The Index Investor

Why Pay More for Less?

Global Asset Class Returns

YTD 30Apr04	In USD	In AUD	In CAD	In EURO	In JPY	In GBP
US Bonds	0.00%	4.04%	5.50%	4.75%	2.85%	0.44%
US Prop.	-4.50%	-0.46%	1.00%	0.25%	-1.65%	-4.06%
US Equity	-0.30%	3.74%	5.20%	4.45%	2.55%	0.14%
AUS Bonds	-7.20%	-3.16%	-1.70%	-2.45%	-4.36%	-6.76%
AUS Prop.	5.10%	9.14%	10.60%	9.86%	7.95%	5.55%
AUS Equity	-2.60%	1.44%	2.90%	2.15%	0.25%	-2.16%
CAN Bonds	-4.36%	-0.32%	1.14%	0.39%	-1.51%	-3.92%
CAN Prop.	-16.70%	-12.66%	-11.21%	-11.95%	-13.86%	-16.26%
CAN Equity	-6.20%	-2.16%	-0.70%	-1.45%	-3.35%	-5.76%
Euro Bonds	-3.16%	0.88%	2.34%	1.59%	-0.31%	-2.72%
Euro Prop.	4.50%	8.54%	9.99%	9.25%	7.34%	4.94%
Euro Equity	-3.30%	0.74%	2.20%	1.45%	-0.45%	-2.86%
Japan Bonds	-3.17%	0.87%	2.33%	1.58%	-0.32%	-2.73%
Japan Prop.	25.75%	29.79%	31.25%	30.50%	28.59%	26.19%
Japan Equity	5.20%	9.24%	10.70%	9.95%	8.05%	5.64%
UK Bonds	-0.48%	3.56%	5.02%	4.27%	2.37%	-0.04%
UK Prop.	21.80%	25.84%	27.30%	26.55%	24.65%	22.24%
UK Equity	0.10%	4.14%	5.60%	4.85%	2.95%	0.54%
World Bonds	-1.60%	2.44%	3.90%	3.15%	1.25%	-1.16%
World Prop.	2.10%	6.14%	7.60%	6.85%	4.95%	2.54%
World Equity	0.50%	4.54%	6.00%	5.25%	3.35%	0.94%
Commodities	9.40%	13.44%	14.90%	14.15%	12.25%	9.84%
Hedge Funds	1.42%	5.46%	6.92%	6.17%	4.27%	1.86%
A$	-4.04%	0.00%	1.46%	0.72%	-1.19%	-3.60%
C$	-5.50%	-1.46%	0.00%	-0.74%	-2.65%	-5.05%
Euro	-4.75%	-0.72%	0.74%	0.00%	-1.91%	-4.31%
Yen	-2.85%	1.19%	2.65%	1.91%	0.00%	-2.40%
UK£	-0.44%	3.60%	5.05%	4.31%	2.40%	0.00%
US$	0.00%	4.04%	5.50%	4.75%	2.85%	0.44%

Model Portfolio Update

The objective of our first set of model portfolios is to deliver higher returns than their respective benchmarks over a one-year holding period, while taking on no more risk. The benchmark for the first portfolio in this group is an aggressive mix of 80% domestic equities, and 20% domestic bonds. Through the end of April, this benchmark had returned 0.5%, while our model portfolio had returned 3.0%. We have also compared our model portfolios to a set of global benchmarks. In this case, the global benchmark is a mix of 80% global equities, and 20% global bonds. Through the end of last month, it had returned 4.6%.

The benchmark for the second portfolio in this group is a mix of 60% domestic equities and 40% domestic bonds. Through the end of last month, it had returned (0.4%), while our model portfolio had returned 1.6%, and the global benchmark had returned 4.6%.

The benchmark for the third portfolio in this group is a conservative mix of 20% domestic equities and 80% domestic bonds. Through the end of last month, it had returned (2.2%), while our model portfolio had returned 0.1% and the global benchmark 4.7%.

The objective of our second set of model portfolios is to deliver less risk than their respective benchmarks, while delivering at least as much return over a one-year holding period. The benchmark for the first portfolio in this group is an aggressive mix of 80% domestic equities, and 20% domestic bonds. Through the end of last month, this benchmark had returned 0.5%, while our model portfolio had returned 1.6%. We have also compared our model portfolios to a set of global benchmarks. In this case, the global benchmark is a mix of 80% global equities, and 20% global bonds. Through the end of last month, it had returned 4.6%.

The benchmark for the second portfolio in this group is a mix of 60% domestic equities and 40% domestic bonds. Through the end of last month, it had returned (0.4%), while our model portfolio had returned (0.2%), and the global benchmark had returned 4.6%.

The benchmark for the third portfolio in this group is a conservative mix of 20% domestic equities and 80% domestic bonds. Through the end of last month, it had returned (2.2%), while our model portfolio had returned (1.0%) and the global benchmark 4.7%.

The objective of our third set of model portfolios is not to outperform a benchmark index, but rather to maximize the probability of achieving a minimum level of compound annual real return over a twenty-year period while taking on as little risk as possible. Through last month, our 7% target real return portfolio had returned, in nominal terms, 4.9% year-to-date, our 5% target real return portfolio had returned, in nominal terms, 5.1%, and our 3% target real return portfolio had returned, in nominal terms, 3.6%.

Our fourth set of model portfolios are also target real return portfolios; however, they include the possibility of investing in a hedge fund index. Through last month, our 7% target real return HF portfolio had returned, in nominal terms, 4.9% year-to-date, our 5% target real return HF portfolio had returned, in nominal terms, 4.5%, and our 3% target real return HF portfolio had returned, in nominal terms, 3.5%.

Equity and Bond Market Valuation Update

Our equity market valuation analysis rests on two fundamental assumptions. The first is that the long term real equity risk premium is 4.0% per year. The second is the average rate of productivity growth an economy will achieve in the future. As described in our June, 2003 issue, we use both high and a low productivity growth assumptions for each region. Given these assumptions, here is our updated market valuation analysis at the end of last month:

Country	Real Risk Free Rate Plus	Equity Risk Premium Equals	Required Real Return on Equities	Expected Real Growth Rate* plus	Dividend Yield Equals	Expected Real Equity Return**
Australia	3.29%	4.00%	7.29%	4.90%	3.67%	8.57%
Canada	2.42%	4.00%	6.42%	2.10%	1.95%	4.05%
Eurozone	1.43%	4.00%	5.43%	2.50%	2.61%	5.11%
Japan	1.13%	4.00%	5.13%	2.70%	0.88%	3.68%
U.K.	1.88%	4.00%	5.88%	2.50%	3.22%	5.72%
U.S.A.	2.54%	4.00%	6.54%	4.50%	1.69%	6.19%

**High Productivity Growth Scenario. See Asset Class Review, in our June 2003 Issue, for assumptions used in both productivity growth scenarios for each region.*
*** When required real equity return is greater than expected real equity return, theoretical index value will be less than actual index value – i.e., the market will appear to be overvalued.*

Country	Implied Index Value*	Current Index Value	(Under) or Overvaluation in High Growth Scenario	(Under) or Overvaluation in Low Growth Scenario
Australia	153.56	100.00	-54%	-8%
Canada	45.14	100.00	55%	63%
Eurozone	89.08	100.00	11%	41%
Japan	37.77	100.00	62%	74%
U.K.	95.27	100.00	5%	34%
U.S.A.	82.84	100.00	17%	44%

*High productivity growth scenario.

