures market can approximate target duration (i.e., sensitivity to interest rates, which generally dominates the majority of fixed income beta risk), investors are still left with exposure problems.[10] Fixed income overlays that are composed solely of U.S. Treasury (UST) futures have no exposure to other factors that may affect a benchmark's total return. Unhedged factors in the overlay may include changes in credit and LIBOR spreads, mortgage prepayment rates, and the convexity of the benchmark indices. The effects of these or other unhedged factors on the total return of the benchmark will not be replicated by an overlay composed solely of UST futures.

For investors with a high level of tracking risk aversion, other derivative solutions might be considered like structured notes or total return swaps. Unfortunately, recent evidence suggests bond swaps tend to cost 4 or 5 times as much as would an equity swap.[11] In addition, they may be operationally cumbersome and documentation intensive while introducing counterparty risk.

Managing Beta Exposure to Non-Dollar Denominated Equities

Physicals: Benchmark Exposure Through Managing an Equity Portfolio
Challenges also arise with vehicles designed to track non-dollar equity benchmarks such as the MSCI EAFE® or MSCI Emerging Markets® indices. The issues seem to be similar to the difficulties faced with fixed income benchmarks — a large number of individual securities and disparate markets make it more difficult and costly to replicate in full. For example, replicating the MSCI World®, with over 1600 names across 23 countries, is a much costlier proposition than replicating the FTSE 100®. Likewise, the MSCI Emerging Markets® index holds close to 800 stocks in 22 different countries, some of which require significant documentation in order to access. In any optimization decision, there will be a balance between cost and risk, i.e., how much tracking error the investor is comfortable with to save a certain amount in trading

9 While the CME Barclays Capital U.S. Aggregate Bond Index Futures contract technically exists, no recent volume data or open interest is available.
10 For a typical basket of investment grade bonds, in our experience, duration will account for 70%-75% of the total risk.
11 Source: BNY Mellon Beta Management 2010 based on quotes received from various dealers in 2010.

costs. ETFs and tracking baskets are constructed using optimized portfolios for a reason — to manage the high transactions costs that would be borne through an approach that uses full replication of an entire index.

An essential component of any beta management decision is quantifying the degree of cost savings versus additional tracking error.

But where does one draw the line between tolerable tracking error and acceptable trading costs? To better understand this, we examined changes in tracking error while considering efficiencies of scale in the context of liquidity and the replication/optimization decision.

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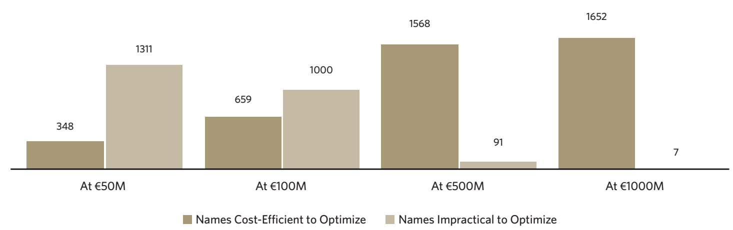
Case Study 1[12]: The effect of portfolio size on the replication vs. optimization decision within the MSCI World universe.

To begin, we constructed four investment portfolios based on the MSCI World Index® to see whether it would be beneficial to limit the size of the beta portfolio through optimization or extend the universe to a fully replicated strategy.

Exhibit 1 highlights the fundamental reciprocal relationship between optimization and full replication: as portfolio size increases, the number of names unsuitable for optimization decreases. In our analysis, the objective function for the optimization was a transaction cost minimizing portfolio with benchmark tracking error no greater than 45 bps per annum. What immediately became apparent was that a large number of small value names in certain countries can lead to inefficient trading, management and custodial charges. Most pertinent are odd lot issues in Asia (e.g.,Japan, China, Korea) where the small nature of individual tickets (in many cases, anything less than 1,000 shares) would typically be deemed inefficient to include in the optimization universe due to the incrementally small tracking error reduction they offer for unit of transaction cost. We can see from the output of the analysis that scale is essential to employing efficient replication.

Exhibit 1 – Reciprocal Relationship Between Optimization and Full Replication



Source: BNY Mellon Beta Management, 2010

As one would expect, efficient replication wouldn't be achievable until a critical mass had been reached. In our study, assuming a mandate for a segregated account, full index replication doesn't start to look attractive until we exceed the €500 million level. Below that threshold, optimization may be the preferred approach.