At the suggestion of a number of readers, this month we are also expanding our equity market valuation analysis. As we have described, our estimate of over or undervaluation is based on the relationship between the returns an equity market is expected to supply, and those investors are likely to demand. We define the former as the current dividend yield plus the expected rate of real long-term economic growth. To be sure, changes in the market price/dividend (or price/earnings) ratio also affect the returns supplied. However, we view these as being essentially driven by psychological factors which we have no basis for predicting. Hence, we do not include future price/dividend ratio changes in our analysis.

We define the future demand for equity market returns to be equal to the current yield on long term real return bonds, plus a four percent long term equity market risk premium. As you can see, the good news is that two of the factors in our model -- current dividend yields and the real bond return -- are easily obtained from the daily paper. The bad news is that the other two -- the expected rate of dividend growth and the "correct" equity market risk premium -- are two of the most contentious issues in finance. However, as a number of readers have pointed out, by assuming one of these, you can derive an estimate of the market's current expectation for the other. Specifically, the market's current implied rate of future dividend growth equals the current real bond yield plus the four percent equity market risk premium less the current dividend yield. Similarly, the market's current implied equity market risk premium equals the current dividend yield plus our estimated future growth rate less the current real bond yield. To further help our readers assess the relative valuation of different equity markets, we will be presenting this information each month, as shown in the following table:

	Current Dividend Yield	Current Real Bond Yield	Implied Future Real Growth Rate, Assuming 4% ERP	Implied ERP, Assuming Low Future Growth Scenario	Implied ERP, Assuming High Future Growth Scenario
Australia	3.67%	3.29%	3.62%	4.28%	5.28%
Canada	1.95%	2.42%	4.47%	0.63%	1.63%
Eurozone	2.61%	1.43%	2.82%	2.18%	3.68%
Japan	0.88%	1.13%	4.25%	1.55%	2.55%
United Kingdom	3.22%	1.88%	2.66%	2.34%	3.84%
United States	1.69%	2.54%	4.85%	2.65%	3.65%

This month we are also adding a new bond market valuation update. It is based on the same supply and demand methodology we use for our equity market valuation update. In this case, the supply of future fixed income returns is equal to the current nominal yield on ten year government bonds. The demand for future returns is equal to the current real bond yield plus the historical average inflation premium (the difference between nominal and real bond yields) between 1989 and 2003. To estimate of the degree of over or undervaluation for a bond market, we use the rate of return supplied and the rate of return demanded to calculate the present values of a ten year zero coupon government bond, and then compare them. If the rate supplied is higher than the rate demanded, the market will appear to be undervalued. This information is contained in the following table:

	Current Real Rate	Average Inflation Premium (89-03)	Required Nominal Return	Nominal Return Supplied (10 year Govt)	Rate Gap	Asset Class Over or (Under) Valuation, based on 10 year zero
Australia	3.29%	2.96%	6.25%	5.95%	-0.30%	2.87%
Canada	2.42%	2.40%	4.82%	4.62%	-0.20%	1.93%
Eurozone	1.43%	2.37%	3.80%	4.21%	0.41%	-3.87%
Japan	1.13%	0.77%	1.90%	1.54%	-0.36%	3.60%
UK	1.88%	3.17%	5.05%	4.98%	-0.07%	0.67%
USA	2.54%	2.93%	5.47%	4.50%	-0.97%	9.68%

It is important to note that this analysis looks only at government bonds. The relative valuation of non-government bond markets is also affected by the extent to which their respective credit spreads (that is, the difference in yield between an investment grade or high yield corporate bond and the yield on a government bond of comparable maturity) are above or below their historical averages (with below average credit spreads indicating potential overvaluation).

Finally, for an investor contemplating the purchase of foreign bonds or equities, the expected future annual percentage change in the exchange rate is also important. Study after study has shown that there is no reliable way to forecast this. At best, you can make an estimate that is justified in theory, knowing that in practice it will not turn out to be accurate. That is what we have chosen to do here. Specifically, we have taken the difference between the yields on ten-year government bonds as our estimate of the likely future annual change in exchange rates between two regions. This information is summarized in the following table:

	To A$	To C$	To EU	To YEN	To GBP	To US$
From						
A$	0.00%	-1.33%	-1.74%	-4.41%	-0.97%	-1.45%
C$	1.33%	0.00%	-0.41%	-3.08%	0.36%	-0.12%
EU	1.74%	0.41%	0.00%	-2.67%	0.77%	0.29%
YEN	4.41%	3.08%	2.67%	0.00%	3.44%	2.96%
GBP	0.97%	-0.36%	-0.77%	-3.44%	0.00%	-0.48%
US$	1.45%	0.12%	-0.29%	-2.96%	0.48%	0.00%

For example, ten-year Eurozone government bonds currently have a nominal yield of 3.96%. Assume their purchase is being considered by an investor whose functional currency is A$. Given the estimated annual change in the A$/Euro exchange rate of 1.74% (that is, the A$ is expected to depreciate versus the Euro), the estimated A$ return on the Eurozone bond is 3.96% + 1.74% =5.70%. Note that this assumes that the foreign exchange risk is not hedged (since, in an efficient market, the cost of that hedge would be equal to slightly more than the expected change in the exchange rate, and would therefore approximately equalize the domestic and foreign government bond yields).

This Month's Letter to the Editor

What is your opinion of the asset allocation calculators available on many other websites?

You raise an interesting question. Based on our previous research, we would have said "pretty low." Now, having looked at them again, we'd like to amend that to "very low." I'll start with a few examples from the sites we researched (the names of which we will withhold, to protect the guilty). Site #1 makes some interesting claims: "Your age is by far the most important aspect of asset allocation." "People with large portfolios…and people who save more each year…can invest more aggressively." "The better your outlook for the economy, the more aggressive you can be with your investments." This site produced its asset allocation recommendations based on our answers to seven questions, including our age, current savings, expected future savings per year, income requirement (expressed as a

percentage of the portfolio), tax rate, risk tolerance (expressed by moving a slider from "low" to "high") and our "economic outlook" (for which we could move a slider from "poor" to "good"). Its asset allocation solution divided a portfolio between the following "asset classes": "Large Cap" (we presume this means large capitalization U.S. equities), "Mid Cap", "Small Cap", Foreign Stock, Bonds (presumably some type of U.S. bonds); "Municipals" (tax advantaged U.S. state and local bonds), and cash.

Site #2's calculator used a similar set of questions and sliders to collect our input data, but limited its recommended allocation to just five asset classes: "Large Caps", "Small Caps", International Equity, Bonds and Cash.

Site #3 asked us only four questions: "when do you need the money?", "how much risk can you handle?", "how much wiggle room do you have?" (one possible answer to this question was "if I miss my goal by a year or two I'll still be okay"), and "as the bear market intensified, did you do nothing, see an opportunity to buy more stocks, or sell?". On the basis of our answers, it produced a suggested asset allocation, divided between Large Cap, Small Cap, Foreign Equity, and Bonds. Oh, yes, and it also conveniently provided lists of suggested funds for each asset class. Said suggestions contained a wide variety of actively managed funds, and, at least in the cast of Large Cap and Small Cap equity, two index funds.

Site #4 is run by a mutual fund company. It asked us eight questions to start with, including one about how much time we had to achieve our primary financial goal (the longest time frame available was "more than ten years."). After this, it divided our portfolio between just three asset classes: Stocks, Bonds, and Cash.

To its great credit, Site #5 based its asset allocation calculations on the rate of return sought by the investor, and noted that its goal was to produce the mix of asset classes most likely to achieve this return with minimum risk. Once we input our desired rate of return, it produced an asset allocation divided between Cash, Bonds, Large Cap Equity, Small Cap Equity, and International Equity. Based on a target return of 8% (which we presume was nominal, but the site didn't specify nominal or real), the site calculator told us that there was a 68% chance that

the return in any year would fall between 5.66% and 10.34%. However, as this implies a portfolio standard deviation of 2.34%, we were confused by the next statement, which noted that "it is possible that in any given year you may earn only .06%." Eight percent less three standard deviations of 2.34% (which gives you the 99% probability range) would give you a minimum return of .98%, not .06%. Finally, this site also provided "helpful" links to "high performing stocks and funds that fit in the asset classes in your recommended portfolio."

We could go on with similar examples, but we won't; frequent readers are already in enough pain.

Needless to say, we have a number of problems with the methodology which underlies these and similar asset allocation calculators. First, they confuse tilts within asset classes (e.g., large and small cap companies) with the asset classes themselves (e.g., U.S. equity). Moreover, they present no arguments on the potential advantages and disadvantages of taking such tilts. Second, they generally employ too few asset classes in their solutions, and thereby forego potential diversification benefits.

Third, their recommendations are typically based (site #5 being the exception) on the results of some type of "risk capacity" survey. In other words, their logic proceeds from determining the maximum risk a person is comfortable with, to the translation of this into a maximum portfolio standard deviation (the statistical measure of the dispersion of an asset or portfolio's returns around its mean), to the calculation of an asset allocation that maximizes expected returns subject to this risk constraint. In our experience, the real world doesn't work like this. The majority of people we know start with a set of financial goals they'd like to achieve within a certain time period, along with their current and expected future savings. They then use these starting points to "back into" the minimum compound rate of return they need to earn on their portfolio to achieve their goals. The asset allocation challenge then becomes how to maximize the probability of achieving this rate of return, at the lowest possible risk. Moreover, if an investor isn't comfortable with the risk implied by the asset allocation solution, he or she must confront some realistic alternatives: reduce his or her goals, stretch

out the time period for achieving them, or increase annual savings. Unfortunately, as they are currently structured most online asset allocation calculators skip these practical realities.

Fourth, in our survey of different sites, it was never clear what underlying assumptions were being used in the asset allocation calculations. How were the asset classes defined? Were the assumed future asset class returns, standard deviations, and correlations based on historical averages? If so, over what period? Or were they based on the outputs of a forward-looking asset pricing model? If so, how does that model work? Or were they based on the combination of these two approaches (theoretically the most defensible solution)? The bottom line is that when you use online calculators you don't know the answers to these critically important questions, and therefore have no way of either judging the quality of the result or comparing the results produced by different calculators.

Fifth, we have a very strong suspicion that in many cases, the underlying methdology used by these calculators to produce their asset allocation recommendations is mean/variance optimization (a straightforward application of linear programming). The basic problem we have is that MVO is a technique designed to produce optimal solutions to problems involving one year holding periods. Its use for longer period problems -- which characterize the ones faced by many users of these calculators -- is much more difficult to theoretically justify (see our blue button "Asset Allocation Methodology Summary" for a much longer discussion of this).

Finally, as we repeatedly point out in our writing on the subject, all asset allocation methodologies are subject to some very important limitations, including non-normal (in the statistical sense!) historical returns for most asset classes, and non-stationary (i.e., changing) underlying returns generating economic processes. Unfortunately, none of the online asset allocation calculators we examined disclosed this to potential users. This violates one of our fundamental principles: you should never use an analytical tool unless you also make clear the potential limitations of the results it produces. Sometimes, knowing what you don't know is as important as knowing what you do. In sum, we found all the online calculators we examined had serious limitations.

This Month's Feature Articles: Key Points

Our first article this month looks at neuroeconomics. This is a new field of study that links brain research to the way people make economic decisions. Fundamentally, neuroeconomics locates the sources of sometimes irrational investor behavior in basic neurochemical processes. It confirms psychological findings that emotions are tightly linked to the way humans cognitively process external stimuli. In other words, the historical belief that "rational thinking" and "emotional feeling" are separate and at odds with each other seems to be wrong. Another area of neuroeconomics research involves human pattern recognition. A key finding is that this is an automatic process that sometimes results in the false recognition of patterns that aren't really there. Unfortunately, this still triggers very real emotional responses. Taken together, the emerging findings from neuroeconomics strengthen the case that consistently successful active management -- which rests on accurate forecasts -- is extraordinarily difficult in practice.

Our second article covers three product and strategy topics. We start with the International Monetary Fund's most recent World Economic Outlook, and find that it largely agrees with the views we presented last month. We then take a look at the confusing topic of European equity indexes, and identify the ones we believe best represent this asset class from the perspective of a long-term investor. Finally, we compare the results from different asset allocation models, and show why our simulation optimization approach produces superior results.

Neuroeconomics and Active Management

Neuroeconomics is a new field of study that links the results of brain research to economic issues. Some of its initial findings further add to the arguments against active management, and in favor of index investing.

Research in evolutionary biology has shown that a complex human reasoning process has developed in response to the twin imperatives of maximizing survival fitness and conserving scarce cognitive resources. This system operates on three different levels. What we

commonly describe as "thinking" -- that is, the conscious use of explicitly rational processes -- requires the most effort, and is therefore the most inefficient (from a resource conservation point of view) to use. Humans have therefore developed two less resource intensive means to process the deluge of external stimuli we encounter each day. The first of these is the use of mental short cuts (technically called "heuristics"). Examples of these include "availability" (using only readily available information when making a decision or solving a problem); "anchoring" (adjusting from a known starting point when making an estimate); and "satisficing" (choosing the first alternative that is "good enough" rather than taking the time to identify and evaluate all that are possible).