12 The case studies may not include all factors that could affect the results of the strategy.

We considered the merits of limiting one's investing universe in Emerging Markets by constructing physical security portfolios by tiers of either liquidity or market capitalization. Such a strategy was hypothesized to reduce the total transaction costs of investing in either an active or indexed portfolio by avoiding the less liquid or smaller capitalized companies.

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Case Study 2: The effect of liquidity in relation to transaction cost optimization in an MSCI Emerging Market universe.

To examine the effect of liquidity on transaction costs, we created three identically weighted index portfolios worth $100 million, $250 million, and $500 million.[13] We divided each portfolio into four tiers, ranging from the least liquid to most liquid securities as measured by their average daily volume. Each quartile portfolio still contained 25% of the number of securities in the index but varied in terms of capitalization.

As one might guess, our model forecast higher market impact for the less liquid names, and higher market impact for the larger portfolios. What came as a surprise, however, was the impact of taxes on the total transaction cost for each quartile.[14] Including taxes, transaction costs could vary as much as 66% per quartile for the $500 million portfolio. In fact, we found that total transaction costs were relatively unrelated to liquidity! Instead, total transaction costs were dominated by local duties and taxes that ranged from three times to six times the cost of market impact.[15]

Case Study 3: The effect of market capitalization on transaction cost optimization in an MSCI Emerging Market universe.

To examine market capitalization and its relationship to transaction costs, we created cap weighted portfolios of the top 25%, 50%, and 75% of market weighted securities as well as a fully replicated portfolio with values of $100 million, $200 million, and $500 million. Again, taxes played a more important role in overall cost than market impact, causing a fully replicated portfolio to actually have the lowest transaction costs, as it holds a greater proportion of securities than an optimized portfolio in lower tax countries.

A single-minded focus on reducing market impact expenses while ignoring the impact of stamp duties and taxes can become the tail that wags the dog, if the investor is not careful.

It's critical to remember that full replication not only appears to reduce the average transaction cost, but it should greatly reduce potential tracking error as well. The potential costs of optimization in lieu of full replication can be demonstrated by reviewing the performance of exchange traded funds that

13 This analysis assumes a starting point in USD cash and buy program.
14 Capital markets transactions are frequently assessed taxes, fees, or duties by local regulators to defray the cost of market governance. In many markets, these charges are de minimus and would typically not impact the trading decision. In other markets, however, like the UK, Ireland, and many emerging countries, such taxes can be quite onerous as our study details.
15 BNY Mellon Beta Management, 2010.

use optimization. The iShares MSCI Emerging Markets ETF (Ticker: EEM) uses an optimized strategy which experienced tracking error of 671 bps net of expenses in 2009.[16] These pros and cons highlight the fundamental reciprocal relationship between optimization and full replication. This relationship revolves around the lower potential transaction costs of the optimization alternative against a higher tracking error (relative to full replication). An essential component of any benchmarking decision will be quantifying the degree of cost savings versus additional tracking error.

Yet another challenge to obtaining international beta exposure, and fairly significant in its scope, is the difficulty in setting benchmark valuation levels to a single fixed point in time for an allocation that spans multiple time zones and disparate market hours around the globe.

Exhibit 2 – Weighing the Pros and Cons of Full Replication vs. Optimization

Full Replication	Optimized Solution
Advantages: 1. Lowest Possible Tracking Error 2. Theoretically easier to implement as little decision making is required	Advantages: 1. Flexible input of constraints and position limits 2. Reduced trading costs from significantly reduced turnover and associated transaction and impact costs
Disadvantages: 1. Index changes imply higher turnover and accompanying trading costs 2. Cash flow management can be very costly (applying low $ value to a high number of shares incurs additional projected ticketing costs)	Disadvantages: 1. Intoduces potential for performance variance 2. Requires dynamically adaptable optimization model 3. Experience needed to calibrate and maintain optimization

Yet another challenge to obtaining international beta exposure, and fairly significant in its scope, is the difficulty in setting benchmark valuation levels to a single fixed point in time for an allocation that spans multiple time zones and disparate market hours around the globe. As in fixed income, often the premiums and discounts for international ETFs are a reflection of the difference in closing times between the various markets. Most markets included in the underlying index are closed during U.S. trading hours. NAVs for exchange-traded funds are calculated by using closing securities prices from local markets and Reuters/WM FX rates at 4 p.m. London time (10 a.m. EST) as that presents a widely recognized currency benchmark point around which to evaluate security prices. Therefore, during the second part of the U.S. trading day, the NAVs for most international funds do not change (their respective markets being closed), yet the market prices for these instruments continue to fluctuate to reflect new information. As a result, the traditional measure of market price/NAV for international ETFs may be more indicative of stale pricing than their sensitivity to exposure to the underlying beta risk factors.