The second less resource intensive approach we use to process external stimuli is emotion. Compared to the other two approaches, emotion is the least understood; until relatively recently it was viewed as fundamentally different from cognition, rather than a complementary part of this process. It is in this area that neuroeconomics has already provided some important new insights.

To be sure, economics researchers had already begun to explore this area. We highlighed some of these in our February issue. For example in "Prospect Theory and Asset Prices", Barberis, Huang, and Santos proposed a modified version of prospect theory in which, rather than being constant, an investor's degree of risk aversion changes in response to the evolution of his or her gains and losses relative to some starting anchor value (reference point). As gains grow larger, the investor becomes less risk averse (i.e., they reduce their equity risk premium), which lowers their required rate of return and drives asset prices still higher. However, as losses grow, so too does risk aversion and the required rate of return, which further accelerates the decline in asset prices. Clearly, there is something more at work here than pure rational thought.

In his paper "Risk As Analysis and Risk As Feelings" Paul Slovic explored this topic, and reported his findings that "there are two fundamental ways in which human beings comprehend risk. The 'analytic system' uses algorithms and normative rules. It is relatively slow, effortful, and requires conscious control." In contrast, "the experiential system is

intuitive, fast, mostly automatic and not very accessible to conscious awareness…It relies on images and associations, linked by experience to emotion and affect (a feeling that something is good or bad). This system represents risk as a feeling…Proponents of formal risk analysis tend to view affective responses to risk as irrational. Current wisdom disputes this view. The rational and the experiential systems operate in parallel and each seems to depend on the other for guidance…Both systems have their advantages, biases, and limitations…Rational decision making requires integration of both modes of thought."

Finally, in their paper "How Do Investors Judge the Risk of Financial Items?", Koonce, McAnally, and Mercer finds that that both rational factors (probabilities and outcome values) as well as two emotionally based factors called "dread" and "unknown" drive perceptions of financial risk. As the authors describe it, "dread captures a risky item's perceived controllability and voluntariness, as well as the amount of worry and catastrophic loss potential associated with the item, while unknown captures a risky item's observability, its newness, the amount of knowledge one has about the item, and the immediacy of the item's effects." In terms of the relationship between these factors, they find that "higher potential loss outcomes lead to greater dread, and greater dread in turn leads to greater perceived risk."

Fundamentally, neuroeconomics takes us from these external observations of investor behavior to the actual brain chemistry and physiology that give rise to them. Let's look at some of the most important recent findings.

Fast automatic responses to strong stimuli are controlled by the amygdala, which is part of our primal brain (in contrast, rational thinking takes place in the cortex, which is believed to have developed later in our evolutionary history). In their paper "Lesions of the Human Amygdala Impair Enhanced Perception of Emotionally Salient Events", Anderson and Phelps note that "commensurate with the importance [to survival] of rapidly and efficiently evaluating significant stimuli, humans are probably endowed with distinct faculties and maintain specialized neural structures to enhance their detection." Based on their research, they conclude that the amygdala "integrates sensory and cognitive [memory] information to

[automatically, without conscious control] interpret the emotional significance of an event or thought."

In their paper "Differential Amygdala Responses to Winning and Losing", Zalla, Koechlin, Pietrini et al find that the emotional responses generated by the amygdala aren't linear, but rise exponentially with the intensity of a stimulus. This not only affects the extent of immediate physiological response (e.g., the release of adrenaline in the case of fear, or dopamine in the case of pleasure), but also the extent to which the stimulus in question is encoded into memory (stronger experiences are later easier to recall than more neutral ones). This latter conclusion has also been reached by other researchers (see, for example, "Amygdala Actively Related to Enhanced Memory" by Hamann, Ely, et al). An interesting aspect of this process seems to be that when a strong emotional response is triggered, it limits what is encoded in memory (suggesting that there is a finite capacity for such encoding, that is heavily taxed by strong emotions). In their paper "The Role of the Human Amygdala in Emotional Modulation of Long Term Declarative Memory", Buchanan and Adolphs cite a common example of this: eyewitnesses to a violent crime typically focus on the weapon used (the direct threat to their survival), but remember few other details.

A related point is made in the paper "Forecasting Affect: Why Don't People Know How They'll Feel?" by Ayton, Naseem, and Pott. These authors start with the observation that multiple studies have found that "people are too extreme in their forecasts of the intensity and duration of their own happiness and unhappiness following emotionally significant incidents." They then look for factors which could explain why people find it so difficult to learn when it comes to their emotions. Their research leads them to conclude that people only remember the emotionally charged aspects of an event, and not the ones lacking this charge. As a result, they make poor predictions when again confronted with a similarly mixed set of stimuli.

The second major area in which neuroeconomics has provided important new insights is pattern recognition. As Huettel, Mack and McCarty note (in their introduction to the special neuroscience issue of Nature magazine), humans evolved an ability to recognize patterns in order to enhance their survival fitness. For example, the ability to recognize patterns helps to

spot both danger and food. Other cognitive psychology researchers have shown how we tend to perceive the patterns we expect to see; that is, our perceptual ability is a function of the patterns we have already stored in our memory (known as "recognition schema"). As Richards Heuer notes in his book The Psychology of Intelligence Analysis, "events consistent with our expectations are perceived and processed easily, while events that contradict prevailing expectations tend to be either ignored or distorted in perception." Others have pointed out that it is a superior ability to recognize patterns that typically distinguishes experts from novices in many fields. However, they have also noted that this comes at a cost: experts also tend to use existing schemas to intepret new information, which sometimes leads to their being taken by surprise by the cumulative impact of gradual changes.

What is more interesting, however, is that neuroscientists have discovered that our tendency to look for patterns is not completely under conscious control; to a significant degree it happens automatically. For example, in one experiment cited by Huettel, Mack and McCarty, test subject's brains showed signs of pattern recognition even when they had explicitly been told that the images they were viewing were randomly generated. Apparently, we have a natural tendency to see patterns (if only at a subconscious level) even when we rationally know they are not present.

This is important because, like strong stimuli, the recognition of a pattern can trigger a series of physiological responses. For example, while it has been shown that people find it much easier to recognize a simple repeating pattern than an alternating one, Samuel McClure (in "Reward Prediction Errors in the Human Brain") found that rewards delivered in an unpredictable sequence produce a much stronger physiological response (which the author concludes is a fundamental reason we are willing to take risks). In related research, Brieter, Aharon, Kahneman, et al (in their paper "Functional Imaging of Neural Responses to Expecting and Experience of Monetary Gains and Losses") found that once a person has experienced a pattern that has produced a reward, just the subsequent recognition of the pattern will cause dopamine to be produced in anticipation of the expected reward. And if that reward is not forthcoming, the physiological reaction is swift and severe, producing a shutdown of dopamine production, a rise in adrenaline, and a spike in anxiety. Finally, these

findings align quite closely with those in another recent paper, "Momentum Trading and Disposition Effects in Financial Decision Making" by Svendsater, Karlsson, Garling. These authors found that "trends in price movements may have more explanatory value than the actual time horizons over which they occur…a continuing trend in share prices results in conceptually different investor behavior than when the price trend has been reversed."

The findings emerging from the study of neuroeconomics also have important implications for the debate over the relative merits of indexing versus active investment management. We know that successful active management fundamentally requests on superior forecasting ability. It seems inarguable that superior cognitive processing ability on the part of the active manager must play a key role in the generation of superior forecasts. The findings emerging from neuroeconomics, however, suggest that superior cognitive processing ability must be quite rare. For example, the value an investor places on a stock may well be a function not just of economic factors, but also of the anticipated emotional rewards he or she will experience if it rises in price. In their paper "Optimal Expectations", Brunnermeier and Parker conclude that this probably produces overoptimism in many investors. Alternatively, consider what happens when an active manager encounters a set of circumstances that have produced a strong negative emotional response in the past (e.g., the loss of accounts during a market downturn). Or, consider what happens when a predictable sequence of events (say, a series of accurate forecasts, or, alternatively, rising profits based on momentum buying) is disrupted. At the physiological level, we know that dopamine production drops, and adrenaline production rises, producing anxiety. We also know that a rise in anxiety is accompanied by a number of other predictable effects. The first is a narrowing of focus (also known as "tunneling"), as attention is focused on a smaller number of cues. The second is a shortening of a person's self-perceived time horizon (also known as "myopia"). And the third is a rise in risk aversion (see the paper "Individual Differences in Risk Aversion and Anxiety" by Eisenberg, Baron, and Seligman). To put it mildly, these are not circumstances ideally suited to the production of superior forecasts and successful active management.

On the other hand, the emerging findings from neuroeconomics suggest that maintaining a consistent long-term asset allocation policy (including target asset class weights and

rebalancing strategy) and using index funds to implement it can help one to escape the mental traps that are the byproduct of our evolutionary history. Once again, the burden of proof in this argument would seem to lie heavily on the shoulders of those who advocate active investment management.

Product and Strategy Notes

IMF World Economic Outlook Released

In late April, the International Monetary Fund released its semi-annual Economic Outlook. It makes interesting reading, and is in line with our own views. The Outlook notes that "in the second half of 2003, global GDP growth averaged nearly 6 percent at an annualized rate, the highest since late 1999. While this was in part due to one-off factors—notably a surge in consumption in the United States due to the short-term impact of tax cuts and mortgage refinancing, and the rebound from the slowdown related to Severe Acute Respiratory Syndrome (SARS) in Asia—recent data suggest that global GDP growth has remained solid in early 2004. While a recovery now appears under way in all regions, its pace and nature vary significantly. To date, the upturn is most rapid in emerging Asia, particularly China, and the United States; it is least well-established in the euro area, where consumption remains weak and some key forward-looking indicators have fallen back or moved sideways in recent months. Differences in the strength of domestic demand, with respect to both consumption and investment, are particularly noticeable. Among the industrial countries, domestic demand is generally strongest in those countries with the largest current account deficits, so that the recovery is tending to exacerbate underlying imbalances…

The U.S. dollar has depreciated 16.5% from its peak in February, 2002. To date, the adjustment has been relatively orderly, with little sign of stress in other financial markets, and volatility in currency markets is close to historical norms. However, the distribution of corresponding appreciations across countries and regions has remained uneven, focused primarily on the euro and a number of other industrial country currencies…Notwithstanding

the deterioration in fiscal positions, long-run interest rates remain unusually low by historical standards…

The increasingly rapid global recovery, combined with currency developments, has also fed through to commodity prices…A significant portion of [their] increase appears to reflect the depreciation of the U.S. dollar…The remainder is due to higher-than-expected demand, particularly in the United States and China…

[Looking ahead] "in industrial countries, the recovery is projected to be strongest in the United States…With the impact of past fiscal and monetary stimulus waning during 2004, much will depend on continued solid investment growth and a sustained pickup in employment. In the euro area, the recovery remains subdued; while there are signs of a pickup in fixed investment, household consumption remains weak…downside risk remains, and much continues to depend on external demand…In Japan, GDP growth has continued to exceed expectations, with strong external demand -- notably from China -- accompanied by rising investment and latterly a pickup in consumption…[However], deflation and corporate and banking system weaknesses remain concerns. In both Europe and Japan, a further sharp currency appreciation would be a key short-term risk….

The global economy continues to face significant risks, some of which have been exacerbated by the proactive policy stance required in the last few years…It is not impossible that a number of these risks could have near-term consequences, both for financial markets and the real economy…The continued large current account deficit in the United States -- matched by a fiscal deficit of a similar size -- and surpluses elsewhere, notably in Asia, remain a serious concern…First, as historical experience attests, even an orderly current account adjustment in the United States would likely be associated with a slowdown in GDP growth, as U.S. national savings rises and/or investment falls, especially if growth were not to pick up in the rest of the world. Second, a more disorderly adjustment -- including abrupt movements in exchange rates -- cannot be ruled out. This would have significantly more serious consequences, with potential spillovers into other financial markets, including higher U.S. interest rates….In a low interest rate environment there is a danger that asset prices, which

have already rebounded substantially, could get ahead of [improvements in] the fundamentals, and that future interest rate rises -- especially if abrupt or unexpected -- could lead to financial market volatility and possibly adversely affect the recovery. This is a particular concern in countries with buoyant property markets, including the United Kingdom, Australia, Ireland and Spain, and to a lesser degree the United States and New Zealand….

Medium term fiscal positions across the globe remain very difficult…At present, the constellation of policies across the major countries and regions does not appear fully consistent with an orderly adjustment over the medium term…Key elements of such a strategy should include a credible plan by the United States to restore budgetary balance over the medium term; stepping up the pace of structural reforms in the euro area; further banking and corporate sector reforms in Japan; and a gradual shift toward more exchange rate flexibility in most of emerging Asia, combined with additional structural reforms to support domestic demand."

European Equity Indexes

With more European indexes being introduced all the time, we thought it would be useful to compare and contrast the ones that exist today. We will look at those produced by four major index suppliers: FTSE, Morgan Stanley Capital International (MSCI), Standard and Poor's, and STOXX, which is a joint venture of Dow Jones, the Swiss Exchange, and Deutsche Borse AG.