16 "Exchange Traded Funds"; Morgan Stanley, February 12,2010: "Seven of the nine international ETFs with the highest 2009 tracking error are based on EM indices, and, on average, the seven trailed their respective underlying index by 836 bps ...attribute this primarily to optimization techniques ... . For example, the (GMF), which currently holds 222 of the 1,392securities in its benchmark, had negative tracking error of 746bps ... relative underweight in smaller holdings, which outperformed the broader index."

Synthetics: Benchmark Exposure Through International Equity Derivatives
Synthetic exposure to international index benchmarks can suffer from the same benchmarking issues and optimization challenges encountered when using physicals. One such hurdle stems from differences in timing between a derivative contract that trades primarily in one region of the world but is designed to track the returns of an overseas index. A good example is the E-mini MSCI EAFE® futures contract which trades in Chicago as a proxy for the benchmark returns of MSCI EAFE® index. The benchmark is tabulated using 21 developed market indices in Europe, Australasia, and the Far East, so there is limited overlap between U.S. market hours and the sessions of the constituent countries.

Another difficulty again touches on the replication/optimization conundrum. One way to overcome the challenge of a single contract providing complete exposure could be to trade the country index futures contracts that make up the benchmark, but this frequently means optimization. For example, U.S. investors may only utilize CFTC approved contracts which excludes the Swiss Market Index (SMI) as part of an overlay. Even before considering other challenges, an EAFE overlay for a U.S. investor would mis-track the benchmark solely due to excluding the SMI. In addition, futures contracts incorporate a minimum contract size. In the ETF market, an investor could tailor exposure down to the share, but fractional futures contracts don't exist so, inevitably, rounding differences need to be addressed when futures overlays are considered to obtain beta. As we saw in our MSCI World study, scale plays a role in the decision to optimize.

Synthetic solutions also incur ongoing maintenance costs and risks that tend to define their efficacy as a function of time. Due to the nature of their expiration schedule, futures contracts are subject to periodic roll costs — an ongoing process that, over time, can begin to erode return to the point that the original benefits of futures use becomes less relevant. This is particularly pertinent for international mandates where baskets of multiple futures are used to provide exposure to an entire region. In addition to roll costs, listed futures contracts also require both an initial posting of margin with the clearinghouse as well as daily mark-to-markets which may require additional collateral to settle. The potential for daily maintenance margin calls can exacerbate liquidity problems for a client who has not made adequate provisions.[17]

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Beta Exposure for Allocations to Alternatives

To preface, we will limit our discussion here to Real Estate and Commodities. These alternative beta exposures exhibit the necessary characteristics for them to be included in a beta allocation, i.e., the capability of being constructed both as an observable index for benchmarking purposes as

17 For more on this subject, see our 2009 paper "Policy Implementation in an Illiquid World" available upon request.

Another driver of risk for commodities is the correlation of commodity prices to currencies, where a low rate environment creates an imbalance in domestic versus foreign prices for the same commodity, again forcing the commodity manager's hand to exercise decision making around expected currency movements in order to manage the portfolio.

well as being replicated by physical or synthetic means. While allocations to Private Equity, Venture Capital, or Hedge Funds are not uncommon for institutional investors, indices that track these betas tend to be narrowly defined and are typically considered poor candidates for synthetic exposure.[18]

Physical replication or optimization via segregated accounts, pooled funds or ETFs, is possible for many Real Estate benchmarks as there are generally a limited number of Real Estate Investment Trusts (REITs) that comprise a given index.[19] But both index funds and ETFs tracking the indices suffer from issues arising from the capital intensive nature of these securities, where large cash flows around a given month's end can create cyclical cash drag, leading to considerable volatility against the benchmark. Synthetic exposure to Real Estate is largely confined to off-market agreements, where the trade-offs between cost, time and suitability force most investors away from this option.