FTSE Indexes

The FTSE All World Europe Index is a subset of the FTSE All World. Like the latter, the FTSE Europe includes large and mid cap companies which represent 90% of the market's total capitalization. FTSE also produces a separate Global Small Cap Index.

At the end of 2003, there were 484 companies in the FTSE Europe Index. On a country basis, the FTSE Europe Index was weighted as follows:

Country	Weight
UK	35.67%
France	14.39%
Germany	10.17%
Switzerland	10.13%
Netherlands	7.22%
Italy	5.85%
Spain	5.39%
Sweden	3.29%
Finland	1.99%
Belgium/Luxembourg	1.40%
Denmark	.98%
Ireland	.92%
Norway	.66%
Greece	.62%
Portugal	.55%
Austria	.24%

The FTSE, DowJones, and Russell Indexes use the same approach to classifying companies by industry (Standard and Poor's and MSCI share a similar system). At the end of 2003, the FTSE Europe had the following industry weights:

Industry	Weight
Financials	29.51%
Non-cyclical Consumer Goods	17.71%
Resources	12.18%
Non-cyclical Services	11.12%
Cyclical Services	7.86%
Basic Industries	5.17%
Utilities	4.67%
General Industrials	4.35%
Information Technology	4.04%
Cyclical Consumer Goods	3.39%

FTSE produces a number of sub-indexes that are derived from the FTSE Europe universe. At a broad based level (aiming for 90% free-float weighted market capitalization coverage), these include the FTSE Eurobloc (covering the Eurozone) and UK indexes.

FTSE also offers other indexes. The FTSE Eurotop 300 Index includes the top companies in the FTSE Europe ranked by market capitalization. At the end of December, 2003, the Eurotop 300 accounted for approximately 93% of the FTSE Europe's market capitalization. The Eurotop 100 contained an even smaller set of highly liquid, large cap shares. At the end of 2003, it accounted for approximately 70% of the FTSE Europe's market capitalization.

More recently, FTSE and Euronext (a stock exchange) have introduced two new indexes designed to be very liquid and to facilitate derivatives trading. The Eurofirst 80 includes 80 of the most liquid companies in the Eurozone; the Eurofirst 100 contains liquid companies from the Eurozone plus the UK.

MSCI Indexes

Morgan Stanley Capital International's Europe Index is widely used by institutional investors. Like MSCI's other broad indexes, it aims to capture 85% of free-float weighted market capitalization. The MSCI Europe Index covers the same 16 countries as the FTSE Europe. MSCI also offers sub-indexes, which include the EMU (Eurozone) Index, and a U.K. Index. Finally, MSCI also offers indexes which include just the largest and most liquid companies. The MSCI Pan-Euro Index aims to capture 90% of the market capitalization of the MSCI Europe Index, while the MSCI Euro Index aims to capture 90% of the market capitalization of the MSCI EMU Index.

Standard and Poor's Indexes

Standard and Poor's main European index is the S&P Europe 350, which is a subset of S&P's Global 1200 Index. The 350 companies included in the index are chosen by the S&P Index Committee on the basis of their representation of overall country and industry weights, as well as their liquidity, and ease of replication by index fund sponsors. The 350 companies are selected from a universe which includes 95% of the aggregate market capitalization of the same 16 country markets covered by FTSE and MSCI. At the end of 2003, the S&P 350's country weights were as follows:

Country	Weight
UK	38.04%
France	13.75%
Germany	10.38%
Switzerland	10.26%
Netherlands	7.59%
Italy	5.37%
Spain	5.29%
Sweden	2.97%
Finland	1.97%
Belgium/Luxembourg	1.58%
Ireland	.88%
Denmark	.77%
Portugal	.58%
Norway	.36%
Greece	.19%
Austria	.04%

By industry sector, the breakdown was as follows:

Industry	Weight
Financials	28.7%
Energy	11.4%
Health Care	10.3%
Consumer Staples	9.9%
Consumer Discretionary	9.7%
Telecomm Services	8.9%
Industrials	6.2%
Basic Materials	6.0%
Utilities	4.5%
Information Technology	4.3%

S&P also offers sub-indexes, including the S&P Euro (Eurozone), the EuroPlus (Eurozone plus Sweden, Switzerland, Norway and Denmark), and the S&P UK.

STOXX Indexes

Conceptually, an equity market index can aim to include either a fixed percentage of total market capitalization, or a fixed number of companies. STOXX Indexes are (somewhat confusingly) based on both approaches.

The STOXX Total Market Europe Index uses the same methodology that Dow Jones uses elsewhere in the world (which, I might add, we admire). The STOXX TMI includes 95% of the total market capitalization in the same 16 country universe used by FTSE, MSCI, and S&P. The STOXX TMI's 95% is further broken down by size, so that companies comprising the top 70% of total market capitalization are included in the TMI large cap index; companies comprising the next 20% of market capitalization make up the TMI midcap index, and companies comprising the next 5% of total market capitalization make up the TMI small cap index. STOXX sub-indexes include EURO STOXX (Eurozone), STOXX ex-UK, and STOXX Nordic (Denmark, Finland, Norway and Sweden).

In contrast to the TMI, the STOXX 600 Index includes the top 600 companies (ranked by market capitalization) in the 16 country region. Its total market cap equals about 95% of the TMI's market cap. Within the 600 companies, the top 200 companies make up the STOXX 600 Large Cap (which cover about 80% of the 600's market cap), the next 200 make up the STOXX 600 MidCap (14% of the 600's market cap), and the smallest 200 of the 600 make up the STOXX 600 Small Cap Index (6% of the 600's market cap).

The STOXX 600 Index also has sub-indexes covering the Eurozone, Nordic Countries, and Europe ex-UK. It also has a number of smaller, more liquid sub-indexes designed to facilitate derivatives trading. The STOXX 50 covers about 60% of the total market capitalization of the STOXX 600. The EURO STOXX 50 has a similar objective with respect to companies included in the Eurozone sub-index.

Comparative Returns

For the 12 months ended 31 March, 2004, the FTSE Europe had returned 34.16% (in Euro, on a price return basis), the MSCI Europe, 33.19%; the S&P Europe 350, 32.90%; the STOXX 50, 26.89%; the STOXX 600 34.11%; and the STOXX Total Market Index 35.11%. The story here is quite straightforward: over the last twelve months, small caps substantially outperformed large caps. As a result, different indexes' performance over this period was

proportional to the percentage of total market capitalization that they cover. This in turn leads to our conclusion about the index we prefer. Given that our goal is to identify the index that best represents European equities as an asset class, our preference is for either the FTSE Europe or the STOXX Europe TMI which cover, respectively, 90% and 95% of the 16 countries' total market capitalization.