In contrast, commodities are not easily managed or replicable by holding underlying physicals, as storing a quantity of copper or natural gas is unrealistic for most institutional investors to say the least. For this reason, derivatives are the most common means to gain exposure, via separate futures contracts or funds that bundle the respective futures contracts for the various underlying commodities that make up the desired benchmark. Yet compared to the passive nature of most beta-type investments, these require a great deal of decision making to manage a pooled fund in order to track a common benchmark such as the S&P GSCI Commodities Index, blurring the line between alpha and beta-derived management. Commodity managers tend to use pre-defined roll dates and must source the most attractive pricing at that time, although inversions between spot prices and futures prices at time of expiry can lead to losses. While this is common in order to minimize undesirable tracking error, it does present a source of volatility between the benchmark and the instrument used to ostensibly provide seamless exposure to the benchmark. Another driver of risk for commodities is the correlation of commodity prices to currencies, where a low rate environment creates an imbalance in domestic versus foreign prices for the same commodity, again forcing the commodity manager's hand to exercise decision making around expected currency movements in order to manage the portfolio.

Balancing Beta Exposure Approaches: Transaction Costs vs. Tracking Error

Today, nearly any major index can be replicated in a beta vehicle, yet as the investor moves down in market capitalization and outside developed markets, beta management becomes an increasingly complex task. Despite the many challenges in its effective implementation, beta exposure is still

18 Current research in hedge fund replication, however, may have implications for potential beta management. See "Jumping the Gates: Using Beta-Overlay Strategies to Hedge Liquidity Constraints" by Healy & Lo as available athttp://ssrn.com/abstract=1407382; 2009.
19 For example, there are 153 issues in the DJ Wilshire REIT Index, a broad and common benchmark for this asset class.

The increasing demand for diversification is likely to generate further proliferation of solutions for beta exposures. Whether physical or synthetic, they will attempt to replicate in the real world what only exists on paper — an index-like return.

perceived as easy to access and cheap to provide. Just as the investor's desired beta is the product of an optimized asset allocation design, so too

must the investor conduct a cost-benefit study when selecting the appropriate investment vehicle with which to express that asset allocation decision. Where as the asset allocation framework specifies a sought-after level of return for a given level of risk, the beta instrument optimization trades off tracking error for transactions costs.

To summarize, we've estimated some of the basic costs, comparing these typical instruments against major benchmarks to derive some guideline cost and risk estimates. This is by no means a complete analysis, and tends to be quite dynamic over time.

Exhibit 3 – Approximate Costs of Typical Beta Instruments for Major Asset Classes

	US Large Cap Equity	US Small Cap Equity	Non-US Equity	Non-US Developed Equity	US Fixed Income	Global Bonds	Commodities	Real Estate
Physicals								
Cost to implement	12	26	20	16	65	80	n/a	n/a
Tracking error	23	52	40	32	130	160	n/a	n/a
High trading costs, low tracking error								
ETFs								
Cost to implement	20	43	50	47	86	116	variable	49
Tracking error	2	14	127	12	23	78	52	26
Simpler to implement than physicals, but higher trading costs and tracking error								
Futures								
Cost to implement	12	8	17	20	48	14	n/a	n/a
Tracking error	2	43	186	105	182	527	n/a	n/a
Cost effective for shorter periods, high tracking error, liquidity against relative benchmarks varies								
Swaps								
Cost to implement	L*-8	L-75	L-39	L-40	n/a	n/a	n/a	n/a
Tracking error	0	0	0	0	n/a	n/a	n/a	n/a
Cost effective for longer periods, low tracking error, rigid terms								

Sources: BNY Mellon Beta, Barra, MS Analytics, Barclays POINT; 2010

Cost to implement in basis points is modeled on a $100M notional investment for a one year holding period and includes both commission as well as predicted bid/ask spread and market impact cost for all asset types. Estimates using futures assume round-trip costs. Estimates for ETFs include published expense ratios for each fund.

**Costs for swaps are quoted based on LIBOR (the London Interbank Offered Rate) less stated spread as provided by a panel of swap dealers in May 2010. The "L" stands for Libor*

Indices used to model benchmarks are as follows: US Large Cap Equity – S&P 500 Index; US Small Cap Equity – Russell 2000 Index; Non-US Equity –

MSCI ACWI ex-US Index; Non-US developed Equity – MSCI EAFE Index; US Fixed Income – Barclays Capital U.S. Aggregate Bond Index; Global Bonds - Citigroup WGBI Index; Commodities – S & P Goldman Sachs Commodities Index; Real Estate – DJ Wilshire Real Estate Index.

The increasing demand for diversification is likely to generate further proliferation of solutions for beta exposures. Whether physical or synthetic, they will attempt to replicate in the real world what only exists on paper — an index-like return. As investors evaluate the innovative instruments offered by investment bankers, asset managers and other strategic providers that create these instruments, we recommend a few questions to ask beforehand in order to uncover potential pitfalls and avoid unpleasant surprises:

- Does the solution have the ability to fully replicate risk premiums or is some element of return being ported from other asset classes?
- What is the size of the investment and over what period is the investment being made?
- What is the sum of ongoing trade and management costs? How does this affect tracking error over time? What are the administrative risks?
- Does round-the-clock trading of underlying securities create pricing and benchmarking issues?
- How does an instrument that uses underlying physical securities manage such issues as index changes, diversification requirements, optimization constraints, cash drag, taxable distributions, and securities lending?
- Is the solution a suitable proxy for the desired benchmark?

The challenge of meeting return expectations in the face of uncertain volatility and opportunities has necessitated a burgeoning of complex investment strategies that seek diversified beta exposures as well as alpha strategies that rely heavily on alpha beta separation. Concurrent with their understanding of the costs and risks that are inherent with these instruments, the judicious use of which beta instrument to employ in meeting investment objectives will continue to evolve as both science and art to meet the needs of today's institutional investors.

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Mark A. Keleher, Chief Executive Officer

Mark A. Keleher is chief executive officer of BNY Mellon Beta Management. His 18 years of investment experience include a decade managing Mellon Capital Management Corporation's Enhanced Asset Allocation and Tangent-Added Tactical Asset Allocation strategies, managing equity derivative sales in Tokyo for Merrill Lynch Japan, Inc. and directing hedge funds at Aspen Capital Management LLC and Grizzly Capital Management L.P. As an industry expert, Mark has been featured in numerous industry articles and co-authored a chapter on transition management in ***Portfolio Analysis – Advanced Topics in Performance Measurement, Risk, & Attribution*** *(RiskBooks, 2006). He received his M.B.A. from the Wharton School of the University of Pennsylvania and holds the designation of Chartered Financial Analyst (CFA).*

Jamie Cashman, Global Head of Marketing

Jamie Cashman is global head of marketing for BNY Mellon Beta Management, responsible for marketing beta management services. Jamie has 16 years of industry experience and has previously worked for the Institutional Equity Division of Morgan Stanley and was a derivatives operations specialist at Credit Suisse. He is a graduate of Georgetown University and has earned the designations as a CFA, Certified Investment Management Analyst (CIMA), Financial Risk Manager (FRM) and Professional Risk Manager (PRM).

Jon Platt, Director of Investments and Trading

Jon Platt is a director of trading and investments at BNY Mellon Beta Management, responsible for creating trading strategies, analyzing trading costs, trade monitoring and managing future overlays. He designs and develops the pre- and post-trade analysis for equity transitions. Prior to this, he was a fixed income portfolio analyst at Montgomery Securities. He has a B.S. and B.A. from Florida State University in finance and English, respectively. He is also a CFA.

Keith Eiger, Product Strategist

Keith Eiger is a product marketing specialist at BNY Mellon Beta Management, with responsibility for RFPs, collateral development, and consultant marketing. He has 14 years of industry experience.

Appendix of Indices

These benchmarks used are broad-based indices which are used for comparative purposes only and have been selected as they are well known and are easily recognizable by investors. Comparisons to benchmarks have limitations because benchmarks have volatility and other material characteristics that may differ from the fund or portfolio to which they are compared. For example, investments made for the fund or portfolio may differ significantly in terms of security holdings, industry weightings, and asset allocation from those of the benchmark. According, investment results and volatility of the fund or portfolio may differ from those of the benchmark. Also, the indices noted in this presentation, are unmanaged, are not available for direct investment, and are not subject to management fees, transaction costs, or other types of expenses that the fund or portfolio may incur. In addition, the performance of the indices reflects reinvestment of dividends, and, where applicable, capital gains distributions. Therefore investors should carefully consider these limitations and differences when evaluating the comparative benchmark data performance.