Growth and Value Sub-Indexes

All four of the index providers we've examined also offer growth and value sub-sets of their respective indexes. S&P uses a single factor -- price to book value -- to split its universe of companies into two equal groups. Companies with the highest price to book ratios go to the growth index, while those with the lower ones go to the value index. In contrast, FTSE and MSCI both use multiple factors to assess the extent to which companies belong in either the growth or value index. Like S&P, one hundred percent of the market capitalization of the overall index is assigned to the growth or the value index. However, unlike S&P, companies whose rating on different indicators produces conflicting results (i.e., indicating growth on one, but value on another) can have their market capitalization split between the two sub-indexes. Finally, STOXX uses the Dow Jones methodology. This also employs a multi-factor model to classify companies as growth or value; however, rather than including all companies in the sub-indexes, it includes only those for which all indicators point to one classification or the other. If there are confusing signals, the company in question is not assigned to the growth or value sub-index. Dow Jones argues that this results in purer style indexes -- that is, ones that are likely to deliver relatively higher results than their peers when their investment style is in favor. Another way to look at this is that if you subtract the difference in returns between different growth and value style indexes, the gap is likely to be larger in the case of the Dow Jones indexes than it is in the case of their competitors.

An Example of Different Optimization Model Results

We have often written about how different methodologies produce different asset allocation recommendations. This month, we'd like to illustrate this point with an example. Let's start with an investor who can choose from only four asset classes -- U.S. real return bonds, U.S. bonds, U.S. equity, and Non-U.S. developed country equity (e.g., the EAFE Index). Let's further assume that the investor's goal is to maximize his or her probability of achieving a six percent compound annual real rate of return over ten years. Finally, let's assume that our investor also wants to be at least 95 percent confident that he or she will earn a compound rate of return of at least zero percent over this period -- that is, they want to be 95 percent sure they won't lose their capital.

Now let's look at the solutions different asset allocation methodologies would produce. In our analysis, we limited foreign equity to a maximum of 35% of the model portfolio. Our expected real returns for each asset class were a weighted combination of 67% times the average historical return between 1971 and 2002, and 33% times our estimate of future returns (for more on these assumptions see our May through August, 2003 issues). We also used historical standard deviations (again for 1971-2002), and return correlations from 1994 to 2003. Possible asset allocations were adjusted in 5% increments to reduce the time required to run the optimization, and to make them easier for our investor to use.

A traditional mean/variance optimization model either minimizes risk (defined as standard deviation) for a given level of expected annual return, or maximizes annual return for given level of risk. For a target annual return of 6%, it produces an allocation of 30% to domestic bonds, 65% to domestic equities, and 5% to foreign equities. The probability that this asset mix would achieve the compound real return target in year ten was 44 percent (where standard deviation is greater than zero, the compound return over a period longer than one year will be lower than the annual return). The probability that it would produce a compound real return of zero or greater in year ten was 93 percent. Over 10,000 different simulations, the lowest compound annual ten-year return it produced was (7.7%).

A variation of the traditional mean/variance approach maximizes the ratio of annual portfolio return less the target return to the portfolio's standard deviation of returns (this is also known as the "safety first model"). This methodology results in a 100% allocation to domestic equities. The probability that this asset mix would achieve the compound real return target in year ten was 48 percent. The probability that it would produce a compound real return of zero or greater in year ten was 87 percent. Over 10,000 different simulations, the lowest compound annual ten-year return it produced was (16.5%).

Finally, our simulation optimization approach (for details, see the blue button labeled "methodology summary" on our home page) is the only one that explicitly takes both of the investor's goals into account. That is, it directly focuses on the six percent long term compound annual rate of return, and on the requirement that 95 percent of the time the allocation produce a compound rate of return of zero or more. The simulation optimization model produces an allocation of 5% to real return bonds, 30% to domestic bonds, 50% to domestic equities, and 15% to foreign equities. The probability that this asset mix would achieve the compound real return target in year ten was 41 percent. The probability that it would produce a compound real return of zero or greater in year ten was 95 percent. Over 10,000 different simulations, the lowest compound annual ten-year return it produced was (5.8%).

Finally, our approach so far has excluded three asset classes that, in our asset allocation studies, we have found to provide substantial diversification benefits: foreign currency bonds, commercial property, and commodities, as well as emerging markets equity, which can be used to increase a portfolio's expected return. The impact of this lack of diversification opportunities is significant. When we added these to the possible asset classes in our simulation optimization model, (with foreign currency bonds limited to a maximum weight of 35%, and commercial property, commodities and emerging markets equity to a maximum weight of 20% each), the probability of achieving the target return rose to 68% -- a substantial improvement over the 41% probability we achieved when using only four asset classes.

Model Portfolio Performance

These portfolios seek to maximize return while matching their benchmark's risk (standard deviation)			
	YTD 30Apr04	**Weight**	Weighted Return
	In A$		In A$
High Risk Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.4%	**80%**	**1.2%**
Australian Bonds	-3.2%	**20%**	**-0.6%**
		100%	**0.5%**
Global Benchmark			
U.S. Equity	3.7%	**40%**	**1.5%**
Non-U.S. Equity	5.3%	**40%**	**2.1%**
U.S. Bonds	4.0%	**10%**	**0.4%**
Non-U.S. Bonds	5.3%	**10%**	**0.5%**
		100%	**4.6%**
Recommended			
Australian Equity	1.4%	**30%**	**0.4%**
Foreign Equity (US)	3.7%	**23%**	**0.9%**
Foreign Equity (EAFE)	5.5%	**18%**	**1.0%**
Australian Bonds	-3.2%	**19%**	**-0.6%**
Commodities	13.4%	**10%**	**1.3%**
		100%	**3.0%**

These portfolios seek to maximize return while matching their benchmark's risk (standard deviation)			
	YTD 30Apr04	**Weight**	Weighted Return
	In A$		In A$
Medium Risk Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.4%	**60%**	**0.9%**
Australian Bonds	-3.2%	**40%**	**-1.3%**
		100%	**-0.4%**
Global Benchmark			
U.S. Equity	3.7%	**30%**	**1.1%**
Non-U.S. Equity	5.3%	**30%**	**1.6%**
U.S. Bonds	4.0%	**20%**	**0.8%**
Non-U.S. Bonds	5.3%	**20%**	**1.1%**
		100%	**4.6%**
Recommended			
Australian Equity	1.4%	**25%**	**0.4%**
Foreign Equity (US)	3.7%	**14%**	**0.5%**
Australian Bonds	-3.2%	**40%**	**-1.3%**
Commodities	13.4%	**10%**	**1.3%**
Foreign Equity (EAFE)	5.5%	**11%**	**0.6%**
		100%	**1.6%**