The indices are trademarks and have been licensed for use by The Bank of New York Mellon Corporation (together with its affiliates and subsidiaries) and are used solely herein for comparative purposes. The foregoing licensers are not affiliated with The Bank of New York Mellon Corporation, do not endorse, sponsor, sell or promote the investment strategies or products mentioned in this paper and they make no representation regarding advisability of investing in the products and strategies described herein.

The Barclays Capital U.S. Aggregate Bond Index is a broad- based benchmark that measures the investment grade, U.S. dollar- denominated, fixed-rate taxable bond market, including Treasuries, government-related and corporate securities, MBS (agency fixed-rate and hybrid ARM pass-throughs), ABS and CMBS.

The Barclays Capital U.S. High-Yield Very Liquid Index (VLI) is a more liquid version of the U.S. Corporate High-Yield Index that measures the market of USD-denominated, non-investment grade, fixed-rate taxable corporate bonds.

The MSCI EAFE Index (Europe, Australasia, Far East) is a free float-adjusted market capitalization index that is designed to measure the equity market performance of developed markets, excluding the U.S. & Canada. As of June 2007 the MSCI EAFE Index consisted of the following 21 developed market country indices: Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and the United Kingdom.

The MSCI EM (Emerging Markets) Europe, Middle East and Africa Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of the emerging market countries of Europe, the Middle East & Africa. As of November 2008, the MSCI EM EMEA Index consisted of the following 9 emerging market country indices: Czech Republic, Hungary, Poland, Russia, Turkey, Israel, Egypt, Morocco, and South Africa.

The MSCI World Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets. As of June 2007 the MSCI World Index consisted of the following 23 developed market country indices: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

The FTSE 100 Index index comprises the 100 most highly capitalized blue chip companies, representing approximately 81% of the UK market. It is used extensively as a basis for investment products, such as derivatives and exchange-traded funds.

The S&P GSCI® is a composite index of commodity sector returns representing an unleveraged, long-only investment in commodity futures that is broadly diversified across the spectrum of commodities. The returns are calculated on a fully collateralized basis with full reinvestment. The combination of these attributes provides investors with a representative and realistic picture of realizable returns attainable in the commodities markets.

The Russell 2000 Index measures the performance of the small-cap segment of the U.S. equity universe. The Russell 2000 Index is a subset of the Russell 3000® Index representing approximately 8% of the total market capitalization of that index. It includes approximately 2,000 of the smallest securities based on a combination of their market cap and current index membership.

The S&P 500® has been widely regarded as the best single gauge of the large cap U.S. equities market since the index was first published in 1957. The index has over US$ 3.5 trillion benchmarked, with index assets comprising approximately US$ 915 billion of this total. The index includes 500 leading companies in leading industries of the U.S. economy, capturing 75% coverage of U.S. equities.

The MSCI ACWI (All Country World Index) ex- US Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets outside of the United States.

The Citigroup World Government Bond Ex-U.S. Index is a market capitalization weighted index consisting of the government bond markets of the following countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Spain, Sweden, and United Kingdom. CITIGROUP is a registered trademark and service mark of Citigroup Inc. or its affiliates and is used and registered throughout the world. The Citigroup World Government Bond Ex-U.S. Index ("Index") is owned and maintained by Citigroup Index LLC ("Citigroup").

The Dow Jones Wilshire REIT Index measures U.S. publicly traded Real Estate Investment Trusts. The Dow Jones REIT Composite Index contains all the publicly traded U.S. REITs in the Dow Jones U.S. stock universe.

The Swiss Market Index (SMI) is a capitalization-weighted index of the 20 largest and most liquid stocks of the Swiss Performance Index universe. It represents about 85% of the free-float market capitalization of the Swiss equity market. The SMI was developed with a base value of 1,500 as of June 30, 1988.

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ASSET MANAGEMENT

The Alcentra Group
Ankura Capital Pty Limited
Blackfriars Asset Management Limited
BNY Mellon ARX
BNY Mellon Beta Management
BNY Mellon Cash Investment Strategies
The Boston Company Asset Management, LLC
The Dreyfus Corporation
EACM Advisors LLC
Hamon Investment Group
Insight Investment
Mellon Capital Management Corporation
The Newton Group
Pareto Investment Management Limited
Siguler Guff & Company LP
Standish Mellon Asset Management Company LLC
Urdang Capital Management, Inc.
Urdang Securities Management, Inc.
Walter Scott & Partners Limited
WestLB Mellon Asset Management