These portfolios seek to maximize return while matching their benchmark's risk (standard deviation)			
	YTD 30Apr04	**Weight**	**Weighted Return**
	In A$		In A$
Low Risk Portfolio			
With suggested US Index Funds			
Australia Benchmark			
Australian Equity	1.4%	**20%**	**0.3%**
Australian Bonds	-3.2%	**80%**	**-2.5%**
		100%	**-2.2%**
Global Benchmark			
Foreign Equity (US)	3.7%	**10%**	**0.4%**
Non-U.S. Equity	5.3%	**10%**	**0.5%**
U.S. Bonds	4.0%	**40%**	**1.6%**
Non-U.S. Bonds	5.3%	**40%**	**2.1%**
		100%	**4.7%**
Recommended			
Australian Equity	1.4%	**10%**	**0.1%**
Foreign Equity (US)	3.7%	**8%**	**0.3%**
Australian Bonds	-3.2%	**60%**	**-1.9%**
Global Bonds	2.4%	**8%**	**0.2%**
Foreign Equity (EAFE)	5.5%	**7%**	**0.4%**
Commodities	13.4%	**7%**	**0.9%**
		100%	**0.1%**
Global Bond Index = 50% US$ plus 50% Non-US$ Bonds			

These portfolios seek to minimize risk while matching their benchmark's returns.			
	YTD 30Apr04	**Weight**	**Weighted Return**
	In A$		In A$
High Return Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.4%	**80%**	**1.2%**
Australian Bonds	-3.2%	**20%**	**-0.6%**
		100%	**0.5%**
Global Benchmark			
U.S. Equity	3.7%	**40%**	**1.5%**
Non-U.S. Equity	5.3%	**40%**	**2.1%**
U.S. Bonds	4.0%	**10%**	**0.4%**
Non-U.S. Bonds	5.3%	**10%**	**0.5%**
		100%	**4.6%**
Recommended			
Australian Equity	1.4%	**11%**	**0.2%**
Foreign Equity (US)	3.7%	**19%**	**0.7%**
Australian Bonds	-3.2%	**45%**	**-1.4%**
Foreign Equity (EAFE)	5.5%	**15%**	**0.8%**
Commodities	13.4%	**10%**	**1.3%**
		100%	**1.6%**

These portfolios seek to minimize risk while matching their benchmark's returns.			
	YTD 30Apr04	**Weight**	**Weighted Return**
	In A$		In A$
Medium Return Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.4%	60.0%	0.9%
Australian Bonds	-3.2%	40.0%	-1.3%
		100%	-0.4%
Global Benchmark			
U.S. Equity	3.7%	30%	1.1%
Non-U.S. Equity	5.3%	30%	1.6%
U.S. Bonds	4.0%	20%	0.8%
Non-U.S. Bonds	5.3%	20%	1.1%
		100%	4.6%
Recommended			
Australian Equity	1.4%	10%	0.1%
Foreign Equity (US)	3.7%	7%	0.3%
Foreign Equity (EAFE)	5.5%	5%	0.3%
Australian Bonds	-3.2%	60%	-1.9%
Global Bonds	2.4%	13%	0.3%
Commodities	13.4%	5%	0.7%
		100%	**-0.2%**

These portfolios seek to minimize risk while matching their benchmark's returns.			
	YTD 30Apr04	**Weight**	**Weighted Return**
	In A$		In A$
Low Return Portfolio			
Asset Classes			
Australia Benchmark			
Australian Equity	1.4%	20.0%	0.3%
Australian Bonds	-3.2%	80.0%	-2.5%
		100%	-2.2%
Global Benchmark			
U.S. Equity	3.7%	10.0%	0.4%
Non-U.S. Equity	5.3%	10.0%	0.5%
U.S. Bonds	4.0%	40.0%	1.6%
Non-U.S. Bonds	5.3%	40.0%	2.1%
		100%	4.7%
Recommended			
Australian Equity	1.4%	12.0%	0.2%
Emerging Mkt Equity	3.3%	3.0%	0.1%
Australian Bonds	-3.2%	60.0%	-1.9%
Global Bonds	2.4%	25.0%	0.6%
		100%	**-1.0%**
Global Bond Index = 50% US$ plus 50% Non-US$ Bonds			

	YTD 30Apr04	Weight	Weighted Return
	In A$		In A$
3% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.8%	56%	**1.6%**
Australian Bonds	-3.2%	10%	**-0.3%**
Global Bonds	2.4%	7%	**0.2%**
Commercial Property	9.1%	0%	**0.0%**
Commodities	13.4%	12%	**1.6%**
Australian Equity	1.4%	5%	**0.1%**
Foreign Equity (USA)	3.7%	6%	**0.2%**
Foreign Equity (EAFE)	5.5%	4%	**0.2%**
Emerging Equity	3.3%	0%	**0.0%**
Hedge Funds	5.5%	0%	**0.0%**
		100%	**3.6%**

These portfolios seek to maximize the probability of achieving at least the target real return over twenty years, at the lowest possible risk.		***Unlike the other target real return portfolios, these allow investment in a hedge fund index.***	
	YTD 27Feb04	**Weight**	**Weighted Return**
	In A$		In A$
7% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.8%	0%	**0.0%**
Australian Bonds	0.6%	2%	**0.0%**
Global Bonds	-1.8%	7%	**-0.1%**
Commercial Property	7.1%	15%	**1.1%**
Commodities	9.0%	8%	**0.7%**
Australian Equity	1.7%	21%	**0.3%**
Foreign Equity (USA)	0.9%	15%	**0.1%**
Foreign Equity (EAFE)	1.0%	12%	**0.1%**
Emerging Equity	4.7%	15%	**0.7%**
Hedge Funds	-0.7%	5%	**0.0%**
		100%	**2.9%**
	YTD 27Feb04	**Weight**	**Weighted Return**
	In A$		In A$
5% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.8%	0%	**0.0%**
Australian Bonds	0.6%	8%	**0.0%**
Global Bonds	-1.8%	10%	**-0.2%**
Commercial Property	7.1%	12%	**0.9%**
Commodities	9.0%	12%	**1.1%**
Australian Equity	1.7%	25%	**0.4%**
Foreign Equity (USA)	0.9%	13%	**0.1%**
Foreign Equity (EAFE)	1.0%	10%	**0.1%**
Emerging Equity	4.7%	8%	**0.4%**
Hedge Funds	-0.7%	2%	**0.0%**
		100%	**2.8%**

	YTD 30Apr04	Weight	Weighted Return
	In A$		In A$
3% Target Real Return	*YTD Returns are Nominal*		
Asset Classes			
Australian Real Return Bonds	2.8%	65%	**1.8%**
Australian Bonds	-3.2%	5%	**-0.2%**
Global Bonds	2.4%	3%	**0.1%**
Commercial Property	9.1%	4%	**0.4%**
Commodities	13.4%	5%	**0.7%**
Australian Equity	1.4%	3%	**0.0%**
Foreign Equity (USA)	3.7%	7%	**0.3%**
Foreign Equity (EAFE)	5.5%	6%	**0.3%**
Emerging Equity	3.3%	0%	**0.0%**
Hedge Funds	5.5%	2%	**0.1%**
		100%	**3.5%**